Effect of Selected Contaminants in Air Conditioning and **Refrigeration Equipment**

Final Report

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EXECUTIVE SUMMARY

The intent of this study was to investigate the effects of air, water, organic acid, and refrigerant contaminants on compressor wear, durability, and longevity. A statistical analysis determined that meaningful results would be produced by running 128 compressors charged with one of four chosen refrigerants at high and low temperatures contaminated in various combinations with 200 ppm water, 0.1 total acid number (TAN), 4% (v/v) air, and 4% (w/w) refrigerant. The refrigerants studied were R-507A, R-407C, R-22, and R-134a. R-507A compressors were contaminated with R-502, R-407C units with R-22, and R-134a machines with R-12. The R-22 compressors did not include a refrigerant contaminant. Sixteen compressors were added as controls, bringing the total number studied to 144.

A glass sealed tube stability study was performed at the same time using the same refrigerants, lubricants, and contaminants as the compressors at 135°C (275°F) and 165°C (329°F). The glass sealed tube stability study provided a visual example of the occurrences inside the running compressors.

Conclusions Drawn from Sealed Tube Visual Observations

System	System Temperature					
Refrigerant	135°C (275°F)	165°C (329°F)				
R-507A (<u>Appendix I</u>)	 Acid corrodes copper in gas phase. Air generates precipitate. 	 Acid corrodes copper in gas phase and corrodes valve steel. Air generates precipitate. 				
R-407C (Appendix J)	 Air corrodes valve steel and generates precipitate. Water, acid, and R-22 corrode copper. 	 Air generates precipitate. Water, acid, and R-22 corrode valve steel. 				
R-22* (Appendix K)	Air corrodes all metals and generates precipitate.	Air corrodes all metals and generates precipitate.				
R-134a (<u>Appendix L</u>)	 Water and acid corrode copper. Acid and air generate precipitate. 	• Air generates precipitate.				

^{*} The R-22 system generated significantly more corrosion than others did.

A final statistical analysis was performed based on a database compiled from visual observations and chemical analysis of the compressors torn down after 12,000 hours running

time. A complete photographic history was also compiled for each compressor's main components. (See Appendix A)

Based on the statistical analysis, R-507A and R-22 were associated with a higher percentage of abnormal machines than R-407C and R-134a. Suniso 3GS was associated with a substantially higher number of abnormal machines than RL32S. Machines that had contaminant acid, air, and water added were declared abnormal far more than control machines. Performance of machines that had refrigerant added as a contaminant was mixed; some machines were worse than controls, others were better. Discharge pressure tended to be lower for outcome variables that were declared normal. Suction pressure tended to be higher for outcome variables that were declared normal. Discharge, return gas, and sump temperatures tended to be lower for outcome variables that were declared normal.

In conclusion, this comprehensive study indeed proves that low levels of water, organic acid, and especially air contribute to the degradation of compressor performance and compressor life. The sealed tube tests at two different temperatures and duration also clearly identified the corrosive effects of water and organic acid, but most importantly showed that the presence of air accelerates refrigerant and lubricant decomposition. Clearly, the lubricant type plays an extraordinary role in tolerance to contaminant levels. Polyolesters are significantly more susceptible to water and the presence of air. This is clearly shown by both the compressor and sealed tube studies.

All of the R-22 compressor test units survived the duration of the study and contained contaminants identical to the other HFC machines. The primary difference was that the R-22 units were a chlorinated refrigerant lubricated with a mineral oil, whereas the HFC machines were lubricated with a polyolester.

Bear in mind that all of the test stands were operated without any kind of contaminant control such as a filter drier or some component in the liquid line prior to the expansion valve. The results reported for compressor can bottom residue, trash in the in-line screen, and residue in the expansion valve could possibly have been eliminated with a filter drier.

The type and construction of the filter drier is an important concept to keep in mind, but more importantly is the contaminant needing to be trapped by the drier. Solid debris, water, acids, and varnish causing issues can be effectively controlled. Therefore, reactive components and solid debris can be retained. What cannot be retained in a filter drier is circulating air

contamination. As evidenced in the sealed tube testing, air is consumed, producing carbon monoxide and carbon dioxide, as well as increasing organic acid content. Naturally, a filter drier equipped to handle quantities of organic acid would be superior. In mineral oil and R-22 systems, air has less of a negative effect and the traditional use of drying-only filter driers may be ideal. In fact, R-22 test stands also show the tolerance of contaminants with chlorinated mineral oil systems.

Finally, organic acid contaminants can be formed *in situ* with the presence of water. The presence of water is shown to be a negative factor in lubrication as well. Friction and wear are attributed to increased acid content in some machines. The inclusion of air in HFC and polyolester systems should be considered the most serious of contaminants. Circulating levels of air in new systems should be kept at lower levels than recommended in current industry guidelines.

INTRODUCTION

Historically, the Air Conditioning and Refrigeration (AC&R) industry has produced a highly reliable product. This success story is attributable to effective common sense and the realization that a quality product requires the use of reliable components and quality manufacturing practices to minimize ambient contaminants.

AC&R systems must be free of contaminants. Contaminants can be solids, liquids, or gasses. Concentrations can range from mere traces of reactive process fluids to process fluids that cause a reaction with lubricants and refrigerants resulting in chemical reactions that produce harmful materials. Traditionally, the refrigerants used were chlorofluorocarbons (CFCs) or hydrochlorofluorocarbons (HCFCs) and included major use refrigerants such as R-12 and R-22 and some blends of these materials. Harmful contaminant materials can range from very dilute amounts of gaseous hydrochloric (HCl) or hydrofluoric (HF) acids obtained from refrigerant decomposition or other refrigerant decomposition intermediates.

AC&R systems also need to be dry. The use of CFCs and HCFCs traditionally require the moisture limits to be less than 50-60 ppm since the presence of moisture will hydrolyze these refrigerants. In wet systems, the formation of HCl can have negative results from iron corrosion caused by trace amounts of ferric chloride and cuprous chloride. Solution of copper salts in mineral oils with CFCs and HCFCs help promote copper plating in addition to other mechanisms.

Nearly a decade ago, The Montreal Protocol established the elimination of CFC and HCFC refrigerants and ushered in hydrofluorocarbons (HFCs) in an attempt to minimize the destruction of the ozone layer. Still using traditional strategies, the AC&R industry moved to maintain the same physical properties of compressor and system lubrication by selecting miscible lubricants with these refrigerants. The use of HFCs with mineral oils is an immiscible combination, but is not necessarily incompatible with the hermetic systems.

The miscible lubricant class chosen for use with HFCs is polyolesters of the pentaerythritol variety and is available in all the required viscosity and miscibility ranges for compressor lubrication. Like the chlorinated refrigerants, polyolester lubricants can be partially hydrolyzed by water forming various levels of carboxylic acids. Unlike HCl or HF, carboxylic acids are considered weak acids under all conditions. However, when a hermetic system is dry, below 50 ppm moisture, HCl, HF, and carboxylic acids are essentially unionized and can be

unreactive toward metal surfaces. However, one of the unique features of a carboxylic acid is its ability to form soluble metal carboxylates that can circulate in a hermetic system. Circulating metal carboxylates can clog capillary tubes, hence very dry systems are required.

Therefore, whether the AC&R industry produces hermetic systems with CFC, HCFC, or HFC refrigerants, with mineral or polyolester lubrication, the elimination of water as a contaminant is essential. Doing so minimizes metal corrosion, the circulation of refrigerant-insoluble metal salts, metals erosion, and plugged expansion devices, such as capillary tubes and refrigerant metering valves.

Refrigerant producers were quick to realize that CFCs and HCFCs produced and packaged with levels of non-condensable gasses (NCGs) above 1.5% of the vapor volume can cause false high pressures and hydrocarbon oxidation, as well as other disruptive products.

For refrigerant manufacturers, the ARI 700 refrigerant specification was established as a means of monitoring the quality of a refrigerant. Typically, refrigerant is produced at lower levels of NCGs. With the advent of alternatives and replacements, refrigerant chemical companies want to produce the best available product in order to maintain a positive reputation in the AC&R industry.

Air, the other ambient contaminant, is frequently overlooked as a reactive component. Air is taught to be a non-condensable gas and its entrapment in the condenser causes a reduction in the efficiency of the refrigeration system. However, air contains oxygen and trapped oxygen will provide a mechanism for an oxidation reaction with lubricants, metals, and refrigerant decomposition products. Typically, however, the industry is taught to believe air causes higher discharge pressures and temperatures and hence reduced performance.

The known and readily available manufacturing procedure for removing NCGs and water from refrigerant hermetic systems is simply to apply a residual system vacuum of at least 100 millitorr. Manufacturing AC&R equipment at these vacuum levels ensures a free product free from any contaminant-induced failure.

There are two kinds of NCGs with which to be concerned: 1) Those that are pure unreactive nitrogen and 2) those that are principally air. Oxygen in air is a well known corrodant and in the presence of moisture can produce disastrous effects. Nitrogen, although inert, should not be present due to excessively high pressures within the system.

Existing CFC refrigeration systems use mineral oils and the internals of these old machines contain trace amounts of metallic chlorides and the chlorinated refrigerant. Generally, R-12 systems are retrofitted with R-134a and R-502 systems are retrofitted with either R-404A or R-507A. Theoretically, the remaining chlorinated refrigerant can be considered a contaminant and could interfere with long-term performance. Long-term controlled tests are needed to evaluate this potential failure mode.

The AC&R industry has been very successful in producing a highly reliable product because of modern technology. It is dangerous to deviate from what is known to be right. We know that having a dry system (10 to 15 ppm moisture) and introducing clean refrigerant from a liquid supply tank with less than 1.5 % of NCGs in the vapor phase of that tank provides for a reliable system. To rephrase, the ARI 700 refrigerant specification maintains that refrigerant is supplied with less than 1.5% v/v of air in the vapor space above the liquid refrigerant in the supply tank and that *not* all of the refrigerant has a minimum of 1.5% v/v air. This means that charging liquid refrigerant into a new system is essentially air free. Using refrigerants with higher levels of contaminants than specified in ARI Standard 700 is very risky. The risk comes from the fact that not all of the CFC, HCFC, or HFC refrigerants have the same air solubility characteristics and simply accepting the ARI-700 specification as a maximum of 1.5% v/v may not be good enough for HFC refrigerants.

BACKGROUND

Compressors selected for AC&R systems are qualified by the manufacturer for long term reliability, capacity, and electrical efficiency. Compressor information is traditionally supplied by the compressor manufacturer that tests their products for reliability at accelerated application conditions. These tests generally last 4000 hours and do not evaluate the effects of contaminants of water, NCGs, acid production, or refrigerant decomposition.

Materials selected for system and compressor construction and lubrication are traditionally tested by using the glass sealed tube test method. This method is a static comparative analytical approach and does not capture the effects of the long-term dynamic relationship found in compressors. Sealed tubes use material coupons that are immersed in compressor lubricant and refrigerant and are constructed scrupulously dry and without any non-condensable gasses or acids present.

This research work was designed to include a sealed tube comparative corrosion study using selected levels of contaminants at the same concentrations that were introduced into the compressors and the AC&R hot gas bypass test systems. Thomas (1993) described the impact of carboxylic acids, moisture, and air as the NCG. The refrigerants used by Thomas included HFC-32, HFC-125, and HFC-143a and most of the commonly used metals in AC&R systems. An earlier paper by DuPont (1992) also confirmed the adverse effects of added moisture and air to a sealed tube system using PAGs and HFC-134a.

To evaluate the temperature, pressure, and refrigerant effects, test stands were operated at two different discharge temperatures. The run time for the AC&R test stands was slated for 12,000 hours, representing at least five years of continuous service. Similarly, sealed tubes were also evaluated at two different temperatures for two different times to simulate the same amount of compressor life.

The concentration levels of contaminants introduced to the compressors were typical of a manufacturing error and at levels very close to recovered refrigerant. The organic acid level was 0.100 TAN, representing a typical off-spec lubricant. All of the test systems were first desiccated with molecular sieve desiccant to known water levels, the desiccants were removed, and water was added at a level typical of a poor evacuation or of system parts that were potentially damp due to atmospheric moisture. Air was added at 4% of the void volume of the test system. That is also a level typical of poor evacuation or a suction leak at charging fittings

with charging refrigerant specified at 1.5% v/v. Small amounts (4% w/w) of R-12, R-22, or R-502 was added to R-134a, R-407C, or R-507A respectively. That level is typical of a retrofit application using those refrigerants.

TEST STANDS

Hot Gas Bypass Test Stand Description

A statistical analysis was carried out in order to design an experiment that would produce statistically meaningful results. This analysis showed that meaningful results could be achieved using 128 compressors running with four different refrigerants and two levels each of four reactive contaminants at high and low temperatures ($4 \times 2^5 = 128$). Sixteen compressors would be added as pure controls, bringing the total number of compressors to 144. This number ensured that the investigation would have at least 32 observations per main effect and have a reasonable power to detect statistical significance if the main effect of the contaminant or refrigerant on outcome was of moderate size. In the test matrix on the following page, please note that R-22 had 12 controls since there was no contaminant gas, thereby providing additional baseline statistical significance.

In order to accommodate this large number of compressor tests, a test stand was devised that minimized physical space requirements while providing ease of control of the test stand conditions. The test stand for each compressor was built as a hot-gas bypass stand to allow for simple, effective control of a continuously running system (see Schematic). The entire stand has a footprint area of 2.5 square feet with a depth of 2.5 feet and a width of 1 foot. The maximum height of each stand is 16". The test stands were distributed on wooden benches built specifically for this purpose. These benches carried condenser water supply piping and all necessary electrical and signal wiring. Wika glycerin-filled analog pressure gauges were installed to measure discharge and suction pressures in psig. An elapsed time indicator was wired into each stand in such a manner that it could only run when the compressor was running so that an accurate total run-time could be established for each unit.

All compressors were manufactured by Copeland Corporation in Sydney, Ohio, and all compressors share a common date of manufacture. The compressors using R-22, R-507A, and R-407C were all model RS43C1E-CAV-250 with start and run capacitors having a nominal 0.54 Hp motor. The R-134a stands used model RS40C1E-IAV-250 compressors that were supplied with a start capacitor only and the same motor power. Each compressor was modified by the manufacturer to contain a threaded port in the side of the bottom shell. This modification was for installing an oil-sampling valve on each unit so that periodic sampling and analysis of the lubricant could be performed.

Test Matrix

		R-507A, R-407C, and R-134a (36 units per refrigerant = 108 units)				R-22 (36 units)		
Test number	4% other refrigerant (w/w)	Organic acid TAN (0.10 mg KOH/ g sample)	4% air by volume	moisture level (ppm)	Тетр	Organic acid TAN (0.10 mg KOH/ g sample)	4% air by volume	moisture level (ppm)
1		control		10		control 1		
2		control		10		control 10		
3		control		10	control			10
4	yes			10		cont	rol	200
5		yes		10		cont	rol	200
6	_	_	yes	10		cont	rol	200
7	yes	yes		10		yes	_	10
8	yes	yes	yes	10		yes		10
9	yes	_	yes	10	1. :1.	_	yes	10
10	_	yes	yes	10	high	_	yes	10
11	yes	_		200		yes	yes	10
12	_	yes		200		yes	yes	10
13		_	yes	200		yes		200
14	_		_	200		yes		200
15	yes	yes		200			yes	200
16	yes	yes	yes	200			yes	200
17	yes	_	yes	200		yes	yes	200
18		yes	yes	200		yes	yes	200
19		control		10		control		10
20		control		10		cont	rol	10
21		control		10		cont	10	
22	yes	_		10		cont	rol	200
23	_	yes		10		cont	rol	200
24	_	_	yes	10		cont	rol	200
25	yes	yes	_	10		yes		10
26	yes	yes	yes	10		yes		10
27	yes	_	yes	10	1	_	yes	10
28		yes	yes	10	low		yes	10
29	yes	_		200		yes	yes	10
30	_	yes		200		yes	yes	10
31	_	_	yes	200		yes		200
32	_	_		200		yes		200
33	yes	yes		200		_	yes	200
34	yes	yes	yes	200			yes	200
35	yes	_	yes	200		yes	yes	200
36		yes	yes	200		yes	yes	200

Each test stand was supplied with a water-cooled 1/3 ton counter-flow heat exchanger manufactured by Doucette Industries, Inc. (model #CX-H-033). Refrigerant flow is directed through the inner tube of the condenser and exits into a one pound liquid receiver manufactured by Refrigeration Research. Filter driers were not used. Coolant flow through the condenser is controlled by a water-regulating valve manufactured by Metrex Valve Co. This valve (model #840P-37-SE) uses an adjustable compression spring in opposition to a diaphragm that is exposed to compressor discharge pressure. The purpose of this valve is to regulate the condensing pressure by varying the flow of 13°C (55°F) inlet coolant to the condenser. Many of these valves had to be modified by installing springs of different spring constant in order to accommodate the discharge pressure in a particular system.

Liquid refrigerant leaving the receiver passes through a vertically mounted Sporlan SA-12 See-All sight glass with moisture indicator on its way to the mixing chamber. Before entering the mixing chamber, the liquid refrigerant is throttled by a constant pressure expansion valve manufactured by Parker Hannifin Corporation. This valve, a model A4, has a range of 5" Hg vacuum to 90 psig, and contains a 200 mesh inlet filter screen. The mixing chamber for each stand was bent in-house out of ½" OD copper tubing, with approximately ten bends total. The mixing chamber is approximately eight feet in length and the outlet to the return line is approximately three inches lower than the inlet and approximately seven inches above the lowest section of the mixing chamber. In addition to the water regulating valve and the expansion valve, a ¼" Parker right angle needle valve (part #2F-V2AN-B) was installed in the compressor discharge line, a few inches from the discharge port. This valve was used to meter hot gas from the discharge port to the inlet of the mixing chamber, downstream of the constant pressure expansion valve to provide hot-gas bypass control and return gas temperature. A valve was added to the process port of the compressor for adding contaminants and/or removing gas samples. This valve is referred to as the injection/sampling valve.

For compressor protection, all units were wired through Ranco pressure cutout switches (model #012-4834-000) that allowed for the setting of both high and low pressure trip points. The standard thermal cutout device was also installed on each compressor as shipped from the manufacturer. One 30A rated circuit breaker was assigned for every five compressors, and manual resets of five units at a time were required if 208VAC power was interrupted at any time (except for computer initiated shut-downs). The condenser coolant is an approximately 70%

water and 30% ethylene glycol mixture, by volume. This coolant was maintained at approximately 55°F by the main coolant chilling system in the test laboratory, which has more than sufficient capacity for 144 test stands. Numerous protection devices are installed to protect the test stands from loss or reduction of condenser coolant flow due to leaks, pump failure, electrical phase loss, or chilling system failure, all of which would result in the immediate shutdown of the test stands under computer control.

Data Acquisition and Control

A PC-based measurement and data collection system was devised to provide the monitoring and logging functions needed to maintain the test stands within operational limits while still remaining within budget constraints. The large number of test stands (up to 160) coupled with the constraints on compressor operating conditions and measured parameters indicated a definite need for some level of automation. The time required for a technician(s) to measure, record, and make adjustments to each test stand was not practical, and the cost of hiring a full time staff of technicians dedicated only to those tasks was prohibitive. At the same time, the cost to provide full measurement, logging, and control of each stand is also excessive when the cost of transducers, motorized valves, and associated electronics and programming is factored in. Instead, a compromise was achieved that fit within budget constraints while still providing critical data and reducing manpower requirements and technician workload.

Data Acquisition Requirements

A requirement for each test stand was that it run within a tight range of temperatures and pressures for the test life cycle and that each stand have sufficient controls to effect changes needed to maintain those conditions. Specifically, discharge, return gas, and sump temperatures needed to be measured, along with discharge and suction pressures. In addition, if any stand exceeded 121°C (250°F), it was to be shut off. Since relationships can be established between temperatures and pressures, a decision was made to automate the temperature measurements only. This allowed for the use of relatively inexpensive thermocouples while avoiding the high cost of pressure transducers and related hardware. Additionally, many data acquisition equipment vendors sell off-the-shelf equipment for thermocouple measurements that provide automatic calibration, signal conditioning, isolation, and cold junction compensation. Rather than automating the test stand controls, which would be extremely costly, the computer can alert

the technician as to which test stands require action based on system temperatures. Semiautomatic controls such as mechanical water regulating valves and constant pressure expansion valves could then be adjusted by the technician, who is aided by the presence of analog pressure gauges for discharge and return gas installed on each test stand. Also, the computer can log the data from each stand, average it on a daily basis, and present it to the technician, thus allowing trends to be observed. Lastly, limits can be set so that the computer may shut down a compressor that has exceeded those limits.

System Description

The system was based on a 386DX PC running DOS. The keyboard and monitor were placed on a mobile cart, and a keyboard/monitor extender was installed. This allowed the keyboard and monitor to be wheeled out to any test stand so that the technician could immediately observe temperature data as he makes adjustments to the stand. A 16 channel, 15 bit-resolution thermocouple and voltage input board from Keithley-Metrabyte was used for reading thermocouples and alarm signals. This board, the DAS-TC, provides on-board automatic and continuous calibration, signal conditioning and cold junction compensation so that thermocouples may be read directly via an external screw terminal board with an on-board CJC sensor. Since there was a need to measure three type 'T' thermocouples for each of up to 160 test stands, channel multiplexing (MUX) was required. Multiplexing reduced both the number of analog input cards needed and the amount of wiring complexity associated with direct interfacing of sensor signals. However, the number of multiplexers required was still cost prohibitive. Therefore, the required multiplexers were designed and constructed in-house at much reduced cost. These consisted of 6-pole relays with low resistance, bifurcated gold-flashed crossbar contacts mounted on printed circuit boards with screw terminals for bus wire and signal wire connections. One multiplexer board was used for each test stand, and each board was then attached to a common set of thermocouple buses made of extension grade type "T" thermocouple bus wire. Copper and constantan terminal connectors were used wherever thermocouple connections were made. The multiplexers were controlled by the PC program via a Keithley 48 channel digital output board. The program activated four multiplexers per channel so that 12 channels of thermocouple data from four test stands could be read at one time. The A/D conversions are initiated after waiting for the settling and debounce time of the multiplexers and

analog signals. Ten conversions on each channel are made and then averaged to give a temperature reading on each channel, including cold junction compensation.

The software was developed in QuickBASIC 4.5 running in a DOS environment. The software program allowed for fully automated monitoring, logging, and averaging of all temperature data with optional printing of the data on a daily or per-scan basis. It also provides for continuous monitoring of an individual test stand, the ability to turn on or off all or individual test stands, and full color-coded display of all relevant test stand data on-screen including temperatures, set-points, compressor serial number, refrigerant, lubricant, condenser cooling water inlet and outlet temperatures, and on/off status. Color coding and text messages provide status information on the relevance of the actual discharge, return gas, and sump temperatures with respect to the set-point (or ideal) temperatures for each stand, thus providing the technicians with a rapid and complete picture of the compressor operating conditions. Additionally, the program provides the capability to assign set-point temperatures for discharge, return gas, and sump either globally or on an individual basis at any time, and to set the number of acceptable excursions from set-points that may occur before the compressor is automatically shut down. This allows flexibility in the handling of each compressor as each one may behave differently in terms of operating conditions, wear rates, etc. due to the various contaminants present in the systems.

In automatic mode, the computer makes a decision based on the actual temperatures and set-point conditions to warn the technician and flag the compressor, leave it alone, or shut it down. Once the compressor is shut down, it must be restarted by a technician who can view the reason(s) for the shut down and make appropriate adjustments to the stand. The capability of turning compressors on or off from the computer keyboard was provided using a Keithley Metrabyte digital I/O board with 192 output channels. This board controlled four racks of electromechanical relay boards, which were in turn wired to a single bi-stable relay at each test stand. This relay controls power to the compressor and a Hobbs elapsed time meter, which logs compressor run-time in hours and tenths of an hour.

A final provision of the computer program was the ability to continuously monitor the status of three emergency shutdown switches and a low-pressure cutout switch on the cooling water inlet distribution manifold. These four switches are regularly polled in software, which will immediately shut down all test stands and the coolant circulation pumps if a dry contact

closure were detected. Upon shutdown, an automatic telephone dialer system is initiated by the software. This system places telephone calls to three separate laboratory personnel and plays a pre-recorded message warning that a shutdown has occurred. A provision was made to allow for testing of the cutout switches and the response system without causing an actual shutdown to occur.

Compressor Test Conditions

As previously discussed, the test stands were assembled on four benches; one bench for each primary refrigerant used in the study. These four refrigerants were R-507A, R-407C, R-22, and R-134a. The R-22 test stands all used mineral oil (Suniso 3GS) as the lubricant, and the remaining test stands used the polyolester Emkarate RL32S. The statistical analysis conducted previous to starting the experiment indicated that 128 contaminated test stands plus 16 controls would provide statistically relevant data while keeping the size and cost of the experiment within a reasonable budget. For each bench, there were also two sets of conditions to be run; half of the stands on each bench would run at a high discharge temperature condition and the other half would run at a low discharge temperature condition. The high and low discharge temperatures were selected to be 10°C (50°F) apart. The selected contaminants were air, water, organic acid, and chlorine-containing refrigerant (either R-12, R-502, or R-22). The operating conditions are summarized in the table below. Water was added to the appropriate stand to bring the amount of water in the lubricant to be 200ppm; in addition, 50mg were to be added for the compressor winding insulation content. The amount of air to be added to the appropriate stands was determined to be 4% of the void volume of the compressor, and the amount of chlorinecontaining refrigerant to be added was also determined to be 4% by weight of the primary refrigerant in the stand.

	Return	Dicharge	Discharge	Suction	Sump
	gas temp	pressure	temp	pressure	temp
Refrigerant	(°F)	(psig)	(°F)	(psig)	(°F)
R-22	65	175	212	32	179
K-ZZ	60	280	143	78	98
R-134a	63	160	224	10	212
K-134a	57-64	145	187	20	174
R-407C	58-65	325	141-153	70-75	81-96
K-40/C	61-62	200	180-193	35-40	147-162
R-507A	54	185	180	30	140
K-30/A	62	355	235	14	242

The compressor test conditions are within the published operating envelopes for pressure and temperature. The two motor types used in this work were identical except for the start winding.

Introduction of Contaminants

The process of introducing contaminants was carried out in several stages. The compressors were brazed into the test stands, leak checked, filled with lubricant, and evacuated to a deep vacuum (50 micron) with a 050 size molecular sieve desiccant filter drier present. It should be noted that the compressors were shipped from the manufacturer with a dry nitrogen charge and no lubricant. After charging the compressors with the appropriate type and volume of dry lubricant and refrigerant, the units were then run for a 72 hour break-in period with the appropriate filter driers installed to dry the systems. The R-407C systems used XH-11 molecular sieve filters and the rest of the stands used 4AXH-6 molecular sieve filters. Upon completion of the 72 hour break-in, lubricant samples were taken from each of the 144 compressors via the oil-sampling port previously described (see Appendix B). An anhydrous vessel under partial vacuum equipped with a 4" by 1/8" stainless steel needle was used for sampling 15 ml of the lubricant into sample bottles sealed by septum and aluminum compression rings. These sample bottles were heated at 105°C (221°) for 30 minutes prior to use to assure dryness before sealing. The sealed samples were then analyzed for moisture content by KF coulometric titration.

Upon validation of dry compressors, each test stand was run at the specified operating conditions for another 24 hours while temperature data was taken to make sure that each stand would meet proper conditions. Then, with the compressor still running, each stand was valved so that liquid refrigerant flow was blocked from the filter drier, bringing down the pressure to vacuum levels in the drier so that as much refrigerant as possible could be removed from it. The filter driers were then removed and replaced by sight glasses from Sporlan, which were dried for 30 minutes at 105°C (221°F). The estimated refrigerant loss from each stand was 1 ounce. The compressors were then re-started, brought to the previous conditions, and monitored for any significant changes from the previous state for a period of 24 hours. After this second 24 hour run, and while still hot, 6 ounces of lubricant were removed to serve as a reference standard and also to allow room in the compressor for the addition of acidic lubricant, if required. The addition of carboxylic acid-dosed acidic lubricant was the method of introduction of the acid contaminant to the appropriate systems. Initially, water contaminant was also to be added in this fashion, so that either a wet lubricant or a wet acidic lubricant would be added to those stands

needing water and/or acid. Instead, water was added to the system via a cylinder and piston arrangement because this allowed for precise amounts of liquid water to be injected into a test stand. A cylinder of known diameter was fitted with a piston and appropriate seals, and a single port with a minimum volume was added, along with a toggle valve of known internal volume and a vacuum purge valve and vacuum pressure gauge. The cylinder was then filled with liquid water, and a zero headspace volume was adjusted with the piston position using nitrogen gas on the opposite face of the piston. A direct connection was then made between the test stand sampling/injection port and the valve connection on the cylinder. Since the sampling/injection port on the test stand is on the suction side of the compressor, the pressure could be adjusted to either above or below atmospheric to assist in the removal or injection of material to or from the compressor, which made sampling easier. The volume between the toggle valve and the compressor sampling/injection port was then brought down to vacuum through the vacuum purge valve, which is connected to an external vacuum pump. Once the pressure gauge shows a good vacuum, the vacuum purge valve was shut, and the sample/injection port valve on the test stand was opened, which filled the vacuumed volume with refrigerant at suction pressure. The suction pressure was previously adjusted to a value lower than the pressure achievable at the piston with the nitrogen gas. The nitrogen gas valve is then opened, forcing the piston down and the water into the test stand. When the piston reaches the bottom of the cylinder (zero cylinder volume), the toggle valve is closed and the test stand suction pressure is brought down to a vacuum condition to remove as much water/refrigerant in the small remaining volume between the cylinder and the test stand port as possible. The sample/injection port valve on the test stand was then closed and the suction pressure returned to normal operating conditions. It should be noted that this procedure required that the Ranco pressure cutout switches be adjusted so that the lowpressure cutout would not trip when the suction pressure was brought down into vacuum conditions. The adjustment had to be made after returning to normal suction pressures so that low-pressure cutout protection was again available.

Along with the water addition, the organic acid was added to select compressors as a mixture in RL32S for the R-507A, R-407C, and R-134a machines, or in 3GS for the R-22 machines. The organic acid cocktail was composed of three straight chain fatty acids mixed into the lubricant to generate a total acid number (TAN) of 0.1. These acids are pentanoic, hexanoic, and heptanoic acids, which are 5, 6, and 7 carbon chains, respectively, and are the most

commonly found acids formed in esters. This lubricant cocktail was added to the test stand in a manner similar to that used for removing lubricant with the exception that the test stand suction pressure was reduced below ambient pressure so that the lubricant could be sucked into the port. The same type of stainless steel needle and valve arrangement that was discussed above was used to draw the acidic lubricant cocktail from the sealed sample bottles into the test stand.

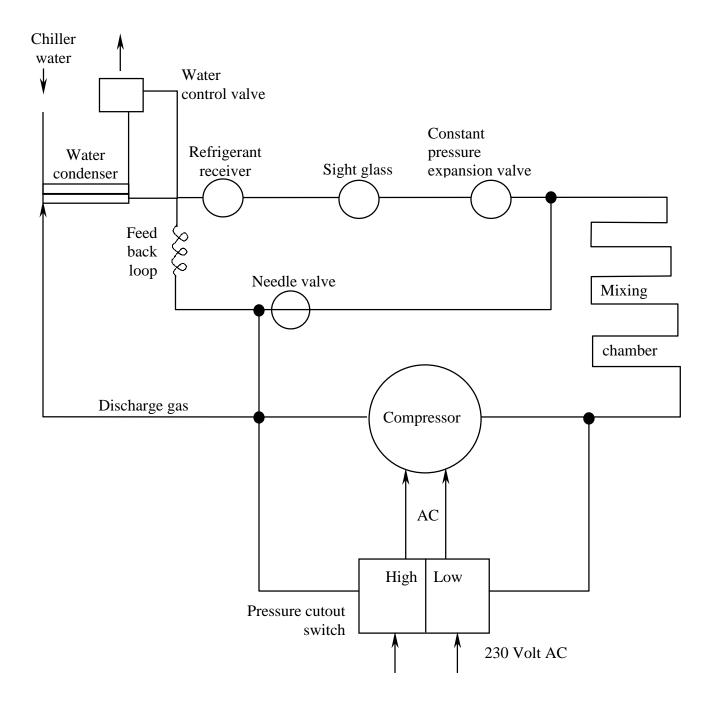
After the addition of water and organic acid to the selected compressors, the stands were run for 24 more hours and a 10ml lubricant sample was taken. This sample was used for moisture and TAN measurements. After 48 hours, specified stands were contaminated with the chlorinated refrigerant contaminant.

The requirement for a chlorinated refrigerant contaminant was met by using R-22 in the R-407C machines, R-12 in the R-134a machines and R-502 in the R-507A machines. A contaminant refrigerant was not used in the compressors that were running R-22 as there primary refrigerant. As previously stated, a mass of contaminant refrigerant equivalent to 4% of the mass of the primary refrigerant in a given compressor was added through the sample/injection port of the test stand. This procedure was simpler than that for adding water because the contaminant refrigerant could be added directly from a tank mounted on a refrigerant charging scale. The procedure required that the refrigerant hose connecting the tank to the sample/injection port be purged prior to opening the valve on the port. Also, the suction pressure of the running compressor was reduced to a level somewhat below that of the saturation pressure of the contaminant refrigerant in the tank so that flow could only proceed into the test stand to avoid contamination of the tank and loss of primary charge in the test stand. After purging the hose, the charging scale is zeroed and the valve on the sample/injection port is cracked open. Flow rate of contaminant refrigerant into the test stand could be controlled by adjusting the opening of the valve and by regulating the suction pressure of the running compressor. The suction pressure adjustments required actions similar to those discussed in the description of the water and air injection method. Once the contaminant refrigerant was added, the stands ran for 48 hours while pressures and temperatures were closely monitored for any significant differences.

Finally, the test stands selected to have air contamination were inoculated. The injection of an amount of zero air equal to 4% of the void volume of the compressor was performed in a manner identical to that for water, using the same apparatus. Again, the pressures and temperatures were closely monitored for a few days to observe any dramatic change in post

contamination operating conditions. Approximately five days after the contamination process was completed, samples were acquired from those test stands that had air and/or refrigerant contaminants introduced. These samples were again taken from the sample/injection port on the test stands into a sampling device made specifically for removing the samples and injecting them into a gas chromatography column. The sampling device had a vacuum port and vacuum pressure gauge and was brought down to vacuum for at least 15 minutes prior to receiving a sample from a compressor test stand. The gas chromatography results along with the TAN and moisture values taken from the lubricant samples provided a complete picture of the true contamination level of each compressor. This data indicated whether a particular stand required more or less of a certain contaminant. The results of the moisture and TAN analysis of the lubricant removed from the running system (see Appendix C) yielded lower levels of water than anticipated. Therefore, the stands were allowed to remain in a static condition for 20 days to allow water to equilibrate within the compressor sump (see Appendix \underline{D}). The entire procedure described above was repeated somewhat several times before satisfactory levels of contamination were reached, as was described in several progress reports prepared during the course of this project (see Appendices E and F).

Schematic of Hot Gas Bypass Test Stand



CHEMICAL METHODS

Compressor Sampling

Oil

Each compressor was modified by the manufacturer to contain a threaded port in the side of the bottom shell. This modification was for installing an oil-sampling valve on each unit to enable periodic sampling and analysis of the lubricant. An anhydrous vessel under partial vacuum equipped with a 4" by 1/8" stainless steel needle was used for sampling 15ml of the lubricant into sample bottles sealed by septum and aluminum compression rings. These sample bottles were heated at 105°C (221°F) for 30 minutes prior to use to assure dryness. The sealed samples were then analyzed for moisture content, TAN, and fluoride/chloride ion content.

Refrigerant

Gas samples were collected from operating compressors for the GC analysis of all refrigerants and gaseous contaminants formed during operation. Proper use of the sampling device (Figure 3) enabled individual samples to be collected from an operating compressor and carried to the laboratory for immediate GC analysis.

To collect a sample, the refrigerant sampling device was connected with a 6" charging hose to the injection/sampling valve, which was braised onto the process port on the suction side of each compressor. The charging hose and sampling device were evacuated and the compressor valve was slowly opened to fill the sampling device. The valves on the sampling device were then opened and it was slowly vented for approximately ten seconds. The pressurized gases were trapped in the sampling device by closing all valves. The sampling device was then connected to the sample inlet of the 6-port GC valve (Figure 1). One valve on the sampling device was opened to allow the trapped gases to flush and fill the sample loop slowly. The sample loop was allowed to reach atmospheric pressure and the gases were injected onto the GC column (Figure 2).

Coulometric Moisture Analysis

The moisture content of the compressor and sealed tube lubricant was determined by coulometric Karl Fischer (KF) titration. This instrument electronically titrates as little as 10µg of

water with internally generated iodine. The accuracy of the coulometer was periodically checked using KF water standard.

To analyze oil samples for moisture content, about 1ml of oil was injected into the coulometer and titrated. The sample weight (g) (weight of full syringe minus weight of empty syringe) and the titrated water (μg) displayed on the coulometer was recorded and used to calculate parts per million water.

Equation 1 Water (ppm) Calculation

$$\frac{\text{titrated water(}\mu\text{g}\text{)}}{\text{sample weight(}\text{g}\text{)}} \times \frac{1\text{g}}{10^6 \mu\text{g}} \times \frac{10^6}{1} = \text{ppm water}$$

Total Acid Number (TAN) of Lubricants

The total acid number (TAN) of lubricants was determined by titration of the lubricant acids with KOH using a color indicator as an end-point (ASTM D664).

The solvent blank was analyzed as follows: (1) 50ml of titration solution, 5-10 drops of p-naphtholbenzein indicator, and a magnetic stir bar were placed in a 100ml beaker; (2) the beaker was covered with a wooden lid and the burette tip was inserted through a hole in the lid (the cover was used to prevent evaporation during the slow titration); and (3) the solvent blank was titrated drop-wise with the standardized KOH solution until the light green endpoint lasted at least 30 seconds.

The oil samples were analyzed by weighing 5-10 grams of lubricant into a 100ml beaker and proceeding as outlined in the preceding paragraph beginning with Step 1. Dark lubricants discolored the solution, causing the end-point to be varying shades of brown. Sometimes as little as one gram of a very dark lubricant had to be used so that the endpoint color change could be detected.

Equation 2 Total Acid Number (TAN)

$$TAN = \frac{(S-B)N \times 56.1}{W} = \frac{mg \, KOH}{gram \, of \, sample}$$

S = ml KOH needed to titrate sample

B = ml KOH needed to titrate solvent blank

N = standardized normality of KOH

W = weight of sample (grams)

Fluoride and Chloride Analysis of Lubricants

Fluoride and chloride ions were extracted from oils into water using a high water:oil ratio. The oil was filtered from the water and the halogens were quantitated using ion selective electrodes.

To prepare the fluoride and chloride standard curves, either 50ml of 10⁻⁶M F or 10⁻⁵M Cl standard and either 2ml of fluoride TISAB solution or chloride ISA solution were placed in a 100ml beaker. This solution was stirred and the stable millivolt (mV) reading was taken using the fluoride (or chloride) and reference electrodes. This procedure was then repeated to determine the mV readings of the 10⁻⁵, 10⁻⁴, 10⁻³, and 10⁻²M F standards (or the 10⁻⁴, 10⁻³, and 10⁻²M Cl standards). A fluoride (or chloride) semi-log plot of standard concentration (y) versus mV reading (x) was created.

The samples were prepared by first weighing 1-1.5g of oil into a screw-top tube and then adding approximately 25ml of distilled water. The weight was recorded, the plastic cap was rinsed with distilled water; the tube was capped and then shaken vigorously for 15-30 seconds before being placed on a tube rotator for 1 hour. A GF/A filter paper was rinsed with 100 ml distilled water and the water was discarded. The oil/water mixture from the tube was filtered through the pre-rinsed filter paper into a pre-rinsed 100ml volumetric flask. The test tube, filter, and funnel were rinsed with more distilled water to bring the volume to exactly 100ml.

The samples were analyzed for fluoride or chloride concentration by the following procedure. 50ml of the sample prepared as directed above were placed in a 100ml beaker with either 2ml of fluoride TISAB solution or chloride ISA solution. This solution was stirred and the stable mV reading of the solution using the either fluoride (or chloride) and reference electrodes was determined. The following equations were used to determine the fluoride or chloride concentration of the sample.

Equation 3 Fluoride and Chloride Sample Molarity

 $y = ab^x$

y = sample molarity

x = mV reading for sample

a = constant found from F or Cl standard curve

b = constant found from F or Cl standard curve

Equation 4 Fluoride Concentration of Sample

$$\frac{y \times 19 \times 0.1 \times 10^6}{W} = ppm F$$

y = sample molarity from Equation 3 W = sample weight (g)

Equation 5 Chloride Concentration of Sample

$$\frac{y \times 35.5 \times 0.1 \times 10^6}{W} = ppm Cl$$

y = sample molarity from Equation 3W = sample weight (g)

Gas Chromatographic Analysis of Refrigerants and Contaminants

Refrigerants from working compressors and refrigerants from aged thermal stability glass sealed tubes were analyzed by gas chromatography (GC). The refrigerants were captured in evacuated sealed systems and loop-injected onto a GC column for detection with a thermal conductivity detector.

GC analysis was done on two sets of samples: (1) refrigerant gases and contaminants intentionally added to working compressors and (2) refrigerant gases and contaminants aged in sealed tubes. The same gaseous contaminants were added to both the compressors and the sealed tubes. These contaminants were 4% (v/v) air, 4% (w/w) R-12 in R-134a, 4% (w/w) R-502 in R-507A, and 4% (w/w) R-22 in R-407C. The GC system quantitated all added contaminants as well as unknown gases formed during compressor operation and sealed tube aging.

Two Scotty gas standards composed of 5% and 1% nitrogen, oxygen, carbon monoxide, carbon dioxide, and methane were purchased as one set of standards. Four other sets of standards were prepared: (1) 4% (v/v) air in R-22; (2) 4% (v/v) air + 4% (w/w) R-12 in R-134a; (3) 4% (v/v) air + 4% (w/w) R-502 in R-507A; and (4) 4% (v/v) air + 4% (w/w) R-22 in R-407C. These four standards were prepared in four 4.5 liter cylinders. The cylinders were first thoroughly evacuated and weighed. Then, 4.0 grams of air or contaminant refrigerant was allowed to enter the tank. After all connecting hoses were completely evacuated, 96.0 grams of

the main refrigerant component in the mixture were added to the cylinder. If both air and a refrigerant contaminant were added to a cylinder, then the weight ratio became 4:4:92 w/w/w.

Both the in-house prepared refrigerant standards and the Scotty gas standards were analyzed by connecting the tanks to the GC 6-port valve sample inlet (<u>Figure 1</u>) and slowly opening the tank valve to flush and fill the sample loop. The sample loop was allowed to reach atmospheric pressure and the gases were injected onto the GC column (<u>Figure 2</u>).

Gas samples were collected from operating compressors for the GC analysis of all refrigerants and gaseous contaminants formed during operation. Proper use of the sampling device (Figure 3) enabled individual samples to be collected from an operating compressor and carried to the laboratory for immediate GC analysis.

To collect a sample, the refrigerant sampling device was connected with a 6" charging hose to the injection/sampling valve, which was braised onto the process port on the suction side of each compressor. The charging hose and sampling device were evacuated and the compressor valve was slowly opened to fill the sampling device. The valves on the sampling device were then opened and it was slowly vented for approximately ten seconds. The pressurized gases were trapped in the sampling device by closing all valves. The sampling device was then connected to the sample inlet of the 6-port GC valve (Figure 1). One valve on the sampling device was opened to allow the trapped gases to flush and fill the sample loop slowly. The sample loop was allowed to reach atmospheric pressure and the gases were injected onto the GC column (Figure 2).

The refrigerant gases in the aged sealed tubes were analyzed by GC for refrigerants and other gaseous contaminants formed during the 28 days of aging at 165°C (329°F) or the 224 days at 135°C (275°F). A specially designed glass sealed tube breaking device (Figure 4) allowed gases captured from the broken sealed tube to be directly delivered to the GC sampling port.

The device consisted of a 5/8" stainless steel rod with a handle for turning and a hole into which a sealed tube could be inserted through the 11 mm Ace Thred. Both the rod and sealed tube were sealed into the device with buna-N O-rings. A ¼" charging hose was attached to the 2mm stopcock and a vacuum pump. A 1/16" ss tube connected the adapter to the sample inlet of the 6-port valve.

To break a sealed tube and collect a GC sample, the sealed tube was first put into a thermos of liquid nitrogen. The surface of the sealed tube was scratched where it was to be

broken. The sealed tube was then inserted into the breaking device (Figure 4) through the 11 mm Ace Thred opening and into the hole in the stainless rod, with the other end of the sealed tube remaining immersed in liquid nitrogen. The refrigerant sampling device was attached to the vent line of the 6-port valve both to monitor the system vacuum/pressure and to use it as a shut-off valve for evacuating the system. The entire system, including the sample loop in the sample filling position, was evacuated through the 2mm stopcock for at least five minutes. The 2mm stopcock was then closed and the liquid nitrogen removed. Rotating the handle of the breaking device broke the tube. The tube was warmed quickly using water or a torch. With the internal system pressure being monitored, the exit valve was opened to allow excess gas to escape and the sample loop gases to reach atmospheric pressure. The sample loop gases were then immediately injected onto the GC column.

The GC parameters were as follows:

- Instrument Varian 3700 GC
- Column 20' x 1/8" ss packed with 100/120 Haysep D
- Carrier gas Helium at 18 ml/min
- Thermal conductivity detector
 - Range 0.5 MV
 - Filament temperature 200°C (392°F)
 - Current 190 amps
- Temperatures
 - TCD 160°C (320°F)
 - Column 30°C (86°F) (5 minutes) \rightarrow 20°C/min (68°F/min) \rightarrow 150°C (302°F) (14 minutes)

Standard curves for each refrigerant, refrigerant contaminant, and non-condensable gas found in the samples were prepared by graphing GC peak area versus percent composition. The sample loop must be at atmospheric pressure before GC injection of all standards and samples take place. The percent composition of samples was determined directly from the standard curves once individual GC peak areas were determined.

Figure 1 6-Port Valve, Sample Filling

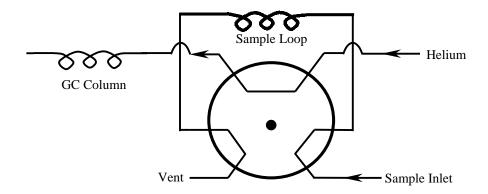


Figure 2 6-Port Valve, Sample Analysis

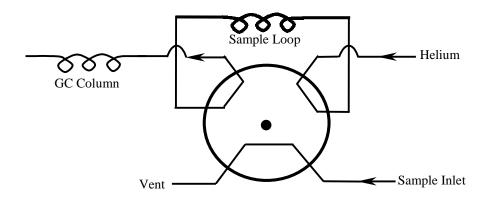


Figure 3
Freon Sampling Device

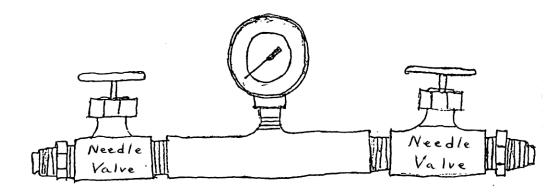
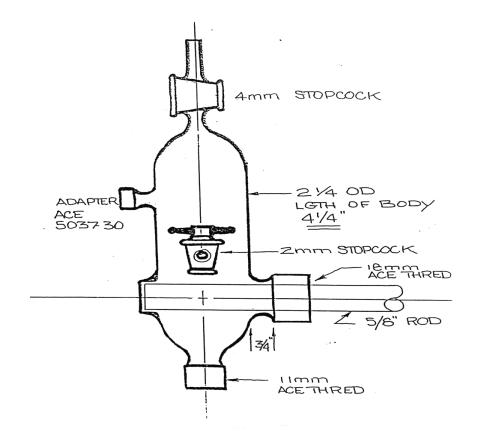


Figure 4
Sealed Tube Breaking Device



Thermal Stability Sealed Tube Analysis Method

This project specified that contaminant water, acid, air, and refrigerants R-12 in R-134a, R-22 in R-407C, or R-502 in R-507A be added to compressors to determine longevity and identify mechanical problems caused by specific contaminants. To get an "inside look" at the compressors under worst case conditions, a glass sealed tube stability study was also performed at two temperatures using the same lubricants, refrigerants, and contaminants as were used in the actual compressors. Glass sealed tubes are a static test whereas the compressor testing was dynamic. Normally, sealed tubes are produced to be pristine in format, excluding all NCGs, all acids, and all water. ASHRAE methods specify the tubes be made in this fashion because there was little interest in elucidating the effects of moisture, air, and system acids. If any of the system contaminants are present with R-12 and R-22, it was well known to produce a negative sealed tube response.

The stability tubes were observed for metallic corrosion and precipitate formation; observations that are important since the tubes mimic what happen inside the compressors. Similar to the empirical part of the study, the tubes were reacted at 135°C (275°) and 165°C (329°F). The tubes aged at 165°C (329°F) were observed after 3, 7, 14, and 28 days and those at 135°C (275°) were observed after 3, 7, 14, 28, 56, 112, and 224 days of aging. The contaminant levels were 200 ppm water, 0.1 TAN, 4% (v/v) air, and 4% (w/w) refrigerant. Appendix I, Appendix J, Appendix K, and Appendix L contain all sealed tube visual observations, chemical analysis results, and photographic history. An extra set of R-507A and R-134a sealed tubes were prepared with extra contaminant acid (0.4 TAN); visual observations only of these tubes are also included in Appendix I and Appendix L. The tubes with extra acid were prepared to illustrate the effects of excess acid in the presence of water and NCG content. Samples were analyzed in triplicate.

Glass Tube Preparation

Glass tubes were identified by burning ceramic marking ink into the glass on both ends using a propane torch. A cooler flame was used to smooth out the sharp stress lines in the glass around the burned area.

Metal Preparation

Copper, aluminum, and carbon steel were cleaned of oxide corrosion using carborundum paper and then cut to 3" in length. The steel and aluminum were approximately 0.2" wide. The metal coupons were wiped clean of dust, rinsed once with methanol, rinsed twice with ethyl acetate, air dried in a hood and placed in the tubes with the aluminum between the copper and steel.

Preparation of Lubricant with Water as a Contaminant

Unless water was an intended contaminant, the lubricant used contained <20ppm water. Mineral oils are hydrophobic and usually contained <20ppm water, but ester oils normally had to be dried. A Karl Fischer water analysis on about 1g of oil dictated the next step. If the oil tested >20 ppm water, it was dehydrated by putting it in a side arm flask with a magnetic bar and evacuated by stirring and applying gentle heat until a coulometric test of the oil showed <20ppm water content. Once dehydrated, the flask was sealed or the oil was poured into a pre-dried bottle, capped, and stored in a desiccator. If water was intended as a contaminant, then water was added to equal 200 ppm. Since ester oils are hydrophilic, water could be adsorbed simply by stirring the oil in an open beaker. With mineral oils, water was added to an oil using a syringe or Eppendorf pipette after calculating the amount to be added using the following formula:

Equation 6 Amount of Contaminant Water to Add to Mineral Oil

$$\frac{W(x-y)}{100} = \mu l H_2 O$$

W = weight of the oil (g)

x = ppm concentration of water desired

y = ppm concentration of water present in oil

Lubricant Addition to Tubes

Each sealed tube test specified the ratio of lubricant:refrigerant. The total weight of lubricant and refrigerant was about 2g. Care was taken not to get oil on the region of the glass tube to be constricted. Weighing was on a 4-place electronic balance, with the weights recorded before and after oil addition.

Preparation of Refrigerant with Contaminants

Refrigerant, air, and acid were contaminants added to the sealed tubes. These contaminants were added by premixing air and/or the contaminant refrigerant in a small tank containing the main refrigerant gas. The small tank was thoroughly evacuated and weighed. 4.0 grams of air or contaminant refrigerant was allowed to enter the tank. After completely evacuating all connecting hoses, 96.0 g of the main refrigerant component in the mixture was added to the small tank. If both air and a refrigerant contaminant were added to the small tank, then the weight ratio became 4:4:92.

Charging Glass Tubes with Refrigerant Gas

A certain weight of refrigerant (see Equation 8) from the small prepared tanks must be added to each constricted glass tube. The weight of added refrigerant is indirectly controlled by the manometer attached to the gas manifold. The refrigerant inside the manifold has an initial pressure measured by the manometer mercury (Hg) level. As refrigerant is condensed inside the glass tube, the internal manifold pressure drops, as indicated by the fallen Hg level. The difference in Hg levels can be related to the weight of condensed refrigerant. Since the specific gravity of all refrigerants is different, a refrigerant constant, which relates Hg pressure drop to refrigerant gas weight, must be determined before sample tubes are charged with refrigerant (see Equation 7, Equation 8, and Equation 9).

Determination of Refrigerant Constant

Five empty glass tubes were prepared, their weights accurately recorded, and they were constricted. Each tube was then attached to the manifold and varying amounts of pure refrigerant from 150-300 mm Hg were precisely added. The tubes were sealed and allowed to warm to room temperature. The matched tops and bottoms of each tube were reweighed. The constant was calculated for each of the five samples by the formula below to obtain an average.

Equation 7 Refrigerant Constant

$$C = \frac{b-a}{H} = \text{grams/mm Hg}$$

C = refrigerant constant

a = initial weight of the tube (g)

b = final weight of refrigerant + tube (g)

H = mm of Hg pressure difference in manifold

Addition of Refrigerant to Sample Tubes

Each sealed tube test specified the ratio of lubricant:refrigerant. Once the lubricant was accurately weighed into the tube, the weight of refrigerant to be added was calculated by the following formula:

Equation 8 Weight of Refrigerant to be Added

$$R = \frac{L(1-P)}{P}$$

R = refrigerant weight (g)

L = lubricant weight (g)

P = percent lubricant [expressed as a decimal

(i.e. 40% = .40)

The mm of Hg manometer pressure drop needed to deliver a certain weight of refrigerant can be calculated from the above equation and the refrigerant constant.

Equation 9 Manometer Pressure Drop

$$M = \frac{R}{C}$$

M = mm Hg manometer pressure

R = refrigerant weight (g)

C = refrigerant constant (g/mm Hg)

Manifold Manipulations

A constricted tube containing the lubricant and coupons was attached to the gas manifold and evacuated. The tube was gently heated with the propane torch and vibrated to expel any dissolved gases from the oil and assist in dehydration. The sample was evacuated to <40mTorr and the valve to the sample was closed. The refrigerant gas was attached to the manifold with a charging hose and the hose was evacuated. The manifold was purged three times by adding refrigerant and evacuating it. The third evacuation was <60mTorr. Refrigerant was added to the manifold so that internal pressure was 800-900 mm Hg. The tube was submerged in liquid nitrogen in a thermos dewar. The tube valve to the manifold was opened slowly to allow the refrigerant gas to condense as it contacted the cold tube. The amount of added refrigerant was controlled by observing the manometer Hg fall. After the proper amount of refrigerant was

added, the dewar was filled with liquid nitrogen and the manifold evacuated to <40 mTorr. The tube valve was opened to eliminate non-condensable gases (such as air) from the tube and evacuated to <40 mTorr.

There are exceptions to the above directions. If the sample had a fixed amount of water in the oil >20ppm, then it was frozen in liquid nitrogen prior to the initial evacuation on the manifold. If the sample was intended to contain a certain amount of non-condensable gases, then the final evacuation prior to sealing the tube did not occur.

Sealing the Tube

After refrigerant from the small prepared tanks was added to the tube, the tube was sealed. The oxygen and MAPP gases were adjusted to give a 3-4" flame. With the tube still evacuated and in liquid nitrogen, the constriction was warmed uniformly until drawn inward by the vacuum. The fused portion was heated strongly while the tube was lowered to produce a molten thread, which was cut with the flame. The tube was annealed while in liquid nitrogen using a cooler carbon-rich flame. The annealing process deposited carbon on the glass, which was wiped off later. The tube was then removed from the liquid nitrogen.

Thermal Aging

Prior to aging, the two parts of the tube were matched and reweighed to determine the actual weight of refrigerant added to calculate the actual weight ratio of lubricant:refrigerant in the sealed tube. The tubes were placed into protective metal sleeves, the sleeves were then capped and put it into an oven at either 135°C (275°F) or 165°C (329°F). When it was time for a visual inspection, the oven was turned off and the tubes were allowed to cool prior to removal from the metal sleeve.

Visual Inspection of Tubes

The tubes were inspected at the aforementioned intervals for metal and liquid discoloration and any signs of precipitate formations. As the coupons heat-aged in the presence of lubricants, refrigerants, and contaminants, they were observed to corrode. The corrosion is manifested by color changes in the metals, which indicate the degree of reactivity. Each metal goes through a series of color changes as it corrodes (<u>Table 1</u>). For example, a copper coupon

changes to orange, dark orange, pink, and eventually black as it reacts with contaminants over time.

The qualification of metal coupon colors is subjective; since subtle shades of color are difficult to express, sometimes two colors were used to accurately describe the degree of coupon corrosion. The colors noted for each set of contaminants is an "average" of three sealed tubes and shows how the corrosion becomes more pronounced over time.

The metal coupons were long enough to extend above the liquid in the sealed tubes. The portion of the coupon above the liquid was exposed only to gas and often corroded at a different rate than the portion submerged in the lubricant and dissolved refrigerant. In the tables contained in Appendix I, Appendix J, Appendix K, and Appendix L, this differentiation is characterized by a forward slash. For example, "tan/orange" means that the three copper coupons for a particular reaction were tan-colored above the liquid level and orange below the liquid level. Sometimes coupons turned colors unexpected in the progression of reactivity. This was generally caused by a precipitate coating on the metal and was seen, for example, in some of the 3GS:R-22 tubes where the aluminum was coated with a pink precipitate.

Another indicator of reactivity in sealed tubes is the liquid color. Lubricant and refrigerant is colorless (clear) when no reaction has occurred. The tables in Appendix I, Appendix J, Appendix K, and Appendix L, show liquid color progressing from light yellow to brown, as the contaminants became more reactive with the metals. Some of this color may manifest itself in the form of a haze or precipitate. The color of the precipitate may be an indicator of its origins; for example, an orange precipitate comes from copper.

Formation of precipitates is the most serious problem in lubricant/refrigerant systems. In sealed tubes, precipitates appear as a haze in the liquid, a gummy coating on the metal and inside tube walls, and crystalline or flocculent solids that settle on the tube bottom. The quantity of precipitate in the tubes as noted in the tables in <u>Appendix I</u>, <u>Appendix J</u>, <u>Appendix K</u>, and <u>Appendix L</u>, is an approximation. For example, a table entry of "(3)" in the liquid column represents an amount of precipitate that easily covers the bottom of the tube and may be as great in volume as a pencil eraser.

Table 1
Stability Tube Metal Coupon Reactivity Rating Guide

Aluminum	Copper	Valve Steel
Least Reactive	Least Reactive	Least Reactive
NR	NR	NR
Dull Gray	Orange	Blue-Green
Dark Gray	Dark Orange	Gray
Black	Pink	Dark Gray
	Yellow	Blue
	Light Tan	Purple
	Tan	Maroon
	Brown	Light Tan
		Tan
	Dark Brown	Brown
	Black	Dark Brown
		Black
Most Reactive	Most Reactive	Most Reactive
NR indicates no reaction or visible color change.		

Extended Sealed Tube Analysis

After the thermal aging period, the refrigerant and lubricant in the sealed tube was analyzed to detect chemical changes that occurred. (See <u>Table 4</u>, <u>Table 5</u>, <u>Table 6</u>, <u>Table 7</u>, <u>Table 8</u>, <u>Table 9</u>, <u>Table 10</u>, <u>Table 11</u>, and <u>Table 12</u>.)

Gas Chromatography

Changes in refrigerant composition were detected by gas chromatography. The sealed tube was broken (<u>Figure 4</u>), the gas was captured in a sample loop (<u>Figure 1</u>), and the gas was injected (<u>Figure 2</u>) for compound separation on a 20' x 1/8" ss column packed with 100/120 mesh Haysep D.

TAN Analysis

The lubricant was also analyzed for total acid number by titration with KOH using a color indicator.

Photography

Color photographs of each set of tubes can be found in <u>Appendix I</u>, <u>Appendix J</u>, <u>Appendix K</u>, and <u>Appendix L</u>.

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TEST STAND WATER INJECTION TEST

Purpose

The purpose of this side project for the ARTI selected Contaminants Program was to

determine if an enclosed 3 liter pressurized metal cylinder equipped with a movable vented

piston could reproducibly dispense water and lubricant into a compressor. Ten samples of

140 µl (0.14 g) of water were added to 6 oz (180 g) of oil. The oil was then tested for water

content by routine Karl Fischer coulometry (see <u>Table 2</u>).

Procedure

The enclosed metal cylinder was equipped with shutoff valves at the top and bottom of

the cylinder housing. The piston could be moved upward (to be filled with oil) with vacuum

pump suction and lowered (to dispense the oil) with air pressure. An L-tube was attached to the

bottom shut-off valve (pointing upward) so that water could be added as oil left the cylinder.

The cylinder would dispense 6 oz of oil when the piston rod moved downward 7/8".

Twelve 250 ml Erlenmeyer flasks were dried at 110°C (230°F) and stoppered. The

lubricant used in this experiment was 10% IPA in RL32S. The purpose of the IPA was to

solubilize the water after sample collection. The cylinder was loaded with this lubricant solution

using suction. Using a 250 µl syringe, 140 µl water was added to the L-tube. The piston was

forced downward 7/8" flushing the water from the L-tube and dispensing 6 oz of oil into a 250

ml Erlenmeyer flask through an identical valve mounted on test compressors. The sample was

mixed until all water was in solution and then tested for water content by Karl Fischer. Ten

samples were collected in this fashion along with two blanks containing no added water.

Calculations

Sample #3 was omitted due to water in suspension.

Blank average = 62 ppm

Average of 9 samples = 831 ppm

Standard Deviation of 9 samples = 26.2

37

Calculation of Added Water

 $140 \mu l$ water added = 0.14 g

180 g oil

$$\frac{0.14g}{180g} \times 10^6 = 777 \text{ ppm H}_2\text{O}$$

777 ppm + 62 ppm blank = 839 ppm target value.

Table 2 Results of Water Injection Test

	Water
Sample	(ppm)
1*	56
2	843
4	840
5	871
6	819
7	779
8	844
9	853
10	802
11	831
12	67

^{*}Blank sample (no water added)

COMPLETION OF COMPRESSOR TESTING

The dynamic test was complete when all of the compressors had acquired 12,000 hours of run time. The final lubricant sample (6 ounces) was taken from the compressor while it was running. All of the refrigerant charge was pushed into the condenser and receiver assembly. The discharge line was then pinched and sealed by brazing, thereby saving the entire refrigerant charge for further analysis.

Finally, the compressor was evacuated and back-filled with dry nitrogen. All of the compressors were taken to Copeland to be cut open using their in-house can cutting milling machine. The compressors were then taken back to our laboratory with the top shell still in tact where they were purged with dry nitrogen gas to inhibit any air corrosion and rusting.

FAILED COMPRESSORS

Of the 144 compressors tested, only seven machines are recorded as failures. A unit was considered a failure when it was unable to maintain pressure and temperature set points. These machines are summarized in the following table.

Table 3
Summary of Failed Compressors

Unit	Refrigerant	Contaminants	Hours	Failure
<u>Unit 55</u>	R-407C	acid, water, and R-22 2,674		suction reed and backer broken
<u>Unit 149</u>	R-134a	water and R-12	water and R-12 2,859 seized crank due to copper pl	
<u>Unit 35</u>	R-507A	air and water 3,555 broken suction reed		broken suction reed
<u>Unit 69</u>	R-407C	water and R-22 5,333 suction reed and backet		suction reed and backer broken
Unit 9	R-507A	acid 5,369 seizure due to bronze p		seizure due to bronze plating
<u>Unit 71</u>	R-407C	acid and water	7,319	broken suction reed and backer
<u>Unit 5</u>	R-507A	control	10,525	motor grounded

Units 55, 35, and 69 all experienced cracking of the suction reed after a minimal number of hours. Broken suction backers and suction reeds were unusual, but found only after several thousand hours of running under normal conditions. Therefore, contaminants were not considered to be the primary cause of failure.

The early failure of Unit 149 was quite unusual because there was no indication that a copper plating-caused failure of the crank was about to occur. All of the mechanical parts were in excellent condition. The failure of unit 149 was definitely caused by the contaminants water and R-12. Smaller bearing tolerances may also have contributed to the failure.

Unit 9 was also running normal with no unusual history, but seized due to bronze plating of the bearing surfaces caused by the organic acid contaminant. Table H.1 shows a very high acid level, increased water formation, and a large amount of trash in the bottom of the can. All of the R-507A control and contaminated machines developed black sight glasses after 3,500-3,600 hours with no untoward performance responses. Except unit 5, a contaminant-free compressor that failed because of a grounded motor winding and had excessive acid and severe bronze bottom bearing wear. The inside of this compressor was jet black, had trace copper plating from the suction port, and a copper plating effect on the motor stator, along with rotor rub. The internals were badly worn due to a lower and upper crankshaft bearing failure and the excessive acid came from the rotor rub.

Unit 71 experienced mechanical fatigue of the reed and backer. However, the short amount of run time suggests that the reed may have been chemically stressed due to the amount of free HF circulating in the system.

The compressors used in this study were rated for R-22, R-134a, R-407C, and R-404A service. Naturally, with low temperature refrigerants such as R-507A and R-404A, the compression ratio increases and the lubricant performance is potentially decreased. There is no experimental evidence that suggests equivalent compression ratios with R-407C or R-22 would have yielded the same general bearing fatigue as did R-507A in a few of the machines. (see Statistical Analysis)

DISASSEMBLY OF COMPRESSORS

Individual compressors were opened and examined in a logical order. A query sheet with the outlined tear down order was used to record detailed observations on each compressor. The data from the query sheets was used to compile a database, which was then evaluated using a SASS statistical routine (see <u>STATISTICAL ANALYSIS</u>). Therefore, each compressor has a two page "report" containing the observations recorded on the query sheets, including the visual observations of the disassembled expansion valve, as well as the results of the final lubricant analysis, including the metal analysis determined by ICP spectroscopy (see <u>APPENDIX A</u>).

VISUAL OBSERVATIONS

In a study of this magnitude, a photographic record of the mechanicals removed from the compressors was essential to provide a comprehensive documentation of the effects of the contaminants. All of the macro and microphotographs were taken with a high-resolution digital camera equipped with a plano Nikon lens.

The mechanicals normally reviewed by compressor engineers as indicators of compressor function and wear are the crankshaft, piston connecting rods, valve seats, valve reeds, and their surfaces and trepan areas. The term "trepanning" signifies the indentation and wear caused by the valve reed action on the reed surface. The appearance of metal removal on the surface of the valve seat was significant with the various refrigerants and contaminants.

Crank Journal Responses to Contaminants

A good low wear example of the crank journal in the loaded position can be seen in the R-22 controls: unit 85 (CJ85), unit 86 (CJ86), and unit 87 (CJ87). These crank journals are considered clean with normal copper plating. A crank journal without copper plating is seen in the R-134a controls: unit 121 (CJ121), unit 122 (CJ122), and unit 123 (CJ123).

Crank journals that are scored with polish are found in the R-407C acid and air contaminant machines: unit 47 (CJ47), unit 48 (CJ48), and unit 49 (CJ49). Crank journals that are clean with polish and a medium level of wear are an R-407C with R-22 contaminant compressor (unit 62) (CJ62) and an R-507A acid contaminant compressor (unit 27) (CJ27).

An example of a crank journal showing corrosion, copper plating, and scoring with polish is a full contaminant R-407C machine (unit 73 CJ73). Crank journal with scoring, copper plating, no polish, and slight wear are found in two high temperature R-507A units: unit 13 (CJ13) with contaminant air and R-502 and unit 17 (CJ17) with contaminant air and water.

Connecting Rod Responses to Contaminants

The wear found on the connecting rod has two unique indications. The large end is easily affected by debris and corrosive system conditions; this is seen in the unloaded section of the circle. In the loaded section of the circle, scoring and heavy contact is indicative of lubrication film loss and general surface deterioration, presumably caused by contaminants.

An example of a clean and polished connecting rod (large end) is seen on the low temperature R-134a controls: unit 121 (CR121) and unit 122 (CR122). Because chlorine is present, the same surface response is seen with copper plating in R-22 controls: unit 85 (CR85) and unit 86 (CR86).

With contaminant water and R-22 introduced into a high temperature R-407C test stand, unit 51 (CR51) demonstrates slight wear and scoring on the large end of the connecting rod. The same response is seen in a high temperature R-507A compressor with contaminant air and R-502 (unit 13) (CR13). The next most severe observation is medium wear with scoring; this is produced by a high temperature R-507A machine contaminated with acid, air, and water (unit 22) (CR22). Since R-22 is a gas easily hydrolyzed by water, the surface condition of the large end of the connecting rod is worsened by the presence of air and organic acid, unit 119 (CR119) and unit 120 (CR120) demonstrate polish wear, but with scoring and corrosion.

The small end of the connecting rod is exposed to more severe loads than any other mechanical part in the compressor. Lubrication loss is definitely indicated here, but if there is a corrosive hermetic atmosphere, insult to the loaded surface will result. The small end of the connecting rod on control stands with R-507A (unit 6 CR6 and unit 23 CR23), R-407C (unit 42 CR42 and unit 59 CR59), R-22 (unit 85 CR85 and unit 103 CR103), and R-134a (unit 121 CR121 and unit 139 CR139) shows only polish and no wear. However, when the contaminant water is introduced into an R-22 compressor, the small end of the connecting rod demonstrates a polish corrosion response (unit 89 CR89). Slight wear with corrosion is seen with an R-134a unit contaminated with air and water (unit 133) (CR133). When contaminated with acid and water, the R-134a compressor shows medium wear and corrosion (unit 124) (CR124).

The presence of contaminant R-12, acid, air, and water with an R-134a unit elicits the worst response of medium wear, corrosion, and copper plating (unit 154) (CR154). The presence of air and water with a high temperature R-22 unit evokes polish and slight wear (unit 118) (CR118), but also copper plating, which is expected in this system. The copper plating failure mode is caused by the presence of air and water.

Valve Plate Responses to Contaminants

Valve plate observations are quite complex. The effects of temperature and the formation of varnish deposits are of utmost importance. The suction reed runs slightly cooler than the discharge reed and thermal effects are less. The indentation of the valve seat on the reed is referred to as trepanning in this report. As the differential pressure increases, so does the trepanning effect. Very slight trepanning is seen with an R-22 control compressor (unit 85) (VP85) and slight trepanning is seen in a high temperature R-22 machine (unit 104) (VP104). The amount of varnish ring just inside the valve seat zone increases with temperature and contaminant levels. With acid or water present, the varnish ring ranges from very slight to slight, seen with both low and high temperature R-134a compressors (unit 126 VP126 and unit 142 VP142). When R-12 is added as a contaminant, the suction reed of an R-134a machine shows copper plating (unit 142) (VP142). The effects of air and R-502 in a high temperature R-507A unit are seen in the worst case response of copper plating and corrosion along with medium trepanning and a heavy varnish ring (unit 13) (VP13).

The discharge reed is exposed to the highest temperatures within the machine. As the machine runs, over time hermetic acids can erode the reed surface, cause varnish accumulation, and eventually lead to leakage because the valve seat is eroded or worn. The control machines were R-22 and mineral oil and the contaminated machines contained the same levels of air, organic acid, and water contaminants as all of the other machines. The high temperature control compressors with R-22 (unit 103) (VP103) and R-407C (unit 59) (VP59) had the best visual responses: no corrosion, very slight trepanning, and no varnish ring. The next magnitude of varnish ring, very slight, is seen in unit 67 (VP67), a high temperature R-407C compressor that had contaminant air and R-22 present. The appearance of carbon, corrosion, bluing, a medium trepan, and a heavy varnish ring is displayed by unit 12 (VP12), a high temperature R-507A unit contaminated with acid, air, and R-502.

The condition of the valve seat is also essential to understanding the effects of system contaminants. The best understanding comes from the photomicrographs of the various valve seats. Although the suction seats are exposed to relatively low-pressure gas velocities and possibly lower temperatures than the discharge seat, they are not immune to erosion by contaminants. An example of a good suction seat is in unit 23 (VP23), a low temperature R-507A control machine. Contaminant air, acid, and R-22 in a low temperature R-407C

compressor (unit 48) (VP48) cause metal erosion of the seat to occur. Adding to the complexity of this analysis is the wear decomposition phenomena of unit 5 (VP5), an R-507A control machine showing a tremendous amount of metal erosion on both the suction seat and the reed. The discharge reeds do not always respond in the same fashion as the suction reeds. The discharge valve seat of unit 5 (VP5) shows only minor erosion and the discharge reed shows slight to medium trepanning.

Cylinder Bore Responses to Contaminants

Upon disassembly of the compressor and examination of the cylinder bore, various levels of varnishing were noted. This varnish ring may be formed by trace residue from manufacturing or during running.

Examples of no wear and no varnish ring are seen in the controls for R-22 (unit 85) (CB85) and R-134a (unit 123) (CB123). Cylinder bores with no wear but a very slight varnish ring are found in water and acid contaminated compressors with R-22 (unit 98) (CB98) and R-507A (unit 34) (CB34). A cylinder bore with low wear and a slight varnish ring came from unit 52 (CB52), a low temperature R-407C compressor with contaminant acid and water, and unit 99 (CB99), a low temperature R-22 compressor with contaminant air and water. A cylinder bore with low wear but with a medium varnish ring is seen in unit 62 (CB62), an R-22 contaminated low temperature R-407C unit. A cylinder bore with low wear but with a heavy varnish ring is found in unit 66 (CB66), also a low temperature R-407C unit, this one with contaminant air, acid, and R-22. Scoring of the wall of the cylinder bore along with copper plating and a slight varnish ring is seen in unit 117 (CB117), an air and water contaminated high temperature R-22 compressor. Corrosion in the cylinder bore along with medium varnish is displayed in unit 56 (CB56) and unit 74 (CB74), both low temperature R-407C compressors with acid, air, water, and R-22 contaminants, and in unit 144 (CB144), a high temperature R-134a unit with contaminant air.

Expansion Valve Responses to Contaminants

Contaminants in hermetic systems constantly play a role in plugging orifices in refrigerant expansion devices. Expansion devices can be capillary tubes, thermostatic expansion valves that control refrigerant superheat, and, as in this study, constant pressure expansion valves (CPEV). Therefore, an investigation of some of the components of the CPEV was undertaken.

The internal construction of the Model A CPEV is seen in Figure 5. The parts visually examined for the query sheet database and photographed were the front side of the stainless steel diaphragm, the end threaded to the diaphragm, the zinc plated body spring, the power piston needle, and the ball used to control the refrigerant orifice. The ball, pin, and seat were also photomicrographed.

The zinc-plated spring and the power piston have been selected to illustrate the effects of contaminants. Both of these parts were exposed to the full flow of the refrigerant/lubricant mixture for the duration of the test. The spring is zinc plated and more sensitive to many aspects of the contaminants and the pin is in direct contact with the liquid prior to expansion.

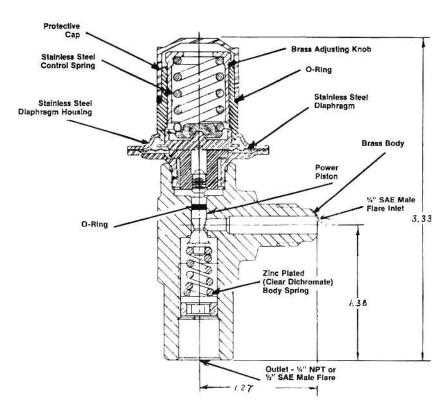


Figure 5
Model A Constant Pressure Expansion Valve

An example of a spring with no residue is from a low temperature R-134a compressor (unit 134) (SP134) that was exposed to low acid and water (see Table H.4). A spring with a very slight amount of residue is seen in a low temperature R-407C machine (unit 52) (SP52) that was exposed to contaminant acid and water and had a high water content of 369ppm (see Table H.2). The spring from unit 137 (SP137) had a hard gray scale. Unit 137 (SP137) was a low temperature R-134a compressor contaminated with air, water, and R-12, but low in TAN, water,

and metals (see <u>Table H.4</u>). A medium amount of gummy gray residue on the spring was produced by a low temperature R-507A machine (unit 36) (<u>SP36</u>) that had only water as a contaminant, but a higher TAN value and 59ppm moisture (see <u>Table H.1</u>). A heavy amount of gummy black residue was produced on the spring in unit 8 (<u>SP8</u>), a high temperature R-507A unit contaminated with R-502, but having a high TAN of .35 and a high metals content (see <u>Table H.1</u>). The worst case example is the very heavy black residue produced by unit 142 (<u>SP142</u>), a high temperature R-134a unit contaminated with R-12 and found to have high metals content (see <u>Table H.4</u>).

The pin examples are equally puzzling. They range from no residue to heavy gummy black residue. The medium and heavy levels of black residue are principally observed in the presence of contaminant organic acid, water, R-22, and R-502.

This section of the report has presented a summarized description of the observed effects of refrigerants and contaminants on the appearance criterion that was used to develop the statistical evaluation.

STATISTICAL ANALYSIS

Introduction

A statistical analysis was performed on selected contaminants in air conditioning and refrigeration systems. This is a numerical analysis based on visual observations. In this study, four refrigerants were studied, along with two lubricants, several reactive contaminants (presence of other refrigerants, organic acids and/or inorganic acids, moisture and air) at a variety of discharge, return gas, and sump temperature levels and a variety of discharge and suction pressure levels. A multi-factorial experiment was performed. In light of the limited availability of machines and resources, it was decided that some combinations would be included at a smaller sample size.

The statistical methods employed included chi-squared tests of homogeneity of the proportion of normal machines at various levels of the independent variables and logistic regression analysis (Rosner 1995).

Following is a detailed list of the outcome and independent variables, an explanation of how the outcome variables were coded as normal or abnormal at the conclusion of the study, and a detailed description of the statistically significant results of the analysis (p-value <0.05 is deemed significant).

The outcome variables analyzed with respect to the statistical significance of the independent variables upon them were the visual observation of:

- suction muffler appearance,
- discharge plate appearance,
- top stator windings' appearance,
- shell bottom appearance,
- qualitative amount of bearing chips (not cam cuttings) in the shell bottom,
- crank journals' appearance,
- level of wear on the crank journals,
- lower crank bearing journal appearance,
- level of wear on the lower crank bearing journal,
- lower bronze bearings' appearance,
- level of wear on the lower bronze bearings,
- piston top appearance,

- cylinder bore appearance,
- magnitude of a varnish ring in the cylinder bore,
- connecting rod (large end) appearance,
- level of wear on the connecting rod (large end),
- connecting rod (small end) appearance,
- level of wear on the connecting rod (small end),
- piston pin washers' appearance,
- piston pin (removed) appearance,
- level of wear on the piston pin,
- valve plate assembly:
- suction side (reed backer) appearance,
- suction side surface appearance,
- suction reed (removed) appearance,
- magnitude of trepanning on suction reed,
- magnitude of varnish ring on suction reed,
- discharge side (reed backer) appearance,
- discharge side surface appearance,
- discharge reed (removed) appearance,
- magnitude of trepanning on discharge reed, and
- magnitude of varnish ring on discharge reed.

The independent variables whose statistical significance on the outcome variables was analyzed were:

- compressor refrigerants,
 - R-507A
 - R-407C
 - R-22
 - R-134a
- compressor lubricants,
 - RL32S
 - 3GS

- contaminants added,
 - acid
 - air
 - water
 - R-12 in R-134a
 - R-22 in R-407C
 - R-502 in R-507A
- discharge pressure (psig),
- suction pressure (psig),
- discharge temperature (°F),
- return gas temperature (°F), and
- sump temperature (°F)

This report also includes several sections that treat certain observations as "normal" with R-22. The formation of HCl on metal surfaces and the appearance of trace amounts of copper plating in some analyses were considered normal. Therefore, the first analysis treated all refrigerants and contaminants equally. However, in sections where evidence of copper plating was expected, it was considered "normal."

Please remember that all of the test machines were dried with molecular sieve drier, but the driers were removed prior to the introduction of contaminants. Therefore, all machines wet with water could form organic acid from the POE and, in the case of R-22, the formation of HCl gas. No contaminant control or filtering mechanism was used except for a 150 mesh screen at the input to the CPEV.

Results

Suction Muffler Appearance

Response Codes	
Normal	Abnormal
clean	black
gray	metal chips
	rust

None of the independent variables was statistically related to the appearance of the suction muffler.

Discharge Plate Appearance

Response Codes	
Normal	Abnormal
clean	black
gray	soot
	copper
	brown

Only the contaminant air was statistically related to the appearance of the discharge plate.

	Compressors with normal
Contaminant	discharge plate appearance
control	46%
air	26%

Top Stator Windings' Appearance

Response Codes		
Normal	Abnormal	
clean	black	
gray	copper trace	
	stator top green	
	stator top copper	
	stator top discolored	
	green under black	

Only temperature was statistically related to the appearance of the top stator windings; discharge, return gas, and sump temperatures were lower in compressors with normal top stator windings than with abnormal.

The temperatures reported are the average temperatures for the machines with normal and abnormal top stator windings appearance. Such means will change for subsequent variables because they will involve different machines.

Temperature	Top stator windings' appearance	
Variable	Normal	Abnormal
Discharge	182°F	193°F
Return gas	60°F	62°F
Sump	148°F	169°F

Shell Bottom Appearance

Response Codes		
Normal	Abnormal	
clean	black	
	copper plating	
	oil green	
	corrosion	
	oxidized	

Shell bottom appearance was statistically related to refrigerant, lubricant, temperature, and pressure. Compressors with normal shell bottoms had higher suction pressure and lower discharge, return gas, and sump temperatures as compared to those with an abnormal shell bottom appearance.

	Compressors with normal shell bottom		Compressors with normal shell bottom
Refrigerant	appearance	Lubricant	appearance
R-407C	89%		
R-134a	64%	RL32S	67%
R-507A	47%		
R-22	47%	3GS	47%

	Shell bottom appearance	
Variable	Normal	Abnormal
Suction pressure	44 psig	26 psig
Discharge temperature	175°F	208°F
Return gas temperature	60°F	63°F
Sump temperature	139°F	192°F

Shell Bottom Appearance Revised for R-22

Response Codes (revised)	
Normal Abnormal	
clean	black
copper plating	oil green
	corrosion
	oxidized

Statistically Significant Relationships Using Revised Response Codes

	Compressors with normal shell bottom		Compressors with normal shell bottom
Refrigerant	appearance	Contaminant	appearance
R-407C	89%	Control	75%
R-22	75%	Control	73%
R-134a	64%	R-502	44%
R-507A	47%	in R-507A	44%

Amount of Bearing Chips in Shell Bottom

Response Codes			
Normal Abnormal			
trace	medium		
slight	heavy		

None of the independent variables was statistically related to the amount of bearing chips in the shell bottom.

Crank Journals' Appearance

Response Codes			
Normal Abnormal			
clean	scored		
copper plating	corrosion		
heavily discolored			

The appearance of the crank journals was statistically related to refrigerant, the contaminant R-12, pressure, and temperature. Compressors with crank journals that appeared normal had higher discharge and suction pressure and lower discharge, return gas, and sump temperatures as compared to those with abnormal-appearing crank journals.

	Compressors with normal crank journal		Compressors with normal crank journal
Refrigerant	appearance	Contaminant	appearance
R-407C	56%	control	71%
R-22	53%	Control	/ 1 %
R-507A	50%	R-12	13%
R-134a	14%	in R-134a	15%

	Crank journals' appearance		
Variable	Normal	Abnormal	
Discharge pressure	247 psig	217 psig	
Suction pressure	47 psig	30 psig	
Discharge temperature	176°F	197°F	
Return gas temperature	59°F	62°F	
Sump temperature	139°F	175°F	

Crank Journal Wear

Response Codes			
Normal Abnormal			
polish medium			
slight heavy			

Crank journal wear was statistically related to refrigerant, lubricant, and the contaminant water.

	Compressors with		Compressors with		Compressors with
	normal crank		normal crank		normal crank
Refrigerant	journal wear	Lubricant	journal wear	Contaminant	journal wear
R-407C	97%			aantral	100%
R-507A	97%	RL32S	94%	control	100%
R-134a	89%				
R-22	61%	3GS	61%	water	77%

Lower Crank Bearing Journal Appearance

Re	Response Codes			
Normal	Abnormal			
clean	scored			
copper plating				
	bronze plating			
corrosion				
heavily discolored				
varnish				

The appearance of the lower crank bearing journal was statistically related to refrigerant, lubricant, pressure, and temperature. Compressors with a normal lower crank bearing journal appearance had higher suction pressure and lower discharge, return gas, and sump temperatures as compared to those with an abnormal lower crank bearing journal appearance.

Refrigerant	Compressors with normal lower crank bearing journal appearance	Lubricant	Compressors with normal lower crank bearing journal appearance
	J 11	Lublicant	Journal appearance
R-407C	81%	DI 220	
R-507A	50%	RL32S	59%
R-134a	47%		
R-22	33%	3GS	33%

	Lower crank bearing journal appearan	
Variable	Normal	Abnormal
Suction pressure	43 psig	31 psig
Discharge temperature	176°F	200°F
Return gas temperature	59°F	63°F
Sump temperature	141°F	180°F

Lower Crank Bearing Journal Appearance Revised for R-22

Response Codes (revised)		
Normal Abnormal		
clean	scored	
copper plating	bronze plating	
	corrosion	
	heavily discolored	
varnish		

Statistically Significant Relationships Using Revised Response Codes

	Compressors with normal		Compressors with normal
	lower crank bearing		lower crank bearing
Refrigerant	journal appearance	Contaminant	journal appearance
R-407C	81%	Control	92%
R-22	72%	Control	9270
R-134a	64%	R-12	38%
R-507A	47%	in R-134a	30%

Lower Crank Bearing Journal Wear

Response Codes	
Normal Abnormal	
polish	medium
slight	heavy

None of the independent variables was statistically related to the level of wear on the lower crank bearing journal.

Lower Bronze Bearings' Appearance

Response Codes	
Normal Abnormal	
clean	scored
	corrosion

Only the contaminant acid was statistically related to the appearance of the lower bronze bearings.

	Compressors with normal	
Contaminant	lower bronze bearing appearance	
control	46%	
acid	26%	

Lower Bronze Bearings Wear

Response Codes		
Normal Abnormal		
none	medium	
polish	heavy	
slight		

Only temperature was statistically related to the level of wear on the lower bronze bearings; discharge and sump temperatures were lower in compressors having a normal level of wear on the lower bronze bearings.

	Lower bronze bearings wear	
Variable	Normal	Abnormal
Discharge temperature	186°F	223°F
Sump temperature	157°F	222°F

Piston Top Appearance

Response Codes	
Normal	Abnormal
clean	carbon
	damaged
	corrosion
	bronze
	varnish

The appearance of the piston top was statistically related to refrigerant, pressure, and temperature. Suction pressure was lower and return gas and sump temperatures were higher in compressors where the piston top appeared normal.

	Compressors with normal
Refrigerant	piston top appearance
R-507A	94%
R-22	86%
R-407C	72%
R-134a	27%

	Piston top appearance	
Variable	Normal	Abnormal
Suction pressure	34 psig	56 psig
Return gas temperature	61°F	60°F
Sump temperature	166°F	122°F

Cylinder Bore Appearance

Response Codes		
Normal	Indeterminate	Abnormal
no wear	no wear plus copper plating and/or corrosion	Any other combination of no wear, low wear, wear,
low wear	low wear plus copper plating and/or corrosion	scored, copper plating, corrosion, soot, or rust.

The appearance of the cylinder bore was statistically related to the contaminant water.

Contaminant	Compressors with normal cylinder bore appearance	Compressors with indeterminate cylinder bore appearance
control	79%	21%
water	58%	14%

Cylinder Bore Varnish Ring

Response Codes	
Normal Abnormal	
none	medium
very slight	heavy
slight	

The magnitude of a varnish ring in the cylinder bore was statistically related to refrigerants, the contaminants air and R-502, pressure, and temperature. The discharge pressure was lower and the return gas temperature was higher in compressors with a normal magnitude varnish ring.

	Compressors with normal magnitude	
Refrigerant	cylinder bore varnish ring	
R-134a	92%	
R-22	86%	
R-407C	78%	
R-507A	53%	

Contaminant	Compressors with normal cylinder bore varnish ring
control	92%
R-502 in R-507A only	88%
air only	70%
R-502 in R-507A + air	13%

	Cylinder bore varnish ring	
Variable	Normal	Abnormal
Discharge pressure	223 psig	254 psig
Return gas temperature	61°F	60°F

Connecting Rod (large end) Appearance

Response Codes	
Normal	Abnormal
none	scored
	copper plating
	corrosion

The appearance of the large end of the connecting rod was statistically related to refrigerant, lubricant, the contaminant acid, and temperature. The compressors where the large end of the connecting rod appeared normal had lower return gas temperatures than those in which the appearance was abnormal. Note: Organic acid and HCl are formed while in the presence of water when using R-22. Therefore, HCl and water, when present, are more corrosive, but the statistical analysis had no bias.

	Compressors		Compressors		Compressors
	with normal		with normal		with normal
	connecting rod		connecting rod		connecting rod
	(large end)		(large end)		(large end)
Refrigerant	appearance	Lubricant	appearance	Contaminant	appearance
R-407C	39%			aantral	38%
R-507A	28%	RL32S	31%	control	36%
R-134a	28%				4
R-22	8%	3GS	8%	acid	17%

	Connecting rod (large end) appearance	
Variable	Normal	Abnormal
Return gas temperature	60°F	61°F

Connecting Rod (large end) Wear

Response Codes		
Normal	Abnormal	
none	medium	
polish	heavy	
slight		

The level of wear on the large end of the connecting rod was statistically related to lubricant and the contaminant water.

	Compressors with normal		Compressors with normal
Lubricant	connecting rod (large end) wear	Contaminant	connecting rod (large end) wear
RL32S	91%	control	100%
3GS	78%	water	77%

Connecting Rod (small end) Appearance

Response Codes	
Normal	Abnormal
none	scored
contact wear	copper plating
	corrosion

Did not separate corrosive effects of HCl and water in R-22 machines.

The appearance of the small end of the connecting rod was statistically related to refrigerant, lubricant, the contaminants water, air, acid, R-502, and R-12, pressure, and temperature.

	Compressors with normal connecting rod (small end)		Compressors with normal connecting rod (small end)
Refrigerant	appearance	Lubricant	appearance
R-507A	78%		
R-407C	78%	RL32S	76%
R-134a	72%		
R-22	33%	3GS	33%

	Compressors with normal connecting rod
Contaminant	(small end) appearance
control	96%
R-502 in R-507A	69%
acid	63%
R-12 in R-134a	63%
air	59%
water	56%

	Connecting rod (small end) appearance	
Variable	Normal	Abnormal
Discharge pressure	233 psig	224 psig
Suction pressure	36 psig	40 psig
Discharge temperature	188°F	187°F
Return gas temperature	60°F	62°F
Sump temperature	160°F	159°F

Connecting Rod (small end) Wear

Response Codes		
Normal	Abnormal	
polish	medium	
slight	heavy	

The level of wear on the small end of the connecting rod was statistically related to refrigerant, lubricant, and the contaminant R-12.

	Compressors		Compressors		Compressors
	with normal		with normal		with normal
	connecting rod		connecting rod		connecting rod
	(small end)		(small end)		(small end)
Refrigerant	wear	Lubricant	wear	Contaminant	wear
R-22	100%	3GS	100%	control	96%
R-507A	81%			Control	90%
R-134a	81%	RL32S	80%	R-12	63%
R-407C	78%			in R-134a	03%

Piston Pin Washers' Appearance

Response Codes			
Normal Abnormal			
no wear	high wear		
contact wear	corrosion		
copper plating			

The appearance of the piston pin washers was statistically related to refrigerant, the contaminant R-12, pressure, and temperature. In compressors with piston pin washers considered normal, suction pressure was higher and discharge, return gas, and sump temperatures were lower than in compressors where the piston pin washers appeared abnormal.

	Compressors with normal piston pin washers'		Compressors with normal piston pin washers'
Refrigerant	appearance	Contaminant	appearance
R-407C	97%	a a m t m a l	92%
R-507A	89%	control	92%
R-22	83%	R-12	63%
R-134a	75%	in R-134a	05%

	Piston pin washers' appearance	
Variable	Normal	Abnormal
Suction pressure	40 psig	20 psig
Discharge temperature	183°F	215°F
Return gas temperature	60°F	63°F
Sump temperature	153°F	199°F

Piston Pin (removed) Appearance

Response Codes			
Normal	Abnormal		
clean	scored		
copper plating			
	bronze plating		
	corrosion		
	discolored		
heavily discolored			

Pressure and temperature only were statistically related to the appearance of the piston pin (removed). In compressors where the piston pin (removed) was judged normal, discharge pressure was higher and return gas temperature was lower than in compressors with an abnormal-appearing piston pin.

	Piston pin (removed) appearance	
Variable	Normal	Abnormal
Discharge pressure	261 psig	221 psig
Return gas temperature	59°F	61°F

Piston Pin Wear

Response Codes			
Normal Abnormal			
none	medium		
polish	heavy		
slight			

None of the independent variables was statistically related to the level of wear on the piston pin.

Suction Side (Reed Backer) Appearance

Response Codes		
Normal	Abnormal	
clean	carbon	
light carbon	copper plating	
	corrosion	
	soot	
	heavy soot	

Only temperature was statistically related to the appearance of the reed backer on the suction side of the valve plate assembly. In compressors where the appearance was normal, return gas temperature was higher.

	Suction side (reed backer) appearance	
Variable	Normal	Abnormal
Return gas temperature	63°F	61°F

Suction Side Surface Appearance

Response Codes		
Normal Abnormal		
carbon	black	
corrosion	soot	
copper plating		
damaged		

The surface appearance of the suction side of the valve plate assembly was statistically related to refrigerant, pressure, and temperature. The discharge pressure, discharge temperature, and sump temperature were all lower in compressors where the surface was normal.

	Compressors with normal
Refrigerant	suction side surface appearance
R-134a	94%
R-407C	89%
R-22	58%
R-507A	42%

	Suction side surface appearance	
Variable	Normal	Abnormal
Discharge pressure	209 psig	281 psig
Discharge temperature	183°F	198°F
Sump temperature	152°F	178°F

Suction Reed (removed) Appearance

Response Codes		
Normal Abnormal		
clean	carbon	
corrosion	copper plating	
	soot	
	heavy soot	

The appearance of the suction reed removed from the valve plate assembly was statistically related to refrigerant, pressure, and temperature. In compressors where the suction reed was normal, discharge pressure was lower, suction pressure was higher, and discharge and sump temperatures were lower.

	Compressors with normal
Refrigerant	suction reed appearance
R-407C	97%
R-134a	94%
R-22	92%
R-507A	56%

	Suction reed appearance	
Variable	Normal	Abnormal
Discharge pressure	215 psig	312 psig
Suction pressure	40 psig	24 psig
Discharge temperature	182°F	216°F
Sump temperature	150°F	211°F

Suction Reed Trepan

Response Codes		
Normal Abnormal		
none	slight	
very slight	medium	
	heavy	

The magnitude of trepanning on the suction reed removed from the valve plate assembly was statistically related to refrigerant, the contaminants air, R-12, and R-22, discharge pressure, and discharge and sump temperatures. The discharge pressure, discharge temperature, and sump temperature were lower in compressors with a normal magnitude of trepanning on the suction reed.

	Compressors with normal		Compressors with normal
Refrigerant	suction reed trepan	Contaminant	suction reed trepan
R-407C	81%	R-22 in R- 407C	81%
R-134a	67%	R-12 in R-134a	81%
R-22	44%	control	63%
R-507A	42%	air	48%

	Suction reed trepan	
Variable	Normal	Abnormal
Discharge pressure	214 psig	252 psig
Discharge temperature	182°F	196°F
Sump temperature	150°F	174°F

Suction Reed Varnish Ring

Response Codes		
Normal	Abnormal	
none	very slight	
	slight	
	medium	
	heavy	

Pressure and temperature only were statistically related to the magnitude of a varnish ring on the suction reed removed from the valve plate assembly. In compressors with no varnish ring (i.e. normal), suction pressure was higher and discharge, return gas, and sump temperatures were lower.

	Suction reed varnish ring	
Variable	Normal	Abnormal
Suction pressure	43 psig	34 psig
Discharge temperature	178°F	193°F
Return gas temperature	59°F	62°F
Sump temperature	142°F	170°F

Discharge Side (Reed Backer) Appearance

Response Codes		
Normal	Abnormal	
clean	carbon	
light carbon	copper plating	
corrosion	blued	
	black	
_	soot	
	heavy soot	

The appearance of the reed backer on the discharge side of the valve plate assembly was statistically related to refrigerant, lubricant, the contaminants air and R-502, suction pressure, and discharge and sump temperatures. In compressors with a normal reed backer appearance, suction pressure was higher and discharge and sump temperatures were lower.

	Compressors with normal discharge side (reed backer)		Compressors with normal discharge side (reed backer)		Compressors with normal discharge side (reed backer)
Refrigerant	appearance	Lubricant	appearance	Contaminant	appearance
R-22	97%	3GS	97%	control	75%
R-407C	69%			air	55%
R-134a	61%	RL32S	56%	R-502 in R- 507A	38%
R-507A	39%				

	Discharge side (reed backer) appearance	
Variable	Normal	Abnormal
Suction pressure	44 psig	24 psig
Discharge temperature	178°F	207°F
Sump temperature	144°F	190°F

Discharge Side Surface Appearance

Response Codes		
Normal Abnormal		
clean	black	
blued	soot	
corrosion	copper plating	
	carbon	

The surface appearance of the discharge side of the valve plate assembly was statistically related to refrigerant, lubricant, the contaminant R-12, and discharge pressure. The discharge pressure was lower in compressors where the surface was normal.

	Compressors with normal discharge side		Compressors with normal discharge side		Compressors with normal discharge side
	surface		surface		surface
Refrigerant	appearance	Lubricant	appearance	Contaminant	appearance
R-134a	92%			R-12	94%
R-407C	89%	RL32S	79%	in R-134a	9 4 70
R-507A	56%				0204
R-22	44%	3GS	44%	control	83%

	Discharge side surface appearance	
Variable	Normal Abnormal	
Discharge pressure	208 psig	281 psig

Discharge Side Surface Appearance Revised for R-22

Response Codes (revised)		
Normal	Abnormal	
clean	black	
blued	soot	
corrosion	carbon	
copper plating		

Statistically Significant Relationships Using Revised Response Codes

	Compressors with normal discharge side surface		Compressors with normal discharge side surface		Compressors with normal discharge side surface
Refrigerant	appearance	Lubricant	appearance	Contaminant	appearance
R-22	100%	3GS	100%	aantual	92%
R-134a	92%			control	92%
R-407C	89%	RL32S	79%	R-502	50%
R-507A	56%			in R-507A	30%

Discharge Reed (removed) Appearance

Response Codes			
Normal	Abnormal		
clean	blued		
very light carbon	copper plating		
corrosion	carbon		
	heavy carbon		
	black		
	soot		

None of the independent variables was statistically related to the appearance of the discharge reed removed from the valve plate assembly.

Discharge Reed (removed) Appearance Revised for R-22

Response Codes (revised)		
Normal Abnormal		
clean	blued	
very light carbon	carbon	
corrosion	heavy carbon	
copper plating	black	
	soot	

Statistically Significant Relationships Using Revised Response Codes

Refrigerant	Compressors with normal discharge reed appearance	Contaminant	Compressors with normal discharge reed appearance
R-22	100%	control	79%
R-407C	81%	air	64%
R-134a	67%	R-502 in R-507A	38%
R-507A	42%		

Discharge Reed Trepan

Response Codes			
Normal Abnormal			
none	slight		
very slight medium			
	heavy		

The magnitude of trepanning on the discharge reed removed from the valve plate assembly was statistically related to refrigerant, lubricant, suction pressure, and discharge, return gas, and sump temperatures. Compressors with a normal magnitude of trepanning had higher suction pressure and lower discharge, return gas, and sump temperatures.

Refrigerant	Compressors with normal discharge reed trepan	Lubricant	Compressors with normal discharge reed trepan
R-407C	97%		
R-134a	89%	RL32S	84%
R-507A	67%		
R-22	53%	3GS	53%

	Discharge reed trepan	
Variable	Normal	Abnormal
Suction pressure	40 psig	29 psig
Discharge temperature	180°F	211°F
Return gas	60°F	63°F
Sump temperature	150°F	192°F

Discharge Reed Varnish Ring

Response Codes			
Normal Abnormal			
none	slight		
very slight	medium		
	heavy		

The magnitude of a varnish ring on the discharge reed removed from the valve plate assembly was statistically related to refrigerant, the contaminants air and R-502, suction pressure, and discharge and sump temperatures. In compressors with no varnish ring (i.e. normal), suction pressure was higher and discharge and sump temperatures were lower.

	Compressors with normal		Compressors with normal
	discharge reed		discharge reed
Refrigerant	varnish ring	Contaminant	varnish ring
R-134a	89%	control	83%
R-22	86%	Control	03%
R-407C	78%	air	69%
R-507A	58%	all	09%

	Discharge reed varnish ring	
Variable	Normal	Abnormal
Suction pressure	43 psig	31 psig
Discharge temperature	176°F	201°F
Sump temperature	143°F	179°F

TAN (Total Acid Number)

The final TAN of the compressor lubricant was statistically related to refrigerant, lubricant, and the contaminants water and R-502. TAN was also statistically significant and positively related to discharge pressure and discharge and sump temperature. TAN was negatively related to suction pressure.

Refrigerant	Mean TAN	Lubricant	Mean TAN
R-507A	.45		
R-134a	.17	RL32S	.25
R-407C	.13		
R-22	.13	3GS	.13

Contaminant	Mean TAN
R-502 in R-507A	.49
water	.28
control	.13

Variable	r
Discharge pressure	.42
Suction pressure	33
Discharge temperature	.47
Sump temperature	.54

Water

The final amount of water (ppm) in the compressor lubricant was statistically related to refrigerant, lubricant, and the contaminants air and R-22. There was no statistical relation between water measurement and pressure or temperature.

Refrigerant	Mean Water (ppm)	Lubricant	Mean Water (ppm)
R-407C	167		
R-507A	123	RL32S	125
R-134a	87		
R-22	33	3GS	33

Contaminant	Mean Water (ppm)
R-22 in R- 407C	200
control	148
air	82

Total Metals

The total amount of metals (ppm) present in the final compressor lubricant was statistically related to refrigerant and the contaminant R-502. The amount of total metals was

also statistically significant and positively related to discharge pressure and discharge and sump temperature. The amount of total metals was negatively related to suction pressure.

Refrigerant	Mean Total Metals (ppm)	Contaminant	Mean Total Metals (ppm)
R-507A	40	R-502 in R-507A	41
R-22	13	10 302 m 10 30771	11
R-134a	11	aantral	17
R-407C	8	control	1 /

Variable	r
Discharge pressure	.43
Suction pressure	18
Discharge temperature	.32
Sump temperature	.38

Trash in Liquid Screen

The amount of trash in the liquid screen (g) of the compressor at the end of the run was statistically related to refrigerant and the contaminant R-502. The amount of trash was statistically significant and positively related to discharge and sump temperature and negatively related to return gas temperature and suction pressure.

Refrigerant	Mean Trash in Liquid Screen (g)	Contaminant	Mean Trash in Liquid Screen (g)
R-507A	.09	R-502	11
R-22	.04	in R-507A	.11
R-134a	.04	aontrol	04
R-407C	.03	control	.04

Variable	r
Suction pressure	20
Discharge temperature	.21
Return gas temperature	21
Sump temperature	.22

Debris in Compressor Bottom

The amount of debris (g) in the compressor bottom at the end of the run was statistically related to refrigerant, lubricant, and the contaminant R-502. The amount of debris was

statistically significant and positively related to discharge and sump temperature and negatively related to suction pressure.

Refrigerant	Mean Debris in Bottom (g)	Lubricant	Mean Debris in Bottom (g)
R-507A	.97		
R-407C	.69	RL32S	.78
R-134a	.67		
R-22	.50	3GS	.50

	Mean Debris in Bottom
Contaminant	(g)
R-502 in R-507A	.92
control	.57

Variable	r
Suction pressure	27
Discharge temperature	.20
Sump temperature	.24

Fluoride Ion

The level of fluoride ion (ppm) in the final lubricant was statistically related to refrigerant, lubricant, and the contaminant R-502. The fluoride ion level was statistically significant and positively related to discharge pressure and negatively related to return gas temperature.

Refrigerant	Mean Fluoride Ion (ppm)	Lubricant	Mean Fluoride Ion (ppm)
R-507A	1.6		
R-407C	1.2	RL32S	1.2
R-134a	.93		
R-22	.93	3GS	.93

Contaminant	Mean Fluoride Ion (ppm)
R-502 in R-507A	1.6
control	1.2

Variable	r
Discharge pressure	.31
Return gas temperature	46

Chloride Ion

The level of chloride ion (ppm) in the final lubricant was statistically related to refrigerant and the contaminants R-12 and R-502. The chloride ion level was statistically significant and positively related to discharge, return gas, and sump temperature and negatively related to discharge and suction pressure.

Refrigerant	Mean Chloride Ion (ppm)	Contaminant	Mean Chloride Ion (ppm)
R-134a	15	R-12 in R-134a	16
R-22	13	control	12
R-407C	11	R-502 in R- 507A	11
R-507A	10		

Variable	r
Discharge pressure	32
Suction pressure	26
Discharge temperature	.26
Return gas temperature	.46
Sump temperature	.29

Conclusions From Statistical Analysis

In brief, R-507A and R-22 were associated with a higher percentage of abnormal machines than R-407C and R-134a. 3GS was associated with a substantially higher number of abnormal machines than RL32S. Machines that had contaminant acid, air, and water added were declared abnormal far more than control machines. Performance of machines that had refrigerant added as a contaminant was mixed; some machines were worse than controls, others were better. Discharge pressure tended to be lower for outcome variables that were declared normal. Suction pressure tended to be higher for outcome variables that were declared normal. Discharge, return gas, and sump temperatures tended to be lower for outcome variables that were declared normal.

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DISCUSSION OF SEALED TUBE RESULTS

The conclusions drawn from the visual observations of the sealed tube tests are summarized in <u>Table 4</u>. There are two chemistry aspects to remember when reviewing the observations and measurements of sealed tubes. When RL32S decomposes by either hydrolysis or oxidation, the acid produced is considered a weak acid whether it is in the non or ionized state if oxygen or water is present. When reviewing the results of the effects of water, organic acid, and air on the tubes containing the mineral oil, Suniso 3GS, a different set of circumstances exist. It is well known that R-22 is easily hydrolyzed by water to form HCl gas.

R-507A

The contaminant refrigerant in the R-507A tubes was R-502. It is thought that R-507A and R-404a could be used as retrofit refrigerants and that retrofitted systems may contain small amounts of the CFC and HCFC component.

The reaction of R-507A and contaminants are presented in <u>Table 5</u> and <u>Table 6</u>. Both temperatures seem to track as expected for the addition of water, while the higher temperature produces a slightly higher TAN value. Remarkably however, air alone produces an acid response, which is not increased by the addition of contaminant organic acid or water. Oxidation of RL32S is an obvious response factor as it is seen with the appearance of CO and CO₂ at apparently equal levels.

In this refrigerant case, air plays a dominant role in organic acid and some HCl formation that appears not to be catalyzed by the presence of R-502.

R-407C and R-134a

Both R-407C with contaminant R-22 and R-134a with contaminant R-12 show a similar chemical and acid formation to R-507A (see <u>Table 7</u>, <u>Table 8</u>, <u>Table 11</u>, and <u>Table 12</u>). More noteworthy, however, is the proportionately higher level of CO₂ at both temperatures, but with similar and proportionate levels of CO being produced. The presence of R-22 and R-12 may possibly increase the amount of ferric salts catalyzing the slightly greater level of carbon monoxide measured. Again, the most striking response are the high TAN values in the presence of contaminant air.

R-22

The chemistry that appears to be different is the response of contaminants to the R-22 and mineral oil combination of reactants (<u>Table 9</u> and <u>Table 10</u>). A possible indicator as to why R-22 and mineral oil systems are tolerant to system contaminants is that the presence of air does not affect the production of significant levels of organic acids as compared to POE lubrication. Higher temperatures (<u>Table 10</u>) cause an increase in TAN level and higher carbon dioxide levels. Yet when compared to POEs at both temperatures and the elevation of organic acid or HCl formed in the mineral oil tubes, the levels are still a magnitude of seven less.

Table 4
Conclusions Drawn from Sealed Tube Visual Observations

System	System Temperature							
Refrigerant	135°C (275°F)	165°C (329°F)						
R-507A (<u>Appendix I</u>)	 Acid corrodes copper in gas phase. Air generates precipitate. 	 Acid corrodes copper in gas phase and corrodes valve steel. Air generates precipitate. 						
R-407C (Appendix J)	 Air corrodes valve steel and generates precipitate. Water, acid, and R-22 corrode copper. 	 Air generates precipitate. Water, acid, and R-22 corrode valve steel. 						
R-22* (Appendix K)	• Air corrodes all metals and generates precipitate.	Air corrodes all metals and generates precipitate.						
R-134a (<u>Appendix L</u>)	 Water and acid corrode copper. Acid and air generate precipitate. 	• Air generates precipitate.						

^{*} The R-22 system generated significantly more corrosion than others did.

 $Table~5 \\ Chemical~Analysis~of~Sealed~Tubes~Containing~RL32S:R-507A~(1:1)\\ Reacted~at~135^{\circ}C~(275^{\circ}F)~for~224~days$

Sample Contaminants					GC Vapor Composition						
Water* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-507A (%)	R-502 (%)	TAN**	
<20	-	-	-	-	-	-	-	100	-	.10	
200	-	-	-	_	-	-	-	100	-	2.0	
<20	0.1	-	-	_	-	-	-	100	-	.78	
<20	-	-	4	_	-	-	-	96.5	3.5	.15	
<20	-	4	-	2.3	-	.10	.20	97.4	-	9.9	
200	0.1	-	-	-	-	-	-	99.8	.20	2.1	
200	_	-	4	_	-	-	-	95.8	4.2	2.0	
200	-	4	-	3.4	.15	.10	.20	96.2	-	11	
<20	0.1	-	4	_	-	-	-	95.7	4.3	.76	
<20	0.1	4	-	3.2	.10	.10	.30	96.3	-	12	
<20	-	4	4	3.1	.15	.10	.20	93.0	3.5	15	
200	0.1	-	4	-	-	-	-	96.4	3.6	2.1	
200	0.1	4	-	3.0	-	.15	.25	96.6	-	12	
200	-	4	4	2.6	_	.19	.22	93.5	3.4	15	
<20	0.1	4	4	2.9	-	.20	.28	93.2	3.3	14	
200	0.1	4	4	2.4	_	.18	.25	93.9	3.2	15	

^{*}Water in lubricant and refrigerant

^{**}Expressed as KOH (mg) / RL32S (g)

Table 6 Chemical Analysis of Sealed Tubes Containing RL32S:R-507A (1:1) Reacted at 165°C (329°F) for 28 days

Sample Contaminants					GC Vapor Composition						
Water* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-507A (%)	R-502 (%)	TAN**	
<20	-	-	-	-	-	-	-	99.9	.10	.53	
200	_	-	-	-	-	-	-	99.8	.20	2.1	
<20	0.1	-	-	_	-	-	-	99.9	.10	.77	
<20	-	-	4	_	-	-	-	98.7	1.3	.12	
<20	-	4	-	3.7	.12	.27	.88	94.8	.07	12	
200	0.1	_	-	_	-	-	-	99.8	.20	NA	
200	-	_	4	_	-	-	-	95.7	4.3	NA	
200	-	4	-	3.3	.14	.25	1.0	94.1	.05	14	
<20	0.1	-	4	_	-	-	-	96.1	3.9	.61	
<20	0.1	4	-	3.5	.14	.27	.77	95.3	.05	11	
<20	-	4	4	2.3	-	.17	.25	94.3	3.0	16	
200	0.1	_	4	_	-	-	-	96.0	4.0	2.2	
200	0.1	4	-	2.0	-	.09	.19	97.7	-	13	
200	-	4	4	3.0	-	.07	1.6	92.0	3.3	20	
<20	0.1	4	4	3.2	.15	.10	.50	92.6	3.5	18	
200	0.1	4	4	3.5	.10	.51	.75	91.8	3.3	16	

^{*}Water in lubricant and refrigerant
**Expressed as KOH (mg) / RL32S (g)
NA = not available/tube failure

Table 7 Chemical Analysis of Sealed Tubes Containing RL32S:R-407C (1:1) Reacted at 135°C (275°F) for 224 days

Sam	Sample Contaminants					GC Vapor Composition						
Water* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-407C (%)	R-22 (%)	TAN**		
<20	-	-	-	-	-	-	-	100	-	.17		
200	_	-	-	-	-	-	-	100	-	NA		
<20	0.1	-	-	-	-	-	-	100	-	.78		
<20	-	-	4	-	-	-	-	97.5	2.5	NA		
<20	-	4	-	3.5	.70	.10	.50	95.2	-	12		
200	0.1	-	-	-	-	_	.48	99.5	-	2.0		
200	-	-	4	-	-	-	-	97.2	2.8	1.9		
200	-	4	-	3.4	.39	.30	.86	95.0	.11	15		
<20	0.1	-	4	-	-	_	.41	96.4	3.2	NA		
<20	0.1	4	-	3.9	.48	.29	.78	94.6	-	14		
<20	-	4	4	3.6	.43	.31	.54	92.4	2.7	13		
200	0.1	-	4	-	-	_	-	97.1	2.9	NA		
200	0.1	4	-	3.9	.46	.12	.96	94.6	.09	16		
200	-	4	4	3.8	.62	.27	.59	92.4	2.4	15		
<20	0.1	4	4	3.7	.57	.28	.81	92.2	2.4	14		
200	0.1	4	4	3.7	.55	.27	.62	92.4	2.5	15		

^{*}Water in lubricant and refrigerant
**Expressed as KOH (mg) / RL32S (g)
NA = not available/tube failure

Table 8 Chemical Analysis of Sealed Tubes Containing RL32S:R-407C (1:1) Reacted at 165°C (329°F) for 28 days

Sam	ple Conta	minan	ıts			RL32S				
Water* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-407C (%)	R-22 (%)	TAN**
<20	-	-	-	-	-	-	-	100	-	.12
200	_	-	-	-	-	-	-	100	-	2.1
<20	0.1	-	-	-	-	-	-	100	-	.70
<20	-	-	4	-	-	-	.32	96.7	2.9	.28
<20	_	4	-	3.4	.41	.32	1.2	94.5	.16	14
200	0.1	-	-	-	-	-	-	100	-	2.0
200	-	-	4	-	-	-	-	96.7	3.3	NA
200	_	4	-	3.8	.70	.28	.75	94.5	-	7.3
<20	0.1	-	4	-	-	-	-	97.0	3.0	.04
<20	0.1	4	-	3.4	1.1	-	1.3	94.1	.11	15
<20	_	4	4	3.7	.58	.30	.78	92.2	2.4	14
200	0.1	-	4	-	-	-	-	96.7	3.3	NA
200	0.1	4	-	3.6	.54	.17	.73	94.9	-	15
200	-	4	4	4.0	.83	.25	.68	92.0	2.2	14
<20	0.1	4	4	3.5	.47	.33	.88	92.3	2.6	12
200	0.1	4	4	3.8	.75	.28	.74	91.9	2.5	12

^{*}Water in lubricant and refrigerant

**Expressed as KOH (mg) / RL32S (g)

NA = not available/tube failure

Table 9 Chemical Analysis of Sealed Tubes Containing 3GS:R-22 (1:1) Reacted at 135°C (275°F) for 224 days

Sample	Contamir	nants		3GS				
Water* (ppm)	Acids (TAN)	Air (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-22 (%)	TAN**
<20	-	-	-	-	-	-	100	.04
200	-	-	_	-	-	-	100	.01
<20	0.1	-	-	-	-	-	100	.11
<20	-	4	3.4	.47	-	.12	96.0	1.1
200	0.1	-	_	-	-	-	100	.10
200	-	4	3.5	.40	.10	.20	95.8	1.7
<20	0.1	4	3.6	.13	.12	.23	95.9	1.5
200	0.1	4	3.4	.12	.18	.21	96.1	1.5

^{*}Water in lubricant and refrigerant **Expressed as KOH (mg) / 3GS (g)

Table 10 Chemical Analysis of Sealed Tubes Containing 3GS:R-22 (1:1) Reacted at 165°C (329°F) for 28 days

Sample		3GS						
Water* (ppm)	Acids (TAN)	Air (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-22 (%)	TAN**
<20	-	-	-	-	-	-	100	.04
200	-	-	-	-	-	-	100	.03
<20	0.1	-	-	-	-	-	100	.13
<20	-	4	.68	<.05	.06	.76	98.5	1.8
200	0.1	-	-	-	-	.28	99.7	.13
200	-	4	3.3	.21	.18	.28	96.0	2.9
<20	0.1	4	3.2	.10	.10	.40	96.2	2.1
200	0.1	4	3.0	<.05	.22	.63	96.1	2.6

^{*}Water in lubricant and refrigerant **Expressed as KOH (mg) / 3GS (g)

Table 11 Chemical Analysis of Sealed Tubes Containing RL32S:R-134a (1:1) Reacted at 135°C (275°F) for 224 days

Sample Contaminants					RL32S					
Water* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
<20	-	-	-	-	-	-	-	100	-	.18
200	-	-	-	-	-	-	-	100	-	2.0
<20	0.1	-	-	-	-	-	-	100	-	.63
<20	_	-	4	-	-	-	-	97.6	2.4	.18
<20	-	4	-	3.5	0.9	<.05	.58	95.9	-	14
200	0.1	_	-	-	-	-	-	100	-	1.9
200	_	-	4	-	-	-	-	97.6	2.4	2.1
200	-	4	-	3.8	-	.28	-	95.9	-	15
<20	0.1	-	4	-	-	-	-	97.7	2.3	.69
<20	0.1	4	-	3.5	-	0.10	0.50	95.9	-	12
<20	-	4	4	3.5	-	0.10	0.50	93.4	2.5	10
200	0.1	-	4	-	-	-	-	96.1	3.9	.72
200	0.1	4	-	3.9	-	.37	.66	95.1	-	2.7
200	-	4	4	3.7	_	.41	.65	92.0	3.2	13
<20	0.1	4	4	3.6	_	.53	.79	91.8	3.2	12
200	0.1	4	4	4.0	-	.57	.83	91.6	3.1	14

^{*}Water in lubricant and refrigerant **Expressed as KOH (mg) / RL32S (g)

 $Table~12 \\ Chemical~Analysis~of~Sealed~Tubes~Containing~RL32S:R-134a~(1:1)\\ Reacted~at~165^{\circ}C~(329^{\circ}F)~for~28~days$

Sam		RL32S								
Water* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
<20	-	-	-	-	-	-	-	100	-	.14
200	-	-	-	-	-	-	-	100	-	2.4
<20	0.1	-	-	-	-	-	-	100	-	.59
<20	-	-	4	-	-	-	-	97.6	2.4	.27
<20	-	4	-	3.3	-	.15	.50	96.0	-	12
200	0.1	-	-	-	-	-	-	100	-	2.3
200	-		4	-	-	-	-	97.6	2.4	2.0
200	-	4	-	2.7	-	.13	.53	96.7	-	15
<20	0.1	-	4	-	-	-	-	97.2	2.8	.74
<20	0.1	4	-	3.5	-	.15	.40	96.0	-	12
<20	-	4	4	3.6	-	.28	.56	92.6	3.0	13
200	0.1	-	4	-	-	-	-	97.8	2.8	1.9
200	0.1	4	-	4.0	-	.28	.71	95.0	-	10
200	-	4	4	3.2	_	.24	.53	93.0	3.0	16
<20	0.1	4	4	4.2	_	.31	.72	91.7	3.1	16
200	0.1	4	4	3.5	-	.26	.59	92.7	3.0	16

^{*}Water in lubricant and refrigerant

^{**}Expressed as KOH (mg) / RL32S (g)

CONCLUSION

This comprehensive study indeed proves that low levels of water, organic acid, and especially air contribute to the degradation of compressor performance and compressor life. Sealed tube tests at two different temperatures and duration also clearly identify the effects of water and organic acid as corrodant, but most importantly show that the presence of air accelerates refrigerant and lubricant decomposition. Clearly, the lubricant type plays an extraordinary role in tolerance to contaminant levels. Polyolesters are significantly more susceptible to water and the presence of air. This is clearly shown by both the compressor and sealed tube studies.

All of the R-22 compressor test units survived the duration of the study and contained contaminants identical to the other HFC machines. The primary difference was that the R-22 units were a chlorinated refrigerant lubricated with a mineral oil, whereas the HFC machines were lubricated with a polyolester. Statistically, lubricant degradation was positively related to the contaminant R-502. We have statistically shown that increased TAN and water formation are indicators of lubricant degradation.

We used the TAN value and water formation as partial indicators of lubricant degradation. Using these two parameters, we have statistically shown that the contaminants of R-502 and water and refrigerant type cause lubricant degradation. An increase in TAN and water is also positively related to discharge pressure and discharge and sump temperature. The positive degradation effect was perhaps accelerated because bearing loads were greater with R-507A, causing increase in contaminant formation. The pressures and bearing loads are similar for R-134a, R-407C, and R-22, but the Suniso 3GS mineral oil shows minimal effects. The presence of contaminant R-502 may have further accelerated the degradation process when combined with the increased bearing loads of R-507A.

One interesting outcome is the statistical significance of fluoride ion formation in the lubricant, suggesting that HFC refrigerant decomposition can be associated with increased temperature and compression ratio. Coupled with the concept of refrigerant decomposition, lubricant degradation is part of the reaction path. Machine failure is inevitable if *in situ* formation of contaminants, such as organic acids, water, soluble metal carboxylate salts, and air oxidation products, are not controlled.

The visual appearance of copper plating, the blush color of copper on iron surfaces, is an unusual effect in mechanical machines. However, with hermetic systems wherein the operating fluid is highly halogenated, copper blush or copper plating is frequently observed.

In this study, R-22 was compared to R-507A, R-407C, and R-134a for its propensity to elicit a copper plating response. 97% of all R-22 units had a slight copper plating response upon hot bearing surfaces and discharge reed contact surfaces. However, a more severe response has been seen with high compression ratio R-507A units to the point of copper or bronze flakes, independent of contaminant and dependent on temperature. R-407C had the lowest response to copper plating but the response was dependent on both acid and water, with temperature being less important.

Refrigerant 134a, when compared to R-22, had nearly equal levels of chloride ion in the lubricant. The copper plating response rate was nearly the same, but most prevalent on bearing surfaces and independent of any contaminant level or temperature.

Bear in mind that all of the test stands were operated without any kind of contaminant control such as a filter drier or some component in the liquid line prior to the expansion valve. The results reported for compressor can bottom residue, trash in the in-line screen, and residue in the expansion valve could possibly have been eliminated with a filter drier.

The type and construction of the filter drier is an important concept to keep in mind, but more importantly is the contaminant needing to be trapped by the drier. Solid debris, water, acids, and varnish causing issues can be effectively controlled. Therefore, reactive components and solid debris can be retained. What cannot be retained in a filter drier is circulating air contamination. As evidenced in the sealed tube testing, air is consumed, producing carbon monoxide and carbon dioxide, as well as increasing organic acid content. Naturally, a filter drier equipped to handle quantities of organic acid would be superior. In mineral oil and R-22 systems, air has less of a negative effect and the traditional use of drying-only filter driers may be ideal. In fact, R-22 test stands also show the tolerance of contaminants with chlorinated mineral oil systems.

In conclusion, organic acid contaminants can be formed *in situ* with the presence of water. The presence of water is shown to be a negative factor in lubrication as well. Each refrigerant has its own particular mechanism of contaminant formation and, if run without halogen ion removal, it further accelerates machine degradation. Friction and wear are attributed to increased acid content in some machines. The inclusion of air in HFC and polyolester systems should be considered the most serious of contaminants. Circulating levels of air in new systems should be kept at lower levels than recommended in current industry guidelines. Further examination is needed to evaluate the best contaminant control mechanism and how it can control wear and further extend machine life.

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Appendix A Visual Inspection, Laboratory Analysis, and Photographic Documentation of Test Compressors after Tear Down

The report for each compressor is comprised of a two page query sheet based on the visual inspection and laboratory analysis conducted after tear down and two pages of macroscopic and microscopic digital photographs taken of key parts of the compressor after tear down.

Report for R-507A Control Compressor

TEST HISTORY OF:			
Unit Number 5			
Model # RS43C1E-CAV-250 Seria	al# 96F16428	Crank journals	
Run Time (hr.) 10525 Faile	ed? Yes	Appearance scored/Cu plating	
Refrigerant R-507A		Wear polish	
Lubricant RL32S		Dimensions Loaded 1.24	70
Contaminants:		Unloaded 1.24	70
Control Unit? Yes			
Acid? No R-12? No		Lower crank bearing journal	
Air? No R-22? No		Appearance scored/Cu plating/bronze pl	lating
H ₂ O? No R-502? No		Wear slight	
-		Dimensions Loaded 0.99	95
Discharge Pressure (psig)	355	Unloaded 0.99	
Suction Pressure (psig)	14	Bottom thrust washer (crank side)	-
Discharge Temp (°F)	235	Appearance bronze plating	
Return Gas Temp (°F)	62	Wear slight	
SumpTemp (°F)	242	ong.ii	
Sumpremp (1)		Bottom washer (casting side)	
Hi-Pot	pass	Appearance bronze plating	
High-low leak	pass	Wear polish	
Top shell appearance	gray	Lower bronze bearings	
Suction exit trail appearance	Cu	Appearance scored	
Cluster block condition	good	Wear heavy	
Wire to cluster block appearance	black	Dimensions Loaded 1.03	340
Suction ring top appearance	black	Unloaded 1.01	15
Remaining torque of discharge muffle			-
(1) ND (2) ND (3) ND	(4) ND	Shaft in cage bearing	
Remaining torque of stator bolts	. ,	Appearance scored	
(1) ND (2) ND (3) ND	(4) ND	Wear polish	
Suction muffler appearance	black	Piston top appearance clean	
OEM flux?	No	Piston skirt	
Loose restrictor?	No	Appearance low wear/bronze plating	
		Dimensions Loaded 1.37	140
Discharge plate appearance Top stator windings appearance	gray black	Unloaded 1.37	
			40
Rotor rub marks present? Was rotor loose?	Yes	Cylinder bore	
	Yes	Appearance no wear/Cu plating	
Shell bottom appearance	black/Cu plate	Varnish ring slight	160
Quantity of bearing chips	heavy	Dimensions Loaded 1.37 Unloaded 1.37	
Remaining torque of discharge muffle			00
(1) ND (2) ND (3) ND Head gasket brittle?	(4) ND	Connecting rod (large end) Appearance scored	
	yes/bonded		
Head suction cavity appearance Head discharge cavity appearance	dirty	Wear polish Dimensions Loaded 1.25	20
Cage bearing top appearance	dirty	Unloaded 1.25	
e e 	dirty	Omoaueu 1.23	143
Remaining torque of cage bearing bol (1) 5 (2) 7 (3) 7.5	(4) 5		
(1) (2) (3) (3) (3)	(-7) J		

Unit Number

Contaminants: Trash in liquid screen (g) 0.019

Control Unit? 2 Yes Number of screens

Acid? Debris in compressor bottom (g) 1.579 No R-12? No Air? No R-22? No

Valve Plate Assembly Inspection

good

slight

heavy

corrosion/carbon

Appearance

Varnish ring

Discharge reed

Trepan

 H_2O ? No R-502? No

Connecting rod (small end) Suction side (reed backer)

Appearance contact wear/incorrect washer Condition good medium Wear corrosion/carbon **Appearance**

Dimensions Loaded 0.5195 **Suction surface appearance** 0.5035 black/soot Unloaded

Piston pin washers appearance **Suction reed** high wear (4 contact points) Condition

Piston pin

Appearance scored/bronze plating

Wear medium **Dimensions** Loaded 0.4980

Unloaded 0.4980

Discharge side (reed backer) Condition good **Final Lubricant Values** Appearance blued/carbon **Total Acid Number (TAN)** 0.50 Discharge surface appearance

Water (ppm) 100 black/soot Fluoride ion (ppm) 1.5

12

4

1

Chloride ion (ppm) Condition Aluminum (ppm) 10 good Appearance Copper (ppm) 4 corrosion/blued/carbon Iron (ppm) 73 **Trepan** slight

Lead (ppm) 3 Varnish ring medium 6 Silicon (ppm)

Expansion Valve Inspection Observations

Tin (ppm)

Zinc (ppm)

Valve Part **Residue Color Residue Description Residue Accumulation Diaphragm Seat** very slight hard gray Rear Pin none none none **Equalizer Hole** none none none Tip of Pin medium black hard Spring heavy black hard **Spring Seat** medium black hard Ball medium black hard Front Side slight black hard

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

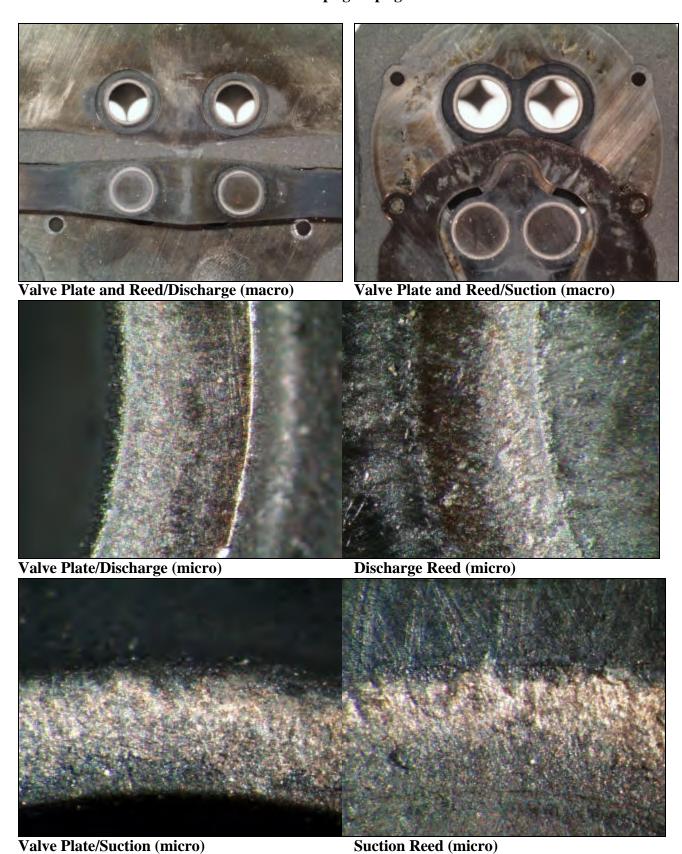


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



Report for R-507A Control Compressor

TEST HISTORY OF:

TEST HISTORY OF.				
Unit Number 6				
Model # RS40C1E-CAV-250 Serial	# 96F16487	Crank journals	;	
Run Time (hr.) 12009 Failed		Appearance	clean	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Differential	Unloaded	1.2470
Control Unit? Yes		I arron anonly b		1.2470
		Lower crank be		
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		D		0.0000
		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	355		Unloaded	0.9990
Suction Pressure (psig)	14		washer (crank side)	
Discharge Temp (°F)	235	Appearance	clean/scored	
Return Gas Temp (°F)	62	Wear	polish	
SumpTemp (°F)	242			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	black	Lower bronze	1	
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	black	Dimensions	Loaded	1.0040
Suction ring top appearance	black	2	Unloaded	1.0040
Remaining torque of discharge muffler				
(1) 5.8 (2) 4.2 (3) 2.9	(4) 3.8	Shaft in cage be	arino	
Remaining torque of stator bolts	(1) 3.0	Appearance	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	slight	
	• •		•	
Suction muffler appearance	black	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	black	Dimensions	Loaded	1.3740
Top stator windings appearance	green under black		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	black	Varnish ring	medium	
Quantity of bearing chips	heavy	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
		Connecting		1.5700
(1) 14 (2) 14 (3) 14 Head goalset brittle?	(4) 14	Connecting rod	scored	
Head gasket brittle?	yes/bonded	Appearance		
Head suction cavity appearance	dirty	Wear	polish	1.0510
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 4 (2) 3 (3) 3	(4) 4			

Unit Number 6

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.108Number of screens1Debris in compressor bottom (g)0.590

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5440Unloaded0.5110

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Appearance scored Wear polish Dimensions Loaded

Unloaded 0.4980

0.4980

Final	Lubricant Va	alues
T-4-1	A add Nissan Is a	. (Tr.

