

INSTALLATION, OPERATION & MAINTENANCE

POLAR-PAC

Pump and Compressor Assembly



Model # PP-GP

OWNER'S MANUAL

INSTALLATION | OPERATION | MAINTENANCE

MODEL # PP-GP

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INTRODUCTION

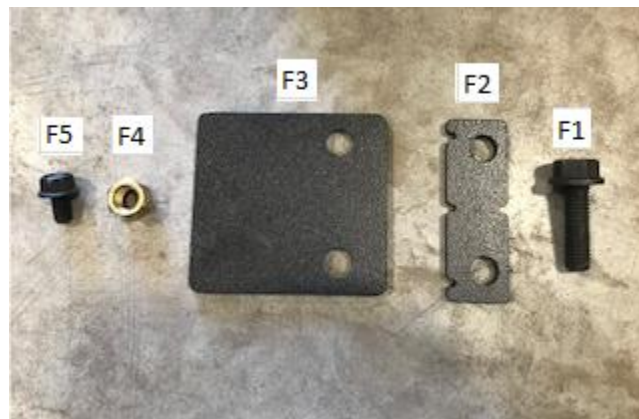
Please read this manual before installing and operating your Polar-Pac Pump and Compressor Assembly.

The Polar-Pac is designed to allow the operator to use a cargo pump or 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 power unit's hydraulic system.

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.



SUPPLIED PARTS



B1 - Bottom Flange Mounting Bracket (1)

F1 - 1/2" Grade 8 Bolt (12)

F2 - Spacer (6)

F3 - Clamping Plate (6)

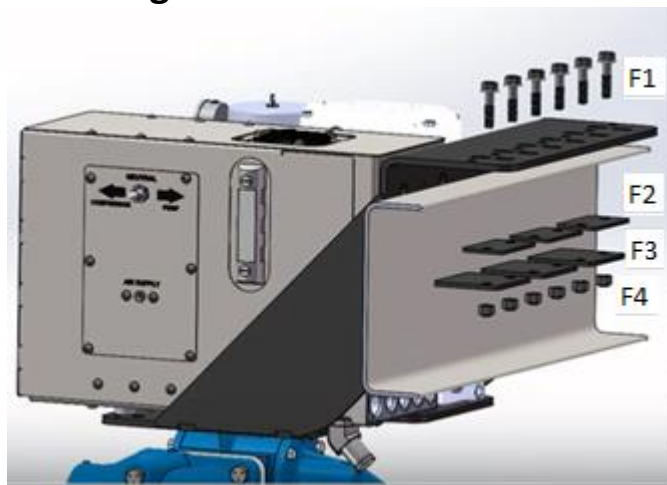
F4 - 1/2" Lock Nut (12)

F5 - 3/8" Grade 8 Bolt (4)

Step 1: POSITIONING & MOUNTING

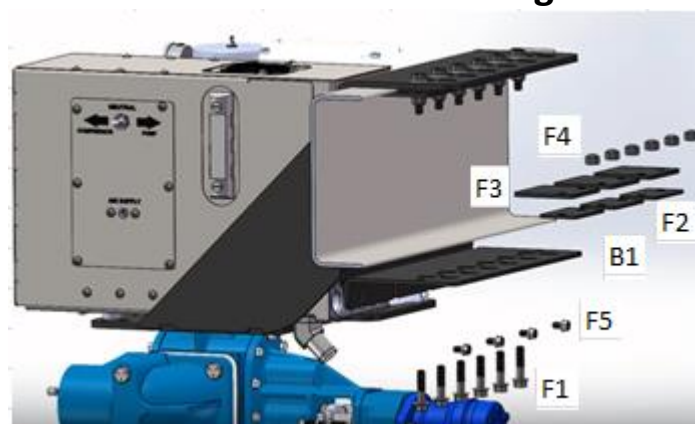
The Polar-Pac requires 20" of frame rail for mounting plus 2" for selector switch clearance. Supplied parts are included to secure (clamp) the assembly to the top and bottom of the frame rail flanges without the need to drill holes. Tighten 1/2" fasteners to 80 Ft. Lbs.

- 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.



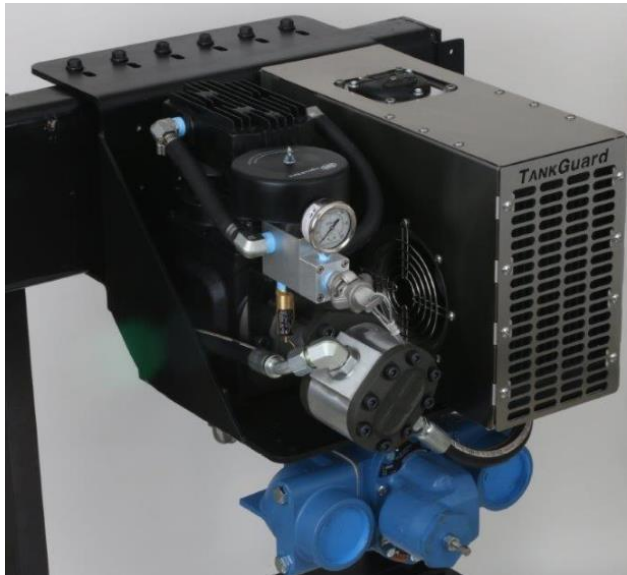
(Fig. 1)

- B: **Bottom Flange Mounting** - Remove supplied mounting bracket (B1) from crate, place flange angle down, slide under frame rail flange and fasten (F5) into main mounting bracket face until tight, then secure as illustrated in Fig. 2.



(Fig. 2)

- C. See finished mounting front (Fig. 3) and back (Fig. 4) photos below.

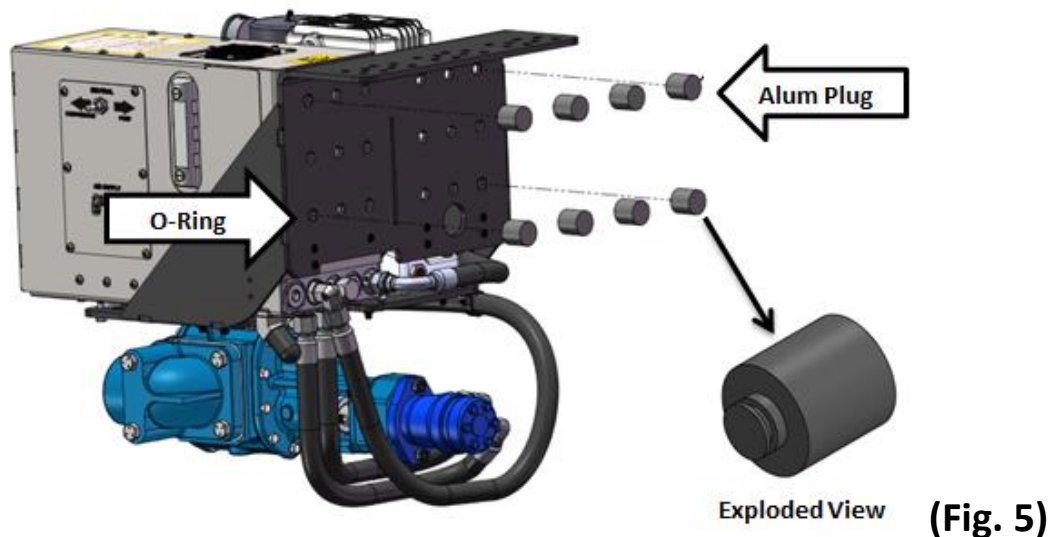


(Fig. 3)



(Fig. 4)

- D. **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.**



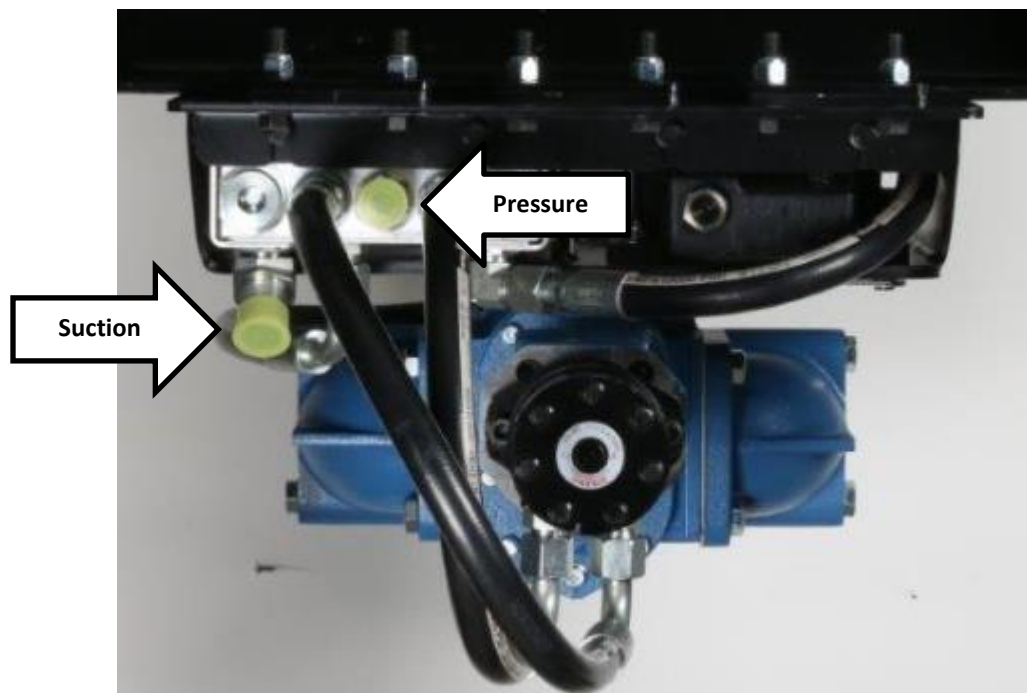
Step 2: INSTALLING THE PTO & HYDRAULIC PUMP

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 HYD PUMP

Connect 3/4" high pressure (2500 PSI min) hose and 1-1/4" suction, (150 PSI/30" Hg min) hose with hydraulic JIC connection fittings to integrated manifold block 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. Use Ingersoll-Rand synthetic compressor lubricant. The crankcase is 1 liter (34 fl. oz.). To access fill plug (back) see below.



