

KOBELT

HRP05/HRP11/HRP17 Accu-Steer Hydraulic Reversing Pump-Set

Owner's Operation, Installation & Maintenance Manual



May 2019

Kobel Manufacturing Co. Ltd.

TABLE OF CONTENTS

1	Introduction	4
1.1	Contact	4
1.2	Safety	4
2	Product Description	6
2.1	Technical Data	6
3	Operation	8
4	Installation	10
4.1	Mechanical	10
4.2	Hydraulic.....	10
4.3	Electrical	12
5	Commissioning	15
5.1	Hydraulic Fill & Bleed	15
5.2	Electrical Check	15
5.3	Functional Test	15
6	Maintenance	16
6.1	Preventative Maintenance.....	16
6.2	Recommended Spare Parts.....	16
7	Troubleshooting	17
8	Warranty	18
9	Appendix A: Installation Dimensions.....	19
10	Appendix B: Pump Parts List	20
11	Appendix D: Manifold Assembly Parts	22
12	Appendix D: Typical System Arrangement.....	24
13	Appendix E: Brush Replacement	25
14	Appendix F: Shaft Seal Replacement	26

1 INTRODUCTION

1.1 CONTACT

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This document is intended to clearly present comprehensive product data and provide technical information to assist the end user in design applications. Kobelt reserves the right, without notice, to change the design, or construction, of any products and to discontinue or limit distribution of any products. Kobelt also reserves the right to change, or update, without notice, any technical information contained within this document.

Kobelt recommends that customers visit our website to check for updates to this Manual. Once a product has been selected for use, it should be tested by the user to ensure proper function in all possible applications. For further instructions, please contact our distributors or visit our website.

1.2 SAFETY

1.2.1 Safety Alerts

Throughout this manual, the following symbols, and their accompanying explanation, are used to alert the user to special instructions concerning a service or operation that may be hazardous if performed incorrectly or carelessly. The associated risk levels are stated below.

 DANGER	This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	This symbol indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
NOTICE	This symbol informs the reader of events not related to personal injury but which there is a risk of damage to property or equipment.
SAFETY INSTRUCTIONS	This symbol informs the reader of safety-related instructions or procedures.

1.2.2 Notice to Installer

Disregarding the following safety measures can result in an accident causing severe injury to personnel and damage to material assets.

- Only use the product as directed in this manual.
- Never put the product into service if there is evidence of visible damage.
- Never put the product into service before fully completing installation and commissioning.
- Do not carry out any modifications to the product.
- Only use authentic Kobelt spare parts.
- Observe all local regulations, directives and laws during the installation of this product.
- All installation, commissioning, and maintenance work must only be conducted by qualified personnel. (For the purpose of this manual, qualified personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.)
- Observe all specifications in this manual. If these guidelines are not followed and damage occurs, the warranty will be voided.

1.2.3 Product Hazards



High Pressure Operation: This HRP unit generates high pressure hydraulics. Ensure all power sources are locked out prior to performing work.



Equipment Starts Automatically: HRP units are controlled remotely and may activate suddenly causing bodily harm. Ensure all power sources are locked out prior to performing work.



Disconnect Power: Turn off power at distribution panel before beginning installation to protect installer from electrical hazards.



Voltage and Current Compatibility: Confirm that the power source is compatible with the maximum voltage and current ratings of is product variant. Failure to do so could result in damage or fire.

2 PRODUCT DESCRIPTION

The HRP05, HRP11, and HRP17 are complete pump assemblies each consisting of a reversing gerotor gear pump, hydraulic lock valves, suction, make-up check valves, a valve housing manifold, and an electric permanent magnet motor.