0.23 Total Acid Number (TAN) Water (ppm) 187 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 11 Aluminum (ppm) 106 Copper (ppm) 1 Iron (ppm) 46 Lead (ppm) 0 Silicon (ppm) 12 Tin (ppm) 11 Zinc (ppm) 4

Suction side (reed backer)

Condition good

Appearance corrosion/carbon **Suction surface appearance**

corrosion/soot

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringheavy

Discharge side (reed backer)

Condition good

Appearance corrosion/soot **Discharge surface appearance**

corrosion/soot

Discharge reed

Condition good

Appearance corrosion/heavy carbon

Trepan very slight **Varnish ring** heavy

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	black	gummy
Spring	medium	black	gummy
Spring Seat	slight	gray	hard
Ball	very slight	gray	hard
Front Side	slight	gray	hard

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

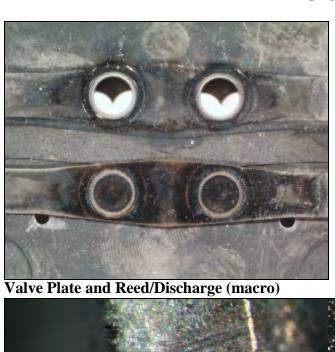


Crank Shaft (loaded) (macro)



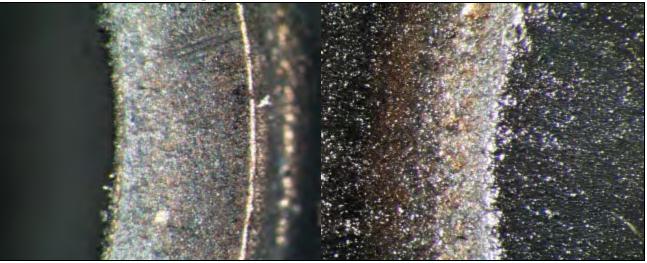
Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



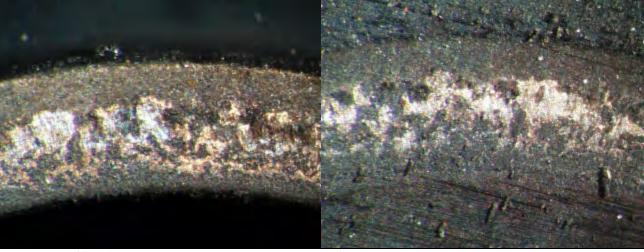


Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Control Compressor

TEST HISTORY OF:

TEST HISTORY OF.				
Unit Number 7				
Model # RS40C1E-CAV-250 Serial	# 96F16415	Crank journals		
Run Time (hr.) 12004 Failed	? No	Appearance	scored/Cu plating/cor	rrosion
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? Yes		Lower crank be		
Acid? No R-12? No		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		, , cui	Polish	
11,000		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	355		Unloaded	0.9980
Suction Pressure (psig)	14	Bottom thrust	washer (crank side)	0.7700
Discharge Temp (°F)	235	Appearance	Cu plating	
Return Gas Temp (°F)	62	Wear	polish	
SumpTemp (°F)	242	*	ponsii	
Sumpremp(1)	272	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze l		
Suction exit trail appearance	none	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	gray	Difficustons	Unloaded	1.0030
Remaining torque of discharge muffler	8)			1.0000
(1) 3 (2) 4 (3) 3	(4) 3	Shaft in cage be	earing	
Remaining torque of stator bolts	(1)	Appearance	clean	
(1) 14 (2) 13 (3) 13	(4) 14	Wear	polish	
Suction muffler appearance	clean	Piston top appe	•	
			al ance cican	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	4.07.40
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear/Cu plating	
Shell bottom appearance	Cu plate	Varnish ring	medium	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 16 (3) 16	(4) 15	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2470
Cage bearing top appearance	clean		Unloaded	1.2470
Remaining torque of cage bearing bolts				
(1) 4 (2) 5 (3) 5	(4) 4			

Unit Number	7
Contaminants:	

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g) 0.050
Number of screens 1
Debris in compressor bottom (g) 0.564

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating Wear polish
Dimensions Loaded

Loaded 0.4990 **Unloaded** 0.4990

Final Lubricant Values	
Total Acid Number (TAN)	0.43
Water (ppm)	202
Fluoride ion (ppm)	1.1
Chloride ion (ppm)	10
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	3
Lead (ppm)	0
Silicon (ppm)	2
Tin (ppm)	13
Zinc (ppm)	1

Suction side (reed backer) Condition good

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion **Suction reed**

ConditiongoodAppearancecorrosionTrepanmediumVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** clean

Discharge surface appearance

clean

Discharge reed

Condition good

Appearance corrosion/v. light carbon **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	hard
Spring	medium	black	gummy
Spring Seat	slight	gray	hard
Ball	medium	black	gummy
Front Side	slight	gray	hard

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

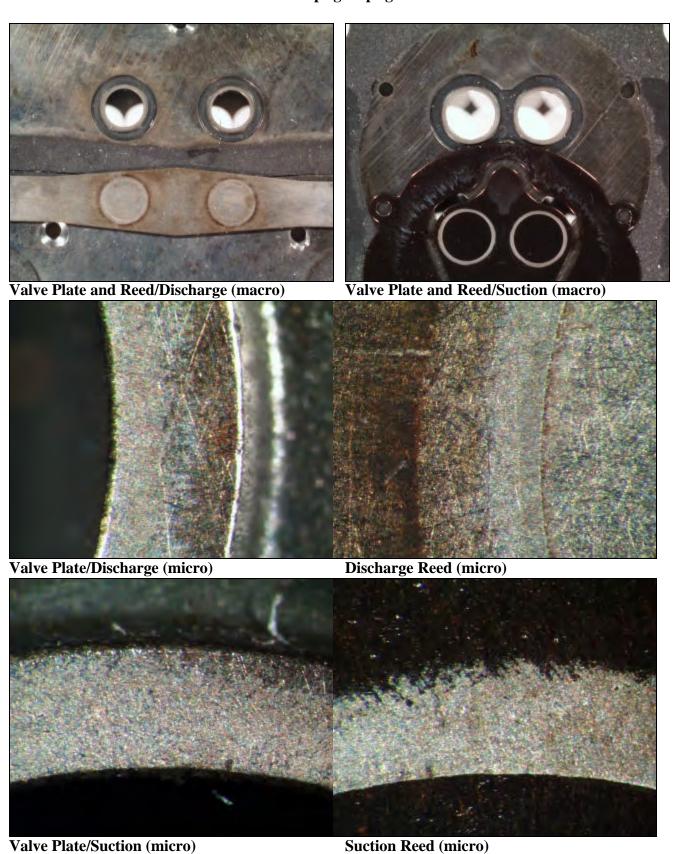


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



Report for R-507A Compressor with Contaminant R-502

TEST HISTORY OF:

ILDI IIIDIONI OI.				
Unit Number 8				
Model # RS43C1E-CAV-250 Serial	l# 96F16432	Crank journals	1	
Run Time (hr.) 12018 Failed	l? No	Appearance	scored/Cu plating	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2450
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank b		1.2.00
Acid? No R-12? No		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No R-502? Yes		vvcar	ponsii	
1120. 110 R 302. 105		Dimensions	Loaded	1.0010
Discharge Pressure (psig)	355	Difficultions	Unloaded	1.0010
Suction Pressure (psig)	14	Rottom thrust	washer (crank side)	1.0010
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	polish	
SumpTemp (°F)	242	vvcai	ponsii	
Sumplemp (1)	242	Bottom washer	(costing side)	
Hi-Pot	pass	Appearance	clean/scored	
High-low leak	fail	Wear	polish	
Top shell appearance		Lower bronze		
Suction exit trail appearance	gray gray	Appearance	clean/scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	0.9980
Suction ring top appearance	gray	Difficusions	Unloaded	0.9980
Remaining torque of discharge muffler			Omoaucu	0.7700
(1) 12 (2) 2.5 (3) 2	(4) 2.5	Shaft in cage be	agring	
Remaining torque of stator bolts	(4) 2.3	Appearance	clean	
(1) 9 (2) 10 (3) 10	(4) 9	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/scored	
Discharge plate appearance	soot	Dimensions	Loaded	1.3730
Top stator windings appearance	gray		Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black/Cu plate	Varnish ring	slight	
Quantity of bearing chips	heavy	Dimensions	Loaded	1.3750
Remaining torque of discharge muffle			Unloaded	1.3750
(1) 12 (2) 13 (3) 13	(4) 12	Connecting roo		
Head gasket brittle?	yes/bonded	Appearance	none	
neau gasket brittle:	y CS/ DOHUCU			
	clean	Wear	polish	
Head suction cavity appearance	clean		polish Loaded	1.2490
Head suction cavity appearance Head discharge cavity appearance	clean dirty	Wear Dimensions	polish Loaded Unloaded	1.2490 1.2480
Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean dirty dirty		Loaded	
Head suction cavity appearance Head discharge cavity appearance	clean dirty dirty		Loaded	

Unit Number 8 Contaminants: Control Unit? No

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 Yes

Trash in liquid screen (g)0.182Number of screens1Debris in compressor bottom (g)0.516

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5110Unloaded0.5020

Piston pin washers appearance

contact wear

Piston pin

Appearance clean
Wear polish
Dimensions Loade

Dimensions Loaded 0.4960 **Unloaded** 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.35 Water (ppm) 69 Fluoride ion (ppm) 0.90 Chloride ion (ppm) 8.8 Aluminum (ppm) 6 Copper (ppm) 0 Iron (ppm) 14 Lead (ppm) 0 Silicon (ppm) 1 Tin (ppm) 15 Zinc (ppm) 2

Suction side (reed backer)

Condition good

Appearance corrosion/soot
Suction surface appearance

corrosion/soot

Suction reed

ConditiongoodAppearancecorrosion/sootTrepanvery slightVarnish ringmedium

Discharge side (reed backer)
Condition good
Appearance heavy soot
Discharge surface appearance

corrosion/soot

Discharge reed

Condition good
Appearance corrosion/carbon
Trepan very slight
Varnish ring medium

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	slight	brown	gummy
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	heavy	black	gummy
Front Side	medium	black	gummy

Photographic Documentation of R-507A Compressor with Contaminant R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

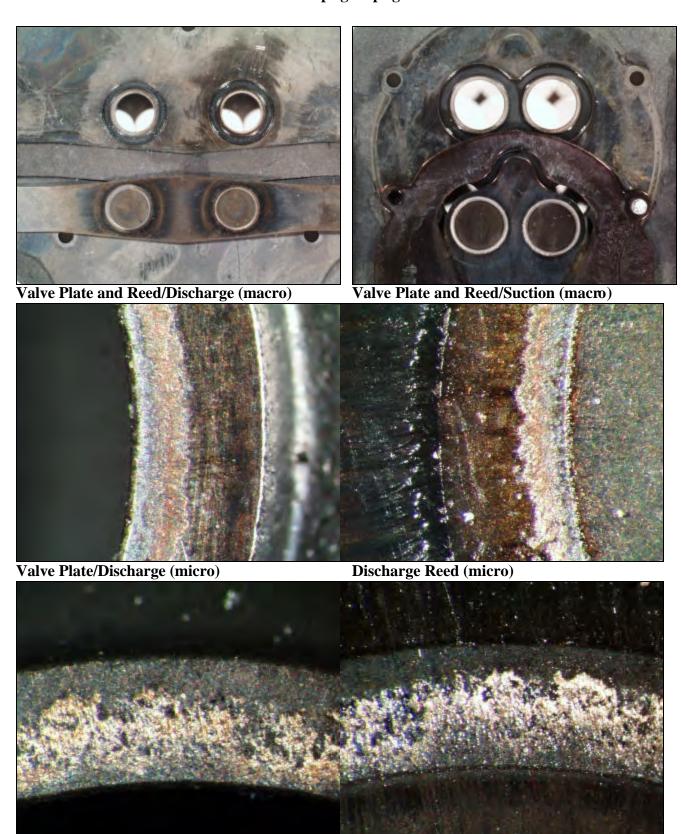


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant R-502 355 psig/14 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant Acid

TEST HISTORY OF:

ILSI IIISIONI OI.				
Unit Number 9				
Model # RS43C1E-CAV-250 Serial	# 96F16443	Crank journals		
Run Time (hr.) 5369 Failed	? Yes	Appearance	scored/Cu plating	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank be		
Acid? Yes R-12? No		Appearance	scored/Cu plating/bro	nze plating
Air? No R-22? No		Wear	slight	F8
H_2O ? No $R-502$? No		***************************************	5115111	
		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	355		Unloaded	0.9985
Suction Pressure (psig)	14	Bottom thrust v	washer (crank side)	0.7702
Discharge Temp (°F)	235	Appearance	scored/bronze plating	
Return Gas Temp (°F)	62	Wear	polish	
SumpTemp (°F)	242	***************************************	ponsii	
Sumpremp(1)	272	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze k	1	
Suction exit trail appearance	black	Appearance	scored/corrosion	
Cluster block condition	good	Wear	heavy	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0260
Suction ring top appearance	clean		Unloaded	1.0115
Remaining torque of discharge muffler				110110
(1) ND (2) ND (3) ND	(4) ND	Shaft in cage be	aring	
Remaining torque of stator bolts	(1) 1.2	Appearance	scored	
(1) ND (2) ND (3) ND	(4) ND	Wear	slight	
Suction muffler appearance	clean	Piston top appe	•	
			arance cican	
OEM flux?	Yes	Piston skirt	1 / 1	
Loose restrictor?	No	Appearance	low wear/bronze platin	-
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green	a	Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	Yes	Appearance	no wear	
Shell bottom appearance	black/Cu plate	Varnish ring	slight	
Quantity of bearing chips	heavy	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) ND (2) ND (3) ND	(4) ND	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2520
Cage bearing top appearance	dirty/heavy bearing wear		Unloaded	1.2515
Remaining torque of cage bearing bolts				
(1) ND (2) ND (3) ND	(4) ND			

Unit Number 9

Contaminants:
Control Unit? No
Acid? Yes R-12?

 Acid?
 Yes
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Connecting rod (small end)

Appearance contact wear/correct washer

Wear polish

Dimensions Loaded 0.5095

Unloaded 0.5030

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/bronze plating

Wear polish

Dimensions Loaded 0.4980

Unloaded 0.4980

Final Lubricant Values **Total Acid Number (TAN)** 0.40 Water (ppm) 100 Fluoride ion (ppm) 1.5 Chloride ion (ppm) 10 Aluminum (ppm) 14 2 Copper (ppm) Iron (ppm) 26 Lead (ppm) 4 5 Silicon (ppm) 4 Tin (ppm) Zinc (ppm) 1

Trash in liquid screen (g) 0.045
Number of screens 1
Debris in compressor bottom (g) 1.636

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good

Appearance corrosion/heavy soot

Suction surface appearance

corrosion/soot

Suction reed

Condition good

Appearance corrosion/heavy soot

Trepan very slight **Varnish ring** none

Discharge side (reed backer)

Condition good

Appearance corrosion/blued/soot

Discharge surface appearance

corrosion/soot

Discharge reed

Condition good

Appearance corrosion/blued/carbon

Trepan very slight **Varnish ring** none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight black gummy Spring black heavy gummy **Spring Seat** heavy black gummy Ball medium black gummy Front Side medium black gummy

Photographic Documentation of R-507A Compressor with Contaminant Acid 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

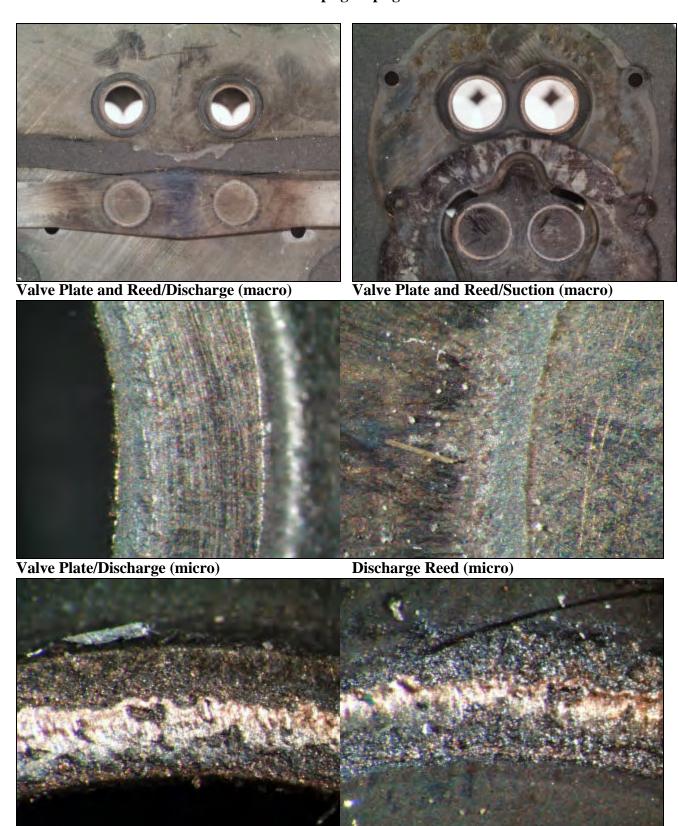


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid 355 psig/14 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

111

Report for R-507A Compressor with Contaminant Air

TEST HISTORY OF:

TEST HISTORY OF.				
Unit Number 10				
Model # RS43C1E-CAV-250 Serial	# 96F16430	Crank journals	5	
Run Time (hr.) 12065 Failed	? No	Appearance	Cu plating	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	_	.2470
Contaminants:				.2470
Control Unit? No		Lower crank b		
Acid? No R-12? No		Appearance	clean/bronze plating	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? No $R-502$? No		vv car	ponsii, siigit	
11,000 100 100 110		Dimensions	Loaded 1	.0020
Discharge Pressure (psig)	355	Difficusions		.0030
Suction Pressure (psig)	14	Rottom thrust	washer (crank side)	1.0050
Discharge Temp (°F)	235	Appearance	clean/scored/Cu plating	
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	242	wear	medium	
Sumpremp(T)	242	Bottom washer	(costing side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	•	Wear	polish	
Top shell appearance	pass	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	gray	Wear ance		
Wire to cluster block appearance	good	Dimensions	polish Loaded 1	.0040
	gray	Difficusions		1.0040
Suction ring top appearance	gray		Univaded	1.0040
Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4	(4) 5	Shoft in coco h	ooning	
Remaining torque of stator bolts	(4) 3	Shaft in cage be Appearance	clean	
~ <u>-</u>	(4) 12	Wear Wear		
(1) 13 (2) 14 (3) 14	(4) 13		polish, slight	
Suction muffler appearance	clean	Piston top appo	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded 1	.3670
Top stator windings appearance	clean		Unloaded 1	.3670
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean	Varnish ring	heavy	
Quantity of bearing chips	slight	Dimensions	•	.3680
Remaining torque of discharge muffler				.3700
(1) 16 (2) 15 (3) 15	(4) 15	Connecting roo		
Head gasket brittle?	no/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	clean	Dimensions	•	.2480
Cage bearing top appearance	dirty			.2480
Remaining torque of cage bearing bolts				
(1) 4 (2) 5 (3) 5	(4) 5			
	• •			

Unit Number 10

Contaminants:

Control Unit? No

Acid? No

R-12? No

Debris in compressor bottom (g)

0.018

Number of screens

Debris in compressor bottom (g)

0.0572

Air? Yes **R-22?** No **H₂O?** No **R-502?** No

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolish, slightDimensionsLoaded0.4990

0.4980

Unloaded

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating
Wear polish, slight
Dimensions Loaded

Dimensions Loaded 0.4970 **Unloaded** 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.61 Water (ppm) 50 Fluoride ion (ppm) 1.8 Chloride ion (ppm) 9.9 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 1 Lead (ppm) 0 Silicon (ppm) 4 Tin (ppm) 9 0 Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)
Condition good
Appearance corrosion

Suction surface appearance

corrosion/black

Suction reed

ConditiongoodAppearancecorrosionTrepanmediumVarnish ringheavy

Discharge side (reed backer)

Condition good

Appearance blued/carbon **Discharge surface appearance**

corrosion

Discharge reed

Condition good

Appearance corrosion/blued/carbon

Trepan medium **Varnish ring** heavy

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	very slight	black	hard
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	slight	black	gummy
Front Side	slight	black	gummy

Photographic Documentation of R-507A Compressor with Contaminant Air 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

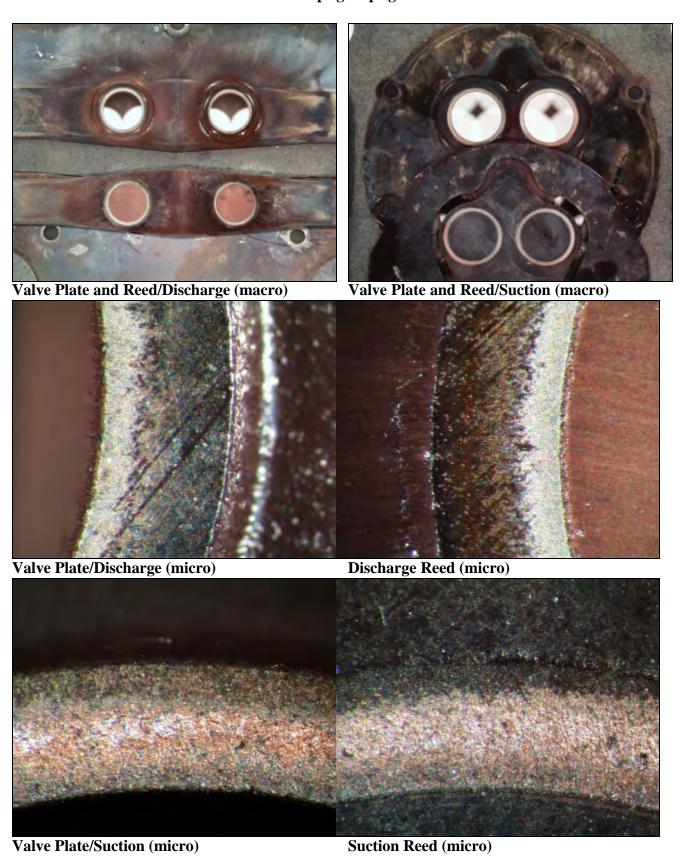


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air 355 psig/14 psig



Report for R-507A Compressor with Contaminant Acid and R-502

TEST HISTORY OF:				
Unit Number 11				
Model # RS43C1E-CAV-250 Seria	l# 96F16429	Crank journals	\$	
Run Time (hr.) 12046 Failed	d? No	Appearance	scored/Cu plating	
Refrigerant R-507A		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b	earing journal	
Acid? Yes R-12? No		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	polish, slight	
H_2O ? No $R-502$? Yes				
		Dimensions	Loaded	0.9950
Discharge Pressure (psig)	355		Unloaded	0.9960
Suction Pressure (psig)	14		washer (crank side)	
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	slight	
SumpTemp (°F)	242	D = 44 = = -l- = -l-	(
Hi-Pot	2000	Bottom washer	clean	
High-low leak	pass	Appearance Wear	polish	
Top shell appearance	pass clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean/scored	
Cluster block condition	good	Wear	none	
Wire to cluster block appearance	gray	Dimensions	Loaded	0.9970
Suction ring top appearance	gray		Unloaded	0.9970
Remaining torque of discharge muffle				
(1) 5 (2) 4 (3) 4	(4) 4	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean/scored/Cu plati	ng
(1) 10 (2) 11 (3) 10	(4) 11	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	clean/gray	Dimensions	Loaded	1.3650
Top stator windings appearance	clean		Unloaded	1.3650
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	black/Cu plate	Varnish ring	medium	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3660
Remaining torque of discharge muffle			Unloaded	1.3660
(1) 14 (2) 15 (3) 15	(4) 15	Connecting roo	, ,	
Head gasket brittle?	no/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	slight	1 2450
Head discharge cavity appearance	clean	Dimensions	Loaded Unloaded	1.2450
Cage bearing top appearance Remaining torque of cage bearing bolt	dirty		Omoaded	1.2440
(1) 4 (2) 5 (3) 5	s (4) 5			
$(1) + (2) 3 \qquad (3) 3$	(3)			

Unit Number 11

Contaminants:

Control Unit? No

Acid? Yes R-12? No

Pebris in compressor bottom (g)

Debris in compressor bottom (g)

No

R-22? No

Air? No **R-22?** No **H₂O?** No **R-502?** Yes

Connecting rod (small end)

Appearancecorrect washerWearslightDimensionsLoaded0.4980Unloaded0.4980

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance clean
Wear polish, slight
Dimensions Loaded

Dimensions Loaded 0.4960 **Unloaded** 0.4970

Final Lubricant Values Total Acid Number (TAN) 0.45 Water (ppm) 581 Fluoride ion (ppm) 2.5 Chloride ion (ppm) 17 Aluminum (ppm) 1 Copper (ppm) 0 Iron (ppm) 17 Lead (ppm) 3 2 Silicon (ppm) Tin (ppm) 31

Valve Plate Assembly Inspection

Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion/black

Suction reed

Condition good

Appearance corrosion/carbon

Trepan medium Varnish ring very slight

Discharge side (reed backer)

Condition good **Appearance** blued

Discharge surface appearance

corrosion/black

Discharge reed

Condition good

Appearance corrosion/carbon medium
Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	hard
Rear Pin	very slight	brown	hard
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

2

Photographic Documentation of R-507A Compressor with Contaminant Acid and R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

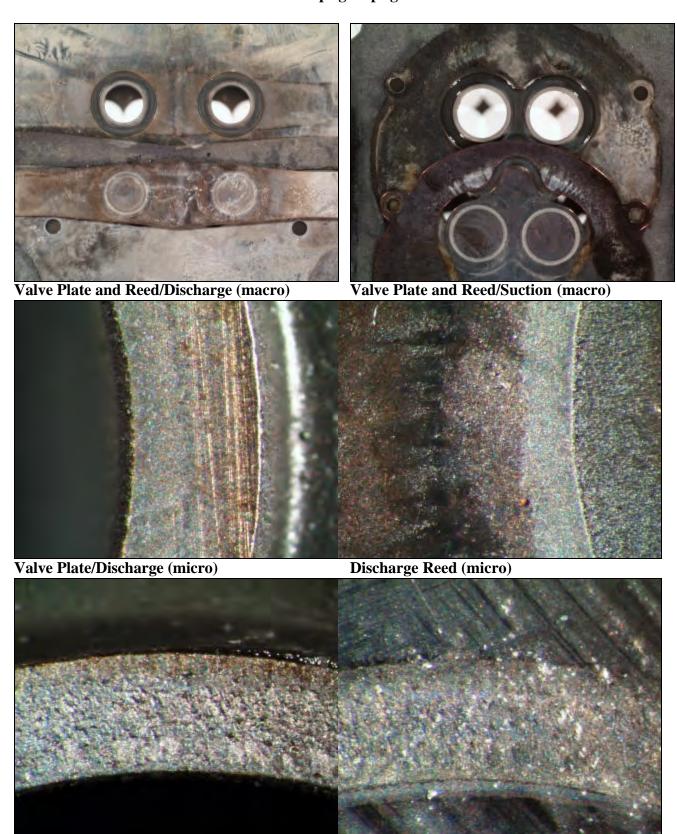


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid and R-502 355 psig/14 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant Acid, Air, and R-502

TEST HISTORY OF:

TEST HISTORY OF.				
Unit Number 12				
Model # RS43C1E-CAV-250 Serial	# 96F16442	Crank journals	S	
Run Time (hr.) 12035 Failed	? No	Appearance	scored/Cu plating	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b		
Acid? Yes R-12? No		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	slight	
H_2O ? No R-502? Yes		vv cui	Siigiit	
120. 10 102. 109		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	355	Difficusions	Unloaded	0.9990
Suction Pressure (psig)	14	Rottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	slight	
SumpTemp (°F)	242	vv cai	Siight	
Sumptemp(T)	242	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0010
Suction ring top appearance		Difficusions	Unloaded	1.0010
Remaining torque of discharge muffler	gray		Omoaucu	1.0010
(1) 3 (2) 4 (3) 3	(4) 4	Shaft in cage b	earing	
Remaining torque of stator bolts	(4) 4	Appearance	scored/Cu plating	
(1) 10 (2) 10 (3) 11	(4) 11	Wear	slight	
	• •		_	
Suction muffler appearance	clean	Piston top appe	e arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/Cu plating	
Discharge plate appearance	gray	Dimensions	Loaded	1.3680
Top stator windings appearance	clean		Unloaded	1.3680
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black/Cu plate	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3690
Remaining torque of discharge muffler			Unloaded	1.3690
(1) 15 (2) 15 (3) 16	(4) 15	Connecting roo		
Head gasket brittle?	no/bonded	Appearance	scored	
Head suction cavity appearance	dirty	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2450
Cage bearing top appearance	•		Unloaded	1.2850
	ulity		Umbaucu	
	dirty		Cinoaucu	1.2030
Remaining torque of cage bearing bolts (1) 5 (2) 5 (3) 6			Omoaucu	1.2030

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? No Air? Yes R-22? No H₂O? No R-502? Yes Trash in liquid screen (g) 0.154 **Number of screens** 0.874 Debris in compressor bottom (g)

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer

Wear slight **Dimensions** Loaded 0.5080 Unloaded 0.5020

Piston pin washers appearance

contact wear

Piston pin

Appearance clean polish, slight Wear **Dimensions** Loaded

0.4960 Unloaded 0.4960

Final Lubricant Values	
Total Acid Number (TAN)	0.62
Water (ppm)	247
Fluoride ion (ppm)	1.3
Chloride ion (ppm)	10
Aluminum (ppm)	1
Copper (ppm)	0
plating/carbon	
Iron (ppm)	6
Lead (ppm)	0
Silicon (ppm)	3
Tin (ppm)	15
Zinc (ppm)	1

Suction side (reed backer)

Condition good

corrosion/light carbon **Appearance**

Suction surface appearance

corrosion/Cu plating

Suction reed

Condition good

Appearance corrosion/Cu plating/carbon

Trepan slight Varnish ring very slight

Discharge side (reed backer)

Condition good

Appearance blued/light carbon Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/blued/Cu

Trepan medium Varnish ring heavy

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	black	hard
Rear Pin	very slight	gray	hard
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	heavy	black	gummy
Spring Seat	heavy	black	gummy
Ball	heavy	black	gummy
Front Side	heavy	black	gummy

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

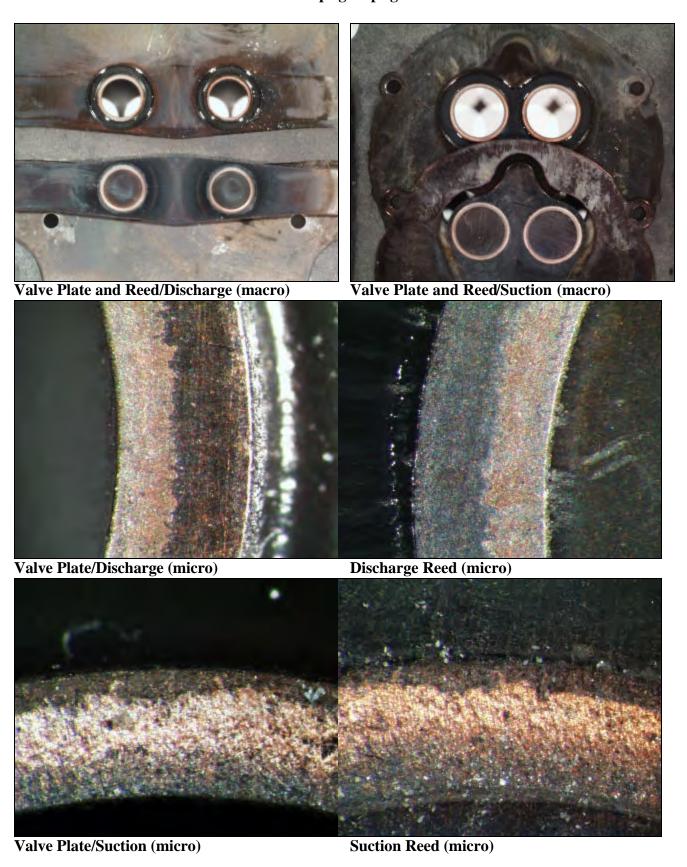


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and R-502 355 psig/14 psig



Report for R-507A Compressor with Contaminant Air and R-502

TEST HISTORY OF:

ILDI IIIDIONI OI.				
Unit Number 13				
Model # RS43C1E-CAV-250 Seria	l # 96F16416	Crank journals		
Run Time (hr.) 12002 Failed	d? No	Appearance	scored/Cu plating	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:		Difficusions	Unloaded	1.2470
Control Unit? No		I arron anoult he		1.2470
		Lower crank be		
Acid? No R-12? No		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	slight	
H_2O ? No $R-502$? Yes		.		0.0000
		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	355		Unloaded	0.9980
Suction Pressure (psig)	14		washer (crank side)	
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	slight	
SumpTemp (°F)	242			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze l	pearings	
Suction exit trail appearance	gray	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0000
Suction ring top appearance	gray		Unloaded	1.0000
Remaining torque of discharge muffle				
(1) 4 (2) 3 (3) 4	(4) 4	Shaft in cage be	aring	
Remaining torque of stator bolts	(-)	Appearance	clean	
(1) 10 (2) 10 (3) 11	(4) 10	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	arance clean	
OEM flux?	V			
	Yes	Piston skirt		
Loose restrictor?	No	Piston skirt Appearance	low wear/scored/Cu pl	ating
Loose restrictor? Discharge plate appearance			low wear/scored/Cu pl	ating 1.3720
Discharge plate appearance	No	Appearance	•	-
Discharge plate appearance Top stator windings appearance	No gray clean	Appearance Dimensions	Loaded	1.3720
Discharge plate appearance Top stator windings appearance Rotor rub marks present?	No gray clean No	Appearance Dimensions Cylinder bore	Loaded Unloaded	1.3720
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	No gray clean No No	Appearance Dimensions Cylinder bore Appearance	Loaded Unloaded no wear/Cu plating	1.3720
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	No gray clean No No oil green	Appearance Dimensions Cylinder bore Appearance Varnish ring	Loaded Unloaded no wear/Cu plating heavy	1.3720 1.3720
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	No gray clean No No oil green slight	Appearance Dimensions Cylinder bore Appearance	Loaded Unloaded no wear/Cu plating heavy Loaded	1.3720 1.3720 1.3740
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	No gray clean No No oil green slight r removed	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	Loaded Unloaded no wear/Cu plating heavy Loaded Unloaded	1.3720 1.3720
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 14 (3) 14	No gray clean No No oil green slight r removed (4) 15	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	Loaded Unloaded no wear/Cu plating heavy Loaded Unloaded (large end)	1.3720 1.3720 1.3740
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 14 (3) 14 Head gasket brittle?	No gray clean No No oil green slight r removed (4) 15 yes/bonded	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	no wear/Cu plating heavy Loaded Unloaded Unloaded (large end) scored	1.3720 1.3720 1.3740
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance	No gray clean No No oil green slight r removed (4) 15 yes/bonded dirty	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded Unloaded no wear/Cu plating heavy Loaded Unloaded (large end) scored slight	1.3720 1.3720 1.3740 1.3740
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	No gray clean No No oil green slight r removed (4) 15 yes/bonded dirty dirty	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	Loaded Unloaded no wear/Cu plating heavy Loaded Unloaded (large end) scored slight Loaded	1.3720 1.3720 1.3740 1.3740 1.2500
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	No gray clean No No oil green slight r removed (4) 15 yes/bonded dirty dirty dirty	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded Unloaded no wear/Cu plating heavy Loaded Unloaded (large end) scored slight	1.3720 1.3720 1.3740 1.3740
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bold	No gray clean No No oil green slight r removed (4) 15 yes/bonded dirty dirty dirty s	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded Unloaded no wear/Cu plating heavy Loaded Unloaded (large end) scored slight Loaded	1.3720 1.3720 1.3740 1.3740 1.2500
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	No gray clean No No oil green slight r removed (4) 15 yes/bonded dirty dirty dirty	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded Unloaded no wear/Cu plating heavy Loaded Unloaded (large end) scored slight Loaded	1.3720 1.3720 1.3740 1.3740 1.2500

Unit Number 13

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 Yes
 R-22?
 No

 H₂O?
 No
 R-502?
 Yes

Trash in liquid screen (g)0.062Number of screens1Debris in compressor bottom (g)0.714

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearmediumDimensionsLoaded0.5060Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

AppearanceCu platingWearpolishDimensionsLoaded

Loaded 0.4980 **Unloaded** 0.4980

Final Lubricant Values	
Total Acid Number (TAN)	
Water (ppm)	
Fluorido ion (nnm)	

1.5 Fluoride ion (ppm) Chloride ion (ppm) 11 Aluminum (ppm) 3 Copper (ppm) 1 Iron (ppm) 8 3 Lead (ppm) Silicon (ppm) 4 Tin (ppm) 41

Suction side (reed backer)

Condition good

Appearance corrosion/carbon Suction surface appearance corrosion/Cu plating

Suction reed

Condition good

Appearance corrosion/Cu plating

Trepan medium **Varnish ring** heavy

Discharge side (reed backer)

Condition good

Appearance corrosion/blued/carbon

Discharge surface appearance corrosion/Cu plating/black

Discharge reed

Condition good

Appearance corrosion/blued/carbon **Trepan** very slight

Varnish ring heavy

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	medium	black	hard
Rear Pin	slight	brown	gummy
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	heavy	black	gummy
Spring Seat	slight	gray	hard
Ball	medium	black	gummy
Front Side	heavy	black	gummy

9

0.98

89

Photographic Documentation of R-507A Compressor with Contaminant Air and R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

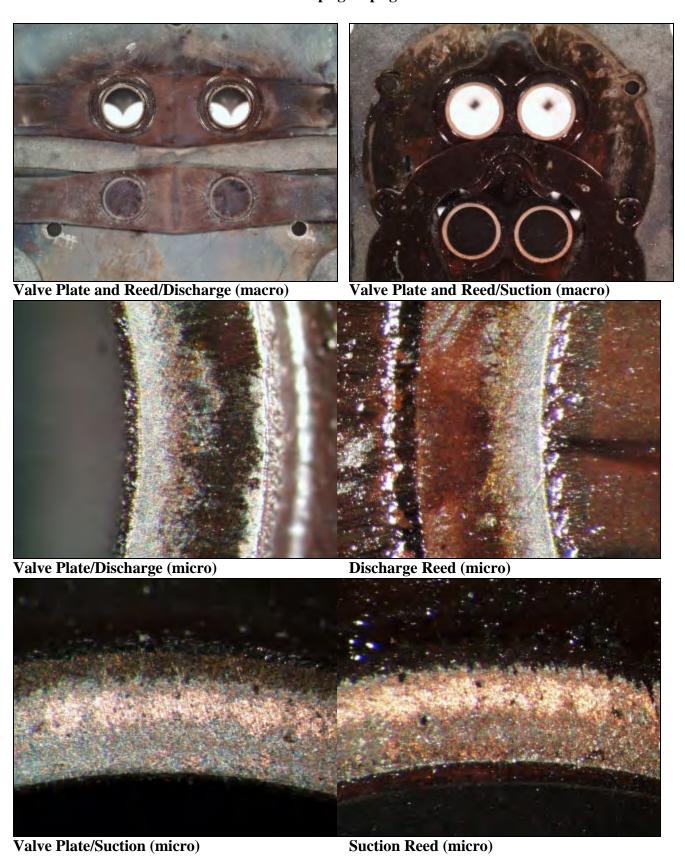


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air and R-502 355 psig/14 psig



Report for R-507A Compressor with Contaminant Acid and Air

Unit Number 14			
Model # RS43C1E-CAV-250 Seria	l# 96F16421	Crank journals	
Run Time (hr.) 9822 Failed		Appearance scored/Cu plating	
, ,	1. 110		
Refrigerant R-507A		F	70
Lubricant RL32S		Dimensions Loaded 1.247	-
Contaminants:		Unloaded 1.247	0
Control Unit? No		Lower crank bearing journal	
Acid? Yes R-12? No		Appearance scored/Cu plating	
Air? Yes R-22? No		Wear polish	
H₂O? No R-502? No		1	
-		Dimensions Loaded 0.998	80
Discharge Pressure (psig)	355	Unloaded 0.998	
Suction Pressure (psig)	14	Bottom thrust washer (crank side)	,0
Discharge Temp (°F)	235		
Return Gas Temp (°F)	62	Wear polish	
SumpTemp (°F)	242		
		Bottom washer (casting side)	
Hi-Pot	pass	Appearance clean	
High-low leak	pass	Wear polish	
Top shell appearance	gray	Lower bronze bearings	
Suction exit trail appearance	black	Appearance clean/scored/corrosion	
Cluster block condition	good	Wear medium	
Wire to cluster block appearance	gray	Dimensions Loaded 1.024	10
Suction ring top appearance	clean	Unloaded 1.010	
Remaining torque of discharge muffler		Cinduct 1.010	,,,
-	(4) ND	Shoft in aggs bearing	
	(4) ND	Shaft in cage bearing	
Remaining torque of stator bolts		Appearance scored/Cu plating	
(4) 115 (2) 115 (2) 115	(4) 170		
(1) ND (2) ND (3) ND	(4) ND	Wear polish	
Suction muffler appearance	(4) ND clean		
	• •	Wear polish	
Suction muffler appearance	clean	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu	
Suction muffler appearance OEM flux? Loose restrictor?	clean Yes No	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean Yes No black	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374	
Suction muffler appearance OEM flux? Loose restrictor?	clean Yes No	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean Yes No black	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	clean Yes No black black/stator top green	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean Yes No black black/stator top green Yes No	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cuplating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cuplating	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean Yes No black black/stator top green Yes No Cu plate	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy	01
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean Yes No black black/stator top green Yes No Cu plate heavy	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376	i0 50
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	clean Yes No black black/stator top green Yes No Cu plate heavy r removed	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376	i0 50
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) ND (2) ND (3) ND	clean Yes No black black/stator top green Yes No Cu plate heavy r removed (4) ND	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cuplating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cuplating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376 Connecting rod (large end)	i0 50
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) ND (2) ND (3) ND Head gasket brittle?	clean Yes No black black/stator top green Yes No Cu plate heavy r removed (4) ND yes/bonded	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376 Connecting rod (large end) Appearance scored/corrosion	i0 50
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle. (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance	clean Yes No black black/stator top green Yes No Cu plate heavy r removed (4) ND yes/bonded clean	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376 Connecting rod (large end) Appearance scored/corrosion Wear slight	50 50
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean Yes No black black/stator top green Yes No Cu plate heavy r removed (4) ND yes/bonded clean clean	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376 Connecting rod (large end) Appearance scored/corrosion Wear slight Dimensions Loaded 1.252	10 60 60 25
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean Yes No black black/stator top green Yes No Cu plate heavy r removed (4) ND yes/bonded clean clean dirty	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376 Connecting rod (large end) Appearance scored/corrosion Wear slight	10 60 60 25
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean Yes No black black/stator top green Yes No Cu plate heavy r removed (4) ND yes/bonded clean clean dirty	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376 Connecting rod (large end) Appearance scored/corrosion Wear slight Dimensions Loaded 1.252	10 60 60 25
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean Yes No black black/stator top green Yes No Cu plate heavy r removed (4) ND yes/bonded clean clean dirty	Wear polish Piston top appearance clean Piston skirt Appearance low wear/scored/Cu plating/corrosion Dimensions Loaded 1.374 Unloaded 1.374 Cylinder bore Appearance no wear/Cu plating Varnish ring heavy Dimensions Loaded 1.376 Unloaded 1.376 Connecting rod (large end) Appearance scored/corrosion Wear slight Dimensions Loaded 1.252	10 60 60 25

Unit Number

Contaminants: Trash in liquid screen (g) 0.045 **Control Unit?** No **Number of screens** Acid? Yes R-12? No Debris in compressor bottom (g) 1.901 R-22? Air? Yes No

6

black

H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear polish **Dimensions** Loaded

0.5060 Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Valve Part

Front Side

Appearance scored/Cu plating

polish Wear

Dimensions Loaded 0.4980 0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.64 Water (ppm) 157 Fluoride ion (ppm) 2.0 Chloride ion (ppm) 9.4 11 0 90

Aluminum (ppm) Copper (ppm) Iron (ppm) Lead (ppm) 31 Silicon (ppm) 6 19 Tin (ppm)

Residue Accumulation

Zinc (ppm) **Expansion Valve Inspection Observations**

Diaphragm Seat very slight **Rear Pin** very slight **Equalizer Hole** very slight Tip of Pin heavy Spring very heavy **Spring Seat** heavy Ball heavy

medium

Valve Plate Assembly Inspection Suction side (reed backer)

Condition good Appearance corrosion/carbon Suction surface appearance corrosion/soot/carbon

Suction reed

Condition good

corrosion/carbon **Appearance**

Trepan slight Varnish ring slight

Discharge side (reed backer)

Condition good

corrosion/blued/carbon **Appearance**

Discharge surface appearance corrosion/carbon/black/soot

Discharge reed

Condition good

Appearance corrosion/blued/carbon

gummy

very slight **Trepan** Varnish ring slight

Residue Description Residue Color gummy gray hard gray black gummy black gummy black gummy black gummy black gummy

Photographic Documentation of R-507A Compressor with Contaminant Acid and Air 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

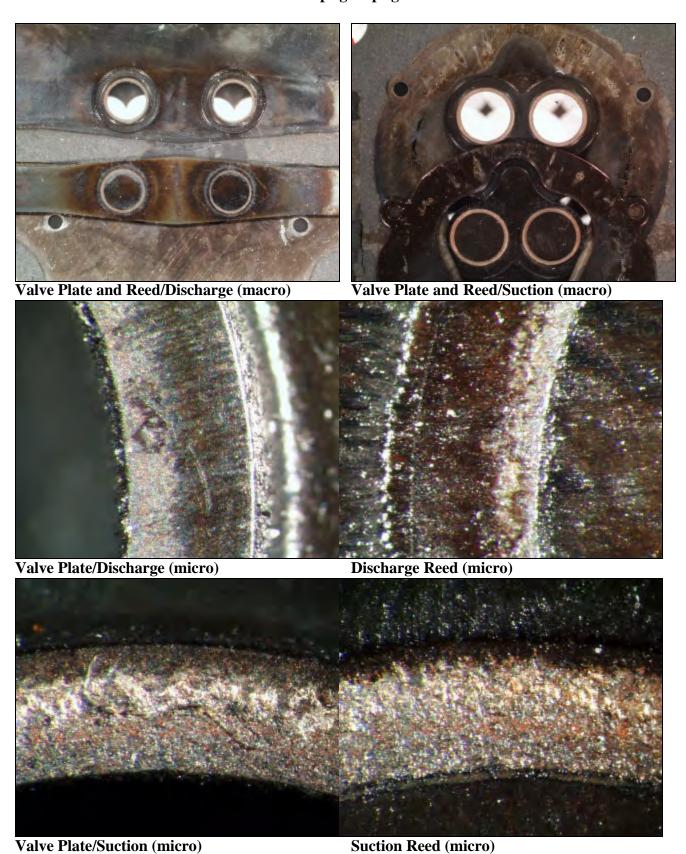


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid and Air 355 psig/14 psig



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Report for R-507A Compressor with Contaminant Water and R-502

Unit Number 15				
Model # RS43C1E-CAV-250 Serial	l# 96F16431	Crank journals	;	
Run Time (hr.) 12037 Failed	l? No	Appearance	clean/Cu plating	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2480
Contaminants:			Unloaded	1.2460
Control Unit? No				
Acid? No R-12? No		Lower crank be	earing journal	
Air? No R-22? No		Appearance	clean	
H_2O ? Yes R-502 ? Yes		Wear	polish	
		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	355		Unloaded	0.9990
Suction Pressure (psig)	14	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	242			
		Bottom washer		
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean/scored	
Cluster block condition	good	Wear	none	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0000
Suction ring top appearance	black		Unloaded	1.0000
Remaining torque of discharge muffler		CI 64 I	•	
(1) 3 (2) 4 (3) 3	(4) 4	Shaft in cage be	_	
Remaining torque of stator bolts	(4) 12	Appearance	clean	
(1) 10 (2) 11 (3) 10	(4) 12	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	black	Dimensions	Loaded	1.3660
Top stator windings appearance	gray		Unloaded	1.3660
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black	Varnish ring	slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3670
Remaining torque of discharge muffler			Unloaded	1.3680
(1) 13 (2) 14 (3) 13	(4) 13	Connecting rod		
Head gasket brittle?	yes	Appearance	scored	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2420
Cage bearing top appearance	dirty		Unloaded	1.2410
Remaining torque of cage bearing bolts				
(1) 4 (2) 5 (3) 4	(4) 4			

Unit Number 15

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 Yes
 R-502?
 Yes

Trash in liquid screen (g)0.075Number of screens1Debris in compressor bottom (g)0.785

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good

Appearance corrosion/light carbon

Suction surface appearance

corrosion/Cu plating

Suction reed

Condition good

Appearance corrosion/Cu plating/carbon

Trepan medium Varnish ring very slight

Discharge side (reed backer)

Condition good

Appearance corrosion/soot
Discharge surface appearance
corrosion/Cu plating

Discharge reed

Condition good

Appearance blued/Cu plating/carbon

Trepan slight Varnish ring medium

Piston pin washers appearance

Connecting rod (small end)

Appearance correct washer

slight

Loaded

Unloaded

0.5010

0.5000

contact wear

Piston pin

Wear

Dimensions

Appearance clean
Wear polish, slight

Dimensions Loaded 0.4980 **Unloaded** 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.96 Water (ppm) 35 Fluoride ion (ppm) 1.7 Chloride ion (ppm) 11 Aluminum (ppm) 9 Copper (ppm) 1 Iron (ppm) 15 Lead (ppm) 1 4 Silicon (ppm) 19 Tin (ppm) Zinc (ppm) 2

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	medium	black	gummy
Rear Pin	very slight	brown	hard
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	heavy	black	gummy
Spring Seat	slight	black	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

Photographic Documentation of R-507A Compressor with Contaminant Water and R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

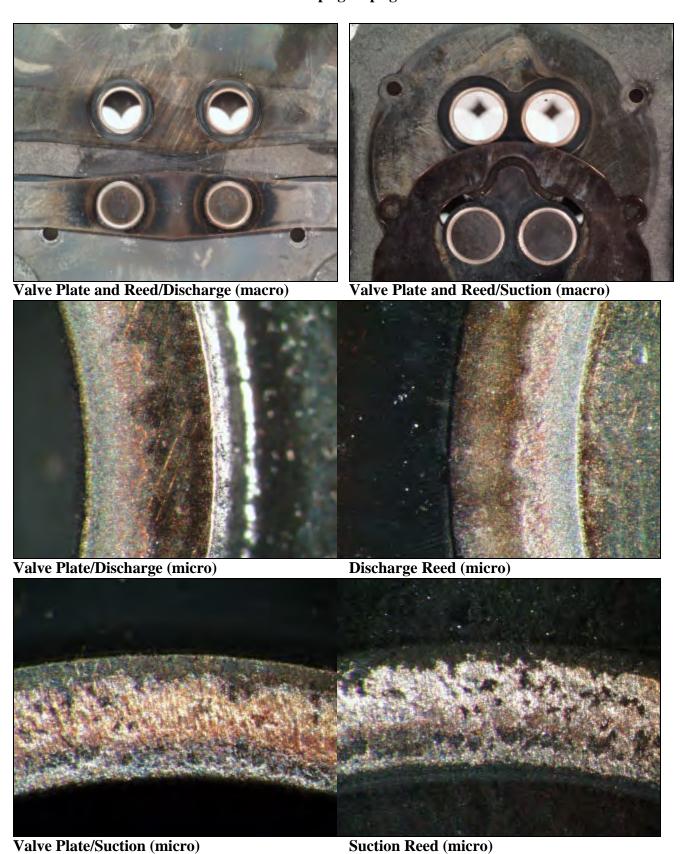


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Water and R-502 355 psig/14 psig



Report for R-507A Compressor with Contaminant Acid and Water

ILSI IIISIORI OI:				
Unit Number 16				
Model # RS43C1E-CAV-250 Serial	# 96F16477	Crank journals	;	
Run Time (hr.) 12008 Failed	? No	Appearance	scored/Cu plating	
Refrigerant R-507A		Wear	medium	
Lubricant RL32S		Dimensions	Loaded	1.2450
Contaminants:			Unloaded	1.2450
Control Unit? No		Lower crank be	earing iournal	
Acid? Yes R-12? No		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	medium	
H_2O ? Yes $R-502$? No		v v cur	mearam	
12,00		Dimensions	Loaded	0.9940
Discharge Pressure (psig)	355		Unloaded	0.9940
Suction Pressure (psig)	14	Rottom thrust	washer (crank side)	0.5510
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	242	* * * * * * * * * * * * * * * * * * * *	mearam	
Sumplemp (1)	212	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze l		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	none	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0000
Suction ring top appearance	gray		Unloaded	1.0000
Remaining torque of discharge muffler				
(1) 3 (2) 4 (3) 3	(4) 4	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	Cu plating	
(1) 9 (2) 9 (3) 9	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	-	
OEM flux?	Yes	Piston skirt	ar arree	
Loose restrictor?	No	Appearance	low wear/scored/Cu	nlating
Discharge plate appearance	soot	Dimensions	Loaded	1.3660
Top stator windings appearance		Dimensions	Unloaded	1.3660
Rotor rub marks present?	gray No	Cylinder bore	Ullivaueu	1.3000
Was rotor loose?	No	•	low wear/scored	
		Appearance		
Shell bottom appearance	black/Cu plate/oil green	Varnish ring	slight	1 2690
Quantity of bearing chips	slight	Dimensions	Loaded	1.3680 1.3680
Remaining torque of discharge muffler	(4) 15	Commonting mod	Unloaded	1.3000
(1) 15 (2) 14 (3) 15	(4) ()	Connecting rod		
	* *	Annogrance	scored	
Head gasket brittle?	yes	Appearance Wear	scored	
Head gasket brittle? Head suction cavity appearance	yes clean	Wear	slight	1 2460
Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	yes clean clean		slight Loaded	1.2460
Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	yes clean clean dirty	Wear	slight	1.2460 1.2450
Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	yes clean clean dirty	Wear	slight Loaded	

Contaminants: Trash in liquid screen (g) 0.071 **Control Unit?** No **Number of screens** Acid? 0.633 Yes R-12? No Debris in compressor bottom (g) Air? No R-22? No

Valve Plate Assembly Inspection

Connecting rod (small end)

Yes

Appearance correct washer Wear slight **Appearance** Dimensions Loaded 0.4970 Unloaded 0.4960 corrosion/Cu plating/soot

Piston pin washers appearance

contact wear

Piston pin

H₂O?

Appearance scored polish, slight Wear **Dimensions** Loaded 0.4950 Unloaded 0.4950

Final Lubricant Values Total Acid Number (TAN) 1.0 Water (ppm) 54 Fluoride ion (ppm) 1.4

R-502?

No

Chloride ion (ppm) 11 Aluminum (ppm) 1 Copper (ppm) 1 Iron (ppm) 17 Lead (ppm) 1 Silicon (ppm) 1 Tin (ppm) 27 Zinc (ppm) 2

Suction side (reed backer)

Condition good corrosion **Suction surface appearance**

Suction reed

Condition good

Appearance corrosion/Cu plating

Trepan medium Varnish ring very slight

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion/carbon **Trepan** slight

Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	black	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	brown	gummy
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

Photographic Documentation of R-507A Compressor with Contaminant Acid and Water 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

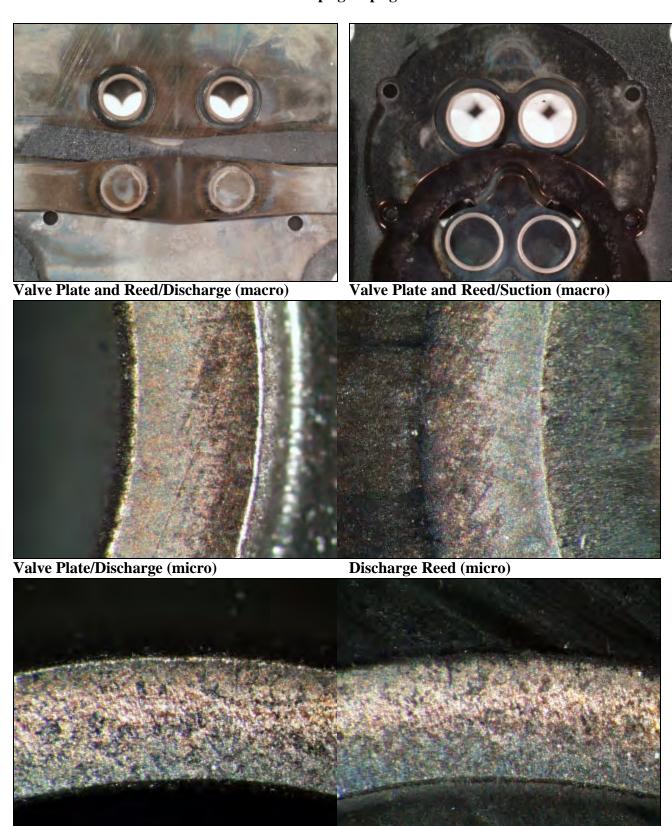


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid and Water 355 psig/14 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Air and Water

ILSI IIISIONI OI.				
Unit Number 17				
Model # RS43C1E-CAV-250 Serial	# 96F16516	Crank journals	S	
Run Time (hr.) 12015 Failed		Appearance	scored/Cu plating	
Refrigerant R-507A	. 1,0	Wear	slight	
Lubricant RL32S		Dimensions	· ·	480
Contaminants:		Difficusions		480
		T		400
Control Unit? No		Lower crank b		
Acid? No R-12? No		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	slight	
H_2O ? Yes R-502 ? No				
		Dimensions		000
Discharge Pressure (psig)	355		Unloaded 1.0	000
Suction Pressure (psig)	14	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	242			
• • •		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze	C	
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	_	030
Suction ring top appearance		Difficusions		020
	gray		Cinoaded 1.0	020
Remaining torque of discharge muffler		Chaftin as a h		
(1) 3 (2) 3 (3) 3	(4) 4	Shaft in cage b	_	
Remaining torque of stator bolts	(4) 0	Appearance	Cu plating	
(1) 8 (2) 8 (3) 9	(4) 9	Wear	polish	
Suction muffler appearance	clean	Piston top appo	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/scored/Cu plating	g
Discharge plate appearance	black	Dimensions	Loaded 1.3	730
Top stator windings appearance	gray		Unloaded 1.3	730
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	black	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	_	750
Remaining torque of discharge muffler		Difficusions		740
		Connecting		740
(1) 14 (2) 15 (3) 14	(4) 14	Connecting roo		
Head gasket brittle?	yes	Appearance	none	
Head suction cavity appearance	dirty	Wear	slight	500
Head discharge cavity appearance	dirty	Dimensions		500
Cage bearing top appearance	dirty		Unloaded 1.2	500
Remaining torque of cage bearing bolts				
(1) 5 (2) 4 (3) 5	(4) 4			

Unit Number	17	
O		

Contaminants:

Control Unit? No

Number of screens

R-12? No

Debris in compressor bottom (g)

1.123

 $\begin{array}{cccc} \textbf{Air?} & \text{Yes} & \textbf{R-22?} & \text{No} \\ \textbf{H_2O?} & \text{Yes} & \textbf{R-502?} & \text{No} \\ \end{array}$

Connecting rod (small end)

Appearancecorrect washerWearpolish, slightDimensionsLoaded0.5120Unloaded0.5050

Piston pin washers appearance

contact wear

Piston pin

Tin (ppm)

Zinc (ppm)

Appearance clean
Wear polish, slight
Dimensions Loaded

Dimensions Loaded 0.4990 **Unloaded** 0.4990

Final Lubricant Values

plating/blued/carbon **Total Acid Number (TAN)** 0.51 Water (ppm) 54 Fluoride ion (ppm) 2.0 Chloride ion (ppm) 10 Aluminum (ppm) 8 Copper (ppm) 0 plating/carbon Iron (ppm) 16 Lead (ppm) 1 Silicon (ppm) 5

Condition Appearance

Discharge surface appearance corrosion/Cu plating

Discharge side (reed backer)

Valve Plate Assembly Inspection

good

good

slight

heavy

good

corrosion/Cu

corrosion/Cu plating/carbon

corrosion

Suction side (reed backer)

Suction surface appearance

corrosion/Cu plating

Condition

Suction reed Condition

Trepan

Appearance

Varnish ring

Appearance

Discharge reed
Condition good

Appearance corrosion/blued/Cu

Trepan slight
Varnish ring medium

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	black	hard
Rear Pin	none	none	none
Equalizer Hole	slight	green	hard
Tip of Pin	medium	gray	gummy
Spring	heavy	black	gummy
Spring Seat	medium	green	gummy
Ball	slight	black	gummy
Front Side	heavy	green, black	gummy

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Photographic Documentation of R-507A Compressor with Contaminant Air and Water 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



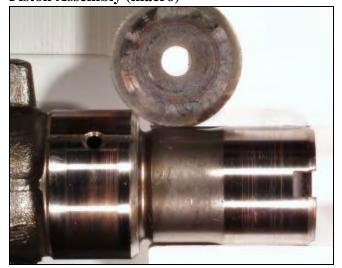
Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

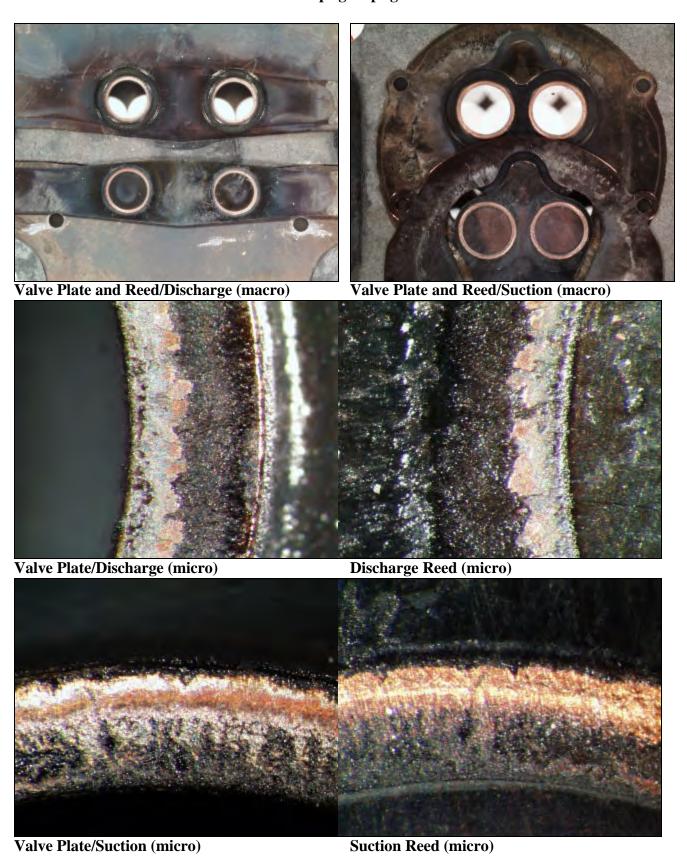


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air and Water 355 psig/14 psig



Report for R-507A Compressor with Contaminant Water

ILSI IIISIORI OI:				
Unit Number 18				
Model # RS43C1E-CAV-250 Serial	# 96F16498	Crank journals	1	
Run Time (hr.) 12015 Failed	!? No	Appearance	scored	
Refrigerant R-507A		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing iournal	
Acid? No R-12? No		Appearance	scored	
Air? No R-22? No		Wear	polish	
H_2O ? Yes R-502? No		*	ponsii	
12,00		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	355	2111011510115	Unloaded	0.9990
Suction Pressure (psig)	14	Bottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	235	Appearance	scored/corrosion	
Return Gas Temp (°F)	62	Wear	slight	
SumpTemp (°F)	242	*	Singin	
Sumptemp (1)	242	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/corrosion	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0010
Suction ring top appearance	gray		Unloaded	1.0010
Remaining torque of discharge muffler			Cinouaca	1.0010
(1) 3 (2) 3 (3) 3	(4) 3	Shaft in cage be	earing	
Remaining torque of stator bolts	(1) 3	Appearance	corrosion	
(1) 10 (2) 9 (3) 9	(4) 10	Wear	polish, slight	
	clean		•	
Suction muffler appearance		Piston top appe	carance cican	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/scored	
Discharge plate appearance	gray	Dimensions	Loaded	1.3730
Top stator windings appearance	gray		Unloaded	1.3730
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/scored	
Shell bottom appearance	black/Cu plate	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3750
Remaining torque of discharge muffler	removed		Unloaded	1.3750
(1) 14 (2) 15 (3) 15	(4) 15	Connecting rod	l (large end)	
Head gasket brittle?	yes	Appearance	scored	
Head suction cavity appearance	dirty	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2500
Cage bearing top appearance	dirty		Unloaded	1.2500
Remaining torque of cage bearing bolts				
(1) 4 (2) 5 (3) 5	(4) 5			

Unit Number 18

Contaminants:

Control Unit? No

Acid? No

R-12? No

Debris in compressor bottom (g)

1.307

Debris in compressor bottom (g)

Debris in compressor bottom (g)

Connecting rod (small end)

Appearance correct washer/corrosion

Wear medium

Dimensions Loaded 0.5070

Unloaded 0.5030

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored **Wear** slight

Dimensions Loaded 0.4990

Unloaded 0.4990

Final Lubricant Values **Total Acid Number (TAN)** 0.87 Water (ppm) 44 Fluoride ion (ppm) 1.4 Chloride ion (ppm) 10 Aluminum (ppm) 5 Copper (ppm) 1 Iron (ppm) 19 Lead (ppm) 0 4 Silicon (ppm) 33 Tin (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion/Cu plating

Suction reed

Condition good

Appearance corrosion/Cu plating

Trepan medium Varnish ring none

Discharge side (reed backer)

Condition good
Appearance corrosion

Discharge surface appearance corrosion/Cu plating

Discharge reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringslight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat black heavy hard **Rear Pin** very slight hard brown **Equalizer Hole** none none none Tip of Pin medium black gummy Spring black heavy gummy **Spring Seat** medium green, black gummy Ball medium black gummy **Front Side** medium green, black gummy

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Photographic Documentation of R-507A Compressor with Contaminant Water 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

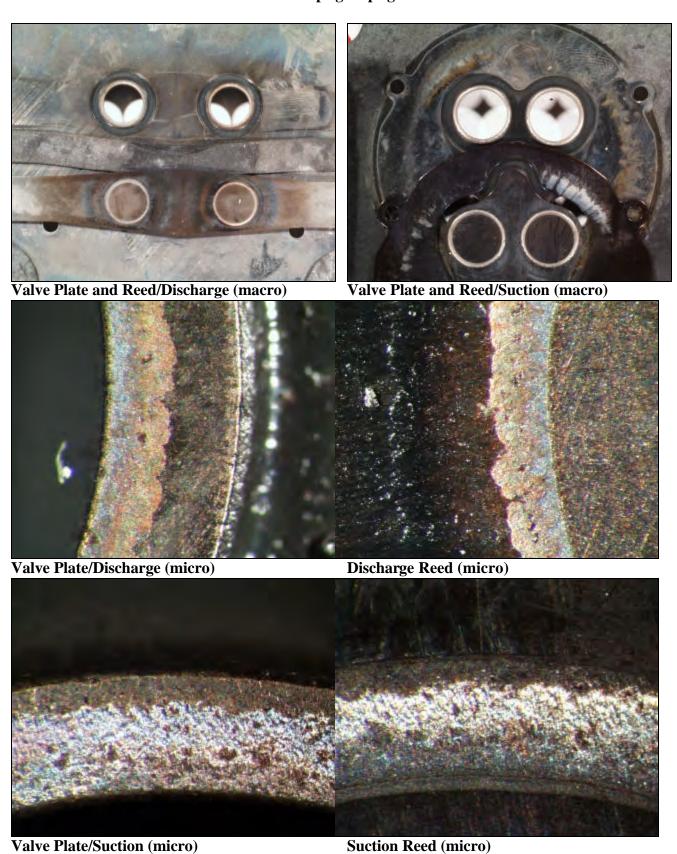


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Water 355 psig/14 psig



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Report for R-507A Compressor with Contaminant Acid, Water, and R-502

Unit Number 19				
Model # RS43C1E-CAV-250 Seria	l# 96F16515	Crank journals		
Run Time (hr.) 12013 Faile		Appearance	clean	
Refrigerant R-507A	. 110	Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2480
Contaminants:		Difficusions	Unloaded	1.2480
Control Unit? No		Lower crank be		1.2460
Acid? Yes R-12? No			scored	
		Appearance Wear		
		vvear	polish, slight	
H_2O ? Yes $R-502$? Yes		Dimensions	Loaded	0.9990
Dischause Prossure (nois)	255	Difficusions	Unloaded	
Discharge Pressure (psig)	355 14	Dottom thurst		0.9990
Suction Pressure (psig)	235		washer (crank side)	
Discharge Temp (°F)	62	Appearance Wear	scored/bronze plating	
Return Gas Temp (°F)		wear	medium	
SumpTemp (°F)	242	Dottom work	(apating gide)	
II: Dot	****	Bottom washer	_	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	medium	
Top shell appearance	gray	Lower bronze b	_	
Suction exit trail appearance	Cu	Appearance	clean	
Cluster block condition	good	Wear Dimensions	none	1 0020
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0020
Creation wing ton appropriate			Unloaded	1 0020
Suction ring top appearance	gray		Unloaded	1.0020
Remaining torque of discharge muffle	r	Shaft in cage he		1.0020
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4		Shaft in cage be	earing	1.0020
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts	r (4) 4	Appearance	earing clean/corrosion	1.0020
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11	r (4) 4 (4) 11	Appearance Wear	earing clean/corrosion polish	1.0020
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance	r (4) 4	Appearance Wear Piston top appea	earing clean/corrosion polish	1.0020
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux?	(4) 4 (4) 11 clean Yes	Appearance Wear	earing clean/corrosion polish	1.0020
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance	(4) 4 (4) 11 clean	Appearance Wear Piston top appea	earing clean/corrosion polish	1.0020
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux?	(4) 4 (4) 11 clean Yes	Appearance Wear Piston top appearance	earing clean/corrosion polish arance clean	1.0020 1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor?	(4) 4 (4) 11 clean Yes No	Appearance Wear Piston top appearance Appearance	clean/corrosion polish arance clean low wear/scored	
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 4 (4) 11 clean Yes No gray	Appearance Wear Piston top appearance Appearance	clean/corrosion polish arance clean low wear/scored Loaded	1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	r (4) 4 (4) 11 clean Yes No gray black	Appearance Wear Piston top appearance Appearance Dimensions	clean/corrosion polish arance clean low wear/scored Loaded	1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 4 (4) 11 clean Yes No gray black No No	Appearance Wear Piston top appearance Appearance Dimensions Cylinder bore	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear	1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	r (4) 4 (4) 11 clean Yes No gray black No	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance	clean/corrosion polish arance clean low wear/scored Loaded Unloaded	1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	r (4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight	1.3730 1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	r (4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded	1.3730 1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	r (4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight r removed	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded	1.3730 1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15	r (4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight r removed (4) 15	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded (large end)	1.3730 1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15 Head gasket brittle?	r (4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight r removed (4) 15 yes/bonded	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded (large end) scored	1.3730 1.3730
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance	(4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight r removed (4) 15 yes/bonded dirty	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded (large end) scored slight	1.3730 1.3730 1.3750 1.3750
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight r removed (4) 15 yes/bonded dirty dirty dirty	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded (large end) scored slight Loaded	1.3730 1.3730 1.3750 1.3750
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 10 (2) 11 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 4 (4) 11 clean Yes No gray black No No black/Cu plate/oil green slight r removed (4) 15 yes/bonded dirty dirty dirty	Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean/corrosion polish arance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded (large end) scored slight Loaded	1.3730 1.3730 1.3750 1.3750

Unit Number

Contaminants: Trash in liquid screen (g) 0.133 **Control Unit?** No **Number of screens** Acid? Debris in compressor bottom (g) 0.893 Yes R-12? No Air? No R-22? No H₂O? Yes R-502?

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear slight **Dimensions** Loaded

0.5090 Unloaded 0.5030

Yes

Piston pin washers appearance

contact wear

Piston pin

Appearance scored slight Wear

Dimensions Loaded 0.4990 0.4990 Unloaded

Final Lubricant Values	
Total Acid Number (TAN)	1.2
Water (ppm)	72
Fluoride ion (ppm)	0.90
Chloride ion (ppm)	11
Aluminum (ppm)	1
Copper (ppm)	1
Iron (ppm)	15
Lead (ppm)	1
Silicon (ppm)	2
Tin (ppm)	23
Zinc (ppm)	2

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good Appearance corrosion Suction surface appearance

corrosion/soot

Suction reed

Condition good

Appearance corrosion/carbon

Trepan slight Varnish ring none

Discharge side (reed backer)

Condition good Appearance corrosion Discharge surface appearance

corrosion/soot

Discharge reed

Condition good

Appearance corrosion/carbon **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	medium	green	gummy
Tip of Pin	medium	black	gummy
Spring	heavy	black	gummy
Spring Seat	heavy	gray	gummy
Ball	medium	black	gummy
Front Side	heavy	gray	gummy

Photographic Documentation of R-507A Compressor with Contaminant Acid, Water, and R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

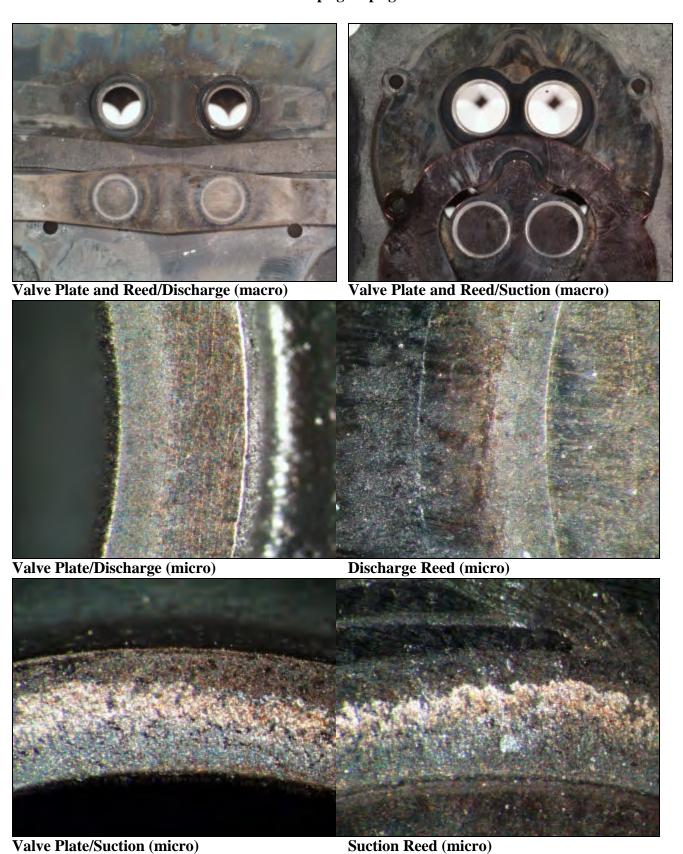


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid, Water, and R-502 355 psig/14 psig



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Report for R-507A Compressor with Contaminant Acid, Air, Water, and R-502

Unit Number 20				
Model # RS43C1E-CAV-250 Seria	1 # 96F16500	Crank journals		
Run Time (hr.) 12032 Failed	1? No	Appearance	scored/Cu plating	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2450
Contaminants:			Unloaded	1.2450
Control Unit? No		Lower crank b		1.2.00
Acid? Yes R-12? No		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	slight	
H_2O ? Yes R-502? Yes		vvcar	Siigiit	
120. 105 1002. 105		Dimensions	Loaded	0.9950
Discharge Pressure (psig)	355	Difference	Unloaded	0.9980
Suction Pressure (psig)	14	Rottom thrust	washer (crank side)	0.7700
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	heavy	
SumpTemp (°F)	242	vvcai	neavy	
Sumplemp (T)	242	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	medium	
Top shell appearance	*	Lower bronze		
Suction exit trail appearance	gray gray/Cu	Appearance	clean/corrosion	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	0.9990
Wife to cluster block appearance	gray	Dimensions	Loaueu	0.2220
			Unloaded	0.0000
Suction ring top appearance	black		Unloaded	0.9990
Suction ring top appearance Remaining torque of discharge muffler	black r	Shaft in cage h		0.9990
Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4	black	Shaft in cage be	earing	0.9990
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts	black r (4) 4	Appearance	earing clean	0.9990
Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10	black r (4) 4 (4) 9	Appearance Wear	earing clean polish	0.9990
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts	black r (4) 4	Appearance	earing clean polish	0.9990
Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10	black r (4) 4 (4) 9	Appearance Wear	earing clean polish	0.9990
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance	black r (4) 4 (4) 9 clean	Appearance Wear Piston top appe	earing clean polish	
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux?	black r (4) 4 (4) 9 clean Yes	Appearance Wear Piston top appe Piston skirt	earing clean polish earance clean	
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	black r (4) 4 (4) 9 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish earance clean low wear/scored/Cu p	olating
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	black r (4) 4 (4) 9 clean Yes No black	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish earance clean low wear/scored/Cu p Loaded	olating 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	black r (4) 4 (4) 9 clean Yes No black black	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded	olating 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	black (4) 4 (4) 9 clean Yes No black black No No	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating	olating 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	black (4) 4 (4) 9 clean Yes No black black No No black/Cu plate	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy	olating 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	black (4) 4 (4) 9 clean Yes No black black No No No black/Cu plate heavy	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded	olating 1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	black (4) 4 (4) 9 clean Yes No black black No No No black/Cu plate heavy r removed	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded Unloaded Unloaded	lating 1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 16	black (4) 4 (4) 9 clean Yes No black black No No No black/Cu plate heavy r removed (4) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roce	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded Unloaded Unloaded Unloaded I (large end)	olating 1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 16 Head gasket brittle?	black (4) 4 (4) 9 clean Yes No black black No No No black/Cu plate heavy r removed (4) 15 yes	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded Unloaded Unloaded I (large end) none	olating 1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance	black (4) 4 (4) 9 clean Yes No black black No No black/Cu plate heavy r removed (4) 15 yes dirty	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded Unloaded (large end) none polish, slight	1.3670 1.3670 1.3740 1.3740
Suction ring top appearance Remaining torque of discharge mufflet (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	black (4) 4 (4) 9 clean Yes No black black No No black/Cu plate heavy r removed (4) 15 yes dirty dirty	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded Unloaded (large end) none polish, slight Loaded	1.3670 1.3670 1.3740 1.3740
Suction ring top appearance Remaining torque of discharge mufflet (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	black (4) 4 (4) 9 clean Yes No black black No No black/Cu plate heavy r removed (4) 15 yes dirty dirty dirty dirty	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded Unloaded (large end) none polish, slight	1.3670 1.3670 1.3740 1.3740
Suction ring top appearance Remaining torque of discharge mufflet (1) 4 (2) 3 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	black (4) 4 (4) 9 clean Yes No black black No No black/Cu plate heavy r removed (4) 15 yes dirty dirty dirty dirty	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean polish earance clean low wear/scored/Cu p Loaded Unloaded low wear/Cu plating heavy Loaded Unloaded (large end) none polish, slight Loaded	1.3670 1.3670 1.3740 1.3740 1.2500

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? No Air? Yes R-22? No H₂O? R-502? Yes Yes

Debris in compressor bottom (g)

0.138

2 0.902

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance correct washer/corrosion

Wear slight

Dimensions Loaded 0.5270

Unloaded 0.5120

Piston pin washers appearance

contact wear

Piston pin

Valve Part

Front Side

Appearance scored/Cu plating/corrosion

slight Wear

Dimensions Loaded 0.4970

0.4970 Unloaded

Final Lubricant Values

Total Acid Number (TAN) Water (ppm) Fluoride ion (ppm) Chloride ion (ppm)

13 Aluminum (ppm) 62 Copper (ppm) Iron (ppm) 89 Lead (ppm) Silicon (ppm)

Tin (ppm) 66 Zinc (ppm) 17

Residue Accumulation

Suction side (reed backer)

Trash in liquid screen (g)

Number of screens

Condition good

Appearance corrosion/soot **Suction surface appearance**

corrosion/Cu plating/soot

Suction reed

Condition good

corrosion/Cu plating/soot **Appearance**

Trepan medium Varnish ring medium

Discharge side (reed backer)

Condition good

corrosion/Cu plating/blued **Appearance**

Discharge surface appearance

corrosion/Cu plating/soot

hard

Discharge reed

Condition good

Appearance corrosion/Cu plating/soot

Trepan slight Varnish ring slight

Expansion Valve Inspection Observations

slight

Residue Description Diaphragm Seat heavy black hard **Rear Pin** very slight hard brown **Equalizer Hole** plugged black gummy Tip of Pin slight black, brown gummy Spring medium black gummy **Spring Seat** medium gummy Cu Ball slight gray gummy

1.1

120

2.0

1

7

9

Residue Color

gray

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, Water, and R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

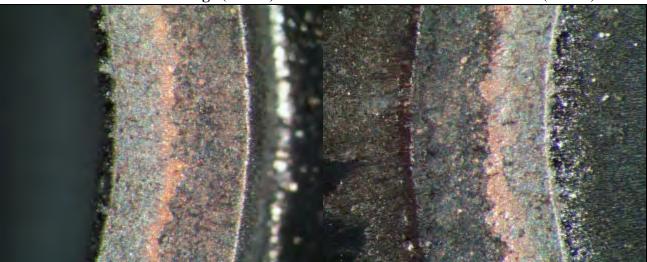
Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, Water, and R-502 355 psig/14 psig





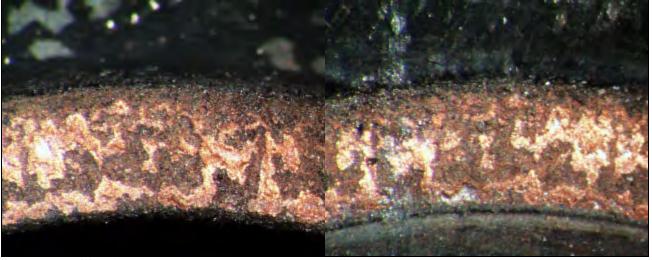
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant Air, Water, and R-502

ILDI IIIDIONI OI.				
Unit Number 21				
Model # RS43C1E-CAV-250 Serial	# 96F16506	Crank journals	S	
Run Time (hr.) 12024 Failed		Appearance	clean/Cu plating	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2475
Contaminants:		Difficusions	Unloaded	1.2475
Control Unit? No		I orrow anomir h		1.2473
		Lower crank b		
Acid? No R-12? No		Appearance	clean/Cu plating	
Air? Yes R-22? No		Wear	polish	
H_2O ? Yes R-502 ? Yes		ъ.		1 0000
		Dimensions	Loaded	1.0000
Discharge Pressure (psig)	355		Unloaded	0.9995
Suction Pressure (psig)	14		washer (crank side)	
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	242			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/Cu plating/corre	osion
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze	bearings	
Suction exit trail appearance	gray/Cu	Appearance	clean	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0040
Suction ring top appearance	gray		Unloaded	1.0035
Remaining torque of discharge muffler				
(1) 2.5 (2) 2.5 (3) 2.5	(4) 2.5	Shaft in cage b	earing	
Remaining torque of stator bolts	(1) =10	Appearance	Cu plating	
(1) 12.5 (2) 15 (3) 12.5	(4) 15	Wear	polish	
Suction muffler appearance		Piston top appe	•	
	gray		cal ance cican	
OEM flux?	Yes	Piston skirt	1 /0 1 .:	
Loose restrictor?	No	Appearance	low wear/Cu plating	
Discharge plate appearance	black/soot	Dimensions	Loaded	1.3730
Top stator windings appearance	black		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/Cu plating	
Shell bottom appearance	black/Cu plate	Varnish ring	medium	
Quantity of bearing chips	heavy	Dimensions	Loaded	1.3755
Remaining torque of discharge muffler			Unloaded	1.3755
(1) 15 (2) 20 (3) 17.5	(4) 17.5	Connecting roo		
Head gasket brittle?	yes/bonded	Appearance	Cu plating	
Head suction cavity appearance	dirty	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2515
Cage bearing top appearance	dirty	Difficusions	Unloaded	1.2515
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 5	(4) 5			
	(1) 3			

Unit Number 21

Contaminants: Trash in liquid screen (g) 0.101 **Number of screens Control Unit?** No Acid? Debris in compressor bottom (g) 1.082 No R-12? No Air? Yes R-22? No

Connecting rod (small end)

Yes

Appearance contact wear/correct washer/corrosion

R-502?

Wear heavy
Dimensions Loaded 0.5110

Unloaded 0.5035

Yes

Piston pin washers appearance

contact wear/Cu plating

Piston pin

H₂O?

Appearance scored/Cu plating/corrosion

Wear slight

Dimensions Loaded 0.4985 Unloaded 0.4980

1.1
81
2.0
17
2
1
18
1
3
27
3

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good

Appearance corrosion/Cu plating

Suction surface appearance

corrosion/Cu plating

Suction reed

Condition good

Appearance corrosion/Cu plating

Trepan medium Varnish ring medium

Discharge side (reed backer)

Condition good

Appearance corrosion/Cu plating/blued

Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/blued/Cu plating

Trepan slight Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black, brown, gray	gummy
Spring	heavy	gray, black	gummy, hard
Spring Seat	heavy	gray	gummy
Ball	slight	black	hard
Front Side	medium	black	gummy

Photographic Documentation of R-507A Compressor with Contaminant Air, Water, and R-502 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

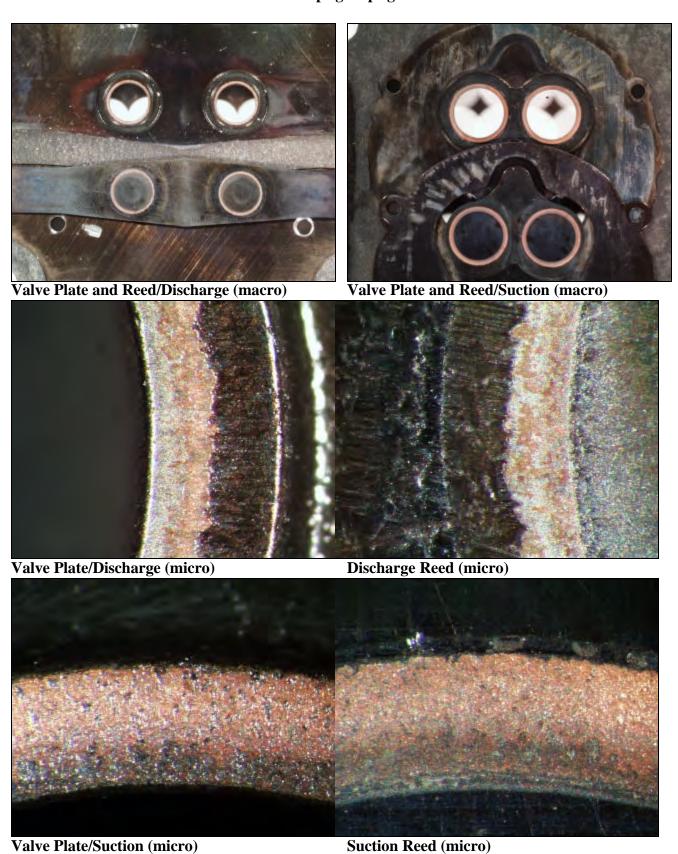


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air, Water, and R-502 355 psig/14 psig



Report for R-507A Compressor with Contaminant Acid, Air, and Water

TEST INSTORT OF.				
Unit Number 22				
Model # RS43C1E-CAV-250 Serial	# 96F16502	Crank journals	;	
Run Time (hr.) 12002 Failed	? No	Appearance	clean/Cu plating	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b	earing iournal	
Acid? Yes R-12? No		Appearance	clean/Cu plating	
Air? Yes R-22? No		Wear	polish	
H_2O ? Yes R-502 ? No			I	
-		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	355		Unloaded	0.9980
Suction Pressure (psig)	14	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	235	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	242			
Sumpremp (1)		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/Cu plating	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0040
Suction ring top appearance	gray		Unloaded	1.0040
Remaining torque of discharge muffler				
(1) 2.5 (2) 2.5 (3) 2.5	(4) 5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 10 (2) 11 (3) 12.5	(4) 10	Wear	polish	
Suction muffler appearance	gray	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	black	Dimensions	Loaded	1.3740
Top stator windings appearance	gray		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		1107.0
Was rotor loose?	No	Appearance	low wear/scored	
Shell bottom appearance	black/oil green	Varnish ring	heavy	
Quantity of bearing chips	heavy	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Differences	Unloaded	1.3760
(1) 15 (2) 12.5 (3) 12.5	(4) 17	Connecting roo		1.3700
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	dirty	Wear	medium	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2515
				1.2010
	•		Unloaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
	dirty		Unloaded	1.2510

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? No Air? Yes R-22? No H₂O? R-502? Yes No

Valve Plate Assembly Inspection

Debris in compressor bottom (g)

Trash in liquid screen (g)

Suction side (reed backer) Condition good

Number of screens

corrosion/Cu plating Appearance

0.176

1.220

Suction surface appearance corrosion/Cu plating

Suction reed

Condition good

corrosion/Cu plating **Appearance**

Trepan slight Varnish ring very slight

Discharge side (reed backer)

Condition good

corrosion/Cu plating/blued **Appearance**

Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/blued/Cu plating

Trepan slight Varnish ring medium

Connecting rod (small end)

Appearance contact wear/correct washer

Wear heavy

Dimensions Loaded 0.5130 Unloaded 0.5025

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Appearance scored/Cu plating/corrosion

Wear heavy

Final Lubricant Values

Dimensions Loaded 0.4965 0.4970 Unloaded

Total Acid Number (TAN) 1.8 Water (ppm) 58 Fluoride ion (ppm) 1.5 Chloride ion (ppm) 11 Aluminum (ppm) 8 0 Copper (ppm)

Iron (ppm) 12 Lead (ppm) Silicon (ppm) 10 Tin (ppm) Zinc (ppm)

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	heavy	gray, black	gummy
Spring Seat	heavy	black, gray, brown	gummy
Ball	medium	black	gummy
Front Side	medium	gray, black	gummy

1

3

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Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and Water 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

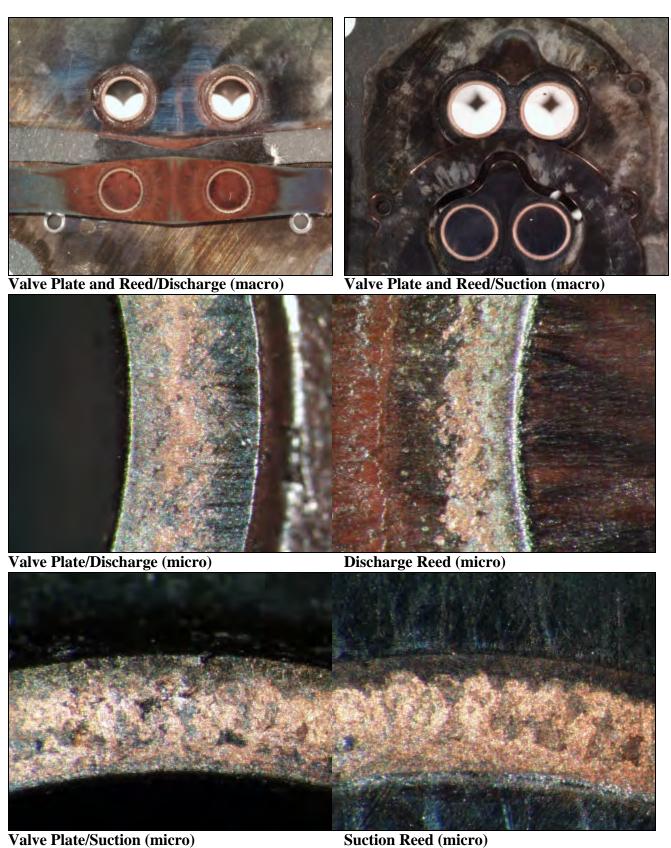


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and Water 355 psig/14 psig



Suction Reca (inicio)

Report for R-507A Control Compressor

ILDI IIIDIORI OI.				
Unit Number 23				
Model # RS43C1E-CAV-250 Serial	# 96F16486	Crank journals		
Run Time (hr.) 12026 Failed	? No		clean	
Refrigerant R-507A			polish	
Lubricant RL32S			Loaded	1.2470
Contaminants:		1	Unloaded	1.2470
Control Unit? Yes		Lower crank bea	aring iournal	
Acid? No R-12? No			clean	
Air? No R-22? No			polish	
H ₂ O? No R-502? No		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	F	
2		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	355		Unloaded	0.9985
Suction Pressure (psig)	14		asher (crank side)	***************************************
Discharge Temp (°F)	180		clean/bronze plating	
Return Gas Temp (°F)	54		polish	
SumpTemp (°F)	140			
~	1.0	Bottom washer (casting side)	
Hi-Pot	pass		clean	
High-low leak	pass	* *	polish	
Top shell appearance	gray	Lower bronze be		
Suction exit trail appearance	gray		scored/corrosion	
Cluster block condition	good		polish	
Wire to cluster block appearance	gray		Loaded	1.0030
Suction ring top appearance	clean	١	Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 5.4 (2) 5.4 (3) 4.2	(4) 3.8	Shaft in cage bea	ring	
Remaining torque of stator bolts		_	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
Suction muffler appearance	metal chips	Piston top appea	rance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No		no wear	
Discharge plate appearance	gray		Loaded	1.3740
Top stator windings appearance	clean/stator top green	1	Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No		no wear	
Shell bottom appearance	clean		slight	
Quantity of bearing chips	slight	U	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 14 (2) 13 (3) 15	(4) 15	Connecting rod (
Head gasket brittle?	yes/bonded	_	scored	
Head suction cavity appearance	clean		polish	
Head discharge cavity appearance	clean	-	Loaded	1.2515
Cage bearing top appearance	clean		Unloaded	1.2515
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 6	(4) 6			

Unit Number

Contaminants: Control Unit? Yes Acid? No R-12? No Air? No R-22? No H₂O? R-502? No No Trash in liquid screen (g) 0.036 **Number of screens** 3 0.935 Debris in compressor bottom (g)

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish **Dimensions** Loaded 0.5010 Unloaded 0.5010

0.4985

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear polish **Dimensions** Loaded

0.4985 Unloaded

Final Lubricant Values Total Acid Number (TAN) Water (ppm) Fluoride ion (ppm) Chloride ion (ppm) Aluminum (ppm) Copper (ppm) Iron (ppm) Lead (ppm)

0.05 174 1.8 8.8 0 0 0 0 3 Silicon (ppm) Tin (ppm) 2 0 Zinc (ppm)

Suction side (reed backer)

Condition good **Appearance** corrosion Suction surface appearance

corrosion

Suction reed

Condition good Appearance clean Trepan very slight Varnish ring none

Discharge side (reed backer) Condition good corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance clean **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	very slight	gray	hard
Spring	slight	gray	hard
Spring Seat	none	none	none
Ball	very slight	gray	hard
Front Side	none	none	none

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

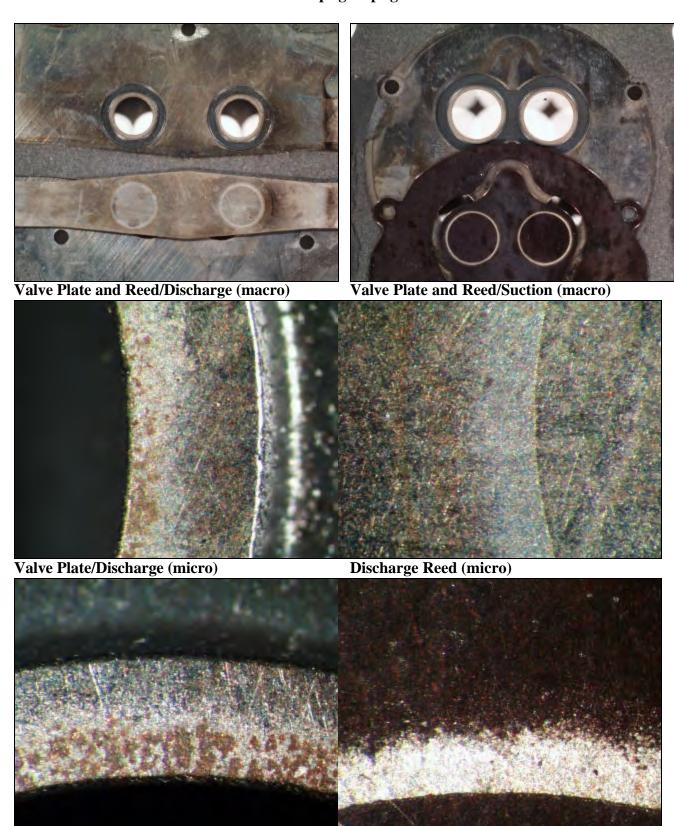


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Control Compressor 355 psig/14 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

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Report for R-507A Control Compressor

ILDI IIIDIONI OI.				
Unit Number 24				
Model # RS43C1E-CAV-250 Seria	l# 96F16488	Crank journals	;	
Run Time (hr.) 12011 Failed	1? No	Appearance	clean	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? Yes		Lower crank be	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No			r · ·	
-		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	185		Unloaded	0.9990
Suction Pressure (psig)	30	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	180	Appearance	clean	
Return Gas Temp (°F)	54	Wear	polish	
SumpTemp (°F)	140		Γ	
2 mp 2 mp (2)	1.0	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0025
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler	r			
(1) 4.2 (2) 3.8 (3) 4.2	(4) 4.2	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	gray		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	none	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 15 (3) 15	(4) 15	Connecting rod		1.0700
Head gasket brittle?	no/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolt			~ ~ ~ ~ ~ ~	
(1) 5 (2) 4 (3) 5	(4) 4			
	` '			

Unit Number 24

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.058Number of screens2Debris in compressor bottom (g)1.192

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance clean
Wear polish
Dimensions Loaded

Unloaded 0.4975

0.4975

0.03

172

Final Lubricant Values
Total Acid Number (TAN)
Water (ppm)
Fluoride ion (ppm)

 Fluoride ion (ppm)
 1.5

 Chloride ion (ppm)
 8.3

 Aluminum (ppm)
 0

 Copper (ppm)
 0

 Iron (ppm)
 0

 Lead (ppm)
 0

 Silicon (ppm)
 1

 Tin (ppm)
 1

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	brown	gummy
Spring	none	none	none
Spring Seat	very slight	gray	hard
Ball	none	none	none
Front Side	none	none	none

0

Photographic Documentation of R-507A Control Compressor 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

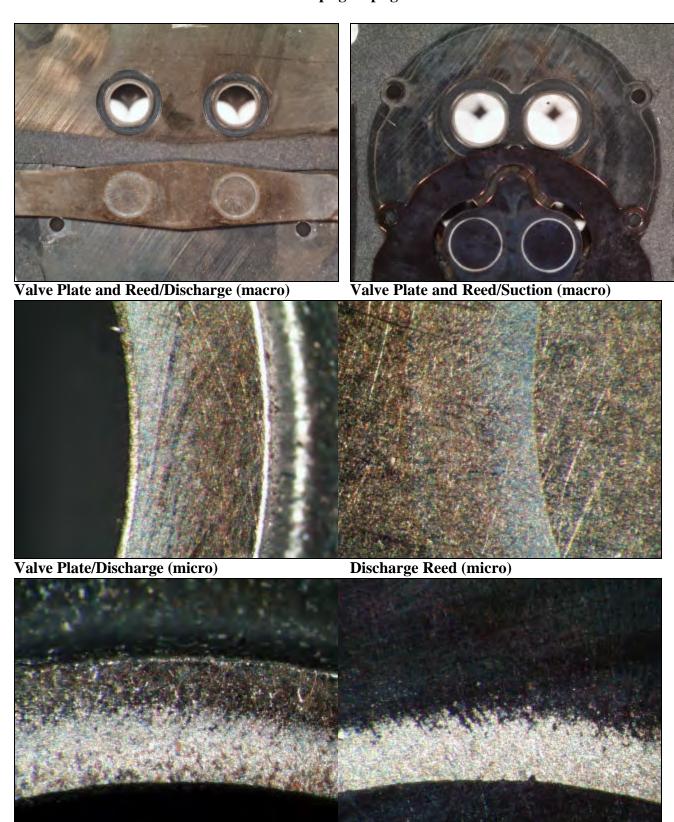


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Control Compressor 185 psig/30 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

Report for R-507A Control Compressor

Unit Number 25			
Model # RS43C1E-CAV-250 Serial	# 96F16469	Crank journals	
Run Time (hr.) 12118 Failed		Appearance clean	
Refrigerant R-507A	. 110	Wear polish	
Lubricant RL32S		Dimensions Loaded 1.247	70
Contaminants:		Unloaded 1.247	
			/ U
Control Unit? Yes		Lower crank bearing journal	
Acid? No R-12? No		Appearance clean	
Air? No R-22? No		Wear polish	
H_2O ? No $R-502$? No		D'	20
D' 1 D (')	105	Dimensions Loaded 0.999	
Discharge Pressure (psig)	185	Unloaded 0.999) ()
Suction Pressure (psig)	30	Bottom thrust washer (crank side)	
Discharge Temp (°F)	180	Appearance clean	
Return Gas Temp (°F)	54	Wear polish	
SumpTemp (°F)	140		
		Bottom washer (casting side)	
Hi-Pot	pass	Appearance clean	
High-low leak	pass	Wear polish	
Top shell appearance	gray	Lower bronze bearings	
Suction exit trail appearance	gray	Appearance clean	
Cluster block condition	good	Wear polish	
Wire to cluster block appearance	gray	Dimensions Loaded 1.004	
Suction ring top appearance	clean	Unloaded 1.004	10
Remaining torque of discharge muffler			
(1) 4.2 (2) 3.8 (3) 3.8	(4) 3.8	Shaft in cage bearing	
Remaining torque of stator bolts		Appearance clean	
(1) 12.5 (2) 12.5 (3) 7.5	(4) 10	Wear polish	
Suction muffler appearance	clean	Piston top appearance clean	
OEM flux?	Yes	Piston skirt	
Loose restrictor?	No	Appearance low wear	
Discharge plate appearance	gray	Dimensions Loaded 1.374	10
Top stator windings appearance	gray	Unloaded 1.374	10
Rotor rub marks present?	No	Cylinder bore	
Was rotor loose?	No	Appearance no wear	
Shell bottom appearance	clean	Varnish ring very slight	
Quantity of bearing chips	slight	Dimensions Loaded 1.376	50
Remaining torque of discharge muffler		Unloaded 1.376	
(1) 14 (2) 14 (3) 14	(4) 14	Connecting rod (large end)	,0
Head gasket brittle?	yes/bonded	Appearance scored	
Head suction cavity appearance	clean	Wear polish	
Head discharge cavity appearance	clean	Dimensions Loaded 1.251	15
Cage bearing top appearance	dirty	Unloaded 1.251	
Remaining torque of cage bearing bolts		Cindaucu 1.231	ر،
(1) 6 (2) 6 (3) 6	(4) 5		
(-)	(=)		

Unit Number 25

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g) 0.060 Number of screens 2 Debris in compressor bottom (g) 0.644

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Tin (ppm)

Zinc (ppm)

Appearance scored Wear polish Dimensions Loaded

Unloaded 0.4985

0.4985

Final Lubricant Values	
Total Acid Number (TAN)	0.05
Water (ppm)	184
Fluoride ion (ppm)	1.4
Chloride ion (ppm)	7.2
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	2

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	very slight	gray	gummy
Spring	none	none	none
Spring Seat	very slight	gray	hard
Ball	very slight	gray	hard
Front Side	none	none	none

1

0

Photographic Documentation of R-507A Control Compressor 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

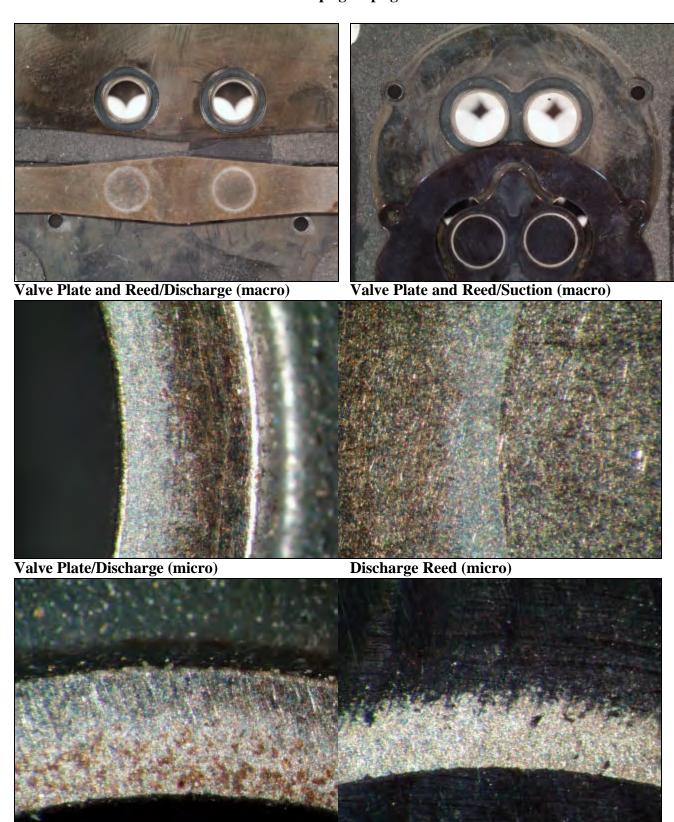


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Control Compressor 185 psig/30 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant R-502

TEST HISTORY OF:			
Unit Number 26			
Model # RS43C1E-CAV-250 Seria	l # 96F16514	Crank journals	
Run Time (hr.) 12001 Failed	1? No	Appearance clean	
Refrigerant R-507A		Wear polis	
Lubricant RL32S		Dimensions Load	
Contaminants:			aded 1.2480
Control Unit? No		Lower crank bearing	
Acid? No R-12? No		_	~
		I I	
		Wear polis	11
H_2O ? No $R-502$? Yes		Dimensions Load	1 0005
Dischause Ducessus (serie)	105		
Discharge Pressure (psig)	185		aded 1.0005
Suction Pressure (psig)	30	Bottom thrust washe	
Discharge Temp (°F)	180	Appearance clean	
Return Gas Temp (°F)	54	Wear none	
SumpTemp (°F)	140	_	
		Bottom washer (casti	
Hi-Pot	pass	* *	ed/corrosion
High-low leak	pass	Wear polis	
Top shell appearance	clean	Lower bronze bearing	ıgs
Suction exit trail appearance	gray	Appearance score	ed
Cluster block condition	good	Wear polis	h
Wire to cluster block appearance	gray	Dimensions Load	led 1.0015
Suction ring top appearance	gray	Unlo	aded 1.0015
Remaining torque of discharge muffle	r		
(1) 2 (2) 5 (3) 3	(4) 4	Shaft in cage bearing	
Remaining torque of stator bolts		Appearance corre	osion
(1) 10 (2) 10 (3) 10	(4) 12.5	Wear none	
Suction muffler appearance	clean	Piston top appearance	e clean
OEM flux?	Yes	Piston skirt	
Loose restrictor?	No	Appearance low v	vear
Discharge plate appearance	gray	Dimensions Load	
Top stator windings appearance	clean		aded 1.3740
Rotor rub marks present?	Yes	Cylinder bore	1.3740
Was rotor loose?	No	-	*****
		Appearance low v	
Shell bottom appearance	clean	Varnish ring sligh	
0 44 61 1 14	4. 4 .		
Quantity of bearing chips	slight	Dimensions Load	
Remaining torque of discharge muffle	r removed	Unlo	aded 1.3760
Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15	r removed (4) 17	Unlo Connecting rod (larg	aded 1.3760 e end)
Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle?	r removed (4) 17 no/bonded	Unlo Connecting rod (larg Appearance none	aded 1.3760 e end)
Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance	r removed (4) 17 no/bonded dirty	Unlo Connecting rod (larg Appearance none Wear sligh	aded 1.3760 e end)
Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	r removed (4) 17 no/bonded dirty dirty	Connecting rod (larg Appearance none Wear sligh Dimensions Load	aded 1.3760 e end) t led 1.2495
Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	r removed (4) 17 no/bonded dirty dirty dirty	Connecting rod (larg Appearance none Wear sligh Dimensions Load	aded 1.3760 e end)
Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolt	r removed (4) 17 no/bonded dirty dirty dirty s	Connecting rod (larg Appearance none Wear sligh Dimensions Load	aded 1.3760 e end) t led 1.2495
Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	r removed (4) 17 no/bonded dirty dirty dirty	Connecting rod (larg Appearance none Wear sligh Dimensions Load	aded 1.3760 e end) t led 1.2495

Unit Number	26
Contaminants:	

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 Yes

Trash in liquid screen (g) 0.145
Number of screens 2
Debris in compressor bottom (g) 0.664

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.4990Unloaded0.4990

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion Wear medium Dimensions Loaded

S Loaded 0.4975 **Unloaded** 0.4970

Final Lubricant Values	
Total Acid Number (TAN)	0.03
Water (ppm)	50
Fluoride ion (ppm)	1.5
Chloride ion (ppm)	10
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	2
Tin (ppm)	1
Zinc (ppm)	0

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** clean

Discharge surface appearance

corrosion

Discharge reed

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	gold-brown	hard
Spring	none	none	none
Spring Seat	none	none	none
Ball	none	none	none
Front Side	very slight	gray	hard

Photographic Documentation of R-507A Compressor with Contaminant R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

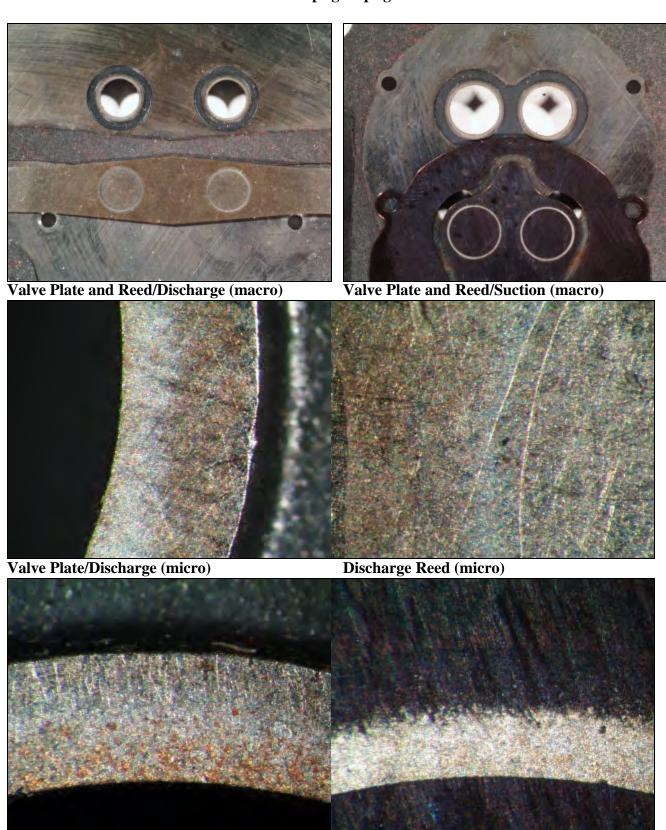


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant R-502 185 psig/30 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

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Report for R-507A Compressor with Contaminant Acid

TEST INSTORT OF				
Unit Number 27				
Model # RS43C1E-CAV-250 Serial	l# 96F16472	Crank journals	S	
Run Time (hr.) 12041 Failed	l? No	Appearance	clean	
Refrigerant R-507A		Wear	polish, medium	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank b	earing iournal	
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	slight	
H_2O ? No R-502? No		***************************************	5116111	
12,00		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	185	2111011310113	Unloaded	0.9940
Suction Pressure (psig)	30	Rottom thrust	washer (crank side)	0.7710
Discharge Temp (°F)	180	Appearance	scored/corrosion	
Return Gas Temp (°F)	54	Wear	medium	
SumpTemp (°F)	140	· · · cui	mearam	
Sumptemp (T)	140	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	heavy	
Top shell appearance	clean/gray	Lower bronze	•	
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Difficusions	Unloaded	1.0030
Remaining torque of discharge muffler			Cinoaucu	1.0030
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage b	earing	
Remaining torque of stator bolts	(4) 3	Appearance	corrosion	
(1) 10 (2) 7.5 (3) 12	(4) 7.5	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	e arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3735
Top stator windings appearance	clean		Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 16 (2) 17.5 (3) 17.5	(4) 17.5	Connecting roo	d (large end)	
Head gasket brittle?	no/bonded	Appearance	scored/Cu plating/cor	rrosion
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2515
Cage bearing top appearance	clean/discolored		Unloaded	1.2515
Remaining torque of cage bearing bolts				
(1) 5 (2) 2.5 (3) 2.5	(4) 5			

Unit Number	27
Contaminants:	

Control Unit? No Acid? Yes R-12? No Air? No R-22? No H₂O? No R-502? No Trash in liquid screen (g) 0.043 **Number of screens** 2 Debris in compressor bottom (g) 0.726

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish, medium Dimensions Loaded 0.5010 0.5010

Unloaded

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating Wear polish, medium **Dimensions** Loaded

0.4980 Unloaded 0.4980

Final Lubricant Values	
Total Acid Number (TAN)	0.08
Water (ppm)	261
Fluoride ion (ppm)	2.3
Chloride ion (ppm)	12
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	1
Tin (ppm)	1
Zinc (ppm)	0

Suction side (reed backer)

Condition good **Appearance** corrosion Suction surface appearance

corrosion

Suction reed

Condition good Appearance corrosion Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good Appearance corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	medium	gray, black	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	gray, brown	gummy
Spring	medium	black	gummy
Spring Seat	very slight	gray	gummy
Ball	medium	black	gummy
Front Side	slight	black	hard

Photographic Documentation of R-507A Compressor with Contaminant Acid 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

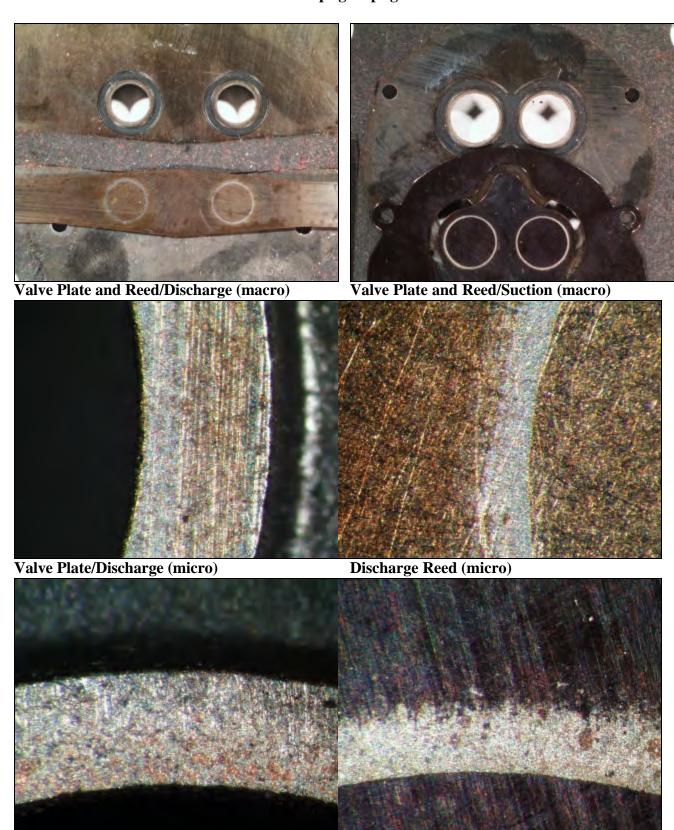


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid 185 psig/30 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant Air

ILDI IIIDIORI OI.				
Unit Number 28				
Model # RS43C1E-CAV-250 Serial	l# 96F16461	Crank journals	S	
Run Time (hr.) 12005 Failed	l? No	Appearance	clean	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	slight	
H_2O ? No R-502? No		7.7.002	5.1. 5. 1.1	
		Dimensions	Loaded	0.9995
Discharge Pressure (psig)	185		Unloaded	0.9995
Suction Pressure (psig)	30	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	180	Appearance	clean	
Return Gas Temp (°F)	54	Wear	polish/slight	
SumpTemp (°F)	140	7.7.002	polish, slight	
Sumpremp(1)	110	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish/slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	bright		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 2.5 (2) 2.5 (3) 2.5	(4) 5	Shaft in cage b	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 5 (2) 10 (3) 7.5	(4) 12.5	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appo		
OEM flux?	Yes	Piston skirt	our unice cream	
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance		Difficusions	Unloaded	1.3740
	clean	Callandon bono	Omoaded	1.5740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear/Cu plating	
Shell bottom appearance	clean	Varnish ring	heavy	1 27 10
Quantity of bearing chips	slight	Dimensions	Loaded	1.3740
Remaining torque of discharge muffler		a	Unloaded	1.3740
(1) 15 (2) 12.5 (3) 15	(4) 15	Connecting roo		
Head gasket brittle?	no/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	slight	1 2400
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2490
Casa baaring ton service	alaam		Unloaded	1 2510
Cage bearing top appearance	clean		Unloaded	1.2510
Cage bearing top appearance Remaining torque of cage bearing bolts (1) 5 (2) 5 (3) 5			Unloaded	1.2510

Unit Number

Contaminants: Trash in liquid screen (g) 0.017 **Control Unit?** No **Number of screens** Acid? No R-12? No Debris in compressor bottom (g) 0.683 Air? Yes R-22? No

H₂O? R-502? **Valve Plate Assembly Inspection** No No

Connecting rod (small end) Suction side (reed backer)

Appearance correct washer/corrosion Condition good Wear slight Appearance corrosion Loaded 0.5015

Dimensions Suction surface appearance Unloaded 0.5015 corrosion

Piston pin washers appearance

Suction reed

Condition contact wear good Piston pin corrosion **Appearance**

Appearance corrosion Trepan very slight polish, medium Varnish ring Wear none

Dimensions Loaded 0.4970

0.4970 Discharge side (reed backer) Unloaded Condition good

Final Lubricant Values corrosion/blued **Appearance**

Total Acid Number (TAN) 0.04 Discharge surface appearance

Water (ppm) 96 corrosion Fluoride ion (ppm) 1.7

Chloride ion (ppm) 9.2 Discharge reed Aluminum (ppm) 0 Condition good 0 Appearance Copper (ppm) corrosion Iron (ppm) 0 **Trepan** very slight

0

Lead (ppm) 0 Varnish ring none 4 Silicon (ppm) 1 Tin (ppm)

Expansion Valve Inspection Observations

Zinc (ppm)

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat heavy black hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight black gummy Spring hard heavy gray, black **Spring Seat** none none none

Ball medium black hard Front Side slight black gummy

Photographic Documentation of R-507A Compressor with Contaminant Air 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

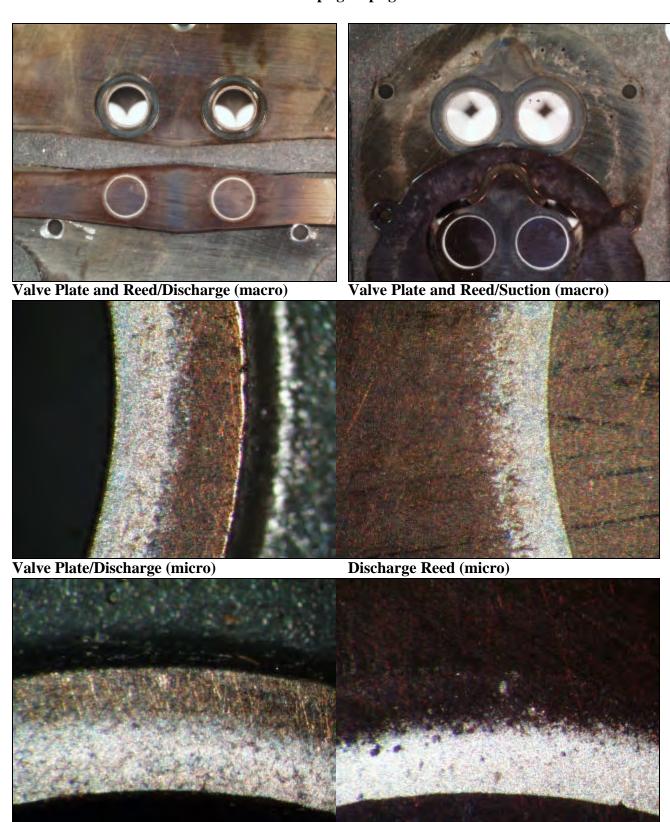


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air 185 psig/30 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant Acid and R-502

TEST HISTORY OF.				
Unit Number 29				
Model # RS43C1E-CAV-250 Serial	l# 96F16464	Crank journals		
Run Time (hr.) 12037 Failed	l? No	Appearance	clean/scored	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:		Difficustons	Unloaded	1.2460
Control Unit? No		Lower crank be		1.2400
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? Yes		Wear	polisii	
1120: No R-302: 168		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	185	Difficusions	Unloaded	0.9990
• •	30	Dottom throat		0.9990
Suction Pressure (psig)	180		washer (crank side)	200
Discharge Temp (°F)		Appearance	clean/scored/Cu platin	ng
Return Gas Temp (°F)	54	Wear	slight	
SumpTemp (°F)	140	D 44	(
II' D.4		Bottom washer	_	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	medium	
Top shell appearance	clean	Lower bronze l	-	
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish	4 0005
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0035
Suction ring top appearance	bright		Unloaded	1.0035
Remaining torque of discharge muffler				
(1) 5 (2) 5 (3) 5	(4) 3	Shaft in cage be	_	
Remaining torque of stator bolts		Appearance	clean	
(1) 9 (2) 9 (3) 9	(4) 9	Wear	none	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/scored	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficustons	Unloaded	1.3755
(1) 15 (2) 15 (3) 12	(4) 16	Connecting rod		1.5755
Head gasket brittle?	no/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	medium	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2500
Cage bearing top appearance	clean	Dimensions	Unloaded	1.2500
Remaining torque of cage bearing bolts			Ombaucu	1.2300
(1) 5 (2) 5 (3) 5	(4) 5			
	(•)			

Unit Number

Contaminants: Trash in liquid screen (g) 0.075 **Control Unit?** No **Number of screens** Acid? Yes R-12? No Debris in compressor bottom (g) 0.313

Air? No R-22? No H₂O? R-502? No Yes

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish, slight Appearance **Dimensions** Loaded 0.5010 Suction surface appearance

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance clean polish, slight Wear **Dimensions** Loaded 0.4970 0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.15 Water (ppm) 262 Fluoride ion (ppm) 1.4 Chloride ion (ppm) 7.5 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 Silicon (ppm) 1 1 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

corrosion

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good clean **Appearance**

Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance clean **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat very slight hard gray **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin very slight brown hard Spring slight gray gummy **Spring Seat** slight black gummy Ball very slight black gummy Front Side very slight gray gummy

Photographic Documentation of R-507A Compressor with Contaminant Acid and R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

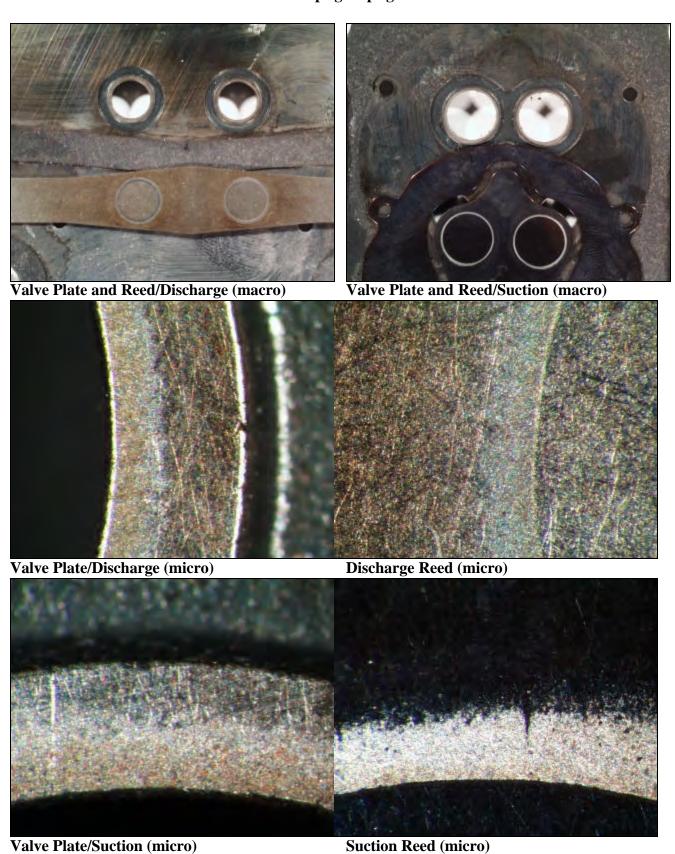


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid and R-502 185 psig/30 psig



Report for R-507A Compressor with Contaminant Acid, Air, and R-502

Unit Number 30			
Model # RS43C1E-CAV-250 Serial	# 96F16463	Crank journals	3
Run Time (hr.) 12060 Failed		Appearance	scored
Refrigerant R-507A		Wear	polish
Lubricant RL32S		Dimensions	Loaded 1.2470
Contaminants:		Difficusions	Unloaded 1.2470
Control Unit? No		I arrow anough h	
		Lower crank be	
		Appearance	clean
Air? Yes R-22? No		Wear	polish
H_2O ? No $R-502$? Yes		D'	I I. I
D. 1 D. (1)	105	Dimensions	Loaded 0.9995
Discharge Pressure (psig)	185	7 0.44	Unloaded 0.9990
Suction Pressure (psig)	30		washer (crank side)
Discharge Temp (°F)	180	Appearance	scored/Cu plating/corrosion
Return Gas Temp (°F)	54	Wear	medium
SumpTemp (°F)	140		
		Bottom washer	
Hi-Pot	pass	Appearance	clean/bronze plating
High-low leak	pass	Wear	polish
Top shell appearance	clean	Lower bronze	_
Suction exit trail appearance	gray	Appearance	scored
Cluster block condition	good	Wear	slight
Wire to cluster block appearance	gray	Dimensions	Loaded 1.0040
Suction ring top appearance	clean		Unloaded 1.0035
Remaining torque of discharge muffler			
(1) 2.5 (2) 2.5 (3) 2.5	(4) 2.5	Shaft in cage be	earing
Remaining torque of stator bolts		Appearance	corrosion
(1) 7.5 (2) 12.5 (3) 12.5	(4) 10	Wear	polish
Suction muffler appearance	clean	Piston top appe	earance clean
OEM flux?	Yes	Piston skirt	
Loose restrictor?	No	Appearance	low wear/bronze plating
		Appearance Dimensions	low wear/bronze plating Loaded 1.3740
Discharge plate appearance	No gray/Cu clean		
Discharge plate appearance Top stator windings appearance	gray/Cu clean	Dimensions	Loaded 1.3740
Discharge plate appearance Top stator windings appearance Rotor rub marks present?	gray/Cu	Dimensions Cylinder bore	Loaded 1.3740 Unloaded 1.3740
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	gray/Cu clean Yes No	Dimensions Cylinder bore Appearance	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	gray/Cu clean Yes No clean/corrosion	Dimensions Cylinder bore Appearance Varnish ring	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	gray/Cu clean Yes No clean/corrosion slight	Dimensions Cylinder bore Appearance	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	gray/Cu clean Yes No clean/corrosion slight removed	Dimensions Cylinder bore Appearance Varnish ring Dimensions	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760 Unloaded 1.3760
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 20 (2) 20 (3) 20	gray/Cu clean Yes No clean/corrosion slight removed (4) 20	Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760 Unloaded 1.3760 I (large end)
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 20 (2) 20 (3) 20 Head gasket brittle?	gray/Cu clean Yes No clean/corrosion slight removed (4) 20 yes/bonded	Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760 Unloaded 1.3760 I (large end) scored
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 20 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance	gray/Cu clean Yes No clean/corrosion slight removed (4) 20 yes/bonded clean	Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760 Unloaded 1.3760 I (large end) scored slight
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 20 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray/Cu clean Yes No clean/corrosion slight removed (4) 20 yes/bonded clean dirty	Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760 Unloaded 1.3760 I (large end) scored slight Loaded 1.2500
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 20 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	gray/Cu clean Yes No clean/corrosion slight removed (4) 20 yes/bonded clean dirty dirty	Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760 Unloaded 1.3760 I (large end) scored slight
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 20 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray/Cu clean Yes No clean/corrosion slight removed (4) 20 yes/bonded clean dirty dirty	Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded 1.3740 Unloaded 1.3740 low wear/Cu plating heavy Loaded 1.3760 Unloaded 1.3760 I (large end) scored slight Loaded 1.2500

Unit Number

Contaminants: Trash in liquid screen (g) 0.115 **Control Unit?** No **Number of screens** 2 Acid? Yes R-12? No Debris in compressor bottom (g) 1.302

R-22? Air? Yes No H₂O? R-502? No Yes

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear slight Appearance

Dimensions Loaded 0.5015 Suction surface appearance Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating Wear polish **Dimensions** Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.14 Water (ppm) 47 1.4 7.7 0 0 0

Fluoride ion (ppm) Chloride ion (ppm) Aluminum (ppm) Copper (ppm) Iron (ppm) Lead (ppm) 0 4 Silicon (ppm) 1 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good corrosion

corrosion/soot

Suction reed

Condition good corrosion **Appearance** Trepan slight Varnish ring none

Discharge side (reed backer)

Condition good blued **Appearance**

Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Residue Description Valve Part **Residue Accumulation Residue Color** Diaphragm Seat medium hard gray **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight black gummy Spring medium black gummy **Spring Seat** slight gray gummy Ball black slight gummy Front Side medium black hard

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

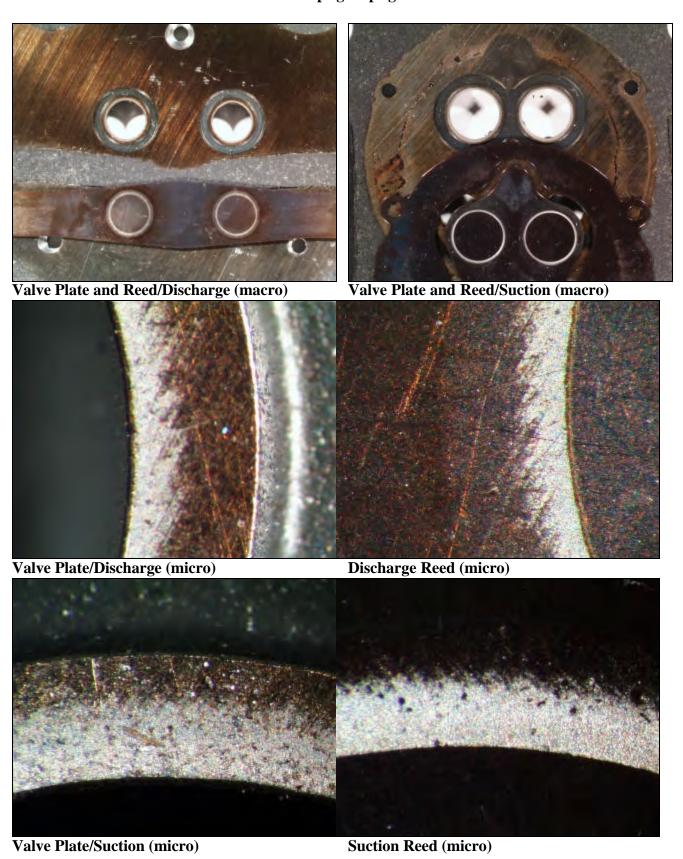


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and R-502 185 psig/30 psig



Report for R-507A Compressor with Contaminant Air and R-502

TEST HISTORY OF:				
Unit Number 31				
Model # RS43C1E-CAV-250 Serial	# 96F16490	Crank journals	2	
Run Time (hr.) 12011 Failed		Appearance	scored	
Refrigerant R-507A	ii No	Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:		Difficusions	Unloaded	1.2460
• • • • • • • • • • • • • • • • • •		T 1 1		1.2400
Control Unit? No		Lower crank b		
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? Yes		D'	T J . J	0.0000
D: 1 D (!)	105	Dimensions	Loaded	0.9990
Discharge Pressure (psig)	185	D . 44 4b	Unloaded	0.9985
Suction Pressure (psig)	30		washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/bronze plating	
Return Gas Temp (°F)	54	Wear	medium	
SumpTemp (°F)	140	70 · / ·	((()	
H. D.		Bottom washer		
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	scored/corrosion	
Cluster block condition	good	Wear	slight	4 0000
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 2.5 (2) 2.5 (3) 2.5	(4) 2.5	Shaft in cage b	_	
Remaining torque of stator bolts	(4) 40 -	Appearance	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Piston top appo	earance carbon	
OEM flux?	No	Piston skirt		
Loose restrictor?	No	Appearance	low wear/bronze plat	ing
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3735
Top stator windings appearance	clean/stator top Cu		Unloaded	1.3735
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/scored/Cu p	olating
Shell bottom appearance	clean	Varnish ring	medium	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 12.5 (3) 15	(4) 15	Connecting roo		
Head gasket brittle?	no/bonded	Appearance	scored/corrosion	
Head suction cavity appearance				

Dimensions

Loaded

Unloaded

dirty

(4) 5

clean/slightly discolored

Head discharge cavity appearance

Remaining torque of cage bearing bolts

(3) 5

Cage bearing top appearance

(2) 5

(1) 5

1.2505

1.2505

Unit Number

Contaminants: Trash in liquid screen (g) 0.146 **Control Unit?** No Number of screens Acid? No R-12? No Debris in compressor bottom (g) 1.314

R-22? Air? Yes No H₂O? R-502? No Yes

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear slight Appearance

Dimensions Loaded 0.5020 Suction surface appearance Unloaded 0.5010

0.07

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion medium Wear

Dimensions Loaded 0.4990 0.4990 Unloaded

Final Lubricant Values **Total Acid Number (TAN)**

Water (ppm) 54 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 11 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 5

Silicon (ppm) Tin (ppm) Zinc (ppm)

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat black, brown slight hard

1

0

Rear Pin none none none **Equalizer Hole** none none none Tip of Pin medium black, brown hard Spring medium hard black **Spring Seat** very slight gummy gray Ball very slight gray gummy Front Side slight black hard

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good corrosion

corrosion

Suction reed

Condition good corrosion **Appearance Trepan** slight Varnish ring very slight

Discharge side (reed backer)

Condition good blued **Appearance**

Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearance corrosion/blued very slight **Trepan** Varnish ring very slight

Photographic Documentation of R-507A Compressor with Contaminant Air and R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

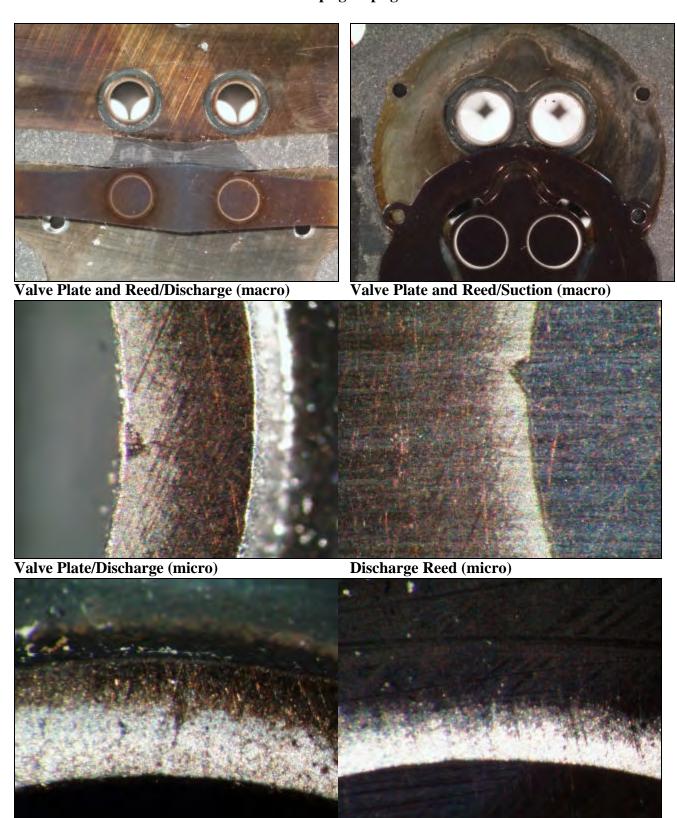


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air and R-502 185 psig/30 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant Acid and Air

TEST HISTORY OF.				
Unit Number 32				
Model # RS43C1E-CAV-250 Serial	# 96F16465	Crank journals	S	
Run Time (hr.) 12103 Failed	? No	Appearance	clean	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2475
Contaminants:		Dimensions	Unloaded	1.2475
Control Unit? No		Lower crank b		1.2473
Acid? Yes R-12? No			clean	
		Appearance		
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? No		Di	Tandad	1 0000
D. 1 D (1)	105	Dimensions	Loaded	1.0000
Discharge Pressure (psig)	185		Unloaded	1.0000
Suction Pressure (psig)	30		washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/corrosion	
Return Gas Temp (°F)	54	Wear	slight	
SumpTemp (°F)	140			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze	bearings	
Suction exit trail appearance	gray	Appearance	scored	
Cluster block condition	good	Wear	none	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	bright		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 3 (2) 3 (3) 3	(4) 4	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 9 (2) 10 (3) 9	(4) 9	Wear	polish	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray/soot	Dimensions	Loaded	1.3730
Top stator windings appearance	clean	Differential	Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore	Cindaded	1.5750
Was rotor loose?	No	Appearance	no wear/scored	
	clean			
Shell bottom appearance		Varnish ring Dimensions	heavy	1.3750
Quantity of bearing chips	trace	Difficusions	Loaded Unloaded	1.3750
Remaining torque of discharge muffler		G		1.5730
(1) 9 (2) 10 (3) 9	(4) 9	Connecting roo		
Head gasket brittle?	no/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	slight	1 2505
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2505
Cage bearing top appearance	clean		Unloaded	1.2505
Remaining torque of cage bearing bolts				
(1) 4 (2) 5 (3) 4	(4) 4			

Unit Number

Contaminants: Trash in liquid screen (g) 0.051 **Control Unit?** No **Number of screens** Acid? 1.357 Yes R-12? No Debris in compressor bottom (g) Air? Yes R-22? No H₂O? No R-502?

