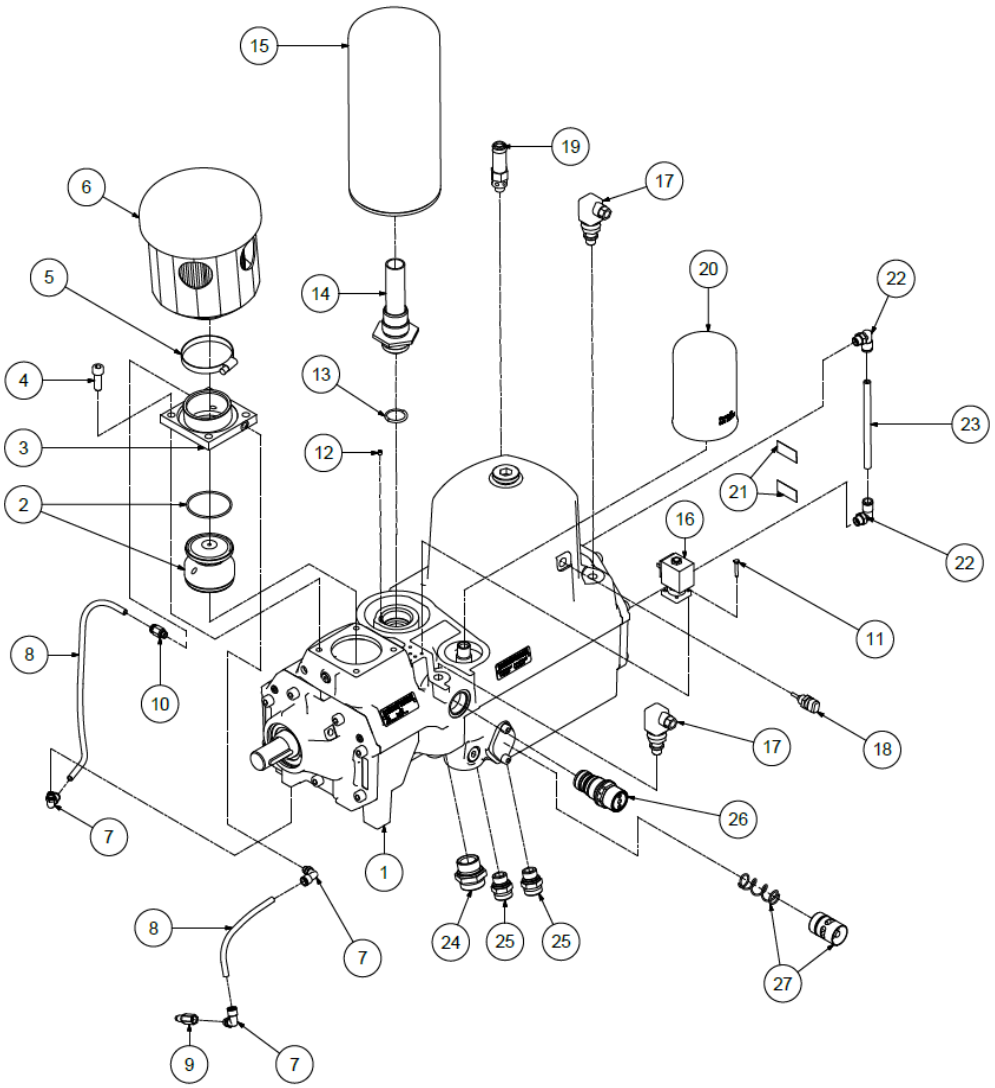
User and Maintenance Manual

EK100

Rev. 12.2022



Exploded View of EK100 Compressor

If you have any questions on this equipment please contact Technical Support at:

Nuvair
1600 Beacon Place
Oxnard, CA 93033 USA

Phone: +1.805.815.4044
Fax: +1.805.486.0900
Email: info@nuvair.com

Hours: Monday through Friday
8:00 am to 5:00 pm Pacific Time

⚠ Warning

This User Manual contains important safety information and should always be available to those personnel operating this equipment. Read, understand, and retain all instructions before operating this equipment to prevent injury or equipment damage.

Every effort was made to ensure the accuracy of the information contained within. Nuvair, however, retains the right to modify its contents without notice. If you have problems or questions after reading the manual, stop and call Nuvair at +1.805.815.4044 for information.

WARNING, PROHIBITION, MANDATORY LABEL INFORMATION

Champion Rotary Screw compressors are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

Boxed text formats are used, within this manual, to alert users of the following conditions:

Safety Labels are used, within this manual and affixed to the appropriate areas of the compressor package, to alert users of the following conditions:

⚠ DANGER

Indicates a hazard with a high level of risk, which if not avoided, <u>WILL</u> result in death or serious injury.

Equipment Starts Automatically

Health Hazard, Explosive Release of Pressure

Cutting of Finger or Hand Hazard, Rotating Impeller Blade

High Voltage, Hazard of Shock, Burn, or Death Present until Electrical Power is Removed

Cutting of Finger or Hand Hazard, Rotating Fan Blade

Entanglement of Fingers or Hand/Rotating Shaft

⚠ WARNING

Indicates a hazard with a medium level of risk which, if not avoided, <u>COULD</u> result in death or serious injury.

Asphyxiation Hazard, Poisonous Fumes or Toxic Gases in Compressed Air

⚠ CAUTION

Indicates a hazard with a low level of risk which, if not avoided, <u>MAY</u> result in a minor or moderate injury.

Burn Hazard, Hot surface

PROHIBITION/MANDATORY ACTION REQUIREMENTS

Do not Operate Compressor with Guard Removed

Lockout Electrical Equipment in De-Energized State

Do Not Lift Equipment with Hook, No Lift Point

Loud Noise Hazard, Wear Ear Protection

Handle Package at Forklift Points Only

Read the Operator's Manual Before Proceeding with Task

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

Failure to observe these notices will result in injury to or death of personnel.

- **Keep fingers and clothing away from rotating fan, drive coupling, etc.**
- **Disconnect the compressor unit from its power source, lockout and tagout before working on the unit, this machine is automatically controlled and may start at any time.**
- **Do not loosen or remove the oil filler plug, drain plugs, covers, the thermostatic mixing valve or break any connections, etc., in the compressor air or oil system until the unit is shut down and the air pressure has been relieved.**
- **Electrical shock can and may be fatal.**
- **Perform all wiring in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring and electrical service must be performed only by qualified electricians.**

  Open main disconnect switch, lockout and tagout and check for voltage before working on the control.

Failure to observe these notices could result in damage to equipment.

- **Stop the unit if any repairs or adjustments on or around the compressor are required.**
- **Do not use the air discharge from this unit for breathing, not suitable for human consumption.**
- **An Excess Flow Valve should be on all compressed air supply hoses exceeding 1/2 inch inside diameter (OSHA Regulation, Section 1926.302).**
- **Do not exceed the rated maximum pressure values shown on the nameplate.**
- **Do not operate unit if safety devices are not operating properly. Check periodically. Never bypass safety devices.**

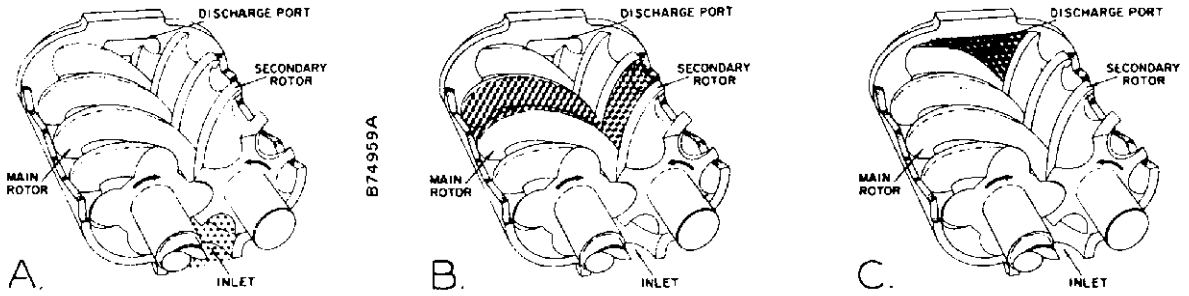


FIGURE 1-1 COMPRESSOR CYCLE

COMPRESSOR - The rotary screw compressor is a single stage, positive displacement rotary machine using meshing helical rotors to effect compression. Both rotors are supported between high capacity anti-friction bearings located outside the compression chamber. Roller bearings are used at the inlet end of the rotors to carry part of the radial loads. Angular contact ball and roller bearings at the discharge end locate each rotor axially and carry all thrust loads and the remainder of the radial loads.

COMPRESSION PRINCIPLE (Figure 1-1) Compression is accomplished by the main and secondary rotors synchronously meshing in a one-piece cylinder. The main rotor has five (5) helical lobes 90° apart. The secondary rotor has six (6) matching helical grooves 72° apart to allow meshing with main rotor lobes.

The air inlet port is located on top of the compressor cylinder near the drive shaft end. The discharge port is near the bottom at the opposite end of the compressor cylinder. *Figure 1-1 is an inverted view to show inlet and discharge ports*. The compression cycle begins as the rotors unmesh at the inlet port and air is drawn into the cavity between the main rotor lobes and the secondary rotor grooves (A). When the rotors pass the inlet port cutoff, air is trapped in the interlobe cavity and flows axially with the meshing rotors (B). As meshing continues, more of the main rotor lobe enters the secondary rotor grove, normal volume is reduced and pressure increases.