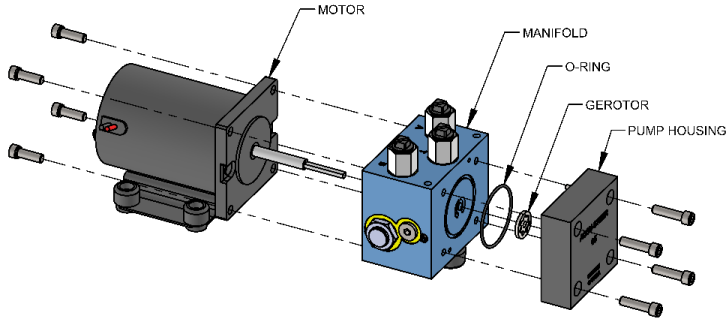


Figure 1: HRP Overview Diagram

2.1 TECHNICAL DATA

Table 1: HRP05/HRP11/HRP17 Technical Data

MODEL	HRP05-12	HRP05-24	HRP11-12	HRP11-24	HRP17-12	HRP17-24
KOBELT PART #	600-071	600-072	600-081	600-082	600-091	600-092
NOMINAL VOLTAGE	12 VDC	24 VDC	12 VDC	24 VDC	12 VDC	24 VDC
NO LOAD CONT. CURRENT	5 A	3 A	6 A	5 A	6 A	4 A
HARDOVER CURRENT	22 A	14 A	28 A	18 A	34 A	23 A
RECOMMENDED PROTECTION	25 A	15 A	30 A	20 A	40 A	25 A
OUTPUT FLOW RATE	0.5 in ³ /sec [8 cc/sec]		1.0 in ³ /sec [16 cc/sec]		1.6 in ³ /sec [26 cc/sec]	
MAX ALLOWABLE PRESSURE	<ul style="list-style-type: none"> • A & B PORTS 1000 PSI [70 bar] • T PORT 50 PSI [3.4 bar] 					
CYLINDER CAPACITY	5 - 9 in ³ [82 - 147 cc]		10 - 16 in ³ [164 - 262 cc]		16 - 30 in ³ [262 - 492 cc]	
SERVICE DUTY	Intermittent: 20% ON / 80% OFF					
RECOMMENDED FLUID	ISO VG 32, VI 60 Hydraulic Oil					
PORT SIZE AT MANIFOLD BODY	-06 SAE ORB					
PORT ADAPTERS	-06 SAE ORB TO 1/4" NPT					
OPERATING TEMPERATURE	14°F to 122°F [-10°C to 50°C]					
PRODUCT WEIGHT	10 lbs [4.5 kg]					
MOTOR WIRE LEADS	14 AWG: 5 feet [1.5 m]					
MOTOR APPROVALS	Ignition Protected: UL-1500, SAE-1171					

2.1.1 Cylinder Compatibility

The HRP05/11/17 works with both balanced and unbalanced cylinders. When unbalanced cylinders are used it is recommended that a vented header tank is used to allow for the expansion and contraction from the unbalanced cylinder.

2.1.2 Duty Cycle

The HRP pump-sets are designed as an intermittently operated unit for normal steering applications. High demand applications will over work the motor and cause over heating.

2.1.3 Temperature Limits

The motor temperature has a maximum limit of 248°F [120°C]. Allowing the temperature to exceed this limit will permanently damage the motor windings. The maximum oil temperature limit is 149°F [65°C].

Observe the operating temperature range of the unit (Table 1: HRP05/HRP11/HRP17 Technical Data). Do not operate the unit if the ambient temperature where the unit is located exceeds this limit.

2.1.4 Pressure Range

The normal operating pressure of the unit is 0 to 500 psi. Avoid operating the unit against the rudder stops for prolonged periods of time.

3 OPERATION

The Kobelt HRP Hydraulic Reversing Pump-sets are designed to interface a hydraulic steering system with electric or autopilot control. The output flow rate of the pump-set determines the actuation speed of the steering cylinder.

The HRP (Hydraulic Reversing Pump-set) operates as follows (reference numbers below refer to Figure 2):

- As the motor (1) rotates CCW, oil from the gear pump (2) is pumped towards output "A".
- This oil passes through the check valve (5) and goes to the output line (7).
- The pressure at output "A" ensures the check valve (3) stays closed and manually opens check valve (6).
- Opening check valve (6) allows the returning oil from the steering cylinder to flow back to the pump.
- If the pressure at the pump suction "B" is less than the pressure in the make-up line, oil from the make up line will pass by the check valve (4). This prevents cavitation due to any air that may be in the steering line.
- When the pump stops turning all spring-loaded check valves return to the normally closed position.
- When the motor (1) rotates (CW) the reverse movement of the oil and valves takes place.

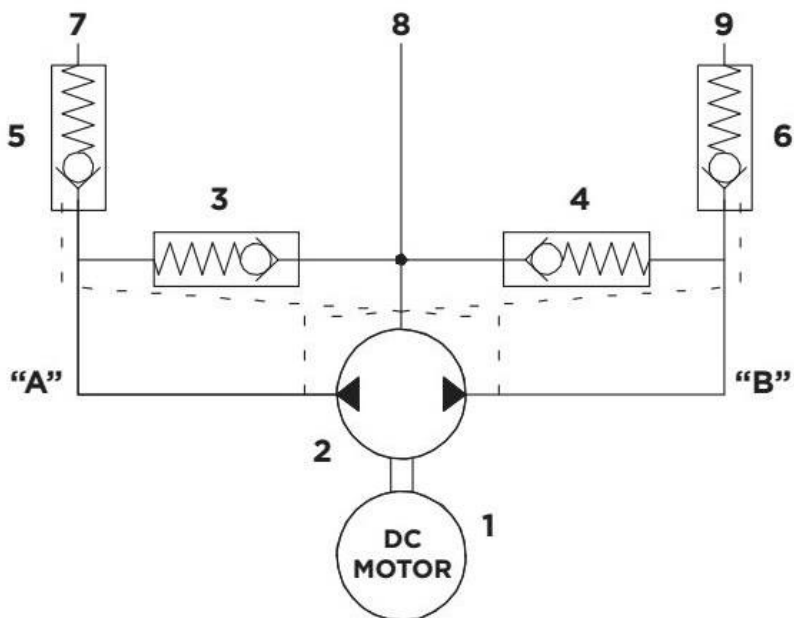


Figure 2: Internal Hydraulic Schematic

4 INSTALLATION

4.1 MECHANICAL

Ideally, the location of the pump-set should satisfy the following conditions:

- Within 6 feet [1.8 m] of the steering cylinder.
- Below the steering cylinder for ease of connections and bleeding.
- Placed on a horizontal shelf or bracket.
- Not exposed to direct sunlight or any source of heat.
- Provide a foundation sturdy enough to prevent the transmission of excessive vibrations.