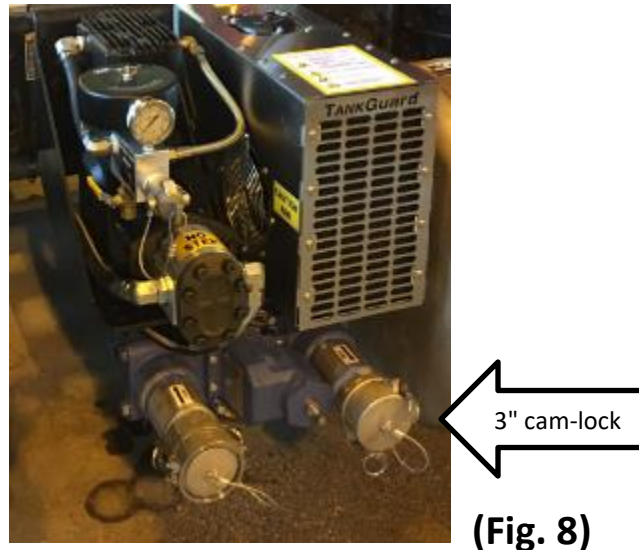
2) Filling Procedures:

- i) Unscrew and remove the oil fill plug (Fig. 7A).
- ii) Slowly fill the crankcase with lubricant until lubricant reaches the top thread of the oil fill opening and the top of the sight glass (Fig. 7).
- iii) Replace the oil fill plug **HAND TIGHT**.

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

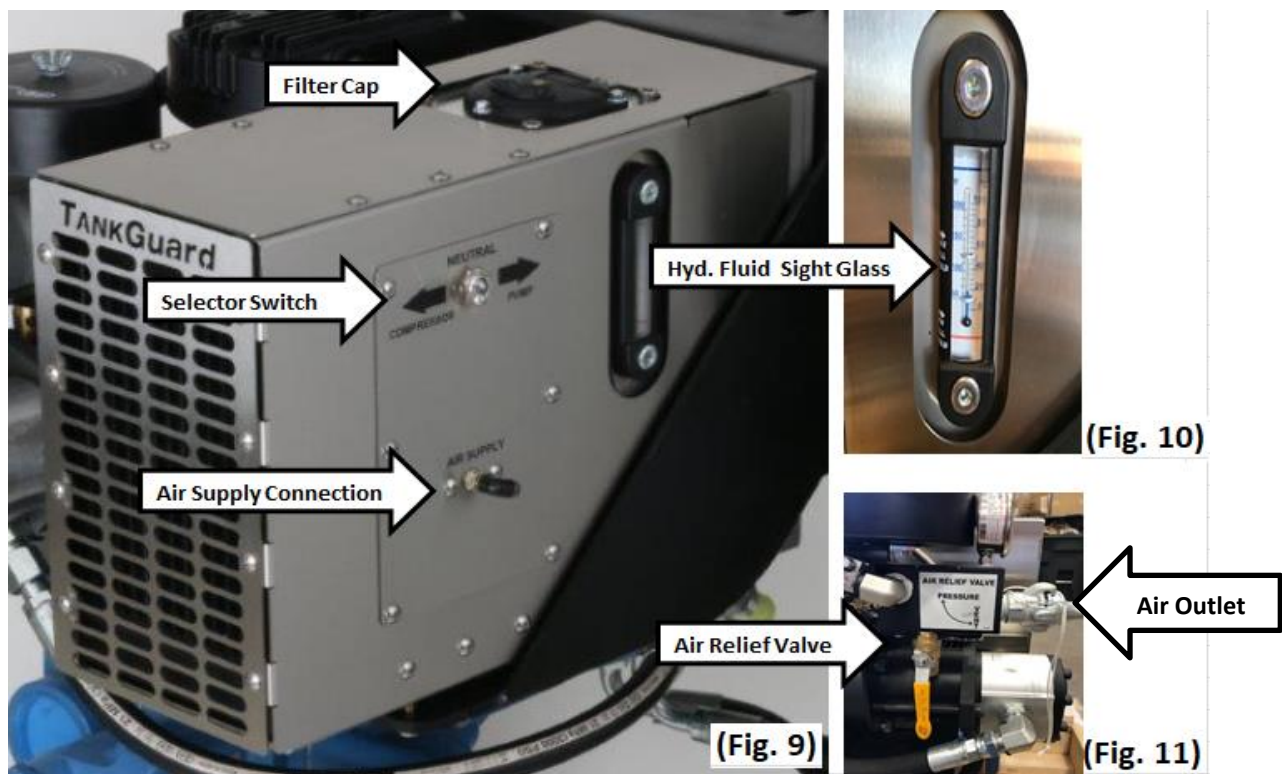
B. Ranger Series 22 Gear Pump

1) Install inlet and outlet fittings (not included). See example in Fig. 8.



C. Tank Guard TGHC20 Hydraulic Oil Cooler

- 1) Ensure Selector Switch is in neutral position (Fig. 9).
- 2) Open Air Relief Valve (Fig. 11).
- 3) Hydraulic Fluid Filling Procedures
 - i) Remove Filter Cap from top of cooler (Fig. 9).
 - ii) Leave filter in place and slowly add fluid until it reaches middle of sight glass (Fig. 10) and reinstall cap.
- 4) Connect (Tee-in) 1/4" Air Hose from Switch/PTO air supply hose to (Selector Switch) Air Supply Connection (Fig. 9).



STEP 5: START-UP PROCEDURES

- A. Ensure Selector Switch is in NEUTRAL position (Fig. 9).**
- 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 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. 11 on page 9).**
- 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 thru J as needed.**

STEP 6: OPERATING PROCEDURES

- A. Ensure Selector Switch is in NEUTRAL position.**
- B. Ensure Air Relief Valve is 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. 11) to cargo tank air inlet valve and open.**
 - 1) Move Selector Switch to COMPRESSOR.**
 - 3) Close the Air Relief 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).**
 - 5) Disconnect air hose (COMPRESSOR).**

MAINTENANCE - Ingersoll Rand SS5 Piston Compressor

A. Specifications & Maintenance

Specifications	Performance						
Two Cylinder Single Stage	SPEED (RPM)	25 PSI			36 PSI		
Cast Iron Construction		CFM	HP	POTENTIAL LIQUID FLOW (GPM)	CFM	HP	POTENTIAL LIQUID FLOW (GPM)
Speed Max. 0-1500 rpm							
1310 Series Flange	500	12	1.5	38	11	1.6	25
Weight 80 lbs	800	19	2.7	61	18	2.8	40
Bi-rotational	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

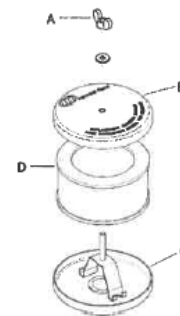
ROUTINE MAINTENANCE SCHEDULE	
Daily or Before Each Operation	Check lubricant level. Fill as needed.
	Drain receiver tank condensate. Open manual drain valve and collect and dispose of condensate accordingly.
	Check for unusual noise and vibration.
	Ensure beltguards and covers are securely in place.
Monthly	Inspect air filter element(s). Clean or replace if necessary.
	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.
3/500 "	Clean exterior.
	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.

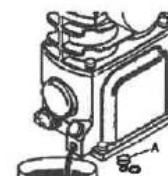
NOTICE

The air intake holes in the baffle and cover must be staggered 180°. 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.