Oil is injected into the cylinder to remove the heat of compression and seal internal clearances. Volume reduction and pressure increase continues until the air/oil mixture trapped in the interlobe cavity by the rotors passes the discharge port and is released to the oil reservoir (C). Each rotor cavity follows the same “fill-compress-discharge” cycle in rapid succession to produce a discharge air flow that is continuous, smooth and shock free.

AIR FLOW IN THE COMPRESSOR SYSTEM (Figure 1-3) Air enters the air filter and passes through the inlet unloader valve and on into the compression chamber where oil is injected into the air. After compression, the air/oil mixture passes into the oil reservoir where most of the entrained oil is removed by velocity change and impingement and drops back into the reservoir. The air and remaining oil then passes through the air/oil separator. The air then passes through the minimum pressure/check valve, the after cooler and the optional moisture separator and into the plant air lines.

LUBRICATION, COOLING AND SEALING - Oil is forced by air pressure from the oil reservoir through the oil cooler, thermostatic mixing valve, and oil filter and discharge into the compressor main oil gallery. A portion of the oil is directed through internal passages to the bearings and shaft oil seal. The balance of the oil is injected directly into the compression chamber to remove heat of compression, seal internal clearances and lubricate the rotors.

Terminal Strip - This device provides an interconnection between the controller and the low voltage hardware such as sensors and switches within the enclosure.

Main Starter
For Fixed Speed variant models, a Wye/Delta reduced voltage starter provides control and overload protection for the main drive motor. The overloads are adjustable and are factory set based on the motor nameplate amps and the instructions located inside the control box door.

For Variable Speed variant models, a variable speed drive provides the overload protection for the main drive motor as well as compressor speed modulation.

Wiring diagrams for the standard configurations are illustrated in the following pages of this section.

NOTICE

Read the Operator's Manual before operating the compressor. It is critical that the detailed instructions for the controller, found in the controller manual are read and understood. Once the appropriate parameters have been selected into the controller, compressor operation may commence. For convenience, a "Quick Start" excerpt from the controller manual is shown in Section 3.

FIELD CONVERSION OF MULTI-VOLTAGE ELECTRICAL SYSTEM – For fixed speed tri-voltage models to convert the compressor package from its as-built voltage configuration to one of its optional ones, contact Champion and request "Instructions, Tri-Voltage Conversion", document TED000631.

MISCELLANEOUS CONTROL DEVICES - Refer to Figure 4-29 for the schematic diagram of the control system.

Air Inlet Filter (1) - Captures solid impurities in the air stream entering compressor inlet. It also attenuates noise emitted by the compressor inlet.

Intake Regulator Assembly (2) - This device controls the intake of atmospheric air entering the compressor during the Load/Unload phases of operation.

- **During the loaded state**: The **inlet poppet (pressure control valve 2.2)** remains open and allows atmospheric air to enter the compressor inlet.
- **During the unloaded state**: The **2-way solenoid valve (Y1**) feeds pressurized air underneath the **piston (actuating cylinder 2.1)**, forcing it and **the inlet poppet (2.2)** upward and blocking-off the compressor intake. Excess gas is vented to atmosphere. A small purge line **(non-return valve 2.3)** allows a stream of air to reach the rotors and keep them from unstable, noisy operation and producing sufficient pressure to maintain cooling / lubricating oil flow.

Electric Motor (3) – Drives the **compressor (4)** via a **belt drive assembly (5),** and drives the package ventilation fan from a secondary rear shaft. It is energized by the Wye/Delta starter (variable frequency drive in variable speed models), which in turn is controlled by the controller.

Pressure Reservoir (6) – Separates by inertial effects the bulk of the compressed air and injection oil streams and serves as a sump for the latter.

Fine Air/Oil separator (7) - Intercepts and coalesces the aerosol oil stream in the compressed air exiting the inertial separation process within the reservoir.

Oil Filler Cap (8) – Oil fill port on the reservoir.

Oil drain (9) – Ball valve drains the oil from the reservoir and the oil trapped in the oil cooler and associated hoses.

Oil Level Indicator (10) - This gauge is located on the oil reservoir and indicates the oil level. See “Oil Level Gauge” on Section 5 for more details.

Oil Filter (11) - Captures solid impurities in the oil entering the compressor injection port.

Oil Cooler (12) – The air-cooled heat exchanger removes heat from the oil stream prior to injection.

Pressure Relief Valve (13) – This device protects the pressure containing components of the compressor package against high pressure exceeding 217 psig. See Section 9, for maintenance information.

Minimum Discharge Pressure/Check Valve (14) - This device maintains minimum pressure (65 psig) within the air/oil sump, thus ensuring adequate lubricating oil injection flow to the compressor even when no air delivery into the system is taking place. It also functions as a check valve to prevent reversed air flow from the system line during compressor stoppage. See Section 9 for maintenance information.

Air cooler (15) – The air-cooled heat exchanger removes heat from the air stream prior to exit from the package.

Oil fine separator extractor (16) – This annular orifice, built into the air/oil separator element adaptor pipe, controls the amount of oil and compressed air that is returned from the air/oil separator back into the compressor.

Solenoid Valve (Y1) - This 2-way valve controls the position of the inlet valve in response to signals from the Controller.

Pressure Sensor - Sump Dry Side (B1) - This device is connected after the minimum pressure valve. It converts the pressure in the plant air system into an electrical signal for use by the controller for monitoring and control load/unload operation.

Pressure Sensor - Sump Wet Side (B2) - This device is connected to the oil sump. It converts the pressure in the oil sump into an electrical signal for use by the controller for monitoring and control. Its signal, when compared to that of sensor **(B1)**, indicates the pressure loss across the air/oil separator element and it can also trigger a shutdown event in case an exceedingly high pressure is detected.

Temperature Sensor - Sump Wet Side (R2) - This device is connected to the oil sump. It converts the temperature in the oil sump into an electrical signal for use by the controller for monitoring and control. Its signal is used to monitor compressor temperature and also trigger a shutdown event in case an exceedingly high is detected.

The following items additional are provided with the Total System variant:

Receiver – Provides storage of compressed air and serves as a support for the compressor unit and optional dryer.

Refrigerated dryer – The [optional] electric refrigerated dryer cools and lowers the dew point of the compressed air stream delivered by the compressor unit by removing the condensed water vapor entrained.

Dryer bypass valve – These [optional] valves allow the isolation of the refrigerated dryer (from the compressed air line) for troubleshooting or maintenance purposes.

Condensate drain valve – This device provides drainage from the receiver. It, along with the receiver, replaces the water separator shipped loose with the basic package.

Pressure relief valve – This device protects the pressure containing components included with the received against high pressure exceeding 195.5 psig. Section 9 for maintenance information.

Pressure gauge – This device monitors the compressed air pressure within the receiver.

LUBRICATION
OIL COOLER, OIL FILTER & SEPARATOR

COMPRESSOR OIL SYSTEM - Lubricating oil is employed to absorb the heat of compression, lubricate moving parts and seal internal clearances between the rotor and the air cylinder. Pressure differential between the air/oil sump and the final injection point into the compressor is used to move the oil mass through the various oil system components. Refer to Figure 4-29 for the arrangement of the oil system components.

Oil exits the air/oil sump and is delivered to the heat exchange and thermal mixing valve, where cold (oil cooler branch) and hot (oil bypass branch) are mixed to the desired compressor injection temperature. The tempered oil is cleansed via the oil filter before injection into the compressor casing.

RECOMMENDED LUBRICANT - Champion compressors is factory filled with one of several Champion RotorLub lubricants. These lubricants are formulated to the highest quality standards and are factory authorized, tested and approved for use in rotary screw compressors. RotorLub lubricants are available through your authorized Champion compressor distributor.

OIL SPECIFICATIONS - This machine has a standard factory fill of RotorLub 4000 – which is a 4000 hour lubricant. However, other lubricants are available for factory fill which may have other hour ratings and compositions. Reference the serial tag, affixed to the side of the machine, for the lubricant that was shipped with the machine.

OIL LEVEL INDICATOR (GAUGE) indicates the amount of oil in the oil reservoir, see Fig 5-1 for details. Read oil level when unit is shut off and the foam has settled out. In operation the oil level will fluctuate as the compressor loads and unloads. Adequate oil level falls between the MAX and MIN limits of the sight glass:

- The approximate oil system total capacity is 2.5 Gals (9.5 L)

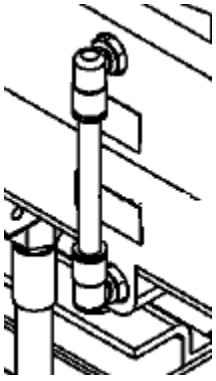


FIGURE 5-1 Oil Level Sight Glass

Before draining, adding, or changing the lubricant oil in the compressor, be aware of the following hazards associated with these tasks:

⚠ DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

⚠ CAUTION

Compressor, air/oil reservoir, separator chamber and all piping and tubing may be at high temperature during and after operation.

⚠ CAUTION

Use of improper lubricants will cause damage to equipment. Do not mix different types of lubricants or use inferior lubricants.

⚠ CAUTION

Improper equipment maintenance with use of synthetic lubricants will damage equipment. Oil filter and oil separator change intervals remain the same as for Champion genuine RotorLub lubricants, see “Maintenance Schedule”, page 82.

⚠ CAUTION

High temperature operation can cause damage to equipment or personal injury. Do not repeatedly restart the unit after high temperature stops operation. Find and correct the malfunction before resuming operation.

⚠ CAUTION

Read the oil level when the unit is shut off for an accurate measurement.

⚠ CAUTION

All materials used in Champion compressor units are compatible with RotorLub Lubricant. Use caution when selecting downstream components such as air line lubricating bowls, gaskets and valve trim.

