Frick®
BY JOHNSON CONTROLS

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INSTALLATION - OPERATION - MAINTENANCE

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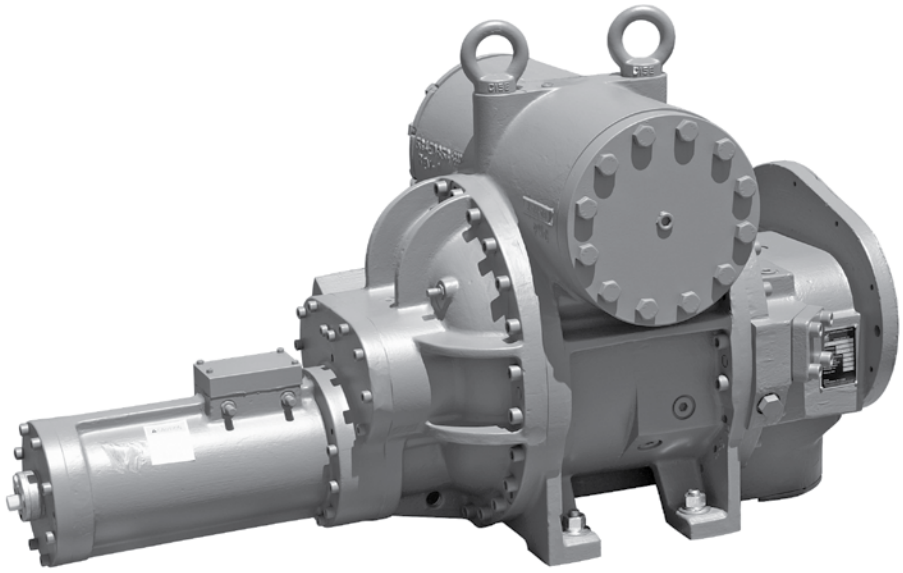
SGC
ROTARY SCREW COMPRESSOR

MODELS SGC1913 - SGC3524



THIS MANUAL CONTAINS RIGGING, ASSEMBLY, START-UP, AND MAINTENANCE INSTRUCTIONS. READ THOROUGHLY BEFORE BEGINNING INSTALLATION. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN DAMAGE OR IMPROPER OPERATION OF THE UNIT.

CONTENTS

SAFETY PRECAUTION DEFINITIONS

DANGER — **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

WARNING — **Indicates a potentially hazardous situation or practice which, if not avoided, will result in death or serious injury.**

CAUTION — **Indicates a potentially hazardous situation or practice which, if not avoided, will result in damage to equipment and/or minor injury.**

NOTE: — **Indicates an operating procedure, practice, etc., or portion thereof which is essential to highlight.**

THE INFORMATION CONTAINED IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE

GENERAL INFORMATION

PREFACE

This manual has been prepared to acquaint the owner and serviceman with the INSTALLATION, OPERATION, and MAINTENANCE procedures as recommended by Johnson Controls-Frick for SGC Rotary Screw Compressors.

It is most important that these compressors be properly applied to an adequately controlled refrigerant or gas system. Your authorized Johnson Controls-Frick representative should be consulted for his expert guidance in this determination.

Proper performance and continued satisfaction with these units is dependent upon:

CORRECT INSTALLATION
PROPER OPERATION
REGULAR, SYSTEMATIC MAINTENANCE

To ensure correct installation and application, the equipment must be properly selected and connected to a properly designed and installed system. The Engineering plans, piping layouts, etc. must be detailed in accordance with the best practices and local codes, such as those outlined in ASHRAE literature.

A screw compressor is a VAPOR PUMP. To be certain that it is not being subjected to pumping liquid, it is necessary that controls are carefully selected and in good operating condition; the piping is properly sized and traps, if necessary, are correctly arranged; the suction line has an accumulator or slugging protection; that load surges are known and provisions are made for control; operating cycles and stand still periods are reasonable; and that high side components are sized within system and compressor design limits.

It is required that the discharge temperature be kept high enough to prevent condensation of any moisture in the compressor and oil separator.

DESIGN LIMITATIONS

SGC compressors are designed for operation within the pressure and temperature limits which are specified by Johnson Controls-Frick and the Johnson Controls-Frick selection software COOLWARE™. They are primarily used for compressing refrigerant gas and most hydrocarbon gasses.

If your application is for sour gas, there are special requirements to protect the compressor. Contact Johnson Controls - Frick Compressor Engineering for application details.

JOB INSPECTION

Immediately upon delivery examine all crates, boxes and exposed compressor and component surfaces for damage. Unpack all items and check against shipping lists for any discrepancy. Examine all items for damage in transit.

STANDARD BARE COMPRESSOR

Items not included with bare compressor that are available as sales order options: Motor Mount, Solenoid Valve Block, Solenoid Valves, Tank Drain Tubing (T connection), Oil Feed Line (P connection), Connection Fittings, Coupling.

TRANSIT DAMAGE CLAIMS

All claims must be made by consignee. This is an ICC requirement. Request immediate inspection by the agent of the carrier and be sure the proper claim forms are executed. Report damage or shortage claims immediately to Johnson Controls-Frick Sales Administration Department, in Waynesboro, PA.

COMPRESSOR AND UNIT IDENTIFICATION

Each compressor has an identification data plate, containing compressor model and serial number mounted on the compressor body.

NOTE: When inquiring about the compressor or unit, or ordering repair parts, provide the MODEL, SERIAL, and JOHNSON CONTROLS - FRICK SALES ORDER NUMBERS from the data plate. See Figure 1.

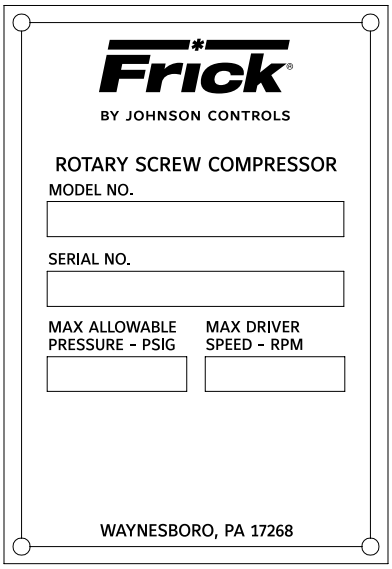


Figure 1 - Identification Data Plate

Rotary screw compressor serial numbers are defined by the following information:

EXAMPLE: 10240A90000015Z

Month: A = JAN, B = FEB, C = MAR, D = APR, E = MAY, F = JUN, G = JUL, H = AUG, K = SEP, L = OCT, M = NOV, N = DEC.

Global Sequence No.: Assigned by SAP

Additional Remarks:

R = Remanufactured
Z = Deviation from Standard Configuration

The name plates in Figure 2 show which refrigerants are compatible with the compressor as manufactured.

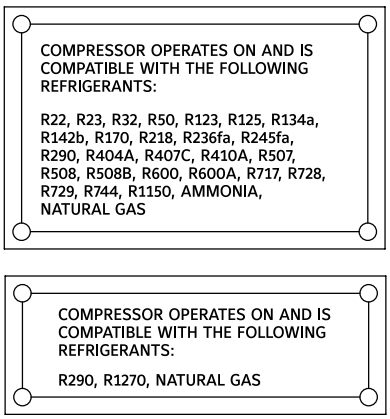


Figure 2 - Refrigerant Name Plates

LONG TERM STORAGE

Long term storage (6 months to 5 years) provisions are required, regardless of storage environment, if start-up and/or useful operation does not occur within six (6) months of equipment shipment. Special provisions may be required for storage of less than six (6) months if the storage area is subject to unusual environment such as high humidity, large changes in temperature, dusty atmosphere, etc.

The standard Johnson Controls-Frick Warranty for an SGC screw compressor covers twelve (12) months from start-up or 18 months from shipment, whichever comes first. It is recommended that arrangements be made with the local JOHNSON CONTROLS-FRICK service organization (arranged through factory service) regarding surveillance and maintenance during the storage period. It will be the customer's responsibility to submit a monthly report showing the condition of the unit and noting any discrepancies to the guidelines listed herein. Failure to comply with this Long Term Storage Recommendation may void the warranty.

Long term storage of equipment may lead to the deterioration of components over the period of time. Synthetic components in the compressor may deteriorate over time even if they are kept flooded with oil. A warm and dry environment is essential to minimize environmental and corrosion damage. Long term storage of the affected equipment at a customer's site may involve additional requirements and interested parties should refer to the Johnson Controls web site, www.johnsoncontrols.com, for specific instructions (Location: Bare Compressors\General\ Warranties\Screw Compressor Purchased for Long Term Storage).

The following guidelines must be followed to maintain the SCREW COMPRESSOR WARRANTY.

PREPARING COMPRESSOR FOR STORAGE

Evacuate compressor to remove moisture. Evacuation lines are to be connected to port SM1. Evacuation lines are to be connected to the three Schrader valves provided with the compressor. One valve is connected to compressor suction. The other two valves are located at the block on the cylinder.

Break vacuum with dry nitrogen and bring pressure to zero psig.

Pump oil into the same ports mentioned in step 1. Johnson Controls-Frick recommends break-in oil P/N 111Q0831809 for storage purposes. The amounts of oil needed per compressor are:

95mm - 2Gal
120mm - 3Gal
163mm - 8Gal
193mm - 12Gal
233mm - 15Gal
283mm - 25Gal
355mm - 35Gal

After compressor is oil charged, pressurize compressor to 15 psig with nitrogen.

Compressor And Packaged Equipment Storage Log								
Model	**Serial No.**	**Compressor, Motor Oil Pump and Refrigerant Pump Shaft Rotation 1½ Turn**	**Rotor Housing Charge**	**Charge Added**	**Visual Inspection Per Qai-3**	**Charge**	**Checked By**	**Date**

MAINTAINING COMPRESSOR

Ensure that the 5-15 psig nitrogen charge is maintained with 15 psig preferred.

Rotate the male rotor shaft every two weeks. Mark the shaft to ensure the rotor does not return to the original position.

The compressor must be stored inside a dry building environment.

Grease the male rotor shaft to prevent rust.

Record all information in a "Compressor Long Term Storage Log." See below.

Contact Johnson Controls - Frick Service with any questions regarding long term storage.

DESCRIPTION

SGC COMPRESSOR

The Frick SGC rotary screw compressor utilizes mating asymmetrical profile helical rotors to provide a continuous flow of vapor and is designed for both high-pressure and low-pressure applications. The compressor incorporates the following features:

1. High capacity roller bearings to carry radial loads at both the inlet and outlet ends of the compressor.

2. Heavy duty, four-point contact ball or angular-contact bearings are mounted at the discharge end of the compressor to carry axial loads.

3. Balance pistons located in the inlet end of the compressor reduce axial loads on the male axial bearings to increase bearing life.

4. Moveable slide valve to provide fully modulating capacity control from 100% to approximately 15% (except SGC3524 at 26%) of full load capacity.

5. VOLUMIZER® volume ratio control to allow infinitely variable volume ratio from 2.2 to 5.0 for all SGC models (except the SGC 3524: V1 = 2.4 – 4.5) during compressor operation.

6. A hydraulic cylinder to operate the slide stop and slide valve.

7. Housings are designed for 400 psig pressure.

8. All bearing and control oil vented to closed thread in the compressor instead of suction pressure to avoid performance penalties from superheating and displacing suction gas.

9. Shaft seal housing is designed to maintain operating pressure on seal well below discharge pressure for increased seal life.

10. Oil injected into the rotors to maintain good volumetric and adiabatic efficiency even at very high compression ratios.

11. Shaft rotation clockwise facing compressor, suitable for all types of drives. **SEE FOLLOWING WARNING.**

WARNING **Compressor rotation is clockwise when facing the compressor drive shaft. The compressor should never be operated in reverse rotation, as bearing damage will result.**

12. Suction and discharge flanges are ANSI B16.1 Class 300 for all models.

13. Integral suction strainers are provided for all models except the SGC 35XX series. The SGC 35XX models must be fitted with a suitable strainer, #60 mesh X .0065" diameter stainless steel wire or better, to prevent damage to the compressor from particles entering the suction area.

COMPRESSOR LUBRICATION SYSTEM

The lubrication system on an SGC screw compressor unit performs several functions:

1. Provides lubrication to bearings and seal.

2. Provides a cushion between the rotors to minimize noise and vibrations.

3. Helps keep the compressor cool and prevents overheating.

4. Provides an oil supply to hydraulically actuate the slide valve and slide stop.

5. Provides oil pressure to the balance piston to help increase bearing life.

6. Provides an oil seal between the rotors to prevent rotor contact or gas bypassing.

OIL PUMP

A demand oil pump is required for low differential pressure applications (CoolWare™ will provide a warning when the oil differential pressure is too low). Oil being supplied to the compressor from the oil separator is at system discharge pressure. Within the compressor, oil porting to all parts of the compressor is vented back to a location in the compressor's body that is at a pressure lower than compressor discharge pressure. All oil entering the compressor is moved by the compressor rotors out the compressor outlet and back to the system oil separator.