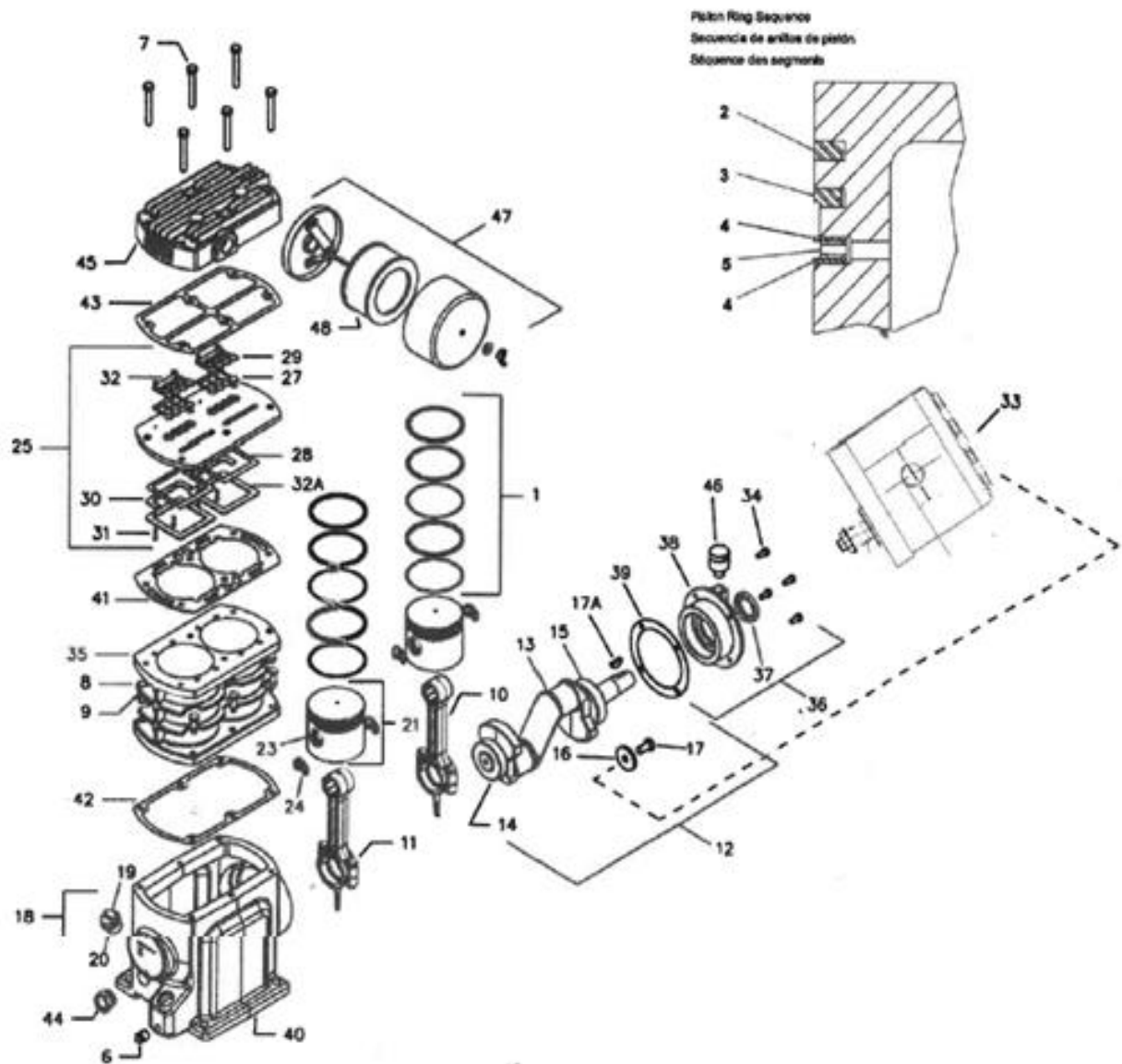


■ OIL CHANGE

1. Remove the oil drain plug (A) and allow the lubricant to drain into suitable container.
2. Replace the oil drain plug.
3. Follow the filling procedures in OPERATION section.



B. Illustrated Parts Breakdown



C. Parts Listing

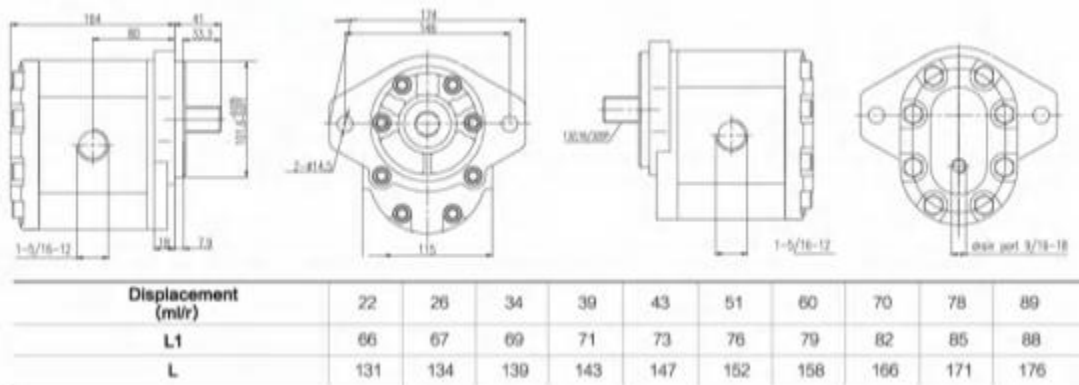
	REF. NO.	PART NO.	DESCRIPTION	QTY. CANT. QTÉ.
	REF.	97334148	PUMP, BARE COMPRESSOR	—
X	1	20102703	SET, PISTON RING	2
	2	NSS	●RING, COMPRESSION	1
	3	NSS	●RING, SCRAPER	1
	4	NSS	●RING, OIL CONTROL SPACER	2
	5	NSS	●RING, OIL CONTROL	1
	6	95033593	PLUG, OIL DRAIN	1
	7	96706874	CAPSCREW, M8X65 (HEAD BOLT)	6
	8	96702253	CAPSCREW, M8 X25 (CYLINDER BOLT)	6
	9	96728316	WASHER, SPRING- M8	6
	10	97333173	ASSEMBLY, CONNECTING ROD	2
	11	96705876	●CAPSCREW, M8 X 25	2
	12	20102711	ASSEMBLY, CRANKSHAFT - SERVICE	1
	13	NSS	●CRANKSHAFT	1
	14	NSS	●BEARING, MAIN	1
	15	NSS	●BEARING, BALL	1
	16	54423504	●WASHER	1
	17	96730437	●CAPSCREW, M8 X 20 - LEFT HAND THREAD	1
	17A	95245494	●KEY, WOODRUFF	
	18	97334254	ASSEMBLY, OIL FILL PLUG	1
	19	NSS	●PLUG, OIL FILL	1
	20	97334288	●O-RING, OIL FILL PLUG	1
	21	97333389	ASSEMBLY, PISTON & PIN	2
	22	NSS	●PISTON	1
	23	NSS	●PIN, PISTON	1
	24	NSS	●RING, LOCK	2
□	25	97335061	ASSEMBLY VALVE	1
	26	NSS	●PLATE, VALVE	1
	27	NSS	●VALVE, DISCHARGE	2
	28	NSS	●VALVE, INLET	2
	29	NSS	●STOP, DISCHARGE	2
	30	NSS	●RETAINER, INLET	2
	31	NSS	●SCREW, HEX HEAD - M3 X 16	4
	32	NSS	●NUT, HEX - M3 W/LOCKWASHER	4
	32A	NSS	●STOP, INLET	2
	33	8355	GEAR MOTOR SS5	1
	34	97330500	CAPSCREW, M6 X 14 (END COVER BOLTS)	4
	35	97333488	CYLINDER	1
	36	20102729	ASSEMBLY, END COVER - SERVICE	1
	37	97335624	●SEAL, SHAFT	1
	38	NSS	●COVER END	1
	39	97333843	●GASKET, END COVER	1
	40	97334171	FRAME, COMPRESSOR	1

C. Parts Listing (Cont'd)

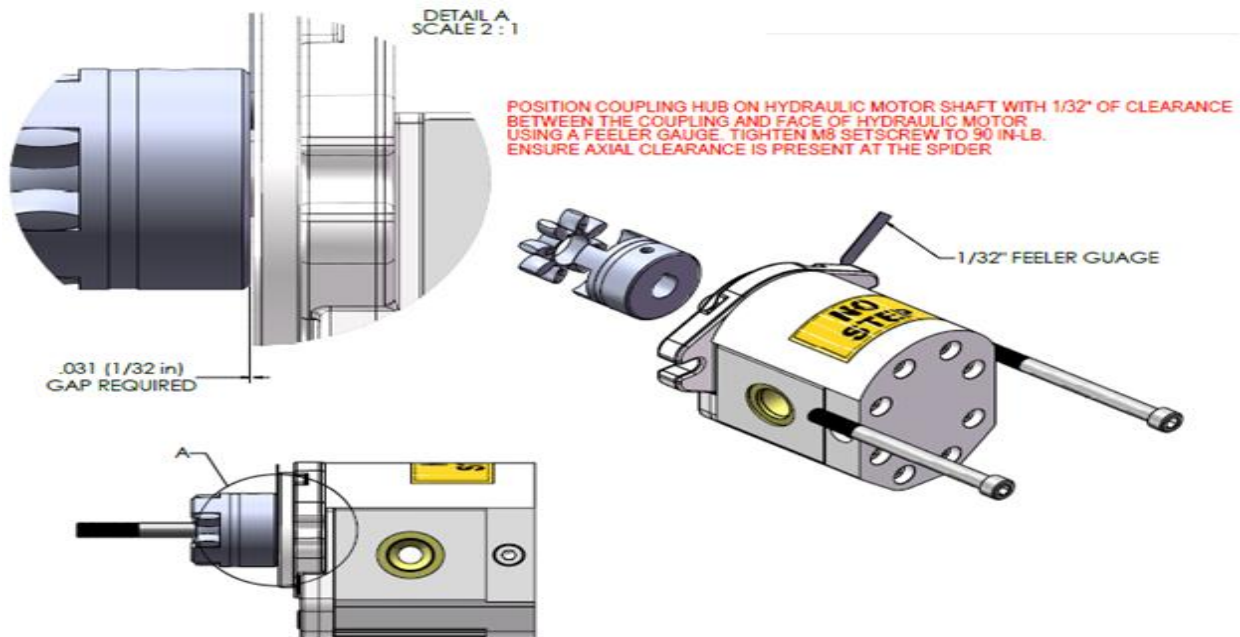
	REF. NO.	PART NO.	DESCRIPTION	QTY. CANT. QTÉ.
<input type="checkbox"/>	41	54429600	GASKET, VALVE PLATE	1
<input checked="" type="checkbox"/>	42	97333546	GASKET, CYLINDER	1
<input type="checkbox"/>	43	54410667	GASKET, HEAD	1
	44	97334270	GLASS, SIGHT	1
	45	54410683	HEAD	1
	46	70243936	ASSEMBLY, VENT	1
	47	54406640	FILTER, INLET	1
	48	32170979	●ELEMENT, FILTER	1
NSS NOT SOLD SEPARATELY <input type="checkbox"/> AVAILABLE INDIVIDUALLY OR IN VALVE KIT 20100277 <input checked="" type="checkbox"/> AVAILABLE INDIVIDUALLY OR IN PISTON RING KIT 20100285				