RotorLub Synthetic Lubricant is not compatible with low nitrile Buna N or acrylic paints. RotorLub is compatible with most air system downstream components.

Safety Sheets (SDS) are available for all RotorLub lubricants at web address.
www.championpneumatic.com/contactus.aspx

LUBRICANT CHANGE PROCEDURE - If upgrading to a different lubricant type (e.g., longer life, higher temperature, food grade, etc.), following the proceeding steps, see Figure 1-3 for hardware details:

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.

2. Disconnect, tag and lockout the power supply to the starter.

3. Thoroughly drain oil system while hot:
   - Remove the plug and open the drain valve at the lower left hand side of the oil core tank. Once the oil has been drained, close the drain valve and reinstall the plug.
   - Remove and drain oil from the oil filter. Reinstall the used filter.

4. Fill the system with a 50 percent charge of the new lubricant:
   - Start the machine and monitor its operation.
   - Allow the machine to reach a stable discharge temperature (5-7 minutes), then shut down.

5. Thoroughly drain oil system.

6. Replace used oil filter and air/oil separator element with new ones.

7. Fill the system with a full charge of the new lubricant.

8. Machine should then be run normally; however, total run time after the initial change-out should be 50 percent of normal anticipated service life of the new lubricant.
   - Drain all lubricant from the system, change the filter and separator, and replace with a full charge of the new lubricant.

9 Subsequent lubricant change-outs should be at normal intervals. See “Oil Change Interval” in this Section for details.

COLD AMBIENT OPERATION - See “Installation for Cold Weather Operation”, Section 2.

ADDITION OF OIL BETWEEN CHANGES must be made when the oil level is below the minimum level of the sight glass as read while the unit is completely off and blown down, and the foam has settled out.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.
2. Disconnect, lockout and tagout the power supply to the starter.
3. Wipe away all dirt around the oil filler plug located on top of the oil sump.
4. Remove the oil filler plug and add oil as required to return the oil level to the middle of the sight gauge.
5. Install oil filler plug, run and check for leaks.

DO NOT OVERFILL (you should see oil slightly above the full line after running fully loaded and then shutting down the machine and allowing the foam to settle out). The quantity required to raise the oil level from “ADD” to “FULL” is shown on page 55. Repeated addition of oil between oil changes may indicate excessive oil carry-over and should be investigated.

⚠ CAUTION

Excessive oil carry-over can damage equipment. Never fill oil reservoir above the “FULL” marker.

OIL CHANGE INTERVAL - Recommended oil change intervals are based on oil temperature - see Figure 5-2 for typical trends for the standard lubricant (RotorLub 4000 / RotorLub 4K) and a synthetic lubricant (RotorLub 8000 / RotorLub 8K). Consult Champion for additional lubricant types available for your compressor.

When operating conditions are severe (very dusty, high humidity, etc.), it will be necessary to change the oil more frequently. Operating conditions and the appearance of the drained oil must be surveyed and the oil change intervals planned accordingly by the user. Champion offers a free oil analysis program with the RotorLub lubricants, and we recommend a sample be sent in at 100 hours on a new unit.

Discharge Temperature	RotorLub 4000 / RotorLub 4K Change Interval	RotorLub 8000 / RotorLub 8K Change Interval	RotorLub 8000TH / RotorLub 8K-HT Change Interval	RotorLub 4000FG Change Interval
Up to 180°F (82°C)	4000 hrs.	8000 hrs.	8000 hrs.	4000 hrs.
180° to 190°F (82°C to 88°C)	3000 hrs.	6000 hrs.	6000 hrs.	3000 hrs.
190° to 200°F (88°C to 93°C)	2000 hrs.	4000 hrs.	4000 hrs.	2000 hrs.
200°F+ (93°C)	1000 hrs.	2000 hrs.	2000 hrs.	1000 hrs.

FIGURE 5-2 Oil Change Interval

DRAINING AND REFILLING THE OIL SYSTEM - Always drain the complete system. Draining when the oil is hot will help to prevent varnish deposits and carry away impurities, see Figure 1-3 for hardware details.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.

2. Disconnect, lockout and tagout the power supply to the starter.

3. Thoroughly drain oil system while system is hot:
   - Remove the plug and open the drain valve at the lower left hand side of the oil core tank. Once the oil has been drained, close the drain valve and reinstall the plug. Make sure to provide a suitable pan to catch the 2.5 gal. (9.5 l) oil charge.
   - If the drained oil and/or oil filter element is contaminated, discontinue this procedure and follow instead the "Lubricant Change Procedure" in this section.
4. Replace both used oil filter and air/oil separator element with new ones.
   - Remove each spin-on element.
   - Clean each gasket face of the filter body.
   - Coat each new element gasket with clean lubricant used in the unit
   - Screw each new element on the filter body and tighten by hand. Tighten 1/2 turn more after gasket makes contact. **DO NOT OVERTIGHTEN ELEMENT**.

5. Wipe away all dirt around the oil filler plug.

6. Remove the oil filler plug and add oil as required to return the oil level to the full marker on the gauge.

7. Install the oil filler plug and operate the unit for about a minute allowing oil to fill all areas of the system. Check for leaks.

8. Shut down unit, allowing the oil to settle, and be certain all pressure is relieved.

9. Add oil, if necessary, to bring level to “FULL.”

Use only CLEAN containers and funnels so no dirt enters the reservoir. Provide for clean storage of oils. Changing the oil will be of little benefit if done in a careless manner.

⚠ CAUTION

Use only the replacement element shown on the filter tag or refer to the parts list for the part number.

⚠ CAUTION

Excessive oil carry-over can damage equipment. Never fill oil reservoir above the “FULL” marker.

⚠ CAUTION

Improper oil filter maintenance will cause damage to equipment. Replace filter element every 1000 hours of operation. More frequent replacement could be required depending on operating conditions. A filter element left in service too long may damage equipment

MOISTURE IN THE OIL SYSTEM – During periods of low ambient temperatures, light duty cycles, high humidity, or in the event of thermal mixing valve malfunction, the oil charge residing in the sump may not reach a high enough temperature to keep water vapor from condensing as liquid water, a condition that contaminates the oil charge, may cause excessive oil carryover, or result in compressor failure.

To help the end user determine if the compressor package is operating under potential water condensing conditions, the charts in Fig 5-3 and 5-4 have been provided. To use, find the prevailing ambient temperature along the horizontal scale of the chart, move vertically from this point until intercepting the slanted line corresponding to the operating discharge pressure; and finally, move horizontally from this point to read the corresponding water vapor dew point on the vertical scale. The compressor discharge temperature must be maintained at a minimum of 10°F (5.5°C) above this dew-point temperature to prevent condensation accumulation in the lubricant reservoir. Note that the charts conservatively assume 100% relative humidity for the ambient air.

The presence of water in the oil may be identified by one of the following means:

- Oil drawn from the oil sampling valve attached to the sump (see Fig 1-3).
- Oil volume drained during an oil exchange.
- Periodic (e.g., every 2000 hours) oil sample analyzed by a reputable laboratory.

If water is found in the oil, drain sufficient volume of oil until no visible water is found - the heavier water will collect at the low elevations of the oil system, thus it will likely be expelled first. If this condition persists, consider the following solutions to avoid water condensation in the compressor oil:

- Make sure that the correct setting for the thermostatic mixing valve element is used - value is stamped on valve body.
- If the standard thermostatic element (55ºC/131°F) does not prevent water condensation, consult your application with Champion. The standard thermostatic element may be replaced with a high temperature one (70ºC/158°F) and the oil charge changed (see "Lubricant Change Procedure in this section) with a high temperature one (RotorLub and RotorLub high temperature). Depending on the prevailing ambient temperature, the controller setting for the high discharge temperature shutdown may have to be reset to 240ºF also.

THERMOSTATIC MIXING VALVE. This device, housed within the compressor body, mixes hot and cooled oil and delivers a tempered mixture to the oil filter and finally the compressor injection port, see Fig 1-3 for its location.

Its thermostatic element expands with heat, it will stroke from just opening to fully open state within a 27°F (15°C) temperature change. Within these two temperature limits the valve gradually mixes hot separator oil with cooled heat exchanger oil to maintain a nearly constant oil injection temperature. Above this range of oil temperature, the valve blocks all hot oil and only cooled oil is delivered.

The valve's nominal setting is stamped on the valve body. It may be verified by immersing the valve assembly into an open container with lubricating oil, raising its temperature to its nominal setting and checking that the element strokes fully from closed to open.

CL15-22 Models

- Standard valve opening temp = 131°F (55°C), fully open temp = 158°F (70°C)
- Optional valve opening temp = 158°F (70°C), fully open temp = 185°F (85°C)

CLRS15-22 Models

- Standard valve opening temp = 158°F (70°C), fully open temp = 185°F (85°C)

Optional Element. If the compressor is used in a predominantly cold (<32ºF, 0ºC) and/or humid environment, proper oil viscosity and avoidance of water vapor condensation in the oil system may be achieved by using a higher setting (185ºF, 85ºC) thermostatic element. Consult Champion for details.

OIL SUMP (RESERVOIR) - This device provides the inertial separation of air and oil streams discharged by the compressor - the bulk (98%) of the air/oil separation is done at this step. It also serves as a holding and degassing volume for the major portion of the oil charge. It provides limited air storage for control and gauge actuation.

AIR / OIL SEPARATOR - This device provides the final (2%) of the air/oil separation, typically 2 ppm oil content at the final discharge of the compressor package. It is housed in a removable spin-on cartridge.

Its high level of performance may be affected by the following conditions:

- Compromised media (e.g., ruptured).
- Contaminated media (e.g., vanish, moisture, inadequate oil type).
- High oil level in oil sump.
- Blockage of oil return orifice.
- Abnormally frequent or fast depressurization cycles.