Connecting rod (small end)

Appearance correct washer (only 1)

Wear polish, slight

Dimensions Loaded 0.5000

> Unloaded 0.5000

No

Piston pin washers appearance

contact wear

Piston pin

Silicon (ppm)

Tin (ppm)

Zinc (ppm)

Appearance scored/corrosion

slight Wear

Dimensions Loaded 0.4980 0.4970 Unloaded

Final Lubricant Values	
Total Acid Number (TAN)	0.15
Water (ppm)	41
Fluoride ion (ppm)	1.3
Chloride ion (ppm)	8.0
Aluminum (ppm)	1
Copper (ppm)	1
Iron (ppm)	1
Lead (ppm)	2

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good

corrosion/soot **Appearance** Suction surface appearance

corrosion/soot

Suction reed

Condition good Appearance corrosion Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good

Appearance corrosion/blued Discharge surface appearance

corrosion/soot

Discharge reed

Condition good

Appearance corrosion/blued **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	black	gummy
Rear Pin	none	none	none
Equalizer Hole	slight	black	gummy
Tip of Pin	heavy	black, brown	gummy
Spring	medium	gray	gummy
Spring Seat	medium	gray	gummy
Ball	medium	gray	gummy
Front Side	medium	gray	gummy

5 2

3

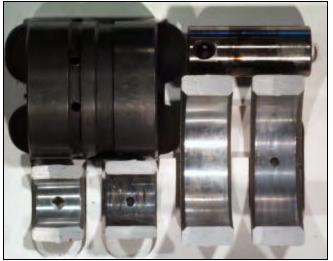
Photographic Documentation of R-507A Compressor with Contaminant Acid and Air 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

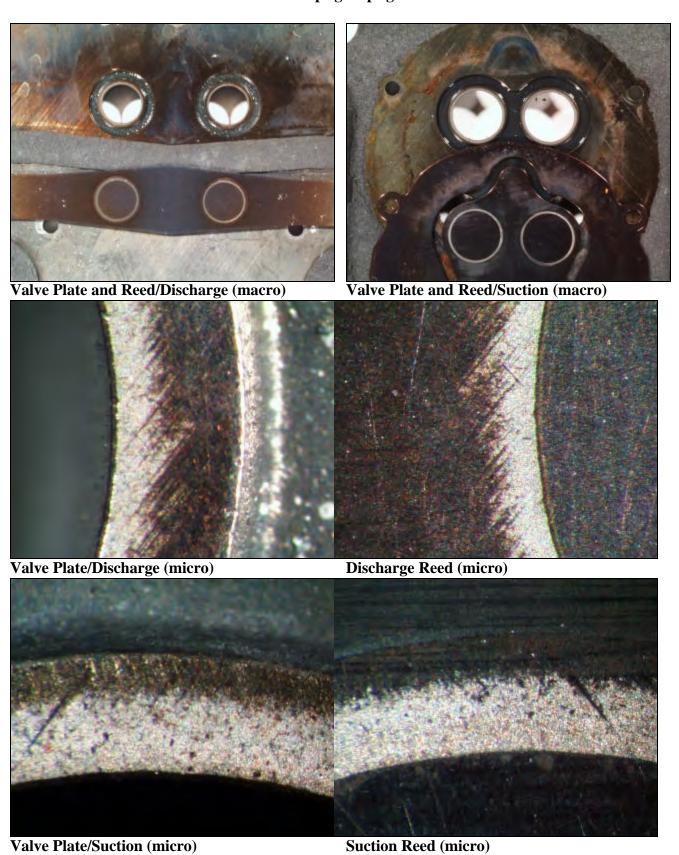


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid and Air 185 psig/30 psig



Report for R-507A Compressor with Contaminant Water and R-502

	oromi or	•					
Unit Num	iber 3	33					
Model #	RS43C1E-0	CAV-250	Serial 7	# 96F16468	Crank journals	;	
Run Time	e (hr.)	12002	Failed?	No	Appearance	scored	
Refrigera	nt	R-507A			Wear	slight	
Lubrican		RL32S			Dimensions	Loaded	1.2470
Contamir	nants:					Unloaded	1.2470
Control U					Lower crank be		
	No	R-12?	No		Appearance	scored	
	No	R-22?	No		Wear	slight	
	Yes	R-502?	Yes		,, 542	2	
					Dimensions	Loaded	0.9990
Discharge	e Pressure	(psig)		185		Unloaded	0.9990
	ressure (ps			30	Bottom thrust	washer (crank side)	0.,,,,
	Temp (°F)			180	Appearance	scored	
	as Temp (°			54	Wear	medium	
SumpTen		- /		140	,, 542		
Sumprem	-P (-)			110	Bottom washer	(casting side)	
Hi-Pot				pass	Appearance	clean	
High-low	leak			fail	Wear	slight	
U	appearanc	e		clean	Lower bronze	•	
	xit trail app			gray	Appearance	scored	
	lock condit			good	Wear	slight	
	luster block		nce	clean	Dimensions	Loaded	1.0030
	ing top app			bright	2	Unloaded	1.0030
	g torque of		e muffler	8			
(1) 2.5	(2) 2.5	_		(4) 3	Shaft in cage b	earing	
	g torque of	` '			Appearance	clean	
(1) 10	(2) 9			(4) 11	Wear	polish	
, ,	uffler app	` ′		clean	Piston top appe	-	
OEM flux				Yes	Piston skirt		
Loose res				No	Appearance	no wear	
	e plate appo	earance		clean	Dimensions	Loaded	1.3660
	r windings		ice	clean	2 mensions	Unloaded	1.3660
	o marks pro			No	Cylinder bore	Cindudea	1.5000
Was rotor		csciit.		No	Appearance	no wear	
	om appear	onoo		clean	Varnish ring		
	tity of beari			trace	Dimensions	slight Loaded	1.3730
	ig torque of		a mufflar		Difficusions	Unloaded	1.3730
(1) 15	(2) 15	_		(4) 14	Connecting roo		1.5750
` '	(2) 13 ket brittle?			yes/bonded	Appearance	scored	
	tion cavity			clean	Wear	slight	
	charge cavity			clean	Dimensions	Loaded	1.2500
	ring top ap			clean	Dillicusions	Unloaded	1.2500
	ring top ap ig torque of			cican		Ombaucu	1.2300
(1) 4	(2) 5	(3)	0	(4) 7			
(-) '	(=)	(3)	-	(-)			

Unit Number

Contaminants: Trash in liquid screen (g) 0.259 **Control Unit?** No **Number of screens** 2 Acid? No R-12? No Debris in compressor bottom (g) 1.507 Air? No R-22? No

H₂O? R-502? **Valve Plate Assembly Inspection** Yes Yes

0.07

65

Connecting rod (small end)

Appearance correct washer Condition Wear polish, slight **Appearance Dimensions** Loaded 0.5000 Unloaded 0.4990

Piston pin washers appearance

contact wear

Piston pin

Appearance scored Wear polish, slight **Dimensions** Loaded

0.4980 Unloaded 0.4970

Final Lubricant Values	
Total Acid Number (TAN)	
Water (ppm)	
Fluoride ion (nnm)	

1.4 Fluoride ion (ppm) Chloride ion (ppm) 8.9 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 Silicon (ppm) 4 Tin (ppm) 1 Zinc (ppm) 0 **Suction side (reed backer)** good

corrosion Suction surface appearance

corrosion

Suction reed

Condition good Appearance corrosion Trepan medium Varnish ring none

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	black	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	brown	hard
Spring	slight	gray	gummy
Spring Seat	very slight	gray	hard
Ball	very slight	gray	gummy
Front Side	slight	gray	hard

Photographic Documentation of R-507A Compressor with Contaminant Water and R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

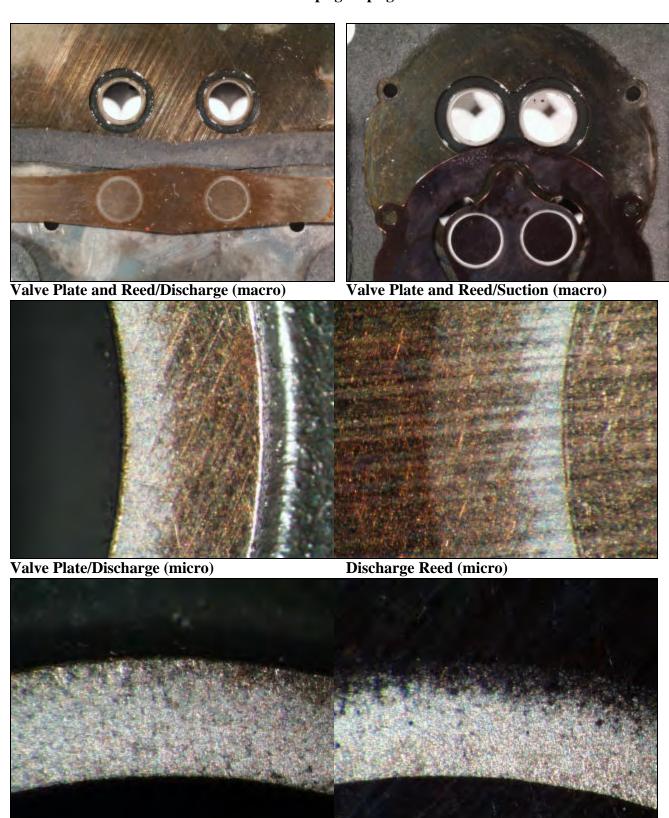


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Water and R-502 185 psig/30 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-507A Compressor with Contaminant Acid and Water

Unit Number 34				
Model # RS43C1E-CAV-250 Seria	l# 96F16471	Cuantz iaumala		
		Crank journals		
Run Time (hr.) 12002 Failed	l? No	Appearance	clean	
Refrigerant R-507A		Wear	polish	1 0 470
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? Yes R-502 ? No				
		Dimensions	Loaded	0.9940
Discharge Pressure (psig)	185		Unloaded	0.9940
Suction Pressure (psig)	30		washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored	
Return Gas Temp (°F)	54	Wear	slight	
SumpTemp (°F)	140			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	none	
Top shell appearance	clean	Lower bronze l	bearings	
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	none	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	bright		Unloaded	1.0030
Suction ring top appearance			Unloaded	1.0030
		Shaft in cage be		1.0030
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 3	•	Shaft in cage be		1.0030
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts	•	_	e aring clean	1.0030
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts	(4) 4	Appearance	earing clean polish, very slight	1.0030
Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10	(4) 4 (4) 11	Appearance Wear	earing clean polish, very slight	1.0030
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux?	(4) 4 (4) 11 clean Yes	Appearance Wear Piston top appe Piston skirt	earing clean polish, very slight	1.0030
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 4 (4) 11 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, very slight earance clean low wear	1.0030
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 4 (4) 11 clean Yes No gray/Cu	Appearance Wear Piston top appe Piston skirt	earing clean polish, very slight earance clean low wear Loaded	1.3670
Suction ring top appearance Remaining torque of discharge mufflet (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 4 (4) 11 clean Yes No gray/Cu clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, very slight earance clean low wear	
Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean polish, very slight earance clean low wear Loaded Unloaded	1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear	1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight	1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight Loaded	1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight r removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish, very slight arance clean low wear Loaded Unloaded no wear slight Loaded Unloaded	1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 14	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight r removed (4) 14	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight Loaded Unloaded (large end)	1.3670 1.3670
Suction ring top appearance Remaining torque of discharge muffler (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 14 Head gasket brittle?	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight r removed (4) 14 yes	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight Loaded Unloaded Unloaded Unloaded (large end) scored	1.3670 1.3670
Suction ring top appearance Remaining torque of discharge mufflet (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight r removed (4) 14 yes clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored slight	1.3670 1.3670 1.3720 1.3720
Suction ring top appearance Remaining torque of discharge mufflet (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight r removed (4) 14 yes clean clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored slight Loaded	1.3670 1.3670 1.3720 1.3720
Suction ring top appearance Remaining torque of discharge mufflet (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight r removed (4) 14 yes clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored slight	1.3670 1.3670 1.3720 1.3720
Suction ring top appearance Remaining torque of discharge mufflet (1) 3 (2) 4 (3) 3 Remaining torque of stator bolts (1) 11 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4 (4) 11 clean Yes No gray/Cu clean Yes No clean slight r removed (4) 14 yes clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, very slight earance clean low wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored slight Loaded	1.3670 1.3670 1.3720 1.3720

Unit Number 34

Contaminants: Trash in liquid screen (g) 0.126 **Control Unit?** No **Number of screens** 2 Acid? Yes R-12? No Debris in compressor bottom (g) 0.649 Air? No R-22? No

 H_2O ? Yes R-502? No

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.4990Unloaded0.4990

Piston pin washers appearance

contact wear

Piston pin

Appearance scored Wear slight Dimensions Loaded

Dimensions Loaded 0.4940 **Unloaded** 0.4940

Final Lubricant Values **Total Acid Number (TAN)** 0.14 Water (ppm) 125 Fluoride ion (ppm) 2.4 Chloride ion (ppm) 9.6 Aluminum (ppm) 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 0 6 Silicon (ppm) 1 Tin (ppm) 2 Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** clean

Discharge surface appearance

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringmedium

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin very slight hard brown Spring slight gray gummy **Spring Seat** none none none Ball very slight black gummy Front Side very slight black gummy

Photographic Documentation of R-507A Compressor with Contaminant Acid and Water 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

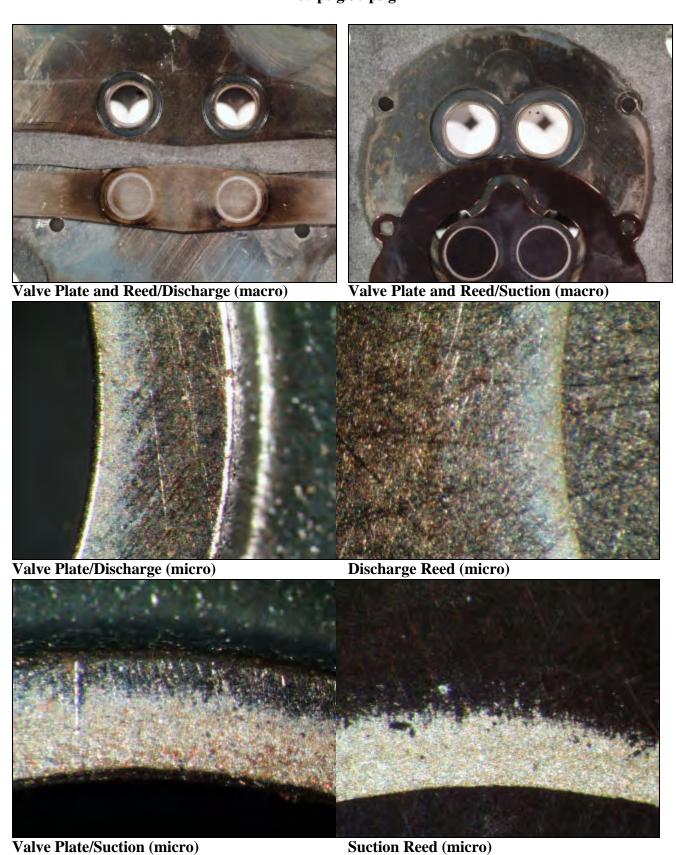


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid and Water 185 psig/30 psig



Suction Reed (micro)

Report for R-507A Compressor with Contaminant Air and Water

ILSI IIISIORI OI:				
Unit Number 35				
Model # RS43C1E-CAV-250 Serial	# 96F16513	Crank journals		
Run Time (hr.) 3555 Failed		Appearance	clean	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Difficusions	Unloaded	1.2470
Control Unit? No		I organ anough b		1.2470
		Lower crank be		
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish	
H_2O ? Yes $R-502$? No		.		0.0000
		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	185		Unloaded	0.9990
Suction Pressure (psig)	30		washer (crank side)	
Discharge Temp (°F)	180	Appearance	clean	
Return Gas Temp (°F)	54	Wear	polish	
SumpTemp (°F)	140			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/scored	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	gray	Difficusions	Unloaded	1.0030
Remaining torque of discharge muffler			Cinouucu	1.0050
(1) ND (2) ND (3) ND	(4) ND	Shaft in cage be	arina	
Remaining torque of stator bolts	(4) ND	Appearance	clean	
	(4) ND	Wear		
(1) ND (2) ND (3) ND	(4) ND		polish	
Suction muffler appearance	clean	Piston top appe	earance damaged	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	wear/scored	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?				
	No	Annearance	low wear/scored	
Chall bottom annogrange	No blook	Appearance	low wear/scored	
Shell bottom appearance	black	Varnish ring	medium	1 2760
Quantity of bearing chips	black slight		medium Loaded	1.3760
Quantity of bearing chips Remaining torque of discharge muffler	black slight removed	Varnish ring Dimensions	medium Loaded Unloaded	1.3760 1.3760
Quantity of bearing chips Remaining torque of discharge muffler (1) ND (2) ND (3) ND	black slight removed (4) ND	Varnish ring Dimensions Connecting rod	medium Loaded Unloaded (large end)	
Quantity of bearing chips Remaining torque of discharge muffler (1) ND (2) ND (3) ND Head gasket brittle?	black slight removed (4) ND yes/bonded	Varnish ring Dimensions Connecting rod Appearance	medium Loaded Unloaded (large end) none	
Quantity of bearing chips Remaining torque of discharge muffler (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance	black slight removed (4) ND yes/bonded clean	Varnish ring Dimensions Connecting rod Appearance Wear	medium Loaded Unloaded (large end) none slight	1.3760
Quantity of bearing chips Remaining torque of discharge muffler (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	black slight removed (4) ND yes/bonded clean clean	Varnish ring Dimensions Connecting rod Appearance	medium Loaded Unloaded (large end) none slight Loaded	1.3760 1.2515
Quantity of bearing chips Remaining torque of discharge muffler (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	black slight removed (4) ND yes/bonded clean clean clean	Varnish ring Dimensions Connecting rod Appearance Wear	medium Loaded Unloaded (large end) none slight	1.3760
Quantity of bearing chips Remaining torque of discharge muffler (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolts	black slight removed (4) ND yes/bonded clean clean clean	Varnish ring Dimensions Connecting rod Appearance Wear	medium Loaded Unloaded (large end) none slight Loaded	1.3760 1.2515
Quantity of bearing chips Remaining torque of discharge muffler (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	black slight removed (4) ND yes/bonded clean clean clean	Varnish ring Dimensions Connecting rod Appearance Wear	medium Loaded Unloaded (large end) none slight Loaded	1.3760 1.2515

Unit Number 35

Contaminants: Trash in liquid screen (g) 0.064 **Control Unit?** No **Number of screens** Acid? 0.946 No R-12? No Debris in compressor bottom (g) Air? R-22? Yes No H₂O? R-502? **Valve Plate Assembly Inspection** Yes No

Connecting rod (small end)

Appearancecontact wear/correct washerConditionbrokenWearpolishAppearancecorrosionDimensionsLoaded0.5025Suction surface appearanceUnloaded0.5010damaged

Piston pin washers appearance

contact wear

Piston pin

Silicon (ppm)

Tin (ppm)

Zinc (ppm)

Appearance
Wearclean
noneDimensionsLoaded
Unloaded0.4985
0.4985

Final Lubricant Values Total Acid Number (TAN) 0.20 Water (ppm) 100 Fluoride ion (ppm) 2.0 Chloride ion (ppm) 10 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0

Suction reed
Condition broken
Appearance corrosion

Suction side (reed backer)

Appearance corrosion
Trepan very slight
Varnish ring none

Discharge side (reed backer)

Condition good **Annearance** corrosio

Appearance corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	brown	gummy
Spring	medium	gray	hard
Spring Seat	medium	black	hard
Ball	very slight	gray	hard
Front Side	none	none	none

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Photographic Documentation of R-507A Compressor with Contaminant Air and Water 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

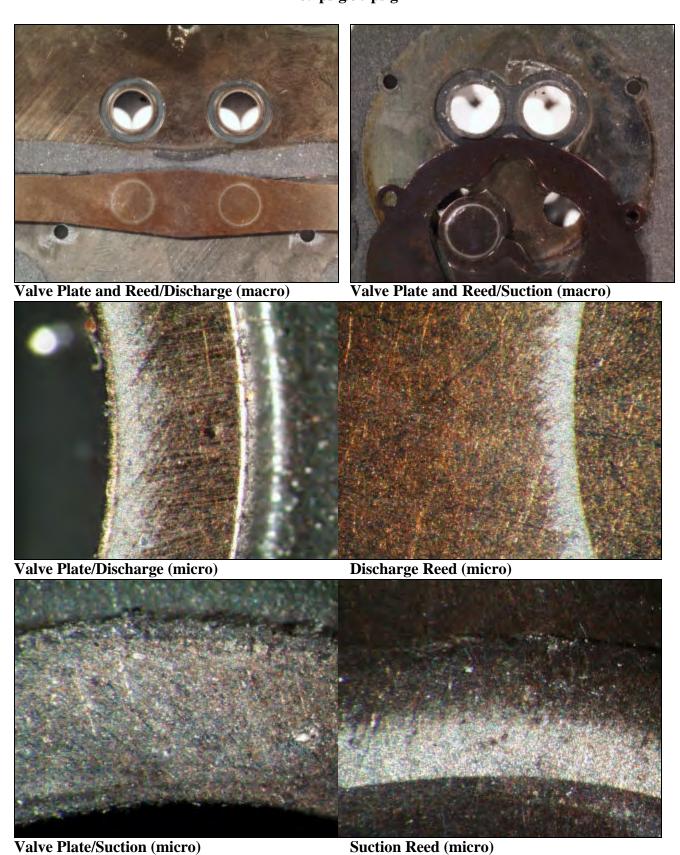


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air and Water 185 psig/30 psig



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Report for R-507A Compressor with Contaminant Water

TT . *4 NT .	.1	26					
Unit Nun		36	~	0.474.440	~		
	RS43C1E-0		Serial #	96F16497	Crank journals		
Run Tim	e (hr.)	12018	Failed?	No	Appearance	clean	
Refrigera	ant	R-507A	•		Wear	polish, slight	
Lubrican	nt	RL32S			Dimensions	Loaded	1.2460
Contami	nants:					Unloaded	1.2460
Control U	Unit? No				Lower crank b	earing iournal	
Acid?	No	R-12?	No		Appearance	clean	
Air?	No	R-22?	No		Wear	polish, slight	
H_2O ?	Yes	R-502?	No		vv cui	ponsii, siigit	
1120.	103	IX-302.	110		Dimensions	Loaded	0.9980
Dicohora	ge Pressure	(ncia)	1	185	Difficusions	Unloaded	0.9980
				30	Dattam thurst	washer (crank side)	0.9960
	Pressure (ps					, , ,	
_	e Temp (°F)			180	Appearance	scored/corrosion	
	Gas Temp (°	(F)		54	Wear	slight	
SumpTer	mp (°F)]	140			
					Bottom washer	_	
Hi-Pot			I	oass	Appearance	clean	
High-low	leak		1	bass	Wear	none	
Top shell	l appearanc	e	(elean	Lower bronze	bearings	
Suction e	exit trail app	pearance	٤	gray	Appearance	scored	
Cluster b	olock condit	ion	ş	good	Wear	none	
Wire to c	cluster block	k appeara	nce c	elean	Dimensions	Loaded	1.0030
	ing top app			oright		Unloaded	1.0030
	ng torque of			C			
(1) 4	(2) 5	(3)		4) 4	Shaft in cage b	earing	
	ng torque of			-, .	Appearance	clean	
(1) 10	(2) 11			4) 10	Wear	none	
	` '	` /	`				
	nuffler app	earance	C	elean	Piston top appe	earance clean	
OEM flux	x?			Yes	Piston skirt		
Loose res	strictor?		1	No	Appearance	no wear	
Discharg	e plate appo	earance	ş	gray	Dimensions	Loaded	1.3670
	or windings		-	elean		Unloaded	1.3670
	b marks pro			No	Cylinder bore		
Was roto	_			No	Appearance	no wear	
		0700		elean	Varnish ring		
	tom appear				Dimensions	slight Loaded	1.3720
	tity of beari			race	Difficusions		
		_	ge muffler re		a	Unloaded	1.3720
(1) 14	(2) 15		,	1) 15	Connecting roo		
	sket brittle?			es/bonded	Appearance	none	
TT 1	4 .		ce c.	lean	Wear	polish	
	ction cavity						
Head dis	charge cavi	ty appear	ance c	lean	Dimensions	Loaded	1.2490
Head dise Cage bea	charge cavi	ty appear pearance	ance c	lean lean	Dimensions	Loaded Unloaded	1.2490
Head dise Cage bea Remainin	charge cavi ring top ap ng torque of	ty appear pearance f cage bea	ance contraction c	lean	Dimensions		
Head dise Cage bea	charge cavi	ty appear pearance	ance contraction c		Dimensions		

Unit Number

Contaminants: Trash in liquid screen (g) 0.069 **Control Unit?** No **Number of screens** Acid? 0.944 No R-12? No Debris in compressor bottom (g) Air? No R-22? No H₂O? R-502? **Valve Plate Assembly Inspection** Yes No

Connecting rod (small end)

Appearance contact wear/correct washer Condition Wear slight Appearance Dimensions Loaded 0.4990

Unloaded 0.4990 corrosion/soot

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear polish **Dimensions** Loaded 0.4970 0.4970 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.11 Water (ppm) 59 Fluoride ion (ppm) 1.4 Chloride ion (ppm) 8.7 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 Silicon (ppm) 1 Tin (ppm) 1 Zinc (ppm) 0

Suction side (reed backer)

good corrosion/soot Suction surface appearance

Suction reed

Condition good Appearance corrosion/soot Trepan slight Varnish ring very slight

Discharge side (reed backer)

Condition good

corrosion/blued/soot **Appearance**

Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion/soot **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	very slight	gray	gummy
Spring	medium	gray	gummy
Spring Seat	none	none	none
Ball	very slight	gray	gummy
Front Side	very slight	gray	gummy

Photographic Documentation of R-507A Compressor with Contaminant Water 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

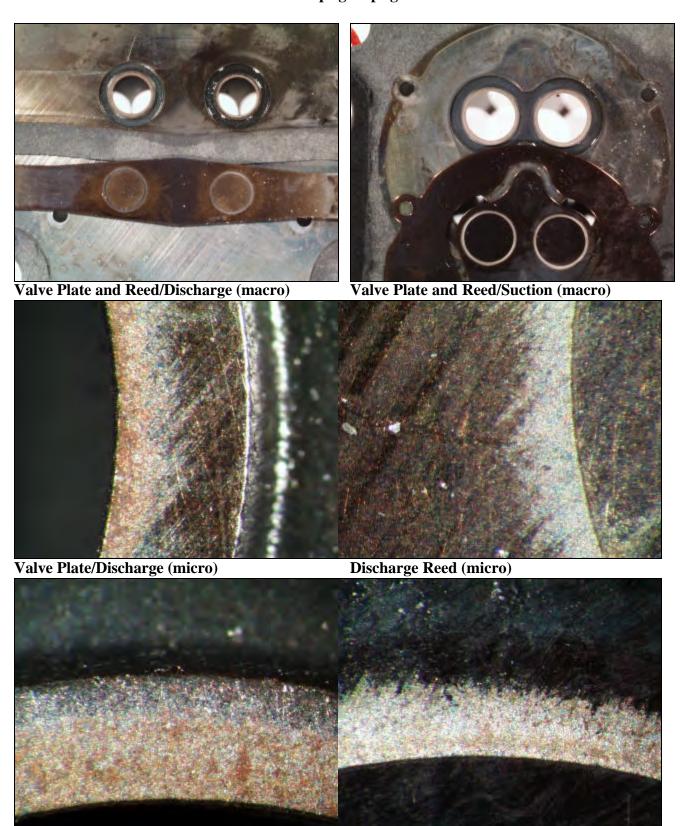


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Water 185 psig/30 psig



Valve Plate/Suction (micro) Suction Reed (micro)

Report for R-507A Compressor with Contaminant Acid, Water, and R-502

TEST HISTORY OF.				
Unit Number 37				
Model # RS43C1E-CAV-250 Serial	# 96F16508	Crank journals		
Run Time (hr.) 12007 Failed	? No	Appearance	clean	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Difficusions	Unloaded	1.2470
Control Unit? No		I arron anoult he		1.2470
		Lower crank be		
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? Yes R-502 ? Yes		.		0.0000
		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	185		Unloaded	0.9990
Suction Pressure (psig)	30		washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/corrosion	
Return Gas Temp (°F)	54	Wear	medium	
SumpTemp (°F)	140			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze l	_	
Suction exit trail appearance	gray/Cu	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	2 1111011510115	Unloaded	1.0030
Remaining torque of discharge muffler				1.0000
(1) 5 (2) 2.5 (3) 2.5	(4) 2.5	Shaft in cage be	ogring .	
Remaining torque of stator bolts	(4) 2.3	Appearance	clean	
(1) 7.5 (2) 15 (3) 15	(4) 10	Wear	polish	
			•	
Suction muffler appearance	clean	Piston top appe	arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/bronze plati	ng
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top Cu		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	wear/Cu plating	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3755
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3765
(1) 20 (2) 17.5 (3) 15	(4) 17.5	Connecting rod		1.5705
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear Wear	medium	
Head discharge cavity appearance		Dimensions	Loaded	1 2510
Cage bearing top appearance	clean	Dimensions	Unloaded	1.2510
	clean		Omoaded	1.2515
Remaining torque of cage bearing bolts				
(1) 2.5 (2) 5 (3) 5	(4) 5			

Unit Number 37

 Contaminants:

 Control Unit?
 No

 Acid?
 Yes
 R-12?
 No

 Air?
 No
 R-22?
 No

 H2O?
 Yes
 R-502?
 Yes

Trash in liquid screen (g)0.024Number of screens1Debris in compressor bottom (g)1.318

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5020Unloaded0.5015

Unloaded 0.5015

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance clean
Wear slight
Dimensions Loaded

Loaded 0.4980 **Unloaded** 0.4980

Final Lubricant Values	
Total Acid Number (TAN)	0.29
Water (ppm)	139
Fluoride ion (ppm)	2.2
Chloride ion (ppm)	9.0
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	1
Silicon (ppm)	4
Tin (ppm)	1

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	purple, brown	gummy
Spring	medium	black	gummy
Spring Seat	very slight	tarnished	hard
Ball	slight	black	hard
Front Side	very slight	tarnished	hard

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Photographic Documentation of R-507A Compressor with Contaminant Acid, Water, and R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

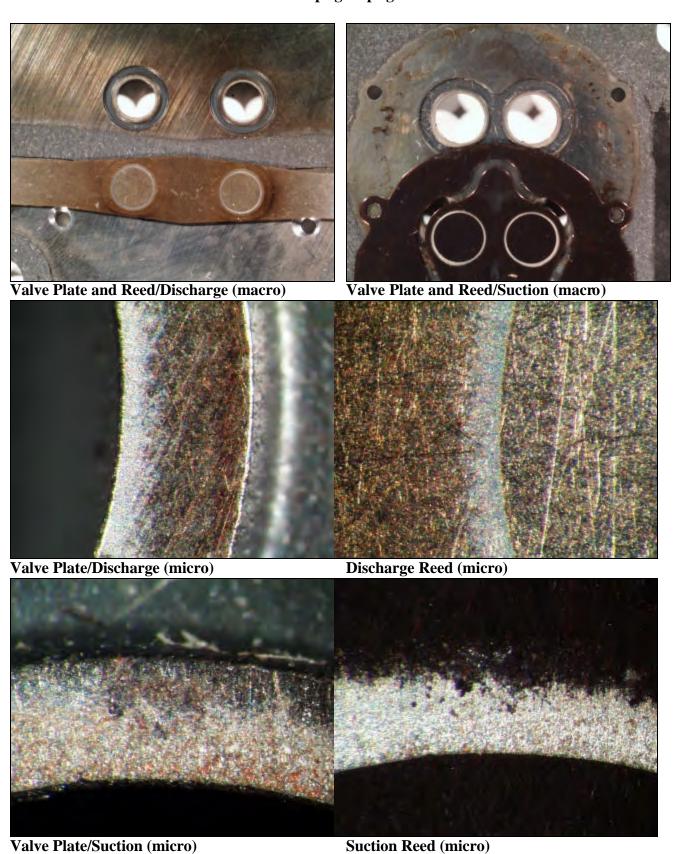


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid, Water, and R-502 185 psig/30 psig



Report for R-507A Compressor with Contaminant Acid, Air, Water, and R-502

ILSI IIISIORI OI:				
Unit Number 38				
Model # RS43C1E-CAV-250 Serial	# 96F16527	Crank journals	}	
Run Time (hr.) 12016 Failed		Appearance	clean	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2465
Contaminants:		Difficusions	Unloaded	1.2465
		T		1.2403
Control Unit? No		Lower crank b		
Acid? Yes R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes $R-502$? Yes				
		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	185		Unloaded	0.9985
Suction Pressure (psig)	30	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/corrosion	
Return Gas Temp (°F)	54	Wear	slight	
SumpTemp (°F)	140			
• • •		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/scored	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean/scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	bright	Differences	Unloaded	1.0030
Remaining torque of discharge muffler			Omoaucu	1.0030
(1) 3 (2) 4 (3) 3	(4) 3	Shaft in cage be	ooning.	
. ,	(4) 3	_	clean	
Remaining torque of stator bolts	(4) 0	Appearance		
(1) 11 (2) 10 (3) 9	(4) 9	Wear	polish, very slight	
Suction muffler appearance	clean	Piston top appo	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3730
Top stator windings appearance	clean		Unloaded	1.3730
Rofor rub marks present?	No	Cylinder bore		
Rotor rub marks present? Was rotor loose?	No No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Was rotor loose? Shell bottom appearance	No clean	Appearance Varnish ring	no wear medium	1 2755
Was rotor loose? Shell bottom appearance Quantity of bearing chips	No clean slight	Appearance	no wear medium Loaded	1.3755
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	No clean slight removed	Appearance Varnish ring Dimensions	no wear medium Loaded Unloaded	1.3755 1.3755
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 14	No clean slight removed (4) 15	Appearance Varnish ring Dimensions Connecting roo	no wear medium Loaded Unloaded I (large end)	
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 14 Head gasket brittle?	No clean slight removed (4) 15 no/bonded	Appearance Varnish ring Dimensions Connecting roc Appearance	no wear medium Loaded Unloaded I (large end) scored	
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance	No clean slight removed (4) 15 no/bonded clean	Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear medium Loaded Unloaded I (large end) scored slight	1.3755
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	No clean slight removed (4) 15 no/bonded clean clean	Appearance Varnish ring Dimensions Connecting roc Appearance	no wear medium Loaded Unloaded I (large end) scored slight Loaded	1.3755 1.2505
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	No clean slight removed (4) 15 no/bonded clean clean clean	Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear medium Loaded Unloaded I (large end) scored slight	1.3755
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolts	No clean slight removed (4) 15 no/bonded clean clean clean	Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear medium Loaded Unloaded I (large end) scored slight Loaded	1.3755 1.2505
Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	No clean slight removed (4) 15 no/bonded clean clean clean	Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear medium Loaded Unloaded I (large end) scored slight Loaded	1.3755 1.2505

Unit	Number	38
Unit	Number	38

0.039 **Contaminants:** Trash in liquid screen (g) **Number of screens Control Unit?** No Acid? Debris in compressor bottom (g) 1.038 Yes R-12? No Air? Yes R-22? No

H₂O? Yes R-502? **Valve Plate Assembly Inspection** Yes

Connecting rod (small end)

Appearance correct washer Condition good Wear polish, slight **Appearance** corrosion **Dimensions** Loaded 0.5015 Suction surface appearance Unloaded 0.5015

Piston pin washers appearance

contact wear

Piston pin

Appearance scored Wear polish, slight **Dimensions** Loaded

0.4990 Unloaded 0.4990

Final Lubricant Values	
Total Acid Number (TAN)	0.23
Water (ppm)	58
Fluoride ion (ppm)	1.7
	_

.7 Chloride ion (ppm) 8.6 Aluminum (ppm) Copper (ppm) Iron (ppm) Lead (ppm) Silicon (ppm) Tin (ppm) Zinc (ppm) 20 **Suction side (reed backer)**

corrosion

Suction reed

Condition good Appearance corrosion Trepan slight Varnish ring very slight

Discharge side (reed backer)

Condition good Appearance corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	medium	black	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	very slight	gray	hard
Spring	very slight	gray	gummy
Spring Seat	very slight	gray	hard
Ball	very slight	gray	gummy
Front Side	very slight	gray	gummy

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Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, Water, and R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

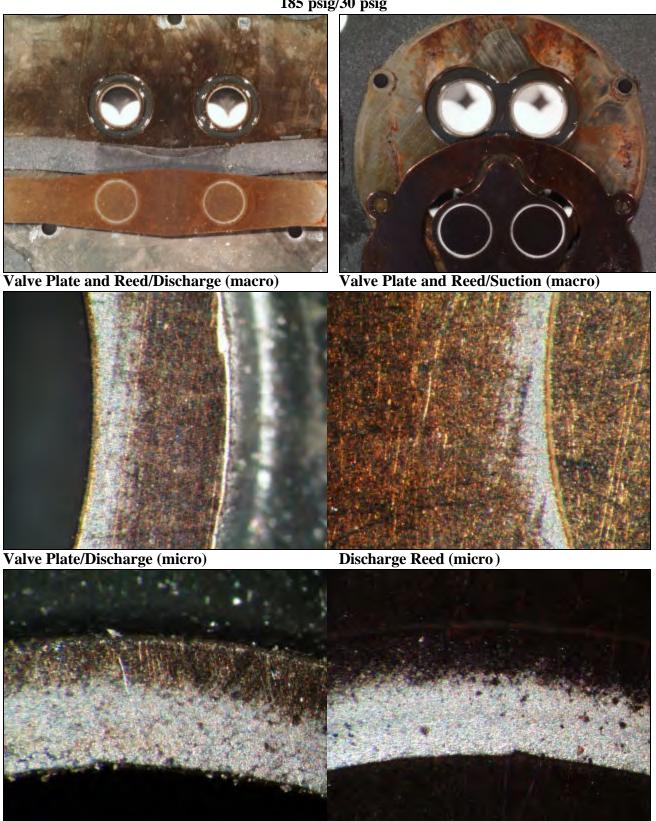


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, Water, and R-502 185 psig/30 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

Report for R-507A Compressor with Contaminant Air, Water, and R-502

Unit Number 39				
Model # RS43C1E-CAV-250 Serial	l # 96F16496	Crank journals		
Run Time (hr.) 12029 Failed	1? No	Appearance	clean	
Refrigerant R-507A		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Dimensions	Unloaded	1.2470
Control Unit? No		Lower crank be		1.2470
Acid? No R-12? No			clean	
		Appearance		
Air? Yes R-22? No		Wear	polish	
H_2O ? Yes R-502 ? Yes		ъ	T 1 1	0.0000
	10-	Dimensions	Loaded	0.9990
Discharge Pressure (psig)	185		Unloaded	0.9990
Suction Pressure (psig)	30		washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored	
Return Gas Temp (°F)	54	Wear	slight	
SumpTemp (°F)	140			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	none	
Top shell appearance	clean	Lower bronze b	earings	
Suction exit trail appearance	gray	Appearance	clean/scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
g 1 11			Unloaded	1.0030
Remaining torque of discharge muffler	r	Shaft in cage be		1.0030
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5		Shaft in cage be	earing	1.0030
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts	r (4) 4	Appearance	earing clean	1.0030
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9	r (4) 4 (4) 9	Appearance Wear	earing clean polish, very slight	1.0030
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance	(4) 4 (4) 9 clean	Appearance Wear Piston top appe	earing clean polish, very slight	1.0030
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux?	(4) 4 (4) 9 clean Yes	Appearance Wear Piston top appe Piston skirt	earing clean polish, very slight arance clean	1.0030
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor?	(4) 4 (4) 9 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	clean polish, very slight arance clean no wear	
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 4 (4) 9 clean Yes No gray	Appearance Wear Piston top appe Piston skirt	earing clean polish, very slight arance clean no wear Loaded	1.3720
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 4 (4) 9 clean Yes No gray clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	clean polish, very slight arance clean no wear	
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 4 (4) 9 clean Yes No gray clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean polish, very slight arance clean no wear Loaded	1.3720
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 4 (4) 9 clean Yes No gray clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, very slight arance clean no wear Loaded	1.3720
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 4 (4) 9 clean Yes No gray clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	caring clean polish, very slight arance clean no wear Loaded Unloaded	1.3720
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 4 (4) 9 clean Yes No gray clean Yes No clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish, very slight arance clean no wear Loaded Unloaded	1.3720
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium	1.3720 1.3720
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded	1.3720 1.3720 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight r removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded	1.3720 1.3720 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 16 (3) 15	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight r removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end)	1.3720 1.3720 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight r removed (4) 15 yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored	1.3720 1.3720 1.3760 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight r removed (4) 15 yes clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored slight	1.3720 1.3720 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight r removed (4) 15 yes clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored slight Loaded	1.3720 1.3720 1.3760 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4 (4) 9 clean Yes No gray clean Yes No clean slight r removed (4) 15 yes clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, very slight arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored slight Loaded	1.3720 1.3720 1.3760 1.3760

Unit Number 39

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 Yes
 R-22?
 No

 H₂O?
 Yes
 R-502?
 Yes

Trash in liquid screen (g)0.108Number of screens2Debris in compressor bottom (g)0.644

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

AppearancescoredWearpolishDimensionsLoaded

Unloaded 0.4980

0.4980

Final Lubricant Values Total Acid Number (TAN) 0.08 Water (ppm) 97 Fluoride ion (ppm) 1.4 Chloride ion (ppm) 8.3 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 Silicon (ppm) 4 Tin (ppm) 0 Zinc (ppm) 0 Suction side (reed backer)

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringnone

Discharge side (reed backer)

Condition good

Appearance corrosion/blued Discharge surface appearance

corrosion

Discharge reed

ConditiongoodAppearancebluedTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	none	none	none
Spring	slight	gray	hard
Spring Seat	very slight	gray	hard
Ball	none	none	none
Front Side	very slight	gray	hard

Photographic Documentation of R-507A Compressor with Contaminant Air, Water, and R-502 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

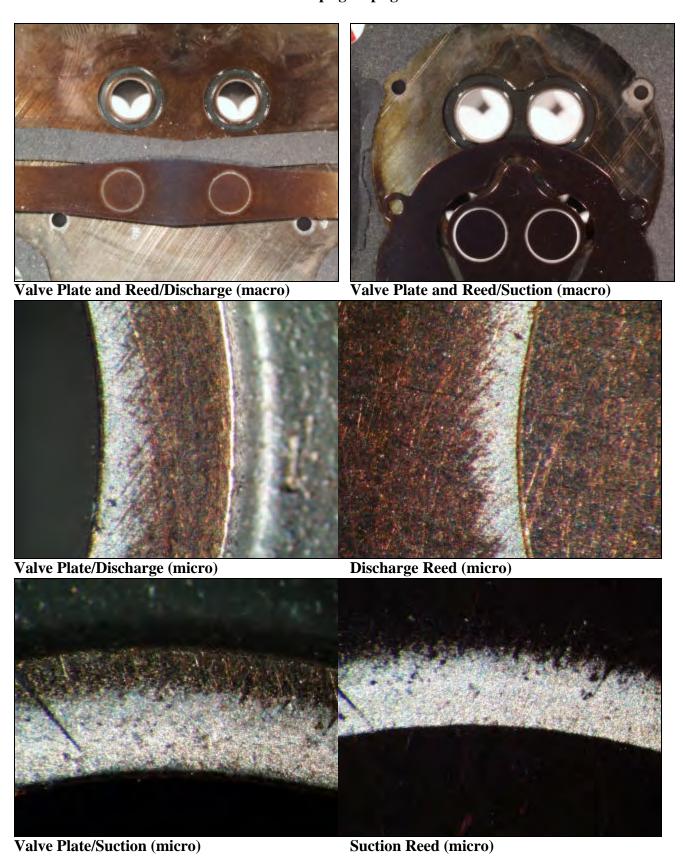


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Air, Water, and R-502 185 psig/30 psig



Report for R-507A Compressor with Contaminant Acid, Air, and Water

Unit Number 40				
Model # RS43C1E-CAV-250 Serial	l# 96F16499	Crank journals		
Run Time (hr.) 12037 Failed		Appearance	scored	
Refrigerant R-507A		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2480
Contaminants:		Dimensions	Unloaded	1.2480
Control Unit? No		Lower crank be		1.2400
Acid? Yes R-12? No		Appearance	scored	
Air? Yes R-22? No		Wear		
		wear	slight	
H_2O ? Yes $R-502$? No		Dimonsions	Loaded	1.0025
D'arlana Danas (arla)	105	Dimensions	Loaded	1.0025
Discharge Pressure (psig)	185	D 44 41 4	Unloaded	1.0025
Suction Pressure (psig)	30		washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored	
Return Gas Temp (°F)	54	Wear	slight	
SumpTemp (°F)	140			
		Bottom washer	_	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze l	0	
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2	Shaft in cage be	_	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts		Shaft in cage be Appearance	e aring Cu plating	
(1) 4.2 (2) 4.2 (3) 4.2		_	_	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts	(4) 4.2	Appearance	Cu plating slight	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4	(4) 4.2(4) 10.4	Appearance Wear	Cu plating slight	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance	(4) 4.2(4) 10.4gray	Appearance Wear Piston top appe	Cu plating slight	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor?	(4) 4.2 (4) 10.4 gray Yes	Appearance Wear Piston top appe Piston skirt	Cu plating slight arance clean	1.3725
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 4.2 (4) 10.4 gray Yes No	Appearance Wear Piston top appe Piston skirt Appearance	Cu plating slight arance clean no wear	1.3725 1.3725
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	Cu plating slight arance clean no wear Loaded	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	Cu plating slight arance clean no wear Loaded Unloaded	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating	
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium	1.3725
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded	1.3725 1.3710
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace r removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded Unloaded Unloaded	1.3725
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace r removed (4) 14.6	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded Unloaded (large end)	1.3725 1.3710
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle?	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace r removed (4) 14.6 yes/bonded	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded Unloaded (large end) scored	1.3725 1.3710
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace r removed (4) 14.6 yes/bonded clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded Unloaded (large end) scored slight	1.3725 1.3710 1.3710
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace r removed (4) 14.6 yes/bonded clean Cu plate	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded Unloaded (large end) scored slight Loaded	1.3725 1.3710 1.3710 1.2485
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace r removed (4) 14.6 yes/bonded clean Cu plate clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded Unloaded (large end) scored slight	1.3725 1.3710 1.3710
(1) 4.2 (2) 4.2 (3) 4.2 Remaining torque of stator bolts (1) 10.4 (2) 10.4 (3) 10.4 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4.2 (4) 10.4 gray Yes No Cu Cu trace Yes No clean trace r removed (4) 14.6 yes/bonded clean Cu plate clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Cu plating slight arance clean no wear Loaded Unloaded low wear/Cu plating medium Loaded Unloaded (large end) scored slight Loaded	1.3725 1.3710 1.3710 1.2485

Unit Number 40

 Contaminants:

 Control Unit?
 No

 Acid?
 Yes
 R-12?
 No

 Air?
 Yes
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Trash in liquid screen (g)0.145Number of screens1Debris in compressor bottom (g)1.110

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearmediumDimensionsLoaded0.5005Unloaded0.5005

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/Cu plating **Wear** medium

Dimensions Loaded 0.4990 Unloaded 0.4990

Final Lubricant Values Total Acid Number (TAN) 0.18 Water (ppm) 68 Fluoride ion (ppm) 1.2 Chloride ion (ppm) 8.8 Aluminum (ppm) 0 Copper (ppm) 1 Iron (ppm) 0 Lead (ppm) 1 5 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0

Suction side (reed backer)

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion **Suction reed**

ConditiongoodAppearancecorrosionTrepanslightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

Condition good
Appearance corrosion/blued
Trepan very slight
Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	gray	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	none	none	none
Spring	slight	gray	hard
Spring Seat	slight	gray	hard
Ball	none	none	none
Front Side	slight	gray	hard

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and Water 185 psig/30 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

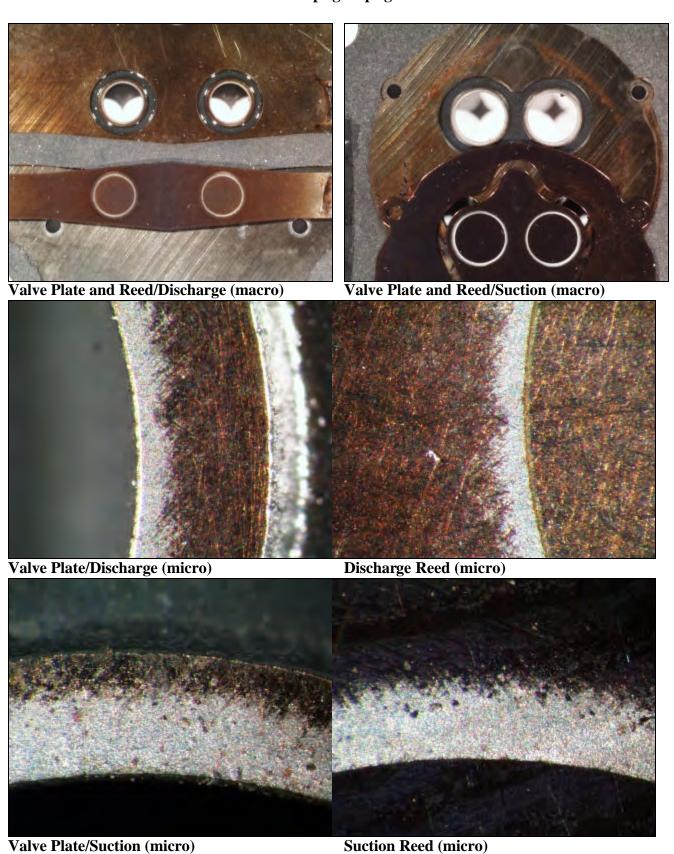


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-507A Compressor with Contaminant Acid, Air, and Water 185 psig/30 psig



Report for R-407C Control Compressor

TEST INSTORT OF.				
Unit Number 41				
Model # RS43C1E-CAV-250 Serial	# 96F16519	Crank journals		
Run Time (hr.) 12005 Failed	? No	Appearance	clean	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? Yes		Lower crank be		
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		vveui	ponsii	
112021 110		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	325	2	Unloaded	0.9990
Suction Pressure (psig)	70	Rottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	153	Appearance	scored/corrosion	
Return Gas Temp (°F)	58	Wear	polish	
SumpTemp (°F)	96	wear	ponsii	
Sumpremp(T)	70	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze l		
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0040
Suction ring top appearance	bright	Difficusions	Unloaded	1.0040
Remaining torque of discharge muffler	origin		Cinoaucu	1.00+0
(1) 4.2 (2) 5.8 (3) 3.8	(4) 3.8	Shaft in cage be	arina	
Remaining torque of stator bolts	(4) 3.8	Appearance	clean	
(1) 12.5 (2) 12.5 (3) 7.5	(4) 7.5	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 15 (3) 15	(4) 15	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	none	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	wear metals		Unloaded	1.2510
	wear metais			1.2310
Remaining torque of cage bearing bolts			Cinouaca	1.2310
Remaining torque of cage bearing bolts (1) 4 (2) 4 (3) 5			Cinducu	1.2310

Unit Number	41
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Contaminants: Trash in liquid screen (g) 0.034 **Control Unit?** Yes **Number of screens** Acid? 0.270 No R-12? No Debris in compressor bottom (g) Air? No R-22? No

No R-502? **Valve Plate Assembly Inspection** No

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish **Appearance** Dimensions Loaded 0.5010 Suction surface appearance Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

H₂O?

Appearance clean Wear none **Dimensions** Loaded 0.4980 0.4980 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.03 Water (ppm) 174 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 8.8 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm) Tin (ppm) 0

Suction side (reed backer)

Condition good corrosion

Suction reed

Condition good **Appearance** corrosion Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	brown	gummy
Spring	very slight	gray	hard
Spring Seat	slight	brown	hard
Ball	medium	brown	gummy
Front Side	none	none	none

0

Photographic Documentation of R-407C Control Compressor 325 psig/70 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

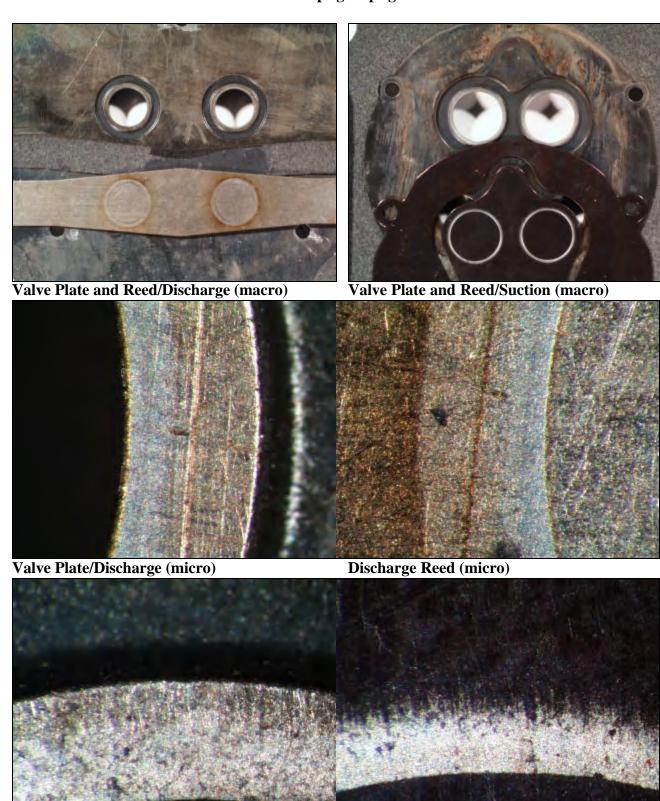


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Control Compressor 325 psig/70 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-407C Control Compressor

TEST HISTORY OF:		
Unit Number 42		
Model # RS43C1E-CAV-250 Seria	l# 96F16509	Crank journals
Run Time (hr.) 12013 Faile	d? No	Appearance clean
Refrigerant 407C		Wear polish
Lubricant RL32S		Dimensions Loaded 1.2470
Contaminants:		Unloaded 1.2470
Control Unit? Yes		Lower crank bearing journal
Acid? No R-12? No		Appearance clean
Air? No R-22? No		Wear polish
H_2O ? No $R-502$? No		
		Dimensions Loaded 0.9990
Discharge Pressure (psig)	325	Unloaded 0.9990
Suction Pressure (psig)	70	Bottom thrust washer (crank side)
Discharge Temp (°F)	153	Appearance scored
Return Gas Temp (°F)	58	Wear polish
SumpTemp (°F)	96	
		Bottom washer (casting side)
Hi-Pot	pass	Appearance clean
High-low leak	pass	Wear polish
Top shell appearance	gray	Lower bronze bearings
Suction exit trail appearance	black	Appearance clean
Cluster block condition	good	Wear polish
Wire to cluster block appearance	gray	Dimensions Loaded 1.0030
Suction ring top appearance	clean	Unloaded 1.0030
Remaining torque of discharge muffle		C1
(1) 3.3 (2) 3.3 (3) 3.3	(4) 3.3	Shaft in cage bearing
Remaining torque of stator bolts	(4) 11	Appearance clean
(1) 10 (2) 10 (3) 11	(4) 11	Wear polish
Suction muffler appearance	clean	Piston top appearance clean
OEM flux?	Yes	Piston skirt
Loose restrictor?	No	Appearance low wear
Discharge plate appearance	soot	Dimensions Loaded 1.3740
Top stator windings appearance	clean	Unloaded 1.3740
Rotor rub marks present?	No	Cylinder bore
Was rotor loose?	No	Appearance no wear
Shell bottom appearance	clean	Varnish ring none
Quantity of bearing chips	slight	Dimensions Loaded 1.3760
Remaining torque of discharge muffle	r removed	Unloaded 1.3760
(1) 15 (2) 15 (3) 16	(4) 15	Connecting rod (large end)
Head gasket brittle?	yes/bonded	Appearance scored
Head suction cavity appearance	clean	Wear slight
Head discharge cavity appearance	clean	Dimensions Loaded 1.2510
Cage bearing top appearance	clean	Unloaded 1.2510
Remaining torque of cage bearing bold		
(1) 5 (2) 5 (3) 6	(4) 6	

Unit Number 42

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.000Number of screens1Debris in compressor bottom (g)0.500

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance clean
Wear polish
Dimensions Loaded

us Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values
Total Acid Number (TAN)
Water (ppm)
112
Fluoride ion (ppm)
0.99
Chloride ion (ppm)
8.3
Aluminum (ppm)
0

Aluminum (ppm)
Copper (ppm)
Iron (ppm)
Lead (ppm)
Silicon (ppm)
Tin (ppm)
Zinc (ppm)

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** clean

Discharge surface appearance

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat very slight hard gray **Rear Pin** very slight brown gummy **Equalizer Hole** none none none Tip of Pin medium brown gummy Spring very slight hard gray **Spring Seat** very slight brown gummy Ball very slight brown gummy Front Side none none none

0

0

0

6

0

0

Photographic Documentation of R-407C Control Compressor 325 psig/70 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

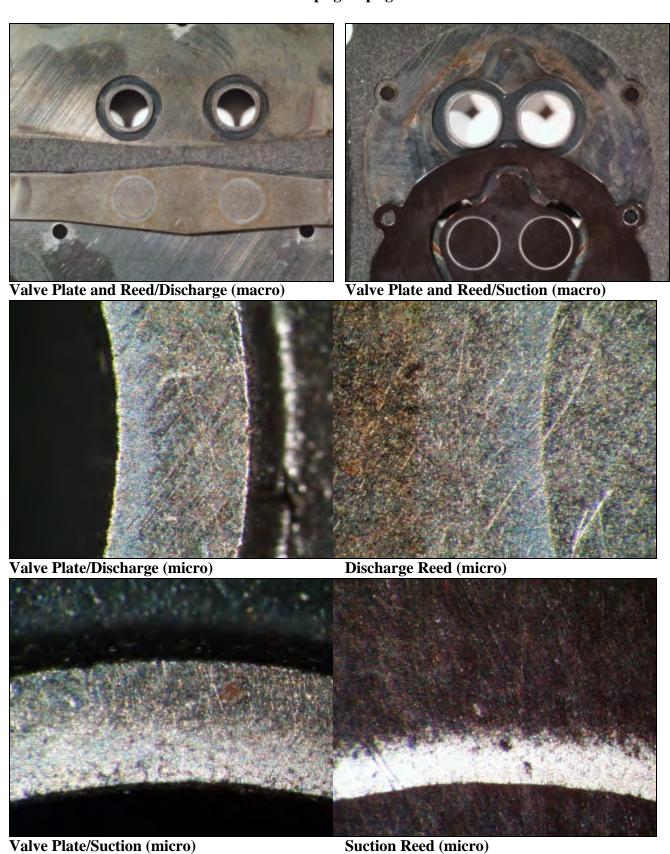


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Control Compressor 325 psig/70 psig



Suction Reed (micro)

Report for R-407C Control Compressor

TEST INSTORT OF				
Unit Number 43				
Model # RS43C1E-CAV-250 Serial	# 96F16510	Crank journals		
Run Time (hr.) 12033 Failed	!? No	Appearance	clean	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? Yes		Lower crank be	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No R-502? No		· · · cui	ponsii	
12,00		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	325	2 111011510115	Unloaded	0.9985
Suction Pressure (psig)	70	Bottom thrust	washer (crank side)	0.7705
Discharge Temp (°F)	153	Appearance	clean	
Return Gas Temp (°F)	58	Wear	polish	
SumpTemp (°F)	96	· · · cui	ponsii	
Sumptemp (T)	70	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	Cu plating	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	black	Appearance	clean/scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Dimensions	Unloaded	1.0030
Remaining torque of discharge muffler			Cinoaucu	1.0030
(1) 3 (2) 3 (3) 4	(4) 3	Shaft in cage be	aring .	
Remaining torque of stator bolts	(4) 3	Appearance	clean	
(1) 2.5 (2) 2.5 (3) 2.5	(4) 2.5	Wear	polish	
	, ,		•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	Cu	Dimensions	Loaded	1.3740
Top stator windings appearance	clean		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear/Cu plating	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 17.5 (3) 15	(4) 17.5	Connecting rod	(large end)	
Head gasket brittle?	yes/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	clean/Cu plate	Dimensions	Loaded	1.2515
Cage bearing top appearance	clean		Unloaded	1.2515
Remaining torque of cage bearing bolts				
(1) 7.5 (2) 7.5 (3) 7.5	(4) 7.5			

Unit Number 43

Contaminants:Trash in liquid screen (g)0.041Control Unit?YesNumber of screens1Acid?NoR-12?NoDebris in compressor bottom (g)0.227Air?NoR-22?No

 $\begin{array}{cccc} \textbf{Air?} & \text{No} & \textbf{R-22?} & \text{No} \\ \textbf{H_2O?} & \text{No} & \textbf{R-502?} & \text{No} \end{array}$

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance scored Wear polish

Dimensions Loaded 0.4985 **Unloaded** 0.4985

Final Lubricant Values	
Total Acid Number (TAN)	0.05
Water (ppm)	211
Fluoride ion (ppm)	1.2
Chloride ion (ppm)	9.1
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	1
Tin (ppm)	0
Zinc (ppm)	0

Valve Plate Assembly Inspection

Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** clean

Discharge surface appearance

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	brown	gummy
Spring	none	none	none
Spring Seat	medium	brown	gummy
Ball	medium	brown	gummy
Front Side	none	none	none

Photographic Documentation of R-407C Control Compressor 325 psig/70 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

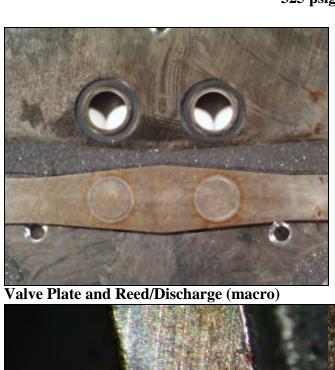


Crank Shaft (loaded) (macro)



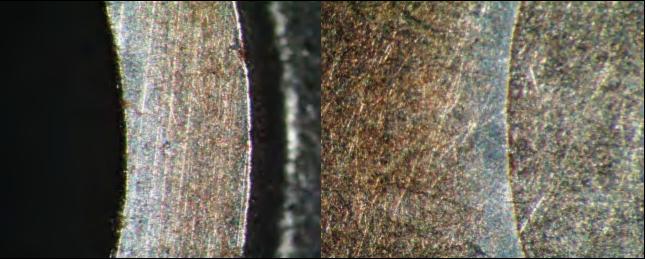
Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Control Compressor 325 psig/70 psig



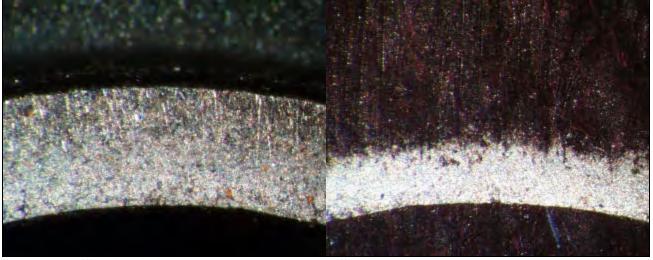


Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-407C Compressor with Contaminant R-22

Limit Nivember							
Unit Numbe	er 4	4					
Model # RS	S43C1E-C	CAV-250	Serial #	96F16511	Crank journals	1	
Run Time (l	nr.)	12007	Failed?	No	Appearance	clean	
Refrigerant	,	407C			Wear	polish, slight	
Lubricant		RL32S			Dimensions	Loaded	1.2460
Contaminar	nts•	TCE525			Difficusions	Unloaded	1.2460
Control Uni					Lower crank be		1.2400
Acid? No		R-12?	No			clean	
					Appearance		
Air? No		R-22?	Yes		Wear	polish, slight	
H_2O ?)	R-502?	No		D: .	T 1 1	0.0000
					Dimensions	Loaded	0.9980
Discharge P				325		Unloaded	0.9980
Suction Pre		ig)		75		washer (crank side)	
Discharge T	_			141	Appearance	clean	
Return Gas		F)		58	Wear	polish, slight	
SumpTemp	(° F)			81			
					Bottom washer	(casting side)	
Hi-Pot				pass	Appearance	clean	
High-low lea	ak			pass	Wear	polish	
Top shell ap	pearance			gray	Lower bronze	bearings	
Suction exit	trail app	earance		black	Appearance	corrosion	
Cluster bloc	k condition	on		good	Wear	polish, slight	
Wire to clus	ter block	appeara	nce	clean	Dimensions	Loaded	1.0020
Suction ring	top appe	earance		gray		Unloaded	1.0010
Remaining t	torque of	discharg	e muffler				
(1) 5	(2) 5	(3)		4) 4	Shaft in cage be	earing	
* *					Appearance	clean	
Remaining t		stator bo	lts		Appearance	Cican	
Remaining (1) 10				(4) 10	Wear	polish, slight	
	torque of (2) 11	(3)	10	4) 10 clean		polish, slight	
(1) 10 Suction muf	torque of (2) 11	(3)	10	•	Wear Piston top appe	polish, slight	
(1) 10 Suction muf OEM flux?	torque of (2) 11 ffler appe	(3)	10	clean Yes	Wear Piston top appe Piston skirt	polish, slight earance clean	
(1) 10 Suction muf OEM flux? Loose restri	torque of (2) 11 ffler appe ctor?	(3) arance	10	clean Yes No	Wear Piston top appe Piston skirt Appearance	polish, slight earance clean low wear	1 3715
(1) 10 Suction muf OEM flux? Loose restri Discharge p	torque of (2) 11 ffler appe ctor? late appe	(3) arance arance	10	clean Yes No gray	Wear Piston top appe Piston skirt	polish, slight earance clean low wear Loaded	1.3715
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v	torque of (2) 11 ifler appe ctor? late appe windings a	(3) arance arance appearan	10 (clean Yes No gray clean	Wear Piston top appe Piston skirt Appearance Dimensions	polish, slight earance clean low wear	1.3715 1.3715
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub n	torque of (2) 11 Iffler appe ctor? late apper vindings a narks pres	(3) arance arance appearan	10 (clean Yes No gray clean No	Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	polish, slight earance clean low wear Loaded Unloaded	
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le	torque of (2) 11 Iffler appe ctor? late apper vindings a narks pres oose?	(3) arance arance appearan sent?	10 (clean Yes No gray clean No	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	polish, slight earance clean low wear Loaded Unloaded no wear	
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom	torque of (2) 11 ffler appe ctor? late apper vindings a narks pres oose? n appeara	(3) arance arance appearan sent?	10 (clean Yes No gray clean No No	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	polish, slight earance clean low wear Loaded Unloaded no wear very slight	1.3715
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom Quantity	torque of (2) 11 Iffler appe ctor? late apper vindings a narks pres oose? n appeara v of bearin	(3) arance arance appearan sent? ance ng chips	10 (clean Yes No gray clean No Clean No clean trace	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded	1.3715 1.3725
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom Quantity Remaining t	torque of (2) 11 Iffer appe ctor? late apper vindings a narks pres oose? n appeara of bearing torque of	(3) arance arance appearan sent? ance ng chips discharg	10 (clean Yes No gray clean No No clean trace emoved	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded	1.3715
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom Quantity Remaining t (1) 5	torque of (2) 11 Iffer appe ctor? late apper vindings a narks pres oose? n appeara of bearin torque of (2) 4	(3) arance arance appearan sent? ance ng chips	10 (nce se muffler r	clean Yes No gray clean No No clean trace emoved 4) 4	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded Unloaded	1.3715 1.3725
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor lo Shell bottom Quantity Remaining t (1) 5 Head gasket	torque of (2) 11 Iffer appe ctor? late apper windings a narks pres oose? n appeara of bearin torque of (2) 4 t brittle?	(3) arance arance appearan sent? ance ng chips discharg (3)	10 (emuffler r	clean Yes No gray clean No No clean trace eemoved 4) 4	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded Unloaded (large end) none	1.3715 1.3725
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub n Was rotor le Shell botton Quantity Remaining t (1) 5 Head gasket Head suction	torque of (2) 11 Iffler appe ctor? late apper windings a narks pres oose? n appeara of bearin torque of (2) 4 brittle? n cavity a	(3) arance arance appearan sent? ance ang chips discharg (3)	te muffler r	clean Yes No gray clean No No clean trace emoved 4) 4 ves	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded I (large end) none polish, slight	1.3715 1.3725 1.3725
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom Quantity Remaining t (1) 5 Head gasket Head suction	torque of (2) 11 iffler appe ctor? late appe vindings a narks pres oose? n appeara of bearin torque of (2) 4 t brittle? n cavity a arge cavity	arance arance appearan sent? ance ng chips discharg (3) appearancy	te muffler r 4 (ce c	clean Yes No gray clean No No clean trace emoved 4) 4 /es clean	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded I (large end) none polish, slight Loaded	1.3715 1.3725 1.3725 1.2490
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom Quantity Remaining t (1) 5 Head gasket Head suction Head dischat Cage bearin	torque of (2) 11 iffler appearance ctor? late appearance narks presonse? nappearance of bearing torque of (2) 4 t brittle? n cavity a large cavity ng top app	arance arance arance appearan sent? ance ng chips discharg (3) appearancy appearance	te muffler r 4 (ce ce c	clean Yes No gray clean No No clean trace emoved 4) 4 ves	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded I (large end) none polish, slight	1.3715 1.3725 1.3725
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom Quantity Remaining t (1) 5 Head gasket Head suction Head dischat Cage bearin Remaining t	torque of (2) 11 iffler appearance ctor? late appearance narks presoose? nappearance of bearing torque of (2) 4 t brittle? n cavity a arge cavity g top appeara torque of	arance arance arance appearance appearance (3) appearance y appearance cage bear	ge muffler r 4 (ce (ance (cring bolts	clean Yes No gray clean No No clean trace emoved 4) 4 /es clean clean	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded I (large end) none polish, slight Loaded	1.3715 1.3725 1.3725 1.2490
(1) 10 Suction muf OEM flux? Loose restri Discharge p Top stator v Rotor rub m Was rotor le Shell bottom Quantity Remaining t (1) 5 Head gasket Head suction Head dischat Cage bearin	torque of (2) 11 iffler appearance ctor? late appearance narks presonse? nappearance of bearing torque of (2) 4 t brittle? n cavity a large cavity ng top app	arance arance arance appearan sent? ance ng chips discharg (3) appearancy appearance	ge muffler r 4 (ce (ance (cring bolts	clean Yes No gray clean No No clean trace emoved 4) 4 /es clean	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish, slight earance clean low wear Loaded Unloaded no wear very slight Loaded Unloaded I (large end) none polish, slight Loaded	1.3715 1.3725 1.3725 1.2490

Unit	Number	44
------	--------	----

Contam	inants:			Trash in liquid screen (g)	0.022
Control	Unit?	No		Number of screens	1
Acid?	No	R-12?	No	Debris in compressor bottom (g)	0.511
Air?	No	R-22?	Yes		

 H_2O ? No R-502? No

Connecting rod (small end)

Appearance	contact wear/correct washer		Condition	good
Wear	polish, mediur	n	Appearance	corrosion
Dimensions	Loaded 0.5010		Suction surface appearance	
	Unloaded	0.5010	corrosion	

Piston pin washers appearance

contact wear

Piston pin

Appearance	ciean	
Wear	polish	
Dimensions	Loaded	0.4990
	Unloaded	0.4990

-	
Final Lubricant Values	
Total Acid Number (TAN)	0.06
Water (ppm)	85
Fluoride ion (ppm)	1.1
Chloride ion (ppm)	9.2
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	4
Tin (ppm)	0
Zinc (ppm)	0

Suction reed

Condition	good
Appearance	corrosion
Trepan	very slight
Varnish ring	none

Valve Plate Assembly Inspection

Suction side (reed backer)

Discharge side (reed backer)

ConditiongoodAppearancecorrosionDischarge surface appearance

corrosion

Discharge reed	
Condition	good
Appearance	corrosion
Trepan	very slight
Varnish ring	none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black, brown	gummy
Spring	very slight	gray	gummy
Spring Seat	very slight	gray	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

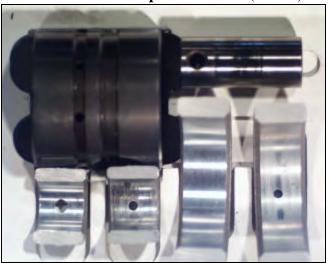
Photographic Documentation of R-407C Compressor with Contaminant R-22 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

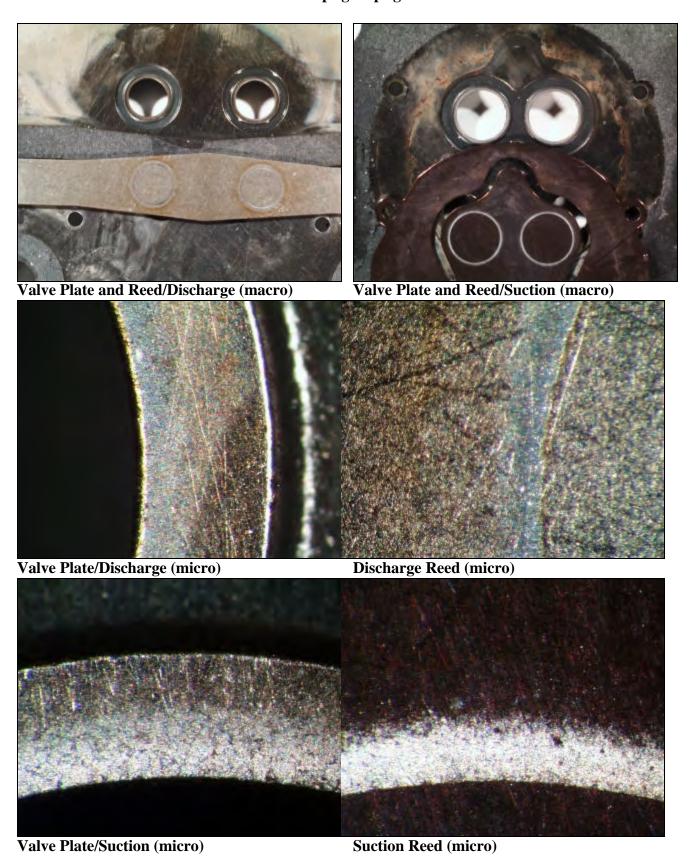


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant R-22 325 psig/75 psig



Report for R-407C Compressor with Contaminant Acid

Unit Number 45				
Model # RS43C1E-CAV-250 Seria	l# 96F16512	Crank journals		
Run Time (hr.) 12071 Failed		Appearance	clean	
. ,	1. NO	Wear		
8			polish, slight	1 2465
		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank be		
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish, slight	
H₂O? No R-502? No		.		0.000
		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	325		Unloaded	0.9990
Suction Pressure (psig)	75		washer (crank side)	
Discharge Temp (°F)	141	Appearance	clean	
Return Gas Temp (°F)	58	Wear	polish, medium	
SumpTemp (°F)	81			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze b	oearings	
Suction exit trail appearance	gray	Appearance	corrosion	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0025
Suction ring top appearance	gray		Unloaded	1.0025
Suction ring top appearance Remaining torque of discharge muffler			Unloaded	1.0025
		Shaft in cage be		1.0025
Remaining torque of discharge muffler	•	Shaft in cage be Appearance		1.0025
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5	•	_	earing	1.0025
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts	(4) 4	Appearance	earing clean polish, slight	1.0025
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11	(4) 4 (4) 9	Appearance Wear	earing clean polish, slight	1.0025
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance	(4) 4 (4) 9 clean	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight	1.0025
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor?	(4) 4 (4) 9 clean Yes	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight arance carbon	1.0025
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 4 (4) 9 clean Yes No clean	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight arance carbon low wear Loaded	
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 4 (4) 9 clean Yes No clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, slight arance carbon low wear	1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 4 (4) 9 clean Yes No clean clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	clean polish, slight arance carbon low wear Loaded Unloaded	1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 4 (4) 9 clean Yes No clean clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight arance carbon low wear Loaded Unloaded	1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 4 (4) 9 clean Yes No clean clean Yes No clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, slight arance carbon low wear Loaded Unloaded low wear slight	1.3730 1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 4 (4) 9 clean Yes No clean clean Yes No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	caring clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded	1.3730 1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 4 (4) 9 clean Yes No clean clean Yes No clean removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded	1.3730 1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 15	(4) 4 (4) 9 clean Yes No clean clean Yes No clean trace r removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	caring clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded Unloaded (large end)	1.3730 1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 15 Head gasket brittle?	(4) 4 (4) 9 clean Yes No clean clean Yes No clean trace r removed (4) 15 yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) scored	1.3730 1.3730
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance	(4) 4 (4) 9 clean Yes No clean clean Yes No clean trace r removed (4) 15 yes clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) scored polish	1.3730 1.3730 1.3760 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4 (4) 9 clean Yes No clean clean Yes No clean trace r removed (4) 15 yes clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) scored polish Loaded	1.3730 1.3730 1.3760 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 4 (4) 9 clean Yes No clean clean Yes No clean trace r removed (4) 15 yes clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) scored polish	1.3730 1.3730 1.3760 1.3760
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 4 (4) 9 clean Yes No clean clean Yes No clean trace r removed (4) 15 yes clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight arance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) scored polish Loaded	1.3730 1.3730 1.3760 1.3760

Unit Number

Contaminants: Trash in liquid screen (g) 0.057 **Control Unit?** No **Number of screens** 2 0.554 Acid? Yes R-12? No Debris in compressor bottom (g)

Air? No R-22? No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish Appearance **Dimensions** Loaded 0.5005 Suction surface appearance Unloaded 0.5000

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear polish

Dimensions Loaded 0.4990 Unloaded 0.4985

Final Lubricant Values Total Acid Number (TAN) 0.10 Water (ppm) 65 Fluoride ion (ppm) 2.1 Chloride ion (ppm) 19 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 4 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 Suction side (reed backer)

Valve Plate Assembly Inspection

corrosion

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat slight gray hard **Rear Pin** very slight brown gummy **Equalizer Hole** very slight black gummy Tip of Pin slight brown gummy Spring none none none **Spring Seat** none none none Ball slight brown gummy Front Side slight brown gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

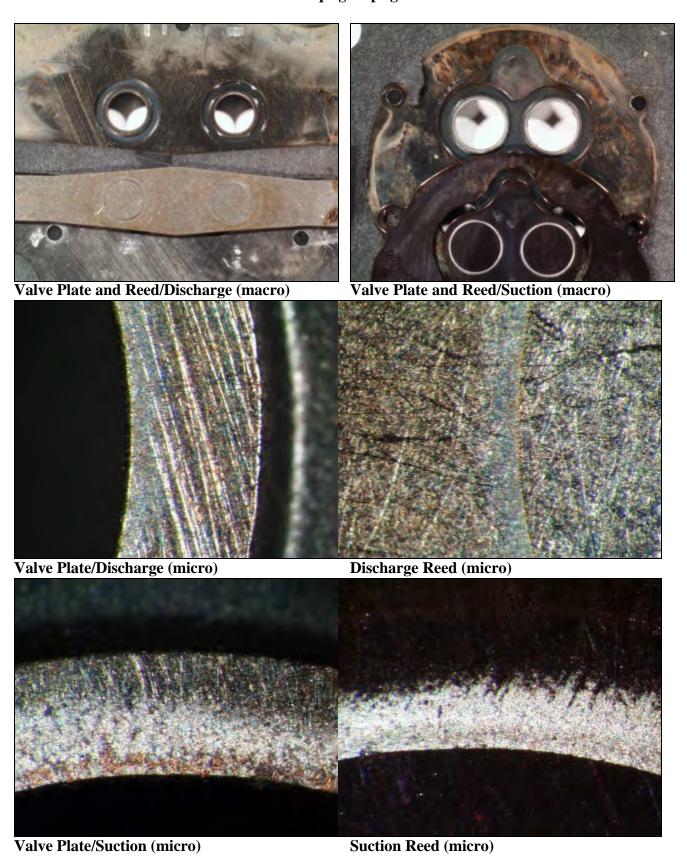


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid 325 psig/75 psig



Report for R-407C Compressor with Contaminant Air

TT 1/ NT 1						
Unit Number	46					
Model # RS43C	1E-CAV-250	Serial #	96F16507	Crank journals	;	
Run Time (hr.)	12024	Failed?	No	Appearance	clean	
Refrigerant	407C			Wear	polish, slight	
Lubricant	RL32S			Dimensions	Loaded	1.2470
Contaminants:	112325				Unloaded	1.2470
	No			Lower crank be		1.2470
Acid? No	R-12?	No			clean	
				Appearance		
Air? Yes	R-22?	No		Wear	polish, slight	
H_2O ? No	R-502?	No		D	T 1 1	0.0005
		_		Dimensions	Loaded	0.9995
Discharge Pressu			325		Unloaded	0.9995
Suction Pressure			75		washer (crank side)	
Discharge Temp			141	Appearance	clean/Cu plating	
Return Gas Tem	p (°F)		58	Wear	polish, medium	
SumpTemp (°F)		8	31			
				Bottom washer	(casting side)	
Hi-Pot		ŗ	bass	Appearance	clean	
High-low leak		ŗ	oass	Wear	polish, slight	
Top shell appear	ance	ş	gray	Lower bronze	bearings	
Suction exit trail		i	black	Appearance	corrosion	
Cluster block cor	ndition	g	good	Wear	polish, slight	
Wire to cluster b	lock appeara		elean	Dimensions	Loaded	1.0030
Suction ring top			gray		Unloaded	1.0030
	appear ance	-	, i u y		Ullivaucu	1.0050
			, ruy		Cinoaueu	1.0030
Remaining torqu	e of discharg	e muffler	· · ·	Shaft in cage be		1.0030
Remaining torqu (1) 4 (2)	e of discharg	ge muffler 4 (4	1) 3	Shaft in cage be	earing	1.0030
Remaining torque (1) 4 (2) Remaining torque	e of discharg (3) e of stator bo	ge muffler 4 (4 olts	1) 3	Appearance	e aring clean	1.0030
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2)	3 (3) te of stator bo 10 (3)	ge muffler 4 (4 olts 9 (4	1) 3 1) 10	Appearance Wear	earing clean polish, slight	1.0030
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler a	3 (3) te of stator bo 10 (3)	ge muffler 4 (4)	1) 3 1) 10 clean	Appearance Wear Piston top appe	earing clean polish, slight	1.0030
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler a OEM flux?	3 (3) e of stator bo 10 (3) appearance	ge muffler 4 (4 olts 9 (4	1) 3 1) 10 clean Yes	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight earance carbon	1.0030
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor?	a of discharg 3 (3) e of stator bo 10 (3) appearance	ge muffler 4 (4 olts 9 (4	1) 3 1) 10 Elean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance carbon low wear	
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at	a of discharg 3 (3) e of stator bo 10 (3) appearance appearance	ge muffler 4 (4 olts 9 (4	1) 3 1) 10 clean Yes No gray	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight earance carbon low wear Loaded	1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding	a of discharg 3 (3) e of stator bo 10 (3) appearance appearance appearance appearance appearance	ge muffler 4 (4 olts 9 (4 N N N N S N S S S S S S S S S S S S S	4) 3 4) 10 clean Yes No gray clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, slight earance carbon low wear	
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks	se of discharg 3 (3) se of stator bo 10 (3) suppearance	ge muffler 4 (4 olts 9 (4 N N N Second S	1) 3 1) 10 clean Yes No gray clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	clean polish, slight carance carbon low wear Loaded Unloaded	1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose?	appearance	ge muffler 4 (4 olts 9 (4 N M M M M M M M M M M M M M M M M M M	1) 3 1) 10 clean Yes No gray clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear	1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app	appearance	ge muffler 4 (4 olts 9 (4 N name N n	1) 3 1) 10 clean Yes No gray clean Yes No clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight	1.3730 1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of bottom	a of discharg (3) (4) (5) (6) (7) (8) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	ge muffler 4 (4 olts 9 (4 N nce C N n	1) 3 1) 10 clean Yes No gray clean Yes No clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded	1.3730 1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of be Remaining torque	a of discharg (3) (4) (5) (6) (7) (8) (8) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	ge muffler 4 (4) lts 9 (4) N nce S ge muffler re	1) 3 1) 10 clean Yes No gray clean Yes No clean Yes emoved	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded	1.3730 1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of be Remaining torque (1) 16 (2)	appearance arance	ge muffler 4 (4) olts 9 (4) N nce S ge muffler rece 16 (4)	1) 3 1) 10 clean Yes No gray clean Yes No clean race emoved 1) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded Unloaded	1.3730 1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of be Remaining torque (1) 16 (2) Head gasket britten	appearance	ge muffler 4 (4) olts 9 (4) N Second of the second of	1) 3 1) 10 clean Yes No gray clean Yes No clean race emoved 1) 15 o/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded Unloaded (large end) none	1.3730 1.3730
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of both Remaining torque (1) 16 (2) Head gasket britted Head suction cave	a of discharg 3 (3) e of stator bo 10 (3) appearance appearan	ge muffler 4 (4 olts 9 (4 nee 16 (4 nee ce ce	1) 3 1) 10 clean Yes No gray clean Yes No clean race emoved 1) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight	1.3730 1.3730 1.3750 1.3750
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of both Remaining torque (1) 16 (2) Head gasket britted the suction caves the success the	ae of discharg 3 (3) e of stator be 10 (3) appearance appearance appearance appearance appearance earing chips e of discharg 16 (3) tle? ity appearance eavity appearance	ge muffler 4 (4 olts 9 (4 nee 16 (4 nee ce ce	1) 3 1) 10 clean Yes No gray clean Yes No clean race emoved 1) 15 o/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight Loaded	1.3730 1.3730 1.3750 1.3750
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of between the property of the point of	a of discharg 3 (3) e of stator be 10 (3) appearance appearance appearance appearance appearance earing chips e of discharg 16 (3) tle? ity appearan eavity appearance appearance appearance	ge muffler 4 (4 olts 9 (4 N nace 16 (4 nace ce cl ance cl	1) 3 1) 10 clean Yes No gray clean Yes No clean race emoved 1) 15 o/bonded lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight	1.3730 1.3730 1.3750 1.3750
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of both Remaining torque (1) 16 (2) Head gasket britted the suction caves the success the	a of discharg 3 (3) e of stator be 10 (3) appearance appearance appearance appearance appearance earing chips e of discharg 16 (3) tle? ity appearan eavity appearance appearance appearance	ge muffler 4 (4 olts 9 (4 N nace 16 (4 nace ce cl ance cl	1) 3 1) 10 clean Yes No gray clean Yes No clean race emoved 1) 15 o/bonded lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight Loaded	1.3730 1.3730 1.3750 1.3750
Remaining torque (1) 4 (2) Remaining torque (1) 10 (2) Suction muffler at OEM flux? Loose restrictor? Discharge plate at Top stator winding Rotor rub marks Was rotor loose? Shell bottom app Quantity of between the property of the point of	a ppearance appearance appearance appearance appearance appearance appearance arance earing chips a of discharg able? appearan avity appearance	ge muffler 4 (4) olts 9 (4) Note 10 (4) 11 (4) 12 (4) 13 (4) 14 (4) 15 (4) 16 (4) 16 (4) 17 (16) 18 (16) 19 (16) 10 (16) 1	1) 3 1) 10 clean Yes No gray clean Yes No clean race emoved 1) 15 o/bonded lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance carbon low wear Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight Loaded	1.3730 1.3730 1.3750 1.3750

Unit Number

Contaminants: Trash in liquid screen (g) 0.000 **Control Unit?** No Number of screens Acid? No R-12? No Debris in compressor bottom (g) 0.437

Air? Yes R-22? No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish, medium Appearance **Dimensions** Loaded 0.5005 **Suction surface appearance** Unloaded 0.5005

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored medium Wear **Dimensions** Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.06 Water (ppm) 34 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 12 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 7 Silicon (ppm) 0 Tin (ppm)

Suction side (reed backer)

Valve Plate Assembly Inspection

corrosion

corrosion **Suction reed**

Condition good corrosion **Appearance** Trepan very slight Varnish ring none

Discharge side (reed backer) Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat medium black hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight brown gummy Spring medium brown gummy **Spring Seat** medium brown gummy Ball medium brown gummy Front Side heavy brown gummy

0

Photographic Documentation of R-407C Compressor with Contaminant Air 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

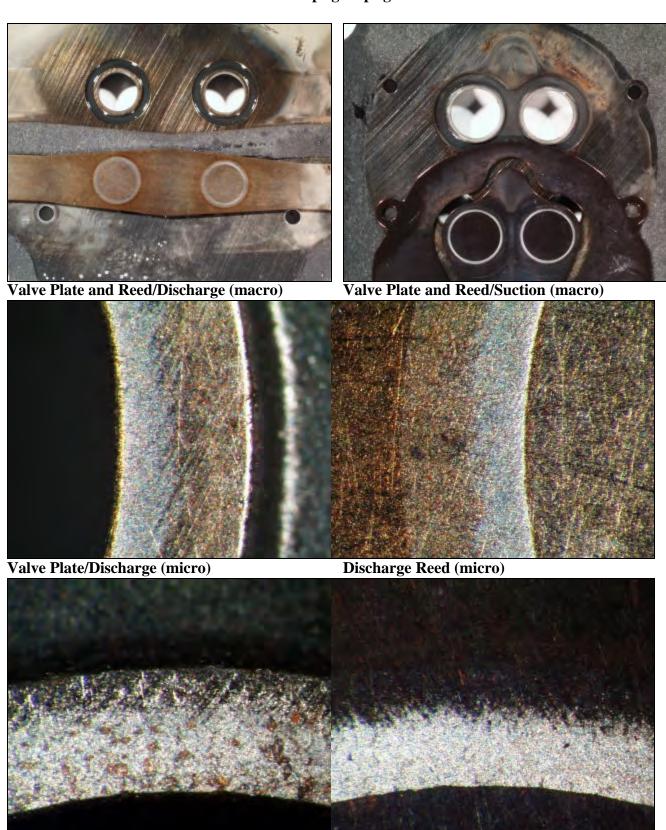


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air 325 psig/75 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

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Report for R-407C Compressor with Contaminant Acid and R-22

ILDI IIIDIONI OI:				
Unit Number 47				
Model # RS43C1E-CAV-250 Serial	# 96F16467	Crank journals		
Run Time (hr.) 12004 Failed	? No	Appearance	scored	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing iournal	
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? Yes		Wear	polish	
H_2O ? No $R-502$? No		***************************************	ponsii	
12,00		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	325	2111011510115	Unloaded	0.9990
Suction Pressure (psig)	75	Bottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	58	Appearance	scored	
Return Gas Temp (°F)	65	Wear	polish	
SumpTemp (°F)	81	vv cur	ponsii	
Sumptemp (1)	01	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Difficustons	Unloaded	1.0030
Remaining torque of discharge muffler			Cinoaucu	1.0050
(1) 5 (2) 2.5 (3) 5	(4) 2.5	Shaft in cage be	aring .	
Remaining torque of stator bolts	(4) 2.3	Appearance	corrosion	
(1) 12.5 (2) 12.5 (3) 7.5	(4) 12.5	Wear	polish	
			•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray/soot	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	removed		Unloaded	1.3760
(1) 12.5 (2) 15 (3) 15	(4) 15	Connecting rod	(large end)	
Head gasket brittle?	no/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2515
Cage bearing top appearance	clean		Unloaded	1.2515
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 5	(4) 5			

Unit Number 47

Contaminants:Trash in liquid screen (g)0.005Control Unit?NoNumber of screens1Acid?YesR-12?NoDebris in compressor bottom (g)1.102

 Air?
 No
 R-22?
 Yes

 H₂O?
 No
 R-502?
 No

Connecting rod (small end)

Appearancecontact wear/correct washer/corrosionConditiongoodWearpolishAppearancecorrosion

Dimensions Loaded 0.5010 Suction surface appearance
Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

Tin (ppm) Zinc (ppm)

Appearance scored/corrosion

Wear slight
Dimensions Loaded 0.4970

Unloaded 0.4970

Final Lubricant Values Total Acid Number (TAN) 0.09 Water (ppm) 63 Fluoride ion (ppm) 0.83 Chloride ion (ppm) 12 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 1 5 Silicon (ppm) 1

Discharge side (reed backer)

Valve Plate Assembly Inspection

good

slight

corrosion

very slight

Suction side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

Suction reed Condition

Trepan

Appearance

Varnish ring

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black gummy **Spring Seat** none none none Ball medium gray gummy Front Side slight brown gummy

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Photographic Documentation of R-407C Compressor with Contaminant Acid and R-22 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

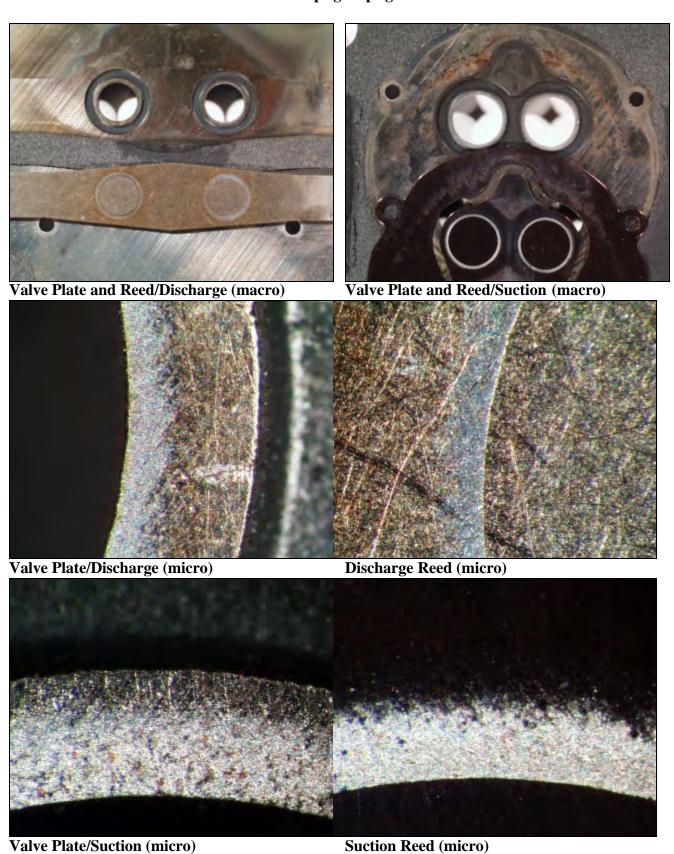


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid and R-22 325 psig/75 psig



Report for R-407C Compressor with Contaminant Acid, Air, and R-22

TEST INSTORT OF.				
Unit Number 48				
Model # RS43C1E-CAV-250 Serial	# 96F16539	Crank journals		
Run Time (hr.) 12002 Failed	? No	Appearance	scored	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		
Acid? Yes R-12? No		Appearance	clean	
Air? Yes R-22? Yes		Wear	polish	
H_2O ? No $R-502$? No		vv cur	ponsii	
nzo. no nzoz. no		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	325		Unloaded	0.9985
Suction Pressure (psig)	75	Rottom thrust	washer (crank side)	0.7703
Discharge Temp (°F)	141	Appearance	scored/corrosion	
Return Gas Temp (°F)	65	Wear	polish	
SumpTemp (°F)	81	vvcai	ponsii	
Sumplemp(1)	61	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	•	Wear	polish	
Top shell appearance	pass clean	Lower bronze l		
Suction exit trail appearance		Appearance	scored/corrosion	
Cluster block condition	gray	Wear	polish	
Wire to cluster block appearance	good clean	Dimensions	Loaded	1.0040
Suction ring top appearance	clean	Difficusions	Unloaded	1.0040
9 1 11			Ullioaueu	1.0040
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5		Chaft in ages he	.auina	
	(4) 5	Shaft in cage be	-	
Remaining torque of stator bolts	(4) 12.5	Appearance	corrosion	
(1) 15 (2) 17 (3) 15	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 17 (2) 17 (3) 17	(4) 17	Connecting rod		-10.00
Head gasket brittle?	yes/bonded	Appearance	corrosion	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2515
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts				1.2310
(1) 7.5 (2) 5 (3) 5	(4) 5			
	(7) 3			

Unit Number

Contaminants: Trash in liquid screen (g) 0.065 **Control Unit?** No **Number of screens** 2 Acid? Yes R-12? No Debris in compressor bottom (g) 1.310 R-22? Air? Yes Yes

H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish Appearance clean **Dimensions** Loaded 0.5010

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion Wear polish **Dimensions** Loaded 0.4970 0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.12 Water (ppm) 92 Fluoride ion (ppm) 0.66 Chloride ion (ppm) 12 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 1 6 Silicon (ppm) 0 Tin (ppm) 3 Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer) Condition good Suction surface appearance

corrosion **Suction reed**

Condition good corrosion **Appearance** Trepan very slight Varnish ring very slight

Discharge side (reed backer) Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed Condition good Appearance corrosion **Trepan** very slight Varnish ring slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight tan, black gummy Spring slight gray, black gummy **Spring Seat** brown very slight gummy Ball slight gray gummy Front Side slight brown gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and R-22 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

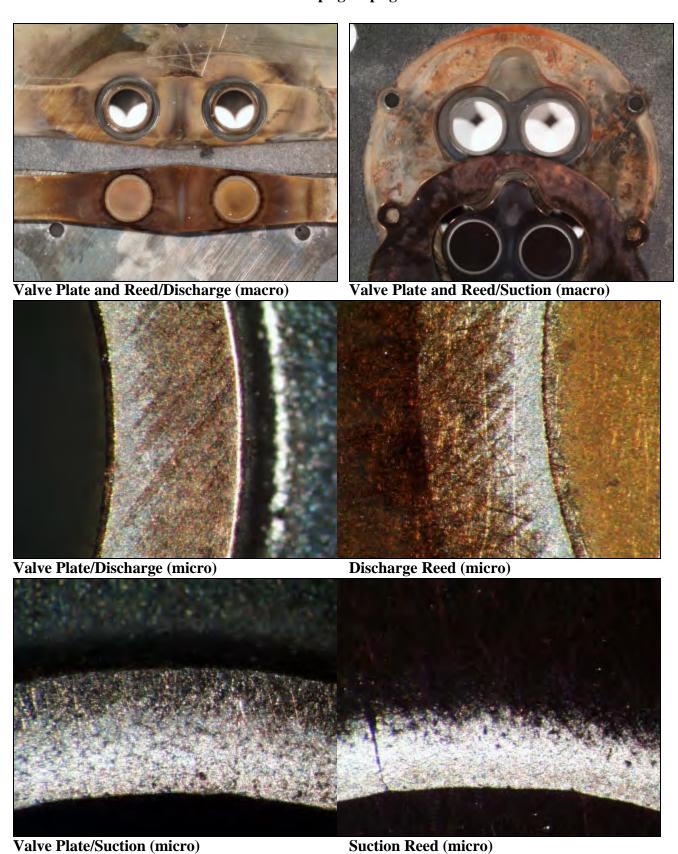


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and R-22 325 psig/75 psig



Report for R-407C Compressor with Contaminant Air and R-22

TEST HISTORY OF.				
Unit Number 49				
Model # RS43C1E-CAV-250 Serial	# 96F16505	Crank journals		
Run Time (hr.) 12018 Failed	? No	Appearance	scored	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		1.2
Acid? No R-12? No		Appearance	scored	
Air? Yes R-22? Yes		Wear	polish	
H_2O ? No $R-502$? No		wear	ponsii	
1120. No K-302. No		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	325	Difficusions	Unloaded	0.9980
Suction Pressure (psig)	75	Rottom thrust	washer (crank side)	0.9960
Discharge Temp (°F)	141	Appearance	scored/corrosion	
Return Gas Temp (°F)	65	Wear	slight	
SumpTemp (°F)	81	D - 44l	(4:: - 1 -)	
Hi-Pot		Bottom washer	_	
	pass	Appearance	scored	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze l		
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	4 0000
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage be		
Remaining torque of stator bolts		Appearance	clean/corrosion	
(1) 15 (2) 15 (3) 15	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/scored/soot	
	clean	Varnish ring	slight	
Shell bottom appearance Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
		Connecting		1.3700
(1) 15 (2) 17 (3) 17 Head gasket brittle?	(4) 17	Connecting rod		
	no/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	1.0510
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 5	(4) 5			

Unit Number

Contaminants: Control Unit? No Acid? No R-12?

R-22? Air? Yes Yes H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer

Wear polish **Dimensions** Loaded

0.5010 Unloaded 0.5010

No

Piston pin washers appearance

contact wear

Piston pin

Tin (ppm) Zinc (ppm)

Rear Pin

Appearance scored polish Wear

Dimensions Loaded 0.4965 Unloaded 0.4965

Final Lubricant Values **Total Acid Number (TAN)** 0.07 Water (ppm) 60 Fluoride ion (ppm) 0.78 Chloride ion (ppm) 11 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm)

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Diaphragm Seat** none none

none none **Equalizer Hole** none none Tip of Pin heavy black Spring medium gray **Spring Seat** medium gray Ball slight gray Front Side heavy gray

0

0

discolored

Trash in liquid screen (g) 0.071 **Number of screens** 0.982 Debris in compressor bottom (g)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good Appearance clean

Suction surface appearance corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Residue Description

none

none

none

gummy

gummy

gummy

gummy

gummy

Photographic Documentation of R-407C Compressor with Contaminant Air and R-22 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

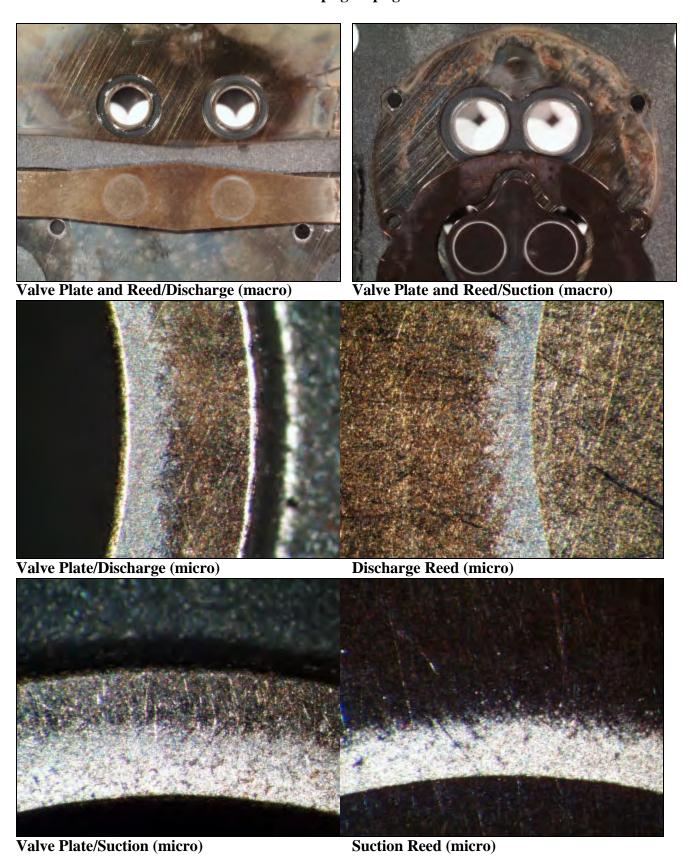


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air and R-22 325 psig/75 psig



Report for R-407C Compressor with Contaminant Acid and Air

Unit Num	ber 5	0					
	RS43C1E-C		Serial #	96F16452	Crank journals	!	
Run Time		12022	Failed?	No	Appearance	clean	
Refrigera		407C	rancu.	110	Wear	polish, slight	
Lubrican		RL32S			Dimensions	Loaded	1.2470
Contamin		KL328			Difficusions	Unloaded	1.2470
Control U					Lower aronk h		1.2470
		R-12?	No		Lower crank be	clean	
					Appearance		
		R-22? R-502?	No No		Wear	polish, slight	
H_2O ?	No	K-502:	No		Dimensions	Loaded	0.9985
Diachana	Dwaggung (2	25	Difficusions	Unloaded	
	e Pressure (25 5	Dottom thungt		0.9985
	ressure (psi	ig <i>)</i>		41		washer (crank side) clean	
	e Temp (°F)	E.)			Appearance		
	as Temp (°l	r <i>)</i>		8	Wear	polish, slight	
SumpTen	ıp (°r)		8	1	Dottom wook	(aggting gids)	
II: Dot				0.00	Bottom washer		
Hi-Pot	last.		-	ass	Appearance	clean	
High-low	appearance			ass	Wear	polish, slight	
-				lean lack	Lower bronze	corrosion	
	xit trail app				Appearance Wear		
	lock conditi			ood	vvear Dimensions	polish, slight Loaded	1.0015
	luster block ing top appo			lean	Dimensions	Unloaded	1.0015
Sucuon ri	IIIY IOD ADDI						
				ray		Univaded	1.0013
Remainin	g torque of	discharg	e muffler		Shoft in cage be		1.0013
Remainin (1) 4	g torque of (2) 4	discharge (3)	e muffler 5 (4) 4	Shaft in cage be	earing	1.0013
Remainin (1) 4 Remainin	g torque of (2) 4 ag torque of	discharg (3) stator bo	e muffler 5 (4 lts) 4	Appearance	e aring clean	1.0013
Remainin (1) 4 Remainin (1) 11	g torque of (2) 4 g torque of (2) 10	discharg (3) stator bo (3)	e muffler 5 (4 lts 12 (4	9) 10	Appearance Wear	earing clean polish, slight	1.0013
Remainin (1) 4 Remainin (1) 11 Suction m	g torque of (2) 4 g torque of (2) 10 nuffler appe	discharg (3) stator bo (3)	e muffler 5 (4 lts 12 (4) 4	Appearance Wear Piston top appe	earing clean polish, slight	1.0013
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux	g torque of (2) 4 g torque of (2) 10 nuffler appe	discharg (3) stator bo (3)	e muffler 5 (4 lts 12 (4	8) 4 8) 10 lean	Appearance Wear	earing clean polish, slight	1.0013
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose res	g torque of (2) 4 g torque of (2) 10 nuffler appe	(3) stator bo (3) earance	e muffler 5 (4 lts 12 (4	8) 4 8) 10 lean	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight	
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose resi	g torque of (2) 4 g torque of (2) 10 nuffler appe	(3) stator bo (3) earance	e muffler 5 (4 lts 12 (4 c Y N g	8) 4 8) 10 lean	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight earance carbon no wear Loaded	1.3720
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top states	g torque of (2) 4 g torque of (2) 10 nuffler appe c? trictor? e plate appe r windings	discharg (3) stator bo (3) earance earance appearan	e muffler 5 (4 lts 12 (4 c Y N g	d) 4 d) 10 lean Ves No	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance carbon no wear	
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top states	g torque of (2) 4 g torque of (2) 10 nuffler appe	discharg (3) stator bo (3) earance earance appearan	e muffler 5 (4 lts 12 (4 C Y Y)	d) 4 d) 10 lean Yes Jo gray	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance carbon no wear Loaded	1.3720
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top states	g torque of (2) 4 g torque of (2) 10 nuffler appear? trictor? e plate appear windings a marks pre	discharg (3) stator bo (3) earance earance appearan	e muffler 5 (4 lts 12 (4 C Y M g ace g Y	1) 4 2) 10 2) lean 2/es 3/o 3/ray ray	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, slight earance carbon no wear Loaded	1.3720
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was roto	g torque of (2) 4 g torque of (2) 10 nuffler appear? trictor? e plate appear windings a marks pre	(3) stator bo (3) earance earance appearance sent?	e muffler 5 (4 lts 12 (4 C Y A R R R R R R R R R R R R	1) 4 2) 10 2) lean 2/es 3/o 3/ray 3/ray 2/es	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean polish, slight earance carbon no wear Loaded Unloaded	1.3720
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was rotor Shell bott	g torque of (2) 4 g torque of (2) 10 nuffler appear? trictor? e plate appear windings a o marks pre r loose?	discharg (3) stator bo (3) earance earance appearan sent?	e muffler 5 (4 lts 12 (4 C N N cee g N C C N C C C C C C C C C C C C C C C	d) 4 d) 10 lean Yes No ray ray Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight earance carbon no wear Loaded Unloaded	1.3720
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was rotor Shell bott Quant	g torque of (2) 4 g torque of (2) 10 nuffler appe c? trictor? e plate appe r windings a o marks pre r loose? om appeara	discharg (3) stator bo (3) earance earance appearan sent? eance ng chips	e muffler 5 (4 lts 12 (4 C N N cee g N C C N C C C C C C C C C C C C C C C	l) 4 lean lean les lo ray ray les lo lean lean race	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy	1.3720 1.3720
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was rotor Shell bott Quant	g torque of (2) 4 g torque of (2) 10 nuffler appe c? trictor? e plate appe r windings a o marks pre r loose? om appeara	discharg (3) stator bo (3) earance earance appearan sent? eance ng chips	e muffler 5 (4 lts 12 (4 C N R ce g ce g te e muffler re	l) 4 lean lean les lo ray ray les lo lean lean race	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy Loaded Unloaded Unloaded	1.3720 1.3720 1.3750
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was rotot Shell bott Quant Remainin (1) 15	g torque of (2) 4 g torque of (2) 10 nuffler appears e plate appear windings a marks pre r loose? om appeara tity of bearing torque of	discharg (3) stator bo (3) earance earance appearance sent? ence ing chips discharg	e muffler 5 (4 lts 12 (4 C N sice g N c the muffler re 15 (4	e) 4 e) 10 lean es lo ray ray es lo lean race moved	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy Loaded Unloaded Unloaded	1.3720 1.3720 1.3750
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was roto Shell bott Quant Remainin (1) 15 Head gash Head suct	g torque of (2) 4 g torque of (2) 10 nuffler appears er trictor? e plate appears o marks pre r loose? om appears ity of bearing g torque of (2) 16 ket brittle? tion cavity a	discharg (3) stator bo (3) earance earance appearance sent? ence ing chips discharg (3) eappearance	e muffler 5 (4 lts 12 (4	e) 4 e) 10 lean es No ray ray es No lean race emoved	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy Loaded Unloaded Unloaded	1.3720 1.3720 1.3750
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was roto Shell bott Quant Remainin (1) 15 Head gash Head suct	g torque of (2) 4 g torque of (2) 10 nuffler appears er trictor? e plate appear windings a marks preer loose? om appearatity of bearing torque of (2) 16 ket brittle?	discharg (3) stator bo (3) earance earance appearance sent? ence ing chips discharg (3) eappearance	e muffler 5 (4 lts 12 (4	b) 4 c) 10 clean ces do gray cray ces do clean crace moved d) 15 b/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy Loaded Unloaded Unloaded (large end) none	1.3720 1.3720 1.3750
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato: Rotor rub Was rotor Shell bott Quant Remainin (1) 15 Head gasl Head suct Head disc Cage bear	g torque of (2) 4 g torque of (2) 10 nuffler appe e? trictor? e plate appe r windings a marks pre r loose? om appeara tity of bearing torque of (2) 16 ket brittle? tion cavity a charge cavit ring top app	discharg (3) stator bo (3) earance earance appearance ance ng chips discharg (3) appearancy appearance	e muffler 5 (4 lts 12 (4	l) 4 l) 10 lean lean les lo lean les lo lean lean lean lean lean lean lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy Loaded Unloaded (large end) none polish, slight	1.3720 1.3720 1.3750 1.3750
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato Rotor rub Was rotor Shell bott Quant Remainin (1) 15 Head gasl Head suct Head disc Cage bear Remainin	g torque of (2) 4 g torque of (2) 10 nuffler appears r trictor? e plate appear windings a marks pre r loose? om appeara tity of bearing torque of (2) 16 ket brittle? tion cavity a charge cavit ring top app	discharg (3) stator bo (3) earance earance appearance ance ng chips discharg (3) appearancy appearance	e muffler 5 (4 lts 12 (4 C N g ce g N ct te muffler re 15 (4 ce cl ance cl ring bolts	d) 4 d) 10 lean Ves No ray ray Ves No lean race moved d) 15 b/bonded ean ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy Loaded Unloaded (large end) none polish, slight Loaded	1.3720 1.3720 1.3750 1.3750
Remainin (1) 4 Remainin (1) 11 Suction m OEM flux Loose rest Discharge Top stato: Rotor rub Was rotor Shell bott Quant Remainin (1) 15 Head gasl Head suct Head disc Cage bear	g torque of (2) 4 g torque of (2) 10 nuffler appe e? trictor? e plate appe r windings a marks pre r loose? om appeara tity of bearing torque of (2) 16 ket brittle? tion cavity a charge cavit ring top app	discharg (3) stator bo (3) earance earance appearance ance ng chips discharg (3) appearancy appearance	e muffler 5 (4 lts 12 (4	l) 4 l) 10 lean lean les lo lean les lo lean lean lean lean lean lean lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance carbon no wear Loaded Unloaded low wear heavy Loaded Unloaded (large end) none polish, slight Loaded	1.3720 1.3720 1.3750 1.3750

Unit Number

Contaminants: Trash in liquid screen (g) 0.014 **Control Unit?** No **Number of screens** 2 0.412 Acid? Yes R-12? No Debris in compressor bottom (g)

R-22? Air? Yes No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish, medium Appearance **Dimensions** Loaded 0.4995 Suction surface appearance

Unloaded 0.4995

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear polish **Dimensions** Loaded 0.4975 0.4975 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.17 Water (ppm) 95 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 12 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

corrosion

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good

corrosion/blued **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearance corrosion/blued **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin black, brown medium gummy Spring slight gray gummy **Spring Seat** very slight gray gummy Ball medium black gummy **Front Side** heavy black gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid and Air 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid and Air 325 psig/75 psig



Report for R-407C Compressor with Contaminant Water and R-22

TEST HISTORY OF.				
Unit Number 51				
Model # RS43C1E-CAV-250 Serial	# 96F16492	Crank journals		
Run Time (hr.) 12018 Failed		Appearance	scored	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Dimensions	Unloaded	1.2470
Control Unit? No		Lower crank be		1.2470
Acid? No R-12? No			scored	
		Appearance		
Air? No R-22? Yes		Wear	polish	
H_2O ? Yes R-502 ? No		D:	T J . J	0.0005
	225	Dimensions	Loaded	0.9985
Discharge Pressure (psig)	325		Unloaded	0.9985
Suction Pressure (psig)	75		washer (crank side)	
Discharge Temp (°F)	141	Appearance	scored/corrosion	
Return Gas Temp (°F)	65	Wear	polish	
SumpTemp (°F)	81			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze b	oearings	
Suction exit trail appearance	black	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0035
Suction ring top appearance	clean		Unloaded	1.0035
Remaining torque of discharge muffler				
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 10 (2) 10 (3) 10	(4) 7.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green	2 1111011510115	Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore	Cinoaucu	1.3710
Was rotor loose?	No	Appearance	low wear/scored	
Shell bottom appearance	clean	Varnish ring	very slight	1 2760
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760 1.3760
Remaining torque of discharge muffler		a	Unloaded	1.3/60
(1) 15 (2) 15 (3) 15	(4) 15	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	slight	4.0=+0
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 5	(4) 5			
(1) 3 (2) 3 (c) 3	(1) 3			

Unit Number

Contaminants: Trash in liquid screen (g) 0.000 **Control Unit?** No Number of screens Acid? No R-12? No Debris in compressor bottom (g) 0.717 R-22? Air? No Yes

H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish Appearance

Dimensions Loaded 0.5010 Suction surface appearance Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion Wear polish

Dimensions Loaded 0.4970

0.4970 Unloaded Final Lubricant Values

Total Acid Number (TAN) 0.03 Water (ppm) 862 Fluoride ion (ppm) 0.86 Chloride ion (ppm) 13 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 4

Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer) Condition good corrosion

Suction reed

Condition good corrosion **Appearance Trepan** very slight Varnish ring very slight

Discharge side (reed backer) Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin black, brown very heavy gummy Spring slight gold gummy **Spring Seat** very slight gold gummy Ball black heavy gummy Front Side heavy black gummy

Photographic Documentation of R-407C Compressor with Contaminant Water and R-22 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

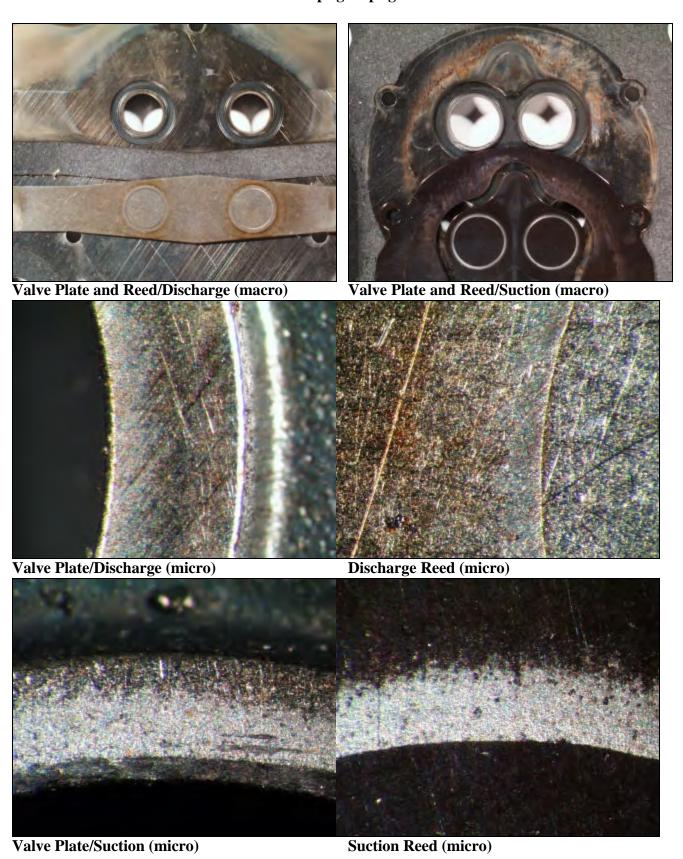


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Water and R-22 325 psig/75 psig



Report for R-407C Compressor with Contaminant Acid and Water

Unit Number 52				
Model # RS43C1E-CAV-250 Seria	l# 96F16482	Crank journals		
Run Time (hr.) 12031 Faile		Appearance	clean	
Refrigerant 407C	110	Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2475
Contaminants:		Difficusions	Unloaded	1.2475
Control Unit? No		Lower crank be		1.2473
Acid? Yes R-12? No			clean	
Air? No R-22? No		Appearance Wear		
H_2O ? Yes $R-502$? No		vvear	polish, slight	
1120: 1es K-302: No		Dimensions	Loaded	0.9990
Dischange Proggune (nois)	325	Difficusions	Unloaded	0.9990
Discharge Pressure (psig) Suction Pressure (psig)	323 75	Pottom thrust	washer (crank side)	0.9990
Discharge Temp (°F)	141	Appearance	corrosion	
	58	Wear Wear		
Return Gas Temp (°F)		vvear	polish, medium	
SumpTemp (°F)	81	Dottom work ow	(agating aids)	
Hi-Pot	2000	Bottom washer	clean	
	pass	Appearance Wear		
High-low leak	pass	Vvear Lower bronze	polish, slight	
Top shell appearance	clean		clean/corrosion	
Suction exit trail appearance	gray	Appearance		
Cluster block condition	good	Wear Dimensions	polish Loaded	1.0030
Wire to cluster block appearance	clean	Dimensions	Unloaded	1.0030
Suction ring top appearance	gray		Umoaded	1.0030
Remaining torque of discharge muffle (1) 4 (2) 3 (3) 4		Chaft in ages he	oning	
(1) 4 (2) 3 (3) 4 Remaining torque of stator bolts	(4) 3	Shaft in cage be Appearance	clean	
	(4) 0	Wear		
(1) 9 (2) 9 (3) 8	(4) 9		polish, slight	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes			
		Piston skirt		
Loose restrictor?	No	Piston skirt Appearance	low wear	
Loose restrictor? Discharge plate appearance	No gray		low wear Loaded	1.3730
		Appearance		1.3730 1.3730
Discharge plate appearance	gray	Appearance	Loaded	
Discharge plate appearance Top stator windings appearance	gray clean	Appearance Dimensions	Loaded	
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	gray clean No	Appearance Dimensions Cylinder bore Appearance	Loaded Unloaded low wear	
Discharge plate appearance Top stator windings appearance Rotor rub marks present?	gray clean No No	Appearance Dimensions Cylinder bore	Loaded Unloaded	
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	gray clean No No clean trace	Appearance Dimensions Cylinder bore Appearance Varnish ring	Loaded Unloaded low wear slight	1.3730
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	gray clean No No clean trace r removed	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	Loaded Unloaded low wear slight Loaded Unloaded	1.3730 1.3750
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	gray clean No No clean trace	Appearance Dimensions Cylinder bore Appearance Varnish ring	Loaded Unloaded low wear slight Loaded Unloaded	1.3730 1.3750
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14	gray clean No No clean trace r removed (4) 15	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	Loaded Unloaded low wear slight Loaded Unloaded (large end)	1.3730 1.3750
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle?	gray clean No No clean trace r removed (4) 15 yes	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	Loaded Unloaded low wear slight Loaded Unloaded (large end) none	1.3730 1.3750
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance	gray clean No No clean trace r removed (4) 15 yes clean	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight	1.3730 1.3750 1.3750
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray clean No No clean trace r removed (4) 15 yes clean clean clean	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight Loaded	1.3730 1.3750 1.3750 1.2505
Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	gray clean No No clean trace r removed (4) 15 yes clean clean clean	Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Loaded Unloaded low wear slight Loaded Unloaded (large end) none polish, slight Loaded	1.3730 1.3750 1.3750 1.2505

Unit Number 52

Contaminants:Trash in liquid screen (g)0.041Control Unit?NoNumber of screens1Acid?YesR-12?NoDebris in compressor bottom (g)0.280Air?NoR-22?No

Air? No **R-22?** No **H₂O?** Yes **R-502?** No

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5005Unloaded0.5005

Piston pin washers appearance

contact wear

Piston pin

Appearance clean
Wear polish
Dimensions Loade

Dimensions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values **Total Acid Number (TAN)** 0.10 Water (ppm) 369 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 11 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 4 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight brown gummy Spring very slight brown gummy **Spring Seat** very slight gray gummy Ball slight brown gummy Front Side medium brown gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid and Water 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

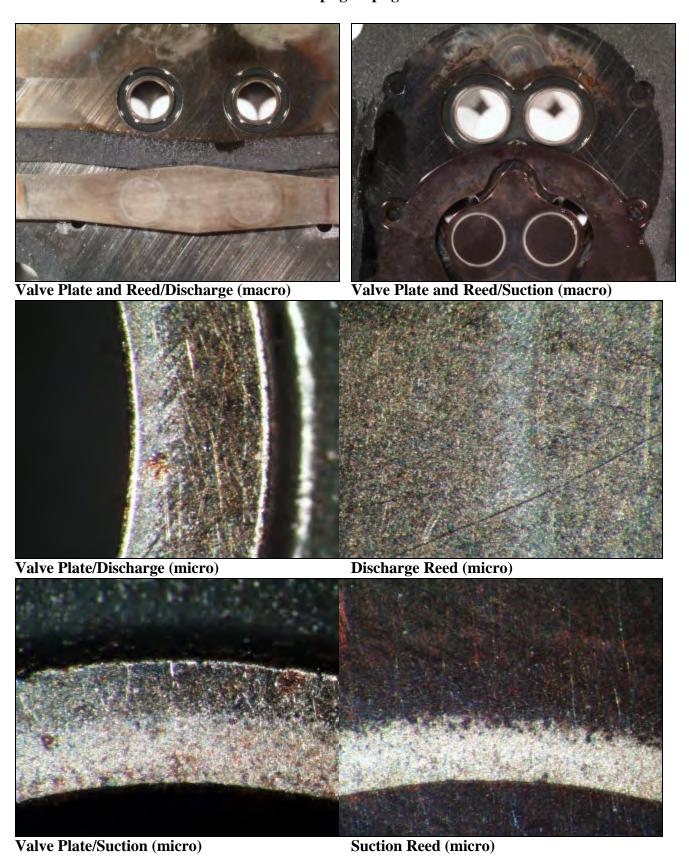


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid and Water 325 psig/75 psig



Report for R-407C Compressor with Contaminant Air and Water

Unit Number 53				
Unit Number 33				
Model # RS43C1E-CAV-250 Seria	l# 96F16491	Crank journals	S	
Run Time (hr.) 12002 Failed	!? No	Appearance	clean	
Refrigerant 407C		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2475
Contaminants:			Unloaded	1.2475
Control Unit? No		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes R-502? No		,,,	ponon, ong	
		Dimensions	Loaded	0.9995
Discharge Pressure (psig)	325		Unloaded	0.9995
Suction Pressure (psig)	75	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	141	Appearance	clean	
Return Gas Temp (°F)	58	Wear	polish, slight	
SumpTemp (°F)	81	,,,	ponon, ong	
Sumpremp(1)	01	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	Cu plating	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0020
Suction ring top appearance	bright/clean		Unloaded	1.0020
Remaining torque of discharge muffler	_			
(1) 3 (2) 4 (3) 4	(4) 3	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 10 (2) 11 (3) 11	(4) 10	Wear	polish, slight	
	` '		•	
Suction muffler appearance	clean	Piston top appe	earance varnish	
	clean Yes		earance varnish	
OEM flux?	Yes	Piston skirt		
OEM flux? Loose restrictor?	Yes No	Piston skirt Appearance	low wear	1.3730
OEM flux? Loose restrictor? Discharge plate appearance	Yes No clean	Piston skirt	low wear Loaded	1.3730 1.3730
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	Yes No clean clean	Piston skirt Appearance Dimensions	low wear	1.3730 1.3730
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	Yes No clean clean No	Piston skirt Appearance Dimensions Cylinder bore	low wear Loaded Unloaded	
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	Yes No clean clean No No	Piston skirt Appearance Dimensions Cylinder bore Appearance	low wear Loaded Unloaded low wear	
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	Yes No clean clean No No clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	low wear Loaded Unloaded low wear very slight	1.3730
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	Yes No clean clean No No clean trace	Piston skirt Appearance Dimensions Cylinder bore Appearance	low wear Loaded Unloaded low wear very slight Loaded	1.3730 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	Yes No clean clean No No clean trace r removed	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	low wear Loaded Unloaded low wear very slight Loaded Unloaded	1.3730
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14 (2) 15 (3) 14	Yes No clean clean No No clean trace r removed (4) 15	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo	low wear Loaded Unloaded low wear very slight Loaded Unloaded I (large end)	1.3730 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle?	Yes No clean clean No No clean trace r removed (4) 15 yes	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	low wear Loaded Unloaded low wear very slight Loaded Unloaded l (large end) scored	1.3730 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle. (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance	Yes No clean clean No No clean trace r removed (4) 15 yes clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	low wear Loaded Unloaded low wear very slight Loaded Unloaded l (large end) scored polish, medium	1.3730 1.3760 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	Yes No clean clean No No clean trace r removed (4) 15 yes clean clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	low wear Loaded Unloaded low wear very slight Loaded Unloaded I (large end) scored polish, medium Loaded	1.3730 1.3760 1.3760 1.2510
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	Yes No clean clean No No clean trace r removed (4) 15 yes clean clean clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	low wear Loaded Unloaded low wear very slight Loaded Unloaded l (large end) scored polish, medium	1.3730 1.3760 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	Yes No clean clean No No clean trace r removed (4) 15 yes clean clean clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	low wear Loaded Unloaded low wear very slight Loaded Unloaded I (large end) scored polish, medium Loaded	1.3730 1.3760 1.3760 1.2510

Unit Number

Contaminants: Trash in liquid screen (g) 0.000 **Control Unit?** No **Number of screens** Acid? No R-12? No Debris in compressor bottom (g) 0.405

Air? Yes R-22? No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer Wear medium Appearance **Dimensions** Loaded 0.5010 Suction surface appearance Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear polish **Dimensions** Loaded 0.4980 0.4980 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.05 Water (ppm) 74 Fluoride ion (ppm) 0.72 Chloride ion (ppm) 11 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 0

Lead (ppm) Silicon (ppm) Tin (ppm) Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer) Condition good corrosion

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring very slight

Discharge side (reed backer) Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat gummy slight gray **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight brown gummy Spring none none none **Spring Seat** slight gray gummy Ball slight black gummy Front Side medium black gummy

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0

0

Photographic Documentation of R-407C Compressor with Contaminant Air and Water 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air and Water 325 psig/75 psig



Report for R-407C Compressor with Contaminant Water

TT *4 NT 1				
Unit Number 54				
Model # RS43C1E-CAV-250 Serial	# 96F16501	Crank journals		
Run Time (hr.) 12011 Failed		Appearance	scored	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Difficusions	Unloaded	1.2470
		T		1.24/0
Control Unit? No		Lower crank be		
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? Yes R-502 ? No				
		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	325		Unloaded	0.9985
Suction Pressure (psig)	75	Bottom thrust v	washer (crank side)	
Discharge Temp (°F)	141	Appearance	scored/corrosion	
Return Gas Temp (°F)	65	Wear	slight	
SumpTemp (°F)	81			
r r v		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze k	1	
Suction exit trail appearance	black	Appearance	scored/corrosion	
Cluster block condition		Wear	polish	
Wire to cluster block appearance	good		*	1.0040
	clean	Dimensions	Loaded	
Suction ring top appearance	clean		Unloaded	1.0040
Remaining torque of discharge muffler	(4) 2.5			
(1) 5 (2) 2.5 (3) 2.5	(4) 2.5	Shaft in cage be	-	
Remaining torque of stator bolts		Appearance	clean	
			1' 1	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 10	Wear	polish	
(1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance	(4) 10 clean	Wear Piston top appe	-	
	• •		-	
Suction muffler appearance OEM flux?	clean	Piston top appe Piston skirt	arance clean	
Suction muffler appearance OEM flux? Loose restrictor?	clean Yes No	Piston top appe Piston skirt Appearance	arance clean no wear	1.3740
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean Yes No gray	Piston top appe Piston skirt	arance clean no wear Loaded	1.3740
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean Yes No gray clean/stator top green	Piston top appe Piston skirt Appearance Dimensions	arance clean no wear	1.3740 1.3740
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	clean Yes No gray clean/stator top green Yes	Piston top appe Piston skirt Appearance Dimensions Cylinder bore	no wear Loaded Unloaded	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean Yes No gray clean/stator top green Yes No	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	no wear Loaded Unloaded no wear	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean Yes No gray clean/stator top green Yes No clean	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	no wear Loaded Unloaded no wear slight	1.3740
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean Yes No gray clean/stator top green Yes No clean trace	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	no wear Loaded Unloaded no wear slight Loaded	1.3740 1.3760
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	clean Yes No gray clean/stator top green Yes No clean trace removed	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	no wear Loaded Unloaded no wear slight Loaded Unloaded	1.3740
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 15	clean Yes No gray clean/stator top green Yes No clean trace removed (4) 15	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	no wear Loaded Unloaded no wear slight Loaded Unloaded (large end)	1.3740 1.3760
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 15 Head gasket brittle?	clean Yes No gray clean/stator top green Yes No clean trace removed (4) 15 no/bonded	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored/corrosion	1.3740 1.3760
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 15	clean Yes No gray clean/stator top green Yes No clean trace removed (4) 15	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	no wear Loaded Unloaded no wear slight Loaded Unloaded (large end)	1.3740 1.3760
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 15 Head gasket brittle?	clean Yes No gray clean/stator top green Yes No clean trace removed (4) 15 no/bonded	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored/corrosion	1.3740 1.3760
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance	clean Yes No gray clean/stator top green Yes No clean trace removed (4) 15 no/bonded clean	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored/corrosion polish	1.3740 1.3760 1.3760
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean Yes No gray clean/stator top green Yes No clean trace removed (4) 15 no/bonded clean clean clean	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3760 1.3760 1.2515
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean Yes No gray clean/stator top green Yes No clean trace removed (4) 15 no/bonded clean clean clean	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3760 1.3760 1.2515

Unit Number

Contaminants: Trash in liquid screen (g) 0.019 **Control Unit?** No **Number of screens** Acid? No R-12? No Debris in compressor bottom (g) 0.873

Air? No R-22? No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/scored/corrosion

Wear polish **Dimensions** Loaded

0.5015 Unloaded 0.5015

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/corrosion

polish Wear

Dimensions Loaded 0.4980

0.4980 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.02 Water (ppm) 120 Fluoride ion (ppm) 1.7

Chloride ion (ppm) 9.7 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 5 Silicon (ppm) 0

Tin (ppm) Zinc (ppm)

heavy

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin heavy black gummy Spring very slight gray gummy **Spring Seat** very slight tarnished hard Ball heavy black gummy Front Side

0

brown

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good Appearance corrosion

Suction surface appearance corrosion

Suction reed

Condition good corrosion **Appearance Trepan** very slight Varnish ring very slight

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance

corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

gummy

Varnish ring none

Photographic Documentation of R-407C Compressor with Contaminant Water 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

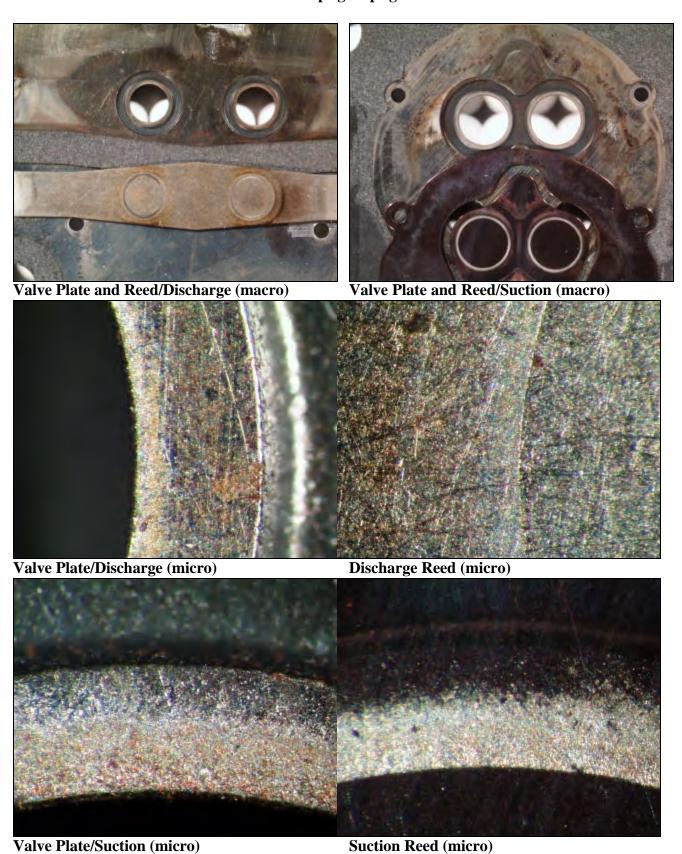


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Water 325 psig/75 psig



Report for R-407C Compressor with Contaminant Acid, Water, and R-22

TEST INSTORT OF				
Unit Number 55				
Model # RS43C1E-CAV-250 Serial	l# 96F16504	Crank journals	S	
Run Time (hr.) 2674 Failed	? Yes	Appearance	clean	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b	earing iournal	
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? Yes		Wear	polish	
H_2O ? Yes R-502? No		* * * Cu1	polish	
12,00		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	325	2 111011510115	Unloaded	0.9980
Suction Pressure (psig)	70	Bottom thrust	washer (crank side)	0.7700
Discharge Temp (°F)	153	Appearance	clean/bronze plating	
Return Gas Temp (°F)	58	Wear	polish	
SumpTemp (°F)	96	* * * Cu1	polish	
Sumplemp (1)	70	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	clean/bronze plating	
High-low leak	fail	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Difficultions	Unloaded	1.0030
Remaining torque of discharge muffler				1.0000
(1) ND (2) ND (3) ND	(4) ND	Shaft in cage b	earing	
Remaining torque of stator bolts	(-)	Appearance	clean	
(1) ND (2) ND (3) ND	(4) ND	Wear	polish	
Suction muffler appearance	metal chips	Piston top appo	•	
OEM flux?	Yes	Piston skirt	carance damaged	
Loose restrictor?	No		wear/scored	
		Appearance Dimensions	Loaded	1.3740
Discharge plate appearance	clean	Dimensions		
Top stator windings appearance	clean	C.P. J. J.	Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore	/ 1/0 1 .:	
Was rotor loose?	No	Appearance	wear/scored/Cu platin	ıg
Shell bottom appearance	clean	Varnish ring	heavy	4 27 40
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		~	Unloaded	1.3760
(1) ND (2) ND (3) ND	(4) ND	Connecting roo		
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	slight	1.0400
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2490
Cage bearing top appearance	dirty		Unloaded	1.2535
Remaining torque of cage bearing bolts				
(1) ND (2) ND (3) ND	(4) ND			

Unit Number

Contaminants: Trash in liquid screen (g) 0.021 **Control Unit?** No **Number of screens** 2 Acid? Yes R-12? No Debris in compressor bottom (g) 0.823 R-22? Air? No Yes

H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish Appearance corrosion **Dimensions** Loaded 0.5010 Unloaded 0.5010 corrosion/damaged

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance clean Wear none **Dimensions** Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.16 Water (ppm) 180 Fluoride ion (ppm) 1.8 Chloride ion (ppm) 10 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 16 Lead (ppm) 1 Silicon (ppm) 6 26 Tin (ppm)

Suction side (reed backer) Condition broken

Valve Plate Assembly Inspection

Suction surface appearance

Suction reed

Condition bent/cracked Appearance corrosion Trepan none Varnish ring none

Discharge side (reed backer) Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition broken Appearance corrosion **Trepan** none Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat very slight hard gray **Rear Pin** very slight hard gray **Equalizer Hole** slight gray hard Tip of Pin heavy black gummy Spring black heavy gummy **Spring Seat** very slight brown gummy Ball very slight brown gummy Front Side very slight brown gummy

2

Photographic Documentation of R-407C Compressor with Contaminant Acid, Water, and R-22 325 psig/70 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

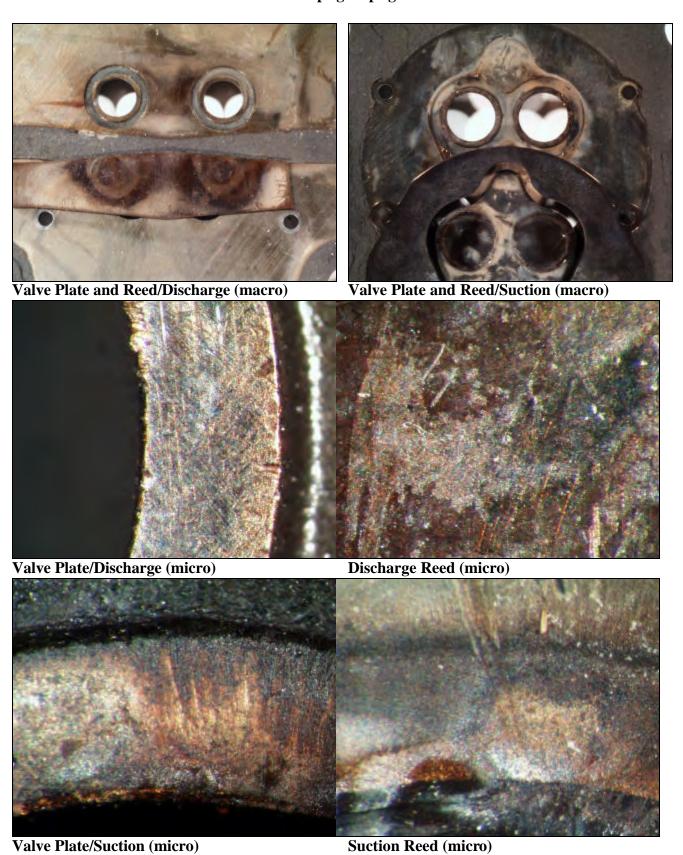


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Water, and R-22 325 psig/70 psig



295

Report for R-407C Compressor with Contaminant Acid, Air, Water, and R-22

ILDI IIIDIORI OI.				
Unit Number 56				
Model # RS43C1E-CAV-250 Serial	# 96F16478	Crank journals		
Run Time (hr.) 12010 Failed	? No	Appearance	scored/corrosion	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		
Acid? Yes R-12? No		Appearance	clean	
Air? Yes R-22? Yes		Wear	polish	
H_2O ? Yes $R-502$? No		vveui	ponsii	
1200 100 1100 110		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	325	2	Unloaded	0.9990
Suction Pressure (psig)	75	Bottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	141	Appearance	scored	
Return Gas Temp (°F)	65	Wear	slight	
SumpTemp (°F)	81	vveui	Siight	
Sumplemp (1)	01	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze l		
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0035
Suction ring top appearance	clean	Differentiations	Unloaded	1.0035
Remaining torque of discharge muffler			Cinouaca	1.0033
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage be	arino	
Remaining torque of stator bolts	(4) 3	Appearance	clean	
(1) 10 (2) 15 (3) 7.5	(4) 10	Wear	polish	
	* *		-	
Suction muffler appearance	clean	Piston top appe	arance carbon	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/scored	
Discharge plate appearance	soot	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/corrosion	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	removed		Unloaded	1.3760
(1) 15 (2) 15 (3) 17.5	(4) 17.5	Connecting rod	(large end)	
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts	1			
(1) 5 (2) 5 (3) 5	(4) 5			

Unit Number 56

Contaminants: Trash in liquid screen (g) 0.002 **Control Unit?** No **Number of screens** Acid? Yes R-12? No Debris in compressor bottom (g) 0.685 R-22? Air? Yes Yes

 H_2O ? Yes **R-502**? No

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.5015Unloaded0.5015

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion
Wear polish
Dimensions Loaded

Loaded 0.4975 **Unloaded** 0.4975

Final Lubricant Values **Total Acid Number (TAN)** 0.15 Water (ppm) 206 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 13 Aluminum (ppm) 1 3 Copper (ppm) Iron (ppm) 6 3

Lead (ppm) 3
Silicon (ppm) 7
Tin (ppm) 0
Zinc (ppm) 14

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat very slight tarnished hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium gummy gray Spring slight black gummy **Spring Seat** slight black gummy Ball medium gray gummy Front Side medium black hard

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, Water, and R-22 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, Water, and R-22 325 psig/75 psig





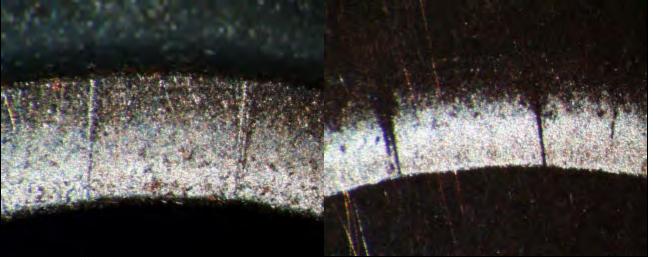
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-407C Compressor with Contaminant Air, Water, and R-22

ILDI IIIDIONI OI.				
Unit Number 57				
Model # RS43C1E-CAV-250 Serial	l# 96F16494	Crank journals	5	
Run Time (hr.) 12021 Failed	l? No	Appearance	clean/scored	
Refrigerant 407C		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2450
Contaminants:			Unloaded	1.2450
Control Unit? No		Lower crank b		
Acid? No R-12? No		Appearance	varnish	
Air? Yes R-22? Yes		Wear	polish, slight	
H_2O ? Yes R-502 ? No		· · · cai	ponsii, siigiit	
12,00		Dimensions	Loaded	0.9965
Discharge Pressure (psig)	325	2 111011010110	Unloaded	0.9965
Suction Pressure (psig)	75	Bottom thrust	washer (crank side)	0.7705
Discharge Temp (°F)	141	Appearance	corrosion	
Return Gas Temp (°F)	58	Wear	slight	
SumpTemp (°F)	81	· · · cai	Siigiit	
Sumplemp (1)	01	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	bright, clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0005
Suction ring top appearance	bright		Unloaded	1.0000
Remaining torque of discharge muffler	_			
(1) 4 (2) 5 (3) 4	(4) 4	Shaft in cage b	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 12 (2) 11 (3) 10	(4) 10	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	-	
OEM flux?	No	Piston skirt	cui unec cicun	
Loose restrictor?	No		lovy wood	
		Appearance Dimensions	low wear Loaded	1.3700
Discharge plate appearance	gray	Difficusions	Unloaded	1.3700
Top stator windings appearance	clean	C-1: J b	Umoaded	1.5700
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	4 2525
Quantity of bearing chips	trace	Dimensions	Loaded	1.3735
Remaining torque of discharge muffler		~	Unloaded	1.3735
(1) 5 (2) 4 (3) 4	(4) 4	Connecting roo		
Head gasket brittle?	yes	Appearance	none	
Head suction cavity appearance	clean	Wear	polish, slight	1.2405
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2485
Cage bearing top appearance	clean		Unloaded	1.2485
Remaining torque of cage bearing bolts				
(1) 5 (2) 6 (3) 5	(4) 6			

Unit Number 57

Contaminants:
Control Unit? No
Acid? No R-12?