D. Gear Motor (SS5)

8355



E. Shaft Coupling



F. Troubleshooting

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 proper 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 grit 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 lubricant.
	Compressor valves leaky, broken, carbonized or loose.	Inspect valves. Clean or replace as required. Install valve kit.
	Piston rings damaged or worn (broken, rough or scratched). 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

F. Troubleshooting (Cont'd)

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Unit does not come up to speed	Loose beltwheel or motor pulley, excessive end play in motor shaft or loose drive belts.	Check beltwheel, motor pulley, crankshaft, drive belt tension and alignment. Repair or replace as required.
	Lubricant viscosity too high	Drain existing lubricant and refill with proper lubricant.
	Improper line voltage	Check line voltage and upgrade lines as required. Contact electrician.
	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 bearings 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 valve seat blown out.	Replace check valve.
	Ambient temperature too low.	Relocate unit to warmer environment. Install crankcase heater kit.
	Bad motor.	Replace.
Unit runs excessively hot	Inadequate ventilation around beltwheel.	Relocate unit for better air flow
	Drive belts too tight or misaligned	Adjust belts to proper tension and alignment.
	Compressor valves leaky, broken, carbonized or loose	Inspect valves. Clean or replace as required. Install valve kit.
	Wrong beltwheel direction of rotation	Check motor wiring for proper connections. Reverse two leads on three-phase motors.
Excessive noise during operation	Loose beltwheel or motor pulley, excessive end play in motor shaft or loose drive belts.	Check beltwheel, motor pulley, crankshaft, drive belt tension and alignment. Repair or replace as required.
	Lubricant viscosity too high	Drain existing lubricant and refill with proper lubricant
	Lubricant level too low	Add lubricant to crankcase to proper level
	Compressor valves leaky, broken, carbonized or loose.	Inspect valves. Clean or replace as required. Install valve kit
	Carbon build-up on top of piston(s).	Clean piston(s). Repair or replace as required.
	Defective ball bearings on crankshaft or motor shaft.	Inspect bearings and replace crankshaft assembly if required
	Leaking check valve or check valve seat blown out.	Replace check valve.
Excessive starting and stopping	Air leaks in air discharge piping.	Check tubing and connections
	Leaking check valve or check valve seat blown out.	Replace check valve
	Excessive condensate in receiver tank	Drain receiver tank with manual drain valve
High oil consumption	Clogged or dirty inlet and/or discharge line filter.	Clean or replace
	Lubricant viscosity too low	Drain existing lubricant and refill with proper lubricant
	Detergent type lubricant being used	Drain existing lubricant and refill with proper lubricant
	Piston rings damaged or worn (broken, rough or scratched). 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
	Connecting rod, piston pin or crankpin bearings worn or scored	Inspect all. Repair or replace as required
	Crankshaft seal worn or crankshaft scored	Replace seal air crankshaft assembly
	Worn cylinder finish	Deglaze cylinder with 180 grit flex-hone

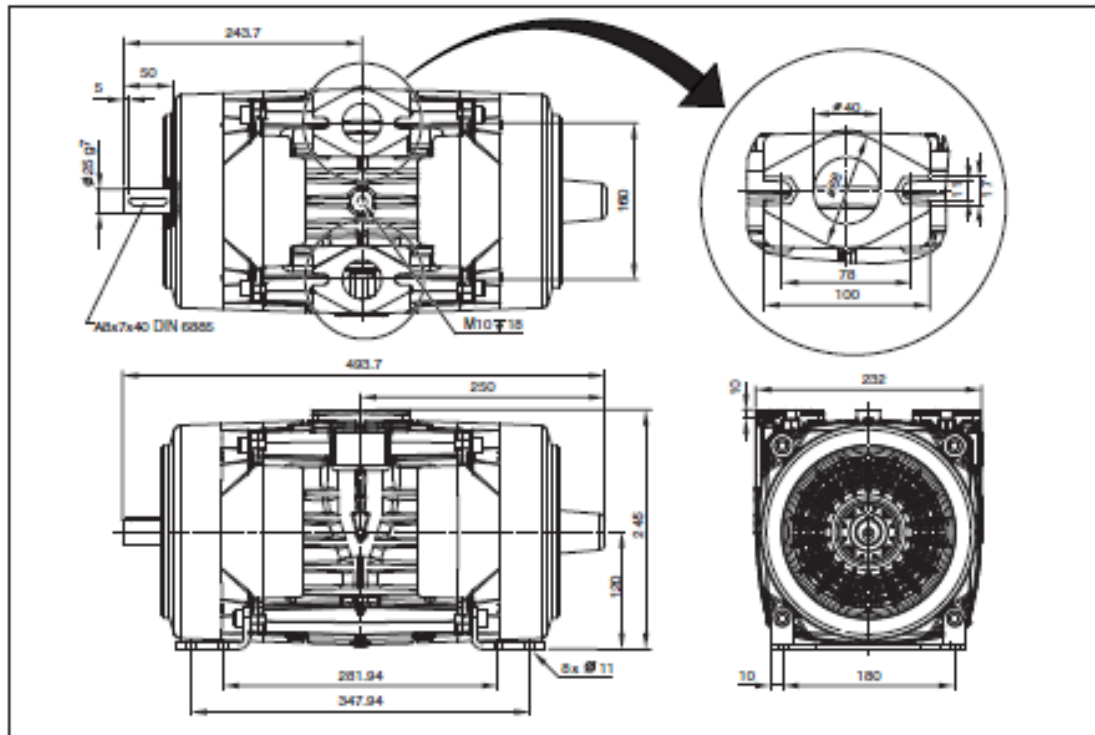
F. Troubleshooting (Cont'd)

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Knocking or rattling	Loose beltwheel or motor pulley, excessive end play in motor shaft or loose drive belts.	Check beltwheel, motor pulley, crankshaft, drive belt tension and alignment. Repair or replace as required.
	Compressor valves leaky, broken, carbonized or loose.	Inspect valves. Clean or replace as required. Install valve kit
	Carbon build-up on top of piston(s).	Clean piston(s). Repair or replace as required.
	Cylinder(s) or piston(s) scratched, worn or scored	Repair or replace as required
	Connecting rod, piston pin or crankpin bearings worn or scored	Inspect all. Repair or replace as required
	Defective ball bearings on crankshaft or motor shaft.	Inspect bearings and replace crankshaft assembly if required
Moisture in crankcase or "milky" appearance in petroleum lubricant or rusting in cylinders	Detergent type lubricant being used	Drain existing lubricant and refill with proper lubricant
	Extremely light duty cycles	Run unit for longer duty cycles
	Unit located in damp or humid location	Relocate unit
Oil in discharge air (oil pumping)	Lubricant viscosity too low	Drain existing lubricant and refill with proper lubricant
	Detergent type lubricant being used	Drain existing lubricant and refill with proper lubricant
	Piston rings damaged or worn (broken, rough or scratched). 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
	Worn cylinder finish	Deglaze cylinder with 180 grit flex-hone
	Excessive condensate in receiver tank	Drain receiver tank with manual drain valve
Oil leaking from shaft seal	Crankshaft seal worn or crankshaft scored	Replace seal air crankshaft assembly
Safety/relief valve "pops"	Clogged or dirty inlet and / or discharge line filter	Clean or replace
	Compressor valves leaky, broken, carbonized or loose.	Inspect valves. Clean or replace as required. Install valve kit
	Defective safety/relief valve	Replace