Oil separator element life cannot be predicted; it will vary greatly depending on the conditions of operation, the quality of the oil used and the maintenance of the oil and air filters. The condition of the separator can be determined by pressure differential or by inspection.

Separator Pressure Differential - The pressure drop across the separator is equivalent to the difference between the two (2) pressure sensors in use. Use the measured pressure difference to forewarn of a potentially contaminated air-oil separator element:

- The pressure differential value may be calculated by subtracting the system pressure value from the compressor discharge pressure value.
- A pressure differential of 8 psi may indicate a moderately dirty element.
- A pressure differential of 15 psi may indicate a severely dirty element, replace as soon as possible.

Using an oil separator element at excessive pressure differential can cause damage to equipment. Replace the separator when the pressure differential has reached 15 psi.

OIL FILTER, AIR/OIL SEPARATOR ELEMENT INSPECTION PROCEDURE

1. Remove the spin-on element.
2. Clean the gasket seating surface of the head.
3. Inspect the element internals by shinning a light unto the media surface. If signs of contamination (dirt, rust, varnish, etc.) or damage is evident, replace the element.
4. Before reassembly, coat the element gasket with the same lubricant used in the unit.
5. Screw on until gasket makes contact. Hand tighten 1/3 to 1/2 turn extra.
6. Run the unit and check for leaks.

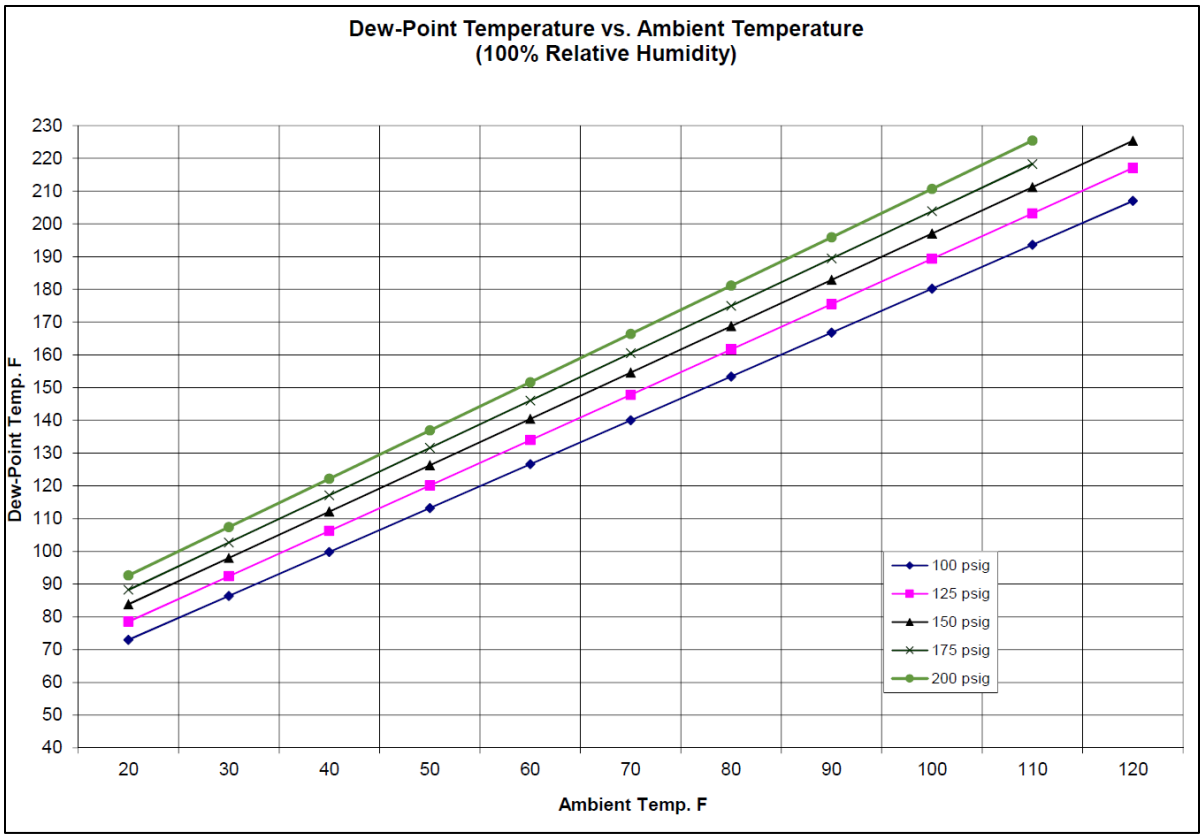


FIGURE 5-3 Dew Point Chart °F

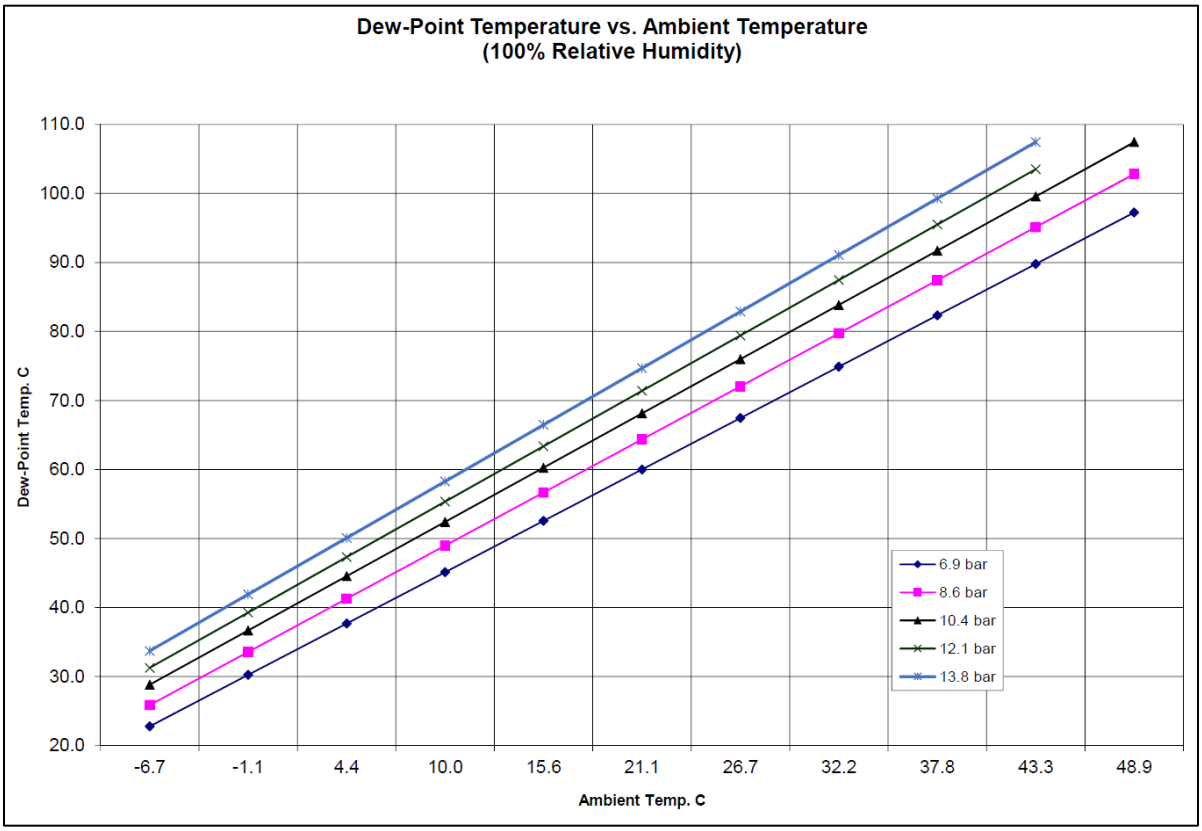


FIGURE 5-4 Dew Point Chart °C

BELT DRIVE SYSTEM

The motor power is transmitted to the compressor with a system comprised of heavy-duty v-belts, sheaves, and bushings. Belt tension is provided by the motor weight with the help of a free-pivoting bracket, see Figure 8-1 for details.

