

*INSTALLATION,
OPERATION
AND
MAINTENANCE
MANUAL*

**TAC-KING[®]
TK120H
240V, 1Ø**

**PROCESS HEATING COMPANY, INC.
POST OFFICE BOX 84585
SEATTLE, WASHINGTON 98124-5885
PHONE: (206) 682-3414 FAX: (206) 682-1582**

WARNINGS

- 1) READ AND UNDERSTAND ALL TAGS AND INSTALLATION AND OPERATING INSTRUCTIONS BEFORE COMMENCING.
- 2) CHECK THAT THE ELECTRICAL SERVICE WILL HANDLE THE LOAD. UNIT MUST BE ADEQUATELY GROUNDED.
- 3) ALL WIRING SHOULD CONFORM TO REQUIREMENTS OF NATIONAL AND LOCAL ELECTRICAL CODES AND STANDARDS.
- 4) ONLY LICENSED ELECTRICIAN SHOULD CONNECT POWER TO PANEL AND SYSTEM.
- 5) IF THERE ARE ANY QUESTIONS CONCERNING THE RATINGS OR INSTRUCTIONS PLEASE CONTACT YOUR LOCAL DISTRIBUTOR OR THE FACTORY. PHONE (206) 682-3414, FAX (206) 682-1582, E-MAIL: inquire@processheating.com, WEBSITE: www.processheating.com

ADDITIONAL IMPORTANT INFORMATION

- 1) THESE INSTRUCTIONS CANNOT POSSIBLY COVER EVERY SITUATION CONCERNING THE OPERATION, INSPECTION, ADJUSTMENT AND TEST OF THE EQUIPMENT FURNISHED. PROCESS HEATING COMPANY (PHCo), IN THE FURNISHING OF THIS EQUIPMENT AND THESE INSTRUCTIONS, MUST PRESUME THAT THE OPERATING AND MAINTENANCE PERSONNEL USING THIS EQUIPMENT HAVE SUFFICIENT TECHNICAL KNOWLEDGE AND EXPERIENCE TO APPLY SOUND SAFETY AND OPERATIONAL PRACTICES WHICH MAY NOT BE MENTIONED.
- 2) IN APPLICATIONS WHERE PHCo FURNISHED EQUIPMENT THAT IS TO BE INTEGRATED WITH A PROCESS OR OTHER EQUIPMENT, THESE INSTRUCTIONS SHOULD BE THOROUGHLY REVIEWED TO DETERMINE THE PROPER INTEGRATION OF THE EQUIPMENT INTO THE OVERALL PLANT OR SYSTEM OPERATIONAL PROCEDURES.
- 3) PHCo DOES NOT SUPPLY, RECOMMEND OR APPROVE THE VARIOUS SYSTEMS IN WHICH ITS PRODUCTS ARE OR MAY BE USED. UNLESS DESIGNED, MANUFACTURED AND USED PROPERLY, VARIOUS SYSTEMS MAY BE INHERENTLY UNSAFE OR DANGEROUS. THE USER SHOULD CHECK AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS AND OTHER REGULATIONS AND RECOMMENDATIONS SUCH AS: NFPA, UL, API, OSHA, ETC.

INSTALLATION

- 1) UNIT MUST BE SECURELY MOUNTED TO “**PATCH-KING**” OR TRUCK BED.
- 2) IF USING WITH “**PATCH-KING**”, TANK IS FACTORY WIRED. IF NOT USING WITH “**PATCH-KING**”, PLUG “**TAC-KING**” INTO APPROPRIATE VOLTAGE AND PHASE (REFER TO LABEL INSIDE PANEL) AND MAKE SURE PANEL IS PROPERLY GROUNDED. CIRCUIT BREAKER OR FUSED DISCONNECT RECOMMENDED.
- 3) CONNECT HYDRAULIC PRESSURE (4 – 6 GPM, 1500 PSI) TO PORT MARKED “**IN**”. RUN HYDRAULIC RETURN LINE BACK TO RESERVOIR.
- 4) IF SUPPLIED WITH A “**PATCH-KING**”, HYDRAULIC LINES ARE CONNECTED.

OPERATION INSTRUCTIONS

- 1) TO OPERATE “**TAC-KING**” PULL INDICATED HYDRAULIC HANDLE OUT. THIS SUPPLIES HYDRAULIC PRESSURE TO THE “**TAC-KING**”. WHEN FINISHED RETURN HANDLE TO ORIGINAL POSITION.
- 2) FILL EMULSION TANK WITH TAC MATERIAL THE NIGHT BEFORE USING. SET THERMOSTAT TO DESIRED OPERATING TEMPERATURE (APPROXIMATELY 120°F). ******IMPORTANT – IT TAKES A MINIMUM OF EIGHT (8) HOURS TO RAISE TAC MATERIAL 60°F******
- 3) IT IS VERY IMPORTANT THAT THE TAC MATERIAL BE HOT FOR PROPER PUMPING AND ATOMIZING AT NOZZLE. THE MATERIAL TEMPERATURE CAN BE CHECKED BY READING THE DIAL THERMOMETER LOCATED ON THE SIDE OF THE TANK.
- 4) TO USE “**TAC-KING**” SELECT EMULSION TANK SUCTION WITH 3-WAY VALVE HANDLE. OPEN MANUAL SHUT-OFF VALVE ON WAND. WITH HYDRAULIC SYSTEM IN OPERATION PUMP WILL START AUTOMATICALLY. **DO NOT RUN PUMP DRY.**
- 5) WHEN FINISHED SPRAYING TAC MATERIAL SELECT DIESEL SUCTION WITH 3-WAY VALVE HANDLE, FLUSH PUMP AND LINES FOR EASY START-UP. ******IMPORTANT – VALVE HANDLE MUST BE IN EITHER DIESEL OR EMULSION POSITION FOR PROPER OPERATION******
- 6) OPEN PANEL AND TURN THERMOSTAT OFF WHEN TANK IS EMPTY OR WHEN NOT IN USE. DRAIN AND CLEAN TANK AND SYSTEM AT DESIRED INTERVALS TO ASSURE PROPER OPERATION AND LONG LASTING SERVICE.

MAINTENANCE

- 1) PERIODICALLY CHECK ALL WIRING CONNECTIONS TO INSURE THEY ARE TIGHT AND FREE OF OXIDATION.

PARTS LISTS - TK120H, 240V, 1Ø

HYDRAULIC PARTS

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
1	Pump Motor	129-0003-002	Char-Lynn
1	Coupling	L095 x 5/8 HUB 3/16 KW	Lovejoy
1	Hydraulic Hose Assembly	3/8FJX663X1/2MP/17" Hose Cut	Aeroquip
1	Hydraulic Hose Assembly	3/8FJX663X1/2MP/18" Hose Cut	Aeroquip

PUMP SYSTEM PARTS

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
1	Pump	2AM03	Roper
1	Coupling	L095 x 1/2 HUB 1/8 KW	Lovejoy
1	Spider	L090/L095 SOX	Lovejoy
1	3-Way Bronze Valve	70-604-01	Apollo

HOSE/WAND ASSEMBLY PARTS

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
1	1/2" Hydraulic Hose x 30' long	100R1AT w/8x8 MP, HU 8x8MPX	
1	1/2" Ball valve w/Deadman Lever	77-503-01	Apollo
1	Stem Extension, 2 1/4"	78-443-01	Apollo
1	Spray Wand Nozzle	H1/4U-4015	

ELECTRICAL HEATING PARTS

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
1	Enclosure Heater/Thermostat	A1210CH	Hoffman
2	Heating Elements	3" x 36" long, 1000 watt	PHCo
1	Thermostat	D1/D18, 60° - 250°F	Robertshaw

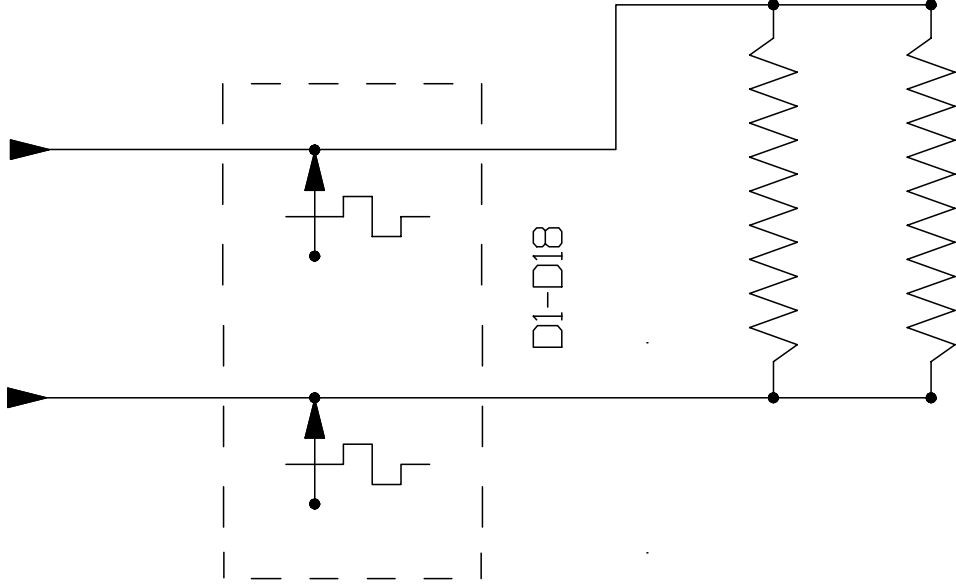
THERMOMETER

QTY	DESCRIPTION	PART NUMBER	MANUFACTURE
1	Thermometer for Tac Temp. Sensing	GT300-12", 50° - 250°F	Tel-Tru

TITLE	PHC089JI
ELECTRICAL RATING	2KW, 240V, 1-PH, 8.3A

TAC-KING PANEL WHEN SUPPLIED WITH PATCH KING

240V, 1Ø FROM
PATCH KING PANEL



TAC-KING
HEATERS

PROCESS HEATING CO 2732 3rd Ave So Seattle, WA 98134	
APPROVALS	DATE
DRAWING BY:	P/N
Proprietary Drawing/Data/Design Exclusive Property of PHCO Not for Reproduction Without Written Consent	

WARRANTY

PHCO “PATCH KING” AND “TAC-KING” PRODUCTS

Process Heating Company shall at any time during the first year after delivery –(heating elements have an additional four year warranty for parts only)- replace any electrical or mechanical components found defective. This work shall be done at the Process Heating

Company factory or any authorized distributor’s shop (to be determined by Process Heating Company). The electrical components that are supplied in the control panel shall carry the manufacturer’s warranty. This warranty will not be valid if the equipment is not maintained, operated and serviced to meet the manufactures recommendations and does not cover damage from
misuse whether accidental or intentional.