Ingersoll Rand SV200 Rotary Valve Compressor Option

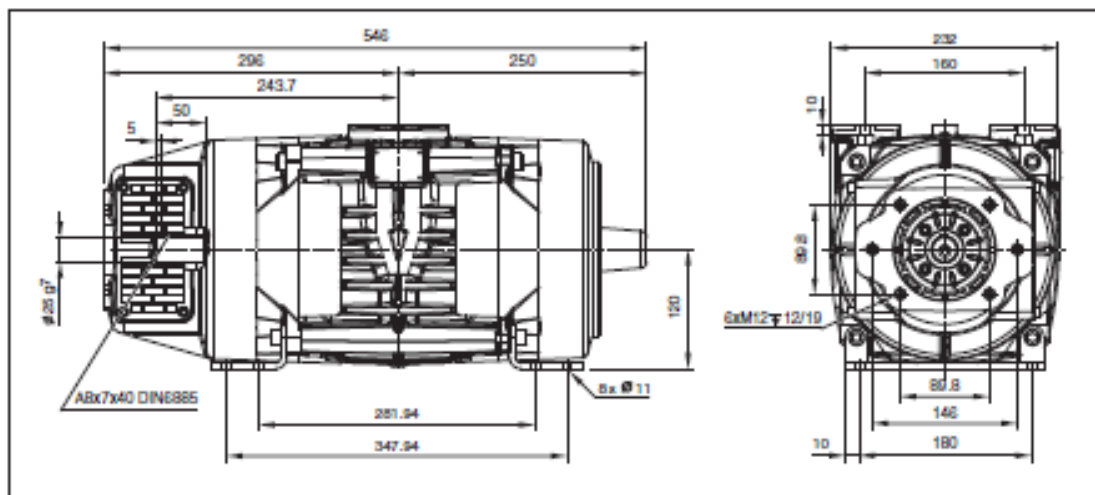
A. Specifications

Technical data of the SV200 rotary valve compressor



Model: SV200 D (direct drive)

All measurements are approximate specifications.



Model: SV200 H (hydraulic drive)

Flange dimensions refer to SV200 D model

All measurements are approximate specifications.

A. Specifications (Cont'd)

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.

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	m ³ /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	m ³ /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	m ³ /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	

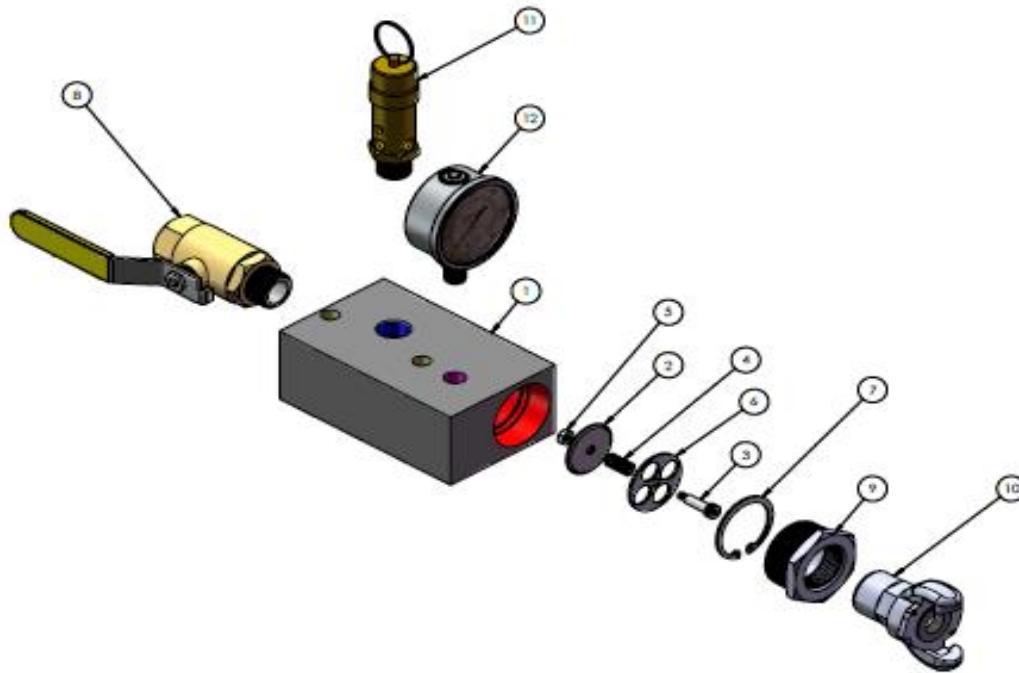
Maximum operating pressure:
2.5 bar (rel.) [36 psig]

Environmental conditions

Environmental temperature:
-25 to +46 °C [-13 to +111.8 °F]

B. Maintenance & Illustrated Parts Breakdown (Cont'd)

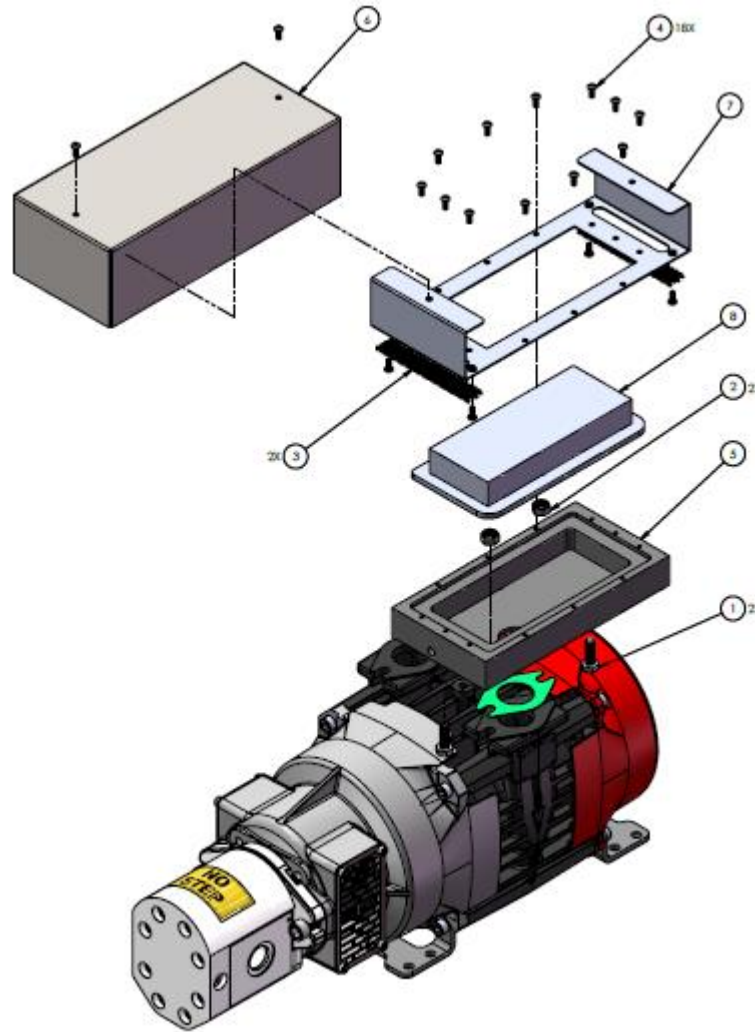
3) Air Manifold Assembly



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	8439	TWIST-CLAW COUPLING 1\" NPT	1
11	8494	SAFETY VALVE, 36PSI 1/2NPT	1
12	8443	PRESSURE GAUGE, POLAR	1

B. Maintenance & Illustrated Parts Breakdown (Cont'd)

4) Air Filter Assembly



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	TORQUE
1	8568	HEX 17MM WIDE M10 X 30 MM LO, SS	2	
2	8569	M10 NYLON LOCK NUT, SS	2	
3	8611	4 X 4 MESH, SST	2	
4	5737	CAPS 10-32 X 1/2 RH SS	18	
5	8565	AIR FILTER BASE, SV200	1	
6	8567	AIR FILTER COVER, SV200	1	
7	8566	AIR FILTER HOLDER, SV200	1	
8	8610	AIR FILTER, SV200	1	

- C. Replacement components required for the repair of this compressor (bearing, separating valve, sealings, O-rings and shim rings) are combined in a special repair kit. This kit includes all components 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 Pump


A. Specifications



SERIES 22

This series of Ranger pumps are designed to output .22 gallons per revolution 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.

Lip Seal Design



Ranger pumps can be supplied with a combination lipseal and back-up packing as shown above. This can be easily converted from the lipseal combination to packing only or a mechanical seal.

Standard Fitted Materials of Construction

PART	STANDARD MATERIALS	OPTIONS
Housing & Backplates	ASTM A48 Class 30 Cast Iron	
Gears	Ductile Iron	
Shafts	Carbon Steel	440 Stainless Steel
Bearing Bushings	Bronze	Carbon, Iron, TFE/Graphite
R.V. Parts	Carbon Steel	Stainless Steel
Gaskets	Fiber	Aluminum
Hardware	Zinc Plated Steel	

Pump Identification Guide

9 - Ports 90°
8 - Ports 180°

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

P - Packing
M - Mechanical Seal

F - Flanges
No letter - Pipe port

HB - Outboard bearing
HH - Pump with hydraulic adaptor and rigid coupling
BH - Replacement pump for HH Pump without adaptor
G0 - Replacement pump for GHB unit without gear reduction
GB - Pump with gear reduction

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

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

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

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

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

Rotation & Shaft position (See Installation Manual pg. 4)
No letter - W position (See Installation Manual pg. 4)

229PHBFRVLX-SSCG

Section C

MAXIMUM PUMP RATING

125 PSI (862 Kpa) maximum inlet and discharge pressure.

750 RPM maximum. (See speed vs. viscosity curve for maximum R.P.M.)

212° F (100° C) maximum temperature for Buna-N mechanical seal.