The HRP is equipped with (4) four clearance holes for #10 (M5) bolts through the mounting feet. Ensure that the unit is securely fastened to a suitable foundation.

4.2 HYDRAULIC

The HRP pump-sets are equipped with a fitting with a 1/4" NPT port that are plugged for shipping.

NOTICE

Ensure the plugs remain in place until the unit is ready for connection.

NOTICE

All piping and hoses must be flushed prior to connection. Failure to do so can result in damaged components and seals.

The three hydraulic ports on the valve block are fitted with 1/4" NPT (National Pipe Thread) adapters. If preferred, the adapters can be removed, and connections can be made directly to the valve blocks -06 SAE ORB ports. When installing the hydraulic fitting in the 1/4" NPT port a pipe thread sealant such as Teflon paste must be used.

NOTICE

All hoses and piping must also be plugged or capped until ready for connection.

The piping to the steering cylinder should be 3/8" nominal size and no less than 1/4" with a suitable wall thickness to safely withstand the operating pressure. The Port and Starboard steering lines should have a pressure rating of 1000 psi minimum. Secure the piping against vibration with pipe clamps spaced every 3 feet [1 m].

The connections to the pump-set must be made by hoses of suitable rating to accommodate any movements, vibration or thermal strain. Hoses are also required to prevent any pump noise from being transmitted to the steering system.

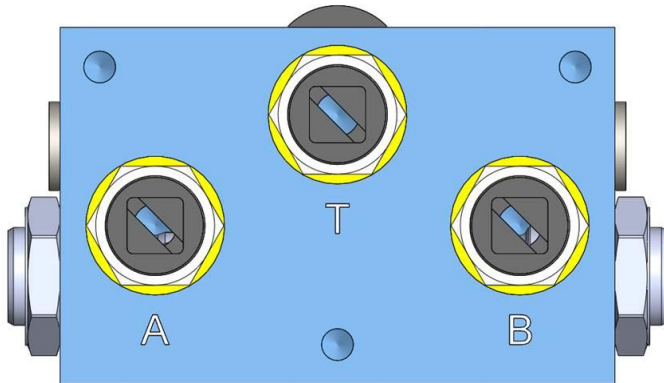


Figure 3: Connections in Top Face of Hydraulic Manifold

Three hydraulic connections are required to the pump-set:

- Connect ports 'A' & 'B' to the steering cylinder ports. It is not critical to identify which of the steering lines is Port or Starboard as most new autopilots will determine the pump direction and program the drive outputs to suit.
- Connect the 'T' port to the header tank or helm pump case. This third line is critical, as it provides make up oil and allows the pump-set to vent any air, which may enter the pump-set from the steering lines.

Shut-off or isolation valves for all three lines are recommended. If the pump-set fails, the isolation valves can be shut off and manual steering maintained.

If more than one helm pump is used, a return/fill line must be installed to connect the cases of all the helm pumps together.

With steering systems where the fill/interconnect line is pressurized (e.g. - Hynautics or Teleflex) the recommended operating pressure is approximately 20 to 25 psi. The plumbing is connected as noted by the port names on the top of the unit shown in Figure 3.

NOTICE

The shaft seal on the HRP pump-sets are rated to 50 psi. Exceeding this pressure will cause a shaft seal failure and void the warranty.

NOTICE

Do not connect the output lines (Cylinder) to the tank (T) port. Failure to observe this caution will cause a shaft seal failure and void the warranty.

4.3 ELECTRICAL

The motor has two 5 foot [1.5 m] long 14 AWG wire leads (1 Red and 1 Black). Connect them to an autopilot pump driver junction box or electrical steering interface.

Kobelt recommends the use of a dedicated circuit breaker to provide power to the HRP. Size the breaker to trip the maximum current as required by the current outlined in the product specifications table. The breaker should trip after no more than 600 seconds.

The motor power source must have proper short circuit and overload protection. Ensure that electrical cable used is sized properly to prevent excessive voltage drop. Refer to your local marine standards or other local governing wiring codes for guidance.