Unless otherwise agreed in writing by Process Heating Company ("PHCo"), all of the following terms & conditions shall apply to its transaction with you (the "buyer"):

1. **LIMITED WARRANTY; DISCLAIMERS.** PHCo warrants that the goods sold under this contract shall be free from defects in workmanship and materials at the time delivery is tendered. If there is discovered any failure of goods to conform to this warranty within one (1) year after tender of delivery (five (5) years in the case of immersion type heating elements other than drop-in style elements), and if Buyer notifies PHCo in writing of such fact within thirty (30) days following such discovery, PHCo at its own expense either will repair the defective item, or replace it, or refund to Buyer the purchase price paid for that item (with choice between repair, replacement or refund to be made solely by PHCo). The foregoing limited warranty and remedy are exclusive of all other warranties, express or implied, and constitute PHCo's exclusive liability, and Buyer's exclusive remedy, on account of any claim relating to any item sold. PHCo DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. If PHCo should elect to repair or replace a defective item and if for any reason the repair or replacement should fail in its essential purpose (which is to provide Buyer with a non-defective item), then PHCo's liability nevertheless shall be limited to the purchase price charged by PHCo for the goods. PHCo shall have no liability on account of any claim asserted under principles of negligence or other tort, breach of any statutory duty, indemnity or contribution, or on any other basis, if PHCo's liability on account of such claim would exceed or in any respect differ from its liability under forgoing limited warranty and exclusive remedy.
2. **LIABILITY OF PHCo UNDER THE FOREGOING LIMITED WARRANTY SHALL EXIST ONLY IF:**
 - a. The goods are installed, operated and tested in accordance with the PHCo approved installation and operation instruction.
 - b. The goods are used and maintained in conformity with installation and operation instructions approved or published by PHCo.
 - c. Written authorization must be given by PHCo before any warranty work is done.The above limited warranty shall be void and no longer in effect if the goods are subject to abuse, strain, impact or loading that is greater than their normal.
3. **LIMITATION OF LIABILITY.** UNDER NO CIRCUMSTANCES SHALL PHCO OR ANYONE ELSE INVOLVED IN THE MANUFACTURE OR SALES OF THE GOODS BE LAIBLE TO BUYER OR OTHERS FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, EVEN IF PHCO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY DAMAGES OR SUMS PAID BY BUYER OR OTHER THIRD PARTIES. THE FOREGOING LIMITATION OF LIABILITY SHALL APPLY WHETHER ANY CLAIM FOR ANY SUCH DAMAGES IS BASED UPON PRINCIPLES OF CONTRACT, WARRANTY, NEGLIGENCE OR OTHER TORT, BREACH OF STATUTORY DUTY, PRINCIPLES OF INDEMNITY OR CONTRIBUTION, THE FAILURE OF ANY LIMITED OR EXCLUSIVE REMEDY TO ACHIEVE ITS ESSENTIAL PURPOSE, OR ANY OTHER BASIS.
4. **AUTHORITY OF PHCo's AGENTS.** No agent, employee or representative of PHCo has any authority to bind PHCo to any other affirmation, representation, promise or warranty concerning the goods sold under this contract, unless it is in writing and included as part of the terms of this contract.
5. **MODIFICATION OF WAIVER.** No subsequent waiver or modification of this Limited Warranty and Liability shall be effective unless the same is in writing and signed by the party against whom such waiver or modification is asserted. No waiver in any one instance shall constitute a waiver of the same or any other term or condition on any subsequent occasion. None of the express terms of this Limited Warranty and Liability may be waived or varied by course of dealing or usage of trade.
6. **DISPUTES.** This agreement shall be governed by the laws of the State of Washington without reference to its choice of law rules. Any action to enforce any of the terms or conditions of this agreement may be commenced or maintained at the option of either party in any federal or state court located in King County, Washington having jurisdiction over the matter, and both parties consent in advance to the exercise by such courts of jurisdiction over them personally. No action by either party arising out of or relating to this contract (including any action based upon principles of contract, tort or otherwise) may be commenced more than one (1) year after the cause of the action has accrued, and any action commenced by a party thereafter shall be dismissed at the instance of the other party.

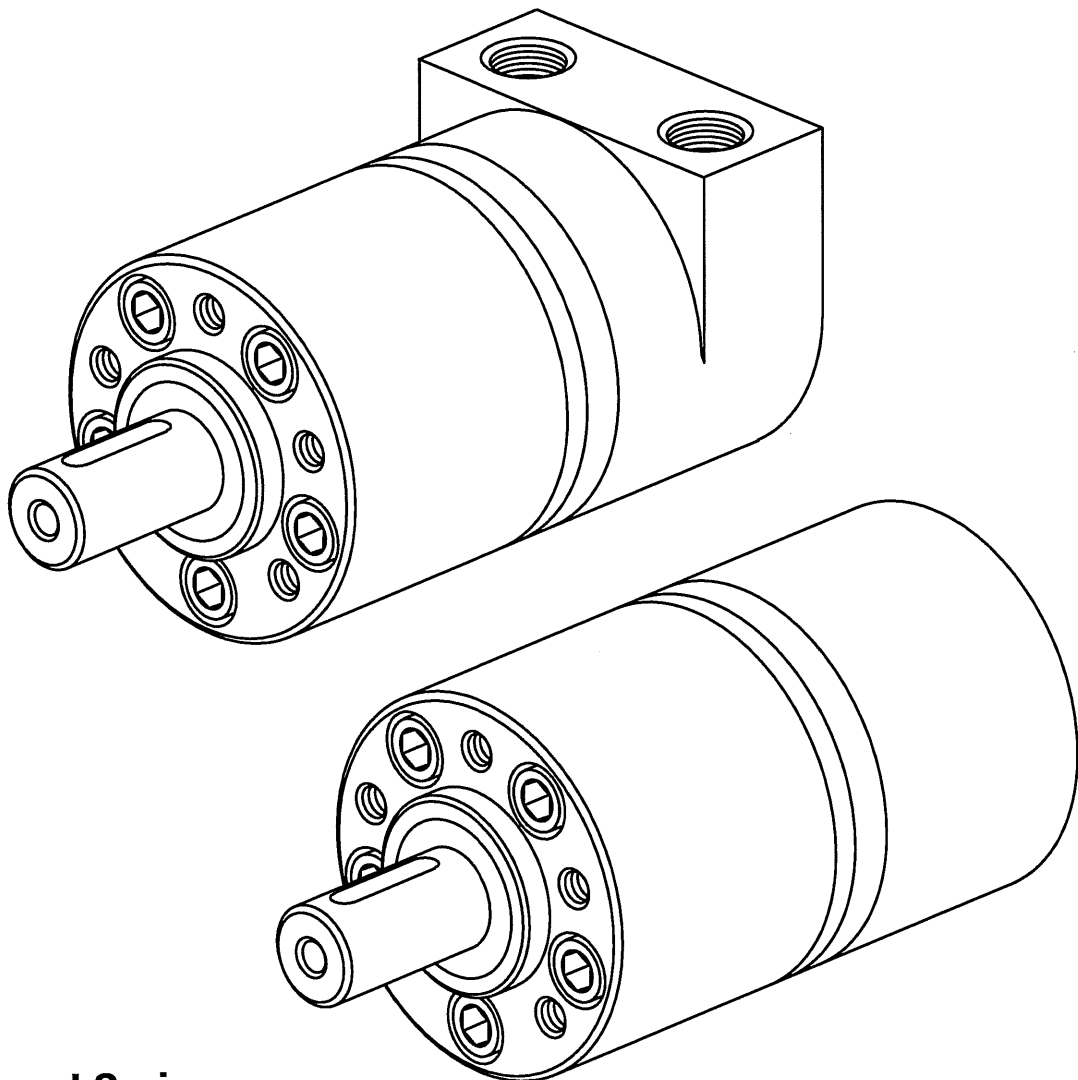
Char-Lynn®

General Purpose Hydraulic Motors

No. 7-144
March, 1996



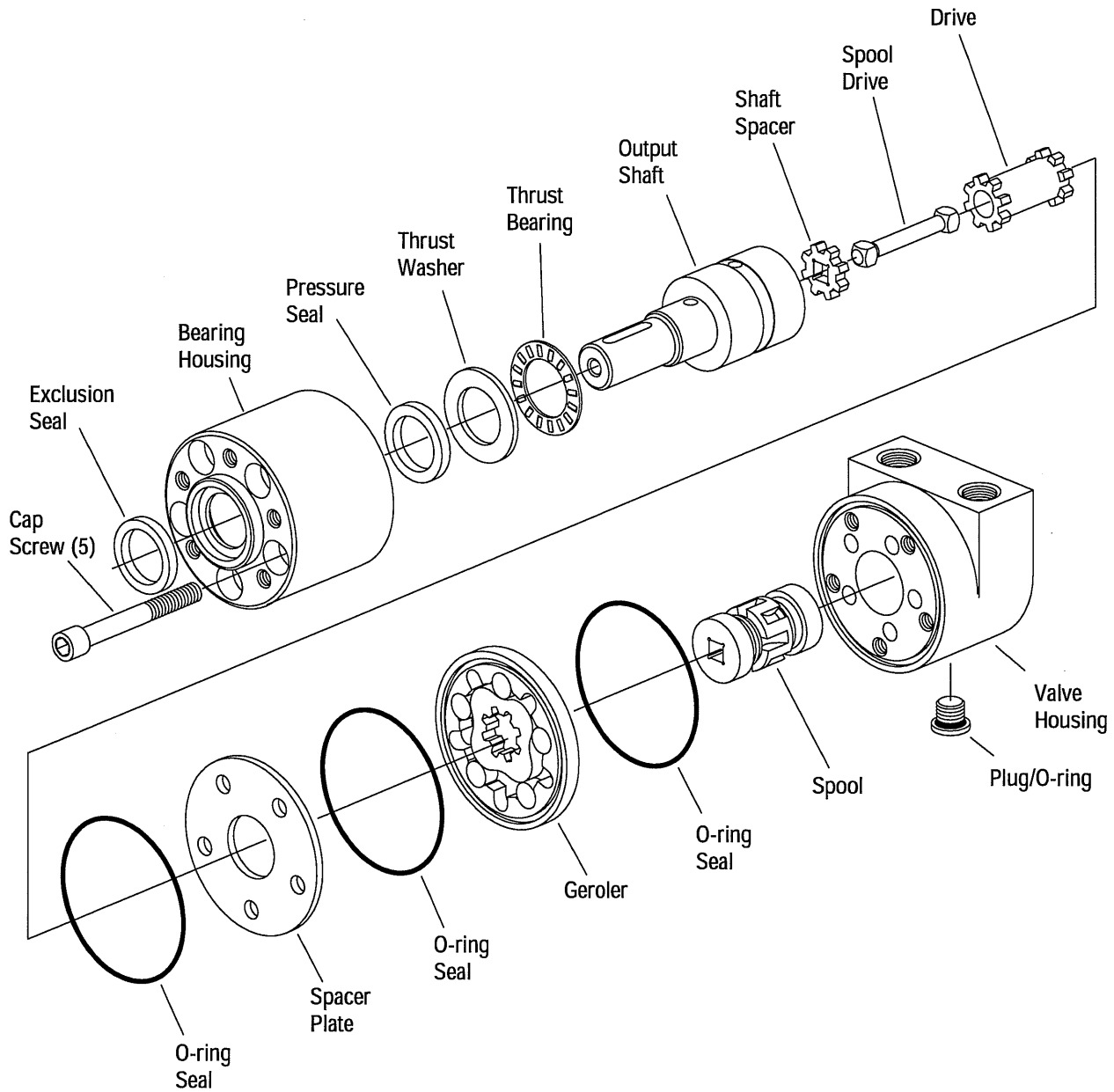
Repair Information



J Series
Geroler® Motor

001 002

J Series Geroler Motors



Required Tools

- 1/8 in. hex key
- 3/16 in. hex key
- 5 mm hex key (for motors with metric ports)
- Torque wrench - 17 Nm [150 lb-in.] capacity

J Series Geroler Motors

1 Cleanliness is extremely important when repairing hydraulic motors. Work in a clean area. Before disconnecting the hydraulic lines, clean the port area of the motor. Before disassembly, drain the oil from the motor. Then plug the ports and thoroughly clean the exterior of the motor. Check the output shaft, remove any burrs, nicks, or sharp edges.

2 Make a scribe mark across the motor sections. This will help get the correct alignment when the motor is reassembled.

3 Remove the five cap screws and disassemble the motor as shown in the parts drawing.

Note: Do not remove the retaining rings and check balls from the spool.

4 Carefully remove the exclusion seal and pressure seal from the bearing housing. A seal removal tool may be fabricated by bending and rounding the end of a small blade screwdriver, see figure 1.

Important: Do not damage the bearing housing.

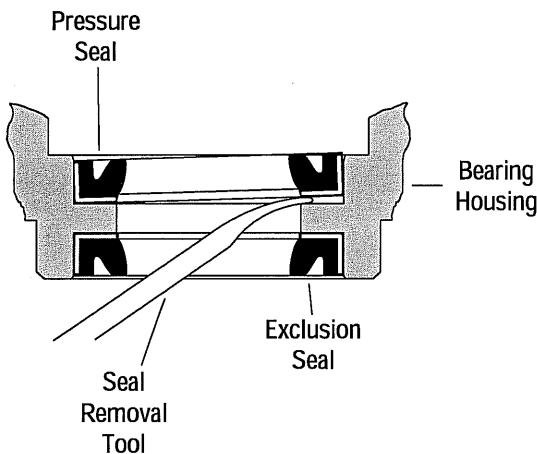


Figure 1

5 Check all mating surfaces. Replace any parts with scratches or burrs that could cause leakage. Wash all metal parts in clean solvent. Blow them dry with pressurized air. Do not wipe parts dry with paper towels or cloth. Lint in a hydraulic system will cause damage. Check the key way and chamfered area of the output shaft; remove any nicks, burrs, or sharp edges that could damage the shaft seals during reassembly.

Note: Always use new seals when reassembling hydraulic motors. Refer to Parts List 6-147 for seal kit part numbers, replacement parts, and ordering information.

Important: During reassembly lubricate the new seals with a petroleum jelly like Vaseline. Also lubricate machined surfaces and bearings with clean hydraulic fluid.