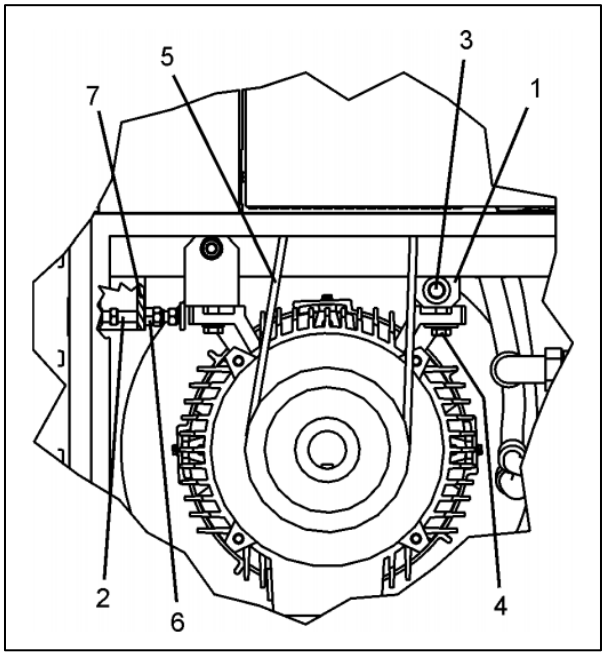


FIGURE 8-1 Motor Jacking Assembly

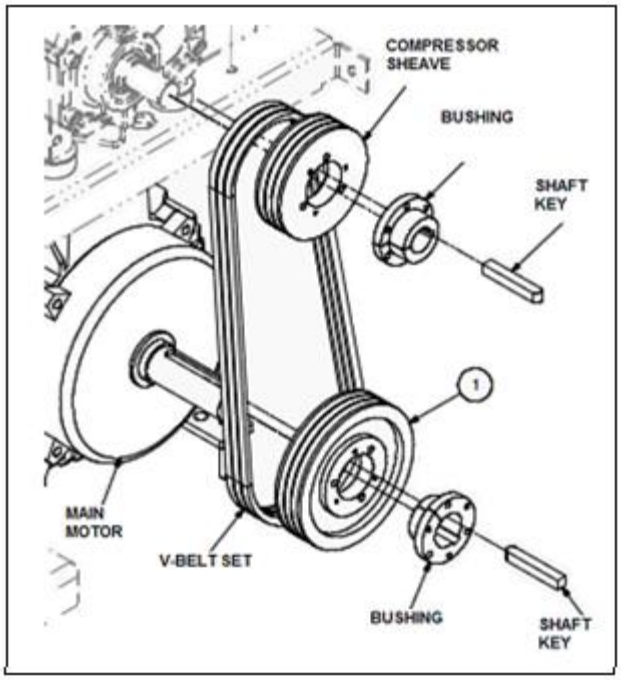


FIGURE 8-2 V-Belt Drive Components

UNPACKING THE V-BELT SYSTEM

To protect the belts from shock and strain during transportation, the free-swinging side of the motor frame is locked in place by means of a carrier bracket assembly. Proceed to prepare the belt system for operation as follows, refer to Figure 8-2, for component description:

1. Unlatch and remove the door panel opposite to the main cooling fan panel to gain access to the v-belt system.
2. Lift motor by loosening jam-nut (6) and turning adjusting bolt (2) clockwise via access hole.
3. Loosen and remove fastening screws (3) and (4) as well as carrier bracket (1). Keep this hardware for future use, such as relocating compressor package.
4. Check alignment of the sheave set and make sure that v-belts are properly seated in sheave grooves.
5. Screw out adjusting bolt (2) and secure with jam-nut (6) to allow motor weight to rest on v-belts.

SHEAVE SET ALIGNMENT

1. Use a straight edge for alignment checks.
2. Check parallel alignment. It should be simple to control by moving one of the sheave/bushing pairs along the shaft to match the other.
3. Check angular alignment. The misalignment A = ArcTan * ((X2-X1)/D), where calculated A is in degrees and measured X1, X2 and D are in inches or mm.
4. The allowable total misalignment is 0.5 degrees for best belt longevity. As reference, 0.5 degrees represents a gap (e.g., X1-X2) of 0.05" (1.33mm) over a 6" diameter sheave.

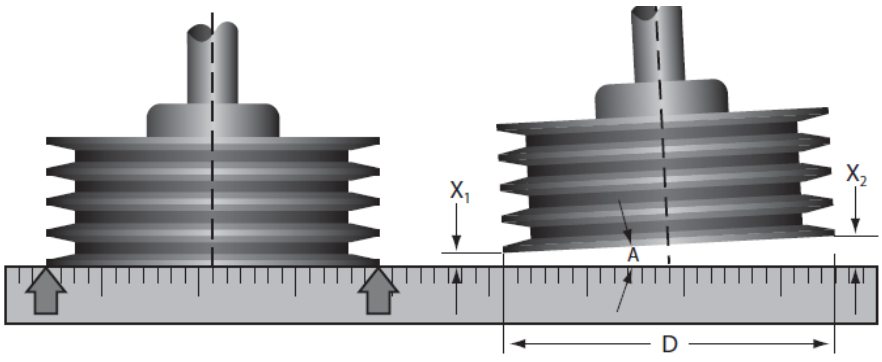


FIGURE 8-3 Measuring Angular Misalignment

⚠ CAUTION

Check sheave misalignment prior to start compressor operation. Failure to do so may shorten the operational live of the belts.

REPLACING THE COMPRESSOR BELTS

When signs damage (e.g., wear, tear, breakage, etc.) appear on any belt, replace the complete set of three (3) v-belts as follows:

1. Disconnect, lockout and tagout the power supply to the starter

2. Unlatch and remove the door panel opposite to the main cooling fan panel to gain access to the v-belt system, see Figure 8-3 for details.

3. Remove the compressor shaft belt guard.

4. Raise the motor to remove the belt set. This is accomplished by turning the jacking screw clockwise (after loosening the jam nut) and raising the motor body until the v-belts can be dismounted from the motor sheave.

5. Replace the old belts with new ones. For proper belt life, use only genuine Champion belts.

6. Check the sheave alignment.

7. Turn the jacking screw counter-clockwise to lower motor and transfer its weight unto the belt set. Make sure that the belts remain aligned into each corresponding groove. Keep turning jacking screw until it clears base frame surface by at least one inch and jam in with provided nut.

REPLACING THE SHEAVES

1. Follow steps 1 through 4 given above to replace the compressor belts.

2. Remove the belts.

3. Carefully sketch or photograph the orientation of each sheave/bushing pair as they sit on their respective shaft. You'll need this information to re-install each pair.

4. Loosen and remove the mounting screws securing the sheave to companion bushing. Install the removed screws in the jack holes provided on the sheave and turn each in to pry the bushing loose from the sheave. Remove the sheave and bushing from the shaft.

5. When installing a new sheave / bushing pair, remove all protective grease their surfaces.

6. Insert the mounting screws in the sheave / bushing pair and lightly tighten them.

7. Clean the shaft and mount the sheave / bushing pair. Align the motor sheave to the air end sheave. When mounting the sheave / bushing pair, the bushing clamps to the shaft first, the sheave can still be moved a little. This can affect the alignment of the sheaves.

8. Tighten the mounting screws evenly.

9. Tap the bushing lightly with a drift, and retighten the screws. **REPEAT THIS PROCEDURE SEVERAL TIMES TO MAKE SURE THE BUSHING AND SHEAVE ASSEMBLY IS TIGHT ON THE SHAFT.**

10. Fill the holes in the bushing/sheave with grease to protect them from dirt and debris.

11. Replace the old belts with new ones. For proper belt life, use only genuine Champion belts.

12. Check the sheave alignment, refer to Sheave Set Alignment Figure 8-3.

SERVICING OF MISCELLANEOUS DEVICES

This section will cover basic maintenance of various control devices used with the compressor package. Refer to Fig 9-1 for pictorial with general locations of these devices.

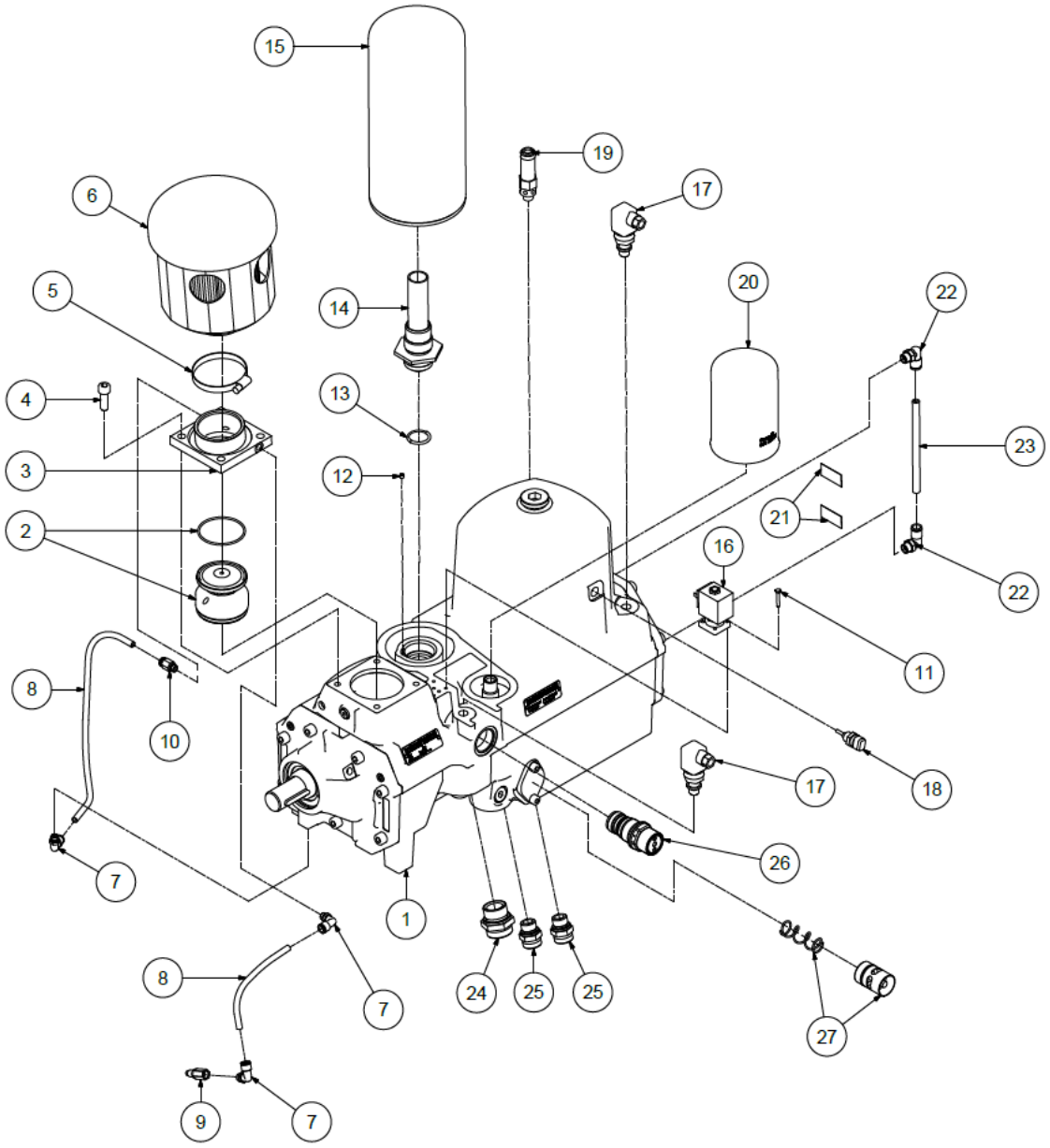


FIGURE 9-1 Exploded View of EK100 Compressor

INLET CONTROL VALVE ASSEMBLY (2)

Inlet-Valve Assembly - This device is located within and below the intake flange of the compressor, see Figure 9-2 for internal details and Figure 4-29 for schematic details.

