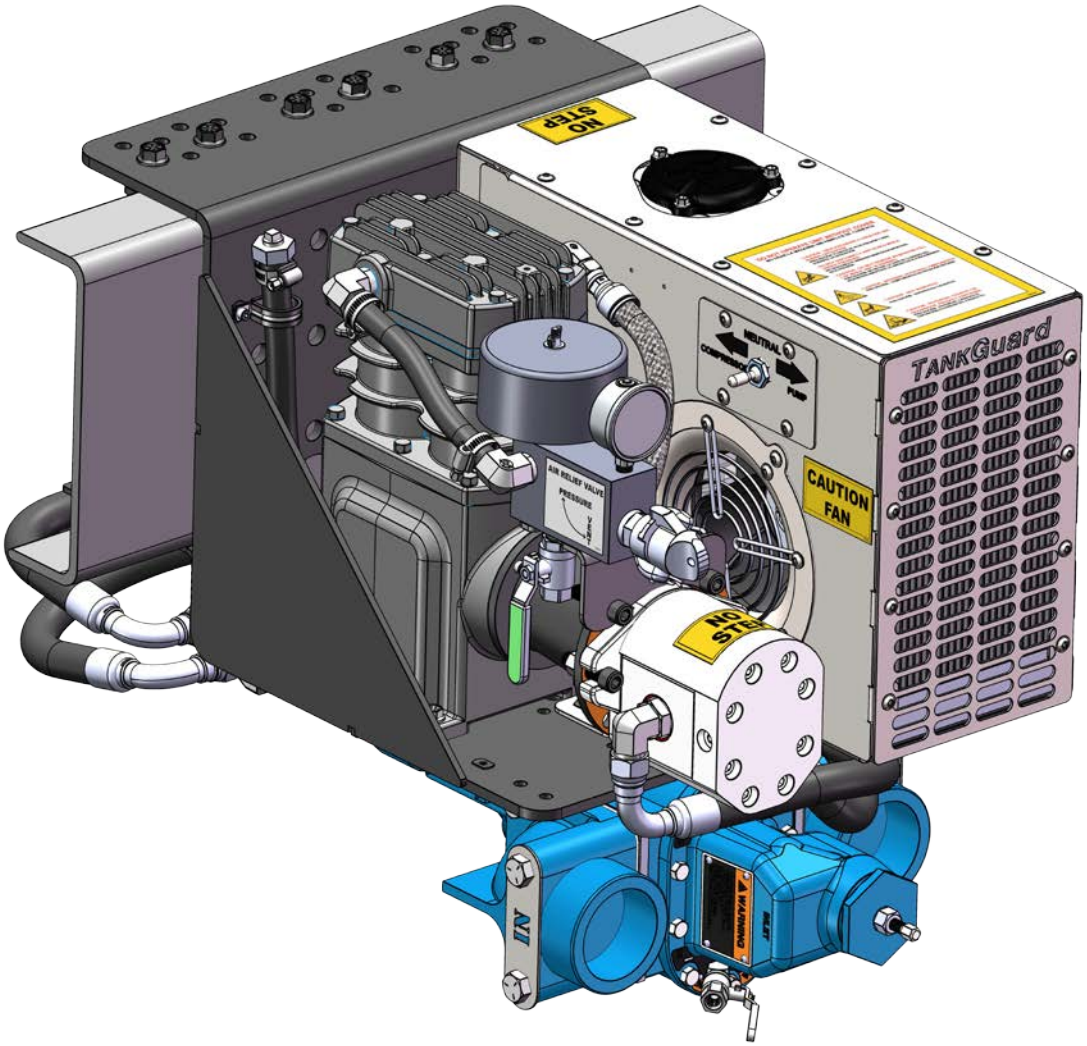
POLAR SERVICE CENTERS THE TANK PROS

PSC Quala THE TANK PROS

INSTALLATION, OPERATION & MAINTENANCE

POLAR-PAC

Pump and Compressor Assembly



OWNER'S MANUAL

Product Catalog : POLAR-PAC-IOM
Revision Date : 05.19.2025

POLAR SERVICE CENTERS THE TANK PROS

PSC Quala THE TANK PROS

POLAR-PAC model identification

PP2-GP-AC-R

R = Reversible Gear Pump

AC = Auxiliary Trailer Hydraulics up to 20 GPM @ 2500 PSI

P = Ingersoll Rand piston compressor SS-5 up to 39 CFM @ 36 PSI
V1 = Ingersoll Rand vane compressor SV150 up to 71 CFM @ 36 PSI
X = No compressor

G = 3" Ranger gear pump (chemical spec) w/s.s. shafts, arbon bushings & "Quad Lip Seal". Up to 165 GPM @ 125 PSI
V = 3" Blackmer vane pump. Up to 260 GPM @ 125 PSI
F = 3" Viking stainless steel food grade pump. Up to 264 GPM @ 145 PSI
S = 3" Viking stainless steel product pump. Up to 264 GPM @ 145 PSI
X = No pump

2 = Generation

PP = Polar Pac

PSC THE TANK PROS

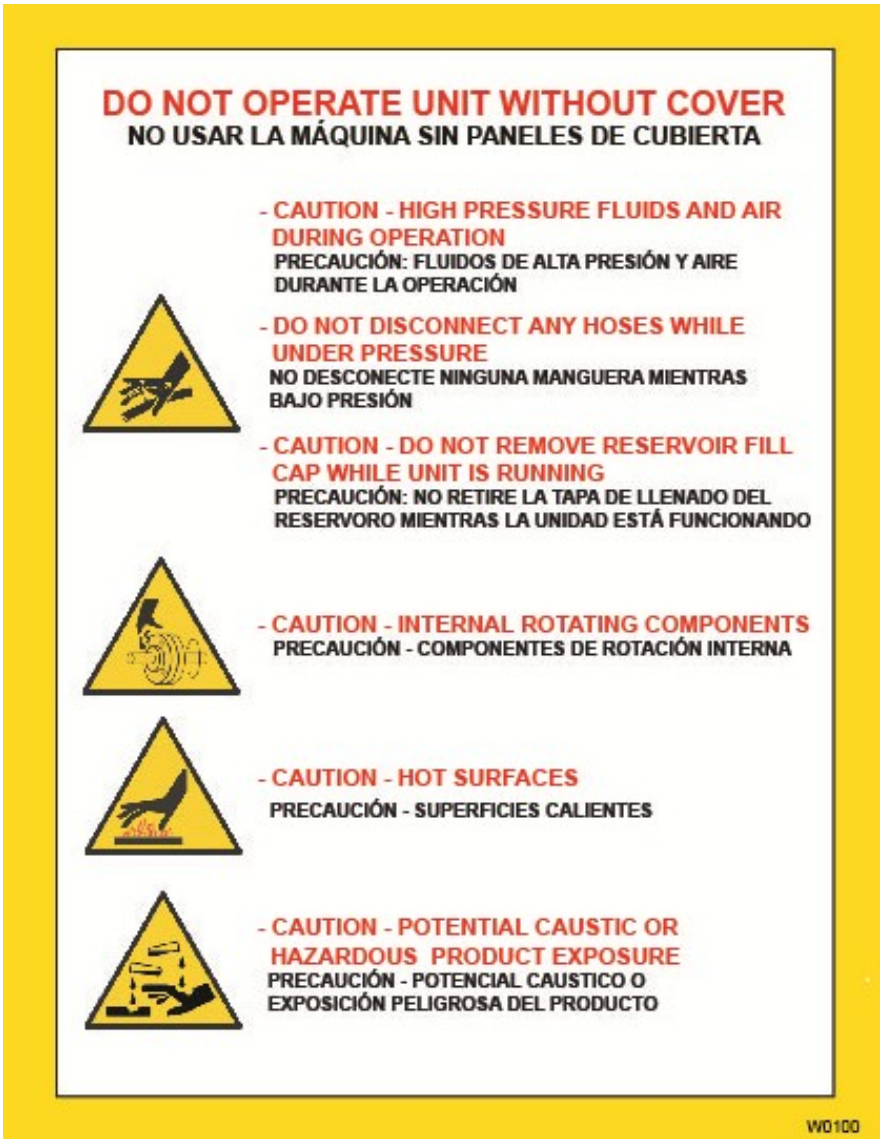
PSC LOCATIONS

PSC's network of locations allows us to offer parts and services to our customers throughout North America. https://polarservicecenters.com/locations/

Please read this manual before installing and operating your Polar-Pac Pump and Compressor Assembly.

Polar-Pac, the engineered solution to all your tank trailer liquid bulk unloading needs. The Polar-Pac has a no-drill, rail-mounted frame that requires only 20 inches of frame. It has a modular design with reservoir and cooler and is easy to install and field serviceable. It can be engineered with an oil-free vane compressor/piston compressor and with multiple types of positive displacement liquid pumps.

Please read the safety notices shown below. Failure to follow these warnings and those that appear on the Polar-Pac components can result in serious bodily injury to persons operating and/or maintaining this equipment.



POLAR SERVICE CENTERS THE TANK PROS

PSC Quala THE TANK PROS

INSTALLATION | OPERATION | MAINTENANCE

POLAR-PAC

TABLE OF CONTENTS

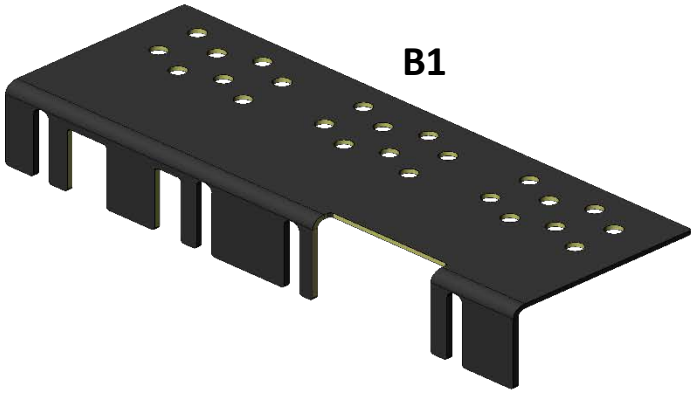
INTRODUCTION

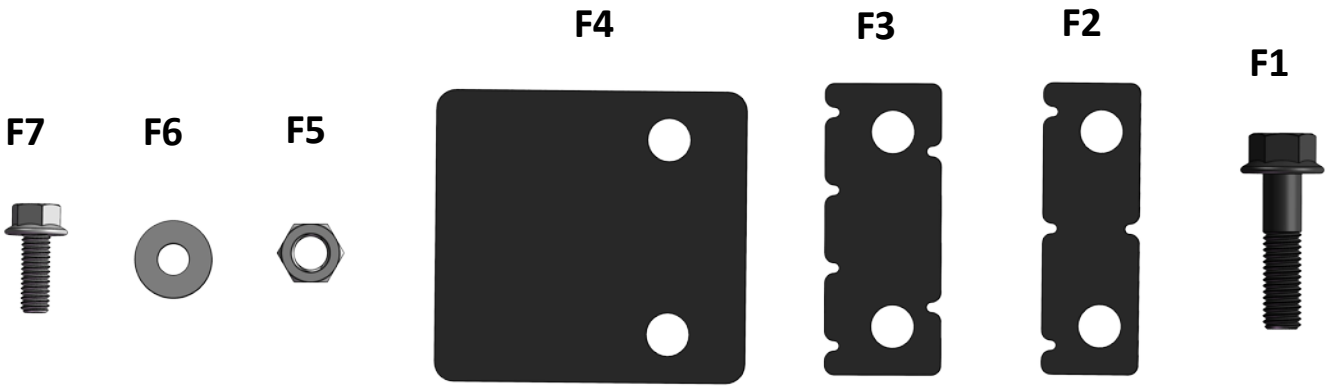
The Polar-Pac is designed to allow the operator to use a pump/ compressed air to load or unload a cargo tank. Both components are equipped with direct-coupled and mounted hydraulic motors. The system is designed to use hydraulic power provided by the truck's hydraulic system.

Specifications :

- Only 20” of frame needed
- No-drill frame rail mounted
- Vane, Gear or Viking pumps for liquid unloading
- Oil free vane or reciprocating compressors
- Fully integrated air over hydraulic controls
- Trailer hydraulics option: 17 GPM up to 2500 PSI
- Modular design with reservoir and cooler
- Proven components
- Easy installation
- Field serviceable
- Multiple configurations

SUPPLIED PARTS

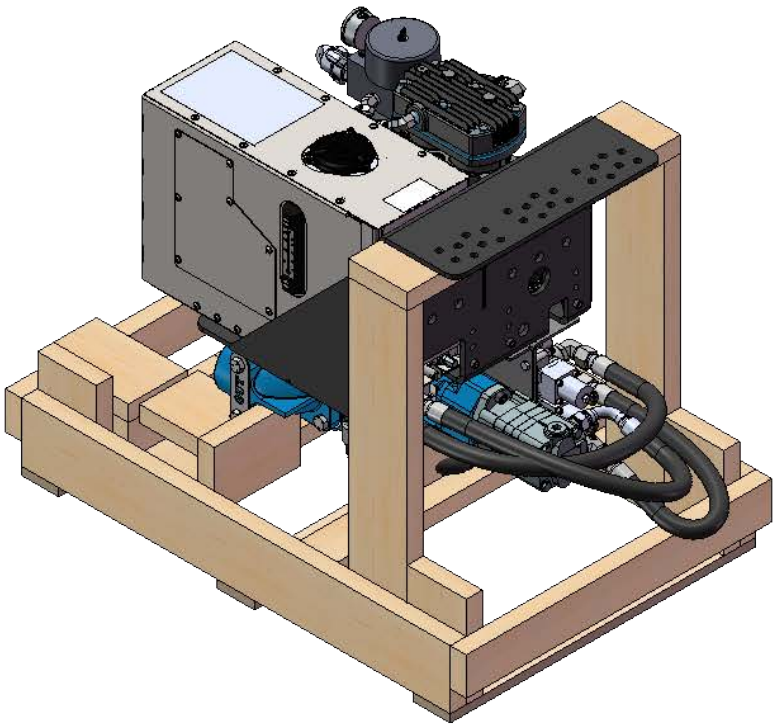




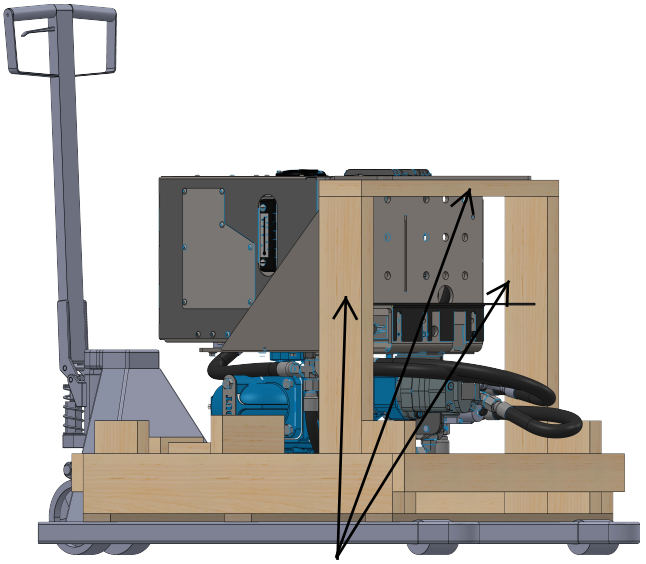
ITEM NO	PART NUMBER	DESCRIPTION	QTY
B1	8888	BOTTOM FLANGE MOUNTING BRACKET	1
F1	8248	1/2"-13 X 2 HH BOLT GRADE 8	12
F2	8394	SPACER	6
F3	8480	SPACER	6
F4	8395	CLAMPING PLATE	6
F5	8123	1/2"-13 LOCK NUT GRADE 8	12
F6	8954	3/8" WASHER	4
F7	8891	3/8"-16 GRADE 8 BOLT	4

POSITIONING & MOUNTING

STEP 1

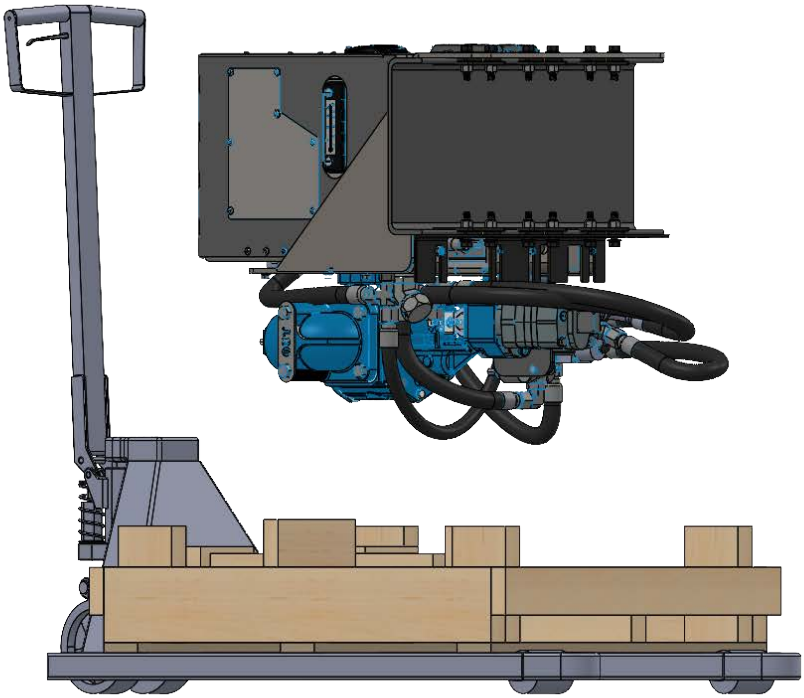


STEP 2



Remove these wooden blocks before installation and raise the unit to C frame level and push it onto C-Frame. Refer page 4 to install the unit to the C-Frame.

STEP 3

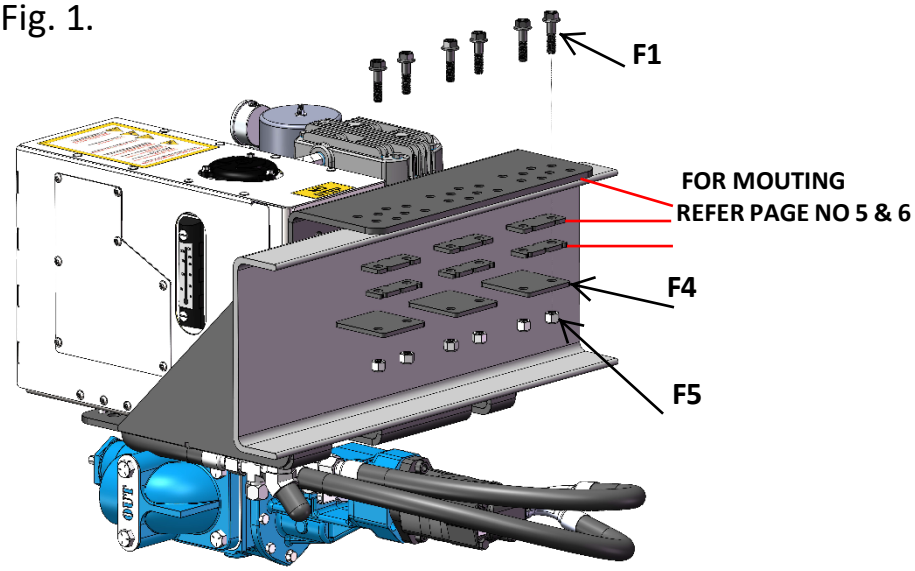


NOTE:
Cut the cable ties before dropping the pallet jack

Step 1: POSITIONING & MOUNTING

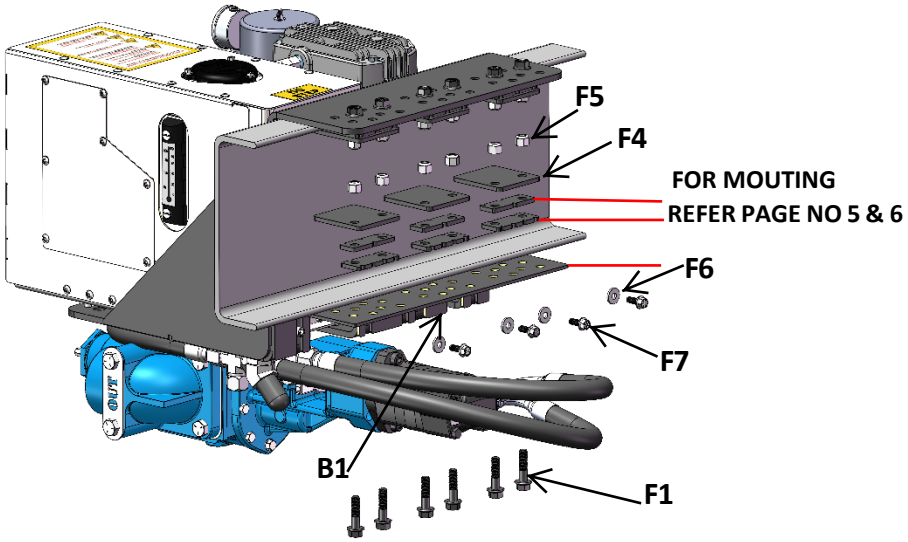
The Polar-Pac only requires 20" of frame rail for mounting. Supplied parts are included to secure (clamp) the assembly to the top and bottom of the frame rail flanges without the need to drill holes. Tighten 1/2" fasteners to 80 Ft. Lbs.

A: **Top Flange Mounting -** Place main mounting bracket face against frame rail with flange over top frame rail flange and secure as illustrated in Fig. 1.



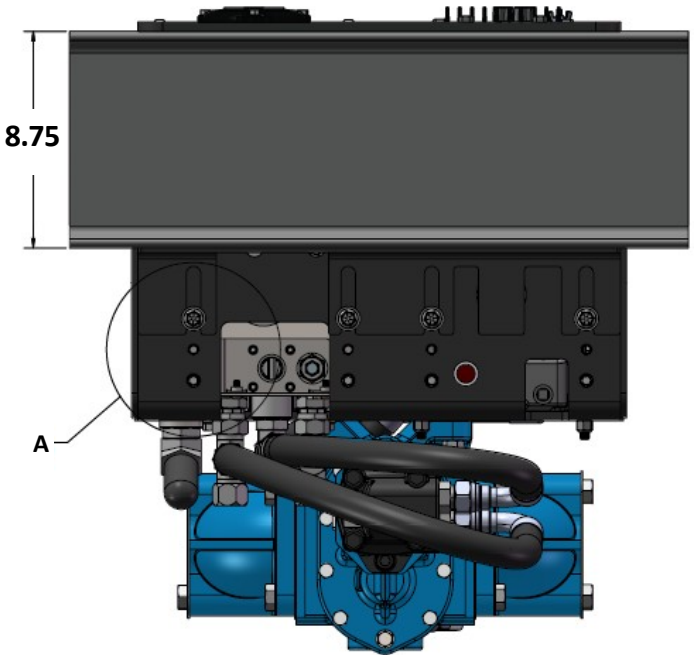
(Fig. 1)

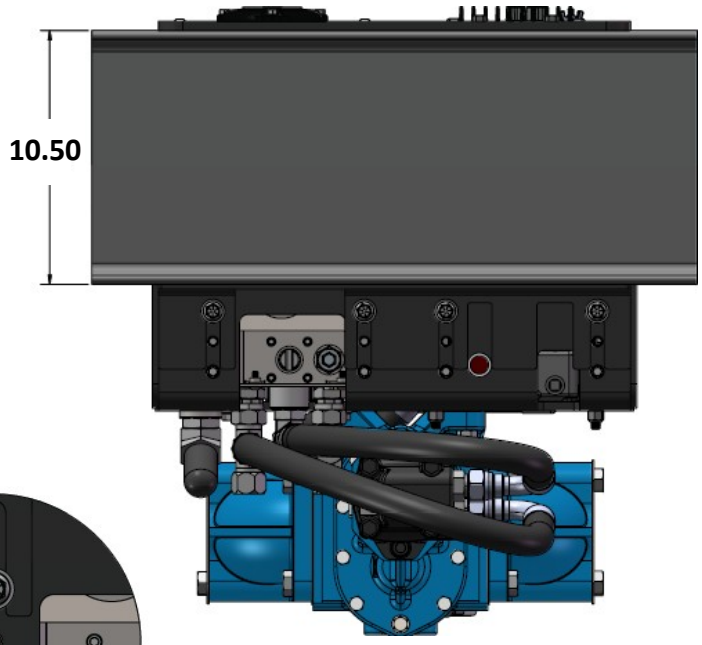
B: **Bottom Flange Mounting -** Remove supplied mounting bracket (B1) from crate, place flange angle down, slide under frame rail flange and fasten (F7) into main mounting bracket face until tight, then secure as illustrated in Fig. 2.



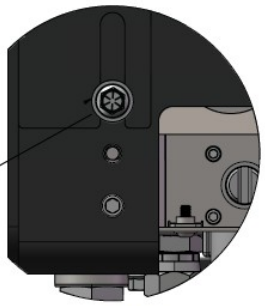
(Fig. 2)

C: C-FRAME OF WIDTH 8.75" TO 10.50"



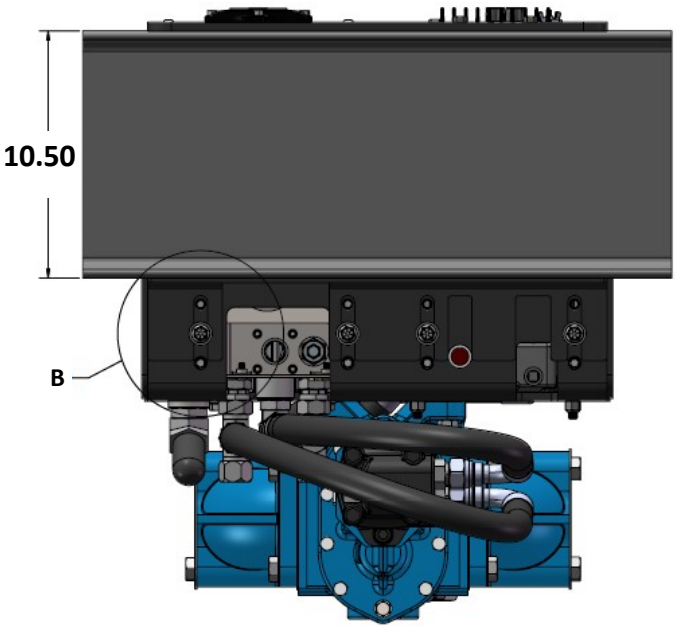


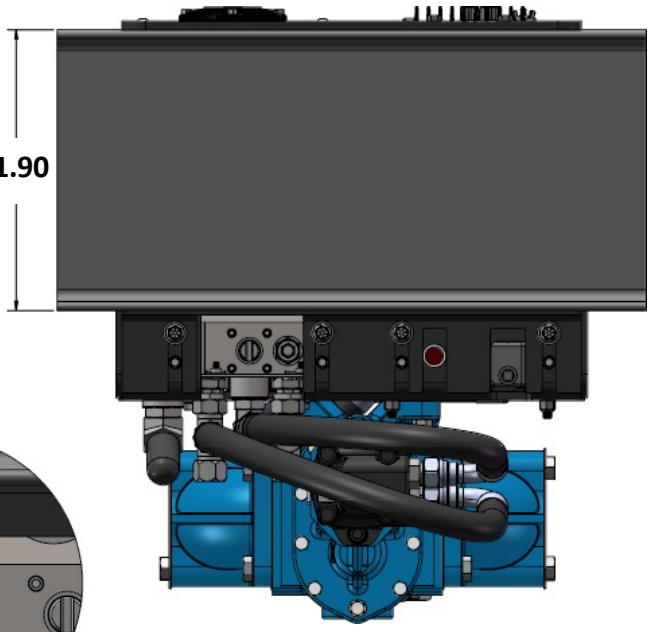
INSTALL WASHER (F6) AND SCREW (F7)
TO TOP HOLE ON THE BRACKET FOR
C-FRAME OF WIDTH 8.75" TO 10.50"



DETAIL A

D: C-FRAME OF WIDTH 10.50" TO 11.90"

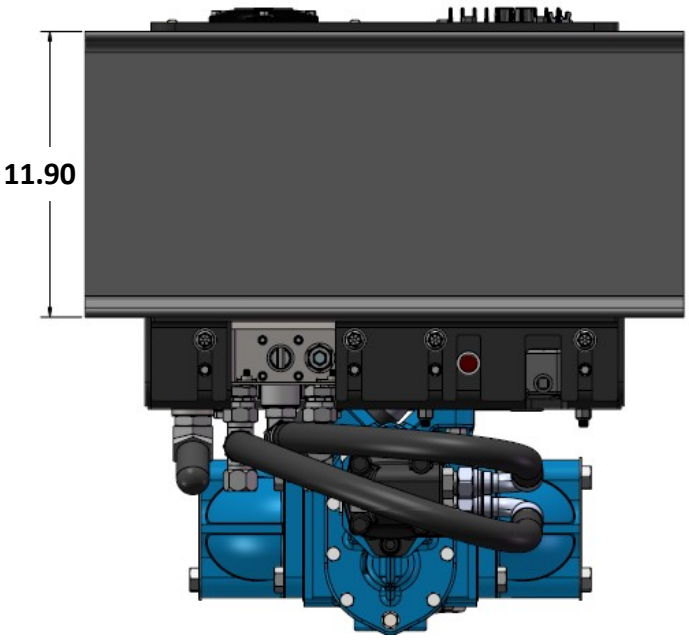


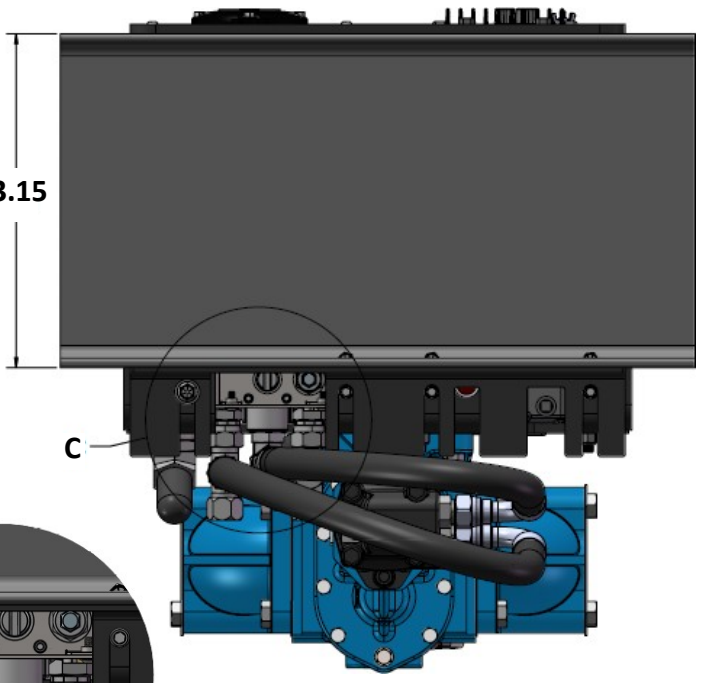


INSTALL WASHER (F6) AND SCREW (F7)
TO MIDDLE HOLE ON THE BRACKET FOR
C-FRAME OF WIDTH 10.50" TO 11.90"

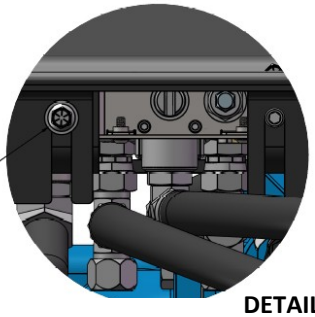
DETAIL B

E: C-FRAME OF WIDTH 11.90" TO 13.15"