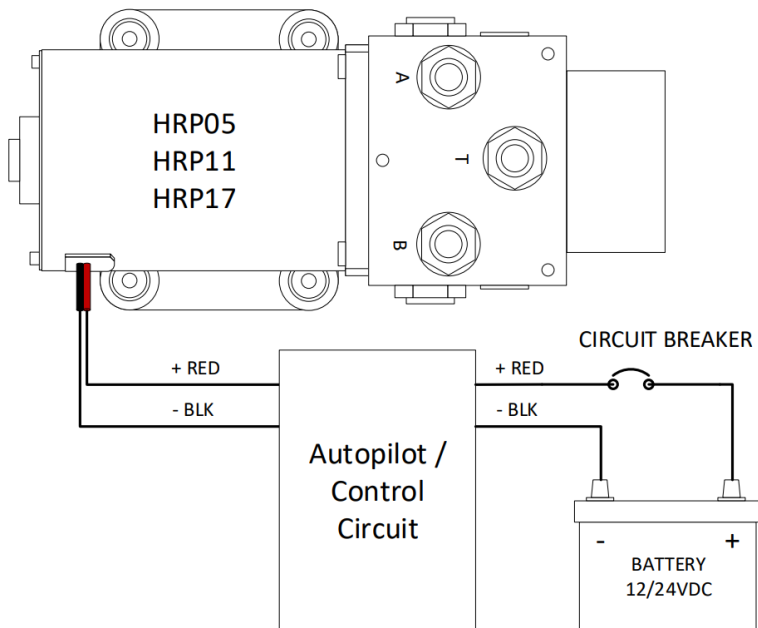


Figure 4: HRP05/11/17 Wiring Diagram

4.3.1 Autopilot Connection

The HRP can be directly connected to autopilots that support the current required of the HRP motor. The voltage supported is either 12VDC or 24VDC respective of the model variant being installed.

Example autopilot wiring diagrams are provided for reference below in Figure 5 thru Figure 7.

NOTICE	Remember to always follow the installation guidelines as provided by your autopilot manufacturers' manual.
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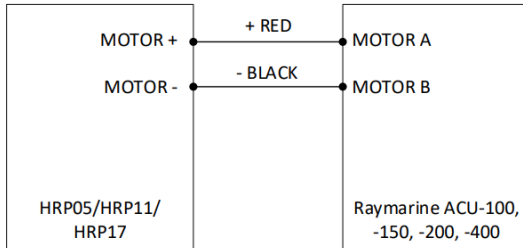


Figure 5: Example Autopilot Connection - Raymarine ACU-100, -150, -200, -400

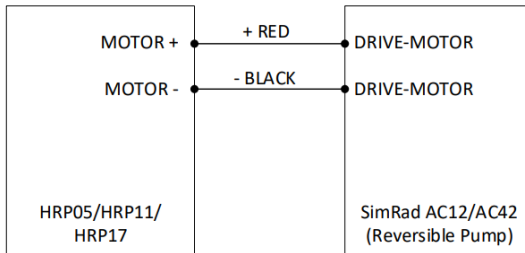


Figure 6: Example Autopilot Connection - SimRad AC12/AC42

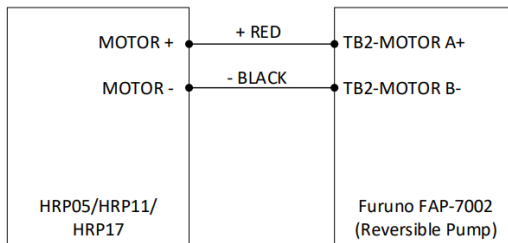


Figure 7: Example Autopilot Connection - Furuno FAP-7002

4.3.2 Jog Lever Connection

Alternatively, the HRP can be controlled from a Jog Lever, such as the Kobelt 7170. The control voltages supported depend on the power relays selected and HRP variant used. A sample configuration for wiring of an HRP and Kobelt 7170 Jog Lever is shown in Figure 8.

NOTICE	It is recommended that any design and implementation of such a system be performed by a Certified Marine Installer, Kobelt Distributor, or individual with appropriate training and knowledge.
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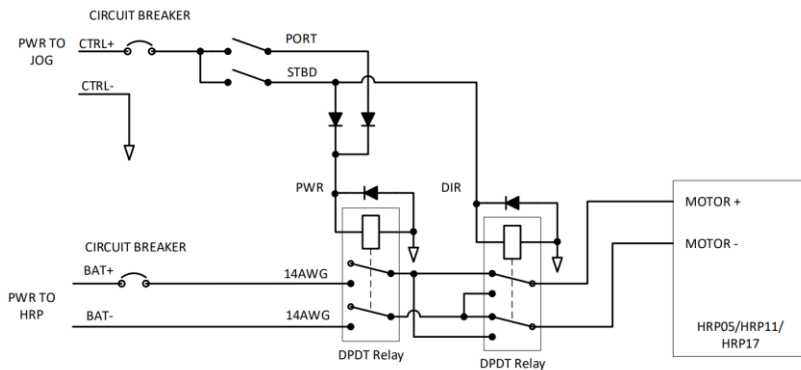


Figure 8: HRP Jog Lever Control Wiring Diagram

Power supply to Jog and HRP should be protected with appropriate circuit breakers as per local codes. If only a single battery power source is available, then they can be tied together at the supply source.

Diodes are required to isolate control signals to the power control relay. It is also recommended that protection diodes be applied across the relay coils if they are not integrated into the relays selected for this application.

5 COMMISSIONING

5.1 HYDRAULIC FILL & BLEED

- Open all vales, if installed, after the hydraulic connections have been made.
- Fill the steering system with an anti-wear petroleum-based fluid appropriate for the service conditions as recommended.
- Allow sufficient time for the pump and lines to fill with oil.

5.2 ELECTRICAL CHECK

- Confirm that the electrical connections to the Autopilot have been made.
- Confirm that a breaker has been installed correctly and is turned ON.

5.3 FUNCTIONAL TEST



CAUTION

The Function Test should be carried out while the vessel is still at dock and before it is taken out to sea after installation has been completed.