6 Put the thrust bearing and thrust washer on the output shaft.

7 Apply a light coating of hydraulic fluid to the outside diameter of the pressure seal and carefully slide it onto the shaft so that it is next to the thrust washer. See figure 1 for the correct seal orientation.

Note: The pressure seal is slightly thicker than the exclusion seal.

8 Slide the shaft into the bearing housing and press the pressure seal into its seat.

9 Remove the shaft, and thrust bearing and washer.

10 Using a 1 inch diameter dowel, press the pressure seal all the way into its seat. Be careful, do not damage the seal.

11 Install the exclusion seal. Be sure to press it all the way into the seat. See figure 1 for the correct seal orientation.

12 Apply a coating of Mobilith SCH 220, or equivalent to inner edges of the shaft seals.

13 Install the thrust bearing and washer onto the output shaft. Dip the bearing end of the output shaft, thrust bearing and washer in clean hydraulic fluid. Then carefully slide the output shaft into the bearing housing.

Important: Do not damage the shaft seals, use of a protective bullet is recommended.

14 Install the shaft spacer, spool drive, and drive. The end of the drive with the small opening goes into the output shaft.

15 Lightly lubricate and install an o-ring seal in the groove in the bearing housing.

16 Install the spacer plate and align the screw holes.

17 Lightly lubricate and install an o-ring seal in the groove in the Geroler.

General Purpose Motors

J Series Geroler Motors

18 Install the Geroler and time the motor.

- Align the corners of the spool drive end with the star points for standard timing, see figure 2.
- Align the corners of the spool drive end with the star valleys for reverse timing, see figure 2.

19 Align the screw holes in the geroler with the screw holes in the bearing housing and spacer plate.

20 Lubricate the spool and slide it into the valve housing.

Note: The spool is match fit to the valve housing, replace them as a subassembly.

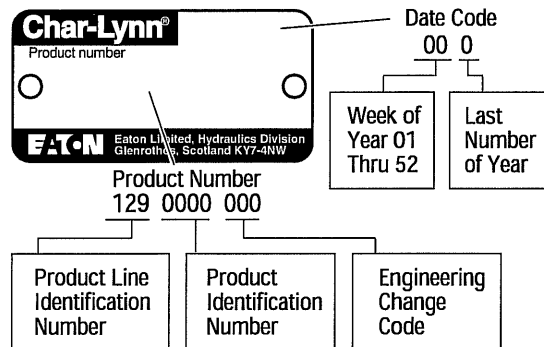
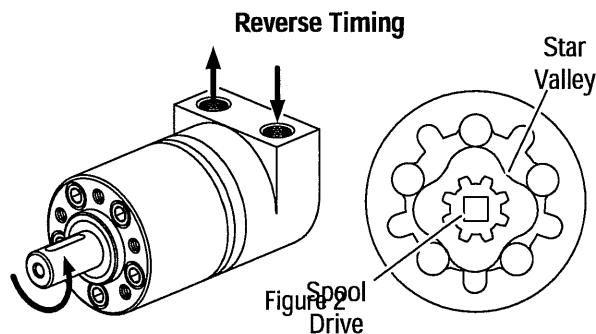
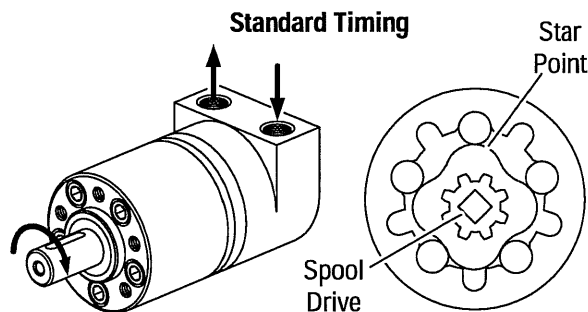
21 Lubricate and install an o-ring seal in the groove in the valve housing.

22 Carefully install the valve housing and spool. Engage the spool with the spool drive, then rotate the valve housing until the scribe marks on the bearing and valve housings align.

23 Install the five cap screws and pretorque them in a criss-cross pattern to 9-10 Nm [80-90 lb-in.]. Final torque in a crisscross pattern to 14-15 Nm [120-130 lb-in.].

22 If no case drain is used, Install the plug in the valve housing. Use a new o-ring and tighten it to 7 Nm [60 lb-in.].

23 If a 2 bolt mounting flange is used, install the flange and tighten the screws, in a criss-cross pattern, to 8 - 10 Nm [71 - 89 lb-in.].



How to Order Parts

Each order must include the following information:

- 1 Product Number
- 2 Date Code
- 3 Part Name
- 4 Part Number
- 5 Quantity

Eaton Corporation
Hydraulics Division
15151 Hwy. 5
Eden Prairie, MN 55344
Telephone 612/937-9800
Fax 612/937-7130

Eaton Ltd.
Hydraulics Division
Glenrothes, Fife
Scotland, KY7 4NW
Telephone 01-592-771-771
Fax 01-592-773-184

Eaton GmbH
Hydraulics Products
Am Schimmersfeld 7
40880 Ratingen, Germany
Telephone 02102-406-830
Fax 02102-406-800



Quality System Certified
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Form No. 7-144

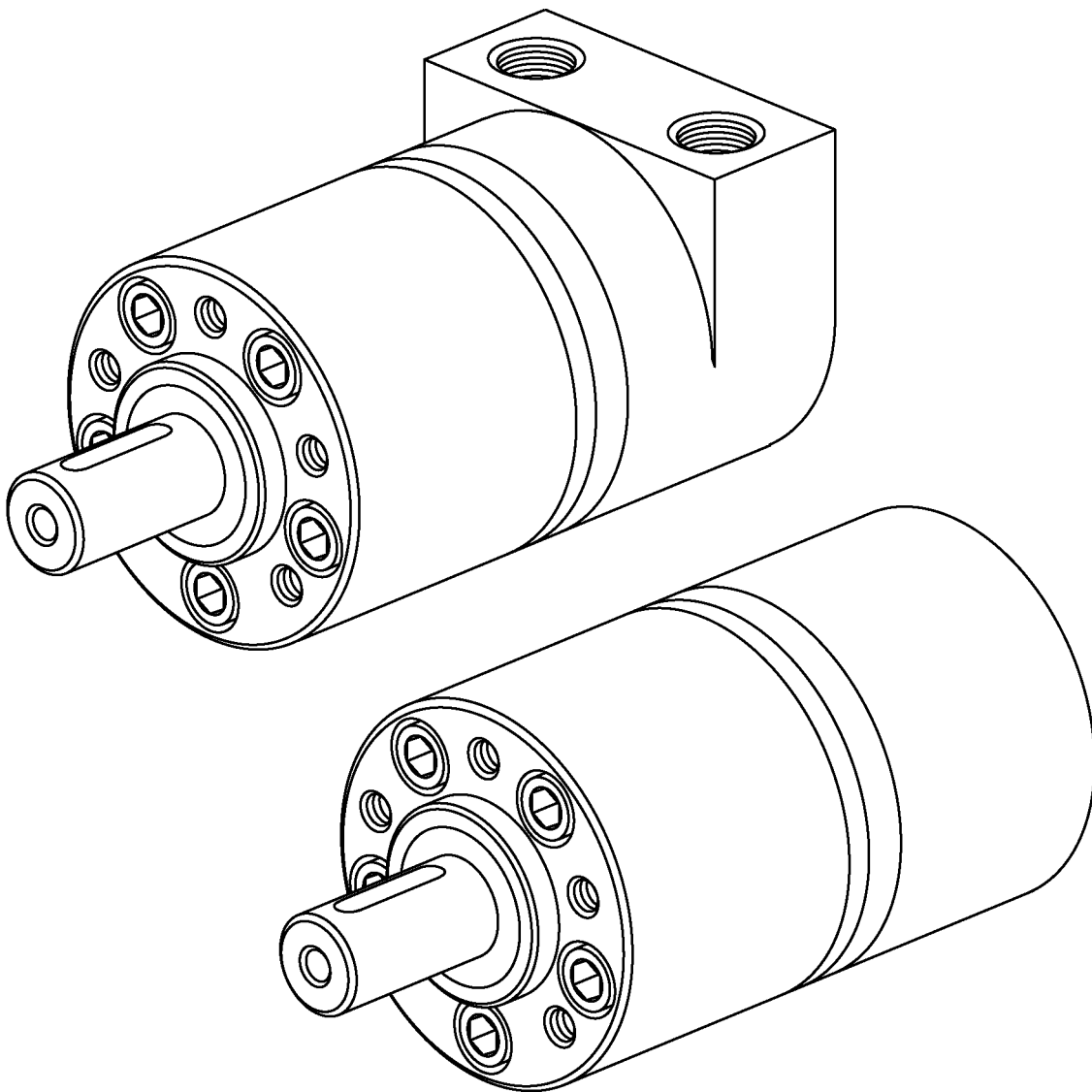
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Char-Lynn®

J Series
Geroler Motor

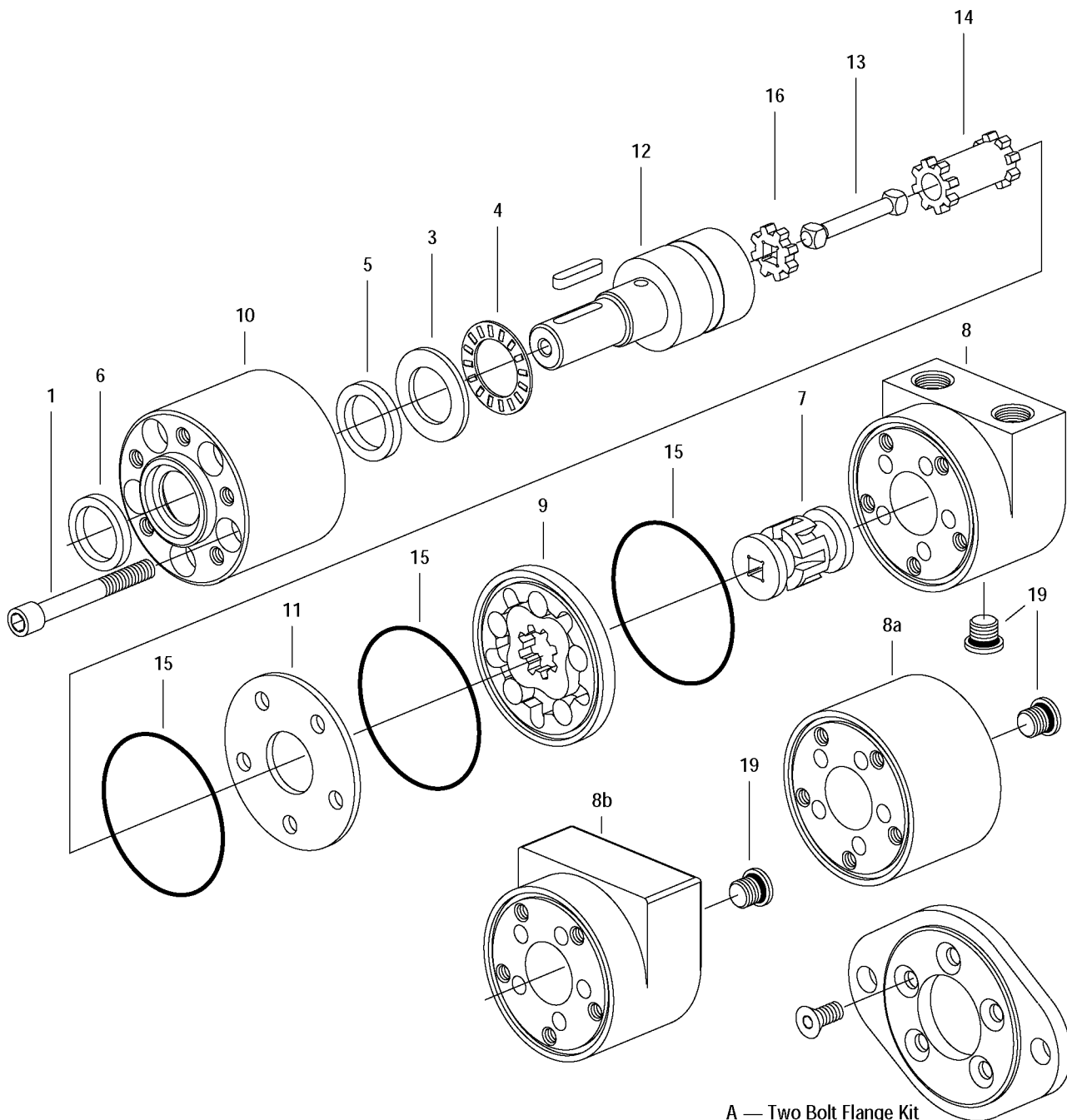
001



J Series

Parts Drawing and Parts List

Displacement cm ³ /r [in ³ /r]	Ref. No. 1 Screw, Cap Internal Hex	Length mm [inch]	Ref. No. 13 Drive, Spool	Length mm [inch]	Ref. No. 14 Drive	Length mm [inch]	Ref. No. 9 Geroler®	Length mm [inch]
8,2 [.50]	16148-422	57,2 [2.25]	23016-001	46,2 [1.82]	23017-001	32,39 [1.275]	201404-001	5,31 [.209]
12,9 [.79]	16148-424	64,0 [2.50]	23016-002	49,0 [1.93]	23017-002	35,48 [1.397]	201404-002	8,38 [.330]
19,8 [1.21]	16148-426	69,9 [2.75]	23016-003	53,8 [2.12]	23017-003	40,03 [1.576]	201404-003	12,83 [.505]
31,6 [1.93]	16148-430	76,0 [3.00]	23016-004	61,5 [2.42]	23017-004	47,68 [1.877]	201404-004	20,47 [.806]