Air? Yes **R-22?** Yes **H₂O?** Yes **R-502?** No

Trash in liquid screen (g) 0.006
Number of screens 1
Debris in compressor bottom (g) 0.899

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearmediumDimensionsLoaded0.4990

Unloaded 0.4990

No

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/corrosion

Wear slight

Dimensions Loaded 0.4960 Unloaded 0.4960

Final Lubricant Values **Total Acid Number (TAN)** 0.08 Water (ppm) 187 Fluoride ion (ppm) 0.75 Chloride ion (ppm) 11 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 Silicon (ppm) 6 0 Tin (ppm) Zinc (ppm) 0 Suction side (reed backer)
Condition good

Appearance corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin black, brown medium gummy Spring brown slight gummy **Spring Seat** slight brown gummy Ball medium black gummy Front Side heavy black gummy

Photographic Documentation of R-407C Compressor with Contaminant Air, Water, and R-22 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

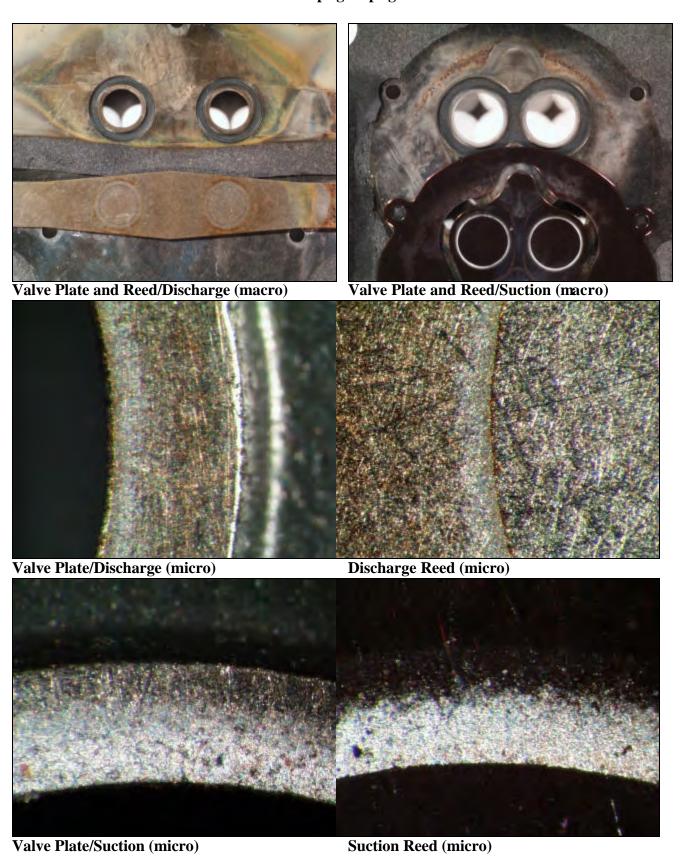


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air, Water, and R-22 325 psig/75 psig



Report for R-407C Compressor with Contaminant Acid, Air, and Water

TEST INSTORT OF.				
Unit Number 58				
Model # RS43C1E-CAV-250 Seria	al# 96F16484	Crank journals		
Run Time (hr.) 12012 Faile	ed? No	Appearance	clean	
Refrigerant 407C		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank be	earing journal	
Acid? Yes R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes R-502 ? No		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ponon, onghi	
2		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	325		Unloaded	0.9990
Suction Pressure (psig)	75	Bottom thrust	washer (crank side)	0.,,,,
Discharge Temp (°F)	141	Appearance	clean	
Return Gas Temp (°F)	58	Wear	polish, medium	
SumpTemp (°F)	81	,,,	ponon, mourum	
Sumpremp(1)	01	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	fail	Wear	polish, slight	
Top shell appearance	gray	Lower bronze l		
Suction exit trail appearance	gray	Appearance	clean/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	bright		Unloaded	1.0030
Remaining torque of discharge muffle				
(1) 4 (2) 5 (3) 4	(4) 4	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 9 (2) 11 (3) 9	(4) 12	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe		
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	black	Dimensions	Loaded	1.3715
Top stator windings appearance	gray	2	Unloaded	1.3715
Rotor rub marks present?	No	Cylinder bore		1.0 / 10
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffle		Difficusions	Unloaded	1.3760
(1) 16 (2) 14 (3) 15	(4) 14	Connecting rod		1.5700
Head gasket brittle?	yes	Appearance	Cu plating	
Head suction cavity appearance	clean	Wear	polish, slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean	Dimensions	Unloaded	1.2510
Remaining torque of cage bearing bol			Omoaucu	1.2310
(1) 4 (2) 5 (3) 4	(4) 4			
\=, \ \ = , \ \	\ - / ·			
	. ,			

Unit Number

Contaminants: Trash in liquid screen (g) 0.002 **Control Unit?** No **Number of screens** Acid? Debris in compressor bottom (g) 0.429 Yes R-12? No Air? Yes R-22? No

H₂O? Yes R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish, slight **Appearance** Dimensions Loaded 0.5010

Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/Cu plating

Wear medium **Dimensions** Loaded 0.4998

Unloaded 0.4998

Final Lubricant Values	
Total Acid Number (TAN)	0.11
Water (ppm)	68
Fluoride ion (ppm)	0.85
Chloride ion (ppm)	13
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	6
Tin (ppm)	0
Zinc (ppm)	0

Valve Plate Assembly Inspection

Suction side (reed backer) corrosion Suction surface appearance

Suction reed

Condition good Appearance corrosion Trepan very slight Varnish ring none

Discharge side (reed backer) Condition good Appearance corrosion Discharge surface appearance

corrosion

Discharge reed Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black, brown	gummy
Spring	medium	black	gummy
Spring Seat	very slight	gray	hard
Ball	medium	black	gummy
Front Side	medium	gray	gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and Water 325 psig/75 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

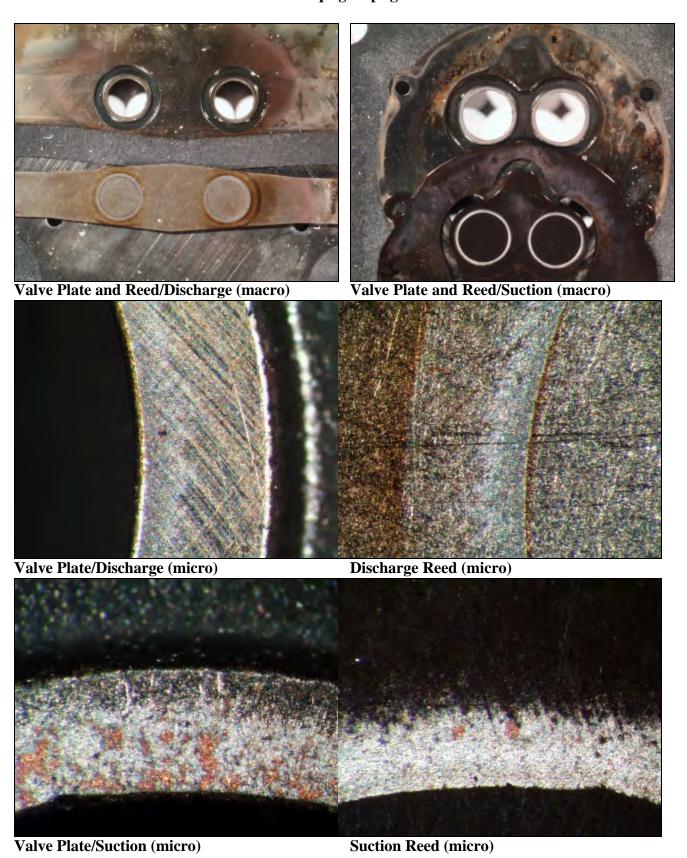


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and Water 325 psig/75 psig



Report for R-407C Control Compressor

ILDI IIIDIORI OI.				
Unit Number 59				
Model # RS43C1E-CAV-250 Serial	l# 96F16481	Crank journals	S	
Run Time (hr.) 12369 Failed	l? No	Appearance	clean	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? Yes		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No R-502? No		* * * * * * * * * * * * * * * * * * * *	ponsii	
11201 110		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	325	2 111011010110	Unloaded	0.9990
Suction Pressure (psig)	70	Bottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	153	Appearance	clean/bronze plating	
Return Gas Temp (°F)	58	Wear	polish	
SumpTemp (°F)	96	· · · cai	ponsii	
Sumpremp(1)	70	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Difficusions	Unloaded	1.0030
Remaining torque of discharge muffler			Cindudu	1.0050
(1) 3.3 (2) 3.8 (3) 3.3	(4) 3.3	Shaft in cage b	earing	
Remaining torque of stator bolts	(1) 3.3	Appearance	clean	
(1) 2.9 (2) 2.9 (3) 2.9	(4) 2.9	Wear	polish	
	clean		•	
Suction muffler appearance		Piston top appe	cal ance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	none	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	r removed		Unloaded	1.3760
(1) 15 (2) 15 (3) 15	(4) 15	Connecting roo	d (large end)	
Head gasket brittle?	yes/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 5	(4) 4			

Unit Number 59

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.014Number of screens2Debris in compressor bottom (g)0.917

Valve Plate Assembly Inspection

good

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Appearance corrosion
Suction surface appearance
corrosion

Suction side (reed backer)

Condition

Suction reed

Piston pin washers appearance

contact wear

Piston pin

Tin (ppm)

Zinc (ppm)

Appearance clean
Wear polish
Dimensions Loaded

Loaded 0.4980 **Unloaded** 0.4980

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Final Labelson Value

Final Lubricant Values Total Acid Number (TAN) 0.16 Water (ppm) 187 Fluoride ion (ppm) 0.82 Chloride ion (ppm) 12 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm)

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance
corrosion

Discharge reed Condition

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	very slight	brown	gummy
Tip of Pin	medium	brown	gummy
Spring	medium	black, gray	gummy
Spring Seat	medium	brown	gummy
Ball	medium	brown	gummy
Front Side	none	none	none

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Photographic Documentation of R-407C Control Compressor 325 psig/70 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

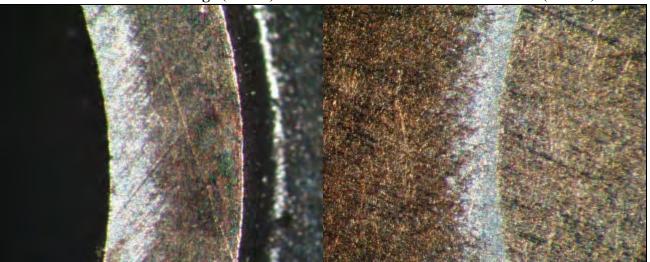
Photographic Documentation of R-407C Control Compressor 325 psig/70 psig





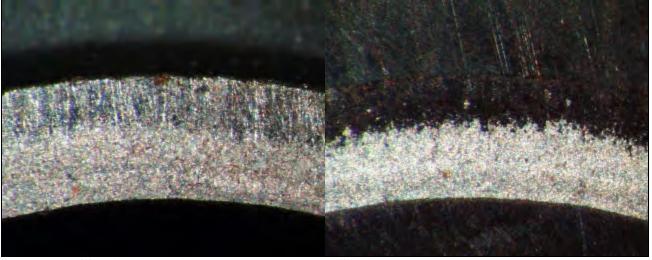
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-407C Control Compressor

Unit Number 60				
Model # RS43C1E-CAV-250 Serial	# 96F16843	Crank journals	,	
Run Time (hr.) 12027 Failed				
	1: 100	Appearance	clean	
Refrigerant 407C		Wear	polish	1 2465
Lubricant RL32S		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? Yes		Lower crank b		
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No				
		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	200		Unloaded	0.9985
Suction Pressure (psig)	35		washer (crank side)	
Discharge Temp (°F)	193	Appearance	clean	
Return Gas Temp (°F)	61	Wear	polish	
SumpTemp (°F)	162			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/scored	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze	bearings	
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0035
Suction ring top appearance	clean		Unloaded	1.0035
Remaining torque of discharge muffler	•			
(1) 4.2 (2) 5.4 (3) 3.3	(4) 2.9	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 11.7 (2) 11.7 (3) 11.7	(4) 11.7	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean	Difficusions	Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore	Cinoaucu	1.3740
Was rotor loose?	No	•	no woor	
		Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	slight	1.07.60
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 15 (3) 14	(4) 14	Connecting roo	_	
Head gasket brittle?	yes/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	slight	1 2515
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2515
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 6	(4) 5			

Unit Number	60
Contaminants:	

Control Unit? Yes Acid? R-12? No No Air? R-22? No No H₂O? R-502? No No Trash in liquid screen (g) 0.000 **Number of screens** 0.894 Debris in compressor bottom (g)

Valve Plate Assembly Inspection

good

good

corrosion

very slight

very slight

corrosion

corrosion

Suction side (reed backer)

Suction surface appearance

Condition

Suction reed

Condition

Trepan

Appearance

Varnish ring

Appearance

corrosion

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish **Dimensions** Loaded 0.5005 Unloaded 0.5005

Piston pin washers appearance

contact wear

Piston pin

Appearance scored polish Wear **Dimensions** Loaded

0.4980 Unloaded

Discharge side (reed backer) Condition good

Final Lubricant Values Appearance **Total Acid Number (TAN)** 0.08 Discharge surface appearance 179 corrosion

0.4975

Water (ppm) Fluoride ion (ppm) 1.8 Chloride ion (ppm) 9.7 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 2

Silicon (ppm) Tin (ppm) Zinc (ppm)

Discharge reed Condition good Appearance corrosion **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	hard
Rear Pin	slight	brown	gummy
Equalizer Hole	very slight	gray	hard
Tip of Pin	very heavy	brown	gummy
Spring	medium	brown	gummy
Spring Seat	medium	brown	gummy
Ball	medium	brown	gummy
Front Side	slight	brown	gummy

0

0

Photographic Documentation of R-407C Control Compressor 200 psig/35 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

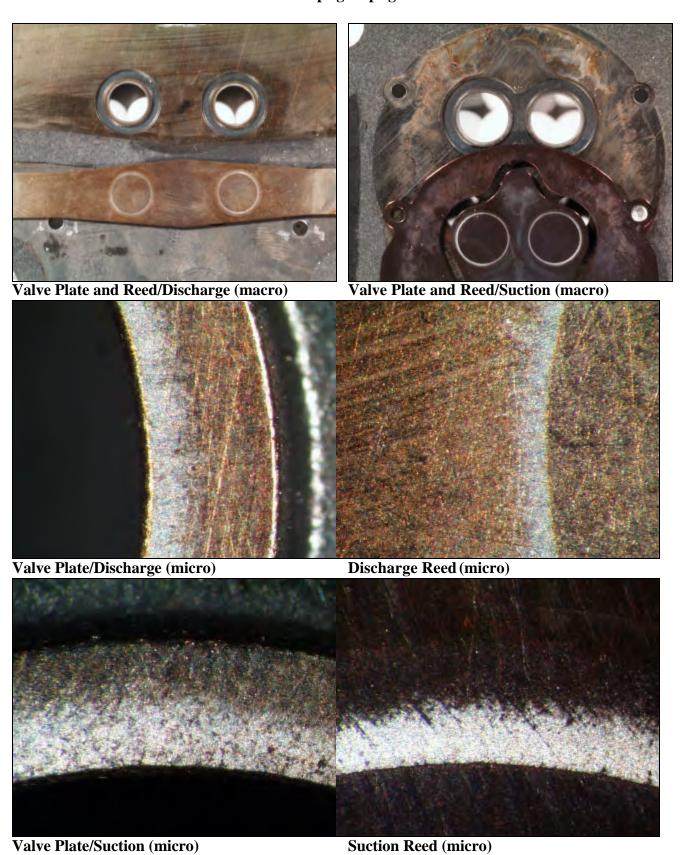


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Control Compressor 200 psig/35 psig



Report for R-407C Control Compressor

Contaminants: Unloaded 1.2 Control Unit? Yes Lower crank bearing journal Acid? No R-12? No Appearance clean Air? No R-22? No Wear polish H ₂ O? No R-502? No Dimensions Loaded 0.9	2465 2465 9985 9985
Run Time (hr.) 12014 Failed? No Appearance wear clean/corrosion Refrigerant 407C Wear polish Lubricant RL32S Dimensions Loaded 1.2 Contaminants: Unloaded 1.2 Control Unit? Yes Lower crank bearing journal Acid? No R-12? No Appearance clean Air? No R-22? No Wear polish H₂O? No R-502? No Wear polish Discharge Pressure (psig) 200 Unloaded 0.9 Suction Pressure (psig) 35 Bottom thrust washer (crank side) 0.9 SumpTemp (°F) 61 Wear polish SumpTemp (°F) 61 Wear polish Hi-Pot pass Appearance clean High-low leak pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	2465 9985
Refrigerant 407C Lubricant RL32S Contaminants: Control Unit? Yes Lower crank bearing journal Acid? No R-12? No Appearance clean Air? No R-22? No H ₂ O? No R-502? No Dimensions Loaded 0.9 Suction Pressure (psig) 200 Suction Pressure (psig) 35 Suction Pressure (psig) 35 Bottom thrust washer (crank side) Discharge Temp (°F) 193 Return Gas Temp (°F) 61 SumpTemp (°F) 162 Hi-Pot pass Hi-Pot pass High-low leak Top shell appearance gray Wear polish Loaded 0.9 Unloaded 0.9 Bottom thrust washer (crank side) Wear polish Bottom washer (casting side) Appearance clean Appearance clean High-low leak Top shell appearance	2465 9985
Lubricant RL32S Dimensions Loaded 1.2	2465 9985
Control Unit? Yes Acid? No R-12? No Air? No R-22? No H ₂ O? No R-502? No Discharge Pressure (psig) Suction Pressure (psig) Suction Pressure (psig) Suction Gas Temp (°F) In SumpTemp (°F) In S	2465 9985
Control Unit? Yes Acid? No R-12? No Air? No R-22? No H ₂ O? No R-502? No Dimensions Loaded 0.9 Suction Pressure (psig) 35 Bottom thrust washer (crank side) Discharge Temp (°F) 193 Return Gas Temp (°F) 61 SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower crank bearing journal Appearance clean Bottom thrust washer (crank side) Wear polish Bottom washer (casting side) Appearance clean High-low leak pass Wear polish Lower bronze bearings	9985
Acid? No R-12? No Wear polish H2O? No R-502? No Dimensions Loaded 0.9 Suction Pressure (psig) 35 Bottom thrust washer (crank side) Discharge Temp (°F) 193 Return Gas Temp (°F) 61 SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
Air? No R-22? No H ₂ O? No R-502? No Dimensions Loaded 0.9 Suction Pressure (psig) 35 Discharge Temp (°F) 193 Return Gas Temp (°F) 61 SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Wear polish Bottom washer (casting side) Appearance clean Bottom washer (casting side) Appearance clean Lower bronze bearings	
H2O? No R-502? No Dimensions Loaded 0.9	
Discharge Pressure (psig) 200 Unloaded 0.9 Suction Pressure (psig) 35 Bottom thrust washer (crank side) Discharge Temp (°F) 193 Appearance clean/bronze plating Return Gas Temp (°F) 61 Wear polish SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
Discharge Pressure (psig) 200 Unloaded 0.9 Suction Pressure (psig) 35 Bottom thrust washer (crank side) Discharge Temp (°F) 193 Appearance clean/bronze plating Return Gas Temp (°F) 61 Wear polish SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
Suction Pressure (psig) 35 Discharge Temp (°F) 193 Return Gas Temp (°F) 61 SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	9985
Discharge Temp (°F) 193 Appearance clean/bronze plating Return Gas Temp (°F) 61 Wear polish SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
Return Gas Temp (°F) 61 Wear polish SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
SumpTemp (°F) 162 Bottom washer (casting side) Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
Hi-Pot pass Appearance clean High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
Hi-PotpassAppearancecleanHigh-low leakpassWearpolishTop shell appearancegrayLower bronze bearings	
High-low leak pass Wear polish Top shell appearance gray Lower bronze bearings	
Top shell appearance gray Lower bronze bearings	
Suction exit trail annearance black Annearance scored/corrosion	
Sucrion can uppearance out the suppearance scored/contosion	
Cluster block condition good Wear polish	
Wire to cluster block appearance clean Dimensions Loaded 1.0	0035
Suction ring top appearance clean Unloaded 1.0	0035
Remaining torque of discharge muffler	
(1) 3 (2) 3 (3) 3 (4) 3 Shaft in cage bearing	
Remaining torque of stator bolts Appearance clean	
(1) 14 (2) 14 (3) 10 (4) 10 Wear polish	
Suction muffler appearance clean Piston top appearance clean	
OEM flux? Yes Piston skirt	
Loose restrictor? No Appearance no wear	
11	3740
	3740
Rotor rub marks present? No Cylinder bore	,, 10
Was rotor loose? No Appearance no wear	
**	
Shell bottom appearance clean Varnish ring very slight Quantity of bearing chips slight Dimensions Loaded 1.3	3760
	3760 3760
· ·	,,00
Head gasket brittle?yes/bondedAppearancescoredHead suction cavity appearancecleanWearslight	
	2510
0 1 1	2510 2510
	.510
0 0 1 11	
Remaining torque of cage bearing bolts (1) 5 (2) 5 (3) 5 (4) 5	

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)	0.000
Number of screens	1
Debris in compressor bottom (g)	0.314

Valve Plate Assembly Inspection

good

good

corrosion

very slight

corrosion

Suction side (reed backer)

Suction surface appearance

Condition

Suction reed

Condition

Trepan

Appearance

Appearance

corrosion

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance scored Wear polish Dimensions Loaded

Loaded 0.4975 **Unloaded** 0.4975

very slight
(reed backer)

Condition good
Appearance corrosion
Discharge surface appearance

corrosion

Final Lubricant Values	
Total Acid Number (TAN)	0.11
Water (ppm)	167
Fluoride ion (ppm)	1.6
Chloride ion (ppm)	9.9
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	8
Tin (ppm)	0
Zinc (ppm)	1

Discharge reed
ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	brown	hard
Rear Pin	very slight	gray	hard
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	gray	hard
Spring Seat	medium	black	hard
Ball	heavy	black	gummy
Front Side	very slight	gray	hard

Photographic Documentation of R-407C Control Compressor 200 psig/35 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

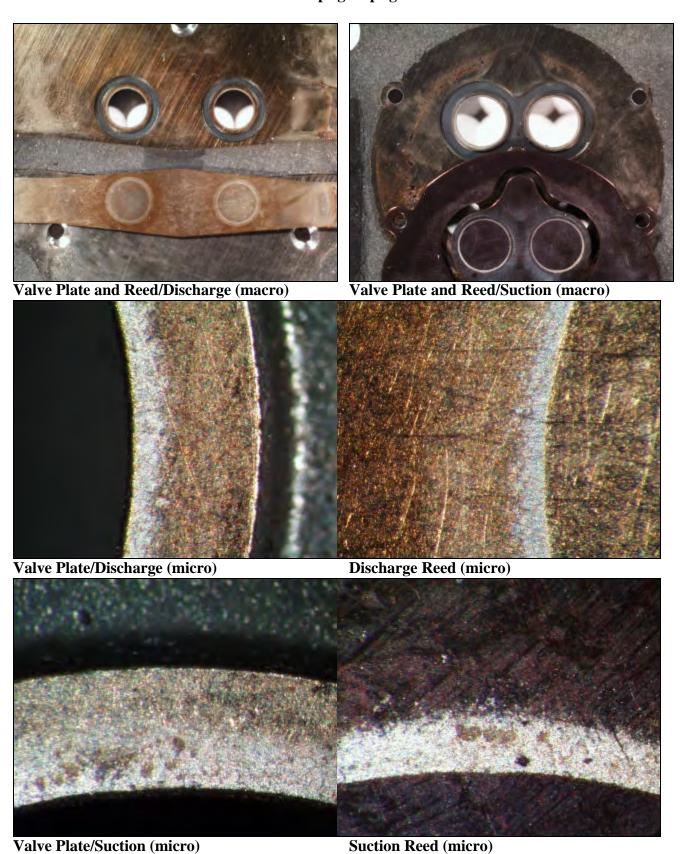


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Control Compressor 200 psig/35 psig



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Report for R-407C Compressor with Contaminant R-22

Unit Number 62		
Model # RS43C1E-CAV-250 Serial	# 96F16476	Crank journals
Run Time (hr.) 12027 Failed	? No	Appearance clean
Refrigerant 407C		Wear polish, medium
Lubricant RL32S		Dimensions Loaded 1.2470
Contaminants:		Unloaded 1.2470
Control Unit? No		Lower crank bearing journal
Acid? No R-12? No		Appearance clean
Air? No R-22? Yes		Wear polish, slight
H_2O ? No $R-502$? No		
		Dimensions Loaded 0.9990
Discharge Pressure (psig)	200	Unloaded 0.9990
Suction Pressure (psig)	40	Bottom thrust washer (crank side)
Discharge Temp (°F)	180	Appearance clean/Cu plating
Return Gas Temp (°F)	62	Wear polish, medium
SumpTemp (°F)	147	
		Bottom washer (casting side)
Hi-Pot	pass	Appearance clean
High-low leak	pass	Wear polish, slight
Top shell appearance	clean	Lower bronze bearings
Suction exit trail appearance	gray	Appearance clean
Cluster block condition	good	Wear polish, slight
Wire to cluster block appearance	clean	Dimensions Loaded 1.0030
Suction ring top appearance	clean	Unloaded 1.0030
Remaining torque of discharge muffler		
(1) 4 (2) 4 (3) 5	(4) 4	Shaft in cage bearing
Remaining torque of stator bolts	40.44	Appearance corrosion
(1) 10 (2) 10 (3) 10	(4) 11	Wear polish, slight
Suction muffler appearance	clean	Piston top appearance clean
OEM flux?	Yes	Piston skirt
Loose restrictor?	No	Appearance low wear
Discharge plate appearance	gray	Dimensions Loaded 1.3720
Top stator windings appearance	clean	Unloaded 1.3720
Rotor rub marks present?	No	Cylinder bore
Was rotor loose?	No	Appearance low wear
Shell bottom appearance	clean	Varnish ring medium
Quantity of bearing chips	trace	Dimensions Loaded 1.3755
Remaining torque of discharge muffler	removed	Unloaded 1.3750
(1) 16 (2) 15 (3) 15	(4) 15	Connecting rod (large end)
Head gasket brittle?	yes	Appearance none
Head suction cavity appearance	clean	Wear polish, slight
Head discharge cavity appearance	clean	Dimensions Loaded 1.2505
Cage bearing top appearance	clean	Unloaded 1.2505
Remaining torque of cage bearing bolts		
(1) 4 (2) 5 (3) 5	(4) 4	

Unit Number	62
Contaminants:	

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 Yes

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g) 0.074
Number of screens 2
Debris in compressor bottom (g) 0.586

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolish, mediumDimensionsLoaded0.5005Unloaded0.5005

Piston pin washers appearance

contact wear

Piston pin

Appearance clean

Wear polish, medium
Dimensions Loaded 0.4980

Unloaded 0.4980

Final Lubricant Values	
Total Acid Number (TAN)	0.13
Water (ppm)	153
Fluoride ion (ppm)	1.3
Chloride ion (ppm)	10
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	8
Tin (ppm)	1
Zinc (ppm)	0

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	slight	gray	hard
Tip of Pin	heavy	black	gummy
Spring	slight	gray	gummy
Spring Seat	slight	gray	gummy
Ball	medium	gray	gummy
Front Side	medium	gray	gummy

Photographic Documentation of R-407C Compressor with Contaminant R-22 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

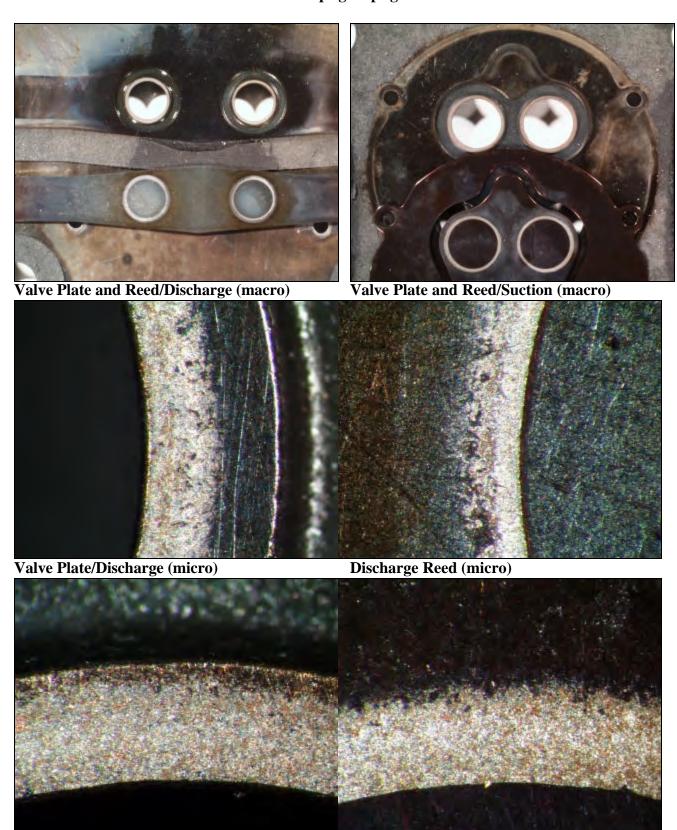


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant R-22 200 psig/40 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

Report for R-407C Compressor with Contaminant Acid

ILSI IIISIORI OI:				
Unit Number 63				
Model # RS43C1E-CAV-250 Serial	# 96F16503	Crank journals	1	
Run Time (hr.) 12045 Failed	? No	Appearance	clean	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		1.2 . , 0
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		vv car	ponsii	
11,0. 110 K 202. 110		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	200	Dimensions	Unloaded	0.9985
Suction Pressure (psig)	40	Rottom thrust	washer (crank side)	0.7703
Discharge Temp (°F)	180	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	147	vv car	mearam	
Sumpremp(T)	147	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/corrosion	
High-low leak	pass	Wear	slight	
Top shell appearance	clean	Lower bronze	•	
Suction exit trail appearance	black	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	gray	Dimensions	Unloaded	1.0030
Remaining torque of discharge muffler			Cinoaucu	1.0050
(1) 5 (2) 2.5 (3) 2.5	(4) 2.5	Shaft in cage be	aring	
Remaining torque of stator bolts	(4) 2.3	Appearance	corrosion	
(1) 17.5 (2) 12.5 (3) 15	(4) 12.5	Wear	polish	
	* *		•	
Suction muffler appearance	clean	Piston top appe	earance damaged	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	medium wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3755
Remaining torque of discharge muffler	removed		Unloaded	1.3755
(1) 17.5 (2) 15 (3) 15	(4) 15	Connecting rod	l (large end)	
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts	}			
(1) 2.5 (2) 5 (3) 5	(4) 5			

Unit Number 63

Contaminants:

Control Unit? No

Acid? Yes R-12? No

Pebris in compressor bottom (g)

Debris in compressor bottom (g)

No

R-22? No

 $\begin{array}{cccc} \textbf{Air?} & \text{No} & \textbf{R-22?} & \text{No} \\ \textbf{H_2O?} & \text{No} & \textbf{R-502?} & \text{No} \end{array}$

Connecting rod (small end)

Appearancecontact wear/correct washerWearmediumDimensionsLoaded0.5015Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance corrosion
Wear medium
Dimensions Loaded

Unloaded 0.4975

0.4975

Final Lubricant Values **Total Acid Number (TAN)** 0.17 Water (ppm) 39 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 9.2 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 2 Lead (ppm) 1 6 Silicon (ppm) 3 Tin (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)
Condition good
Appearance corrosion

Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat very slight tarnished hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin black, brown heavy gummy Spring medium gray gummy **Spring Seat** medium gray gummy brown Ball heavy gummy **Front Side** medium black gummy

2

Photographic Documentation of R-407C Compressor with Contaminant Acid 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

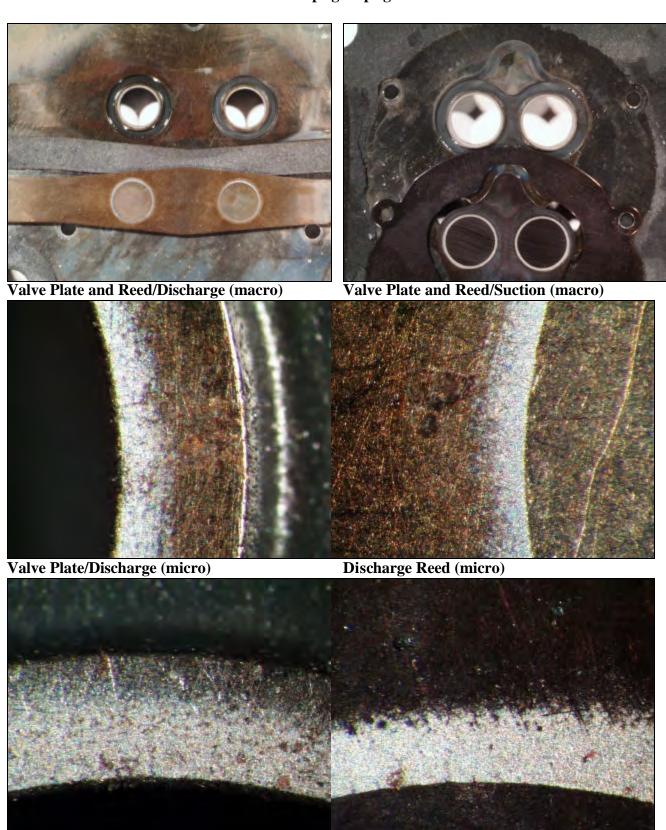


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid 200 psig/40 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

327

Report for R-407C Compressor with Contaminant Air

Unit Number 64				
	L# 06E16405	Carala tarrarala		
Model # RS43C1E-CAV-250 Seria		Crank journals		1
Run Time (hr.) 12042 Failed	l? No	Appearance	scored/heavily discolo	rea
Refrigerant 407C		Wear	polish	1.0.450
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		
Acid? No R-12? No		Appearance	clean/heavily discolor	ed
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? No				
		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	200		Unloaded	0.9990
Suction Pressure (psig)	40	Bottom thrust v	washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/bronze plating/	corrosion
Return Gas Temp (°F)	62	Wear	polish	
SumpTemp (°F)	147			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/bronze plating	
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze b		
Suction exit trail appearance	gray	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0035
			Unloaded	
Suction ring top appearance	grav/discolored		Omoaded	1.0055
Suction ring top appearance Remaining torque of discharge muffler	gray/discolored r		Ullioaueu	1.0035
Remaining torque of discharge muffle	r	Shaft in cage be		1.0055
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1		Shaft in cage be	earing	1.0033
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts	r (4) 1	Appearance	earing heavily discolored	1.0033
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10	(4) 1 (4) 12.5	Appearance Wear	earing heavily discolored polish	1.0033
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance	(4) 1 (4) 12.5 gray	Appearance Wear Piston top appe	earing heavily discolored polish	1.0033
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux?	(4) 1 (4) 12.5 gray Yes	Appearance Wear Piston top appe Piston skirt	earing heavily discolored polish arance clean	1.0033
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 1 (4) 12.5 gray	Appearance Wear Piston top appe Piston skirt Appearance	earing heavily discolored polish arance clean no wear	
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 1 (4) 12.5 gray Yes No gray	Appearance Wear Piston top appe Piston skirt	heavily discolored polish arance clean no wear Loaded	1.3740
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 1 (4) 12.5 gray Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing heavily discolored polish arance clean no wear	
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 1 (4) 12.5 gray Yes No gray	Appearance Wear Piston top appe Piston skirt Appearance	heavily discolored polish arance clean no wear Loaded	1.3740
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	heavily discolored polish arance clean no wear Loaded	1.3740
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing heavily discolored polish arance clean no wear Loaded Unloaded	1.3740
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	heavily discolored polish arance clean no wear Loaded Unloaded	1.3740
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded	1.3740 1.3740 1.3760
Remaining torque of discharge mufflet (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace r removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded Unloaded	1.3740 1.3740
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 10	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace r removed (4) 10	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end)	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 10 Head gasket brittle?	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace r removed (4) 10 yes/bonded	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored/corrosion	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 10 Head gasket brittle? Head suction cavity appearance	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace r removed (4) 10 yes/bonded dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored/corrosion polish	1.3740 1.3740 1.3760 1.3760
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 10 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace r removed (4) 10 yes/bonded dirty dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 10 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace r removed (4) 10 yes/bonded dirty dirty dirty/wear metals	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored/corrosion polish	1.3740 1.3740 1.3760 1.3760
Remaining torque of discharge muffler (1) 2 (2) 1 (3) 1 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 10 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 1 (4) 12.5 gray Yes No gray gray/stator top green Yes No black trace r removed (4) 10 yes/bonded dirty dirty dirty/wear metals	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	heavily discolored polish arance clean no wear Loaded Unloaded no wear medium Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760

Unit Number

Contaminants: Trash in liquid screen (g) 0.083 **Control Unit?** No **Number of screens** 2 Acid? No R-12? No Debris in compressor bottom (g) 0.681

Valve Plate Assembly Inspection

good

good

good

slight

corrosion very slight

corrosion

corrosion

very slight

very slight

Suction side (reed backer)

Discharge side (reed backer)

Suction reed

Condition

Trepan

Appearance

Varnish ring

Condition

Trepan

Varnish ring

Air? Yes R-22? No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Condition good Wear polish Appearance corrosion Loaded 0.5015

Dimensions Suction surface appearance Unloaded 0.5015 corrosion

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Appearance corrosion/discolored

Wear polish **Dimensions** Loaded 0.4980

0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.22 Water (ppm) 140 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 9.7 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 1

Appearance Discharge surface appearance corrosion Discharge reed Condition Appearance

4 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin heavy black gummy Spring black, brown heavy gummy **Spring Seat** slight brown gummy Ball heavy black gummy **Front Side** medium brown gummy

Photographic Documentation of R-407C Compressor with Contaminant Air 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

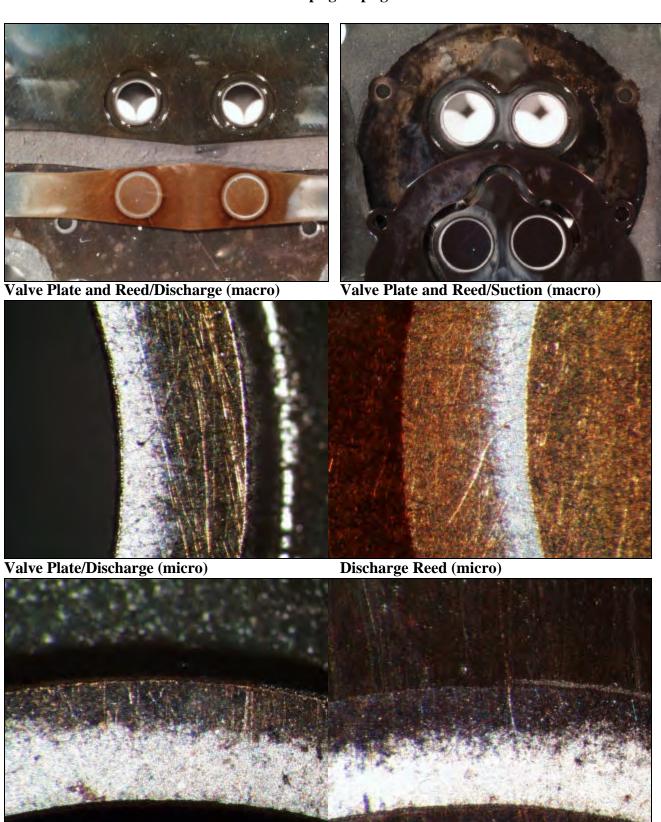


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air 200 psig/40 psig



Valve Plate/Suction (micro) Suction Reed (micro)

Report for R-407C Compressor with Contaminant Acid and R-22

Unit Number 65			
Model # RS43C1E-CAV-250 Seria	1 # 96F16441	Crank journals	
Run Time (hr.) 12002 Failed		Appearance clean/corrosic	n e
Refrigerant 407C	1: 100)11
Lubricant RL32S		r ,	1 2465
			1.2465
Contaminants:		Unloaded	1.2465
Control Unit? No		Lower crank bearing journal	
Acid? Yes R-12? No		Appearance clean	
Air? No R-22? Yes		Wear polish, slight	
H_2O ? No $R-502$? No		D:	0.0005
	200	Dimensions Loaded	0.9985
Discharge Pressure (psig)	200	Unloaded	0.9985
Suction Pressure (psig)	40	Bottom thrust washer (crank	side)
Discharge Temp (°F)	180	Appearance Cu plating	
Return Gas Temp (°F)	62	Wear polish, slight	
SumpTemp (°F)	147		
		Bottom washer (casting side)	
Hi-Pot	pass	Appearance clean/bronze p	olating
High-low leak	pass	Wear polish, slight	
Top shell appearance	gray	Lower bronze bearings	
Suction exit trail appearance	gray	Appearance clean/corrosion	on
Cluster block condition	good	Wear polish, slight	
Wire to cluster block appearance	clean	Dimensions Loaded	1.0020
Suction ring top appearance	gray	Unloaded	1.0020
Remaining torque of discharge muffle	r		
(1) 4 (2) 4 (3) 4	(4) 5	Shaft in cage bearing	
Remaining torque of stator bolts		Appearance corrosion	
(1) 10 (2) 10 (3) 11	(4) 12	Wear polish, slight	
Suction muffler appearance	clean	Piston top appearance cle	an
OEM flux?	Yes	Piston skirt	
Loose restrictor?	No	Appearance low wear	
Discharge plate appearance	gray	Dimensions Loaded	1.3720
Top stator windings appearance	clean	Unloaded	1.3720
Rotor rub marks present?	No	Cylinder bore	
Was rotor loose?	No	Appearance no wear	
	clean	Varnish ring medium	
Shell bottom appearance Quantity of bearing chips	trace	Dimensions Loaded	1.3760
Remaining torque of discharge muffle		Unloaded	1.3760
(1) 14 (2) 15 (3) 14			1.5700
	(4) 15 no/bonded	Connecting rod (large end) Appearance none	
Head gasket brittle?	clean	* *	
Head suction cavity appearance		1 , 0	1 2400
Head discharge cavity appearance	clean	Dimensions Loaded Unloaded	1.2490
Cage bearing top appearance Remaining torque of cage bearing bolt	clean	Omoaded	1.2490
(1) 4 (2) 4 (3) 4	s (4) 5		
(1) 7 (2) 4 (3) 4	(T) 3		

Unit Number 65

Contaminants:Trash in liquid screen (g)0.085Control Unit?NoNumber of screens2Acid?YesR-12?NoDebris in compressor bottom (g)0.453

Air? No **R-22?** Yes **H₂O?** No **R-502?** No

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolish, slight

Dimensions Loaded 0.5010 Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/corrosion

Wear medium
Dimensions Loaded 0

Dimensions Loaded 0.4970 **Unloaded** 0.4970

Final Lubricant Values Total Acid Number (TAN) 0.23 Water (ppm) 122 Fluoride ion (ppm) 1.5 Chloride ion (ppm) 9.8 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 1 7 Silicon (ppm) Tin (ppm) 0 2 Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)
Condition good
Appearance clean

Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good

Appearance corrosion/blued Discharge surface appearance

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	gray	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black, brown	gummy
Spring	medium	black, gray	gummy
Spring Seat	very slight	gray	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid and R-22 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

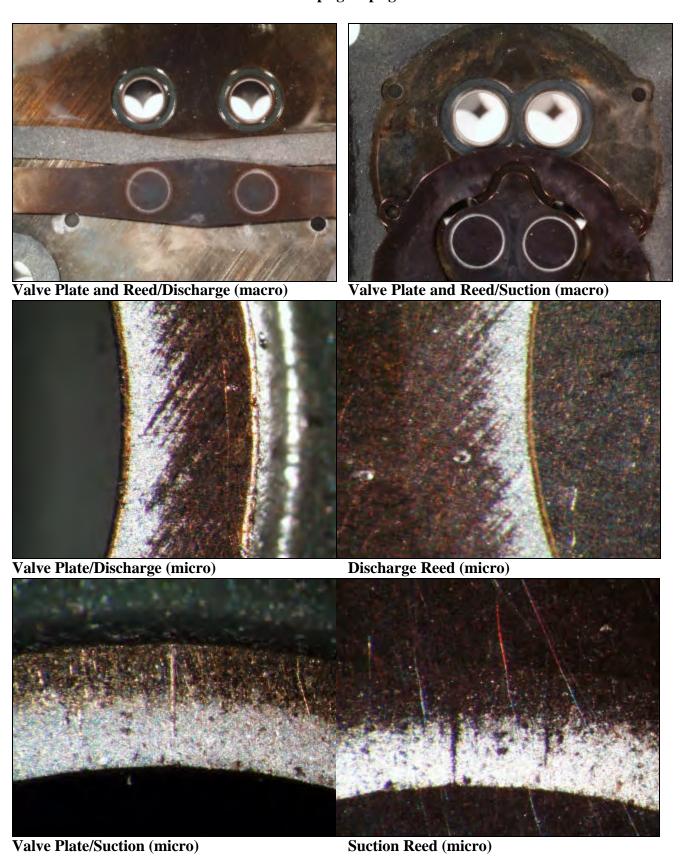


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid and R-22 200 psig/40 psig



Report for R-407C Compressor with Contaminant Acid, Air, and R-22

ilbi instont or.				
Unit Number 66				
Model # RS43C1E-CAV-250 Serial	# 96F16438	Crank journals	S	
Run Time (hr.) 12011 Failed	? No	Appearance	clean	
Refrigerant 407C		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Dimensions	Unloaded	1.2470
Control Unit? No		Lower crank b		1.2470
Acid? Yes R-12? No			clean	
		Appearance		
Air? Yes R-22? Yes		Wear	polish, slight	
H_2O ? No $R-502$? No		ъ.	T 1 1	0.0000
	•	Dimensions	Loaded	0.9990
Discharge Pressure (psig)	200		Unloaded	0.9990
Suction Pressure (psig)	40		washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/Cu plating/cor	rosion
Return Gas Temp (°F)	62	Wear	medium	
SumpTemp (°F)	147			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/bronze plating	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	gray		Unloaded	1.0030
Remaining torque of discharge muffler	8-117			1.0000
(1) 4 (2) 5 (3) 4	(4) 4	Shaft in cage b	earino	
Remaining torque of stator bolts	(4) +	Appearance	corrosion	
(1) 10 (2) 11 (3) 11	(4) 12	Wear	polish, slight	
	• •			
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3725
Top stator windings appearance	clean		Unloaded	1.3725
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean	Varnish ring	heavy	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
		Commenting		1.3700
(1) 14 (2) 15 (3) 15 Head gasket brittle?	(4) 15	Connecting roo		
	no/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	polish, slight	1 2760
Head discharge cavity appearance	clean	Dimensions	Loaded	1.3760
Cage bearing top appearance	clean		Unloaded	1.3760
Remaining torque of cage bearing bolts	(4) 5			
(1) 4 (2) 4 (3) 5	(4) 5			

Unit Number

Contaminants: Trash in liquid screen (g) **Number of screens Control Unit?** No Acid? Debris in compressor bottom (g) Yes R-12? No Air? Yes R-22? Yes H₂O? No R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish, slight

Dimensions Loaded 0.5010 Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/corrosion

Wear medium

Dimensions Loaded 0.4985 Unloaded 0.4985

0.22
246
1.3
9.3
0
0
1
1
3
0
4

Valve Plate Assembly Inspection

0.027

0.375

Suction side (reed backer) Condition good Appearance corrosion

Suction surface appearance

corrosion

Suction reed

Condition good Appearance corrosion Trepan very slight Varnish ring slight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued Discharge surface appearance corrosion/black/soot

Discharge reed

Condition good

Appearance corrosion/blued **Trepan** very slight Varnish ring medium

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	gray	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	medium	black	gummy
Spring Seat	slight	black	gummy
Ball	medium	black	gummy
Front Side	slight	black	gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and R-22 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

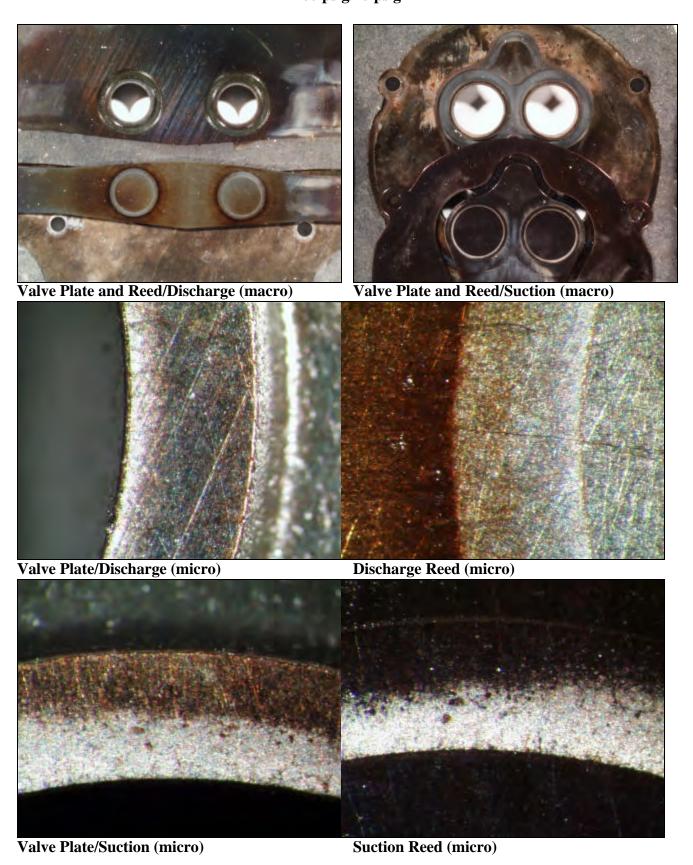


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and R-22 200 psig/40 psig



Report for R-407C Compressor with Contaminant Air and R-22

Unit Nun	nher <i>(</i>	67					
	RS43C1E-0		Serial #	96F16489	Crank journals	.	
Run Time		12052	Failed?	No	Appearance	clean	
Refrigera		407C	ranca.	110	Wear	polish, slight	
Lubrican		RL32S			Dimensions	Loaded	1.2480
Contami		KL328			Difficusions	Unloaded	1.2480
					Lawan anoult be		1.2460
Control U		D 129	No		Lower crank be		
Acid?	No	R-12?	No		Appearance	clean	
Air?	Yes	R-22?	Yes		Wear	polish, slight	
H_2O ?	No	R-502?	No		Dimensions	Loaded	0.0000
D' l	. D	(•)	2	00	Dimensions		0.9980
	e Pressure			00	D . 44 41	Unloaded	0.9980
	Pressure (ps			0		washer (crank side)	
_	e Temp (°F)			80	Appearance	clean/Cu plating	
	as Temp (°	F)		2	Wear	polish, medium	
SumpTen	np (°F)		1	47	7 5.44	(·	
II. D.					Bottom washer	_	
Hi-Pot			-	ass	Appearance	clean	
High-low				ass	Wear	polish, slight	
	appearanc			lean	Lower bronze l	-	
	xit trail app		_	ray	Appearance	clean	
	lock condit			ood	Wear	polish, slight	4 0000
Wire to c	luster block	k appeara	nce c	lean	Dimensions	Loaded	1.0020
							4 0000
Suction r	ing top app	earance	b	right		Unloaded	1.0020
Suction r Remainin	ing top app ig torque of	earance f discharg	e muffler	right			1.0020
Suction r Remainin (1) 4	ing top app ng torque of (2) 5	earance f discharg (3)	te muffler 4 (4		Shaft in cage be	earing	1.0020
Suction r Remainin (1) 4 Remainin	ing top app ng torque of (2) 5 ng torque of	earance f discharg (3) f stator bo	ge muffler 4 (4 olts	right	Appearance	e aring clean	1.0020
Suction r Remainin (1) 4 Remainin (1) 10	ing top app ng torque of (2) 5 ng torque of (2) 11	earance f discharg (3) f stator bo (3)	ge muffler 4 (4 olts	right	_	earing	1.0020
Suction r Remainin (1) 4 Remainin (1) 10	ing top app ng torque of (2) 5 ng torque of	earance f discharg (3) f stator bo (3)	te muffler 4 (4 olts 10 (4	right	Appearance	earing clean polish, slight	1.0020
Suction r Remainin (1) 4 Remainin (1) 10	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler app	earance f discharg (3) f stator bo (3)	be muffler 4 (4 olts 10 (4	right 3) 4 3) 10	Appearance Wear	earing clean polish, slight	1.0020
Remainin (1) 4 Remainin (1) 10 Suction n	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler appo	earance f discharg (3) f stator bo (3)	be muffler 4 (4 olts 10 (4	right i) 4 i) 10 lean	Appearance Wear Piston top appe	earing clean polish, slight	1.0020
Remainin (1) 4 Remainin (1) 10 Suction n OEM flux Loose res	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler appo	earance f discharg (3) f stator bo (3) earance	be muffler 4 (4 olts 10 (4	right 1) 4 2) 10 1ean Zes	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight earance clean	1.0020 1.3705
Remaining (1) 4 Remaining (1) 10 Suction in OEM flux Loose results Discharge	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler app x?	earance f discharg (3) f stator bo (3) earance	be muffler 4 (4 olts 10 (4 C N g	right 1) 4 2) 10 1ean 7es	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance clean low wear/scored	
Remaining (1) 4 Remaining (1) 10 Suction in OEM flux Loose residence Discharge Top state	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler appo x? strictor? e plate appo	earance f discharg (3) f stator bo (3) earance earance appearan	be muffler 4 (4 olts 10 (4 N N g ace	right 1) 4 2) 10 1ean Ves No ray	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance clean low wear/scored Loaded	1.3705
Remaining (1) 4 Remaining (1) 10 Suction in OEM flux Loose residence Discharge Top state	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler appo x? strictor? e plate appo or windings b marks pro	earance f discharg (3) f stator bo (3) earance earance appearan	te muffler 4 (4) olts 10 (4) CC N acce N	right 1) 4 2) 10 1ean Yes No Tray 1ean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean polish, slight earance clean low wear/scored Loaded	1.3705
Remaining (1) 4 Remaining (1) 10 Suction in OEM flux Loose resident Discharge Top state Rotor ruly Was roto	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport x? etrictor? e plate apport or windings b marks pro r loose?	earance f discharg (3) f stator bo (3) earance earance appearan esent?	be muffler 4 (4 olts 10 (4	right 2) 4 2) 10 lean Ves No rray lean No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish, slight carance clean low wear/scored Loaded Unloaded no wear	1.3705
Remaining (1) 4 Remaining (1) 10 Suction in OEM flux Loose responsible to the Control of the Con	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport x? etrictor? e plate apport or windings b marks pro r loose? tom appear	earance f discharg (3) f stator bo (3) earance earance appearancesent?	te muffler 4 (4) 4 (5) 10 (4) 5 (7) 7 (8) 8 (8)	right 2) 4 3) 10 lean Yes No Tray lean No No No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish, slight carance clean low wear/scored Loaded Unloaded no wear slight	1.3705 1.3705
Suction r Remainin (1) 4 Remainin (1) 10 Suction n OEM flux Loose res Discharge Top stato Rotor rul Was roto Shell bott Quant	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport x? e plate apport or windings b marks pro r loose? tom appear tity of beari	earance f discharg (3) f stator bo (3) earance earance appearan esent? ance ing chips	te muffler 4 (4) 4 (4) 6) 10 (4) 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	right 2) 4 3) 10 lean Yes No rray lean No lean light	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish, slight carance clean low wear/scored Loaded Unloaded no wear	1.3705 1.3705
Suction r Remainin (1) 4 Remainin (1) 10 Suction n OEM flux Loose res Discharge Top stato Rotor rul Was roto Shell bott Quant Remainin	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport x? etrictor? e plate apport or windings b marks pro r loose? tom appear tity of bearing torque of	earance (3) Stator bo (3) earance earance appearancesent? ance ing chips f discharg	te muffler 4 (4) 4 (4) 6 (4) 6 (7) 7 (8) 7 (8) 8	right 1) 4 2) 10 lean Yes No ray lean No lean light moved	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish, slight carance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded	1.3705 1.3705
Suction r Remainin (1) 4 Remainin (1) 10 Suction n OEM flux Loose res Discharge Top stato Rotor rul Was roto Shell bott Quant Remainin (1) 16	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport x? etrictor? e plate apport or windings to marks pro r loose? tom appear tity of bearing (2) 15	earance (3) Stator bo (3) earance earance appearance esent? ance ing chips f discharg (3)	te muffler 4 (4) olts 10 (4) N N nce C N N C S S S S S S S S S S S S S S S S	right 1) 4 2) 10 lean Yes No ray lean No lean light moved	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish, slight earance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded (large end)	1.3705 1.3705
Remaining (1) 4 Remaining (1) 10 Suction in OEM flux Loose resident Discharge Top state Rotor rul Was rote Shell bott Quant Remaining (1) 16 Head gas	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport x? etrictor? e plate apport or windings to marks pro r loose? tom appear tity of bearing torque of (2) 15 ket brittle?	earance (3) Stator bo (3) earance earance appearance esent? ance ing chips f discharg (3)	te muffler 4 (4) olts 10 (4) N nce c N c s e muffler re 15 (4)	right 1) 4 2) 10 lean Yes No ray lean No lean light moved 1) 16 b/bonded	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish, slight earance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded (large end) none	1.3705 1.3705
Suction r Remainin (1) 4 Remainin (1) 10 Suction n OEM flux Loose res Discharge Top stato Rotor rul Was roto Shell bott Quant Remainin (1) 16 Head gas Head suc	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport etrictor? e plate apport or windings to marks pro r loose? tom appear tity of bearing torque of (2) 15 ket brittle? tion cavity	earance (3) Stator bo (3) earance earance appearance sent? ance ing chips f discharg (3) appearance	te muffler 4 (4) olts 10 (4) N gence N cc see muffler re 15 (4) nc cc cc	right 2) 4 3) 10 lean Zes No ray lean No lean light moved 2) 16 b)/bonded ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded Unloaded (large end) none polish, slight	1.3705 1.3705 1.3745 1.3745
Remaining (1) 4 Remaining (1) 10 Suction in OEM flux Loose res Discharge Top state Rotor rul Was roto Shell bott Quant Remaining (1) 16 Head gas Head suc Head disc	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler appear ex? etrictor? e plate appear or windings b marks pro r loose? tom appear tity of beari ng torque of (2) 15 ket brittle? tion cavity charge cavi	earance (3) Stator bo (3) Earance earance earance appearance sent? ance ing chips f discharg (3) appearancty	best ce ce ce ce ce ce ce c	right 2) 4 3) 10 lean Zes No Tray lean No No lean light moved 4) 16 b/bonded ean ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, slight earance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded I (large end) none polish, slight Loaded	1.3705 1.3705 1.3745 1.3745
Suction r Remainin (1) 4 Remainin (1) 10 Suction n OEM flux Loose res Discharge Top stato Rotor rul Was roto Shell bott Quant Remainin (1) 16 Head gas Head suc Head disc Cage bea	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler apport (2) strictor? te plate apport (2) replate apport (3) tomappear (4) tomappear (5) tomappear (6) totale? (1) totale? (2) totale? (3) totale? (4) totale? (5) totale? (6) totale? (7) totale? (8) totale? (8) totale? (9) totale? (9) totale? (9) totale? (9) totale? (9) totale? (9) totale?	earance (3) (3) (5) stator bo (3) earance earance appearance ance ing chips (discharg (3) appearancty appearancty appearance	te muffler 4 (4) 10 (4) 10 (4) 10 (4) 10 (5) 10 (6) 10 (7) 10 (7) 10 (7) 11 (7) 12 (7) 13 (7) 14 (7) 15 (7) 16 (8) 17 (10 (8) 18 (10	right 2) 4 3) 10 lean Zes No ray lean No lean light moved 2) 16 b)/bonded ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded Unloaded (large end) none polish, slight	1.3705 1.3705 1.3745 1.3745
Suction r Remainin (1) 4 Remainin (1) 10 Suction n OEM flux Loose res Discharge Top stato Rotor rul Was roto Shell bott Quant Remainin (1) 16 Head gas Head suc Head disc Cage bea	ing top app ng torque of (2) 5 ng torque of (2) 11 nuffler appear ex? etrictor? e plate appear or windings b marks pro r loose? tom appear tity of beari ng torque of (2) 15 ket brittle? tion cavity charge cavi	earance (3) (3) (5) stator bo (3) earance earance appearance ance ing chips (discharg (3) appearancty appearancty appearance	te muffler 4	right 2) 4 3) 10 lean Zes No Tray lean No No lean light moved 4) 16 b/bonded ean ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance clean low wear/scored Loaded Unloaded no wear slight Loaded Unloaded I (large end) none polish, slight Loaded	1.3705 1.3705 1.3745 1.3745

Unit Number

Contaminants: Trash in liquid screen (g) 0.025 **Control Unit?** No **Number of screens** Acid? Debris in compressor bottom (g) No R-12? No 0.185Air? Yes R-22? Yes

H₂O? No R-502? **Valve Plate Assembly Inspection** No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish, medium Appearance corrosion Loaded 0.5000

Dimensions Suction surface appearance Unloaded 0.5000 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion Wear polish, medium **Dimensions** Loaded

0.4970 Unloaded 0.4970

Final Lubricant Values	
Total Acid Number (TAN)	0.14
Water (ppm)	506
Fluoride ion (ppm)	1.1
Chloride ion (ppm)	9.1
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	13
Tin (ppm)	0
Zinc (ppm)	0

Discharge side (reed backer)

good

slight

corrosion

very slight

Suction side (reed backer)

Condition good Appearance corrosion Discharge surface appearance

corrosion

Discharge reed

Suction reed

Condition

Trepan

Appearance

Varnish ring

Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	gray	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black, brown	gummy
Spring	slight	brown, gray	gummy
Spring Seat	none	none	none
Ball	NA	NA	NA
Front Side	slight	gray	gummy

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Photographic Documentation of R-407C Compressor with Contaminant Air and R-22 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

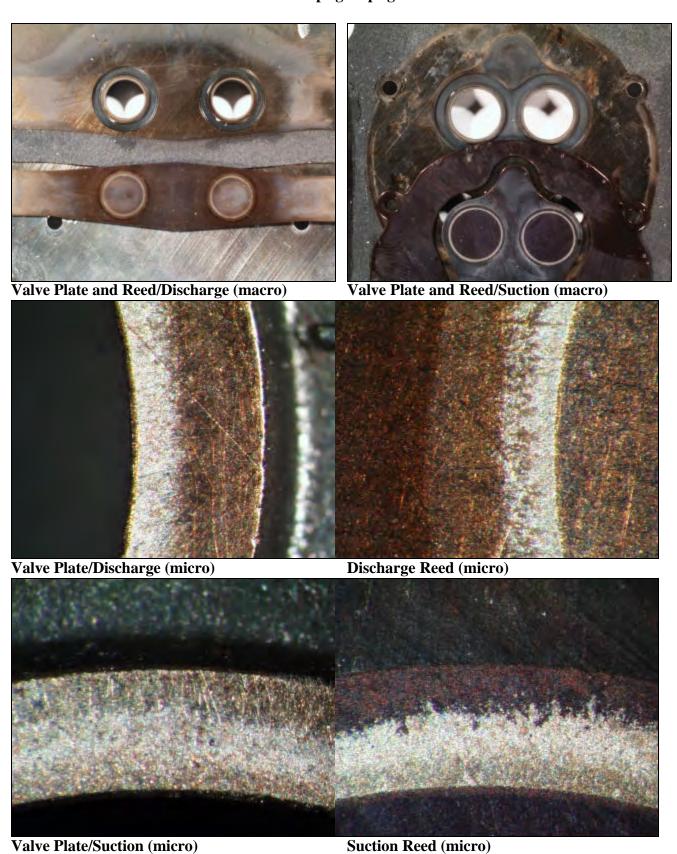


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air and R-22 200 psig/40 psig



Report for R-407C Compressor with Contaminant Acid and Air

Unit Number 68			
Model # RS43C1E-CAV-250 Seria	l # 96F16435	Crank journals	3
Run Time (hr.) 12014 Faile		Appearance	scored
Refrigerant 407C		Wear	polish
Lubricant RL32S		Dimensions	Loaded 1.2470
Contaminants:		Difficusions	Unloaded 1.2470
Control Unit? No		Lower anonly h	
Acid? Yes R-12? No		Lower crank be	clean
		Appearance	
Air? Yes R-22? No		Wear	polish
H_2O ? No $R-502$? No		D'	T - 1-1
	200	Dimensions	Loaded 0.9985
Discharge Pressure (psig)	200	D 44 4	Unloaded 0.9985
Suction Pressure (psig)	40		washer (crank side)
Discharge Temp (°F)	180	Appearance	scored/bronze plating/corrosion
Return Gas Temp (°F)	62	Wear	polish
SumpTemp (°F)	147	_	
		Bottom washer	
Hi-Pot	pass	Appearance	scored/bronze plating
High-low leak	pass	Wear	polish
Top shell appearance	clean	Lower bronze	O
Suction exit trail appearance	gray	Appearance	scored/corrosion
Cluster block condition	good	Wear	polish
Wire to cluster block appearance	clean	Dimensions	Loaded 1.0040
Suction ring top appearance	clean		Unloaded 1.0040
Remaining torque of discharge muffle			
(1) 5 (2) 2.5 (3) 5	(4) 5	Shaft in cage be	earing
(1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts	(4) 5	Shaft in cage be Appearance	earing clean
	(4) 5(4) 12.5	_	_
Remaining torque of stator bolts		Appearance	clean polish
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10	(4) 12.5	Appearance Wear	clean polish
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance	(4) 12.5 clean	Appearance Wear Piston top appe	clean polish
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 12.5 clean Yes No	Appearance Wear Piston top appe Piston skirt	clean polish earance clean
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 12.5 clean Yes No gray	Appearance Wear Piston top appe Piston skirt Appearance	clean polish earance clean no wear
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 12.5 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	clean polish earance clean no wear Loaded 1.3740
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 12.5 clean Yes No gray clean/stator top green No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 12.5 clean Yes No gray clean/stator top green No No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 12.5 clean Yes No gray clean/stator top green No No clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace r removed	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760 Unloaded 1.3760
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 15 (3) 15	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace r removed (4) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roce	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760 Unloaded 1.3760 Unloaded 1.3760 I (large end)
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 15 (3) 15 Head gasket brittle?	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace r removed (4) 15 yes/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760 Unloaded 1.3760 I (large end) scored/corrosion
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace r removed (4) 15 yes/bonded clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760 Unloaded 1.3760 I (large end) scored/corrosion polish
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace r removed (4) 15 yes/bonded clean clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760 Unloaded 1.3760 I (large end) scored/corrosion polish Loaded 1.2510
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace r removed (4) 15 yes/bonded clean clean clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760 Unloaded 1.3760 I (large end) scored/corrosion polish
Remaining torque of stator bolts (1) 10 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 12.5 clean Yes No gray clean/stator top green No No clean trace r removed (4) 15 yes/bonded clean clean clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	clean polish earance clean no wear Loaded 1.3740 Unloaded 1.3740 no wear slight Loaded 1.3760 Unloaded 1.3760 I (large end) scored/corrosion polish Loaded 1.2510

Unit Number

Contaminants: Trash in liquid screen (g) 0.000 **Control Unit?** No **Number of screens** 2 Acid? 1.066 Yes R-12? No Debris in compressor bottom (g)

Air? Yes R-22? No H₂O? No R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear polish Dimensions Loaded 0.5010 Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance corrosion Wear polish

Dimensions Loaded 0.4980 0.4980 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.27 Water (ppm) 82 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 11 Aluminum (ppm) 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 5 Silicon (ppm) Tin (ppm) 0

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good **Appearance** corrosion Suction surface appearance

corrosion

Suction reed

Condition good **Appearance** corrosion Trepan very slight Varnish ring very slight

Discharge side (reed backer)

Condition good

corrosion/blued **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	black	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	gray	gummy
Front Side	medium	black	gummy

0

Photographic Documentation of R-407C Compressor with Contaminant Acid and Air 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

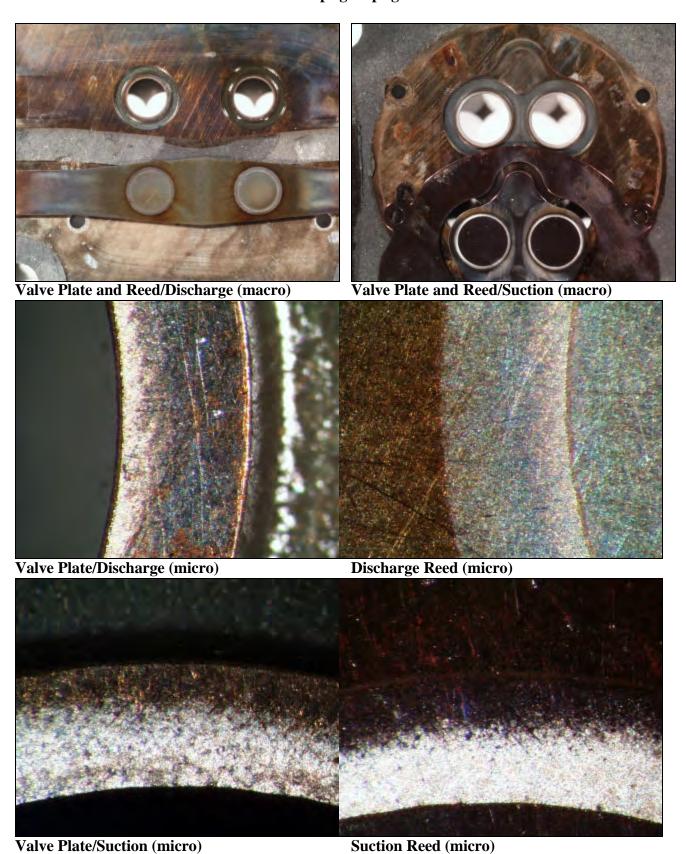


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid and Air 200 psig/40 psig



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Report for R-407C Compressor with Contaminant Water and R-22

ILDI IIIDIORI OI:				
Unit Number 69				
Model # RS43C1E-CAV-250 Serial	l# 96F16440	Crank journals	S	
Run Time (hr.) 5333 Failed	? Yes	Appearance	clean	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? No R-22? Yes		Wear	polish	
H_2O ? Yes R-502 ? No			F	
2		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	200		Unloaded	0.9985
Suction Pressure (psig)	35	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	193	Appearance	clean/scored	
Return Gas Temp (°F)	61	Wear	polish	
SumpTemp (°F)	162		F	
Sumpremp(1)	102	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	black/gray	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) ND (2) ND (3) ND	(4) ND	Shaft in cage b	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) ND (2) ND (3) ND	(4) ND	Wear	polish	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	No	Piston skirt	_	
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean	Difficusions	Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore	Cinoaucu	1.3740
Was rotor loose?	No	Appearance	no wear	
	clean		no wear	
Shell bottom appearance		Varnish ring Dimensions	none Loaded	1.3760
Quantity of bearing chips Remaining torque of discharge muffler	slight	Difficusions	Unloaded	1.3760
		Connecting rec		1.3700
(1) ND (2) ND (3) ND Head gasket brittle?	(4) ND yes/bonded	Connecting room Appearance	scored	
Head suction cavity appearance	clean	Appearance Wear	polish	
	Cican		-	1.0510
Hand discharge carrity annearonce	clean	Dimensions	Loadad	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean	Dimensions	Loaded Unloaded	1.2510
	clean	Dimensions		

Unit Number 69

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 Yes

 H₂O?
 Yes
 R-502?
 No

Trash in liquid screen (g)0.016Number of screens1Debris in compressor bottom (g)0.967

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5015Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored Wear polish Dimensions Loaded

nensions Loaded 0.4970 Unloaded 0.4975

Final Lubricant Values Total Acid Number (TAN)

Water (ppm) 110 Fluoride ion (ppm) 0.90 Chloride ion (ppm) 9.6 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 4 Silicon (ppm) 0 Tin (ppm)

Suction side (reed backer)

Condition broken
Appearance corrosion
Suction surface appearance
corrosion/damaged

Suction reed

ConditionbentAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** very slight gray hard **Equalizer Hole** very heavy black gummy Tip of Pin very heavy black gummy Spring medium black, gray gummy **Spring Seat** heavy black gummy Ball medium black gummy Front Side slight brown gummy

0.09

0

Photographic Documentation of R-407C Compressor with Contaminant Water and R-22 200 psig/35 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

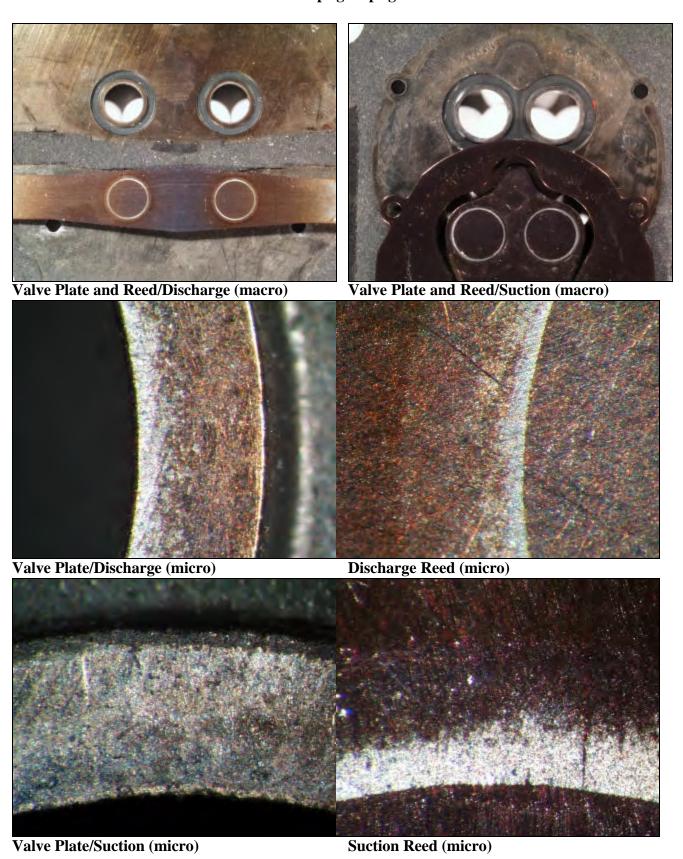


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Water and R-22 200 psig/35 psig



Report for R-407C Compressor with Contaminant Acid and Water

Unit Number 70				
Model # RS43C1E-CAV-250 Serial	# 96F16448	Crank journals		
Run Time (hr.) 12019 Failed	? No	Appearance	scored	
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing journal	
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? Yes R-502 ? No			r	
-		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	200		Unloaded	0.9985
Suction Pressure (psig)	40	Bottom thrust v	washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/corrosion	
Return Gas Temp (°F)	62	Wear	polish	
SumpTemp (°F)	147			
r r v		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze b		
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0040
Suction ring top appearance	clean		Unloaded	1.0040
Remaining torque of discharge muffler				
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 12.5 (2) 15 (3) 12.5	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	removed		Unloaded	1.3760
(1) 15 (2) 15 (3) 15	(4) 15	Connecting rod	(large end)	
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 5	(4) 7			

Unit Number

Contaminants: Trash in liquid screen (g) 0.011 **Control Unit?** No **Number of screens** Acid? Debris in compressor bottom (g) 1.004 Yes R-12? No

Air? No R-22? No H₂O? Yes R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Appearance Wear polish Dimensions Loaded 0.5015

0.5015

Piston pin washers appearance

Unloaded

contact wear

Piston pin

Appearance scored/corrosion

Wear polish **Dimensions** Loaded

0.4975 0.4975 Unloaded

Final Lubricant Values	
Total Acid Number (TAN)	0.31
Water (ppm)	225
Fluoride ion (ppm)	1.1
Chloride ion (ppm)	9.3
Aluminum (ppm)	0
Copper (ppm)	1
Iron (ppm)	0
Lead (ppm)	1
Silicon (ppm)	3
Tin (ppm)	0
Zinc (ppm)	1

Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good corrosion Suction surface appearance

corrosion **Suction reed**

Condition good Appearance corrosion Trepan very slight Varnish ring very slight

Discharge side (reed backer) Condition good Appearance corrosion Discharge surface appearance

corrosion

Discharge reed Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	tarnished	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	hard
Spring	very heavy	black, gray	gummy
Spring Seat	heavy	brown	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid and Water 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

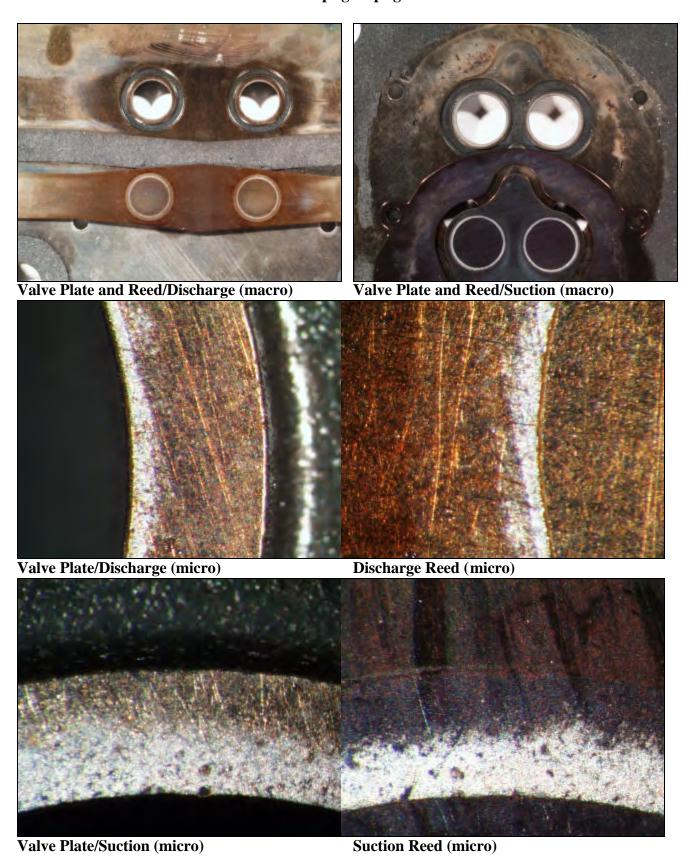


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid and Water 200 psig/40 psig



Report for R-407C Compressor with Contaminant Air and Water

Unit Nun	nber 7	1					
Model #	RS43C1E-C	CAV-250	Serial #	96F16433	Crank journals	;	
Run Tim		7319	Failed?	Yes	Appearance	clean	
Refrigera	ant	407C			Wear	polish	
Lubrican		RL32S			Dimensions	Loaded	1.2470
Contami	nants:					Unloaded	1.2470
Control U					Lower crank be	earing journal	
Acid?	No	R-12?	No		Appearance	clean	
Air?	Yes	R-22?	No		Wear	polish	
H_2O ?	Yes	R-502?	No			•	
					Dimensions	Loaded	0.9985
Discharg	e Pressure (psig)		200		Unloaded	0.9985
Suction I	Pressure (ps	ig)		35	Bottom thrust	washer (crank side)	
Discharg	e Temp (°F)			193	Appearance	clean/scored	
Return G	as Temp (°	F)		61	Wear	polish	
SumpTer	np (°F)			162			
					Bottom washer	(casting side)	
Hi-Pot				pass	Appearance	clean	
High-low				pass	Wear	polish	
	appearance			gray	Lower bronze	bearings	
	xit trail app			black	Appearance	clean	
	lock conditi			good	Wear	polish	
	luster block			gray	Dimensions	Loaded	1.0030
	ing top app			clean		Unloaded	1.0030
	ng torque of	_					
(1) ND	(2) ND	` ,		4) ND	Shaft in cage be	_	
	ng torque of				Appearance	clean	
(1) ND	(2) ND	` ′	ND ((4) ND	Wear	polish	
	nuffler appe	earance		clean	Piston top appe	earance clean	
OEM flu	x?			No	Piston skirt		
Loose res	strictor?			No	Appearance	low wear/scored	
Discharg	e plate appe	earance		clean/Cu	Dimensions	Loaded	1.3740
Top state	or windings	appearan	ice	clean		Unloaded	1.3740
Rotor ru	b marks pre	esent?		No	Cylinder bore		
Was roto	r loose?			No	Appearance	no wear/scored	
Shell bot	tom appeara	ance		clean	Varnish ring	slight	
Quan	tity of beari	ng chips		trace	Dimensions	Loaded	1.3760
Remainii	ng torque of	discharg	e muffler r	emoved		Unloaded	1.3760
(1) ND	(2) ND	(3)	ND (4) ND	Connecting rod	l (large end)	
Head gas	ket brittle?		<u>,</u>	es/bonded	Appearance	scored	
Head suc	tion cavity a	appearan	ce d	elean	Wear	polish	
Head dis	charge cavit	y appear	ance	elean	Dimensions	Loaded	1.2510
	ring top app			clean		Unloaded	1.2510
	ng torque of	cage bear	ring bolts				
(1) NID		_					
(1) ND	(2) ND	(3)	ND (4) ND			

Unit Number

Contaminants: Control Unit? No Acid? No R-12?

No Air? R-22? Yes No H₂O? R-502? Yes No

Valve Plate Assembly Inspection

Debris in compressor bottom (g)

0.001

1.017

Suction side (reed backer)

Trash in liquid screen (g)

Number of screens

Condition broken **Appearance** corrosion **Suction surface appearance**

corrosion/damaged

Suction reed

Condition broken/bent/cracked

corrosion Trepan very slight Varnish ring none

Appearance

Discharge side (reed backer) Condition good

corrosion/blued **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Connecting rod (small end)

Appearance contact wear/correct washer

Wear polish

Dimensions Loaded 0.5020 Unloaded 0.5020

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear polish **Dimensions**

Loaded 0.4970 0.4970 Unloaded

Final Lubricant Values

Total Acid Number (TAN) 0.09 Water (ppm) 200 Fluoride ion (ppm) 0.90 Chloride ion (ppm) 9.2 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 8 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	hard
Rear Pin	very slight	gray	hard
Equalizer Hole	very slight	gray	hard
Tip of Pin	heavy	black	gummy
Spring	medium	black, gray	hard
Spring Seat	medium	gray	hard
Ball	medium	black	gummy
Front Side	very slight	gray	hard

Photographic Documentation of R-407C Compressor with Contaminant Air and Water 200 psig/35 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

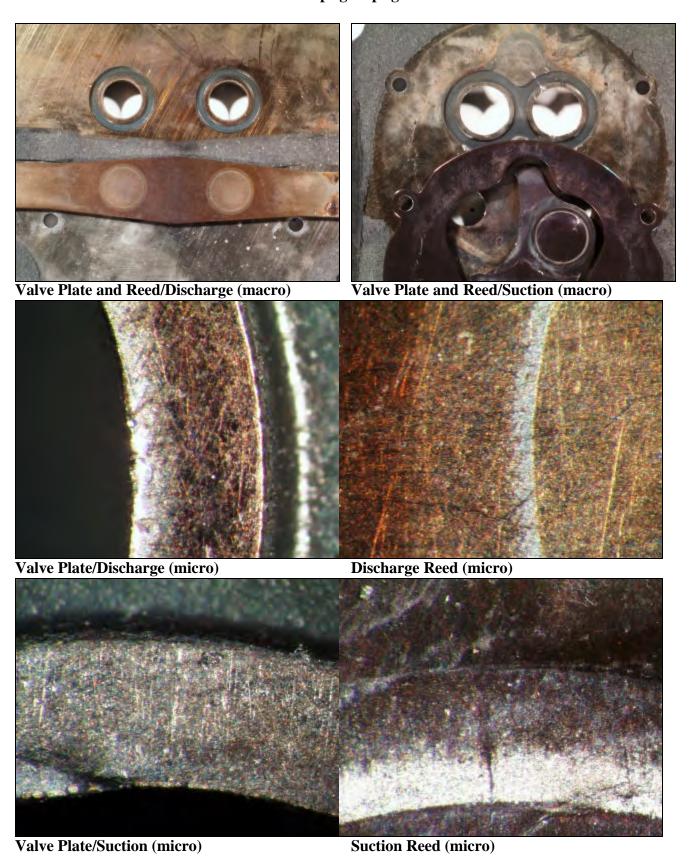


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air and Water 200 psig/35 psig



Report for R-407C Compressor with Contaminant Water

ILDI IIIDI OKI	01.					
Unit Number	72					
Model # RS43C	1E-CAV-250	Serial #	96F16434	Crank journals	}	
Run Time (hr.)	12013	Failed?	No	Appearance	scored	
Refrigerant	407C			Wear	slight	
Lubricant	RL32S			Dimensions	Loaded	1.2470
Contaminants:					Unloaded	1.2470
	No			Lower crank b	earing iournal	
Acid? No	R-12?	No		Appearance	scored	
Air? No	R-22?	No		Wear	polish	
H_2O ? Yes	R-502?	No		,,,	Polisii	
				Dimensions	Loaded	0.9985
Discharge Pressu	ire (psig)		200		Unloaded	0.9985
Suction Pressure			40	Bottom thrust	washer (crank side)	0.7700
Discharge Temp			180	Appearance	scored	
Return Gas Tem			62	Wear	polish	
SumpTemp (°F)	P (-)		147	, , car	ponsii	
Sumpremp(1)			17/	Bottom washer	(casting side)	
Hi-Pot			pass	Appearance	scored/Cu plating	
High-low leak			pass	Wear	slight	
Top shell appear	ance		clean	Lower bronze	<u> </u>	
Suction exit trail			gray	Appearance	scored	
Cluster block con			good	Wear	polish	
Wire to cluster b			clean	Dimensions	Loaded	1.0035
Suction ring top			clean	Differentiations	Unloaded	1.0030
Remaining torqu			cicuii		Cinouaca	1.0030
(1) 7.5 (2)	-		4) 5	Shaft in cage be	earing	
Remaining torqu	, ,		1) 3	Appearance	clean	
			4) 10	Wear	polish	
	` ′	`	•		-	
Suction muffler	арреагансе		clean	Piston top appe	earance carbon	
OEM flux?			Yes	Piston skirt		
Loose restrictor?			No	Appearance	low wear	
Discharge plate a			gray	Dimensions	Loaded	1.3740
Top stator windi			clean/stator top green		Unloaded	1.3740
Rotor rub marks			No	Cylinder bore		
Was rotor loose?			No	Appearance	low wear	
Shell bottom app	earance		clean	Varnish ring	very slight	
Quantity of b			trace	Dimensions	Loaded	1.3760
Remaining torqu	ie of discharg	ge muffler r	emoved		Unloaded	1.3760
(1) 15 (2)	15 (3)	15 (4) 15	Connecting rod	l (large end)	
Head gasket brit			es/bonded	Appearance	scored/corrosion	
Head suction cav			lean	Wear	polish	
Head discharge of			lirty	Dimensions	Loaded	1.2510
Cage bearing top			lirty		Unloaded	1.2510
Remaining torqu	e of cage bea	_				
(1) 7.5 (2)	5 (3)	5 (4) 5			

Unit Number

Contaminants: Trash in liquid screen (g) 0.050 **Control Unit?** No **Number of screens** Acid? Debris in compressor bottom (g) 0.810 No R-12? No

Air? No R-22? No H₂O? Yes R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear slight

Dimensions Loaded 0.5015 Suction surface appearance Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion polish Wear Dimensions Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values	
Total Acid Number (TAN)	0.09
Water (ppm)	321
Fluoride ion (ppm)	1.5
Chloride ion (ppm)	11
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	6
Tin (ppm)	0
Zinc (ppm)	0

Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good Appearance corrosion

corrosion/soot

Suction reed

Condition good

Appearance corrosion/carbon

slight Trepan Varnish ring slight

Discharge side (reed backer)

Condition good

Appearance corrosion/soot Discharge surface appearance

corrosion/soot

Discharge reed

Condition good

Appearance corrosion/soot **Trepan** slight Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black, brown	gummy
Spring	medium	black, gray	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

Photographic Documentation of R-407C Compressor with Contaminant Water 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

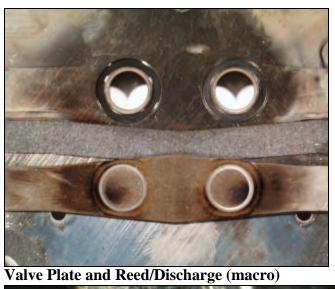


Crank Shaft (loaded) (macro)



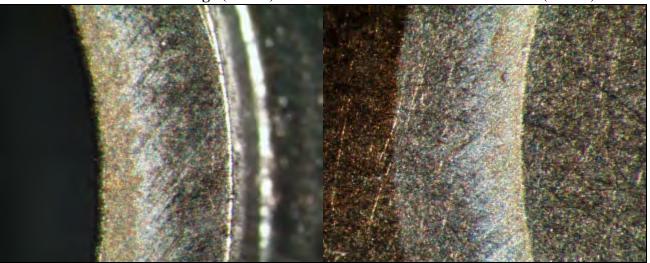
Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Water 200 psig/40 psig



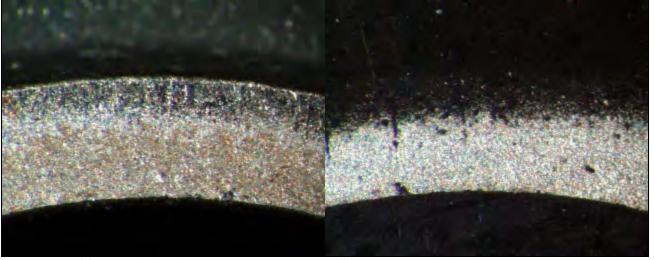


Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-407C Compressor with Contaminant Acid, Water, and R-22

Unit Number 73				
Model # RS43C1E-CAV-250 Serial	# 96F16445	Crank journals	}	
Run Time (hr.) 12006 Failed	? No	Appearance	scored/Cu plating/cor	rrosion
Refrigerant 407C		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank be	earing iournal	
Acid? Yes R-12? No		Appearance	clean/Cu plating	
Air? No R-22? Yes		Wear	polish	
H_2O ? Yes R-502? No			F *	
-		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	200		Unloaded	0.9980
Suction Pressure (psig)	40	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	180	Appearance	scored/Cu plating	
Return Gas Temp (°F)	62	Wear	slight	
SumpTemp (°F)	147			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating/cor	rrosion
High-low leak	pass	Wear	medium	
Top shell appearance	clean	Lower bronze	bearings	
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler	•			
(1) 5 (2) 7 (3) 5	(4) 5	Shaft in cage be		
Remaining torque of stator bolts		Appearance	corrosion	
(1) 10 (2) 10 (3) 10	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	black	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 17.5 (2) 17.5 (3) 17.5	(4) 17.5	Connecting rod	l (large end)	
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2505
Cage bearing top appearance	dirty		Unloaded	1.2505
Remaining torque of cage bearing bolts				
(1) 7.5 (2) 7.5 (3) 7.5	(4) 7.5			

Unit Number

Contaminants: Trash in liquid screen (g) 0.013 **Control Unit?** No **Number of screens** Acid? 0.747 Yes R-12? No Debris in compressor bottom (g)

Air? R-22? No Yes H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear slight **Appearance Dimensions** Loaded 0.5015 Suction surface appearance

Unloaded 0.5015

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored Wear slight **Dimensions** Loaded

0.4970 0.4970 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.13 Water (ppm) 70 Fluoride ion (ppm) 1.6 Chloride ion (ppm) 9.3 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 3 Silicon (ppm) Tin (ppm) 0 Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good corrosion

corrosion

Suction reed

Condition good **Appearance** corrosion Trepan very slight Varnish ring very slight

Discharge side (reed backer) Condition good

corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	tarnished	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black, brown	gummy
Spring	heavy	black, gray	gummy
Spring Seat	medium	black	gummy
Ball	medium	black, gray	gummy
Front Side	heavy	black	gummy

0

Photographic Documentation of R-407C Compressor with Contaminant Acid, Water, and R-22 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

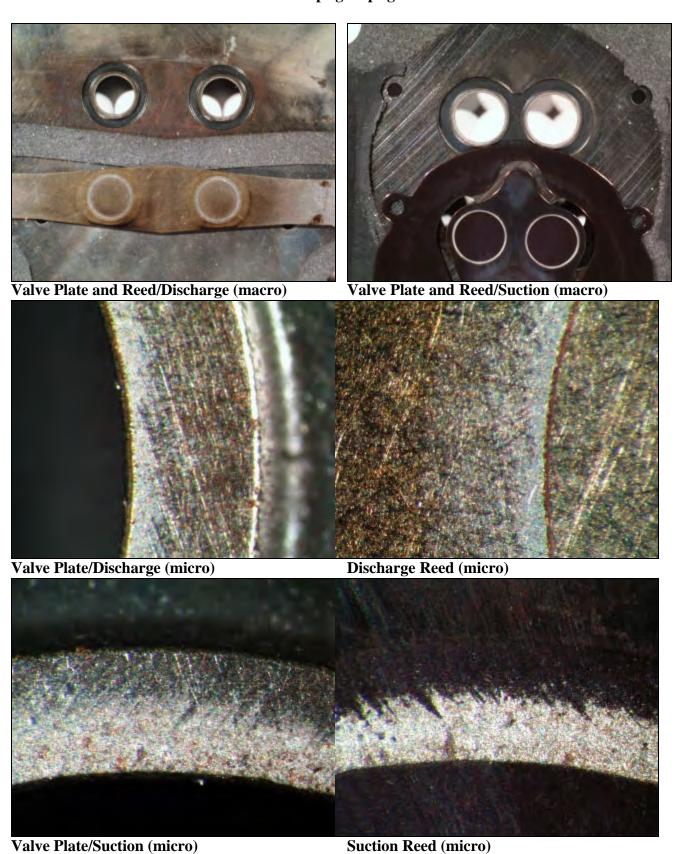


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Water, and R-22 200 psig/40 psig



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Report for R-407C Compressor with Contaminant Acid, Air, Water, and R-22

Unit Number 74				
Model # RS43C1E-CAV-250 Seria	l# 96F16439	Crank journals		
Run Time (hr.) 12023 Failed			clean/corrosion	
Refrigerant 407C	110		polish	
Lubricant RL32S			Loaded	1.2495
Contaminants:			Unloaded	1.2495
				1.2493
		Lower crank bea		
			clean/corrosion	
Air? Yes R-22? Yes		Wear	polish	
H_2O ? Yes R-502 ? No		Dimensions	Loaded	0.0000
D'ada a Dama a (ada)	200			0.9990
Discharge Pressure (psig)	200		Unloaded	0.9990
Suction Pressure (psig)	40		vasher (crank side)	
Discharge Temp (°F)	193		scored/corrosion	
Return Gas Temp (°F)	62	Wear	polish	
SumpTemp (°F)	162	D 44	(
TT D		Bottom washer (
Hi-Pot	pass	1.1	clean	
High-low leak	fail		slight	
Top shell appearance	gray	Lower bronze be		
Suction exit trail appearance	black		clean/scored	
Cluster block condition	good		polish	4 00 40
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0040
Suction ring top appearance	gray		Unloaded	1.0040
Suction ring top appearance Remaining torque of discharge muffler	gray			1.0040
Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1	gray	Shaft in cage bea	aring	1.0040
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts	gray r (4) 2.1	Shaft in cage bea	aring corrosion	1.0040
Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6	gray	Shaft in cage bea	aring	1.0040
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts	gray r (4) 2.1	Shaft in cage bea	aring corrosion slight	1.0040
Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6	gray (4) 2.1 (4) 14.6	Shaft in cage bea Appearance Wear	aring corrosion slight	1.0040
Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance	gray (4) 2.1 (4) 14.6 gray	Shaft in cage bea Appearance Wear Piston top appea Piston skirt	aring corrosion slight	1.0040
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux?	gray r (4) 2.1 (4) 14.6 gray Yes	Shaft in cage bea Appearance Wear Piston top appea Piston skirt Appearance	aring corrosion slight arance clean	1.0040 1.3720
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor?	gray r (4) 2.1 (4) 14.6 gray Yes No	Shaft in cage bea Appearance Wear Piston top appea Piston skirt Appearance Dimensions	aring corrosion slight arance clean no wear	
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	gray r (4) 2.1 (4) 14.6 gray Yes No gray	Shaft in cage bea Appearance Wear Piston top appea Piston skirt Appearance Dimensions	aring corrosion slight arance clean no wear Loaded	1.3720
Suction ring top appearance Remaining torque of discharge mufflet (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	gray r (4) 2.1 (4) 14.6 gray Yes No gray clean	Shaft in cage bea Appearance Wear Piston top appea Piston skirt Appearance Dimensions	aring corrosion slight arance clean no wear Loaded	1.3720
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	gray (4) 2.1 (4) 14.6 gray Yes No gray clean No No	Shaft in cage bea Appearance Wear Piston top appea Piston skirt Appearance Dimensions Cylinder bore Appearance	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion	1.3720
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	gray (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean	Shaft in cage bea Appearance Wear Piston top appea Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium	1.3720 1.3720
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	gray (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace	Shaft in cage beat Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded	1.3720 1.3720 1.3765
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	gray (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace r removed	Shaft in cage bea Appearance Wear Piston top appea Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded Unloaded Unloaded	1.3720 1.3720
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6	gray r (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace r removed (4) 14.6	Shaft in cage beat Appearance Wear Piston top appear Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded Unloaded (large end)	1.3720 1.3720 1.3765
Suction ring top appearance Remaining torque of discharge muffler (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle?	gray r (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace r removed (4) 14.6 yes/bonded	Shaft in cage beat Appearance Wear Piston top appear Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded Unloaded (large end) Cu plating	1.3720 1.3720 1.3765
Suction ring top appearance Remaining torque of discharge mufflet (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance	gray r (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace r removed (4) 14.6 yes/bonded clean	Shaft in cage beat Appearance Wear Piston top appear Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded Unloaded (large end) Cu plating slight	1.3720 1.3720 1.3765 1.3765
Suction ring top appearance Remaining torque of discharge mufflet (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray r (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace r removed (4) 14.6 yes/bonded clean clean	Shaft in cage beat Appearance Wear Piston top appear Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear Dimensions	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded Unloaded (large end) Cu plating slight Loaded	1.3720 1.3720 1.3765 1.3765
Suction ring top appearance Remaining torque of discharge mufflet (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	gray r (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace r removed (4) 14.6 yes/bonded clean clean dirty	Shaft in cage beat Appearance Wear Piston top appear Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear Dimensions	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded Unloaded (large end) Cu plating slight	1.3720 1.3720 1.3765 1.3765
Suction ring top appearance Remaining torque of discharge mufflet (1) 4.2 (2) 2.1 (3) 2.1 Remaining torque of stator bolts (1) 14.6 (2) 14.6 (3) 14.6 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray r (4) 2.1 (4) 14.6 gray Yes No gray clean No No clean trace r removed (4) 14.6 yes/bonded clean clean dirty	Shaft in cage beat Appearance Wear Piston top appear Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear Dimensions	aring corrosion slight arance clean no wear Loaded Unloaded no wear/corrosion medium Loaded Unloaded (large end) Cu plating slight Loaded	1.3720 1.3720 1.3765 1.3765

Unit Number 74

Contaminants:
Control Unit? No
Acid? Yes R-12?

 Acid?
 Yes
 R-12?
 No

 Air?
 Yes
 R-22?
 Yes

 H₂O?
 Yes
 R-502?
 No

Valve Plate Assembly Inspection

Debris in compressor bottom (g)

0.065

0.658

2

Suction side (reed backer)

Trash in liquid screen (g)

Number of screens

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringslight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued Discharge surface appearance

corrosion/black

Discharge reed

Condition good

Appearance corrosion/blued/Cu plating

Trepan very slight Varnish ring slight

Connecting rod (small end)

Appearance contact wear/correct washer

Wear slight
Dimensions Loaded

sions Loaded 0.5020 Unloaded 0.5020

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion Wear slight Dimensions Loaded

mensions Loaded 0.4975 Unloaded 0.4975

Final Lubricant Values

Total Acid Number (TAN) 0.17 Water (ppm) 76 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 10 Aluminum (ppm) 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 1 11 Silicon (ppm) 0 Tin (ppm) 2 Zinc (ppm)

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	black	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black	hard
Spring Seat	slight	black	gummy
Ball	very slight	black	gummy
Front Side	slight	black	gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, Water, and R-22 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, Water, and R-22 200 psig/40 psig





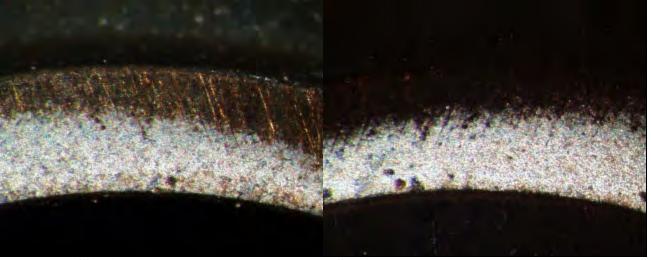
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-407C Compressor with Contaminant Air, Water, and R-22

ILDI IIIDIONI OI.				
Unit Number 75				
Model # RS43C1E-CAV-250 Seria	l# 96F16437	Crank journals	8	
Run Time (hr.) 12009 Failed	l? No	Appearance	clean	
Refrigerant 407C		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2445
Contaminants:		Difficusions	Unloaded	1.2445
Control Unit? No		I arreau anomir h		1.2443
		Lower crank b		
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? Yes		Wear	polish, slight	
H_2O ? Yes R-502 ? No		.		
		Dimensions	Loaded	0.9970
Discharge Pressure (psig)	200		Unloaded	0.9970
Suction Pressure (psig)	40	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	193	Appearance	clean/scored/corrosion	1
Return Gas Temp (°F)	62	Wear	slight	
SumpTemp (°F)	162			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	fail	Wear	polish, slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	0.9990
Suction ring top appearance	bright	Differential	Unloaded	0.9990
Remaining torque of discharge muffler			Cinoaucu	0.7770
(1) 2 (2) 2 (3) 2.5	(4) 2	Shaft in cage b	aarina	
Remaining torque of stator bolts	(4) 2	Appearance	clean	
	(4) 11	Wear		
(1) 11 (2) 10 (3) 11	(4) 11		polish, slight	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3690
Top stator windings appearance	clean		Unloaded	1.3690
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3730
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3730
		Connecting roo		1.5750
(1) 14 (2) 15 (3) 14	(4) 15	t annecting rac	i (targe end)	
II. a.d al- a4 h:441 a9	(4) 15			
Head gasket brittle?	no/bonded	Appearance	none	
Head suction cavity appearance	no/bonded clean	Appearance Wear	none polish, slight	1 2405
Head suction cavity appearance Head discharge cavity appearance	no/bonded clean clean	Appearance	none polish, slight Loaded	1.2485
Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	no/bonded clean clean clean	Appearance Wear	none polish, slight	1.2485 1.2485
Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolt	no/bonded clean clean clean	Appearance Wear	none polish, slight Loaded	
Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	no/bonded clean clean clean	Appearance Wear	none polish, slight Loaded	

Unit Number 75

Contaminants: Trash in liquid screen (g) **Control Unit?** No **Number of screens** Acid? No R-12? No Debris in compressor bottom (g) Air? R-22? Yes Yes H₂O? R-502? **Valve Plate Assembly Inspection** Yes No

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.4985Unloaded0.4985

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored
Wear medium
Dimensions Loaded

Unloaded 0.4960

0.4955

0

Final Lubricant Values Total Acid Number (TAN)

0.25 Water (ppm) 71 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm) 0 Tin (ppm)

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation** Diaphragm Seat none **Rear Pin** none **Equalizer Hole** slight Tip of Pin medium Spring medium **Spring Seat** medium Ball slight Front Side medium

Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

Condition good

Appearancecorrosion/bluedTrepanvery slightVarnish ringslight

Residue Color	Residue Description
none	none
none	none
black	gummy
black, brown	gummy
gray	gummy
gray	gummy
black	gummy
black	gummy

0.046

0.906

Photographic Documentation of R-407C Compressor with Contaminant Air, Water, and R-22 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

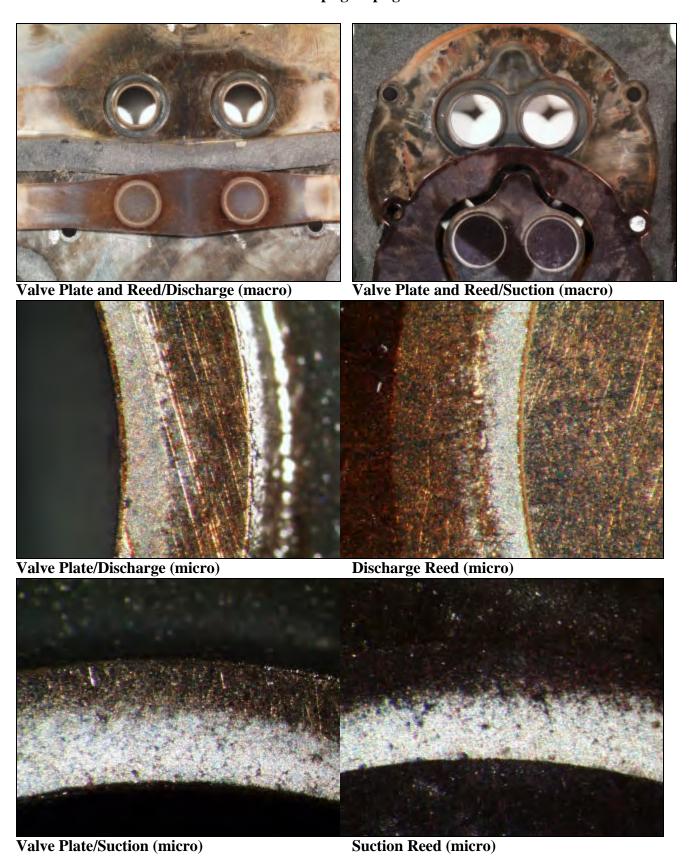


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Air, Water, and R-22 200 psig/40 psig



Report for R-407C Compressor with Contaminant Acid, Air, and Water

Unit Number 76				
Model # RS43C1E-CAV-250 Seria	l# 96F16449	Crank journals		
Run Time (hr.) 12040 Failed		Appearance	scored	
Refrigerant 407C	. 110	Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Difficusions	Unloaded	1.2470
Control Unit? No		Lower crank be		1.2470
Acid? Yes R-12? No		Appearance	clean	
		Wear	polish, slight	
H_2O ? Yes $R-502$? No		Dimensions	Loaded	0.9990
Dischause Bussesses (nois)	200	Difficusions	Unloaded	
Discharge Pressure (psig)	200 40	Dottom thunst.		0.9990
Suction Pressure (psig)	180	Appearance	washer (crank side) scored	
Discharge Temp (°F)		Wear Wear		
Return Gas Temp (°F)	62	wear	medium	
SumpTemp (°F)	147	Dottomal	(agating aids)	
II: Dot	** 000	Bottom washer		
Hi-Pot	pass	Appearance	clean/bronze plating	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze b		
Suction exit trail appearance	gray	Appearance	clean/corrosion	
Cluster block condition Wire to cluster block appearance	good	Wear	polish, slight	1 0025
wire to cluster block appearance	gray	Dimensions	Loaded	1.0025
			Unloaded	1 0025
Suction ring top appearance	clean		Unloaded	1.0025
Suction ring top appearance Remaining torque of discharge muffler	clean r	Shaft in agas ha		1.0025
Suction ring top appearance Remaining torque of discharge muffle (1) 4 (2) 5 (3) 4	clean	Shaft in cage be	aring	1.0025
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts	clean r (4) 4	Appearance	aring corrosion	1.0025
Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9	clean r (4) 4 (4) 11	Appearance Wear	aring corrosion polish, slight	1.0025
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance	clean r (4) 4	Appearance Wear Piston top appe	aring corrosion polish, slight	1.0025
Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9	clean r (4) 4 (4) 11	Appearance Wear	aring corrosion polish, slight	1.0025
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance	clean r (4) 4 (4) 11 clean	Appearance Wear Piston top appe	aring corrosion polish, slight	1.0025
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux?	clean r (4) 4 (4) 11 clean Yes	Appearance Wear Piston top appe Piston skirt	aring corrosion polish, slight arance clean	1.0025 1.3715
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor?	clean r (4) 4 (4) 11 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	aring corrosion polish, slight arance clean low wear	
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean r (4) 4 (4) 11 clean Yes No gray	Appearance Wear Piston top appe Piston skirt Appearance	aring corrosion polish, slight arance clean low wear Loaded	1.3715
Suction ring top appearance Remaining torque of discharge mufflet (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean r (4) 4 (4) 11 clean Yes No gray clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	aring corrosion polish, slight arance clean low wear Loaded	1.3715
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	clean r (4) 4 (4) 11 clean Yes No gray clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	aring corrosion polish, slight arance clean low wear Loaded Unloaded	1.3715
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	aring corrosion polish, slight arance clean low wear Loaded Unloaded	1.3715
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium	1.3715 1.3715
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded	1.3715 1.3715 1.3750
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace r removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded	1.3715 1.3715 1.3750
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 15	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace r removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded Unloaded (large end)	1.3715 1.3715
Suction ring top appearance Remaining torque of discharge muffler (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 15 Head gasket brittle?	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace r removed (4) 15 yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored	1.3715 1.3715 1.3750
Suction ring top appearance Remaining torque of discharge mufflet (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 16 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace r removed (4) 15 yes clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored slight	1.3715 1.3715 1.3750 1.3750
Suction ring top appearance Remaining torque of discharge mufflet (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 16 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace r removed (4) 15 yes clean Cu plate clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored slight Loaded	1.3715 1.3715 1.3750 1.3750
Suction ring top appearance Remaining torque of discharge mufflet (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 16 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean r (4) 4 (4) 11 clean Yes No gray clean Yes No clean trace r removed (4) 15 yes clean Cu plate clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	aring corrosion polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored slight Loaded	1.3715 1.3715 1.3750 1.3750

Unit	Number	76
	_	

Contaminants: Trash in liquid screen (g) 0.102 **Number of screens Control Unit?** No 2 Acid? Debris in compressor bottom (g) 1.062 Yes R-12? No

Air? Yes R-22? No H₂O? Yes R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Appearance Wear slight **Dimensions** Loaded 0.5000 Unloaded 0.5000 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance scored slight Wear **Dimensions** Loaded

0.4975 Unloaded 0.4975

Final Lubricant Values	
Total Acid Number (TAN)	0.18
Water (ppm)	57
Fluoride ion (ppm)	1.7
Chloride ion (ppm)	9.2
Aluminum (ppm)	0
Copper (ppm)	2
Iron (ppm)	1
Lead (ppm)	2
Silicon (ppm)	4
Tin (ppm)	0
Zinc (ppm)	3

Suction side (reed backer)

Valve Plate Assembly Inspection

corrosion Suction surface appearance

Suction reed

Condition good Appearance corrosion Trepan slight Varnish ring medium

Discharge side (reed backer)

Condition good

Appearance corrosion/blued Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion/blued **Trepan** very slight Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	very slight	gray	gummy
Tip of Pin	medium	black, brown	gummy
Spring	heavy	black, gray	gummy
Spring Seat	medium	black	gummy
Ball	slight	black	gummy
Front Side	medium	gray	gummy

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and Water 200 psig/40 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

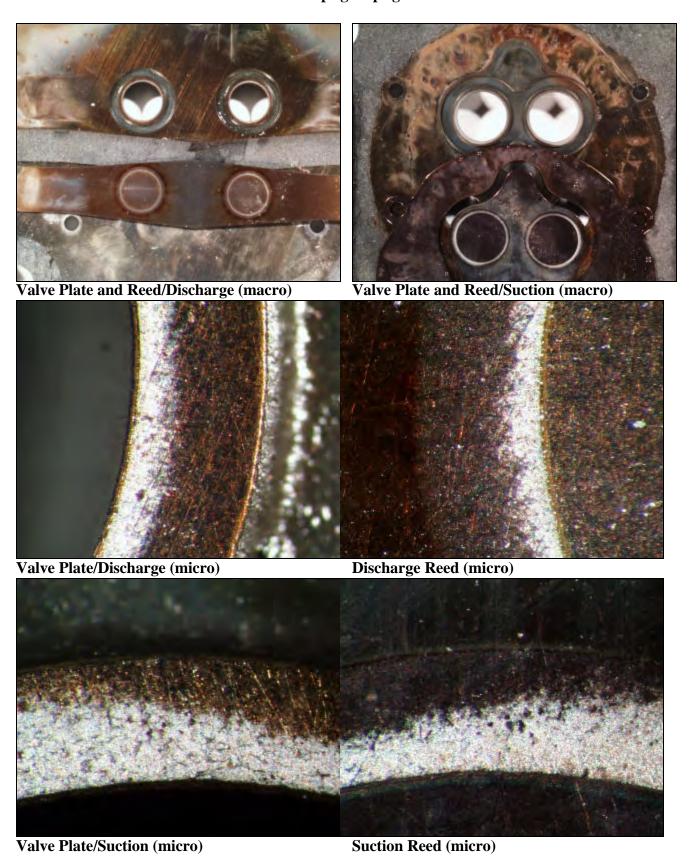


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-407C Compressor with Contaminant Acid, Air, and Water 200 psig/40 psig



Report for R-22 Control Compressor

TEST HISTORY OF:

Unit Number 85				
Onit Number 65				
Model # RS43C1E-CAV-250 Serial	l# 96F16532	Crank journals	;	
Run Time (hr.) 12021 Failed	1? No	Appearance	clean/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? Yes		Lower crank be		
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No R-502? No		***************************************	ponsii	
1200 110 110020 110		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	280	Dimensions	Unloaded	0.9980
Suction Pressure (psig)	78	Rottom thrust	washer (crank side)	0.7700
Discharge Temp (°F)	143	Appearance	clean/Cu plating	
Return Gas Temp (°F)	60	Wear	polish	
SumpTemp (°F)	98	vvcai	polisii	
Sumplemp(T)	38	Bottom washer	(costing side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	-	Wear	polish	
Top shell appearance	pass	Lower bronze	1	
Suction exit trail appearance	gray black	Appearance	scored/corrosion	
Cluster block condition		Wear	polish	
Wire to cluster block appearance	good clean	Dimensions	Loaded	1.0030
	clean	Difficusions	Unloaded	1.0030
Suction ring top appearance Remaining torque of discharge muffler			Unioaueu	1.0030
(1) 5 (2) 3.5 (3) 5		Chaft in ages h	onin a	
	(4) 5	Shaft in cage be	clean	
Remaining torque of stator bolts	(4) 0	Appearance Wear		
(1) 11 (2) 10 (3) 9	(4) 9		polish	
Suction muffler appearance	clean			
	Clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston top appe Piston skirt	earance clean	
- -				
OEM flux? Loose restrictor?	Yes	Piston skirt	low wear/Cu plating Loaded	1.3740
OEM flux? Loose restrictor? Discharge plate appearance	Yes No	Piston skirt Appearance	low wear/Cu plating	1.3740 1.3740
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	Yes No clean/Cu	Piston skirt Appearance Dimensions	low wear/Cu plating Loaded	
OEM flux? Loose restrictor? Discharge plate appearance	Yes No clean/Cu clean No	Piston skirt Appearance Dimensions Cylinder bore	low wear/Cu plating Loaded Unloaded	
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	Yes No clean/Cu clean No Yes	Piston skirt Appearance Dimensions Cylinder bore Appearance	low wear/Cu plating Loaded Unloaded no wear	
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	Yes No clean/Cu clean No Yes clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	low wear/Cu plating Loaded Unloaded no wear none	1.3740
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	Yes No clean/Cu clean No Yes clean trace	Piston skirt Appearance Dimensions Cylinder bore Appearance	low wear/Cu plating Loaded Unloaded no wear none Loaded	1.3740 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet	Yes No clean/Cu clean No Yes clean trace r removed	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	low wear/Cu plating Loaded Unloaded no wear none Loaded Unloaded	1.3740
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14 (2) 14 (3) 15	Yes No clean/Cu clean No Yes clean trace r removed (4) 15	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo	low wear/Cu plating Loaded Unloaded no wear none Loaded Unloaded I (large end)	1.3740 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14 (2) 14 (3) 15 Head gasket brittle?	Yes No clean/Cu clean No Yes clean trace r removed (4) 15 yes/bonded	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	low wear/Cu plating Loaded Unloaded no wear none Loaded Unloaded I (large end) Cu plating	1.3740 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance	Yes No clean/Cu clean No Yes clean trace r removed (4) 15 yes/bonded clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	low wear/Cu plating Loaded Unloaded no wear none Loaded Unloaded I (large end) Cu plating polish	1.3740 1.3760 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	Yes No clean/Cu clean No Yes clean trace r removed (4) 15 yes/bonded clean clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	low wear/Cu plating Loaded Unloaded no wear none Loaded Unloaded I (large end) Cu plating polish Loaded	1.3740 1.3760 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	Yes No clean/Cu clean No Yes clean trace r removed (4) 15 yes/bonded clean clean clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	low wear/Cu plating Loaded Unloaded no wear none Loaded Unloaded I (large end) Cu plating polish	1.3740 1.3760 1.3760
OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 14 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	Yes No clean/Cu clean No Yes clean trace r removed (4) 15 yes/bonded clean clean clean	Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	low wear/Cu plating Loaded Unloaded no wear none Loaded Unloaded I (large end) Cu plating polish Loaded	1.3740 1.3760 1.3760

Unit Number

Contaminants: Control Unit? Yes Acid? No R-12? No R-22? Air? No No H₂O? R-502? No No

Trash in liquid screen (g) 0.050 **Number of screens** 2 Debris in compressor bottom (g) 0.111

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish **Dimensions** Loaded 0.5010 Unloaded

0.5010

0.4980

Piston pin washers appearance

contact wear

Piston pin

Appearance scored polish Wear **Dimensions** Loaded

0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.51 Water (ppm) 39 Fluoride ion (ppm) 1.2 Chloride ion (ppm) 9.3 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 1 0

Lead (ppm) 2 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 Suction side (reed backer)

Condition good Appearance corrosion Suction surface appearance

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** slight gray hard Tip of Pin heavy black gummy Spring medium black, gray hard **Spring Seat** medium black hard Ball hard medium black Front Side slight black hard

Photographic Documentation of R-22 Control Compressor 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

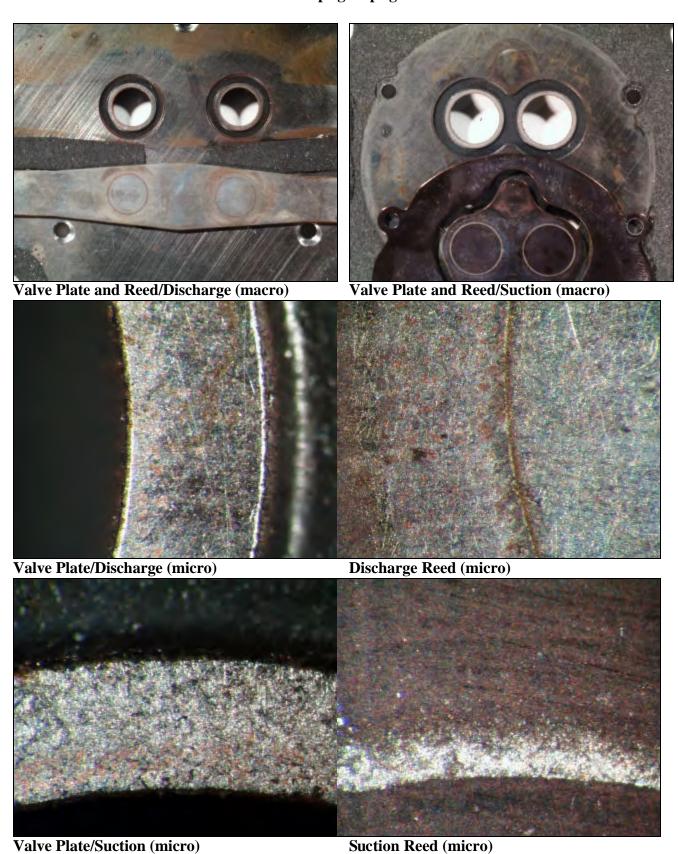


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Control Compressor 280 psig/78 psig



Report for R-22 Control Compressor

TEST HISTORY OF:

ILSI IIISIORI OI:				
Unit Number 86				
Model # RS43C1E-CAV-250 Serial	# 96F16521	Crank journals	\$	
Run Time (hr.) 12005 Failed	!? No	Appearance	clean	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? Yes		Lower crank be		
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		v cui	ponsii	
12,00		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	280	2 111011510115	Unloaded	0.9985
Suction Pressure (psig)	78	Rottom thrust	washer (crank side)	0.7703
Discharge Temp (°F)	143	Appearance	clean/scored	
Return Gas Temp (°F)	60	Wear	polish	
SumpTemp (°F)	98	v cui	ponsii	
Sumptemp (1)	70	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0025
Suction ring top appearance	clean	Dimensions	Unloaded	1.0025
Remaining torque of discharge muffler			Cinouaca	1.0023
(1) 5.4 (2) 3.8 (3) 5.4	(4) 4.6	Shaft in cage be	earing	
Remaining torque of stator bolts	(4) 1.0	Appearance	clean	
(1) 5.8 (2) 5.8 (3) 12.5	(4) 5.8	Wear	polish	
			-	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear/Cu plating	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear/Cu plating	
Shell bottom appearance	clean/Cu plate	Varnish ring	slight	
Quantity of bearing chips	heavy	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	removed		Unloaded	1.3760
(1) 14 (2) 14 (3) 15	(4) 15	Connecting rod	l (large end)	
Head gasket brittle?	yes/bonded	Appearance	Cu plating	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2515
Cage bearing top appearance	clean		Unloaded	1.2520
Remaining torque of cage bearing bolts	S			
(1) 4 (2) 5 (3) 5	(4) 5			

Unit Number 86

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.119Number of screens2Debris in compressor bottom (g)0.537

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washer/CuWearpolishDimensionsLoaded0.5025

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored/Cu plating

Wear polish
Dimensions Loaded

Unloaded 0.4975

0.4975

Final Lubricant Values Total Acid Number (TAN) 0.31 Water (ppm) 32 Fluoride ion (ppm) 1.5 Chloride ion (ppm) 15 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 8 0 Lead (ppm) 3 Silicon (ppm) Tin (ppm) 1 Suction side (reed backer)
Condition good

Appearance corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good

Appearance corrosion/Cu plating **Discharge surface appearance**

corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	very slight	gray	hard
Equalizer Hole	slight	gray	hard
Tip of Pin	heavy	black	gummy
Spring	medium	black, gray	hard
Spring Seat	heavy	black	hard
Ball	heavy	black	hard
Front Side	slight	gray	hard

3

Photographic Documentation of R-22 Control Compressor 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

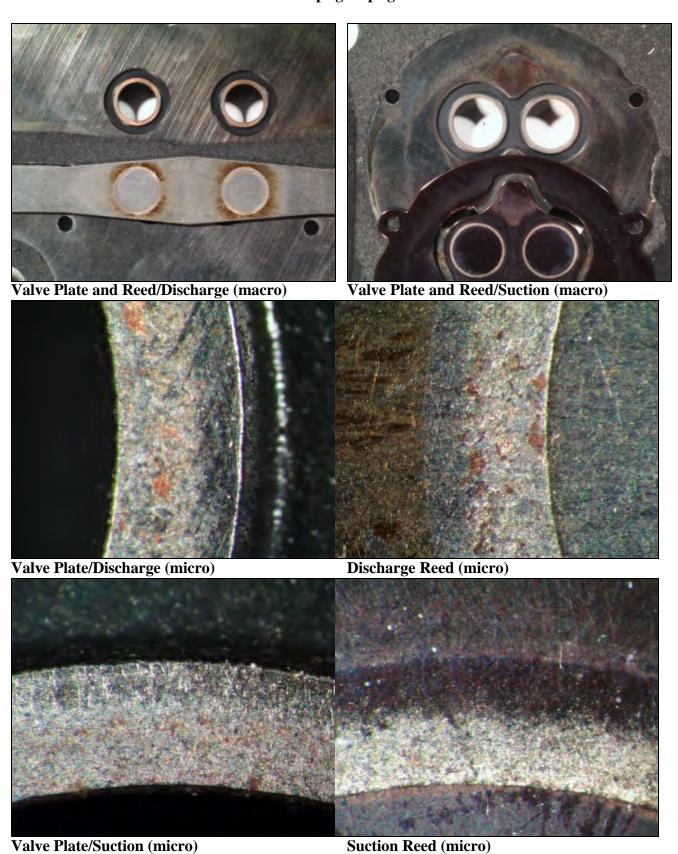


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Control Compressor 280 psig/78 psig



Report for R-22 Control Compressor

TEST HISTORY OF:

Unit Number 87				
0 0 - 10 0				
Model # RS43C1E-CAV-250 Seria	l# 96F16540	Crank journals	3	
Run Time (hr.) 12017 Failed	l? No	Appearance	clean/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? Yes		Lower crank b		1.2 103
Acid? No R-12? No		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		wear	ponsii	
1120. 140 K-302. 140		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	280	Difficusions	Unloaded	0.9985
Suction Pressure (psig)	78	Rottom thrust	washer (crank side)	0.9963
Discharge Temp (°F)	143	Appearance	clean/scored/Cu plati	nα
Return Gas Temp (°F)	60	Wear	polish	ng
SumpTemp (°F)		wear	ponsii	
Sumptemp (F)	98	Dottom weeher	(costing side)	
Hi-Pot	P OGG	Bottom washer Appearance	clean	
	pass	Wear		
High-low leak	pass		polish	
Top shell appearance	gray	Lower bronze	_	
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish Loaded	1 0025
Wire to cluster block appearance	gray	Dimensions		1.0035
Suction ring top appearance	clean		Unloaded	1.0035
Remaining torque of discharge muffler		Ch. C	•	
(1) 5 (2) 5.4 (3) 5.4 Provide the following of the following states and the following states are states as a fine state of the following states are states as a fine state of the following states are states as a fine state of the following states are states as a fine state of the following states are states as a fine state of the following states are states as a fine state of the fine states are states as a fine state of the states are states as a fine state of the fine states are states as a fine state of the states are states as a fine state of the states are states as a fine state of the states are states as a	(4) 5	Shaft in cage b	-	
Remaining torque of stator bolts	(4) (2)	Appearance	clean	
(1) 2.1 (2) 2.1 (3) 2.1	(4) 6.3	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Discharge place appearance	CHOY!		Unloaded	1.3740
Top stator windings appearance	gray		Ullibaueu	1.3740
	No	Cylinder bore	Omoaded	1.3740
Top stator windings appearance		Cylinder bore Appearance	no wear	1.3740
Top stator windings appearance Rotor rub marks present? Was rotor loose?	No No	Appearance	no wear	1.3740
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	No No clean	Appearance Varnish ring		1.3740
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	No No clean slight	Appearance	no wear none Loaded	1.3760
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	No No clean slight r removed	Appearance Varnish ring Dimensions	no wear none Loaded Unloaded	
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle. (1) 15 (2) 14 (3) 15	No No clean slight r removed (4) 15	Appearance Varnish ring Dimensions Connecting roo	no wear none Loaded Unloaded I (large end)	1.3760
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 15 (2) 14 (3) 15 Head gasket brittle?	No No clean slight r removed	Appearance Varnish ring Dimensions	no wear none Loaded Unloaded I (large end) scored/Cu plating	1.3760
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 15 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance	No No clean slight r removed (4) 15 yes/bonded clean	Appearance Varnish ring Dimensions Connecting roo Appearance Wear	no wear none Loaded Unloaded I (large end) scored/Cu plating slight	1.3760 1.3760
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	No No clean slight r removed (4) 15 yes/bonded clean clean	Appearance Varnish ring Dimensions Connecting roo Appearance	no wear none Loaded Unloaded I (large end) scored/Cu plating slight Loaded	1.3760 1.3760 1.2515
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	No No clean slight r removed (4) 15 yes/bonded clean clean clean	Appearance Varnish ring Dimensions Connecting roo Appearance Wear	no wear none Loaded Unloaded I (large end) scored/Cu plating slight	1.3760 1.3760
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 14 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	No No clean slight r removed (4) 15 yes/bonded clean clean clean	Appearance Varnish ring Dimensions Connecting roo Appearance Wear	no wear none Loaded Unloaded I (large end) scored/Cu plating slight Loaded	1.3760 1.3760 1.2515