CONSTRUCTION DETAILS

HOUSING: All SGC screw compressor castings are close grain, ASTM-A-48 Class 40 cast iron to ensure structural integrity and mechanical and thermal stability under all operating conditions. Ductile iron and steel housings are also available for special applications. Contact Johnson Controls – Frick Sales for additional information.

ROTORS: The rotors are machined from AISI-1141 steel to the exacting tolerances of the latest industry standard asymmetric profile. The four-lobed male rotor is directly connected to the driver. The six-lobed female rotor is driven by the male on a thin oil film.

BEARINGS: Antifriction bearings with L10 rated life in excess of 50,000 hours (using the Frick Superfilter™) at design conditions are used for reduced frictional horsepower and superior rotor positioning, resulting in reduced power consumption, particularly at higher pressure ratios. Cylindrical roller bearings are provided to handle the radial loads and the thrust loads are absorbed by four point

contact or angular contact bearings. In addition, thrust balance pistons are provided to reduce the thrust load and improve bearing life.

SHAFT SEAL: The compressor shaft seal is a single-face type with a spring-loaded carbon stationary surface riding against a cast iron rotating seat. The seal is capable of withstanding static pressure up to 400 psig. During operation it is vented to low pressure to provide extended life.

VOLUMIZER VARIABLE VOLUME RATIO CONTROL: The Frick compressor includes a method of varying the internal volume ratio to match the system pressure ratio. Control of the internal volume ratio eliminates the power penalty associated with over- or under-compression. Volume ratio control is achieved by the use of a slide stop which is a movable portion of the rotor housing that moves axially with the rotors to control discharge port location. The slide stop is moved by hydraulic actuation of a control piston. The range of adjustment is listed in the *COMPRESSOR VOLUME and CAPACITY RATIO* table.

STEPLESS CAPACITY CONTROL: Capacity control is achieved by use of a movable slide valve. The slide valve moves axially under the rotors to provide fully modulated capacity control from 100% to minimum load capacity. Minimum load capacity varies slightly with compressor model, pressure ratio, discharge pressure level, and rotor speed. See the TABLE 1 for minimum capacity for all SGC models.

The slide valve is positioned by hydraulic movement of its control piston. When in the unloaded position, gas is bypassed back to suction through a recirculation slot before compression begins and any work is expended, providing the most efficient unloading method available for part-load operation of a screw compressor.

MOTOR MOUNT: The SGC series is designed with a drive end flange that mates with a cast iron motor mount (available as a sales order option). The motor mount is precision machined so that it ensures proper alignment of the compressor and motor coupling.

TABLE 1
COMPRESSOR VOLUME AND CAPACITY RATIO

MODEL	MIN. VI*	MAX. VI	MIN. CAPACITY %	SLIDE VALVE TRAVEL (IN.)	SLIDE STOP TRAVEL (IN.)
SGC 1913	2.2	5.0	REFER TO COOLWARE™	6.497	2.530
SGC 1918	2.2	5.0		8.662	3.374
SGC 2313	2.2	5.0		7.843	3.055
SGC 2317	2.2	5.0		9.877	3.847
SGC 2321	2.2	5.0		12.200	4.752
SGC 2813	2.2	5.0		9.526	3.710
SGC 2817	2.2	5.0		11.996	4.672
SGC 2821	2.2	5.0		13.679	5.615
SGC 2824	2.0	4.1		15.633	6.418
SGC 3511	2.2	5.0		10.360	3.690
SGC 3515	2.2	5.0		14.127	5.031
SGC 3519	2.2	5.0		15.443	6.373
SGC 3524	2.4	4.5		15.482	6.399

* Optional 1.7 - 3.0 VI

INSTALLATION

DESIGN LIMITS

General information for all of the models is provided below. **Please see CoolWare to determine the limits for a specific application.**

SGC compressors are primarily designed for connecting to an electric drive motor using a tunnel mount. If the application requires it, the compressor can also be driven with a foot-mounted motor. The tunnel mount ensures proper alignment of the compressor and motor so that the shaft seal and coupling will operate properly. The rotor and bearing design set limitations must not be exceeded (See CoolWare). Refer to Johnson Controls - Frick Compressor Control Panel instruction S90-020 for additional information on set point limits.

OUTLINE DIMENSIONS

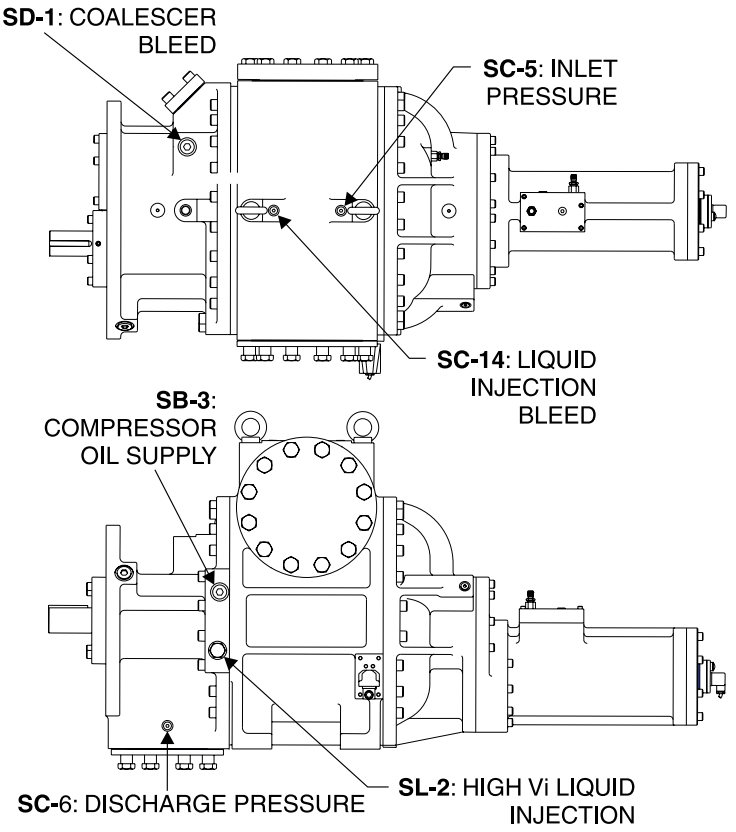
Drawings ***for reference only*** can be found on the following pages. Complete dimensions and access connections can be found on the outline drawings.

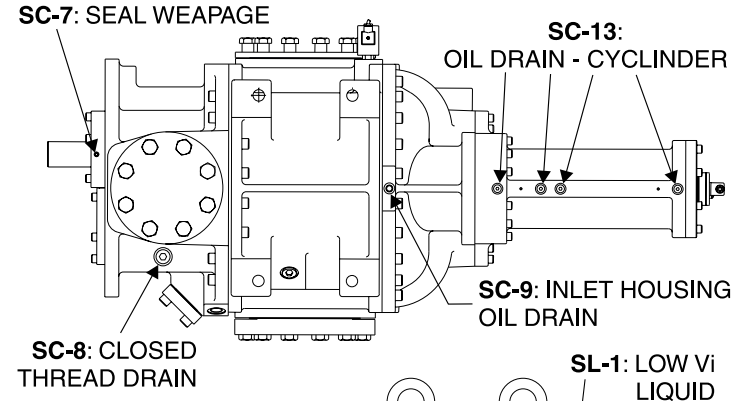
SGC 1913 & 1918	DWG# 534E0677
SGC 2313 & 2317	DWG# 534E0700
SGC 2321	DWG# 534E0714
SGC 2813 & 2817	DWG# 534E0749
SGC 2821	DWG# 534E0768
SGC 2824	DWG# 534E0973
SGCH 3511 & SGCB 3511	DWG# 534E0966
SGCH 3515 & SGCB 3515	DWG# 534E0971
SGCH 3519 & SGCB 3519	DWG# 534E0972
SGCB 3524	DWG# 534E0974

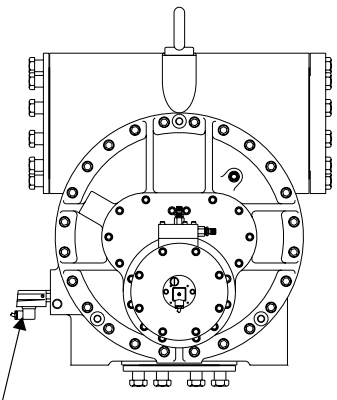
If you do not have these drawings, please request any you require by contacting Johnson Controls - Frick sales.

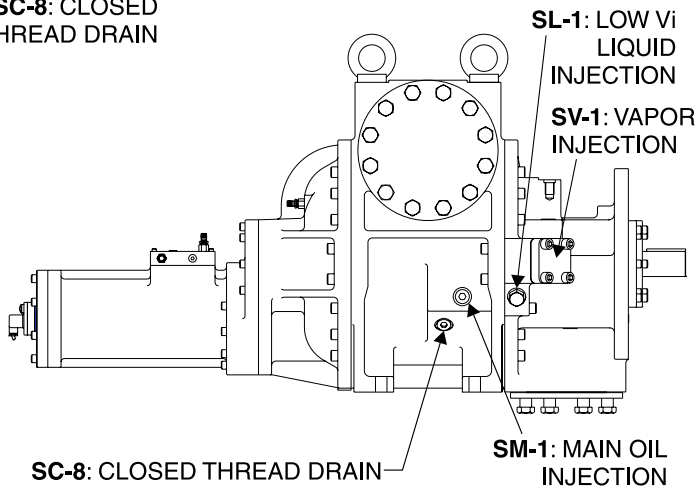
COMPRESSOR PORT LOCATIONS - SGC 1913 & 1918

PORT	THREAD SIZE	O-RING
SB-3	1 1/16-12 UN-2B	980A0012K66
SC-5	9/16-18 UNF-2B	980A0012K60
SC-6	9/16-18 UNF-2B	980A0012K60
SC-8	1 1/16-12 UN-2B	980A0012K66
SC-9	9/16-18 UNF-2B	980A0012K60
SC-13	9/16-18 UNF-2B	980A0012K60
SC-14	9/16-18 UNF-2B	980A0012K60
SD-1	1 1/16-12 UN-2B	980A0012K66
SL-1	1 1/16-12 UN-2B	980A0012K66
SL-2	1 1/16-12 UN-2B	980A0012K66
SM-1	1 1/16-12 UN-2B	980A0012K66



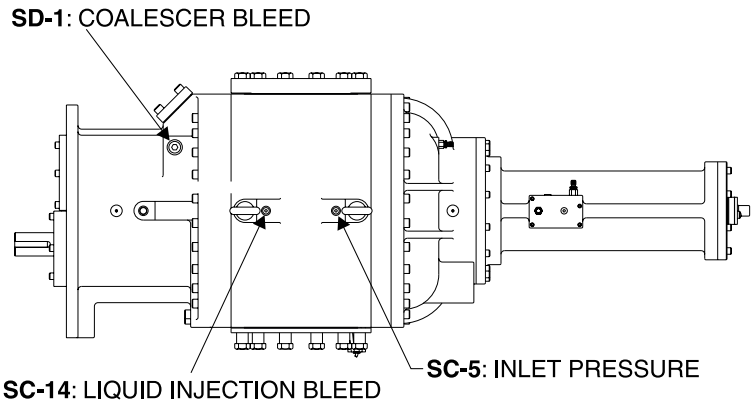


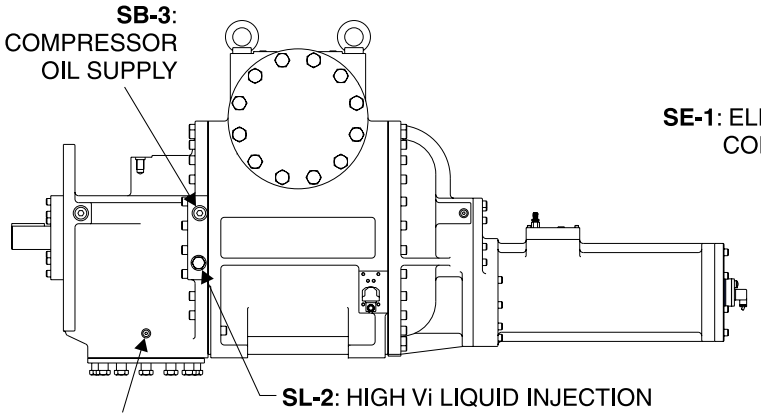


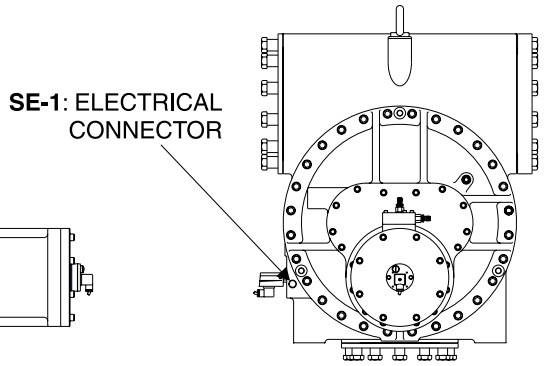


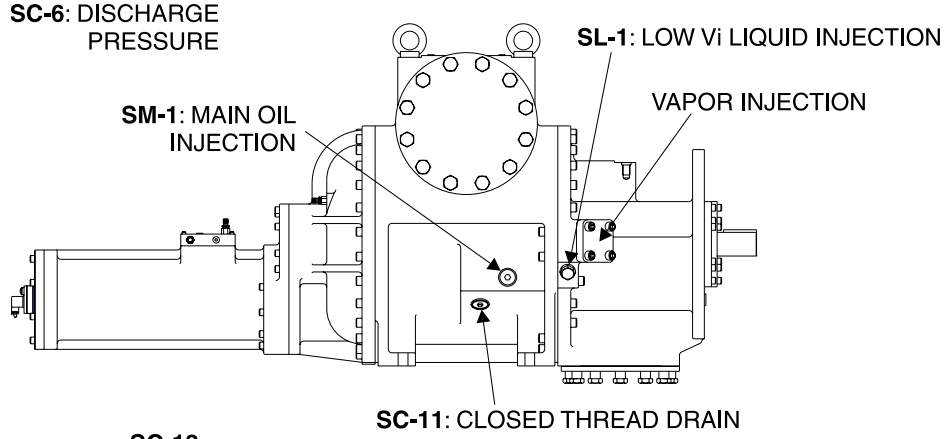
COMPRESSOR PORT LOCATIONS - SGC 2113, 2317, & 2321