Ref. No.	Part Number	Description	Quantity
1	*	Screw, Cap Internal Hex	5
3	16241-C1220	Washer, Thrust	1
4	16241-1220	Bearing, Needle Thrust	1
X 5	9117-015	Seal, Pressure	1
X 6	9121-003	Seal, Exclusion	1
7	23015-000	Spool	1
8	23061-001	Housing, Valve (Side Ports — 9/16-18 UNF)	1
	23061-004	Housing, Valve (Side Ports — M14)	1
	23061-003	Housing, Valve (Side Ports — G 1/4 (BSP))	1
	23061-002	Housing, Valve (Side Ports — G 3/8 (BSP))	1
8a	23018-001	Housing, Valve (End Ports — 9/16-18 UNF)	1
	23018-003	Housing, Valve (End Ports — M14)	1
	23018-002	Housing, Valve (End Ports — G 1/4 (BSP))	1
8b	23333-001	Housing, Valve (End Ports — G 3/8 (BSP))	1
9	*	Geroler®	1
10	23019-001	Housing, Bearing (1/4-28 UNF-2B Mounting Holes)	1
	23019-002	Housing, Bearing (M6 x 1 - 6H)	1
11	23024-000	Plate, Spacer	1
12	23020-001	Shaft, Output (5/8 Straight Keyed)	1
	14535-004	Key (for 5/8 Straight Keyed Shaft)	1
	23020-002	Shaft, Output (16 mm Straight Keyed)	1
	14530-001	Key (for 16 mm Straight Keyed Shaft)	1
	23020-007	Shaft, Output (5/8 Straight with Crosshole)	1
	23020-008	Shaft, Output (3/4 Tapered)	1
	16029-610	Key (.188 x .625 Woodruff Key) (for 3/4 Tapered)	1
	16267-108	Nut, Slotted (1/2-20 UNF x 11,2 [.44] Thick) (for 3/4 Tapered)	1
	23020-004	Shaft, Output (11/16 Straight Keyed)	1
	14535-004	Key (for 11/16 Straight Keyed Shaft)	1
	23020-005	Shaft, Output (18 mm Straight Keyed)	1
	14531-001	Key (for 18 mm Straight Keyed Shaft)	1
	23020-006	Shaft, Output (Involute Splined Metric)	1
13	*	Drive, Spool	1
14	*	Drive	1
X 15	16007-006	Seal, O-ring	3
16	23074-000	Spacer, Output Shaft	1
19	9072-002	Plug/O-ring S/A (3/8-24 UNF Drain Port)	1
X	250003-903	O-ring (for 3/8-24 UNF Plug)	1
	9237-001	Plug/O-ring S/A (M10 Drain Port)	1
X	14581-001	O-ring (for M10 Plug)	1
	9170-001	Plug/O-ring S/A (G 1/8 (BSP) Drain Port)	1
X	14591-001	Ring Seal (for G 1/8 (BSP) Plug)	1
A	60552-000	2 Bolt Flange Kit (for 3/8 Mounting Bolts)	1
	60553-000	2 Bolt Flange Kit (for M8 Mounting Bolts)	1
	60554-000	Seal Kit — Contains Parts Indicated by X	

* See Chart on Page 2

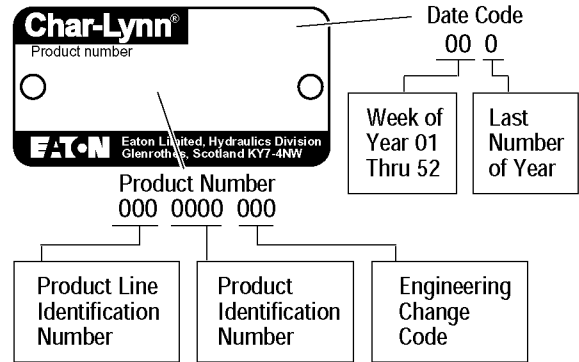
How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts

For More Detailed Information Contact Eaton Corp. Hydraulics Division 15151 Highway 5 Eden Prairie, MN 55344.

- Specifications and performance data, Catalog No. 11-104
- When servicing J Series Motors refer to Repair Information No. 7-144. This repair manual lists tools required, and step by step disassembly and reassembly procedures.



Port Location	Port Size	Mounting Holes (5)	Shaft	Displ. cu. cm./rev. [cu. in./rev.]/ Product Numbers				
				8,2 [.50]	12,9 [.79]	19,8 [1.21]	31,6 [1.93]	
End Port Motors	9/16-18 UNF O-ring (2) 3/8-24 UNF Drain Port (1)	1/4-28 UNF 2B	5/8 inch Straight	129-0001	129-0002	129-0003	129-0004	
			11/16 inch Straight	129-0089	129-0090	129-0091	129-0092	
			Splined — Metric	129-0009	129-0010	129-0011	129-0012	
	M14 (2) M10 Drain Port (1)	M6 x 1 - 6H	16 mm Straight	129-0041	129-0042	129-0043	129-0044	
			18 mm Straight	129-0045	129-0046	129-0047	129-0048	
			Splined — Metric	129-0049	129-0050	129-0051	129-0052	
	G 1/4 (BSP) (2) G 1/8 (BSP) Drain Port (1)	M6 x 1 - 6H	16 mm Straight	129-0005	129-0006	129-0007	129-0008	
			18 mm Straight					
			Splined — Metric	129-0013	129-0014	129-0015	129-0016	
	End Port* Motors	G 3/8 (BSP) (2) G 1/8 (BSP) Drain Port (1)	M6 x 1 - 6H	16 mm Straight	129-0113	129-0114	129-0115	129-0116
				18 mm Straight				
				Splined — Metric	129-0141	129-0142	129-0143	129-0144
Side Port Motors	9/16-18 UNF O-ring (2) 3/8-24 UNF Drain Port (1)	1/4-28 UNF 2B	5/8 inch Straight	129-0017	129-0018	129-0019	129-0020	
			11/16 inch Straight	129-0093	129-0094	129-0095	129-0096	
			Splined — Metric	129-0029	129-0030	129-0031	129-0032	
	M14 (2) M10 Drain Port (1)	M6 x 1 - 6H	16 mm Straight	129-0053	129-0054	129-0055	129-0056	
			18 mm Straight	129-0057	129-0058	129-0059	129-0060	
			Splined — Metric	129-0061	129-0062	129-0063	129-0064	
	G 1/4 (BSP) (2) G 1/8 (BSP) Drain Port (1)	M6 x 1 - 6H	16 mm Straight	129-0025	129-0026	129-0027	129-0028	
			18 mm Straight					
			Splined — Metric	129-0037	129-0038	129-0039	129-0040	
	G 3/8 (BSP) (2) G 1/8 (BSP) Drain Port (1)	M6 x 1 - 6H	16 mm Straight	129-0021	129-0022	129-0023	129-0024	
			18 mm Straight					
			Splined — Metric	129-0033	129-0034	129-0035	129-0036	

Two Bolt Mounting Flange Kit (for 3/8 inch Mounting Bolts) — Kit Number 60552 (includes 5 screws — 1/4-28 UNF)

Two Bolt Mounting Flange Kit (for M8 Mounting Bolts) — Kit Number 60553 (includes 5 screws — M6 x 1 - 6H)

*Note: The Same Casting used for Side Ports is Required for G 3/8 (BSP) End Ports

Availability of J Series Motors Listed without Product Numbers (on the Chart above), Contact your Eaton Representative

Eaton
14615 Lone Oak Road
Eden Prairie, MN 55344
USA
Tel: 952 937-9800
Fax: 952 974-7722
www.hydraulics.eaton.com

Eaton
20 Rosamond Road
Footscray
Victoria 3011
Australia
Tel: (61) 3 9319 8222
Fax: (61) 3 9318 5714

Eaton
46 New Lane, Havant
Hampshire PO9 2NB
England
Tel: (44) 23 92 486 451
Fax: (44) 23 92 487 110



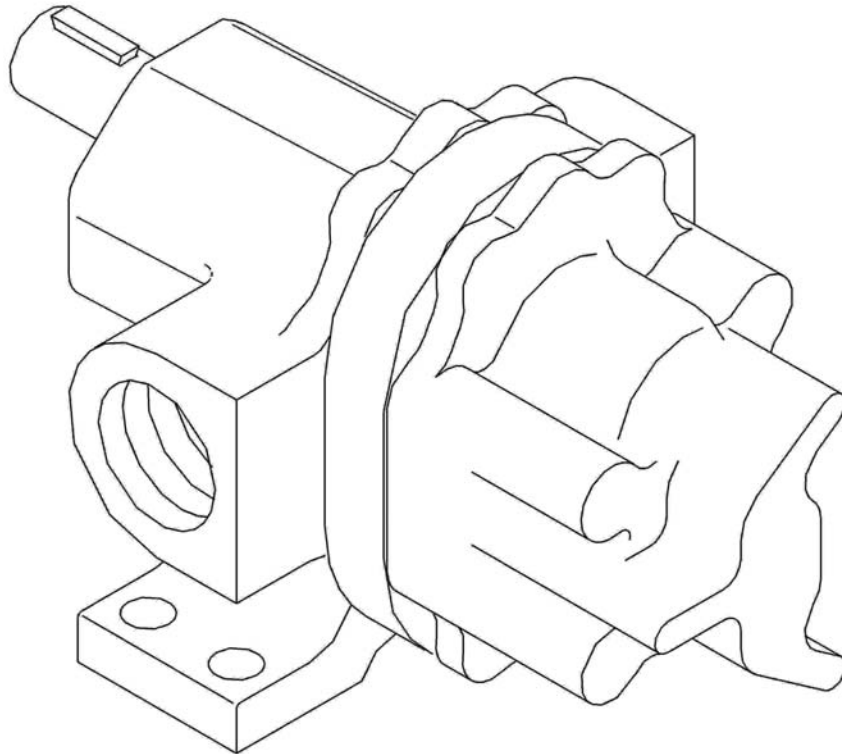
Hydraulics



AM, AP & AL SERIES PUMPS OWNERS MANUAL

G12-207

2/2/04



SAFETY INSTRUCTIONS

This is an industrial component. Only a qualified systems integrator should be allowed to design it into a system. The integrator must determine proper plumbing, mounting, driveline and guard components.

Improper installation or use could lead to a serious, even fatal, accident. The system integrator must communicate all safe operation procedures to the end user(s).

Before operation, fully understand and follow the instructions shown in this manual and any instructions communicated by the system integrator. No one should be allowed to operate or maintain this pump who has not been fully trained to work safely according to the configuration of the pump system and in accordance with all applicable government and industry regulations.