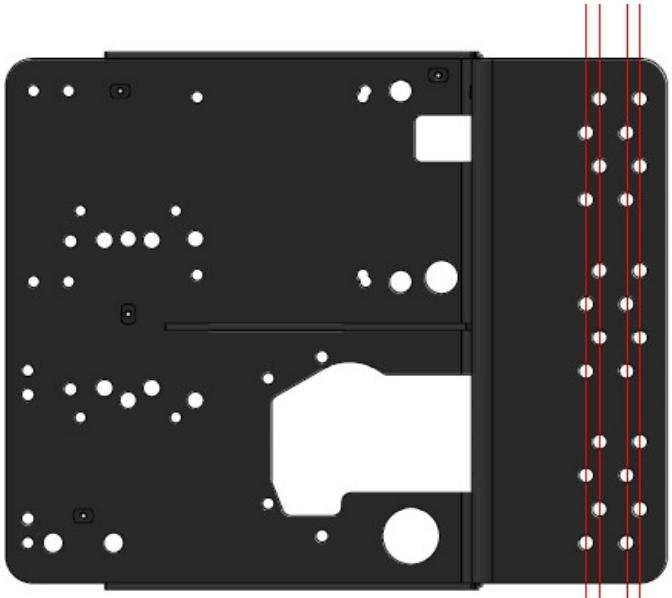


INSTALL WASHER (F6) AND SCREW (F7) TO BOTTOM HOLE ON THE BRACKET FOR C-FRAME OF WIDTH 11.90" TO 13.15" BY REMOVING THE EXISTING CAP SCREW AND ADDING WASHER AND SCREW AND THEN PROCEED TO OTHER SCREWS



DETAIL C

F: BRACKET ATTACHMENT AGAINST C-FRAME



[F2 - SPACER]

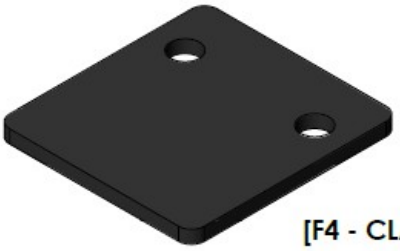
SPACER SIDE-1

SPACER SIDE-3

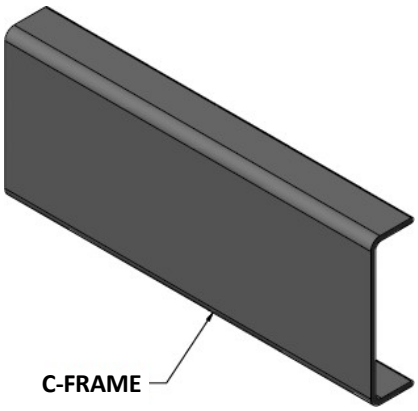
[F3 - SPACER]

SPACER SIDE-2

SPACER SIDE-4

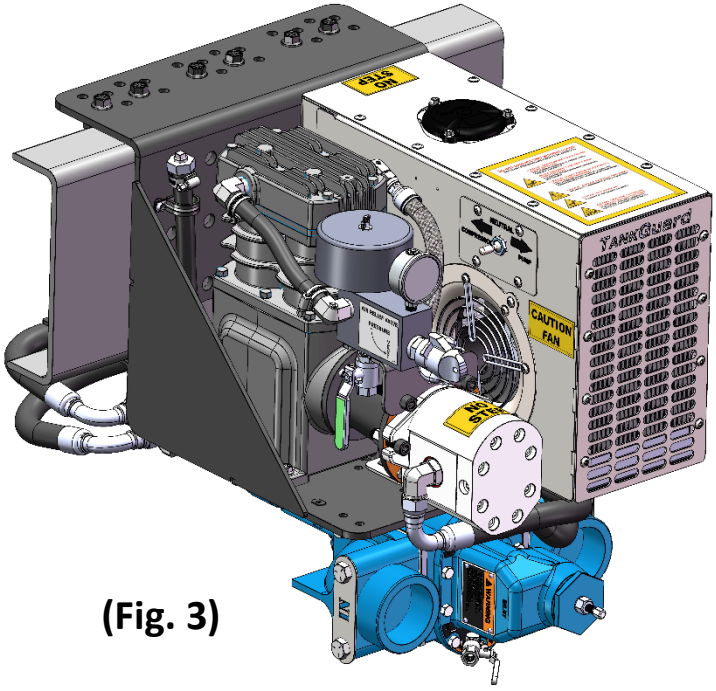


[F4 - CLAMPING PLATE]

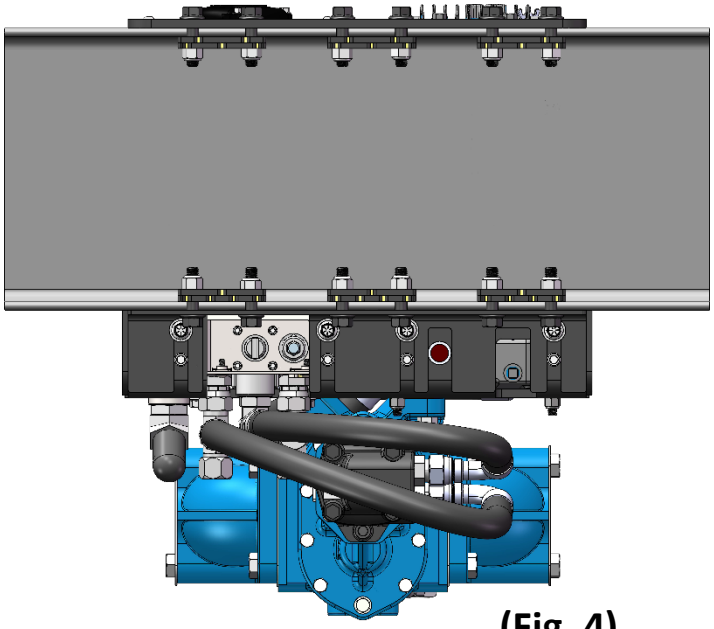


	FRAME WIDTH (W)	HOLE ROW ON BRACKET	SPACER SIDE
WITHOUT HUCK BOLT SPACERS	≤3"	A	4
	3" - 3.125"	A	3
	3.125" - 3.25"	A	2
	3.25" - 3.375"	A	1
	3.375" - 3.5"	B	4
	3.5" - 3.625"	B	3
	3.625" - 3.75"	B	2
	3.75" - 3.875"	B	1
WITH 1-1/2" HUCK BOLT SPACERS	≤3"	C	4
	3" - 3.125"	C	3
	3.125" - 3.25"	C	2
	3.25" - 3.375"	C	1
	3.375" - 3.5"	D	4
	3.5" - 3.625"	D	3
	3.625" - 3.75"	D	2
	3.75" - 3.875"	D	1

G: SEE FINISHED MOUNTING FRONT (Fig. 3) and BACK (Fig.4)



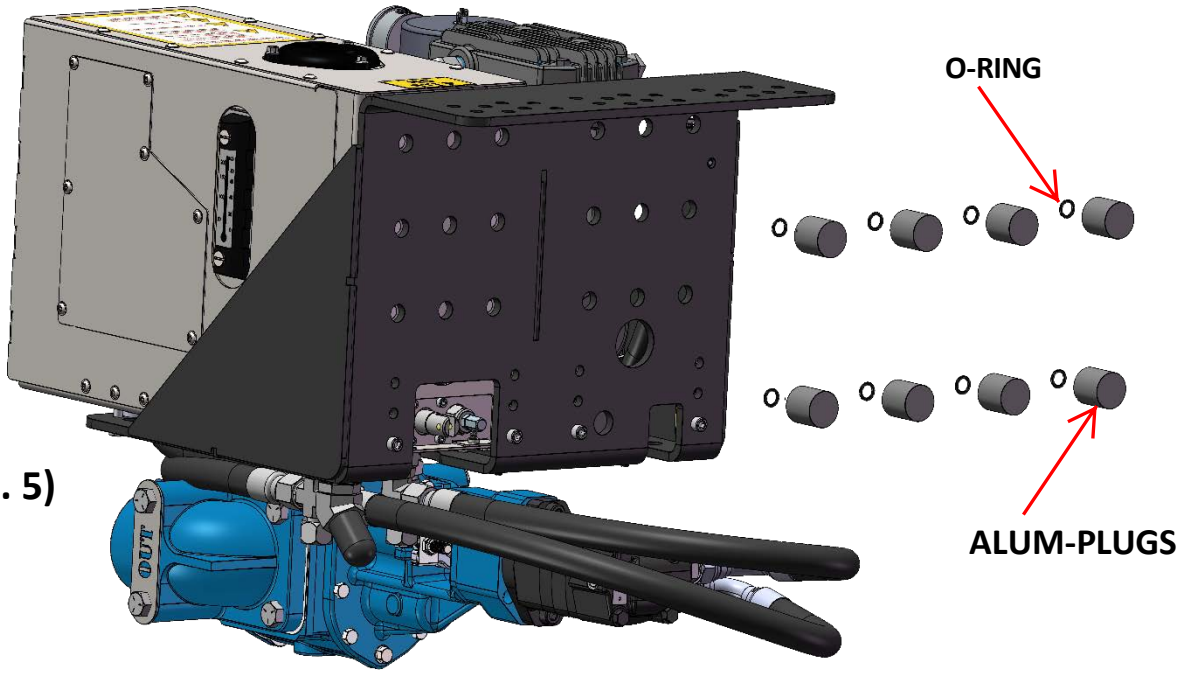
(Fig. 3)



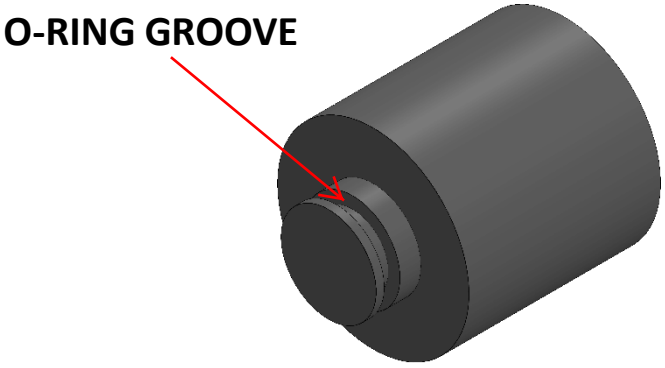
(Fig. 4)

H. Alternative Frame Rail Mounting - Use the "Huck Bolt Spacer Kit" when installing the Polar-Pac on a frame rail containing huck bolts. The kit includes 8 aluminum plugs (spacers) and O-rings. To install, insert O-rings into the main mounting bracket face, where appropriate and press in the aluminum plugs (see Fig. 5), then install as per Step 1, pressing spacers between main mounting bracket face and frame rail.

HUCK BOLT SPACER MOUNTING



(Fig. 5)



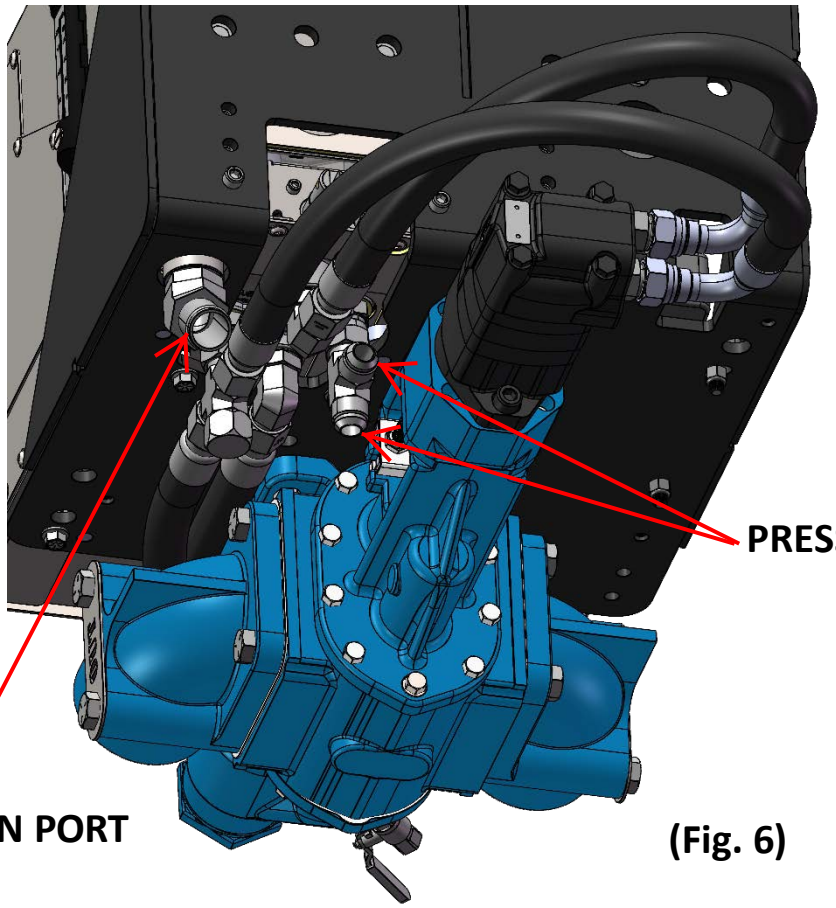
Step 2: INSTALLING THE PTO & HYDRAULIC PUMP

Install the PTO to the transmission and mount the hydraulic pump according to instructions included with the PTO.

NOTE: If using a direct mount hydraulic pump/PTO combination (piggyback), be sure the pump splines are well lubricated with heavy grease. This will prevent spline wear on the PTO and pump shafts.

Step 3: HYDRAULIC HOSE CONNECTIONS FROM PTO HYDRAULIC PUMP

Connect 3/4" high pressure (2500 PSI min) hose and 1-1/4" supply (suction), (150 PSI/30" Hg min) hose with hydraulic JIC connection fittings as shown below (Fig. 6).

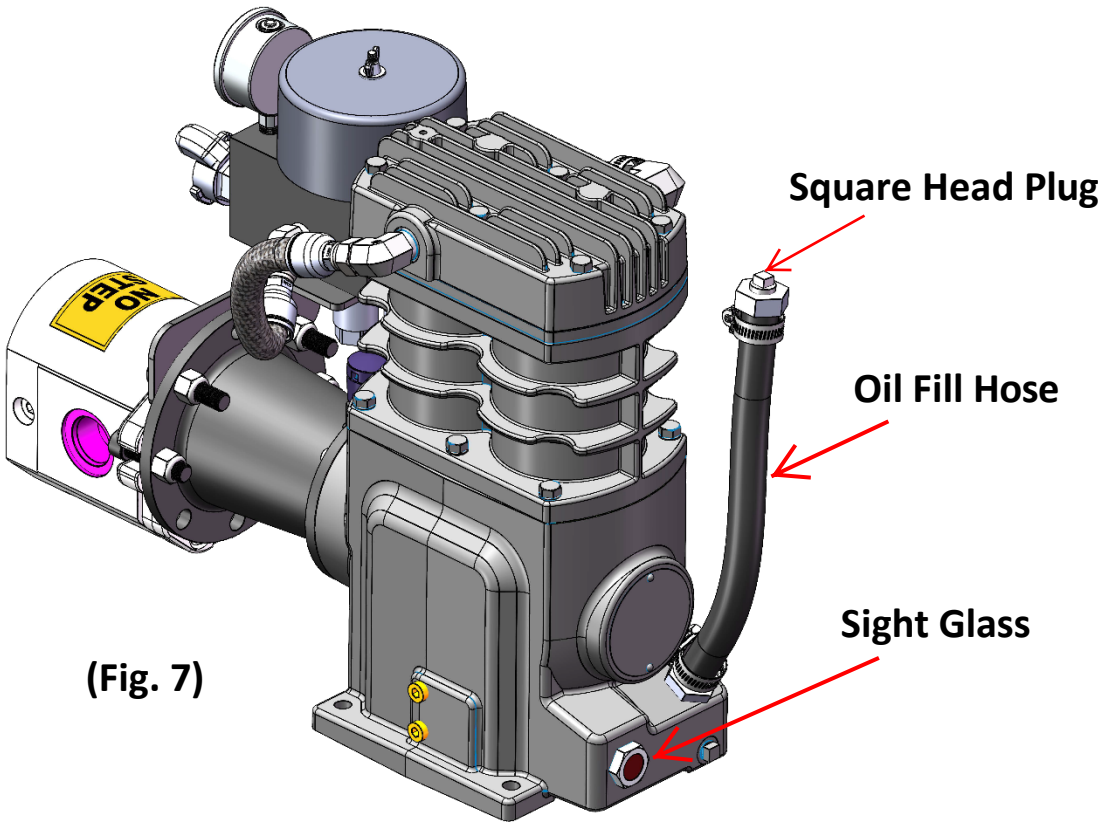


(Fig. 6)

Step 4: PRE-START-UP PROCEDURES

A. Ingersoll Rand SS5 Piston Compressor

1) Make sure the compressor has oil in the crankcase. We recommend Ingersoll-Rand synthetic compressor lubricant. The crankcase capacity is 1 liter (34 fl. oz.).



(Fig. 7)

2) Filling Procedures:
   i) Remove the square head plug.
   ii) Slowly fill the crankcase with lubricant until lubricant reaches the top of the sight glass.
   iii) After filling the oil, tighten the square head plug.

3) Open the air relief valve to prevent air pressure from building up in the tank.

B. Ingersoll Rand SV200 Rotary Vane Compressor

1) Prior to run the compressor, check all safety-relevant screw connections for a tight fit (Fig. 8).

2) Vehicle motors with EDC (Electronic Diesel Control) must potentially be re-parameterized prior to the start of operations.

(Fig. 8)

3) The rotation direction, the rotational speed and the flawless function of the safety equipment must be checked before the start of compressor.

4) Only start the compressor without load.

5) Never go into operation against a potentially existing counter pressure.

C. Ranger Series 22 Gear Pump

1) Make sure of any leaks before starting the pump.

2) Check proper rotation of both drive shaft and gears before starting pump.

3) Make sure that the relief valve end plate is in the proper position in reference to drive shaft rotation and discharge side of pump.

4) Install inlet and outlet fittings (not included). See example in (Fig.9.)

(Fig. 9)

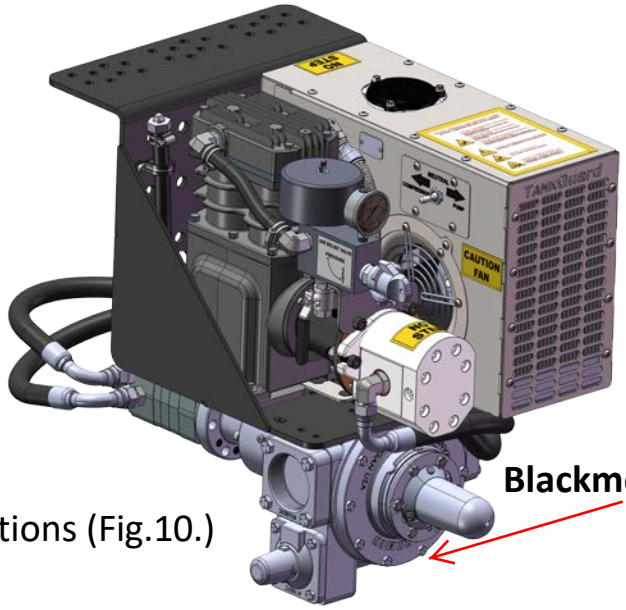
3" cam-lock

D. Blackmer Pump [TXDI3]

1) Check the alignment of the pipes to the pump. Pipes must be supported so that they do not spring away or drop down when the pump flanges or union joints are disconnected.

2) Inspect the complete piping system to ensure that no piping loads are being placed on the pump.

(Fig. 10)



3) Secure appropriate hose connections (Fig.10.)

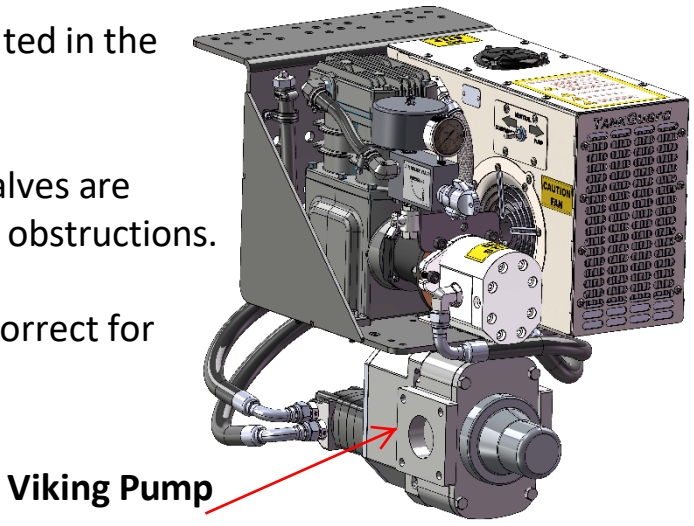
E. Viking Pump [RTPe20]

1) Check that all piping and associated equipment are clean and free from debris and that all pipe connections are secure and leak free (Fig.11)

2) If an external relief valve is incorporated in the system check that it is set correctly.

3) Ensure both suction and discharge valves are fully open, and pipework is free from all obstructions.

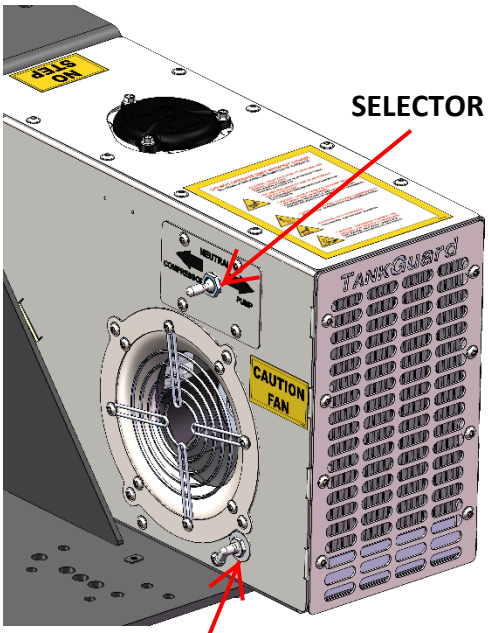
4) Ensure rotation of the drive shaft is correct for the direction of flow required.



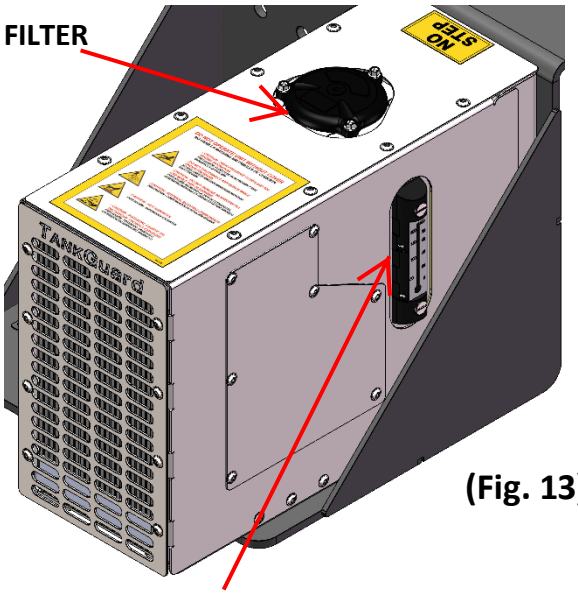
(Fig. 11)

F. Tank Guard TGHC20-DV Hydraulic Oil Cooler

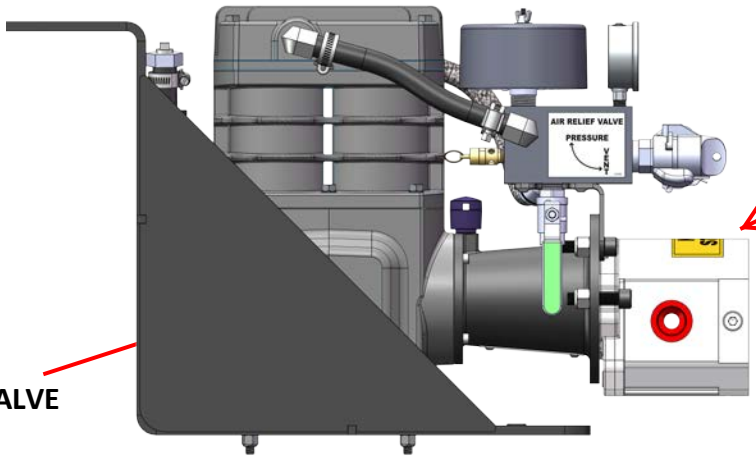
1) Ensure selector switch is in neutral position (Fig. 12).
2) Open air relief valve (Fig. 14).
3) Hydraulic fluid filling procedures
    i) Remove filter cap from top of cooler (Fig. 13).
    ii) Leave filter in place and slowly add fluid until it reaches middle of sight glass (Fig. 13) and reinstall cap.
4) Connect (Tee-in) 1/4" air hose from switch/PTO air supply hose to (Selector Switch) air supply connection (Fig. 12).



(Fig. 12)



(Fig. 13)



(Fig. 14)

Step 5: START-UP PROCEDURES

A. Ensure selector switch is in NEUTRAL position (Fig 12).

B. Check all hoses and connections for leaks.

C. Start power unit engine and slowly engage PTO with engine at IDLE speed.

D. Run for 2 to 3 seconds to eliminate air from the system.

E. Recheck PTO pressure and supply (suction) hoses for leaks.

F. Move selector switch to PUMP position and run for 5-15 seconds to eliminate air form this system.

G. Recheck pump pressure and return hoses for leaks.

H. Move selector switch to COMPRESSOR position and run for 5-15 seconds to eliminate air from this system.

I. Close air relief valve (Fig. 14).

J. Recheck compressor pressure and return hoses for leaks.

K. Disengage PTO and check oil cooler reservoir fluid level and refill as needed. Repeat steps "D" through "J" as needed.

Step 6: OPERATING PROCEDURES

A. Ensure selector switch is in NEUTRAL position.

B. Ensure ball valve in open (VENT) position.

C. Ensure power unit engine is running.

D. Engage the PTO at idle speed.

E. When using PUMP:
   1) Connect product hoses.
   2) Move selector switch to PUMP.
   3) Set engine speed as prescribed for operation (see PTO instructions).

F. When using COMPRESSOR:
   1) Connect air hose from air outlet (Fig. 14) to cargo tank air in let valve and open.
   2) Move selector switch to COMPRESSOR.
   3) Close the air ball valve and allow pressure to build.

G. When finished with operation:
   1) Reduce engine speed to idle (PUMP).
   2) Move selector switch to NEUTRAL position.
   3) Open air relief valve to VENT position (COMPRESSOR).
   4) Disengage the PTO.
   5) Disconnect product hoses (PUMP).
   6) Disconnect air hose (COMPRESSOR).

MAINTENANCE - Tank Guard TGHC20-DV Hydraulic Oil Cooler

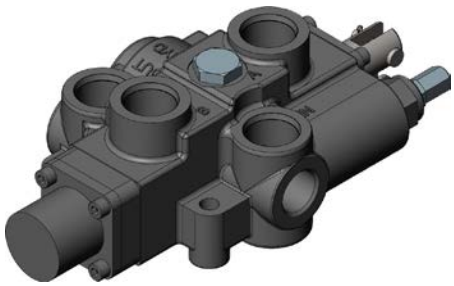
A. Specifications

Model	Flow Rate (GPM)	Reservoir Size (Gallons)	Pressure (PSI)	HP Cooled
TGHC20-DV	20	3.5	Up to 4,000	13

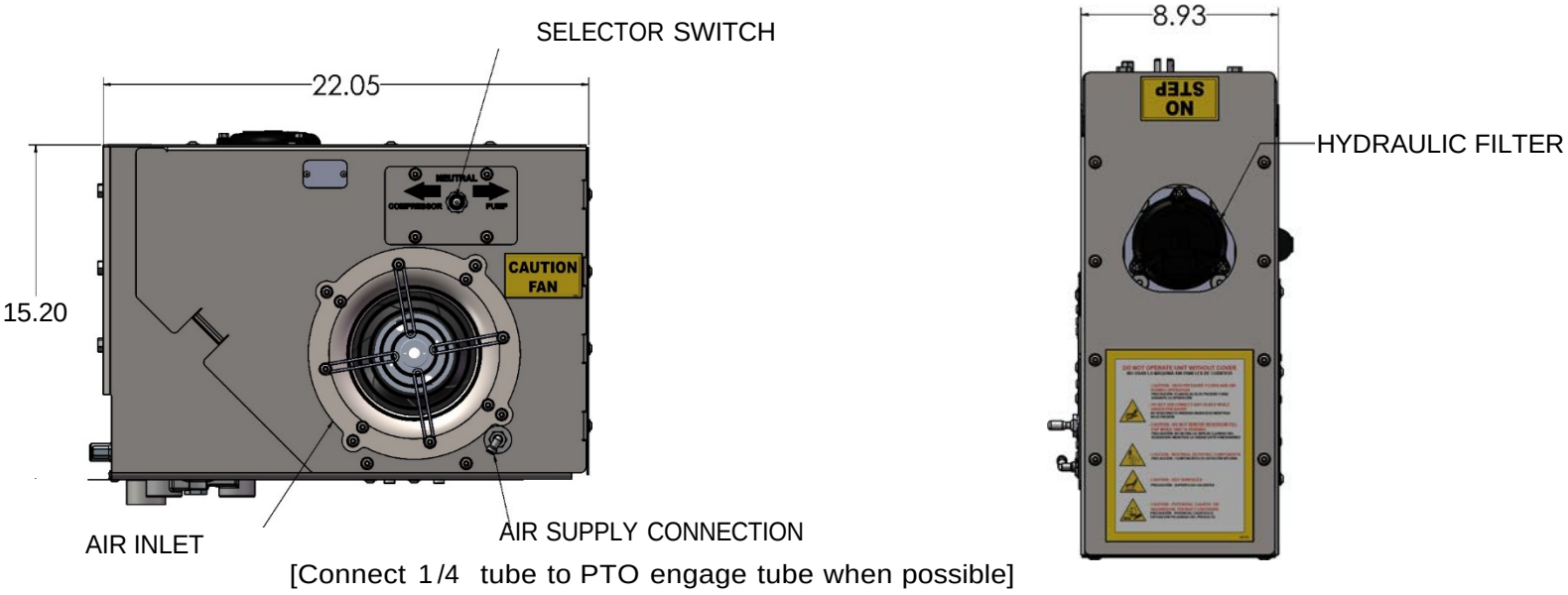
Capacity	20 GPM
Slimline or Box	Slimline
Reservoir Size	3.5 gallons
Suction	SAE-16 ORB Female
High Pressure	SAE-12 ORB Female
Low Pressure Return	SAE-12 ORB Female
High Pressure Compressor	SAE-12 ORB Female
High Pressure Pump	SAE-12 ORB Female
Relief Valve	Adjustable 500-3000 PSI, factory set point: 2800 PSI
Fan	Hydraulic drive 1.2 GPM
Filter	Tank top design with integral breather
Filter Element	10 microns. Element easily serviceable from top (other filter options available)
Oil Level Site Glass	5" long sight glass with a thermometer mounted on side
Basic dimensions (LxWxH)	22 X 9 X 15.2
Cooler Bypass - Cold Start	60 PSI high flow
Finish	Stainless exterior brushed finish
Weight	97 Lbs.
Heat Rejection	13.5 HP at 20 GPM and 80°F ETD

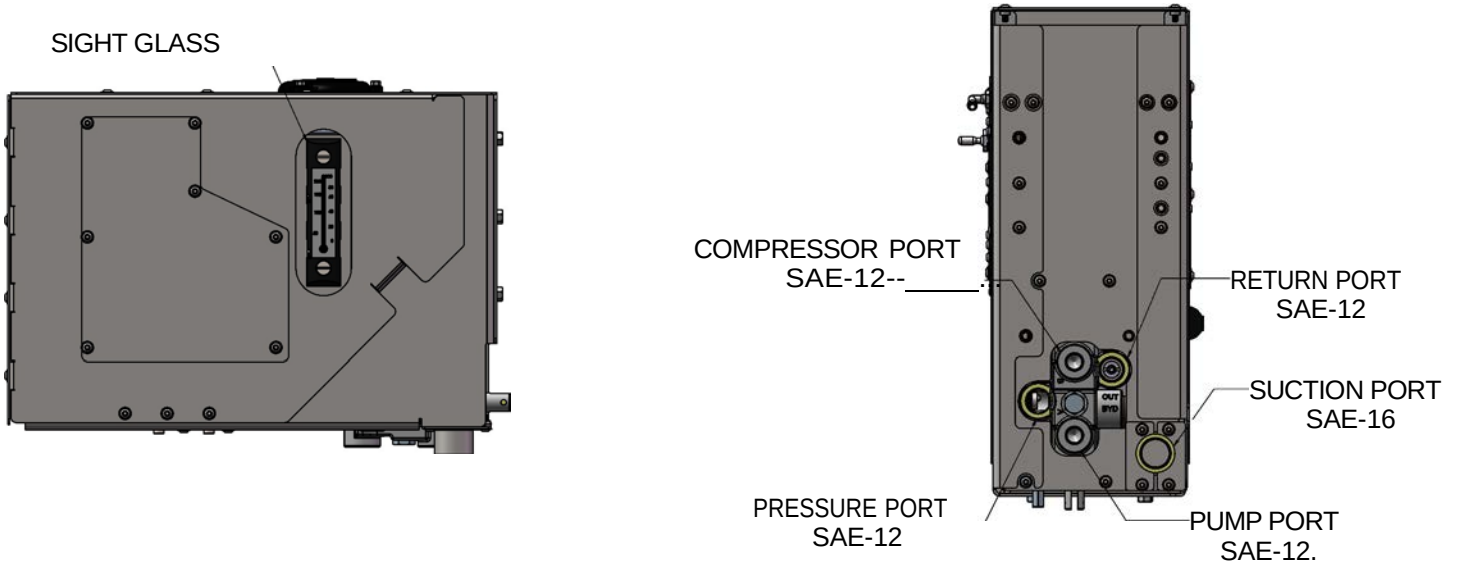
TGHC20-DV

MONO-BLOCK VALVE



B: TGHC20-DV Dimensions





C: System Maintenance

NOTE: Make sure the unit is off, cool and safe to perform maintenance.