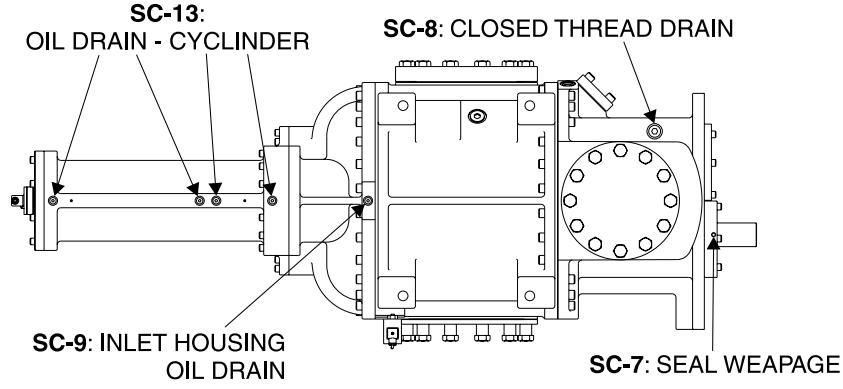
PORT	THREAD SIZE	O-RING
SB-3	1 1/16-12 UN-2B	980A0012K66
SC-5	9/16-18 UNF-2B	980A0012K60
SC-6	9/16-18 UNF-2B	980A0012K60
SC-8	1 1/16-12 UN-2B	980A0012K66
SC-9	9/16-18 UNF-2B	980A0012K60
SC-11	1 5/16-12 UN-2B	980A0012K69
SC-13	9/16-18 UNF-2B	980A0012K60
SC-14	9/16-18 UNF-2B	980A0012K60
SD-1	1 1/16-12 UN-2B	980A0012K66
SL-1	1 1/16-12 UN-2B	980A0012K66
SL-2	1 1/16-12 UN-2B	980A0012K66
SM-1	1 5/16-12 UN-2B	980A0012K69





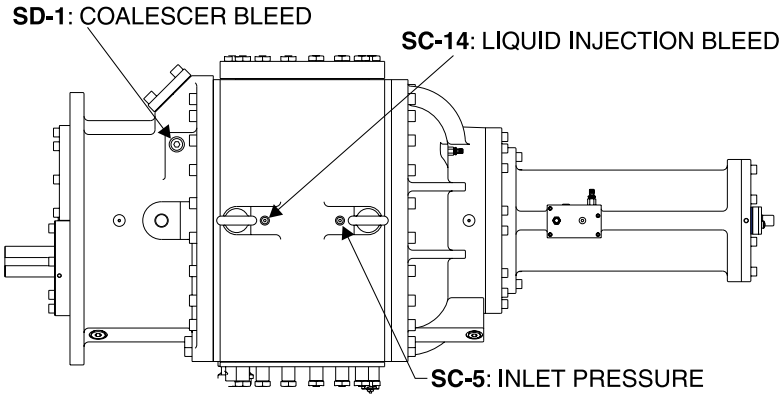


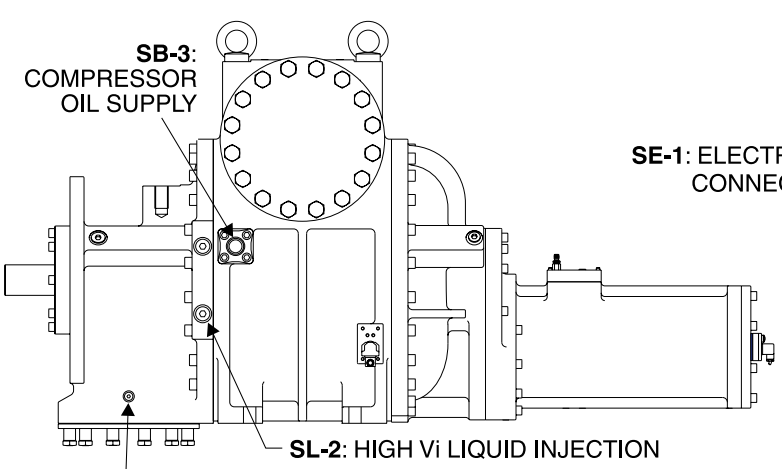


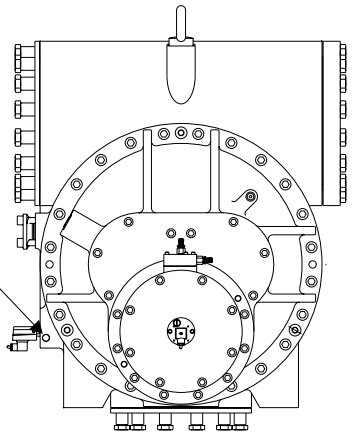


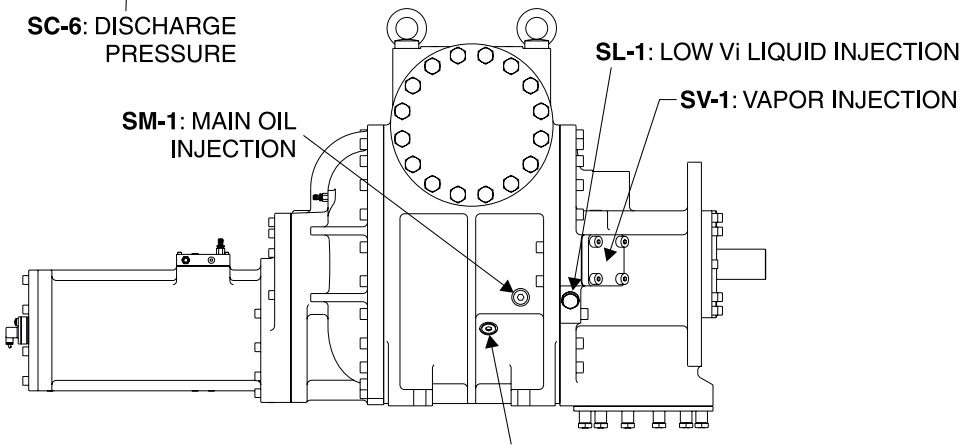
COMPRESSOR PORT LOCATIONS - SGC 2813 & 2817

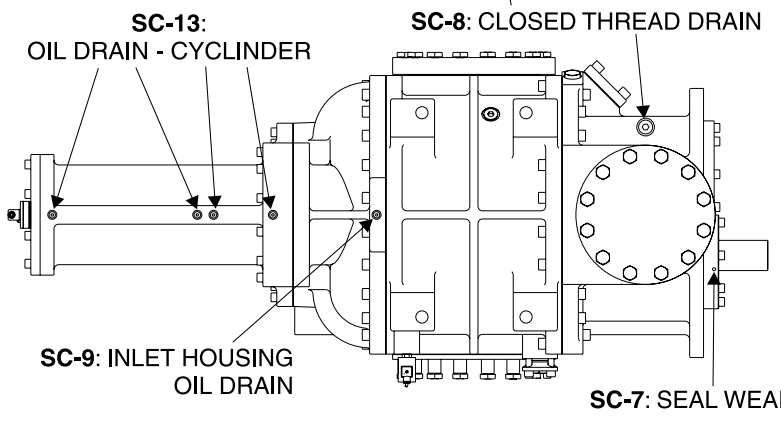
PORT	THREAD SIZE	O-RING
SC-5	3/4-16 UNF-2B	980A0012K62
SC-6	9/16-18 UNF-2B	980A0012K60
SC-8	1 5/16-12 UN-2B	980A0012K69
SC-9	9/16-18 UNF-2B	980A0012K60
SC-13	9/16-18 UNF-2B	980A0012K60
SC-14	9/16-18 UNF-2B	980A0012K60
SD-1	1 1/16-12 UN-2B	980A0012K66
SL-1	1 5/16-12 UN-2B	980A0012K69
SL-2	1 5/16-12 UN-2B	980A0012K69
SM-1	1 5/16-12 UN-2B	980A0012K69