Unit Number 87 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.066Number of screens2Debris in compressor bottom (g)0.504

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolish

Dimensions Loaded 0.5015 Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored Wear polish Dimensions Loaded

Dimensions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values
Total Acid Number (TAN) 0.05
Water (ppm) 26

Fluoride ion (ppm) 1.4 Chloride ion (ppm) 11 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 0 3 Silicon (ppm) 0 Tin (ppm)

Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion/Cu plating

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good
Appearance corrosion

Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** slight gray hard **Equalizer Hole** very slight gray hard Tip of Pin very heavy black gummy Spring medium hard black, gray **Spring Seat** hard slight gray Ball medium black gummy Front Side slight gray hard

2

Photographic Documentation of R-22 Control Compressor 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

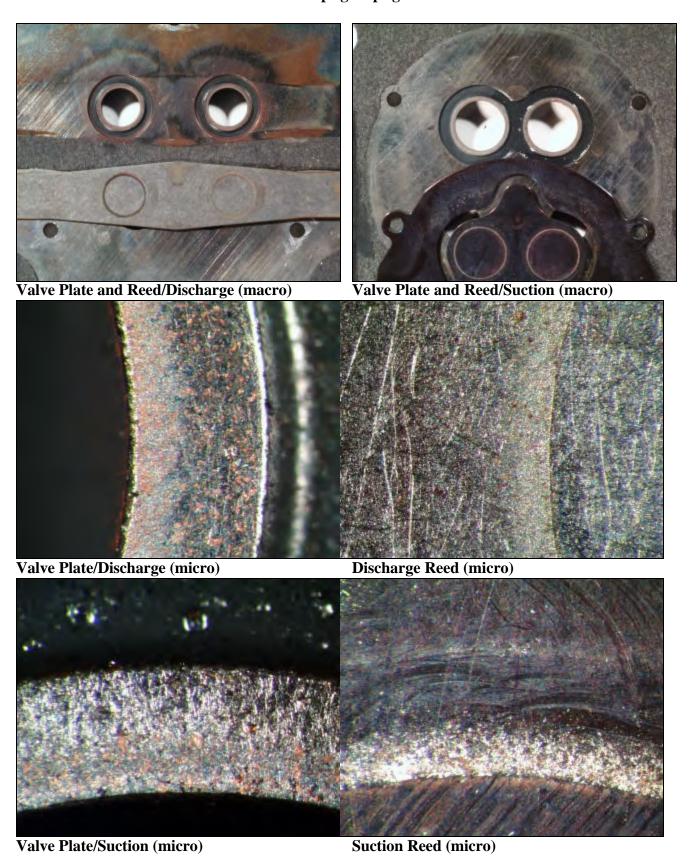


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Control Compressor 280 psig/78 psig



Report for R-22 Compressor with Contaminant Water

TEST HISTORY OF:

Unit Number 88			
	rial# 96F16529	Crank journals	
		Crank journals	
. ,	iled? No	Appearance clean/Cu plating	
Refrigerant R-22		Wear polish, medium	70
Lubricant 3GS		Dimensions Loaded 1.247	
Contaminants:		Unloaded 1.247	0
Control Unit? No		Lower crank bearing journal	
Acid? No R-12? No		Appearance clean	
Air? No R-22? No		Wear polish, slight	
H_2O ? Yes $R-502$? No			
		Dimensions Loaded 0.998	
Discharge Pressure (psig)	280	Unloaded 0.998	80
Suction Pressure (psig)	78	Bottom thrust washer (crank side)	
Discharge Temp (°F)	143	Appearance clean/Cu plating	
Return Gas Temp (°F)	60	Wear polish, heavy	
SumpTemp (°F)	98		
		Bottom washer (casting side)	
Hi-Pot	pass	Appearance clean	
High-low leak	pass	Wear polish, slight	
Top shell appearance	clean	Lower bronze bearings	
Suction exit trail appearance	gray	Appearance clean	
Cluster block condition	good	Wear polish, slight	
Wire to cluster block appearance	gray	Dimensions Loaded 0.999	95
Suction ring top appearance	bright	Unloaded 0.999	95
Suction ring top appearance Remaining torque of discharge muff	_	Unloaded 0.999	95
	_	Unloaded 0.999 Shaft in cage bearing	95
Remaining torque of discharge muff	fler		95
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5	fler	Shaft in cage bearing	05
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts	(4) 4	Shaft in cage bearing Appearance clean	05
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10	(4) 4 (4) 9	Shaft in cage bearing Appearance clean Wear polish, slight	05
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance	(4) 4 (4) 9 rust	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt	95
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	fler (4) 4 (4) 9 rust Yes	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt	
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	fler (4) 4 (4) 9 rust Yes No	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373	80
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	fler (4) 4 (4) 9 rust Yes No brown clean	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373	80
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	fler (4) 4 (4) 9 rust Yes No brown clean No	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore	80
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	fler (4) 4 (4) 9 rust Yes No brown clean No No	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear	80
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	fler (4) 4 (4) 9 rust Yes No brown clean No No black	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy	80 80
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375	30 30
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace fler removed	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375 Unloaded 1.375 Unloaded 1.375	30 30
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 16 (3) 15	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace fler removed (4) 16	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375 Unloaded 1.355 Connecting rod (large end)	30 30
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 16 (3) 15 Head gasket brittle?	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace fler removed (4) 16 yes	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375 Unloaded 1.375 Connecting rod (large end) Appearance Cu plating	30 30
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace fler removed (4) 16 yes clean	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375 Unloaded 1.355 Connecting rod (large end) Appearance Cu plating Wear polish, medium	80 80 60
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace fler removed (4) 16 yes clean dirty	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375 Unloaded 1.355 Connecting rod (large end) Appearance Cu plating Wear polish, medium Dimensions Loaded 1.250	30 30 50 50
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace fler removed (4) 16 yes clean dirty clean	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375 Unloaded 1.355 Connecting rod (large end) Appearance Cu plating Wear polish, medium	30 30 50 50
Remaining torque of discharge muff (1) 4 (2) 5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	fler (4) 4 (4) 9 rust Yes No brown clean No No black trace fler removed (4) 16 yes clean dirty clean	Shaft in cage bearing Appearance clean Wear polish, slight Piston top appearance varnish Piston skirt Appearance low wear/scored Dimensions Loaded 1.373 Unloaded 1.373 Cylinder bore Appearance low wear Varnish ring heavy Dimensions Loaded 1.375 Unloaded 1.355 Connecting rod (large end) Appearance Cu plating Wear polish, medium Dimensions Loaded 1.250	30 30 50 50

Unit Number	88
C	

Contaminants:Trash in liquid screen (g)0.061Control Unit?NoNumber of screens1Acid?NoR-12?NoDebris in compressor bottom (g)0.358

 Air?
 No
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolish, slightDimensionsLoaded0.5005Unloaded0.5005

Piston pin washers appearance

contact wear

Piston pin

Appearance clean

Wear polish, medium

Dimensions Loaded 0.4990 Unloaded 0.4990

Final Lubricant Values Total Acid Number (TAN) 0.14 Water (ppm) 34 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 9.2 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 5 0 Lead (ppm) 9 Silicon (ppm) Tin (ppm) 1 Zinc (ppm) 15

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating
Trepan very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black	gummy
Spring Seat	medium	black	gummy
Ball	heavy	black	gummy
Front Side	slight	black	hard

Photographic Documentation of R-22 Compressor with Contaminant Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

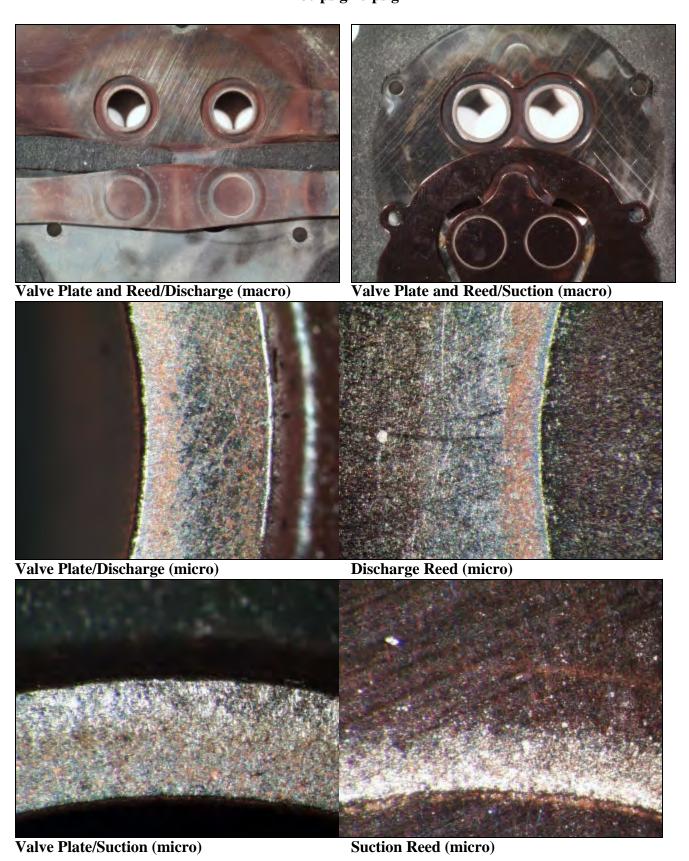


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Water 280 psig/78 psig



Report for R-22 Compressor with Contaminant Water

TEST HISTORY OF:

Unit Number 89			
Model # RS43C1E-CAV-250 Ser	ial# 96F16522	Crank journals	
Run Time (hr.) 12011 Fail	ed? No	Appearance scored/Cu plating	
Refrigerant R-22		Wear polish	
Lubricant 3GS		•	1.2465
Contaminants:		Unloaded	1.2465
Control Unit? No		Lower crank bearing journal	
Acid? No R-12? No		Appearance clean	
Air? No R-22? No		Wear polish	
H_2O ? Yes $R-502$? No		ponsii	
1200 100 1100 110		Dimensions Loaded	0.9975
Discharge Pressure (psig)	280		0.9975
Suction Pressure (psig)	78	Bottom thrust washer (crank side)	0.7775
Discharge Temp (°F)	143	Appearance scored	
Return Gas Temp (°F)	60	Wear polish	
SumpTemp (°F)	98	polish	
Sumpremp(1)	76	Bottom washer (casting side)	
Hi-Pot	pass	Appearance scored	
High-low leak	fail	Wear polish	
Top shell appearance	clean	Lower bronze bearings	
Suction exit trail appearance	gray	Appearance scored/corrosion	
Cluster block condition	good	Wear polish	
Wire to cluster block appearance	clean	1	1.0035
Will to cluster block appearance	Cican	Differences Educed	1.0055
	clean	Unloaded	1.0035
Suction ring top appearance	clean	Unloaded	1.0035
Suction ring top appearance Remaining torque of discharge muffl	ler		1.0035
Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5		Shaft in cage bearing	1.0035
Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts	(4) 5	Shaft in cage bearing Appearance clean	1.0035
Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10	(4) 5 (4) 10	Shaft in cage bearing Appearance clean Wear polish	1.0035
Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance	(4) 5 (4) 10 rust	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean	1.0035
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux?	(4) 5 (4) 10 rust Yes	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt	1.0035
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 5 (4) 10 rust	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating	
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 5 (4) 10 rust Yes No gray	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded	1.3740
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 5 (4) 10 rust Yes No	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded	
Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 5 (4) 10 rust Yes No gray	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded	1.3740
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 5 (4) 10 rust Yes No gray clean/stator top green	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded	1.3740
Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 5 (4) 10 rust Yes No gray clean/stator top green No	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore	1.3740
Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight	1.3740
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	ler (4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Loaded	1.3740 1.3740
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	ler (4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Unloaded Connecting rod (large end)	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	ler (4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight ler removed	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Unloaded	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffi (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffi (1) 15 (2) 15 (3) 17 Head gasket brittle? Head suction cavity appearance	(4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight ler removed (4) 17	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Unloaded Connecting rod (large end)	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffl (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl (1) 15 (2) 15 (3) 17 Head gasket brittle?	(4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight ler removed (4) 17 no/bonded	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Unloaded Connecting rod (large end) Appearance scored/Cu plating/corre Wear polish	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffi (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffi (1) 15 (2) 15 (3) 17 Head gasket brittle? Head suction cavity appearance	(4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight ler removed (4) 17 no/bonded clean	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Unloaded Connecting rod (large end) Appearance scored/Cu plating/corre Wear polish Dimensions Loaded	1.3740 1.3740 1.3760 1.3760 osion
Suction ring top appearance Remaining torque of discharge muffi (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffi (1) 15 (2) 15 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight ler removed (4) 17 no/bonded clean clean clean	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Unloaded Connecting rod (large end) Appearance scored/Cu plating/corre Wear polish Dimensions Loaded	1.3740 1.3740 1.3760 1.3760 osion 1.2515
Remaining torque of discharge muffi (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffi (1) 15 (2) 15 (3) 17 Head gasket brittle? Head suction cavity appearance Cage bearing top appearance	(4) 5 (4) 10 rust Yes No gray clean/stator top green No No clean slight ler removed (4) 17 no/bonded clean clean clean	Shaft in cage bearing Appearance clean Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded Unloaded Cylinder bore Appearance rust Varnish ring slight Dimensions Loaded Unloaded Connecting rod (large end) Appearance scored/Cu plating/corre Wear polish Dimensions Loaded	1.3740 1.3740 1.3760 1.3760 osion 1.2515

Unit Number 89

Contaminants:Trash in liquid screen (g)0.059Control Unit?NoNumber of screens1Acid?NoR-12?NoDebris in compressor bottom (g)0.487

Air? No **R-22?** No **H₂O?** Yes **R-502?** No

Connecting rod (small end)

 Appearance
 contact wear/correct washer/corrosion
 Condition

 Wear
 polish
 Appearance

 Dimensions
 Leaded
 0.5010

Dimensions Loaded 0.5010 Suction surface appearan
Unloaded 0.5010 corrosion/Cu plating

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion
Wear polish
Dimensions Loaded

nensions Loaded 0.4970 Unloaded 0.4970

Final Lubricant Values
Total Acid Number (TAN)
Water (ppm)
18
Fluoride ion (ppm)
1.5
Chloride ion (ppm)
Aluminum (ppm)
0

 Aluminum (ppm)
 0

 Copper (ppm)
 0

 Iron (ppm)
 0

 Lead (ppm)
 0

 Silicon (ppm)
 2

 Tin (ppm)
 0

 Zinc (ppm)
 1

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good
Appearance corrosion

Discharge surface appearance
corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black, brown hard, gummy **Spring Seat** medium black gummy Ball medium hard black Front Side medium black hard

Photographic Documentation of R-22 Compressor with Contaminant Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

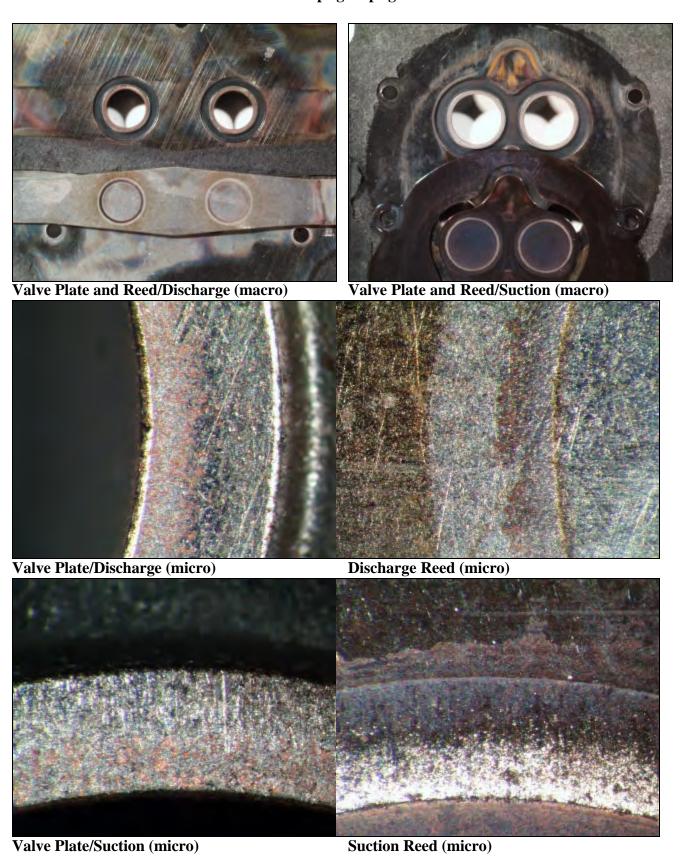


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Water 280 psig/78 psig



Report for R-22 Compressor with Contaminant Water

TEST HISTORY OF:

Unit Number 90				
and the second s				
Model # RS43C1E-CAV-250 Serial	# 96F16536	Crank journals		
Run Time (hr.) 12031 Failed	!? No	Appearance	scored/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		1.2 . , 0
Acid? No R-12? No		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? Yes $R-502$? No		vv cai	ponsii	
11.0. 103 R-302. 110		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	280	Difficustons	Unloaded	0.9980
Suction Pressure (psig)	78	Rottom thrust	washer (crank side)	0.7700
Discharge Temp (°F)	143	Appearance	scored/Cu plating	
Return Gas Temp (°F)	60	Wear	polish	
SumpTemp (°F)	98	vvcai	ponsii	
Sumplemp(F)	38	Bottom washer	(casting side)	
Hi-Pot	nace	Appearance	scored	
High-low leak	pass	Wear	slight	
Top shell appearance	pass clean	Lower bronze l	_	
Suction exit trail appearance		Appearance	scored/corrosion	
Cluster block condition	gray	Wear Wear		
Wire to cluster block appearance	good clean	Dimensions	polish Loaded	1.0035
Suction ring top appearance	clean	Difficusions	Unloaded	1.0035
~			Ullibaueu	1.0033
Remaining torque of discharge muffler		Shoft in cogo h	oning	
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage be	_	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts	(4) 5	Appearance	clean	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10	(4) 5(4) 10	Appearance Wear	clean polish	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts	(4) 5	Appearance	clean polish	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10	(4) 5(4) 10	Appearance Wear	clean polish	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance	(4) 5(4) 10clean	Appearance Wear Piston top appe Piston skirt Appearance	clean polish	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux?	(4) 5 (4) 10 clean Yes	Appearance Wear Piston top appe Piston skirt	clean polish earance clean	1.3740
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 5 (4) 10 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	clean polish earance clean no wear/Cu plating	1.3740 1.3740
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 5 (4) 10 clean Yes No gray	Appearance Wear Piston top appe Piston skirt Appearance	clean polish earance clean no wear/Cu plating Loaded	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 5(4) 10cleanYesNograyclean/stator top green	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	clean polish earance clean no wear/Cu plating Loaded	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 5(4) 10cleanYesNograyclean/stator top greenNo	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish carance clean no wear/Cu plating Loaded Unloaded no wear/rust	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish earance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight	
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish earance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded	1.3740 1.3760
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish arance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded Unloaded	1.3740
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 17.5 (2) 20 (3) 20	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	clean polish carance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded Unloaded (large end)	1.3740 1.3760 1.3760
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace removed (4) 17.5	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish carance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded Unloaded (large end) scored/Cu plating/con	1.3740 1.3760 1.3760
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 17.5 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace removed (4) 17.5 no/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean polish carance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded Unloaded (large end)	1.3740 1.3760 1.3760 rrosion
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 17.5 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace removed (4) 17.5 no/bonded clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish carance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded Unloaded (large end) scored/Cu plating/compolish	1.3740 1.3760 1.3760
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 17.5 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace removed (4) 17.5 no/bonded clean clean clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish carance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded Unloaded I (large end) scored/Cu plating/compolish Loaded	1.3740 1.3760 1.3760 rrosion 1.2510
(1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 17.5 (2) 20 (3) 20 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 5 (4) 10 clean Yes No gray clean/stator top green No No clean trace removed (4) 17.5 no/bonded clean clean clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish carance clean no wear/Cu plating Loaded Unloaded no wear/rust very slight Loaded Unloaded I (large end) scored/Cu plating/compolish Loaded	1.3740 1.3760 1.3760 rrosion 1.2510

Unit Number

Contaminants: Trash in liquid screen (g) 0.114 **Control Unit?** No **Number of screens** 2 Acid? 0.379 No R-12? No Debris in compressor bottom (g)

Air? No R-22? No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish **Appearance** corrosion Dimensions Loaded 0.5010

Unloaded 0.5010 corrosion/Cu plating

Piston pin washers appearance

contact wear

Piston pin

Tin (ppm)

Zinc (ppm)

Appearance corrosion Wear polish **Dimensions** Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.07 Water (ppm) 2 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 11 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 3 Silicon (ppm)

Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good **Suction surface appearance**

Suction reed

Condition good

Appearance corrosion/Cu plating

Trepan very slight Varnish ring none

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	black	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	medium	black	hard
Spring Seat	slight	black	hard
Ball	medium	black, brassy	hard
Front Side	medium	black	hard

0

1

Photographic Documentation of R-22 Compressor with Contaminant Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

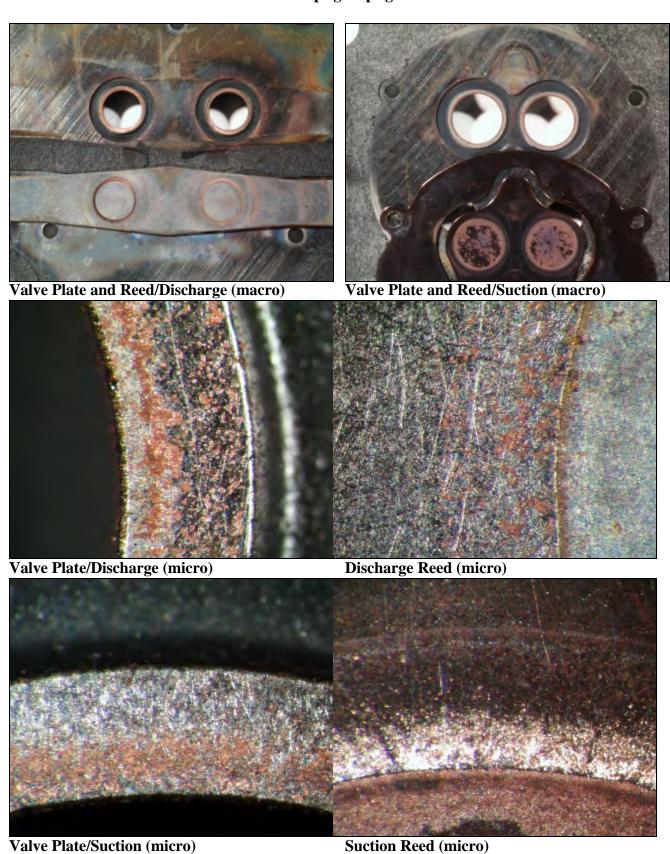


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Water 280 psig/78 psig



Report for R-22 Compressor with Contaminant Acid

TEST HISTORY OF:				
Unit Number 91				
Model # RS43C1E-CAV-250 Seria	l# 96F16520	Crank journals	S	
Run Time (hr.) 12036 Failed	1? No	Appearance	clean/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2465
Contaminants:		Difficusions	Unloaded	1.2465
		I arran anonly h		1.2403
		Lower crank b		
Acid? Yes R-12? No		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No				
		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	280		Unloaded	0.9980
Suction Pressure (psig)	78	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	143	Appearance	scored/Cu plating/co	rrosion
Return Gas Temp (°F)	60	Wear	polish	
SumpTemp (°F)	98			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/Cu plating	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0040
	giav	Dimensions	Loaucu	1.00+0
			Unloaded	1.0035
Suction ring top appearance	clean		Unloaded	1.0035
Suction ring top appearance Remaining torque of discharge muffle	clean r	Shoft in cogo b		1.0035
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5	clean	Shaft in cage be	earing	
Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts	clean r (4) 5	Appearance	earing clean/Cu plating/corr	
Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10	clean r		earing clean/Cu plating/corr polish	
Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts	clean r (4) 5	Appearance	earing clean/Cu plating/corr polish	
Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10	clean r (4) 5 (4) 10	Appearance Wear	earing clean/Cu plating/corr polish	
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance	clean r (4) 5 (4) 10 clean	Appearance Wear Piston top appe Piston skirt	earing clean/Cu plating/corr polish earance clean	
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	clean r (4) 5 (4) 10 clean Yes No	Appearance Wear Piston top appe	earing clean/Cu plating/corr polish	osion
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean r (4) 5 (4) 10 clean Yes No gray	Appearance Wear Piston top appe Piston skirt Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded	osion 1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean/Cu plating/corr polish earance clean no wear/Cu plating	osion
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded	osion 1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear	osion 1.3740
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight	1.3740 1.3740
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded	1.3740 1.3740 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded Unloaded	1.3740 1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 17 (3) 15	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed (4) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded Unloaded I (large end)	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 17 (3) 15 Head gasket brittle?	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed (4) 15 yes/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded I (large end) scored/Cu plating/cor	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed (4) 15 yes/bonded clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded I (large end) scored/Cu plating/corpolish	1.3740 1.3740 1.3760 1.3760 rrosion
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed (4) 15 yes/bonded clean clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded I (large end) scored/Cu plating/corpolish Loaded	1.3740 1.3740 1.3760 1.3760 rrosion 1.2510
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed (4) 15 yes/bonded clean clean dirty	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded I (large end) scored/Cu plating/corpolish	1.3740 1.3740 1.3760 1.3760 rrosion
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolt	clean (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed (4) 15 yes/bonded clean clean dirty s	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded I (large end) scored/Cu plating/corpolish Loaded	1.3740 1.3740 1.3760 1.3760 rrosion 1.2510
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean r (4) 5 (4) 10 clean Yes No gray gray/stator top green No No clean slight r removed (4) 15 yes/bonded clean clean dirty	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded no wear very slight Loaded Unloaded I (large end) scored/Cu plating/corpolish Loaded	1.3740 1.3740 1.3760 1.3760 rrosion 1.2510

Unit Number 91

Contaminants:Trash in liquid screen (g)0.031Control Unit?NoNumber of screens1Acid?YesR-12?NoDebris in compressor bottom (g)0.586

Air? No **R-22?** No **H₂O?** No **R-502?** No

Connecting rod (small end)

Appearancecontact wear/correct washer/corrosionConditiongoodWearpolishAppearancecorrosionDimensionsLoaded0.5010Suction surface appearance

Dimensions Loaded 0.5010 Suction surface appearan
Unloaded 0.5010 corrosion/Cu plating

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance Cu plating/corrosion

 Wear
 polish

 Dimensions
 Loaded
 0.4970

 Unloaded
 0.4970

Final Lubricant Values **Total Acid Number (TAN)** 0.15 Water (ppm) Fluoride ion (ppm) 1.1 Chloride ion (ppm) 11 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 2 0 Lead (ppm) 3 Silicon (ppm) 8 Tin (ppm)

Discharge side (reed backer)

Valve Plate Assembly Inspection

good

corrosion

very slight

very slight

Suction side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**corrosion/Cu plating

Discharge reed

Suction reed Condition

Trepan

Appearance

Varnish ring

Condition good

Appearance corrosion/Cu plating **Trepan** slight

Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring black hard heavy **Spring Seat** medium black hard Ball medium black hard Front Side heavy black hard

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Photographic Documentation of R-22 Compressor with Contaminant Acid 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

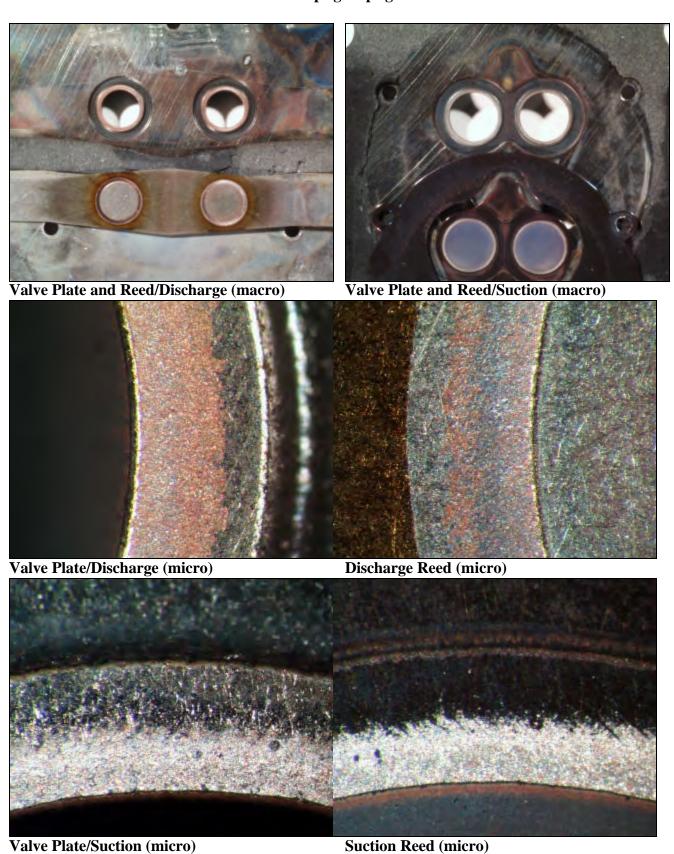


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid 280 psig/78 psig



Report for R-22 Compressor with Contaminant Acid

TEST HISTORY OF:

Unit Number 92				
Model # RS43C1E-CAV-250 Seria	1 # 96F16524	Crank journals	S	
Run Time (hr.) 12020 Failed	1? No	Appearance	clean/Cu plating/corr	osion
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b		1.2170
Acid? Yes R-12? No		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No R-502? No		v cai	ponsii	
1120. 110 11.002. 110		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	280	Difficusions	Unloaded	0.9990
Suction Pressure (psig)	78	Rottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	143	Appearance	scored/Cu plating/we	ar metals
Return Gas Temp (°F)	60	Wear	slight	ai inctais
SumpTemp (°F)	98	vvcai	Silgit	
Sumpremp(r)	96	Bottom washer	(costing side)	
Hi-Pot	pass	Appearance	Cu plating	
High-low leak	•	Wear	slight	
Top shell appearance	pass clean	Lower bronze	0	
Suction exit trail appearance		Appearance	scored/corrosion	
Cluster block condition	gray	Wear	polish	
Wire to cluster block appearance	good gray	Dimensions	Loaded	1.0030
wire to cluster block abbearance	gray	Dimensions	Loaueu	1.0030
			Unloaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Suction ring top appearance Remaining torque of discharge muffler	clean	Shaft in cage b		1.0030
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5	clean	Shaft in cage be	earing	
Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts	clean r (4) 5	Appearance	earing clean/Cu plating/corr	
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5	clean r (4) 5 (4) 12.5	Appearance Wear	earing clean/Cu plating/corr polish	
Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts	clean r (4) 5	Appearance	earing clean/Cu plating/corr polish	
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5	clean r (4) 5 (4) 12.5	Appearance Wear	earing clean/Cu plating/corr polish	
Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance	clean r (4) 5 (4) 12.5 clean	Appearance Wear Piston top appo	earing clean/Cu plating/corr polish	
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux?	clean r (4) 5 (4) 12.5 clean Yes No	Appearance Wear Piston top appo Piston skirt	earing clean/Cu plating/corr polish earance clean	
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean r (4) 5 (4) 12.5 clean Yes No gray, soot	Appearance Wear Piston top appo Piston skirt Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating	rosion
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor?	clean r (4) 5 (4) 12.5 clean Yes No	Appearance Wear Piston top apport Piston skirt Appearance Dimensions	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded	rosion 1.3740
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean r (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green	Appearance Wear Piston top apport Piston skirt Appearance Dimensions Cylinder bore	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded	rosion 1.3740
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear	rosion 1.3740
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight	1.3740 1.3740
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded	1.3740 1.3740 1.3760
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	clean (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium r removed	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded Unloaded Unloaded	1.3740 1.3740
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17	clean (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium r removed (4) 17	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roc	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded Unloaded Unloaded Unloaded (large end)	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffler (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17 Head gasket brittle?	clean (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium r removed	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded Unloaded Unloaded (large end) scored/Cu plating/co	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance	clean r (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium r removed (4) 17 yes/bonded clean	Appearance Wear Piston top apport Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded Unloaded d (large end) scored/Cu plating/co polish	1.3740 1.3740 1.3760 1.3760 rrosion
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean r (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium r removed (4) 17 yes/bonded clean dirty	Appearance Wear Piston top apport Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded Unloaded Unloaded (large end) scored/Cu plating/co	1.3740 1.3740 1.3760 1.3760 rrosion 1.2510
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean r (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium r removed (4) 17 yes/bonded clean dirty dirty	Appearance Wear Piston top apport Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded Unloaded d (large end) scored/Cu plating/co polish Loaded	1.3740 1.3740 1.3760 1.3760 rrosion
Suction ring top appearance Remaining torque of discharge mufflet (1) 5 (2) 2.5 (3) 5 Remaining torque of stator bolts (1) 10 (2) 15 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean r (4) 5 (4) 12.5 clean Yes No gray, soot gray/stator top green No No clean medium r removed (4) 17 yes/bonded clean dirty dirty	Appearance Wear Piston top apport Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean/Cu plating/corr polish earance clean no wear/Cu plating Loaded Unloaded low wear slight Loaded Unloaded d (large end) scored/Cu plating/co polish Loaded	1.3740 1.3740 1.3760 1.3760 rrosion 1.2510

Unit Number

Contaminants: Trash in liquid screen (g) 0.003 **Control Unit?** No **Number of screens** Acid? Yes R-12? No Debris in compressor bottom (g) 0.122

Air? R-22? No No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish **Appearance**

Dimensions Loaded 0.5010 Unloaded 0.5010 corrosion/Cu plating

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance Cu plating/corrosion

Wear polish **Dimensions** Loaded

0.4970 0.4970 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.14 Water (ppm) 25 Fluoride ion (ppm) 0.93 Chloride ion (ppm) 11 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 6 Lead (ppm) 0 4 Silicon (ppm) Tin (ppm) 6 Suction side (reed backer) Condition good

corrosion **Suction surface appearance**

Valve Plate Assembly Inspection

Suction reed

Condition good

Appearance corrosion/Cu plating

Trepan very slight Varnish ring very slight

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	medium	black	gummy
Spring Seat	medium	black	hard
Ball	medium	black, brown	hard
Front Side	slight	black	hard

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Photographic Documentation of R-22 Compressor with Contaminant Acid 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

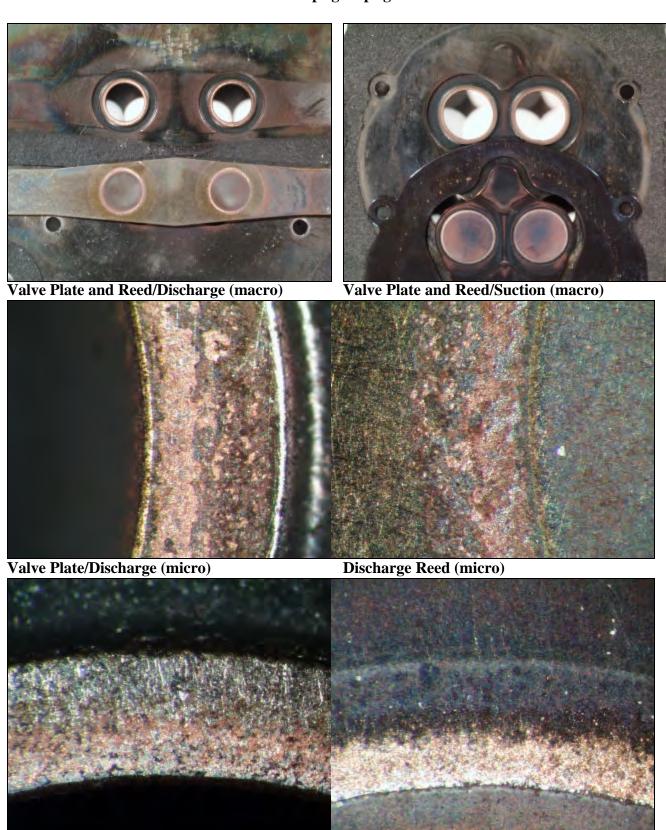


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid 280 psig/78 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

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Report for R-22 Compressor with Contaminant Air

TEST HISTORY OF:		
Unit Number 93		
Model # RS43C1E-CAV-250 S	erial# 96F16518	Crank journals
Run Time (hr.) 12029 F	ailed? No	Appearance clean/Cu plating
Refrigerant R-22		Wear polish
Lubricant 3GS		Dimensions Loaded 1.2470
Contaminants:		Unloaded 1.2470
Control Unit? No		Lower crank bearing journal
Acid? No R-12? No		Appearance clean/Cu plating
Air? Yes R-22? No		Wear polish
H_2O ? No $R-502$? No		
		Dimensions Loaded 0.9990
Discharge Pressure (psig)	280	Unloaded 0.9990
Suction Pressure (psig)	78	Bottom thrust washer (crank side)
Discharge Temp (°F)	143	Appearance scored/Cu plating/corrosion
Return Gas Temp (°F)	60	Wear polish
SumpTemp (°F)	98	r
Sumpremp (1)	70	Bottom washer (casting side)
Hi-Pot	pass	Appearance clean/Cu plating
High-low leak	•	
O	pass	I a second
Top shell appearance	clean	Lower bronze bearings
Suction exit trail appearance	black	Appearance scored/corrosion
Cluster block condition	good	Wear polish
Wire to cluster block appearance	gray	Dimensions Loaded 1.0035
Suction ring top appearance	clean	Unloaded 1.0035
	clean	
Suction ring top appearance	clean	
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5	clean ffler	Unloaded 1.0035 Shaft in cage bearing
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts	clean ffler (4) 5	Unloaded 1.0035 Shaft in cage bearing Appearance clean/Cu plating/corrosion
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10	clean ffler (4) 5 (4) 12.5	Unloaded 1.0035 Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance	clean ffler (4) 5 (4) 12.5 clean	Unloaded 1.0035 Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10	clean ffler (4) 5 (4) 12.5 clean Yes	Unloaded 1.0035 Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance	clean ffler (4) 5 (4) 12.5 clean	Unloaded 1.0035 Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux?	clean ffler (4) 5 (4) 12.5 clean Yes	Unloaded 1.0035 Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Unloaded 1.3740
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No	Unloaded1.0035Shaft in cage bearing Appearance Wearclean/Cu plating/corrosion polishPiston top appearance
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No	Unloaded1.0035Shaft in cage bearing Appearance Wearclean/Cu plating/corrosion polishPiston top appearance Piston skirt Appearance DimensionscleanAppearance Dimensionsno wear/Cu plating Loaded1.3740Cylinder bore AppearanceUnloaded1.3740
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean	Unloaded1.0035Shaft in cage bearingAppearanceclean/Cu plating/corrosionWearpolishPiston top appearancecleanPiston skirtAppearanceno wear/Cu platingDimensionsLoaded1.3740Cylinder boreAppearanceno wearAppearanceno wearVarnish ringvery slight
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Unloaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Unloaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Unloaded 1.3760 Unloaded 1.3760 Unloaded 1.3760
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu (1) 17.5 (2) 17.5 (3) 15	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed (4) 15	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Unloaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Unloaded 1.3760 Connecting rod (large end)
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu (1) 17.5 (2) 17.5 (3) 15 Head gasket brittle?	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed (4) 15 no/bonded	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Unloaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Unloaded 1.3760 Connecting rod (large end) Appearance scored/Cu plating/corrosion
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu (1) 17.5 (2) 17.5 (3) 15 Head gasket brittle? Head suction cavity appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed (4) 15 no/bonded clean	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Unloaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Unloaded 1.3760 Connecting rod (large end) Appearance scored/Cu plating/corrosion Wear polish
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu (1) 17.5 (2) 17.5 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed (4) 15 no/bonded	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Connecting rod (large end) Appearance scored/Cu plating/corrosion Wear polish Dimensions Loaded 1.2510
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu (1) 17.5 (2) 17.5 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed (4) 15 no/bonded clean Cu plate clean	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Unloaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Unloaded 1.3760 Connecting rod (large end) Appearance scored/Cu plating/corrosion Wear polish
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu (1) 17.5 (2) 17.5 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed (4) 15 no/bonded clean Cu plate clean	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Connecting rod (large end) Appearance scored/Cu plating/corrosion Wear polish Dimensions Loaded 1.2510
Suction ring top appearance Remaining torque of discharge mu (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mu (1) 17.5 (2) 17.5 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean ffler (4) 5 (4) 12.5 clean Yes No brown clean/stator top green No No clean trace ffler removed (4) 15 no/bonded clean Cu plate clean	Shaft in cage bearing Appearance clean/Cu plating/corrosion Wear polish Piston top appearance clean Piston skirt Appearance no wear/Cu plating Dimensions Loaded 1.3740 Cylinder bore Appearance no wear Varnish ring very slight Dimensions Loaded 1.3760 Connecting rod (large end) Appearance scored/Cu plating/corrosion Wear polish Dimensions Loaded 1.2510

Unit Number 93

0.071 **Contaminants:** Trash in liquid screen (g) **Control Unit?** No **Number of screens** Acid? Debris in compressor bottom (g) 0.042 No R-12? No Air? Yes R-22? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion/Cu

No

R-502?

Wear polish

No

Dimensions Loaded 0.5015

Unloaded 0.5015

Piston pin washers appearance

contact wear

Piston pin

H₂O?

Appearance Cu plating/corrosion

Wear polish

Dimensions Loaded 0.4970

Unloaded 0.4970

Final Lubricant Values	
Total Acid Number (TAN)	0.13
Water (ppm)	37
Fluoride ion (ppm)	0.98
Chloride ion (ppm)	11
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	4
Lead (ppm)	0
Silicon (ppm)	5
Tin (ppm)	0
Zinc (ppm)	7

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good **Appearance** corrosion

Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion/Cu plating

 $Discharge\ reed$

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	heavy	black	gummy
Front Side	heavy	black	hard

Photographic Documentation of R-22 Compressor with Contaminant Air 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

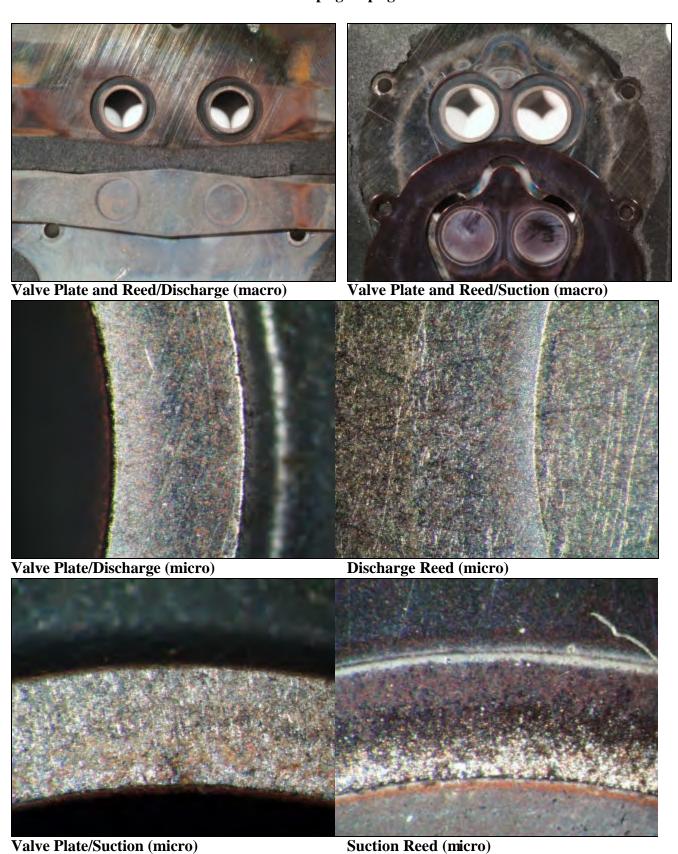


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air 280 psig/78 psig



Report for R-22 Compressor with Contaminant Air

Unit Number 94				
Model # RS43C1E-CAV-250 Seria	al# 96F16526	Crank journals		
Run Time (hr.) 12000 Faile	d? No	Appearance	clean/Cu plating	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing journal	
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? No $R-502$? No		***************************************	ponon, ongni	
2		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	280		Unloaded	0.9990
Suction Pressure (psig)	78	Bottom thrust	washer (crank side)	0.,,,,
Discharge Temp (°F)	143	Appearance	corrosion	
Return Gas Temp (°F)	60	Wear	polish, medium	
SumpTemp (°F)	98	***************************************	ponon, medium	
Sumpremp(1)		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze l		
Suction exit trail appearance	gray/Cu	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
	Č .		-	1.0005
Wire to cluster block appearance	clean	Dimensions	Loaded	
Wire to cluster block appearance Suction ring top appearance	clean bright	Dimensions	Loaded Unloaded	
Suction ring top appearance	bright	Dimensions		1.0005
Suction ring top appearance Remaining torque of discharge muffle	bright r		Unloaded	
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6	bright	Shaft in cage be	Unloaded	
Suction ring top appearance Remaining torque of discharge muffle	bright r	Shaft in cage be	Unloaded earing	
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts	bright r (4) 5	Shaft in cage be Appearance	Unloaded earing clean polish, slight	
Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11	bright er (4) 5 (4) 11	Shaft in cage be Appearance Wear	Unloaded earing clean polish, slight	
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux?	bright (4) 5 (4) 11 clean Yes	Shaft in cage be Appearance Wear Piston top appe Piston skirt	Unloaded earing clean polish, slight earance varnish	
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor?	bright (4) 5 (4) 11 clean Yes No	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance	Unloaded earing clean polish, slight earance varnish low wear/Cu plating	1.0005
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	bright (4) 5 (4) 11 clean Yes No gray	Shaft in cage be Appearance Wear Piston top appe Piston skirt	Unloaded earing clean polish, slight earance varnish low wear/Cu plating Loaded	1.0005
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	bright (4) 5 (4) 11 clean Yes No gray clean	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions	Unloaded earing clean polish, slight earance varnish low wear/Cu plating	1.0005
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	bright (4) 5 (4) 11 clean Yes No gray clean Yes	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded	1.0005
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	bright (4) 5 (4) 11 clean Yes No gray clean Yes No	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear	1.0005
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium	1.3720 1.3720
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded	1.3720 1.3720 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace er removed	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded Unloaded	1.3720 1.3720
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 16	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace er removed (4) 15	Shaft in cage be Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded Unloaded (large end)	1.3720 1.3720 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 16 Head gasket brittle?	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes	Shaft in cage be Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded Unloaded (large end) none	1.3720 1.3720 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean	Shaft in cage be Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) none polish, slight	1.3720 1.3720 1.3745 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace r removed (4) 15 yes clean clean	Shaft in cage be Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) none polish, slight Loaded	1.3720 1.3720 1.3745 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean clean clean clean	Shaft in cage be Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) none polish, slight	1.3720 1.3720 1.3745 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 5 (2) 4 (3) 6 Remaining torque of stator bolts (1) 10 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	bright (4) 5 (4) 11 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean clean clean clean	Shaft in cage be Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance varnish low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) none polish, slight Loaded	1.3720 1.3720 1.3745 1.3745

Unit Number

Contaminants: Trash in liquid screen (g) **Control Unit?** No **Number of screens** Acid? No R-12? No Debris in compressor bottom (g) Air? Yes R-22? No H₂O?

R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/Cu Wear polish Appearance **Dimensions** Loaded 0.4995 Suction surface appearance

0

0

4

0

8

0

1

Unloaded 0.4995 corrosion/Cu plating

Piston pin washers appearance

contact wear Piston pin

Appearance Cu plating polish, medium Wear

Dimensions Loaded 0.4975

0.4975 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.18 Water (ppm) 37 Fluoride ion (ppm) 0.93 10

Chloride ion (ppm) Aluminum (ppm) Copper (ppm) Iron (ppm) Lead (ppm) Silicon (ppm)

Tin (ppm) Zinc (ppm)

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium brown gummy Spring hard slight gray **Spring Seat** very slight black hard Ball black medium gummy Front Side very slight black hard

Suction side (reed backer) Condition good corrosion

Suction reed

Condition good corrosion **Appearance Trepan** very slight Varnish ring none

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring slight 0.026

0.256

Photographic Documentation of R-22 Compressor with Contaminant Air 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air 280 psig/78 psig



Report for R-22 Compressor with Contaminant Acid and Air

TEST HISTORY OF.				
Unit Number 95				
Model # RS43C1E-CAV-250 Serial	# 96F16541	Crank journals		
Run Time (hr.) 12007 Failed	? No	Appearance	scored/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		1.2170
Acid? Yes R-12? No		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? No		Wear	ponsn	
1120: NO R-302: NO		Dimensions	Loaded	0.9990
Discharge Program (ngig)	290	Difficusions	Unloaded	0.9990
Discharge Pressure (psig)	280 78	Dottom thungt		0.9990
Suction Pressure (psig)			washer (crank side)	4 - 1 -
Discharge Temp (°F)	143	Appearance	scored/Cu plating/wes	ar metais
Return Gas Temp (°F)	60	Wear	polish	
SumpTemp (°F)	98			
		Bottom washer		
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze l		
Suction exit trail appearance	gray	Appearance	clean/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0040
Suction ring top appearance	bright		Unloaded	1.0040
Remaining torque of discharge muffler				
(1) 1 (2) 1 (3) 1	(4) 2.5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 15 (2) 15 (3) 10	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear/Cu plating	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green	Differential	Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore	Cinoaucu	1.5740
Was rotor loose?	No	•	no wear/Cu plating	
		Appearance		
Shell bottom appearance	Cu plate	Varnish ring	very slight	1 2760
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		a	Unloaded	1.3760
(1) 17 (2) 17 (3) 17	(4) 15	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	scored/Cu plating/co	rrosion
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 7	(4) 7			

Unit Number

Contaminants: Trash in liquid screen (g) 0.084 **Control Unit?** No **Number of screens** 2 0.930 Acid? Yes R-12? No Debris in compressor bottom (g)

Air? Yes R-22? No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish Appearance corrosion **Dimensions** Loaded 0.5010

Unloaded 0.5010 corrosion/Cu plating

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/corrosion

polish Wear **Dimensions** Loaded 0.4980

0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.26 Water (ppm) 56 Fluoride ion (ppm) Chloride ion (ppm) Aluminum (ppm) Copper (ppm) Iron (ppm) Lead (ppm)

0.99 11 0 0 2 0 4 Silicon (ppm) 7 Tin (ppm) 3 Zinc (ppm)

Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good Suction surface appearance

Suction reed

Condition good corrosion **Appearance Trepan** slight Varnish ring very slight

Discharge side (reed backer) Condition good corrosion **Appearance**

Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good Appearance corrosion **Trepan** slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black gummy **Spring Seat** medium black gummy Ball medium black gummy Front Side heavy black gummy

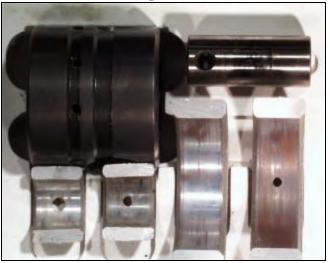
Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

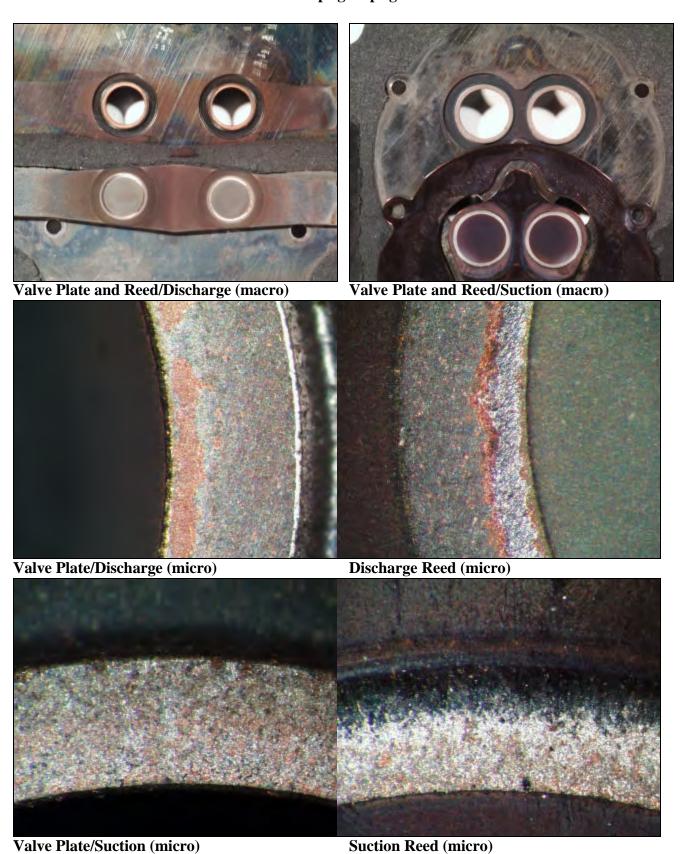


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 280 psig/78 psig



Report for R-22 Compressor with Contaminant Acid and Air

TEST HISTORY OF:				
Unit Number 96				
Model # RS43C1E-CAV-250 Serial	l# 96F16528	Crank journals	;	
Run Time (hr.) 12039 Failed	l? No	Appearance	scored	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:		2 111011510115	Unloaded	1.2470
Control Unit? No		Lower crank b		1.2470
Acid? Yes R-12? No			clean	
		Appearance Wear		
		vvear	polish	
H_2O ? No $R-502$? No		D::	Tandad	0.0000
D. 1 D. (1)	200	Dimensions	Loaded	0.9980
Discharge Pressure (psig)	280	7 5 (4) (3)	Unloaded	0.9980
Suction Pressure (psig)	78		washer (crank side)	
Discharge Temp (°F)	143	Appearance	scored/corrosion/wea	r metals
Return Gas Temp (°F)	60	Wear	polish	
SumpTemp (°F)	98			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze	bearings	
Suction exit trail appearance	gray	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0035
Suction ring top appearance	clean		Unloaded	1.0035
Remaining torque of discharge muffler	•			
(1) 5 (2) 2 (3) 5	(4) 5	Shaft in cage be	earing	
Remaining torque of stator bolts	,	Appearance	clean	
(1) 12.5 (2) 12.5 (3) 10	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		1107.10
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
(1) 18 (2) 17.5 (3) 15	(4) 17	Connecting rod		1.5700
Head gasket brittle?	no/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear Wear	polish	
		Dimensions	Loaded	1 2510
Head discharge cavity appearance	clean/green	Dimensions		1.2510
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts (1) 5 (2) 5 (3) 7	(4) 6			
	(+) ()			

Unit	Number	96

Contan	ninants:			Trash in liquid screen (g)	0.038
Control	Unit?	No		Number of screens	2
Acid?	Yes	R-12?	No	Debris in compressor bottom (g)	0.754

 $\begin{array}{cccc} \textbf{Air?} & \textbf{Yes} & \textbf{R-22?} & \textbf{No} \\ \textbf{H_2O?} & \textbf{No} & \textbf{R-502?} & \textbf{No} \end{array}$

Connecting rod (small end)

Appearance	contact wear/co	orrect washer/corrosion	Condition	good
Wear	polish		Appearance	corrosion
Dimensions	Loaded	0.5010	Suction surface	appearance
	Unloaded	0.5010	corrosion	

Piston pin washers appearance

contact wear

Piston pin

Appearance	corrosion
Wear	polish
Dimensions	Loaded

Dimensions Loaded 0.4975 Unloaded 0.4975

Final Lubricant Values	
Total Acid Number (TAN)	0.11
Water (ppm)	57
Fluoride ion (ppm)	1.1
Chloride ion (ppm)	10
Aluminum (ppm)	0
Copper (ppm)	11
Iron (ppm)	13
Lead (ppm)	3
Silicon (ppm)	10
Tin (ppm)	4
Zinc (ppm)	42

Suction reed Condition

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Valve Plate Assembly Inspection

Suction side (reed backer)

Discharge side (reed backer)
Condition good

Appearance corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	tarnished	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	black	gummy
Spring	medium	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	slight	black	gummy

Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

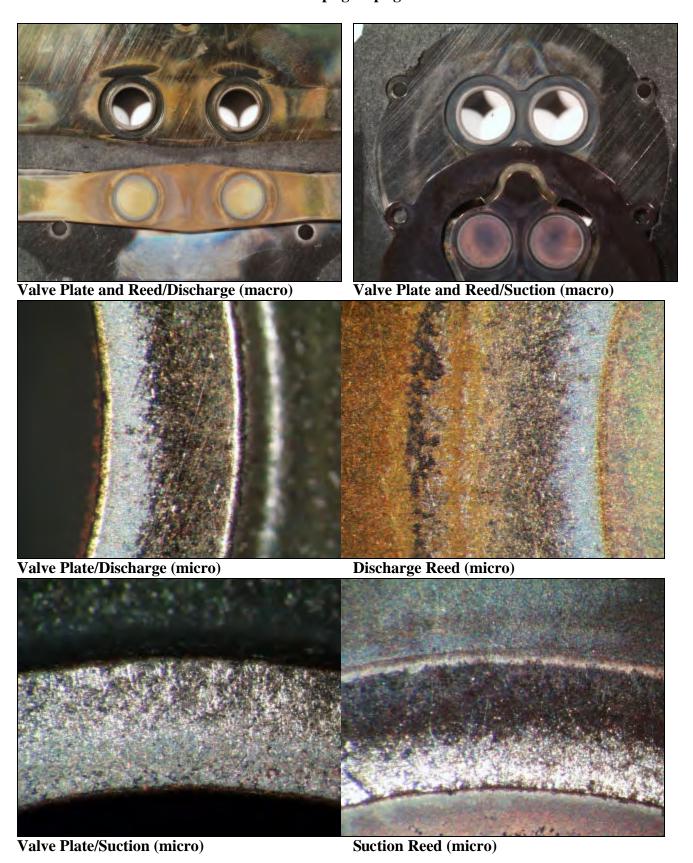


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 280 psig/78 psig



Report for R-22 Compressor with Contaminant Acid and Water

ILSI IIISIONI OI.				
Unit Number 97				
Model # RS43C1E-CAV-250 Serial	# 96F16517	Crank journals	S	
Run Time (hr.) 12005 Failed	? No	Appearance	clean	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2475
Contaminants:			Unloaded	1.2475
Control Unit? No		Lower crank b		
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish, slight	
H_2O ? Yes $R-502$? No		***************************************	ponsii, siigiit	
112,000 1100		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	280		Unloaded	0.9990
Suction Pressure (psig)	78	Bottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	143	Appearance	Cu plating/corrosion	
Return Gas Temp (°F)	60	Wear	polish, medium	
SumpTemp (°F)	98	* * * * * * * * * * * * * * * * * * * *	ponsii, incurum	
Sumpremp(1)	70	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	corrosion	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	bright		Unloaded	1.0020
Remaining torque of discharge muffler	0119111			1.0020
(1) 4 (2) 5 (3) 5	(4) 4	Shaft in cage b	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 10 (2) 11 (3) 12	(4) 10	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt	carance varinish	
	Yes		lovy vysom/Cy mlotima	
Loose restrictor?		Appearance	low wear/Cu plating	1 2720
Discharge plate appearance	gray	Dimensions	Loaded	1.3730
Top stator windings appearance	clean	0 11 1 1	Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore	1 (0 1	
Was rotor loose?	No	Appearance	low wear/Cu plating	
Shell bottom appearance	clean	Varnish ring	medium	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3750
Remaining torque of discharge muffler			Unloaded	1.3750
(1) 15 (2) 16 (3) 15	(4) 15	Connecting roo		
Head gasket brittle?	yes	Appearance	none	
Hood quotion covity ennougence		Wear	polish, slight	
Head suction cavity appearance	clean		1	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2500
Head discharge cavity appearance Cage bearing top appearance	clean clean		Loaded Unloaded	1.2500 1.2500
Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolts	clean			
Head discharge cavity appearance Cage bearing top appearance	clean clean			

Unit Number 97

Contaminants:Trash in liquid screen (g)0.002Control Unit?NoNumber of screens2Acid?YesR-12?NoDebris in compressor bottom (g)0.499

Air? No **R-22?** No **H₂O?** Yes **R-502?** No

Connecting rod (small end)

Appearance contact wear/correct washer
Wear polish, slight
Dimensions Loaded 0.5000

Unloaded 0.5000

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating
Wear polish, medium
Dimensions Loaded

Dimensions Loaded 0.4985 Unloaded 0.4985

Final Lubricant Values **Total Acid Number (TAN)** 0.07 Water (ppm) 32 Fluoride ion (ppm) 1.0 Chloride ion (ppm) 9.7 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 5 2 Lead (ppm) 6 Silicon (ppm) 2 Tin (ppm) Zinc (ppm) 16 **Valve Plate Assembly Inspection**

Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance

corrosion/Cu plating

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black gummy **Spring Seat** medium black gummy Ball medium black gummy Front Side slight black gummy

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

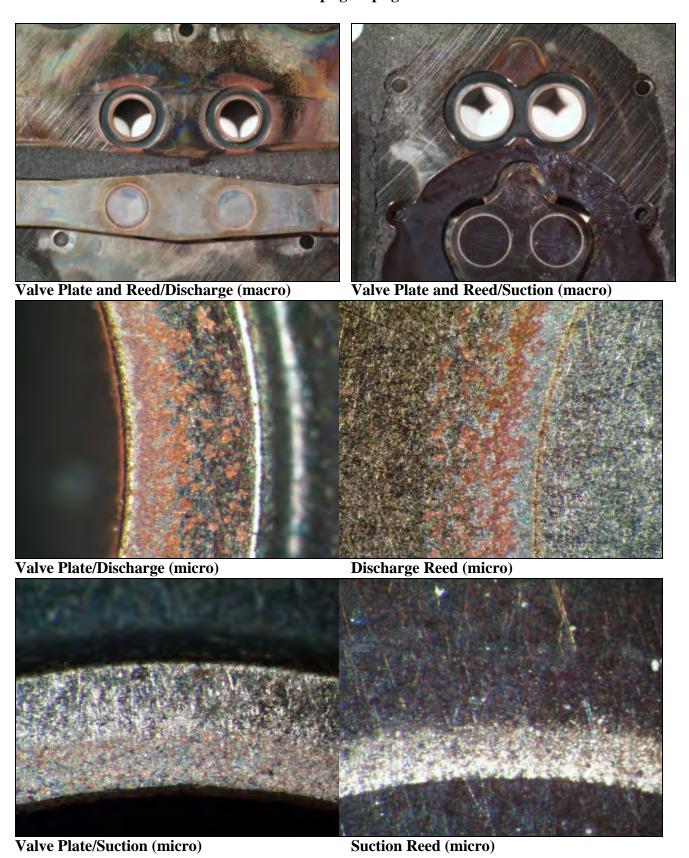


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 280 psig/78 psig



431

Report for R-22 Compressor with Contaminant Acid and Water

TEST INSTORT OF.				
Unit Number 98				
Model # RS43C1E-CAV-250 Serial	l# 96F16525	Crank journals	}	
Run Time (hr.) 12004 Failed	!? No	Appearance	clean/Cu plating	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing journal	
Acid? Yes R-12? No		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish, slight	
H_2O ? Yes R-502 ? No			1 - 4 , 4 & -	
-		Dimensions	Loaded	0.9995
Discharge Pressure (psig)	280		Unloaded	0.9995
Suction Pressure (psig)	78	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	143	Appearance	Cu plating/corrosion	
Return Gas Temp (°F)	60	Wear	polish, slight	
SumpTemp (°F)	98		1 - 4 , 4 & -	
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish, medium	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	black/gray	Appearance	corrosion	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	gray		Unloaded	1.0020
Remaining torque of discharge muffler	•			
(1) 4 (2) 5 (3) 4	(4) 5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 10 (2) 9 (3) 10	(4) 9	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	earance varnish	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3730
Top stator windings appearance	clean		Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore		-10.00
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3750
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3750
(1) 17 (2) 16 (3) 16	(4) 15	Connecting roo		1.5750
Head gasket brittle?	no/bonded	Appearance	Cu plating	
Head suction cavity appearance	clean	Wear	polish, slight	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2500
Cage bearing top appearance	clean		Unloaded	1.2500
	V-V411		~	1.2000
	s			
Remaining torque of cage bearing bolts (1) 5 (2) 4 (3) 5	s (4) 5			

Unit Number 98

Contaminants:

Control Unit? No

Acid? Yes R-12? No

Debris in compressor bottom (g)

0.076

Number of screens

Debris in compressor bottom (g)

0.477

Air? No **R-22?** No **H₂O?** Yes **R-502?** No

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolish, slightDimensionsLoaded0.5000

Unloaded 0.5000

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating Wear polish, medium

Dimensions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.23 Water (ppm) 21 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 11 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 5 0 Lead (ppm) 2 Silicon (ppm) Tin (ppm) 1 Zinc (ppm) 24

Valve Plate Assembly Inspection

Suction side (reed backer)
Condition good
Appearance clean

Suction surface appearance

corrosion **Suction reed**

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance
corrosion/Cu plating

Discharge reedgoodConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	slight	gray	hard
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	slight	black	gummy

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

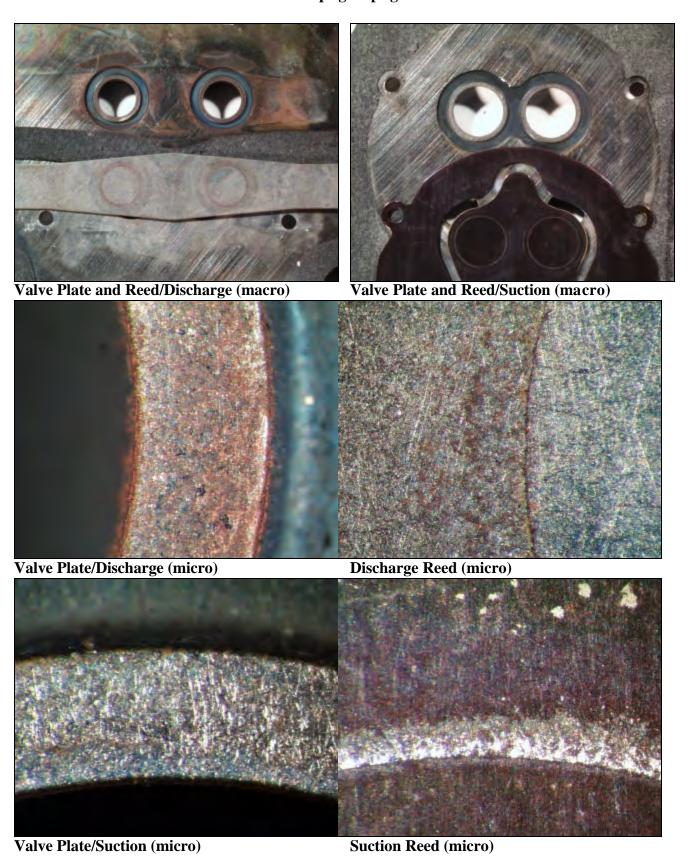


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 280 psig/78 psig



Report for R-22 Compressor with Contaminant Air and Water

ILDI IIIDIORI OI.				
Unit Number 99				
Model # RS43C1E-CAV-250 Serial	# 96F16474	Crank journals	S	
Run Time (hr.) 12007 Failed	!? No	Appearance	clean	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes $R-502$? No			F,8	
2		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	280		Unloaded	0.9985
Suction Pressure (psig)	78	Bottom thrust	washer (crank side)	******
Discharge Temp (°F)	143	Appearance	clean	
Return Gas Temp (°F)	60	Wear	polish, medium	
SumpTemp (°F)	98	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ponon, mouram	
Sumpremp(1)		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	gray		Unloaded	1.0020
Remaining torque of discharge muffler				
(1) 4 (2) 4 (3) 5	(4) 4	Shaft in cage be	earing	
Remaining torque of stator bolts	•	Appearance	clean	
(1) 9 (2) 9 (3) 10	(4) 10	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/Cu plating	
Discharge plate appearance	gray	Dimensions	Loaded	1.3730
Top stator windings appearance	clean		Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore		1.0,00
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3750
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3750
(1) 16 (2) 16 (3) 15	(4) 15	Connecting roo		1.5750
Head gasket brittle?	no/bonded	Appearance	none	
		Wear	polish, medium	
Head suction cavity appearance	clean		r ,	
Head suction cavity appearance Head discharge cavity appearance	clean clean		-	1.2505
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2505 1.2500
Head discharge cavity appearance Cage bearing top appearance	clean clean		-	1.2505 1.2500
Head discharge cavity appearance	clean clean		Loaded	

Unit Number 99

Contaminants:
Control Unit? No
Acid? No R-12? No
Air? Yes R-22? No

No

Trash in liquid screen (g)0.016Number of screens3Debris in compressor bottom (g)0.381

Valve Plate Assembly Inspection

Connecting rod (small end)

Yes

Appearancecontact wear/correct washer/CuWearpolish, slightDimensionsLoaded0.5005

R-502?

Unloaded 0.5005

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

H₂O?

Appearance clean

Wear polish, medium

Dimensions Loaded 0.4985 Unloaded 0.4985

Final Lubricant Values	
Total Acid Number (TAN)	0.08
Water (ppm)	49
Fluoride ion (ppm)	1.2
Chloride ion (ppm)	11
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	1
Lead (ppm)	0
Silicon (ppm)	6
Tin (ppm)	0

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance
corrosion/Cu plating

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good
Appearance corrosion

Discharge surface appearance
corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating
Trepan very slight
Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	brown	gummy
Spring	medium	black	hard
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

0

Photographic Documentation of R-22 Compressor with Contaminant Air and Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air and Water 280 psig/78 psig



Report for R-22 Compressor with Contaminant Air and Water

Unit Number 100				
Model # RS43C1E-CAV-250 Seria	al# 96F16480	Crank journals		
Run Time (hr.) 12003 Faile	d? No	Appearance	clean	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank be	earing journal	
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes R-502 ? No		***************************************	ponon, ongni	
		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	280		Unloaded	0.9980
Suction Pressure (psig)	78	Bottom thrust	washer (crank side)	0.7700
Discharge Temp (°F)	143	Appearance	clean	
Return Gas Temp (°F)	60	Wear	polish, slight	
SumpTemp (°F)	98	***************************************	ponon, ongm	
Sumpremp(1)	70	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze l		
Suction exit trail appearance	gray	Appearance	clean/corrosion	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	0.9900
Suction ring top appearance	clean		Unloaded	0.9900
Remaining torque of discharge muffle	er			
Remaining torque of discharge muffle (1) 5 (2) 6 (3) 5		Shaft in cage be	earing	
(1) 5 (2) 6 (3) 5	er (4) 5	Shaft in cage be Appearance	earing clean	
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts	(4) 5	Shaft in cage be Appearance Wear	clean	
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9		Appearance Wear	clean polish, slight	
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance	(4) 5(4) 10	Appearance Wear Piston top appe	clean polish, slight	
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux?	(4) 5(4) 10cleanYes	Appearance Wear Piston top appe Piston skirt	clean polish, slight arance clean	
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor?	(4) 5 (4) 10 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	clean polish, slight arance clean low wear/Cu plating	1.3735
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 5(4) 10cleanYesNogray	Appearance Wear Piston top appe Piston skirt	clean polish, slight arance clean low wear/Cu plating Loaded	1.3735 1.3735
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 5 (4) 10 clean Yes No gray clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	clean polish, slight arance clean low wear/Cu plating	1.3735 1.3735
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 5 (4) 10 clean Yes No gray clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded	
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 5 (4) 10 clean Yes No gray clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear	
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 5 (4) 10 clean Yes No gray clean Yes No clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium	1.3735
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded	1.3735 1.3755
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge mufflet	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded Unloaded	1.3735
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 16 (3) 16	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end)	1.3735 1.3755
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 16 (3) 16 Head gasket brittle?	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded Unloaded (large end) corrosion	1.3735 1.3755
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 16 (3) 16 Head gasket brittle? Head suction cavity appearance	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) corrosion polish, medium	1.3735 1.3755 1.3755
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 16 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) corrosion polish, medium Loaded	1.3735 1.3755 1.3755
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 16 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) corrosion polish, medium	1.3735 1.3755 1.3755
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 16 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolt	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) corrosion polish, medium Loaded	1.3735 1.3755 1.3755
(1) 5 (2) 6 (3) 5 Remaining torque of stator bolts (1) 10 (2) 9 (3) 9 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 15 (2) 16 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 5 (4) 10 clean Yes No gray clean Yes No clean trace er removed (4) 15 yes clean clean clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight arance clean low wear/Cu plating Loaded Unloaded low wear medium Loaded Unloaded (large end) corrosion polish, medium Loaded	1.3735 1.3755 1.3755

Unit Number

Contaminants: Trash in liquid screen (g) 0.034 **Control Unit?** No **Number of screens** 2 Acid? No R-12? No Debris in compressor bottom (g) 0.814

R-22? Air? Yes No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear polish, slight

Dimensions Loaded 0.5000

Unloaded 0.5000

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating polish, medium Wear

Dimensions Loaded 0.4990

0.4990 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.13 Water (ppm) 20 Fluoride ion (ppm) 0.92 Chloride ion (ppm) 16 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 0

Silicon (ppm) 1 0 Tin (ppm) 2 Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good Appearance corrosion Suction surface appearance

corrosion/Cu plating **Suction reed**

Condition good corrosion **Appearance Trepan** very slight Varnish ring none

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin heavy black gummy Spring medium black gummy **Spring Seat** slight black gummy Ball heavy black gummy Front Side heavy black gummy

Photographic Documentation of R-22 Compressor with Contaminant Air and Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

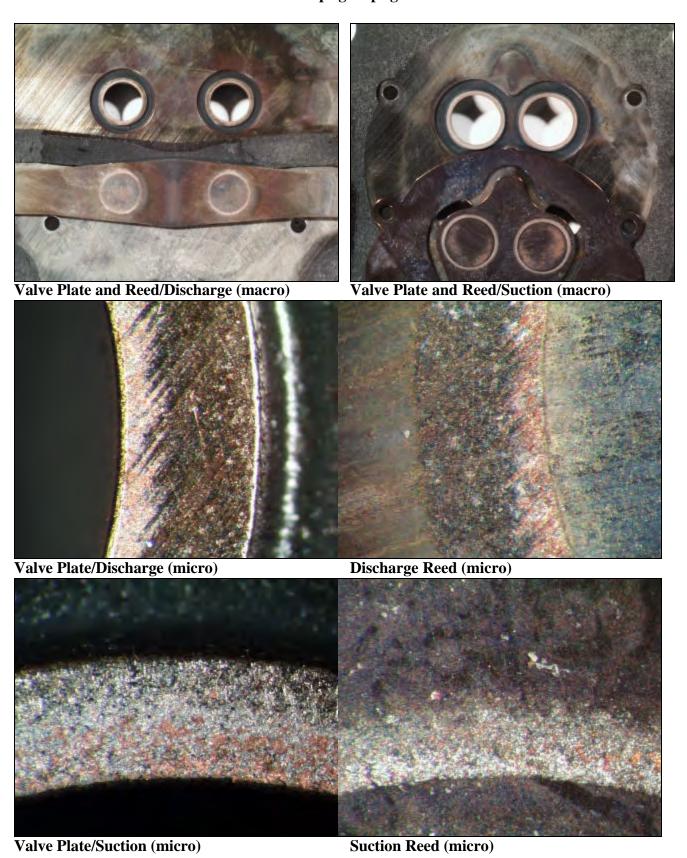


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air and Water 280 psig/78 psig



Report for R-22 Compressor with Contaminant Acid, Air, and Water

Unit Number 101				
Model # RS43C1E-CAV-250 Serial	l# 96F16470	Crank journals		
		Appearance	clean	
` ,	i: NO			
Refrigerant R-22		Wear	polish, medium	1 2445
Lubricant 3GS		Dimensions	Loaded	1.2445
Contaminants:			Unloaded	1.2445
Control Unit? No		Lower crank be		
Acid? Yes R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes $R-502$? No				
		Dimensions	Loaded	0.9960
Discharge Pressure (psig)	280		Unloaded	0.9960
Suction Pressure (psig)	78		washer (crank side)	
Discharge Temp (°F)	143	Appearance	clean	
Return Gas Temp (°F)	60	Wear	polish	
SumpTemp (°F)	98			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	corrosion	
High-low leak	pass	Wear	polish, medium	
Top shell appearance	clean	Lower bronze l	oearings	
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0010
Suction ring top appearance	gray		Unloaded	1.0010
Suction ring top appearance Remaining torque of discharge muffler			Unloaded	1.0010
		Shaft in cage be		1.0010
Remaining torque of discharge muffler	•	Shaft in cage be Appearance		1.0010
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5	•	_	earing	1.0010
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts	· (4) 5	Appearance	earing Cu plating polish, slight	1.0010
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10	(4) 5 (4) 10	Appearance Wear	earing Cu plating polish, slight	1.0010
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance	(4) 5 (4) 10 clean	Appearance Wear Piston top appe Piston skirt	earing Cu plating polish, slight	1.0010
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 5 (4) 10 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	earing Cu plating polish, slight arance clean	1.0010
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 5 (4) 10 clean Yes No brown	Appearance Wear Piston top appe Piston skirt	earing Cu plating polish, slight earance clean low wear Loaded	1.3700
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 5 (4) 10 clean Yes No brown clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing Cu plating polish, slight arance clean low wear	
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 5 (4) 10 clean Yes No brown clean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing Cu plating polish, slight arance clean low wear Loaded Unloaded	1.3700
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 5 (4) 10 clean Yes No brown clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing Cu plating polish, slight arance clean low wear Loaded Unloaded	1.3700
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 5 (4) 10 clean Yes No brown clean Yes No clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing Cu plating polish, slight arance clean low wear Loaded Unloaded low wear medium	1.3700 1.3700
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing Cu plating polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded	1.3700 1.3700 1.3740
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace r removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	caring Cu plating polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded	1.3700 1.3700
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 14 (3) 14	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace r removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing Cu plating polish, slight arance clean low wear Loaded Unloaded low wear medium Loaded Unloaded Unloaded	1.3700 1.3700 1.3740
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 14 (3) 14 Head gasket brittle?	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace removed (4) 15 no/bonded	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	caring Cu plating polish, slight carance clean low wear Loaded Unloaded low wear medium Loaded Unloaded Unloaded (large end) scored/Cu plating	1.3700 1.3700 1.3740
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace r removed (4) 15 no/bonded dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	caring Cu plating polish, slight carance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored/Cu plating medium	1.3700 1.3700 1.3740 1.3740
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace r removed (4) 15 no/bonded dirty dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	caring Cu plating polish, slight carance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored/Cu plating medium Loaded	1.3700 1.3700 1.3740 1.3740
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace removed (4) 15 no/bonded dirty dirty clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	caring Cu plating polish, slight carance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored/Cu plating medium	1.3700 1.3700 1.3740 1.3740
Remaining torque of discharge muffler (1) 4 (2) 4 (3) 5 Remaining torque of stator bolts (1) 9 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 14 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 5 (4) 10 clean Yes No brown clean Yes No clean trace removed (4) 15 no/bonded dirty dirty clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	caring Cu plating polish, slight carance clean low wear Loaded Unloaded low wear medium Loaded Unloaded (large end) scored/Cu plating medium Loaded	1.3700 1.3700 1.3740 1.3740

Unit Number 101

 Contaminants:

 Control Unit?
 No

 Acid?
 Yes
 R-12?
 No

 Air?
 Yes
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Trash in liquid screen (g)0.047Number of screens1Debris in compressor bottom (g)0.738

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.4990Unloaded0.4990

Piston pin washers appearance

contact wear

Piston pin

AppearancecleanWearpolishDimensionsLoaded

Loaded 0.4970 **Unloaded** 0.4970

Final Lubricant Values	
Total Acid Number (TAN)	0.10
Water (ppm)	26
Fluoride ion (ppm)	0.91
Chloride ion (ppm)	15
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	3
Lead (ppm)	0
Silicon (ppm)	2
Tin (ppm)	1
Zinc (ppm)	25

Suction side (reed backer)
Condition good
Appearance corrosion

Appearance corrosion
Suction surface appearance
corrosion/Cu plating

Suction reed

Condition good

Appearance corrosion/Cu plating

Trepan very slight **Varnish ring** none

Discharge side (reed backer)

Condition good
Appearance corrosion

Discharge surface appearance
corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

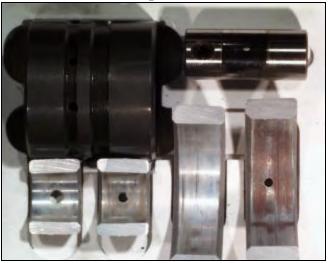
Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

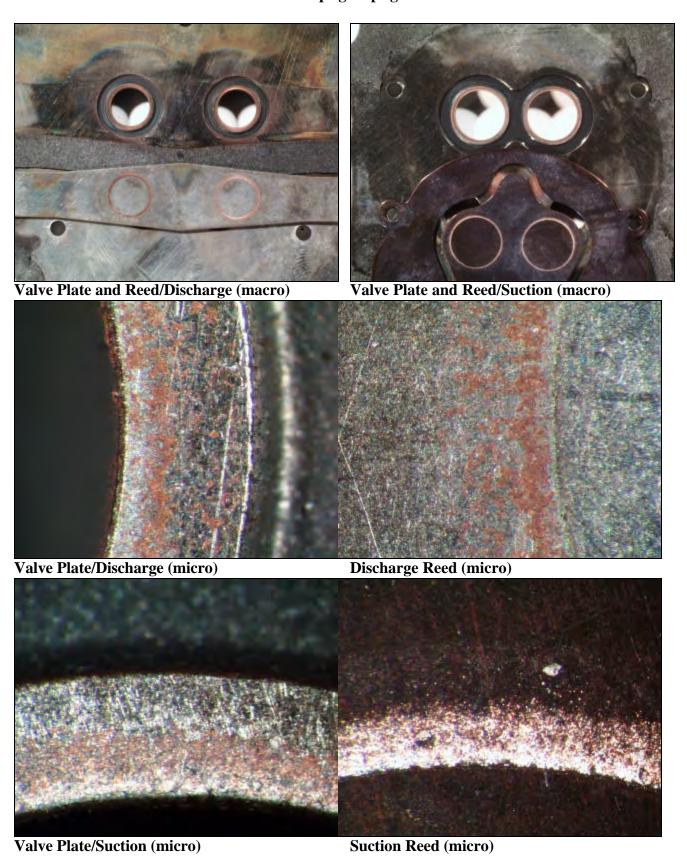


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 280 psig/78 psig



Report for R-22 Compressor with Contaminant Acid, Air, and Water

Unit Number 102			
Model # RS43C1E-CAV-250 Seri	al # 96F16473	Crank journals	
Run Time (hr.) 12007 Faile	ed? No	Appearance clean	
Refrigerant R-22		Wear polish, n	nedium
Lubricant 3GS		Dimensions Loaded	1.2465
Contaminants:		Unloade	d 1.2465
Control Unit? No		Lower crank bearing jou	rnal
Acid? Yes R-12? No		Appearance clean	
Air? Yes R-22? No		Wear polish, sl	ight
H_2O ? Yes R-502 ? No		1	C
-		Dimensions Loaded	0.9990
Discharge Pressure (psig)	280	Unloade	d 0.9990
Suction Pressure (psig)	78	Bottom thrust washer (c	
Discharge Temp (°F)	143	Appearance Cu platin	
Return Gas Temp (°F)	60	Wear polish, n	nedium
SumpTemp (°F)	98		
1 /		Bottom washer (casting s	side)
Hi-Pot	pass	Appearance clean/Cu	
High-low leak	pass	Wear polish, sl	
Top shell appearance	clean	Lower bronze bearings	
Suction exit trail appearance	gray	Appearance clean/con	rosion
Cluster block condition	good	Wear polish, sl	ight
Wire to cluster block appearance	gray	Dimensions Loaded	1.0015
Suction ring top appearance	bright	Unloade	d 1.0015
Suction ring top appearance Remaining torque of discharge muffl		Unloade	d 1.0015
		Unloade Shaft in cage bearing	d 1.0015
Remaining torque of discharge muffl	er		d 1.0015
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4	er	Shaft in cage bearing	
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts	er (4) 5	Shaft in cage bearing Appearance clean	
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10	er (4) 5 (4) 9	Shaft in cage bearing Appearance clean Wear polish, sl	ight
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance	er (4) 5 (4) 9 rust	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt	ight
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	er (4) 5 (4) 9 rust Yes No	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt	ight clean
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	er (4) 5 (4) 9 rust Yes	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear	ight clean //scored/Cu plating 1.3725
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	er (4) 5 (4) 9 rust Yes No gray	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded	ight clean //scored/Cu plating 1.3725
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	er (4) 5 (4) 9 rust Yes No gray clean	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore	ight clean //scored/Cu plating 1.3725 d 1.3730
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	er (4) 5 (4) 9 rust Yes No gray clean Yes No	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear	ight clean //scored/Cu plating 1.3725 d 1.3730
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	er (4) 5 (4) 9 rust Yes No gray clean Yes	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore	ight clean //scored/Cu plating 1.3725 d 1.3730
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Appearance slight Dimensions Loaded Loaded	ight clean //scored/Cu plating 1.3725 d 1.3730 //scored
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace er removed	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Varnish ring slight Dimensions Loaded Unloade	ight clean //scored/Cu plating 1.3725 d 1.3730 //scored 1.3735 d 1.3735
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl (1) 14 (2) 15 (3) 14	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Appearance slight Dimensions Loaded Loaded	ight clean //scored/Cu plating 1.3725 d 1.3730 //scored 1.3735 d 1.3735
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace er removed (4) 15	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Appearance slight Dimensions Loaded Unloade Connecting rod (large en	ight clean //scored/Cu plating
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl (1) 14 (2) 15 (3) 14 Head gasket brittle?	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace er removed (4) 15 no/bonded	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Varnish ring slight Dimensions Loaded Unloade Connecting rod (large en	ight clean //scored/Cu plating
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace ter removed (4) 15 no/bonded clean	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Varnish ring slight Dimensions Loaded Unloade Connecting rod (large en Appearance scored Wear polish, m	ight clean //scored/Cu plating 1.3725 d 1.3730 //scored 1.3735 d 1.3735 d 1.3735 d 1.3735
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace ter removed (4) 15 no/bonded clean dirty clean	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Varnish ring slight Dimensions Loaded Unloade Connecting rod (large en Appearance scored Wear polish, m	ight clean //scored/Cu plating 1.3725 d 1.3730 //scored 1.3735 d 1.3735 d 1.3735 d 1.3735
Remaining torque of discharge muffl (1) 4 (2) 5 (3) 4 Remaining torque of stator bolts (1) 9 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffl (1) 14 (2) 15 (3) 14 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	er (4) 5 (4) 9 rust Yes No gray clean Yes No clean trace ter removed (4) 15 no/bonded clean dirty clean	Shaft in cage bearing Appearance clean Wear polish, sl Piston top appearance Piston skirt Appearance low wear Dimensions Loaded Unloade Cylinder bore Appearance low wear Varnish ring slight Dimensions Loaded Unloade Connecting rod (large en Appearance scored Wear polish, m	ight clean //scored/Cu plating 1.3725 d 1.3730 //scored 1.3735 d 1.3735 d 1.3735 d 1.3735

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? No Air? Yes R-22? No H₂O? R-502? Yes No Trash in liquid screen (g) 0.023 **Number of screens** 0.431 Debris in compressor bottom (g)

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish, slight **Dimensions** Loaded 0.4995 0.4995

Unloaded

Piston pin washers appearance

no wear

Piston pin

Appearance clean polish, slight Wear **Dimensions** Loaded

0.4975 Unloaded 0.4975

Final Lubricant Values Total Acid Number (TAN) 0.11 Water (ppm) 26 Fluoride ion (ppm) 0.88 Chloride ion (ppm) 15 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 3 0 Lead (ppm) 5 Silicon (ppm) Tin (ppm) 1 Zinc (ppm) 13

Suction side (reed backer) Condition good **Appearance** corrosion **Suction surface appearance**

corrosion/Cu plating

Suction reed

Condition good Appearance corrosion Trepan very slight Varnish ring none

Discharge side (reed backer) Condition good

corrosion **Appearance** Discharge surface appearance

corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 280 psig/78 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

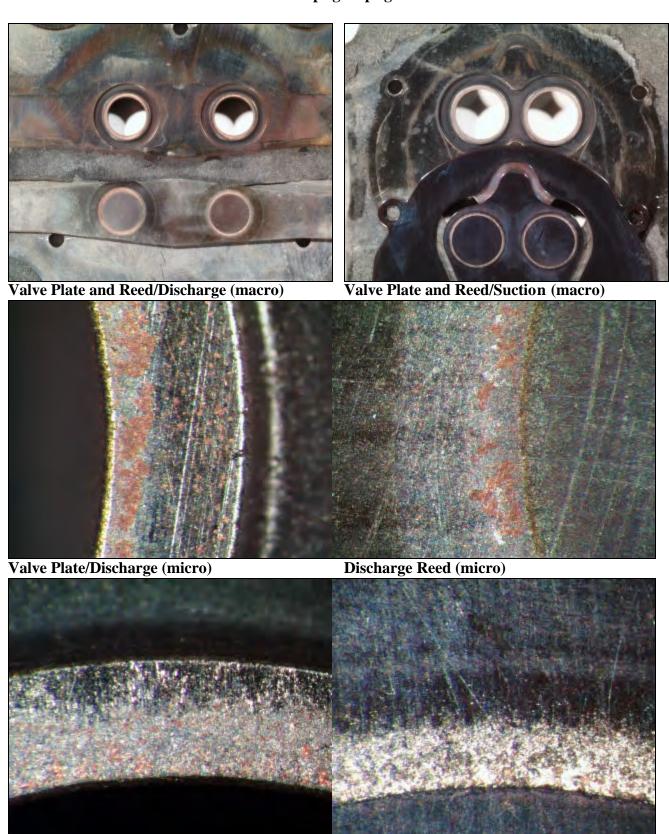


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 280 psig/78 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

Report for R-22 Control Compressor

Unit Number 103				
Model # RS43C1E-CAV-250 Seria	l# 96F16543	Crank journals		
Run Time (hr.) 12021 Failed		Appearance	clean/Cu plating	
Refrigerant R-22	1. 140	Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
		Difficusions	Unloaded	1.2470
Contaminants:		T 1 1		1.2403
Control Unit? Yes		Lower crank be		
Acid? No R-12? No		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		7 0.		0.0005
		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	175		Unloaded	0.9985
Suction Pressure (psig)	32		washer (crank side)	
Discharge Temp (°F)	212	Appearance	clean/bronze plating	
Return Gas Temp (°F)	65	Wear	polish	
SumpTemp (°F)	179			
		Bottom washer	,	
Hi-Pot	pass	Appearance	clean	
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze	-	
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	gray		Unloaded	1.0030
Remaining torque of discharge muffler	r			
(1) 2.5 (2) 1.7 (3) 2	(4) 2	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		1.07.10
Was rotor loose?	No	Appearance	no wear	
		Varnish ring		
Shell bottom appearance Quantity of bearing chips	clean/Cu plate slight	Dimensions	none Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
(1) 14 (2) 15 (3) 14	(4) 14	Connecting roo		1.5700
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance		Dimensions	•	1 2510
Cage bearing top appearance	clean clean	Dimensions	Loaded Unloaded	1.2510 1.2510
Remaining torque of cage bearing bolt			Omoaucu	1.2310
(1) 4 (2) 3 (3) 5	(4) 4			
(1) ¬ (2) J (3) J	(=) =			

Unit Number 103

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.022Number of screens1Debris in compressor bottom (g)0.499

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/bronze plating

Wear polish
Dimensions Loaded 0.4980
Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.04 Water (ppm) 19 Fluoride ion (ppm) 0.92 Chloride ion (ppm) 14 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0 Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** clean

Discharge surface appearance

corrosion

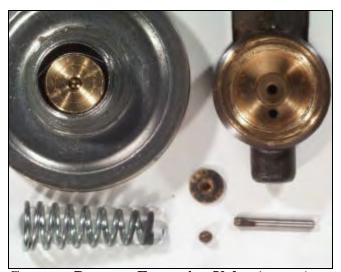
Discharge reed

ConditiongoodAppearanceCu platingTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	very slight	gray	hard
Tip of Pin	medium	black	hard
Spring	medium	black, gray	hard
Spring Seat	heavy	black	hard
Ball	heavy	black	gummy
Front Side	slight	black	hard

Photographic Documentation of R-22 Control Compressor 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Control Compressor 175 psig/32 psig





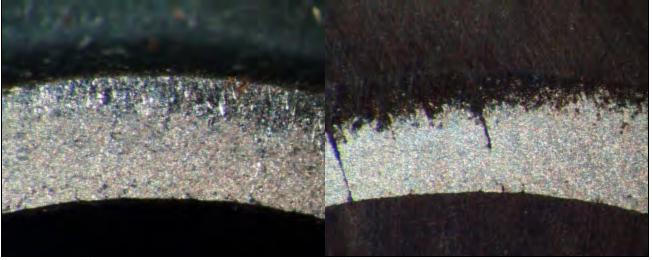
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Control Compressor

ILDI IIIDIORI OI.				
Unit Number 104				
Model # RS43C1E-CAV-250 Serial	# 96F16475	Crank journals		
Run Time (hr.) 12026 Failed	? No	Appearance	clean/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? Yes		Lower crank be	earing journal	
Acid? No R-12? No		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No				
		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	175		Unloaded	0.9985
Suction Pressure (psig)	32	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	212	Appearance	clean/Cu plating	
Return Gas Temp (°F)	65	Wear	polish	
SumpTemp (°F)	179			
		Bottom washer		
Hi-Pot	pass	Appearance	clean	
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze	_	
Suction exit trail appearance	Cu	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 2.9 (2) 2.5 (3) 1.7	(4) 2.1	Shaft in cage be	-	
Remaining torque of stator bolts	(4) 40.7	Appearance	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/Cu plating	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	gray		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/Cu plating	
Shell bottom appearance	black/Cu plate	Varnish ring	very slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 14 (2) 14 (3) 14	(4) 14	Connecting rod	(large end)	
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2505
Cage bearing top appearance	dirty		Unloaded	1.2505
Remaining torque of cage bearing bolts	S			
(1) 5 (2) 5 (3) 4	(4) 5			

Unit Number 104

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.028Number of screens1Debris in compressor bottom (g)0.584

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5015

Loaded0.5015Suction surfaceUnloaded0.5010corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/Cu plating Wear polish

Dimensions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.04 Water (ppm) 15 Fluoride ion (ppm) 0.78 Chloride ion (ppm) 14 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 Silicon (ppm) 1 Tin (ppm) 0 Zinc (ppm) 0

Suction side (reed backer)

Condition good
Appearance clean
Suction surface appearance

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringnone

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance

corrosion

Discharge reedgoodConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	very slight	brown	hard
Equalizer Hole	very slight	gray	hard
Tip of Pin	medium	black	hard
Spring	medium	black, gray	hard
Spring Seat	heavy	black	hard
Ball	heavy	black	hard
Front Side	heavy	black	hard

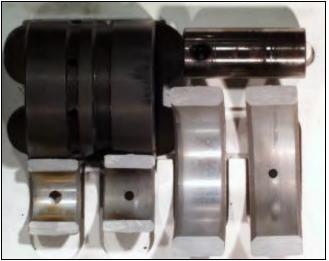
Photographic Documentation of R-22 Control Compressor 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

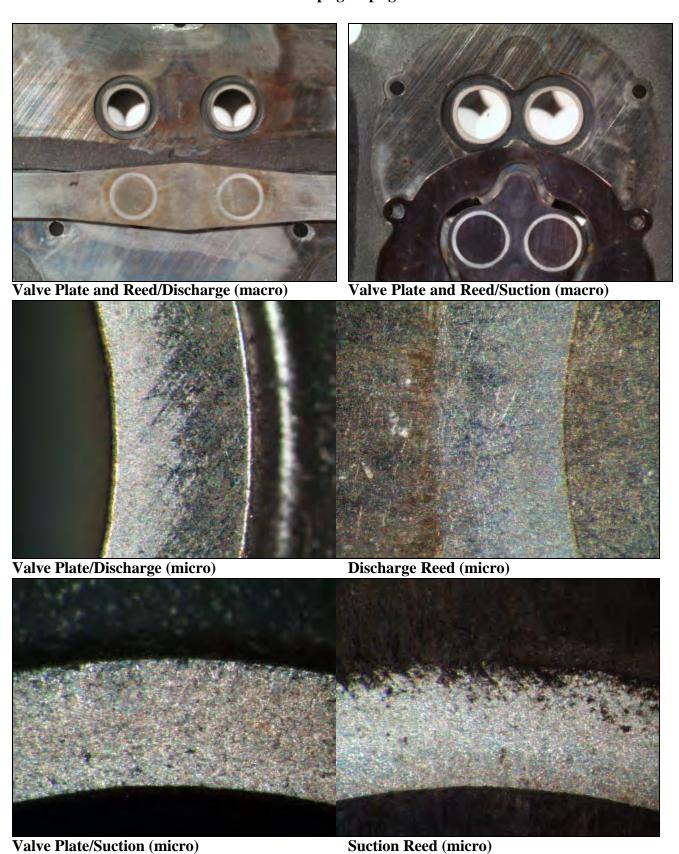


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Control Compressor 175 psig/32 psig



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Report for R-22 Control Compressor

TEST HISTORY OF.				
Unit Number 105				
Model # RS43C1E-CAV-250 Serial	# 96F16450	Crank journals	S	
Run Time (hr.) 12017 Failed	? No	Appearance	clean	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:		Differential	Unloaded	1.2470
Control Unit? Yes		I arreau anomir h		1.2470
		Lower crank b		
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		.		0 000=
		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	175		Unloaded	0.9985
Suction Pressure (psig)	32		washer (crank side)	
Discharge Temp (°F)	212	Appearance	clean/scored	
Return Gas Temp (°F)	65	Wear	polish	
SumpTemp (°F)	179			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze	1	
Suction exit trail appearance	black/Cu	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Dimensions	Unloaded	1.0030
Remaining torque of discharge muffler	Cican		Cinouaca	1.0050
(1) 2.1 (2) 2.1 (3) 2.1	(4) 2.1	Shaft in cage b	paring	
Remaining torque of stator bolts	(4) 2.1	Appearance	clean	
(1) 11.7 (2) 11.7 (3) 11.7	(4) 11.7	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	clean		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance		Varnish ring	very slight	
Quantity of bearing chips	clean/Cu plate	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	trace	Difficusions	Unloaded	1.3760
		C		1.3700
(1) 16 (2) 15 (3) 14	(4) 15	Connecting roo	, ,	
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	1.0510
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 5 (3) 5	(4) 4			

Unit Number

No

0.059 **Contaminants:** Trash in liquid screen (g) **Control Unit?** Yes **Number of screens** Acid? Debris in compressor bottom (g) 0.304 No R-12? No Air? No R-22? No

Connecting rod (small end)

R-502?

No

Appearance contact wear/correct washer Condition good Wear polish Appearance **Dimensions** Loaded 0.5010 Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

H₂O?

Appearance scored polish Wear **Dimensions** Loaded

0.4970 0.4970 Unloaded

Final Lubricant Values	
Total Acid Number (TAN)	0.15
Water (ppm)	14
Fluoride ion (ppm)	0.85
Chloride ion (ppm)	13
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	1
Tin (ppm)	1
Zinc (ppm)	0

Suction side (reed backer)

Valve Plate Assembly Inspection

corrosion Suction surface appearance

Suction reed

Condition good Appearance corrosion Trepan slight Varnish ring slight

Discharge side (reed backer) Condition good Appearance corrosion Discharge surface appearance

corrosion

Discharge reed Condition good corrosion Appearance **Trepan** slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	very slight	black	gummy
Tip of Pin	medium	black	gummy
Spring	medium	gray	hard
Spring Seat	medium	black	hard
Ball	medium	black	gummy
Front Side	very slight	gray	hard

Photographic Documentation of R-22 Control Compressor 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

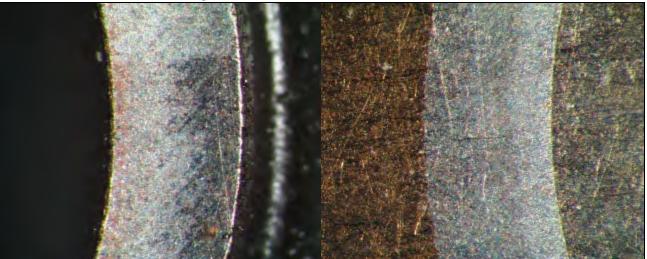
Photographic Documentation of R-22 Control Compressor 175 psig/32 psig





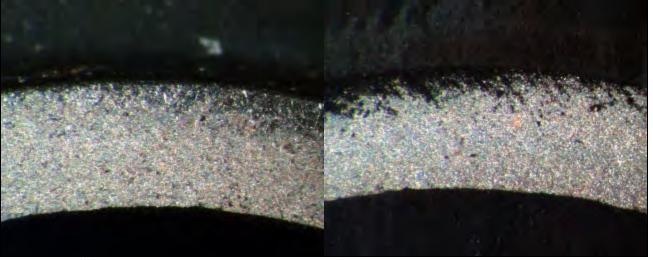
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Water

TEST INSTORT OF:				
Unit Number 106				
Model # RS43C1E-CAV-250 Serial	l# 96F16544	Crank journals	;	
Run Time (hr.) 12015 Failed	l? No	Appearance	clean/Cu plating	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank be	earing iournal	
Acid? No R-12? No		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish, slight	
H_2O ? Yes $R-502$? No			r,8	
-		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	175		Unloaded	0.9985
Suction Pressure (psig)	32	Bottom thrust	washer (crank side)	01,7,00
Discharge Temp (°F)	212	Appearance	clean/Cu plating	
Return Gas Temp (°F)	65	Wear	polish, medium	
SumpTemp (°F)	179		r,	
Sumpremp (1)	1,7	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish, slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	corrosion	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	gray		Unloaded	1.0015
Remaining torque of discharge muffler				
(1) 3 (2) 4 (3) 4	(4) 3	Shaft in cage be	earing	
Remaining torque of stator bolts	` ,	Appearance	clean	
(1) 10 (2) 11 (3) 9	(4) 10	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/scored	
Discharge plate appearance	clean	Dimensions	Loaded	1.3720
Top stator windings appearance	clean		Unloaded	1.3720
Rotor rub marks present?	Yes	Cylinder bore	Cinouaca	1.3720
Was rotor loose?	No	Appearance	low wear/scored	
	clean	Varnish ring		
Shell bottom appearance Quantity of bearing chips	trace	Dimensions	very slight Loaded	1.3750
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3750
-		Connecting red		1.5750
(1) 17 (2) 16 (3) 15 Head gasket brittle?	(4) 15 yes	Connecting room Appearance	scored/corrosion	
neau gaskei britue:	ves			
	•	Woor	nolich	
Head suction cavity appearance	clean	Wear	polish Landad	1 2500
Head suction cavity appearance Head discharge cavity appearance	clean clean	Wear Dimensions	Loaded	1.2500
Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean clean clean		1	1.2500 1.2500
Head suction cavity appearance Head discharge cavity appearance	clean clean clean		Loaded	

Unit Number

Contaminants: Trash in liquid screen (g) 0.004 **Control Unit?** No **Number of screens** 0.293 Acid? No R-12? No Debris in compressor bottom (g)

R-22? Air? No No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish Appearance corrosion **Dimensions** Loaded 0.4995 Suction surface appearance 0.4995

Piston pin washers appearance

Unloaded

contact wear

Piston pin

Tin (ppm) Zinc (ppm)

Appearance Cu plating polish, medium Wear **Dimensions** Loaded

0.4970 0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.07 Water (ppm) 14 Fluoride ion (ppm) 0.87 Chloride ion (ppm) 14 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm)

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin black, brown medium gummy Spring medium black gummy **Spring Seat** slight hard gray Ball black medium gummy Front Side heavy black gummy

0

0

Discharge side (reed backer)

good

corrosion

very slight

very slight

Valve Plate Assembly Inspection

Suction side (reed backer)

corrosion

Suction reed Condition

Trepan

Appearance

Varnish ring

Condition good clean **Appearance**

Discharge surface appearance

corrosion

Discharge reed Condition good

Appearance corrosion **Trepan** very slight Varnish ring none

Photographic Documentation of R-22 Compressor with Contaminant Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

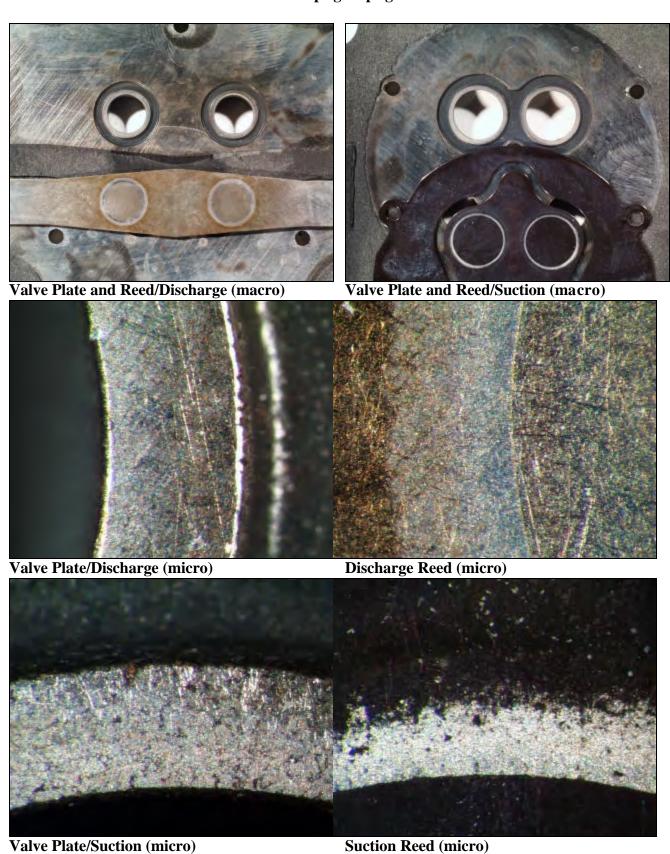


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Water 175 psig/32 psig



Suction Reed (micro)

Report for R-22 Compressor with Contaminant Water

TEST INSTORT OF.				
Unit Number 107				
Model # RS43C1E-CAV-250 Seria	l# 96F16451	Crank journals	;	
Run Time (hr.) 12003 Faile	d? No	Appearance	Cu plating	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank be	earing iournal	
Acid? No R-12? No		Appearance	Cu plating	
Air? No R-22? No		Wear	polish, slight	
H_2O ? Yes $R-502$? No			r,8	
-		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	175		Unloaded	0.9985
Suction Pressure (psig)	32	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	212	Appearance	Cu plating	
Return Gas Temp (°F)	65	Wear	polish, medium	
SumpTemp (°F)	179		1 ,	
Sumpremp (1)	2.75	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	corrosion	
High-low leak	fail	Wear	polish, slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	corrosion	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	gray		Unloaded	1.0030
Remaining torque of discharge muffle				
(1) 2 (2) 3 (3) 2	(4) 2	Shaft in cage be	earing	
Remaining torque of stator bolts	•	Appearance	clean	
(1) 9 (2) 8 (3) 9	(4) 9	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/scored	
Discharge plate appearance	clean	Dimensions	Loaded	1.3720
Top stator windings appearance	clean		Unloaded	1.3720
Rotor rub marks present?	Yes	Cylinder bore		1.0.20
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean/Cu plate	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3755
Remaining torque of discharge muffle		Difficusions	Unloaded	1.3755
(1) 15 (2) 15 (3) 16	(4) 15	Connecting roo		1.3733
Head gasket brittle?	yes	Appearance	corrosion	
Head suction cavity appearance	clean	Wear	polish, slight	
in a paction curry appearance	CICUII		-	1 2 100
Head discharge cavity annearance	clean	Dimensions	Loaded	1 2490
Head discharge cavity appearance	clean clean	Dimensions	Loaded Unloaded	1.2490
Cage bearing top appearance	clean	Dimensions	Loaded Unloaded	1.2490
	clean	Dimensions		

Unit Number

Contaminants: Trash in liquid screen (g) 0.031 **Control Unit?** No **Number of screens** 0.354 Acid? No R-12? No Debris in compressor bottom (g)

R-22? Air? No No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish, slight Appearance clean

Dimensions Loaded 0.4990 Suction surface appearance Unloaded 0.4990 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion polish, medium Wear

Dimensions Loaded 0.4985

0.4985 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.05 Water (ppm) 36 Fluoride ion (ppm) 0.85 Chloride ion (ppm) 14 Aluminum (ppm) 0 0 Copper (ppm)

Iron (ppm) 0 Lead (ppm) 0 4 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good

Suction reed

Condition good corrosion **Appearance** Trepan slight Varnish ring very slight

Discharge side (reed backer)

Condition good clean **Appearance**

Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat water none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black hard Spring medium black gummy **Spring Seat** slight black gummy Ball medium black gummy Front Side heavy black hard

Photographic Documentation of R-22 Compressor with Contaminant Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

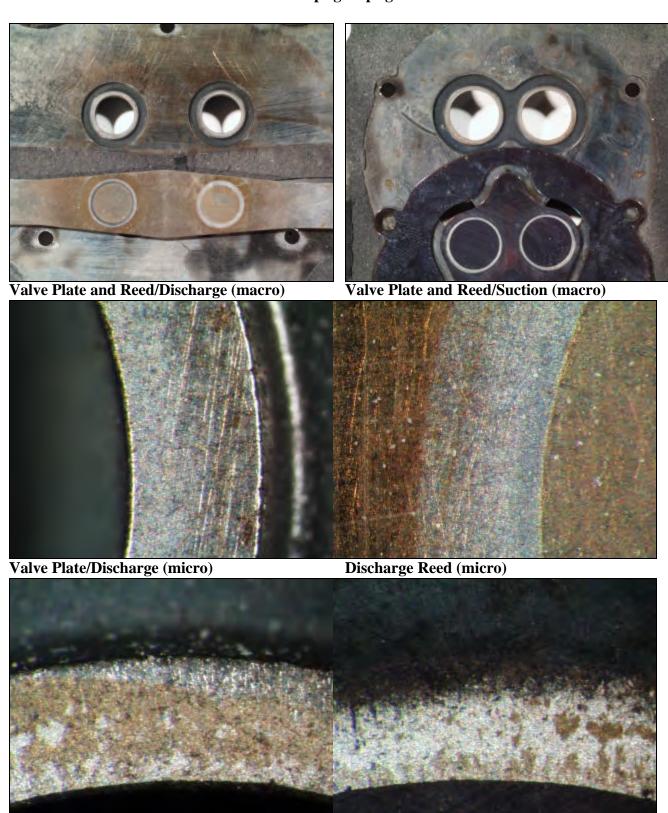


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Water 175 psig/32 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Water

Unit Number 108						
Model# RS43C1E-CAV-	-250	Serial #	96F16458	Crank journals	;	
Run Time (hr.)	2021	Failed?	No	Appearance	Cu plating	
Refrigerant R-	22			Wear	polish, medium	
Lubricant 3G				Dimensions	Loaded	1.2470
Contaminants:					Unloaded	1.2470
Control Unit? No				Lower crank be	earing iournal	
Acid? No R-1	2? N	No		Appearance	Cu plating	
Air? No R-2		No		Wear	polish, medium	
H_2O ? Yes $R-5$		No		,, ,	ponon, mount	
				Dimensions	Loaded	0.9975
Discharge Pressure (psig)	1	75		Unloaded	0.9975
Suction Pressure (psig)	,	3		Bottom thrust	washer (crank side)	0.7778
Discharge Temp (°F)			12	Appearance	clean/Cu plating	
Return Gas Temp (°F)		6		Wear	polish, medium	
SumpTemp (°F)			79	, , , , , , , , , , , , , , , , , , , 	ponsii, mediani	
Sumpremp (1)		1	1)	Bottom washer	(casting side)	
Hi-Pot		n	ass	Appearance	clean	
High-low leak		-	ail	Wear	polish, slight	
Top shell appearance			ray	Lower bronze		
Suction exit trail appeara	nce	_	ray/Cu	Appearance	scored	
Cluster block condition		_	ood	Wear	polish, slight	
Wire to cluster block app	earanc	_	ray	Dimensions	Loaded	1.0010
THE TO CHASTEL DIOCK app	cui unc	~ 5	iuy	Difficultion	Louded	1.0010
Suction ring ton annears	nce	σ	rav		Unloaded	1.0005
Suction ring top appeara			ray		Unloaded	1.0005
Remaining torque of disc	harge 1	muffler		Shaft in cage he		1.0005
Remaining torque of disc (1) 2 (2) 3	charge 1 (3) 2	muffler 2 (4	ray) 2	Shaft in cage be	earing	1.0005
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state	charge 1 (3) 2 or bolts	muffler 2 (4 5) 2	Appearance	e aring clean	1.0005
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10	(3) 2 or bolts (3) 9	muffler (4 s (4) 2	Appearance Wear	earing clean polish, slight	1.0005
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearan	(3) 2 or bolts (3) 9	muffler (4 s) (4 c) 2) 9 lean	Appearance Wear Piston top appe	earing clean polish, slight	1.0005
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux?	(3) 2 or bolts (3) 9	muffler (4 s) (4 c) 2	Appearance Wear	earing clean polish, slight	1.0005
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor?	charge i (3) 2 or bolts (3) 9	muffler 2 (4 s 0 (4 c) 2) 9 lean	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight	1.0005
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux?	charge i (3) 2 or bolts (3) 9	muffler (4) (5) (4) (6) (7) (N)) 2) 9 lean	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight earance clean low wear/scored Loaded	1.0005 1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor?	charge i (3) 2 or bolts (3) 9 nce	muffler (4) (5) (4) (6) (7) N g) 2) 9 lean 'es	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance clean low wear/scored	
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearan OEM flux? Loose restrictor? Discharge plate appearan	charge i (3) 2 or bolts (3) 9 nce	muffler 2 (4 5 6 (4 7 N g c c c) 2) 9 lean 'es Jo ray	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance clean low wear/scored Loaded	1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearan OEM flux? Loose restrictor? Discharge plate appearan Top stator windings appearan	charge i (3) 2 or bolts (3) 9 nce	muffler (4) (5) (4) (7) N g c Y) 2) 9 lean Yes Jo ray lean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, slight earance clean low wear/scored Loaded	1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearan OEM flux? Loose restrictor? Discharge plate appearan Top stator windings appearant	charge i (3) 2 or bolts (3) 9 nce	muffler (4) (5) (4) (7) (7) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9) 2) 9 lean Yes Jo ray lean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	clean polish, slight carance clean low wear/scored Loaded Unloaded	1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearan OEM flux? Loose restrictor? Discharge plate appearan Top stator windings appearant Rotor rub marks present Was rotor loose?	(3) 2 or bolts (3) 9 nce	muffler (4) (5) (4) (7) N g C Y N C Y) 2) 9 lean Yes Jo ray lean Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear	1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearan OEM flux? Loose restrictor? Discharge plate appearan Top stator windings appearant Rotor rub marks present Was rotor loose? Shell bottom appearance	charge i (3) 2 or bolts (3) 9 nce nce earance ?	muffler (4 c Y N g Y N c Y C T T T T T T T T T T T T) 2) 9 lean Yes Jo lean Yes Jo lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish, slight carance clean low wear/scored Loaded Unloaded low wear very slight	1.3725 1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor? Discharge plate appearant Top stator windings appearant Rotor rub marks present Was rotor loose? Shell bottom appearance Quantity of bearing class	charge i (3) 2 or bolts (3) 9 nce nce earance ?	muffler (4) (4) (4) (4) (7) N (6) (7) N (7) (7) (8) (9) (1) muffler re) 2) 9 lean Yes Jo lean Yes Jo lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	clean polish, slight carance clean low wear/scored Loaded Unloaded low wear very slight Loaded Unloaded	1.3725 1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearan OEM flux? Loose restrictor? Discharge plate appearan Top stator windings appearant Rotor rub marks present Was rotor loose? Shell bottom appearance Quantity of bearing cl Remaining torque of disc	charge i (3) 2 or bolts (3) 9 nce nce earance ?	muffler (4 (5 (4 (4 (4 (4 (4 (4 (4) 2) 9 lean Yes Jo lean Yes an Jo lean Tace moved	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	clean polish, slight carance clean low wear/scored Loaded Unloaded low wear very slight Loaded Unloaded	1.3725 1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor? Discharge plate appearant Top stator windings appearant Top stator windings appearant Was rotor loose? Shell bottom appearance Quantity of bearing of Remaining torque of disc (1) 15 (2) 15	(3) 2 or bolts (3) 9 nce nce earance?	muffler (4 (5 (4 (4 (7 (4 (4 (4 (4 (6 (4) (4) (4) (4)) 2) 9 lean Yes lo ray lean Yes lo lean race moved) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear very slight Loaded Unloaded Unloaded Loaded Unloaded Loaded	1.3725 1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor? Discharge plate appearant Top stator windings appearant Top stator windings appearant Was rotor loose? Shell bottom appearance Quantity of bearing cl Remaining torque of disc (1) 15 (2) 15 Head gasket brittle?	charge i (3) 2 or bolts (3) 9 nce nce earance ?	muffler (4 (5 (4 (4 (7 (4 (4 (4 (4 (6 (6 (6 (6 (7 (7 (7 (7 (7 (7) 2) 9 lean 'es lo ray lean 'es lo lean 'ace moved) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean polish, slight carance clean low wear/scored Loaded Unloaded low wear very slight Loaded Unloaded Unloaded (large end) scored/corrosion	1.3725 1.3725
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor? Discharge plate appearant Top stator windings apper Rotor rub marks present Was rotor loose? Shell bottom appearance Quantity of bearing cl Remaining torque of disc (1) 15 (2) 15 Head gasket brittle? Head suction cavity appe	charge i (3) 2 or bolts (3) 9 nce nce earance ? hips charge i (3) 1 arance pearan	muffler (4 S (4 Y N g C Y N C tr muffler re 4 nc cle cle ce cle) 2) 9 lean Yes Io ray lean Yes Io lean race moved) 15 o/bonded ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight carance clean low wear/scored Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion medium	1.3725 1.3725 1.3745 1.3745
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor? Discharge plate appearant Top stator windings apper Rotor rub marks present Was rotor loose? Shell bottom appearance Quantity of bearing cl Remaining torque of disc (1) 15 (2) 15 Head gasket brittle? Head suction cavity apper Head discharge cavity apper	charge i (3) 2 or bolts (3) 9 nce nce earance ? hips charge i (3) 1 arance pearan	muffler (4 (5 (4 (4 (7 (4 (7 (4 (4 (4 (6 (c) (c) (c) (c) (c) (c) (c)) 2) 9 lean Yes Jo ray lean Yes Jo lean Race moved) 15 o/bonded ean ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight carance clean low wear/scored Loaded Unloaded low wear very slight Loaded Unloaded I (large end) scored/corrosion medium Loaded	1.3725 1.3725 1.3745 1.3745
Remaining torque of disc (1) 2 (2) 3 Remaining torque of state (1) 10 (2) 10 Suction muffler appearant OEM flux? Loose restrictor? Discharge plate appearant Top stator windings apper Rotor rub marks present Was rotor loose? Shell bottom appearance Quantity of bearing cl Remaining torque of disc (1) 15 (2) 15 Head gasket brittle? Head suction cavity apper Head discharge cavity appearant of the control of th	charge i (3) 2 or bolts (3) 9 nce nce earance ? hips charge i (3) 1 arance pearan	muffler (4 (5 (4 (7 (7 (7 (7 (7 (7 (7 (7 (7 (7 (7 (7 (7) 2) 9 lean Yes Jo ray lean Yes Jo lean Race moved) 15 o/bonded ean ean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean polish, slight carance clean low wear/scored Loaded Unloaded low wear very slight Loaded Unloaded I (large end) scored/corrosion medium Loaded	1.3725 1.3725 1.3745 1.3745

Unit Number

Contaminants: Trash in liquid screen (g) 0.000 **Control Unit?** No Number of screens 0.599 Acid? No R-12? No Debris in compressor bottom (g)

R-22? Air? No No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish, slight Appearance clean

Dimensions Loaded 0.5005 Suction surface appearance Unloaded 0.5005 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance clean

polish, medium Wear **Dimensions** Loaded

0.4980

0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.09 Water (ppm) 21 Fluoride ion (ppm) 0.88 Chloride ion (ppm) 14 Aluminum (ppm) 0 Copper (ppm) 0 0

Iron (ppm) Lead (ppm) 0 Silicon (ppm) 1 0 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good

Suction reed

Condition good corrosion **Appearance** Trepan slight Varnish ring very slight

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring slight black gummy **Spring Seat** black slight gummy Ball medium black gummy Front Side heavy black hard

Photographic Documentation of R-22 Compressor with Contaminant Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Water 175 psig/32 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Acid

Unit Number 109				
Model # RS43C1E-CAV-250 Seria	I # 96F16446	Crank journals		
Run Time (hr.) 12001 Failed	l? No	Appearance	scored/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank be		
Acid? Yes R-12? No		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? No R-502? No		, , cui	ponsii	
12,00		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	175		Unloaded	0.9985
Suction Pressure (psig)	32	Bottom thrust	washer (crank side)	0.7705
Discharge Temp (°F)	212	Appearance	scored/Cu plating/bro	nze
Return Gas Temp (°F)	65	12ppourumet	plating/wear	
SumpTemp (°F)	179	Wear	polish	
Sumptemp (1)	177	Bottom washer	*	
Hi-Pot	pass	Appearance	clean/Cu plating	
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze l	•	
Suction exit trail appearance	gray/Cu	Appearance	scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0040
Suction ring top appearance	clean	Differences	Unloaded	1.0040
Remaining torque of discharge muffle			Cinouaca	1.0010
(1) 5 (2) 2.5 (3) 2.5	(4) 5	Shaft in cage be	aring	
	(•) 3	Share in eage se		
Remaining torque of stator bolts		Appearance	clean/Cu plating/corr	osion
Remaining torque of stator bolts	(4) 10	Appearance Wear	clean/Cu plating/corr	osion
(1) 12.5 (2) 10 (3) 10	(4) 10	Wear	polish	osion
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance	clean	Wear Piston top appe	polish	osion
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux?	clean Yes	Wear Piston top appe Piston skirt	polish	osion
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	clean Yes No	Wear Piston top appe Piston skirt Appearance	polish earance clean no wear	
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean Yes No clean	Wear Piston top appe Piston skirt	polish earance clean no wear Loaded	1.3740
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean Yes No clean clean/stator top green	Wear Piston top appe Piston skirt Appearance Dimensions	polish earance clean no wear	
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	clean Yes No clean	Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	polish earance clean no wear Loaded	1.3740
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean Yes No clean clean/stator top green	Wear Piston top appe Piston skirt Appearance Dimensions	polish earance clean no wear Loaded	1.3740
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	clean Yes No clean clean/stator top green No	Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	polish earance clean no wear Loaded Unloaded	1.3740
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean Yes No clean clean/stator top green No No	Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	polish earance clean no wear Loaded Unloaded low wear	1.3740
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded	1.3740 1.3740
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed (4) 15	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded (large end)	1.3740 1.3740 1.3760
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17 Head gasket brittle?	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion	1.3740 1.3740 1.3760
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed (4) 15	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish	1.3740 1.3740 1.3760 1.3760
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed (4) 15 yes/bonded clean clean	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed (4) 15 yes/bonded clean clean dirty	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish	1.3740 1.3740 1.3760 1.3760
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bold	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed (4) 15 yes/bonded clean clean dirty s	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760
(1) 12.5 (2) 10 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean Yes No clean clean/stator top green No No clean/Cu plate trace r removed (4) 15 yes/bonded clean clean dirty	Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish earance clean no wear Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760

Unit Number 109		
Contaminants:	Trash in liquid screen (g)	0.000
Control Unit? No	Number of screens	1

Control	Unit?	No		Number of screens	1
Acid?	Yes	R-12?	No	Debris in compressor bottom (g) 0.2	255
Air?	No	R-22?	No	-	
H_2O ?	No	R-502?	No	Valve Plate Assembly Inspection	

Connecting rod (small end)

Appearance	contact wear/c	orrect washer	Condition	good
Wear	polish		Appearance	corrosion
Dimensions	Loaded	0.5015	Suction surface	appearance
	Unloaded	0.5015	corrosion/	damaged

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

	~		тррешшее	
Appearance	Cu plating		Trepan	slig
Wear	polish		Varnish ring	slig
Dimensions	Loaded	0.4970		
	Unloaded	0.4970	Discharge side	(reed
			Condition	goo
Final Lubrica	nt Values		Appearance	cor
Total Acid Nu	mber (TAN)	0.08	Discharge surfa	ace ap
Water (ppm)		16	corrosion	
Fluoride ion (p	opm)	0.84		
Chloride ion (opm)	14	Discharge reed	
Aluminum (pp	om)	0	Condition	god
Copper (ppm)		0	Appearance	cor
Iron (ppm)		2	Trepan	slig
Lead (ppm)		0	Varnish ring	ver
Silicon (ppm)		2	o .	
Tin (ppm)		3		

Suction side (reed backer) ce corrosion/damaged

Suction reed

Condition good Condition metals good corrosion **Appearance** Trepan slight ight

ed backer)

ood rrosion appearance

Condition	good
Appearance	corrosion
Trepan	slight
Varnish ring	very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	heavy	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

1

Photographic Documentation of R-22 Compressor with Contaminant Acid 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

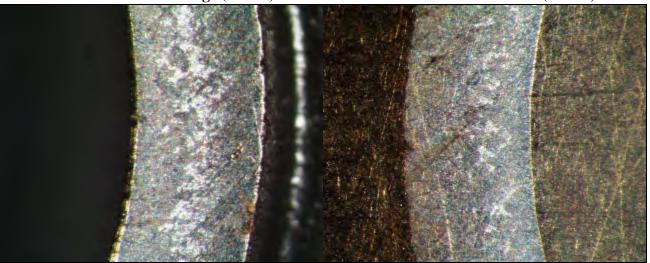
Photographic Documentation of R-22 Compressor with Contaminant Acid 175 psig/32 psig





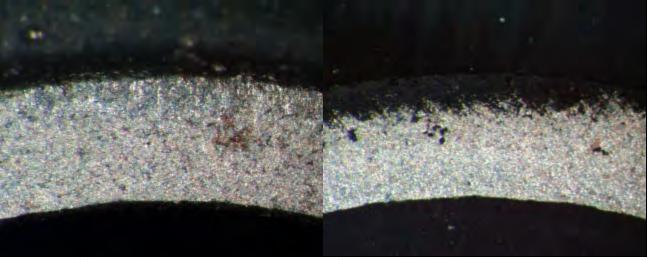
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Acid

Unit Number 110				
Model # RS43C1E-CAV-250 Serial	# 96F16534	Crank journals		
Run Time (hr.) 12021 Failed	? No	Appearance	scored/Cu plating	
Refrigerant R-22		Wear	polish, medium	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing journal	
Acid? Yes R-12? No		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	polish, medium	
H_2O ? No $R-502$? No				
		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	175		Unloaded	0.9990
Suction Pressure (psig)	32	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	212	Appearance	clean/Cu plating	
Return Gas Temp (°F)	65	Wear	polish, medium	
SumpTemp (°F)	179			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	fail	Wear	polish, slight	
Top shell appearance	clean	Lower bronze l	oearings	
Suction exit trail appearance	gray/Cu	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0010
Suction ring top appearance	bright		Unloaded	1.0010
Remaining torque of discharge muffler				
(1) 2 (2) 2 (3) 3	(4) 3	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 11 (2) 10 (3) 10	(4) 11	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3720
Top stator windings appearance	clean		Unloaded	1.3720
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean/Cu plate	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3755
Remaining torque of discharge muffler	removed		Unloaded	1.3755
(1) 16 (2) 15 (3) 16	(4) 16	Connecting rod	(large end)	
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	polish, medium	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2500
Cage bearing top appearance	dirty		Unloaded	1.2500
Remaining torque of cage bearing bolts (1) 4 (2) 4 (3) 5	(4) 5			

Unit Number

Contaminants: Trash in liquid screen (g) 0.025 **Control Unit?** No **Number of screens** Acid? 0.003 Yes R-12? No Debris in compressor bottom (g)

Air? No R-22? No H₂O? No R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish **Appearance** corrosion **Dimensions** Loaded 0.5000

Unloaded 0.5000

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance Cu plating Wear medium

Dimensions Loaded 0.4980 Unloaded 0.4980

Cinouaca	0.1700
Final Lubricant Values	
Total Acid Number (TAN)	0.07
Water (ppm)	62

62 Fluoride ion (ppm) 0.75 Chloride ion (ppm) 14 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 1 0 Lead (ppm) Silicon (ppm) 3 Tin (ppm) 3

Valve Plate Assembly Inspection

Suction side (reed backer) Condition good

Suction surface appearance

corrosion

Suction reed

Condition good **Appearance** corrosion Trepan slight Varnish ring very slight

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black	gummy
Spring Seat	heavy	black	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

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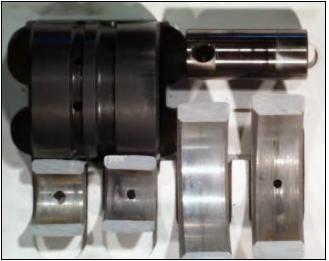
Photographic Documentation of R-22 Compressor with Contaminant Acid 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

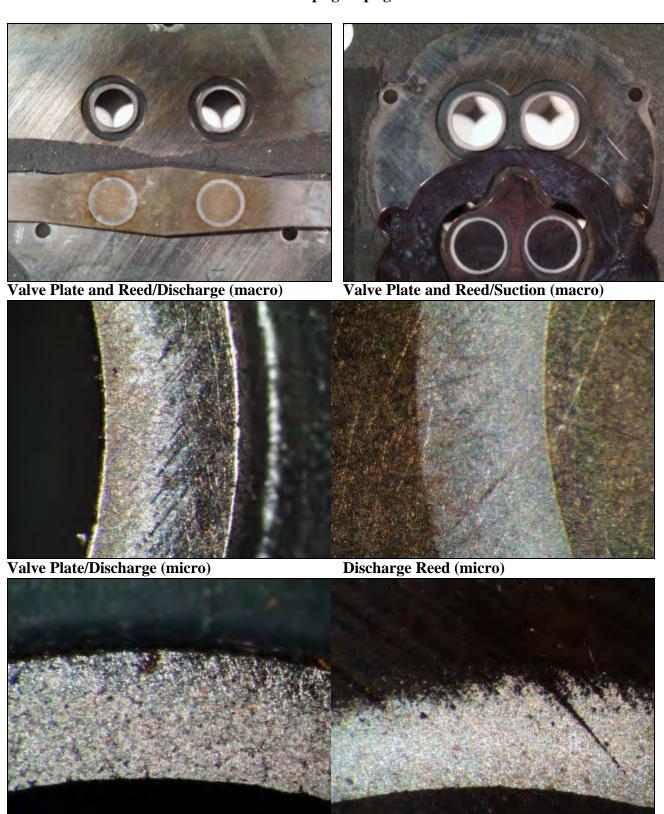


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid 175 psig/32 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Air

Unit Number 111				
Model # RS43C1E-CAV-250 Serial	# 96F16538	Crank journals		
Run Time (hr.) 12024 Failed	!? No	Appearance	scored/Cu plating	
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		1.2170
Acid? No R-12? No		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? No		vvcai	ponsii	
1120: NO R-302: NO		Dimensions	Loaded	0.9990
Disabanas Dusasuns (nais)	175	Difficusions	Unloaded	0.9990
Discharge Pressure (psig)		D = 44 = 4h = 4 =		0.9990
Suction Pressure (psig)	32		washer (crank side)	
Discharge Temp (°F)	212	Appearance	scored/bronze	
Return Gas Temp (°F)	65		plating/ corrosion/we	ar
SumpTemp (°F)	179	Wear	slight	
		Bottom washer	, ,	
Hi-Pot	pass	Appearance	scored/corrosion	
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze b	oearings	
Suction exit trail appearance	gray/Cu	Appearance	scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0040
Suction ring top appearance	gray		Unloaded	1.0040
9 · I · I I	<i>8)</i>			
Remaining torque of discharge muffler			<u> </u>	
		Shaft in cage be		
Remaining torque of discharge muffler	•	Shaft in cage be Appearance		
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts	(4) 1	_	earing clean/corrosion	
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts	•	Appearance	earing clean/corrosion polish	
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5	(4) 1 (4) 10	Appearance Wear	earing clean/corrosion polish	
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance	(4) 1 (4) 10 clean	Appearance Wear Piston top appe Piston skirt	earing clean/corrosion polish arance clean	
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor?	(4) 1 (4) 10 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	earing clean/corrosion polish	
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 1 (4) 10 clean Yes No gray	Appearance Wear Piston top appe Piston skirt	earing clean/corrosion polish arance clean low wear/Cu plating Loaded	1.3740
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 1 (4) 10 clean Yes No gray clean/stator top green	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean/corrosion polish arance clean low wear/Cu plating	
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 1 (4) 10 clean Yes No gray clean/stator top green No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded	1.3740
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear	1.3740
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight	1.3740 1.3740
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	caring clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded Unloaded	1.3740 1.3740
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 12.5 (2) 12.5 (3) 17	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded Unloaded (large end)	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 12.5 (2) 12.5 (3) 17 Head gasket brittle?	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed (4) 15 yes/bonded	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 12.5 (2) 12.5 (3) 17 Head gasket brittle? Head suction cavity appearance	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed (4) 15 yes/bonded clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish	1.3740 1.3740 1.3760 1.3760
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 12.5 (2) 12.5 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed (4) 15 yes/bonded clean clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 12.5 (2) 12.5 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed (4) 15 yes/bonded clean clean dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish	1.3740 1.3740 1.3760 1.3760
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 12.5 (2) 12.5 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolts	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed (4) 15 yes/bonded clean clean dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760
Remaining torque of discharge muffler (1) 0 (2) 1 (3) 1 Remaining torque of stator bolts (1) 12.5 (2) 12.5 (3) 12.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 12.5 (2) 12.5 (3) 17 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 1 (4) 10 clean Yes No gray clean/stator top green No No Cu plate heavy removed (4) 15 yes/bonded clean clean dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	clean/corrosion polish arance clean low wear/Cu plating Loaded Unloaded low wear very slight Loaded Unloaded (large end) scored/corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760

Unit Number

Contaminants: Trash in liquid screen (g) 0.013 **Control Unit?** No **Number of screens** Acid? No R-12? No Debris in compressor bottom (g) 0.682