1) Filter: Remove filter cap and replace element every 6 months.

2) Hydraulic Fluid: Check fluid level daily. Level should reach middle of sight-glass with PTO disengaged. Drain and replace fluid every 6 to 12 months depending on use.

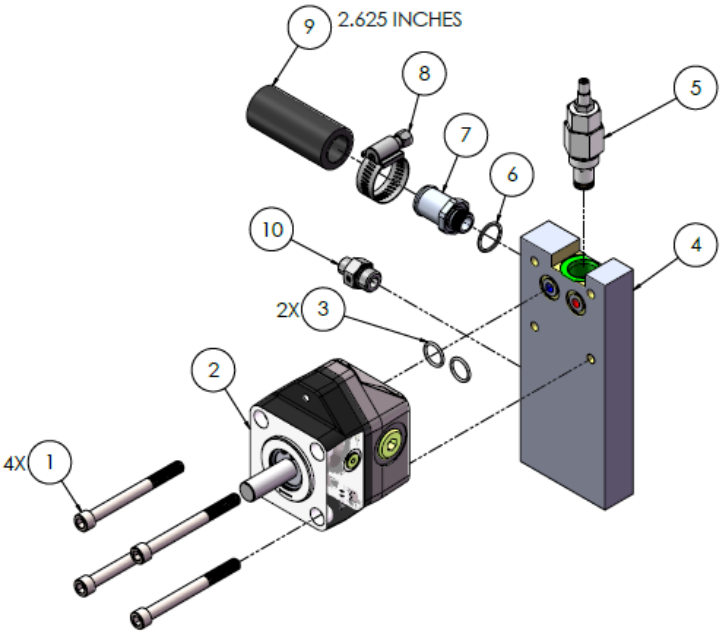
3) Recommended Fluid: Use non-foaming fluid and see pump and motor manufacturer recommendations.

4) Clean Radiator: Use a mild cleaner compatible with aluminum. Be careful not to damage fins if using a power washer to rinse cleaner off radiator. Visually inspect daily and clean if necessary.

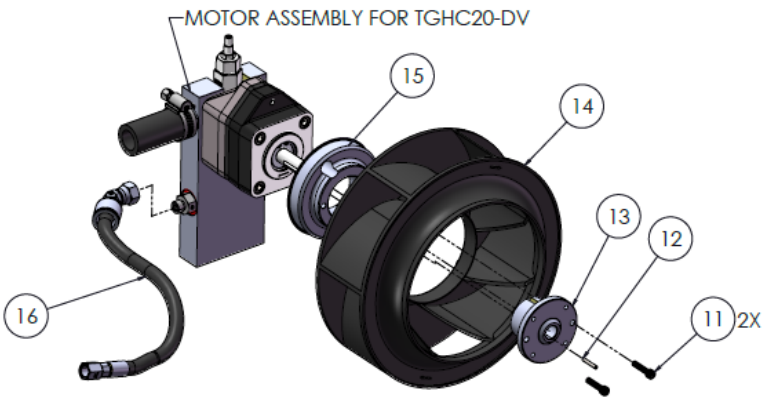
D: Trouble-shooting

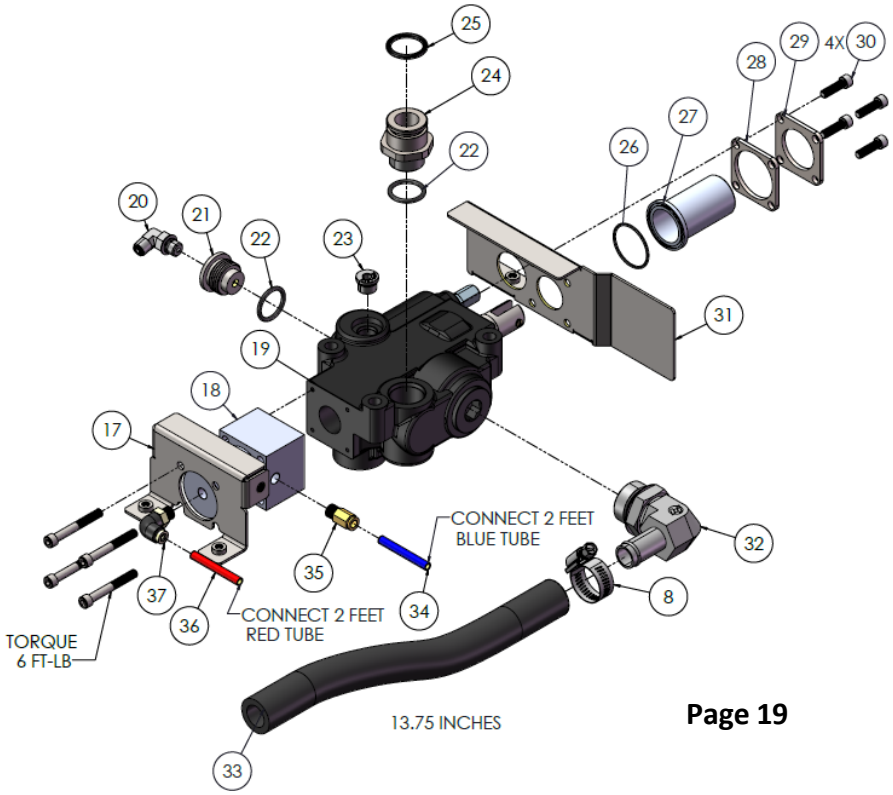
PROBLEM	CAUSE	CORRECTIVE ACTION
Fan not spinning	Air leaks in suction hose or fitting connections.	Tighten fittings and bleed air from lines.
	Flow control valve has blocked orifice.	Remove and clean or replace valve. Change fluid and filter element.
	Low oil level in tank	Fill tank, tighten fittings, and bleed air from lines.
High Oil Temperature	Dirty heat exchanger assembly.	Clean heat exchanger. Use mild cleaner compatible with aluminum. Be careful not to damage fins when using a pressure washer.
	System relief valve is opening	Ensure that valve relief pressure is set higher than your system pressure. Remove and clean or replace valve. Change fluid and filter element.
Aeration of oil (milky looking oil)	Water contamination	Replace fluid and filter element. Check all fittings and filter cap for tightness. Tighten fittings and bleed air from lines.
	Pump is not lower than the tank	Reposition to ensure the fluid can gravity feed into the pump through the suction line.
Heat exchanger Assembly leaks	Loose fittings or cut O-rings.	Replace p-rings and tighten fittings.
	Brust heat exchanger	Replace cold start relief valve and Heat exchanger assembly.

E: TGHC20-DV PARTS BREAKDOWN

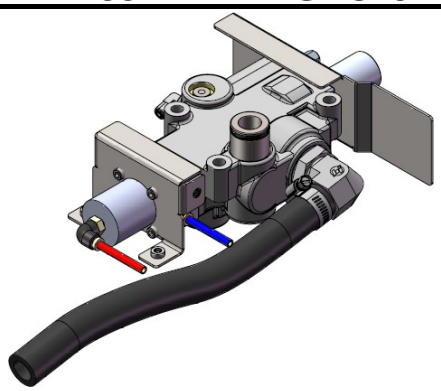


MOTOR ASSEMBLY

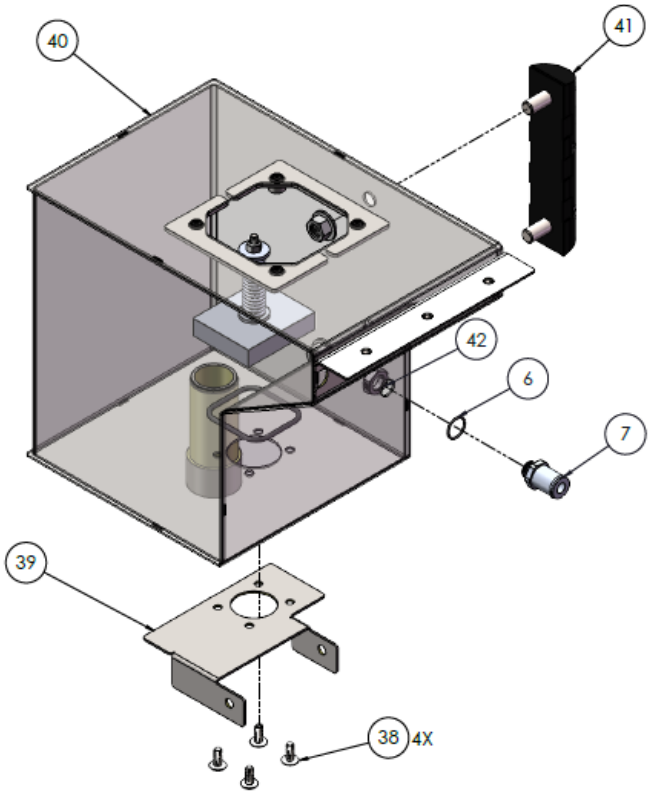




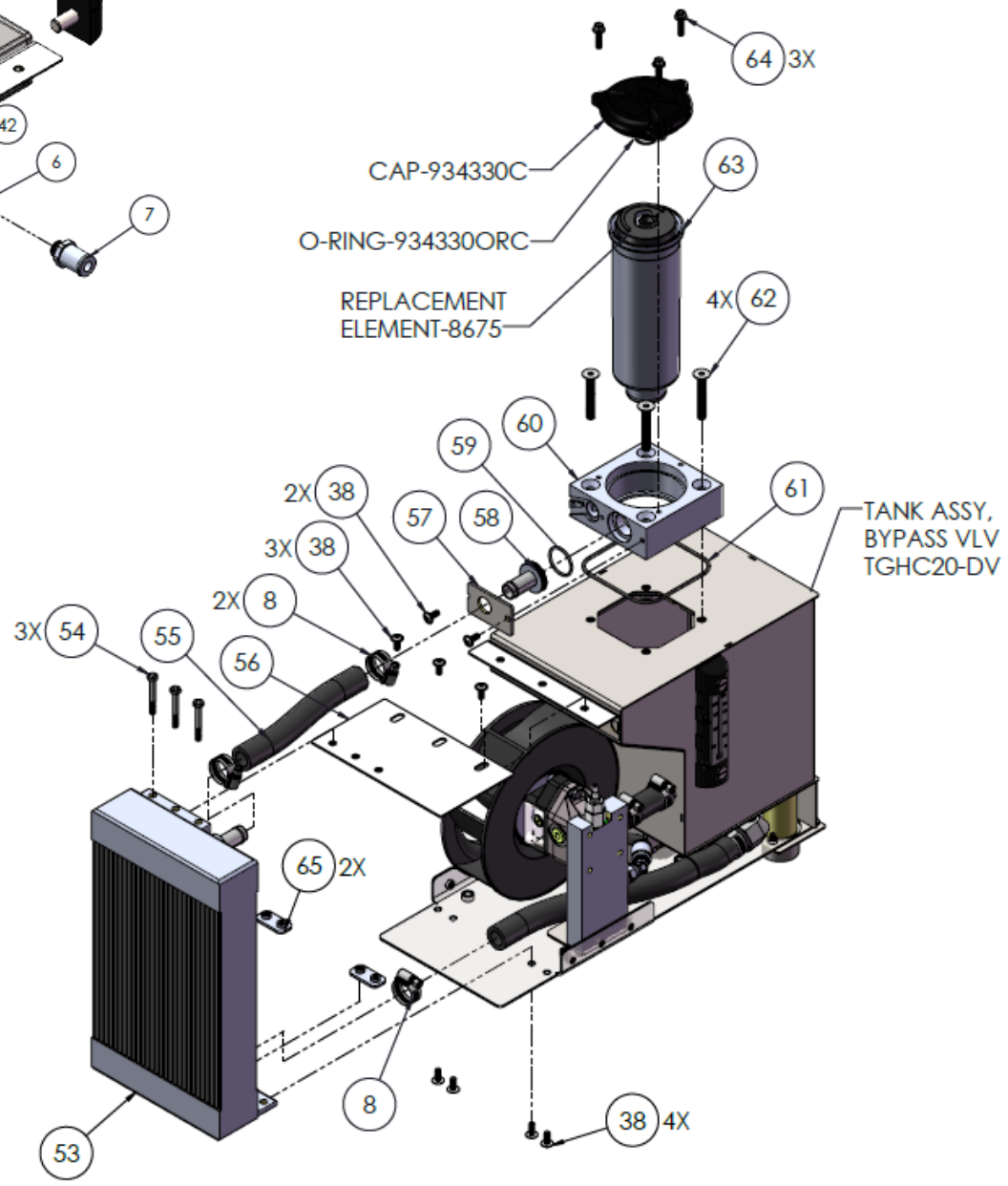
VALVE ASSEMBLY TGHC20-DV

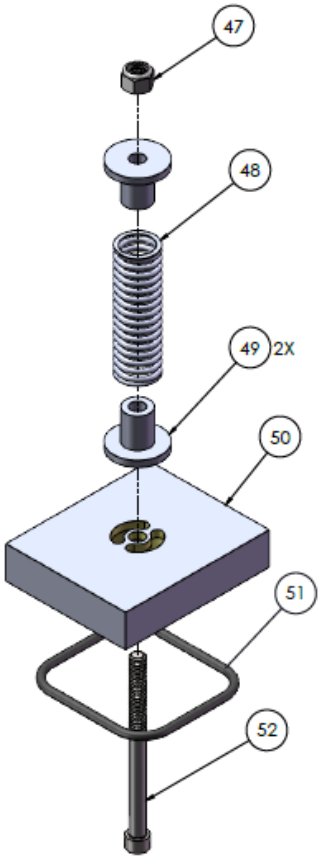


TANK AND SIGHT-GLASS



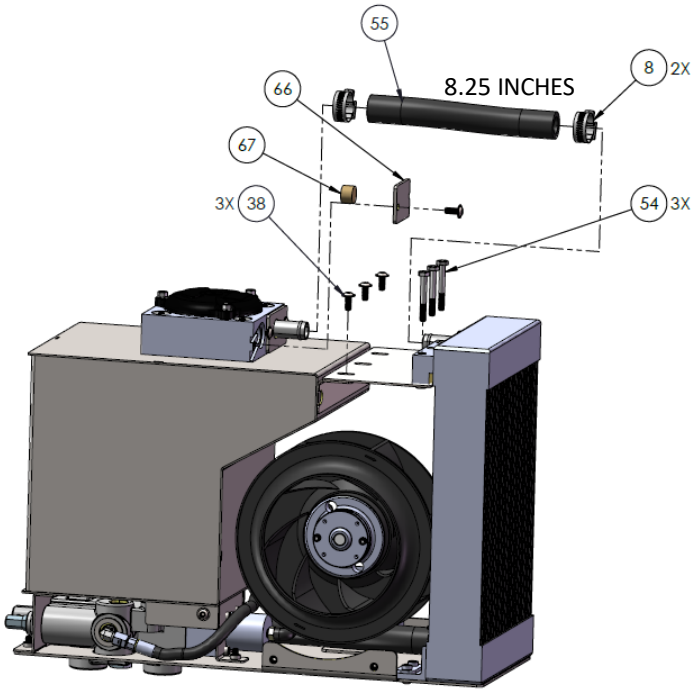
BASE-PLATE, VALVE, TANK , FILTER ASSY & HEAT EXCHANGER



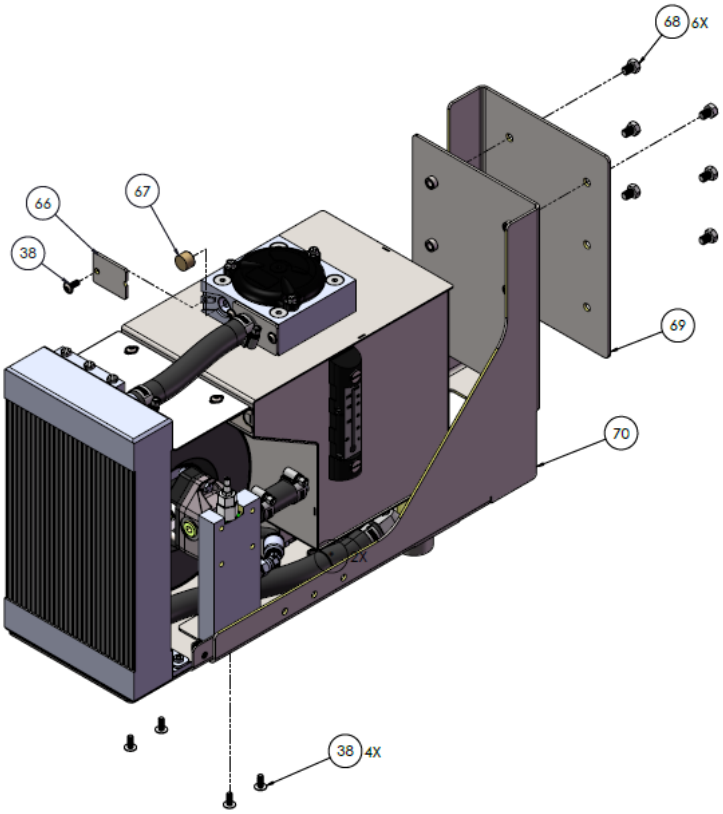


BYPASS VALVE ASSEMBLY

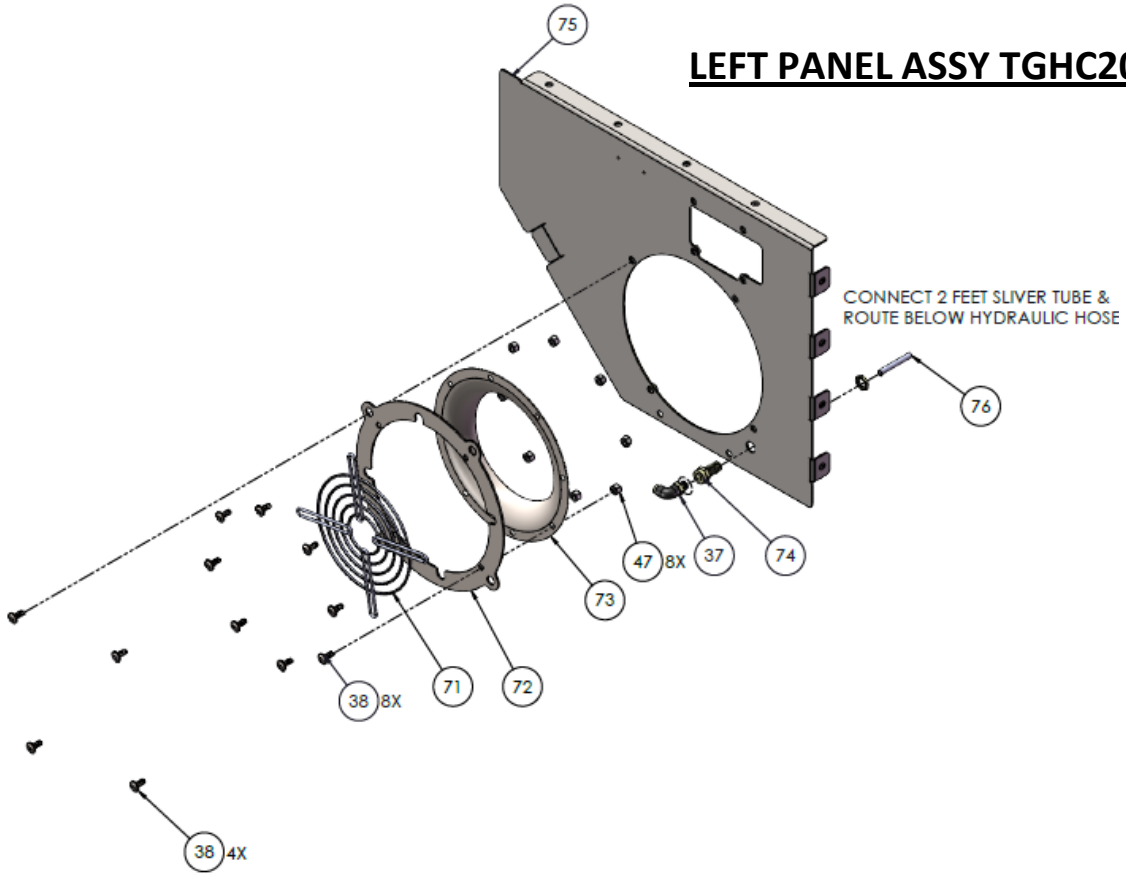
MOTOR, HEAT-EXCHANGER, TANK BRCT & RETURN HOSE ASSY



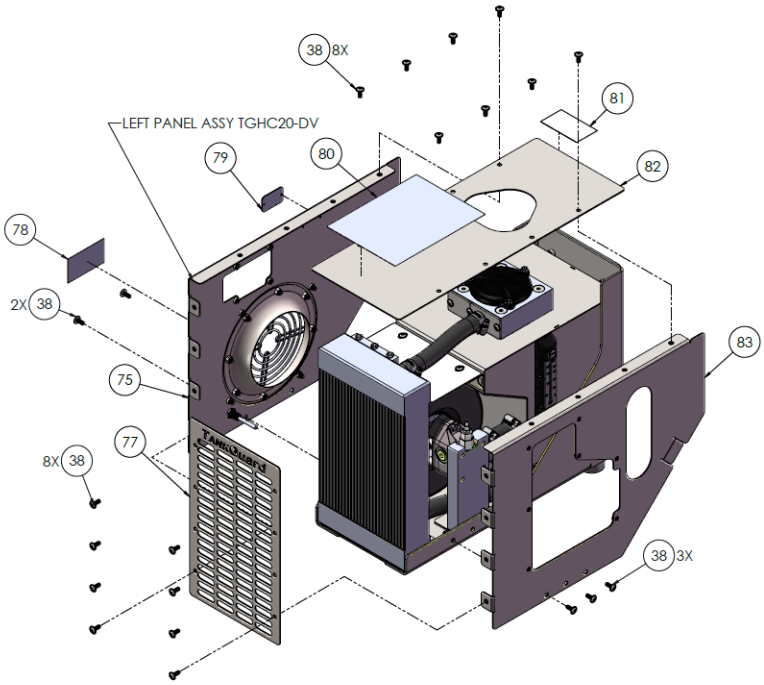
LEFT AND RIGHT FRAME SUPPORTS



LEFT PANEL ASSY TGHC20-DV



LEFT PANEL, RIGHT PANEL, TOP PANEL, FRONT PANEL AND DECALS



F: TGHC20-DV PARTS LIST

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	7654	SCW 5/16-18 3.25 SH SS	4
2	7641	HYDRAULIC MOTOR, CW ROTATION	1
3	9054	ORNG 015 9/16 X 11/16	2
4	8784	MOTOR MOUNT, TGHC20-DV	1
5	7656	FLOW REGULATOR 8-2 CAVITY	1
6	7343	O-RING 2-017 13/16 OD 11/16 ID	2
7	8786	SAE-6 TO HB-12 FTG	2
8	8343	HOSE CLAMP, 3/4 ID HOSE	7
9	9508	HOSE .75" ID 1.15" OD 2.625" L	1
10	8901	SAE-06 TO FS-04 FTG	1
11	9578	SCW 10-32 7/8 SH ZNC	2
12	9579	7/64"D 3/4"L DOWEL PIN 18-8SS	1
13	9568	BUSH FAN 2.48OD PRSFIT	1
14	7642	FAN 225MM BACKWARD CURVE	1
15	9567	HUB, PRESS FIT	1
16	8817	HIGH PRES HOSE, TGHC20	1
17	8797	TANK SUPRT-2, TGHC20-DV	2
18	C-3551-DM	AIR ACT FOR 5100 MONOBLOCK VAL	2
19	9179	MONO BLOCK VALVE, SAE-12 PORTS	1
20	8900	SAE-04 TO FS-04, 90 FTG	2
21	8785	MOTOR PORT FTG, TGHC20	2
22	8820	O-RING 912 1.156" OD .924" ID	3
23	9211	PLUG, SAE-06 ZERO LEAK	1
24	9530	FTG, 12MORB TO 1.25" BR SEAL	1
25	1234	O-RING 2-214 1 1/4 OD 1 ID	3
26	2074	O-RING 2-028 1 1/2 OD 1 3/8 ID	1
27	9366	SPOOL CAP, TGHC20-DV	1
28	9367	SPL CAP WASHER, TGHC20-DV	1
29	9368	SPL CAP PLT, TGHC20-DV	1
30	9369	CAPS 1/4-20 X 7/8, SH SS	4
31	8871	BLOCK PLATE, TGHC20-DV	2
32	8819	SAE-16 TO HB-12 90 FTG	2
33	9507	HOSE .75" ID 1.15" OD 13.75" L	2
34	1707-BU	TUBE 1/4 DOT BLUE [2 FEET]	1
35	4361	FITTING QC 1/4 TUBE TO 1/8 MALE PIPE THREAD	2
36	1707-RD	TUBE 1/4 DOT RED [2 FEET]	1
37	3760	FITTING QC 1/4 TUBE 1/8 NPT EB	3
38	7709	1/4-20 X 5/8" TORX T30 ADHESIV	61
39	8791	TANK SUPRT-1, TGHC20-DV	1
40	8793	TANK ASSEMBLY, NEW TGHC20	1
41	8324	SIGHT LEVEL GUAGE, MIN, MAX PRINTED	1
42	8823	BULK HEAD NUT, 9/16-18	1
43	8794	BASE PLATE, TGHC20-DV	1
44	8831	REINFORCE PLATE, FAN ASB	1
45	8872	SUCTION FTG CLAMPS, TGHC20-DV	2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
46	7653	SHCS 3/8"-16 SS 1" LG	2
47	3786	NUT 1/4-20 NC SS HEX NYLOCK	9
48	8390	SPG, .55" ID, .72" OD, 4"LG	1
49	8345	BUSH FLNG 1 OD	2
50	8781	BYPASS VALVE BLOCK, TGHC20-DV	1
51	8110	O-RING 2-231 2 7/8 OD 2 5/8 ID	1
52	3467	CAPS 1/4-20 X 3 1/4 SH	1
53	8223	HEAT EXCHANGER, TGHC20	1
54	7841	CAP SCREW 1/4-20 X 2 LG HH	3
55	9509	HOSE .75" ID 1.15" OD 8.25" L	1
56	8799	TANK BRACKET, TGHC20-DV	1
57	8800	FLTR HOLDER PLATE-1, TGHC20-DV	1
58	8782	BARB FITTING, 3/4 HOSE ID	1
59	8826	O-RING 125 1 1/2 OD, 1 5/16 ID	1
60	8783	FILTER HOLDER, APSCO COOLER	1
61	8824	O-RING 2-252 5 1/2 OD 5 1/4 ID	1
62	8825	3/8-16 X 2-1/2", FLAT HEAD 18-8	4
63	8323	RETURN FILTER ASSEMBLY	1
64	8350	HEX HEAD 1/4-20 X 1 LG	3
65	8342	HE CLAMP PLATE, TGHC20	2
66	8801	FLTR HOLDER PLATE-2, TGHC20-DV	1
67	8827	BREATHER SPONGE, COOLER	1
68	8564	CAPSCREW 3/8-16 1/2 LG HH SS	6
69	8795	LEFT FRAME SUPRT, TGHC20-DV	1
70	8796	RIGHT FRAME SUPRT, TGHC20-DV	1
71	7631	FINGER GUARD	1
72	8590	RADIAL MISALIGNMENT ADAPTER	1
73	7630	INLET RING FOR 225MM IMPELLER	1
74	9599	FTG, 1/4QC, 1/8FNPT, BLKHD	1
75	8802	LEFT PANEL, TGHC20	1
76	1707-SL	TUBE 1/4 DOT SILVER [2 FEET]	1
77	8239	FRONT PANEL, TGHC-20	1
78	8497	DECAL, CAUTION FAN	1
79	7563	HYD-V-TAG	1
80	9011	DECAL, POLAR WARNING LABEL	1
81	8498	DECAL, NO STEP	1
82	8805	TOP PANEL, TGHC20-DV	1
83	8803	RIGHT PANEL, TGHC20	1
84	8166	SS FLANGE NUT M12 X 1.75	2
85	8788	TANK FTG, TGHC20	1
86	RYCO_T2040-0407	RYCO_T2040-0407	1
87	RYCO_T208-0409	RYCO_T208-0409	1
88	8323	RETURN FILTER ASSEMBLY	1
89	8341	RETURN HOSE, 3/4" ID	1

MAINTENANCE - Ingersoll Rand SS5 Piston Compressor

A. Specifications & Maintenance

Specifications	Performance						
Two cylinder single stage cast iron construction speed Max. 0-1500 rpm 1310 series flange weight 80 lbs Bi-rotational	SPEED (RPM)	25 PSI			36 PSI		
		CFM	HP	POTENTIAL LIQUID FLOW (GPM)	CFM	HP	POTENTIAL LIQUID FLOW (GPM)
	500	12	1.5	38	11	1.6	25
	800	19	2.7	61	18	2.8	40
	1000	24	3.5	79	22	3.6	50
	1200	30	4.3	95	27	4.4	59
	1350	35	4.9	105	29	4.8	67
	1500	39	5.4	125	32	5.2	75

Maintenance

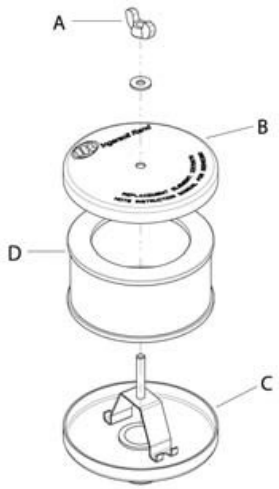
ROUTINE MAINTENANCE SCHEDULE	
Daily or Before Each Operation	Check lubricant level. Fill as needed.
	Drain receiver tank condensate. Open manual drain valve and collect and dispose of condensate accordingly.
	Check for unusual noise and vibration.
	Ensure beltguards and covers are securely in place.
	Ensure area around compressor is free from rags, tools, debris, and flammable or explosive materials.
Weekly	Inspect air filter element(s). Clean or replace if necessary.
Monthly	Inspect for air leaks. Squirt soapy water around joints during compressor operation and watch for bubbles.
	Check tightness of screws and bolts. Tighten as needed.
	Inspect drive belts. Adjust if necessary.
	Clean exterior.
3/500 "	Change petroleum lubricant while crankcase is warm.
12/2000 "	Change synthetic lubricant while crankcase is warm.
	Replace filter element.
" indicates months/operating hours, whichever occurs first.	