During the loaded state, the inlet poppet remains open and enables atmospheric air to enter the compressor inlet, this is done by venting to atmosphere the gas trapped underside of the piston via a check valve. During the unloaded state, a two-way solenoid valve feeds pressurized air underneath the piston, forcing it and the inlet poppet upward and blocking-off the compressor intake.

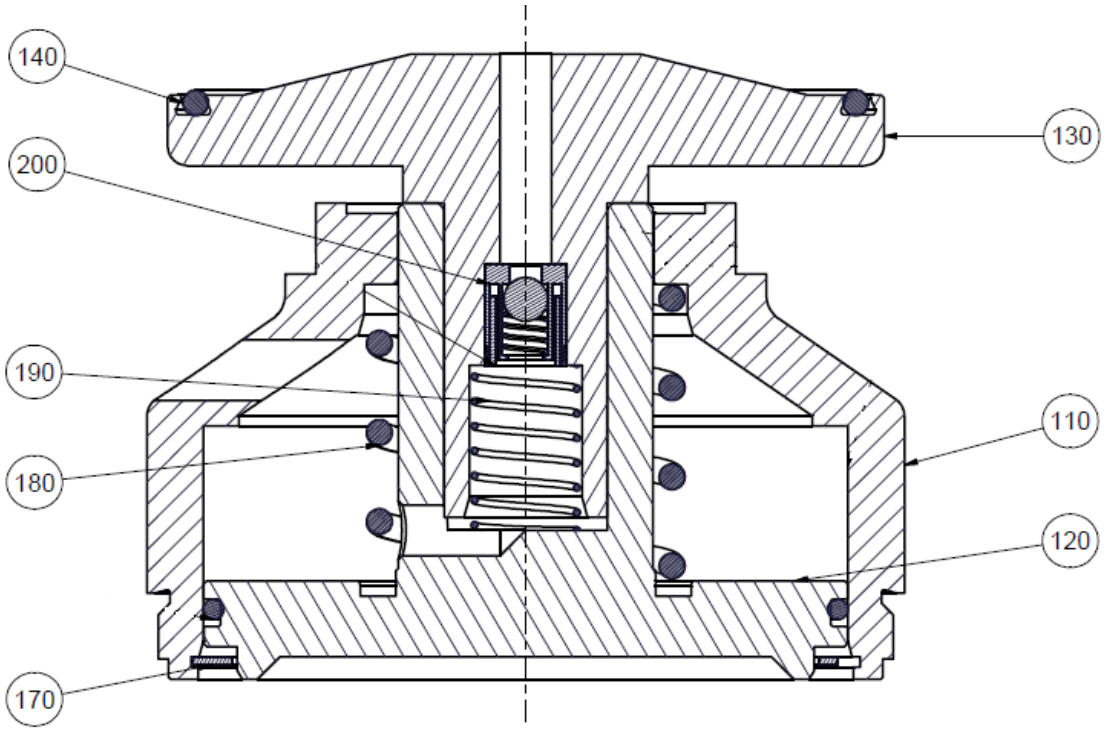


FIGURE 9-2 Inlet Valve Assembly

Item	Description
110	Cylinder
120	Piston
130	Inlet Poppet
170	Piston Retainer Spring
180	Compression Spring, Piston
190	Compression Spring, Poppet
200	Check Valve

DANGER

Air/oil pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

Inlet Valve (Body) Inspection - The valve does not require maintenance or lubrication. If air/oil leaks develop across the valve disc during pressurized conditions (e.g., machine stopped), valve seals should be inspected for wear and tear signs:

1. Be sure the unit is completely off and oil sump is depressurized.
2. Disconnect, lockout and tag out power supply to the compressor package.
3. Close (when provided) valve isolating compressor package from air system.
4. Refer to Figure 9-1 for hardware details.
5. Loosen and remove the air filter element.
6. Remove four bolts securing inlet flange to the compressor body and remove the flange.
7. Remove the poppet assembly and the poppet return spring.
8. Unscrew the valve body from the compressor housing using the hex pattern provided on the valve body, see Figure 9-3 for details.
9. Inspect poppet seals (O-rings) for wear and tear.
10. In case of noted malfunction (e.g., valve will not open/close properly with good air signal), unless a damaged or worn component can be identified and/or repaired, replace the complete inlet valve assembly.
    - Remove retainer ring to release piston assembly free.
    - Inspect the piston seal and piston return spring. If any component if found worn of damaged, replace the complete valve.
    - Re-assembly the piston assembly in reverse order.
11. Reinstall inlet valve in reverse order.

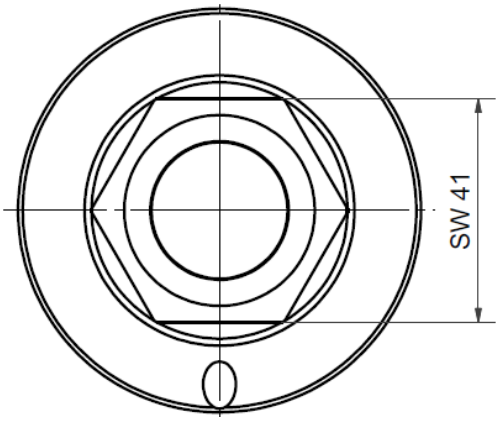


FIGURE 9-3 Inlet Valve Body Hex

PRESSURE RELIEF VALVE (19)

Pressure Relief Valve - This device protects the pressure-containing components of the compressor package against pressures exceeding 218 psig. It is installed on the wet-side of the oil sump.

FIGURE 9-4 Pressure Relief Valve

⚠ DANGER

Before inspecting the pressure relief valve, release air pressure, lockout and tagout the power supply to the compressor package. Failure to release pressure or properly disconnect the power may result in personal injury or death.

⚠ CAUTION

Never paint, lubricate or alter a relief valve. Do not plug vent or restrict.

⚠ DANGER

Operation of the unit with improper relief valve setting can result in severe personal injury or machine damage. Ensure properly set valves are installed and maintained.

Pressure Relief Valve Check During Operation - The pressure relief valve has no user-serviceable or repairable components. However, it should be tested for proper operation at least once every year. To test the pressure relief valve:

- Raise the system operating pressure to its normal level
- Pull the stem ring to open valve and let it vent for a few seconds.
- Release the stem ring to close the valve.

MINIMUM PRESSURE VALVE (26)

Minimum Pressure Valve (MPV) Inspection – This device has no user-serviceable or repairable components. If it fails to maintain adequate minimum pressure (65 psig) or fails to check the backflow of system compressed air after compressor stoppage, replace it as follows:

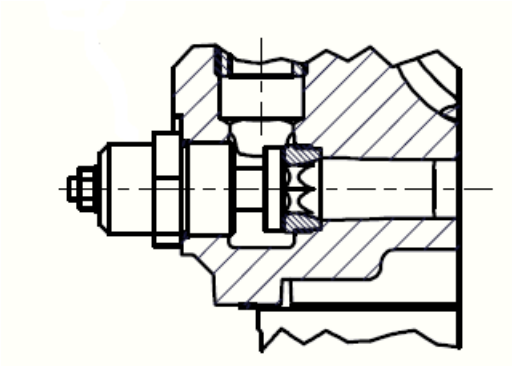


FIGURE 9-5 Minimum Pressure Valve and Seat

DANGER

Air/oil pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir and in the air cooled after cooler. Close the service valve.

2. Disconnect lockout and tagout the power supply to the starter.

3. Unscrew the minimum pressure valve assembly from compressor housing and remove.

4. Inspect the valve seat surface screwed into the compressor housing. Cleanse or replace as needed. Note that fitting an O-ring on the hex wrench body helps hold the seat in position during installation.

5. Assemble the MPV assembly into the host manifold.

6. Run the unit and check for leaks.

7. If a new MPV has been fitted, its proper setting must be adjusted:

    a. Make sure the site pipe system has a means to vent the compressor air to atmosphere with a valve. If this is not available, temporarily fit a ball valve.
    b. Start the compressor and monitor the wet and dry sump pressure sensors at the controller display.
    c. Open the site vent valve to limit the dry sump pressure to about 40 psig (2.8 bar)
    d. Loosen the jam nut on the TMV adjusting stem and screw it in until the wet sump reaches 70 psig (4.8 bar).
    e. Tighten the jam nut on the TMV adjusting stem.
    f. Close the site vent valve.