400° F (205° C) maximum temperature for Viton mechanical seal.

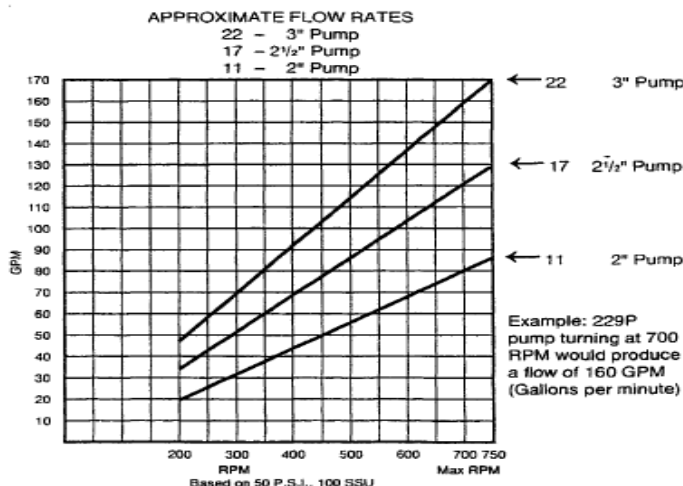
350° F (177° C) maximum temperature for standard packing.

500° F (260° C) maximum temperature for graphite TFE packing.

600° F (345° C) maximum 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

SHAFT SEALING

(1) 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 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 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

B. Maintenance (Cont'd)



Installation Instructions 11, 17, 22 Series Quad Lip Seal



*HH (Hydraulic Driven)



*HB (Shaft Driven)

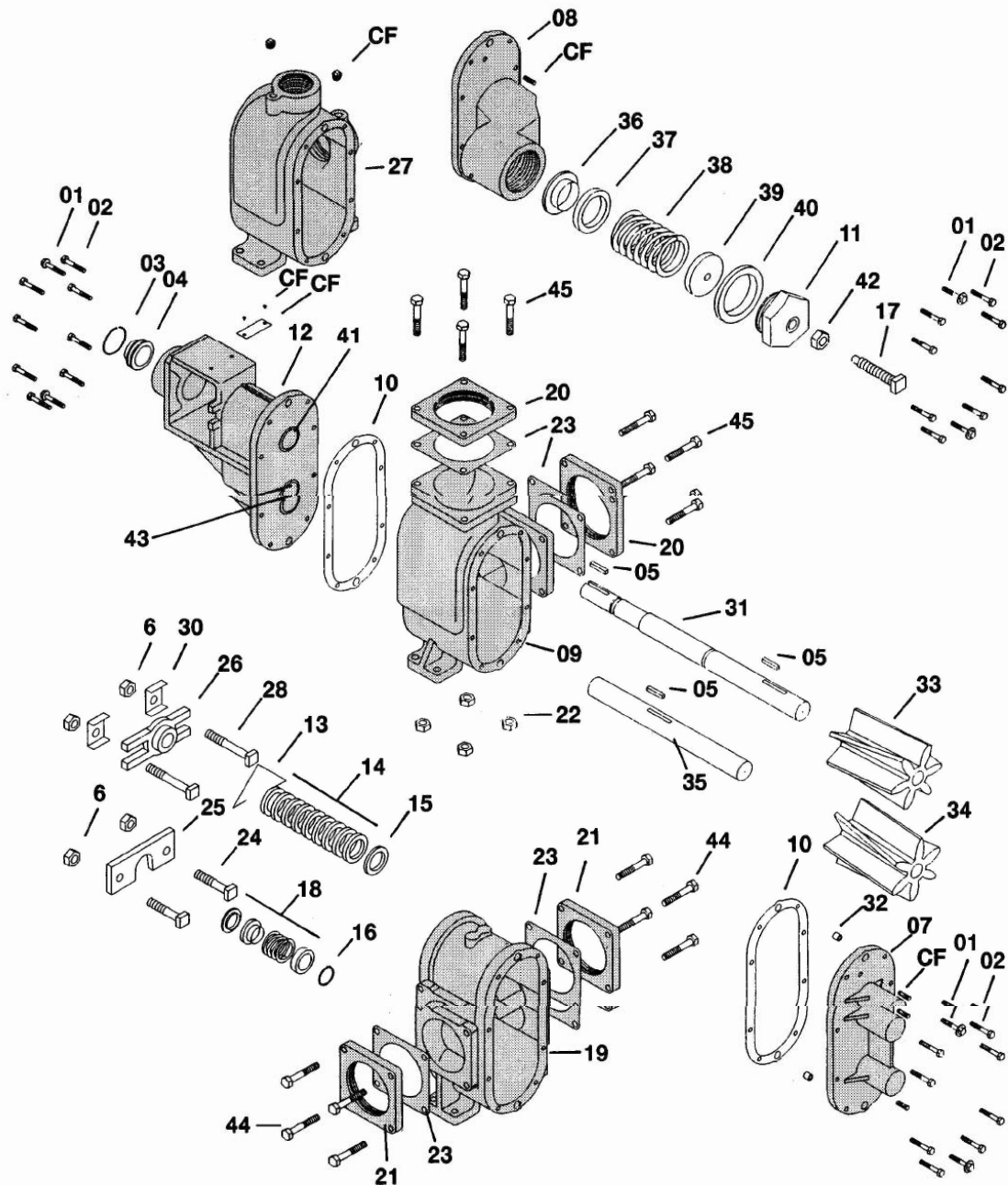
1. Clean the packing bore. Clean and deburr the driveshaft.
2. Grease the outer ring of the Viton oil ring on the lip seal and grease inner part of the ring.
3. Install the lip seal with the lips of the seal facing down toward the bushing inside the packing bore. The smooth side of the seal will be facing up toward the top open end of the packing bore.



4. Use a piece of PVC pipe to push the lip seal all the way to the bottom of the packing bore.
5. Repeat steps 3 and 4 to install the second lip seal.
6. Install the packing washer.
7. Install a total of 5 graphite packing rings.
8. Install the packing gland, put the clips on the gland, run the bolts thru, put the spring clip around the bolts, and finally screw on the locknuts and lightly tighten down. **DO NOT OVER TIGHTEN. LOOSELY TIGHTEN.**
9. *HB (PTO Shaft Driven) Installation - Install the ball bearing onto the drive shaft and tighten down into place. Insert the shaft into the top of the drive plate down thru the packing gland until the ball bearing is into place using a rubber mallet if necessary.

10. *HH (Hydraulic Driven) Installation - Insert the shaft into the top of the drive plate down thru the packing gland until you push pass the second groove on the shaft just far enough pass the endplate face (1/8" to 1/4") to install the external retaining ring that holds the hydraulic gear into place, using a rubber mallet if necessary. If the shaft is pushed too far, when you pull the shaft back up into place you will destroy the lip seal.
11. This completes the installation of the lip seal. **DO NOT** install the shaft thru the bottom bushing side of the drive plate or you will ruin the lip seal.

C. Illustrated Parts Breakdown



Ranger, Inc. is not affiliated with Roper Pump Company. Ranger, Inc.'s pumps and replacement parts are neither certified nor approved by Roper Pump Company. ROPER® is a registered trademark of Roper Holdings, Inc.

D. Parts Listing

PIC NO.	PART DESCRIPTION	RANGER PART #	Competitor PART #
01	Wash Hd. Cap Screw	B63-038150	G49-24
02	Hex Hd. Cap Screw	B60-038100	G49-037100
03	Retaining Ring Internal	03S-205I	G41-10
04	Ball Bearing	04C-100205	G40-41
05	Key Standard	05C-252515	D30-9
06	Locknut	N61-437	D441-755
07*	Plain Rearplate Assy.	THIS PAGE	
08*	RV Rearplate Assy.	THIS PAGE	
09	Case	09G-22U	PI-175
10	Gasket Case	10F-01U	D11-338
10	Gasket Case Aluminum	10A-01U	D11-339
11	Plug Cap, RV	11G-01U	P17-110
12*	Driveplate Assy.	THIS PAGE	
13	Spring Clip	13C-01U	D42-2
14	Packing Set TFE (Std.)	14X-01U	N43-1
14	Packing Set Graphite	14G-01U	N43-151
14	Packing Set Pure TFE	14T-01U	N43-101
14	Packing Set Ranger DSA	14D-01U	N43-170
15	Washer Packing	15C-01U	G8-246
16	Retaining Ring	03C-106E	G41-76
17	RV Screw Adjust	B60-038200	G62-44
18	Mech Seal Compl., Buna-N	18B-106175	G4-101
18	Mech Seal Comp., Viton	18V-106175	G4-140
19	Case, Straight	19G-22U	PI-171
20	Flange, 3" Straight NPT	20G-NPT3	P23-12
21	Flange, Straight 4" (Std.)	21G-22NPT4	P23-19
22	Nut	N60-063	G44-062
23	Gasket, Flange	23V-22U	D11-90
24	Square Head Bolt	B40-044125	G67-043125
25	Retainer Plate, Seal	25C-01U	D23-252
26	Packing Gland	26G-01U	P10-178
27	Case, Tapped	N/A	N/A
28	Square Head Bolt	B40-044275	G67-043275
29	Flange, Elbow 90 (229P)	29G-90LK	N14-31
29	Flange, Elbow 90 (228P)	29G-80SK	N14-23
30	Clip, Packing Gland	30C-01U	D42-1