■ FILTER REPLACEMENT (SS5)

1. Unscrew and remove the wing nut (A) securing the filter housing (B) to its base (C).
2. Remove the filter busing and withdraw the old filter element (D) Clean the element with a jet of air or vacuum.
3. Replace the filter element and housing, securing it in place with the wing nut previously removed.

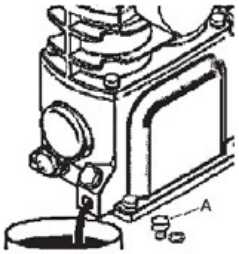
NOTICE

The air intake holes in the baffle and cover must be staggered 1800. When reinstalling the assembly at the inlet connection, ensure the intake hole in the cover is on the bottom to minimize the entry of foreign matter from the air.



■ *OIL CHANGE*

1. Remove the oil drain plug (A) and allow the lubricant to drain into a suitable container.
2. Replace the oil drain plug.



■ COMPRESSOR LUBRICATION

CAUTION

Do not operate without lubricant or with inadequate lubricant.

■ *INGERSOLL RAND SYNTHETIC LUBRICANT*

Part No.	Description
32318875	Lubricant 0.5L Bottle
32318883	Lubricant, 6 Pack of 0.5L Bottles

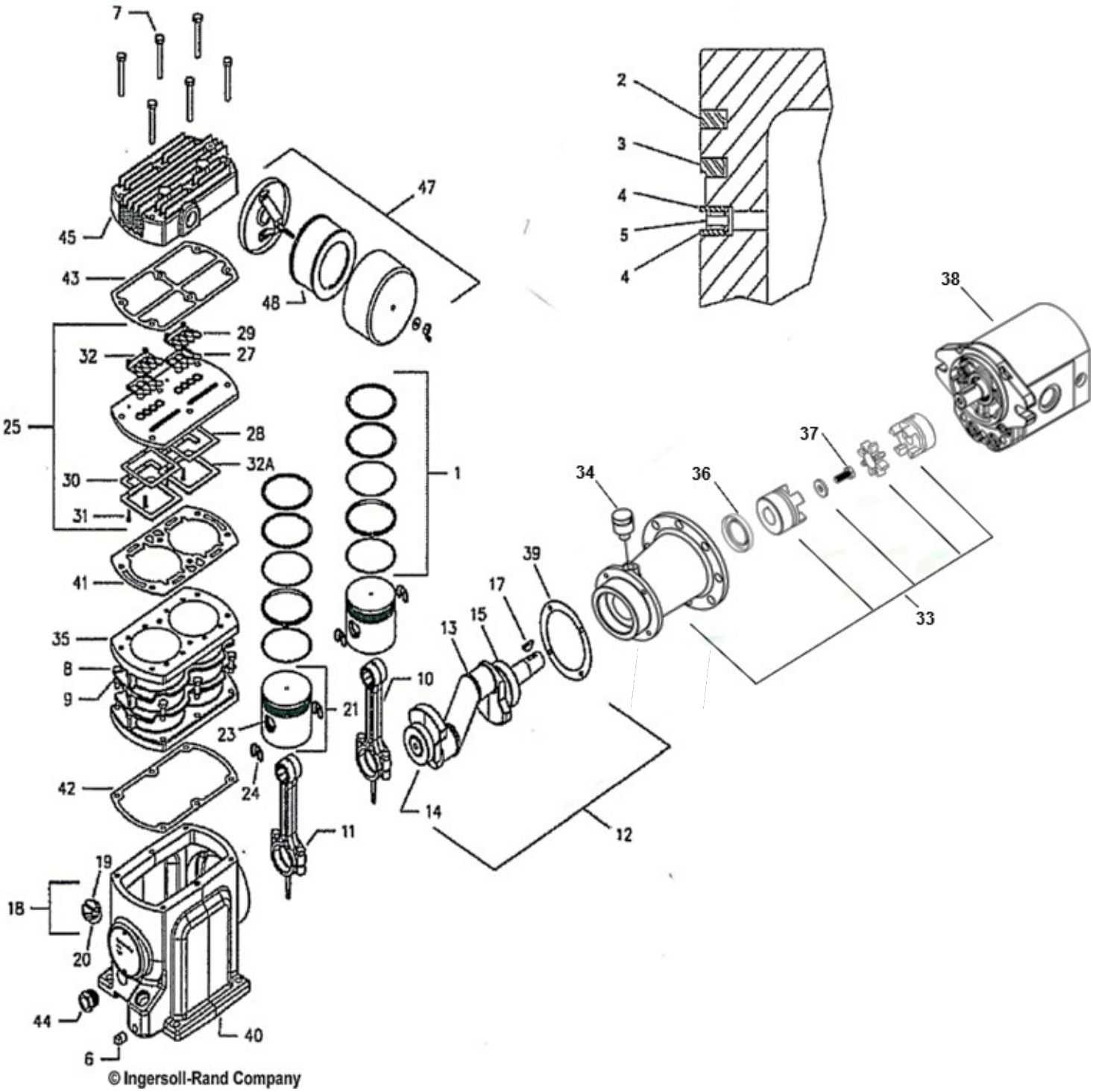
■ *SYNTHETIC COMPRESSOR LUBRICANT*

We recommend Ingersoll Rand synthetic compressor lubricant from start-up. The crankcase capacity is 1 liter (34 fl. oz.).

■ *ALTERNATE LUBRICANTS*

You may use XL-300 or a comparable petroleum-based lubricant that is premium quality, does not contain detergents, contains only anti-rust, anti-oxidation, and anti-foam agents as additives, has a flashpoint of 440°F (227°C) or higher, and has an auto-ignition point of 650°F (343°C) or higher.

B. Illustrated Parts Breakdown

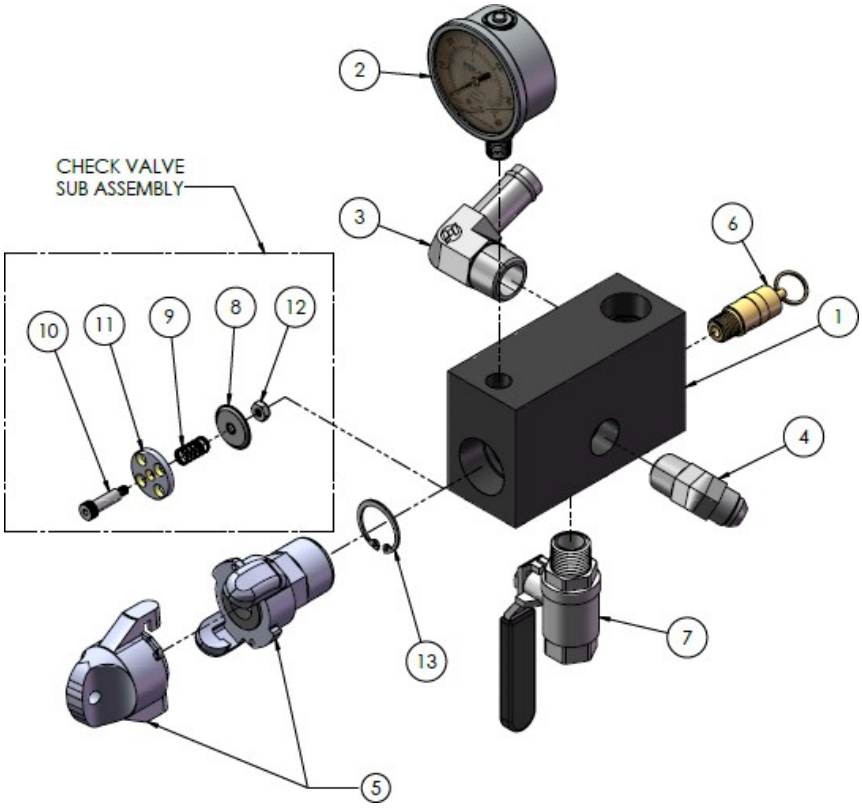


C. Parts Listing

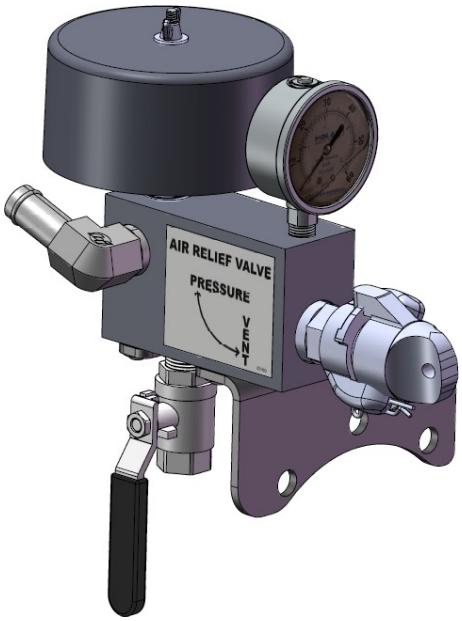
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
REF.	97334148	PUMP, BARE COMPRESSOR	-
1	20102703	Piston Ring Set	2
2	NSS	Compression Ring	1
3	NSS	Scraper Ring	1
4	NSS	Oil Control Spacer Ring	2
5	NSS	Oil Control Ring	1
6	95033593	Oil Drain Plug	1
7	96706874	M8 X 65 Capscrew	6
8	96702253	M8 X 25 Capscrew	6
9	96728316	Spring M8 Washer	6
10	97333173	Connecting Rod Assembly	2
11	96705876	M8 X 35 Capscrew	2
12	20102711	Crankshaft Assembly	1
13	NSS	Crankshaft	1
14	NSS	Main Bearing	1
15	NSS	Ball Bearing	1
17	95245494	Woodruff Key	1
18	97334254	Oil Fill Plug Assembly	1
19	NSS	Oil Fill Plug	1
20	97334288	Oil Fill Plug O-Ring	1
21	97333389	Piston & Pin Assembly	2
23	NSS	Piston Pin	1
24	NSS	Lock Ring	2
25	97335061	Valve Assembly	1
27	NSS	Discharge Valve	2
28	NSS	Inlet Valve	2
29	NSS	Discharge Stop	2
30	NSS	Inlet Retainer	2
31	NSS	Hex Head Screw M3 X 16	4
32	NSS	Hex Nut - M3 W/ lock washer	4
32A	NSS	Inlet Stop	2
33	8862	End Flange	1
33A	8359	Shaft Coupling	1
34	70243936	Air Breather	1
35	97333488	Cylinder	1
36	97335624	Shaft Seal	1
37	49228737-2	Left-Handed M10 Screw	1
37A	8370	Washer	1
38	8355	Hydraulic Gear Motor	1
39	97333843	Bearing Carrier Gasket	1
40	97334171	Compressor Frame	1
41	54429600	Valve Plate Gasket	1
42	97333546	Cylinder Gasket	1
43	54410657	Head Gasket	1
44	97334270	Sight Glass	1
45	54410683	Head	1
47	54406640	Filter Assembly	1
48	32170979	Filter Element	1

*NSS-NOT SOLD SEPERATELY

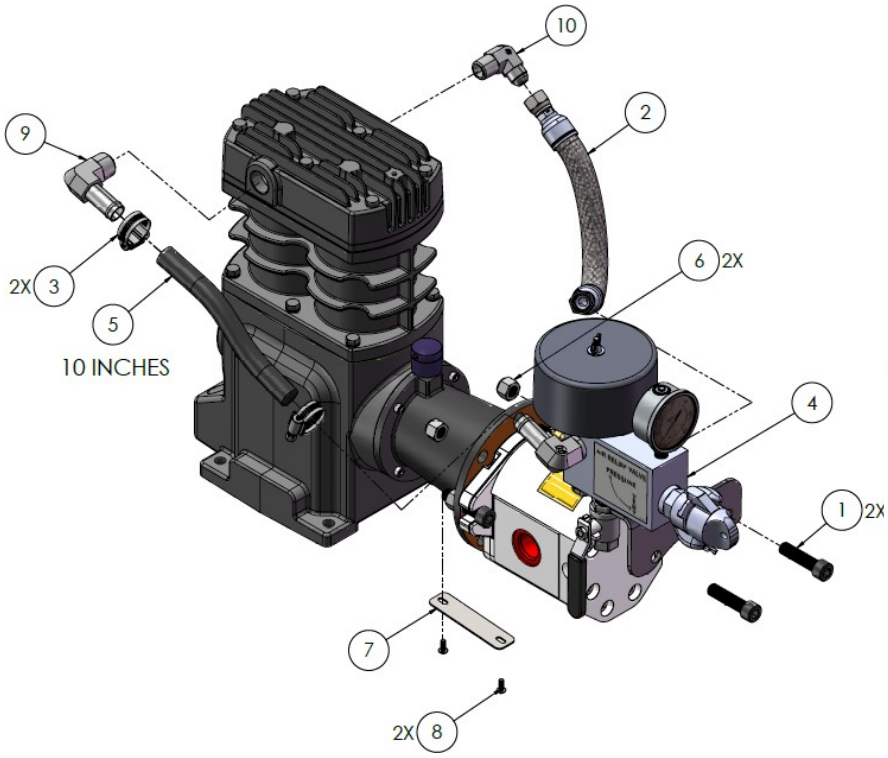
D: SS5 Air Manifold assembly [SS5AMASB]

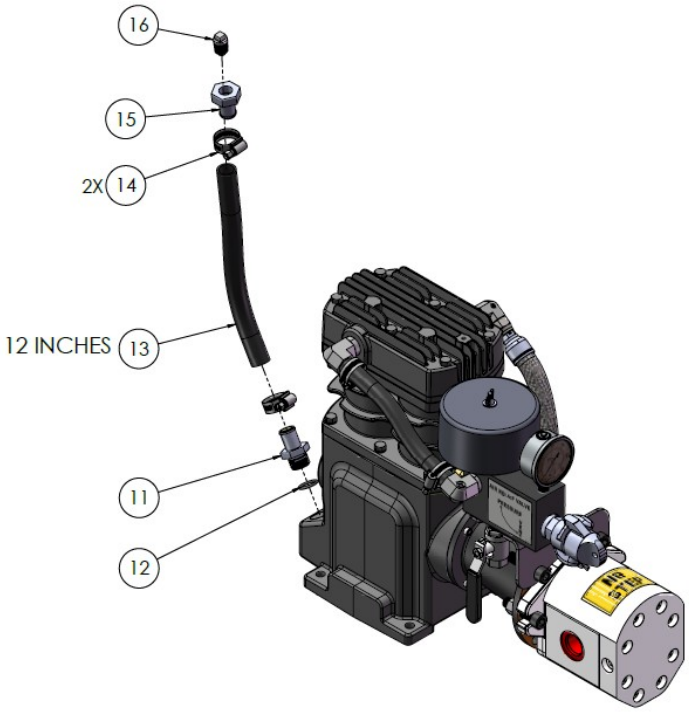


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	8279	AIR MANIFOLD, SS5 COMPRESSOR	1
2	8443	PRESSURE GAUGE, POLAR	1
3	8403	FTG, 3/4 NPT TO 3/4 ID HOSE	1
4	8990	FTG 8MJ-8MP 45	1
5	8559	TWIST-CLAW COUPLING 1" NPT	1
6	8435	1/4 ST RELIEF VALVE 35 PSI	1
7	8442	SHUT OFF VALVE 1/2 NPT F X 1/2 NPT M	1
8	8440	SEALING WASHER 1" OD .2" ID	1
9	8444	SPRING SS 0.875" L, 0.36" OD,	1
10	8441	SHOULDER BOLT 10-32 1/4 OD	1
11	8437	CHECK VALVE WASHER, SS5	1
12	8493	THIN LOCK NUT, 10-32	1
13	8438	RETAINING RING 1 1/8" ID, SS	1
14	8365-9	AIR FILTER, SS5	1
15	7709	1/4-20 X 5/8" SS TORX T27 BUTTON HD	4
16	8766	BRACKET, SS5AMASB	1

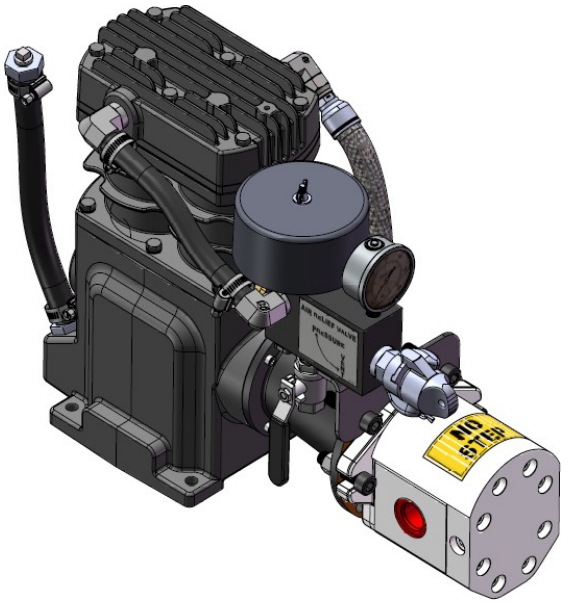


E: SS5 Compressor assembly

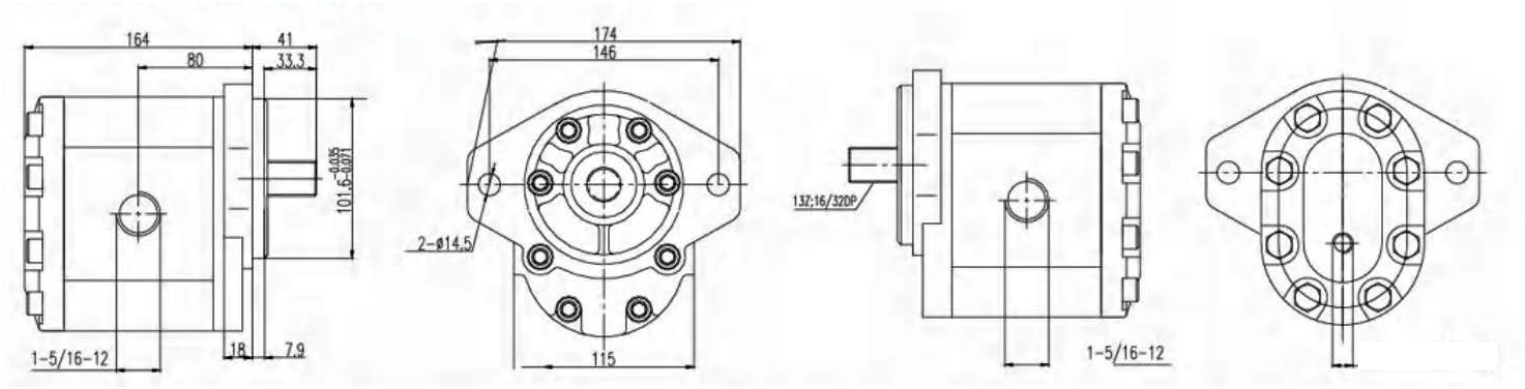




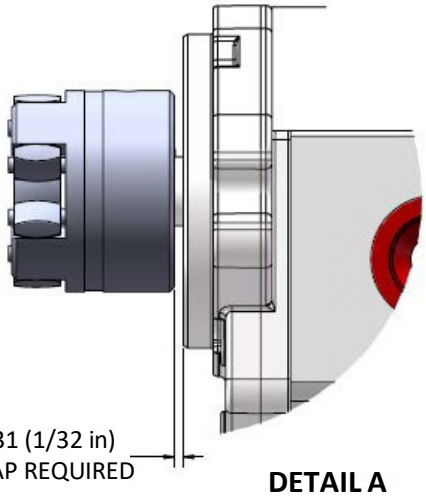
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	8769	CAPS 1/2-13 X 2" LONG SH	2
2	8410	OUTPUT HOSE ASSY, SS5	1
3	8343	HOSE CLAMP, 3/4 ID HOSE	2
4	SS5AMASB	SS5 AIR MANIFOLD ASSEM	1
5	8341	RETURN HOSE, 3/4" ID	1
6	8123	NUT, 1/2-13 NYLOCK GR 8 ZINC	2
7	8770	FINGER GUARD, SS5	1
8	5324	CAPS 10-24 X 1/2 BH SS	2
9	8403	FTG, 3/4 NPT TO 3/4 ID HOSE	1
10	8404	FTG, 1/2 NPT TO 3/4-16 JIC	1
11	8708	FILL PORT FITTING, SS5	1
12	4122	O-RING 2-117 1 OD 13/16 ID	1
13	8341	RETURN HOSE, 3/4" ID	1
14	8343	HOSE CLAMP, 3/4 ID HOSE	2
15	8709	3/4 HOSE TO 3/8-18 FNPT FITTING	1
16	8710	SQ HEAD PLUG, 3/8-18 NPT	1



F. Gear Motor [8355]

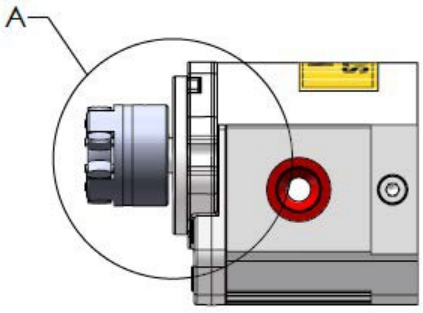


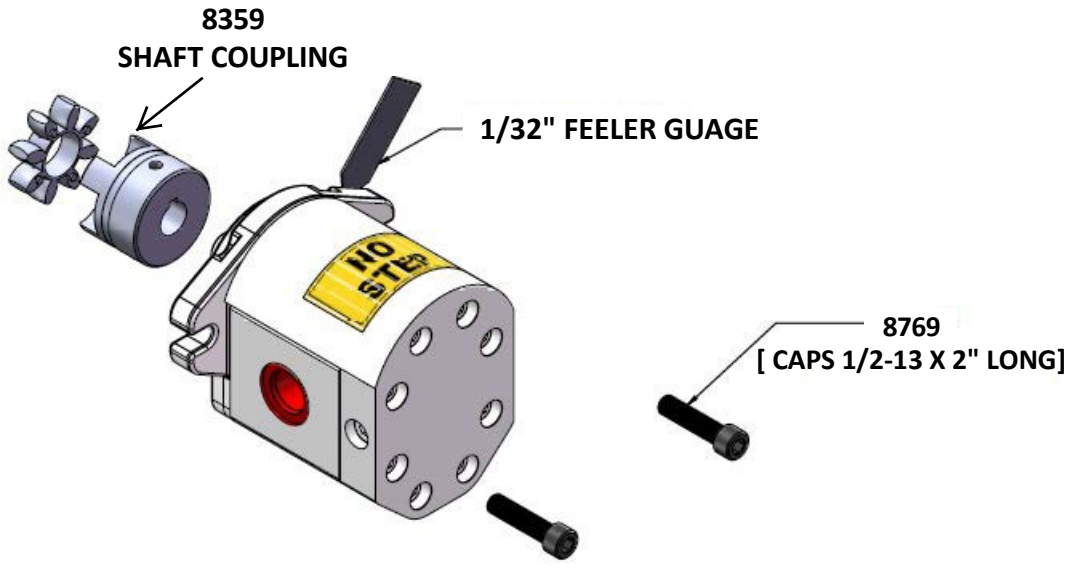
G. Shaft Coupling



DETAIL A

POSITION COUPLING HUB ON HYDRAULIC MOTOR SHAFT WITH 1/32" OF CLEARANCE BETWEEN THE COUPLING AND FACE OF HYDRAULIC MOTOR USING A FEELER GUAGE. TIGHTEN M8 SET SCREW TO 90 IN-LB. ENSURE AXIAL CLEARANCE IS PRESENT AT THE SPIDER

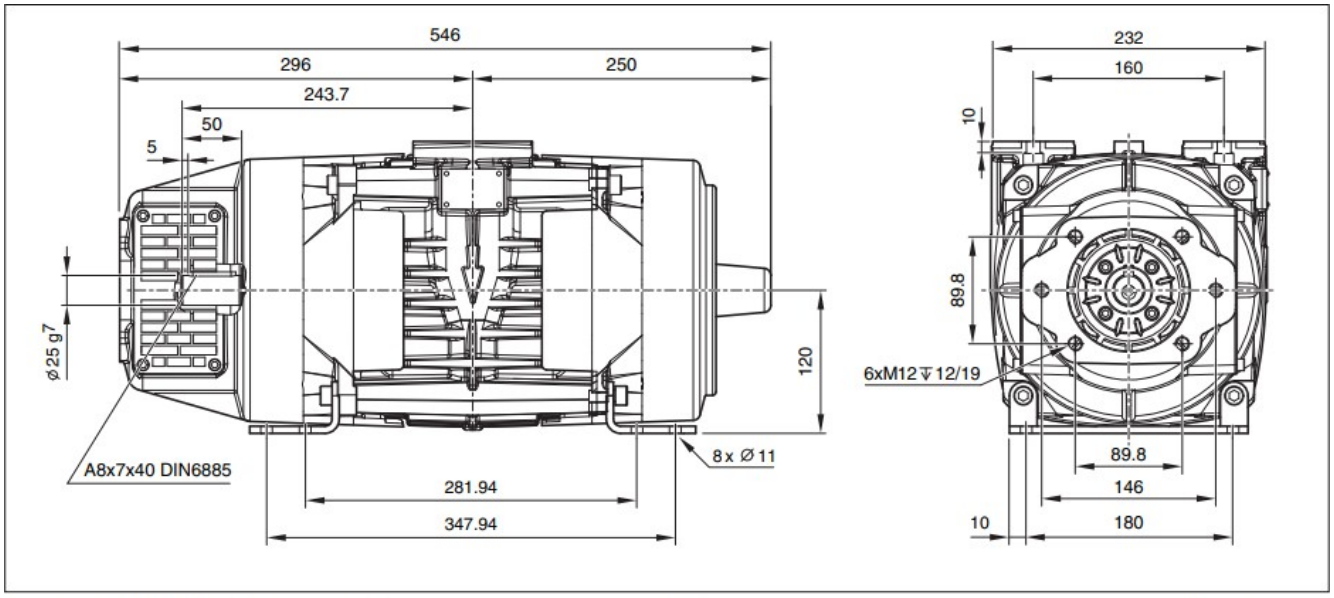




PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
ABNORMAL PISTON, RING OR CYLINDER WEAR	LUBRICANT VISCOSITY TOO LOW	DRAIN EXISTING LUBRICANT AND REFILL WITH PROPER LUBRICANT
	LUBRICANT LEVEL TOO LOW	ADD LUBRICANT TO CRANKCASE TO LEVEL
	DETERGENT TYPE LUBRICANT BEING USED	DRAIN EXISTING LUBRICANT AND REFILL WITH PROPER LUBRICANT
	CYLINDER(S) OR PISTON(S) SCRATCHED WORN OR SCORED	REPAIR OR REPLACE AS REQUIRED
	EXTREMELY DUSTY ATMOSPHERE	INSTALL REMOTE AIR INLET PIPING AND ROUTE TO SOURCE OF CLEANER AIR. INSTALL MORE EFFECTIVE FILTRATION
	WORN CYLINDER FINISH	DEGLAZE CYLINDER WITH 180 FLEX-HONE
AIR DELIVERY DROPS OFF	CLOGGED OR DIRTY INLET AND/ OR DISCHARGE LINE FILTER	CLEAN OR REPLACE
	AIR LEAKS IN AIR DISCHARGE PIPING	CHECK TUBING AND CONNECTIONS
	LUBRICANT VISCOSITY TOO HIGH	DRAIN EXISTING LUBRICANT AND REFILL WITH PROPER LUBRICATION
	COMPRESSOR VALVES LEAKY, BROKEN, CARBONIZED OR LOOSE	INSPECT VALVES. CLEAN OR REPLACE AS REQUIRED. INSTALL VALVE KIT
	PISTON RINGS DAMAGED OR WORN. EXCESSIVE END GAP OR SIDE CLEARANCE	INSTALL RING KIT
	PISTON RINGS NOT SEATED, ARE STUCK IN GROOVES OR END GAPS NOT STAGGERED	ADJUST PISTON RINGS
	CYLINDER(S) OR PISTON(S) SCRATCHED, WORN OR SCORED	REPAIR OR REPLACE AS REQUIRED
	DEFECTIVE SAFETY/ RELIEF VALVE	REPLACE
UNIT DOES NOT COME UP TO SPEED	LOOSE BELT WHEEL OR MOTOR PULLEY, EXCESSIVE END PLAY IN MOTOR SHAFT	CHECK BELT WHEEL, MOTOR PULLEY, CRANKSHAFT, DRIVE BELT TENSION
	LUBRICANT VISCOSITY TOO HIGH	DRAIN EXISTING LUBRICANT AND REFILL WITH PROPER LUBRICANT
	IMPROPER LINE VOLTAGE	CHECK LINE VOLTAGE AND UPGRADE LINES AS REQUIRED
	COMPRESSOR VALVES LEAKY, BROKEN, CARBONIZED OR LOOSE.	INSPECT VALVES. CLEAN OR REPLACE AS REQUIRED. INSTALL VALVE KIT
	DEFECTIVE BALL BEARINGS ON CRANKSHAFT OR MOTOR SHAFT	INSPECT BEARING AND REPLACE CRANKSHAFT ASSEMBLY IF REQUIRED
UNIT IS SLOW TO COME UP TO SPEED	LUBRICANT VISCOSITY TOO HIGH	DRAIN EXISTING LUBRICANT AND REFILL WITH PROPER LUBRICANT
	LEAKING CHECK VALVE OR CHECK SEAT BLOWN OUT	REPLACE CHECK VALVE
	AMBIENT TEMPERATURE TOO LOW	RELOCATE UNIT TO WARMER ENVIRONMENT. INSTALL HEATER KIT
	BAD MOTOR	REPLACE
UNIT RUNS EXCESSIVELY HOT	INADEQUATE VENTILATION AROUND WHEEL	RELOCATE UNIT FOR BETTER AIR FLOW
	DRIVE BELTS TOO TIGHT OR MISALIGNED	ADJUST BELTS TO PROPER TENSION
	COMPRESSOR VALVES LEAKY, BROKEN, CARBONIZED OR LOOSE	INSPECT VALVES. CLEAN OR REPLACE AS REQUIRED. INSTALL VALVE KIT
	WRONG BELT WHEEL DIRECTION OF ROTATION	CHECK MOTOR WIRING FOR PROPER CONNECTIONS

SV200 Rotary Valve Compressor Option

A. Specifications



Model: SV200 **H** (hydraulic drive)

All measurements are approximate specifications.