After installation and filling perform the following function tests:

1. Power ON the autopilot (or electronic jog lever).
2. Active the autopilot (or electronic jog lever) to command motion.
3. Verify that the rudder position changed.
4. Set the autopilot to the manual mode and operate the pump-set to determine if the Port and Starboard directions are correct.
5. If the rudder goes the opposite way than expected.
 - a. Reverse the two electrical leads between the motor and the autopilot.

NOTICE

Most new autopilot systems will perform this test during their dockside set-up procedures.

6. Operate the pump-set and note the "hard-over" to "hard-over" (HO to HO) time.
7. Verify that it is in the range of 10 to 16 seconds. Times outside of this range indicate a mismatched pump-set for the steering system.
8. Confirm the unit develops rated pressure during operation.

6 MAINTENANCE

6.1 PREVENTATIVE MAINTENANCE

- Monthly (12 times per year)
 - Inspect connections for leaks.
- Quarterly (4 times per year)
 - Verify adequate oil level.
 - Inspect the motor brushes.
 - Visually inspect wire and cable insulation for splits or damage.
- Every two years
 - Sample and analyze the oil in the steering lines.
 - Drain reservoir and clean out.
 - Verify pump develops rated pressure.
 - Verify insulation integrity of motor windings.

6.2 RECOMMENDED SPARE PARTS

As a minimum Kobelt recommends the following spare parts are on-hand:

Table 2: Recommended Spares

RECOMMENDED SPARES		
QTY	ITEM	KOBELT PART #
1	HRP05/HRP11/HRP17 REPAIR KIT (12 VDC/24 VDC)	600-071-RK

** Repair kit contains O-ring, shaft seal and brushes.*

When purchasing spare parts refer to Appendix B: Pump Parts List at the back of this manual for Kobelt component Part Numbers. See instructions at the end of this manual for shaft seal and motor brush replacement.

NOTICE

It is recommended that any required service work on an Accu-Steer unit be performed by a factory authorized service representative. Please contact the nearest Kobelt authorized distributor for assistance.

7 TROUBLESHOOTING

If you encounter problems with the operation of your product, please refer to the troubleshooting suggestions before contacting Kobelt for assistance. If the steps below do not resolve your issue, please reach out either Kobelt directly or our Dealers in your area.

Table 3: Common Solutions

Problem (Issue encountered)	Cause (What it means)	Corrective Action (What to do)
HRP does not turn ON	No power to unit.	<ol style="list-style-type: none"> 1. Check that the breaker is ON and has not tripped. 2. Check that power is being output by the Autopilot. 3. Use a Mutli-meter to confirm if power is present between the motor leads when the Autopilot is commanding motion.
Wheel feels soft	Air present in Hydraulic System	<ol style="list-style-type: none"> 1. Bleed hydraulic system to remove trapped air. 2. Check for proper operation.
HRP turns in opposite direction then expected	Motor connection leads are backwards, OR, the autopilot is expecting the reversed wiring configuration.	<ol style="list-style-type: none"> 1. Shut off power to the unit. 2. Disconnect the Red and Black wire leads. 3. Swap the lead connections and re-connect. 4. Check for proper operating direction.

8 WARRANTY

Kobelt Manufacturing Co. Ltd. ("Kobelt") warrants the Products and Parts manufactured by Kobelt to be free from defects in workmanship or material and that said products are designed mechanically and functionally to perform to specifications.

This warranty is effective providing:

- The equipment is used within the intended operating conditions and in accordance with Kobelt recommendations
- The equipment is installed according to equipment diagrams, specifications and recommendations which Kobelt has provided

This warranty becomes invalid if the factory supplied serial number has been removed or altered on the product. This warranty does not cover cosmetic damage or damage caused by an act of God, accident, misuse, abuse, negligence or modification of any part of the product. This warranty does not cover damage due to improper operation or maintenance, connection to inappropriate equipment or attempted repair by anyone other than an authorized Kobelt representative.

Upon identification of a potential issue or defect with a Kobelt Product or Part, the Warranty Applicant ("Applicant") must immediately contact Kobelt and describe the issue in writing, by letter, fax, email or other electronic conveyance. Kobelt will then assess the cause of the defect and determine warranty applicability and appropriate remediation.

If any part is found to be defective, Kobelt will replace said part FOB the Kobelt factory provided that any such defective part is returned by the Buyer with freight and applicable forwarding charges prepaid by the Buyer. Kobelt's sole obligation to the Applicant will be to repair or replace the defective part with same or similar product, to a maximum value of the list price of the product or part. The Kobelt warranty does not cover labour charges, travel or any other associated expenses.

All Products and Parts manufactured by Kobelt, are subject to a warranty against manufacturer's defects in materials or workmanship for a period of two (2) years from the date of purchase.

Kobelt will be responsible for all Products or Parts sold by Kobelt but manufactured by 3rd party manufacturing companies. However, these products and parts are subject to applicable 3rd party warranties and may not be the same as the Kobelt warranty.