D. Parts Listing (Cont'd)

PIC NO.	PART DESCRIPTION	RANGER PART #	Competitor PART #
31	Shaft, Drive	31C-22R	D1-1998
31	Shaft, Drive SST	31S-22R	D1-2027
32	Dowel Pin	32C-01U	D48-34
33	Gear, LH	33I-22U	P6-278
34	Gear, RH	34I-22U	P6-277
35	Shaft, Idler	35C-22U	D1-1077
35	Shaft, Idler SST	35S-22U	D1-1078
36	RV Poppet/Guide Spring	36S-01U	D16-16
37	Adapter Poppet	37C-01U	G8-281
37	Adapter Poppet SST	37S-01U	G8-282
38	Spring Standard	38C-01U	G10-355
38	Spring, SST	38S-01U	G10-363
38	Spring, High Pressure	38C-01H	G10-375
39	Guide Spring	39C-01U	D8-348
39	Guide Spring, SST	39S-01U	D8-355
40	Gasket, Cap RV	40V-01U	D828-41
41**	Bushing, Short	THIS PAGE	
42	Nut Lock Seal	N65-038S	G43-8
43**	Bushing, Long	THIS PAGE	
44	Hex Hd Cap Screw	B62-063175	G49-062175
45	Hex Hd Cap Screw	B62-063225	G49-062225

*ENTER MATERIAL CODES TO COMPLETE REQUIRED PART NUMBERS

PLAIN REARPLATE	RV REARPLATE	DRIVEPLATE ASSY
0 7 - 0 1 U	0 8 - 0 1	1 2 - 0 1
BUSHING MATERIAL CODE	RV CODE	MODEL CODE
B = Bronze C = Carbon	U = No RV Parts R = Regular H = Hi Pressure	R = Regular (HB) H = Hydraulic Drive G = Gear Reduction

**Bushing Part Number

43B-01U Bronze, Long
41B-01U Bronze, Short
43H-01U Bronze, Long, Hi Temp
41H-01U Bronze, Short, Hi Temp
43C-01U Carbon, Long
41C-01U Carbon, Short
43T-01U TFE & Carbon, Long
41T-01U TFE & Carbon, Short
43I-01U Iron, Long
41I-01U Iron, Short

E. Orbital Motor #8356

F. Troubleshooting

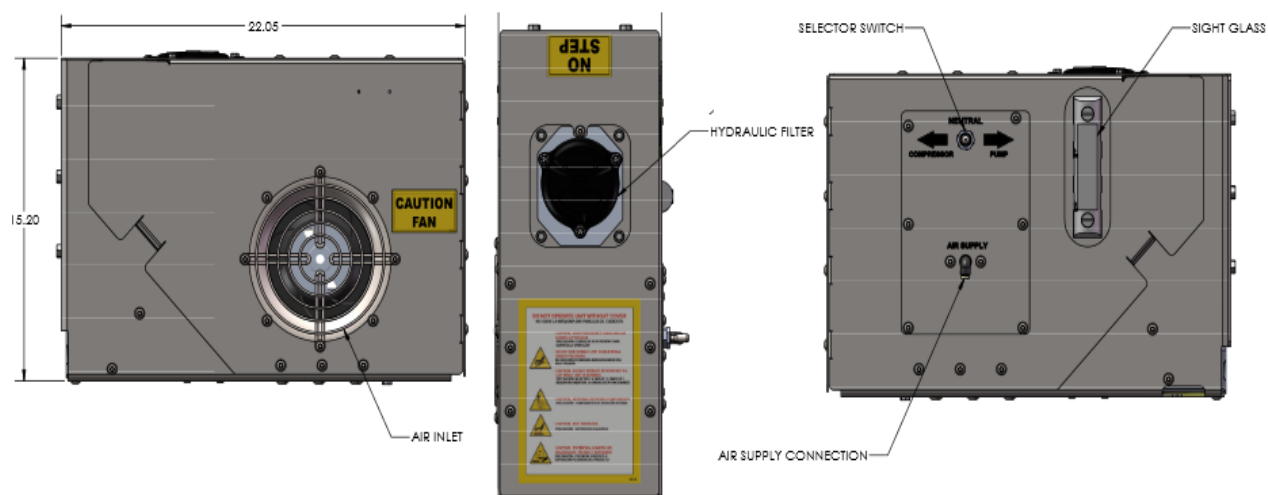
NO LIQUID DELIVERED	<ol style="list-style-type: none"> 1. Pump not primed. If pump fails to deliver liquid after a minute, stop the pump and prime it by pouring some liquid into the discharge side of the pump. 2. Rotating in wrong direction. 3. Inlet lift too high. Check this with gauge at pump inlet. 4. Clogged inlet line. 5. Air pockets or vapor lock. 6. Air leaks in inlet line. 7. Foreign matter under valve seat or poppet. Remove and clean poppet and valve seat. CAUTION: If poppet or seat is damaged it must be remachined or replaced.
INSUFFICIENT LIQUID DELIVERED	<ol style="list-style-type: none"> 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 gauge at the pump inlet. 5. Viscosity of liquid too high for 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 misalignment. 10. Excessive clearance in pump caused by wear or corrosion. 11. Relief valve set too low, or stuck partially open.
RAPID WEAR	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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 pressure setting. 6. Improper mounting. Check alignment thoroughly. See instructions for aligning driver and pump and preparation of foundation for baseplate mounted pumps.
PUMP TAKES TOO MUCH POWER	<ol style="list-style-type: none"> 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 defect, such as bent shaft, packing gland too tight, or misalignment of piping. 6. Relief valve not operating properly.

MAINTENANCE - Tank Guard TGHC20 Hydraulic Oil Cooler

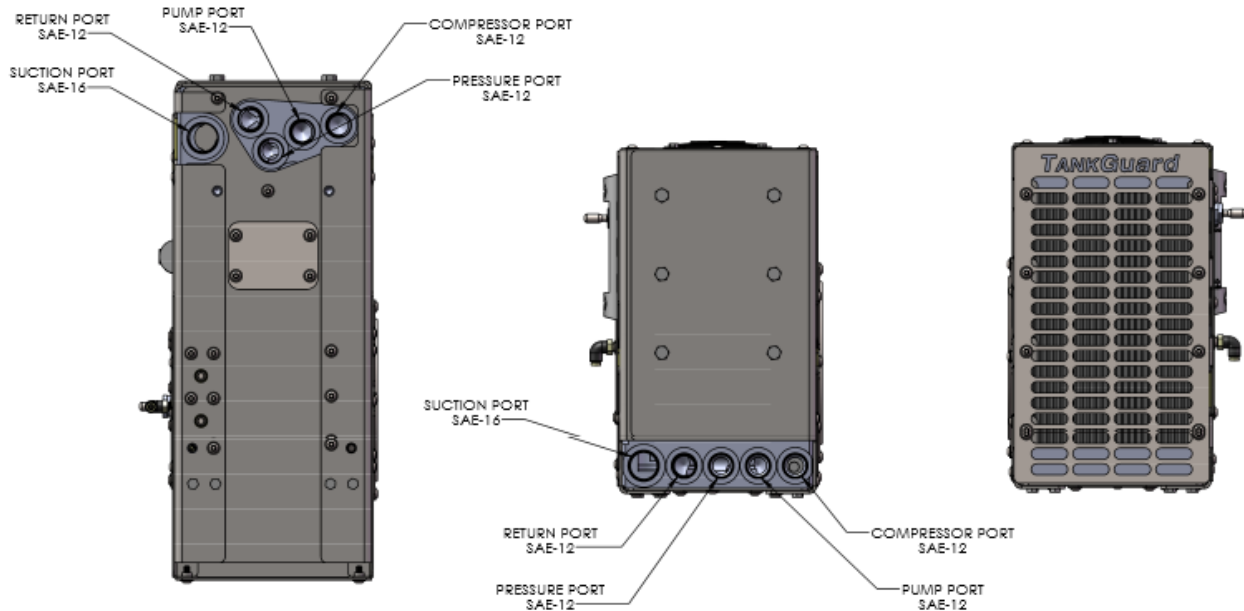
A. Specifications

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

Capacity	20 gpm
Slim line or box	Slim
Tank size	3.5 gallons
Suction	SAE-16 ORB Female
High pressure	SAE-12 ORB Female
Low pressure return	SAE-12 ORB Female (2 ports)
High pressure Compressor	SAE-12 ORB Female
High pressure Pump	SAE-12 ORB Female
Relief valve	Adjustable 500-3000 psi
Fan	Hydraulic drive 1.2 gpm
Drain/ case drain	SAE-16 ORB Female (Optional one of the suction ports)
Filter	Tank top design with integral breather
Filter Element	10 micron. Element easily servicable from top (other filter options available)
Site glass	5" long sight glass with a thermometer mounted on side
Basic dimensions	22 X 9 X 15.2
Cooler bypass -Cold start	60 psi high flow
Finish	Stainless exterior brushed finish
Guage port	SAE-12 ORB Female (Optional one of the pressure ports)
Weight	97 LBS
Heat rejection	13.5 HP at 20 GPM and 80°F ETD