Dimensions & weight

SV200...		...D	...H
Length (approx.)	mm	494	546
Width (approx.)	mm	232	232
Height (approx.)	mm	245	245
Weight (approx.)	kg	37	39

Rotational speed range

SV200	
min. min^{-1}/rpm	1000
max. min^{-1}/rpm	1800

Connection dimensions

Intake-/pressure flange:	DN40 / Ø68 - 2 x M10
Articulated shaft:	Only articulated shafts with two joints are permitted. Only balanced articulated shafts with a balancing quality of G 6.3 in accordance with DIN ISO 1940 with length compensation may be used.

A. Specifications (Cont'd)

Performance data

	Unit	SV200		
Rotary valve compressor	min^{-1} [rpm]	1000	1400	1800
Working gage pressure	**bar (g) [psig]**		**1.5 [15.0]**	
Intake volume	m³/h [cfm]	75 [50]	119 [76]	163 [102]
Coupling output	kW [hp]	5.0 [5.5]	7.1 [8.1]	9.8 [11.1]
Final temperature	°C [°F]	136 [229]	133 [231]	142 [247]
Intake temperature max.	°C [°F]	46 [115]	46 [115]	46 [115]
Working gage pressure	**bar (g) [psig]**		**2.0 [25.0]**	
Intake volume	m³/h [cfm]	65 [42]	109 [67]	152 [93]
Coupling output	kW [hp]	6.0 [7.3]	8.2 [10.1]	11.3 [14.0]
Final temperature	°C [°F]	164 [299]	157 [290]	166 [306]
Intake temperature max.	°C [°F]	46 [115]	46 [115]	46 [115]
Working gage pressure	**bar (g) [psig]**		**2.5 [36.0]**	
Intake volume	m³/h [cfm]	55 [32]	98 [58]	140 [83]
Coupling output	kW [hp]	7.0 [9.3]	9.3 [12.4]	12.9 [17.2]
Final temperature	°C [°F]	192 [375]	181 [356]	190 [372]
Intake temperature max.	°C [°F]	46 [115]	46 [115]	46 [115]
Final temperature with max. intake temperature	°C [°F]	240 [464]	227 [441]	238 [460]

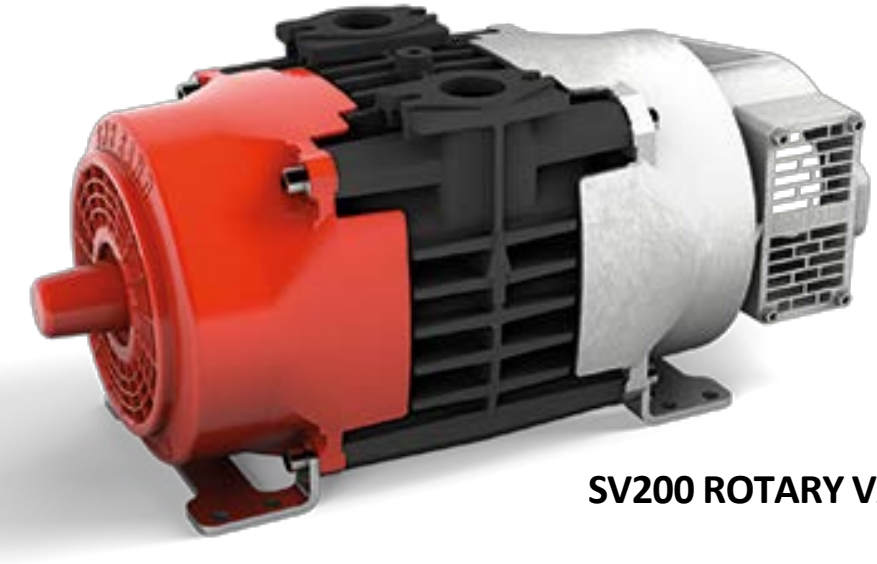
All information for:	
Feed medium:	atmospheric air
Intake pressure:	1 bar (abs.) [14.504 psia]
Intake temperature:	20 °C [68 °F]
Technical data without intake or pressure losses	

Environmental conditions

Environmental temperature:

25 to +46 °C [-13 to +111.8 °F]

Maximum operating pressure:
2.5 bar (rel.) [36 psig]



SV200 ROTARY VALVE COMPRESSOR

B. Features & Benefits

- **Footprint Interchangeable:** Footprint interchangeable with most existing sliding vane compressors, enabling ease of replacement and low exchange costs.

- **Optimized Volume Flow:** Optimized volume flow significantly improves product discharge time and reduces noise contamination and engine fuel consumption.

- **Corrosion Protection:** Galvanized and passivated mounting feet alongside an anodized body and side plates substantially reduce the risk of internal corrosion and unplanned off-road time and expenditure.

- **Quality of Life Features:** Long blade life due to geometrical optimization of the blade position and angle alongside reduced internal temperatures result in a lower risk of transferred product damage and a longer life expectancy.

C. Maintenance

1) The dismantling/reinstallation of the compressor on the vehicle, the compressor as well as the area surrounding the vehicle must be cleaned to prevent the entry of dirt/foreign particles into the compressor.

2) Ensure that the seals are clean during the installation.

3) Only the specified amount of grease apply into the bearings, because it may other-wise lead to a failure of the bearing due to excessive warming of the bearing.

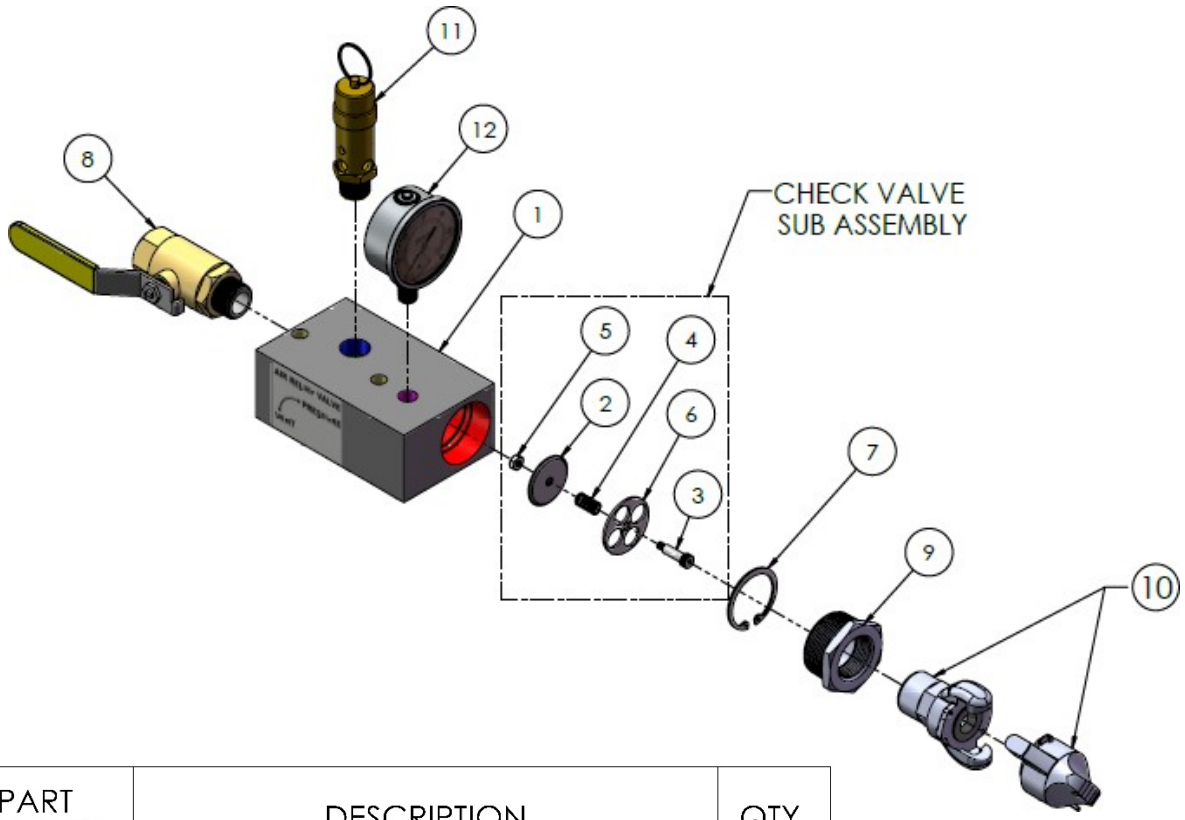
4) Prior to inserting the separating valve into the rotor, if necessary clean separating valve from attached dirt/grease.

5) In conjunction with broken separation valves, the following additional work must be carried out:

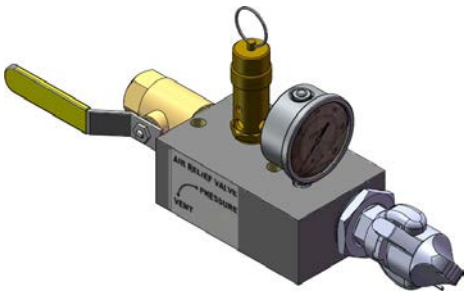
- Cleaning of the air filter /replacement of the air filter cartridge.
- Cleaning of the intake and pressure lines.
- Check and potentially replacement of safety and non-return valve.

D. Illustrated Parts Breakdown

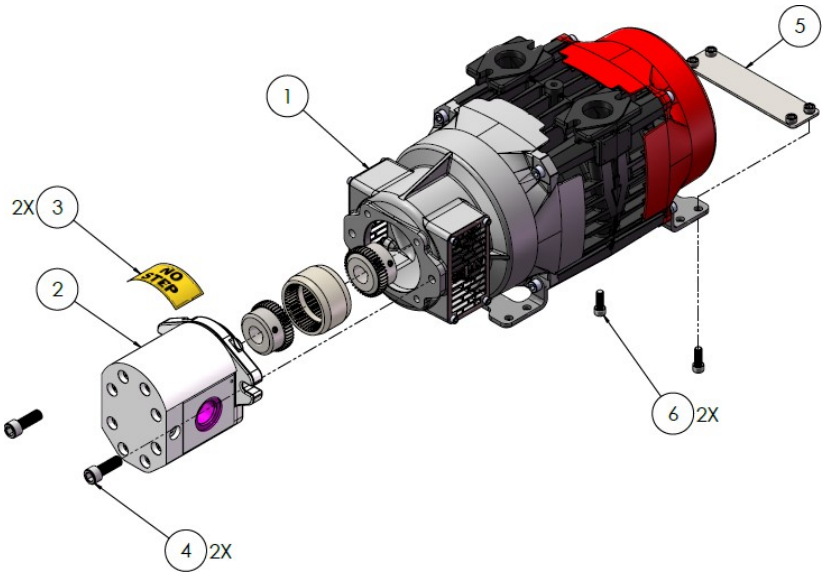
Air Manifold Assembly [SV200AMASB]

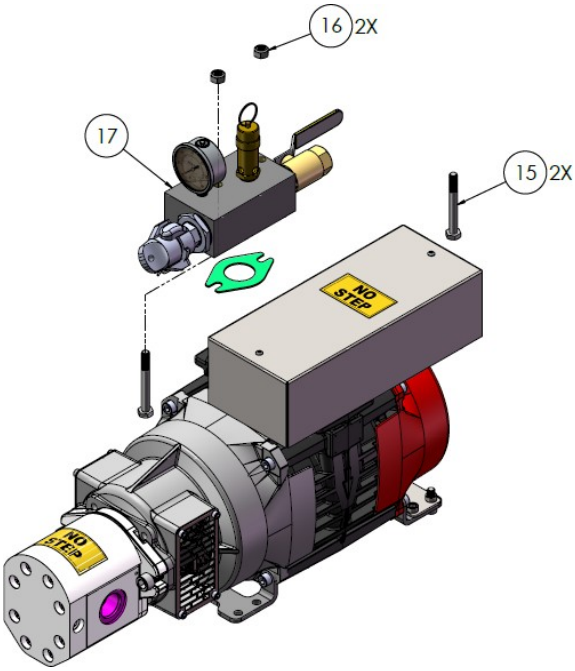


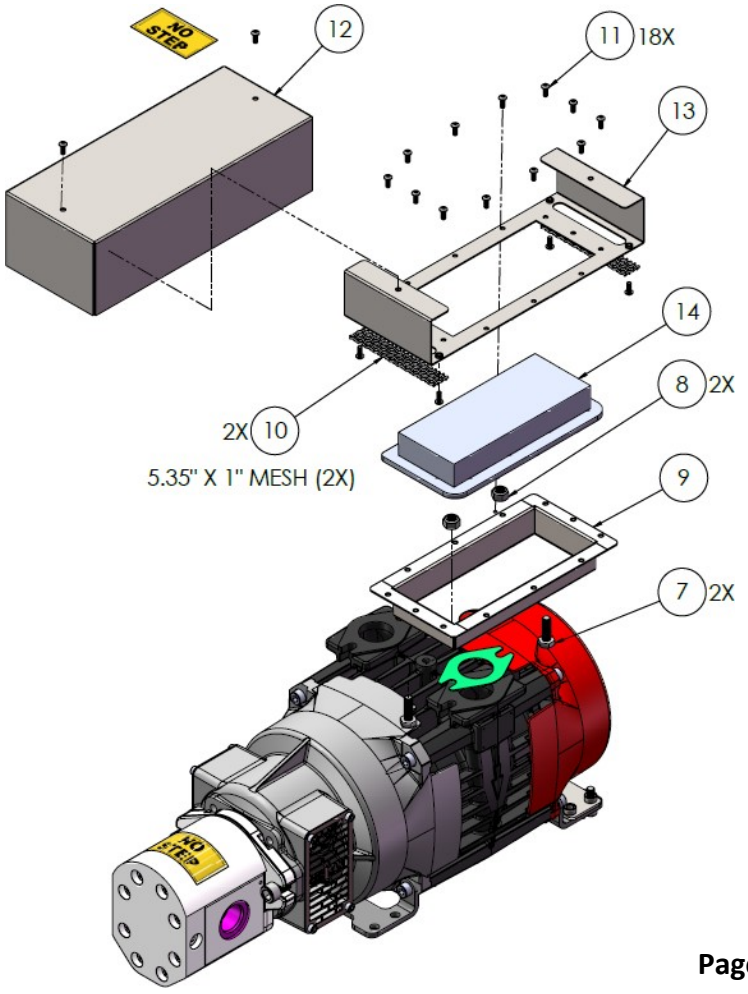
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	8491	DISCHARGE MANIFOLD, SV200	1
2	8577	SEALING WASHER 1.5" OD, .2" ID	1
3	8441	SHOULDER BOLT 10-32 1/4 OD	1
4	8444	SPRING SS 0.875" L, 0.36" OD,	1
5	8493	THIN LOCK NUT, 10-32	1
6	8578	CHECK VALVE PLATE, SV200	1
7	8579	RETAINING RING, 1 3/4 ID, SS	1
8	8576	SHUT OFF VALVE 3/4 NPTF X 3/4 NPTM	1
9	8580	1 1/2 NPT M TO 1" NPT F ADAPTER	1
10	8559	TWIST-CLAW COUPLING 1" NPT	1
11	8494	SAFETY VALVE, 36PSI, 1/2NPT	1
12	8443	PRESSURE GAUGE, POLAR	1



Air Filter Assembly [SV200ASB]







ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	SV200	SLIDING VANE COMPRESSOR POLAR	1
2	8355	GEAR MOTOR	1
3	8498	DECAL, NO STEP	2
4	8775	CAPS M14-2.0 X 40MM LG	2
5	9189	PEM PLATE, SV200	1
6	8706	CAPS 3/8-16 X1" LG, BLACK OXIDE	2
7	8568	HEX 17MM WIDE M10 X 30 MM LG, SS	2
8	8569	M10 NYLON LOCK NUT, SS	2
9	8565	SV200 FILTER BASE	1
10	8611	4 X 4 MESH, SST	2
11	5737	CAPS 10-32 X 1/2 BH SS	18
12	8567	AIR FILTER COVER, SV200	1
13	8566	AIR FILTER HOLDER, SV200	1
14	8610	AIR FILTER, SV200	1
15	8570	HEX 17MM WIDE M10 X 90 MM LG, SS	2
16	8569	M10 NYLON LOCK NUT, SS	2
17	SS5AMASB	AIR MANIFOLD ASSEMBLY, SV200	1

E: Replacement parts

The components required for the repair of the rotary valve compressor (bearing, separating valve, sealings, O-rings and shim rings) are combined in a special repair kit. This kit includes all components that are required for a new bearing and/or sealing including the replacement of the separating valves. The required special grease must be ordered separately.

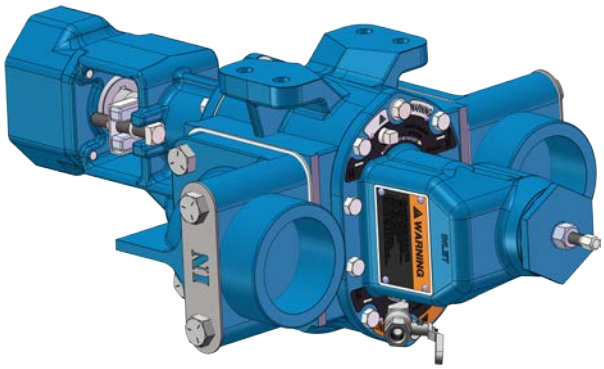
Name	GHH RAND order number
SV200 repair kit	23523012
SV200 Bearing Grease	23537509

MAINTENANCE - Ranger Series 22 Gear

A. Introduction

SERIES22

This series of Ranger pumps are designed to output .22 GPM at a maximum of 750 RPM and generate up to 165 gallons per minute. These pumps are offered in 90° and 180° with 3" and 4" flanges.



[228PHHFRVLZ SSCLLF]

Pump Identification Guide

HB - Outboard bearing
HH - Pump with hydraulic adaptor and rigid coupling
BH - Replacement pump for HH Pump without adaptor
GO - Replacement pump for GHB unit without gear reduction
GB - Pump with gear reduction

C - Carbon graphite bearing
X - or no letter bronze bearing
T - TFE & graphite bearing
I - Iron Bearing
H - Hi Temperature bronze bearing

9 - Ports 90°
8 - Ports 180°

DB - Double relief valve
RV - Relief valve
No letter - No relief valve

229PHBFRVLX-SSCG

MECHANICAL SEAL PUMP
B - Buna-N
V - Viton
T - Teflon

1 - .11 Gallons per rev.
17 - .17 Gallons per rev.
22 - .22 Gallons per rev.
48 - .48 Gallons per rev.

F - Flanges
No letter - Pipe port

SS - Stainless-steel shafts
No letter or XX - Steel shafts

PACKING PUMP
G - TFE & graphite packing
LG - Lip seal with graphite packing
X - or no letter - standard packing
T - Pure TFE packing
D - DSA 8093 packing
LD - Lip seal with DSA packing

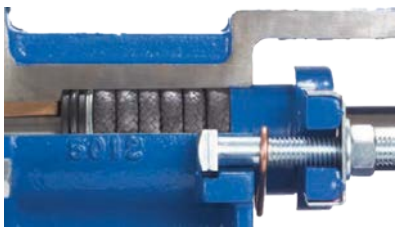
P - Packing
M - Mechanical Seal

Rotation & Shaft position
No letter - W position

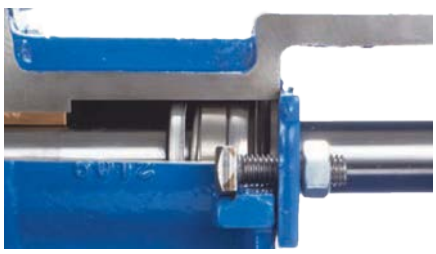
Ranger Pump Features

Field Adjustable Relief Valve

Lip Seal Design



Mechanical Seal

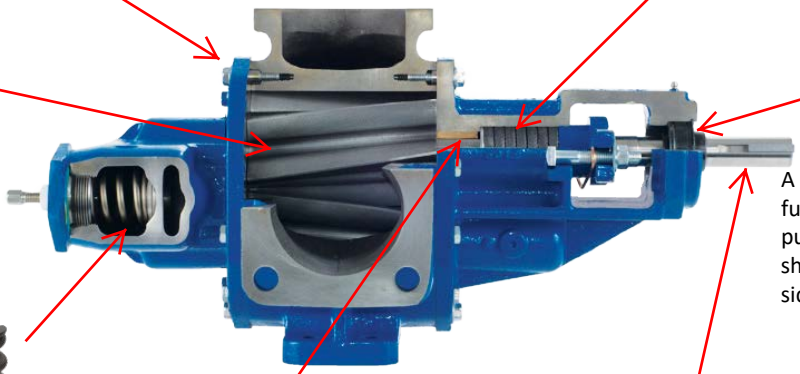


Key Components of Ranger Pump

Pumps come standard with fiber case gaskets (*Max2300F/1100C). For temperature up to 4500F/2320C, we offer optional aluminum gaskets.

Various types of seals are available including packing, lip seals, or mechanical seals.

Heat treated ductile Iron gears are accurately machined for quiet, efficient operation and long life.



A large outboard bearing is furnished on all HB model pumps that support the drive shaft on applications with side loads.

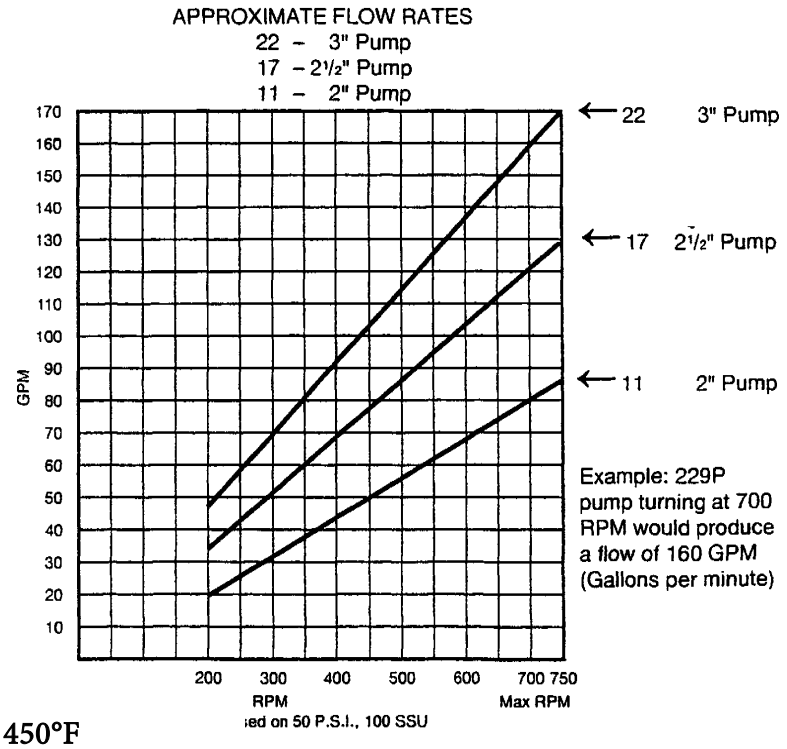
Carbon steel relief valve springs come standard or optional stainless-steel spring. Various springs are available for a wide range of operational duties.

Four heavy duty sleeve bearings give positive support to pumping gears and ensure long, efficient service.

The steel shafts are induction hardened in the bearing and packing areas and are precision ground to exacting standards for maximum life. Hardened stainless steel shafts are available.

Maximum Pump Rating

- 125 PSI (862 Kpa) max inlet and discharge pressure
- 750RPM max (See speed vs viscosity curve for max R.P.M)
- 212°F (100°C) max temperature for Buna-N mechanical seal
- 400°F (205°C) max temperature for Viton mechanical seal
- 350°F (177°C) max temperature for standard packing
- 500°F (260°C) max temperature for graphite TEE packing
- 600°F (345°C) max temperature for carbon graphite packing
- Consult Ranger for any application over 350°F (172°C)



WARNING: Never operate Ranger Pumps over 450°F

B. Maintenance

PACKING BOX PUMPS

(a) Operate the pump under normal conditions and before startup; tighten the lock nuts evenly - no more than one turn. After a short run-in period, examine the packing for leakage. If leakage is excessive, tighten locknuts evenly until there is only a slight leakage from the packing. A slight leakage is a necessary and normal condition for packing which allows for expansion and seating.

WARNING: NEVER TIGHTEN PACKING WHEN THE PUMP IS RUNNING. FULL PRECAUTIONS SHOULD BE TAKEN AT ALL TIMES WHERE LIQUID IS HAZARDOUS OR VOLATILE. NEVER REPLACE PACKING WITHOUT TURNING OFF PUMP AND LOCKING DRIVER OUT.

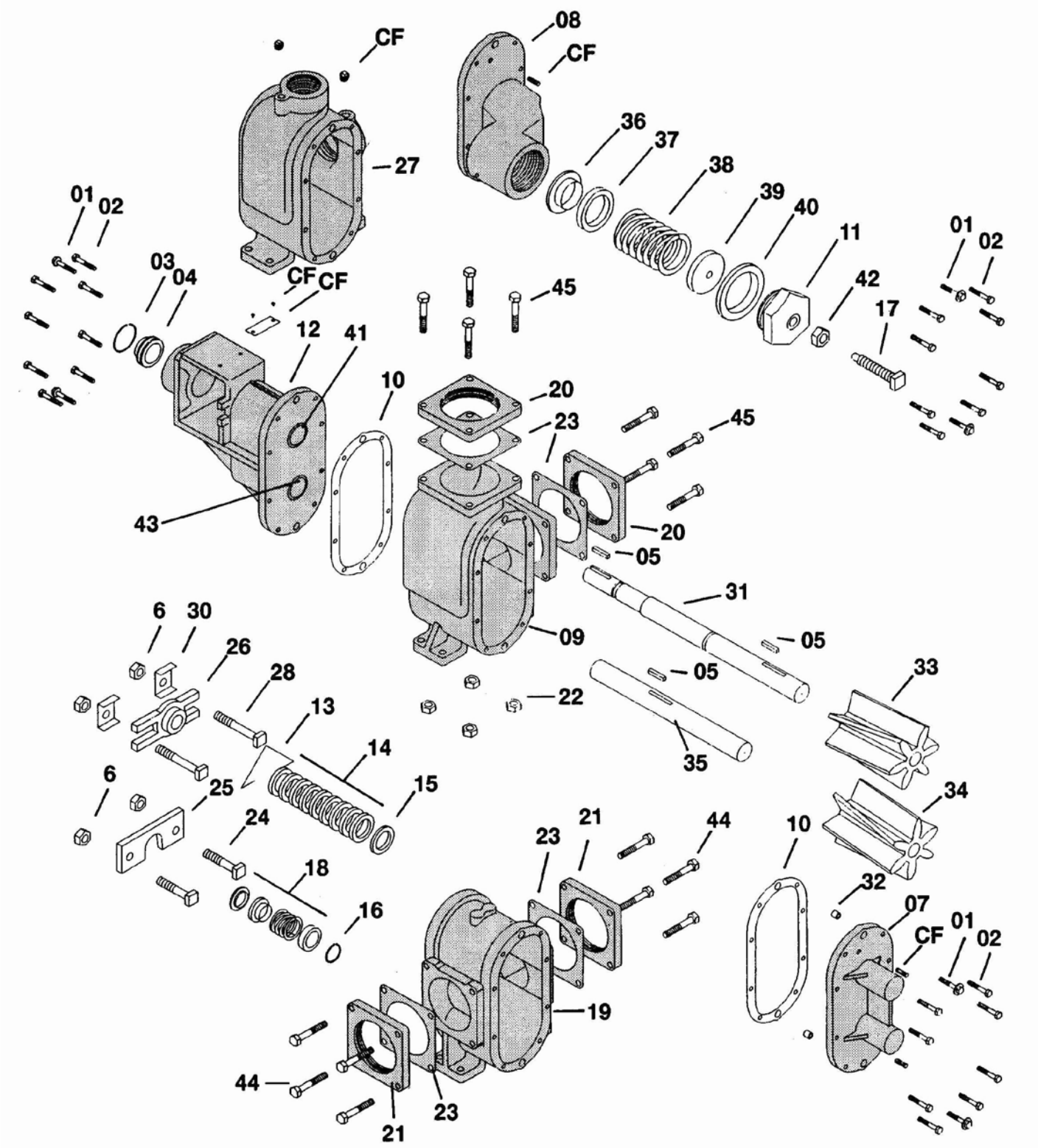
(b) To replace packing, remove two bolts, clips, spring clip and packing gland. Packing hooks are available to remove used packing rings. Clean the shaft and gland. Examine the shaft. If it is worn or scored replace the shaft.

(c) Insert packing rings, making sure the joints are staggered 180 degrees. Each ring is the same, so it does not matter which order they are placed in the pump. Use split ring bushings or a flexible packing tamper to seat each ring before adding the next ring. DO NOT seat rings too tightly.

(d) Check shaft for free movement after rings are installed. Allow about 1/4" for entry of the packing gland. Then reassemble the packing gland, clips, bolts and nuts. Tighten each bolt evenly and DO NOT cock then packing gland. This will cause overheating and binding. Care must be taken not to over tighten the packing and score the shaft.