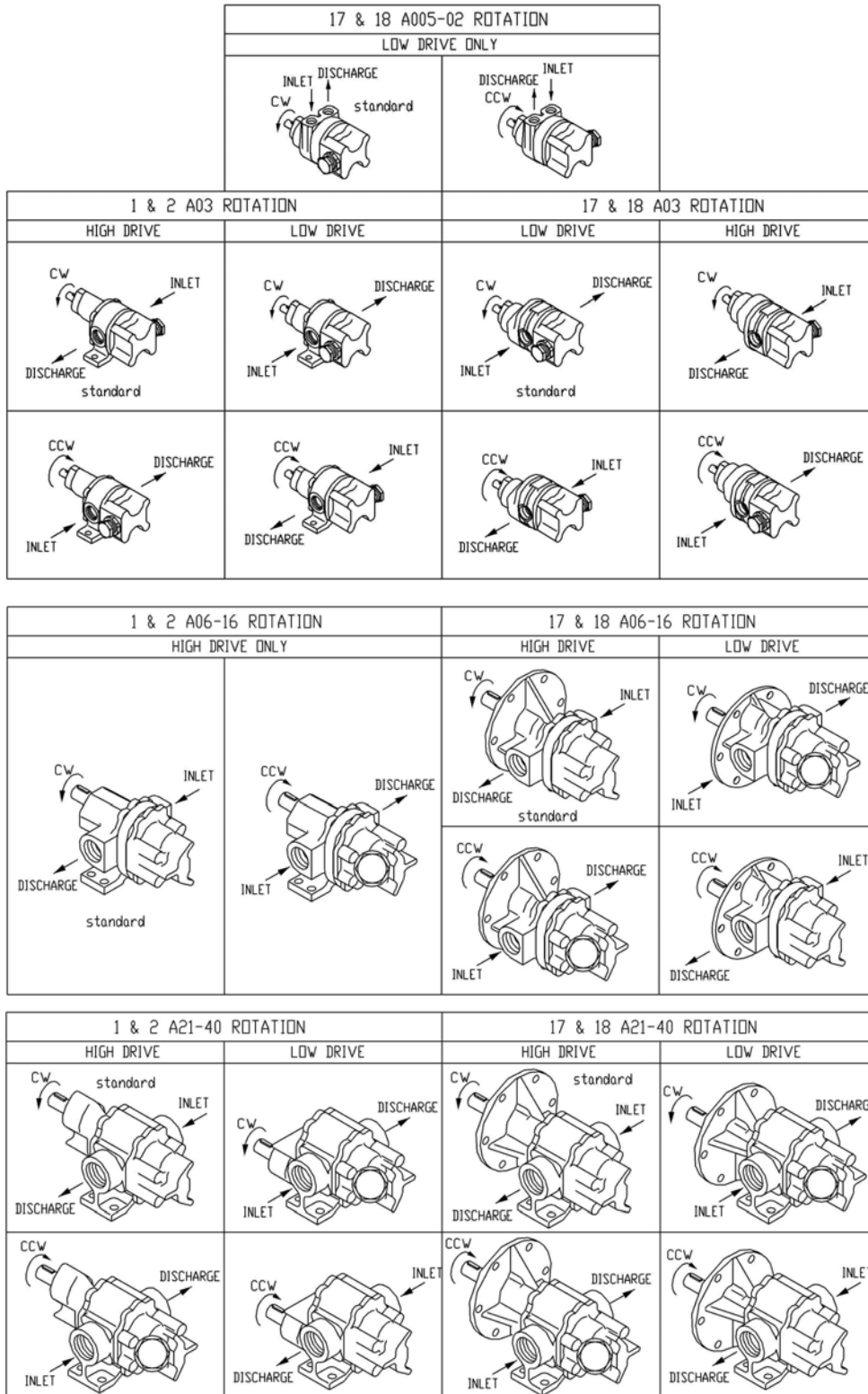
Roper Pump Company
P.O. Box 269
Commerce, GA 30529 USA

Telephone: (706) 335-5551
TeleFAX: (706) 335-5490
Email: sales@roperpumps.com
www.roperpumps.com

INSTALLATION

Check Ports Versus Rotation:

Make sure the inlet and outlet ports have been correctly plumbed corresponding to the direction of rotation. See figure below for various configurations.



Good Practice

NOTE: These are general guidelines and do not cover all possible situations.

It is the responsibility of the system integrator to apply this product properly.

Plumbing

1. The inlet pipe should be as short and straight as possible to minimize suction pressure losses. Excessive restrictions at the inlet can cause cavitation resulting in poor performance, noise, vibration, or pump damage.
2. Slope the inlet plumbing appropriately to avoid air pockets.
3. Plumbing weight, misalignment with the ports or thermal expansion can exert excessive force on the pump. Plumbing must be properly supported and aligned with expansion joints, if required, to minimize these forces.
4. To prevent over pressure situations, install a relief valve as close to the pump outlet as possible. Install the relief valve before any shut-off valves.

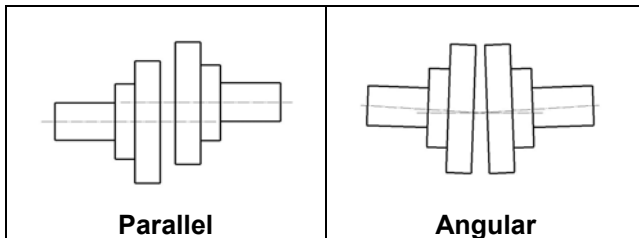
Separate Pump and Drive Assemblies

Driveline Guards

1. Assure adequate guards have been installed to prevent personnel contacting moving components.
2. Follow all OSHA, Federal, state and local codes.

Check Alignment of Pump to Driveline

Excessive misalignment can overload the pump input shaft and cause premature failure. The figures below show parallel and angular misalignments.



Mounting Base

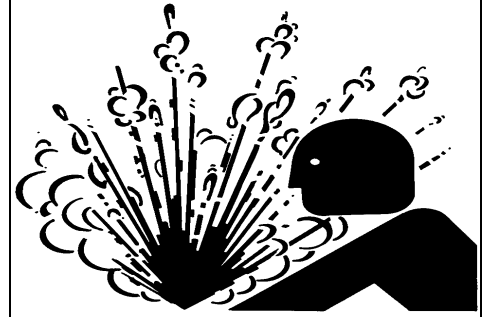
1. Mount the unit on a rigid, heavy base to provide support and absorb shock. Bases should be designed for high rigidity, not just strength.
2. The pump feet were not designed for mounting to concrete and do not have enough contact area to prevent concrete from failing. When mounting to cement or concrete, use a steel base plate (supplied by others) to distribute the mounting stress over an area large enough to prevent the cement from failing. The base plate should be at least as thick as the pump feet. Grout it in place.

Roper Pumps' Close Coupled Drives

Units where the drive mounts directly to the pump

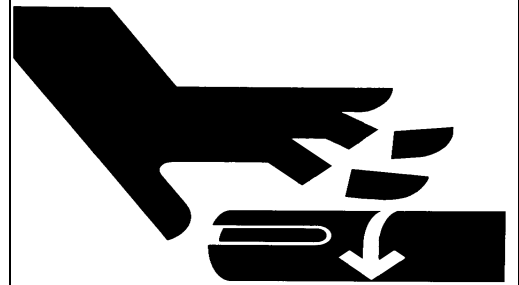
- Exposed drivelines require guards.
- Alignment between pump and drive line is maintained by the assembly.
- Because the assembly absorbs reaction forces of the driveline, the mounting base does not need to be as robust. The level of rigidity and strength is determined by the piping stresses from the system.

! WARNING



Over-pressure may burst pump or system components. Always include a relief valve in installation. Do not over pressurize pump or block discharge line while running.

! WARNING



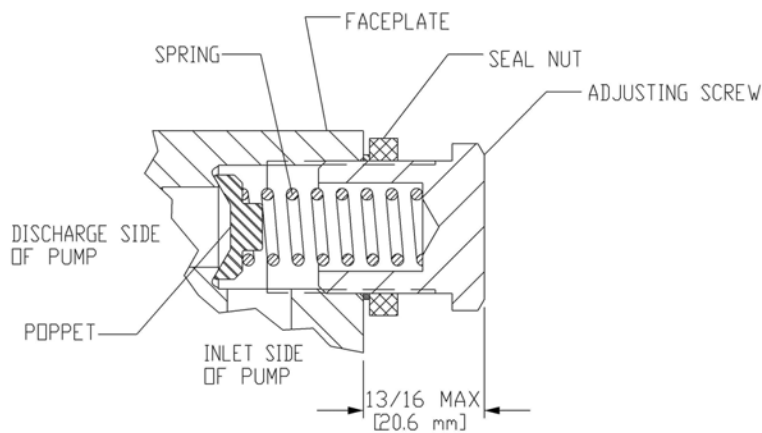
Operating without guards could result in serious injury or death. Machinery in operation can grab, crush, cut, mangle and dismember. Do not operate without adequate guards in place.

PUMP RATINGS

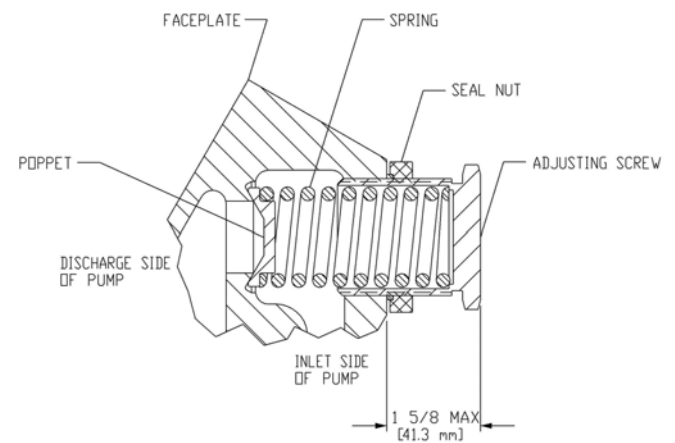
Maximum Ratings				
Pump Size	Flow Rate GPM	Pressure PSI	Temperature °F	Input Speed RPM
005	1.8	300	212	3600
01	3.6	300	212	3600
02	7.6	300	212	3600
03	11.6	300	212	3600
06	11.2	150	212	1800
08	16.3	150	212	1800
12	23.5	150	212	1800
16	30.8	150	212	1800
21	40.2	150	212	1800
27	49.8	150	212	1800
32	59.1	150	212	1800
40	75.6	150	212	1800

RELIEF VALVE

SIZES 005 thru 03



SIZES 06 thru 40



The relief valve must be positioned as shown in instructions for direction of rotation – otherwise the valve is inoperable, discharge pressure will not be working against the relief valve.

If the built-in relief valve is used, it is mandatory that the relief valve be set BY THE USER, since maximum relief valve pressure depends upon the viscosity and specific gravity of the liquid, the flow rate (pump RPM), and also the initial relief valve setting.

NOTE: The fact that the pump has the correct rotation and discharges liquid thru the desired port does NOT insure that the relief valve is installed in the correct position, or that it has the correct setting for the application.

TO ADJUST RELIEF VALVE

Warning: Take precautions necessary to prevent personal injury or physical damage that could be caused by any loss of the product being pumped while adjusting relief valve.

DO NOT adjust relief valve without all guards in place.

Relief valve must be adjusted under conditions identical to the operating conditions (Viscosity, RPM, etc.)

1. Connect a pressure gauge near the pump in the discharge line between the pump and the point where the discharge line will be closed. (Some pumps have tapped and plugged holes in the case near the outlet which may be used for this connection.)
2. Loosen the sealing nut on the adjusting screw.
3. Back the adjusting screw out to the point where the end of the adjusting screw will be as shown on the Relief Valve drawing.
4. Start pump and close discharge line slowly. Do not exceed pressure rating of pump or other equipment between pump and discharge line valve. If this pressure is reached while closing the discharge valve, do not close any further. (This might occur with very high viscosity liquids.) It would then be necessary to install a separate relief valve in the system for protection. Do not run pump with closed discharge line for more than two minutes at a time.
5. With discharge valve closed, turn adjusting screw clockwise in ½ turn increments until the pressure gauge shows the desired pressure setting.
6. Tighten sealing nut.
7. Open discharge line, and turn pump off.

Relief valve is now set.

To replace spring and/or poppet, shut pump off, decrease the pressure on the spring and remove the plug cap by unscrewing it from the faceplate. After inspecting parts and replacing those required, reassemble the parts in reverse order to which they were removed, making sure the spring is centered on poppet and guide. Replace gasket and screw the plug cap into position and adjust pressure to desired setting. Tighten sealing nut.

A built-in relief valve should not be used on applications where the discharge must be closed for more than a few minutes. Prolonged operation with the relief valve fully by-passing will cause heating of the liquid circulating thru the valve, thus resulting in possible damage.