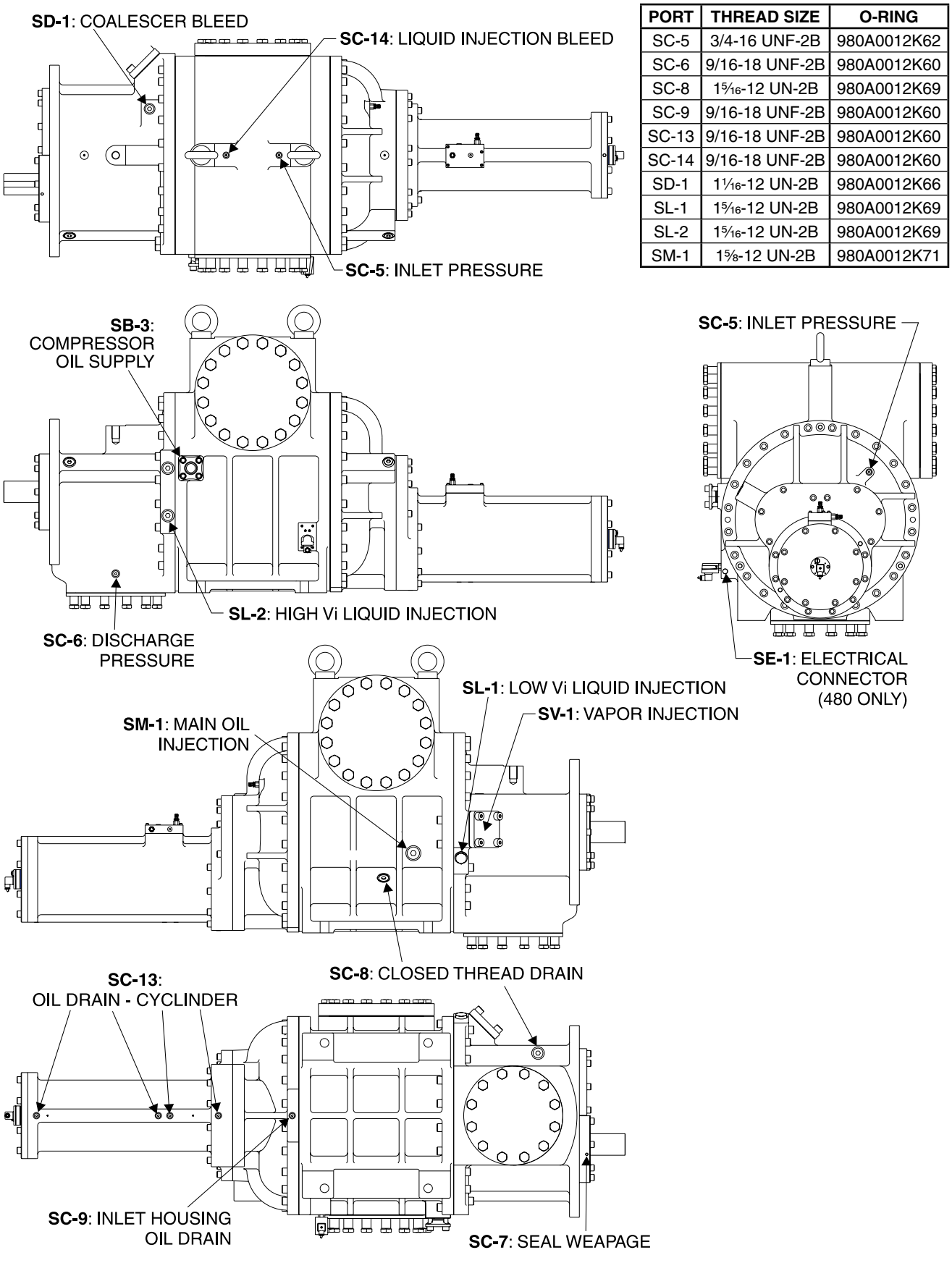




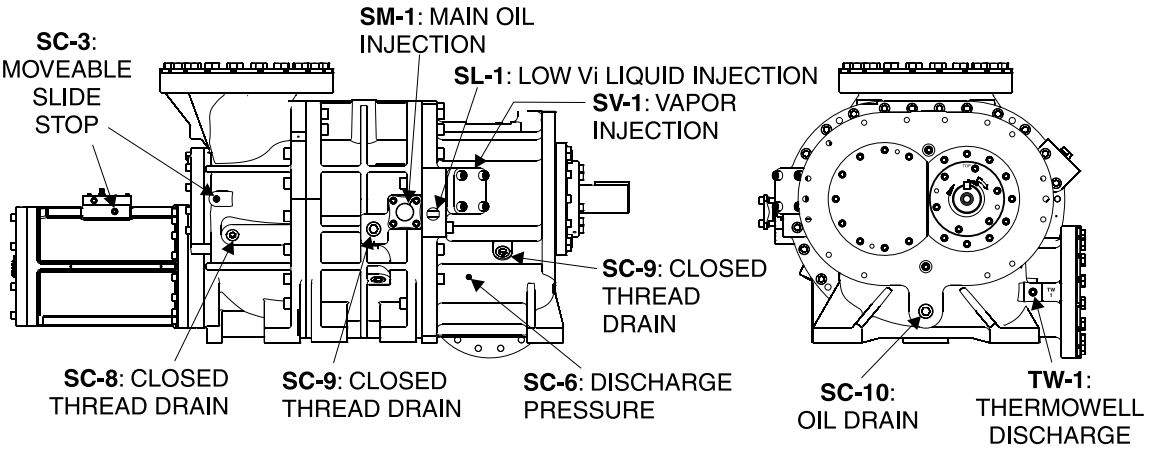


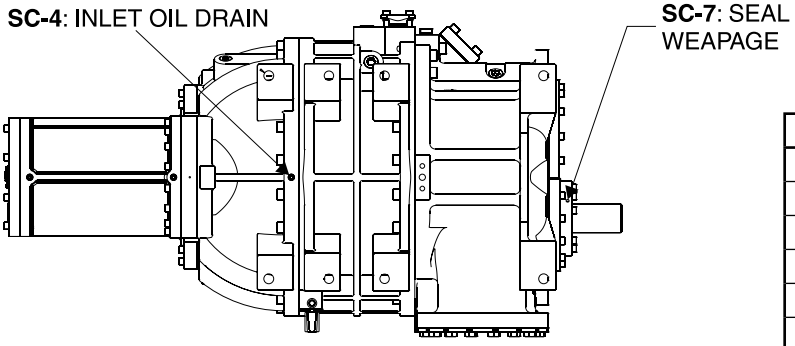
COMPRESSOR PORT LOCATIONS - SGC 2821 & 2824

PORT	THREAD SIZE	O-RING
SC-5	3/4-16 UNF-2B	980A0012K62
SC-6	9/16-18 UNF-2B	980A0012K60
SC-8	1 5/16-12 UN-2B	980A0012K69
SC-9	9/16-18 UNF-2B	980A0012K60
SC-13	9/16-18 UNF-2B	980A0012K60
SC-14	9/16-18 UNF-2B	980A0012K60
SD-1	1 1/16-12 UN-2B	980A0012K66
SL-1	1 5/16-12 UN-2B	980A0012K69
SL-2	1 5/16-12 UN-2B	980A0012K69
SM-1	1 5/8-12 UN-2B	980A0012K71

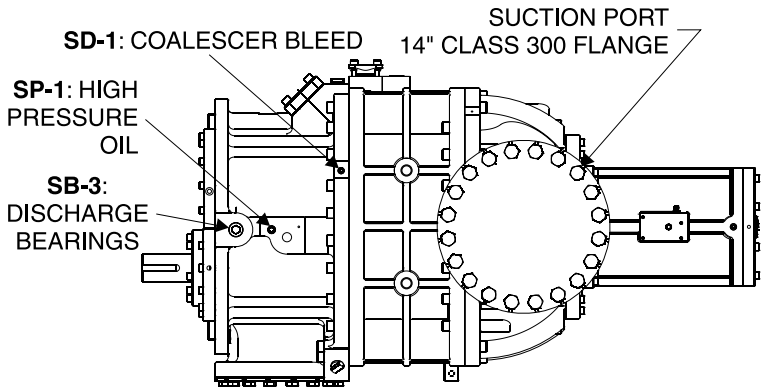


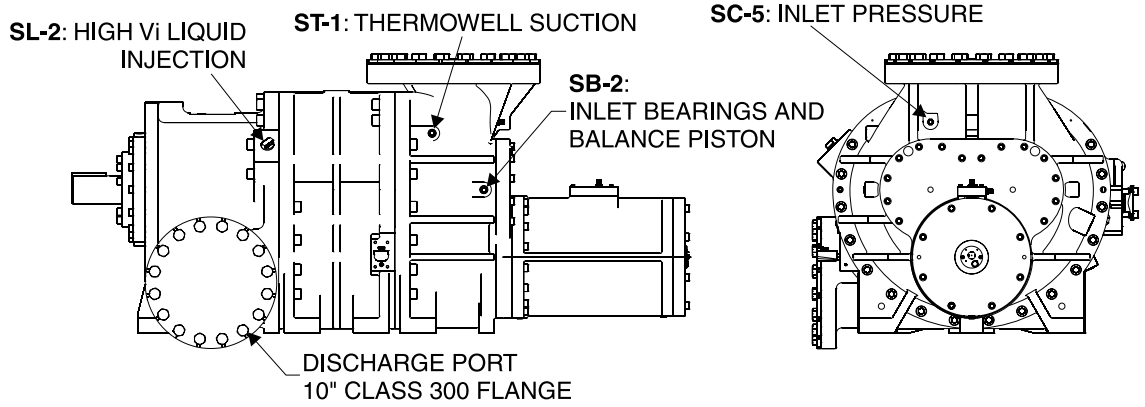
COMPRESSOR PORT LOCATIONS - SGC 3511 & 3515



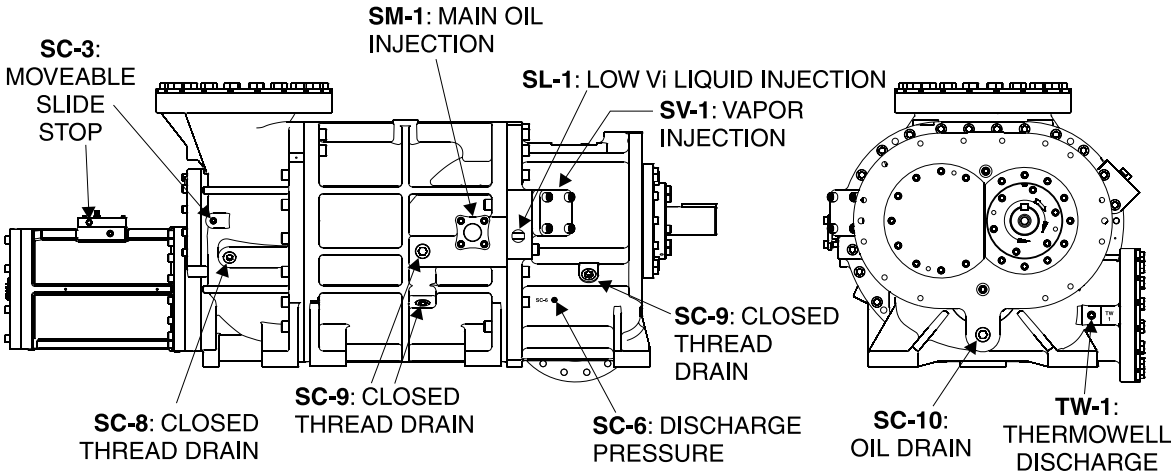


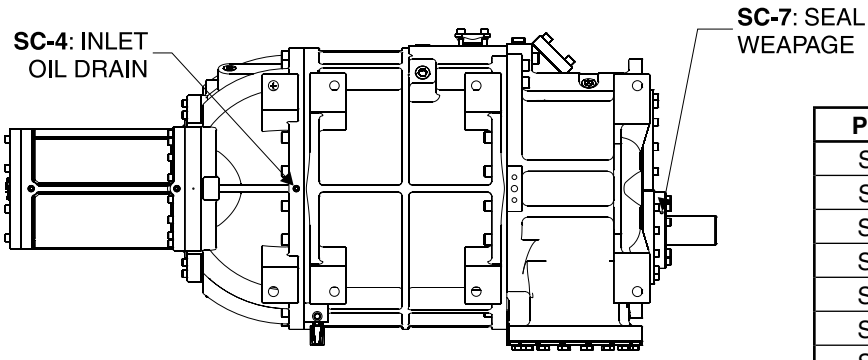
PORT	SIZE
SB-2	3/4-14 NPTF
SB-3	1½-11½ NPTF
SC-3	1/2-14 NPTF
SC-4	1/2-14 NPTF
SC-5	3/8-18 NPTF
SC-6	3/8-18 NPTF
SC-7	1/8-27 NPTF
SC-8	1¼-11½ NPTF
SC-9	1½-11½ NPTF
SC-10	1½-11½ NPTF
SD-1	1/2-14 NPTF
SL-1	1¼-11½ NPTF
SL-2	1¼-11½ NPTF
SM-1	2” SQ FLANGE
ST-1	3/4-14 NPTF
SV-1	3” SQ FLANGE
TW-1	3/4-14 NPTF
SP-1	3/4-14 NPTF

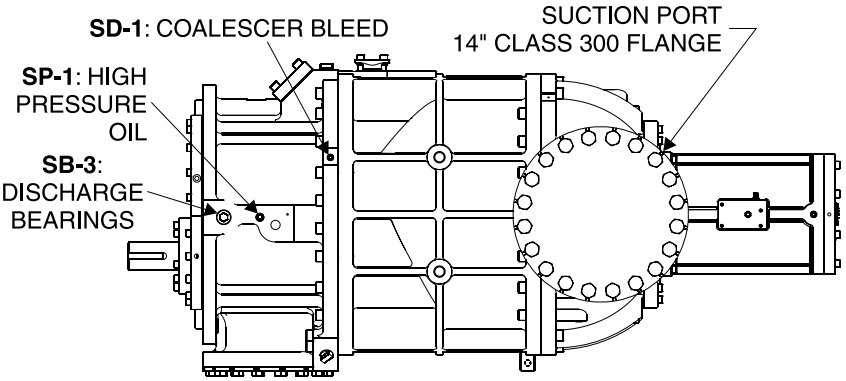




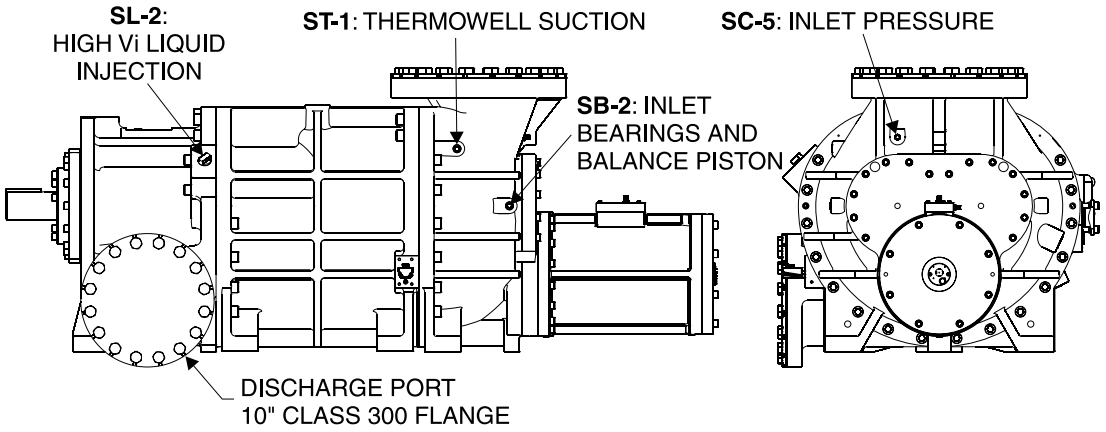
COMPRESSOR PORT LOCATIONS - SGC 3519 & 3524







PORT	SIZE
SB-2	3/4-14 NPTF
SB-3	1½-11½ NPTF
SC-3	1/2-14 NPTF
SC-4	1/2-14 NPTF
SC-5	3/8-18 NPTF
SC-6	3/8-18 NPTF
SC-7	1/8-27 NPTF
SC-8	1¼-11½ NPTF
SC-9	1½-11½ NPTF
SC-10	1½-11½ NPTF
SD-1	1/2-14 NPTF
SL-1	1¼-11½ NPTF
SL-2	1¼-11½ NPTF
SM-1	2” SQ FLANGE
ST-1	3/4-14 NPTF
SV-1	3” SQ FLANGE
TW-1	3/4-14 NPTF
SP-1	3/4-14 NPTF



HOLDING CHARGE AND STORAGE

Every SGC compressor is pressure and leak tested at the Johnson Controls–Frick Factory and then thoroughly evacuated and charged with dry nitrogen to ensure its integrity during shipping and short term storage prior to installation.