WARNING: NEVER WORK ON PACKING WHILE PUMP IS RUNNING

C. Illustrated Parts Breakdown



D. Parts Listing

22 SERIES QUAD SEAL KIT

HELICAL GEARS

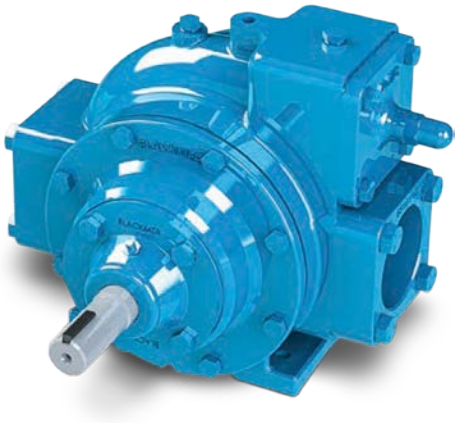
ITEM NO	PART NUMBER	DESCRIPTION
01	B63-038150	WASH HEAD CAP SCREW
02	B60-038100	HEX HEAD CAP SCREW
03	03S-205I	RETAINING RING INTERNAL
04	04C-100205	BALL BEARING
05	05C-252515	KEY STANDARD
06	N61-437	LOCK NUT
07	07C-01U	PLAIN REAR PLATE ASSY
08	08C-01R	RV REAR PLATE ASSY
09	09G-22U	CASE
10	10F-01U	GASKET CASE
10	10A-01U	GASKET CASE ALUMINIUM
11	11G-01U	PLUG CAP, RV
12	12C-01H	DRIVE PLATE ASSY
13	13C-01U	SPRING CLIP
14	14X-01U	PACKING SET TFE (STD)
14	14G-01U	PACKING SET GRAPHITE
14	14T-01U	PACKING SET PURE TFE
14	14D-01U	PACKING SET RANGER DSA
15	15C-01U	WASHER PACKING
16	03C-01U	RETAINING RING
17	B60-038200	RV SCREW ADJUST
18	18B-106175	MECH SEAL,BUNA-N
18	18V-106175	MECH SEAL,VITON
19	19G-22U	CASE,STRAIGHT
20	20G-NPT3	FLANGE, 3"STRAIGHT NPT
21	21G-22NPT4	FLANGE, STRAIGHT 4" (STD)
22	N60-063	NUT
23	23V-22U	GASKET, FLANGE
24	B40-044125	SQUARE HEAD BOLT
25	25C-01U	RETAINER PLATE, SEAL
26	26G-01U	PACKING GLAND
27	N/A	CASE, TAPPED
28	B40-044275	SQUARE HEAD BOLT
29	29G-90LK	FLANGE ELBOW 90 (229P)
29	29G-80SK	FLANGE ELBOW 90 (228P)
30	30C-01U	CLIP, PACKING GLAND
31	31C-22R	SHAFT, DRIVE
31	31S-22R	SHAFT, DRIVE SST
32	32C-01U	DOWEL PIN
33	33I-22U	GEAR, LH
34	34I-22U	GEAR, RH
35	35C-22U	SHAFT, IDLER
35	35S-22U	SHAFT, IDLER SST
36	36S-01U	RV POPPET / GUIDE SPRING
37	37C-01U	ADAPTER POPPET
37	37S-01U	ADAPTER POPPET SST
38	38C-01U	SPRING STANDARD
38	38S-01U	SPRING, SST
38	38C-01H	SPRING, HIGH PRESSURE
39	39C-01U	GUIDE SPRING
39	39S-01U	GUIDE SPRING, SST
40	40V-01U	GASKET, CAP RV
41	41C-01U	BUSHING, SHORT
42	N65-038S	NUT LOCK SEAL
43	43C-01U	BUSHING, LONG
44	B62-063175	HEX HD CAP SCREW
45	B62-063225	HEX HD CAP SCREW

E. Troubleshooting

NO LIQUID DELIVERED	1. Pump not primed. If the pump fails to deliver liquid after a minute, stop the pump and prime it by pouring some liquid into the discharge side of the pump 2. Rotating in the wrong direction 3. Inlet lift too high. Check this with gauge at pump inlet 4. Clogged inlet line 5. Air pockets or vapor lock 6. Air leaks in inlet line
INSUFFICIENT LIQUID DELIVERED	1. Air leaks in inlet line 2. Air leaks through packing or mechanical seal 3. Speed too slow 4. Excessive lift at inlet. Check this with a gauge at the pump inlet 5. The viscosity of liquid is too high for the size and length of inlet pipe 6. Foot valve or end of inlet pipe not immersed deeply enough in liquid 7. Foot valve, if used, too small, stuck, or not working properly. 8. Partial air pockets or vapor lock 9. Pump damaged by foreign matter or alignment
RAPID WEAR	1. Abrasives in liquid 2. Compatibility of liquid and pump material 3. Excessive pressure 4. Non-lubricating liquid 5. Pipe stress on pump 6. Excessive abrasives in liquid
EXCESSIVE NOISE	1. Starved pump 2. Air leaks in inlet line 3. Air or gases in liquid 4. Pump speed too high 5. Relief valve chatter. Check the pressure setting 6. Improper mounting. Check alignment thoroughly
PUMP TAKES TOO MUCH POWER	1. Speed too high 2. Liquid more viscous than previously anticipated 3. Operating pressure higher than specified. Check this with gauge at the pump outlet 4. Outlet line obstructed 5. Mechanical defects, such as bent shaft, packing gland too tight, or misalignment of piping 6. Relief valve not operating properly

MAINTENANCE - Blackmer Pump [TXDI3]

A. Introduction



TXDI Series Sliding Vane Pumps are durable pumps utilized for fast and quiet operation. The sliding vane design provides sustained performance and trouble-free operation. These pumps are equipped with FKM O-rings and Blackmer mechanical seals that are compatible with all biodiesel and ethanol blends. TXDI options include corrosion resistant relief valve, pneumatic relief valves and Buna or PTFE elastomers and seals.

Specifications [TXDI3]

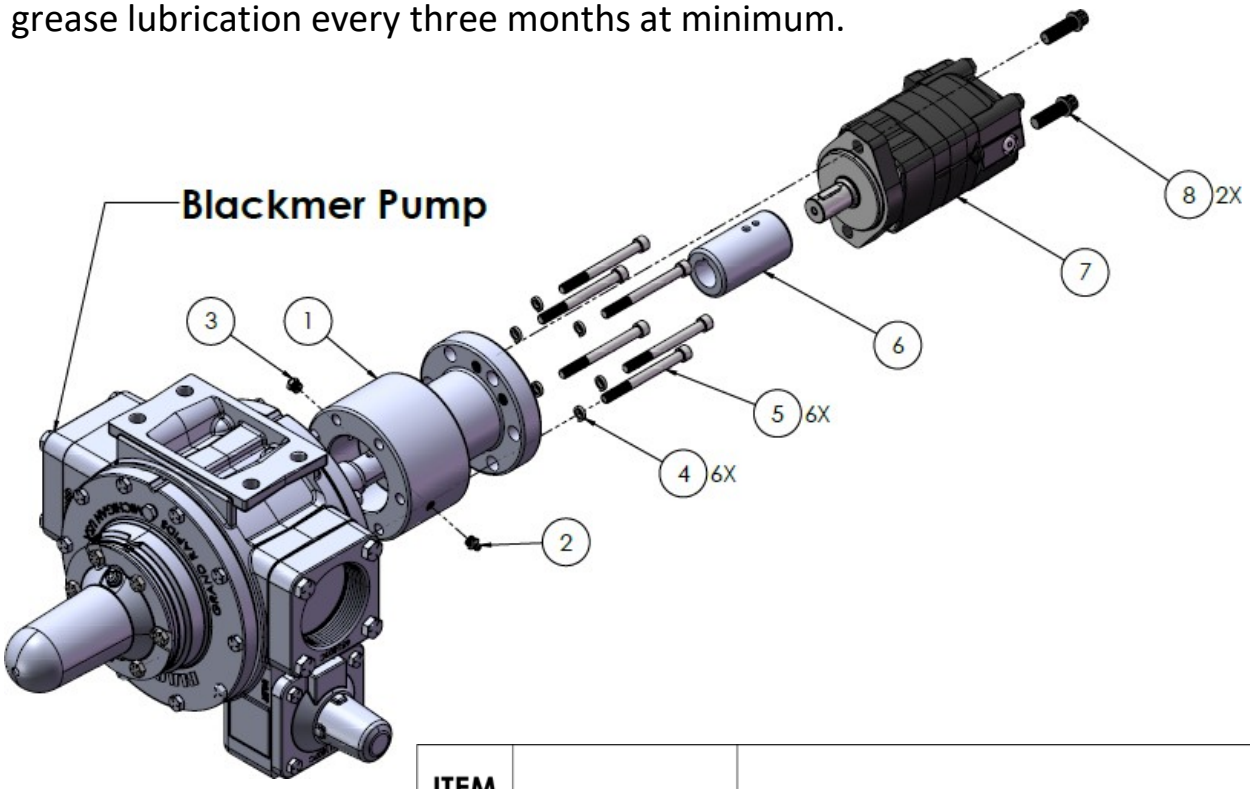
Nominal flow rate	: 270 GPM (1,022 L/min)
Differential pressure	: 125 PSI (8.6 bar)
Maximum working pressure	: 175 PSI (15.5 bar)
Viscosity	: 1.0 - 4250 cP
Material of construction	: Ductile Iron
Connection orientation	: Side Inlet | Side Outlet
Temperature	: -25°F to 240°F (-32°C to 115°C)
Min/Max Speed (RPM)	: 70 RPM- 640 RPM
Pump dimensions (L X W X H)	: 20.35" X 13.5" X 12.8"
Pump Weight	: 152 Lbs

Features and Benefits

- Double-ended drive shaft for either clockwise (RH) or counterclockwise (LH) rotation.
- External roller ball bearings support the rotor from both sides, creating a stable environment for the internal mechanical seals.
- Adjustable relief valve protects the pump against excessive pressures.
- Symmetrical bearing support assures even loading and wear for long life.
- T-type strainers are available to protect pumping systems from damage caused by welding slag and foreign matter in pumps and tanks.
- Excellent self-priming and dry-run capabilities.
- Easy maintenance: vanes can be easily replaced without removing the pump from the truck.

B: Hydraulic drive

Hydraulic motors need to be well supported with their shafts parallel to the pump shaft in all respects. Polar-Pac provides a close-coupled hydraulic motor adapter. The adapter provides for straight alignment of a hydraulic motor drive through a solid coupling connected to a straight key shaft. This coupling connection requires grease lubrication every three months at minimum.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	575010	6 BOLT ALUMINUM MOUNT	1
2	575020	DYNAFLO[REG] 1/8"-27 STRAIGHT STEEL ZINC GREASE FITTING WITH BALL CHECK	1
3	575022	1/8"NPT 1-5PSI STRAIGHT PRESSURE RELIEF ZERK ZINC	1
4	575026	3/8" LOCK WASHER HIGH COLLAR ZINC	6
5	575024	3/8"-16 X 4" BLACK OXIDE ALLOY STEEL SOCKET CAP SCREW	6
6	575007	SHAFT COUPLING, 1-1/8" TO 1"	1
7	8833	ORB HYD MOTOR	1
8	575028	1/2-20 X 1-1/2" 12 POINT PLAIN FINISH FLANGE SCREW	2

C: Maintenance

1) Strainers must be cleaned regularly to avoid pump starvation. Schedule will depend upon the application and conditions.
2) Lubricate the ball bearings, and hydraulic motor couplings (if equipped), every three months at a minimum.
3) If a seal has been leaking, the entire seal should be replaced.
4) Examine the discs (or heads) and rotor for wear. A few scratches or a lightly abraded area should not affect pump performance.
5) After a period of time, the vanes will wear. Change the vanes if they are worn unevenly or have raised projections on the wearing edge.
6) Take care in rebuilding your pump. When assembled, make sure you can rotate the shaft by hand. Grease the bearings immediately. Do not over-grease.
7) CHECK THE SYSTEM -After repair, the entire system (pump, piping, valves, meter, etc.) must be checked for leaks. DO NOT operate the system if leaks are present.

D: Relief Valve

1) The pump internal relief valve is designed to protect the pump from excessive pressure and must not be used as a system pressure control valve.
2) The relief valve pressure setting is marked on a metal tag attached to the valve cover. Generally, the relief valve should be set at least 15 - 20 psi (1.0 - 1.4 Bar) higher than the operating pressure, or the external bypass valve setting (if equipped).

DO NOT remove the R/V cap OR adjust the relief valve pressure setting while the pump is in operation.

1) To INCREASE the pressure setting, remove the relief valve cap, loosen the locknut, and turn the adjusting screw inward, or clockwise. Retighten the locknut and replace the valve cap.

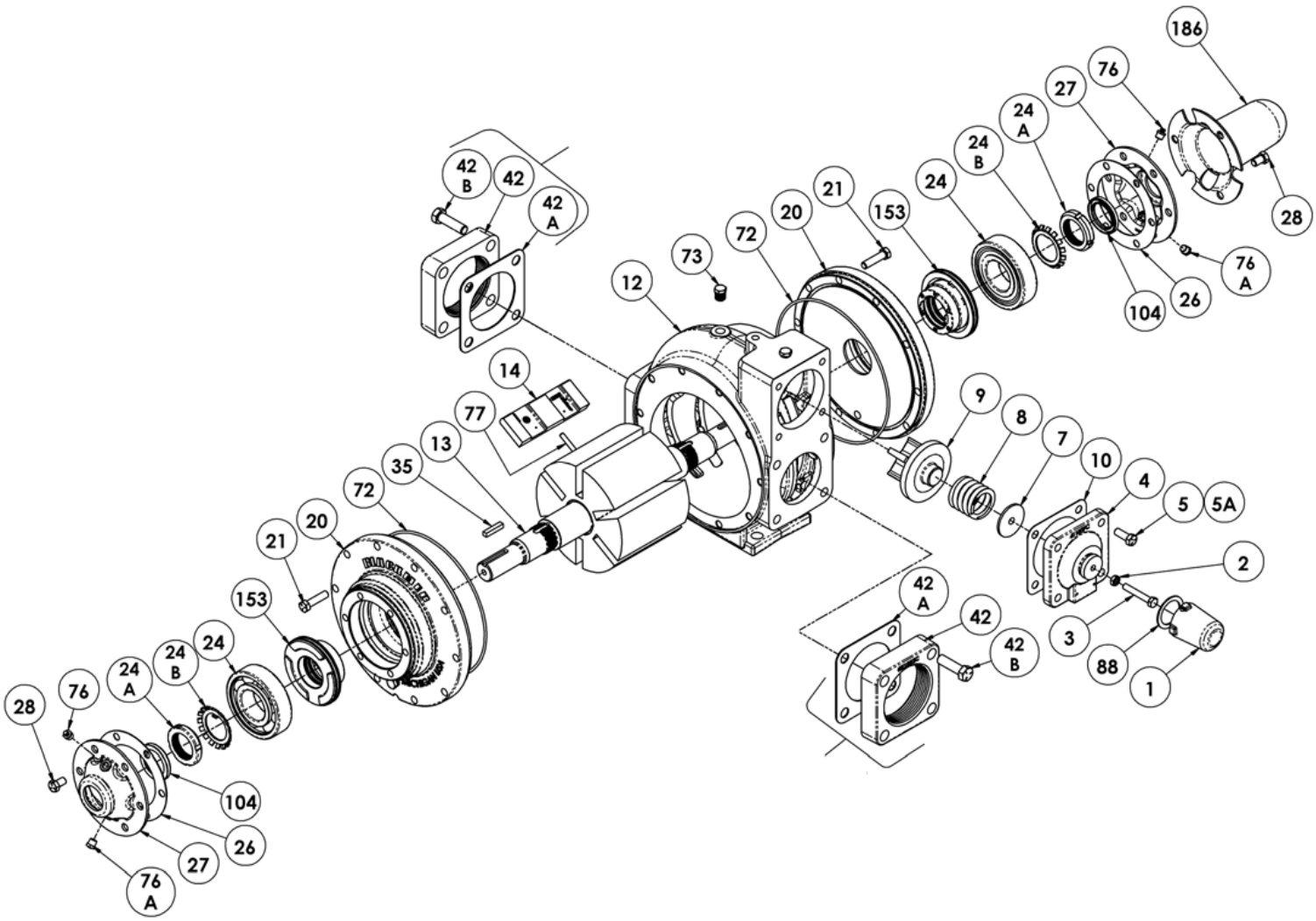
2) To DECREASE the pressure setting, remove the relief valve cap, loosen the locknut, and turn the adjusting screw outward, or counterclockwise. Retighten the locknut and replace the valve cap.

WARNING

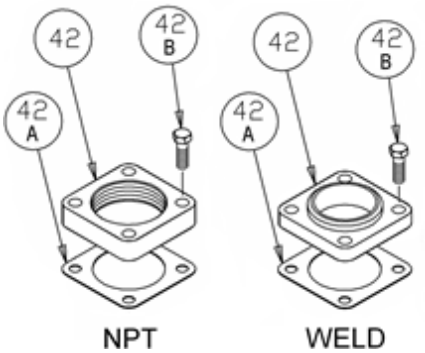
Relief valve cap is exposed to pumpage and will contain some fluid

Hazardous or toxic fluids can cause serious injury.

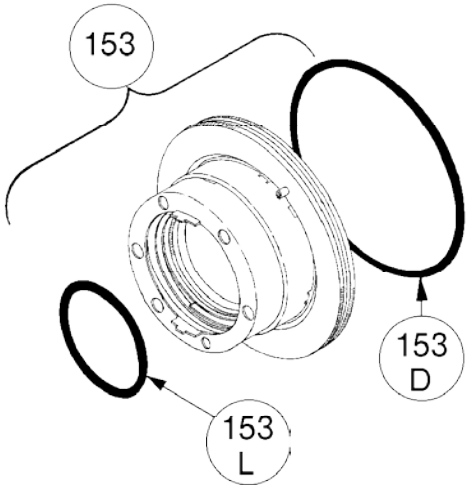
E: Illustrated break-down (BLACKMER PUMP)



FLANGES



MECHANICAL SEALS



F: Parts list (BLACKMER PUMP)

ITEM NO	PART NUMBER	DESCRIPTION	QTY
1	413957	Cap – Relief Valve (R/V)	1
2	431808	Adjusting Screw – R/V	1
3	922923	Locknut – Adjusting Screw	1
4	411807	Cover – R/V	1
5	920331	Capscrew – R/V Cover	3
5A	920330	Capscrew w / Hole – R/V Cover	1
7	421805	Spring Guide – R/V	1
8	471806	8 Spring – R/V (51-75 & 76-110 psi) (Std.)	1
8	471809	Spring – R/V (111-125 psi)	1
9	451807	Valve - R/V 3	1
9	451808	Valve - R/V (Nickel Plated)	1
10	531803	Gasket – R/V Cover	1
12	021835	Cylinder	1
13	261837	Rotor & Shaft Asy. - Double Ended 2	1
14	091819	Vane – Duravane	6
20	031815	Head	2
21	920369	Capscrews – Head	20
24	903172	Ball Bearing	2
24A	903523	Locknut – Bearing	2
24B	903524	Lockwasher - Bearing	2
26	381817	Gasket – Bearing Cover	2
27	041815	Bearing Cover	2
28	920285	Capscrews – Bearing Cover	12
35	909178	Key – Shaft	1
72	711938	O-Ring - Head (FKM)	2
72	701944	O-Ring - Head (Buna-N)	2
73	908198	Gage Plug	2
76	317815	Grease Fitting	2
76A	701992	Grease Relief Fitting	2
77	121807	Push Rod	3
88	533908	Gasket - R/V Cap	1
104	331908	Grease Seal	2
186	341801	Shaft Protector	1
153	331883	Cast Iron Stationary Seat, FKM O-Rings, Carbon Seal Face. (IVCV)	2
153	331880	Cast Iron Stationary Seat, Carbon Seal Face, Buna-N O-Rings. (INCN)	2
153D	711931	O-Ring - Stationary (FKM)	2
153D	701936	O-Ring - Stationary (Buna-N)	2
153L	701962	O-Ring - Rotating (FKM)	2
153L	711912	O-Ring - Rotating (Buna-N)	2
42	651803	Flange – 3" NPT	1-2
42	655102	Flange – 3" Weld	1-2
42A	381816	Gasket – Flange, NPT and Weld	0-2
42B	920532	Capscrews – NPT Flange	4-8
42B	920510	Capscrews – Weld Flange	4-8
	903091	Tool-Locknut	
	898958	Maintenance Kit, FKM	
	898952	Maintenance Kit, Buna-N	

G: Trouble Shooting

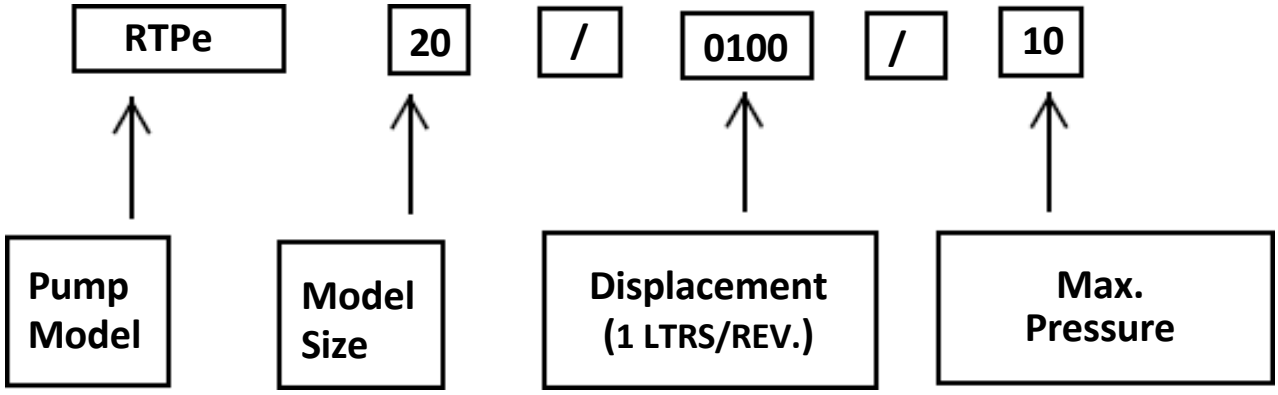
Pump Not Priming	1) Pump not wetted 2) Worn vanes 3) Suction valve closed 4) Air leaks in the suction line 5) Strainer clogged 6) Pump speed too low for priming
Reduced Capacity	1) Pump speed too low 2) Suction valves not fully open 3) Air leaks in the suction line 4) Excessive restriction in the suction line 5) Damaged or worn parts. 6) Relief Valve worn, set too low, or not seating properly
Noise	1) Excessive vacuum on the pump due to pump too far from fluid source 2) Pump not securely mounted 3) Bearings worn or damaged 4) Running the pump for extended periods with a closed discharge line
Damaged Vanes	1) Foreign objects entering the pump 2) Running the pump dry for extended periods of time 3) Cavitation 4) Viscosity too high for the vanes and /or the pump speed 5) Incompatibility with the liquids pumped 6) Excessive heat
Broken Shaft	1) Foreign objects entering the pump 2) Viscosity too high for the pump speed 3) Relief valve not opening 4) Hydraulic hammer - pressure spikes 5) Pump/driver misalignment 6) Settled or solidified material in the pump at start-up
Mechanical Seal Leakage	1) O-rings not compatible with the liquids pumped 2) O-rings nicked, cut or twisted 3) Shaft at seal area damaged, worn or dirty 4) Ball bearings over greased 5) Excessive cavitation 6) Mechanical seal faces cracked, scratched, pitted or dirty

MAINTENANCE Viking Pump [RTPe20]

A. Introduction

For too long, cast iron pumps have compromised the integrity of chemicals carried in stainless steel road tankers. The RTPe20, designed specifically for the chemical transport industry, the RTPe stainless steel pump delivers that essential missing component. Better yet, it provides a cost-effective solution to this problem in both speed and reliability, the RTPe incorporates all the features your chemical tanker needs.

Pump Model Designation



Specifications [RTPe20]

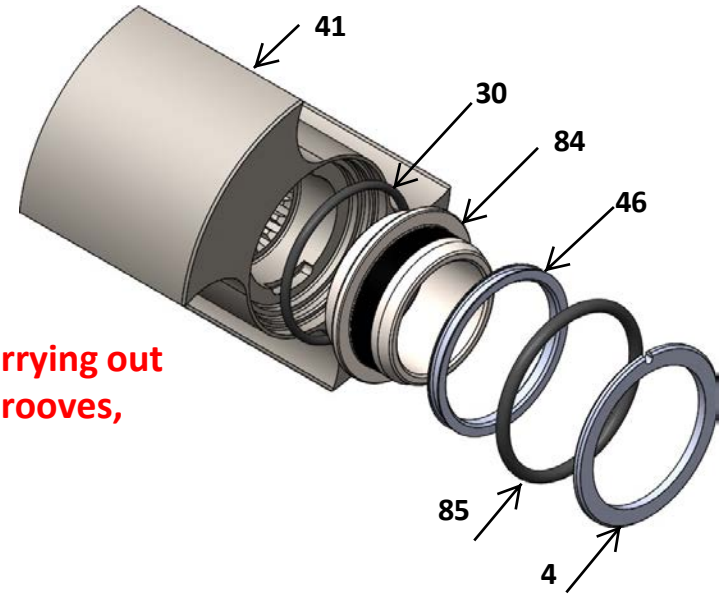
Capacity	:	1,000 Litre/min (or) 264 GPM
Max Pressure	:	10 bar (or) 145psi
Viscosity	:	200,000 cSt (or) 910,000 SSU
Max Temperature	:	110°C (or) 230°F
Max Speed	:	1000 rpm
Nominal Connection Size	:	3" (or) 75mm
Material of Construction	:	316L stainless steel wet end construction
Sealing	:	Mechanical seals and dry-run capable composite O-ring seals

Features and Benefits

- Wide range of chemical compatibility.
- Efficiently handles both low and high viscosity liquids with improved pressure capabilities for faster loading and unloading.
- Excellent displacement/weight ratios, which means more in the tank and less in the cabinet (1 l/rev./ 0.264 USG/rev).
- Precision helical gears, rotors and shaft design, with optimized bearing position, minimize overhung load – extending seal & bearing life.
- The simple design behind the rotor makes strip cleaning easy and fast.
- Innovative front loading seal design enables quick inspection and easy servicing.

B. Sealing

1) Composite O-ring Seal
2) Mechanical Seal



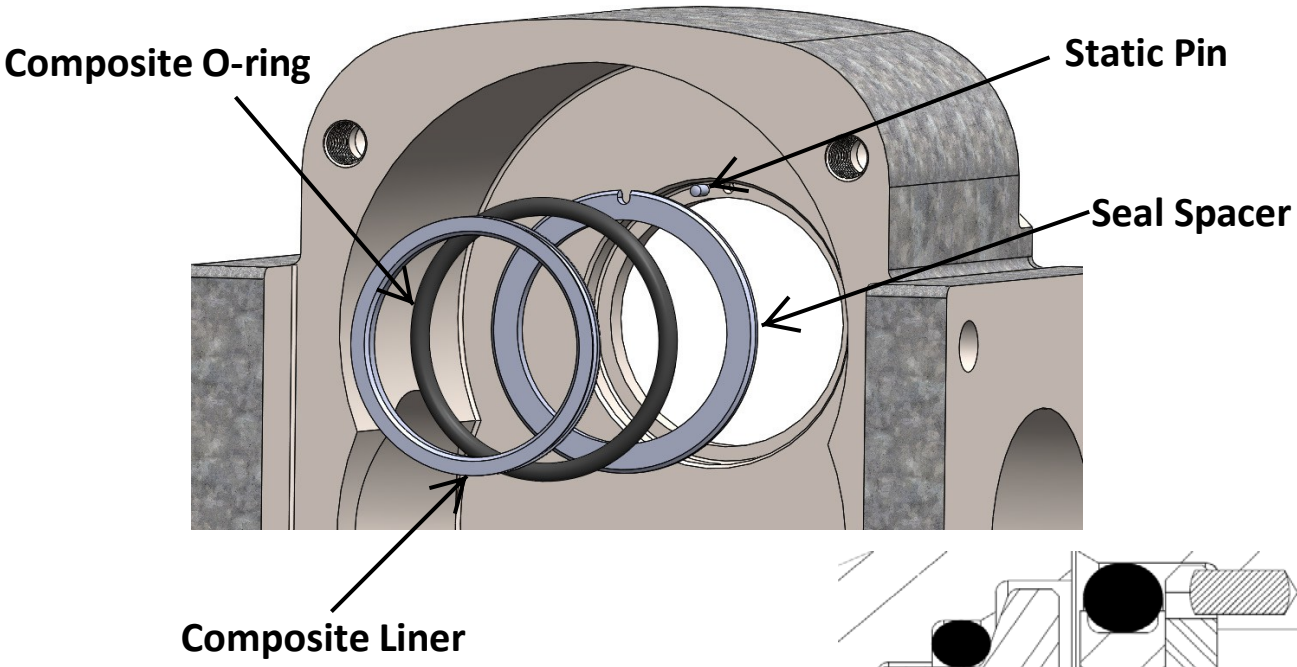
1) Composite O-ring Seal

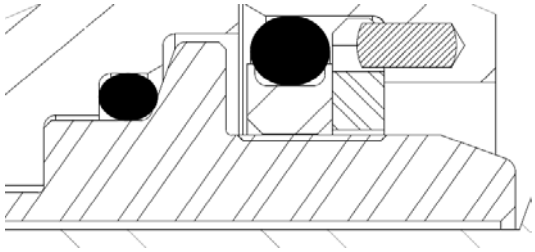
Note: Extreme care should be taken when carrying out these procedures to ensure that the O-ring grooves, sleeve faces, and O-ring are not damaged

Removal and installation

- Remove the front cover screws, front cover, rotor retainer and rotor.
- The composite O-ring & seal sleeve in the rotor are now ready for inspection and replacement if needed.
- During inspection of the sleeve, do not remove the black film of PTFE on the sleeve. This is part of the composite sealing during running.
- To remove the rotor sleeve, pull the sleeve out from the rotor.
- To remove the composite O-ring seal, push the seal spacer from the rear of rotor case through the bore using the seal extractor tool.

- The sleeve and composite O-ring can now be inspected and replaced if needed.
- To install the sleeve, make sure the sleeve O-ring is placed in the rotor and the location of the two drive dogs lines up. Install the static pin using Loctite, then place seal spacer ensuring the slot and pin are in line. Fit composite O-ring to the liner and use lubricate on the outside O-ring then install composite seal into seal bore ensuring the seal is pushed against the spacer.

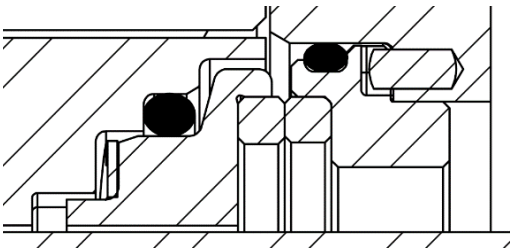




- To install the rotors, see the rotor clearance chart.

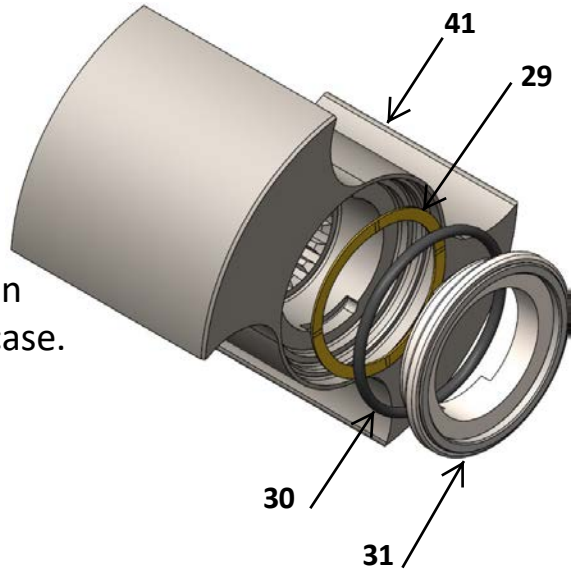
2) Mechanical Seal

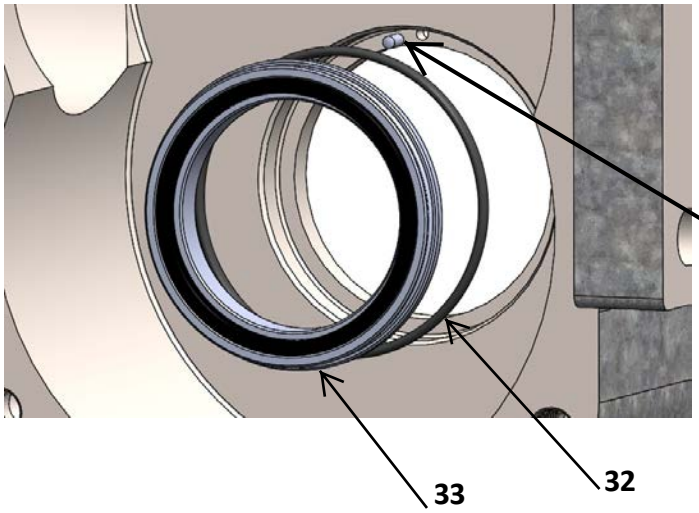
Note: Extreme care should be taken when carrying out these procedures to ensure that the O-ring grooves, sleeve faces, and O-ring are not damaged



- Remove the front cover screws, front cover, rotor retainer and rotor.
- Remove the rotary seal face and inspect or replace the O-rings as required. When installing the seal face ensure correct engagement of the two drive dogs.