R-22? Air? Yes No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear polish **Dimensions** Loaded

0.5015 Unloaded 0.5010

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Tin (ppm)

Zinc (ppm)

Appearance Cu plating/corrosion

polish Wear

Dimensions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.24 Water (ppm) Fluoride ion (ppm) Chloride ion (ppm) 14 Aluminum (ppm) Copper (ppm) 1 Iron (ppm)

33 0.75 0 0 0 Lead (ppm) Silicon (ppm) 2 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good Appearance corrosion

Suction surface appearance

corrosion

Suction reed

Condition good

Condition metals good **Appearance** corrosion **Trepan** very slight Varnish ring very slight

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good corrosion **Appearance Trepan** slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description Diaphragm Seat** very slight tarnished hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black hard **Spring** medium black hard **Spring Seat** slight black hard Ball medium black hard Front Side medium black hard

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Photographic Documentation of R-22 Compressor with Contaminant Air 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

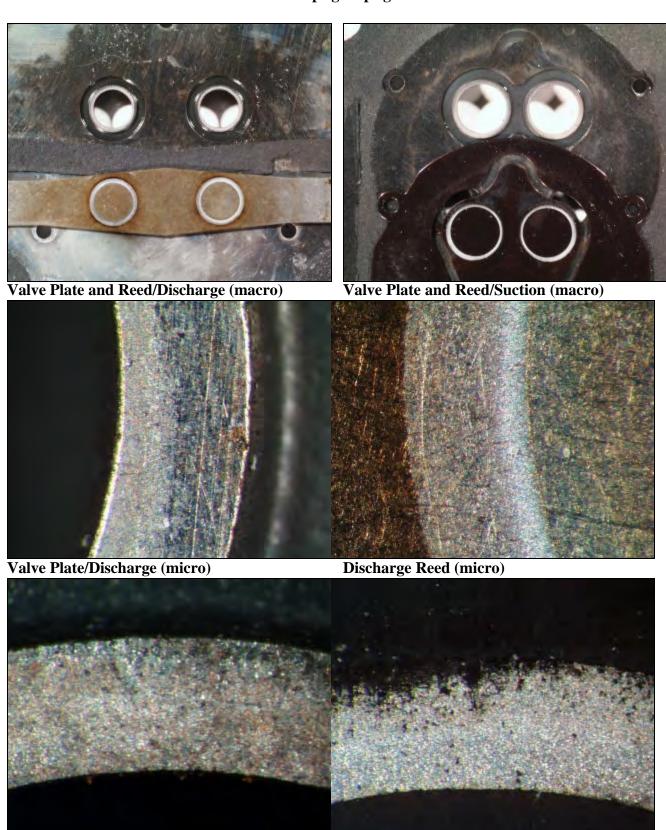


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air 175 psig/32 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

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Report for R-22 Compressor with Contaminant Air

TEST HISTORY OF:	:
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ILDI IIIDIONI OI:				
Unit Number 112				
Model # RS43C1E-CAV-250 Serial	# 96F16530	Crank journals	}	
Run Time (hr.) 12011 Failed		Appearance	scored/Cu plating	
Refrigerant R-22	1.0	Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:		Difficusions	Unloaded	1.2470
		T		1.2470
Control Unit? No		Lower crank b		
Acid? No R-12? No		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? No				
		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	175		Unloaded	0.9990
Suction Pressure (psig)	32	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	212	Appearance	scored/Cu plating/cor	rosion/wear
Return Gas Temp (°F)	65		metals	
SumpTemp (°F)	179	Wear	polish	
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating/cor	rosion
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0035
Suction ring top appearance	clean		Unloaded	1.0035
Remaining torque of discharge muffler				
(1) 5 (2) 2 (3) 2	(4) 2	Shaft in cage be	aring	
Remaining torque of stator bolts	(1) 2	Appearance	clean	
(1) 17 (2) 15 (3) 12.5	(4) 12.5	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	Cu plate	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	removed		Unloaded	1.3760
(1) 15 (2) 15 (3) 15	(4) 15	Connecting roo		
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts				1.2010
(1) 5 (2) 5 (3) 5	(4) 5			
(-, - (-, - (-))	(-, -			

Unit Number

Contaminants: Trash in liquid screen (g) 0.029 **Control Unit?** No **Number of screens** Acid? No R-12? No Debris in compressor bottom (g) 1.115

R-22? Air? Yes No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish Appearance

Dimensions Loaded 0.5010 Suction surface appearance Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/Cu plating

polish Wear **Dimensions** Loaded 0.4970

0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.11 Water (ppm) 21 Fluoride ion (ppm) 0.70 Chloride ion (ppm) 13 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 0 5 Silicon (ppm) 1 Tin (ppm) Zinc (ppm) 0 Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good corrosion

Suction reed

Condition good corrosion **Appearance** Trepan slight Varnish ring none

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin hard slight black Spring very slight black hard **Spring Seat** very slight black hard Ball medium hard black Front Side heavy black hard

Photographic Documentation of R-22 Compressor with Contaminant Air 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

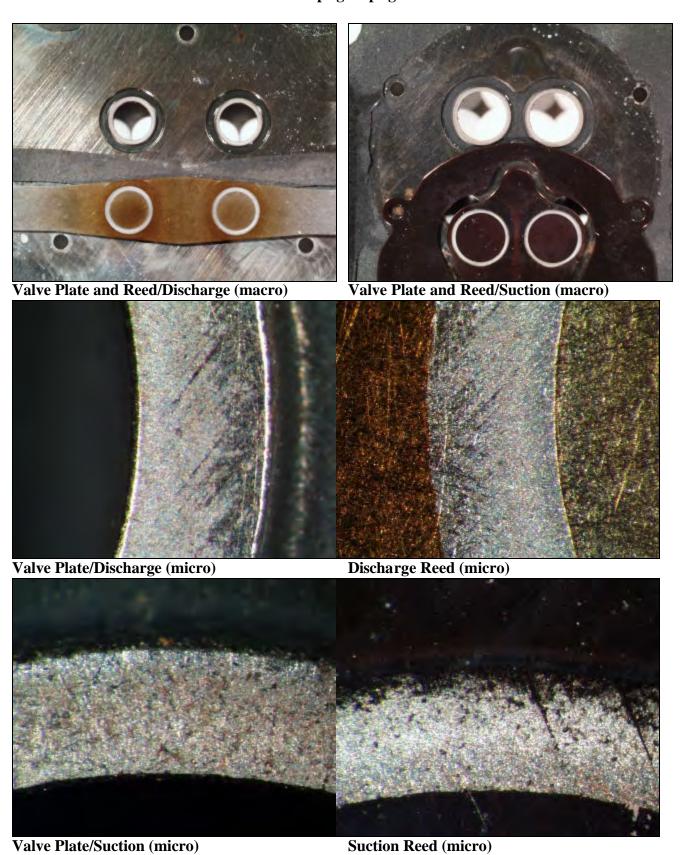


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air 175 psig/32 psig



Report for R-22 Compressor with Contaminant Acid and Air

TEST HISTORY OF.				
Unit Number 113				
Model # RS43C1E-CAV-250 Serial	# 96F16479	Crank journals	S	
Run Time (hr.) 12041 Failed	? No	Appearance	scored/Cu plating/co	rrosion
Refrigerant R-22		Wear	polish	
Lubricant 3GS		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b		1.2.70
Acid? Yes R-12? No		Appearance	clean/Cu plating	
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? No		vvcai	ponsii	
1120. 110 K-302. 110		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	175	Difficusions	Unloaded	0.9990
Suction Pressure (psig)	32	Rottom thrust	washer (crank side)	0.9990
Discharge Temp (°F)	212	Appearance	scored/Cu plating/co	rrosion/wear
		Appearance		iiosion/wear
Return Gas Temp (°F)	65	XX7	metals	
SumpTemp (°F)	179	Wear	polish	
II: D-4		Bottom washer		
Hi-Pot	pass	Appearance	scored/Cu plating/co	orrosion
High-low leak	fail	Wear	polish	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray/Cu	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	1 0005
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0035
Suction ring top appearance	clean		Unloaded	1.0035
Remaining torque of discharge muffler			_	
(1) 5 (2) 2 (3) 1	(4) 2	Shaft in cage b	_	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 15 (2) 10 (3) 10	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black/Cu plate	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
(1) 15 (2) 17 (3) 15	(4) 15	Connecting roo		1.5700
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	dirty	Wear	polish	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	•	Dimensions	Unloaded	1.2510
Remaining torque of cage bearing bolts	dirty		Ombaued	1.2310
(1) 5 (2) 7 (3) 7	(4) 7			
	(1) /			

Unit Number

Contaminants: Trash in liquid screen (g) 0.064 **Control Unit?** No **Number of screens** Acid? Yes R-12? No Debris in compressor bottom (g) 1.071

Air? R-22? Yes No H₂O? R-502? No No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear polish **Dimensions** Loaded

Unloaded 0.5010

0.5010

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Appearance scored/corrosion

polish Wear **Dimensions** Loaded

0.4970 0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.15 Water (ppm) 13 0.72 Fluoride ion (ppm) Chloride ion (ppm) 15 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0

0 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good Appearance corrosion Suction surface appearance corrosion/Cu plating

Suction reed

Condition good corrosion **Appearance Trepan** slight Varnish ring none

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating

slight **Trepan** Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin slight gray, brown hard Spring medium black hard medium **Spring Seat** black hard Ball slight black hard Front Side slight black hard

Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

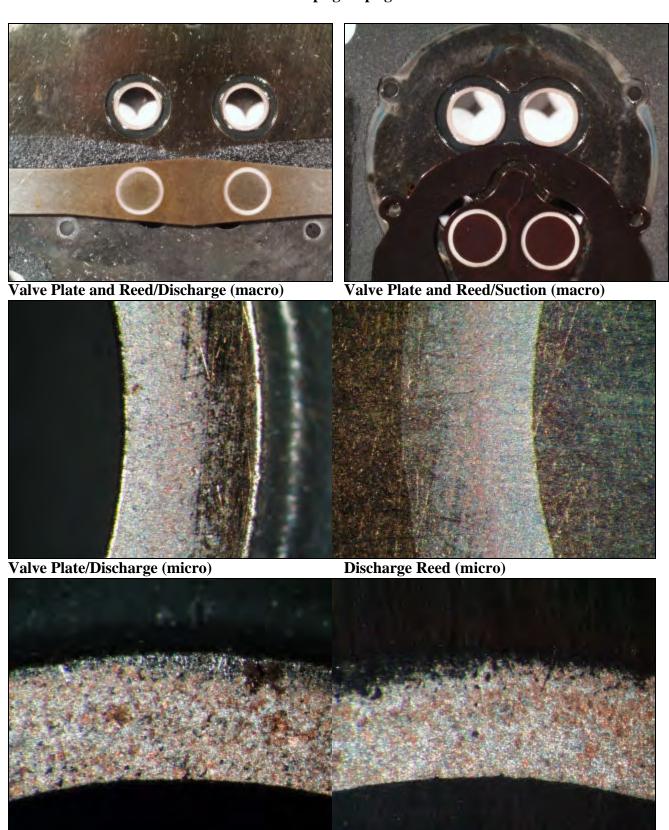


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 175 psig/32 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Acid and Air

Unit Number 114			
Model # RS43C1E-CAV-250 Serie	al# 96F16462	Crank journals	
Run Time (hr.) 12034 Faile		Appearance Cu pla	atino
Refrigerant R-22	110		i, medium
Lubricant 3GS		Dimensions Load	
Contaminants:		Unloa	
Control Unit? No		Lower crank bearing	
Acid? Yes R-12? No		Appearance Cu pla	-
Air? Yes R-22? No			n, medium
H_2O ? No $R-502$? No		wear ponsi	i, illeululli
1120: NO K-302: NO		Dimensions Load	ed 0.9990
Dischange Pressure (nsig)	175	Unloa	
Discharge Pressure (psig) Suction Pressure (psig)	32	Bottom thrust washer	
Discharge Temp (°F)	212		Cu plating
	65		
Return Gas Temp (°F)		vvear ponsi	, medium
SumpTemp (°F)	179	Dattam washan (aastin	a aida)
Hi-Pot	2000	Bottom washer (casting Appearance clean	ig side)
	pass		aliaht
High-low leak	pass clean		, slight
Top shell appearance Suction exit trail appearance		Lower bronze bearing Appearance clean	38
Cluster block condition	gray/Cu	1.1	aliaht
Wire to cluster block appearance	good	Dimensions Load	, slight ed 1.0015
wire to cluster block abbearance	gray	Difficusions Load	1.0013
		Unlos	dod 1.0015
Suction ring top appearance	gray	Unloa	nded 1.0015
Suction ring top appearance Remaining torque of discharge muffle	gray er		nded 1.0015
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4	gray	Shaft in cage bearing	nded 1.0015
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts	gray er (4) 4	Shaft in cage bearing Appearance clean	
Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11	gray er (4) 4 (4) 10	Shaft in cage bearing Appearance clean Wear polish	ı, slight
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance	gray er (4) 4	Shaft in cage bearing Appearance clean Wear polish Piston top appearance	ı, slight
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux?	gray er (4) 4 (4) 10 clean Yes	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt	ı, slight e clean
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance	gray er (4) 4 (4) 10 clean	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w	ı, slight
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux?	gray er (4) 4 (4) 10 clean Yes	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt	ı, slight e clean rear/Cu plating
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor?	gray er (4) 4 (4) 10 clean Yes No	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w	e clean rear/Cu plating ed 1.3715
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	gray er (4) 4 (4) 10 clean Yes No clean	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load	e clean rear/Cu plating ed 1.3715
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	gray er (4) 4 (4) 10 clean Yes No clean gray	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa	e clean rear/Cu plating ed 1.3715 aded 1.3715
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	gray er (4) 4 (4) 10 clean Yes No clean gray No	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w	rear/Cu plating ed 1.3715 aded 1.3715 rear
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	gray er (4) 4 (4) 10 clean Yes No clean gray No No	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore	rear/Cu plating ed 1.3715 ear light
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	gray er (4) 4 (4) 10 clean Yes No clean gray No No No black trace	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Loade Unloa Cylinder bore Appearance low w Varnish ring very s	rear/Cu plating ed 1.3715 aded 1.3715 rear light ed 1.3735
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	gray er (4) 4 (4) 10 clean Yes No clean gray No No No black trace	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w Varnish ring Dimensions Load	rear/Cu plating ed 1.3715 aded 1.3715 rear light ed 1.3735 read 1.3735 red 1.3735
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	gray er (4) 4 (4) 10 clean Yes No clean gray No No black trace er removed	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w Varnish ring Dimensions Load Unloa	rear/Cu plating ed 1.3715 aded 1.3715 rear light ed 1.3735 rear light ed 1.3735 aded 1.3735
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 16 (3) 15	gray er (4) 4 (4) 10 clean Yes No clean gray No No black trace er removed (4) 15	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w Varnish ring Dimensions Load Unloa Connecting rod (large Appearance corros	rear/Cu plating ed 1.3715 aded 1.3715 rear light ed 1.3735 rear light ed 1.3735 aded 1.3735
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 16 (3) 15 Head gasket brittle?	gray er (4) 4 (4) 10 clean Yes No clean gray No No black trace er removed (4) 15 yes	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w Varnish ring Dimensions Load Unloa Connecting rod (large Appearance corros	rear/Cu plating ed 1.3715 nded 1.3715 rear light ed 1.3735 read 1.3735 read 1.3735 read 1.3735 read 1.3735 read 1.3735
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance	gray er (4) 4 (4) 10 clean Yes No clean gray No No black trace er removed (4) 15 yes clean	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w Varnish ring Dimensions Load Unloa Connecting rod (large Appearance Wear polish	rear/Cu plating red 1.3715 rear light red 1.3735 rear light red 1.3735 red 1.3735 red 1.3735 rend) rein 1.3735 rend) rein 1.3735
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray er (4) 4 (4) 10 clean Yes No clean gray No No black trace er removed (4) 15 yes clean clean dirty	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w Varnish ring Dimensions Load Unloa Connecting rod (large Appearance Wear polish Dimensions Load	rear/Cu plating rear light red 1.3715 rear light red 1.3735 rear light red 1.3735 red 1.3735 rend) reion resion re
Suction ring top appearance Remaining torque of discharge muffle (1) 3 (2) 4 (3) 4 Remaining torque of stator bolts (1) 11 (2) 10 (3) 11 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 16 (2) 16 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	gray er (4) 4 (4) 10 clean Yes No clean gray No No black trace er removed (4) 15 yes clean clean dirty	Shaft in cage bearing Appearance clean Wear polish Piston top appearance Piston skirt Appearance low w Dimensions Load Unloa Cylinder bore Appearance low w Varnish ring Dimensions Load Unloa Connecting rod (large Appearance Wear polish Dimensions Load	rear/Cu plating rear light red 1.3715 rear light red 1.3735 rear light red 1.3735 red 1.3735 rend) reion resion re

Unit Number

Contaminants: Trash in liquid screen (g) 0.000 **Control Unit?** No **Number of screens** Acid? R-12? 0.720 Yes No Debris in compressor bottom (g)

Air? R-22? Yes No R-502? H_2O ? No No

Valve Plate Assembly Inspection

good

good

corrosion

corrosion

Suction side (reed backer)

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Condition Wear polish, slight Appearance

0.4990 **Dimensions** Loaded **Suction surface appearance** corrosion

0.4990 Unloaded Suction reed

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance Cu plating Wear polish **Dimensions** Loaded

0.4970

0.4970 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.11 Water (ppm) 62 Fluoride ion (ppm) 0.64 Chloride ion (ppm) 17 0

Aluminum (ppm) Copper (ppm) 0 Iron (ppm) 4 Lead (ppm) 0 7 Silicon (ppm) 5 Tin (ppm)

Trepan slight Varnish ring very slight

Discharge side (reed backer) good Condition Appearance corrosion Discharge surface appearance

corrosion

Discharge reed

Condition

Appearance

Condition good

corrosion/Cu plating Appearance

Trepan very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	medium	black	gummy

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Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

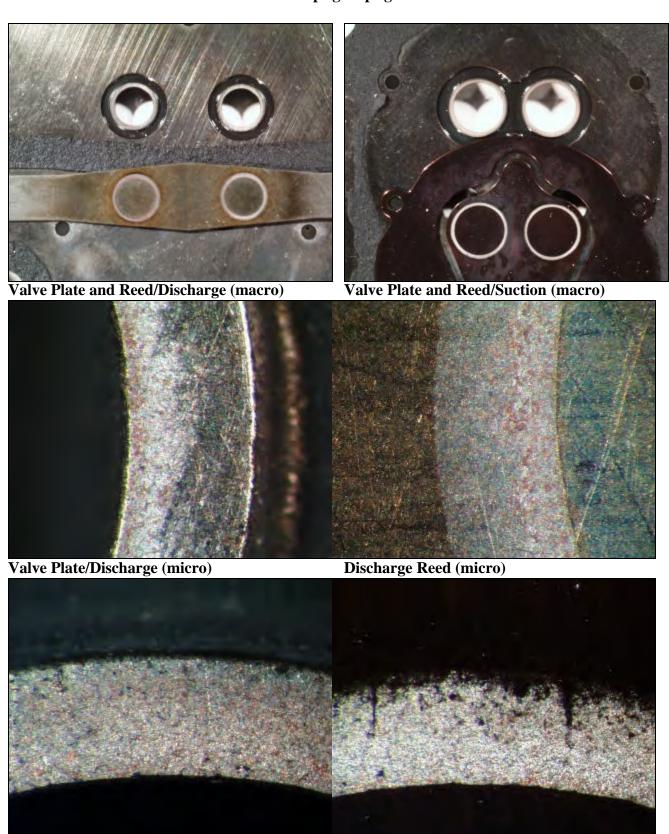


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Air 175 psig/32 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

Report for R-22 Compressor with Contaminant Acid and Water

# 96F16542	Crank journals		
? No	Appearance	scored/Cu plating	
	Wear	polish	
	Dimensions	Loaded	1.2460
		Unloaded	1.2460
	Lower crank be	earing journal	
		F ******	
	Dimensions	Loaded	0.9980
175		Unloaded	0.9980
	Bottom thrust		
			r metals
		B	
17,5	Bottom washer	(casting side)	
pass			
•			
		_	
_		*	1.0040
	2		1.0040
(4) 2	Shaft in cage be	earing	
(-) =	_		
(4) 12.5			
• •		1	
		arance clean	
			1 2740
	Dimensions		1.3740
		Unioaded	1.3740
		í	
Cu plate/corrosion			
trace	Dimensions		1.3760
			1.3760
•			
		-	
•	Dimensions		1.2510
		Unloaded	1.2510
(4) /			
	Possible No. 175 32 212 65 179 pass fail clean black/Cu good gray clean (4) 2 (4) 12.5 clean Yes No gray clean/stator top green Yes No Cu plate/corrosion	Appearance Wear Dimensions Lower crank be Appearance Wear Dimensions 175 32 212 Appearance Wear 179 Bottom washer Appearance Wear Lower bronze be Appearance Wear Lower bronze be Appearance Wear Dimensions Shaft in cage be Appearance Wear Dimensions (4) 2 Shaft in cage be Appearance Wear Dimensions (4) 12.5 clean Piston top appee Yes No Gray clean/stator top green Yes No Cu plate/corrosion trace Cu plate/corrosion trace removed (4) 17 yes/bonded clean dirty dirty Connecting rod Appearance Wear Dimensions	Appearance scored/Cu plating Wear polish Dimensions Loaded Unloaded Lower crank bearing journal Appearance Cu plating Wear polish Dimensions Loaded Unloaded 32 Dimensions Loaded Unloaded 32 Appearance scored/Cu plating/wear 65 Wear slight 179 Bottom washer (casting side) Appearance clean/Cu plating Mear polish 179 Lower bronze bearings black/Cu Appearance scored good Wear polish gray clean Unloaded (4) 2 Shaft in cage bearing Appearance clean/Cu plating Wear polish Dimensions Loaded Unloaded (4) 12.5 Wear polish clean Piston top appearance clean Yes Piston skirt No Appearance no wear gray clean/stator top green Yes Piston skirt No Appearance low wear Cu plate/corrosion trace Dimensions Loaded Tunloaded (4) 17 Connecting rod (large end) yes/bonded clean Wear polish Dimensions Loaded Unloaded (4) 17 Connecting rod (large end) yes/bonded clean Wear polish Dimensions Loaded Unloaded Unloaded Unloaded Unloaded Unloaded Unloaded Unloaded Unloaded

Unit Number

Contaminants: Trash in liquid screen (g) 0.043 **Control Unit?** No **Number of screens** 0.546 Acid? Yes R-12? No Debris in compressor bottom (g)

R-22? Air? No No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish Appearance **Dimensions** Loaded 0.5005 Suction surface appearance

Unloaded 0.5005

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Appearance Cu plating/corrosion

Wear polish **Dimensions** Loaded

0.4970 0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.06 Water (ppm) 15 Fluoride ion (ppm) 0.70 Chloride ion (ppm) 15 Aluminum (ppm) 0 0 Copper (ppm) 0

Iron (ppm) Lead (ppm) 0 2 Silicon (ppm) 1 Tin (ppm) Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good corrosion

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan slight Varnish ring none

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black gummy **Spring Seat** heavy black gummy Ball medium black gummy Front Side heavy black gummy

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

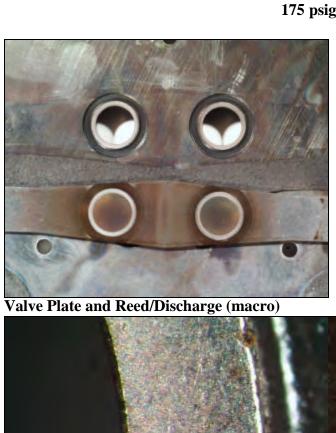


Crank Shaft (loaded) (macro)



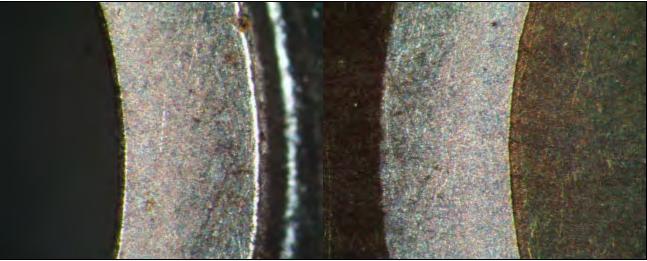
Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 175 psig/32 psig



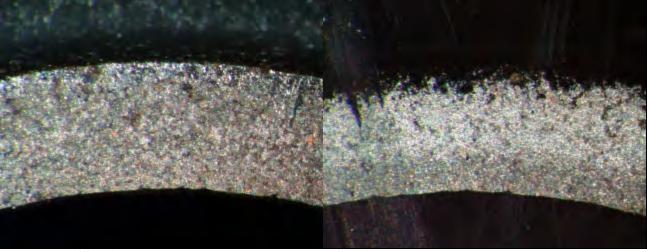


Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Acid and Water

Unit Number 116		
Model # RS43C1E-CAV-250 Se	rial # 96F16457	Crank journals
Run Time (hr.) 12003 Fa	iled? No	Appearance scored/Cu plating
Refrigerant R-22		Wear polish
Lubricant 3GS		Dimensions Loaded 1.2460
Contaminants:		Unloaded 1.2460
Control Unit? No		Lower crank bearing journal
Acid? Yes R-12? No		Appearance scored/Cu plating
Air? No R-22? No		Wear polish
H_2O ? Yes $R-502$? No		r
2		Dimensions Loaded 0.9985
Discharge Pressure (psig)	175	Unloaded 0.9985
Suction Pressure (psig)	32	Bottom thrust washer (crank side)
Discharge Temp (°F)	212	Appearance scored/Cu plating
Return Gas Temp (°F)	65	Wear polish
SumpTemp (°F)	179	ponon
Sumpremp(1)	177	Bottom washer (casting side)
Hi-Pot	pass	Appearance clean/Cu plating
High-low leak	fail	Wear polish
Top shell appearance	clean	Lower bronze bearings
Suction exit trail appearance	gray/Cu	Appearance scored
Cluster block condition	good	Wear polish
Wire to cluster block appearance	gray	Dimensions Loaded 1.0040
Suction ring top appearance	clean	Unloaded 1.0035
Remaining torque of discharge muf	fler	
(1) 0 (2) 0 (3) 1	(4) 1	Shaft in cage bearing
Remaining torque of stator bolts		Appearance clean/corrosion
(1) 12.5 (2) 10 (3) 12.5	(4) 10	Wear polish
Suction muffler appearance	clean	Piston top appearance clean
OEM flux?	Yes	Piston skirt
Loose restrictor?	No	Appearance no wear/Cu plating
Discharge plate appearance	gray	Dimensions Loaded 1.3740
Top stator windings appearance	gray/stator top green	Unloaded 1.3740
Rotor rub marks present?	Yes	Cylinder bore
Was rotor loose?	No	Appearance low wear/scored
Shell bottom appearance	black/Cu plate	Varnish ring very slight
Quantity of bearing chips	slight	Dimensions Loaded 1.3760
Remaining torque of discharge mut	_	Unloaded 1.3760
(1) 2 (2) 5 (3) 5	(4) 12.5	Connecting rod (large end)
Head gasket brittle?	yes/bonded	Appearance scored/corrosion
Head suction cavity appearance	clean	Wear polish
Head discharge cavity appearance	clean	Dimensions Loaded 1.2510
Cage bearing top appearance	dirty	Unloaded 1.2510
Remaining torque of cage bearing b		1.2310
(1) 5 (2) 7 (3) 5	(4) 5	
(, (-)	· / -	

Unit Number

Contaminants: Trash in liquid screen (g) 0.029 **Control Unit?** No **Number of screens** 2 Acid? 0.346 Yes R-12? No Debris in compressor bottom (g)

Air? R-22? No No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish **Appearance**

Dimensions Loaded 0.5010 **Suction surface appearance** Unloaded 0.5010

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Appearance corrosion Wear polish **Dimensions** Loaded 0.4985 0.4985 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.13 Water (ppm) 22 Fluoride ion (ppm) 0.67 Chloride ion (ppm) 14 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0

Lead (ppm) 0 17 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0 **Valve Plate Assembly Inspection**

Suction side (reed backer)

Condition good corrosion

corrosion

Suction reed

Condition good Appearance corrosion Trepan slight Varnish ring slight

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** slight

Varnish ring medium

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

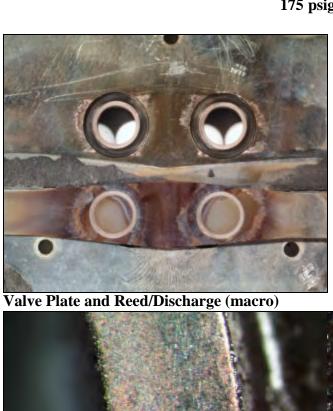


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid and Water 175 psig/32 psig





Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Air and Water

Unit Number 117				
	A # 06E16525	Cuanti taumala		
		Crank journals		
Run Time (hr.) 12014 Faile	ed? No	Appearance	scored	
Refrigerant R-22		Wear	polish, medium	1.0400
Lubricant 3GS		Dimensions	Loaded	1.2480
Contaminants:			Unloaded	1.2480
Control Unit? No		Lower crank be		
Acid? No R-12? No		Appearance	scored	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes $R-502$? No				
		Dimensions	Loaded	1.0000
Discharge Pressure (psig)	175		Unloaded	1.0000
Suction Pressure (psig)	32	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	212	Appearance	Cu plating	
Return Gas Temp (°F)	65	Wear	polish, medium	
SumpTemp (°F)	179			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/bronze plating	
High-low leak	fail	Wear	polish, slight	
Top shell appearance	gray	Lower bronze l		
Suction exit trail appearance	gray/Cu	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0020
			Unloaded	1.0020
Suction ring top appearance	gray		Unloaded	1.0020
Suction ring top appearance Remaining torque of discharge muffle	gray er	Shaft in cage be		1.0020
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2	gray	Shaft in cage be Appearance	earing	1.0020
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts	gray er (4) 2	Appearance	earing clean	1.0020
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10	gray er (4) 2 (4) 9	Appearance Wear	earing clean polish, slight	1.0020
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance	gray er (4) 2 (4) 9 rust	Appearance Wear Piston top appe	earing clean polish, slight	1.0020
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux?	gray er (4) 2 (4) 9 rust Yes	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight earance clean	1.0020
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	gray er (4) 2 (4) 9 rust Yes No	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance clean low wear/scored	
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	gray er (4) 2 (4) 9 rust Yes No gray	Appearance Wear Piston top appe Piston skirt	earing clean polish, slight earance clean low wear/scored Loaded	1.3730
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	gray er (4) 2 (4) 9 rust Yes No gray gray gray	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, slight earance clean low wear/scored	
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	gray er (4) 2 (4) 9 rust Yes No gray	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish, slight earance clean low wear/scored Loaded	1.3730
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	gray er (4) 2 (4) 9 rust Yes No gray gray gray	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish, slight earance clean low wear/scored Loaded	1.3730 1.3730
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	gray er (4) 2 (4) 9 rust Yes No gray gray No No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean polish, slight earance clean low wear/scored Loaded Unloaded	1.3730 1.3730
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	gray er (4) 2 (4) 9 rust Yes No gray gray gray No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p	1.3730 1.3730
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	gray er (4) 2 (4) 9 rust Yes No gray gray No No black/Cu plate slight	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight	1.3730 1.3730 lating
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	gray er (4) 2 (4) 9 rust Yes No gray gray No No black/Cu plate slight	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight Loaded Unloaded	1.3730 1.3730 lating 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 16	gray er (4) 2 (4) 9 rust Yes No gray gray No No black/Cu plate slight er removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight Loaded Unloaded Unloaded (large end)	1.3730 1.3730 lating 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	gray er (4) 2 (4) 9 rust Yes No gray gray No No No black/Cu plate slight er removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight Loaded Unloaded	1.3730 1.3730 lating 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance	gray er (4) 2 (4) 9 rust Yes No gray gray No No black/Cu plate slight er removed (4) 15 yes clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight Loaded Unloaded (large end) scored/Cu plating	1.3730 1.3730 lating 1.3745 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray er (4) 2 (4) 9 rust Yes No gray gray No No black/Cu plate slight er removed (4) 15 yes clean dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight Loaded Unloaded (large end) scored/Cu plating polish, medium	1.3730 1.3730 lating 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	gray er (4) 2 (4) 9 rust Yes No gray gray No No black/Cu plate slight er removed (4) 15 yes clean dirty dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight Loaded Unloaded (large end) scored/Cu plating polish, medium Loaded	1.3730 1.3730 lating 1.3745 1.3745
Suction ring top appearance Remaining torque of discharge muffle (1) 2 (2) 1 (3) 2 Remaining torque of stator bolts (1) 11 (2) 9 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 14 (2) 15 (3) 16 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray er (4) 2 (4) 9 rust Yes No gray gray No No black/Cu plate slight er removed (4) 15 yes clean dirty dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish, slight earance clean low wear/scored Loaded Unloaded low wear/scored/Cu p slight Loaded Unloaded (large end) scored/Cu plating polish, medium Loaded	1.3730 1.3730 lating 1.3745 1.3745

Unit Number 117

Contaminants:Trash in liquid screen (g)0.045Control Unit?NoNumber of screens1Acid?NoR-12?NoDebris in compressor bottom (g)0.344

 $\begin{array}{ccc} \textbf{Air?} & \text{Yes} & \textbf{R-22?} & \text{No} \\ \textbf{H_2O?} & \text{Yes} & \textbf{R-502?} & \text{No} \end{array}$

Connecting rod (small end)

Appearance contact wear/correct washer/Cu plating

Wear polish, slight

Dimensions Loaded 0.4995 Unloaded 0.4995

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating Polish, medium

Dimensions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values
Total Acid Number (TAN) 0.10
Water (ppm) 124

 Water (ppm)
 124

 Fluoride ion (ppm)
 0.64

 Chloride ion (ppm)
 15

 Aluminum (ppm)
 0

 Copper (ppm)
 0

 Iron (ppm)
 1

 Lead (ppm)
 0

 Silicon (ppm)
 3

Lead (ppm)
Silicon (ppm)
Tin (ppm)
Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion/Cu plating

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringnone

Discharge side (reed backer)

Condition good
Appearance corrosion

Discharge surface appearance
corrosion/Cu plating

corrosion, cu piun

 $Discharge\ reed$

Condition good

Appearance corrosion/Cu plating

Trepan slight Varnish ring very slight

Expansion Valve Inspection Observations

Residue Description Valve Part **Residue Accumulation Residue Color** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black gummy **Spring Seat** medium black gummy Ball medium black gummy Front Side slight black gummy

1

0

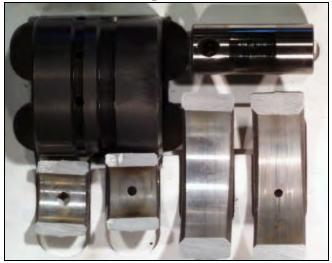
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Constant Pressure Expansion Valve (macro)



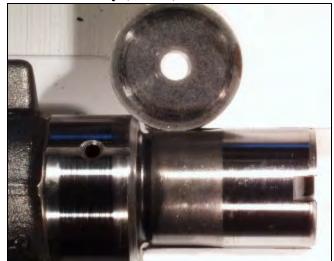
Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

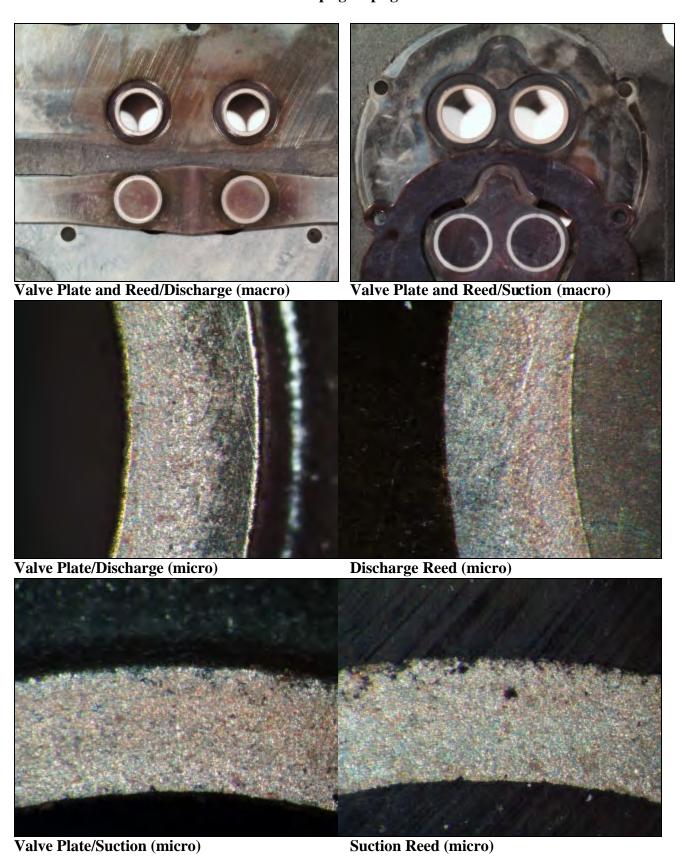


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air and Water 175 psig/32 psig



Report for R-22 Compressor with Contaminant Air and Water

ILSI IIISI	oki oi.						
Unit Numbe	r 118						
Model # RS	S43C1E-CAV-2	250 S	erial# 9	6F16531	Crank journals		
Run Time (h	r.) 120)45 F	ailed? N	lo	Appearance	clean/Cu plating	
Refrigerant	R-2	2			Wear	polish, slight	
Lubricant	3GS				Dimensions	Loaded	1.2470
Contaminan	ıts:					Unloaded	1.2470
Control Unit					Lower crank be	earing journal	
Acid? No		? No			Appearance	clean/Cu plating	
Air? Ye					Wear	polish, slight	
H_2O ? Ye					,, , ,	ponon, onghe	
2					Dimensions	Loaded	0.9990
Discharge P	ressure (psig)		175			Unloaded	0.9990
Suction Pres			32		Bottom thrust	washer (crank side)	0.,,,,
Discharge To			212		Appearance	clean/Cu plating	
Return Gas	_		65		Wear	polish, medium	
SumpTemp (179		,, ,	ponon, medium	
Sump remp	(-)		1//		Bottom washer	(casting side)	
Hi-Pot			pass		Appearance	clean/Cu plating	
High-low lea	ık		fail		Wear	polish, medium	
Top shell ap			clea	n	Lower bronze l		
	trail appearar	ıce	gray		Appearance	clean	
Cluster bloc			goo		Wear	polish, slight	
	ter block appe	arance	gray		Dimensions	Loaded	1.0020
	top appearan		gray			Unloaded	1.0015
_	orque of disch						
(1) 1	(2) 2	(3) 2	(4)	1	Shaft in cage be	earing	
	orque of stato	` /	()		Appearance	clean	
(1) 12	(2) 11	(3) 10	(4)	10	Wear	polish, slight	
	fler appearance	ce	clea		Piston top appe		
OEM flux?			Yes		Piston skirt		
Loose restric	ctor?		No		Appearance	low wear/Cu plating	
	late appearanc	e	gray	,	Dimensions	Loaded	1.3725
	vindings appea		gray		2 11110110110	Unloaded	1.3725
	arks present?		No		Cylinder bore	Cinouaca	1.0720
Was rotor lo			No		Appearance	low wear	
			blac	1,	Varnish ring	very slight	
			Diac	K	v armsn ring	very stight	
	appearance	inc		2			1 3750
Quantity	of bearing chi		trace		Dimensions	Loaded	1.3750
Quantity Remaining t	of bearing chi corque of disch	arge mu	trace ffler rem o	ved	Dimensions	Loaded Unloaded	1.3750 1.3750
Quantity Remaining t (1) 15	of bearing chicorque of disch (2) 8		trace ffler remo (4)	ved	Dimensions Connecting rod	Loaded Unloaded (large end)	
Quantity Remaining t (1) 15 Head gasket	of bearing chicorque of disch (2) 8 brittle?	(3) 15	trace offler remo (4) yes	ved 7	Dimensions Connecting rod Appearance	Loaded Unloaded (large end) Cu plating	
Quantity Remaining t (1) 15 Head gasket Head suction	of bearing chicorque of disch (2) 8 brittle? n cavity appea	(3) 15	trace offler remo (4) yes clear	ved 7	Dimensions Connecting rod Appearance Wear	Loaded Unloaded (large end) Cu plating polish	1.3750
Quantity Remaining t (1) 15 Head gasket Head suction Head discha	of bearing chi corque of disch (2) 8 brittle? n cavity appea rge cavity app	(3) 15 rance	trace ffler remo (4) yes clean clean	ved 7	Dimensions Connecting rod Appearance	Loaded Unloaded (large end) Cu plating polish Loaded	1.3750 1.2475
Quantity Remaining t (1) 15 Head gasket Head suction Head discha Cage bearing	of bearing chi corque of disch (2) 8 brittle? n cavity appea rge cavity app g top appearat	rance bearance	trace (4) yes clear clear dirty	ved 7	Dimensions Connecting rod Appearance Wear	Loaded Unloaded (large end) Cu plating polish	1.3750
Quantity Remaining t (1) 15 Head gasket Head suction Head discha Cage bearing Remaining t	of bearing chicorque of disch (2) 8 brittle? n cavity appearge cavity app g top appearatorque of cage	narge mu (3) 15 rance bearance nce bearing	trace (4) yes clear clear dirty	ved 7	Dimensions Connecting rod Appearance Wear	Loaded Unloaded (large end) Cu plating polish Loaded	1.3750 1.2475
Quantity Remaining t (1) 15 Head gasket Head suction Head discha Cage bearing	of bearing chi corque of disch (2) 8 brittle? n cavity appea rge cavity app g top appearat	rance bearance	trace (4) yes clear clear dirty	ved 7	Dimensions Connecting rod Appearance Wear	Loaded Unloaded (large end) Cu plating polish Loaded	1.3750 1.2475

Unit Number 118

Contaminants:

Control Unit? No

Acid? No

R-12? No

Debris in compressor bottom (g)

0.014

Number of screens

1

Debris in compressor bottom (g)

0.338

 $\begin{array}{ccc} \textbf{Air?} & \text{Yes} & \textbf{R-22?} & \text{No} \\ \textbf{H_2O?} & \text{Yes} & \textbf{R-502?} & \text{No} \end{array}$

Connecting rod (small end)

Appearance contact wear/correct washer/Cu plating

Wear polish, slight

Dimensions Loaded 0.4995 Unloaded 0.4995

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion
Wear polish
Dimensions Loaded

Dimensions Loaded 0.4975 **Unloaded** 0.4975

Final Lubricant Values	
Total Acid Number (TAN)	0.13
Water (ppm)	49
Fluoride ion (ppm)	0.67
Chloride ion (ppm)	14
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	1
Lead (ppm)	0
Silicon (ppm)	2
Tin (ppm)	2
Zinc (ppm)	0

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance
corrosion/Cu plating

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Discharge side (reed backer)

Condition good
Appearance corrosion

Discharge surface appearance
corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** very slight

Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	hard
Spring	slight	gray	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

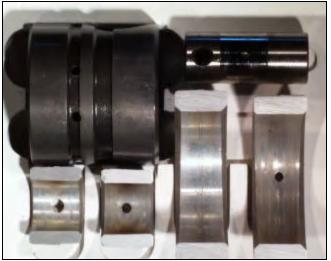
Photographic Documentation of R-22 Compressor with Contaminant Air and Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Air and Water 175 psig/32 psig



Report for R-22 Compressor with Contaminant Acid, Air, and Water

TEST INSTORT OF					
Unit Number 119					
Model # RS43C1E-CAV-250 Seria	l# 96F16525	Crank journals			
Run Time (hr.) 12002 Faile	d? No	Appearance	scored/corrosion		
Refrigerant R-22		Wear	polish		
Lubricant 3GS		Dimensions	Loaded	1.2470	
Contaminants:			Unloaded	1.2470	
Control Unit? No		Lower crank be	earing journal		
Acid? Yes R-12? No		Appearance	scored		
Air? Yes R-22? No		Wear	polish		
H_2O ? Yes R-502 ? No			1		
-		Dimensions	Loaded	0.9980	
Discharge Pressure (psig)	175		Unloaded	0.9980	
Suction Pressure (psig)	32	Bottom thrust v	washer (crank side)		
Discharge Temp (°F)	212	Appearance	scored/wear metals		
Return Gas Temp (°F)	65	Wear	polish		
SumpTemp (°F)	179				
		Bottom washer	(casting side)		
Hi-Pot	pass	Appearance	scored/corrosion		
High-low leak	fail	Wear	polish		
Top shell appearance	gray	Lower bronze b			
Suction exit trail appearance	gray/Cu	Appearance	scored		
Cluster block condition	good	Wear	polish		
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0040	
Suction ring top appearance	clean		Unloaded	1.0040	
Remaining torque of discharge muffle	r				
(1) 1 (2) 1 (3) 1	(4) 1	Shaft in cage be	earing		
Remaining torque of stator bolts		Appearance	corrosion		
(1) 12.5 (2) 12.5 (3) 10	(4) 10	Wear	polish		
uction muffler appearance Piston top appearance clean					
OEM flux?	Yes	Piston skirt			
Loose restrictor?	No	Appearance	low wear/Cu plating		
Discharge plate appearance	gray	Dimensions	Loaded	1.3740	
Top stator windings appearance	clean/stator top green		Unloaded	1.3740	
Rotor rub marks present?	No	Cylinder bore			
Was rotor loose?	No	Appearance	low wear/scored		
Shell bottom appearance	black/Cu plate	Varnish ring	very slight		
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760	
Remaining torque of discharge muffle			Unloaded	1.3760	
(1) 7.5 (2) 12.5 (3) 15	(4) 7.5	Connecting rod			
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion		
Head suction cavity appearance	clean	Wear	slight		
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2515	
Cage bearing top appearance	dirty		Unloaded	1.2515	
Remaining torque of cage bearing bolts					
Remaining torque of cage bearing bolt					
Remaining torque of cage bearing bolt (1) 5 (2) 5 (3) 5					

Unit Number

Contaminants: Trash in liquid screen (g) 0.068 **Control Unit?** No **Number of screens** Acid? Yes R-12? No Debris in compressor bottom (g) 0.583

R-22? Air? Yes No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Wear polish Appearance

Dimensions Loaded 0.5010 Suction surface appearance Unloaded 0.5010

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Zinc (ppm)

Appearance corrosion Wear polish **Dimensions** Loaded

0.4975 0.4975 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.16 Water (ppm) 30 Fluoride ion (ppm) 0.59 Chloride ion (ppm) 13 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 2 0 Lead (ppm) 3

Silicon (ppm) Tin (ppm)

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin hard slight black Spring slight black hard **Spring Seat** medium black hard Ball slight black hard Front Side very slight black hard

2

0

Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good corrosion

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan slight Varnish ring slight

Discharge side (reed backer) Condition good **Appearance** corrosion

Discharge surface appearance

corrosion

Discharge reed Condition

good Appearance corrosion **Trepan** slight Varnish ring medium

Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

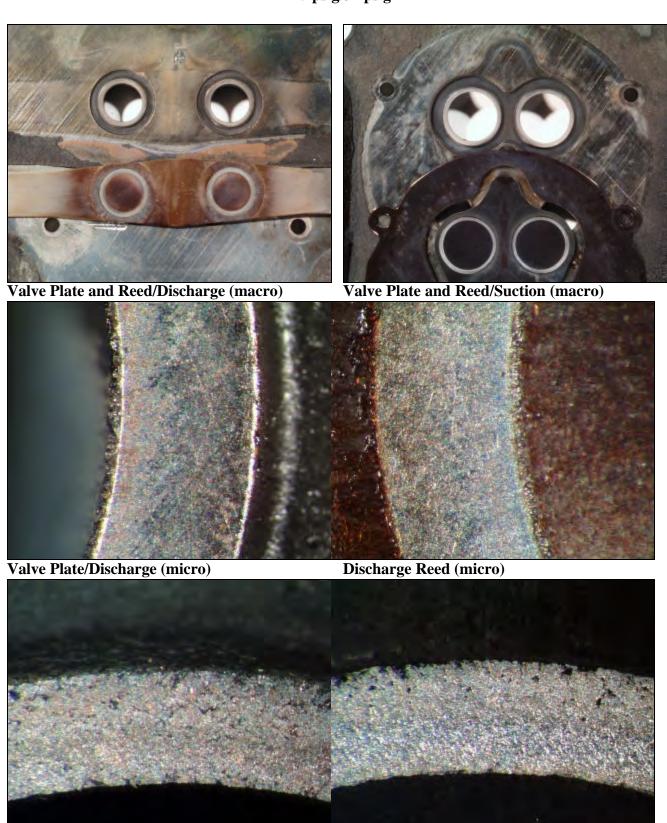


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 175 psig/32 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-22 Compressor with Contaminant Acid, Air, and Water

ILDI IIIDIORI OI.						
Unit Number 120						
Model # RS43C1E-CAV-250 Seria	l# 96F16537	Crank journals	3			
Run Time (hr.) 12003 Failed	l? No	Appearance	clean			
Refrigerant R-22		Wear	polish			
Lubricant 3GS		Dimensions	Loaded	1.2465		
Contaminants:			Unloaded	1.2465		
Control Unit? No		Lower crank b		1.2403		
Acid? Yes R-12? No		Appearance	scored/Cu plating			
Air? Yes R-22? No		Wear				
		vvear	polish			
H_2O ? Yes $R-502$? No		Dimondiana	Looded	0.9980		
D'arte de Deserve (este)	175	Dimensions	Loaded			
Discharge Pressure (psig)	175	D . 44 4b	Unloaded	0.9980		
Suction Pressure (psig)	32		washer (crank side)	/ . 1		
Discharge Temp (°F)	212	Appearance	scored/bronze plating	g/wear metals		
Return Gas Temp (°F)	65	Wear	slight			
SumpTemp (°F)	179					
		Bottom washer				
Hi-Pot	pass	Appearance	scored/corrosion/wea	r metals		
High-low leak	fail	Wear	polish			
Top shell appearance	clean	Lower bronze				
Suction exit trail appearance	gray/Cu	Appearance	scored/corrosion			
Cluster block condition	good	Wear	polish			
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030		
Suction ring top appearance	clean		Unloaded	1.0030		
Remaining torque of discharge muffler						
(1) 2 (2) 1 (3) 2	(4) 2	Shaft in cage be	earing			
Remaining torque of stator bolts		Appearance	corrosion			
(1) 10 (2) 10 (3) 10	(4) 10	Wear	polish			
Suction muffler appearance	clean	Piston top appo	earance clean			
OEM flux?	Yes	Piston skirt				
Loose restrictor?	No	Appearance	no wear/scored			
Discharge plate appearance	clean	Dimensions	Loaded	1.3740		
Top stator windings appearance	gray/stator top green		Unloaded	1.3740		
Rotor rub marks present?	No	Cylinder bore				
Was rotor loose?	No	Appearance	no wear/scored			
Shell bottom appearance	Cu plate	Varnish ring				
Quantity of bearing chips	slight	Dimensions	none Loaded	1.3760		
Remaining torque of discharge muffle		Difficusions	Unloaded	1.3760		
-		Connecting rec		1.5700		
(1) 17.5 (2) 15 (3) 17.5 Head gasket brittle?	(4) 15 yes/bonded	Connecting room Appearance	scored/corrosion			
	•	Appearance Wear				
Head suction cavity appearance	clean		polish	1.0510		
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510		
Cage bearing top appearance	dirty		Unloaded	1.2510		
Remaining torque of cage bearing bolt						
(1) 5 (2) 5 (3) 5	(4) 5					

Unit Number 120

Contaminants: Trash in liquid screen (g) 0.033 **Control Unit?** No **Number of screens** 0.954 Acid? Yes R-12? No Debris in compressor bottom (g)

Air? R-22? Yes No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear polish **Dimensions** Loaded 0.5010 Suction surface appearance Unloaded 0.5010 corrosion

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Appearance scored/corrosion

polish Wear **Dimensions** Loaded 0.4970

0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.17 Water (ppm) 69 Fluoride ion (ppm) 0.68 Chloride ion (ppm) 11 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 3 0 Lead (ppm) 7 Silicon (ppm) 3 Tin (ppm) Zinc (ppm) 1

Suction side (reed backer)

Valve Plate Assembly Inspection

Condition good Appearance corrosion

Suction reed

Condition good corrosion **Appearance Trepan** slight Varnish ring medium

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion very slight **Trepan** Varnish ring slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin hard medium black Spring medium black hard **Spring Seat** medium black hard Ball hard medium black Front Side slight black hard

Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 175 psig/32 psig



Constant Pressure Expansion Valve (macro)



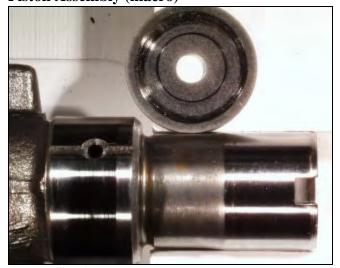
Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

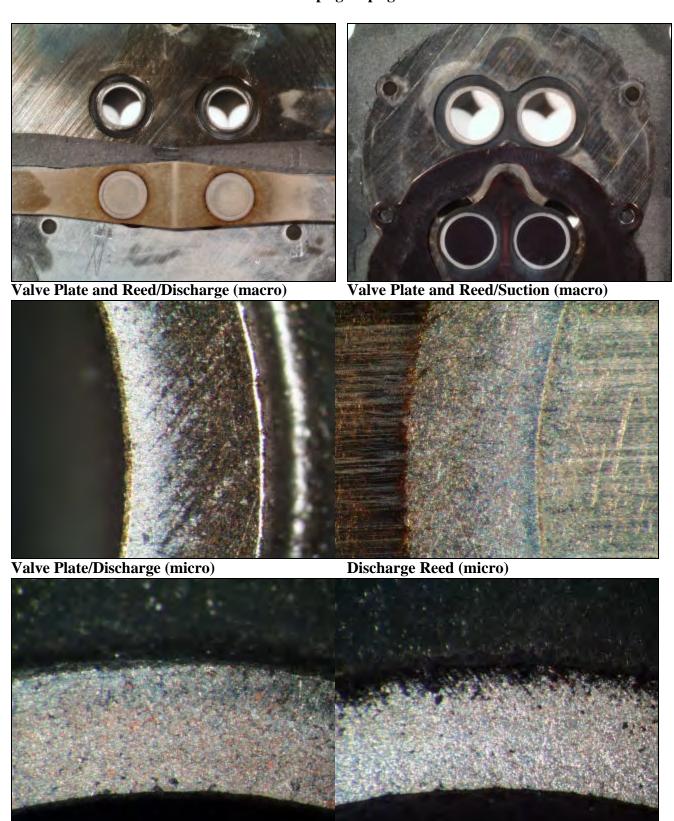


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-22 Compressor with Contaminant Acid, Air, and Water 175 psig/32 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Control Compressor

ILDI IIIDI	oni oi.					
Unit Number	121					
Model # RS	40C1E-IAV-250	Serial #	96F16558	Crank journals	;	
Run Time (h	r.) 12010	Failed?	No	Appearance	clean	
Refrigerant	R-134a			Wear	polish	
Lubricant	RL32S			Dimensions	Loaded	1.2470
Contaminan	ts:				Unloaded	1.2470
Control Unit				Lower crank be		
Acid? No		No		Appearance	clean	
Air? No		No		Wear	polish	
H_2O ? No		No		7.7.002	Polish	
				Dimensions	Loaded	0.9980
Discharge Pi	essure (psig)		145		Unloaded	0.9980
Suction Pres			20	Bottom thrust	washer (crank side)	0.7700
Discharge Te			187	Appearance	clean/scored	
Return Gas	_		57	Wear	polish	
SumpTemp (174	7.7.002	Polish	
Sump remp (- /		., .	Bottom washer	(casting side)	
Hi-Pot		1	oass	Appearance	clean	
High-low lea	k		oass	Wear	polish	
Top shell ap			clean	Lower bronze		
	trail appearance		olack	Appearance	clean	
Cluster block			good	Wear	polish	
	er block appeara		gray	Dimensions	Loaded	1.0030
	top appearance		clean	2 111011510115	Unloaded	1.0030
	orque of discharg					
(1) 5	(2) 6.7 (3)	•	4) 4.3	Shaft in cage be	earing	
, ,	orque of stator bo		-,	Appearance	clean	
(1) 11.7	_		4) 11.7	Wear	polish	
• •	der appearance	`	clean	Piston top appe	-	
OEM flux?	F F		Yes	Piston skirt		
Loose restric	tor?		No	Appearance	no wear	
	ate appearance		clean	Dimensions	Loaded	1.3740
	indings appearan		gray	Diffensions	Unloaded	1.3740
	arks present?		No	Cylinder bore	Cindadea	1.3740
Was rotor lo			No	Appearance	low wear	
Shell bottom			olack	Varnish ring Dimensions	very slight Loaded	1.3760
	of bearing chips orque of discharg		slight	Difficusions	Unloaded	1.3760
_	-		4) 15	Connecting no		1.3700
(1) 15 Head gasket	` '		o/bonded	Connecting rod Appearance	none	
	ortue: cavity appearan		lean	Appearance Wear	polish	
	rge cavity appearan		lean	Dimensions	Loaded	1.2510
	rge cavity appear g top appearance		lean lean	Dimensions	Loaded Unloaded	1.2510
	g top appearance orque of cage bea		icali		Omoaucu	1.2310
(1) 5	(2) 5 (3)	0	4) 5			
(1) 3	(2) 3	5 (.	1) 3			

Unit Number 121

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.001Number of screens1Debris in compressor bottom (g)0.380

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

AppearancescoredWearpolishDimensionsLoaded

Unloaded 0.4980

0.4975

Final Lubricant Values Total Acid Number (TAN) 0.06 Water (ppm) 220 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 14 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 1 Silicon (ppm) 1 Tin (ppm) 1 Zinc (ppm) 0

Suction side (reed backer) Condition good

Appearance corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	hard
Spring	none	none	none
Spring Seat	heavy	black	hard
Ball	medium	black	gummy
Front Side	none	none	none

Photographic Documentation of R-134a Control Compressor 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Control Compressor 145 psig/20 psig



Report for R-134a Control Compressor

TEST HISTORY OF.				
Unit Number 122				
Model # RS40C1E-IAV-250 Serial	# 96F16557	Crank journals	3	
Run Time (hr.) 12026 Failed	!? No	Appearance	clean	
Refrigerant R-134a		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? Yes		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		11002	Polish	
2		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	145		Unloaded	0.9985
Suction Pressure (psig)	20	Bottom thrust	washer (crank side)	0.,,,,
Discharge Temp (°F)	187	Appearance	clean	
Return Gas Temp (°F)	57	Wear	polish	
SumpTemp (°F)	174	* * Cu1	ponsii	
Sumpremp (1)	1/4	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze	*	
Suction exit trail appearance	black	Appearance	scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Difficusions	Unloaded	1.0030
Remaining torque of discharge muffler			Cinduded	1.0030
(1) 3.8 (2) 6.3 (3) 5	(4) 3.8	Shaft in cage b	earing	
Remaining torque of stator bolts	(4) 3.0	Appearance	clean	
(1) 11.7 (2) 11.7 (3) 11.7	(4) 11.7	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	e arance clean	
OEM flux?	No	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	clean/Cu	Dimensions	Loaded	1.3740
Top stator windings appearance	black		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black	Varnish ring	very slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 15 (3) 14	(4) 14	Connecting roo		
Head gasket brittle?	yes/bonded	Appearance	none	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2505
Cage bearing top appearance	dirty		Unloaded	1.2505
Remaining torque of cage bearing bolts				
(1) 3 (2) 5 (3) 5	(4) 6			

Unit Number 122

Contaminants: Trash in liquid screen (g) 0.024 **Number of screens Control Unit?** Yes 2 Acid? Debris in compressor bottom (g) 0.314 No R-12? No Air? No R-22? No

H₂O? No R-502? No Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerConditiongoodWearpolishAppearancecorrosionDimensionsLoaded0.5010Suction surface appearance

Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/bronze plating

Wear polish
Dimensions Loaded 0.4980

Unloaded 0.4980

Final Lubricant Values	
Total Acid Number (TAN)	0.07
Water (ppm)	209
Fluoride ion (ppm)	1.1
Chloride ion (ppm)	16
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	0
Silicon (ppm)	4
Tin (ppm)	1
Zinc (ppm)	0

Varnish ring very slight

good

corrosion

very slight

Suction side (reed backer)

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance

corrosion

Discharge reed

Suction reed

Condition

Trepan

Appearance

Condition good
Appearance corrosion/carbon
Trepan very slight
Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	medium	black	gummy
Tip of Pin	heavy	black	gummy
Spring	none	none	none
Spring Seat	medium	black	hard
Ball	slight	brown	gummy
Front Side	very slight	brown	hard

Photographic Documentation of R-134a Control Compressor 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

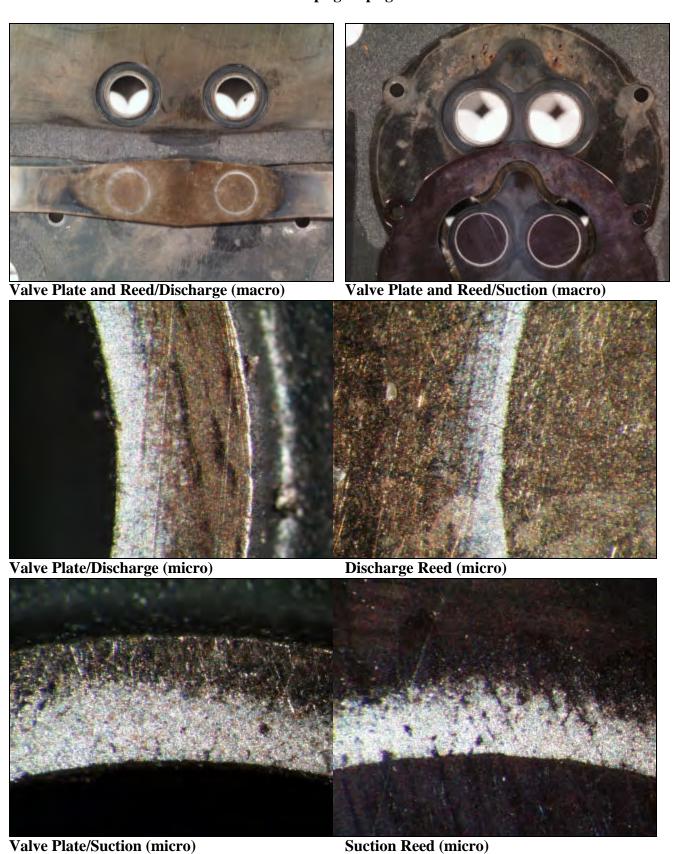


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Control Compressor 145 psig/20 psig



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Report for R-134a Control Compressor

TT. *4 NT I	100					
Unit Number	123	a	0.574.5770	~		
Model # RS40		Serial #	96F16572	Crank journals		
Run Time (hr.) 12005	Failed?	No	Appearance	clean/corrosion	
Refrigerant	R-134a			Wear	polish	
Lubricant	RL32S			Dimensions	Loaded	1.2470
Contaminants	:				Unloaded	1.2470
Control Unit?	Yes			Lower crank be	earing iournal	
Acid? No	R-12?	No		Appearance	clean	
Air? No	R-22?	No		Wear	polish	
H_2O ? No	R-502?	No		vvcai	polisii	
1120.	K-302.	140		Dimensions	Loaded	0.9985
Diaghanas Dus	aarra (naia)	1	1.45	Difficusions	Unloaded	
Discharge Pre			145	D : 44 : 41 :		0.9985
Suction Pressu			20		washer (crank side)	
Discharge Ten	_		187	Appearance	clean	
Return Gas To			57	Wear	polish	
SumpTemp (°l	F)]	174			
				Bottom washer	(casting side)	
Hi-Pot		I	pass	Appearance	clean	
High-low leak		Ţ	oass	Wear	polish	
Top shell appe	earance	C	elean	Lower bronze	bearings	
Suction exit tr	ail appearance	r	none	Appearance	scored	
Cluster block		2	good	Wear	polish	
	r block appeara	-	gray	Dimensions	Loaded	1.0030
Suction ring to			clean			1.0030
	ii) addearance				Umoaded	1.00.00
			Jean		Unloaded	1.0030
Remaining tor	que of discharg	e muffler		Shaft in cage he		1.0030
Remaining tor (1) 4.6 (eque of discharg 2) 5 (3)	ge muffler 5 (4	4) 4.6	Shaft in cage be	earing	1.0030
Remaining tor (1) 4.6 (Remaining tor	eque of discharg 2) 5 (3) eque of stator bo	ge muffler 5 (4 olts	4) 4.6	Appearance	e aring clean	1.0030
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3)	ge muffler 5 (4 olts 11.7 (4	4) 4.6 4) 11.7	Appearance Wear	earing clean polish	1.0030
Remaining tor (1) 4.6 (Remaining tor	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3)	ge muffler 5 (4 olts 11.7 (4	4) 4.6	Appearance	earing clean polish	1.0030
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3)	ge muffler 5 (4 olts 11.7 (4	4) 4.6 4) 11.7	Appearance Wear	earing clean polish	1.0030
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance	se muffler 5 (4 olts 11.7 (4	4) 4.6 4) 11.7 clean	Appearance Wear Piston top appe	earing clean polish	1.0030
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux?	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance	e muffler 5 (4 olts 11.7 (4 olts 11.7 olts 11.	4) 4.6 4) 11.7 clean Yes	Appearance Wear Piston top appe Piston skirt	earing clean polish earance clean	1.3740
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat	eque of discharg (2) 5 (3) eque of stator bo (2) 11.7 (3) er appearance or? ee appearance	ge muffler 5 (4 olts 11.7 (4 olts 1.7 o	1) 4.6 1) 11.7 clean Yes No clean/Cu	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish earance clean no wear	
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? te appearance adings appearan	ge muffler 5 (4 olts 11.7 (4 olts 1.7 o	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish earance clean no wear Loaded	1.3740
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? te appearance adings appearance rks present?	se muffler 5 (4 olts 11.7 (4 olts 11.7 olts 11	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	earing clean polish earance clean no wear Loaded Unloaded	1.3740
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricted Discharge plat Top stator wir Rotor rub man Was rotor loose	eque of discharg (2) 5 (3) (3) (4) (4) (5) (7) (7) (8) (8) (8) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	se muffler 5 (4 olts 11.7 (4 olts n n n n n n n n n n n n n n n n n n n	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish earance clean no wear Loaded Unloaded	1.3740
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Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricted Discharge plat Top stator wir Rotor rub man Was rotor loose Shell bottom a Quantity of	eque of discharg (2) 5 (3) (3) (4) (4) (5) (7) (7) (8) (8) (8) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	te muffler 5 (4 olts 11.7 (4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded	1.3740 1.3740 1.3760
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man Was rotor loos Shell bottom a Quantity o Remaining tor	eque of discharg (2) 5 (3) (3) (4) (2) 11.7 (3) (5) (6) (7) (8) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	ge muffler 5 (4) 11.7 (4) 11.7 (5) 11.7 (6) 11.7 (6) 11.7 (7) 11.7	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean elean race emoved	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded	1.3740 1.3740
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub mar Was rotor loos Shell bottom a Quantity o Remaining tor (1) 15 (eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? de appearance dings appearance rks present? se? ppearance f bearing chips eque of discharg 2) 15 (3)	ge muffler 5 (4 olts 11.7 (4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1) 4.6 1) 11.7 clean Yes No clean/Cu clean/stator top green No No clean race emoved 1) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded (Unloaded)	1.3740 1.3740 1.3760
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man Was rotor loos Shell bottom a Quantity of Remaining tor (1) 15 (Head gasket b	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? the appearance dings appearance rks present? se? ppearance f bearing chips eque of discharg 2) 15 (3) rittle?	ge muffler 5 (4 olts 11.7 (4 11.7 (5 11.7 (6 11.7 (7 1	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean race emoved 4) 15 es/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded Unloaded (large end) none	1.3740 1.3740 1.3760
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man Was rotor loos Shell bottom a Quantity of Remaining tor (1) 15 (Head gasket b Head suction of	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? the appearance adings appearance rks present? se? ppearance f bearing chips eque of discharg 2) 15 (3) rittle? eavity appearance	ge muffler 5 (4 olts 11.7 (4 1.7 (4	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean race emoved 4) 15 es/bonded lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded (large end) none polish	1.3740 1.3740 1.3760 1.3760
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man Was rotor loos Shell bottom a Quantity of Remaining tor (1) 15 (Head gasket b Head suction of Head discharge	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? ee appearance adings appearance rks present? se? ppearance f bearing chips eque of discharg 2) 15 (3) rittle? eavity appearance ee cavity appearance	te muffler 5 (4) 5 (4) 6 (4) 6 (6) 6 (6) 7 (6) 7 (7) 7	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean lean race emoved 4) 15 es/bonded lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded I (large end) none polish Loaded	1.3740 1.3740 1.3760 1.3760
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man Was rotor loos Shell bottom a Quantity of Remaining tor (1) 15 (Head gasket b Head suction of Head discharg Cage bearing	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? ee appearance dings appearance rks present? se? ppearance f bearing chips eque of discharg 2) 15 (3) rittle? eavity appearance ee cavity appearance top appearance	ge muffler 5 (4 olts 11.7 (4 1.7 (4	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean race emoved 4) 15 es/bonded lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded (large end) none polish	1.3740 1.3740 1.3760 1.3760
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man Was rotor loos Shell bottom a Quantity of Remaining tor (1) 15 (Head gasket b Head suction of Head discharg Cage bearing tor	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? ee appearance dings appearance dings appearance see? eppearance f bearing chips eque of discharg 2) 15 (3) rittle? eavity appearance ee cavity appearance ee cavity appearance eque of cage bea	te muffler 5 (4) 5 (4) 6 (4) 6 (4) 6 (4) 6 (4) 7	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean race emoved 4) 15 es/bonded lean lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded I (large end) none polish Loaded	1.3740 1.3740 1.3760 1.3760
Remaining tor (1) 4.6 (Remaining tor (1) 11.7 (Suction muffle OEM flux? Loose restricte Discharge plat Top stator wir Rotor rub man Was rotor loos Shell bottom a Quantity of Remaining tor (1) 15 (Head gasket b Head suction of Head discharg Cage bearing tor	eque of discharg 2) 5 (3) eque of stator bo 2) 11.7 (3) er appearance or? ee appearance dings appearance rks present? se? ppearance f bearing chips eque of discharg 2) 15 (3) rittle? eavity appearance ee cavity appearance top appearance	te muffler 5 (4) 5 (4) 6 (4) 6 (4) 6 (4) 6 (4) 7	4) 4.6 4) 11.7 clean Yes No clean/Cu clean/stator top green No No clean lean race emoved 4) 15 es/bonded lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear none Loaded Unloaded I (large end) none polish Loaded	1.3740 1.3740 1.3760 1.3760

Unit Number 123

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.001Number of screens1Debris in compressor bottom (g)0.510

Valve Plate Assembly Inspection

good

good

corrosion

very slight

very slight

corrosion

Suction side (reed backer)

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Suction surface appearance corrosion

Condition

Suction reed

Condition

Trepan

Appearance

Varnish ring

Appearance

Piston pin washers appearance

contact wear

Final Lubricant Values

Piston pin

Appearance scored/bronze plating Wear polish

Dimensions Loaded 0.4980 Unloaded 0.4980

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance

TAN) 0.04 Discharge surfa 188 corrosion

Total Acid Number (TAN) Water (ppm) 188 Fluoride ion (ppm) 1.2 Chloride ion (ppm) 15 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm) Tin (ppm) 1 Zinc (ppm) 0

Discharge reedgoodConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	gray	hard
Rear Pin	none	none	none
Equalizer Hole	very slight	black	hard
Tip of Pin	medium	black	hard
Spring	very slight	gray	gummy
Spring Seat	medium	brown	gummy
Ball	slight	gray	gummy
Front Side	very slight	gray	hard

Photographic Documentation of R-134a Control Compressor 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

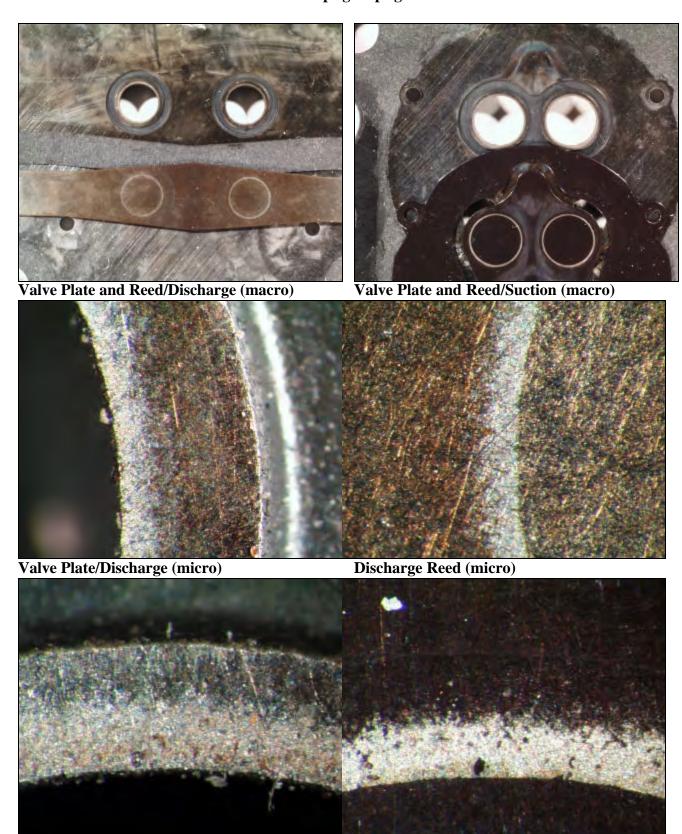


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Control Compressor 145 psig/20 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant R-12

Unit Number 124				
Model # RS40C1E-IAV-250 Serial	# 96F16570	Crank journals		
Run Time (hr.) 12012 Failed		Appearance	scored/corrosion	
Refrigerant R-134a	. 110	Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		Difficusions	Unloaded	1.2470
Control Unit? No		Lower anonly he		1.2470
Acid? No R-12? Yes		Lower crank be	scored	
		Appearance		
Air? No R-22? No H_2O ? No R-502? No		Wear	polish	
H₂O? No R-502? No		Dimensions	Loaded	0.9985
Dischause Ducessus (asia)	1.45	Difficusions		
Discharge Pressure (psig)	145 20	D = 44 = 4b = 4 =	Unloaded	0.9985
Suction Pressure (psig)	187		washer (crank side)	
Discharge Temp (°F)		Appearance	scored/Cu plating	
Return Gas Temp (°F)	64	Wear	slight	
SumpTemp (°F)	174	D - 44l	(
II: Dot	***	Bottom washer	_	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze b		
Suction exit trail appearance	black/Cu	Appearance	scored/corrosion	
Cluster block condition	good	Wear Dimensions	slight	1 0020
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Custian wing tan annagrange	alaam		Unloaded	1 0020
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler		Shaft in cage he		1.0030
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5		Shaft in cage be	aring	1.0030
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts	(4) 5	Appearance	aring corrosion	1.0030
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10	(4) 5 (4) 10	Appearance Wear	aring corrosion polish	1.0030
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance	(4) 5	Appearance	aring corrosion polish	1.0030
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux?	(4) 5 (4) 10 clean Yes	Appearance Wear	aring corrosion polish	1.0030
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance	(4) 5 (4) 10 clean	Appearance Wear Piston top appe	aring corrosion polish	1.0030
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux?	(4) 5 (4) 10 clean Yes	Appearance Wear Piston top appe Piston skirt	aring corrosion polish arance clean	1.0030 1.3740
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 5 (4) 10 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	aring corrosion polish arance clean low wear	
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 5 (4) 10 clean Yes No gray	Appearance Wear Piston top appe Piston skirt Appearance	aring corrosion polish arance clean low wear Loaded	1.3740
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 5 (4) 10 clean Yes No gray gray/stator top green	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	aring corrosion polish arance clean low wear Loaded	1.3740
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	aring corrosion polish arance clean low wear Loaded Unloaded	1.3740
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored	1.3740
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium	1.3740 1.3740
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium Loaded Unloaded Unloaded	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium Loaded Unloaded Unloaded	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 17.5	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight removed (4) 15	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium Loaded Unloaded (large end)	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 17.5 Head gasket brittle?	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight removed (4) 15 yes/bonded	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium Loaded Unloaded (large end) scored/corrosion	1.3740 1.3740 1.3760
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 17.5 Head gasket brittle? Head suction cavity appearance	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight removed (4) 15 yes/bonded clean	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium Loaded Unloaded (large end) scored/corrosion slight	1.3740 1.3740 1.3760 1.3765
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 17.5 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight removed (4) 15 yes/bonded clean clean dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium Loaded Unloaded (large end) scored/corrosion slight Loaded	1.3740 1.3740 1.3760 1.3765
Remaining torque of discharge muffler (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 15 (2) 12.5 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 15 (2) 15 (3) 17.5 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 5 (4) 10 clean Yes No gray gray/stator top green Yes No black slight removed (4) 15 yes/bonded clean clean dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	aring corrosion polish arance clean low wear Loaded Unloaded low wear/scored medium Loaded Unloaded (large end) scored/corrosion slight Loaded	1.3740 1.3740 1.3760 1.3765

Unit Number 124

Contaminants:Trash in liquid screen (g)0.011Control Unit?NoNumber of screens1Acid?NoR-12?YesDebris in compressor bottom (g)0.717

Air? No R-22? No H₂O? No R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear medium

Dimensions Loaded 0.5020 Unloaded 0.5015

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored/corrosion

Wear slight

Dimensions Loaded 0.4970 Unloaded 0.4970

Unloaded 0.49

Final Lubricant Values **Total Acid Number (TAN)** 0.09 Water (ppm) 48 Fluoride ion (ppm) 1.3 Chloride ion (ppm) 17 Aluminum (ppm) 0 Copper (ppm) 1 Iron (ppm) 0 Lead (ppm) 2 2 Silicon (ppm) 0 Tin (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

suction surface appear an

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat tarnished very slight hard **Rear Pin** hard slight tan **Equalizer Hole** none none none Tip of Pin slight black gummy Spring slight tan gummy **Spring Seat** very slight tarnished hard

1

Ball medium gray, brown hard, gummy

Front Side medium brown, tan hard

Photographic Documentation of R-134a Compressor with Contaminant R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

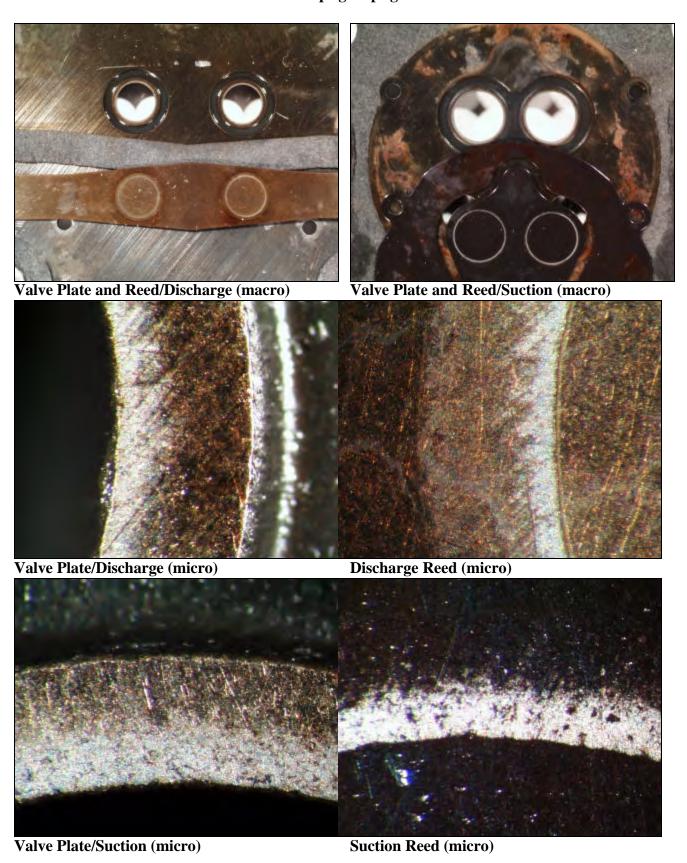


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant R-12 145 psig/20 psig



Report for R-134a Compressor with Contaminant Acid

ILDI IIIDI	ORI OI.						
Unit Numbe	er 125						
Model # R	S40C1E-IAV	-250	Serial	# 96F16554	Crank journals	;	
Run Time (hr.) 1	2085	Failed'	? No	Appearance	Cu plating/corrosion	
Refrigerant	R	-134a			Wear	slight	
Lubricant		L32S			Dimensions	Loaded	1.2465
Contamina						Unloaded	1.2465
Control Uni					Lower crank b		1.2.00
Acid? Y		122	No		Appearance	clean/Cu plating	
Air? No			No		Wear	slight	
H_2O ?		502?	No		vv cai	Siight	
1120.			110		Dimensions	Loaded	0.9995
Discharge F	Pressure (psig	α)		145	Differential	Unloaded	0.9995
Suction Pre		5)		20	Rottom thrust	washer (crank side)	0.7773
Discharge T				187	Appearance	clean/scored/corrosion	n
Return Gas	_			64	Wear	slight	11
SumpTemp				174	vveai	Siigiit	
Sumpremp	(r)			1/4	Bottom washer	(costing side)	
Hi-Pot				noss	Appearance	clean/scored	
High-low lea	alz			pass	Wear	slight	
0				pass	Lower bronze	•	
Top shell ap	pearance trail appear	onaa		gray		-	
Cluster bloo		ance		black	Appearance	clean	
				good	Wear	polish	1.0045
	ster block ap		nce	clean	Dimensions	Loaded	1.0045
	g top appeara			gray		Unloaded	1.0045
	torque of dis	_		(4) 4.2	Clasfetia as as h		
(1) 4.2	(2) 4.2	` '	4.2	(4) 4.2	Shaft in cage be	_	
	torque of star			(4) 10.5	Appearance	clean	
(1) 12.5	(2) 12.5	` ′	12.5	(4) 12.5	Wear	slight	
Suction mut	ffler appeara	nce		clean	Piston top appe	earance clean	
OEM flux?				Yes	Piston skirt		
Loose restri	ictor?			No	Appearance	no wear	
Discharge p	late appeara	nce		Cu	Dimensions	Loaded	1.3725
	windings app		ice	gray		Unloaded	1.3725
	narks presen			No	Cylinder bore		
Was rotor l	_			No	Appearance	no wear/scored/corros	sion
	n appearance	Δ.		clean	Varnish ring	slight	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	y of bearing o			trace	Dimensions	Loaded	1.3765
	torque of dis		e muffler		Difficusions	Unloaded	1.3765
(1) 16.7	(2) 16.7		16.7	(4) 16.7	Connecting roo		1.5705
Head gaske		(3)	10.7	yes/bonded	Appearance	scored	
_	n cavity app	earan	ce	clean	Wear	slight	
	arge cavity app			clean	Dimensions	Loaded	1.2510
	arge cavity a _l ig top appeai		ance	clean	Dimensions	Unloaded	1.2510
				Cicali		Omoaucu	1.2310
Kemaining	torane of coo	re hea	ring halte				
	torque of cag	-	0	(4) 4.2.			
(1) 4.2	(2) 4.2	-	ring bolts 4.2	(4) 4.2			

Unit Number 125

Contaminants:Trash in liquid screen (g)0.032Control Unit?NoNumber of screens2Acid?YesR-12?NoDebris in compressor bottom (g)1.168

Air? No R-22? No H₂O? No R-502? No

O? No R-502? No Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerConditiongoodWearslightAppearancecorrosionDimensionsLoaded0.5010Suction surface appearanceUnloaded0.5010corrosion

0.4980

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance corrosion
Wear slight
Dimensions Loaded

Unloaded 0.4980

Final Lubricant Values
Total Acid Number (TAN)

Total Acid Number (TAN) 0.11 Water (ppm) 43 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 16 Aluminum (ppm) 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 4 1 Silicon (ppm) 0 Tin (ppm)

ConditiongoodAppearancecorrosion

good

corrosion

very slight

very slight

Suction side (reed backer)

Discharge surface appearance

corrosion

Discharge reed

Suction reed Condition

Trepan

Appearance

Varnish ring

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat slight black hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium hard black Spring medium black hard **Spring Seat** slight black hard Ball medium black hard Front Side none none none

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Photographic Documentation of R-134a Compressor with Contaminant Acid 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

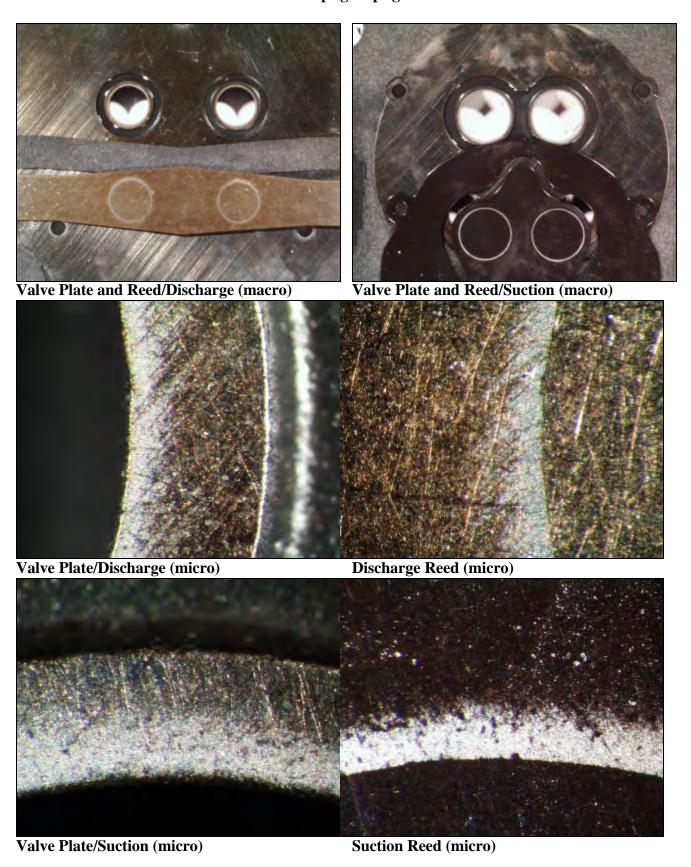


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid 145 psig/20 psig



Report for R-134a Compressor with Contaminant Air

TEST INSTORT OF.				
Unit Number 126				
Model # RS40C1E-IAV-250 Seria	l# 96F16578	Crank journals	8	
Run Time (hr.) 12012 Failed	d? No	Appearance	clean/corrosion	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2475
Contaminants:			Unloaded	1.2475
Control Unit? No		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	clean/Cu plating	
Air? Yes R-22? No		Wear	slight	
H_2O ? No $R-502$? No			8	
		Dimensions	Loaded	1.0000
Discharge Pressure (psig)	145		Unloaded	1.0000
Suction Pressure (psig)	20	Bottom thrust	washer (crank side)	1.0000
Discharge Temp (°F)	187	Appearance	clean/Cu plating	
Return Gas Temp (°F)	64	Wear	polish	
SumpTemp (°F)	174	* * * Cu1	polish	
Sumpremp(1)	174	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0035
Suction ring top appearance	clean	Difficusions	Unloaded	1.0035
Remaining torque of discharge muffle			emouded	1.0033
(1) 6.3 (2) 4.2 (3) 4.2	(4) 6.3	Shaft in cage b	earino	
Remaining torque of stator bolts	(4) 0.3	Appearance	clean/Cu plating	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3730
Top stator windings appearance	clean		Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffle	r removed		Unloaded	1.3760
(1) 16.7 (2) 16.7 (3) 16.7	(4) 16.7	Connecting roo	d (large end)	
Head gasket brittle?	yes/bonded	Appearance	Cu plating	
Head suction cavity appearance	dirty	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2520
Cage bearing top appearance	dirty		Unloaded	1.2520
Remaining torque of cage bearing bold				
(1) 4.2 (2) 4.2 (3) 4.2	(4) 6.3			

Unit Number 126

Contaminants: Trash in liquid screen (g) 0.100 **Control Unit?** No **Number of screens** 3 Acid? 0.974 No R-12? No Debris in compressor bottom (g)

Air? R-22? Yes No H₂O? R-502? No No

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear slight **Appearance Dimensions** Loaded 0.5020 Unloaded 0.5020

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion Wear slight **Dimensions** Loaded 0.4980 0.4980 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.09 Water (ppm) 27 Fluoride ion (ppm) 0.92 Chloride ion (ppm) 16 Aluminum (ppm) 0 0

Copper (ppm) Iron (ppm) 0 Lead (ppm) 1 Silicon (ppm) 1 Tin (ppm) 0 Zinc (ppm) 0 Suction side (reed backer)

Condition good corrosion Suction surface appearance

corrosion

Suction reed

Condition good **Appearance** corrosion Trepan very slight Varnish ring slight

Discharge side (reed backer)

Condition good corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	medium	black	gummy
Rear Pin	none	none	none
Equalizer Hole	slight	black	gummy
Tip of Pin	slight	black	gummy
Spring	slight	black	gummy
Spring Seat	very slight	black	hard
Ball	very slight	black	gummy
Front Side	medium	black	hard

Photographic Documentation of R-134a Compressor with Contaminant Air 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

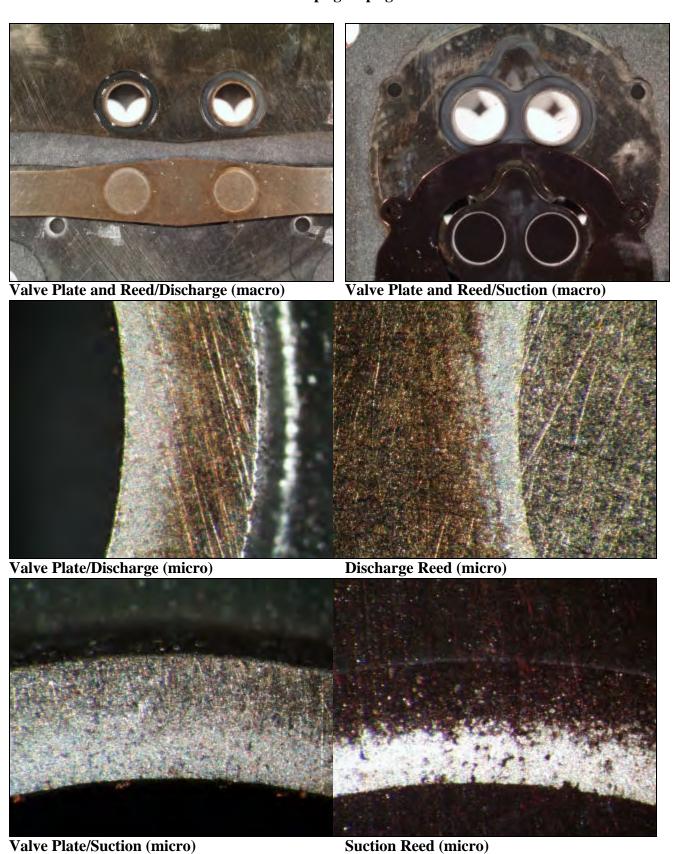


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air 145 psig/20 psig



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Report for R-134a Compressor with Contaminant Acid and R-12

Unit Number 127 Model # RS40C1E-IAV-250 Serial	l# 96F16579	Crank journals		
Run Time (hr.) 12025 Failed		Appearance	clean/Cu plating/corre	nsion
Refrigerant R-134a	1. 110	Wear	slight	751011
Lubricant RL32S		Dimensions	Loaded	1.2485
Contaminants:		Difficusions	Unloaded	1.2485
		I arrow anough he		1.2463
Control Unit? No Acid? Yes R-12? Yes		Lower crank be		
		Appearance	clean/bronze plating	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		Dimensions	Loaded	1.0020
Disahansa Duagawa (nais)	145	Difficusions	Unloaded	
Discharge Pressure (psig)	20	Dattam thurst		1.0020
Suction Pressure (psig)	187		washer (crank side)	
Discharge Temp (°F)		Appearance	clean/Cu plating	
Return Gas Temp (°F)	64	Wear	slight	
SumpTemp (°F)	174	Dottom work an	(coating aids)	
Hi-Pot	***************************************	Bottom washer	_	
	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze	_	
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	polish	1 0040
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0040
Suction ring top appearance	gray		Unloaded	1.0040
Remaining torque of discharge muffler		Chaft in accept		
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2	Shaft in cage be	_	
Remaining torque of stator bolts	(4) 10.5	Appearance	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Wear Piston top appe	•	
			•	
Suction muffler appearance	clean	Piston top appe	•	
Suction muffler appearance OEM flux?	clean Yes	Piston top appe Piston skirt	arance clean	1.3730
Suction muffler appearance OEM flux? Loose restrictor?	clean Yes No	Piston top appe Piston skirt Appearance	arance clean no wear	1.3730 1.3730
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	clean Yes No gray	Piston top appe Piston skirt Appearance	no wear Loaded	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	clean Yes No gray clean	Piston top appe Piston skirt Appearance Dimensions	no wear Loaded	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean Yes No gray clean No	Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	no wear Loaded Unloaded no wear	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean Yes No gray clean No	Piston top appe Piston skirt Appearance Dimensions Cylinder bore	no wear Loaded Unloaded	
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean Yes No gray clean No No clean trace	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	no wear Loaded Unloaded no wear very slight	1.3730
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	clean Yes No gray clean No No clean trace	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	no wear Loaded Unloaded no wear very slight Loaded Unloaded	1.3730 1.3745
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean Yes No gray clean No No clean trace	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	no wear Loaded Unloaded no wear very slight Loaded Unloaded	1.3730 1.3745
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16.7 (2) 16.7 (3) 16.7	clean Yes No gray clean No No clean trace r removed (4) 16.7	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	no wear Loaded Unloaded no wear very slight Loaded Unloaded Unloaded (large end)	1.3730 1.3745
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16.7 (2) 16.7 (3) 16.7 Head gasket brittle? Head suction cavity appearance	clean Yes No gray clean No No clean trace r removed (4) 16.7 yes/bonded	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	no wear Loaded Unloaded no wear very slight Loaded Unloaded Unloaded (large end) Cu plating	1.3730 1.3745
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16.7 (2) 16.7 (3) 16.7 Head gasket brittle?	clean Yes No gray clean No No clean trace r removed (4) 16.7 yes/bonded clean	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end) Cu plating slight	1.3730 1.3745 1.3745
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16.7 (2) 16.7 (3) 16.7 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	clean Yes No gray clean No No clean trace r removed (4) 16.7 yes/bonded clean dirty clean	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end) Cu plating slight Loaded	1.3730 1.3745 1.3745 1.2510
Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 16.7 (2) 16.7 (3) 16.7 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean Yes No gray clean No No clean trace r removed (4) 16.7 yes/bonded clean dirty clean	Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end) Cu plating slight Loaded	1.3730 1.3745 1.3745 1.2510

Unit Number 127

 Contaminants:

 Control Unit?
 No

 Acid?
 Yes
 R-12?
 Yes

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.073Number of screens2Debris in compressor bottom (g)0.752

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.5020Unloaded0.5020

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion
Wear slight
Dimensions Loaded
Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.14 Water (ppm) 41 Fluoride ion (ppm) 0.95 Chloride ion (ppm) 17 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 1 Silicon (ppm) 1 Tin (ppm) 1 Zinc (ppm) 0

0.4975 0.4975 Suction side (reed backer)
Condition good
Appearance corrosion

Suction surface appearance corrosion

Suction reed

Condition good

Appearance clean
Trepan very slight
Varnish ring none

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	heavy	black	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	hard
Spring	slight	black	hard
Spring Seat	medium	black	hard
Ball	medium	black	hard
Front Side	heavy	black	hard

Photographic Documentation of R-134a Compressor with Contaminant Acid and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid and R-12 145 psig/20 psig



Report for R-134a Compressor with Contaminant Acid, Air, and R-12

TEST INSTORT OF				
Unit Number 128				
Model # RS40C1E-IAV-250 Serial	l# 96F16553	Crank journals		
Run Time (hr.) 12109 Failed	l? No	Appearance	clean/Cu plating	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2480
Contaminants:			Unloaded	1.2480
Control Unit? No		Lower crank b		
Acid? Yes R-12? Yes		Appearance	clean/Cu plating	
Air? Yes R-22? No		Wear	slight	
H_2O ? No $R-502$? No		· · · cui	5115111	
120. 10 102. 10		Dimensions	Loaded	1.0020
Discharge Pressure (psig)	145	2111011310113	Unloaded	1.0020
Suction Pressure (psig)	20	Rottom thrust	washer (crank side)	1.0020
Discharge Temp (°F)	187	Appearance	clean/scored	
Return Gas Temp (°F)	57	Wear	slight	
SumpTemp (°F)	174	· · · cui	Siigiit	
Sumptemp (T)	174	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0035
Suction ring top appearance	clean	Difficusions	Unloaded	1.0035
Remaining torque of discharge muffler			Omoaucu	1.0033
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2	Shaft in cage b	aarina	
Remaining torque of stator bolts	(4) 4.2	Appearance	clean	
(1) 12.5 (2) 12.5 (3) 12.5	(4) 14.6	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appo	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray/black/Cu	Dimensions	Loaded	1.3730
Top stator windings appearance	clean		Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/corrosion	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3755
Remaining torque of discharge muffler			Unloaded	1.3755
(1) 16.7 (2) 16.7 (3) 16.7	(4) 16.7	Connecting roo		
Head gasket brittle?	yes/bonded	Appearance	none	
Head suction cavity appearance	dirty	Wear	polish	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2505
Cage bearing top appearance	clean	, 	Unloaded	1.2515
Remaining torque of cage bearing bolts				
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2			

Unit Number 128

 Contaminants:

 Control Unit?
 No

 Acid?
 Yes
 R-12?
 Yes

 Air?
 Yes
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.036Number of screens2Debris in compressor bottom (g)0.694

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.5010Unloaded0.5010

oaded 0.5010 Suction s con

Piston pin washers appearance

contact wear

Piston pin

Appearance Cu plating/corrosion

Wear slight
Dimensions Loaded 0.4980
Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.11 Water (ppm) 50 Fluoride ion (ppm) 0.99 Chloride ion (ppm) 17 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 1 Lead (ppm) 3 3 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0 Suction side (reed backer)
Condition good
Appearance corrosion

Suction surface appearance

corrosion **Suction reed**

Condition good Appearance corrosion Trepan very slight Varnish ring very slight

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance

corrosion

Discharge reed
Condition good

Appearance clean
Trepan very slight
Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	slight	black	hard
Spring Seat	slight	gray	hard
Ball	very slight	gray	hard
Front Side	very slight	gray	hard

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

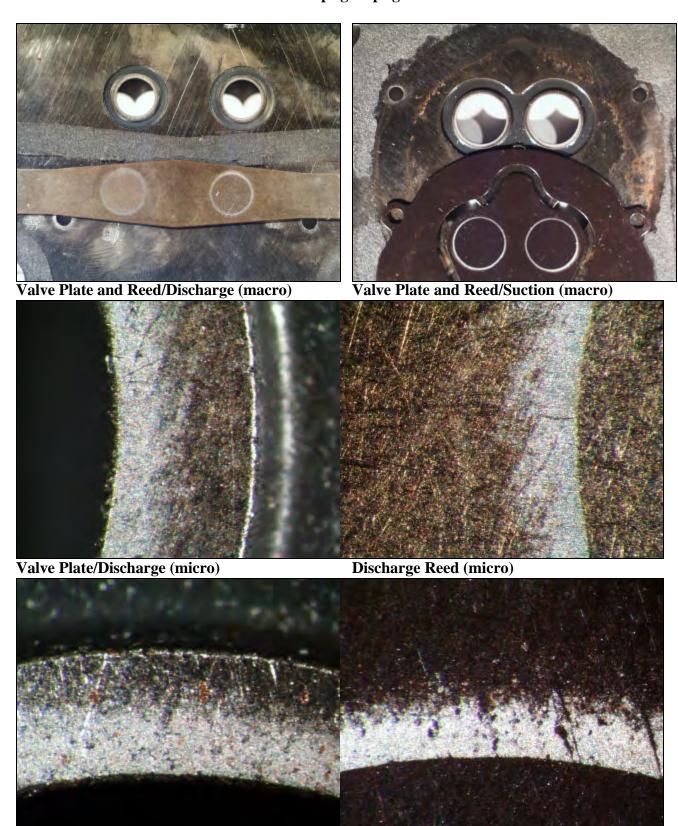


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and R-12 145 psig/20 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

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Report for R-134a Compressor with Contaminant Air and R-12

Unit Number 129				
Model # RS40C1E-IAV-250 Serial	# 96F16569	Crank journals		
Run Time (hr.) 12053 Failed		Appearance	clean/corrosion	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2500
Contaminants:			Unloaded	1.2500
Control Unit? No		Lower crank be	earing iournal	
Acid? No R-12? Yes		Appearance	clean/corrosion	
Air? Yes R-22? No		Wear	slight	
H_2O ? No $R-502$? No			S	
_		Dimensions	Loaded	1.0015
Discharge Pressure (psig)	145		Unloaded	1.0015
Suction Pressure (psig)	20	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	187	Appearance	scored/bronze plating	
Return Gas Temp (°F)	64	Wear	medium	
SumpTemp (°F)	174			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	slight	
Top shell appearance	gray/black	Lower bronze l	oearings	
Suction exit trail appearance	black	Appearance	clean/corrosion	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 6.3 (2) 4.2 (3) 6.3	(4) 6.3	Shaft in cage be	-	
Remaining torque of stator bolts		Appearance	clean	
(1) 10.4 (2) 10.4 (3) 10.4	(4) 10.4	Wear	polish	
Suction muffler appearance	clean	Piston top appe	arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
D: 1				1 0500
Discharge plate appearance	Cu	Dimensions	Loaded	1.3730
Top stator windings appearance	clean	Dimensions	Loaded Unloaded	1.3730
		Dimensions Cylinder bore		
Top stator windings appearance	clean			
Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean No	Cylinder bore Appearance	Unloaded no wear/Cu plating	
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	clean No No	Cylinder bore	Unloaded	
Top stator windings appearance Rotor rub marks present? Was rotor loose?	clean No No clean trace	Cylinder bore Appearance Varnish ring	Unloaded no wear/Cu plating very slight	1.3730
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	clean No No clean trace	Cylinder bore Appearance Varnish ring	Unloaded no wear/Cu plating very slight Loaded Unloaded	1.3730 1.3745
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler	clean No No clean trace removed	Cylinder bore Appearance Varnish ring Dimensions	Unloaded no wear/Cu plating very slight Loaded Unloaded	1.3730 1.3745
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance	clean No No clean trace removed (4) 14.6	Cylinder bore Appearance Varnish ring Dimensions Connecting rod	Unloaded no wear/Cu plating very slight Loaded Unloaded (large end)	1.3730 1.3745
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle?	clean No No clean trace removed (4) 14.6 yes/bonded	Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	unloaded no wear/Cu plating very slight Loaded Unloaded (large end) none slight Loaded	1.3730 1.3745
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean No No clean trace removed (4) 14.6 yes/bonded clean clean dirty	Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	Unloaded no wear/Cu plating very slight Loaded Unloaded (large end) none slight	1.3730 1.3745 1.3745
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bolts	clean No No clean trace removed (4) 14.6 yes/bonded clean clean dirty	Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	unloaded no wear/Cu plating very slight Loaded Unloaded (large end) none slight Loaded	1.3730 1.3745 1.3745 1.2510
Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffler (1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	clean No No clean trace removed (4) 14.6 yes/bonded clean clean dirty	Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	unloaded no wear/Cu plating very slight Loaded Unloaded (large end) none slight Loaded	1.3730 1.3745 1.3745 1.2510

Unit Number

Contaminants: Trash in liquid screen (g) 0.022 **Control Unit?** No **Number of screens** Acid? 0.546 No R-12? Yes Debris in compressor bottom (g)

good

corrosion

Air? Yes R-22? No H₂O? No R-502? No

Valve Plate Assembly Inspection

Connecting rod (small end) Suction side (reed backer) Appearance correct washer Condition good Wear slight **Appearance** clean **Dimensions** Loaded 0.5015 Suction surface appearance Unloaded 0.5015 corrosion

Piston pin washers appearance

Suction reed

contact wear Condition Piston pin **Appearance**

Appearance corrosion Trepan very slight Wear slight Varnish ring none **Dimensions** Loaded 0.4985

0.4985 Discharge side (reed backer) Unloaded Condition good

Final Lubricant Values corrosion **Appearance Total Acid Number (TAN)** 0.05 Discharge surface appearance Water (ppm) 40 corrosion

Fluoride ion (ppm) 0.91 Chloride ion (ppm) 16 Discharge reed Aluminum (ppm) 0 Condition good Copper (ppm) 0 Appearance clean Iron (ppm) 0 **Trepan** very slight

0

Lead (ppm) 2 Varnish ring none Silicon (ppm) 1 Tin (ppm) 0

Expansion Valve Inspection Observations

Zinc (ppm)

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	hard
Spring	none	none	none
Spring Seat	slight	gray	hard
Ball	slight	gray	hard
Front Side	slight	gray	hard

Photographic Documentation of R-134a Compressor with Contaminant Air and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

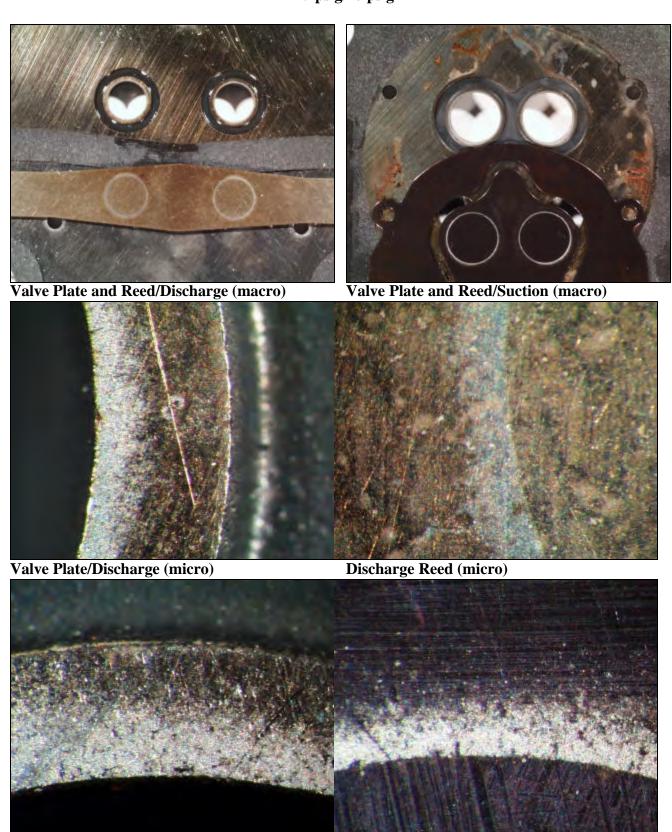


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air and R-12 145 psig/20 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Acid and Air

TEST INSTORT OF				
Unit Number 130				
Model # RS40C1E-IAV-250 Serial	# 96F16561	Crank journals	}	
Run Time (hr.) 12023 Failed	? No	Appearance	corrosion	
Refrigerant R-134a		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2510
Contaminants:			Unloaded	1.2515
Control Unit? No		Lower crank be	earing journal	
Acid? Yes R-12? No		Appearance	corrosion	
Air? Yes R-22? No		Wear	slight	
H_2O ? No $R-502$? No			U	
-		Dimensions	Loaded	1.0015
Discharge Pressure (psig)	145		Unloaded	1.0015
Suction Pressure (psig)	20	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	187	Appearance	scored/Cu plating	
Return Gas Temp (°F)	57	Wear	slight	
SumpTemp (°F)	174		8	
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	bronze plating	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze	1	
Suction exit trail appearance	black	Appearance	corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0035
Suction ring top appearance	bright		Unloaded	1.0035
Remaining torque of discharge muffler				
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean/corrosion	
(1) 8.3 (2) 8.3 (3) 8.3	(4) 8.3	Wear	polish	
Suction muffler appearance	gray	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3735
Top stator windings appearance	clean/Cu trace		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 14.6 (2) 14.6 (3) 14.6	(4) 14.6	Connecting rod		1.0700
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean		Unloaded	1.2510
Remaining torque of cage bearing bolts			J	2010
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2			
(-)				

Unit Number 130

Contaminants:Trash in liquid screen (g)0.019Control Unit?NoNumber of screens2Acid?YesR-12?NoDebris in compressor bottom (g)0.282

 Air?
 Yes
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Connecting rod (small end)

Appearancecontact wear/correct washerConditiongoodWearslightAppearancecleanDimensionsLoaded0.5010Suction surface appearance

Unloaded 0.5010 Suction surface

Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance scored/corrosion

Wear slight
Dimensions Loaded 0.4980
Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.09 Water (ppm) 41 Fluoride ion (ppm) 0.82 Chloride ion (ppm) 9.0 Aluminum (ppm) 0 Copper (ppm) Iron (ppm) 1 Lead (ppm) 4 2 Silicon (ppm) Tin (ppm) 0 Discharge side (reed backer)

good

none

corrosion

very slight

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good
Appearance corrosion
Discharge surface appearance

corrosion

Discharge reed Condition

Suction reed

Condition

Trepan

Appearance

Varnish ring

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	hard
Rear Pin	very slight	gray	hard
Equalizer Hole	very slight	gray	hard
Tip of Pin	heavy	black	gummy
Spring	slight	gray	hard
Spring Seat	heavy	black	gummy
Ball	medium	black	gummy
Front Side	very slight	gray	hard

2

Photographic Documentation of R-134a Compressor with Contaminant Acid and Air 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

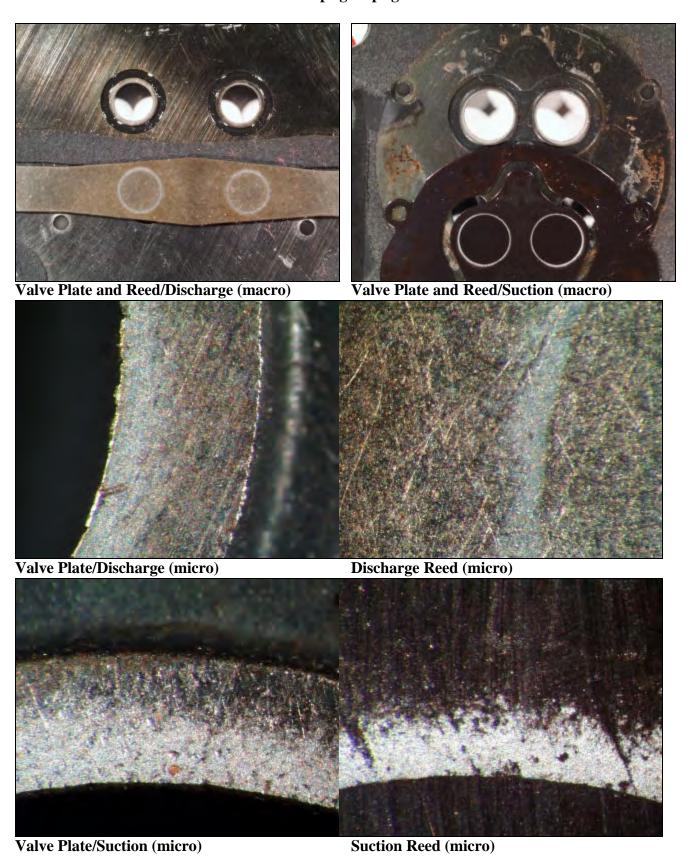


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid and Air 145 psig/20 psig



Report for R-134a Compressor with Contaminant Water and R-12

ILSI IIISIORI OI:				
Unit Number 131				
Model # RS40C1E-IAV-250 Serial	# 96F16556	Crank journals		
Run Time (hr.) 12005 Failed	? No	Appearance	scored/corrosion	
Refrigerant R-134a		Wear	medium	
Lubricant RL32S		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank be		
Acid? No R-12? Yes		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? Yes $R-502$? No		v v cui	ponsii	
12,00		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	145	21110110101	Unloaded	0.9985
Suction Pressure (psig)	20	Rottom thrust y	washer (crank side)	0.7703
Discharge Temp (°F)	187	Appearance	scored/Cu plating	
Return Gas Temp (°F)	64	Wear	medium	
SumpTemp (°F)	174	v v cui	medium	
Sumptemp (1)	1/4	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	slight	
Top shell appearance	clean	Lower bronze l	C	
Suction exit trail appearance	gray/Cu	Appearance	scored/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 5 (2) 2.5 (3) 3	(4) 2.5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 10 (2) 15 (3) 10	(4) 7.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	scored	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green	21110110101	Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore	Cinouaca	1.57 10
Was rotor loose?	No	Appearance	low wear/scored	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
(1) 15 (2) 15 (3) 17.5	(4) 17.5	Connecting rod		1.5700
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	medium	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean	Dimensions	Unloaded	1.2510
Remaining torque of cage bearing bolts			Chioacca	1.2310
(1) 5 (2) 5 (3) 5	(4) 5			
	\ -/ ~			

Unit Number 131

Contaminants:Trash in liquid screen (g)0.000Control Unit?NoNumber of screens3Acid?NoR-12?YesDebris in compressor bottom (g)0.380

Air? No **R-22?** No **H₂O?** Yes **R-502?** No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear slight
Dimensions Loaded 0.5010
Unloaded 0.5010

Piston pin washers appearance

high wear (4 contact points)/Cu plating

Piston pin

Zinc (ppm)

Front Side

AppearancecorrosionWearmediumDimensionsLoaded0.4975

Unloaded 0.4980

Final Lubricant Values
Total Acid Number (TAN)

0.10 Water (ppm) 57 Fluoride ion (ppm) 0.95 Chloride ion (ppm) 15 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 0 2 Silicon (ppm) 0 Tin (ppm)

Expansion Valve Inspection Observations

medium

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring black slight gummy **Spring Seat** none none none Ball slight black gummy

0

black

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good **Appearance** clean **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good clean

Discharge surface appearance

corrosion

Discharge reed

ConditiongoodAppearancecleanTrepanvery slightVarnish ringnone

gummy

Photographic Documentation of R-134a Compressor with Contaminant Water and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

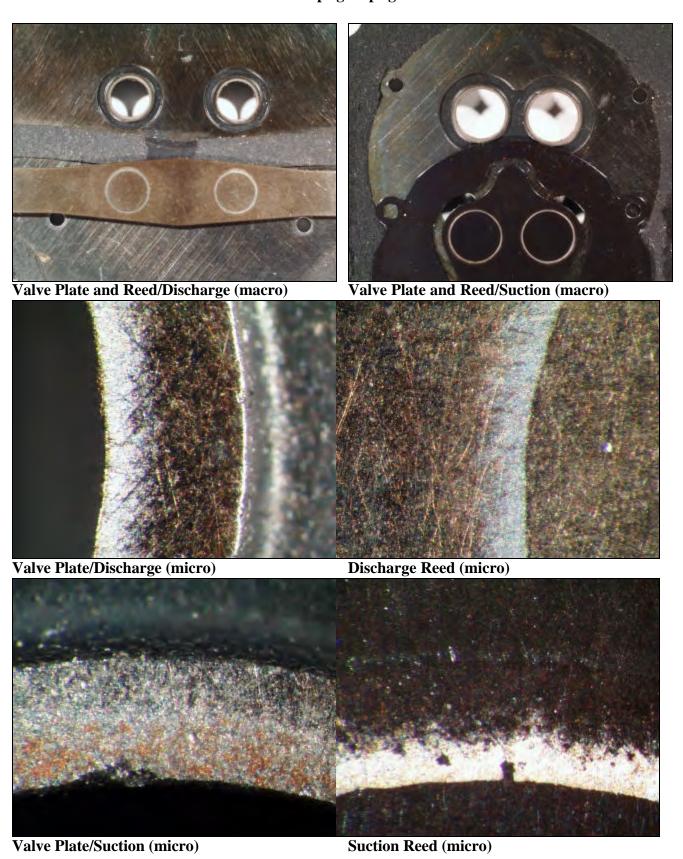


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Water and R-12 145 psig/20 psig



Report for R-134a Compressor with Contaminant Acid and Water

ILSI IIISIONI OI.				
Unit Number 132				
Model # RS40C1E-IAV-250 Serial	# 96F16552	Crank journals	8	
Run Time (hr.) 12002 Failed	? No	Appearance	corrosion	
Refrigerant R-134a		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank b		-1-100
Acid? Yes R-12? No		Appearance	corrosion	
Air? No R-22? No		Wear	polish	
H_2O ? Yes $R-502$? No		, , cui	ponsii	
12,00		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	145		Unloaded	0.9985
Suction Pressure (psig)	20	Bottom thrust	washer (crank side)	0.7705
Discharge Temp (°F)	187	Appearance	scored	
Return Gas Temp (°F)	57	Wear	slight	
SumpTemp (°F)	174	, , cui	5115111	
Sumpremp(1)	1/4	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	gray	Appearance	clean	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0045
Suction ring top appearance	bright		Unloaded	1.0045
Remaining torque of discharge muffler			c mountu	1.00.0
(1) 4 (2) 4 (3) 5	(4) 4	Shaft in cage b	earing	
Remaining torque of stator bolts	(-)	Appearance	scored	
(1) 9 (2) 10 (3) 10	(4) 10	Wear	polish	
Suction muffler appearance	clean	Piston top appe	•	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3730
Top stator windings appearance	clean		Unloaded	1.3730
Rotor rub marks present?	Yes	Cylinder bore	emouded	1.5750
Was rotor loose?	No	Appearance	no wear	
	clean	Varnish ring		
Shell bottom appearance Quantity of bearing chips	trace	Dimensions	slight Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
(1) 14 (2) 15 (3) 15	(4) 15	Connecting roo		1.5700
Head gasket brittle?	yes	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	clean	Dimensions	Unloaded	1.2510
Remaining torque of cage bearing bolts			Ombaucu	1.4310
(1) 5 (2) 4 (3) 5	(4) 5			
	(-)			

Unit Number

Contaminants: Trash in liquid screen (g) 0.009 **Control Unit?** No **Number of screens** Acid? Yes R-12? No Debris in compressor bottom (g) 0.709

good

R-22? Air? No No H₂O? R-502? Yes No

Valve Plate Assembly Inspection

Connecting rod (small end) Suction side (reed backer) Appearance correct washer Condition good Wear polish, slight Appearance corrosion **Dimensions** Loaded 0.5010 Suction surface appearance

Unloaded 0.5010 corrosion Piston pin washers appearance

Suction reed

Condition contact wear

Piston pin corrosion **Appearance** Appearance corrosion Trepan very slight Wear polish Varnish ring very slight **Dimensions** Loaded 0.4990

0.4990 Discharge side (reed backer) Unloaded Condition good Final Lubricant Values **Appearance** corrosion **Total Acid Number (TAN)** 0.17 Discharge surface appearance

Water (ppm) 126 corrosion

Fluoride ion (ppm) 0.87 Chloride ion (ppm) 14 Discharge reed Aluminum (ppm) 0 Condition good Appearance Copper (ppm) 1 corrosion Iron (ppm) 0 **Trepan** very slight 2

0

Lead (ppm) Varnish ring none 2 Silicon (ppm) 0 Tin (ppm)

Expansion Valve Inspection Observations

Zinc (ppm)

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium gray gummy **Spring Seat** slight gray gummy Ball black medium gummy Front Side medium black hard

Photographic Documentation of R-134a Compressor with Contaminant Acid and Water 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

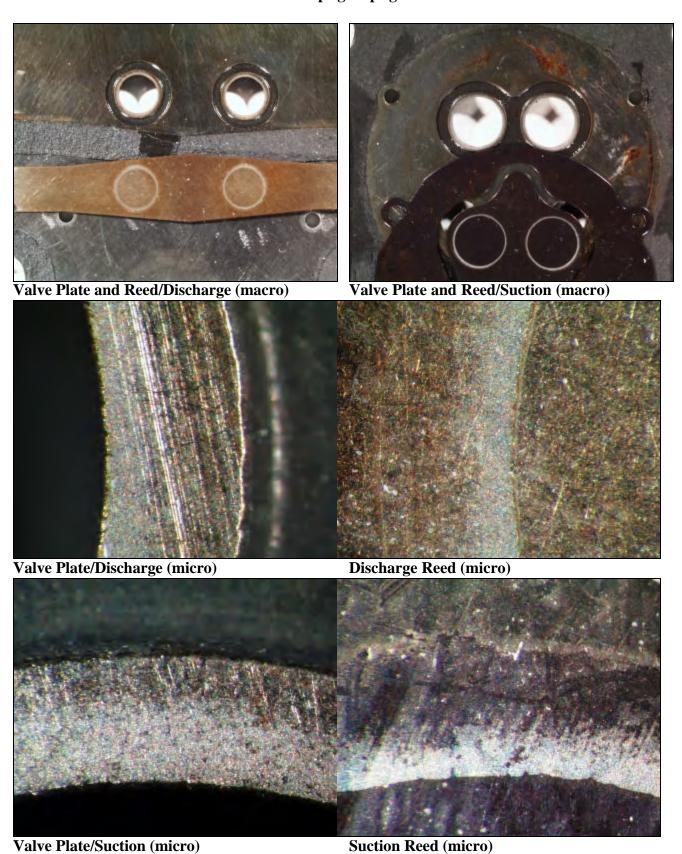


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid and Water 145 psig/20 psig



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Report for R-134a Compressor with Contaminant Air and Water

TEST F	HSTORY (DF:					
Unit Nu		133					
	RS40C1I		Serial #	96F16575	Crank journals	•	
Run Tir		12073	Failed?	No	Appearance	scored/corrosion/he	avilv
discolored	` /	12073	Tuncu.	110	rippeurunee	scored, corrosion, no	avily
Refrige		R-134a			Wear	slight	
Lubrica		RL32S			Dimensions	Loaded	1.2465
Contam	inants:					Unloaded	1.2465
Control	Unit? N	0			Lower crank b	earing journal	
Acid?	No	R-12?	No		Appearance	clean/heavily discol	ored
Air?	Yes	R-22?	No		Wear	polish	
H_2O ?	Yes	R-502?	No				
					Dimensions	Loaded	0.9985
	ge Pressur		_	45		Unloaded	0.9985
	Pressure (0		washer (crank side)	,
	ge Temp (°			87	Appearance	scored/bronze platin	ng/corrosion
	Gas Temp	(° F)		4	Wear	slight	
SumpTo	emp (°F)		1	74	D = 44 = = -l- = -l-	(
II: Dot				0.00	Bottom washer	_	
Hi-Pot High-lo	w look		-	ass	Appearance Wear	bronze plating/corre	osion
	w icak ll appearai	100	-	ass lean	Lower bronze	1	
	exit trail a			lack/Cu	Appearance	scored/corrosion	
	block cond			ood	Wear	medium	
		ck appeara		lean	Dimensions	Loaded	1.0040
	ring top a			lean		Unloaded	1.0040
		of discharg	ge muffler				
(1) 5	(2) 5) 2.5	Shaft in cage be	earing	
Remain	ing torque	of stator bo	olts		Appearance	corrosion/heavily di	scolored
(1) 12.5	(2) 1	5 (3)	10 (4) 10	Wear	polish	
Suction	muffler ap	pearance	c	lean	Piston top appe	earance clean	
OEM fl	ux?		Y	Zes Zes	Piston skirt		
Loose re	estrictor?		N	Vo	Appearance	low wear	
Dischar	ge plate ap	pearance	g	ray	Dimensions	Loaded	1.3740
Top sta	tor winding	gs appearan	i ce b	lack/stator top green		Unloaded	1.3740
Rotor r	ub marks p	resent?	Y	'es	Cylinder bore		
	tor loose?			Ю	Appearance	no wear	
	ttom appe			lack	Varnish ring	medium	
_	ntity of bea	_		light	Dimensions	Loaded	1.3760
	_	_	ge muffler re			Unloaded	1.3760
(1) 17	(2) 1	` '		15	Connecting roo		
_	asket brittl		•	es/bonded	Appearance	scored/corrosion	
		y appearan		ean	Wear	polish Londod	1 2510
	_	vity appear		ean	Dimensions	Loaded Unloaded	1.2510 1.2510
		appearance of cage bea		rty		Omoaueu	1.2310
(1) 5	ing torque (2) 5	0	_) 5			
(1) 3	(4)	(3)	<i>J</i> (4	., 5			

Unit Number

Contaminants: Trash in liquid screen (g) 0.049 **Control Unit?** No **Number of screens** 3 Acid? No R-12? No Debris in compressor bottom (g) 0.802

Air? R-22? Yes No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion

Wear slight **Dimensions** Loaded

0.5010

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Front Side

Appearance corrosion/heavily discolored

slight Wear

Dimensions Loaded 0.4975

0.4975 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.07 Water (ppm) 136 Fluoride ion (ppm) 0.88 Chloride ion (ppm) 16 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 1 3 Silicon (ppm) 0 Tin (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good Appearance clean

Suction surface appearance

corrosion

Suction reed

Condition good corrosion **Appearance Trepan** very slight Varnish ring none

Discharge side (reed backer)

Condition good

corrosion/blued **Appearance** Discharge surface appearance

black

Discharge reed

Condition good

Appearance corrosion/blued/Cu plating

very slight **Trepan** Varnish ring none

hard

Expansion Valve Inspection Observations

medium

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat medium tarnished hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black, brown hard, gummy **Spring Seat** medium brown gummy Ball medium hard gray

gray

0

Photographic Documentation of R-134a Compressor with Contaminant Air and Water 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

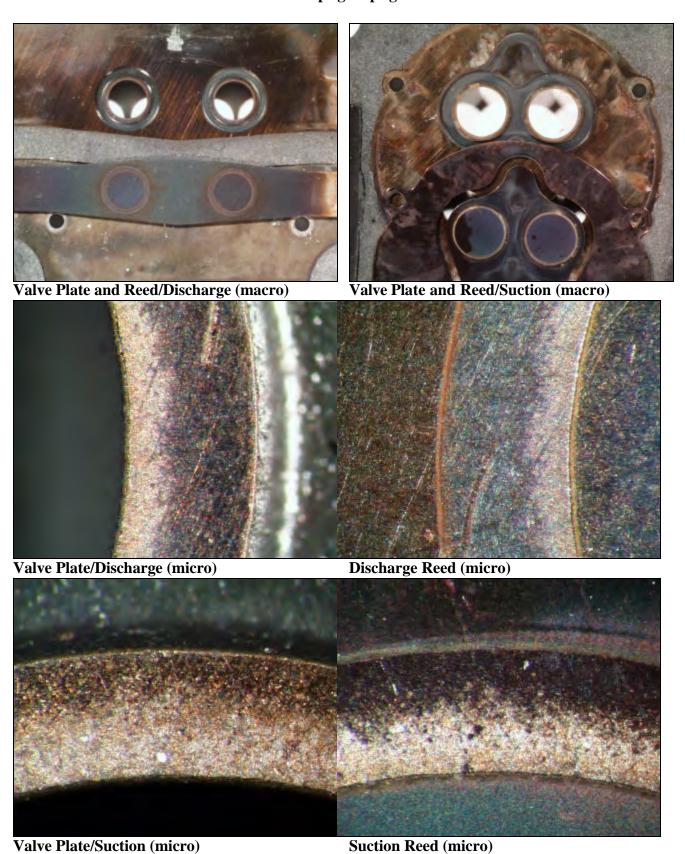


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air and Water 145 psig/20 psig



Report for R-134a Compressor with Contaminant Water

ILDI IIIDIORI OI.				
Unit Number 134				
Model # RS40C1E-IAV-250 Serial	l# 96F16583	Crank journals	8	
Run Time (hr.) 12105 Failed	l? No	Appearance	clean/Cu plating/cor	rosion
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b	earing iournal	
Acid? No R-12? No		Appearance	Cu plating	
Air? No R-22? No		Wear	slight	
H_2O ? Yes $R-502$? No		, , cui	5115111	
1200 100 1100 110		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	145		Unloaded	0.9985
Suction Pressure (psig)	20	Rottom thrust	washer (crank side)	0.7703
Discharge Temp (°F)	187	Appearance	clean/scored/Cu plat	ing
Return Gas Temp (°F)	64	Wear	slight	8
SumpTemp (°F)	174	* * Cu1	Silgin	
Sumpremp(T)	1/4	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze	C	
Suction exit trail appearance	black	Appearance	clean	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0040
Suction ring top appearance	gray		Unloaded	1.0040
Remaining torque of discharge muffler				1.00.0
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2	Shaft in cage b	earing	
Remaining torque of stator bolts	(1)2	Appearance	Cu plating	
(1) 10.4 (2) 10.4 (3) 10.4	(4) 10.4	Wear	slight	
Suction muffler appearance	clean/gray	Piston top appe	· ·	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3720
Top stator windings appearance	black	Diffensions	Unloaded	1.3720
Rotor rub marks present?	Yes	Cylinder bore	Cinoaucu	1.5720
Was rotor loose?	No	Appearance	no wear/Cu plating/o	corrosion
		Varnish ring		OHOSIOH
Shell bottom appearance Quantity of bearing chips	black slight	Dimensions	slight Loaded	1.3765
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3765
(1) 14.6 (2) 14.6 (3) 14.6	(4) 16.7	Connecting roo		1.5705
Head gasket brittle?	yes/bonded	Appearance	Cu plating	
Head suction cavity appearance	dirty	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2515
Cage bearing top appearance	wear metals	Dimensions	Unloaded	1.2515
Remaining torque of cage bearing bolt			Ombaucu	1.4313
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2			
(2)2 (2)2 (0)2	(-) 1.2			

Unit Number 134

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Trash in liquid screen (g) 0.000
Number of screens 1
Debris in compressor bottom (g) 0.997

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.5015Unloaded0.5015

Piston pin washers appearance

contact wear

Piston pin

Appearance bronze plating slight
Dimensions Loaded

imensions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.06 Water (ppm) 57 Fluoride ion (ppm) 0.88 Chloride ion (ppm) 14 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 1 2 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0

Suction side (reed backer) Condition good Appearance corrosion

Suction surface appearance

Suction reed

corrosion

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringslight

Discharge side (reed backer)
Condition good
Appearance corrosion

Discharge surface appearance

corrosion

Discharge reed Condition

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	none	none	none
Spring Seat	none	none	none
Ball	slight	black	hard
Front Side	slight	black	hard

Photographic Documentation of R-134a Compressor with Contaminant Water 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

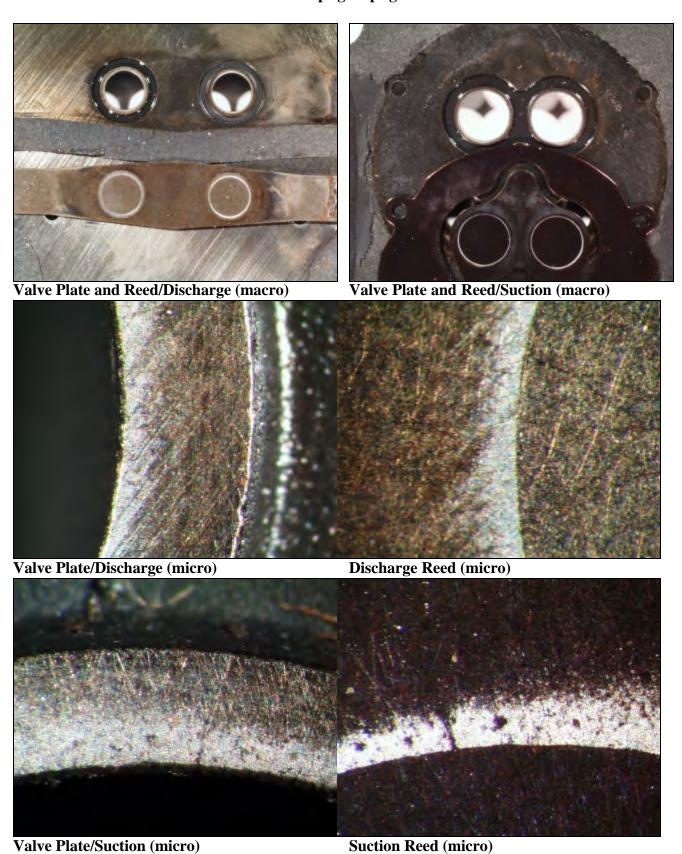


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Water 145 psig/20 psig



579

Report for R-134a Compressor with Contaminant Acid, Water, and R-12

Unit Number 135			
Model # RS40C1E-IAV-250 Ser	rial# 96F16576	Crank journals	
Run Time (hr.) 12009 Fai	iled? No	Appearance scored	d/Cu plating/corrosion
Refrigerant R-134a		Wear slight	
Lubricant RL32S		Dimensions Load	
Contaminants:		Unloa	nded 1.2465
Control Unit? No		Lower crank bearing	journal
Acid? Yes R-12? Yes		Appearance score	~
Air? No R-22? No		Wear polish	1
H_2O ? Yes R-502 ? No		1	
-		Dimensions Load	ed 0.9990
Discharge Pressure (psig)	145	Unloa	nded 0.9990
Suction Pressure (psig)	20	Bottom thrust washer	
Discharge Temp (°F)	187		d/Cu plating/corrosion
Return Gas Temp (°F)	64	Wear slight	
SumpTemp (°F)	174	Č	
r r		Bottom washer (castin	ng side)
Hi-Pot	pass		Cu plating
High-low leak	pass	Wear polish	
Top shell appearance	clean	Lower bronze bearing	
Suction exit trail appearance	black/Cu		d/corrosion
Cluster block condition	good	Wear polish	1
Wire to cluster block appearance	clean	Dimensions Load	
	1	TI-slan	1.0020
Suction ring top appearance	clean	Unloa	1.0030
Suction ring top appearance Remaining torque of discharge muft		Unioa	1.0030
		Shaft in cage bearing	1.0030
Remaining torque of discharge muf	fler	Shaft in cage bearing	ating/corrosion
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5	fler	Shaft in cage bearing	ating/corrosion
Remaining torque of discharge muft (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts	(4) 2.5	Shaft in cage bearing Appearance Cu pla	ating/corrosion
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10	(4) 2.5 (4) 15	Shaft in cage bearing Appearance Cu pla Wear polish	ating/corrosion
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance	(4) 2.5 (4) 15 clean	Shaft in cage bearing Appearance Cu pla Wear polish Piston top appearance Piston skirt	ating/corrosion
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor?	(4) 2.5 (4) 15 clean Yes	Shaft in cage bearing Appearance Cu pla Wear polish Piston top appearance Piston skirt	ating/corrosion c clean year/scored/Cu plating
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux?	(4) 2.5 (4) 15 clean Yes No gray	Shaft in cage bearing Appearance Cu pla Wear polish Piston top appearance Piston skirt Appearance low w	ating/corrosion c clean year/scored/Cu plating ed 1.3740
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 2.5 (4) 15 clean Yes No	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Load Unloa	ating/corrosion c clean year/scored/Cu plating ed 1.3740
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Load Unload Cylinder bore	ating/corrosion e clean vear/scored/Cu plating ed 1.3740 aded 1.3740
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Load Unloa Cylinder bore Appearance low w	ating/corrosion e clean rear/scored/Cu plating ed 1.3740 aded 1.3740
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Load Unloa Cylinder bore Appearance Varnish ring Vuery services	ating/corrosion e clean rear/scored/Cu plating ed 1.3740 aded 1.3740
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unload Load Unload Load Unload Load Load Load Load Load Load Load L	ating/corrosion e clean rear/scored/Cu plating ed 1.3740 aded 1.3740 rear clight ed 1.3760
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy fler removed	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unload	rear/scored/Cu plating ed 1.3740 rear clight ed 1.3760 readed 1.3760 readed 1.3760
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 15 (3) 15	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy fler removed (4) 17.5	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unloa Connecting rod (large	rear/scored/Cu plating ed 1.3740 rear clight ed 1.3760 readed 1.3760 readed 1.3760
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy fler removed	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unloa Connecting rod (large	rear/scored/Cu plating rear/scored/Cu plating red 1.3740 rear relight red 1.3760
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 15 (3) 15 Head gasket brittle?	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy fler removed (4) 17.5 yes/bonded	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unloa Connecting rod (large Appearance Scored	rear/scored/Cu plating rear/scored/Cu plating read 1.3740 rear slight red 1.3760 read 1.3760
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy fler removed (4) 17.5 yes/bonded clean	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unloa Connecting rod (large Appearance Wear Cuples Scored Wear Councilla Councilla Connecting rod	rear/scored/Cu plating rear/scored/Cu plating rear 1.3740 rear dight red 1.3760 rear dight red 1.3760 rear dictorrosion red 1.2515
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy fler removed (4) 17.5 yes/bonded clean clean clean	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unloa Connecting rod (large Appearance Wear Dimensions Load Unloa Connecting rod Load Load Load Load Load Load Load Lo	rear/scored/Cu plating rear/scored/Cu plating rear 1.3740 rear dight red 1.3760 rear dight red 1.3760 rear dicorrosion red 1.2515
Remaining torque of discharge muff (1) 5 (2) 5 (3) 5 Remaining torque of stator bolts (1) 12.5 (2) 15 (3) 10 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muff (1) 15 (2) 15 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 2.5 (4) 15 clean Yes No gray clean/stator top green Yes No Cu plate heavy fler removed (4) 17.5 yes/bonded clean clean clean	Shaft in cage bearing Appearance Wear Piston top appearance Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Load Unloa Connecting rod (large Appearance Wear Dimensions Load Unloa Connecting rod Load Load Load Load Load Load Load Lo	rear/scored/Cu plating rear/scored/Cu plating rear 1.3740 rear dight red 1.3760 rear dight red 1.3760 rear dicorrosion red 1.2515

Unit Number 135

Contaminants:Trash in liquid screen (g)0.006Control Unit?NoNumber of screens2Acid?YesR-12?YesDebris in compressor bottom (g)0.609

Valve Plate Assembly Inspection

good

good

clean

none

very slight

corrosion

very slight

very slight

Suction side (reed backer)

Suction reed

Condition

Trepan

Appearance

Varnish ring

Discharge reed

Appearance

Varnish ring

Condition

Trepan

Air? No **R-22?** No **H₂O?** Yes **R-502?** No

Connecting rod (small end)

 Appearance
 contact wear/correct washer/corrosion
 Condition
 good

 Wear
 medium
 Appearance
 corrosion

 Dimensions
 Loaded
 0.5015
 Suction surface appearance

Dimensions Loaded 0.5015 Suction surface appearance Unloaded 0.5015 corrosion

Piston pin washers appearance

contact wear/Cu plating

Piston pin

Appearance Cu plating/corrosion

Wear medium

Dimensions Loaded 0.4970 **Unloaded** 0.4975

Unloaded 0.4975 Discharge side (reed backer)

Condition good
Appearance clean

Total Acid Number (TAN) 0.16 Discharge surface appearance
Water (ppm) 42 corrosion

 Water (ppm)
 42

 Fluoride ion (ppm)
 0.95

 Chloride ion (ppm)
 13

 Aluminum (ppm)
 0

 Copper (ppm)
 0

 Iron (ppm)
 2

 Lead (ppm)
 1

 Silicon (ppm)
 3

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat slight hard gray **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black, brown gummy Spring medium black, gray gummy **Spring Seat** medium black, gray, brown hard Ball NA NA NA Front Side heavy black, brown hard

Photographic Documentation of R-134a Compressor with Contaminant Acid, Water, and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



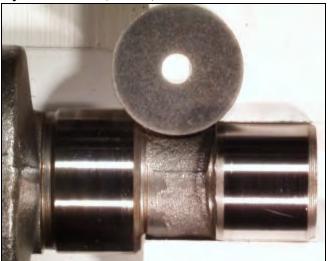
Piston Assembly (macro)



Cylinder Bore (macro)

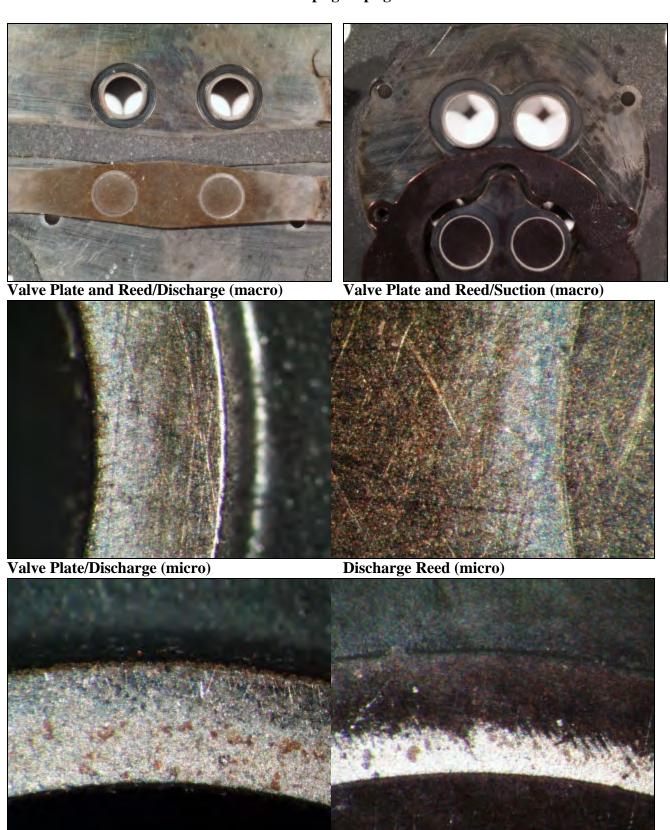


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid, Water, and R-12 145 psig/20 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Acid, Air, Water, and R-12

TEST HISTORY OF.				
Unit Number 136				
Model # RS40C1E-IAV-250 Serial	# 96F16577	Crank journals	S	
Run Time (hr.) 12004 Failed	? No	Appearance	clean/corrosion	
Refrigerant R-134a		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2445
Contaminants:			Unloaded	1.2445
Control Unit? No		Lower crank be		
Acid? Yes R-12? Yes		Appearance	clean	
Air? Yes R-22? No		Wear	polish	
H_2O ? Yes $R-502$? No		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ponsii	
1200 100 1100 110		Dimensions	Loaded	0.9970
Discharge Pressure (psig)	145	Difference	Unloaded	0.9970
Suction Pressure (psig)	20	Rottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	187	Appearance	scored	
Return Gas Temp (°F)	57	Wear	slight	
SumpTemp (°F)	174	vvcai	Siigiit	
Sumpremp(T)	1/4	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	•	Wear	polish	
Top shell appearance	pass clean	Lower bronze	1	
Suction exit trail appearance		Appearance	clean	
Cluster block condition	gray good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0015
Suction ring top appearance	bright	Difficusions	Unloaded	1.0013
Remaining torque of discharge muffler	bright		Univaded	1.0010
(1) 5 (2) 5 (3) 4	(4) 3	Shaft in cage be	narina	
Remaining torque of stator bolts	(4) 3	Appearance	clean	
(1) 10 (2) 10 (3) 9	(4) 0	Wear		
	(4) 9		polish, slight	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3700
Top stator windings appearance	clean		Unloaded	1.3700
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3730
Remaining torque of discharge muffler		Difference	Unloaded	1.3730
(1) 16 (2) 15 (3) 14	(4) 14	Connecting rod		110,00
Head gasket brittle?	yes	Appearance	none	
		Wear	polish, slight	
Head Suction cavity appearance	ciean			
Head suction cavity appearance Head discharge cavity appearance	clean			1.2485
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2485 1.2485
Head discharge cavity appearance Cage bearing top appearance	clean clean			1.2485 1.2485
Head discharge cavity appearance	clean clean		Loaded	

Unit Number

Contaminants: Trash in liquid screen (g) 0.092 **Control Unit?** No **Number of screens** 3 Acid? Yes R-12? Yes Debris in compressor bottom (g) 0.362

Air? Yes R-22? No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer Condition good Wear polish, slight **Appearance Dimensions** Loaded 0.4985 Suction surface appearance

Unloaded 0.4985

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear slight **Dimensions** Loaded 0.4960 0.4960 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.16 Water (ppm) 81 Fluoride ion (ppm) 0.86 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 1 Lead (ppm) 2 1 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 1

Suction side (reed backer)

Valve Plate Assembly Inspection

corrosion

corrosion

Suction reed

Condition good **Appearance** corrosion Trepan very slight Varnish ring very slight

Discharge side (reed backer) Condition good corrosion **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	very slight	gray	gummy
Equalizer Hole	none	none	none
Tip of Pin	medium	gray	gummy
Spring	medium	gray	gummy
Spring Seat	slight	gray	gummy
Ball	medium	gray	gummy
Front Side	medium	gray	gummy

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, Water, and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

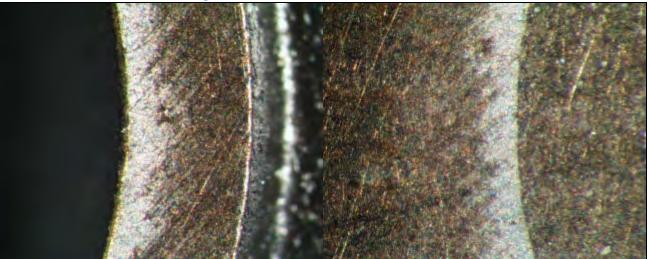
Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, Water, and R-12 145 psig/20 psig





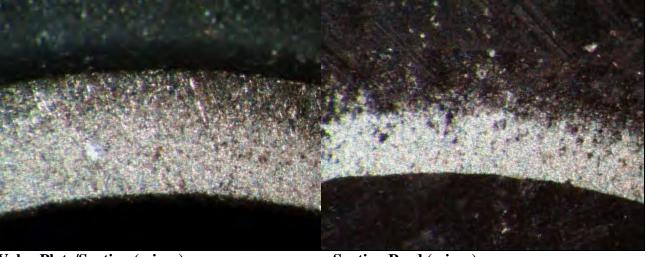
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Air, Water, and R-12

Unit Number 137		
	rial# 96F16568	Crank journals
	iled? No	
. ,	neu: No	
Refrigerant R-134a		Wear slight
Lubricant RL32S		Dimensions Loaded 1.2470
Contaminants:		Unloaded 1.2470
Control Unit? No		Lower crank bearing journal
Acid? No R-12? Yes		Appearance clean/corrosion
Air? Yes R-22? No		Wear slight
H_2O ? Yes $R-502$? No		
		Dimensions Loaded 1.0010
Discharge Pressure (psig)	145	Unloaded 1.0010
Suction Pressure (psig)	20	Bottom thrust washer (crank side)
Discharge Temp (°F)	187	Appearance scored/Cu plating
Return Gas Temp (°F)	64	Wear slight
SumpTemp (°F)	174	
		Bottom washer (casting side)
Hi-Pot	pass	Appearance clean
High-low leak	pass	Wear slight
Top shell appearance	gray	Lower bronze bearings
Suction exit trail appearance	black	Appearance clean
Cluster block condition	good	Wear slight
Wire to cluster block appearance	clean	Dimensions Loaded 1.0040
Suction ring top appearance	clean	Unloaded 1.0040
Remaining torque of discharge muf	fler	
(1) 10.4 (2) 4.2 (3) 8.3	(4) 4.2	Shaft in cage bearing
Remaining torque of stator bolts		Appearance Cu plating
(1) 14.6 (2) 14.6 (3) 14.6	(4) 18.8	Wear slight
Suction muffler appearance	clean	Piston top appearance clean
OEM flux?	Yes	Piston skirt
Loose restrictor?	No	Appearance no wear
Discharge plate appearance	clean	Dimensions Loaded 1.3720
Top stator windings appearance	clean	Unloaded 1.3720
Rotor rub marks present?	No	Cylinder bore
Was rotor loose?	No	Appearance no wear/corrosion
Shell bottom appearance	clean	Varnish ring slight
Quantity of bearing chips	trace	Dimensions Loaded 1.3765
Remaining torque of discharge muf		Unloaded 1.3760
(1) 16.7 (2) 16.7 (3) 16.7	(4) 16.7	Connecting rod (large end)
Head gasket brittle?	yes/bonded	Appearance Cu plating
Head suction cavity appearance	clean	Wear slight
Head discharge cavity appearance	clean	Dimensions Loaded 1.2515
Cage bearing top appearance	clean	Unloaded 1.2515
Remaining torque of cage bearing b		Omoaueu 1.2313
(1) 6.3 (2) 6.3 (3) 6.3	(4) 6.3	
141 U.J 141 U.J 131 U.J		

Unit Number 137

Contaminants:
Control Unit? No
Acid? No R-12?