All compressors must be kept in a clean, dry location to prevent corrosion damage. Compressors that will be stored for more than two months must have their nitrogen charge checked periodically (see pages in GENERAL INFORMATION for complete instructions).

⚠WARNING **Holding-charge shipping gauges (if mounted) are rated for 30 psig and are for checking the shipping charge only. They must be removed before pressure testing and operating the system. Failure to remove these gauges may result in catastrophic failure of the gauge resulting in serious injury or death.**

Access valves are bronze and they must be replaced with steel plugs when package is assembled.

⚠ CAUTION

THIS EQUIPMENT HAS BEEN PRESSURIZED WITH NITROGEN GAS. TEMPORARY VALVES & GAUGES HAVE BEEN INSTALLED.

1. RELIEVE PRESSURE PRIOR TO OPENING LINES OR MAKING FIELD CONNECTIONS.
2. REMOVE CHARGING VALVES OR GAUGES PRIOR TO PRESSURIZING SYSTEM.
3. REFER TO INSTALLATION OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL INFORMATION.

ESCAPING GAS MAY CAUSE INJURY

RIGGING AND HANDLING

The compressor can be moved with rigging, using a crane or forklift, by hooking into the two lifting rings at each end of the main housings. The compressor lifting rings shall only be used to lift the compressor itself. See Figures 3 and 4.

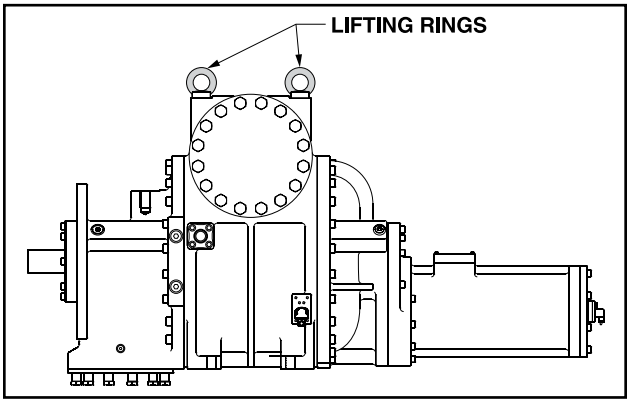


Figure 3 - Lifting Rings

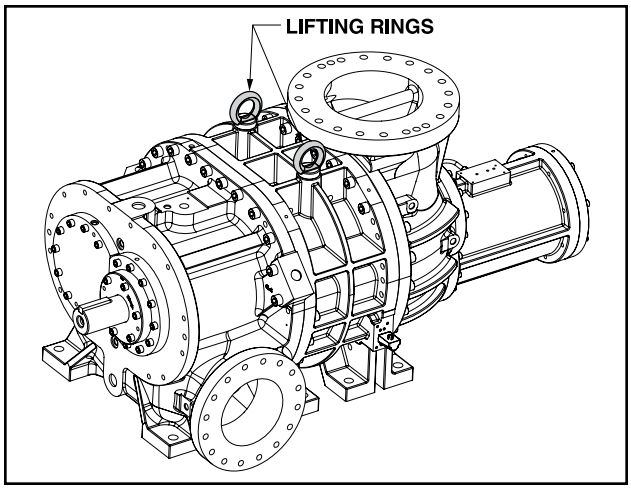


Figure 4 - Lifting Rings, Model 355

FOUNDATION

Each SGC Rotary Screw Compressor is shipped mounted on a wooden skid, which must be removed prior to unit installation.

⚠CAUTION **Allow proper spacing for servicing (see Dimensional Outline Drawing).**

The first requirement of the compressor foundation is that it must be able to support the weight.

SGC 1913	1,830 lb.	SGC 2321	3,115 lb.
SGC 1918	2,050 lb.	SGC 2813	4,505 lb.
SGC 2313	2,690 lb.	SGC 2817	4,585 lb.
SGC 2317	2,990 lb.	SGC 2824	6,440 lb.
SGC 3511	8,525 lb.		
SGC 3515	9,000 lb.		
SGC 3519	9,500 lb.		
SGC 3524	10,000 lb.		

Screw compressors are capable of converting large quantities of shaft power into gas compression in a relatively small space. The compression process creates relatively high frequency vibrations that require sufficient mass in the base to effectively dampen them.

The best insurance for a trouble-free installation is to firmly anchor the compressor to a suitable foundation using proper bolting and by preventing piping stress from being imposed on the compressor. Once the compressor is rigged into place, its feet must be shimmed to level it. There must be absolutely no stresses introduced into the compressor body due to bolting of the feet and flanges.

The compressor motor mount is not designed to carry the unsupported weight of the motor. The full motor weight must be supported using the motor lifting point during the motor installation process. After the necessary bracket to support the motor have been welded into place on the package and the rear motor feet and the motor mount have been bolted into place, the weight of the motor can rest on the support bracket and the motor mount.

In any screw compressor installation, suction and discharge lines should be supported in pipe hangers (preferably within

2 feet of vertical pipe run) so that the lines won't move if disconnected from the compressor. See table for Allowable Flange Loads.

ALLOWABLE FLANGE LOADS						
NOZ. SIZE	MOMENTS (ft-lbf)			LOAD (lbf)		
	AXIAL	VERT.	LAT.	AXIAL	VERT.	LAT.
NPS	M_R	M_C	M_L	P	V_C	V_L
1	25	25	25	50	50	50
1.25	25	25	25	50	50	50
1.5	50	40	40	100	75	75
2	100	70	70	150	125	125
3	250	175	175	225	250	250
4	400	200	200	300	400	400
5	425	400	400	400	450	450
6	1,000	750	750	650	650	650
8	1,500	1,000	1,000	1,500	900	900
10	1,500	1,200	1,200	1,500	1,200	1,200
14	2,000	1,800	1,800	1,700	2,000	2,000

CUSTOMER CONNECTIONS

As a minimum you must connect to the following locations in addition to suction and discharge.

SB-2	Inlet Bearings and Balance Piston
SB-3	Compressor oil supply
SM-1	Main oil injection
P	Manifold block pressure
T	Manifold block tank

Other connections are available for instrumentation and service as noted on the Dimensional Outline drawing. The electrical connections for the slide stop and the slide valve transmitters and the solenoid valve coils must be connected to your control system .

The oil supply system for the compressor must be designed for a total pressure drop of no more than 15 psi with a new oil filter element. This is critical for the proper operation of the balance piston which is used to ensure the life of the male axial bearing. Excessive pressure drop in the oil circuit can also prevent proper operation of the slide valve and slide stop pistons.

COMPRESSOR OIL

⚠WARNING **DO NOT MIX OILS of different brands, manufacturers, or types. Mixing of oils can cause excessive oil foaming, nuisance oil level cutouts, oil pressure loss, gas or oil leakage and catastrophic compressor failure. CoolWare will select a specific Frick oil for the refrigerant being used. Depending on the application, a different oil can be selected provided it is of the proper viscosity and is compatible with the refrigerant and compressor elastomers.**

OIL PUMP

If your SGC compressor application requires an oil pump, it is recommended that a strainer be mounted upstream to protect it. Frick supplied pumps are a positive displacement gear type that must have a safety relief valve to ensure the oil pressure will not be more than 50 psi above compressor discharge pressure for all models.

⚠CAUTION **If oil pressure exceeds 55 PSI above compressor discharge it could cause catastrophic compressor failure due to male axial bearing failure. See CoolWare™ for your application's requirements.**

COMPRESSOR

COMPRESSOR ROTATION IS CLOCKWISE WHEN FACING THE END OF THE COMPRESSOR SHAFT

Confirm motor will rotate the compressor clockwise before installing the coupling.

MOTOR MOUNTING USING TUNNEL

1. Attach the motor mount to the compressor. Torque bolts to the values listed in Table 2.
2. The rear feet of the motor (away from the motor drive end) must be properly supported on the package. The remainder of the support for the motor will be provided by the motor mount and the compressor mounting.
3. The motor mounting design must allow for proper positioning of the motor mounting bracket on the package by welding it in place (see Figure 5).

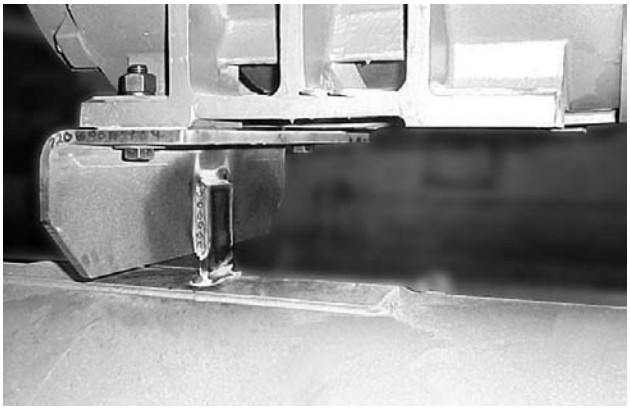


Figure 5 - Motor Mount

4. Use a scale to weigh the motor prior to assembly.
5. Bolt the motor to the motor mount while the motor weight is still supported by the scale and torque bolts to 250 ft-lb.
6. Bolt the bracket that attaches to the rear motor feet to the motor. Hand tighten bolts.
7. Weld motor support bracket to motor support per Figure 5.
8. Weld motor support bracket to separator pad per Figure 5.
9. Verify the actual scale reading is within +/- 10% of the original motor weight.
10. Torque the motor mounting bolts to 250 ft-lb.
11. Remove scale and align motor.

TABLE 2 - BOLT TORQUE VALUE

Compressor Model	Screw Size	Torque	
		ft-lb	NM
SGC 19XX	M12 X 1.75	58	79
SGC 23XX	M12 X 1.75	58	79
SGC 28XX	M16 X 2.0	144	195
SGC 35XX	M20 X 2.5	260	353

MOTOR MOUNTING (FOOT MOUNTED ONLY)

1. Thoroughly clean the motor feet and mounting pads of grease, burrs, and other foreign matter to ensure firm seating of the motor.
2. Attach the motor to the base using bolts and motor raising blocks, if required.
3. Weld the four kick bolts (not included with compressor) into place so that they are positioned to allow movement of the motor feet.
4. After the motor has been set, check to see that the shafts are properly spaced for the coupling being used. Check the appropriate Dimensional Outline drawing for the minimum clearance required between the shaft ends to change the shaft seal.

COMPRESSOR/MOTOR COUPLING REQUIREMENTS.

SGC compressors are arranged for direct motor drive and require a flexible drive coupling to connect the compressor to the motor.

If you are using the Johnson Controls – Frick motor mount, the mount is machined to ensure that motor to compressor alignment is in specification (see the above "MOTOR MOUNTING" section for mounting details).

If you are using a foot mounted motor, it is essential that the coupling be properly aligned to ensure proper bearing and seal performance.

1. Coupling must be selected and installed so that it doesn't transmit any axial load to the compressor shaft.
2. Set up the minimum distance between compressor shaft and motor shaft to allow for seal removal (see Outline drawings).
3. Coupling must be able to take up any misalignment between motor and compressor. It is critical to the life of the shaft seal that misalignment is kept to the minimum possible value. Be sure to follow the coupling manufacturer's guidelines for checking and correcting any misalignment. See the next section for Johnson Controls – Frick requirements.

COUPLING ALIGNMENT REQUIREMENTS (FOOT MOUNTED ONLY)

Coupling alignment must be performed prior to start up. After the compressor has been installed on the job site, alignment must be checked again and if necessary corrected prior to start up. After a few hours operation, the alignment must be checked while the package is still hot. Correct hot alignment is critical to ensure the life of the shaft seal and compressor bearings.

Maximum radial runout is .004" total indicator reading.
Maximum axial runout is .004" total indicator reading.

A dial indicator or another appropriate measuring device is to be used to determine the Total Indicator Runout.

Indicator bracket sag must be checked as all brackets have some flexibility. The best way to measure this is to attach the dial indicator and bracket on a pipe at the coupling span distance. Zero the indicator in the 12:00 position, and rotate the pipe so the indicator is in the 6:00 position. The reading on the indicator in the 6:00 position is the bracket sag. This value must be included in the dial indicator readings when affixed to the coupling for an accurate alignment.

OIL HEATER(S)

Your package must be equipped with oil heaters that provide sufficient heat to prevent condensation from occurring during shutdown cycles.

OIL FILTER(S)

Use of filter elements other than Johnson Controls - Frick must be approved in writing by Johnson Controls - Frick engineering or a warranty claim may be denied. Typical oil filter specification $\beta_5 = 75$ according to ISO 4572 is required to obtain the recommended oil cleanliness class 16/14/11 according to ISO 4406.

OIL COOLING REQUIREMENTS

Compressor oil needs to be cooled to control the discharge temperature, maintain proper oil viscosity and to preserve the life of the oil. Normally the discharge temperature will be in the 170° - 180°F range (see CoolWare™).