9 APPENDIX A: INSTALLATION DIMENSIONS

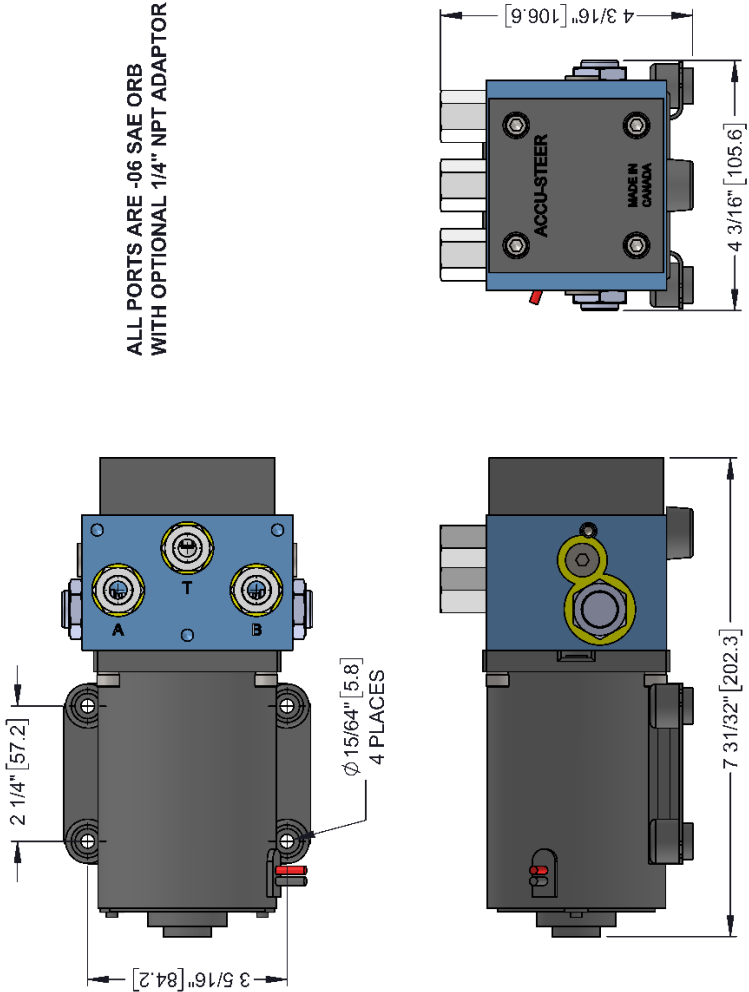


Figure 9: HRP05/HRP11/HRP17 Installation Dimensions

10 APPENDIX B: PUMP PARTS LIST

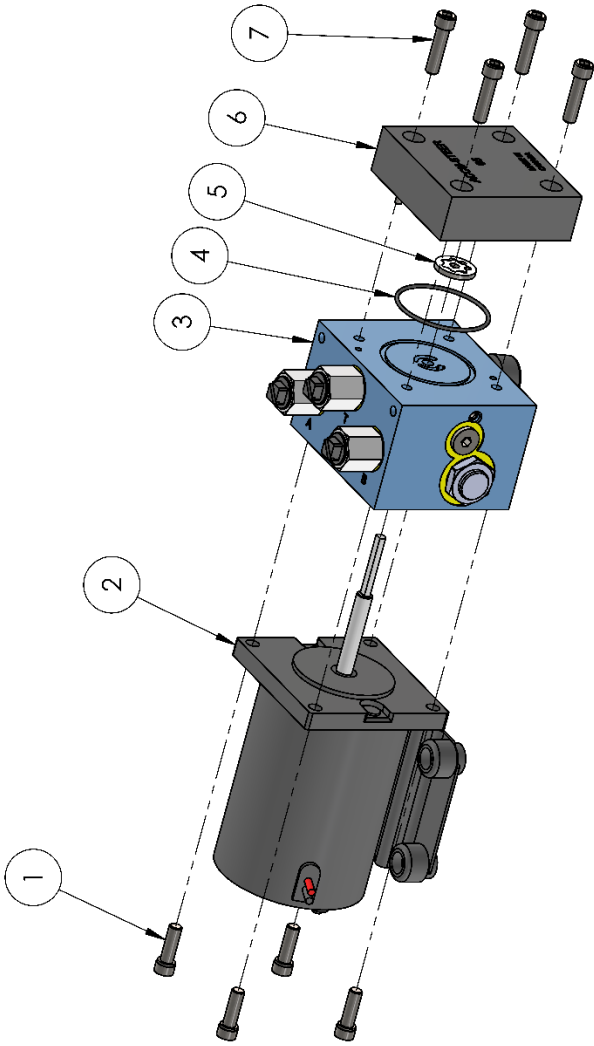
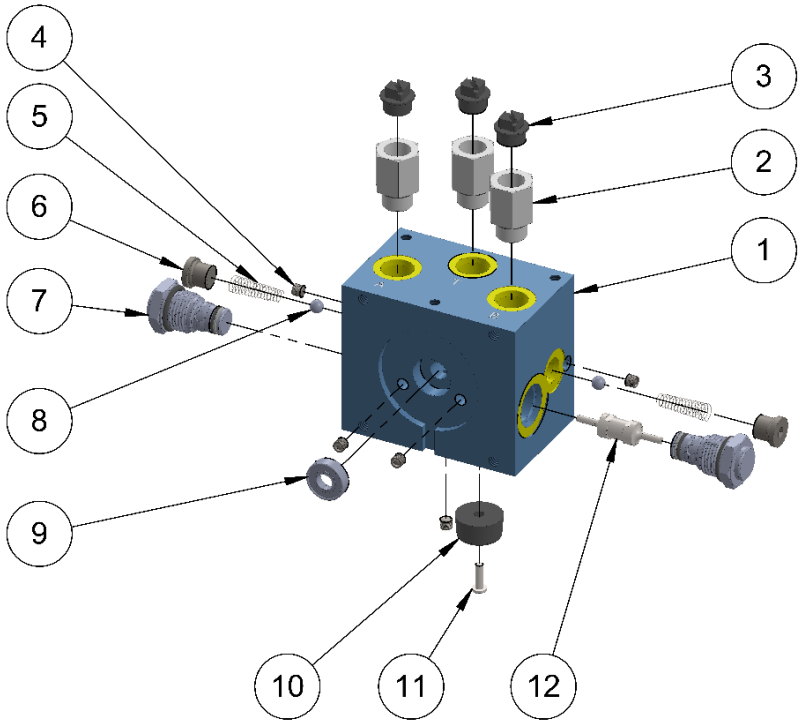