 $\begin{array}{cccc} \textbf{Air?} & \textbf{Yes} & \textbf{R-22?} & \textbf{No} \\ \textbf{H_2O?} & \textbf{Yes} & \textbf{R-502?} & \textbf{No} \end{array}$

Trash in liquid screen (g)0.000Number of screens1Debris in compressor bottom (g)0.662

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearslightDimensionsLoaded0.5010

Unloaded 0.5010

Yes

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance corrosion
Wear slight
Dimensions Loaded

nsions Loaded 0.4975 Unloaded 0.4975

Omoaded

Final Lubricant Values **Total Acid Number (TAN)** 0.06 Water (ppm) 67 Fluoride ion (ppm) 0.88 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 1 2 Silicon (ppm) 0 Tin (ppm)

Suction side (reed backer)

Condition good
Appearance clean

Suction surface appearance corrosion

Suction reed

Condition good

Appearance corrosion
Trepan very slight
Varnish ring very slight

Discharge side (reed backer)

Condition good
Appearance corrosion
Discharge surface appearance

corrosion

Discharge reed

Condition good
Appearance corrosion
Trepan very slight
Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat slight black hard **Rear Pin** none none none **Equalizer Hole** slight black gummy Tip of Pin medium black, brown hard Spring slight hard gray **Spring Seat** slight hard gray Ball hard medium gray Front Side heavy black hard

0

Photographic Documentation of R-134a Compressor with Contaminant Air, Water, and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

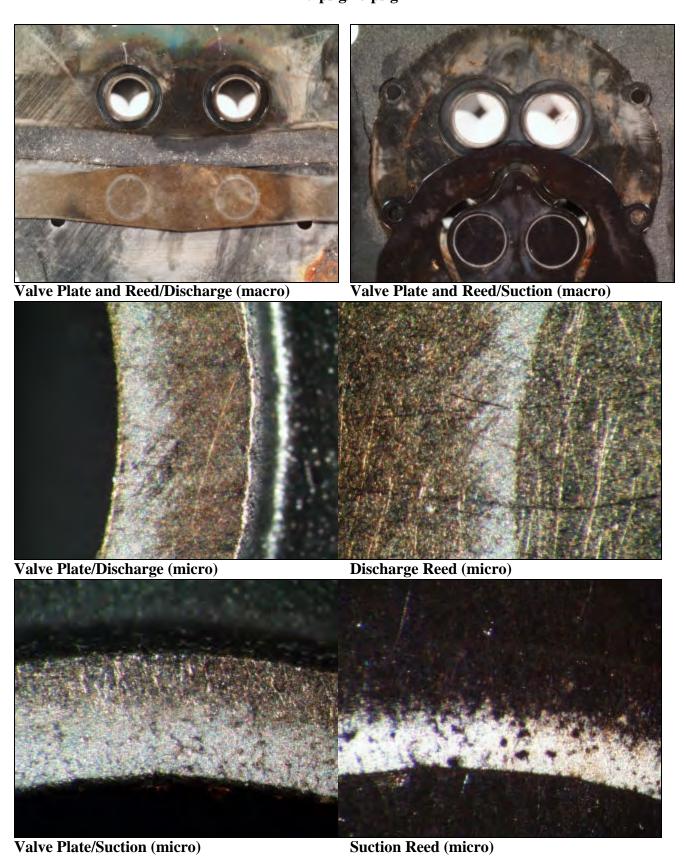


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air, Water, and R-12 145 psig/20 psig



Report for R-134a Compressor with Contaminant Acid, Air, and Water

Unit Number 138			
	rial# 96F16559	Crank journals	
	iled? No		
	neu: No	Appearance corrosion	
Refrigerant R-134a		Wear slight	_
Lubricant RL32S		Dimensions Loaded 1.2475	
Contaminants:		Unloaded 1.2475)
Control Unit? No		Lower crank bearing journal	
Acid? Yes R-12? No		Appearance bronze plating	
Air? Yes R-22? No		Wear slight	
H_2O ? Yes R-502 ? No			
		Dimensions Loaded 1.0010	
Discharge Pressure (psig)	145	Unloaded 1.0010)
Suction Pressure (psig)	20	Bottom thrust washer (crank side)	
Discharge Temp (°F)	187	Appearance scored/bronze plating	
Return Gas Temp (°F)	64	Wear slight	
SumpTemp (°F)	174		
		Bottom washer (casting side)	
Hi-Pot	pass	Appearance clean	
High-low leak	pass	Wear slight	
Top shell appearance	gray	Lower bronze bearings	
Suction exit trail appearance	black	Appearance corrosion	
Cluster block condition	good	Wear slight	
Wire to cluster block appearance	clean	Dimensions Loaded 1.0045	5
Suction ring top appearance	clean	Unloaded 1.0045	5
Remaining torque of discharge muff	fler		
(1) 6.3 (2) 6.3 (3) 6.3	(4) 6.3	Shaft in cage bearing	
Remaining torque of stator bolts		Appearance clean	
(1) 6.3 (2) 8.3 (3) 8.3	(4) 12.5	Wear slight	
Suction muffler appearance	clean	Piston top appearance clean	
OEM flux?	Yes	Piston skirt	
Loose restrictor?	No	Appearance no wear	
Discharge plate appearance	Cu	Dimensions Loaded 1.3720)
Top stator windings appearance	clean	Unloaded 1.3720)
Rotor rub marks present?	Yes	Cylinder bore	
Was rotor loose?	No	Appearance no wear/Cu plating	
	clean	Varnish ring very slight	
Shell bottom appearance Quantity of bearing chips	trace	Dimensions Loaded 1.3760	`
Remaining torque of discharge muft		Unloaded 1.3760	
			,
(1) 14.6 (2) 14.6 (3) 14.6 Head gasket brittle?	(4) 14.6 yes/bonded	Connecting rod (large end) Appearance Cu plating	
Head suction cavity appearance	clean	Wear slight	
Head discharge cavity appearance	clean	Dimensions Loaded 1.2515	Ξ.
Cage bearing top appearance	wear metals	Unloaded 1.2515	
Remaining torque of cage bearing b		Univaueu 1.2515	,
(1) 6.3 (2) 6.3 (3) 6.3	(4) 6.3		
(2) (3) (3) (3)	(4) 0.3		

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? No Air? R-22? Yes No H₂O? R-502? Yes No Trash in liquid screen (g) 0.000 **Number of screens** Debris in compressor bottom (g) 0.865

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear slight **Dimensions** Loaded 0.5010

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance bronze plating/corrosion

slight Wear **Dimensions** Loaded

Unloaded

0.4980 0.4980

Final Lubricant Values **Total Acid Number (TAN)** 0.17 Water (ppm) 65 Fluoride ion (ppm) 0.91 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 1 Iron (ppm) 0 Lead (ppm) 2 5 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 1

Suction side (reed backer)

Condition good Appearance corrosion Suction surface appearance

corrosion

Suction reed

Condition good corrosion **Appearance Trepan** very slight Varnish ring very slight

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat very slight tan hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin very slight gummy tan Spring slight hard black, gray **Spring Seat** very slight gummy gray very slight Ball tan gummy Front Side very slight gray hard

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and Water 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

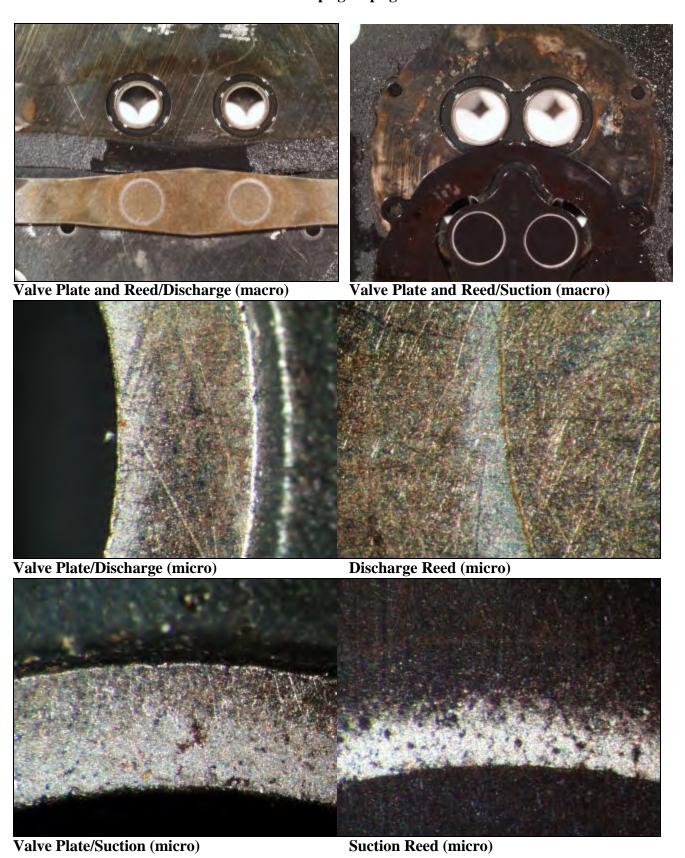


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and Water 145 psig/20 psig



Report for R-134a Control Compressor

Timit Nima	mbon	120					
Unit Nur		139	G • 1 //	0.651.65.65	0 11 1		
		1E-IAV-250	Serial #	96F16567	Crank journals		
Run Tim		12037	Failed?	No	Appearance	scored/corrosion	
Refriger		R-134a			Wear	polish	
Lubrica		RL32S			Dimensions	Loaded	1.2465
Contami	inants:					Unloaded	1.2465
Control	Unit?	Yes			Lower crank be	earing journal	
Acid?	No	R-12?	No		Appearance	clean	
Air?	No	R-22?	No		Wear	polish	
H ₂ O?	No	R-502?	No		7.7 0.002	Polisii	
11201	110	11 0021	110		Dimensions	Loaded	0.9975
Discharg	10 Proces	ra (ncia)		160	Difficusions	Unloaded	0.9935
Suction 1				100	Dottom throat	washer (crank side)	0.3333
Discharg	_			224	Appearance	clean	
Return (_	p (°F)		53	Wear	polish	
SumpTe	mp (°F)		7	212			
					Bottom washer		
Hi-Pot			1	pass	Appearance	clean/bronze plating	
High-low	v leak		1	pass	Wear	polish	
Top shel	l appeara	ance	(clean	Lower bronze	bearings	
Suction 6	exit trail	appearance	l	olack	Appearance	clean	
Cluster l	block con	dition	ş	good	Wear	polish	
Wire to	cluster b	lock appeara		gray	Dimensions	Loaded	1.0030
Suction 1						77 1 1 1	1.0020
		арреагансе	(ciean		Unloaded	1.0030
				clean		Unloaded	1.0030
Remaini	ng torqu	e of discharg	e muffler		Shaft in cage be		1.0030
Remaini (1) 4.6	ng torqu (2)	e of discharg	e muffler 4.2 (4	4) 4.2	Shaft in cage be	earing	1.0030
Remaini (1) 4.6 Remaini	ng torqu (2) ng torqu	e of discharg 4.6 (3) e of stator bo	e muffler 4.2 (4	4) 4.2	Appearance	e aring clean	1.0030
Remaini (1) 4.6 Remaini (1) 12.5	ng torqu (2) ng torqu (2)	e of discharg 4.6 (3) e of stator bo 12.5 (3)	e muffler 4.2 (4) olts 12.5 (4)	4) 4.2 4) 12.5	Appearance Wear	earing clean polish	1.0030
Remaini (1) 4.6 Remaini (1) 12.5 Suction i	ng torqu (2) ng torqu (2) muffler a	e of discharg 4.6 (3) e of stator bo	e muffler 4.2 (4) olts 12.5 (4)	4) 4.2	Appearance Wear Piston top appe	earing clean polish	1.0030
Remaini (1) 4.6 Remaini (1) 12.5	ng torqu (2) ng torqu (2) muffler a	e of discharg 4.6 (3) e of stator bo 12.5 (3)	te muffler 4.2 (4) olts 12.5 (4)	4) 4.2 4) 12.5	Appearance Wear	earing clean polish	1.0030
Remaini (1) 4.6 Remaini (1) 12.5 Suction i	ng torqu (2) ng torqu (2) muffler a	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance	e muffler 4.2 (4) 0lts 12.5 (4)	4) 4.2 4) 12.5 clean	Appearance Wear Piston top appe	earing clean polish	1.0030
Remaini (1) 4.6 Remaini (1) 12.5 Suction of OEM fluth Loose research	ng torqu (2) ng torqu (2) muffler a ax? strictor?	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance	e muffler 4.2 (4) 6lts 12.5 (4) 1	4) 4.2 4) 12.5 clean No	Appearance Wear Piston top appe Piston skirt	earing clean polish earance clean	1.3740
Remaini (1) 4.6 Remaini (1) 12.5 Suction I OEM flu Loose re Discharg	ng torqu (2) ng torqu (2) muffler a x? strictor? ge plate a	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance	e muffler 4.2 (4) 6lts 12.5 (4) 1	4) 4.2 4) 12.5 clean No	Appearance Wear Piston top appe Piston skirt Appearance	earing clean polish earance clean no wear	
Remaini (1) 4.6 Remaini (1) 12.5 Suction of the Company of the Com	ng torqu (2) ng torqu (2) muffler a x? strictor? ge plate a or windii	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance	4.2 (4.2 (4.2 (4.2 (4.2 (4.2 (4.2 (4.2 (4) 4.2 4) 12.5 clean No No clean gray	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	earing clean polish earance clean no wear Loaded	1.3740
Remaini (1) 4.6 Remaini (1) 12.5 Suction of the Court of	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windin b marks	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance	e muffler 4.2 (4.2) 6lts 12.5 (4.2) 1.5 (4.2)	4) 4.2 4) 12.5 clean No No clean gray	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore	earing clean polish earance clean no wear Loaded Unloaded	1.3740
Remaini (1) 4.6 Remaini (1) 12.5 Suction of OEM flu Loose red Discharg Top state Rotor ru Was rote	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windin ab marks or loose?	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance present?	e muffler 4.2 (4) 6lts 12.5 (4) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4) 4.2 4) 12.5 clean No No clean gray No No	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish earance clean no wear Loaded Unloaded	1.3740
Remaini (1) 4.6 Remaini (1) 12.5 Suction of OEM fluth Loose report to Discharge Top state Rotor ruth Was roto Shell boto state Rotor ruth Rotor Rot	ng torqu (2) ng torqu (2) muffler a x? strictor? ge plate a or windir ab marks or loose? ttom app	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance	e muffler 4.2 (4) 6lts 12.5 (4) 11 11 11 11 11 11 11 11 11 11 11 11 11	4) 4.2 4) 12.5 clean No No clean gray No No clean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	earing clean polish earance clean no wear Loaded Unloaded no wear slight	1.3740 1.3740
Remaini (1) 4.6 Remaini (1) 12.5 Suction of the control of the con	ng torqu (2) ng torqu (2) muffler a x? strictor? ge plate a or windin b marks or loose? ttom app ntity of be	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance appearance arance earance earance earance earance	e muffler 4.2 (4) 6lts 12.5 (4) 11 11 11 11 11 11 11 11 11 11 11 11 11	4) 4.2 4) 12.5 clean No No clean gray No No clean slight	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded	1.3740 1.3740 1.3760
Remaini (1) 4.6 Remaini (1) 12.5 Suction of the control of the con	ng torqu (2) ng torqu (2) muffler a ix? strictor? ge plate a or windin b marks or loose? itom appinity of be ng torqu	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance appearance are appearance earing chips e of discharg	te muffler 4.2 (4) 4.2 (4) 6 12.5 (4) 6 14 15 16 17 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	4) 4.2 4) 12.5 clean No No clean gray No No clean glight emoved	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded	1.3740 1.3740
Remaini (1) 4.6 Remaini (1) 12.5 Suction of the control of the con	ng torqu (2) ng torqu (2) muffler a ix? strictor? ge plate a or windin b marks or loose? ittom app ntity of be ng torqu (2)	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance error appearance error appearance appearance 15 (3)	### ##################################	4) 4.2 4) 12.5 clean No No clean gray No No clean slight emoved 4) 15	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roce	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded (I (large end)	1.3740 1.3740 1.3760
Remaini (1) 4.6 Remaini (1) 12.5 Suction of the Coose report of th	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windin b marks or loose? ttom app ntity of be ng torqu (2) sket britt	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance error appearance e	### ##################################	4) 4.2 4) 12.5 clean No No clean gray No No clean slight emoved 4) 15 es/bonded	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roc Appearance	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored	1.3740 1.3740 1.3760
Remaini (1) 4.6 Remaini (1) 12.5 Suction of the control of the con	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windir ab marks or loose? ttom app ntity of be ng torqu (2) sket britt ction cav	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance error appearance e	### ##################################	4) 4.2 4) 12.5 clean No No clean gray No No clean slight emoved 4) 15 es/bonded lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored polish	1.3740 1.3740 1.3760 1.3760
Remaini (1) 4.6 Remaini (1) 12.5 Suction in OEM flu Loose res Discharg Top state Rotor ru Was roto Shell bot Quan Remaini (1) 15 Head gas Head suc Head dis	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windin ab marks or loose? atom app ntity of be ng torqu (2) sket britt ction cav scharge c	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance appearance appearance appearance appearance arance earing chips e of discharg 15 (3) ale? aity appearance avity appearance	te muffler 4.2 (4) 4.2 (4) 12.5 (4) 12.5 (4) 14 15 (4) 15 (4) 16 17 18 19 19 19 19 19 19 19 19 19 19 19 19 19	4) 4.2 4) 12.5 clean No No clean gray No No clean slight emoved 4) 15 es/bonded lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roc Appearance	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded I (large end) scored polish Loaded	1.3740 1.3740 1.3760 1.3760
Remaini (1) 4.6 Remaini (1) 12.5 Suction in OEM flu Loose res Discharg Top state Rotor ru Was roto Shell bot Quan Remaini (1) 15 Head gas Head suc Head dis Cage bea	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windin ab marks or loose? atom app ntity of be ng torqu (2) sket britt ction cav scharge c	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance appearance earing chips e of discharg 15 (3) ale? ity appearance appearance	4.2 (4.2 (4.2 (4.2 (4.2 (4.2 (4.2 (4.2 (4) 4.2 4) 12.5 clean No No clean gray No No clean slight emoved 4) 15 es/bonded lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded (large end) scored polish	1.3740 1.3740 1.3760 1.3760
Remaini (1) 4.6 Remaini (1) 12.5 Suction I OEM flu Loose re Discharg Top state Rotor ru Was roto Shell bot Quan Remaini (1) 15 Head gas Head suc Head dis Cage bea	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windir ab marks or loose? tom app ntity of be ng torqu (2) sket britt ction cav scharge c aring top ng torqu	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance erance	te muffler 4.2 (4) 4.2 (4) 6 12.5 (4) 6 12.6 (7) 6 15 (4) 7 15 (4)	4) 4.2 4) 12.5 clean No No clean gray No No clean slight emoved 4) 15 es/bonded lean lean irty	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded I (large end) scored polish Loaded	1.3740 1.3740 1.3760 1.3760
Remaini (1) 4.6 Remaini (1) 12.5 Suction in OEM flu Loose res Discharg Top state Rotor ru Was roto Shell bot Quan Remaini (1) 15 Head gas Head suc Head dis Cage bea	ng torqu (2) ng torqu (2) muffler a ax? strictor? ge plate a or windin ab marks or loose? atom app ntity of be ng torqu (2) sket britt ction cav scharge c	e of discharg 4.6 (3) e of stator bo 12.5 (3) appearance appearance appearance erance	te muffler 4.2 (4) 4.2 (4) 6 12.5 (4) 6 12.6 (7) 6 15 (4) 7 15 (4)	4) 4.2 4) 12.5 clean No No clean gray No No clean slight emoved 4) 15 es/bonded lean lean	Appearance Wear Piston top apper Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting roo Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear slight Loaded Unloaded I (large end) scored polish Loaded	1.3740 1.3740 1.3760 1.3760

Unit Number 139

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.041Number of screens3Debris in compressor bottom (g)0.513

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

no wear

Piston pin

Appearance clean
Wear polish
Dimensions Loaded

sions Loaded 0.4980 Unloaded 0.4980

Final Lubricant Values Total Acid Number (TAN) 0.19 Water (ppm) 212 Fluoride ion (ppm) 0.88 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 4 2 Lead (ppm) Silicon (ppm) 4 Tin (ppm) 1 Zinc (ppm) 3 Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued **Discharge surface appearance**

corrosion/blued

Discharge reed

Condition good

Appearance corrosion/blued/Cu plating **Trepan** very slight

Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	slight	brown	gummy
Equalizer Hole	none	none	none
Tip of Pin	medium	brown	gummy
Spring	heavy	black	gummy
Spring Seat	medium	brown	gummy
Ball	medium	brown	gummy
Front Side	none	none	none

Photographic Documentation of R-134a Control Compressor 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

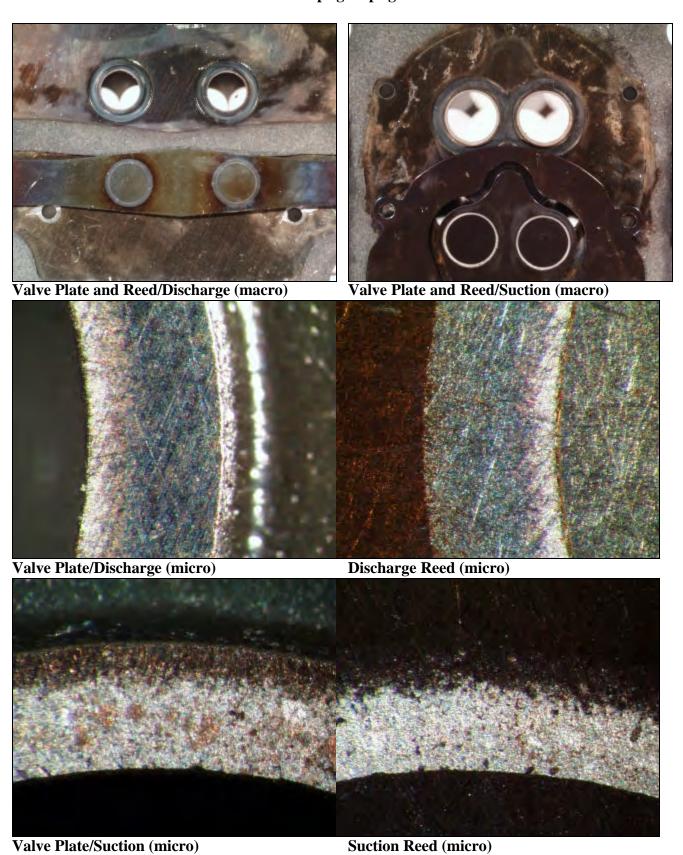


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Control Compressor 160 psig/10 psig



Report for R-134a Control Compressor

TEST HISTORY OF.				
Unit Number 140				
Model # RS40C1E-IAV-250 Serial	# 96F16566	Crank journals	S	
Run Time (hr.) 12013 Failed	? No	Appearance	scored	
Refrigerant R-134a		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? Yes		Lower crank b		112 . 7 0
Acid? No R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No		vvcai	ponsii	
11.0. 1.0 IX-302. 1.0		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	160	Difficusions	Unloaded	0.9980
Suction Pressure (psig)	100	Rottom thrust	washer (crank side)	0.3360
Discharge Temp (°F)	224	Appearance	clean	
		Wear		
Return Gas Temp (°F)	63	wear	polish	
SumpTemp (°F)	212	D . 44	. (
II: Da4		Bottom washer	_	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	slight	
Top shell appearance	clean	Lower bronze	_	
Suction exit trail appearance	none	Appearance	clean	
Cluster block condition	good	Wear	polish	4 0000
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler			_	
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage b	_	
Remaining torque of stator bolts		Appearance	clean	
(1) 7.5 (2) 12.5 (3) 12.5	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	clean	Dimensions	Loaded	1.3740
Top stator windings appearance	gray		Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
(1) 14 (2) 14 (3) 14	(4) 14	Connecting roo		1.3700
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear Wear	polish	
·		Dimensions	Loaded	1 2510
Head discharge cavity appearance	clean	Dimensions	Loaded Unloaded	1.2510
Cage bearing top appearance Remaining torque of cage bearing bolts	dirty		Omoaded	1.2510
e . e e	(4) 5			
(1) 6 (2) 6 (3) 6	(T) 3			

Unit Nu	mber	140			
Contam	inants:			Trash in liquid screen (g)	0.081
Control	Unit?	Yes		Number of screens	3
Acid?	No	R-12?	No	Debris in compressor bottom (g)	0.678

No R-22? Air? No H₂O? No R-502? No

Connecting rod (small end) Suction side (reed backer) Appearance correct washer

Wear polish **Appearance** corrosion Dimensions Loaded 0.5030 Suction surface appearance

Unloaded 0.5010 Piston pin washers appearance

contact wear

Piston pin

Appearance clean polish Wear

Dimensions Loaded 0.4990 Unloaded 0.4985

Final Lubricant Values Total Acid Number (TAN) 0.07 Water (ppm) 172 Fluoride ion (ppm) 0.94 Chloride ion (ppm) 14 Aluminum (ppm) 0 0 Copper (ppm) 0

Iron (ppm) Lead (ppm) 1 6 Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 Condition good

Valve Plate Assembly Inspection

corrosion

Suction reed

Condition good Appearance corrosion Trepan very slight Varnish ring slight

Discharge side (reed backer)

Condition good

corrosion/blued Appearance Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearance corrosion/blued **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	black	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black	gummy
Spring Seat	slight	black	hard
Ball	slight	black	gummy
Front Side	none	none	none

Photographic Documentation of R-134a Control Compressor 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

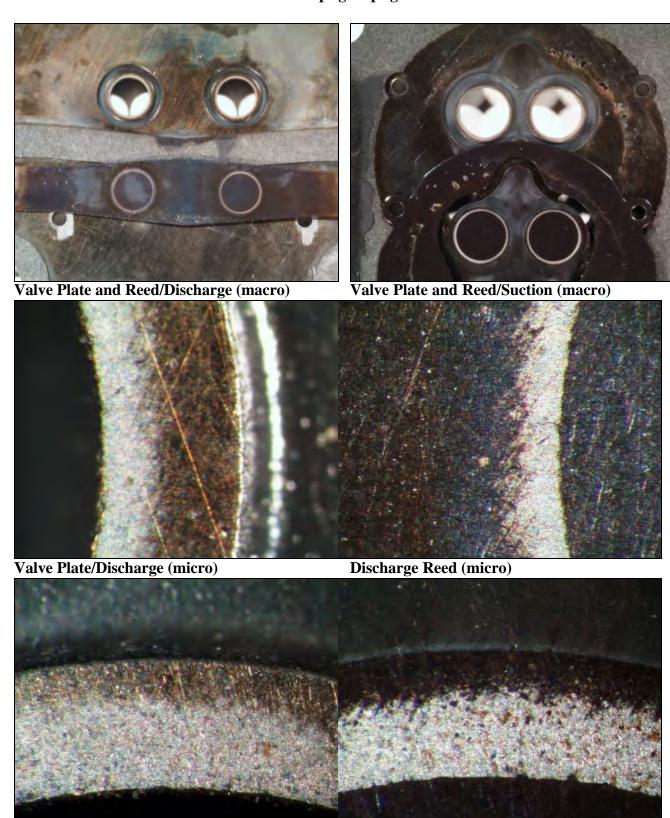


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Control Compressor 160 psig/10 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

Report for R-134a Control Compressor

TEST HISTORY OF.			
Unit Number 141			
Model # RS40C1E-IAV-250 Se	rial # 96F16564	Crank journals	
Run Time (hr.) 12002 Fa	iled? No	Appearance scored	
Refrigerant R-134a		Wear polish	
Lubricant RL32S		Dimensions Loaded	1.2465
Contaminants:		Unloaded	1.2465
Control Unit? Yes		Lower crank bearing journal	1.2.00
Acid? No R-12? No		Appearance clean	
Air? No R-22? No		Wear polish	
H_2O ? No $R-502$? No		ponsii	
1120. 110 R-302. 110		Dimensions Loaded	0.9980
Discharge Pressure (psig)	160	Unloaded	0.9980
Suction Pressure (psig)	100	Bottom thrust washer (crank side)	0.5560
Discharge Temp (°F)	224	Appearance clean	
Return Gas Temp (°F)	63	Wear polish	
SumpTemp (°F)	212	Dattana and have (as atime wide)	
II: D-4		Bottom washer (casting side)	
Hi-Pot	pass	Appearance clean	
High-low leak	pass	Wear polish	
Top shell appearance	gray	Lower bronze bearings	
Suction exit trail appearance	black	Appearance scored	
Cluster block condition	good	Wear polish	4 0000
Wire to cluster block appearance	gray	Dimensions Loaded	1.0030
Suction ring top appearance	clean	Unloaded	1.0030
Remaining torque of discharge muf			
(1) 5 (2) 7 (3) 5	(4) 7	Shaft in cage bearing	
Remaining torque of stator bolts		Appearance clean	
(1) 9 (2) 9 (3) 9	(4) 11	Wear polish	
Suction muffler appearance	clean/gray	Piston top appearance clean	
OEM flux?	Yes	Piston skirt	
Loose restrictor?	No	Appearance no wear	
Discharge plate appearance	black/Cu	Dimensions Loaded	1.3740
Top stator windings appearance	clean	Unloaded	1.3740
Rotor rub marks present?	No	Cylinder bore	
Was rotor loose?	Yes	Appearance no wear	
Shell bottom appearance	clean	Varnish ring very slight	
Quantity of bearing chips	trace	Dimensions Loaded	1.3746
Remaining torque of discharge muf		Unloaded	1.3746
(1) 15 (2) 15 (3) 15	(4) 14	Connecting rod (large end)	1.5710
Head gasket brittle?	yes/bonded	Appearance none	
Head suction cavity appearance	clean	Wear polish	
Head discharge cavity appearance	clean	Dimensions Loaded	1.2510
Cage bearing top appearance		Unloaded	1.2510
Remaining torque of cage bearing b	clean	Umoaded	1.2310
(1) 6 (2) 5 (3) 4	(4) 5		
	(*) 3		

Unit Number 141

 Contaminants:

 Control Unit?
 Yes

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.073Number of screens3Debris in compressor bottom (g)0.212

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/corrosion

Wear polish
Dimensions Loaded 0.4970
Unloaded 0.4970

Final Lubricant Values Total Acid Number (TAN) 0.08 Water (ppm) 307 Fluoride ion (ppm) 0.91 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 0 7 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0

Suction side (reed backer) Condition good

Appearance corrosion
Suction surface appearance

corrosion **Suction reed**

ConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	very slight	gray	hard
Equalizer Hole	none	none	none
Tip of Pin	slight	black	gummy
Spring	medium	black, gray	gummy
Spring Seat	heavy	black	gummy
Ball	medium	black	gummy
Front Side	very slight	gray	hard

Photographic Documentation of R-134a Control Compressor 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

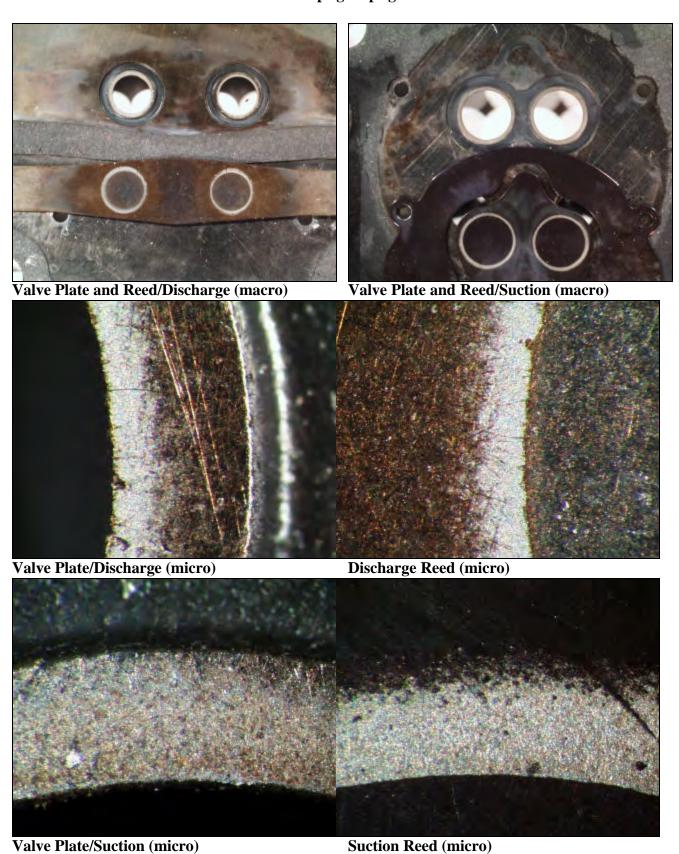


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Control Compressor 160 psig/10 psig



Report for R-134a Compressor with Contaminant R-12

ILSI IIISIORI OI:				
Unit Number 142				
Model # RS40C1E-IAV-250 Serial	# 96F16562	Crank journals	;	
Run Time (hr.) 12015 Failed	? No	Appearance	scored/Cu plating	
Refrigerant R-134a		Wear	medium	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		1.2
Acid? No R-12? Yes		Appearance	scored/Cu plating	
Air? No R-22? No		Wear	medium	
H_2O ? No $R-502$? No		v v cui	mearam	
120. 10 10 10		Dimensions	Loaded	0.9995
Discharge Pressure (psig)	160		Unloaded	0.9995
Suction Pressure (psig)	10	Rottom thrust	washer (crank side)	0.7773
Discharge Temp (°F)	224	Appearance	scored/bronze plating	
Return Gas Temp (°F)	63	Wear	medium	
SumpTemp (°F)	212	v v cui	mearam	
Sumptemp (T)	212	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/bronze plating	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze	•	
Suction exit trail appearance	black	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0035
Suction ring top appearance	clean	Difficusions	Unloaded	1.0035
Remaining torque of discharge muffler			Cinductu	1.0055
(1) 4.2 (2) 4.2 (3) 6.3	(4) 6.3	Shaft in cage be	aring .	
Remaining torque of stator bolts	(4) 0.3	Appearance	Cu plating/black	
(1) 10.4 (2) 10.4 (3) 10.4	(4) 10.4	Wear	slight	
	. ,			
Suction muffler appearance	gray	Piston top appe	earance carbon	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	black	Dimensions	Loaded	1.3730
Top stator windings appearance	Cu trace		Unloaded	1.3730
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	low wear	
Shell bottom appearance	black/Cu plate	Varnish ring	very slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler	removed		Unloaded	1.3760
(1) 18.8 (2) 18.8 (3) 18.8	(4) 18.8	Connecting rod	l (large end)	
Head gasket brittle?	yes/bonded	Appearance	Cu plating	
Head suction cavity appearance	dirty	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty/wear metals		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 8.3 (2) 8.3 (3) 8.3	(4) 6.3			

Unit Number 142

Contaminants: Control Unit? No Acid? No R-12? Yes Air? No R-22? No H₂O? R-502? No No

Number of screens 0.533 Debris in compressor bottom (g)

0.061

2

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear medium Dimensions Loaded 0.5010

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance scored/Cu plating/corrosion slight Wear **Dimensions** Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values	
Total Acid Number (TAN)	0.07
Water (ppm)	40
Fluoride ion (ppm)	0.95
Chloride ion (ppm)	14
Aluminum (ppm)	0
Copper (ppm)	1
Iron (ppm)	5
Lead (ppm)	0
Silicon (ppm)	4
Tin (ppm)	14
Zinc (ppm)	2

Suction side (reed backer)

Trash in liquid screen (g)

Condition good

corrosion/Cu plating **Appearance**

Suction surface appearance corrosion/Cu plating

Suction reed

Condition good

Appearance corrosion/Cu plating

slight Trepan Varnish ring slight

Discharge side (reed backer)

Condition good

Appearance corrosion/black Discharge surface appearance corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** slight

Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	hard
Spring	very heavy	black	hard
Spring Seat	medium	black	hard
Ball	slight	gray	hard
Front Side	heavy	black, green	hard

Photographic Documentation of R-134a Compressor with Contaminant R-12 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

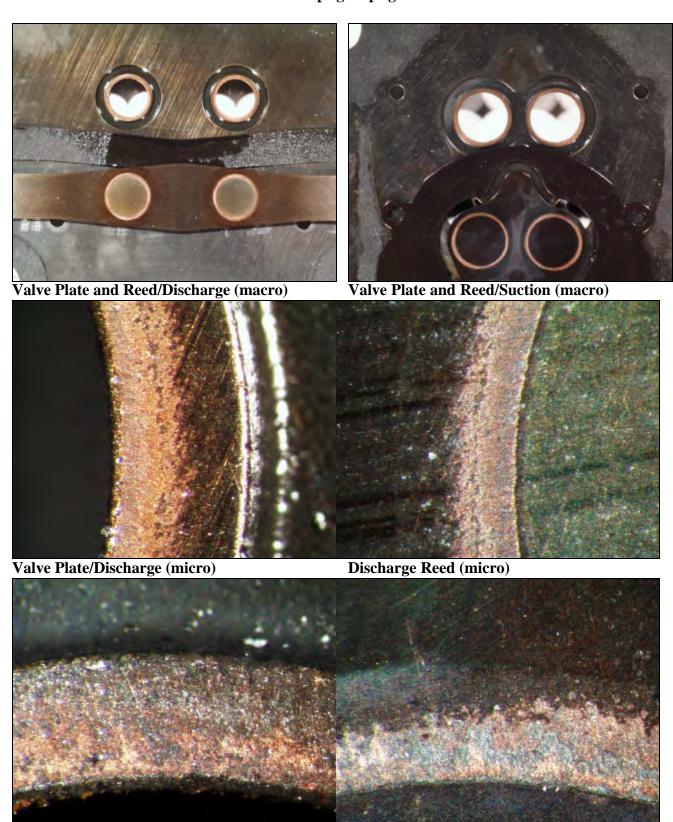


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant R-12 160 psig/10 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Acid

ILSI IIISIORI OI:				
Unit Number 143				
Model # RS40C1E-IAV-250 Serial	# 96F16573	Crank journals		
Run Time (hr.) 12011 Failed	? No	Appearance	scored/corrosion	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing iournal	
Acid? Yes R-12? No		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No			F ******	
-		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	160		Unloaded	0.9990
Suction Pressure (psig)	10	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/Cu plating	
Return Gas Temp (°F)	63	Wear	slight	
SumpTemp (°F)	212		8	
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	slight	
Top shell appearance	clean	Lower bronze		
Suction exit trail appearance	black	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 12.5 (2) 12.5 (3) 10	(4) 12.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 17.5 (2) 20 (3) 15	(4) 17.5	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2515
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts				- 1
(1) 7.5 (2) 7.5 (3) 5	(4) 5			

Unit Number

Contaminants: Trash in liquid screen (g) 0.000 **Control Unit?** No **Number of screens** 2 Acid? 0.554 Yes R-12? No Debris in compressor bottom (g)

Air? No R-22? No H₂O? No R-502? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion Condition good Wear slight **Appearance** corrosion

Dimensions Loaded 0.5010 Suction surface appearance Unloaded 0.5010

Piston pin washers appearance

contact wear/corrosion

Piston pin

Appearance corrosion Wear medium

Dimensions Loaded 0.4965 0.4970 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.21

Water (ppm) 44 Fluoride ion (ppm) 0.81 Chloride ion (ppm) 16 Aluminum (ppm) 0 2 Copper (ppm) Iron (ppm) 3 2 Lead (ppm) 2

Silicon (ppm) Tin (ppm) Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

corrosion

Suction reed

Condition good Appearance corrosion Trepan slight Varnish ring slight

Discharge side (reed backer)

Condition good

corrosion/blued **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearance corrosion/blued **Trepan** slight

Varnish ring medium

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	tarnished	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black	gummy
Spring	medium	black, brown	hard, gummy
Spring Seat	none	none	none
Ball	medium	black	hard
Front Side	medium	black	hard

1 3

Photographic Documentation of R-134a Compressor with Contaminant Acid 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

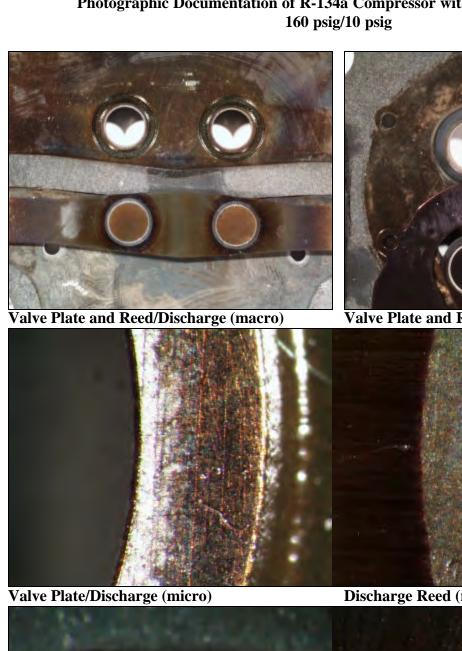


Crank Shaft (loaded) (macro)



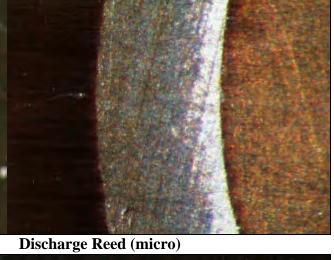
Crank Shaft (unloaded) (macro)

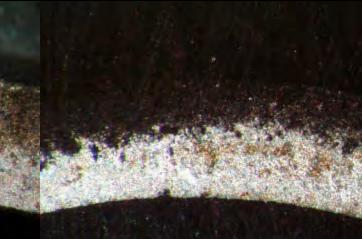
Photographic Documentation of R-134a Compressor with Contaminant Acid





Valve Plate and Reed/Suction (macro)





Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Air

TEST INSTORT OF.				
Unit Number 144				
Model # RS40C1E-IAV-250 Serial	l# 96F16580	Crank journals	S	
Run Time (hr.) 12156 Failed	l? No	Appearance	clean	
Refrigerant R-134a		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank b		1.2.00
Acid? No R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish	
H_2O ? No R-502? No		v v cui	ponsii	
120. 10 110 110		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	160	2111011910119	Unloaded	0.9990
Suction Pressure (psig)	10	Rottom thrust	washer (crank side)	0.7770
Discharge Temp (°F)	224	Appearance	scored/corrosion	
Return Gas Temp (°F)	63	Wear	slight	
SumpTemp (°F)	212	v v cui	Siigiit	
Sumpremp(T)	212	Bottom washer	· (casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	black	Appearance	clean/scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	clean	Dimensions	Unloaded	1.0030
Remaining torque of discharge muffler			emouded	1.0050
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2	Shaft in cage b	earing	
Remaining torque of stator bolts	(4) 4.2	Appearance	corrosion	
(1) 12.5 (2) 4.2 (3) 12.5	(4) 14.6	Wear	slight	
	• •		•	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3730
Top stator windings appearance	clean		Unloaded	1.3730
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear/corrosion	
Shell bottom appearance	clean	Varnish ring	medium	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3765
Remaining torque of discharge muffler	r removed		Unloaded	1.3765
(1) 16.7 (2) 16.7 (3) 16.7	(4) 16.7	Connecting roo	l (large end)	
Head gasket brittle?	yes/bonded	Appearance	Cu plating	
Head suction cavity appearance	dirty	Wear	polish	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts	S			
(1) 6.3 (2) 6.3 (3) 6.3	(4) 6.3			

Unit Number 144

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 Yes
 R-22?
 No

 H₂O?
 No
 R-502?
 No

Trash in liquid screen (g)0.070Number of screens3Debris in compressor bottom (g)0.613

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearancescored/Cu plating/corrosionWearpolishDimensionsLoaded0.4975Unloaded0.4975

Final Lubricant Values Total Acid Number (TAN) 0.18 Water (ppm) 60 Fluoride ion (ppm) 0.81 Chloride ion (ppm) 22 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 1 3 Silicon (ppm) Tin (ppm) 0 Zinc (ppm) 0 Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanslightVarnish ringvery slight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

Condition good
Appearance corrosion/blued
Trepan very slight
Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	medium	black	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	black	hard
Spring	very heavy	black	hard
Spring Seat	heavy	black	hard
Ball	slight	black	gummy
Front Side	heavy	black	hard

Photographic Documentation of R-134a Compressor with Contaminant Air 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

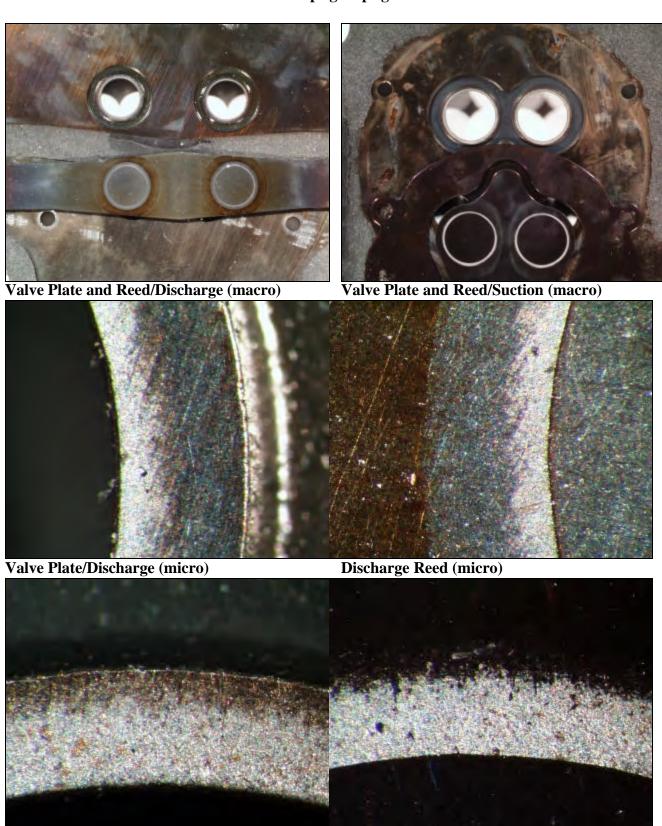


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air 160 psig/10 psig



Suction Reed (micro)

Valve Plate/Suction (micro)

Report for R-134a Compressor with Contaminant Acid and R-12

ILDI IIIDIORI OI.				
Unit Number 145				
Model # RS40C1E-IAV-250 Serial	# 96F16584	Crank journals	}	
Run Time (hr.) 12000 Failed	!? No	Appearance	clean	
Refrigerant R-134a		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2480
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank b	earing journal	
Acid? Yes R-12? Yes		Appearance	clean	
Air? No R-22? No		Wear	polish	
H_2O ? No $R-502$? No			r	
-		Dimensions	Loaded	0.9995
Discharge Pressure (psig)	160		Unloaded	0.9995
Suction Pressure (psig)	10	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/corrosion	
Return Gas Temp (°F)	63	Wear	slight	
SumpTemp (°F)	212		6	
2		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/scored	
High-low leak	pass	Wear	slight	
Top shell appearance	gray	Lower bronze	•	
Suction exit trail appearance	gray	Appearance	clean/corrosion	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	clean		Unloaded	1.0020
Remaining torque of discharge muffler	•			
(1) 4.2 (2) 4.2 (3) 4.2	(4) 4.2	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 10.4 (2) 10.4 (3) 10.4	(4) 10.4	Wear	slight	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3725
Top stator windings appearance	clean		Unloaded	1.3725
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	Yes	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		2 111011910119	Unloaded	1.3760
(1) 16.7 (2) 16.7 (3) 16.7	(4) 16.7	Connecting roo		-10.00
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2520
Cage bearing top appearance	clean		Unloaded	1.2520
Remaining torque of cage bearing bolts				
(1) 6.3 (2) 6.3 (3) 6.3	(4) 6.3			

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? Yes Air? No R-22? No H₂O? No R-502? No

Trash in liquid screen (g) 0.031 **Number of screens** 2 0.673 Debris in compressor bottom (g)

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish **Dimensions** Loaded 0.5020 Unloaded 0.5020

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear polish **Dimensions** Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values	
Total Acid Number (TAN)	0.09
Water (ppm)	41
Fluoride ion (ppm)	0.77
Chlasida issa (sassa)	21

0.77 Chloride ion (ppm) 21 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 1 Lead (ppm) 1 3 Silicon (ppm) Tin (ppm) 2 Zinc (ppm) 1

Suction side (reed backer)

Condition good **Appearance** corrosion Suction surface appearance

corrosion

Suction reed

Condition good Appearance corrosion Trepan very slight Varnish ring very slight

Discharge side (reed backer)

Condition good corrosion Appearance Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	black	hard
Spring	none	none	none
Spring Seat	none	none	none
Ball	very slight	brown	hard
Front Side	very slight	brown	hard

Photographic Documentation of R-134a Compressor with Contaminant Acid and R-12 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

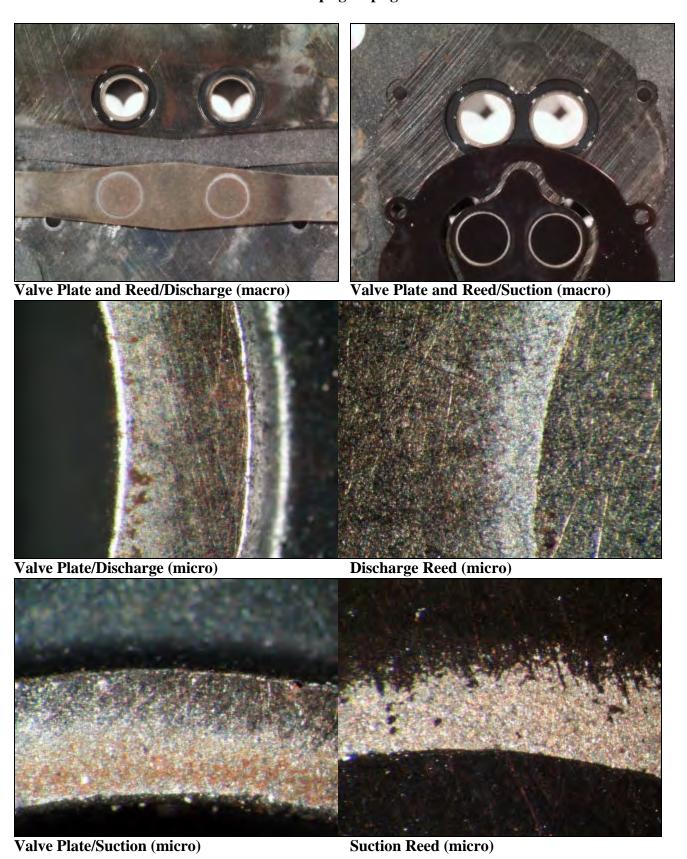


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid and R-12 160 psig/10 psig



Report for R-134a Compressor with Contaminant Acid, Air, and R-12

ildi motoki or.				
Unit Number 146				
Model # RS40C1E-IAV-250 Serial	# 96F16563	Crank journals		
Run Time (hr.) 12101 Failed	? No	Appearance	scored/corrosion	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:		2	Unloaded	1.2470
Control Unit? No		Lower crank be		1.2470
Acid? Yes R-12? Yes			clean	
		Appearance		
Air? Yes R-22? No		Wear	polish	
H ₂ O? No R-502? No		D' '	T 3 . 3	0.0000
D.	4.50	Dimensions	Loaded	0.9980
Discharge Pressure (psig)	160		Unloaded	0.9980
Suction Pressure (psig)	10		washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/corrosion	
Return Gas Temp (°F)	63	Wear	slight	
SumpTemp (°F)	212			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze b	pearings	
Suction exit trail appearance	black/Cu	Appearance	scored/corrosion	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0040
Suction ring top appearance	clean		Unloaded	1.0040
Remaining torque of discharge muffler			CIIIOMACA	1.00.0
(1) 5 (2) 5 (3) 5	(4) 5	Shaft in cage be	arino	
Remaining torque of stator bolts	(4) 3	Appearance	corrosion	
(1) 12.5 (2) 17.5 (3) 10	(4) 10	Wear	polish	
	• •		•	
Suction muffler appearance	clean	Piston top appe	arance	
carbon/corrosion/bronze				
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green	Differential	Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore	Ullivaueu	1.3740
<u>-</u>		•		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions		1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 20 (2) 15 (3) 20	(4) 22.5	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	clean	Wear	slight	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2515
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolts				
(1) 5 (2) 7.5 (3) 5	(4) 5			

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? R-22? Air? Yes

Yes No H₂O? R-502? No No

Valve Plate Assembly Inspection

Debris in compressor bottom (g)

Trash in liquid screen (g)

Number of screens

Connecting rod (small end)

Appearance contact wear/correct washer Wear slight **Dimensions** Loaded 0.5010 Unloaded 0.5010

Piston pin washers appearance

contact wear/Cu plating

Piston pin

Zinc (ppm)

Appearance corrosion polish Wear **Dimensions** Loaded

0.4970 0.4970 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** Water (ppm)

78 Fluoride ion (ppm) 0.78 Chloride ion (ppm) 24 Aluminum (ppm) 0 Copper (ppm) 1 Iron (ppm) 3 3 Lead (ppm) 7 Silicon (ppm) 0 Tin (ppm)

Suction side (reed backer)

Condition good Appearance corrosion Suction surface appearance

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring very slight

Discharge side (reed backer)

Condition good

corrosion/blued **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearance corrosion/blued **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat very slight tarnished hard **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring heavy black gummy **Spring Seat** slight gray gummy Ball slight gray gummy **Front Side** slight gray gummy

0.17

7

0.011

0.650

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and R-12 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

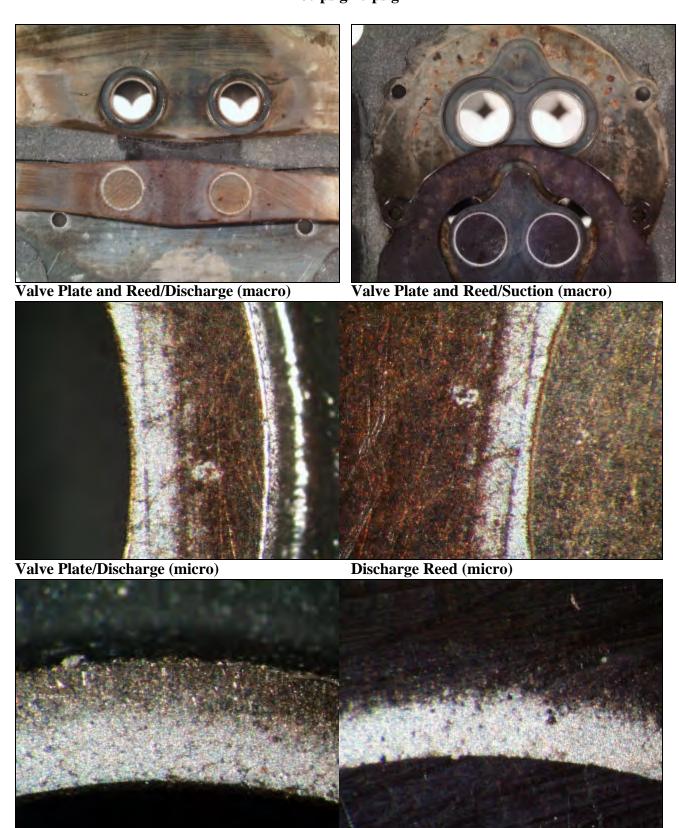


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and R-12 160 psig/10 psig



Valve Plate/Suction (micro) Suction Reed (micro)

Report for R-134a Compressor with Contaminant Air and R-12

TEST INSTORT OF				
Unit Number 147				
Model # RS40C1E-IAV-250 Serial	# 96F16586	Crank journals		
Run Time (hr.) 12001 Failed	? No	Appearance	scored/corrosion	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		112.70
Acid? No R-12? Yes		Appearance	clean	
Air? Yes R-22? No		Wear	polish	
H_2O ? No $R-502$? No		vvcar	ponsii	
11,0. 110 11.01. 110		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	160	Difficustons	Unloaded	0.9990
Suction Pressure (psig)	10	Rottom thrust v	washer (crank side)	0.7770
Discharge Temp (°F)	224	Appearance	scored/Cu plating	
Return Gas Temp (°F)	63	Wear	slight	
SumpTemp (°F)	212	vvcai	stight	
Sumplemp(T)	212	Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	slight	
Top shell appearance	clean	Lower bronze b		
Suction exit trail appearance	black/Cu	Appearance	scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	gray	Difficusions	Unloaded	1.0030
Remaining torque of discharge muffler			Cinoaucu	1.0050
(1) 5 (2) 5 (3) 2.5	(4) 3	Shaft in cage be	arina	
Remaining torque of stator bolts	(4) 3	Appearance	corrosion	
(1) 7.5 (2) 12.5 (3) 10	(4) 10	Wear	polish	
	• •		-	
Suction muffler appearance	clean	Piston top appe	arance clean/bron	ize
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	black	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	black	Varnish ring	slight	
	Oluck	, ar mon r me	Siigiit	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Quantity of bearing chips Remaining torque of discharge muffler	trace	U	_	1.3760 1.3760
Remaining torque of discharge muffler (1) 15 (2) 15 (3) 12.5	trace	U	Loaded Unloaded (large end)	
Remaining torque of discharge muffler	trace removed	Dimensions	Loaded Unloaded	
Remaining torque of discharge muffler (1) 15 (2) 15 (3) 12.5 Head gasket brittle? Head suction cavity appearance	trace removed (4) 12.5	Dimensions Connecting rod	Loaded Unloaded (large end)	
Remaining torque of discharge muffler (1) 15 (2) 15 (3) 12.5 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	trace removed (4) 12.5 yes/bonded	Dimensions Connecting rod Appearance	Loaded Unloaded (large end) scored/corrosion	1.3760 1.2515
Remaining torque of discharge muffler (1) 15 (2) 15 (3) 12.5 Head gasket brittle? Head suction cavity appearance	trace removed (4) 12.5 yes/bonded dirty	Dimensions Connecting rod Appearance Wear	Loaded Unloaded (large end) scored/corrosion medium	1.3760
Remaining torque of discharge muffler (1) 15 (2) 15 (3) 12.5 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	trace removed (4) 12.5 yes/bonded dirty dirty dirty	Dimensions Connecting rod Appearance Wear	Loaded Unloaded (large end) scored/corrosion medium Loaded	1.3760 1.2515
Remaining torque of discharge muffler (1) 15 (2) 15 (3) 12.5 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	trace removed (4) 12.5 yes/bonded dirty dirty dirty	Dimensions Connecting rod Appearance Wear	Loaded Unloaded (large end) scored/corrosion medium Loaded	1.3760 1.2515

Unit Number 147

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 Yes

 Air?
 Yes
 R-22?
 No

 H2O?
 No
 R-502?
 No

Trash in liquid screen (g)0.041Number of screens2Debris in compressor bottom (g)0.886

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearmediumDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance clean Wear medium Dimensions Loaded

Dimensions Loaded 0.4980 Unloaded 0.4980

·	
Final Lubricant Values	
Total Acid Number (TAN)	0.09
Water (ppm)	39
Fluoride ion (ppm)	0.78
Chloride ion (ppm)	17
Aluminum (ppm)	0
Copper (ppm)	0
Iron (ppm)	0
Lead (ppm)	1
Silicon (ppm)	2
Tin (ppm)	1
Zinc (ppm)	0

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Discharge side (reed backer)

Condition good **Appearance** blued

Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearancecorrosion/bluedTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	gray	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	heavy	black	gummy
Spring	medium	black	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

Photographic Documentation of R-134a Compressor with Contaminant Air and R-12 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

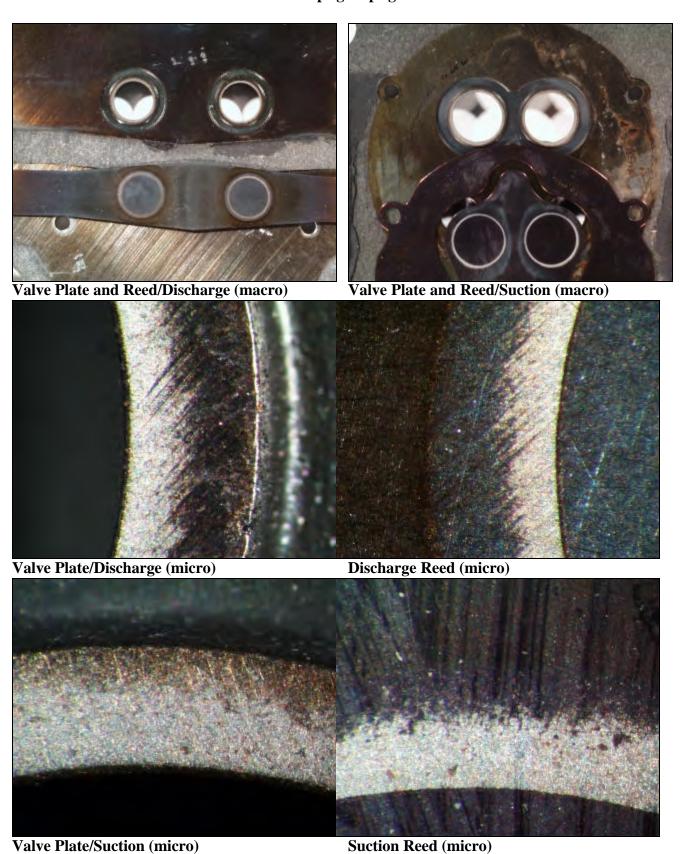


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air and R-12 160 psig/10 psig



Report for R-134a Compressor with Contaminant Acid and Air

Timit Nima	b.o	1.40					
Unit Nun		148	G • 1//	0.CE1.CE0.7	a		
	RS40C1E		Serial #		Crank journals		
Run Tim	` ,	12035	Failed?	No	Appearance	clean/corrosion	
Refriger		R-134a			Wear	polish	
Lubricar	nt	RL32S			Dimensions	Loaded	1.2470
Contami	nants:					Unloaded	1.2470
Control 1	Unit? N	O			Lower crank b	earing journal	
Acid?	Yes	R-12?	No		Appearance	clean	
Air?	Yes	R-22?	No		Wear	slight	
H ₂ O?	No	R-502?	No		***************************************	5 5	
11201	110	11 0021	1.0		Dimensions	Loaded	0.9995
Dischard	ge Pressur	o (peig)		160	Difficusions	Unloaded	0.9995
	Pressure (₁			100	Dottom thmust	washer (crank side)	0.5555
_	ge Temp (°			224	Appearance	scored/bronze plating	
	Gas Temp	(°F)		63	Wear	slight	
SumpTer	mp (°F)			212			
					Bottom washer		
Hi-Pot				pass	Appearance	clean	
High-low	v leak			pass	Wear	slight	
Top shell	l appearar	ıce		clean	Lower bronze	bearings	
Suction 6	exit trail a	ppearance		black	Appearance	scored	
Cluster b	olock cond	ition		good	Wear	slight	
Wire to o	cluster blo	ck appeara		clean	Dimensions	Loaded	1.0030
	ring top ap			gray		Unloaded	1.0030
		of discharg		2 ,			
(1) 6.3	(2) 4			4) 2.1	Shaft in cage b	earing	
		of stator bo		-, -, -, -	Appearance	clean	
(1) 12.5	(2) 1			4) 12.5	Wear	slight	
	` ,	` ′				•	
	muffler ap	pearance		clean	Piston top appe	earance clean	
OEM flu	x?			Yes	Piston skirt		
Loose res	strictor?			No	Appearance	no wear	
Discharg	ge plate ap	pearance		black	Dimensions	Loaded	1.3730
Top state						TI .1	1.3730
	or winding	gs appearar	ice	clean		Unloaded	1.5750
NOTOL LA		gs appearar resent?			Cylinder bore	Unioaded	1.5750
	b marks p			No	Cylinder bore		1.3730
Was roto	b marks p or loose?	resent?		No No	Appearance	no wear	1.3730
Was roto Shell bot	b marks p or loose? ctom appea	resent?		No No clean	Appearance Varnish ring	no wear slight	
Was roto Shell bot Quan	b marks por loose? Itom appeatity of bea	arance aring chips		No No clean trace	Appearance	no wear slight Loaded	1.3765
Was roto Shell bot Quan Remainin	b marks por loose? Itom appeatity of beang torque	resent? arance aring chips of discharg	ge muffler r	No No clean trace emoved	Appearance Varnish ring Dimensions	no wear slight Loaded Unloaded	
Was rote Shell bot Quan Remainin (1) 16.7	b marks p or loose? tom appea atity of bea ng torque (2) 1	resent? arance aring chips of discharg 6.7 (3)	ge muffler r 16.7 (No No clean trace emoved 4) 16.7	Appearance Varnish ring Dimensions Connecting roo	no wear slight Loaded Unloaded I (large end)	1.3765
Was roto Shell bot Quan Remainin (1) 16.7 Head gas	b marks por loose? tom appea tity of bea ng torque (2) 1 sket brittle	resent? nrance nring chips of discharg 6.7 (3)	ge muffler r 16.7 (No No clean trace emoved 4) 16.7 ves/bonded	Appearance Varnish ring Dimensions Connecting roc Appearance	no wear slight Loaded Unloaded I (large end) none	1.3765
Was rote Shell bot Quan Remainin (1) 16.7 Head gas Head suc	b marks por loose? tom appeatity of beaug torque (2) 1 sket brittle	resent? rance ring chips of discharg 6.7 (3) e? y appearan	ge muffler r 16.7 (ce	No No clean trace emoved 4) 16.7 ves/bonded	Appearance Varnish ring Dimensions Connecting roc Appearance Wear	no wear slight Loaded Unloaded I (large end) none slight	1.3765 1.3765
Was rote Shell bot Quan Remainin (1) 16.7 Head gas Head suc Head dis	b marks por loose? tom appeatity of beang torque (2) 1 sket brittle ction cavity	resent? arance uring chips of discharg 6.7 (3) e? y appearan vity appear	ge muffler r 16.7 (ce c	No No clean trace emoved 4) 16.7 ves/bonded elean lirty	Appearance Varnish ring Dimensions Connecting roc Appearance	no wear slight Loaded Unloaded I (large end) none slight Loaded	1.3765 1.3765 1.2510
Was rote Shell bot Quan Remainin (1) 16.7 Head gas Head suc Head dis Cage bea	b marks por loose? tom appeatity of beaug torque (2) 1 sket brittle ction cavity charge cavaring top a	arance uring chips of discharg 6.7 (3) e? y appearan vity appear	ge muffler r 16.7 (ce c ance	No No clean trace emoved 4) 16.7 ves/bonded	Appearance Varnish ring Dimensions Connecting roc Appearance Wear	no wear slight Loaded Unloaded I (large end) none slight	1.3765 1.3765
Was rote Shell bot Quan Remainin (1) 16.7 Head gas Head suc Head dis Cage bea Remainin	b marks por loose? tom appearatity of bearing torque (2) 1 sket brittle ction cavity charge caving top and torque	arance aring chips of discharg 6.7 (3) e? y appearan vity appear appearance of cage bea	ge muffler r 16.7 (ce (ance (ring bolts	No No clean trace emoved 4) 16.7 ves/bonded elean lirty	Appearance Varnish ring Dimensions Connecting roc Appearance Wear	no wear slight Loaded Unloaded I (large end) none slight Loaded	1.3765 1.3765 1.2510
Was rote Shell bot Quan Remainin (1) 16.7 Head gas Head suc Head dis Cage bea	b marks por loose? tom appeatity of bearing torque (2) 1 sket brittle ction cavity charge caviring top a	arance aring chips of discharg 6.7 (3) e? y appearan vity appear appearance of cage bea	ge muffler r 16.7 (ce (ance (ring bolts	No No clean trace emoved 4) 16.7 ves/bonded elean lirty	Appearance Varnish ring Dimensions Connecting roc Appearance Wear	no wear slight Loaded Unloaded I (large end) none slight Loaded	1.3765 1.3765 1.2510

Unit Number

Contaminants: Control Unit? No Acid? Yes R-12? No Air? Yes R-22? No H₂O? R-502? No No Trash in liquid screen (g) 0.038 **Number of screens** 4 0.575 Debris in compressor bottom (g)

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear slight **Dimensions** Loaded 0.5015 Unloaded

0.5015 corrosion

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion Wear slight **Dimensions** Loaded

0.4990 0.4990 Unloaded

Final Lubricant Values Total Acid Number (TAN) 0.16 Water (ppm) 41 Fluoride ion (ppm) 0.81 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 1 Iron (ppm) 2 2 Lead (ppm) Silicon (ppm) 3 Tin (ppm) 15 Zinc (ppm) 1

Suction side (reed backer) Condition good **Appearance** corrosion Suction surface appearance

Suction reed

Condition good **Appearance** corrosion Trepan slight Varnish ring slight

Discharge side (reed backer)

Condition good

corrosion/black **Appearance** Discharge surface appearance

corrosion

Discharge reed

Condition good

Appearance corrosion/black **Trepan** slight

Varnish ring slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	black	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	black	hard
Spring	heavy	black	hard
Spring Seat	medium	black	hard
Ball	slight	gray	hard
Front Side	slight	black	hard

Photographic Documentation of R-134a Compressor with Contaminant Acid and Air 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)



Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid and Air 160 psig/10 psig



Report for R-134a Compressor with Contaminant Water and R-12

II:4 N				
Unit Number 149		~		
Model # RS40C1E-IAV-250 Seria		Crank journals		
Run Time (hr.) 2859 Failed	l? Yes	Appearance	Cu plating/corrosion	
Refrigerant R-134a		Wear	polish	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing iournal	
Acid? No R-12? Yes		Appearance	clean/Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? Yes $R-502$? No		· · · cui	ponsii	
1120. 103 R-302. 110		Dimensions	Loaded	0.9980
Discharge Pressure (psig)	145	Difficusions	Unloaded	0.9980
• •	20	Dottom thurst		0.9980
Suction Pressure (psig)			washer (crank side)	
Discharge Temp (°F)	187	Appearance	scored/Cu plating	
Return Gas Temp (°F)	63	Wear	polish	
SumpTemp (°F)	174			
		Bottom washer	_	
Hi-Pot	pass	Appearance	scored	
High-low leak	NA	Wear	slight	
Top shell appearance	gray	Lower bronze l	oearings	
Suction exit trail appearance	black	Appearance	scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0035
wife to cluster block appearance	gray			
Suction ring top appearance	gray		Unloaded	1.0035
Suction ring top appearance	gray			1.0035
Suction ring top appearance Remaining torque of discharge muffle	gray r		Unloaded	1.0035
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND	gray	Shaft in cage be	Unloaded	1.0035
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts	gray r (4) ND		Unloaded earing clean	1.0035
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND	gray r (4) ND (4) ND	Shaft in cage be Appearance Wear	Unloaded earing clean polish	1.0035
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance	gray r (4) ND (4) ND clean	Shaft in cage be Appearance Wear Piston top appe	Unloaded earing clean polish	1.0035
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux?	gray r (4) ND (4) ND clean Yes	Shaft in cage be Appearance Wear Piston top appe Piston skirt	Unloaded earing clean polish arance clean	1.0035
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor?	gray r (4) ND (4) ND clean Yes No	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance	Unloaded earing clean polish arance clean no wear	
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	gray r (4) ND (4) ND clean Yes No gray	Shaft in cage be Appearance Wear Piston top appe Piston skirt	Unloaded earing clean polish earance clean no wear Loaded	1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	gray r (4) ND (4) ND clean Yes No gray black	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions	Unloaded earing clean polish arance clean no wear	
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	gray r (4) ND (4) ND clean Yes No gray black No	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions	Unloaded earing clean polish earance clean no wear Loaded	1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	gray r (4) ND (4) ND clean Yes No gray black	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions	Unloaded earing clean polish earance clean no wear Loaded	1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	gray r (4) ND (4) ND clean Yes No gray black No	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	Unloaded earing clean polish arance clean no wear Loaded Unloaded	1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	gray r (4) ND (4) ND clean Yes No gray black No No	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	Unloaded earing clean polish arance clean no wear Loaded Unloaded	1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	gray r (4) ND (4) ND clean Yes No gray black No No black trace	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	Unloaded earing clean polish arance clean no wear Loaded Unloaded no wear very slight	1.3740 1.3740
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	gray r (4) ND (4) ND clean Yes No gray black No No black trace	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	unloaded earing clean polish arance clean no wear Loaded Unloaded no wear very slight Loaded Unloaded	1.3740 1.3740 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	gray r (4) ND (4) ND clean Yes No gray black No No black trace r removed	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	unloaded earing clean polish arance clean no wear Loaded Unloaded no wear very slight Loaded Unloaded	1.3740 1.3740 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) ND (2) ND (3) ND	gray r (4) ND (4) ND clean Yes No gray black No No black trace r removed (4) ND	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	unloaded earing clean polish arance clean no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end)	1.3740 1.3740 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance	gray r (4) ND (4) ND clean Yes No gray black No No black trace r removed (4) ND no/bonded dirty	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	earing clean polish earance clean no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end) corrosion polish	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray r (4) ND (4) ND clean Yes No gray black No No black trace r removed (4) ND no/bonded dirty dirty	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end) corrosion polish Loaded	1.3740 1.3740 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	gray r (4) ND (4) ND clean Yes No gray black No No black trace r removed (4) ND no/bonded dirty dirty dirty	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end) corrosion polish	1.3740 1.3740 1.3760 1.3760
Suction ring top appearance Remaining torque of discharge muffle (1) ND (2) ND (3) ND Remaining torque of stator bolts (1) ND (2) ND (3) ND Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) ND (2) ND (3) ND Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	gray r (4) ND (4) ND clean Yes No gray black No No black trace r removed (4) ND no/bonded dirty dirty dirty	Shaft in cage be Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	earing clean polish earance clean no wear Loaded Unloaded no wear very slight Loaded Unloaded (large end) corrosion polish Loaded	1.3740 1.3740 1.3760 1.3760

Unit Number 149

Contaminants:Trash in liquid screen (g)0.153Control Unit?NoNumber of screens3Acid?NoR-12?YesDebris in compressor bottom (g)0.550

 Air?
 No
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Connecting rod (small end)

Appearancecontact wear/correct washer/corrosionConditiongoodWearpolishAppearancecorrosion

Dimensions Loaded 0.5010 Suction surface appearance Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear/Cu plating

Piston pin

Tin (ppm) Zinc (ppm)

Appearance Cu plating/corrosion

Wear polish
Dimensions Loaded 0.4970

Unloaded 0.4970

Final Lubricant Values **Total Acid Number (TAN)** 0.08 Water (ppm) 70 Fluoride ion (ppm) 0.85 Chloride ion (ppm) 14 Aluminum (ppm) 1 0 Copper (ppm) Iron (ppm) 33 Lead (ppm) 0 4 Silicon (ppm)

Discharge side (reed backer)

Condition good **Appearance** corrosion/black

Appearance corrosion/black **Discharge surface appearance**

Valve Plate Assembly Inspection

good

corrosion

very slight

very slight

Suction side (reed backer)

corrosion

Discharge reed

Suction reed

Condition

Trepan

Appearance

Varnish ring

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Residue Description Valve Part **Residue Accumulation Residue Color** Diaphragm Seat medium black gummy **Rear Pin** none none none **Equalizer Hole** slight black gummy Tip of Pin medium black gummy Spring black heavy very gummy **Spring Seat** medium black gummy Ball none none none Front Side none none none

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Photographic Documentation of R-134a Compressor with Contaminant Water and R-12 145 psig/20 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

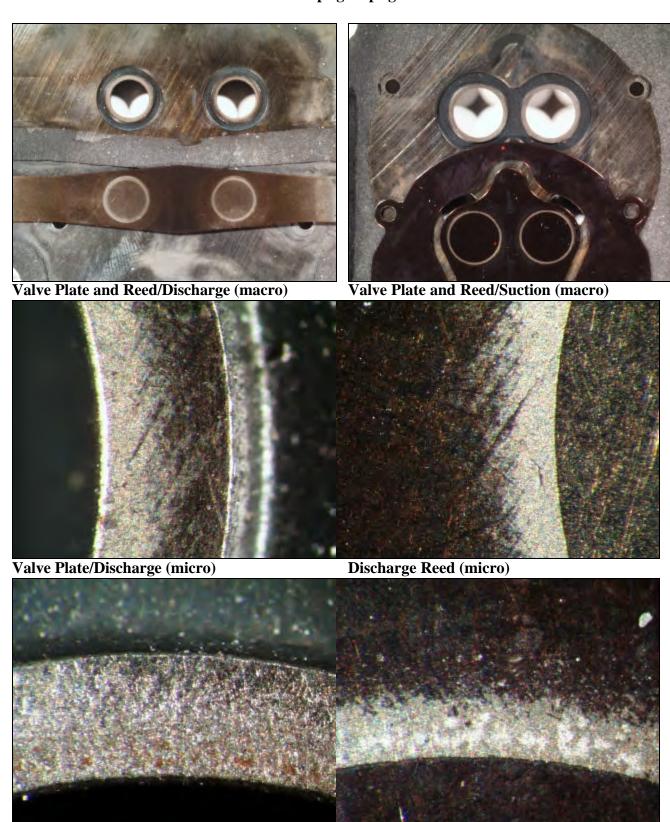


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Water and R-12 145 psig/20 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Acid and Water

TEST INSTORT OF.				
Unit Number 150				
Model # RS40C1E-IAV-250 Seria	l# 96F16560	Crank journals	;	
Run Time (hr.) 12003 Faile	d? No	Appearance	scored/Cu plating	
Refrigerant R-134a		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2465
Contaminants:			Unloaded	1.2465
Control Unit? No		Lower crank b	earing iournal	
Acid? Yes R-12? No		Appearance	Cu plating	
Air? No R-22? No		Wear	polish	
H_2O ? Yes R-502 ? No			r · ·	
-		Dimensions	Loaded	0.9990
Discharge Pressure (psig)	160		Unloaded	0.9990
Suction Pressure (psig)	10	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/Cu plating	
Return Gas Temp (°F)	63	Wear	slight	
SumpTemp (°F)	212		6	
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	scored	
High-low leak	pass	Wear	polish	
Top shell appearance	gray	Lower bronze		
Suction exit trail appearance	gray	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0020
Suction ring top appearance	gray		Unloaded	1.0025
Remaining torque of discharge muffle	r			
(1) 6 (2) 5 (3) 4	(4) 5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 9 (2) 9 (3) 9	(4) 8	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	black	Dimensions	Loaded	1.3720
Top stator windings appearance	gray		Unloaded	1.3720
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffle		2 111011010110	Unloaded	1.3760
(1) 15 (2) 15 (3) 15	(4) 14	Connecting roo		-10.00
Head gasket brittle?	yes	Appearance	scored	
Head suction cavity appearance	clean	Wear	polish	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty		Unloaded	1.2510
Remaining torque of cage bearing bolt				
(1) 5 (2) 4 (3) 5	(4) 5			

Unit Number 150

 Contaminants:

 Control Unit?
 No

 Acid?
 Yes
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Trash in liquid screen (g)0.159Number of screens7Debris in compressor bottom (g)1.025

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolishDimensionsLoaded0.5010Unloaded0.5010

Piston pin washers appearance

high wear (4 contact points)

Piston pin

Zinc (ppm)

AppearanceCu platingWearpolishDimensionsLoaded

Loaded 0.4980 **Unloaded** 0.4980

0.67
58
0.78
12
3
6
21
3
2
20

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance
corrosion/Cu plating

Suction reed

ConditiongoodAppearanceCu platingTrepanmediumVarnish ringnone

Discharge side (reed backer)

Condition good

Appearance Cu plating/soot
Discharge surface appearance
corrosion/Cu plating

Discharge reed

Condition good

Appearance corrosion/Cu plating **Trepan** slight

Varnish ring none

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	heavy	black	gummy
Equalizer Hole	medium	black	gummy
Tip of Pin	heavy	black	gummy
Spring	very heavy	black	gummy
Spring Seat	heavy	black	gummy
Ball	heavy	black	gummy
Front Side	heavy	black	gummy

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Photographic Documentation of R-134a Compressor with Contaminant Acid and Water 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

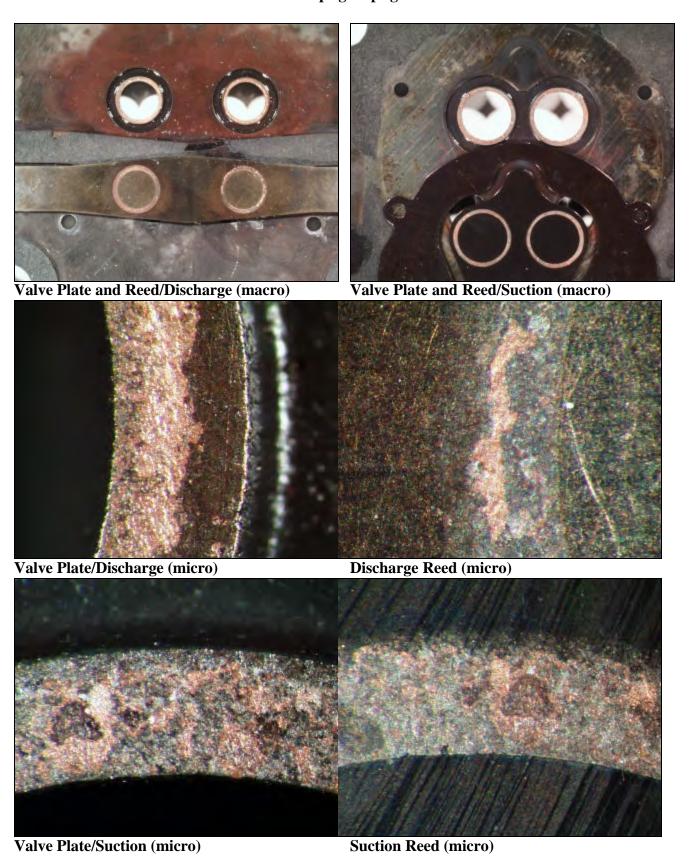


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid and Water 160 psig/10 psig



Report for R-134a Compressor with Contaminant Air and Water

TEST HISTORY OF.				
Unit Number 151				
Model # RS40C1E-IAV-250 Serial	# 96F16585	Crank journals		
Run Time (hr.) 12000 Failed	? No	Appearance	scored/corrosion	
Refrigerant R-134a		Wear	medium	
Lubricant RL32S		Dimensions	Loaded	1.2460
Contaminants:			Unloaded	1.2460
Control Unit? No		Lower crank be		1.2.00
Acid? No R-12? No		Appearance	scored	
Air? Yes R-22? No		Wear	slight	
H_2O ? Yes $R-502$? No		vvcai	stight	
1120. 103 K-302. NO		Dimensions	Loaded	0.9985
Discharge Pressure (psig)	160	Difficusions	Unloaded	0.9985
Suction Pressure (psig)	100	Rottom thrust	washer (crank side)	0.9963
Discharge Temp (°F)	224	Appearance	scored/Cu plating/co	rrosion
		Wear Wear	medium	11031011
Return Gas Temp (°F)	63	wear	meatum	
SumpTemp (°F)	212	D - 44l	(4:: -] -)	
III Da4		Bottom washer		
Hi-Pot	pass	Appearance	corrosion	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze l		
Suction exit trail appearance	black/Cu	Appearance	scored/corrosion	
Cluster block condition	good	Wear	slight	1 0000
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	clean		Unloaded	1.0030
Remaining torque of discharge muffler				
(1) 5 (2) 5 (3) 2.5	(4) 2.5	Shaft in cage be	-	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 10 (2) 10 (3) 10	(4) 7.5	Wear	polish	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear	
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler		Difficusions	Unloaded	1.3760
(1) 17.5 (2) 17.5 (3) 12.5	(4) 15	Connecting rod		1.5700
Head gasket brittle?	yes/bonded	Appearance	scored	
Head suction cavity appearance	clean	Wear Wear	medium	
Head discharge cavity appearance	dirty	Dimensions	Loaded	1.2510
Cage bearing top appearance	•	Dimensions	Unloaded	1.2510
Remaining torque of cage bearing bolts	dirty		Omoaueu	1.2310
(1) 5 (2) 5 (3) 5	(4) 5			
(1) 3 (2) 3	(1)			

Unit Number

Contaminants: Trash in liquid screen (g) 0.085 **Control Unit?** No **Number of screens** 2 Acid? No R-12? No Debris in compressor bottom (g) 0.690

R-22? Air? Yes No H₂O? R-502? Yes No

Connecting rod (small end)

Appearance contact wear/correct washer/scored Wear medium Appearance clean **Dimensions** Loaded 0.5010 Suction surface appearance

Unloaded 0.5010

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion medium Wear **Dimensions** Loaded

0.4980 0.4980 Unloaded

Final Lubricant Values **Total Acid Number (TAN)** 0.12 Water (ppm) 60 Fluoride ion (ppm) 0.88 Chloride ion (ppm) 14 Aluminum (ppm) 0 0 Copper (ppm) 1

Iron (ppm) Lead (ppm) Silicon (ppm) Tin (ppm) Zinc (ppm)

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good

corrosion

Suction reed

Condition good corrosion **Appearance Trepan** very slight Varnish ring very slight

Discharge side (reed backer)

Condition good blued **Appearance**

Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance blued **Trepan** very slight Varnish ring none

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin black, brown medium gummy Spring black, brown hard, gummy heavy **Spring Seat** heavy brown gummy Ball medium black, gray gummy Front Side medium black, brown hard, gummy

0

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Photographic Documentation of R-134a Compressor with Contaminant Air and Water 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

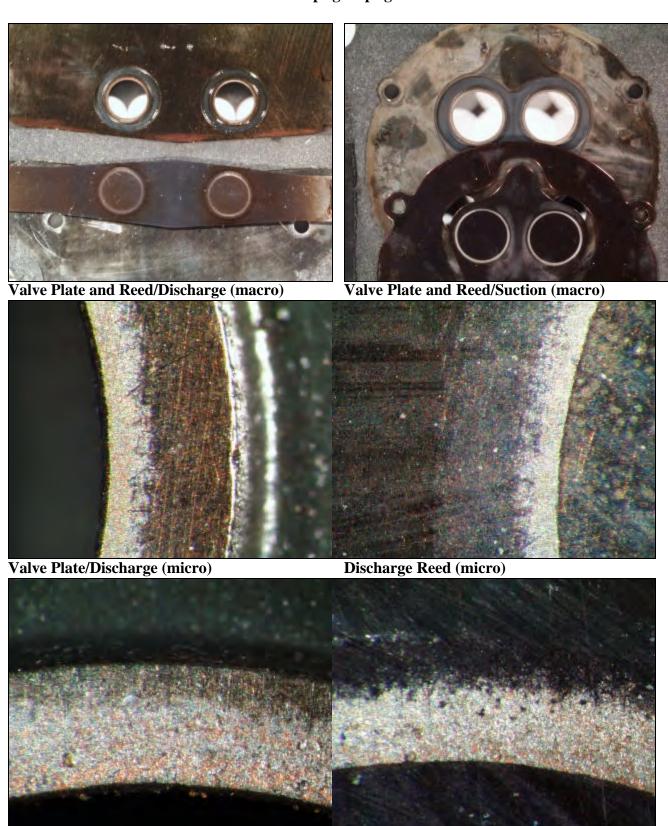


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air and Water 160 psig/10 psig



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Water

Unit Number 152			
	erial# 96F16549	Crank journals	
. ,	ailed? No	Appearance scored/Cu plating	
Refrigerant R-134a		Wear polish	1 2460
Lubricant RL32S		Dimensions Loaded	1.2460
Contaminants:		Unloaded	1.2460
Control Unit? No		Lower crank bearing journal	
Acid? No R-12? No		Appearance clean	
Air? No R-22? No		Wear polish	
H_2O ? Yes $R-502$? No			
		Dimensions Loaded	0.9990
Discharge Pressure (psig)	160	Unloaded	0.9990
Suction Pressure (psig)	10	Bottom thrust washer (crank side)	
Discharge Temp (°F)	224	Appearance scored/Cu plating	
Return Gas Temp (°F)	63	Wear polish	
SumpTemp (°F)	212		
		Bottom washer (casting side)	
Hi-Pot	pass	Appearance scored/Cu plating	
High-low leak	pass	Wear polish	
Top shell appearance	clean	Lower bronze bearings	
Suction exit trail appearance	gray	Appearance scored/corrosion	
Cluster block condition	good	Wear polish	
Wire to cluster block appearance	clean	Dimensions Loaded	1.0040
Suction ring top appearance	clean	Unloaded	1.0040
Remaining torque of discharge mu	ıffler		
(1) 4 (2) 5 (3) 6	(4) 4	Shaft in cage bearing	
Remaining torque of stator bolts		Appearance corrosion	
(1) 10 (2) 11 (3) 11	(4) 10	Wear polish	
Suction muffler appearance	clean	Piston top appearance clean	
OEM flux?	Yes	Piston skirt	
Loose restrictor?	No	Appearance no wear	
Discharge plate appearance	gray	Dimensions Loaded	1.3730
Top stator windings appearance	clean	Unloaded	1.3730
Rotor rub marks present?	No	Cylinder bore	-10.00
Was rotor loose?	No	Appearance no wear	
Shell bottom appearance	clean		
Quantity of bearing chips	trace	Varnish ring very slight Dimensions Loaded	1.3760
Remaining torque of discharge mu		Unloaded	1.3760
(1) 16 (2) 15 (3) 16	(4) 15	Connecting rod (large end)	1.5700
Head gasket brittle?	yes	Appearance none	
Head suction cavity appearance	clean	Wear polish, slight	
Head discharge cavity appearance	clean	Dimensions Loaded	1.2515
Cage bearing top appearance	clean	Unloaded	1.2515
Remaining torque of cage bearing		Omoaucu	1.2313
(1) 7 (2) 5 (3) 5			
	(4) 5		

Unit Number 152

 Contaminants:

 Control Unit?
 No

 Acid?
 No
 R-12?
 No

 Air?
 No
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Trash in liquid screen (g)0.025Number of screens2Debris in compressor bottom (g)0.675

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearancecontact wear/correct washerWearpolish, slightDimensionsLoaded0.4990Unloaded0.4990

ded 0.4990 Suction surface ded 0.4990 corrosion

Piston pin washers appearance

contact wear

Piston pin

Zinc (ppm)

Appearance corrosion
Wear polish, slight
Dimensions Loaded

Dimensions Loaded 0.4960 Unloaded 0.4960

Final Lubricant Values Total Acid Number (TAN) 0.32 Water (ppm) 38 Fluoride ion (ppm) 0.82 Chloride ion (ppm) 13 Aluminum (ppm) 0 Copper (ppm) 0 Iron (ppm) 0 Lead (ppm) 1 Silicon (ppm) 4 Tin (ppm) 1 Suction side (reed backer)
Condition good
Appearance corrosion
Suction surface appearance

Suction reed

ConditiongoodAppearancecleanTrepanslightVarnish ringnone

Discharge side (reed backer)
Condition good
Appearance corrosion
Discharge surface appearance

corrosion

Discharge reedgoodConditiongoodAppearancecorrosionTrepanvery slightVarnish ringnone

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	none	none	none
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	very slight	black	gummy
Spring	slight	gray	gummy
Spring Seat	medium	black	gummy
Ball	medium	black	gummy
Front Side	heavy	black	gummy

0

Photographic Documentation of R-134a Compressor with Contaminant Water 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

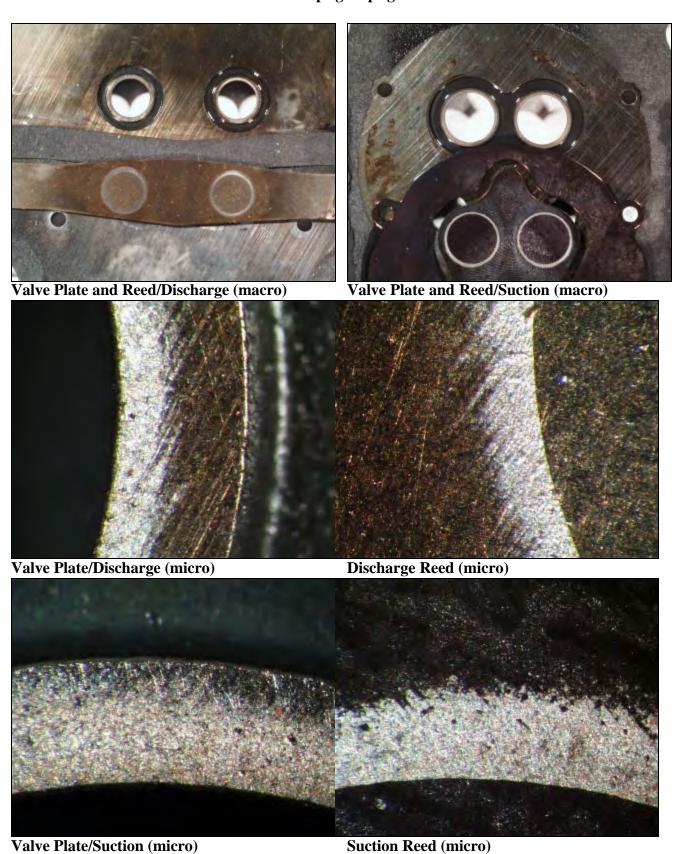


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Water 160 psig/10 psig



Report for R-134a Compressor with Contaminant Acid, Water, and R-12

TEST HISTORY OF:				
Unit Number 153				
Model # RS40C1E-IAV-250 Serial	# 96F16565	Crank journals		
Run Time (hr.) 12032 Failed	? No	Appearance	Cu plating	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2475
Contaminants:			Unloaded	1.2475
Control Unit? No		Lower crank be		1.2173
Acid? Yes R-12? Yes		Appearance	scored/Cu plating	
		Wear		
		wear	polish	
H_2O ? Yes R-502 ? No		Dimondiana	Loaded	0.0000
D: 1 D (!)	1.00	Dimensions	Loaded	0.9990
Discharge Pressure (psig)	160	.	Unloaded	0.9990
Suction Pressure (psig)	10		washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/Cu plating/co	rrosion
Return Gas Temp (°F)	63	Wear	medium	
SumpTemp (°F)	212			
		Bottom washer		
Hi-Pot	pass	Appearance	scored/Cu plating/co	rrosion
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze b	oearings	
Suction exit trail appearance	gray/Cu	Appearance	clean/scored	
Cluster block condition	good	Wear	medium	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0040
Suction ring top appearance	clean		Unloaded	1.0040
Remaining torque of discharge muffler				
(1) 7.5 (2) 7.5 (3) 5	(4) 2.5	Shaft in cage be	aring	
Remaining torque of stator bolts		Appearance	corrosion	
(1) 10 (2) 15 (3) 7.5	(4) 10	Wear	polish	
* * * * * * * * * * * * * * * * * * * *	clean		•	
Suction muffler appearance		Piston top appe	arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/scored/Cu	
Discharge plate appearance	gray/Cu	Dimensions	Loaded	1.3740
Top stator windings appearance	clean/stator top green		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	low wear/scored	
Shell bottom appearance	oxidized	Varnish ring	slight	
Quantity of bearing chips	slight	Dimensions	Loaded	1.3760
Remaining torque of discharge muffler			Unloaded	1.3760
(1) 15 (2) 20 (3) 15	(4) 12.5	Connecting rod		1.0700
Head gasket brittle?	yes/bonded	Appearance	scored/Cu plating	
Head suction cavity appearance	clean	Wear	medium	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2510
Cage bearing top appearance	dirty	Difficusions	Unloaded	1.2510
Remaining torque of cage bearing bolts			Ombaucu	1.2310
(1) 5 (2) 5 (3) 5	(4) 5			
	(1) 3			

Unit Number 153

Contaminants:Trash in liquid screen (g)0.000Control Unit?NoNumber of screens2Acid?YesR-12?YesDebris in compressor bottom (g)1.369

Valve Plate Assembly Inspection

good

slight

good

clean

none

very slight

corrosion

very slight

Suction side (reed backer)

Suction reed

Condition

Trepan

Appearance

Varnish ring

Discharge reed

Appearance

Varnish ring

Condition

Trepan

Air? No **R-22?** No **H₂O?** Yes **R-502?** No

Connecting rod (small end)

 Appearance
 contact wear/correct washer/corrosion
 Condition
 good

 Wear
 medium
 Appearance
 corrosion

 Dimensions
 Loaded
 0.5015
 Suction surface appearance

Dimensions Loaded 0.5015 Suction surface appearance Unloaded 0.5010 corrosion

Piston pin washers appearance

contact wear/Cu plating

Piston pin

Appearance scored/Cu plating/corrosion

Wear medium

Dimensions Loaded 0.4980 Unloaded 0.4980

Unloaded 0.4980 Discharge side (reed backer)

Condition good
Appearance clean

Total Acid Number (TAN) 0.80 Discharge surface appearance
Water (ppm) 69 corrosion

 Total Acid Number (TAN)
 0.80

 Water (ppm)
 69

 Fluoride ion (ppm)
 0.91

 Chloride ion (ppm)
 14

 Aluminum (ppm)
 0

 Copper (ppm)
 0

 Iron (ppm)
 1

 Lead (ppm)
 1

 Silicon (ppm)
 1

 Lead (ppm)
 1

 Silicon (ppm)
 1

 Tin (ppm)
 9

 Zinc (ppm)
 2

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium black gummy Spring medium black, brown gummy **Spring Seat** medium black gummy Ball medium black, gray gummy Front Side heavy green, white, Cu hard, not bonded

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Photographic Documentation of R-134a Compressor with Contaminant Acid, Water, and R-12 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

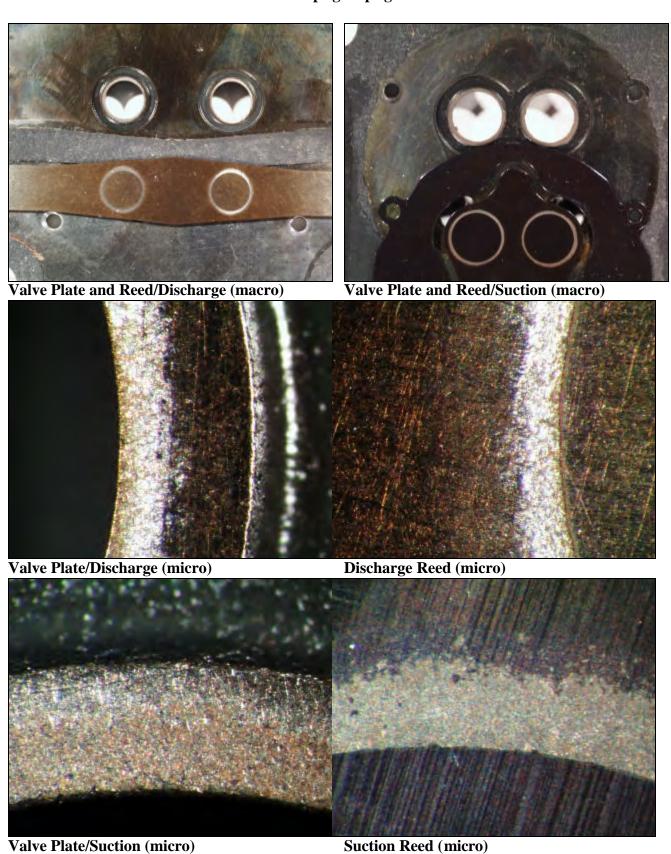


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Acid, Water, and R-12 160 psig/10 psig



Report for R-134a Compressor with Contaminant Acid, Air, Water, and R-12

Unit Number 154				
Model # RS40C1E-IAV-250 Seria	l# 96F16548	Crank journals		
Run Time (hr.) 12023 Failed	d? No	Appearance	scored/Cu plating/cor	rosion
Refrigerant R-134a		Wear	medium	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be		1.2
Acid? Yes R-12? Yes		Appearance	scored/Cu plating	
Air? Yes R-22? No		Wear	polish	
H_2O ? Yes $R-502$? No		vvcai	ponsii	
120. 10s R-302. No		Dimensions	Loaded	0.9990
Dischange Pressure (nsig)	160	Difficusions	Unloaded	0.9990
Discharge Pressure (psig)		Dottom throat		0.9990
Suction Pressure (psig)	10		washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/Cu plating	
Return Gas Temp (°F)	63	Wear	medium	
SumpTemp (°F)	212			
		Bottom washer	_	
Hi-Pot	pass	Appearance	scored/Cu plating	
High-low leak	pass	Wear	medium	
Top shell appearance	clean	Lower bronze l	_	
Suction exit trail appearance	gray/Cu	Appearance	scored	
Cluster block condition	good	Wear	polish	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0030
Suction ring top appearance	gray		Unloaded	1.0030
Remaining torque of discharge muffle				
(1) 7 (2) 2.5 (3) 2.5	(4) 5	Shaft in cage be	earing	
	* /	U		
Remaining torque of stator bolts	,	Appearance	Cu plating/corrosion	
Remaining torque of stator bolts (1) 7.5 (2) 10 (3) 7.5	(4) 10	_	Cu plating/corrosion polish	
-		Appearance	polish	
(1) 7.5 (2) 10 (3) 7.5	(4) 10	Appearance Wear	polish	
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux?	(4) 10 clean Yes	Appearance Wear Piston top appe Piston skirt	polish	
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor?	(4) 10 clean Yes No	Appearance Wear Piston top appe Piston skirt Appearance	polish arance clean low wear/scored	1.3745
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance	(4) 10 clean Yes No gray	Appearance Wear Piston top appe Piston skirt	polish arance clean low wear/scored Loaded	1.3745
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance	(4) 10 clean Yes No gray clean/stator top green	Appearance Wear Piston top appe Piston skirt Appearance Dimensions	polish arance clean low wear/scored	1.3745 1.3745
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present?	(4) 10 clean Yes No gray clean/stator top green No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore	polish arance clean low wear/scored Loaded Unloaded	
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose?	(4) 10 clean Yes No gray clean/stator top green No No	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	polish arance clean low wear/scored Loaded Unloaded no wear	
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring	polish arance clean low wear/scored Loaded Unloaded no wear very slight	1.3745
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded	1.3745 1.3760
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded	1.3745
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed (4) 17	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded (large end)	1.3745 1.3760
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle?	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed (4) 17 yes/bonded	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded (large end) scored/corrosion	1.3745 1.3760
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed (4) 17 yes/bonded dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded (large end) scored/corrosion slight	1.3745 1.3760 1.3760
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed (4) 17 yes/bonded dirty dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded (large end) scored/corrosion slight Loaded	1.3745 1.3760 1.3760 1.2510
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed (4) 17 yes/bonded dirty dirty dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded (large end) scored/corrosion slight	1.3745 1.3760 1.3760
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bold	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed (4) 17 yes/bonded dirty dirty dirty s	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded (large end) scored/corrosion slight Loaded	1.3745 1.3760 1.3760 1.2510
(1) 7.5 (2) 10 (3) 7.5 Suction muffler appearance OEM flux? Loose restrictor? Discharge plate appearance Top stator windings appearance Rotor rub marks present? Was rotor loose? Shell bottom appearance Quantity of bearing chips Remaining torque of discharge muffle (1) 17 (2) 17 (3) 15 Head gasket brittle? Head suction cavity appearance Head discharge cavity appearance Cage bearing top appearance	(4) 10 clean Yes No gray clean/stator top green No No black/Cu plate trace r removed (4) 17 yes/bonded dirty dirty dirty	Appearance Wear Piston top appe Piston skirt Appearance Dimensions Cylinder bore Appearance Varnish ring Dimensions Connecting rod Appearance Wear	polish arance clean low wear/scored Loaded Unloaded no wear very slight Loaded Unloaded (large end) scored/corrosion slight Loaded	1.3745 1.3760 1.3760 1.2510

Unit Number 154

0.019 **Contaminants:** Trash in liquid screen (g) **Control Unit?** No **Number of screens** 2 Acid? 0.382 Yes R-12? Yes Debris in compressor bottom (g) Air? Yes R-22? No

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion/Cu

No

R-502?

Wear medium

Yes

Dimensions Loaded 0.5010

Unloaded 0.5010

Piston pin washers appearance

contact wear/Cu plating

Piston pin

H₂O?

Appearance scored/Cu plating

Wear medium

Dimensions Loaded 0.4980

Unloaded	0.4980
Final Lubricant Values	
Total Acid Number (TAN)	0.52

Water (ppm) 32
Fluoride ion (ppm) 0.81
Chloride ion (ppm) 14
Aluminum (ppm) 0
Copper (ppm) 1
Iron (ppm) 4
Lead (ppm) 0

Valve Plate Assembly Inspection

Suction side (reed backer)

Condition good **Appearance** corrosion **Suction surface appearance**

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringslight

Discharge side (reed backer)

Condition good

Appearance corrosion/blued **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringslight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	very slight	tarnished	hard
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	slight	black	gummy
Spring	heavy	black, gray	hard
Spring Seat	heavy	black	gummy
Ball	medium	black, gray, brown	gummy
Front Side	heavy	black, gray	gummy

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, Water, and R-12 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

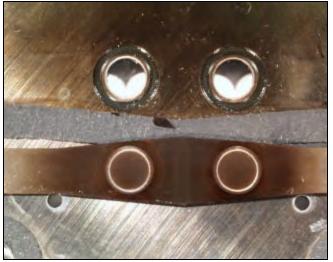


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

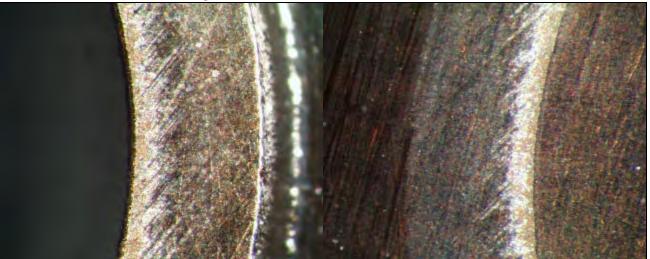
Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, Water, and R-12 160 psig/10 psig





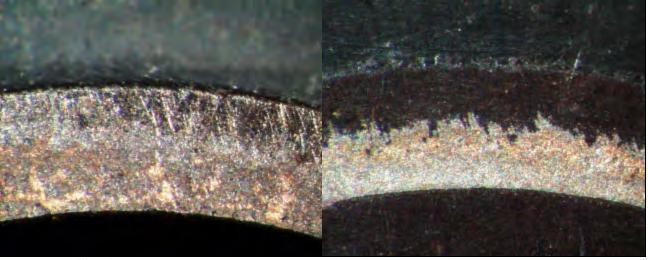
Valve Plate and Reed/Discharge (macro)

Valve Plate and Reed/Suction (macro)



Valve Plate/Discharge (micro)

Discharge Reed (micro)



Valve Plate/Suction (micro)

Suction Reed (micro)

Report for R-134a Compressor with Contaminant Air, Water, and R-12

TEST INSTORT OF.				
Unit Number 155				
Model # RS40C1E-IAV-250 Seria	l# 96F16550	Crank journals	}	
Run Time (hr.) 12109 Faile	d? No	Appearance	scored	
Refrigerant R-134a		Wear	polish, slight	
Lubricant RL32S		Dimensions	Loaded	1.2450
Contaminants:			Unloaded	1.2450
Control Unit? No		Lower crank be	earing journal	
Acid? No R-12? Yes		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes R-502 ? No			1 , 0	
		Dimensions	Loaded	0.9970
Discharge Pressure (psig)	160		Unloaded	0.9970
Suction Pressure (psig)	10	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/corrosion	
Return Gas Temp (°F)	63	Wear	polish, slight	
SumpTemp (°F)	212			
• • •		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze	bearings	
Suction exit trail appearance	gray	Appearance	scored	
Cluster block condition	good	Wear	polish, slight	
Wire to cluster block appearance	clean	Dimensions	Loaded	1.0020
Suction ring top appearance	clean		Unloaded	1.0020
Remaining torque of discharge muffle	r			
(1) 5 (2) 5 (3) 4	(4) 4	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	clean	
(1) 11 (2) 10 (3) 10	(4) 10	Wear	polish, slight	
Suction muffler appearance	clean	Piston top appe	earance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	no wear	
Discharge plate appearance	gray	Dimensions	Loaded	1.3705
Top stator windings appearance	clean		Unloaded	1.3705
Rotor rub marks present?	No	Cylinder bore		
Was rotor loose?	No	Appearance	no wear	
Shell bottom appearance	clean	Varnish ring	very slight	
Quantity of bearing chips	trace	Dimensions	Loaded	1.3740
Remaining torque of discharge muffle			Unloaded	1.3740
(1) 14 (2) 15 (3) 14	(4) 14	Connecting rod		
Head gasket brittle?	yes	Appearance	none	
Head suction cavity appearance	clean	Wear	polish, slight	
Head discharge cavity appearance	clean	Dimensions	Loaded	1.2480
Cage bearing top appearance	clean		Unloaded	1.2480
Remaining torque of cage bearing bolts				
(1) 6 (2) 5 (3) 5	(4) 5			

Unit Number

Contaminants: Trash in liquid screen (g) 0.053 **Control Unit?** No **Number of screens** 2 Acid? No R-12? Yes Debris in compressor bottom (g) 0.817

R-22? Air? Yes No H₂O? R-502? Yes No

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer Wear polish, slight Appearance Dimensions Loaded 0.4980 Suction surface appearance

Unloaded 0.4980

Piston pin washers appearance

contact wear

Piston pin

Appearance corrosion polish, slight Wear **Dimensions** Loaded

0.4955 Unloaded 0.4955

Final Lubricant Values **Total Acid Number (TAN)**

0.16 Water (ppm) 88 Fluoride ion (ppm) 1.1 Chloride ion (ppm) 13 Aluminum (ppm) 0 0 Copper (ppm) Iron (ppm) 0 Lead (ppm) 1 1

Silicon (ppm) 0 Tin (ppm) Zinc (ppm) 0 Suction side (reed backer)

Condition good corrosion

corrosion

Suction reed

Condition good corrosion **Appearance** Trepan very slight Varnish ring very slight

Discharge side (reed backer)

Condition good **Appearance** corrosion Discharge surface appearance

corrosion

Discharge reed

Condition good Appearance corrosion **Trepan** very slight Varnish ring very slight

Expansion Valve Inspection Observations

Valve Part **Residue Accumulation Residue Color Residue Description** Diaphragm Seat none none none **Rear Pin** none none none **Equalizer Hole** none none none Tip of Pin medium brown gummy Spring heavy black, gray gummy **Spring Seat** heavy black gummy Ball medium black gummy Front Side heavy black gummy

Photographic Documentation of R-134a Compressor with Contaminant Air, Water, and R-12 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

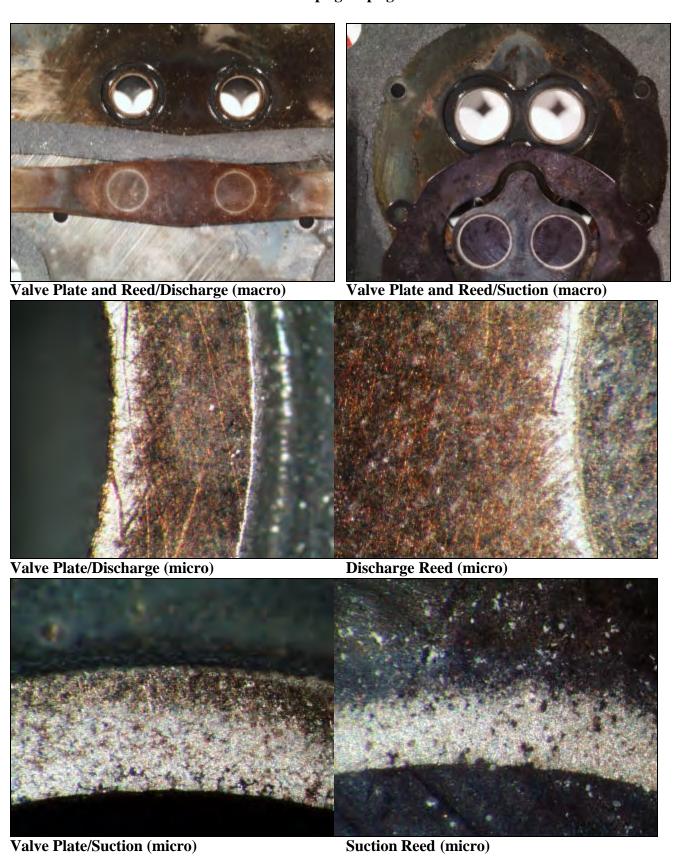


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (macro)

Photographic Documentation of R-134a Compressor with Contaminant Air, Water, and R-12 160 psig/10 psig



Report for R-134a Compressor with Contaminant Acid, Air, and Water

TEST INSTORT OF				
Unit Number 156				
Model # RS40C1E-IAV-250 Seria	l# 96F16551	Crank journals		
Run Time (hr.) 12007 Faile	d? No	Appearance	scored	
Refrigerant R-134a		Wear	slight	
Lubricant RL32S		Dimensions	Loaded	1.2470
Contaminants:			Unloaded	1.2470
Control Unit? No		Lower crank be	earing journal	
Acid? Yes R-12? No		Appearance	clean	
Air? Yes R-22? No		Wear	polish, slight	
H_2O ? Yes R-502 ? No			1 , 6	
-		Dimensions	Loaded	0.9975
Discharge Pressure (psig)	160		Unloaded	0.9975
Suction Pressure (psig)	10	Bottom thrust	washer (crank side)	
Discharge Temp (°F)	224	Appearance	scored/Cu plating	
Return Gas Temp (°F)	63	Wear	medium	
SumpTemp (°F)	212			
		Bottom washer	(casting side)	
Hi-Pot	pass	Appearance	clean/Cu plating	
High-low leak	pass	Wear	polish	
Top shell appearance	clean	Lower bronze b		
Suction exit trail appearance	gray/Cu	Appearance	scored	
Cluster block condition	good	Wear	slight	
Wire to cluster block appearance	gray	Dimensions	Loaded	1.0030
Suction ring top appearance	gray		Unloaded	1.0030
Remaining torque of discharge muffle	r			
(1) 2 (2) 2 (3) 2	(4) 2.5	Shaft in cage be	earing	
Remaining torque of stator bolts		Appearance	Cu plating	
(1) 7.5 (2) 12.5 (3) 7.5	(4) 7.5	Wear	polish	
Suction muffler appearance	gray	Piston top appe	arance clean	
OEM flux?	Yes	Piston skirt		
Loose restrictor?	No	Appearance	low wear/Cu plating	
Discharge plate appearance	black/soot/Cu	Dimensions	Loaded	1.3740
Top stator windings appearance	gray/stator top Cu		Unloaded	1.3740
Rotor rub marks present?	Yes	Cylinder bore		
Was rotor loose?	No	Appearance	no wear/soot	
Shell bottom appearance	black/Cu plate	Varnish ring	very slight	
Quantity of bearing chips	heavy	Dimensions	Loaded	1.3760
Remaining torque of discharge muffle			Unloaded	1.3760
(1) 15 (2) 15 (3) 17.5	(4) 12.5	Connecting rod		
Head gasket brittle?	yes/bonded	Appearance	scored/corrosion	
Head suction cavity appearance	dirty	Wear	medium	
Head discharge cavity appearance	dirty/Cu plate	Dimensions	Loaded	1.2515
Head discharge cavity appearance Cage bearing top appearance	dirty/Cu plate dirty	Dimensions	Loaded Unloaded	1.2515 1.2515
Head discharge cavity appearance Cage bearing top appearance Remaining torque of cage bearing bol	dirty	Dimensions		
Cage bearing top appearance	dirty	Dimensions		

Unit Number 156

 Contaminants:

 Control Unit?
 No

 Acid?
 Yes
 R-12?
 No

 Air?
 Yes
 R-22?
 No

 H₂O?
 Yes
 R-502?
 No

Trash in liquid screen (g) 0.034 Number of screens 1 Debris in compressor bottom (g) 0.987

Valve Plate Assembly Inspection

Connecting rod (small end)

Appearance contact wear/correct washer/corrosion
Wear slight

Dimensions Loaded 0.5015 Unloaded 0.5010

Piston pin washers appearance

high wear (4 contact points)/Cu plating

Piston pin

Appearance clean
Wear heavy
Dimensions Loaded

Dimensions Loaded 0.4980 **Unloaded** 0.4990

Unloaded	0.4990	
Final Lubricant Values		
Total Acid Number (TAN)	0.38	
Water (ppm)	138	
Fluoride ion (ppm)	1.1	
Chloride ion (ppm)	13	
Aluminum (ppm)	1	
Copper (ppm)	0	
Iron (ppm)	3	
Lead (ppm)	1	
Silicon (ppm)	2	
Tin (ppm)	5	
Zinc (ppm)	7	

Suction side (reed backer)

Condition good
Appearance corrosion
Suction surface appearance

corrosion

Suction reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringslight

Discharge side (reed backer)

Condition good **Appearance** corrosion **Discharge surface appearance**

corrosion

Discharge reed

ConditiongoodAppearancecorrosionTrepanvery slightVarnish ringvery slight

Expansion Valve Inspection Observations

Valve Part	Residue Accumulation	Residue Color	Residue Description
Diaphragm Seat	slight	gray, tarnished	gummy
Rear Pin	none	none	none
Equalizer Hole	none	none	none
Tip of Pin	medium	black, tan	gummy
Spring	medium	black	gummy
Spring Seat	medium	black, tan	gummy
Ball	medium	black, gray	gummy
Front Side	heavy	black	gummy

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and Water 160 psig/10 psig



Constant Pressure Expansion Valve (macro)



Ball, Pin, Seat of CPEV (micro)



Piston Assembly (macro)



Cylinder Bore (macro)

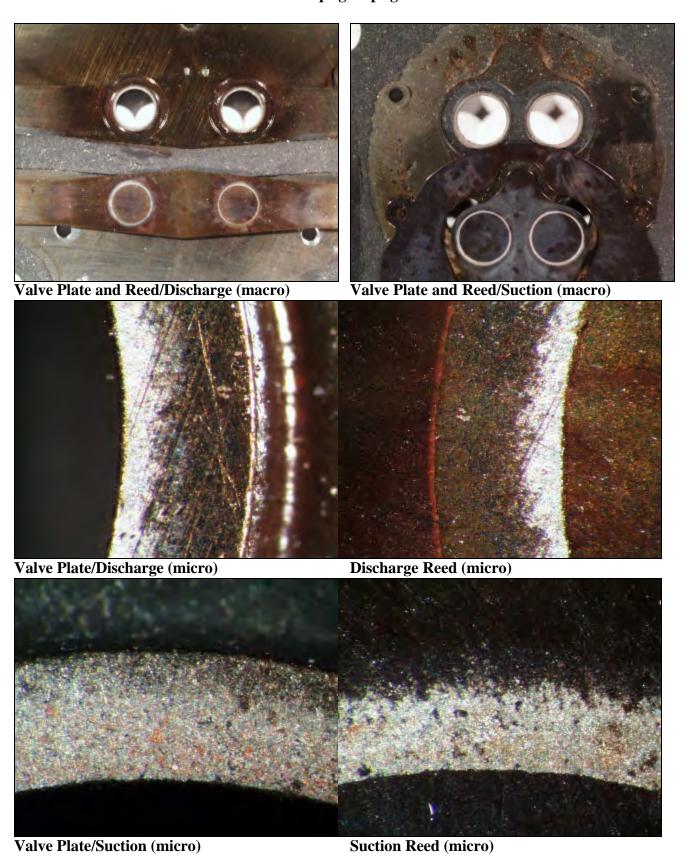


Crank Shaft (loaded) (macro)



Crank Shaft (unloaded) (ma cro)

Photographic Documentation of R-134a Compressor with Contaminant Acid, Air, and Water 160 psig/10 psig



Appendix B Moisture Analysis of Compressor Lubricants after 72 hour Break-in with Filter Driers Installed (Compressors remained at static conditions.)