One application that typically requires higher discharge temperatures (as high as 250°F) is natural gas gathering at the wellhead. Moisture is normally present in the gas and it is imperative that the discharge temperature be at least 30°F higher than the discharge dew point temperature for the gas. Run Coolware with the "Water Saturated" block checked to get the discharge dew point temperature for your application. Oil temperatures as high as 170°F can be used to achieve the necessary discharge temperature to prevent moisture from condensing in the oil separator. Contact Johnson Controls – Frick for additional information for natural gas compression.

The main oil injection line that is connected to port SM1 must have a regulating valve to permit adjustment of the oil flow to maintain the desired discharge temperature at all times.

The use of a three-way mixing valve is recommended to keep the oil temperature in the normal range of 120° - 140°F. The valve will provide warm oil to the compressor quickly, reducing the pressure drop caused by cold, viscous oil. This ensures proper oil flow and temperature over the full range of operating conditions.

DEHYDRATION / EVACUATION TEST

Evacuate the system to 1000 microns. Valve off the vacuum pump and hold vacuum for one hour.

Pass – Vacuum cannot rise more than 500 microns during one hour hold period.
Fail – Vacuum rise is more than 500 microns during one hour hold period. Identify and repair any system leaks. Repeat vacuum test until requirements are met.

ELECTRICAL INSTALLATION

SLIDE STOP TRANSMITTER

The slide stop transmitter (Figure 5) measures the position of the slide stop (SS) using a 20 to 4 mA signal to cover the range of minimum to maximum VI. The signal is sent to your control system so that it can adjust the position of SS according to system pressures. The correct SS position is important to achieve the most efficient compressor operation. Connect to +/- and signal as show in the wiring diagram in Figure 6. Refer to Frick compressor panel instructions S90-020 for calibration procedure.

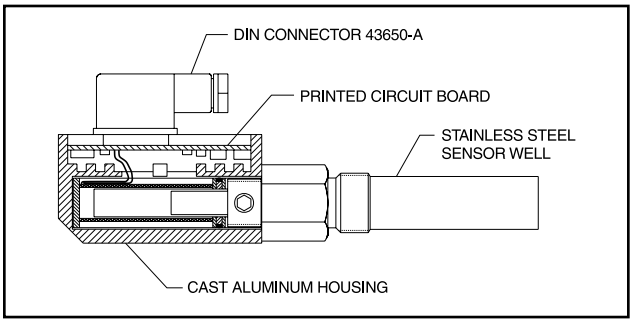


Figure 5 - Slide Stop Transmitter

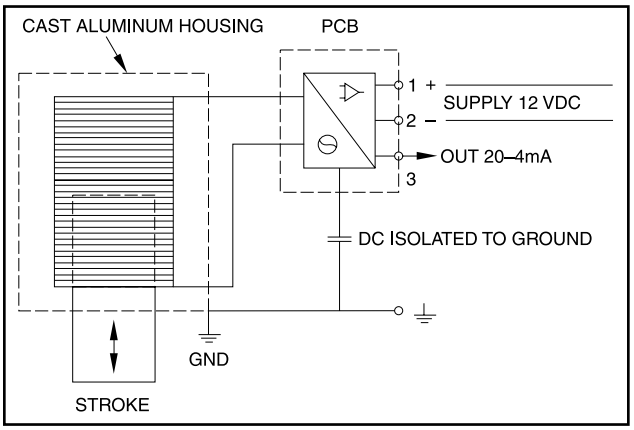


Figure 6 - Wiring Diagram for Slide Stop Transmitter

CAPACITY SLIDE VALVE TRANSMITTER

The slide valve transmitter (Figure 7) measures the position of the slide valve (SV) and sends a 4 to 20mA signal to your control system. See Figure 8. The controller will adjust the position of the SV according to the motor load set point. The correct position is important to properly load the compressor and motor. It is important not to overload the compressor and motor. Observe the maximum power input and ensure design limitations are not exceeded. Connect to +/- and signal as shown in the wiring diagram, Figure 8. Refer to Frick compressor panel instructions for calibration procedure S90-020.

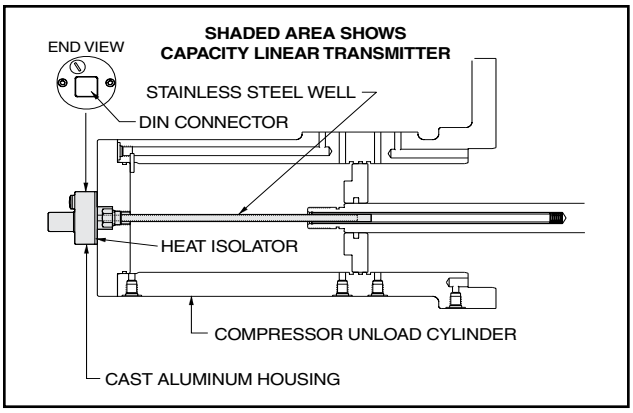


Figure 7 - Capacity Slide Valve Transmitter

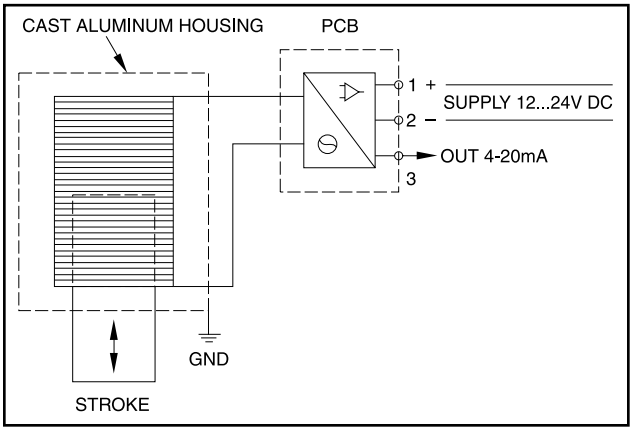


Figure 8 - Wiring Diagram for Slide Valve Transmitter

DIRECTIONAL CONTROL VALVES

Solenoids YY1, YY2, YY3 and YY4 must be wired to give the correct function. A description of their function is given in the **OPERATION** chapter. For control system information refer to Frick Compressor Control Panel S90-020. See wiring diagram in Figure 9.

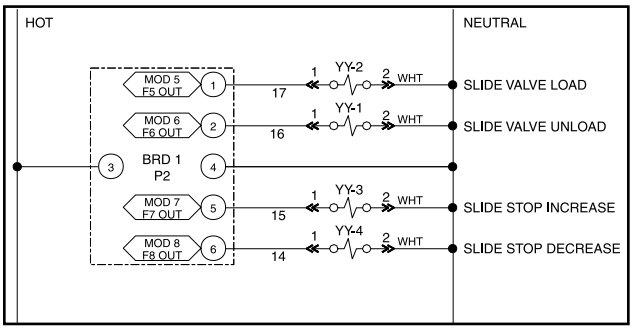


Figure 9 - Directional Control Valve Wiring Diagram

OPERATION

OPERATION AND START-UP INSTRUCTIONS

The Frick SGC Rotary Screw Compressor will be a component in an integrated system. As such the compressor requires some specific operation and conditions to ensure trouble-free running.

The information in this section of the manual provides the logical step-by-step instructions to properly start up and operate the SGC Rotary Screw Compressor in your Unit. Only matters which may influence the proper operation of the SGC compressor are included.

THE FOLLOWING SUBSECTIONS MUST BE READ AND UNDERSTOOD BEFORE ATTEMPTING TO START OR OPERATE THE UNIT.

COMPRESSOR HYDRAULIC SYSTEM

(The solenoid valves and manifold block are available as a sales order option)

The compressor hydraulic system actuates the movable slide valve (SV) to load and unload the compressor. It also actuates the movable slide stop (SS) to increase or decrease the compressor's volume ratio (VI). The hydraulic cylinder located at the inlet end of the SGC compressor serves a dual purpose. It is separated by a fixed bulkhead into two sections. The SV section is to the left of the bulkhead and the SS is to the right if you are facing the right side of the compressor. Both operations are controlled by double-acting, four-way solenoid valves, which are actuated when a signal from the appropriate microprocessor output energizes the solenoid valve.

SINGLE-ACTING MODE - High Stage
Open valve at SC1
Close valve at SC2
Open valve at BP (bypass)

High stage compressor loading: The compressor loads when SV solenoid YY2 is energized and oil flows from the unload side of the cylinder out port SC1, through valve ports A and T to compressor suction. Simultaneously, discharge pressure loads the slide valve.

High stage compressor unloading: The compressor unloads when SV solenoid YY1 is energized and oil flows from the oil manifold through valve ports P and A to cylinder port SC1 and enters the unload side of the cylinder. Simultaneously, gas on the load side of the cylinder is vented through port SC2 and valve BP to compressor suction.

NOTE: To control the rate of loading and unloading, throttle the needle valve at SC1 port.

DOUBLE-ACTING MODE - Booster (low differential)
Open valve at SC1
Open valve at SC2
Close valve at BP (bypass)

Booster Compressor Loading: The compressor loads when SV solenoid YY2 is energized and oil flows from the oil manifold through valve ports P and B to cylinder port SC2 and enters the load side of the cylinder. Simultaneously, oil contained in the unload side of the cylinder flows out cylinder port SC1 through valve ports A and T to compressor suction.

Booster Compressor Unloading: The compressor unloads when SV solenoid YY1 is energized and oil flows from the oil manifold through valve ports P and A to cylinder port SC1 and enters the unload side of the cylinder. Simultaneously, oil contained in the load side of the cylinder flows out of compressor port SC2 through valve ports B and T to compressor suction.

NOTE: To control the rate of loading and unloading, throttle valves SC1 and SC2.
NOTE: To slow all valve movements - loading, unloading, and VI change - throttle valve 2.

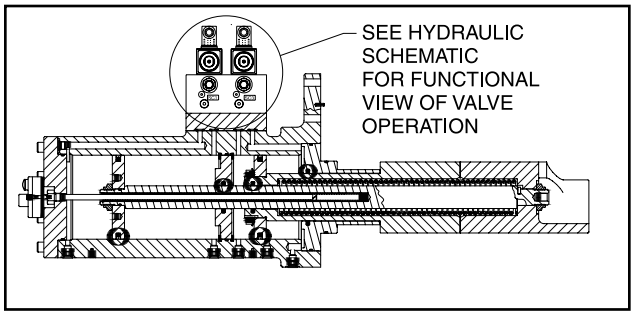


Figure 10 - Solenoid Valve Block

CAUTION **NEVER open valve BP and valve SC2 at the same time during compressor operation.**

VOLUMIZER VOLUME RATIO CONTROL

Open valve at SC3
Open valve at SC4
Compressor VI increase: The volume ratio Vi is increased when MSS solenoid valve YY3 is energized and oil flows from the oil manifold through valve ports P and A to compressor port SC3, enters the increase side of the cylinder and overcomes the decrease spring tension. Simultaneously, oil flows from SC4 port through valve ports B and T to compressor suction.

Compressor VI decrease: The volume ration Vi is decreased when MSS solenoid valve YY4 is energized and oil flows from the oil manifold through valve ports P and B to compressor port SC4, enters the decrease side of the cylinder. Simultaneously, oil flows form SC3 port through valve ports A and T to compressor suction.

TO CONTROL THE RATE OF VI CHANGE, THROTTLE THE NEEDLE VALVE AT SC3 PORT.

LOW AMBIENT OPERATION

It is recommended that package oil separators be insulated as a minimum requirement to preserve the heat generated by the oil heaters, to prevent condensation and secure lubrication at start-up.

INITIAL STARTUP

Prior to the start-up, the prestart check must be accomplished.