THERMOSTATIC MIXING VALVE (27)

Thermostatic Mixing Valve (TMV) Inspection – This device has no user-serviceable or repairable components. Refer to Section 5, for further details on this device. If it fails to maintain adequate compressor discharge temperature, replace it as follows:

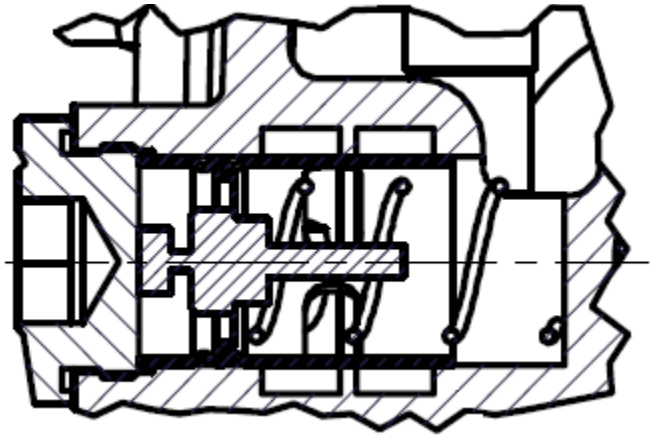


FIGURE 9-6 Thermostatic Mixing Valve

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir and in the air cooled after cooler. Close the service valve.

2. Disconnect lockout and tagout the power supply to the starter.

3. Unscrew the hex cap holding the TMV assembly within the manifold block. Retrieve the TMV body and its spring from the compressor housing.

4. Inspect the valve seat surfaces for damage or foreign matter. Note its setting temperature, it is stamped on the valve seat area.

5. Immerse the valve body in a bath of compressor oil; heat the oil slowly and note the temperatures at which seat first starts moving and at it finally stops moving. Replace the device if one of the following conditions is present:

   a. The stamped setting on the valve seat is not correct.
   b. The seat fails to stroke fully at the correct temperature.

6. Assemble the TMV assembly into the housing in the reverse order.

7. Run the unit and check for leaks.

MAINTENANCE SCHEDULE

SERVICE CHECK LIST

Air Filter and Pre-Filter - Operating conditions determine frequency of service. See “Air Filter,” Section 7.

Motor Lubrication - Refer to Section 2.

Every 8 Hours Operation

1. Check the reservoir oil level, add oil if required. See Section 5.
2. Observe if the unit loads and unloads properly.
3. Check discharge pressure and temperature.
4. Check control panel display for advisory text messages.

Every 125 Hours Operation

1. Check for dirt accumulation on oil, air core finned faces and the cooling fan. If cleaning is required, clean the exterior fin surfaces of the cores by blowing compressed air carrying a nonflammable safety solvent in a direction opposite that of the cooling fan air flow. This cleaning operation will keep the exterior cooling surfaces clean and ensure effective heat dissipation.

Every 2000 Hours Operation

1. Change oil filter element.

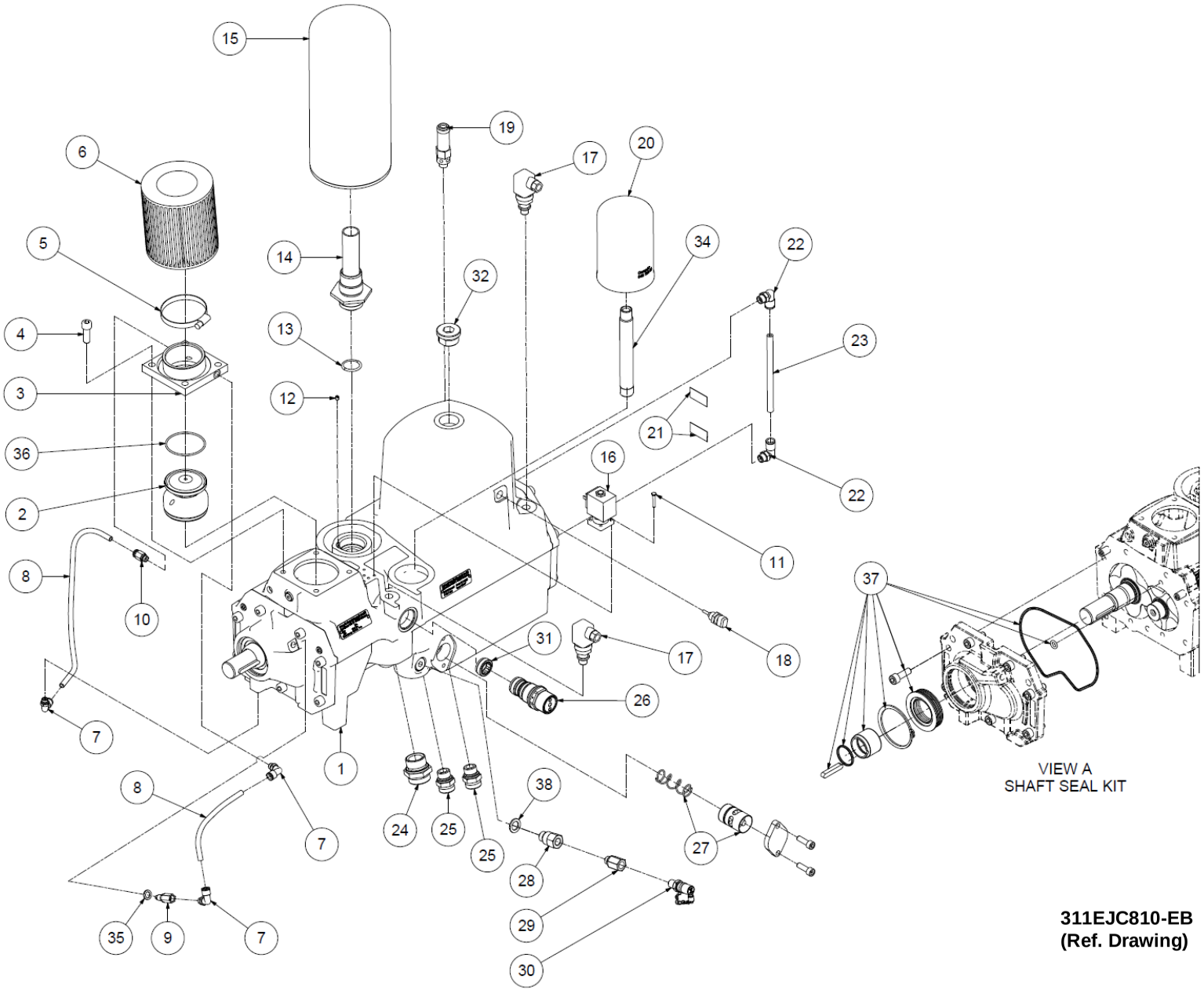
Every 4000 Hours Operation

1. Change the compressor lubricant. Under adverse conditions, **change more frequently** (refer to “Oil Change Interval”, Figure 5-2. Flush system if required.

Every Year

1. Check the pressure relief valve for proper operation. See Section 9.
2. Change oil separator. See “Removal of Oil Separator for Inspection or Replacement”, Section 5, for further details.

AIREND GROUP / GRUPO DE AVIACIÓN / GROUPE AIREND / GRUPO AIREND



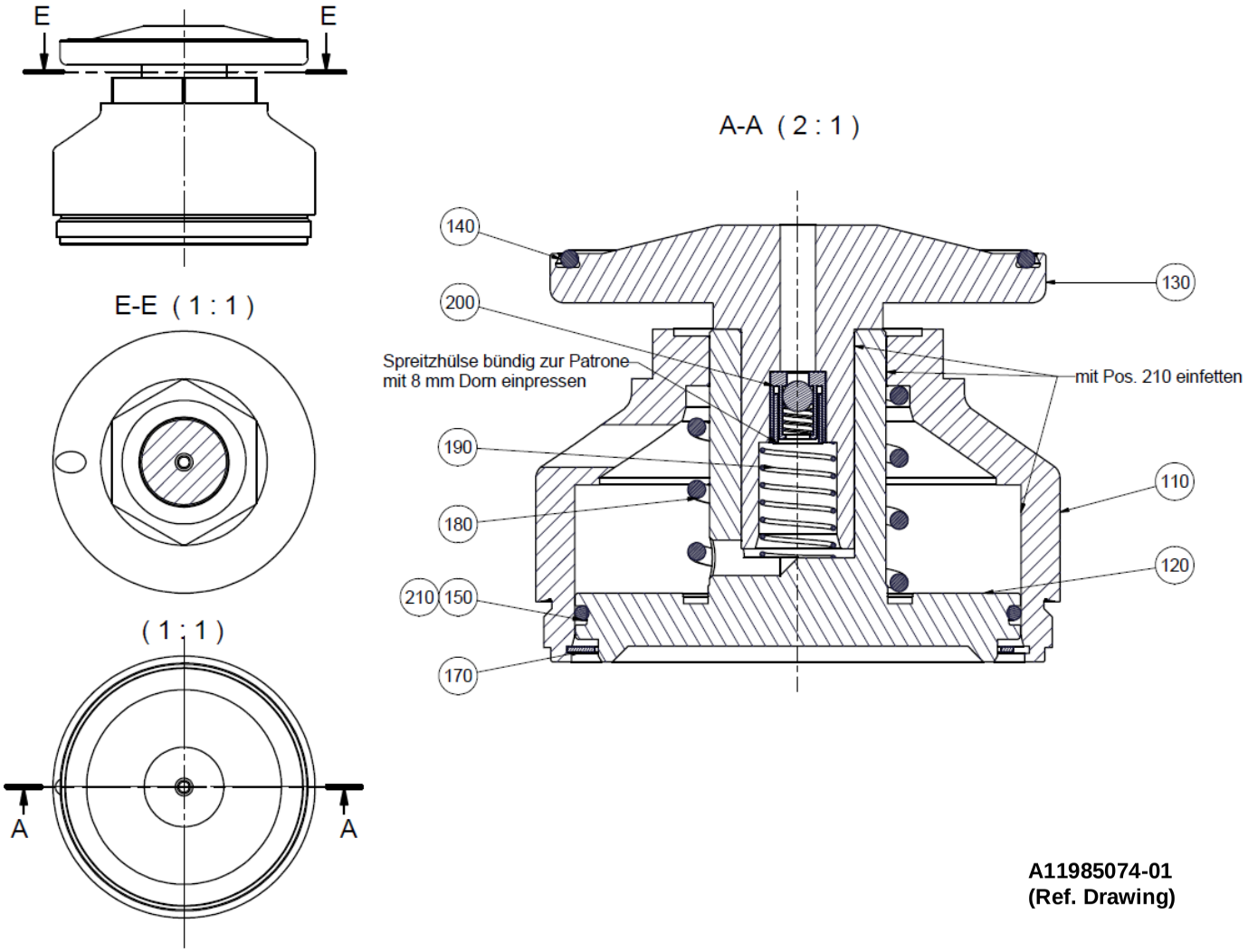
311EJC810-EB
(Ref. Drawing)