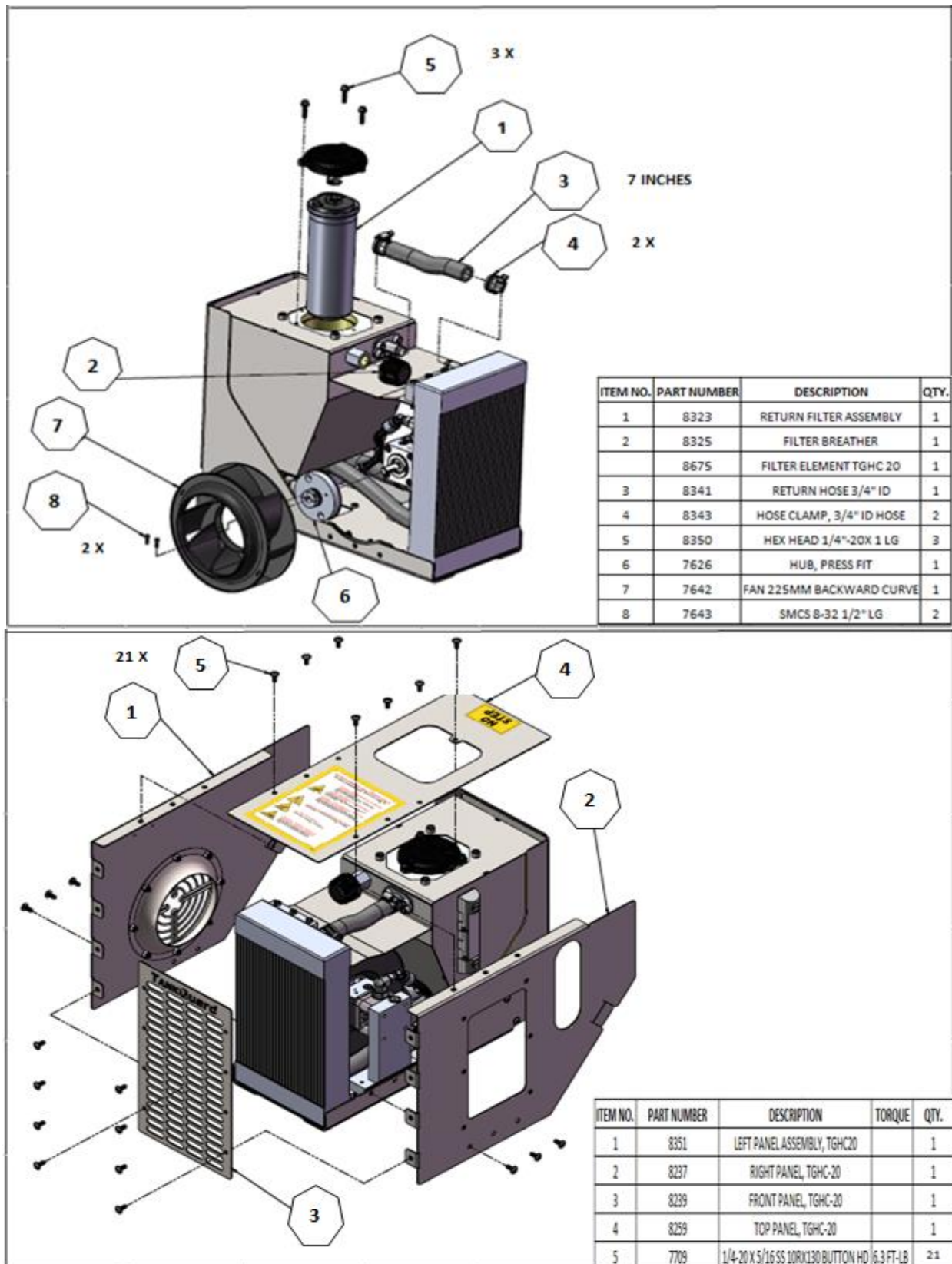
A. Specifications (Cont'd)



B. Maintenance

- 1) **Filter:** Unscrew filter cap and replace element every 3 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. Use non-foaming fluid (see pump and motor manufacturer recommendations).
- 3) **Clean Radiator:** Use a mild cleaner compatible with aluminum. Be careful not to damage fins if using a power washer to rinse cleaner off of radiator. Visually inspect daily and clean as necessary.

C. Illustrated Parts Breakdown

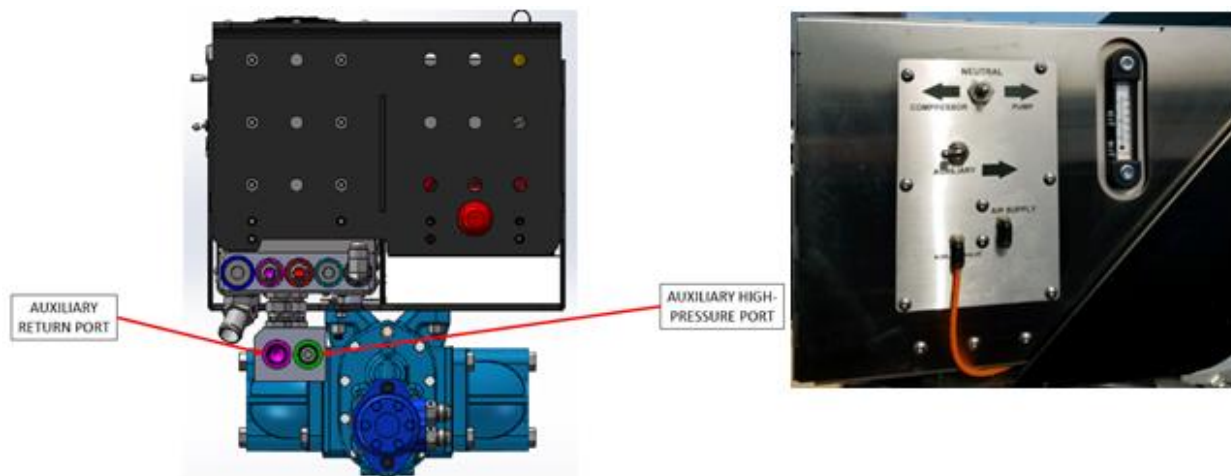


D. Troubleshooting

Problem	Cause	Corrective Action
Fan not spinning	<p>Low system pressure</p> <p>Low oil level in tank</p> <p>Air leak in suction hose or fitting connections</p> <p>Pinch Bolts (Item 29) are loose or missing</p> <p>Collapsed Suction Hose</p> <p>Flow Control Valve (Item 19) has blocked orifice</p> <p>Fan sucked in road trash such as a plastic bag and has caused fan to be in a bind</p>	<p>The system pressure must be higher than 900 psi for the fan to spin at full speed. Slower fan speeds in an unloaded condition are part of normal operation</p> <p>Fill Tank, tighten fittings, and bleed air from lines</p> <p>Tighten fittings and bleed air from lines</p> <p>Replace and re-torque</p> <p>Replace suction hose</p> <p>Remove and clean or replace valve. Change fluid and filter element</p> <p>With Unit de-energized, remove debris, check for proper torque of pinch bolts. Check to make sure the fan is not broken or cracked and motor functions properly</p>
High Oil Temperature	<p>Dirty Heat Exchanger Assembly (Item 31)</p> <p>System Relief Valve (Item 17) is opening</p> <p>low oil level in tank</p> <p>Collapsed Suction Hose</p> <p>Air leak in suction hose or fitting connections</p>	<p>Clean Heat Exchanger. Use mild cleaner compatible with aluminum. Be careful not to damage fins when using a pressure washer.</p> <p>Ensure that valve relief pressure is set higher than your system pressure. Remove and clean or replace valve. Change fluid and filter element</p> <p>Fill Tank and tighten fittings</p> <p>Replace suction hose</p> <p>Bleed air and tighten fittings</p>
Aeration of oil (Milky looking oil)	<p>Water Contamination</p> <p>Air leak in suction hose or fitting connections</p> <p>Pump is not lower than the tank</p> <p>Restricted suction line</p> <p>low oil level in tank</p>	<p>Replace Fluid and Filter Element. Check all fittings and Filter Cap for tightness</p> <p>Tighten fittings and bleed air from lines</p> <p>Reposition to ensure the fluid can gravity feed into the pump through the suction line.</p> <p>Route suction line to make as straight and short of a run as possible. Ideally you would want a 1.5" suction line for minimum flow restriction.</p> <p>Fill Tank and tighten fittings, verify proper fill level before use</p>
Heat exchanger Assembly leaks	<p>Loose Fittings (Items 48 & 48) or cut o-rings (Items 55 & 52)</p> <p>Burst Heat Exchanger</p>	<p>Replace o-rings and tighten fittings</p> <p>Replace Cold start relief valve (Item 32) and Heat exchanger assembly (Item 31)</p>

E. AC Auxiliary Circuit Option

Model #PP-GP-AC.



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