Figure 10: HRP05/HRP11/HRP17 Parts Diagram

1

Model No.:		HRP05-12	HRP05-24	HRP11-12	HRP11-24	HRP17-12	HRP17-24
Part No.:		600-071	600-072	600-081	600-082	600-091	600-092
ITEM	DESCRIPTION						
1	SCREW	1002-1012-2					
2	MOTOR	7070-0010	7070-0011	7070-0010	7070-0011	7070-0010	7070-0011
3	MANIFOLD	502-005					
4	REPAIR KIT	600-071-RK					
5	GEROTOR	7250-0001		7250-0002		7250-0003	
6	PUMP HOUSING	502-011		502-011		502-012	
7	SCREW	1002-1016					

11 APPENDIX D: MANIFOLD ASSEMBLY PARTS



NOTES:

1. TIGHTENING TORQUE:
ITEM 7: 25-30 ft lbs (34-41 Nm)

Figure 11: 502-005 Manifold Parts Diagram

Table 4: HRP 502-005 Manifold Parts Table

			Part No.:
			502-005
ITEM	QTY	DESCRIPTION	
1	1	HRP 05/11/17 MANIFOLD BODY	7001-0033
2	3	FITTING, -06 ORB M x 1/4 NPT F	7039-0141
3	3	PLASTIC PLUG, 1/4 NPT	7039-3042
4	5	EXPANSION PLUG CV173-218S	7039-3054
5	2	SPRING	1201-0261
6	2	PLUG, HEX SKT, -04 ORB, PLATED STEEL	7039-0661
7	2	CHECK VALVE	7049-0017
8	2	BALL CHECK	1301-0108
9	1	REPAIR KIT	600-071-RK
10	1	RUBBER FOOT	7056-0052
11	1	SCREW, PAN HD, PHIL, #6-32 x 1/2, 18-8	1012-0608
12	1	HRP LOCKVALVE SPOOL	7006-0002