MECHANICAL SEAL (AM) PUMPS

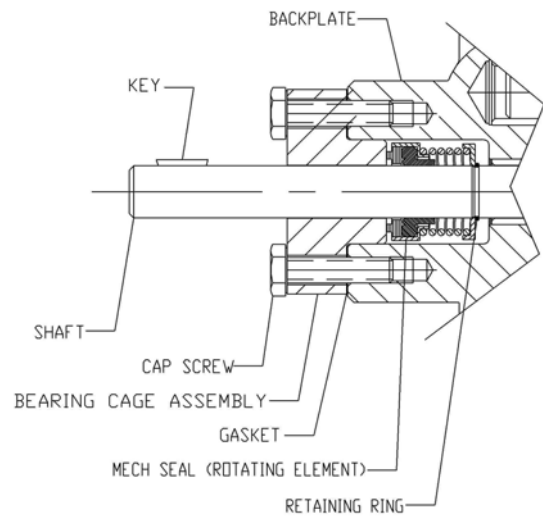
Mechanical seals do not require adjustment. Leakage developed at the seal may be due to one of the following conditions: worn, marred, or cracked rotating or stationary seal face, or bellows that have become hard, soft, cracked, expanded or extruded.

When replacing or servicing a mechanical seal, take particular care not to mar or scratch the sealing surfaces or injure the bellows. If the seal has been used, do not put it back into service unless both sealing surfaces are perfectly flat and smooth or else replaced.

To replace the mechanical seal, remove the key, cap screws, and bearing cage assembly (AM005 thru AM03) or seal retainer (AM06 thru AM40). Remove burrs and sharp edges from the end of shaft and keyway and clean the shaft. Next, the seal rotating parts may be removed from the shaft.

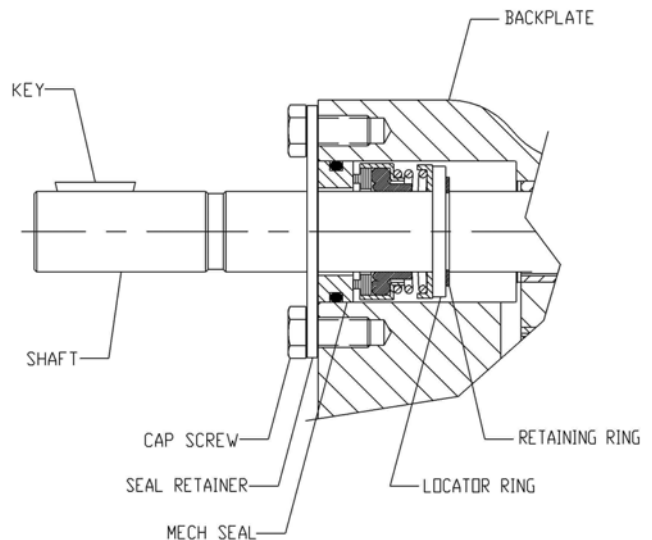
AM005-AM03

To reassemble the mechanical seal on pump sizes AM005 thru AM03, lubricate with light machine oil the section of the shaft over which the seal is to be mounted. Slide the rotating element onto the shaft. Be sure it is properly positioned against the retaining ring. After checking the bearing cage and replacing, if required, coat the sealing surfaces with light machine oil. Install bearing cage and gasket and secure with cap screws.



AM06-AM40

To reassemble the mechanical seal on pump sizes AM06 thru AM40, lubricate with light machine oil the section of the shaft over which the seal is to be mounted. Slide the locator ring over the shaft and back against the retaining ring. Slide the rotating element onto the shaft. Be sure it is properly positioned against the locator ring. After checking the stationary seal face and o-ring and replacing, if required, coat the sealing surface with light machine oil. Install stationary seal face and retainer plate and secure with cap screws.



CHANGING FROM PACKED BOX TO MECHANICAL SEAL

When it is desirable to change from packed box to mechanical seal, remove the key, cap screws, packing plate, packing gland, packing rings and washer (AM06-AM40 only). The exposed surface of the shaft should be free from burrs and sharp edges. Clean the shaft and apply a film of light machine oil. Install the retaining ring. Refer above to install the seal.

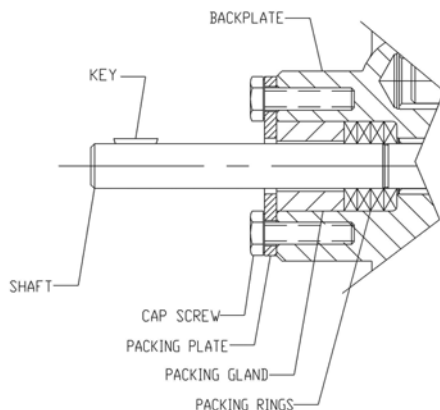
LIP SEAL (AL) PUMPS

AL pumps with lip seals must be run in the clockwise direction of rotation only. Maximum discharge pressure is 100 PSIG (6.9 BAR) and maximum inlet pressure is 5 PSIG (3 BAR). For a pump equipped with a lip seal, follow these instructions. Leaking lip seals should be replaced. Note the direction of the lip on the old seal. Carefully pry the defective seal from the bore, making certain that the bore is not scored or damaged. Clean the shaft and bore. Inspect the shaft for wear. If worn or scored, replace. The exposed surface of the shaft should be free from burrs and sharp edges. Lightly oil shaft and bore into which the lip seal is to be fitted. Be careful not to damage the sealing lip and be certain that the lip on the new seal is turned the same direction as the old seal. Slide the seal onto the shaft and press into the bore.

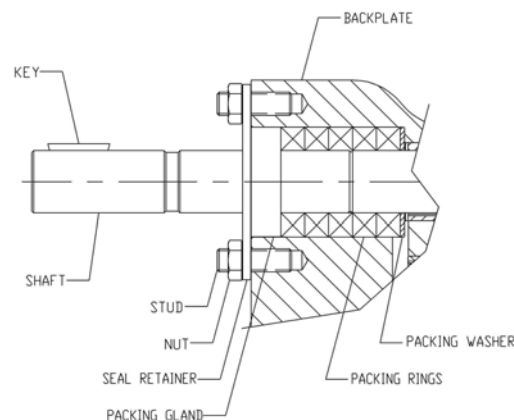
PACKED BOX (AP) PUMPS

Operate the pump under normal conditions and, after a short run-in period, examine the packing for leakage. If leakage is excessive, stop the pump and follow the procedure described below. A slight leakage is a necessary and normal condition for packing and allows for expansion and proper seating.

SIZES 005 THRU 03



SIZES 06 THRU 40



To replace packing, remove the key, cap screws or nuts, packing plate, packing gland, and packing rings. (Packing hooks are commercially available to assist in removing the packing rings.)

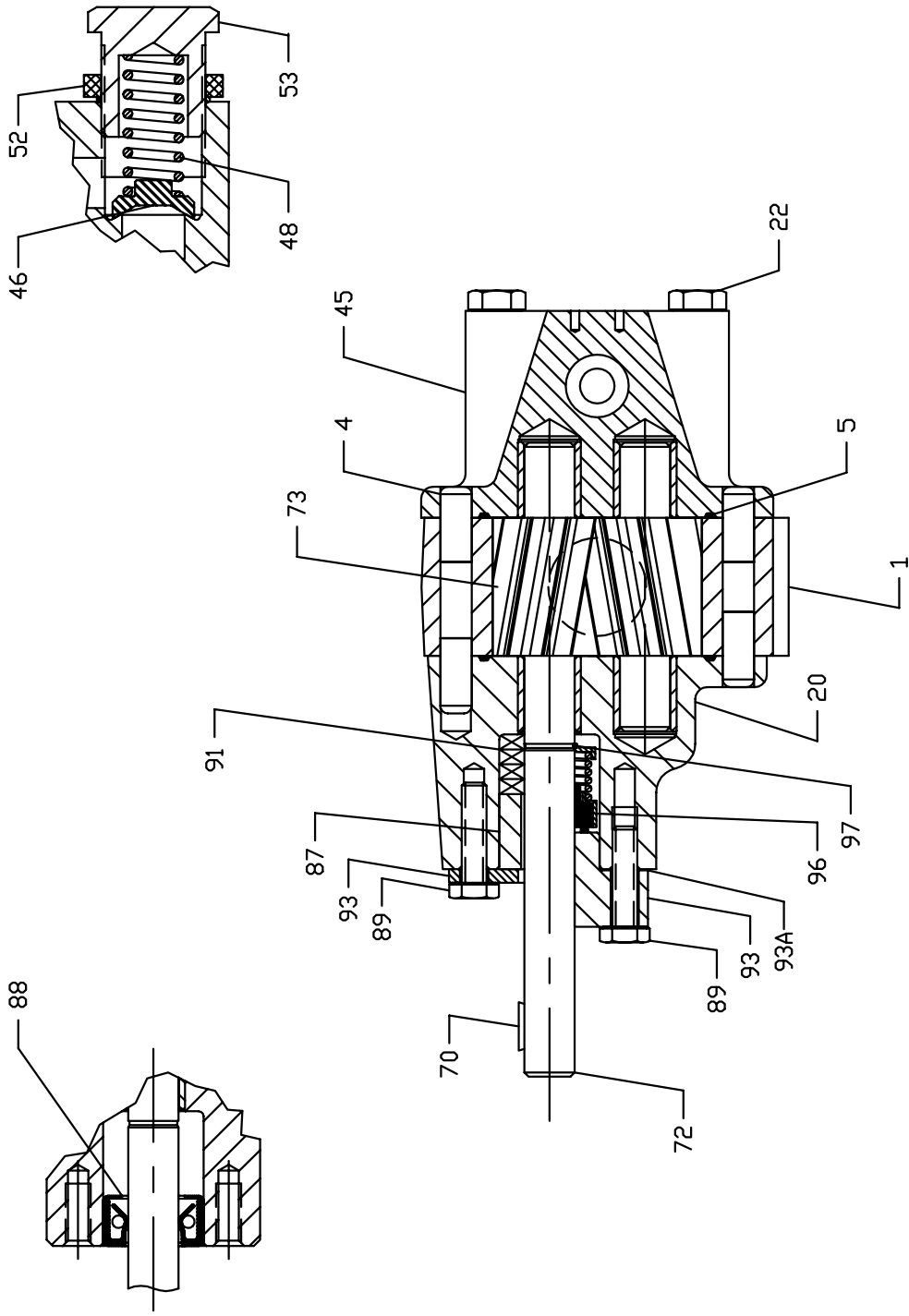
Clean the shaft and adjacent parts. Examine the shaft. If it is excessively worn or scored, replace shaft and gear assembly. It is generally not recommended to reuse old packing rings. When installing packing, use formed packing rings. DO NOT use a one-piece spiral wrap of packing. Before installing packing, carefully clean the stuffing box and shaft.

Packing rings should be installed one ring at a time, with the joints of adjacent rings staggered approximately 180°. Each ring should be seated firmly before the next ring is installed.

The packing gland cap screws or nuts should first be evenly tightened with a wrench to seat the packing firmly in the stuffing box and against the shaft. DO NOT over-tighten the packing. The gland cap screws or nuts should then be backed off until finger-tight. After the pump is started, visually examine the stuffing box for excessive leakage. If the packing leakage exceeds ten drops per minute, stop the pump and adjust the gland nuts. The gland cap screws or nuts should be adjusted evenly in 1/6 to 1/3 turn (1 to 2 flats on the nut) increments. Start the pump and allow it to operate for several minutes. Again, visually examine the stuffing box for excessive leakage. Repeat the above procedure until the stuffing box leakage is between five to ten drops per minute.

DO NOT over-tighten the packing. Slight leakage is a necessary requirement for proper packing operation. Leakage of five to ten drops per minute when the pump is operating is desirable, as it will preserve the packing and avoid scoring of the shaft. Over-tight packing may score shafts, increase torque requirements of the pump, damage couplings and drives, and generate excessive heat.

The packing gland should be adjusted whenever leakage exceeds ten drops per minute. The condition of the packing should be checked at regular intervals, the frequency depending on the type of service. Experience will dictate how frequently the inspections should be made.