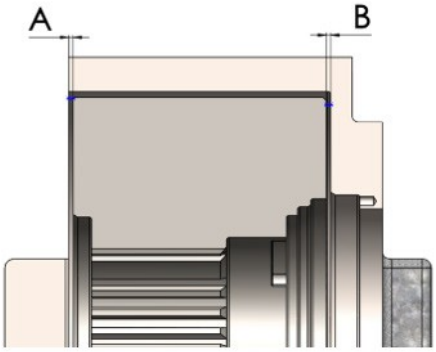
- Remove the static seal face pushing on the rear of the static seal and inspect or replace the O-rings as required using the seal extractor tool.
- Install the static pin using Loctite, when installing the static face into the rotorcase make sure that the slot in the static face lines up with the static pin in the rotorcase.

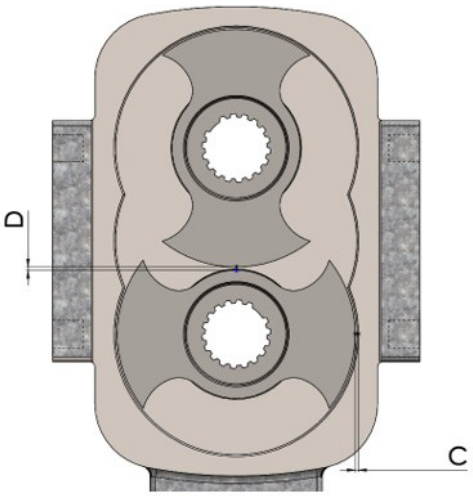




- To install the rotors, see the rotor clearance chart.

Clearance Chart



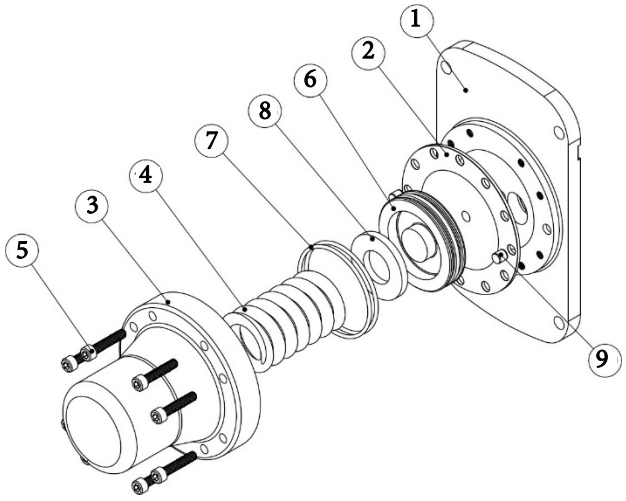


		A		B		C		D
		Min	Max	Min	Max	Min	Max	Max
RTPe20	Millimetres	0.48	0.6	0.2	0.5	0.45	0.65	0.15
	Inches	0.019	0.024	0.008	0.020	0.018	0.026	0.006

Relief Valve

Integral pressure relief valves are normally used to protect the pump from the effects of increases in system pressure caused, for example, by a restricted or closed discharge line. In response to a pressure increase, the valve opens and internally circulates the pumped media within the pump chamber.

ITEM NUMBER	DESCRIPTION
1	RV FRONT COVER
2	DIAPHRAGM
3	SPRING HOUSING
4	SPRING
5	SCREW
6	VALVE HEAD
7	O-RING
8	SPACER
9	DOWEL



C: Maintenance

1) GREASE - Check for any signs of lubricant leakage on startup.
Check for any signs of overheating.
Low maintenance gearbox, factory filled with EP 00 semi-fluid grease. The grease should not require replacement during the lifetime of the bearings or until 14,000 hours of operation.

2) Oil - Check oil levels on startup.
Check for any signs of overheating.
Change the oil every 6 months or 1500 operating hours, whichever is the sooner.

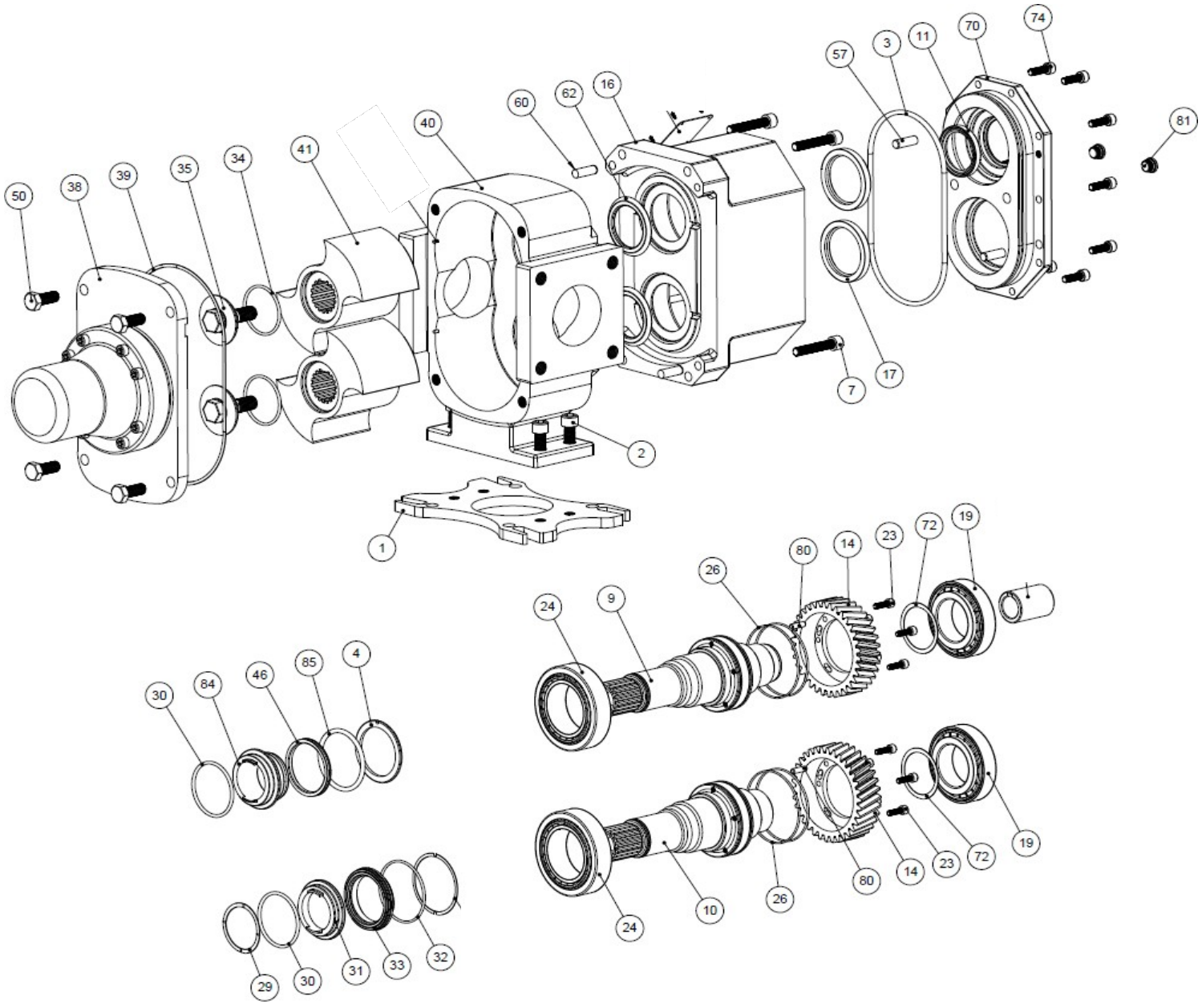
3) Seal Replacement -

It is recommended that the rotor retainer O-ring seal is replaced every 12 months to maintain a bacteria-tight seal.

4) Rotor Retainer Seal Inspection -

Periodically inspect the rotor retainer O-ring seal for any discoloration, nicks, or cracks. If any of the defects above are noticed, the O-ring seal must be replaced.

D: Illustrated Break-Down (VIKING PUMP)



E: Parts List (VIKING PUMP)

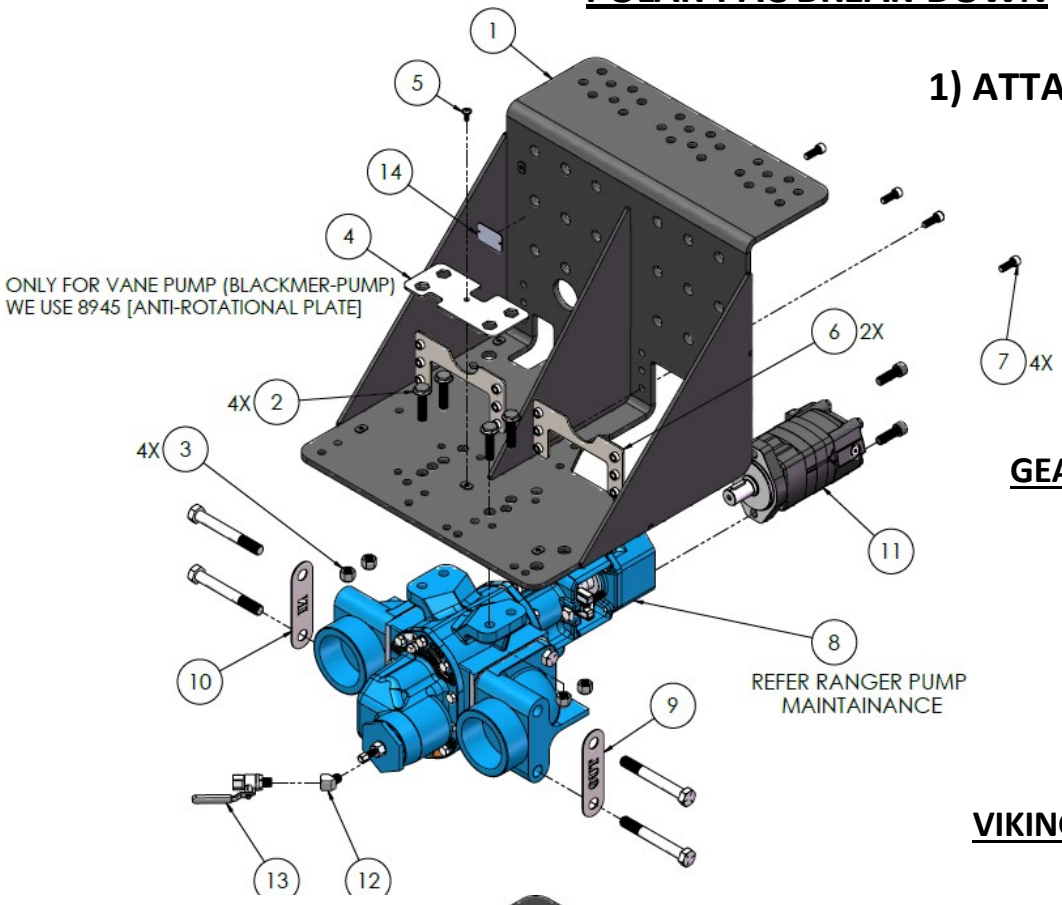
ITEM NO	DESCRIPTION
1	ADPATER PLATE
2	CAP SCREWS
3	O-RINGS
4	SEAL SPACER
7	SCREW
9	SHAFT
10	SHAFT
11	REAR LIP-SEAL
14	TIMING GEAR
16	GEAR BOX
17	FRONT LIP-SEALS
19	REAR BEARING
23	TIMING GEAR SCREWS
24	FRONT BEARING
26	O-RINGS
29	WAVE SPRING
30	SLEEVE O-RINGS
31	ROTARY SEAL FACE
32	O-RING
33	STATIC SEAL FACE
34	RETAINER O-RING
35	ROTOR RETAINER
38	FRONT COVER
39	FRONT COVER O-RING
40	ROTOR CASE
41	ROTORS
46	COMPOSITE LINER
50	FRONT COVER BOLTS
57	DOWELS
60	DOWELS
62	GAMMA SEAL
70	END PLATE
72	BEARING PRE-LOAD SHIMS
74	SCREWS
80	LOCATING DOWEL
81	DRAIN PLUG
84	SLEEVE
85	COMPOSITE O-RING

F: TROUBLE-SHOOTING

PROBLEM	CAUSE	ACTION
NO FLOW	INCORRECT DIRECTION OF ROTATION	REVERSE MOTOR
	PUMP NOT PRIMED	EXPEL GAS FROM SUCTION LINE PUMP
	INSUFFICIENT NPSH AVAILABLE	SIMPLIFY SUCTION & REDUCE LENGTH
	GAS IN SUCTION LINE	EXPEL GAS FROM SUCTION LINE
IRREGULAR FLOW	INSUFFICIENT NPSH AVAILABLE	EXPEL GAS FROM SUCTION LINE PUMP
	AIR ENTERING SUCTION LINE	REMAKE PIPEWORK JOINTS
	GAS IN SUCTION LINE	EXPEL GAS FROM SUCTION LINE
	INSUFFICIENT STATIC SUCTION HEAD	RAISE PRODUCT LEVEL TO INCREASE STATIC SUCTION HEAD
UNDER CAPACITY	PRODUCT VISCOSITY TOO LOW	INCREASE PUMP SPEED
	AIR ENTERING SUCTION LINE	REMAKE PIPEWORK JOINTS
	PRODUCT TEMPERATURE TOO HIGH	COOL PRODUCT
	INSUFFICIENT STATIC SUCTION HEAD	RAISE PRODUCT LEVEL TO INCREASE STATIC SUCTION HEAD
PUMP OVERHEAT	PROCUT VISCOSITY TOO HIGH	DECREASE PUMP SPEED
	DISCHARGE PRESSURE TOO HIGH	CHECK FOR BLOCKAGES
	PRODUCT TEMPERATURE TOO HIGH	COOL PRODUCT
	ROTORCASE STRAINED BY PIPEWORK	CHECK PIPE ALIGNMENT
MOTOR OVERHEAT	PRODUCT VISCOSITY TOO HIGH	DECREASE PUMP SPEED
	PRODUCT TEMPERATURE TOO LOW	HEAT PRODUCT
	DISCHARGE PRESSURE TOO HIGH	CHECK FOR BLOCKAGES
	PUMP SPEED TOO HIGH	DECREASE PUMP SPEED
PUMP STALLS ONSTART UP	PRODUCT VISCOSITY TOO HIGH	DECREASE PUMP SPEED
	PRODUCT TEMPERATURE TOO HIGH	COOL PRODUCT
	PRODUCT TEMPERATURE TOO LOW	HEAT PRODUCT
	DISCHARGE PRESS TOO HIGH	CHECK FOR BLOCKAGES
NOISE/ VIBRATION	INSUFFICIENT NPSH AVAILABLE	EXPEL GAS FROM SUCTION LINE PUMP
	AIR ENTERING SUCTION LINE	REMAKE PIPEWORK JOINTS
	GAS IN SUCTION LINE	EXPEL GAS FROM SUCTION LINE
	INSUFFICIENT STATIC SUCTION HEAD	RAISE PRODUCT LEVEL TO INCREASE STATIC SUCTION HEAD
EXCESSIVE SEAL WEAR	UNEXPECTED SOLIDS IN PRODUCT	CLEAN SYSTEM
	SEAL FLUSH INADEQUATE	INCR SEAL FLUSH TO REQD PRESSURE
	BEARING/ TIMING GEAR WEAR	REPLACE WORN COMPONENTS

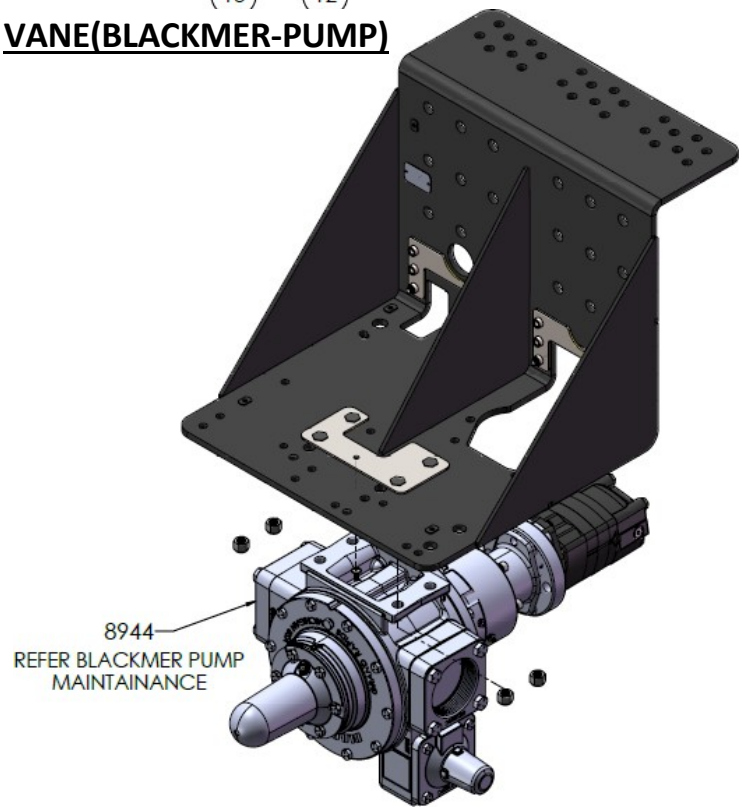
POLAR-PAC BREAK-DOWN

1) ATTACH PUMP TO BRACKET

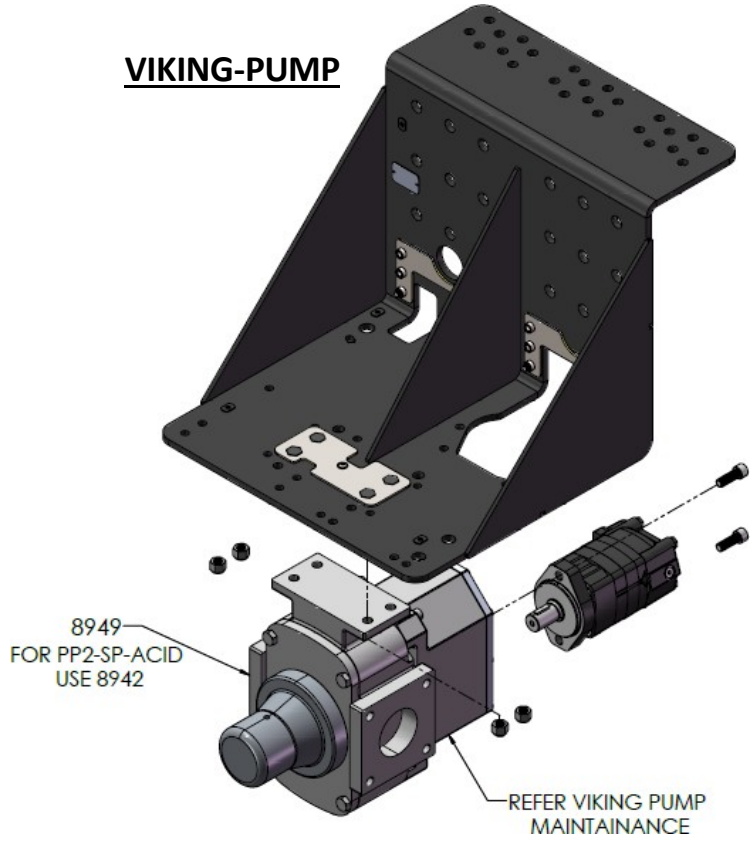


GEAR-PUMP

VANE(BLACKMER-PUMP)



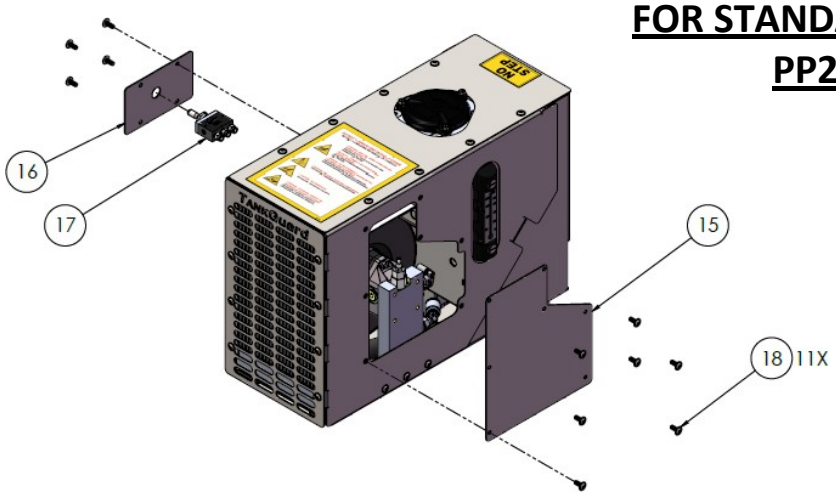
VIKING-PUMP

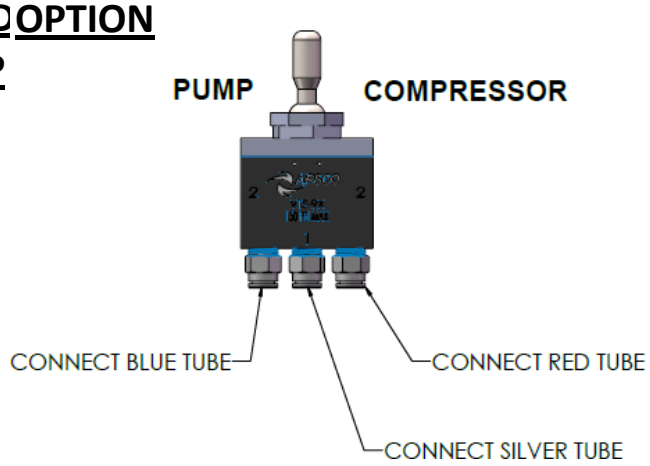


2) ATTACH SIDE PANEL ASSY TO COOLER

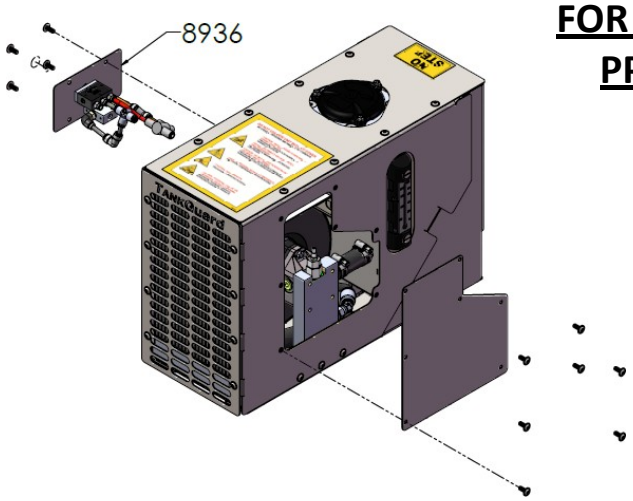
VTS-9X

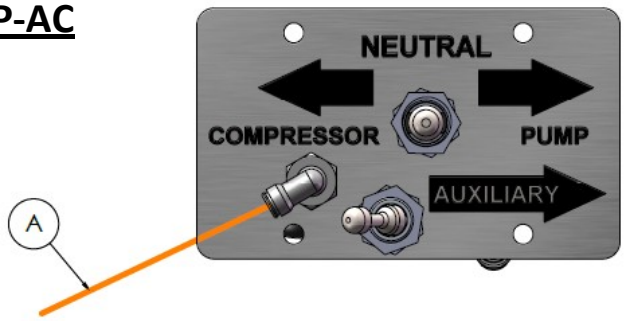
FOR STANDARD OPTION
PP2-GP



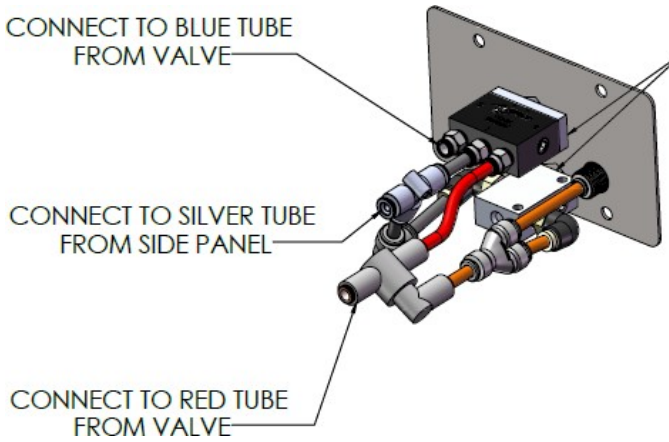


FOR AC OPTION
PP2-GP-AC



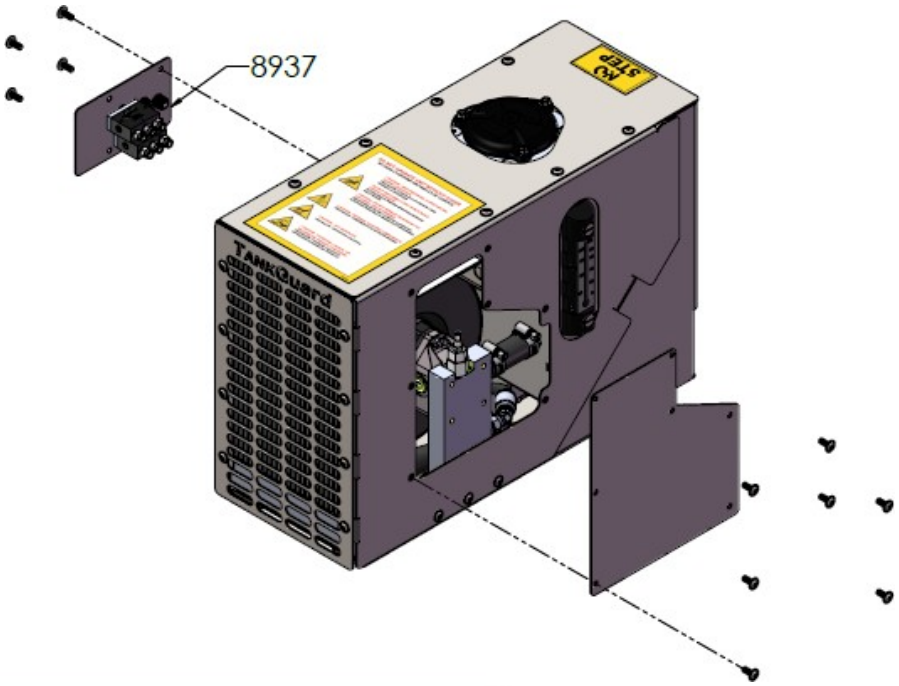


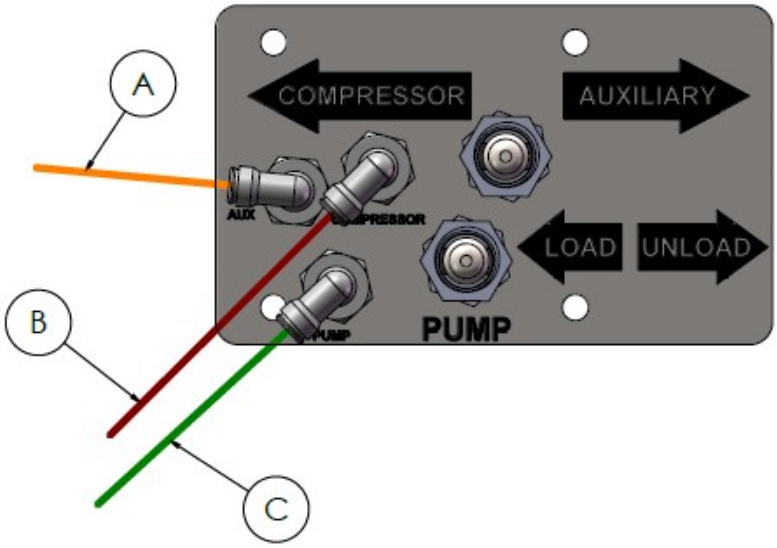
TUBING					
LETTER	PART NUMBER	LENGTH	UNIT	QTY	DESCRIPTION
A	1707-OR	24	INCHES	1	TUBE 1/4 DOT ORANGE



8936

FOR REVERSIBLE PUMP OPTION
PP2-GP-AC-R

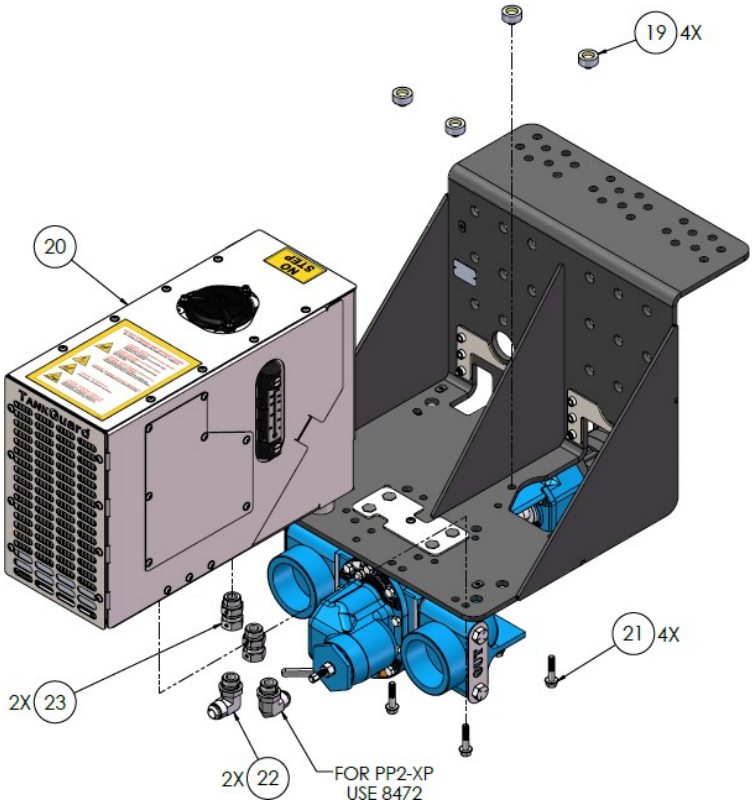




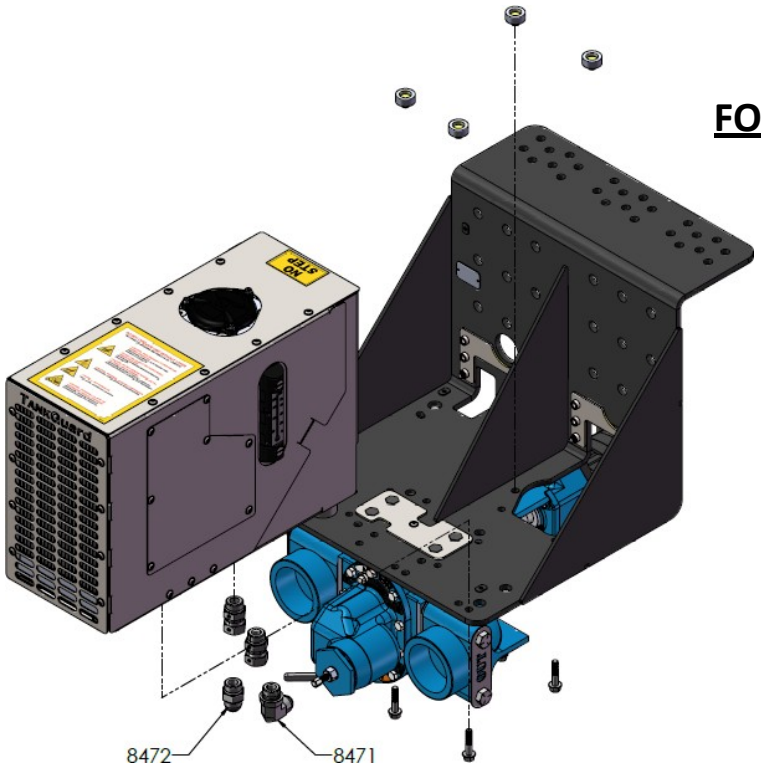
8937

TUBING					
LETTER	PART NUMBER	LENGTH	UNIT	QUANTITY	DESCRIPTION
A	1707-OR	29	INCHES	1	TUBE 1/4 DOT ORANGE
B	1707-BR	34	INCHES	1	TUBE 1/4 DOT BROWN
C	1707-GN	38.75	INCHES	1	TUBE 1/4 DOT GREEN