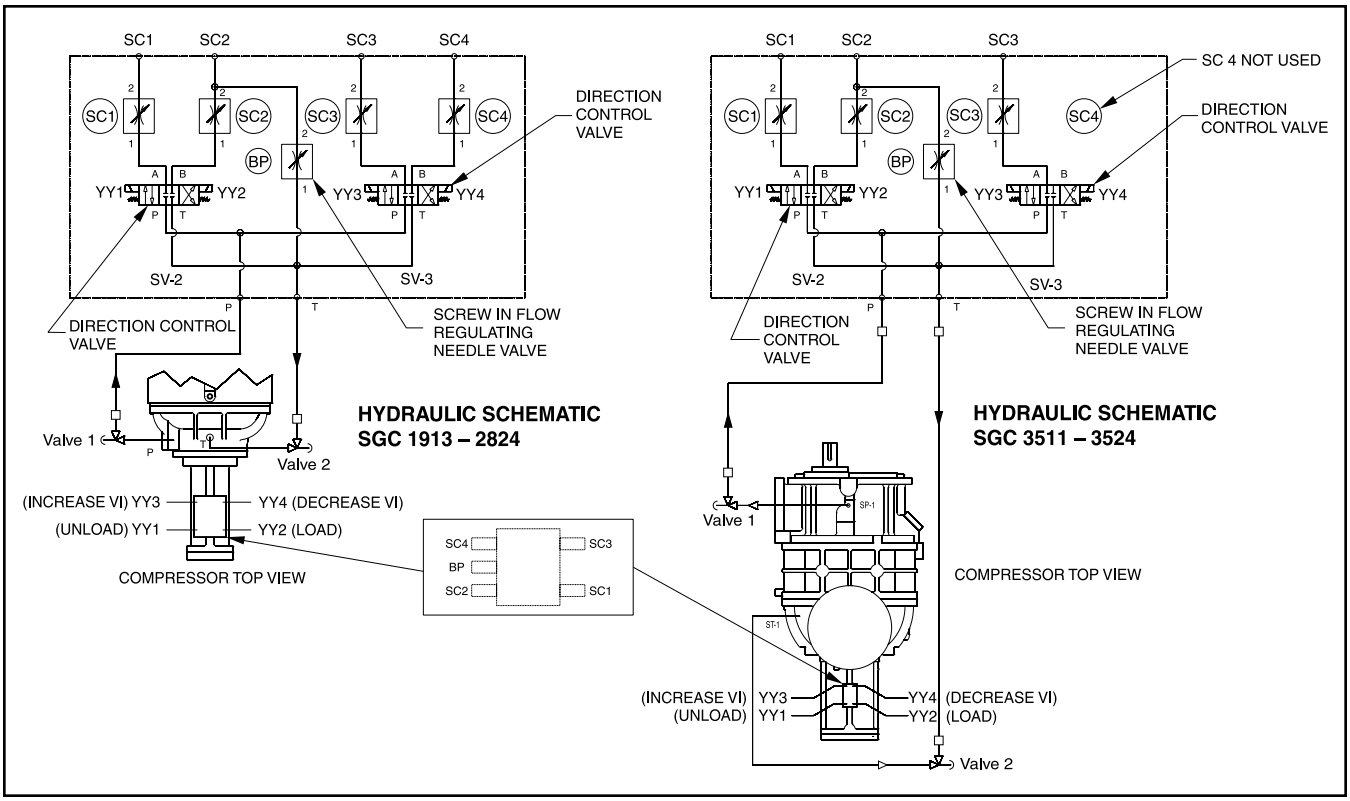


Figure 11 - Hydraulic Schematic

INITIAL STARTUP PROCEDURE

Having performed the prestart check, the compressor unit is ready for start-up. It is important that an adequate gas load be available to load test the unit at normal operating conditions. The following points should be kept in mind during initial start-up.

1. For proper and safe operation, the compressor must be run at the proper speed and discharge pressure. Exceeding design conditions creates a potential hazard.

2. After 1 to 3 hours of operation adjust oil cooling system.

3. Pull and clean suction strainer after 24 hours of operation. If it is excessively dirty, repeat every 24 hours until system is clean. Otherwise, follow the normal maintenance schedule.

4. Perform vibration analysis if equipment is available.

NORMAL STARTUP PROCEDURE

1. Confirm system conditions permit starting the compressor.

2. Start.

3. Observe the compressor unit for mechanical tightness of the external piping, bolts and valves. Ensure that the machine has no oil and vapor leaks. If any of these occur, shut down the compressor and correct the problem as necessary using good safety precautions.

MAINTENANCE

GENERAL INFORMATION

This section provides instructions for normal maintenance, a recommended maintenance program, troubleshooting and correction guides and typical P & I diagrams.

WARNING **THIS SECTION MUST BE READ AND UNDERSTOOD BEFORE ATTEMPTING TO PERFORM ANY MAINTENANCE OR SERVICE TO THE UNIT.**

CAUTION **Cylinder assembly under high spring load. Consult manual before disassembly. Improper disassembly may cause injury due to spring tension release.**

NORMAL MAINTENANCE OPERATIONS

When performing maintenance you must take several precautions to ensure your safety:

1. IF UNIT IS RUNNING, PRESS [STOP] KEY.
2. STOP MOTOR AND LOCK OUT STARTER BEFORE PERFORMING ANY MAINTENANCE.
3. WEAR PROPER SAFETY EQUIPMENT WHEN COMPRESSOR UNIT IS OPENED TO ATMOSPHERE.
4. ENSURE ADEQUATE VENTILATION.
5. TAKE NECESSARY SAFETY PRECAUTIONS REQUIRED FOR THE GAS BEING USED.

GENERAL MAINTENANCE

Proper maintenance is important in order to assure long and trouble-free service from your screw compressor. Some areas critical to good compressor operation are:

1. Keep oil clean and dry, avoid moisture contamination. After servicing any portion of the refrigeration system, evacuate to remove moisture before returning to service. Water vapor condensing in the compressor while running or more likely while shut down, can cause rusting of critical components and reduce life.

2. Keep suction strainer clean. Check periodically, particularly on new systems where welding slag or pipe scale could find its way to the compressor suction. Excessive dirt in the suction strainer could cause it to collapse, dumping particles into the compressor.

3. Keep oil filters clean. If filters show increasing pressure drop, indicating dirt or water, stop the compressor and change filters. Running a compressor for long periods with high filter pressure drop can starve the compressor of oil and lead to premature bearing failure. Dual oil filters are recommended so that the filters can be changed without shutting down the package.

4. Avoid slugging the compressor with liquids (oil). While screw compressors are probably the most tolerant of any compressor type available today about ingestion of some liquid, they are not liquid pumps. Make certain a properly sized suction accumulator is used to avoid dumping liquid into compressor suction.

5. Protect the compressor during long periods of shutdown. If the compressor will be sitting for long periods without running, it is advisable to evacuate to low pressure and charge with dry nitrogen or oil. This is particularly true on systems known to contain water vapor.

6. Preventive maintenance inspection is recommended any time a compressor exhibits a noticeable change in vibration level, noise, or performance.

CHANGING OIL

WARNING **DO NOT MIX OILS of different brands, manufacturers, or types. Mixing of oils may cause excessive oil foaming, nuisance oil level cutouts, oil pressure loss, gas or oil leakage and catastrophic compressor failure.**

Shut down the unit when changing oil. At the same time all oil filter cartridges must be changed and all oil strainer elements removed and cleaned. The procedure is as follows:

1. Stop the compressor unit.
2. Lock out the motor starter.
3. Close the suction and discharge service valves
4. Using appropriate equipment, lower the compressor pressure to 0 psig.
5. Open the drain valve(s) and drain oil into a suitable container.
6. Drain the oil filter(s) and the oil coolers.
7. Remove the old filter cartridges, and install new ones.
8. Remove, clean, and reinstall elements in the strainers.
9. Evacuate the unit.
10. Open the suction service valve and pressurize the unit to system suction pressure. Close the suction valve and leak test.
11. Add oil.
12. Open the suction and discharge service valves
13. Remove the lockout from the motor starter.
14. Start the unit

RECOMMENDED MAINTENANCE PROGRAM

In order to obtain maximum compressor performance and ensure reliable operation, a regular maintenance program should be followed. The compressor unit should be checked regularly for leaks, abnormal vibration, noise, and proper operation. A log should also be maintained. Oil analysis should be performed on a regular basis. It is a valuable tool that can identify the presence of moisture, acid, metallics and other contaminants that will shorten compressor life if not corrected. In addition, an analysis of the compressor vibration should be made periodically.

VIBRATION ANALYSIS

Periodic vibration analysis can be useful in detecting bearing wear and other mechanical failures. If vibration analysis is used as a part of your preventive maintenance program, take the following guidelines into consideration.

1. Always take vibration readings from exactly the same places and at exactly the same percentage of load.

2. Use vibration readings taken from the new unit at start-up as the base line reference.

3. Evaluate vibration readings carefully as the instrument range and function used can vary. Findings can be easily misinterpreted.

4. Vibration readings can be influenced by other equipment operating in the vicinity or connected to the same piping as the unit.

OIL QUALITY AND ANALYSIS

High quality and suitable oil is necessary to ensure compressor longevity and reliability. Oil quality will rapidly deteriorate in systems containing moisture and air or other contaminants. In order to ensure the quality of the oil in the compressor unit:

1. Only use Frick oil or high quality oils approved by Johnson Controls - Frick for your application.

2. Only use Frick filter elements. Substitutions must be approved in writing by Johnson Controls - Frick engineering or warranty claim may be denied.

3. Participate in a regular, periodic oil analysis program to maintain oil and system integrity.

OPERATING LOG

The use of an operating log as included in this manual permits thorough analysis of the operation of a system by those responsible for its maintenance and servicing. Continual recording of gauge pressures, temperatures, and other pertinent information, enables the observer and serviceman to be constantly familiar with the operation of the system and to recognize immediately any deviations from normal operating conditions. It is recommended that readings be taken at least daily.

MAINTENANCE SCHEDULE

The schedule below should be followed to ensure trouble-free operation of the compressor unit.

MAINTENANCE SCHEDULE

This schedule should be followed to ensure trouble-free operation of the compressor unit.

MAINTENANCE	FREQUENCY OR HOURS OF OPERATION (MAXIMUM)																				
	200	1000	5000	8000	10,000	15,000	20,000	25,000	30,000	35,000	40,000	45,000	50,000	55,000	60,000	65,000	70,000	75,000	80,000	85,000	90,000	95,000
Change Oil	As Directed By Oil Analysis																					
Oil Analysis		■	Every 6 Months																			
Replace Oil Filters	■		■		■		■		■		■		■		■		■		■		■	
Clean Oil Strainers	■		■		■		■		■		■		■		■		■		■		■	
Clean Liquid Strainers	■		■		■		■		■		■		■		■		■		■		■	
Replace Coalescers									■						■						■	
Check and Clean Suction Strainer	■		■		■		■		■		■		■		■		■		■		■	
Vibration Analysis	■	Every 6 Months, More Frequently If Levels Increase																				
Replace Shaft Seal	When Leak Rate Exceeds 7 - 8 Drops Per Minute																					

TROUBLESHOOTING GUIDE

Successful problem solving requires an organized approach to define the problem, identify the cause, and make the proper correction. Sometimes it is possible that two relatively obvious problems combine to provide a set of symptoms that can mislead the troubleshooter. Be aware of this possibility and avoid solving the "wrong problem".

ABNORMAL OPERATION ANALYSIS AND CORRECTION

Four logical steps are required to analyze an operational problem effectively and make the necessary corrections:

1. Define the problem and its limits.
2. Identify all possible causes.
3. Test each cause until the source of the problem is found.
4. Make the necessary corrections.

The first step in effective problem solving is to define the limits of the problem. The following list of abnormal system conditions can cause abnormal operation of the SGC compressor:

1. Insufficient or excessive refrigerant or gas load.
2. Excessively high suction pressure.
3. Excessively high discharge pressure.
4. Excessively high or low temperature coolant to the oil cooler.
5. Excessive liquid entering the compressor (slugging).
6. Insufficient oil cooling.
7. Excessive oil cooling
8. Incorrect gas line sizing.
9. Improper system piping.
10. Wrong operation of hydraulic operated slide valve.
11. Problems in electrical service to compressor.
12. Moisture present in the system.

Make a list of all deviations from normal compressor operation. Delete any items, which do not relate to the symptom and separately list those items that might relate to the symptom. Use the list as a guide to further investigate the problem.

The second step in problem solving is to decide which items on the list are possible causes and which items are additional symptoms. High discharge temperature and high oil temperature readings on a display may both be symptoms of a problem and not causally related.

The third step is to identify the most likely cause and take action to correct the problem. If the symptoms are not relieved, move on to the next item on the list and repeat the procedure until you have identified the cause of the problem. Once the cause has been identified and confirmed make the necessary corrections.

CAPACITY LINEAR TRANSMITTER REPLACEMENT - SLIDE VALVE

The Capacity Linear Transmitter is located on the end of the compressor cylinder (see Figure 10). The linear transmitter with hermetic enclosure is based on the inductive measuring principle. It features removable electronics (from the sensor well) eliminating the need to evacuate the compressor for replacement. This type of transmitter is dedicated to capacity control and is not adjustable.

1. Shut off control power.
2. Remove DIN connector plug from transmitter.
3. Loosen cap screws.
4. Remove transmitter unit.
5. Install new transmitter unit.
6. Tighten cap screws.
7. Apply DIN connector plug to transmitter.
8. Turn on control power.

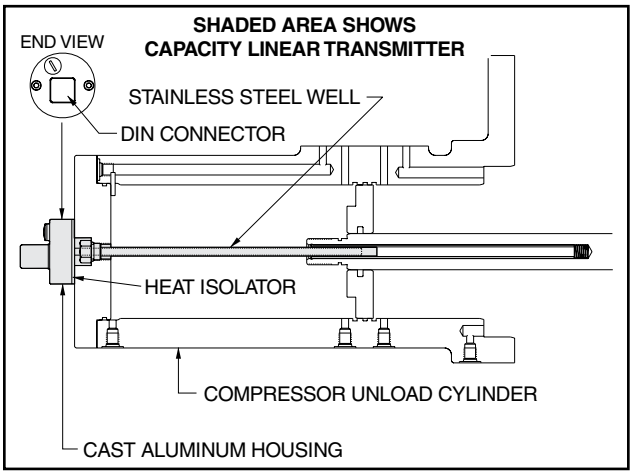


Figure 10 - Capacity Linear Transmitter

VOLUMIZER® TRANSMITTER REPLACEMENT - SLIDE STOP

The VOLUMIZER® Transmitter is located on the right side of the compressor (facing shaft) at the inlet end (see Figure 11).