1 & 2 AL, AM, AP 03 TYPE 2

1, 2 AL, AM, AP 03 TYPE 2

KEY NO.	DESCRIPTION	A03	
		QTY	PART NO.
1	Case	1	P1-1056
4	Dowel Pin	4	G48-42
5	"O" Ring, Case	2	G68-108
20	Backplate Assy, Brz Brgs	1	N2-1505
22	Hex Hd Cap Screw, Plain	4	G49-031200
	Hex Hd Cap Screw, RV	4	G49-031375
45	Faceplate Assy, Plain, Brz Brgs	1	N3-724
	Faceplate Assy, RV, Brz Brgs	1	N3-727
46	Poppet	1	D16-113
48	Spring, Std Press	1	G10-389
	Spring, High Press	1	G10-390
52	Nut, Lock & Seal	1	G33-31
53	Adjusting Screw	1	D15-43
70	Key, Drive	1	D30-80
72	Drive Shaft & Gear	1	D2-1015
73	Idler Shaft & Gear	1	D2-1271
87	Pkg Gland, Pkg	1	D5-443
88	Lip Seal	1	D83-20
89	Hex Hd Cap Screw	2	G49-025100
91	Pkg Rings, Pkg	4	G14-193
93	Retainer, Pkg	1	D8-374
	Brg Cage Assy, Mech Seal	1	N8-42
93A	Brg Cage Gasket, Mech Seal	1	G11-14
96	Mech Seal	1	G14-263
97	Ret Ring	1	G41-72

Backplate Assy includes Brz Brgs: (2) G5-371

Faceplate Assy includes Brz Brgs: (2) G5-371



TERMS & CONDITIONS AND LIMITED WARRANTY

This agreement (this "Agreement"), consisting of these Terms and Conditions, and the associated Order Acknowledgement is binding upon Roper Pump Company, hereinafter "SELLER," and the customer, hereinafter "BUYER." By placing an order for a product with the Seller, the Buyer agrees to these Terms and Conditions of sale and acknowledges that the person placing the order has the authority to enter into the Order Acknowledgement on Buyer's behalf.

LEGAL EFFECT: Except as expressly otherwise agreed to in writing by an authorized representative of Seller, the following terms and conditions shall apply to and form a part of any Order Acknowledgement. Seller may suspend its performance of any Order Acknowledgement if Buyer defaults in the performance of its duties under the Order Acknowledgement or under any other agreement between the Buyer and Seller.

ACCEPTANCE: The sale of goods and services is expressly conditional on Buyer's acceptance of Seller's terms and conditions as stated herein. Provided that Seller's terms and conditions have not been previously accepted by Buyer, Buyer's receipt of goods or services shipped under this Agreement constitutes acceptance of these terms and conditions. No additional, different or conflicting provisions proposed by Buyer are acceptable to Seller and are hereby specifically rejected, Seller being unwilling to sell goods on any terms conflicting with, limiting or modifying the terms hereof. Buyer shall not sell, transfer or otherwise provide any goods to another for resale without the prior, written authorization of Seller. Seller reserves the right to sell and to authorize other entities to sell such goods through all means and channels of distribution and in competition with Buyer. Buyer acknowledges that it has no authority to bind or contract in the name or for the account of Seller, to create any liability against Seller or to exert any direction or control over Seller's personnel.

CHANGES: This Agreement and the associated Order Acknowledgement constitutes the entire agreement between Seller and Buyer with respect to the subject matter thereof, and supersedes all prior oral or written agreements. This Agreement and the associated Order Acknowledgement may not be amended or modified, except by a further written agreement signed by an authorized representative of Seller. Seller reserves the right to make reasonable changes to an Order Acknowledgement, including changes as to packaging, testing, specifications, designs and delivery schedules. The terms and conditions of any purchase order or other instrument issued by Buyer or its agent in connection with this Agreement and the associated Order Acknowledgement or any goods sold thereunder that is in addition to or inconsistent with the terms and conditions of this Agreement or the associated Order Acknowledgement are null and void and shall not be binding on Seller. Buyer's changes made after formation of this Agreement that affect the schedule or requirements for services or otherwise affect the scope of this Agreement shall be submitted in writing by Buyer and shall become binding only if approved in writing by Seller's cognizant representative. All charges and delays resulting from such changes shall be solely determined by Seller and shall be binding upon Buyer.

TERMINATION, SUSPENSION, AND CANCELED ORDERS: Provided that Seller receives adequate written notice from Buyer, Buyer may terminate or suspend performance at Buyer's convenience subject to all reasonable charges, which charges shall be solely determined by Seller. Buyer cannot cancel or alter Orders without the Seller's written consent. If Seller grants such consent, Buyer will reimburse Seller for all of Seller's losses and expense caused by such cancellation or alteration, including without limitation all of Seller's additional costs caused by changes in design or specifications, or by product revisions, and all incidental and consequential damages incurred by Seller as a result of such cancellation or alteration. No goods may be returned to Seller except with Seller's written consent. Title in a returned good will pass when Seller takes possession of the returned goods.

CREDIT: The amount of credit offered by Seller to Buyer is contingent upon Seller's opinion of Buyer's capacity, ability, and willingness to promptly pay for goods and services received under the terms of this Agreement. Provided that, in Seller's opinion, there is a material adverse change in Buyer's financial condition and/or Buyer has not, within the agreed time, fully paid for goods and services previously supplied under this and/or another Agreement(s) with Seller, Seller reserves the right to revoke Buyer's credit and/or suspend performance on this and/or other orders for goods and services.

PAYMENTS: Standard terms for customers who qualify for credit net 30. A monthly service charge of 1.5% may be charged on amounts owed by Buyer to Seller that have not been paid within by the due date, subject to the maximum amount permitted by law.

TAXES. Buyer assumes exclusive liability for any and all taxes, tariffs, fees, duties, withholdings or like charges, whether domestic or foreign, now imposed or hereafter becoming effective ("Taxes") related to the goods and its purchases from Seller, including without limitation, federal, provincial, state and local taxes, value-added taxes, goods and services taxes, stamp, documentary, excise or property taxes, duties and other governmental charges.

TITLE AND LIEN RIGHTS: The equipment will remain personal property, regardless of how it is installed or affixed to any realty or structure. After delivery to Buyer, Seller will have all such rights, including security interests and liens, in the equipment as lawfully may be conferred upon Seller by contract under any applicable provision of law. Buyer agrees to cooperate fully with Seller in the filing of any financing statements, including Uniform Commercial Code (UCC) filings or other documents necessary to perfect such interests and liens. If Buyer defaults in its obligations under the Order

Acknowledgement before the price (including any notes given therefore) of the equipment has been fully paid in cash, Seller may take any and all actions permitted by law to protect its interests including, where permissible, repossession of such equipment.

SHIPMENTS: All sales are Ex-Works Factory (as such term is defined by the International Chamber of Commerce as of the date hereof). Shipping contracts made by Seller shall be to Buyer's account. All claims for loss or damage after risk of loss has passed to Buyer shall be filed by Buyer with the carrier. Buyer shall be liable to Seller for the full price of the goods, irrespective of loss or damage in transit. Seller shall not be required to provide freight cost receipts to Buyer at the time of invoice. Buyer shall bear all risk and expense for delivery of goods, including without limitation, shipping, loading, unloading, storage, freight, and insurance. Goods may be shipped to Buyer in whole or in part. Title to goods shall pass to Buyer when delivered to the carrier or the Buyer, whichever occurs first, even if the goods are shipped freight prepaid. Among other things, a signed delivery receipt or bill of lading will constitute proof of delivery. The choice of carrier is made solely at the discretion of Seller, and Seller makes no representation as to the acceptability of a particular carrier. Except when Seller expressly agrees in writing, Seller does not guarantee shipment or delivery by a certain date or time, although Seller will strive to deliver goods by the date that it may communicate to Buyer. Seller shall not be liable to Buyer, or any other person, for any loss or damage of any kind which results from delay in shipment, delivery, or failure to give notice of delay, whether or not such delay was caused by Seller or otherwise. Seller reserves the right to backorder any goods and to ship from backorder in such order as Seller determines.

LIMITED WARRANTY: Seller warrants, to its original Buyer, that goods manufactured by Seller are free from defects in material and workmanship for 12 months from date of shipment (except for specified products with warranties that supercede this limited warranty. Please consult factory for these products). The Buyer hereby acknowledges and agrees, though free from defects in material and workmanship at the time of shipment, that the useful life of goods manufactured by Seller will vary depending upon the Buyer's frequency of use, application, and other factors, with regard to such goods. In that respect, notwithstanding any other provision to the contrary in the Agreement, these Terms and Conditions, or the Order Acknowledgement, the Seller specifically does not warrant the useful life of any product. If a failure to conform to specifications or a defect in materials or workmanship is discovered within this period, Seller must promptly be notified in writing within thirty (30) days, which notification, in any event must be received no later than 12 months from the date of shipment. Within a reasonable time after such notification, Seller will correct any failure to conform to specifications or any defect in materials or workmanship, or in lieu of such repair, and at its sole option, shall replace the equipment. **THE ABOVE ARE THE BUYER'S EXCLUSIVE REMEDIES FOR BREACH OF WARRANTY.** Seller does not warrant: (a) defects caused by failure to provide suitable installation environment for the product, (b) damage caused by use of the product for purposes other than those for which it was purchased, (c) damage caused by disasters such as fire, flood, wind, and lightning, (d) damage caused by unauthorized attachments, or modification, (e) any other abuse or misuse by the Buyer, including improper installation; or (f) goods which have been damaged or altered by Buyer or its customers. Each good sold by Seller to Buyer shall be deemed to be without defect and in conformity with its specifications and the terms of this Agreement and the associated Order Acknowledgement even though reasonable variances may exist. As a result, Seller cannot and does not guarantee that goods sold hereunder, whether in whole or in part, will exactly match in specification or otherwise, and Buyer acknowledges that reasonable variance is permissible. Additionally, Seller shall have no liability if a good does not conform to any applicable state, county or local ordinance, as the conformity of a good to each state, county and local ordinance is the sole responsibility of the Buyer. Seller reserves the right to change its goods and the components of its goods without prior notice to Buyer, although in circumstances where an order from Buyer has been accepted by Seller, Seller will use commercially reasonable efforts to ensure that such change will not affect performance of the good in a materially adverse manner.

EXCEPT AS SET FORTH ABOVE AND TO THE MAXIMUM EXTENT PERMITTED BY LAW, SELLER MAKES NO OTHER WARRANTIES FOR A PRODUCT OR UNDER THIS AGREEMENT OR ANY ORDER ACKNOWLEDGEMENT AND HEREBY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE, AND INCLUDING THE WARRANTY OF MERCHANTABILITY. IN NO CASE SHALL SELLER BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES BASED UPON ANY LEGAL THEORY, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS, LOSS OF SAVINGS OR REVENUE, LOSS OF USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF ANY SUBSTITUTE EQUIPMENT, FACILITIES OR SERVICES, DOWNTIME, THE CLAIMS OF THIRD PARTIES INCLUDING CUSTOMERS, INJURY TO PROPERTY AND, UNLESS PRECLUDED UNDER APPLICABLE STATE LAW, BODILY AND PERSONAL INJURY.

INDEMNITY; LIABILITY LIMITATION: Buyer hereby agrees to indemnify, reimburse in full, defend and hold harmless Seller, its subsidiaries, affiliates, officers, directors, personnel and agents from and against any and all liability, claims, suits, actions, losses, costs or expenses including (without limitation) reasonable attorneys' fees relating to or arising out of any claim or demand (a) for any Taxes or related penalties and interest, (b) due to Buyer's breach of the Order Acknowledgement; (c) that Buyer's customers or a third party may make against Seller based upon or arising from damage due to the acts and/or omissions of Buyer or due to the installation of the goods; (d) for infringement or misappropriation of a third party's intellectual property rights based upon Seller's incorporation of any designs, formulas or specifications in any goods where such designs, formulas or specifications have been specifically ordered or requested by Buyer. To the maximum extent allowable under applicable law and excluding those liabilities that by law Seller cannot limit or disclaim, (i) Seller's aggregate liability arising from or relating to this Order Acknowledgement or goods, regardless

of the cause of action asserted, is limited to the amount paid by Buyer to Seller for the applicable goods and (ii) Seller shall not be liable for any special, incidental, consequential, indirect, or punitive damages, including without limitation, lost revenues, loss of use of the goods, loss resulting from improper storage, processing, padding/cushion, delay in delivery or shipment or errors in shipment or labeling, loss of data, or the cost of any substitute goods or related equipment, even if Seller has been advised of the possibility of such damages.

EXPORT RESTRICTIONS: Buyer shall not export or re-export goods in violation of any applicable laws or regulations of the United States or the country in which Buyer obtained them.

CONFIDENTIAL INFORMATION. During the term of this Agreement and the associated Order Acknowledgement and for the longer of (a) three (3) years following its termination and (b) for such Confidential Information of Seller that is a Trade Secret of Seller as defined by applicable law, for the life of such Seller Trade Secret, Buyer agrees to receive and hold Confidential Information of Seller in trust and in strictest confidence and shall not use, reproduce, distribute, disclose or otherwise disseminate any Confidential Information except as necessary to perform its obligations hereunder.