B/M: 300EJC4001, 330&332EJC4013

ITEM	DESCRIPTION	DESCRIPCIÓN	LA DESCRIPTION	DESCRIÇÃO	QTY	PART NO.	ITEM
1	AIREND EK100NK	AIREND EK100NK	AIREND EK100NK	AIREND EK100NK	1	A11982074	1
2	INTAKE CONTROLLER	CONTROLADOR DE ENTRADA	CONTRÔLEUR D'ADMISSION	CONTROLADOR ADMISSÃO	1	A11985074	2
3	SUCTION FLANGE	BRIDA DE SUCCION	BRIDE D'ASPIRATION	FLANÇA DE SUCÇÃO	1	ZS1060583	3
4	SCREW	TORNILLO	VIS	PARAFUSO	4	A93040680	4
5	HOSE CLIP	ABRAZADERA	COLLIER DE SERRAGE	MANGUEIRA CLIP	1	A93616840	5
*6	AIR FILTER	FILTRO DE AIRE	FILTRE À AIR	FILTRO DE AR	1	300KCA1445	*6
7	FITTING	ADECUADO	RACCORD	APROPRIADO	3	A13309474	7
8	TUBING (IN METERS)	TUBERÍA (EN METROS)	TUYAUTERIE (EN MÈTRES)	TUBULAÇÃO (EM METROS)	.61	A91801030	8
9	BLOW OFF VALVE	VÁLVULA DEL DESCARGAR	SOUPAPE DE COUPURE	VÁLVULA DE ESCAPE	1	A11984374	9
10	FITTING	ADECUADO	RACCORD	APROPRIADO	1	A13310474	10
11	SCREW	TORNILLO	VIS	PARAFUSO	4	95044-248	11
12	NOZZLE	BOQUILLA	AJUTAGE	BOCAL	1	A11981674	12
13	PIPE SEAL	SELLO DE TUBO	JOINT DE TUYAUTERIE	TUBO DE VEDAÇÃO	1	A93196770	13
14	DOUBLE FITTING, SEPARATOR	AJUSTE DOBLE, SEPARADOR	OUBLE FITTING, SEPARATOR	MONTAGEM DUPLA, SEPARADOR	1	ZS1060271	14
*15	AIR/OIL SEPARATOR	SEPARADOR DE AIRE/ACEITE	SEPARATEUR AIR / HUILE	SEPARADOR DE AR / ÓLEO	1	300KCA035	*15
16	SOLENOID VALVE	VÁLVULA DE SOLENOIDE	ELECTROVANNE	VÁLVULA SOLENOIDE	1	100015591	16
17	PRESSURE TRANSDUCER	TRANSDUCTOR DE PRESIÓN	TRANSDUCTEUR DE PRESSION	TRANSDUTOR DE PRESSÃO	2	47749803001	17
18	TEMPERATURE PROBE	PROBETA DE TEMPERATURA	SONDE DE TEMPÉRATURE	SONDA DE TEMPERATURA	1	100013684	18
19	PRESSURE RELIEF VALVE	VÁLVULA DE ALIVIO DE PRESIÓN	SOUPAPE LIMITATION PRESSION	VÁLVULA ALÍVIO PRESSÃO	1	100003009	19
*20	OIL FILTER	FILTRO DE ACEITE	FILTRE À L'HUILE	FILTRO DE ÓLEO	1	300KBA1446	*20
21	LABEL	ETIQUETA	ÉTIQUETTE	RÓTULO	2	A05021878	21
22	ELBOW	CODO	COUDE	COTOVELO	2	A93581670	22
23	PLASTIC HOSE (IN METERS)	MANGUERA PLÁSTICA (EN METROS)	TUYAU EN PLASTIQUE (EN MÈTRES)	MANGUEIRA DE PLÁSTICO (EM METROS)	.15	A91801060	23
24	HEXAGON SPUD	HEXÁGONO ESCARDA	HEXAGONE PATATE	HEXÁGONO ESCARDILHO	1	A93580260	24
25	HEXAGON SPUD	HEXÁGONO ESCARDA	HEXAGONE PATATE	HEXÁGONO ESCARDILHO	2	A93580270	25
26	MINIMUM PRESSURE VALVE	VÁLVULA DE PRESIÓN MÍNIMA	SOUPAPE DE PRESSION MINIMUM	VÁLVULA DE PRESSÃO MÍNIMA	1	100015593	26
27	THERMOSTATIC VALVE 55°C 70°C	VÁLVULA TERMOSTÁTICA 55°C 70°C	SOUPAPE THERMOSTATIQUE 55°C 70°C	VÁLVULA TERMOSTÁTICA 55°C 70°C	 1 1	 A11203274 89560169	27
28	REDUCER	REDUCTOR	RÉDUCTEUR	REDUTOR	1	100016114	28
29	ADAPTOR	ADAPTADOR	ADAPTATEUR	ADAPTADOR	1	100003603	29
30	OIL SAMPLING VALVE	VALVULA DE MUESTREO DE ACEITE	VANNE D'ÉCHANTILLONNAGE D'HUILE	VÁLVULA DE AMOSTRAGEM DE ÓLEO	1	86N345	30
31	PRESSURE NON RETURN VALVE SEAT	ASIENTO DE LA VÁLVULA DE NO RETORNO A PRESIÓN	SIÈGE DE SOUPAPE DE RETOUR SANS RETOUR	ASSENTO DA VÁLVULA DE PRESSÃO SEM RETORNO	1	A11984174	31
35	GASKET	EMPAQUETADOR	JOINT DE CULASSE	GAXETA	1	25BC865	35
36	PIPE SEAL	SELLO DE TUBO	JOINT DE TUYAUTERIE	TUBO DE VEDAÇÃO	1	A93191540	36
37	SHAFT SEAL KIT	KIT DE SELLO DE EJE	KIT DE JOINT D'ARBRE	KIT DE VEDAÇÃO DO EIXO	1	A11988474	37
38	WASHER, BONDED	ARANDELA	RONDELLE	ARRUELA	1	CZ9613	38

* Parts included in maintenance kits 302KCA6032 (CL15-22) and 301EJC6032 (CLRS15-22) / Piezas incluidas en los kits de mantenimiento 302KCA6032 (CL15-22) y 301EJC6032 (CLRS15-22)
* Pièces incluses dans les kits maintenance 302KCA6032 (CL15-22) et 301EJC6032 (CLRS15-22) / Peças incluídas nos kits manutenção 302KCA6032 (CL15-22) e 301EJC6032 (CLRS15-22)

INLET VALVE
VÁLVULA DE ENTRADA
SOUPAPE D'ADMISSION
VÁLVULA DE ADMISSÃO



A11985074-01
(Ref. Drawing)

B/M: A11985074

ITEM	DESCRIPTION	DESCRIPCIÓN	LA DESCRIPTION	DESCRIÇÃO	QTY	PART NO.	ITEM
110	CYLINDER	CILINDRO	CYLINDRE	CILINDRO	1	A11985274	110
120	PISTON	PISTÓN	PISTON	PISTÃO	1	A11985474	120
130	NON RETURN PISTON	PISTON NO DEVOLUCIÓN	PISTON NON RETOUR	PISTÃO NÃO DEVOLVER	1	A11985674	130
140	PIPE SEAL	SELLO DE TUBO	JOINT DE TUYAUTERIE	TUBO DE VEDAÇÃO	1	A93190940	140
150	PIPE SEAL	SELLO DE TUBO	JOINT DE TUYAUTERIE	TUBO DE VEDAÇÃO	1	A93199270	150
170	SPRING RING	ANILLO ELÁSTICO	RING SPRING	ANEL DE PRIMAVERA	1	A93148820	170
180	COMPRESSION SPRING	RESORTE DE COMPRESIÓN	RESSORT DE COMPRESSION	MOLA DE COMPRESSÃO	1	A93300500	180
190	COMPRESSION SPRING	RESORTE DE COMPRESIÓN	RESSORT DE COMPRESSION	MOLA DE COMPRESSÃO	1	A93300510	190
200	NON RETURN VALVE	VÁLVULA DE RETENCIÓN	CLAPET ANTI-RETOUR	VÁLVULA DE NÃO RETORNO	1	A07715741	200
210	AUTOL FLOW GREASE	GRASA AUTOL FLOW	GRAISSE AUTOMATIQUE À FLUX	GRAVAÇÃO DE FLUXO AUTOL	.001	A92132160	210

Nuvair
Phone +1.805.815.4044
Fax +1.805.486.0900
1600 Beacon Place
Oxnard, CA 93033 USA
info@nuvair.com
www.nuvair.com