3) ATTACH TGHC20-DV TO BRACKET



FOR STANDARD OPTION
PP2-GP

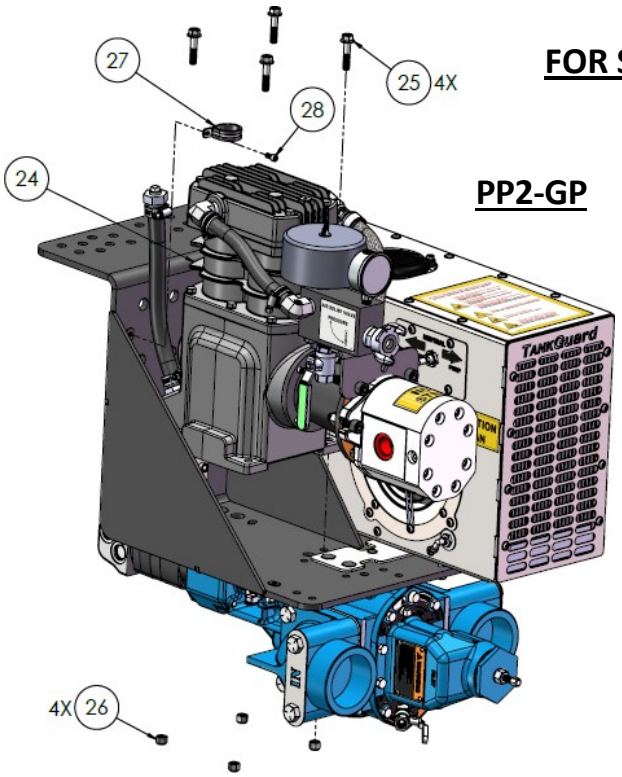


FOR AC & REVERSIBLE PUMP OPTION
PP2-GP-AC & PP2-GP-AC-R

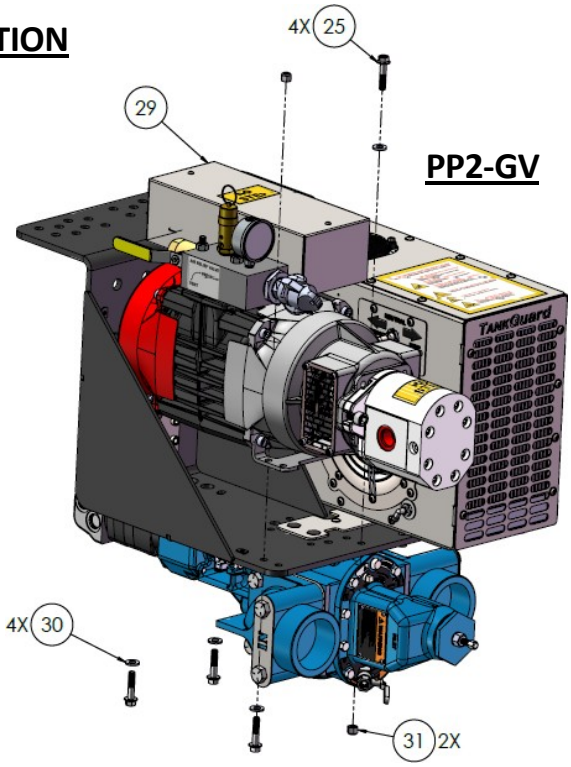
4) ATTACH SS5 TO BRACKET

ATTACH SV200 TO BRACKET

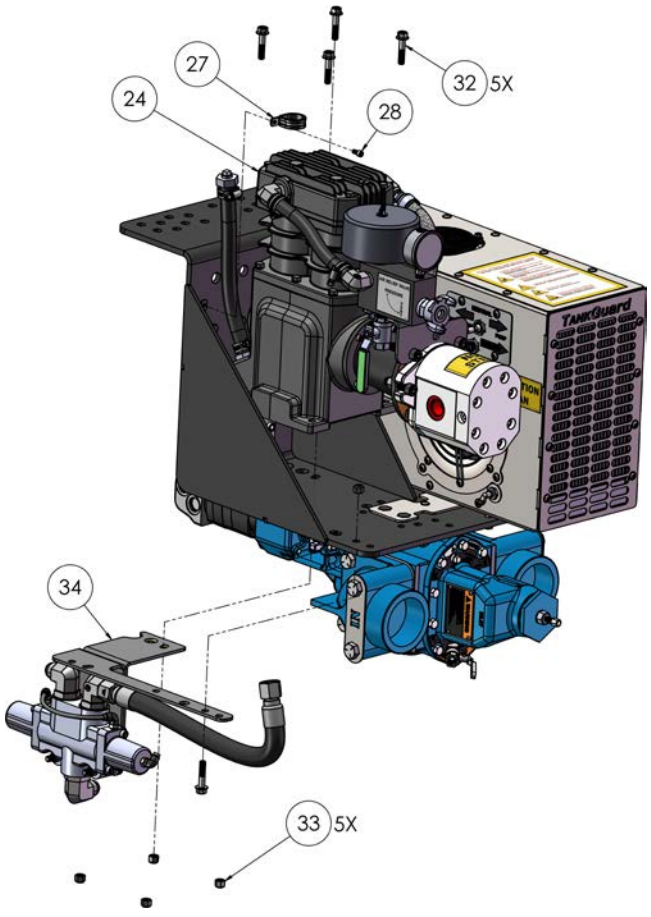
FOR STANDARD OPTION



PP2-GP

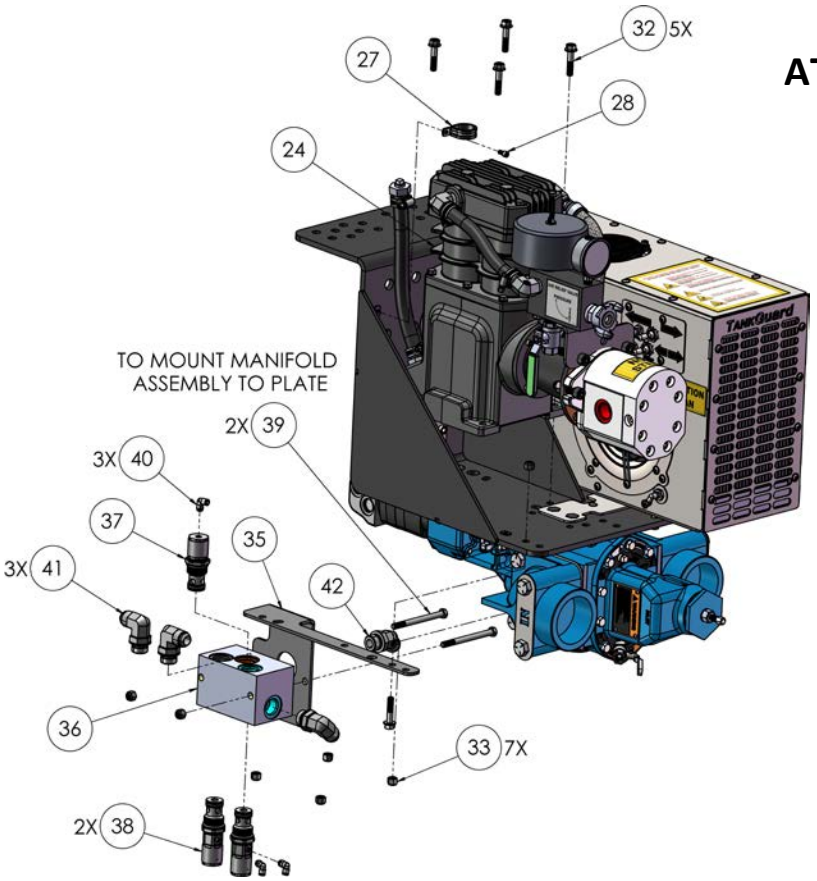


PP2-GV



ATTACH SS5 AND SELECTOR VALVE TO BRACKET

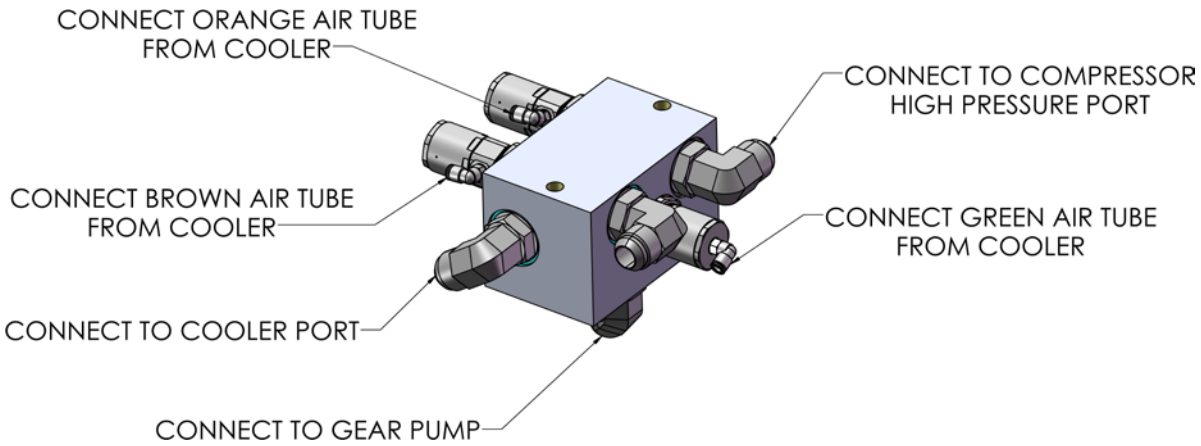
FOR AC OPTION
PP2-GP-AC



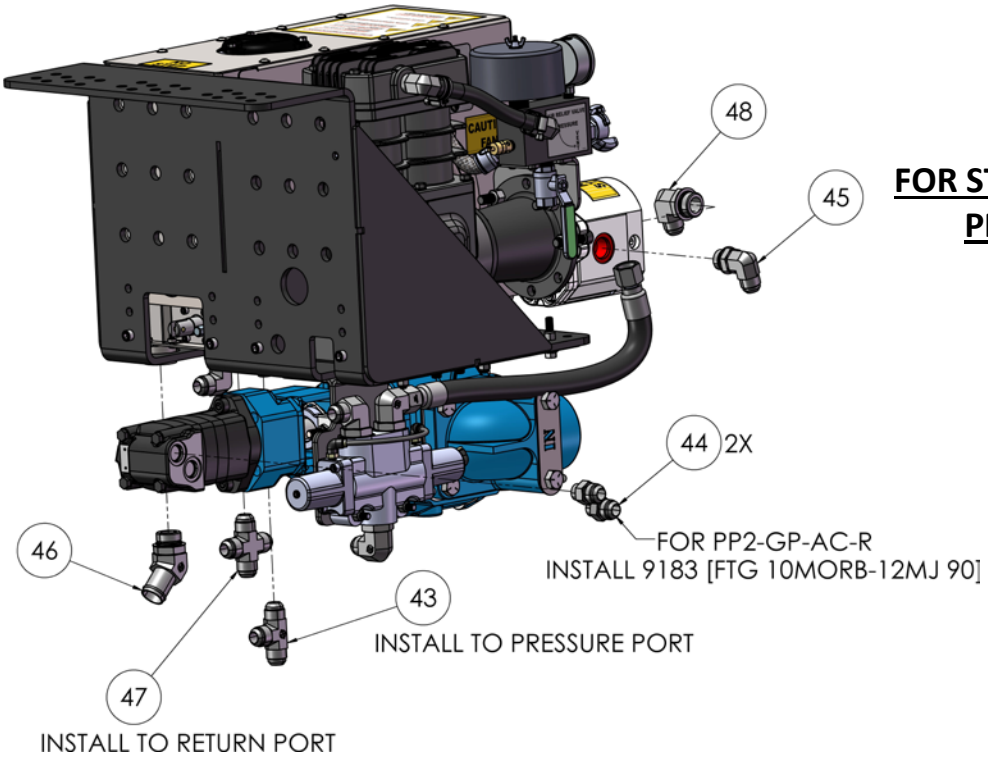
ATTACH SS5 AND MANIFOLD ASSEMBLY TO BRACKET

FOR REVERSIBLE PUMP OPTION PP2-GP-AC-R

MANIFOLD ASSEMBLY

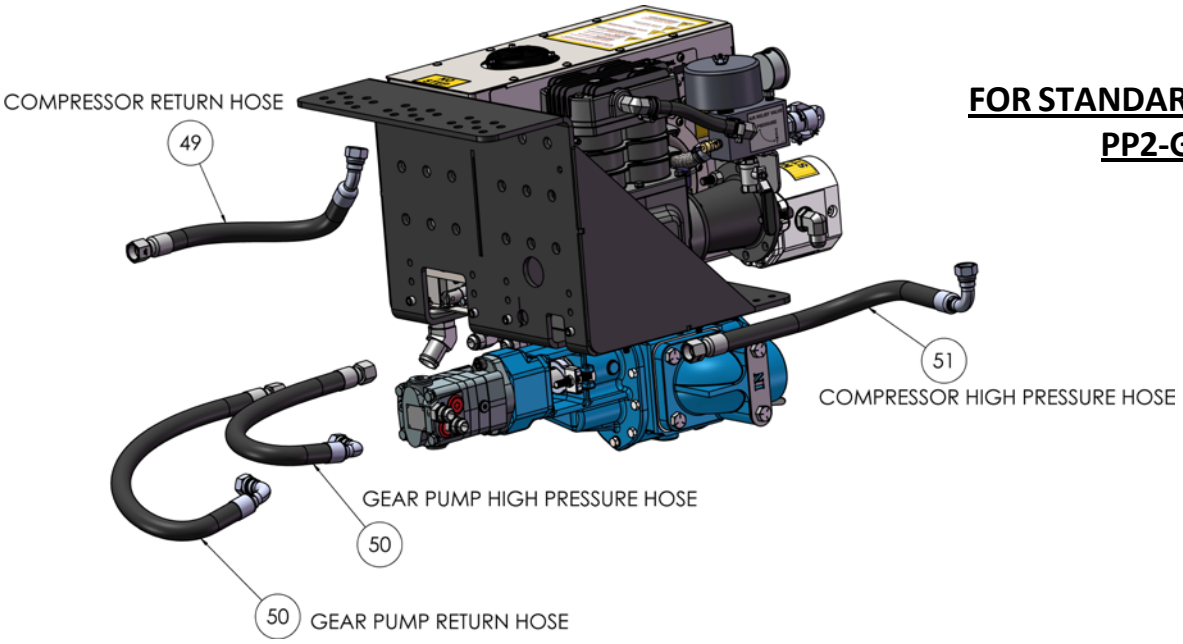


5) INSTALL FITTINGS



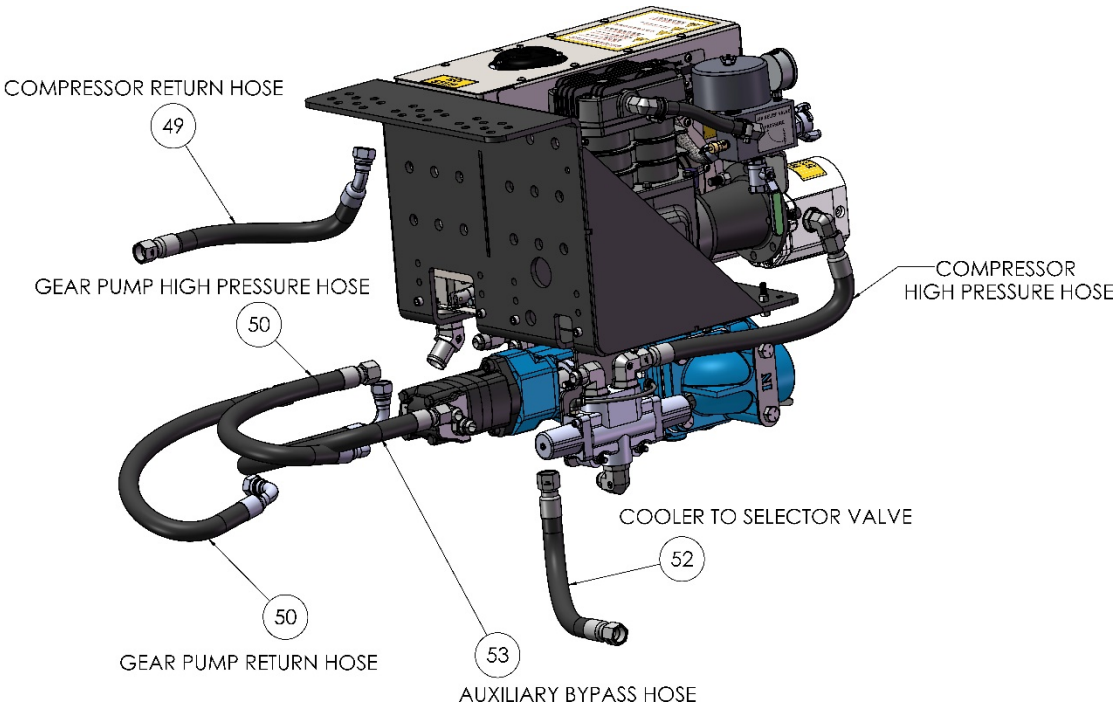
FOR STANDARD & AC OPTION
PP2-GP & PP2-GP-AC

6) INSTALL HOSES

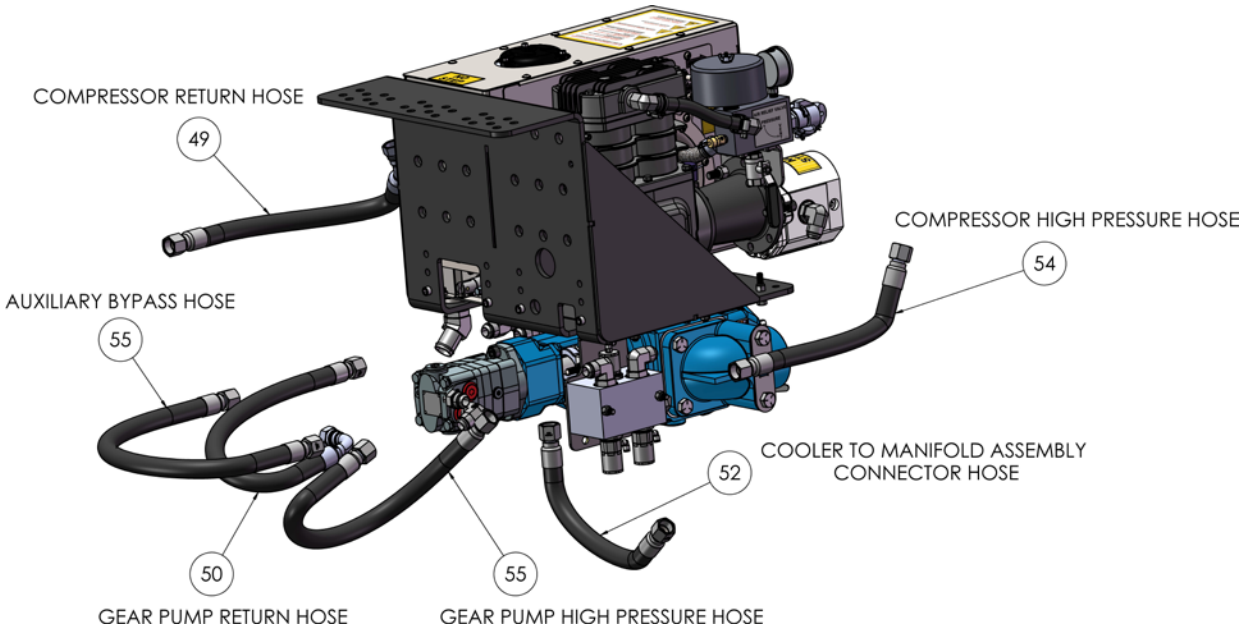


FOR STANDARD OPTION
PP2-GP

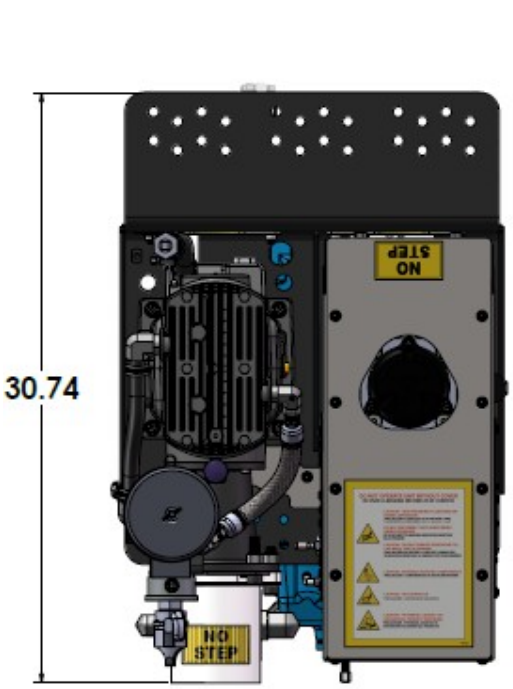
FOR AC OPTION
PP2-GP-AC

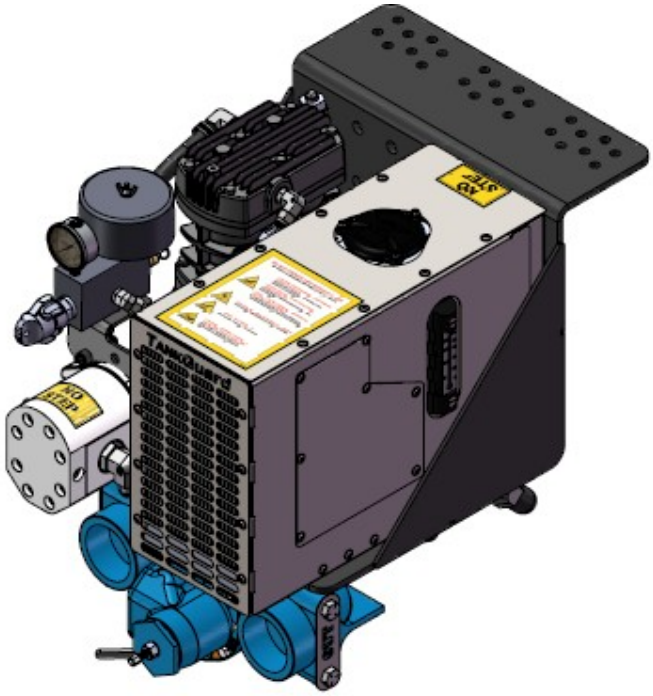


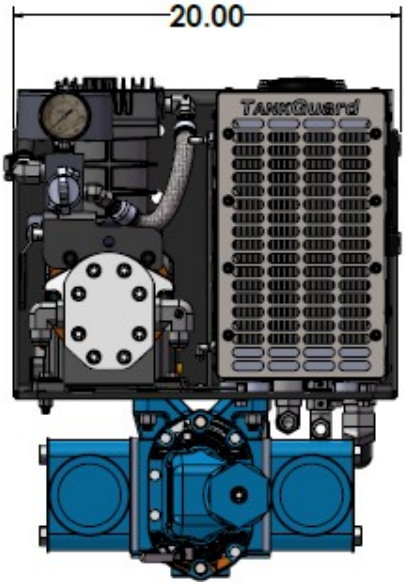
FOR REVERSIBLE PUMP OPTION
PP2-GP-AC-R

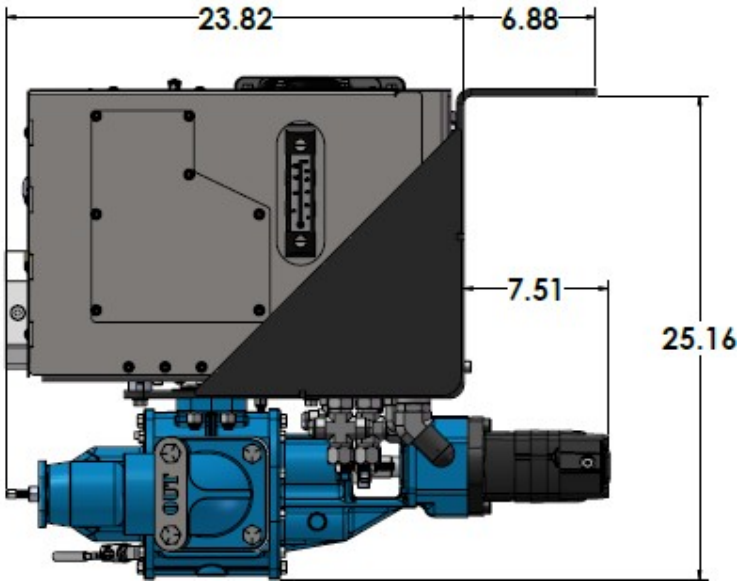


POLAR-PAC DIMENSTIONAL DATA









POLAR-PAC PARTS LIST

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	8810	BRACKET, POLAR PAC	1
2	8173	FLANGE BOLT, 1/2-20	4
3	7714	1/2-20 NYLON LOCK NUT	4
4	8312	ANTI-ROTATION PLATE, RAN PUMP	1
5	7709	1/4-20 X 5/8" SS TORX T27 BUTTON HD	1
6	8812	PEM PLATE, POLAR PAC	2
7	8706	CAPS 3/8-16 X1" LG, BLACK OXIDE	4
8	8378	RANGER PUMP 288	1
9	8592	OUT PLATE, RAN228	1
10	8591	IN PLATE, RAN228	1
11	8833	ORB HYD MOTOR 104-1671-006	1
12	8961	1/4 NPTF TO 1/4 NPTM, 45	1
13	8962	BALL VLV, 1/4 NPTF X 1/4 NPTM	1
14	7563	HYD-V-TAG	1
15	8806	ACCESS PANEL, TGHC20-DV	1
16	8807	SIDE ACCESS PNL, TGHC20	1
17	VTS-9X	VALVE TOGGLE 3 POS FD/N/FD	1
18	7709	1/4-20 X 5/8" SS TORX T27 BUTTON HD	1
19	8450	ALUM SPACER PP	4
20	TGHC20-DV	POLAR, COOLER HYDRAULIC OIL 20	1
21	8458	3/8-16 X 1 3/4 HH SCREW FR 8	4
22	8471	12MJ-12MAORB 90 FITTING	2
23	8575	12FJS-12MORB STRAIGHT FITTING	2
24	SS5ASB	SS5 COMPRESSOR, ASSEMBLED	1
25	8458	3/8-16 X 1 3/4 HH SCREW FR 8	4
26	8507	3/8-16 NYLCOK NUT BLACK OX	4
27	8514	HOSE LOOP CLAMP, 1" ID	1
28	3303	CAPS 1/4-20 X 1/2 SH	1
29	SV200ASB	SV200 COMPRESSOR, ASSEMBLED	1
30	7566	3/8 SAE FLAT WASHER .85 OD	4

31	8507	3/8-16 NYLCOK NUT BLACK OX	2
32	8458	3/8-16 X 1 3/4 HH SCREW FR 8	5
33	8507	3/8-16 NYLCOK NUT BLACK OX	7
34	9487	SELECTOR VLV ASSY, PP2	1
35	9098	SLCTR VLV PLATE, PP2	1
36	8913	MANIFOLD, PP2-XX-AC-R	1
37	8201	POPPET VALVE, 2-WAY, NO	1
38	8202	POPPET VALVE, 2-WAY, NC	2
39	9090	CAPS 3/8-16 4.5" LG, HH	2
40	8469	8 X 6MM ELBOW FITTING	3
41	8471	12MJ-12MAORB 90 FITTING	3
42	8625	12MORB-12MJ 45	1
43	8877	TEE FTG, 12 JIC	1
44	8473	12MJ-10MORB STRAIGHT FITTING	2
45	8471	12MJ-12MAORB 90 FITTING	1
46	8451	20HB-16MAORB 45	1
47	8884	CROSS FTG, 12 JIC	1
48	8454	12MJ-16MAORB 90 FITTING 30GPM	1
49	8572	SV200 AUX "OUT" HOSE	1
50	8462	SS5 "IN" HOSE	1
51	8465	HOSE OUT, RAN225	1
52	9088	HOSE, 12FJS-12FJS STR 17.5	1
53	8571	SV200 AUX "IN" HOSE	1
54	8963	SELCTR HP HOSE 12-12 STRT	1
55	9001	HOSE, 12FJS-12FJS STR 37"	1

REFERENCE DOCUMENTS FOR COMPRESSOR's AND PUMP's

1) Ingersoll Rand SS5 Piston Compressor

Owner's Manual : *https://www.industrialairpower.com/assets/images/Manuals/SS5-parts-book-2002.pdf*

2) Ingersoll Rand SV200 Rotary Valve Compressor

Owner's Manual : *https://data2.manualslib.com/pdf7/157/15634/1563365-ingersoll_rand/sv200.pdf?6e0785a9c31026793cd37b47bbddfaae*

3) Ranger Series 22 Gear Pump

Owner's Manual : *http://rangerpumps.com.poweredbyawesomehosting.com/wp-content/uploads/2018/07/Series11-17-22Manual.pdf*

Brochure : *http://rangerpumps.com.poweredbyawesomehosting.com/ wp-content/uploads/2018/07/Ranger-Brochure.pdf*

4) Blackmer Vane Pump (TXDI3)

Owners Manual : *https://www.psgdover.com/docs/default-source/blackmer-docs/ioms/201-a00.pdf?sfvrsn=f6dfa9be_12*

Part's List : *https://www.psgdover.com/docs/default-source/blackmer-docs/parts-lists/201-a08.pdf?sfvrsn=6550afa6_9*

Brochure : *https://www.psgdover.com/docs/default-source/blackmer-docs/brochures/201-001.pdf?sfvrsn=fb129973_18*

5) Viking Pump [RTPe20]

Owner's Manual : *https://cdn.brandfolder.io/FMWE0LVS/at/kb4vgz2twxg8b5v96954fmv/RTPe_TSM.pdf*

Brochure : *https://cdn.brandfolder.io/FMWE0LVS/at/6gkspw8p5sjb863mc3qpp36v/Form_1728_RTPe.pdf*

NOTES

Warranty

The Tank Guard product is owned by PSC Custom, LLC ("PSC"). PSC warrants that the Tank Guard equipment manufactured by it and delivered hereunder shall be free of defects in material and workmanship for a period of eighteen (18) months from the date of purchase of the equipment. Should any failure of the equipment under warranty be reported in writing to PSC within said period, PSC shall, at its option, correct such non-conformity by suitable repair to such equipment, or furnish a replacement part F.O.B. point of shipment, provided the purchaser has installed, maintained and operated such equipment in accordance with good industry practice and has complied with the specific recommendations of PSC. Accessories or equipment furnished by PSC but manufactured by others shall carry whatever warranty the manufacturer conveyed to PSC, and which can be passed on to the purchaser. PSC shall not be liable for any repairs, replacements, or adjustments to the equipment, or any costs of labor performed by the purchaser without PSC's prior written approval.

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