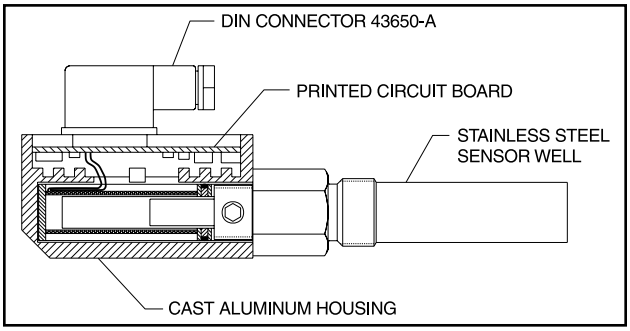


Figure 11 - Volumizer® Transmitter

The linear transmitter, with hermetic, enclosure is based on the inductive measuring principle. It features removable electronics (from the sensor well) eliminating the need to evacuate the compressor for replacement. This type of transmitter is dedicated to volume ratio control and has no user adjustments.

1. Shut off control power.
2. Remove DIN connector plug from transmitter.
3. Loosen setscrews.
4. Remove transmitter unit.
5. Install new transmitter unit.
6. Tighten setscrews.
7. Apply DIN connector plug to transmitter.
8. Turn on control power.

NOTE: For calibration of the Volumizer® unit, refer to the Analog Calibration instructions in publication 090-020 O.

BARE COMPRESSOR REPLACEMENT

The following procedure is required only when a bare compressor is replaced in the field.

1. Verify that the starter is locked out.
2. Remove all tubing, piping, and wiring that is connected to the compressor.
3. Disconnect the coupling from the motor shaft.
4. While supporting the motor and compressor assembly with a crane, remove the bolts at the compressor feet.
5. Thoroughly clean the compressor feet and mounting pads of burrs and other foreign matter to ensure firm seating of the compressor.
6. Thoroughly clean the new compressor and remove all cover plates and protection etc.
7. Install new gaskets and sealing in all connections.
8. Set the new compressor in place and shim feet where required.
9. Reattach the drive coupling.
10. Check the shaft alignment.
11. Complete tubing, piping, and wiring.

SHUTDOWN DUE TO IMPROPER OIL PRESSURE (High Stage and Booster)

The compressor must not operate with incorrect oil pressure.

1. Refer to CONTROL SETUP

TROUBLESHOOTING THE SGC COMPRESSOR

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
SLIDE VALVE and/or SLIDE STOP WILL NOT MOVE	4-way hydraulic control valve failed. Repair or replace. Slide stop indicator rod stuck. Contact Johnson Controls – Frick Service for assistance. Check both S.V. and S.S. feedback devices for wiring and resistance. Compressor must be running with sufficient oil pressure. Unloader piston stuck. Contact Johnson Controls – Frick service for assistance. Piston Seals worn out or damaged. Contact Johnson Controls - Frick Service for assistance.

NOTE: Unless the Service Technician has been certified by Johnson Controls – Frick to rebuild our compressors, troubleshooting the compressor is limited to identifying the probable cause. If a mechanical problem is suspected contact Johnson Controls – Frick Service. DO NOT ATTEMPT TO DISASSEMBLE COMPRESSOR.

TROUBLESHOOTING THE HYDRAULIC SYSTEM

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
SLIDE VALVE WILL NOT LOAD OR UNLOAD	Solenoid coils burned out. Replace. Valve closed. Open hydraulic service valves. Solenoid spool stuck or centering spring broken. Replace. Check LED on coil. If lit, there is power to the coil. Check coil. Solenoid may be actuated mechanically by inserting a piece of 3/16" rod against armature pin and pushing spool to opposite end. Push A side to confirm unload capability. If valve works, problem is electrical.
SLIDE VALVE WILL LOAD BUT WILL NOT UNLOAD	A side solenoid coil may be burned out. Replace. Dirt inside solenoid valve preventing valve from operating both ways. Clean. Check LED on coil. If lit, valve is functioning mechanically. Problem is electrical. Solenoid may be actuated mechanically by inserting a piece of 3/16" rod against armature pin and pushing spool to opposite end. Push A side to confirm unload capability. If valve works, problem is electrical.
SLIDE VALVE WILL UNLOAD BUT WILL NOT LOAD	A side solenoid coil may be burned out. Replace. Dirt inside solenoid valve preventing valve from operating both ways. Clean. Check LED on coil. If lit, valve is functioning mechanically. Problem is electrical. Solenoid may be actuated mechanically by inserting a piece of 3/16" rod against armature pin and pushing spool to opposite end. Push A side to confirm unload capability. If valve works, problem is electrical.
SLIDE STOP WILL NOT FUNCTION EITHER DIRECTION	Solenoid coils may be burned out. Replace. Solenoid service valves may be closed. Open. Manually actuate solenoid. If slide stop will not move, mechanical problems are indicated. Consult Johnson Controls - Frick Service.

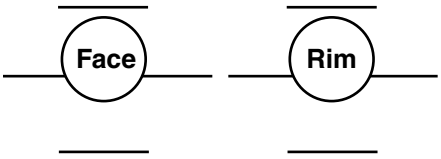
TROUBLESHOOTING THE OIL PUMP AND SYSTEM

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
PUMP WILL NOT PRODUCE ENOUGH OIL PRESSURE AT START-UP	Check that service valves are open. Filter cartridges may be blocked. Check PSID across filters. Strainer may be blocked. Clean. Oil pressure regulator set too low or stuck open. Readjust or repair. Pump worn out. Repair or replace.
OIL PRESSURE RAPIDLY DROPS OFF WHEN COMPRESSOR STARTS	Main oil injection throttling valve too wide open or oil pressure regulating valve improperly adjusted. Readjust both valves.
NOISE and VIBRATION	Pump strainer blocked. Clean. Pump worn out. Repair or replace.
OIL PRESSURE DROPS AS HEAD PRESSURE INCREASES	Normal behavior. Set main oil injection and oil pressure for maximum head pressure condition.
MAIN UNIT FILTER PSID IS TOO HIGH	Filters clogged with dirt. Replace. Oil is too cold. Allow oil to warm up and check again. Service valve on filter outlet is partially closed. Open valves fully.

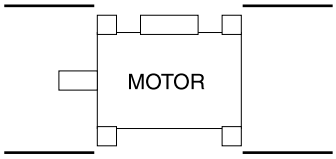
DRIVE TRAIN ALIGNMENT

Ambient Temperature at Time of Alignment _____ Oil Separator Temperature at Time of Alignment_____
Motor Coupling Type _____ Size _____ Distance Between Coupling Hub Faces _____
Soft Foot Check ☐ OK as Found ☐ Shimming Required Amount of Shims used to Correct _____
Indicator Readings in ☐ in./1000 ☐ mm Indicator Clamped to ☐ Motor ☐ Compressor
Indicator Readings Facing ☐ Compressor ☐ Motor Magnetic Center Checked ☐ Marked ☐ N/A
Compressor Coupling Hub Runout _____ Motor Coupling Hub Runout _____

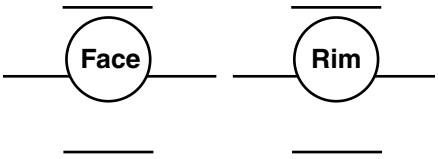
Initial Cold Alignment



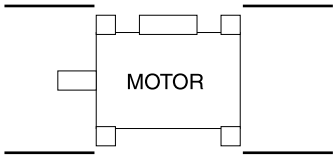
Thickness of Shims Added



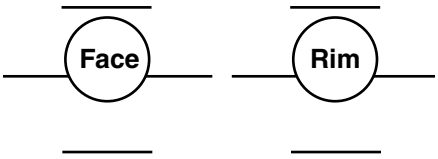
Initial Hot Alignment



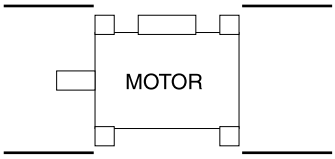
Thickness of Shims Added



Final Hot Alignment



Thickness of Shims Added



OPERATING LOG SHEET

Date							
Time							
Hour Meter Reading							
Equip. Room Temp.							
Suction Pressure							
Suction Temperature							
Suction Superheat							
Discharge Pressure							
Discharge Temperature							
Corresponding Temperature							
Oil Pressure							
Oil Temperature							
Oil Filter Pressure Drop							
Separator Temperature							
Slide Valve Position							
Volume Ratio (VI)							
Motor Amps / FLA %							
Capacity Control Setpoint							
Oil Level							
Oil Added							
Seal Leakage (Drops/Min.)							

VIBRATION DATA SHEET

Date: _____
End User: _____
Address: _____

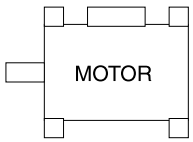
Sales Order Number: _____
Installing Contractor: _____
Service Technician: _____

Equipment ID (As in Microlog): _____
Compressor Serial Number: _____
Unit Serial Number: _____
National Board Number: _____
Running Hours: _____
Manufacturer and Size of Coupling: _____
Motor Manufacturer: _____
Motor Serial Number: _____
RPM: _____ Frame Size: _____ H.P. _____
Refrigerant:
Ambient Room Temperature: _____ °F
Operating Conditions:

Final Hot Alignment

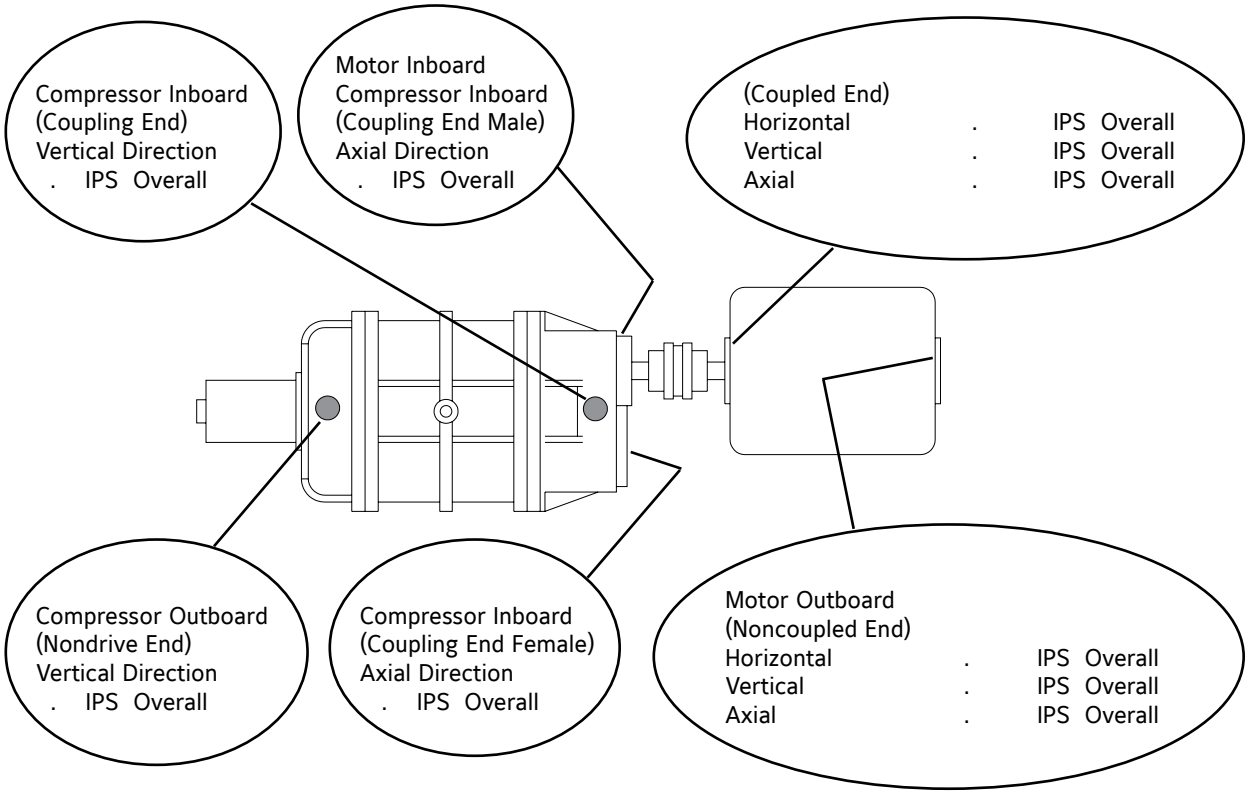
Total Thickness of Shims Added

Soft Foot **Soft Foot**



Soft Foot **Soft Foot**

SUCTION	DISCHARGE	OIL	SEPARATOR	Slide Valve Position %
Press #	Press #	Press #	Temp °F	V.I. Ratio
Temp °F	Temp °F	Temp °F		F.L.A. %



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