12 APPENDIX D: TYPICAL SYSTEM ARRANGEMENT

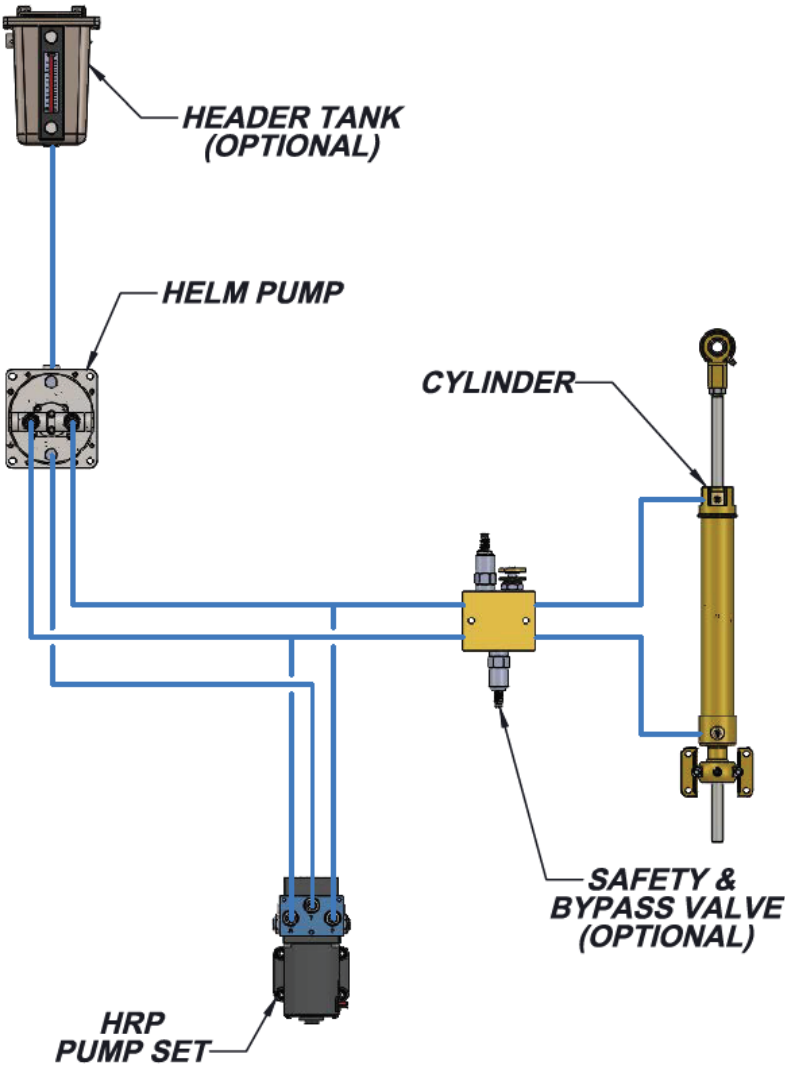


Figure 12: Typical System Arrangement

13 APPENDIX E: BRUSH REPLACEMENT

Steps for Replacement of Motor Brushes:

1. Remove the two nuts at the back of the motor.
2. Remove the motor end cap.
3. Inspect the brushes for wear.
4. If replacement required.
 - a. Remove them with consideration to the direction of brushes and springs.
 - b. Install new brushes in proper orientation.
 - c. Re-assemble motor housing.
5. If replacement not required.
 - a. Re-assemble motor housing.

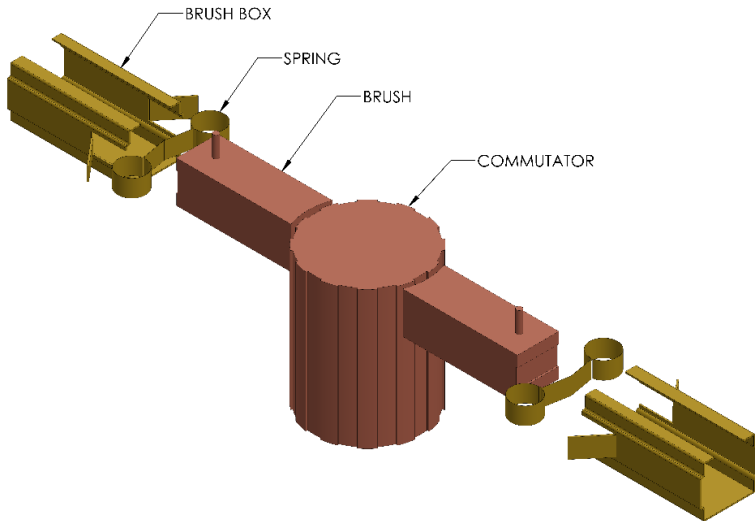


Figure 13: Motor Brush Diagram

14 APPENDIX F: SHAFT SEAL REPLACEMENT

Steps for Replacement of Motor Shaft Seal:

1. Clean both the Bore and Seal thoroughly with Methyl Hydrate or Similar Degreaser
2. Apply thin film of Loctite 567 (Liquid Teflon) to the Bore and Seal
3. Using moderate force, drive Seal into bottom of Bore using seating tool.

Note: Installation force is often provided solely by hand-operated arbor presses or soft-faced mallets (used in conjunction with strike plates).

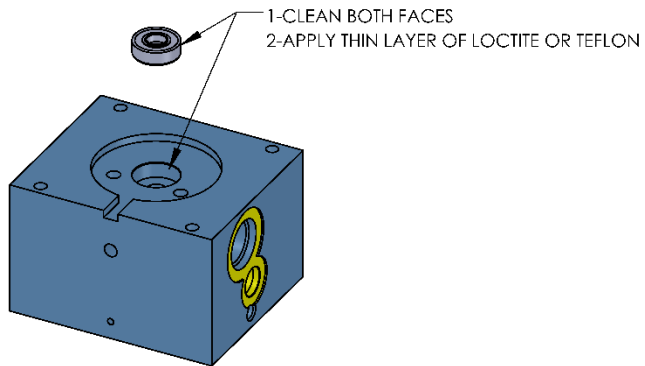


Figure 14: Motor Shaft Seal Diagram A

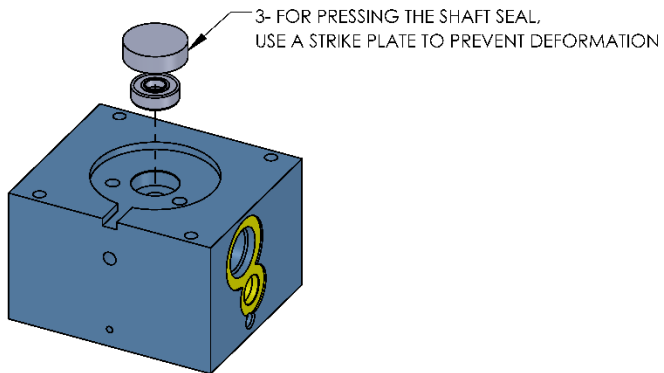


Figure 15: Motor Shaft Seal Diagram B

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