Moisture Analysis after 72 hours at Break-in Conditions with 4AXH-6 Filter Drier Installed in Compressors Containing R-507A and Lubricant RL32S Table B.1

Water
(ppm)
18
22 25
25
30
17
11
12
12
13
21
12
17
18
21
12
13
16
15
18
10
17
11
14
12
16
21
10
7
29
12
10
14 29
29
14
13
9

Moisture Analysis after 72 hours at Break-in Conditions with XH-11 Filter Drier Installed in Compressors Containing R-407C and Lubricant RL32S Table B.2

	Water
Stand	(ppm)
41	29
42	12
43	24
44	17
45	21
46	18
47	13
48	13
49	13
50	7
51	18
52	17
53	17
53 54	14
55	22
56	17
57	12
58	12
59	10
60	10
61	15
62	17
63	15
64	8
65	12
66	14
67	13
68	13
69	19
70	17
71	16
72	12
73	13
74	17
75	15
76	21

Moisture Analysis after 72 hours at Break-in Conditions with 4AXH-6 Filter Drier Installed in Compressors Containing R-22 and Lubricant 3GS Table B.3

	Water
Stand	(ppm)
85	8
86	5
87	4
88	28
89 90 91 92 93 94 95 96 97 98 99	5
90	5
91	3
92	5
93	3
94	5
95	3
96	2
97	3
98	7
99	5
100	5
101	5
102	(ppm) 8 5 4 28 5 3 5 3 5 3 5 3 5 5 5 5 8
103	8
104	16
105	8
106	16
107	3
108	3
109	16 3 3 2
110	1
111	11
112	12
113	42
114	22
115	40
116	20
117	27
118	33
119	20 27 33 28 27
120	27
_	-

Moisture Analysis after 72 hours at Break-in Conditions with 4AXH-6 Filter Drier Installed in Compressors Containing R-134a and Lubricant RL32S Table B.4

	Water
Stand	(ppm)
121	24
122	12
123A*	74
124	19
125	17
126	19
127	13
128	15
129	14
130	37
131	22
132	16
133	23
134	16
135	13
136	16
137	15
138	23
139	18
140	12
141	12
142	21
143	21
144	26
145	11
146	9
147	30
148	11
149	13
150	14
151	31
152	15
153	27
154	24
155	17
156	19
* original pr	m water – 21

^{*} original ppm water = 21

Appendix C

Moisture and TAN Analysis of Compressor Lubricants after Contaminant Addition and 120 hours Running Drawn with Filter Driers Removed while the System Was Running

Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed after 120 hours while Compressors Were Running (Dynamic) at Test Conditions with R-507A and RL32S

Table C.1

Water		
(ppm)	TAN*	Miscellaneous
34	0.03	High D Temp
31	0.03	High D Temp
20	0.01	High D Temp
27	0.01	High D Temp
15	0.03	High D Temp
6	0.02	High D Temp
8	0.01	High D Temp
	0.02	High D Temp
11	0.03	High D Temp
15	0.07	High D Temp
9	0.02	High D Temp
6	0.08	High D Temp
11	0.02	High D Temp
21	0.04	High D Temp
5	0.04	High D Temp
10	0.03	High D Temp
17	0.01	High D Temp
9	0.02	High D Temp
14	0.01	Low D Temp
6	0.01	Low D Temp
9	0.10	Low D Temp
10	0.01	Low D Temp
7	0.07	Low D Temp
16	0.03	Low D Temp
13	0.09	Low D Temp
4	0.08	Low D Temp
11	0.03	Low D Temp
4	0.08	Low D Temp
11	0.06	Low D Temp
23	0.08	Low D Temp
26	0.05	Low D Temp
15	0.07	Low D Temp
22	0.08	Low D Temp
21	0.04	Low D Temp
14	0.08	Low D Temp
18	0.03	Low D Temp
	(ppm) 34 31 20 27 15 6 8 7 11 15 9 6 11 21 5 10 17 9 14 6 9 10 7 16 13 4 11 23 26 15 22 21 14 18	(ppm) TAN* 34 0.03 31 0.03 20 0.01 27 0.01 15 0.03 6 0.02 8 0.01 7 0.02 11 0.03 15 0.07 9 0.02 6 0.08 11 0.02 21 0.04 5 0.04 10 0.03 17 0.01 9 0.10 10 0.01 9 0.10 10 0.01 7 0.07 16 0.03 13 0.09 4 0.08 11 0.03 4 0.08 11 0.06 23 0.08 26 0.05 15 0.07 22 0.08 21 <t< td=""></t<>

^{*} KOH (mg)/RL32S (g)

Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed after 120 hours while Compressors Were Running (Dynamic) at Test Conditions with R-407C and RL32S

Table C.2

	Water		
Stand	(ppm)	TAN*	Miscellaneous
41	22	0.02	Low D Temp
42	12	0.10	Low D Temp
43	8	0.06	Low D Temp
44	32	0.01	Low D Temp
45	12	0.07	Low D Temp
46	12	0.02	Low D Temp
47	15	0.08	Low D Temp
48	16	0.13	Low D Temp
49	10	0.05	Low D Temp
50	13	0.15	Low D Temp
51	64	0.08	Low D Temp
52	62	0.01	Low D Temp
53	22	0.01	Low D Temp
54	49	0.10	Low D Temp
55	60	0.10	Low D Temp
56	99	0.07	Low D Temp
57	47	0.01	Low D Temp
58	68	0.01	Low D Temp
59	21	0.01	High D Temp
60	32	0.01	High D Temp
61	34	0.01	High D Temp
62	58	0.02	High D Temp
63	30	0.09	High D Temp
64	18	0.01	High D Temp
65	26	0.08	High D Temp
66	30	0.05	High D Temp
67	40	-	High D Temp
68	24	0.09	High D Temp
69	36	0.02	High D Temp
70	53	0.08	High D Temp
71	48	0.04	High D Temp
72	42	0.03	High D Temp
73	43	0.07	High D Temp
74	47	0.08	High D Temp
75	36	0.05	High D Temp
76	316	0.08	High D Temp
Shading in	dicates that c	ontaminant w	ater or acid was added to th

^{*} KOH (mg)/RL32S (g)

Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed after 120 hours while Compressors Were Running (Dynamic) at Test Conditions with R-22 and 3GS

Table C.3

Stand	Water (ppm)	TAN*	Miscellaneous
85	(pp m)		
86	12	0.01	Low D Temp Low D Temp
87	0	0.01	Low D Temp
88	29		
89	32	0.06	Low D Temp
90	2	0.04	Low D Temp Low D Temp
90	6	0.01	
92		<0.01	Low D Temp
92	2 2		Low D Temp
93	0	0.01	Low D Temp
	0	0.01	Low D Temp
95	_	0.06	Low D Temp
96	0	0.06	Low D Temp
97	_	0.05	Low D Temp
98	34	0.06	Low D Temp
99	64	0.01	Low D Temp
100	3	0.01	Low D Temp
101	2	0.06	Low D Temp
102	2	0.07	Low D Temp
103	4	0.02	High D Temp
104	9	0.01	High D Temp
105	9	0.03	High D Temp
106	1	0.02	High D Temp
107	2	0.01	High D Temp
108	4	0.04	High D Temp
109	3	0.02	High D Temp
110	8	0.03	High D Temp
111	11	0.01	High D Temp
112	2	0.02	High D Temp
113	1	0.04	High D Temp
114	2	0.03	High D Temp
115	7	0.03	High D Temp
116	4	0.03	High D Temp
117	2	0.02	High D Temp
118	0	0.03	High D Temp
119	4	0.01	High D Temp
120	4	0.04	High D Temp

^{*} KOH (mg)/3GS (g)

Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed after 120 hours while Compressors Were Running (Dynamic) at Test Conditions with R-134a and RL32S

Table C.4

Refrige	Refrigerant: R-134a Lu		Lu	bricant: RL32S
	Water			
Stand	(ppm)	TAN	[*	Miscellaneous
121	40	0.02	2	Low D Temp
122	31	0.04	1	Low D Temp
123	0	0.01	Į	Low D Temp
124	29	0.01		Low D Temp
125	28	0.08	3	Low D Temp
126	31	0.01		Low D Temp
127	31	0.07	7	Low D Temp
128	27	0.07	7	Low D Temp
129	21	0.04	1	Low D Temp
130	29	0.07	7	Low D Temp
131	29	0.03	3	Low D Temp
132	57	0.08	3	Low D Temp
133	51	0.07	7	Low D Temp
134	51	0.02	2	Low D Temp
135	36	0.11		Low D Temp
136	41	0.13	3	Low D Temp
137	38	0.03	3	Low D Temp
138	50	0.10)	Low D Temp
139	19	0.02	2	High D Temp
140	15	0.02	2	High D Temp
141	25	0.03	3	High D Temp
142	15	0.03	3	High D Temp
143	12	0.07	7	High D Temp
144	16	0.03	3	High D Temp
145	23	0.05	5	High D Temp
146	18	0.04		High D Temp
147	27	0.09)	High D Temp
148	34	0.12	2	High D Temp
149	44	0.01		High D Temp
150	25	0.05	5	High D Temp
151	35	0.01		High D Temp
152	27	0.04	1	High D Temp
153	32	0.09)	High D Temp
154	30	0.08	3	High D Temp
155	29	0.08		High D Temp
156	35	0.08	3	High D Temp

Shading indicates that contaminant water or acid was added to the unit. * KOH (mg)/RL32S (g)

Appendix D

Moisture and TAN Analysis of Compressor Lubricants after Contaminant Addition and 120 hours Running Drawn with Filter Driers Removed while the System Was Static

Moisture and TAN Analysis of Lubricant Samples Drawn at Ambient Conditions with Filter Driers Removed after Compressors Were Static for 20 days after 120 hours at Test Conditions with R-507A and RL32S Table D.1

	Water		
Stand	(ppm)	TAN*	Miscellaneous
5	35	0.07	High D Temp
6	28	0.03	High D Temp
7	23	0.03	High D Temp
8	57	0.01	High D Temp
9	16	0.08	High D Temp
10	19	0.02	High D Temp
11	16	0.05	High D Temp
12	11	0.08	High D Temp
13	25	0.03	High D Temp
14	11	0.07	High D Temp
15	55	0.03	High D Temp
16	48	0.03	High D Temp
17	5	0.04	High D Temp
18	57	0.03	High D Temp
19	48	0.07	High D Temp
20	57	0.08	High D Temp
21	81	0.04	High D Temp
22	62	0.05	High D Temp
23	15	0.03	Low D Temp
24	7	0.01	Low D Temp
25	7	0.02	Low D Temp
26	15	0.02	Low D Temp
27	24	0.10	Low D Temp
28	16	0.02	Low D Temp
29	12	0.10	Low D Temp
30	5	0.10	Low D Temp
31	11	0.02	Low D Temp
32	3	0.09	Low D Temp
33	25	0.01	Low D Temp
34	52	0.10	Low D Temp
35	56	0.02	Low D Temp
36	51	0.03	Low D Temp
37	55	0.11	Low D Temp
38	51	0.11	Low D Temp
39	52	0.03	Low D Temp
40	56	0.10	Low D Temp

Shading indicates that contaminant water or acid was added to the unit. * KOH (mg)/RL32S (g)

Moisture and TAN Analysis of Lubricant Samples Drawn at Ambient Conditions with Filter Driers Removed after Compressors Were Static for 20 days after 120 hours at Test Conditions with R-407C and RL32S Table D.2

	Water		
Stand	(ppm)	TAN*	Miscellaneous
41	12	0.04	Low D Temp
42	12	0.01	Low D Temp
43	13	0.03	Low D Temp
44	12	0.01	Low D Temp
45	12	0.14	Low D Temp
46	9	0.02	Low D Temp
47	10	0.10	Low D Temp
48	14	0.11	Low D Temp
49	18	0.03	Low D Temp
50	12	0.09	Low D Temp
51	77	0.02	Low D Temp
52	75	0.10	Low D Temp
53	37	0.02	Low D Temp
54	66	0.02	Low D Temp
55	69	0.11	Low D Temp
56	80	0.13	Low D Temp
57	58	0.03	Low D Temp
58	57	0.08	Low D Temp
59	8	0.05	High D Temp
60	13	0.03	High D Temp
61	28	0.03	High D Temp
62	68	0.03	High D Temp
63	13	0.09	High D Temp
64	8	0.02	High D Temp
65	23	0.09	High D Temp
66	33	0.10	High D Temp
67	5	0.02	High D Temp
68	12	0.09	High D Temp
69	56	0.03	High D Temp
70	56	0.10	High D Temp
71	54	0.03	High D Temp
72	38	0.04	High D Temp
73	42	0.11	High D Temp
74	42	0.09	High D Temp
75	106	0.03	High D Temp
76	48	0.10	High D Temp

Shading indicates that contaminant water or acid was added to the unit. * KOH (mg)/RL32S (g)

Moisture and TAN Analysis of Lubricant Samples Drawn at Ambient Conditions with Filter Driers Removed after Compressors Were Static for 20 days after 120 hours at Test Conditions with R-22 and 3GS Table D.3

Water		
(ppm)	TAN*	Miscellaneous
0	0.02	Low D Temp
2	0.04	Low D Temp
0	0.03	Low D Temp
9	0.06	Low D Temp
0	0.04	Low D Temp
0	0.04	Low D Temp
0	0.08	Low D Temp
0	0.10	Low D Temp
1	0.03	Low D Temp
1	0.02	Low D Temp
0	0.11	Low D Temp
0	0.08	Low D Temp
2	0.11	Low D Temp
2	0.06	Low D Temp
20	0.02	Low D Temp
2	0.03	Low D Temp
0	0.10	Low D Temp
0	0.13	Low D Temp
0	0.03	High D Temp
0	0.02	High D Temp
8	0.09	High D Temp
0	0.01	High D Temp
0	0.02	High D Temp
0	0.07	High D Temp
0	0.16	High D Temp
0	0.11	High D Temp
2	0.05	High D Temp
0	0.03	High D Temp
0	0.09	High D Temp
0	0.11	High D Temp
0	0.08	High D Temp
0	0.06	High D Temp
2	0.03	High D Temp
1	0.03	High D Temp
0	0.09	High D Temp
0	0.05	High D Temp
	0 2 0 9 0 0 0 0 0 1 1 1 0 0 2 2 2 2 0 0 0 0 0 0	(ppm) TAN* 0 0.02 2 0.04 0 0.03 9 0.06 0 0.04 0 0.04 0 0.08 0 0.10 1 0.03 1 0.02 0 0.11 0 0.08 2 0.11 2 0.06 20 0.02 2 0.03 0 0.13 0 0.03 0 0.01 0 0.01 0 0.02 8 0.09 0 0.01 0 0.02 8 0.09 0 0.01 0 0.05 0 0.01 0 0.03 0 0.03 0 0.03 0 0.03 0 0.03

^{*} KOH (mg)/3GS (g)

Moisture and TAN Analysis of Lubricant Samples Drawn at Ambient Conditions with Filter Driers Removed after Compressors Were Static for 20 days after 120 hours at Test Conditions with R-134a and RL32S Table D.4

	Water		
Stand	(ppm)	TAN*	Miscellaneous
121	33	0.03	Low D Temp
122	22	0.02	Low D Temp
123	13	0.03	Low D Temp
124	20	0.02	Low D Temp
125	14	0.11	Low D Temp
126	16	0.01	Low D Temp
127	15	0.10	Low D Temp
128	5	0.09	Low D Temp
129	9	0.03	Low D Temp
130	15	0.10	Low D Temp
131	44	0.03	Low D Temp
132	52	0.10	Low D Temp
133	62	0.04	Low D Temp
134	60	0.01	Low D Temp
135	53	0.06	Low D Temp
136	59	0.12	Low D Temp
137	43	0.06	Low D Temp
138	53	0.10	Low D Temp
139	15	0.03	High D Temp
140	14	0.02	High D Temp
141	15	0.02	High D Temp
142	17	0.02	High D Temp
143	13	0.07	High D Temp
144	12	0.02	High D Temp
145	7	0.09	High D Temp
146	26	0.09	High D Temp
147	10	0.02	High D Temp
148	55	0.08	High D Temp
149	49	0.03	High D Temp
150	15	0.05	High D Temp
151	60	0.03	High D Temp
152	48	0.05	High D Temp
153	80	0.08	High D Temp
154	59	0.08	High D Temp
155	52	0.02	High D Temp
156	69	0.08	High D Temp

^{*} KOH (mg)/RL32S (g)

Appendix E First Dynamic Moisture, TAN, and Gas Analysis of Test Systems after Complete Addition of Water, Organic Acid, Air, and Contaminant Refrigerant

First Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed and Air and Refrigerant Contamination Analysis of Circulating Gas+: R-507A and RL32S Table E.1

	Lubricant	Water ²			Air ⁴	R-502	
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
5	CLY	92	0.03	543	0.30	0.10	High D Temp
6	С	29	0.09	575	0.13	0.09	High D Temp
7	CLY	75	0.10	581	0.23	0.11	High D Temp
8	CLY	62	0.14	582	0.20	3.8	High D Temp
9	CY	74	0.16	594	0.20	0.09	High D Temp
10	CDY	51	0.09	582	1.3	0.09	High D Temp
11	CLY	39	0.16	2382	0.36	3.5***	High D Temp
12	CY	51	0.09	1821	0.59	4.7*	High D Temp
13	CDY	67	0.07	593	3.1	3.7	High D Temp
14	CDY	55	0.07	576	1.5	0.09	High D Temp
15	CLY	67	0.14	593	0.43	4.0	High D Temp
16	С	86	0.15	562	0.23	0.09	High D Temp
17	CY	47	0.39	565	0.24	0.10	High D Temp
18	CG	68	0.21	593	0.23	0.09	High D Temp
19	CY	70	0.16	598	0.23	4.2	High D Temp
20	CY	27	0.29	2524	2.6	3.9***	High D Temp
21	CY	63	0.12	783	2.6	4.1***	High D Temp
22	CDY	80	0.11	589	3.2	0.09	High D Temp
23	С	81	0.10	617	0.43	0.10	Low D Temp
24	С	62	0.05	617	0.40	0.10	Low D Temp
25	С	58	0.06	618	0.40	0.10	Low D Temp
26	С	67	0.05	609	0.30	3.8	Low D Temp
27	С	152	0.11	619	0.40	0.07	Low D Temp
28	С	80	0.06	604	2.8	0.03	Low D Temp
29	С	73	0.13	617	0.40	3.8	Low D Temp
30	С	68	0.10	620	3.7	3.7	Low D Temp
31	С	74	0.09	2477	2.8	3.9***	Low D Temp
32	С	57	0.10	601	3.0	0.03	Low D Temp
33	С	71	0.05	590	1.2	4.0	Low D Temp
34	С	198	0.71	621	0.56	0.05	Low D Temp
35	С	105	0.06	620	3.2	0.09	Low D Temp
36	insufficient	sample	0.10	621	2.5	0.08	Low D Temp
37	С	152	0.12	2532	4.1	4.3***	Low D Temp
38	С	26	0.14	2529	2.8	4.7***	Low D Temp
39	С	95	0.06	2484	3.1	3.8***	Low D Temp
40	С	80	0.09	630	3.7	0.09	Low D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminant added to the unit.

¹ C = clear, CLY = clear light yellow, CY = clear yellow, CDY = clear dark yellow, CG = clear gray

² Samples drawn at 2030-2050 hours.

³ Hour gas sample drawn. ⁴ % volume of refrigerant

⁵ KOH (mg)/RL32S (g)
* Additional contaminant refrigerant added.

^{***} Additional test refrigerant added.

First Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed and Air and Refrigerant Contamination Analysis of Circulating Gas⁺: R-407C and RL32S Table E.2

	Lubricant	Water ²			Air ⁴	R-22	
Stand	Appearance ¹	(ppm)	TAN ^{2,7}	Hours ³	(%)	(%)	Miscellaneous
41	С	64	0.13	855	0.43	0.04	Low D Temp
42	С	25	0.08	803	0.49	0.00	Low D Temp
43	С	61	0.01	856	0.37	0.04	Low D Temp
44	С	58	0.03	2560	1.4	3.5***	Low D Temp
45	С	89	0.12	837	0.40	0.06	Low D Temp
46	С	80	0.06	805	1.6	0.14	Low D Temp
47	С	155	0.14	1842	0.72	3.6*	Low D Temp
48 ⁵	С	212	0.12	2541	2.8**	4.7***	Low D Temp
49	С	510	0.05	1815	2.9	4.1*	Low D Temp
50	С	389	0.11	1818	1.4**	0.28	Low D Temp
51	С	87	0.06	1867	0.52	4.2	Low D Temp
52	С	194	0.13	858	0.52	0.00	Low D Temp
53	CLY	71	0.05	1596	3.1	0.06	Low D Temp
54	С	99	0.08	1595	0.84	0.07	Low D Temp
55	С	208	0.14	1580	0.46	4.6	Low D Temp
56	С	161	0.12	1820	1.2	3.9*	Low D Temp
57	С	174	0.02	1868	1.9	4.5*	Low D Temp
58	С	150	0.08	1598	2.1	0.05	Low D Temp
59	С	60	0.05	1602	0.37	0.05	High D Temp
60	С	28	0.05	1600	0.92	0.05	High D Temp
61	С	86	0.04	1600	1.5	0.05	High D Temp
62	CLY	74	0.06	2173	0.17	3.8***	High D Temp
63	С	54	0.13	1598	0.26	0.05	High D Temp
64	CY	99	0.13	1559	3.6	0.26	High D Temp
65	С	72	0.15	2575	0.78	3.7***	High D Temp
66	CLY	77	0.09	2497	2.3**	4.0***	High D Temp
67	CLY	175	0.07	2559	1.3	3.7***	High D Temp
68	CY	80	0.10	1563	2.9	0.05	High D Temp
69	С	97	0.06	1616	1.0	3.7	High D Temp
70	С	128	0.08	1604	1.4	0.04	High D Temp
71	С	125	0.04	1605	2.8	0.06	High D Temp
72	С	171	0.06	1620	0.78	0.03	High D Temp
73	С	54	0.12	1618	0.72	3.6	High D Temp
74 ⁶	С	163	0.09	2364	1.3	4.8	High D Temp
75	С	256	0.12	1619	2.4	3.6	High D Temp
76	С	104	0.13	1615	1.9	0.06	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminant added to the unit.

¹ C = clear, CLY = clear light yellow, CY = clear yellow

² Samples drawn at 2030-2050 hours.

³ Hour gas sample drawn.

⁴ % volume of refrigerant

⁵ Repaired, pumped down, filled with R-407C, and re-inoculated with contaminants.

⁶ Low lubricant, pumped down, filled with R-407C, and re-inoculated with contaminants.

⁷ KOH (mg)/RL32S (g)

^{*} Additional contaminant refrigerant added.

^{**} Additional contaminant air added.

^{***} Additional test refrigerant added.

First Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed and Air and Refrigerant Contamination Analysis of Circulating Gas+: R-22 and 3GS Table E.3

	Lubricant	Water ²			Air ⁴	
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	Miscellaneous
85	CLY	10	0.02	761	3.8	Low D Temp
86	CY	0.00	0.03	741	0.75	Low D Temp
87	CLY	9.7	0.03	752	0.20	Low D Temp
88	CY	33	0.07	762	2.9	Low D Temp
89	CLY	19	0.04	762	2.4	Low D Temp
90	CLY	5.4	0.01	761	0.20	Low D Temp
91	CY	14	0.06	780	2.8	Low D Temp
92	CLY	3.5	0.09	780	3.6	Low D Temp
93	CY	17	0.02	781	5.2	Low D Temp
94	CY	7.4	0.02	781	13	Low D Temp
95	CLY	7.4	0.10	781	5.3	Low D Temp
96	CLY	2.4	0.09	781	3.8	Low D Temp
97	CY	7.7	0.09	782	0.40	Low D Temp
98	CLY	13	0.08	782	2.9	Low D Temp
99	CY	10	0.01	762	2.9	Low D Temp
100	CY	16	0.03	783	2.2	Low D Temp
101	CY	12	0.07	784	1.4	Low D Temp
102	CLY	1.8	0.05	784	1.9	Low D Temp
103	CLY	11	0.01	778	1.6	High D Temp
104	CLY	0.00	0.02	765	0.23	High D Temp
105	CDY	20	0.06	760	1.9	High D Temp
106	insufficient	sample	0.02	781	0.78	High D Temp
107	CY	9.4	0.04	799	0.46	High D Temp
108	CY	29	0.03	776	0.78	High D Temp
109	CLY	16	0.06	785	0.63	High D Temp
110	CY	17	0.04	779	0.40	High D Temp
111	CDY	23	0.03	755	2.4	High D Temp
112	CDY	13	0.04	804	1.4	High D Temp
113	CDY	21	0.08	805	1.3	High D Temp
114	CDY	12	0.05	805	1.1	High D Temp
115	CY	14	0.05	790	2.7	High D Temp
116	CDY	13	0.07	794	1.1	High D Temp
117	CDY	25	0.04	801	1.6	High D Temp
118	CDY	18	0.05	770	1.3	High D Temp
119	CDY	1.3	0.07	786	1.5	High D Temp
120	CDY	20	0.08	800	1.2	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions. Shading indicates contaminant added to the unit.

¹ CLY = clear light yellow, CY = clear yellow, CDY = clear dark yellow ² Samples drawn at 2030-2050 hours.

Hour gas sample drawn.

We volume of refrigerant

⁵ KOH (mg)/3GS (g)

First Moisture and TAN Analysis of Lubricant Samples Drawn with Filter Driers Removed and Air and Refrigerant Contamination Analysis of Circulating Gas+: R-134a and RL32S Table E.4

	Lubricant	Water ²			Air ⁴	R-12	
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
121	С	63	0.04	659	1.2	0.00	Low D Temp
122	С	91	0.05	633	0.54	0.01	Low D Temp
123	insufficient sa	ample	0.02	661	0.37	0.00	Low D Temp
124	insufficient sa	ample	0.09	661	1.7	3.8	Low D Temp
125	С	89	0.12	663	1.0	0.00	Low D Temp
126	С	83	0.04	655	1.5	0.04	Low D Temp
127	С	66	0.11	663	0.27	4.8	Low D Temp
128	С	71	0.10	663	0.72	3.8	Low D Temp
129	С	67	0.03	251	1.2	3.7	Low D Temp
130	С	69	0.07	665	0.68	0.01	Low D Temp
131	С	99	0.10	2585	0.41	3.3***	Low D Temp
132	С	93	0.09	665	0.85	0.00	Low D Temp
133	С	102	0.04	660	2.2	0.01	Low D Temp
134	insufficient	sample	0.06	667	0.65	0.00	Low D Temp
135	С	113	0.12	2567	0.24	3.3***	Low D Temp
136	С	152	0.10	667	0.78	4.0	Low D Temp
137	С	113	0.07	1864	0.61	3.9***	Low D Temp
138	С	106	0.08	645	0.61	0.03	Low D Temp
139	С	179	0.06	679	0.55	0.00	High D Temp
140	С	29	0.06	679	0.17	0.02	High D Temp
141	С	71	0.04	681	0.24	0.01	High D Temp
142	С	100	0.09	2472	0.75	3.7***	High D Temp
143	CY	89	0.08	656	1.3	0.00	High D Temp
144	CLY	93	0.06	676	0.82	0.02	High D Temp
145	С	75	0.11	2563	0.10	4.0***	High D Temp
146	С	98	0.08	678	0.68	4.1	High D Temp
147	С	87	0.09	655	0.99	4.2	High D Temp
148	CLY	92	0.10	638	0.61	0.01	High D Temp
149	С	68	0.10	672	0.20	3.9	High D Temp
150	С	93	0.08	680	0.10	0.00	High D Temp
151	С	0.00	0.05	665	0.68	0.04	High D Temp
152	С	85	0.08	649	0.17	0.00	High D Temp
153	С	111	0.11	689	0.20	4.4	High D Temp
154	С	34	0.08	2560	0.20	4.1***	High D Temp
155	С	114	0.06	689	0.72	4.6	High D Temp
156	CLY	104	0.11	1871	0.75	0.02	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions. Shading indicates contaminant added to the unit.

¹ C = clear, CLY = clear light yellow, CY = clear yellow ² Samples drawn at 2030-2050 hours.

³ Hour gas sample drawn. ⁴ % volume of refrigerant

⁵ KOH (mg)/RL32S (g)
*** Additional test refrigerant added.

Appendix F Second Dynamic Moisture, TAN, and Gas Analysis of Test Systems after Complete Addition of Water, Organic Acid, Air, and Contaminant Refrigerant

R-507A and RL32S

Table F.1

C41	Lubricant	Water ²	TE A N 2.5	TT3	Air ⁴	R-502	Messellessesses
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
5	DY	61	0.29	10524	0.19	0.02	High D Temp
6	G	89	0.10	9300	1.4	0.11	High D Temp
7	LY	79	0.48	8823	0.14	0.09	High D Temp
8	LY	40	0.36	9283	0.08	4.0	High D Temp
9	failed			5368	0.68	0.10	High D Temp
10	DY	43	0.19	9295	0.53	0.10	High D Temp
11	G	47	0.22	8999	0.16	3.9	High D Temp
12	Y	52	0.44	9141	0.27	4.3	High D Temp
13	DY	92	0.29	9250	0.83	3.7	High D Temp
14	DY	46	0.49	9231	0.85	0.08	High D Temp
15	Y	33	0.66	8886	0.16	4.0	High D Temp
16	LY	50	0.77	9319	0.25	0.08	High D Temp
17	G	47	0.45	9337	0.12	0.12	High D Temp
18	LY	47	0.68	9423	0.32	0.08	High D Temp
19	LY	58	1.1	9249	0.23	4.4	High D Temp
20	DY	46	0.44	9299	0.44	4.1	High D Temp
21	DY	40	0.82	3487	0.75	4.9	High D Temp
22	DY	81	0.66	9205	1.1	0.08	High D Temp
23	Y	110	0.04	8995	1.3	0.07	Low D Temp
24	С	53	0.01	9216	0.19	0.07	Low D Temp
25	С	98	0.04	9176	1.2	0.08	Low D Temp
26	С	73	0.01	8779	0.24	3.9	Low D Temp
27	С	65	0.05	9101	0.31	0.05	Low D Temp
28	LY	71	0.04	8671	1.1	0.02	Low D Temp
29	С	52	0.13	8768	0.27	3.7	Low D Temp
30	DY	57	0.11	7822	0.94	3.7	Low D Temp
31	LY	79	0.03	8544	0.80	3.8	Low D Temp
32	Y	57	0.12	8234	0.64	0.04	Low D Temp
33	С	56	0.01	8418	0.38		Low D Temp
34	С	insufficien	t sample	9295	0.05	0.09	Low D Temp
35				iled			Low D Temp
36	С	89	0.08	9186	0.82		Low D Temp
37	C	390	0.14	8953	0.77	4.2	Low D Temp
38	DY	59	0.15	9010	0.83	3.6	Low D Temp
39	LY	64	0.04	9177	0.65	4.0	Low D Temp
40	Y	52	0.20	9094	0.94	0.12	Low D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit.

C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray

² Samples drawn at ≤9600 hours.

³ Hour gas sample drawn.

⁴ % volume of refrigerant

⁵ KOH (mg)/RL32S (g)

R-407C and RL32S Table F.2

	Lubricant	Water ²	2.5	2	Air ⁴	R-22	
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
41	С	52	0.01	8397	0.27	0.04	Low D Temp
42	С	53	0.01	9246	0.67	0.13	Low D Temp
43	С	insufficient sa		9489	0.23	0.05	Low D Temp
44	С	41	0.05	9430	1.2	2.7	Low D Temp
45	С	140	0.10	9290	0.18	0.05	Low D Temp
46	С	110	0.03	9487	0.75	0.10	Low D Temp
47	C	130	0.08	8651	0.76	0.04	Low D Temp
48	С	64	0.09	8700	1.4	5.9	Low D Temp
49	С	47	0.03	9428	1.1	4.6	Low D Temp
50	Y	97	0.09	8277	0.46	0.07	Low D Temp
51	С	98	0.05	8969	0.50	3.9	Low D Temp
52	С	190	0.12	9368	0.18	0.04	Low D Temp
53	С	130	0.18	9234	0.94	0.04	Low D Temp
54	С	140	0.03	9502	0.27	0.05	Low D Temp
55		failed					Low D Temp
56	С	160	0.01	9521	0.61	3.3	Low D Temp
57	С	180	0.05	8946	0.87	5.0	Low D Temp
58	С	74	0.12	8724	0.23	0.04	Low D Temp
59	LY	82	0.10	5583	0.12	0.05	High D Temp
60	LY	74	0.05	9240	0.65	0.05	High D Temp
61	LY	insufficient sa	mple	9244	0.48	0.05	High D Temp
62	Y	260	0.12	8545	0.41	4.0	High D Temp
63	LY	insufficient sample	0.06	8873	0.22	0.07	High D Temp
64	DY	170	0.18	9178	1.5	0.04	High D Temp
65	DY	100	0.25	8668	0.39	3.6	High D Temp
66	DY	85	0.18	9115	0.93	5.1	High D Temp
67	LY	insufficient sa	mple	9075	0.41	.36	High D Temp
68	DY	82	0.20	9019	1.3	0.05	High D Temp
69			failed		•		High D Temp
70	Y	110	0.18	9196	0.40	0.05	High D Temp
71			failed				High D Temp
72	С	390	0.08	8835	0.55	0.03	High D Temp
73	С	73	0.17	9110	0.21	3.8	High D Temp
74	Y	90	0.20	8751	1.7	3.6	High D Temp
75	Y	71	0.09	9134	0.68	3.7	High D Temp
76	DY	110	0.20	9328	2.2	0.05	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit.

C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray

² Samples drawn at ≤9600 hours.

³ Hour gas sample drawn.

⁴ % volume of refrigerant

⁵ KOH (mg)/RL32S (g)

Table F.3

Stand Appearance¹ (ppm) TAN⁴S Hours³ (%) Miscellaneous 85 LY 15 0.01 9068 0.10 Low D Temp 86 DY 23 0.06 8936 0.28 Low D Temp 87 LY 14 0.01 9350 0.18 Low D Temp 88 DY 38 0.03 9378 1.3 Low D Temp 89 Y 15 0.04 9408 0.19 Low D Temp 90 LY 15 0.04 9367 0.33 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 92 LY 17 0.05 9898 0.13 Low D Temp 93 Y 17 0.05 9929 0.22 Low D Temp 95 DY 37 0.09 8424 <td< th=""><th></th><th>Lubricant</th><th>Water²</th><th>2.5</th><th></th><th>Air⁴</th><th></th></td<>		Lubricant	Water ²	2.5		Air ⁴	
86 DY 23 0.06 8936 0.28 Low D Temp 87 LY 14 0.01 9350 0.18 Low D Temp 88 DY 38 0.03 9378 1.3 Low D Temp 89 Y 15 0.04 9408 0.19 Low D Temp 90 LY 15 0.04 9367 0.33 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 92 LY 17 0.02 8998 0.13 Low D Temp 93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47	Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	Miscellaneous
87 LY 14 0.01 9350 0.18 Low D Temp 88 DY 38 0.03 9378 1.3 Low D Temp 89 Y 15 0.04 9408 0.19 Low D Temp 90 LY 15 0.04 9367 0.33 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 92 LY 17 0.02 8998 0.13 Low D Temp 93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27							1
88 DY 38 0.03 9378 1.3 Low D Temp 89 Y 15 0.04 9408 0.19 Low D Temp 90 LY 15 0.04 9367 0.33 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 92 LY 17 0.02 8998 0.13 Low D Temp 93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9464 0.27 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 100 Y 25 0.03 9381 0.47		DY	23			0.28	Low D Temp
89 Y 15 0.04 9408 0.19 Low D Temp 90 LY 15 0.04 9367 0.33 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 92 LY 17 0.02 8998 0.13 Low D Temp 93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 100 Y 25 0.03 9381 0.47 Low D Temp 101 Y 43 0.06 9458 0.14	87	LY		0.01		0.18	Low D Temp
90 LY 15 0.04 9367 0.33 Low D Temp 91 DY 25 0.06 8632 0.49 Low D Temp 92 LY 17 0.02 8998 0.13 Low D Temp 93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14	88		38	0.03	9378	1.3	Low D Temp
91 DY 25 0.06 8632 0.49 Low D Temp 92 LY 17 0.02 8998 0.13 Low D Temp 93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 100 Y 25 0.03 9458 0.14 Low D Temp 101 Y 43 0.06 9458 0.14	89	Y		0.04	9408	0.19	Low D Temp
92 LY 17 0.02 8998 0.13 Low D Temp 93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 102 Y 33 0.05 9016 0.14	90	LY	15	0.04	9367	0.33	Low D Temp
93 Y 17 0.05 9392 0.22 Low D Temp 94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39	91	DY	25	0.06	8632	0.49	Low D Temp
94 DY 130 0.05 9249 0.51 Low D Temp 95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14	92		17	0.02	8998	0.13	Low D Temp
95 DY 37 0.09 8424 0.58 Low D Temp 96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69	93	Y	17	0.05	9392	0.22	Low D Temp
96 DY 88 0.07 9258 0.47 Low D Temp 97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 <t< td=""><td>94</td><td>DY</td><td>130</td><td>0.05</td><td>9249</td><td>0.51</td><td>Low D Temp</td></t<>	94	DY	130	0.05	9249	0.51	Low D Temp
97 LY 64 0.05 9461 0.32 Low D Temp 98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 <	95	DY	37	0.09	8424	0.58	Low D Temp
98 LY 38 0.08 9464 0.27 Low D Temp 99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791	96	DY	88	0.07	9258	0.47	Low D Temp
99 Y 51 0.03 9381 0.47 Low D Temp 100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036	97	LY	64	0.05	9461	0.32	Low D Temp
100 Y 25 0.03 9465 0.49 Low D Temp 101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317	98	LY	38	0.08	9464	0.27	Low D Temp
101 Y 43 0.06 9458 0.14 Low D Temp 102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 13 0.05 8819	99	Y	51	0.03	9381	0.47	Low D Temp
102 Y 33 0.05 9420 1.1 Low D Temp 103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819	100		25	0.03	9465	0.49	Low D Temp
103 LY 16 0.11 8832 0.39 High D Temp 104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400<	101		43	0.06	9458	0.14	Low D Temp
104 LY 50 0.05 9016 0.14 High D Temp 105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212<	102	Y	33	0.05	9420	1.1	Low D Temp
105 DY 28 0.06 8896 0.69 High D Temp 106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923	103	LY	16	0.11	8832	0.39	High D Temp
106 LY 23 0.01 8851 1.3 High D Temp 107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 922	104	LY	50	0.05	9016	0.14	High D Temp
107 LY insufficient sample 8839 0.23 High D Temp 108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9	105	DY	28	0.06	8896	0.69	High D Temp
108 Y 24 0.01 8759 0.49 High D Temp 109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651	106	LY	23	0.01	8851	1.3	High D Temp
109 Y 26 0.03 8791 0.34 High D Temp 110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	107	LY	insufficient	sample	8839	0.23	High D Temp
110 LY 19 0.06 9036 0.32 High D Temp 111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	108	Y	24	0.01	8759	0.49	High D Temp
111 DY 21 0.04 3317 0.57 High D Temp 112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	109	Y	26	0.03	8791	0.34	High D Temp
112 DY 11 0.03 9075 0.54 High D Temp 113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	110	LY	19	0.06	9036	0.32	High D Temp
113 DY 13 0.05 8819 0.89 High D Temp 114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	111	DY	21	0.04	3317	0.57	High D Temp
114 DY 9.6 0.01 9400 0.38 High D Temp 115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	112	DY	11	0.03	9075	0.54	High D Temp
115 Y 7.7 0.09 9212 0.22 High D Temp 116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	113	DY	13	0.05	8819	0.89	High D Temp
116 DY 9.1 0.05 8923 0.67 High D Temp 117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	114	DY	9.6	0.01	9400	0.38	High D Temp
117 DY 6.1 0.02 9227 0.54 High D Temp 118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp	115	Y	7.7	0.09	9212	0.22	
118 DY 8.8 0.04 9109 0.45 High D Temp 119 DY 6.8 0.05 8651 0.84 High D Temp				0.05		0.67	High D Temp
119 DY 6.8 0.05 8651 0.84 High D Temp				0.02	9227	0.54	High D Temp
\mathcal{E}	118	DY	8.8	0.04	9109	0.45	High D Temp
120 DY 18 0.06 9005 0.29 High D Temp			6.8	0.05	8651	0.84	High D Temp
	120	DY	18	0.06	9005	0.29	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit.

C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray

² Samples drawn at ≤9600 hours.

³ Hour gas sample drawn.
4 % volume of refrigerant
5 KOH (mg)/3GS (g)

R-134a and RL32S

Table F.4

G. I	Lubricant	Water ²	m 4 × 2.5	TT 3	Air ⁴	R-12) II
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
121	C	73	0.03	9497	0.51	0.03	Low D Temp
122	C	52	0.04	9364	0.26	0.00	Low D Temp
123	C	54	0.01	9328	0.22	0.00	Low D Temp
124	LY	130	0.06	9035	1.1	3.4	Low D Temp
125	LY	76	0.11	9467	0.37	0.00	Low D Temp
126	С	76	0.05	9174	0.55	0.00	Low D Temp
127	С	95	0.08	9379	0.40	5.0	Low D Temp
128	С	81	0.15	9246	0.36	3.4	Low D Temp
129	С	58	0.05	9112	0.55	3.4	Low D Temp
130	LY	42	0.10	9040	0.47	0.03	Low D Temp
131	С	79	0.05	9504	0.23	2.6	Low D Temp
132	LY	250	0.13	9388	0.53	0.00	Low D Temp
133	LY	88	0.05	8838	7.4	0.00	Low D Temp
134	С	72	0.03	9340	0.32	0.00	Low D Temp
135	С	110	0.16	8832	0.15	3.3	Low D Temp
136	С	120	0.12	9501	0.36	3.1	Low D Temp
137	С	100	0.04	9325	0.39	3.4	Low D Temp
138	Y	100	0.14	9417	0.27	0.01	Low D Temp
139	DY	110	0.13	8754	0.29	0.08	High D Temp
140	Y	66	0.07	9307	0.16	0.01	High D Temp
141	С	99	0.47	9012	0.15	0.00	High D Temp
142	С	41	0.50	9398	0.20	3.0	High D Temp
143	DY	90	0.21	9083	0.31	0.00	High D Temp
144	DY	61	0.12	3560	0.38	0.01	High D Temp
145	LY	86	0.12	9402	0.14	3.6	High D Temp
146	DY	100	0.20	9400	0.53	3.8	High D Temp
147	Y	67	0.07	9606	0.28	3.3	High D Temp
148	DY	70	0.60	9105	1.1	0.04	High D Temp
149			failed				High D Temp
150	Y	74	0.55	8795	0.18	0.04	High D Temp
151	LY	99	0.03	2731	0.19	0.00	High D Temp
152	С	59	0.22	9441	0.24	0.01	High D Temp
153	С	72	0.15	9432	0.18	4.2	High D Temp
154	С	140	0.29	9479	0.30	3.9	High D Temp
155	LY	130	0.11	9325	0.25	1.5	High D Temp
156	DY	140	0.48	9451	0.41	0.01	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit.

C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray

² Samples drawn at ≤9600 hours.

³ Hour gas sample drawn.

⁴ % volume of refrigerant

⁵ KOH (mg)/RL32S (g)

Appendix G Final Dynamic Moisture, TAN, and Gas Analysis of Test Systems after Completion of the 12,000 hour Test Period

R-507A and RL32S

Table G.1

G4 I	Lubricant	Water ²	TD A N 2.5	тт 3	Air ⁴	R-502	3.61
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
5	DY	100	0.50	10524	0.19	0.02	High D Temp
6	G	187	0.23	9300	1.4	0.11	High D Temp
7	LY	202	0.43	8823	0.14	0.09	High D Temp
8	LY	69	0.34	9283	0.08	4.0	High D Temp
9	CY	100	0.40	5368	0.68	0.10	High D Temp
10	DY	50	0.61	9295	0.53	0.10	High D Temp
11	G	581	0.45	8999	0.16	3.9	High D Temp
12	Y	247	0.62	9141	0.27	4.3	High D Temp
13	DY	89	0.98	9250	0.83	3.7	High D Temp
14	DY	157	0.64	9231	0.85	0.08	High D Temp
15	Y	35	0.96	8886	0.16	4.0	High D Temp
16	LY	54	1.0	9319	0.25	0.08	High D Temp
17	G	54	0.51	9337	0.12	0.12	High D Temp
18	LY	44	0.87	9423	0.32	0.08	High D Temp
19	LY	72	1.2	9249	0.23	4.4	High D Temp
20	DY	120	1.1	9299	0.44	4.1	High D Temp
21	DY	81	1.1	3487	0.75	4.9	High D Temp
22	DY	58	1.8	9205	1.1	0.08	High D Temp
23	Y	174	0.05	8995	1.3	0.07	Low D Temp
24	С	172	0.03	9216	0.19	0.07	Low D Temp
25	С	184	0.05	9176	1.2	0.08	Low D Temp
26	С	50	0.03	8779	0.24	3.9	Low D Temp
27	С	261	0.08	9101	0.31	0.05	Low D Temp
28	LY	96	0.04	8671	1.1	0.02	Low D Temp
29	С	262	0.15	8768	0.27	3.7	Low D Temp
30	DY	47	0.14	7822	0.94	3.7	Low D Temp
31	LY	54	0.07	8544	0.80	3.8	Low D Temp
32	Y	41	0.15	8234	0.64	0.04	Low D Temp
33	С	65	0.07	8418	0.38		Low D Temp
34	С	125	0.14	9295	0.05	0.09	Low D Temp
35	С	100	0.20	620	3.2	0.09	Low D Temp
36	С	59	0.11	9186	0.82		Low D Temp
37	С	139	0.29	8953	0.77	4.2	Low D Temp
38	DY	58	0.23	9010	0.83	3.6	Low D Temp
39	LY	97	0.08	9177	0.65	4.0	Low D Temp
40	Y	68	0.18	9094	0.94	0.12	Low D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit.

¹ C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray

² Samples drawn at <12400 hrs.

³ Hour gas sample drawn.

^{4 %} volume of refrigerant

⁵ KOH (mg)/RL32S (g)

R-407C and RL32S

Table G.2

G. I	Lubricant	Water ²	E 4 3 2 5	TT 3	Air ⁴	R-22	3.6. 11
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
41	C	174	0.03	8397	0.27	0.04	Low D Temp
42	C	112	0.06	9246	0.67	0.13	Low D Temp
43	C	211	0.05	9489	0.23	0.05	Low D Temp
44	С	85	0.06	9430	1.2	2.7	Low D Temp
45	С	65	0.10	9290	0.18	0.05	Low D Temp
46	С	34	0.06	9487	0.75	0.10	Low D Temp
47	С	63	0.09	8651	0.76	0.04	Low D Temp
48	С	92	0.12	8700	1.4	5.9	Low D Temp
49	С	60	0.07	9428	1.1	4.6	Low D Temp
50	Y	95	0.17	8277	0.46	0.07	Low D Temp
51	С	862	0.03	8969	0.50	3.9	Low D Temp
52	С	369	0.10	9368	0.18	0.04	Low D Temp
53	С	74	0.05	9234	0.94	0.04	Low D Temp
54	С	120	0.02	9502	0.27	0.05	Low D Temp
55	С	180	0.16	1580	0.46	4.6	Low D Temp
56	С	206	0.15	9521	0.61	3.3	Low D Temp
57	С	187	0.08	8946	0.87	5.0	Low D Temp
58	С	68	0.11	8724	0.23	0.04	Low D Temp
59	LY	187	0.16	5583	0.12	0.05	High D Temp
60	LY	179	0.08	9240	0.65	0.05	High D Temp
61	LY	167	0.11	9244	0.48	0.05	High D Temp
62	Y	153	0.13	8545	0.41	4.0	High D Temp
63	LY	39	0.17	8873	0.22	0.07	High D Temp
64	DY	140	0.22	9178	1.5	0.04	High D Temp
65	DY	122	0.23	8668	0.39	3.6	High D Temp
66	DY	246	0.22	9115	0.93	5.1	High D Temp
67	LY	506	0.14	9075	0.41	0.36	High D Temp
68	DY	82	0.27	9019	1.3	0.05	High D Temp
69	С	110	0.09	1616	1.0	3.7	High D Temp
70	Y	225	0.31	9196	0.40	0.05	High D Temp
71	С	200	0.09	1605	2.8	0.06	High D Temp
72	С	321	0.09	8835	0.55	0.03	High D Temp
73	С	70	0.13	9110	0.21	3.8	High D Temp
74	Y	76	0.17	8751	1.7	3.6	High D Temp
75	Y	71	0.25	9134	0.68	3.7	High D Temp
76	DY	57	0.18	9328	2.2	0.05	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit.

C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray

² Samples drawn at <12400 hrs.

³ Hour gas sample drawn.

^{4 %} volume of refrigerant

⁵ KOH (mg)/RL32S (g)

R-22 and 3GS Table G.3

	Lubricant	Water ²			Air ⁴	
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	Miscellaneous
85	LY	39	0.51	9068	0.10	Low D Temp
86	DY	32	0.31	8936	0.28	Low D Temp
87	LY	26	0.05	9350	0.18	Low D Temp
88	DY	34	0.14	9378	1.3	Low D Temp
89	Y	18	0.08	9408	0.19	Low D Temp
90	LY	2	0.07	9367	0.33	Low D Temp
91	DY	1	0.15	8632	0.49	Low D Temp
92	LY	25	0.14	8998	0.13	Low D Temp
93	Y	37	0.13	9392	0.22	Low D Temp
94	DY	37	0.18	9249	0.51	Low D Temp
95	DY	56	0.26	8424	0.58	Low D Temp
96	DY	57	0.11	9258	0.47	Low D Temp
97	LY	32	0.07	9461	0.32	Low D Temp
98	LY	21	0.23	9464	0.27	Low D Temp
99	Y	49	0.08	9381	0.47	Low D Temp
100	Y	20	0.13	9465	0.49	Low D Temp
101	Y	26	0.10	9458	0.14	Low D Temp
102	Y	26	0.11	9420	1.1	Low D Temp
103	LY	19	0.04	8832	0.39	High D Temp
104	LY	15	0.04	9016	0.14	High D Temp
105	DY	14	0.15	8896	0.69	High D Temp
106	LY	14	0.07	8851	1.3	High D Temp
107	LY	36	0.05	8839	0.23	High D Temp
108	Y	21	0.09	8759	0.49	High D Temp
109	Y	16	0.08	8791	0.34	High D Temp
110	LY	62	0.07	9036	0.32	High D Temp
111	DY	33	0.24	3317	0.57	High D Temp
112	DY	21	0.11	9075	0.54	High D Temp
113	DY	13	0.15	8819	0.89	High D Temp
114	DY	62	0.11	9400	0.38	High D Temp
115	Y	15	0.06	9212	0.22	High D Temp
116	DY	22	0.13	8923	0.67	High D Temp
117	DY	124	0.10	9227	0.54	High D Temp
118	DY	49	0.13	9109	0.45	High D Temp
119	DY	30	0.16	8651	0.84	High D Temp
120	DY	69	0.17	9005	0.29	High D Temp
+ Samples tak	en while compressors	were running (dyn	amic) at test	conditions		

Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit. 1 C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray

² Samples drawn at <12400 hrs.

³ Hour gas sample drawn. ⁴ % volume of refrigerant

⁵ KOH (mg)/3GS (g)

R-134a and RL32S

Table G.4

G. I	Lubricant	Water ²	m	3	Air ⁴	R-12	
Stand	Appearance ¹	(ppm)	TAN ^{2,5}	Hours ³	(%)	(%)	Miscellaneous
121	C	220	0.06	9497	0.51	0.03	Low D Temp
122	С	209	0.07	9364	0.26	0.00	Low D Temp
123	С	188	0.04	9328	0.22	0.00	Low D Temp
124	LY	48	0.09	9035	1.1	3.4	Low D Temp
125	LY	43	0.11	9467	0.37	0.00	Low D Temp
126	С	27	0.09	9174	0.55	0.00	Low D Temp
127	С	41	0.14	9379	0.40	5.0	Low D Temp
128	С	50	0.11	9246	0.36	3.4	Low D Temp
129	С	40	0.05	9112	0.55	3.4	Low D Temp
130	LY	41	0.09	9040	0.47	0.03	Low D Temp
131	С	57	0.10	9504	0.23	2.6	Low D Temp
132	LY	126	0.17	9388	0.53	0.00	Low D Temp
133	LY	136	0.07	8838	7.4	0.00	Low D Temp
134	С	57	0.06	9340	0.32	0.00	Low D Temp
135	С	42	0.16	8832	0.15	3.3	Low D Temp
136	С	81	0.16	9501	0.36	3.1	Low D Temp
137	С	67	0.06	9325	0.39	3.4	Low D Temp
138	Y	65	0.17	9417	0.27	0.01	Low D Temp
139	DY	212	0.19	8754	0.29	0.08	High D Temp
140	Y	172	0.07	9307	0.16	0.01	High D Temp
141	С	307	0.08	9012	0.15	0.00	High D Temp
142	С	40	0.07	9398	0.20	3.0	High D Temp
143	DY	44	0.21	9083	0.31	0.00	High D Temp
144	DY	60	0.18	3560	0.38	0.01	High D Temp
145	LY	41	0.09	9402	0.14	3.6	High D Temp
146	DY	78	0.17	9400	0.53	3.8	High D Temp
147	Y	39	0.09	9606	0.28	3.3	High D Temp
148	DY	41	0.16	9105	1.1	0.04	High D Temp
149	С	70	0.08	672	0.20	3.9	High D Temp
150	Y	58	0.67	8795	0.18	0.04	High D Temp
151	LY	60	0.12	2731	0.19	0.00	High D Temp
152	С	38	0.32	9441	0.24	0.01	High D Temp
153	С	69	0.80	9432	0.18	4.2	High D Temp
154	С	32	0.52	9479	0.30	3.9	High D Temp
155	LY	88	0.16	9325	0.25	1.5	High D Temp
156	DY	138	0.38	9451	0.41	0.01	High D Temp

⁺ Samples taken while compressors were running (dynamic) at test conditions.

Shading indicates contaminants added to the unit. 1 C = clear, LY = light yellow, Y = yellow, DY = dark yellow, G = gray 2 Samples drawn at <12400 hrs.

³ Hour gas sample drawn. 4 % volume of refrigerant 5 KOH (mg)/RL32S (g)

Appendix H Summary of Final Lubricant Analysis: TAN, Moisture, Total Metals, Trash in Expansion Valve Screen, Debris in Compressor Bottom, Fluoride, and Chloride

Summary of Final Lubricant Analysis: R-507A and RL32S Table H.1

Stand	Final	Final H ₂ O	Total Metals	Trash in screen	Debris in bottom	F	Cl
#	TAN*	(ppm)	(ppm)	(g)	(g)	(ppm)	(ppm)
5	0.50	100	101	0.019	1.579	1.5	12
6	0.23	187	180	0.108	0.590	1.1	11
7	0.43	202	19	0.050	0.564	1.1	10
8	0.35	69	38	0.182	0.516	0.90	8.8
9	0.40	100	56	0.045	1.636	1.5	10
10	0.61	50	14	0.018	0.572	1.8	9.9
11	0.45	581	56	0.059	0.878	2.5	17
12	0.62	247	26	0.154	0.874	1.3	10
13	0.98	89	69	0.062	0.714	1.5	11
14	0.64	157	163	0.045	1.901	2.0	9.4
15	0.96	35	51	0.075	0.785	1.7	11
16	1.0	54	50	0.071	0.633	1.4	11
17	0.51	54	44	0.172	1.123	2.0	10
18	0.87	44	66	0.075	1.307	1.4	10
19	1.2	72	45	0.133	0.893	0.9	11
20	1.1	120	251	0.138	0.902	2.0	13
21	1.1	81	55	0.101	1.082	2.0	17
22	1.8	58	39	0.176	1.220	1.5	11
23	0.05	174	5	0.036	0.935	1.8	8.8
24	0.03	172	2	0.058	1.192	1.5	8.3
25	0.05	184	3	0.060	0.644	1.4	7.2
26	0.03	50	3	0.145	0.664	1.5	10
27	0.08	261	2	0.043	0.726	2.3	12
28	0.04	96	5	0.017	0.683	1.7	9.2
29	0.15	262	2	0.075	0.313	1.4	7.5
30	0.14	47	5	0.115	1.302	1.4	7.7
31	0.07	54	6	0.146	1.314	1.3	11
32	0.15	41	15	0.051	1.357	1.3	8.0
33	0.07	65	5	0.259	1.507	1.4	8.9
34	0.14	125	11	0.126	0.649	2.4	9.6
35	0.20	100	5	0.064	0.946	2.0	10
36	0.11	59	2	0.069	0.944	1.4	8.7
37	0.29	139	6	0.024	1.318	2.2	9.0
38	0.23	58	35	0.039	1.038	1.7	8.6
39	0.08	97	4	0.108	0.644	1.4	8.3
40	0.18	68	7	0.145	1.110	1.2	8.8

^{*} KOH (mg)/RL32S (g)

Summary of Final Lubricant Analysis: R-407C and RL32S Table H.2

Stand	Final	Final H ₂ O	Total Metals	Trash in	Debris in bottom	F	Cl
#	TAN*	(ppm)	(ppm)	screen (g)	(g)	(ppm)	(ppm)
41	0.03	174	2	0.034	0.270	1.3	8.8
42	0.06	112	6	0.000	0.500	0.99	8.3
43	0.05	211	1	0.041	0.227	1.2	9.1
44	0.06	85	4	0.022	0.511	1.1	9.2
45	0.10	65	4	0.057	0.554	2.1	19
46	0.06	34	7	0.000	0.437	1.1	12
47	0.09	63	8	0.005	1.102	0.83	12
48	0.12	92	11	0.065	1.310	0.66	12
49	0.07	60	2	0.071	0.982	0.78	11
50	0.17	95	2	0.014	0.412	1.1	12
51	0.03	862	4	0.000	0.717	0.86	13
52	0.10	369	4	0.041	0.280	1.1	11
53	0.05	74	3	0.000	0.405	0.72	11
54	0.02	120	5	0.019	0.873	1.7	9.7
55	0.16	180	51	0.021	0.823	1.8	10
56	0.15	206	34	0.002	0.685	1.1	13
57	0.08	187	6	0.006	0.899	0.75	11
58	0.11	68	6	0.002	0.429	0.85	13
59	0.16	187	3	0.014	0.917	0.82	12
60	0.08	179	2	0.000	0.894	1.8	9.7
61	0.11	167	9	0.000	0.314	1.6	9.9
62	0.13	153	9	0.074	0.586	1.3	10
63	0.17	39	14	0.095	0.854	1.3	9.2
64	0.22	140	5	0.083	0.681	1.1	9.7
65	0.23	122	10	0.085	0.453	1.5	9.8
66	0.22	246	9	0.027	0.375	1.3	9.3
67	0.14	506	13	0.025	0.185	1.1	9.1
68	0.27	82	6	0.000	1.066	1.3	11
69	0.09	110	4	0.016	0.967	0.90	9.6
70	0.31	225	6	0.011	1.004	1.1	9.3
71	0.09	200	8	0.001	1.017	0.90	9.2
72	0.09	321	6	0.050	0.810	1.5	11
73	0.13	70	3	0.013	0.747	1.6	9.3
74	0.17	76	16	0.065	0.658	1.3	10
75	0.25	71	2	0.046	0.906	1.3	13
76	0.18	57	12	0.102	1.062	1.7	9.2

^{*} KOH (mg)/RL32S (g)

Summary of Final Lubricant Analysis: R-22 and 3GS Table H.3

Stand	Final	Final H ₂ O	Total Metals	Trash in screen	Debris in bottom	F	Cl
#	TAN*	(ppm)	(ppm)	(g)	(g)	(ppm)	(ppm)
85	0.51	39	3	0.050	0.111	1.2	9.3
86	0.31	32	15	0.119	0.537	1.5	15
87	0.05	26	6	0.066	0.504	1.4	11
88	0.14	34	30	0.061	0.358	1.3	9.2
89	0.08	18	3	0.059	0.487	1.5	10
90	0.07	2	4	0.114	0.379	1.1	11
91	0.15	1	15	0.031	0.586	1.1	11
92	0.14	25	39	0.003	0.122	0.93	11
93	0.13	37	16	0.071	0.042	0.98	11
94	0.18	37	13	0.026	0.256	0.93	10
95	0.26	56	16	0.084	0.930	0.99	11
96	0.11	57	83	0.038	0.754	1.1	10
97	0.07	32	31	0.002	0.499	1.0	9.7
98	0.23	21	32	0.076	0.477	1.1	11
99	0.08	49	7	0.016	0.381	1.2	11
100	0.13	20	4	0.034	0.814	0.92	16
101	0.10	26	31	0.047	0.738	0.91	15
102	0.11	26	22	0.023	0.431	0.88	15
103	0.04	19	2	0.022	0.499	0.92	14
104	0.04	15	1	0.028	0.584	0.78	14
105	0.15	14	2	0.059	0.304	0.85	13
106	0.07	14	2	0.004	0.293	0.87	14
107	0.05	36	4	0.031	0.354	0.85	14
108	0.09	21	1	0.000	0.599	0.88	14
109	0.08	16	8	0.000	0.255	0.84	14
110	0.07	62	7	0.025	0.003	0.75	14
111	0.24	33	4	0.013	0.682	0.75	14
112	0.11	21	7	0.029	1.115	0.70	13
113	0.15	13	0	0.064	1.071	0.72	15
114	0.11	62	17	0.000	0.720	0.64	17
115	0.06	15	3	0.043	0.546	0.70	15
116	0.13	22	17	0.029	0.346	0.67	14
117	0.10	124	5	0.045	0.344	0.64	15
118	0.13	49	5	0.014	0.338	0.67	14
119	0.16	30	7	0.068	0.583	0.59	13
120	0.17	69	14	0.033	0.954	0.68	11

^{*} KOH (mg)/3GS (g)

Summary of Final Lubricant Analysis: R-134a and RL32S Table H.4

Stand	Final	Final H ₂ O	Total Metals	Trash in screen	Debris in bottom	F	Cl
#	TAN*	(ppm)	(ppm)	(g)	(g)	(ppm)	(ppm)
121	0.06	220	3	0.001	0.380	1.3	14
122	0.07	209	5	0.024	0.314	1.1	16
123	0.04	188	3	0.001	0.510	1.2	15
124	0.09	48	6	0.011	0.717	1.3	17
125	0.11	43	9	0.032	1.168	1.1	16
126	0.09	27	2	0.100	0.974	0.92	16
127	0.14	41	3	0.073	0.752	0.95	17
128	0.11	50	7	0.036	0.694	0.99	17
129	0.05	40	3	0.022	0.546	0.91	16
130	0.09	41	10	0.019	0.282	0.82	9.0
131	0.10	57	2	0.000	0.380	0.95	15
132	0.17	126	5	0.009	0.709	0.87	14
133	0.07	136	4	0.049	0.802	0.88	16
134	0.06	57	3	0.000	0.997	0.88	14
135	0.16	42	11	0.006	0.609	0.95	13
136	0.16	81	5	0.092	0.362	0.86	13
137	0.06	67	3	0.000	0.662	0.88	13
138	0.17	65	9	0.000	0.865	0.91	13
139	0.19	212	14	0.041	0.513	0.88	13
140	0.07	172	7	0.081	0.678	0.94	14
141	0.08	307	7	0.073	0.212	0.91	13
142	0.07	40	26	0.061	0.533	0.95	14
143	0.21	44	13	0.000	0.554	0.81	16
144	0.18	60	4	0.070	0.613	0.81	22
145	0.09	41	8	0.031	0.673	0.77	21
146	0.17	78	21	0.011	0.650	0.78	24
147	0.09	39	4	0.041	0.886	0.78	17
148	0.16	41	24	0.038	0.575	0.81	13
149	0.08	70	60	0.153	0.550	0.85	14
150	0.67	58	62	0.159	1.025	0.78	12
151	0.12	60	7	0.085	0.690	0.88	14
152	0.32	38	6	0.025	0.675	0.82	13
153	0.80	69	14	0.000	1.369	0.91	14
154	0.52	32	22	0.019	0.382	0.81	14
155	0.16	88	2	0.053	0.817	1.1	13
156	0.38	138	19	0.034	0.987	1.1	13

^{*} KOH (mg)/RL32S (g)

Appendix I
Glass Sealed Tube Evaluation and Photographic History of R-507A
after 224 days Aging at 135°C and 28 days Aging at 165°C with Contaminants Added

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	NR	NR	clear							
				7	NR	NR	NR	clear							
				14	NR	NR	NR	clear]	
<20	-	-	-	28	NR	NR	NR	clear]	
				56	NR	NR	NR	clear							
				112	NR	NR	NR	clear							
				224	NR	NR	blue-gray	clear	-	-	-	-	100	-	0.10
				3	NR	gray-orange/orange	NR	clear							
				7	NR	gray-orange/orange	light tan	clear							
				14	NR	yellow/gray-orange	tan	clear							
200	_	_	_	28	NR	yellow-orange	brown	light yellow							
200	_	_	_	56	NR	yellow-orange	brown	light yellow							
				112	NR	yellow-orange	brown	light yellow							
				224	NR	orange	brown & dark gray/brown	light yellow	-	-	-	-	100	-	2.0
				3	NR	dark orange/NR	light tan/NR	clear							
				7	NR	dark orange/ NR	light tan/ blue-green	clear							
-20	0.1			14	NR	tan/NR	tan/blue-green	clear]						
<20	0.1	-	-	28	NR	yellow-tan/NR	tan/blue-green	clear							
				56	NR	brown/NR	tan/blue-gray	clear							
				112	NR	tan/NR	tan/blue-gray	clear							
				224	NR	dark orange/NR	tan/blue-gray	clear	-	-	-	-	100	-	0.78

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

	Contam	inants								GC	Vapor	· Com	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange/orange	NR/blue-green	clear							Ì
				7	NR	dark orange/orange	NR/blue-green	clear							
				14	NR	dark orange/orange	NR/blue-green	clear							
				28	NR	dark orange/orange	NR/blue-green	clear							
<20	0.4	-	-	56	NR	dark orange/NR	light tan/NR	clear							
				112	NR	tan/ NR	light tan/ blue-gray	clear							
				224	NR	orange/ NR	light tan/ blue-gray	clear							
				3	NR	orange	NR	clear							
				7	NR	orange/NR	NR	clear							
				14	NR	dark orange/NR	NR	clear							
< 20	-	-	4	28	NR	dark orange/NR	NR	clear							
				56	NR	orange/NR	NR	clear							
				112	NR	NR	NR	clear							
				224	NR	NR	blue-gray	clear	-	-	-	-	96.5	3.5	0.15
				3	NR	dark orange	NR	clear							
				7	NR	dark orange/NR	NR	light yellow]						
				14	NR	dark orange/NR	NR	yellow							
< 20	-	4	-	28	NR	dark orange/NR	NR	yellow 🌣							
				56	NR	orange/NR	NR	yellow 🌣							
				112	NR	NR	NR	yellow 🌣							
				224	NR	NR	blue-gray	yellow 🛭 (1)	2.3	-	0.10	0.20	97.4	-	9.9

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g) NR = no reaction/no visible color change

red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg)

	Contami	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange/NR	light tan/NR	clear							
				7	NR	dark orange/NR	light tan/blue-green	clear							
				14	NR	light tan/NR	light tan/blue-green	clear							
200	0.1	-	-	28	NR	tan/NR	gray, blue-green	clear							
				56	NR	tan/NR	blue-gray	clear							
				112	NR	tan/NR	light tan/blue-gray	clear							
				224	NR	dark orange/NR	light tan/blue-gray	clear	-	-	-	-	99.8	0.20	2.1
				3	NR	dark orange	blue-green	clear							
				7	NR	dark orange/NR	light tan/blue-green	clear							
				14	NR	dark orange/NR	light tan/blue-green	clear							
				28	NR	dark orange/NR	light tan/blue-green	clear							
200	0.4	-	-	56	NR	dark orange/NR	light tan/blue-green	clear							
				112	NR	orange/NR	gray, tan/blue-gray	clear							
				224	NR	NR	black & tan	cloudy with ppt (1)							
				3	NR	yellow/dark orange	NR	clear							
				7	NR	yellow/dark orange	light tan	clear]						
				14	NR	yellow-tan/ light orange	tan	clear							
200			4	28	NR	yellow-tan/ light orange	tan/ blue-green	light yellow							
200	-	-	4	56	NR	NR/ yellow-orange	tan/ blue-green	light yellow							
				112	NR	yellow-tan/ NR	tan/ blue-green	light yellow							
				224	NR	yellow-tan/ NR	tan	light yellow		-	-	-	95.8	4.2	2.0

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change
(1) precipitate barely noticeable (0-1mg)

	Contami	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂	R- 507A (%)	R-502 (%)	TAN**
**				3	NR	dark orange	NR	clear	. /						
				7	NR	dark orange/NR	blue-green	light yellow							
				14	NR	dark orange/NR	blue-green	yellow							
200	-	4	-	28	NR	dark orange/NR	blue-green	yellow 🗘							
				56	NR	orange/NR	blue-green	yellow 🗘							
				112	NR	NR	light tan/blue-green	yellow 😂							
				224	NR	NR	tan/blue-gray	yellow 🏖	3.4	0.15	0.10	0.20	96.2	-	11
				3	NR	dark orange/NR	light tan/NR	clear							
				7	NR	dark orange/NR	tan/blue-green	clear							
				14	NR	light tan/NR	tan/blue-green	clear							
<20	0.1	-	4	28	NR	light tan/NR	tan/blue-green	clear							
				56	NR	tan/NR	tan/blue-gray	clear							
				112	NR	tan/NR	tan/blue-gray	clear							
				224	NR	dark orange	tan/blue-gray	clear	-	-	-	-	95.7	4.3	0.76
				3	NR	dark orange/NR	gray/blue-green	clear							
				7	NR	dark orange/NR	light tan	clear							
				14	NR	dark orange/NR	light tan/blue-green	clear							
<20	0.4	-	4	28	NR	tan/NR	light tan/blue-green	clear							
				56	NR	tan/NR	light tan/blue-green	clear							
				112	NR	tan/NR	light tan/blue-green	clear							
				224	NR	tan/NR	light tan/blue-green	clear							

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

red, orange, or tan precipitate rings on inside tube wall

	Contami	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange/NR	blue-green	clear							
				7	NR	dark orange/NR	gray, blue-green	light yellow							
				14	NR	light tan/NR	gray, blue-green	yellow]]	
<20	0.1	4	-	28	NR	light tan/NR	gray, blue-green	yellow							
				56	NR	light tan/NR	blue-gray	yellow							
				112	NR	dark orange/NR	light tan/blue-gray	yellow							
				224	NR	orange/NR	tan & dark gray	yellow	3.2	0.10	0.10	0.30	96.3	-	12
				3	NR	dark orange	blue-green	clear							
				7	NR	dark orange/NR	light tan	light yellow							
				14	NR	dark orange/NR	light tan	yellow							
				28	NR	light tan/ NR	light tan/ blue-green	yellow ≎							
<20	0.4	4	-	56	NR	light tan/ NR	light tan	yellow- red ppt ♀							
				112	NR	orange/ NR	light tan/ blue-gray	yellow- red ppt ♡							
				224	NR	NR	black & brown	yellow- red ppt • (3)							
				3	NR	dark orange	blue-green	clear							
				7	NR	dark orange/NR	blue-green	light yellow							
				14	NR	dark orange/NR	blue-green	yellow							
				28	NR	dark orange/NR	blue-green	yellow							
<20	-	4	4	56	NR	corrosion spots/ NR	blue-green/ light tan	yellow							
				112	NR	tan spots/NR	light tan	yellow							
				224	NR	tan spots/ NR	black spots & tan	cloudy yellow with ppt (3)	3.1	0.15	0.10	0.20	93.0	3.5	15

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

red, orange, or tan precipitate rings on inside tube wall
(3) significant amounts of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange/NR	light tan/NR	clear							
				7	NR	dark orange/NR	tan/blue-green	clear							
				14	NR	light tan/dark orange	tan/blue-green	clear							
200	0.1	-	4	28	NR	light tan/dark orange	tan/blue-green	clear							
				56	NR	brown/NR	tan	clear]	
				112	NR	brown/NR	tan	clear							
				224	NR	tan/NR	tan	light yellow	-	-	-	-	96.4	3.6	2.1
				3	NR	dark orange	blue-green	clear							
				7	NR	dark orange/ NR	light tan/ blue-green	clear							
200	0.4			14	NR	dark orange/NR	tan/blue-green	clear							
200	0.4	-	4	28	NR	light tan/NR	tan/blue-green	clear							
				56	NR	tan/NR	tan/blue-green	clear							
				112	NR	tan/NR	tan/blue-gray	clear							
				224	NR	orange/NR	tan/blue-gray	clear							
				3	NR	dark orange/NR	tan/blue-green	clear							
				7	NR	light tan/ NR	gray, blue-green	light yellow							
				14	NR	tan/orange	gray, light tan	yellow							
				28	NR	tan/orange	gray, light tan	yellow							
200	0.1	4	-	56	NR	orange/NR	blue-gray	yellow]	
				112	NR	orange/ NR	light tan	yellow- dark ppt							
				224	NR	orange/ NR	tan & gray	yellow- red ppt • (2)	3.0	-	0.15	0.25	96.6	-	12

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

♣ red, orange, or tan precipitate rings on inside tube wall
(2) precipitate readily noticeable (1-10mg)

	Contam	inants								GC	Vapor	· Com	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange	NR	clear							
				7	NR	dark orange	NR	light yellow							
				14	NR	dark orange/NR	NR	yellow							
				28	NR	dark orange/NR	blue-green	yellow							
200	0.4	4	_	56	NR	orange/NR	blue-green	yellow							
				112	NR	orange/ NR	light tan/ light tan with gray spots	yellow- brown ppt							
				224	NR	NR	black & dark gray	yellow- brown ppt (2)							
				3	NR	light tan/ dark orange	blue-green	clear							
				7	NR	dark orange/NR	blue-green	light yellow							
				14	NR	tan/ NR	light tan/ blue-green	yellow							
200	-	4	4	28	NR	tan/ NR	light tan/ blue-green	yellow							
				56	NR	dark orange/ NR	light tan/ blue-green	yellow ≎							
				112	NR	orange/ NR	light tan/ blue-gray	yellow							
				224	NR	NR	black & tan	yellow with ppt (2)	2.6	-	0.19	0.22	93.5	3.4	15

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall (2) precipitate readily noticeable (1-10mg)

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange/NR	blue-green	light yellow							
				7	NR	dark orange/NR	gray, blue-green	yellow							
				14	NR	dark orange/NR	gray, blue-green	yellow							
<20	0.1	4	4	28	NR	light tan/NR	gray, blue-green	yellow							
\20	0.1	7	7	56	NR	light tan/NR	light tan, gray	yellow							
				112	NR	dark orange/NR	light tan/black	yellow							
				224	NR	orange/ NR	black & dark gray	hazy yellow- brown ppt (3)	2.9	-	0.20	0.28	93.2	3.3	14
				3	NR	light tan/ dark orange	blue-green	clear							
				7	NR	brown/NR	blue-green	light yellow							
				14	NR	tan/NR	blue-green	yellow							
				28	NR	tan/NR	blue-green	yellow 🗘							
<20	0.4	4	4	56	NR	dark orange/ NR	blue-gray, tan	yellow- dark ppt ≎							
				112	NR	orange/ NR	light tan/ gray & black	yellow- dark ppt ❖							
				224	NR	NR	black & gray	cloudy yellow- dark ppt • (3)							

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

red, orange, or tan precipitate rings on the inside tube wall

(3) significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	light tan/ dark orange	blue-green	light yellow							
				7	NR	light tan/NR	gray, blue-green	yellow							
				14	NR	tan/NR	gray, blue-green	yellow							
200	0.1	4	4	28	NR	tan/NR	gray, blue-green	yellow							
200	0.1	7	_	56	NR	tan/NR	light tan, gray	yellow							
				112	NR	light tan/ NR	light tan, gray	yellow- dark ppt							
				224	NR	orange/ NR	black & dark gray	yellow- brown ppt (1)	2.4	-1	0.18	0.25	93.9	3.2	15
				3	NR	light tan/ dark orange	blue-green	clear							
				7	NR	brown/NR	light tan/blue-green	light yellow							
				14	NR	tan/NR	light tan/blue-green	yellow							
				28	NR	tan/NR	light tan/blue-green	yellow 🗘							
200	0.4	4	4	56	NR	dark orange/ NR	blue-gray, tan	yellow- dark ppt ≎							
				112	NR	dark orange/ NR	light tan/ gray & black	yellow- dark ppt ≎							
				224	NR	orange/ NR	black & gray	cloudy yellow- ppt ② (3)							

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g) NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg)

⁽³⁾ significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contami	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	NR	NR	clear							
<20	_	_	_	7	NR	NR	NR	clear							
\20	_	_	_	14	NR	NR	blue-green	clear							
				28	NR	NR	blue-green	clear	-	-	-	-	99.9	0.10	0.53
				3	NR	yellow/NR	tan/NR	clear							
200	_	_	_	7	NR	light green/NR	tan/NR	clear							
200	_	_	_	14	NR	tan/NR	tan/blue-green	clear							
				28	NR	tan/NR	tan/blue-green	clear	-	-	-	-	99.8	0.20	2.1
				3	NR	tan/NR	brown/blue-green	clear							
<20	0.1	_	_	7	NR	tan/NR	brown/blue-green	clear							
\20	0.1		_	14	NR	brown/NR	brown/blue-green	clear							
				28	NR	brown/NR	brown/blue-green	clear	-	-	-	-	99.9	0.10	0.77
				3	NR	dark orange/NR	tan/blue-green	clear	_						
<20	0.4	_	_	7	NR	dark orange/NR	tan/blue-green	light yellow	_						
\20	0.4			14	NR	dark orange/NR	tan/blue-green	light yellow							
				28	NR	tan/NR	tan/blue-green	light yellow							
				3	NR	dark orange/NR	blue-green	clear	_						
<20	_	_	4	7	NR	orange/NR	light tan/blue-green	clear	_	Į.	Į.	:			
\20			-	14	NR	dark orange/NR	light tan/blue-green	clear							
				28	NR	tan/NR	light tan/blue-green	clear	-	-	-	-	98.7	1.3	0.12
				3	NR	light tan/NR	blue-green	light yellow	_	Į.	Į.	:			
<20	_	4	_	7	NR	orange/NR	light tan/blue-green	light yellow	_			1			
\20		•		14	NR	NR	light tan/blue-green	yellow							
				28	NR	NR	light tan/blue-green	yellow	3.7	0.12	0.27	0.88	94.8	0.07	12
				3	NR	light tan/NR	brown/blue-green	clear	_						
200	0.1	_	_	7	NR	light tan/NR	brown/blue-green	clear							
200	0.1	=	_	14	NR	tan/NR	brown/blue-green	clear							
				28	NR	tan/NR	brown/blue-green	clear	-	-	-	-	99.8	0.20	NA

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g) NR = no reaction/no visible color change

NA = not available/tube failure

	Contam	inants								GC	Vapor	· Com	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	light tan/NR	tan/blue-green	clear							
				7	NR	brown/NR	tan/blue-green	light yellow							
200	0.4	-	-	14	NR	tan/NR	brown/blue-green	light yellow							
				28	NR	tan/NR	brown/gray	light yellow- hazy ppt (2)							
				3	NR	gold tan/NR	tan/blue-green	clear							
200			4	7	NR	gold tan/NR	tan/blue-green	clear							
200	_	_	4	14	NR	gold tan/NR	brown/blue-green	clear							
				28	NR	gold tan/NR	brown/blue-green	clear	-	-	-	-	95.7	4.3	NA
				3	NR	light tan/NR	tan/blue-green	light yellow							
				7	NR	light tan/NR	tan/blue-green	light yellow							
200	_	4	_	14	NR	NR	tan/blue-green	yellow 😂							
200		*		28	NR	brown spots/ NR	tan/ blue-green	yellow- brown ppt ✿ (1)	3.3	0.14	0.25	1.0	94.1	0.05	14
				3	NR	tan/NR	brown/blue-green	clear							
<20	0.1		4	7	NR	tan/NR	brown/blue-green	clear							
<20	0.1	_	4	14	NR	tan/NR	brown/blue-green	clear							
				28	NR	tan/NR	brown/blue-green	clear	-	-	-	-	96.1	3.9	0.61
				3	NR	dark orange/NR	tan/blue-green	clear							
<20	0.4	_	4	7	NR	tan/NR	tan/blue-green	clear							
<20	0.4	_	4	14	NR	dark orange/NR	tan/blue-green	clear							
				28	NR	dark orange/NR	tan/blue-green	clear							

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg) (2) precipitate readily noticeable (1-10mg)

NA = not available/tube failure

	Contami	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange/NR	tan/blue-green	yellow-dark ppt							
				7	NR	dark orange/NR	tan/blue-green	yellow-dark ppt	ļ						
<20	0.1	4	-	14	NR	dark orange/NR	tan/blue-green	yellow-dark ppt�							
				28	NR	brown spots/ NR	tan/ blue-green	yellow- dark ppt (1)	3.5	0.14	0.27	0.77	95.3	0.05	11
				3	NR	tan/ NR	blue-green	dark gold- brown ppt							
<20	0.4	4		7	NR	tan/ NR	light tan/ blue-green	dark gold- brown ppt							
<20	0.4	4	-	14	NR	tan/ NR	light tan/ blue-green	dark yellow- brown ppt							
				28	NR	brown spots/ NR	light tan/ blue-green	dark yellow- brown ppt (2)							
				3	NR	tan/ NR	light tan/ blue-green	light yellow							
<20		4	4	7	NR	tan/ NR	light tan/ blue-green	light yellow							
<20	-	4	4	14	NR	dark orange/ NR	light tan/ blue-green	dark yellow							
				28	NR	brown spots/ NR	light tan/ blue-green	dark yellow- brown ppt (1)	2.3	-	0.17	0.25	94.3	3.0	16
				3	NR	dark orange/ NR	brown/ blue-green	clear							
200	0.1		4	7	NR	light tan/ NR	brown/ blue-green	clear							
200	0.1	-	4	14	NR	tan/ NR	brown/ blue-green	clear							
	Typical content of lubrical		1 6.:	28	NR	yellow orange/ NR	brown/ blue-green	clear	-	-	-	-	96.0	4.0	2.2

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

② red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg)

⁽²⁾ precipitate readily noticeable (1-10mg)

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
				3	NR	dark orange/NR	tan/blue-green	clear							
200	0.4		4	7	NR	brown/NR	tan/blue-green	clear							
200	0.4	-	4	14	NR	tan/NR	brown/blue-green	light yellow							
				28	NR	tan/NR	brown/blue-green	light yellow							
				3	NR	dark orange/NR	tan/blue-green	yellow							
				7	NR	dark orange/NR	tan/blue-green	yellow]]	
200	0.1	4	-	14	NR	dark orange/ NR	light tan/ blue-green	yellow- dark ppt ≎							
				28	NR	brown spots/ NR	tan/ gray spots, blue-green	yellow- dark ppt (1)	2.0	-	0.09	0.19	97.7	-	13
				3	NR	dark orange/NR	tan/blue-green	yellow							
				7	NR	orange/NR	tan/blue-green	yellow							
200	0.4	4	-	14	NR	dark orange/ NR	tan/ blue-green	dark yellow- brown ppt							
				28	NR	brown spots/ NR	tan/ gray	dark yellow- brown ppt ♣ (1)							
				3	NR	tan/ NR	tan/ blue-green	light yellow- tan ppt							
200		4		7	NR	tan/ NR	tan/ blue-green	light yellow- tan ppt							
200	-	4	4	14	NR	tan/NR	tan/blue-green	yellow- tan ppt							
				28	NR	tan, brown spots/ NR	dark gray spots	yellow- brown ppt (2)	3.0	-	0.07	1.6	92.0	3.3	20

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

[♥] red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg) (2) precipitate readily noticeable (1-10mg)

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O*	Acids (TAN)	Air (%)	R-502 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 507A (%)	R-502 (%)	TAN**
***				3	NR	dark orange/NR	blue-green	yellow						Ì	
				7	NR	dark orange/NR	blue-green	yellow							
<20	0.1	4	4	14	NR	brown spots/ NR	tan/ blue-green	yellow- dark ppt ≎							
				28	NR	brown spots/ NR	tan, gray spots/ gray, blue-green	yellow- dark ppt (2)	3.2	0.15	0.10	0.50	92.6	3.5	18
				3	NR	tan/NR	blue-green	yellow-tan ppt							
				7	NR	light tan/NR	blue-green	yellow-tan ppt							
<20	0.4	4	4	14	NR	tan/ NR	light tan/ blue-green	dark yellow- red-brown ppt							
				28	NR	tan, brown spots/ NR	light tan/ gray	dark yellow- red-brown ppt (2)							
				3	NR	dark orange/NR	tan/blue-green	yellow							
				7	NR	dark orange/NR	tan/blue-green	yellow							
200	0.1	4	4	14	NR	brown spots/ NR	tan/ blue-green	yellow- dark ppt ≎							
				28	NR	brown spots/ NR	tan/ blue-green	yellow- dark ppt (2)	3.5	0.10	0.51	0.75	91.8	3.3	16
				3	NR	tan/NR	tan/blue-green	yellow							
				7	NR	tan/NR	tan/blue-green	yellow							
200	0.4	4	4	14	NR	tan/ NR	tan/blue-green	dark yellow- red-brown ppt							
	entant of lul			28	NR	tan/ NR	dark gray spots	dark yellow- red-brown ppt (3)							

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall
(2) precipitate readily noticeable (1-10mg)
(3) significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

Photos of Sealed Tubes Containing R-507A and Contaminants at 135° C (275° F) for 224 days Figure I.1









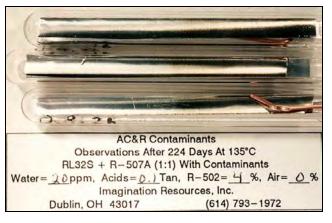




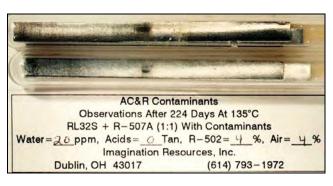




Photos of Sealed Tubes Containing R-507A and Contaminants at 135°C (275°F) for 224 days Figure I.2

















Photos of Sealed Tubes Containing R-507A and Contaminants at 165° C (329° F) for 28 days Figure I.3





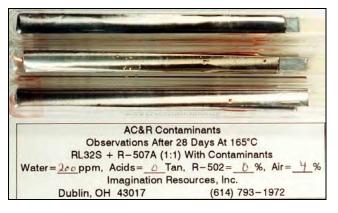












Photos of Sealed Tubes Containing R-507A and Contaminants at 165°C (329°F) for 28 days

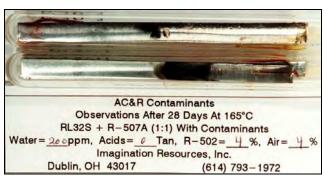
















Appendix J Glass Sealed Tube Evaluation and Photographic History of R-407C after 224 days Aging at 135°C and 28 days Aging at 165°C with Contaminants Added

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	NR	NR	clear							
				7	NR	NR	NR	clear							
				14	NR	NR	blue-green	clear							
<20	-	-	-	28	NR	NR	blue-green	clear							
				56	NR	NR	blue-green	clear							
				112	NR	NR	NR	clear							
				224	NR	NR	NR	clear	-	-	-	-	100	-	0.17
				3	NR	yellow-tan/ dark orange	tan	clear							
				7	NR	yellow-tan/ dark orange	tan	clear							
200	_	-	-	14	NR	yellow-tan	tan	light yellow							
				28	NR	yellow-tan/NR	tan	light yellow							
				56	NR	tan/NR	tan	light yellow							
				112	NR	tan/NR	tan	light yellow							
				224	NR	dark orange/NR	tan	light yellow	-		-	-	100	-	NA
				3	NR	light tan/ dark orange	tan/ blue-green	clear							
				7	NR	yellow-tan/ dark orange	tan/ blue-green	clear							
<20	0.1	-	-	14	NR	yellow-tan/ dark orange	tan/ blue-green	clear							
				28	NR	tan/dark orange	tan/blue-gray	clear							
				56	NR	tan/NR	tan/blue-gray	clear							
				112	NR	tan/NR	tan/blue-gray	clear							
				224	NR	dark orange/NR	tan/blue-gray	clear	-	-	-	-	100	-	0.78

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

NA = not available/tube failure

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	yellow-tan/dark orange	tan	clear							
				7	NR	yellow-tan/dark orange	tan	clear							
				14	NR	yellow-tan/dark orange	tan	clear							
< 20	-	-	4	28	NR	yellow-tan/dark orange	tan	clear							
				56	NR	yellow-tan/NR	brown	clear							
				112	NR	yellow-tan/NR	brown	clear							
				224	NR	gold/NR	brown	clear	-	1	1	-	97.5	2.5	NA
				3	NR	light tan/NR	NR	light yellow							
				7	NR	orange-tan/NR	NR	yellow							
				14	NR	tan/NR	blue-green	yellow							
				28	NR	tan/NR	blue-green	yellow							
< 20	-	4	-	56	NR	dark orange/NR	blue-gray	yellow							
				112	NR	orange/ NR	blue-gray	yellow- gray ppt							
				224	NR	NR	tan & dark gray	yellow- gray ppt (1)	3.5	0.70	0.10	0.50	95.2	1	12
				3	NR	yellow-tan/NR	tan	clear							
				7	NR	yellow-tan/dark orange	tan	clear							
				14	NR	yellow-tan/dark orange	tan	clear							
200	0.1	-	-	28	NR	yellow-tan/dark orange	tan	clear							
				56	NR	yellow-tan/NR	tan	light yellow							
				112	NR	tan/NR	brown	light yellow							
				224	NR	tan/NR	brown	light yellow	-	-	-	0.48	99.5	-	2.0

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

⁽¹⁾ precipitate barely noticeable (0-1mg)

NA = not available/tube failure

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	yellow-tan/ dark orange	light tan	clear							
				7	NR	yellow-tan	tan	clear							
200			4	14	NR	yellow-tan	tan	clear							
200	-	-	4	28	NR	yellow-tan	brown	light yellow]						
				56	NR	tan	brown	light yellow							
				112	NR	tan	brown	light yellow							
				224	NR	tan/NR	brown	light yellow	-	-	-	-	97.2	2.8	1.9
				3	NR	light tan/NR	gray, blue-green	clear							
				7	NR	orange-tan/NR	gray, blue-green	light yellow							
				14	NR	orange-tan/NR	gray, blue-green	yellow]						
				28	NR	NR	gray, blue-green	yellow							
200	-	4	-	56	NR	NR	blue, tan/ blue-gray	yellow- gray ppt							
				112	NR	NR	blue, tan/ blue-gray	yellow- gray ppt							
				224	NR	NR	gray & tan/ black	yellow- gray ppt (2)	3.4	0.39	0.30	0.86	95.0	0.11	15
				3	NR	yellow-tan/ dark orange	light tan	clear							
				7	NR	yellow-tan/ dark orange	tan	clear							
				14	NR	tan/dark orange	brown	clear							
<20	0.1	-	4	28	NR	brown/ yellow-orange	brown	clear							
				56	NR	brown/ yellow-orange	brown	clear							
				112	NR	brown/ yellow-orange	brown	light yellow							
				224	NR	brown/NR	brown	light yellow	-	-	-	0.41	96.4	3.2	NA

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

⁽²⁾ precipitate readily noticeable (1-10mg)

NA = not available/tube failure

	Contam	inants								GC	Vapor	· Com	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	orange-tan/NR	gray, blue-green	light yellow							
				7	NR	tan/NR	gray, blue-green	yellow							
				14	NR	tan/NR	gray, blue-green	yellow							
				28	NR	dark orange/NR	gray, blue-green	yellow ᢒ							
<20	0.1	4	-	56	NR	orange/ NR	blue-gray	yellow- red ppt ♀							
				112	NR	NR	blue-gray/ gray-black	yellow- red ppt ≎							
				224	NR	NR	gray & tan/ black	yellow- red ppt ② (2)	3.9	0.48	0.29	0.78	94.6	-	14
				3	NR	tan/NR	gray, blue-green	light yellow							
				7	NR	tan/NR	gray, blue-green	yellow							
				14	NR	tan/NR	gray, blue-green	yellow							
				28	NR	tan/NR	gray, blue-green	yellow							
<20	-	4	4	56	NR	dark orange/ NR	blue-gray	yellow- red ppt							
				112	NR	orange/ NR	blue-gray/ gray-black	yellow- red ppt							
				224	NR	NR	gray & black	yellow- red ppt (2)	3.6	0.43	0.31	0.54	92.4	2.7	13
				3	NR	yellow-tan/ yellow	tan	clear							
				7	NR	yellow-tan	tan	clear							
				14	NR	tan	brown	light yellow							
200	0.1	-	4	28	NR	brown	brown	light yellow							
				56	NR	brown	brown	light yellow							
				112	NR	brown/ dark orange	brown	light yellow							
				224	NR	brown/NR	brown	light yellow	-	-	-	-	97.1	2.9	NA

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)

NR = no reaction/no visible color change
• red, orange, or tan precipitate rings on inside tube wall
(2) precipitate readily noticeable (1-10mg)

NA = not available/tube failure

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	light tan/ dark orange	gray, blue-green	light yellow							
				7	NR	orange-tan/NR	gray, blue-green	yellow							
				14	NR	orange-tan/NR	gray, blue-green	yellow							
				28	NR	dark orange/NR	gray, blue-green	yellow							
200	0.1	4	-	56	NR	NR	blue-gray	yellow- dark ppt							
				112	NR	NR	blue-gray/ gray-black	yellow- dark ppt							
				224	NR	NR	gray & tan/ black	yellow- dark ppt (3)	3.9	0.46	0.12	0.96	94.6	0.09	16
				3	NR	light tan/ yellow-orange	tan/ blue-green	light yellow							
				7	NR	orange-tan/yellow	tan/blue-green	yellow							
				14	NR	tan/NR	tan/blue-green	yellow							
				28	NR	tan/NR	tan/blue-green	yellow							
200	-	4	4	56	NR	orange-tan/ NR	tan/ blue-green	yellow- orange ppt							
				112	NR	orange/ NR	tan/ gray-black	yellow- gray ppt							
				224	NR	NR	Black	yellow- gray ppt (3)	3.8	0.62	0.27	0.59	92.4	2.4	15

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

⁽³⁾ significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O*	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	tan/NR	gray, blue-green	light yellow							
				7	NR	tan/NR	gray, blue-green	yellow							
				14	NR	tan/NR	gray, blue-green	yellow							
				28	NR	tan/NR	gray, blue-green	yellow							
<20	0.1	4	4	56	NR	dark orange/ NR	blue-gray	yellow- gray, orange ppt							
				112	NR	orange/ NR	blue-gray/ gray-black	yellow- gray ppt							
				224	NR	NR	dark gray/ black	yellow- gray ppt (3)	3.7	0.57	0.28	0.81	92.2	2.4	14
				3	NR	tan/NR	gray, blue-green	light yellow							
				7	NR	tan/NR	gray, blue-green	yellow							
				14	NR	tan/NR	gray, blue-green	yellow							
				28	NR	tan/NR	light tan/blue-gray	yellow							
200	0.1	4	4	56	NR	dark orange/ NR	light tan/ blue-gray	yellow- tan ppt ≎							
				112	NR	orange/ NR	tan/ gray-black	yellow- tan ppt ❖							
			1 6:	224	NR	NR	Black	yellow- tan ppt (3)	3.7	0.55	0.27	0.62	92.4	2.5	15

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall

⁽³⁾ significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	NR	blue-green	clear							
-20				7	NR	NR	blue-green	clear							
<20	-	-	_	14	NR	NR	blue-green	clear							
				28	NR	NR	blue-green	clear	-	-	-	-	100	-	0.12
				3	NR	yellow-orange/NR	brown/blue-green	clear							
200				7	NR	yellow-tan/NR	brown/blue-green	clear							
200	-	_	-	14	NR	tan/NR	brown/blue-green	clear							
				28	NR	tan/NR	brown/blue-green	clear	-	-	-	-	100	-	2.1
				3	NR	yellow-tan/NR	brown/blue-green	clear							
<20	0.1			7	NR	yellow-tan/NR	brown/blue-green	clear							
<20	0.1	-	-	14	NR	yellow-tan/NR	brown/blue-green	clear							
				28	NR	yellow-tan/NR	brown/blue-green	clear	-	1	1	-	100	-	0.70
				3	NR	yellow-orange/NR	brown/blue-green	clear							
<20			4	7	NR	yellow/NR	brown/blue-green	clear							
<20	-	_	4	14	NR	yellow-tan/NR	brown/blue-green	clear							
				28	NR	yellow-tan/NR	brown/blue-green	clear	-	-	-	0.32	96.7	2.9	0.28
				3	NR	dark orange/NR	blue-green	yellow 😂							
				7	NR	dark orange/ NR	blue-green	yellow- dark ppt							
<20	-	4	-	14	NR	dark orange/ NR	gray, blue-green	yellow- dark ppt							
				28	NR	dark orange/ NR	gray, tan/ maroon, blue	yellow- dark ppt •• (1)	3.4	0.41	0.32	1.2	94.5	0.16	14

^{*} water content of lubricant and refrigerant

** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg)

	Contami	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	yellow-tan/NR	brown/blue-green	clear							
200	0.1			7	NR	tan/NR	brown/blue-green	light yellow							
200	0.1	-	-	14	NR	tan/NR	brown/blue-green	light yellow							
				28	NR	tan/NR	brown/blue-green	light yellow	-	-	-	-	100	-	2.0
				3	NR	yellow-tan/NR	brown/blue-green	clear							
200			4	7	NR	tan/dark orange	brown/blue-green	clear							
200	-	-	4	14	NR	tan/NR	brown/blue-green	clear							
				28	NR	tan/NR	brown/blue-green	light yellow	-	-	-	-	96.7	3.3	NA
				3	NR	dark orange/NR	blue-green	yellow							
				7	NR	dark orange/ NR	light tan/ blue-green	yellow							
200	-	4	-	14	NR	dark orange/ NR	light tan/ blue-green	yellow- dark ppt							
				28	NR	dark orange, brown spots/NR	blue, tan/ blue-gray	yellow- dark ppt (1)	3.8	0.70	0.28	0.75	94.5	-	7.3
				3	NR	tan/NR	brown/blue-green	clear							
20	0.1			7	NR	brown/orange	brown/blue-green	light yellow							
<20	0.1	-	4	14	NR	brown/orange	brown/blue-green	light yellow							
				28	NR	brown/orange	brown	light yellow	-	-	-	-	97.0	3.0	0.04
				3	NR	NR	light tan/ blue-green	yellow- dark ppt							
20	0.1	4		7	NR	orange/ NR	light tan/ blue-green	yellow- dark ppt							
<20	0.1	4	-	14	NR	orange/ NR	light tan/ blue-green	yellow- dark ppt							
				28	NR	orange/ NR	blue, tan/ blue-gray	yellow- dark ppt (1)	3.4	1.1	-	1.3	94.1	0.11	15

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

⁽¹⁾ precipitate barely noticeable (0-1mg)

NA = not available/tube failure

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
				3	NR	orange-tan/ NR	light tan/ blue-green	yellow- dark ppt ≎							
<20		4	4	7	NR	brown spots/ NR	light tan/ blue-green	yellow- dark ppt ≎							
<20	-	4	4	14	NR	brown spots/ NR	light tan/ blue-green	yellow- dark ppt ≎							
				28	NR	brown spots/ NR	blue, tan/ blue-gray	yellow- dark ppt (1)	3.7	0.58	0.30	0.78	92.2	2.4	14
				3	NR	yellow-tan/NR	brown/blue-green	clear							
200	0.1	_	4	7	NR	tan/NR	brown/blue-green	light yellow	ļ						
200	0.1		_	14	NR	tan/NR	brown/blue-green	light yellow							
				28	NR	brown/NR	brown	light yellow	-	-	-	-	96.7	3.3	NA
				3	NR	brown spots/ NR	gray-tan/ blue-green	yellow- brown ppt							
200	0.1	4		7	NR	brown spots/ NR	gray-tan/ blue-green	yellow- brown ppt							
200	0.1	4	-	14	NR	brown spots/ NR	gray-tan/ blue-green	yellow- brown ppt							
				28	NR	brown spots/ NR	blue, tan/ blue-gray	yellow- brown ppt (1)	3.6	0.54	0.17	0.73	94.9	-	15
				3	NR	dark orange/NR	gray-tan/blue-green	yellow							
				7	NR	dark orange/NR	gray-tan/blue-green	yellow							
200	-	4	4	14	NR	dark orange/ NR	gray-tan/ blue-green	yellow- dark ppt							
			1 6:	28	NR	brown spots/ NR	blue, tan/ blue-gray	yellow- dark ppt (1)	4.0	0.83	0.25	0.68	92.0	2.2	14

^{*} water content of lubricant and refrigerant
** KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg)

NA = not available/tube failure

Contaminants										GC Vapor Composition					
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-22 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R- 407C (%)	R-22 (%)	TAN**
<20	0.1	4	4	3	NR	tan, brown spots/ NR	tan/ blue-green	yellow- brown ppt							
				7	NR	tan, brown spots/ NR	tan/ blue-green	yellow- brown ppt ♡							
				14	NR	tan, brown spots/ NR	tan/ blue-green	yellow- brown ppt ♀							
				28	NR	brown spots/ NR	blue, tan/ blue-gray	yellow- dark ppt (1)	3.5	0.47	0.33	0.88	92.3	2.6	12
200	0.1	4	4	3	NR	brown spots/ NR	tan/ blue-green	yellow- brown ppt							
				7	NR	brown spots/ NR	tan/ blue-green	yellow- brown ppt ♀							
				14	NR	brown spots/ NR	tan/ blue-green	yellow- brown ppt ♡							
				28	NR	brown spots/ NR	blue, tan/ blue-gray	yellow- brown ppt (1)	3.8	0.75	0.28	0.74	91.9	2.5	12

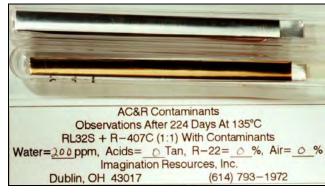
^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

♣ red, orange, or tan precipitate rings on inside tube wall
(1) precipitate barely noticeable (0-1mg)

Photos of Sealed Tubes Containing R-407C and Contaminants at 135° C (275° F) for 224 days Figure J.1

















Photos of Sealed Tubes Containing R-407C and Contaminants at 135°C (275°F) for 224 days Figure J.2











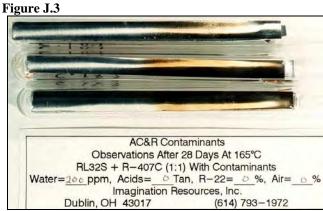






Photos of Sealed Tubes Containing R-407C and Contaminants at $165^{\circ}C$ ($329^{\circ}F$) for 28 days











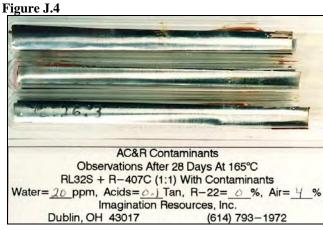


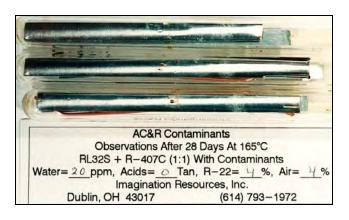




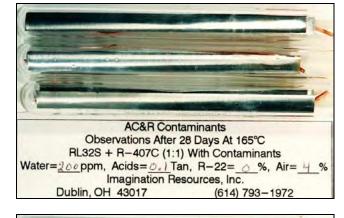
Photos of Sealed Tubes Containing R-407C and Contaminants at 165°C (329°F) for 28 days





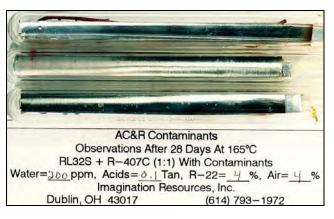












$Appendix\ K$ Glass Sealed Tube Evaluation and Photographic History of R-22 after 224 days Aging at 135°C and 28 days Aging at 165°C with Contaminants Added

Visual Observations and Chemical Analysis of Sealed Tubes Containing 3GS:R-22 (1:1) at 135 $^{\circ}\text{C}$ Table K.1

Co	ntaminar	nts						(GC Vap	or Con	positio	n	3GS
H ₂ O*	Acids	Air	Dor	Al	Connor	Valve Steel	Lianid	N ₂	O ₂	CO	CO ₂	R-22	TO A NAME.
(ppm)	(TAN)	(%)	Day		Copper		Liquid	(%)	(%)	(%)	(%)	(%)	TAN**
			3	NR	NR	NR	yellow						
			7	NR	NR	NR	yellow						
			14	NR	NR	NR	yellow						
< 20	-	-	28	NR	NR	NR	yellow						
			56	NR	NR	light tan	yellow						
			112	NR	NR	brown spots on light tan	yellow						
			224	NR	NR	dark gray on tan & blue-gray	yellow	-	-	-	-	100	0.04
			3	NR	NR	NR	yellow						
			7	NR	NR	NR	yellow						
			14	NR	NR	NR	yellow						
200	-	-	28	NR	NR	NR	yellow						
			56	NR	NR	light tan	yellow						
			112	NR	NR	brown spots on blue-gray	yellow						
			224	NR	NR	brown spots on blue-gray	yellow	-	-	-	-	100	0.01
			3	NR	orange/NR	brown spots	yellow						
			7	NR	orange/NR	brown spots	yellow						
			14	NR	orange/NR	brown spots/blue-gray	yellow						
< 20	0.1	-	28	NR	orange/NR	brown spots/blue-gray	yellow						
			56	NR	NR	brown spots/gray	yellow						
			112	NR	NR	brown spots	yellow						
			224	NR	NR	brown spots	yellow	-	-	-	-	100	0.11

^{*} water content of lubricant and refrigerant

** KOH (mg) / 3GS (g)
NR = no reaction/no visible color change

Visual Observations and Chemical Analysis of Sealed Tubes Containing 3GS:R-22 (1:1) at $135^{\circ}C$ Table K.2

Con	taminan	ts						G	C Vap	or Co	mposit	ion	3GS
H ₂ O* (ppm)	Acids (TAN)	Air (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-22 (%)	TAN**
			3	dark gray	brown/brown spots	brown/blue-gray	orange-dark ppt 🗘						
			7	dark gray	brown/brown spots	brown/blue-gray	dark orange-dark ppt 🏖						
			14	dark gray	dark brown/ NR	brown-black/ blue-gray	brown-dark ppt						
<20	-	4	28	dark gray	dark brown/ NR	brown-black/ blue-gray	brown-dark ppt						
			56	dark gray	dark brown/ NR	brown-black/ blue-gray	brown-dark ppt						
			112	blue-gray	dark brown/ NR	brown-black/ blue-gray	brown-dark ppt						
			224	blue-gray	dark brown/NR	brown-black/brown	brown-dark ppt 🕻 (1)	3.4	0.47	-	0.12	96.0	1.1
			3	NR	NR	NR/blue-gray	yellow						
			7	NR	NR	blue-gray	yellow						
			14	NR	NR	blue-gray	yellow						
			28	NR	NR	blue-gray	yellow	ļ					
200	0.1	-	56	NR	NR	light tan	yellow						
			112	NR	NR	brown spots on blue-gray	yellow						
			224	NR	NR	brown spots on blue-gray	yellow	-	-	-	-	100	0.10

^{*} water content of lubricant and refrigerant
** KOH (mg) / 3GS (g)
NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall

⁽¹⁾ precipitate barely noticeable (0-1mg)

Visual Observations and Chemical Analysis of Sealed Tubes Containing 3GS:R-22 (1:1) at $135^{\circ}C$ Table K.3

Cor	ntaminaı	nts						G	C Var	or Co	mposit	ion	3GS
H ₂ O* (ppm)	Acids (TAN)	Air (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-22 (%)	TAN**
			3	NR/ gray	brown spots, brown/ NR	brown/ blue-gray	orange-dark ppt						
			7	dark gray	brown spots, brown/ NR	dark brown/ gray	dark orange-dark ppt						
			14	gray/ blue-gray	dark brown/ NR	gray-black/ gray	brown, orange-dark ppt						
200	-	4	28	gray/ blue-gray	dark brown/ NR	gray-black/ gray	brown, orange-dark ppt						
			56	gray/ blue-gray	dark brown/ NR	gray-black/ dark gray	brown-dark ppt ❖						
			112	blue-gray	dark brown/ NR	gray-black/ gray-brown	brown-dark ppt ❖						
			224	dark gray/ blue-gray	dark brown/ NR	gray-black/ brown	dark brown-dark ppt ② (1)	3.5	0.40	0.10	0.20	95.8	1.7
			3	dull gray	brown spots, brown/ NR	brown/ blue-gray	orange-dark ppt						
			7	gray	brown spots, brown/ NR	dark brown/ gray	dark orange-dark ppt						
			14	gray/ blue-gray	dark brown/ NR	gray-black/ gray	brown-dark ppt						
<20	0.1	4	28	gray/ blue gray	dark brown/ NR	gray-black/ gray	brown-dark ppt ❖						
			56	gray/ blue-gray	dark brown/ tan	gray-black/ dark gray	brown-dark ppt ❖						
			112	dark gray	dark brown/ tan	brown-black/ gray-brown	brown-dark ppt						
			224	dark gray/ blue-gray	dark brown spots	brown-black/ brown	dark brown-dark ppt ② (1)	3.6	0.13	0.12	0.23	95.9	1.5

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / 3GS (g)

NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall (1) precipitate barely noticeable (0-1mg)

Visual Observations and Chemical Analysis of Sealed Tubes Containing 3GS:R-22 (1:1) at 135 $^{\circ}\text{C}$ Table K.4

Co	ontaminar	nts						G	C Vap	or Co	mposit	ion	3GS
H ₂ O* (ppm)	Acids (TAN)	Air (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-22 (%)	TAN**
			3	gray/ maroon	brown spots, brown/ NR	brown/ blue-gray	orange-dark ppt						
			7	gray/ maroon	brown spots, brown/ NR	dark brown/ dark gray	dark orange-dark ppt						
			14	gray/ gray-pink	dark brown/ NR	gray-black/ gray	brown-dark ppt						
200	0.1	4	28	gray/ gray-pink	dark brown/ NR	gray-black/ gray	brown-dark ppt						
			56	dark gray	dark brown/ NR	gray-black/ dark gray	brown-dark ppt						
			112	dark gray	dark brown/ NR	brown-black/ gray-brown	brown-dark ppt						
			224	dark gray/ blue-gray	dark brown/ NR	brown-black/ brown	dark brown-dark ppt ② (1)	3.4	0.12	0.18	0.21	96.1	1.5

^{*} water content of lubricant and refrigerant

** KOH (mg) / 3GS (g)

NR = no reaction/no visible color change

red, orange, or tan precipitate rings on inside tube wall

⁽¹⁾ precipitate barely noticeable (0-1mg)

Co	ntaminaı	nts						(GC Vap	or Cor	npositi	on	3GS
H ₂ O* (ppm)	Acids (TAN)	Air (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-22 (%)	TAN**
			3	NR	NR	NR/blue-gray	yellow						
-20			7	NR	NR	light tan/blue-gray	yellow						
<20	-	-	14	NR	NR	light tan/blue-gray	yellow						
			28	NR	NR	blue-gray	yellow	-	-	-	-	100	0.04
			3	NR	NR	NR/blue-gray	yellow						
200			7	NR	NR	light tan/blue-gray	yellow			Ì	Ì		
200	-	-	14	NR	NR	light tan/blue-gray	yellow						
			28	NR	NR	blue-gray	yellow	-	-	-	-	100	0.03
			3	NR	NR	light tan/blue	yellow						
			7	NR	NR	light tan/blue	yellow						
< 20	0.1	-	14	NR	NR	light tan/blue	yellow						
			28	NR	NR	light tan/ maroon-blue	yellow	-	-	-	-	100	0.13
			3	gray/	brown, black	brown/	orange-dark ppt						
			3	pink	spots/NR	blue-gray	•						
			7	gray/	dark brown/	gray-brown/	dark orange-dark ppt						
<20	_	4	,	pink	NR	blue	0						
\20		-	14	gray/	black/	tan/	orange-brown-						
			- 1	blue-gray	NR	blue	dark ppt						
			28	gray-tan/	black/	tan/	brown-dark ppt	0.68	< 0.05	0.06	0.76	98.5	1.8
				pink	NR	blue	(3)						
			3	NR	NR	light tan/blue	yellow	4					
200	0.1	_	7	NR	NR	light tan/blue	yellow						
200	0.1		14	NR	NR	light tan/blue	yellow						
			28	NR	NR	light tan/green	yellow	-	-	-	0.28	99.7	0.13

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / 3GS (g)

NR = no reaction/no visible color change

red, orange, or tan precipitate rings on inside tube wall
(3) significant amount of precipitate on metal coupons, tube wall, and tube bottom (10-100mg)

Visual Observations and Chemical Analysis of Sealed Tubes Containing 3GS:R-22 (1:1) at 165° C Table K.6

Cor	taminan	ıts						G	C Vap	or Cor	npositi	on	3GS
H ₂ O* (ppm)	Acids (TAN)	Air (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-22 (%)	TAN**
			3	gray/ pink	brown, black spots/NR	brown, black/ blue-gray	brown-dark ppt ❖						
200		4	7	tan/ blue-gray	dark brown/ NR	brown, black/ blue	brown-dark ppt ❖						
200	-	4	14	tan/ blue-gray	black/ NR	brown, black/ blue, maroon	brown-orange- dark ppt						
			28	gray-tan/ dark gray	black/ NR	brown, black/ blue, maroon	brown-dark ppt (3)	3.3	0.21	0.18	0.28	96.0	2.9
			3	gray/ pink	brown, black spots/NR	black/ gray, brown	brown-dark ppt ❖						
<20	0.1	4	7	gray/ blue-gray	dark brown/ NR	black/ gray, brown	brown-dark ppt						
<20	0.1	4	14	gray/ blue-gray	dark brown/ NR	black/ gray-red	brown- dark ppt						
			28	tan/ blue-gray	black/ NR	black/ gray-red	brown-dark ppt (3)	3.2	0.10	0.10	0.40	96.2	2.1
			3	gray/ pink	brown, black spots/NR	brown, black/ blue-gray	brown-dark ppt ❖						
200	0.1	4	7	gray/ pink	dark brown/ NR	brown, black/ blue	brown-dark ppt ❖						
200	0.1	4	14	gray/ gray-pink	dark brown/ NR	brown, black/ blue-gray	brown- dark ppt						
			28	tan/ blue-pink	black/ NR	brown, black/ blue-gray	brown-dark ppt (3)	3.0	< 0.05	0.22	0.63	96.1	2.6

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / 3GS (g)

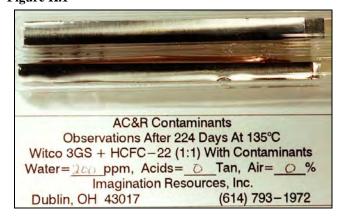
NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall

⁽³⁾ significant amount of precipitate on metal coupons, tube wall, and tube bottom (10-100mg)

Photos of Sealed Tubes Containing R-22 and Contaminants at 135°C (275°F) for 224 days Figure K.1

















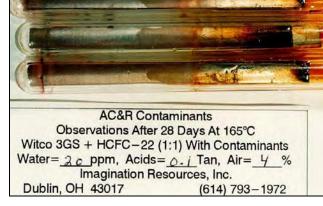
Photos of Sealed Tubes Containing R-22 and Contaminants at 165° C (329° F) for 28 days Figure K.2

















Appendix L Glass Sealed Tube Evaluation and Photographic History of R-134a after 224 days Aging at 135°C and 28 days Aging at 165°C with Contaminants Added

	Contam	inants								GC	Vapor	· Com	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	light tan/orange	light tan	clear							
				7	NR	yellow/orange	light tan	clear							
				14	NR	tan	tan	clear							
<20		_	_	28	NR	gold tan/gold	yellow tan	light yellow							
<20	-	-	-	56	NR	yellow-tan/ dark orange	brown	light yellow							
				112	NR	yellow/NR	brown	light yellow							
				224	NR	yellow/NR	brown	light yellow	-	-	-	-	100	-	0.18
				3	NR	light tan/orange	light tan	clear							
				7	NR	light tan/orange	tan	clear							
				14	NR	tan	tan	clear							
200	-	-	-	28	NR	brown/tan	golden tan	light yellow							
				56	NR	brown/orange	brown	light yellow							
				112	NR	brown/NR	brown	light yellow							
				224	NR	brown/NR	brown	light yellow	-	-	-	-	100	-	2.0
				3	NR	NR	NR/blue-green	clear							
				7	NR	NR	NR/blue-green	clear							
				14	NR	NR	NR/blue-green	clear							
<20	0.1	-	-	28	NR	orange/NR	NR/blue-green	clear							
				56	NR	orange/NR	blue-gray	clear							
				112	NR	orange/NR	blue-gray	clear							
				224	NR	NR	tan/blue-gray	clear	-	-	-	-	100	-	0.63

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	light tan/orange	light tan	clear							
				7	NR	light tan/dark orange	tan	light yellow							
				14	NR	tan	tan	light yellow							
< 20	0.4	-	-	28	NR	tan/orange	tan	light yellow							
				56	NR	brown/orange	brown	light yellow							
				112	NR	brown/NR	brown	light yellow							
				224	NR	brown/NR	brown	light yellow							
				3	NR	orange	blue-green	clear							
				7	NR	dark orange	blue-green	clear							
				14	NR	dark orange	blue-green	clear]						
				28	NR	dark orange	tan/light tan	clear							
<20	_	_	4	56	NR	orange	blue-green/tan	clear							
20				112	NR	NR	blue-green/ gray, tan	clear							
				224	NR	NR	dark gray/ maroon & blue-green	clear	-	1	ı	1	97.6	2.4	0.18
				3	NR	light tan/orange	blue-green	clear							
				7	NR	light tan/dark orange	blue-green	light yellow							
				14	NR	light tan/dark orange	blue-green	light yellow]						
<20		4	_	28	NR	light tan/dark orange	brown/tan	yellow							
\20	_	+	_	56	NR	orange	gray	yellow							
				112	NR	NR	gray	yellow							
				224	NR	NR	light tan/ blue-gray	yellow	3.5	0.90	<0.05	0.58	95.9	-	14

^{*} water content of lubricant and refrigerant

** KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

	Contam	inants								GC	Vapor	· Com	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	NR	NR/blue-green	clear							
				7	NR	NR	NR/blue-green	clear							
				14	NR	NR	NR/blue-green	clear							
200	0.1	-	-	28	NR	orange/NR	NR/blue-green	clear							
				56	NR	orange/NR	blue-gray	clear							
				112	NR	orange/NR	light tan/NR	clear							
				224	NR	orange/NR	tan/blue-gray	clear	-	-	-	-	100	-	1.9
				3	NR	light tan/orange	light tan	clear							
				7	NR	light tan/dark orange	light tan	light yellow							
				14	NR	light tan/dark orange	tan	light yellow							
200	0.4	-	-	28	NR	brown/light tan	tan	light yellow							
				56	NR	brown/dark orange	brown	light yellow							
				112	NR	brown/NR	brown	light yellow							
				224	NR	tan/NR	brown	light yellow							
				3	NR	dark orange/light tan	light tan	clear							
				7	NR	yellow/light tan	light tan	clear							
				14	NR	yellow	tan	clear							
				28	NR	brown/light tan	brown/tan	clear							
200	-	-	4	56	NR	yellow-tan/ dark orange	brown	light yellow							
				112	NR	yellow-tan/NR	brown	light yellow							
				224	NR	light tan/NR	blue-gray/ brown	yellow- white ppt (2)	-	-	-	-	97.6	2.4	2.1

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)

NR = no reaction/no visible color change (2) precipitate readily noticeable (1-10mg)

	Contam	inants								GC	Vapoi	r Com	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	dark orange/light tan	blue-green	clear							
				7	NR	dark orange	blue-green	light yellow							
				14	NR	dark orange	blue-green	light yellow							
200		4		28	NR	brown/light tan	light tan	yellow							
200	-	4	-	56	NR	orange	gray, blue-green	yellow							
				112	NR	NR	gray	yellow							
				224	NR	NR	blue-gray	yellow	3.8	-	0.28	-	95.9	-	15
				3	NR	dark orange	light tan	clear							
				7	NR	dark orange	tan/blue-green	clear							
				14	NR	light tan/orange	tan/blue-green	clear							
<20	0.1	-	4	28	NR	light tan/orange	tan/blue-green	clear							
				56	NR	light tan/orange	tan/blue-green	clear							
				112	NR	light tan/orange	tan/blue-green	light yellow							
				224	NR	NR/pink & orange	tan	yellow	-	-	-	-	97.7	2.3	0.69
				3	NR	orange	blue-green	clear							
				7	NR	light tan/ orange	light tan/ blue-green	clear							
20	0.4		4	14	NR	light tan/orange	light tan	clear							
<20	0.4	-	4	28	NR	tan/light tan	light tan/tan	light yellow							
				56	NR	dark orange/orange	tan/blue-green	light yellow							
				112	NR	dark orange/NR	tan/gray	light yellow							
				224	NR	dark orange/NR	tan &blue-gray	light yellow							

^{*} water content of lubricant and refrigerant

NR = no reaction/no visible color change

^{**} KOH (mg) / RL32S (g)

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O*	Acids	Air	R-12	Dan	A 1	C	Walne Cteel	Timela	N ₂	O ₂	CO	CO ₂	R-134a	R-12	
(ppm)	(TAN)	(%)	(%)	Day	Al	Copper	Valve Steel	Liquid	(%)	(%)	(%)	(%)	(%)	(%)	TAN**
				3	NR	dark orange/NR	blue-green	light yellow							
				7	NR	dark orange/NR	gray, blue-green	light yellow	ļ						
				14	NR	dark orange/NR	gray, blue-green	yellow 🗘		ļ.	ļ.				
				28	NR	orange/NR	gray, blue-green	yellow 🌣	Į						
<20	0.1	4	-	56	NR	orange/NR	blue-gray	yellow 🗘							
				112	NR	orange/	light tan/	yellow-							
				112	111	NR	blue-gray	dark ppt 🗘							
				224	NR	NR	gray & tan with	yellow-	3.5	_	0.10	0.50	95.9	_	12
				224		TVIX	black spots	red ppt ② (2)	3.3	_	0.10	0.50	73.7	_	12
				3	NR	dark orange	blue-green	clear							
				7	NR	light tan/orange	blue-green	light yellow							
				14	NR	tan/orange	blue-green	yellow							
<20	0.4	4	_	28	NR	brown/tan	brown/tan	yellow							
<20	0.4	4	_	56	NR	dark orange	gray	yellow							
				112	NR	dark orange/NR	light tan/gray	yellow							
				224	ND	orange/	tan/	yellow-							
				224	NR	NR	gray & black	dark ppt (3)							
				3	NR	dark orange	blue-green	clear							
				7	NR	light tan/orange	blue-green	light yellow							
				14	NR	light tan/orange	blue-green	yellow							
				28	NR	light tan/orange	blue-green	yellow							
<20	-	4	4	56	NR	dark orange/ orange	gray	yellow							
				112	NR	dark orange/ NR	blue-green/ gray, tan	yellow							
				224	NR	dark orange/ NR	gray & black/ maroon & blue	yellow- gray ppt (3)	3.5	-	0.10	0.50	93.4	2.5	10

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall (2) precipitate readily noticeable (1-10mg)

⁽³⁾ significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

$Visual\ Observations\ and\ Chemical\ Analysis\ of\ Sealed\ Tubes\ Containing\ RL32S: R-134a\ (1:1)\ at\ 135^{\circ}C$ Table L.6

	Contam	inants								GC	Vapor	· Com	position		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	dark orange/NR	light tan	clear							
				7	NR	dark orange/ NR	light tan/ blue-green	clear							
200	0.1		4	14	NR	dark orange/ NR	light tan/ blue-green	clear							
200	0.1	-	4	28	NR	light tan/NR	light tan	clear							
				56	NR	light tan/NR	light tan	clear]						
				112	NR	light tan/NR	gray & tan	light yellow							
				224	NR	NR/ pink & orange	gray & tan/ tan	yellow- white ppt (1)	-	-	-	-	96.1	3.9	0.72
				3	NR	dark orange	light tan	clear							
				7	NR	light tan/orange	light tan	clear							
				14	NR	light tan/dark orange	light tan	clear							
200	0.4	-	4	28	NR	dark orange/ light orange	light tan	light yellow							
				56	NR	dark orange/orange	light tan	light yellow							
				112	NR	NR	light tan	light yellow							
				224	NR	NR	black/ gray & tan	light yellow							

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

⁽¹⁾ precipitate barely noticeable (0-1mg)

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O*	Acids (TAN)	Air (%)	R-12 (%)	Dav	Al	Copper	Valve Steel	Liquid	N ₂	O ₂	CO		R-134a	R-12	TAN**
(ppm)	(IAN)	(%)	(%)	3	NR	dark orange/NR		light yellow	(%)	(%)	(%)	(%)	(%)	(%)	IAN
				7	NR		light tan spots gray, blue-green		1						
						dark orange/NR		light yellow	1			1			
				14	NR	dark orange/NR	gray, blue-green	yellow	-						
200	0.1	4		28	NR	dark orange/NR	gray, blue-green	yellow 🖸	ł))	ļ			
200	0.1	4	-	56	NR	orange/NR	blue-gray	yellow 🛇				ı			
				112	NR	orange/ NR	gray & light tan	yellow- red ppt ♡							
				224	NR	NR	gray & tan with black spots	yellow- red ppt (2)	3.9	-	0.37	0.66	95.1	-	2.7
				3	NR	dark orange	blue-green	clear							
				7	NR	light tan/orange	blue-green	light yellow							
				14	NR	light tan/orange	blue-green	yellow							
200	0.4	4	-	28	NR	tan/light orange	blue-green	yellow							
				56	NR	orange	blue-green	yellow							
				112	NR	NR	gray	yellow							
				224	NR	NR	black & gray	yellow							
				3	NR	dark orange	blue-green	clear							
				7	NR	light tan/orange	blue-green	light yellow							
				14	NR	light tan/orange	blue-green	yellow							
				28	NR	tan/light orange	yellow	yellow							
200	-	4	4	56	NR	orange	gray	yellow							
				112	NR	NR	gray with black spots	yellow- white ppt							
				224	NR	NR	black	yellow- dark ppt (3)	3.7	-	0.41	0.65	92.0	3.2	13

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

[•] red, orange, or tan precipitate rings on inside tube wall

⁽²⁾ precipitate readily noticeable (1-10mg)
(3) significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	light tan/ dark orange	blue-green	light yellow							
				7	NR	light tan/ dark orange	gray, blue-green	yellow							
				14	NR	tan/orange	gray, blue-green	yellow							
< 20	0.1	4	4	28	NR	dark orange/NR	gray, blue-green	yellow 😂							
				56	NR	orange/NR	blue-gray	yellow 😂							
				112	NR	orange/ NR	gray/ black	yellow haze- dark ppt							
				224	NR	NR	dark gray & black	yellow haze- dark ppt (3)	3.6	-	0.53	0.79	91.8	3.2	12
				3	NR	light tan/orange	blue-green	clear							
				7	NR	light tan/orange	blue-green	light yellow							
				14	NR	light tan/orange	blue-green	yellow							
				28	NR	tan/orange	yellow	yellow							
<20	0.4	4	4	56	NR	orange	blue-green/ dark gray	yellow- brown ppt							
				112	NR	NR	gray, black	yellow- dark ppt							
				224	NR	NR	black	yellow- dark ppt (3)							

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

⁽³⁾ significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	light tan/ dark orange	blue-green	light yellow							
				7	NR	light tan/ dark orange	gray, blue-green	yellow							
				14	NR	tan/orange	gray, blue-green	yellow							
200	0.1	4	4	28	NR	tan/orange	gray, blue-green	yellow							
				56	NR	dark orange/NR	blue-gray	yellow							
				112	NR	dark orange/ NR	gray/ black	yellow- dark ppt							
				224	NR	NR	dark gray & black	yellow haze- dark ppt (3)	4.0	-	0.57	0.83	91.6	3.1	14
				3	NR	light tan/orange	blue-green	clear							
				7	NR	light tan/orange	blue-green	light yellow							
				14	NR	light tan/ orange	light tan/ blue-green	yellow							
200	0.4	4	4	28	NR	tan/ orange	light tan/ yellow-green	yellow							
				56	NR	orange	blue-green	yellow							
				112	NR	NR	gray, black spots	yellow- white ppt							
				224	NR	NR	black	yellow- dark ppt (3)							

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)

NR = no reaction/no visible color change
(3) significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	dark orange/yellow	golden brown	clear							
-20				7	NR	dark orange/yellow	golden brown	light yellow							
<20	-	-	-	14	NR	dark orange/yellow	golden brown	light yellow							
				28	NR	tan/yellow-pink	brown/tan	light yellow	-	-	-	-	100	-	0.14
				3	NR	dark orange/yellow	golden brown	clear							
200				7	NR	light tan/yellow	golden brown	clear]						
200	-	-	-	14	NR	light tan/yellow	golden brown	light yellow							
				28	NR	brown/yellow-pink	brown/tan	light yellow	-	-	-	-	100	1	2.4
				3	NR	NR	gray/blue-green	clear							
				7	NR	NR	light tan/ blue-green	clear							
<20	0.1	-	-	14	NR	orange/ NR	light tan/ blue-green	clear							
				28	NR	orange/ NR	light tan/ blue-green	clear	-	-	1	-	100	1	0.59
				3	NR	dark orange/ orange	golden brown/ blue-green	light yellow							
<20	0.4	-	-	7	NR	light tan/ orange	golden brown/ blue-green	light yellow							
				14	NR	light tan/ orange	brown/ blue-green	light yellow		0					
				28	NR	brown/orange	tan/light tan	light yellow							
				3	NR	orange	light tan/ blue-green	clear							
<20	-	-	4	7	NR	orange	light tan/ blue-green	clear							
				14	NR	orange	light tan/ blue-green	clear							
				28	NR	NR	brown/tan	light yellow	-	-	-	-	97.6	2.4	0.27

^{*} water content of lubricant and refrigerant ** KOH (mg) / RL32S (g)

NR = no reaction/no visible color change

$Visual\ Observations\ and\ Chemical\ Analysis\ of\ Sealed\ Tubes\ Containing\ RL32S: R-134a\ (1:1)\ at\ 165^{\circ}C$ Table L.11

	Contam	inants								GC	Vapor	· Comp	osition		RL32S
H ₂ O*	Acids	Air	R-12	_		~			N ₂	O_2	CO	CO ₂	R-134a	R-12	
(ppm)	(TAN)	(%)	(%)	Day	Al	Copper	Valve Steel	Liquid	(%)	(%)	(%)	(%)	(%)	(%)	TAN**
				3	NR	dark orange/ orange	blue-green	light yellow							
-20		4		7	NR	dark orange/ orange	blue-green	light yellow							
<20	-	4	1	14	NR	dark orange/ orange	blue-green	yellow							
				28	NR	orange/ yellow	light tan	yellow- orange ppt (1)	3.3	-	0.15	0.50	96.0	-	12
				3	NR	NR	gray/blue-green	clear							
200	0.1			7	NR	orange/NR	light tan/blue-green	clear							
200	0.1	-	-	14	NR	orange/NR	light tan/blue-green	clear							
				28	NR	orange/NR	light tan/blue-green	clear	-	-	-	-	100	-	2.3
				3	NR	dark orange	golden brown	light yellow							
200	0.4			7	NR	tan/dark orange	golden brown	light yellow							
200	0.4	-	-	14	NR	tan/dark orange	golden brown	light yellow							
				28	NR	brown/orange	brown/tan	yellow							
				3	NR	dark orange	brown/blue-green	clear							
200			4	7	NR	tan/orange	brown/blue-green	clear							
200	-	-	4	14	NR	tan/orange	brown/blue-green	clear							
				28	NR	orange	tan/pink	light yellow	-	-	-	-	97.6	2.4	2.0
				3	NR	dark orange/ orange	blue-green	light yellow							
200		4		7	NR	dark orange/ orange	blue-green	yellow							
200	-	4	-	14	NR	dark orange/ orange	tan/ blue-green	yellow							
				28	NR	orange	tan/ light tan	yellow- orange ppt (1)	2.7	-	0.13	0.53	96.7	-	15

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g) NR = no reaction/no visible color change

⁽¹⁾ precipitate barely noticeable (0-1mg)

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	(%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
(PPIII)	(1111)	(/0)	(,0)	3	NR	dark orange/NR	brown/blue-green	clear	(,0)	(70)	(,0)	(,0)	(,0)	(,0)	2121
			_	7	NR	light tan/NR	brown/blue-green	clear							
<20	0.1	-	4	14	NR	light tan/NR	brown/blue-green	clear							
				28	NR	light tan/NR	brown/blue-green	light yellow	-	-	-	-	97.2	2.8	0.74
				3	NR	dark orange	brown/blue-green	clear							
-20	0.4		4	7	NR	tan/orange	brown/blue-green	light yellow							
<20	0.4	-	4	14	NR	tan/orange	brown/blue-green	light yellow							
				28	NR	yellow/orange	tan/light tan	light yellow							
				3	NR	NR	blue-green	yellow							
				7	NR	NR	blue-green	yellow							
<20	0.1	4	-	14	NR	orange/ NR	gray, blue-green	yellow- dark ppt							
				28	NR	brown spots/ NR	gray, blue-green	yellow- dark ppt (1)	3.5	-	0.15	0.40	96.0	-	12
				3	NR	orange	blue-green	light yellow							
				7	NR	orange	blue-green	yellow							
<20	0.4	4	-	14	NR	orange	tan/blue-green	yellow							
				28	NR	tan/ light gold	light tan/ NR	yellow- orange ppt (1)							
				3	NR	dark orange/NR	blue-green	light yellow							
				7	NR	dark orange/NR	blue-green	yellow							
<20	-	4	4	14	NR	dark orange/ orange	tan/ blue-green	yellow							
			1 6:	28	NR	tan/ orange	tan/ light green	yellow- orange ppt (1)	3.6	-	0.28	0.56	92.6	3.0	13

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change
(1) precipitate barely noticeable (0-1mg)

	Contam	inants								GC	Vapor	· Com	osition		RL32S
H ₂ O*	Acids	Air	R-12	Day	Al	Connor	Valve Steel	Liquid	N ₂	O ₂	CO	CO ₂	R-134a	R-12	TEL A NI Tabab
(ppm)	(TAN)	(%)	(%)			Copper			(%)	(%)	(%)	(%)	(%)	(%)	TAN**
				3	NR	dark orange/NR	brown/blue-green	clear							
200	0.1	-	4	7	NR	dark orange/NR	brown/blue-green	clear	{						
				14	NR	dark orange/NR	brown/blue-green	clear							
				28	NR	dark orange/NR	brown/blue-green	light yellow	-	-	-	-	97.8	2.8	1.9
				3	NR	dark orange/ NR	golden brown/ blue-green	clear							
200	0.4	-	4	7	NR	light tan/ NR	golden brown/ blue-green	clear							
				14	NR	light tan/orange	brown/blue-green	clear							
				28	NR	orange	light tan/ red-green	light yellow							
				3	NR	dark orange/NR	blue-green	yellow							
				7	NR	dark orange/ NR	blue-green/ red-gray	yellow- dark ppt							
200	0.1	4	-	14	NR	dark orange/ NR	gray/ maroon-gray	yellow- dark ppt							
				28	NR	light tan/ NR	tan/ maroon-gray	yellow- dark ppt (1)	4.0	1	0.28	0.71	95.0	ı	10
				3	NR	dark orange/NR	blue-green	light yellow							
				7	NR	tan/ NR	blue-green	yellow- brown ppt							
200	0.4	4	-	14	NR	tan/ orange	brown/ blue-green	yellow- brown ppt							
				28	NR	tan/ orange	tan/ light green	yellow- brown ppt (2)							
				3	NR	dark orange/NR	blue-green	light yellow							
				7	NR	dark orange/NR	blue-green	yellow							
200	-	4	4	14	NR	dark orange/ orange	tan/ blue-green	yellow							
				28	NR	orange/gold	tan/light tan	yellow	3.2	-	0.24	0.53	93.0	3.0	16

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g)
NR = no reaction/no visible color change

⁽¹⁾ precipitate barely noticeable (0-1mg) (2) precipitate readily noticeable (1-10mg)

	Contam	inants								GC	Vapor	Comp	osition		RL32S
H ₂ O* (ppm)	Acids (TAN)	Air (%)	R-12 (%)	Day	Al	Copper	Valve Steel	Liquid	N ₂ (%)	O ₂ (%)	CO (%)	CO ₂ (%)	R-134a (%)	R-12 (%)	TAN**
				3	NR	NR	blue-green	yellow							
-20	0.1	4	4	7	NR	NR	blue-green	yellow							
<20	0.1	4	4	14	NR	orange/NR	gray, blue-green	yellow							
				28	NR	orange/NR	tan/dark gray	dark yellow	4.2	-	0.31	0.72	91.7	3.1	16
				3	NR	dark orange/NR	blue-green	light yellow						-	
				7	NR	dark orange/NR	blue-green	yellow							
<20	0.4	4	4	14	NR	dark orange/ orange	brown/ blue-green	yellow- brown ppt							
				28	NR	tan/ light gold	light tan/ NR	yellow- brown ppt (2)							
				3	NR	dark orange/ NR	tan/ blue-green	yellow- dark ppt							
				7	NR	tan spots/ NR	tan/ blue-green	yellow- dark ppt							
200	0.1	4	4	14	NR	brown spots/ NR	light tan/ blue-green	yellow- dark ppt							
				28	NR	brown spots/ NR	tan/ dark gray	dark yellow/ gray- brown ppt (3)	3.5	-	0.26	0.59	92.7	3.0	16
				3	NR	dark orange/NR	blue-green	light yellow			-	-			=
				7	NR	dark orange/NR	blue-green	yellow							
200	0.4	4	4	14	NR	dark orange/ orange	brown/ blue-green	yellow- brown ppt							
	entant of lu			28	NR	tan/ light gold	light tan/ black	yellow- brown ppt (3)							

^{*} water content of lubricant and refrigerant

^{**} KOH (mg) / RL32S (g) NR = no reaction/no visible color change

⁽²⁾ precipitate readily noticeable (1-10mg)
(3) significant amount of precipitate on metal coupons, tube walls, and tube bottom (10-100mg)

Photos of Sealed Tubes Containing R-134a and Contaminants at 135°C (275°F) for 224 days Figure L.1

















Photos of Sealed Tubes Containing R-134a and Contaminants at 135°C (275°F) for 224 days Figure L.2









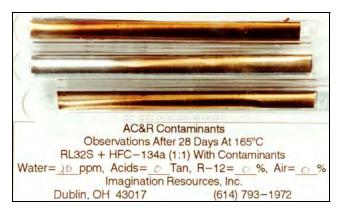




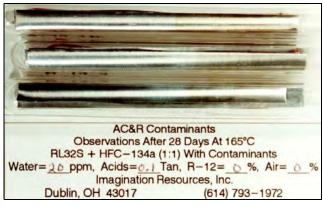




Photos of Sealed Tubes Containing R-134a and Contaminants at 165°C (329°F) for 28 days Figure L.3



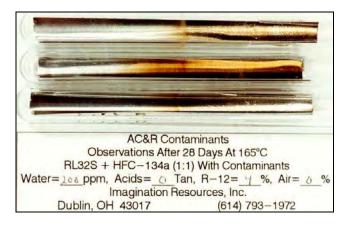














Photos of Sealed Tubes Containing R-134a and Contaminants at 165°C (329°F) for 28 days Figure L.4