Disclosures of the Confidential Information may be made only to Buyer's employees and agents who have a specific need to know and are subject to confidentiality restrictions at least as restrictive as those contained herein. "Confidential Information" means confidential information relating to the business, products and services of Seller which is or has been disclosed to Buyer, and which has value to Seller and is not generally known to Seller's competitors, including (without limitation), information regarding the specifications provided to Buyer by Seller and Seller's product plans, designs, costs, prices, finances, marketing plans, business opportunities, personnel, R&D activities and know-how.

CONTROLLING LAW: This Agreement and the associated Order Acknowledgement entered into hereunder shall be governed and construed in accordance with the laws of the State of Georgia and of the United States of America without reference to any conflicts of law principles; the parties submit themselves to the jurisdiction of the federal and state courts located in Jackson County, Georgia, which shall have exclusive jurisdiction of any disputes arising hereunder, and the parties waive any objection to venue therein. The United Nations Convention on Contracts for the International Sale of Goods, the Uniform Law on the Formation of Contracts for the International Sale of Goods, and any applicable international discovery and service of process conventions shall not be applicable. In the event legal action is undertaken by Seller to collect any amounts due to Seller by Buyer hereunder and if Seller prevails in such action, then Buyer shall reimburse Seller for its reasonable attorney fees and costs incurred in conjunction with such action, which amount shall not exceed the maximum amount allowed by law of the forum in which such action is brought.

ASSIGNMENT: Neither this Agreement nor any associated Order Acknowledgement may be assigned by the Buyer, or its contents publicized by the Buyer, without the written consent of Seller. Seller shall have the right to assign, transfer or sublicense all or any part of this Agreement or any associated Order Acknowledgement to another at any time and without the consent of Buyer.

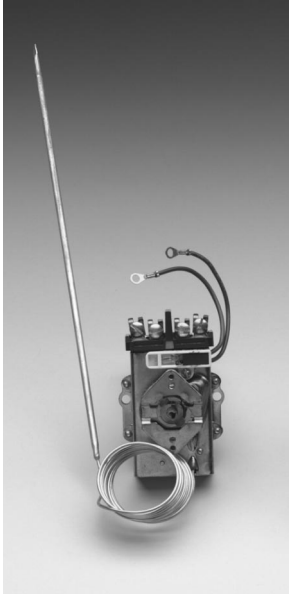
MISCELLANEOUS: The various provisions of this Agreement and any associated Order Acknowledgement are severable, and any determination of invalidity or unenforceability of any one provision hereof shall no bearing on the continuing force and effect of the remaining provisions hereof. This Agreement and any associated Order Acknowledgement and the terms and conditions contained herein constitute the entire understanding of the parties with respect to the purchase and sale of the goods, and any prior agreements, with respect thereto, whether written or oral, are superseded hereby. This Agreement and any associated Order Acknowledgement shall be binding on the parties and their respective successors and any permitted assigns.

ELECTRONIC DATA INTERCHANGE. The parties may execute a Order Acknowledgement by transmitting and receiving the data contained in the Order Acknowledgement electronically rather than in paper form. To provide the legal validity and enforceability of such Order Acknowledgement, the parties further agree that the data transmitted herein will be considered "in writing" and to have been "signed." The parties agree not to contest the validity or enforceability of a Order Acknowledgement because of the electronic origination, transmission, storage or handling of such Order Acknowledgement. Any computer printout of the data contained in the Order Acknowledgement will be considered an "original" when maintained in the ordinary course of business and will be admissible as between the parties to the same extent and under the same conditions as other business records maintained in documentary form. The parties agree to properly use those security procedures which are reasonably sufficient to ensure that a transmission of the data contained in a Order Acknowledgement is authorized and to protect its business records and data from improper sources.



Appliance Controls

Model D1/D18 Series Electric Thermostat



Design Features

- Temperature ranges to 650°F (343°C)
- DPST with Positive OFF
- The mechanical snap action is instantaneous, positive and non-fatiguing. It reacts to exceedingly small movements of the diaphragms giving a very close temperature differential.
- The diaphragm assembly consists of two stainless steel diaphragms, electrically welded together. Both halves of the assembly are used to actuate the snap-action mechanism, giving maximum sensitivity without danger of overstressing the metal.
- Can be supplied with terminals mounted in four different positions.
- Bulb and capillary available in copper, nickel plated copper, nickel plated steel, or stainless steel.
- Plastic coating available to protect against moisture, dust, etc.

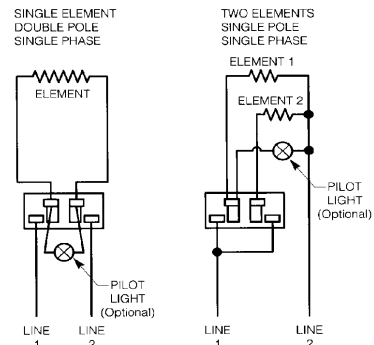
The model D1/D18 series is a heavy duty thermostat designed for use in harsh applications where precise temperature control is required. The control uses a DPST snap-action mechanism with a positive “OFF” switch.

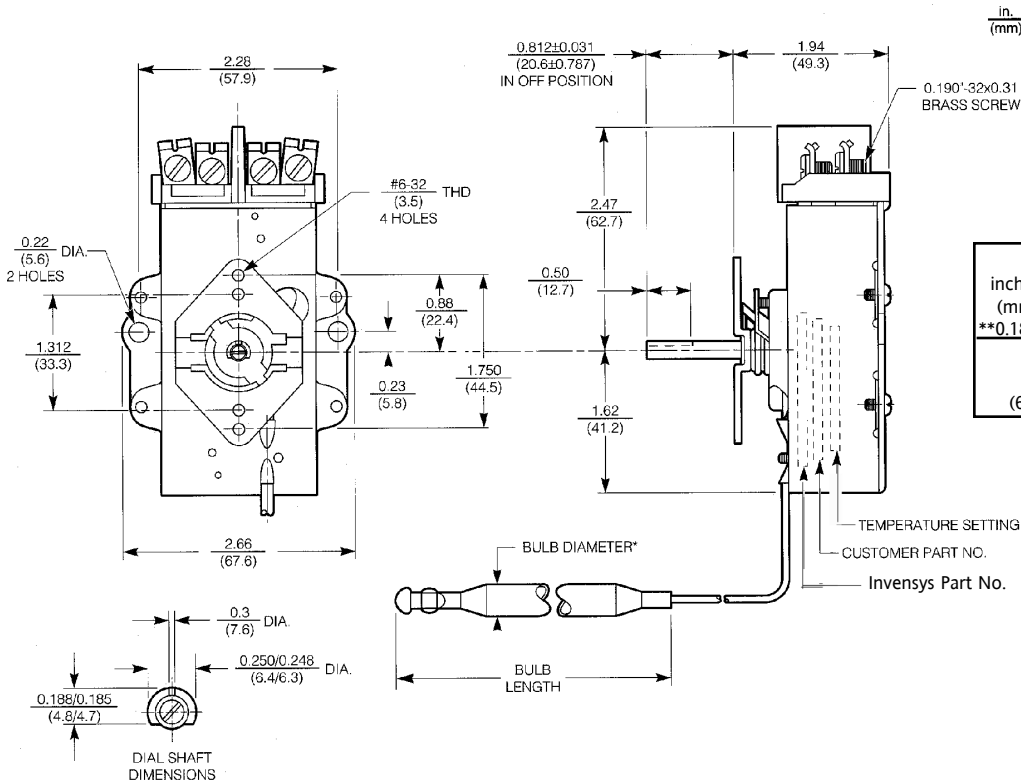
It is recommended for use on applications that require double pole operation and accurate temperature control.

Specifications

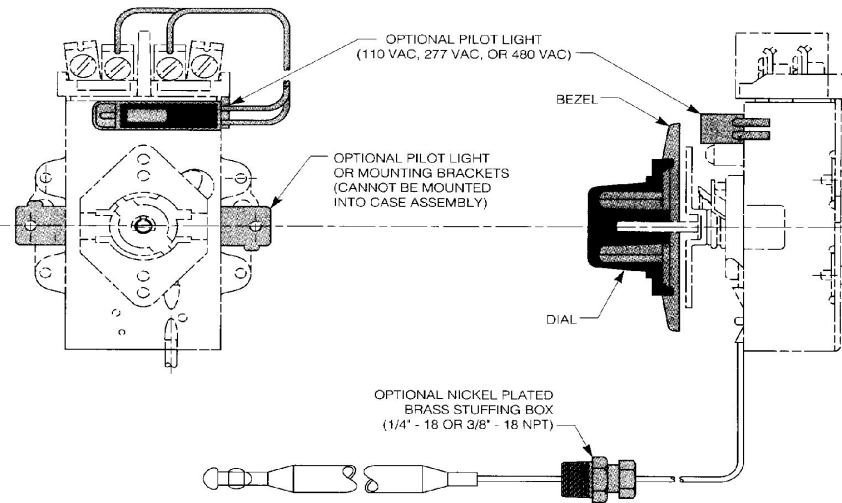
- Ambient temperature:
0°F (-18°C) to 150°F (66°C)
- Double pole single throw contacts (DPST)
- Positive OFF - Contacts are mechanically open in OFF position
- 120, 277 VAC @ 30A
277 VAC @ 250VA
125 VAC @ 125VA
480 VAC @ 10A
- Agency, Certification Numbers:
UL Guide No. XAPX2
UL File No. E12103
CSA File No. LR36461
CSA Class 4823 02

Wiring Diagrams





*AVAILABLE BULB DIAMETERS				
inches	0.187**	0.250	0.312	0.375
(mm)	(4.8)	(6.4)	(7.9)	(9.5)
**0.187 inch diameter bulb is most common.				
AVAILABLE CAPILLARY LENGTHS				
24 to 120 in 12" increments				
(609.6 to 3048 in 304.8mm increments)				



Dial

- Other temperature ranges available.
- Available in black (most common), white, and red.

Bezel

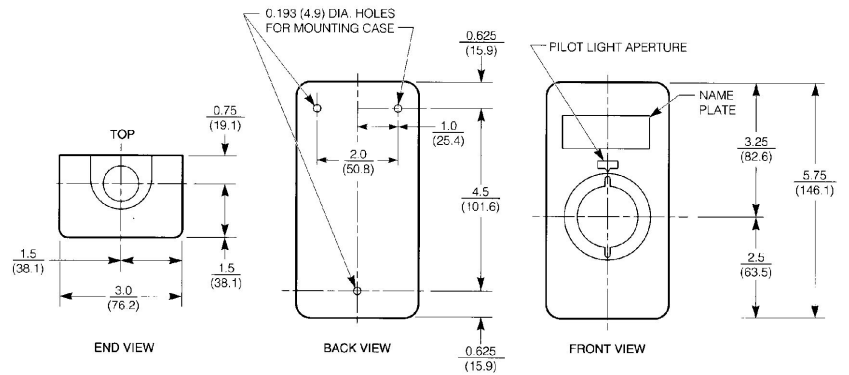
- Available with and without pilot light.
- Not for use with case assembly.
- Chrome plated brass.

Protective Case Assembly

- Protective case, gray only.
- Aluminum cover with plated steel case.

Application Responsibility

Invensys Appliance Controls, as a supplier, will comply with those agreed to drawing requirements and specifications that define this product. Suitability for any application is the responsibility of the purchaser.



3", 4" and 5" Back Connected Industrial Thermometers

A rugged 90° back angle, rear threaded connection design. Commonly used in industrial, pulp and paper, food and beverage processing, HVAC, and OEM applications.



► MODEL CODES:

GT-300	3" diameter head
GT-300R	3" diameter head with calibration feature
MX-325R	3" diameter head with calibration feature and min or max temperature indicator
MM-325R	3" diameter head with calibration feature and min and max temperature indicator
GT-400	4" diameter head
GT-400R	4" diameter head with calibration feature
GT-500	5" diameter head
GT-500R	5" diameter head with calibration feature
MX-525R	5" diameter head with calibration feature and min or max temperature indicator
MM-525R	5" diameter head with calibration feature and min and max temperature indicator

► SPECIFICATIONS:

Stem Lengths:	2½", 4", 6", 9", 12", 15", 18" and 24" (available up to 120").
Stem Diameter:	.250" standard up to 42" stem. .375" standard over 42" stem.
Connection:	½" NPT.
External Reset:	Models with calibration feature are easy to calibrate by inserting ⅜" Allen wrench into reset opening.
Construction:	304 stainless steel external parts. Welded construction. Corrosion resistant to most chemicals.
Hermetic seal:	Per ASME B40.3 dustproof and leakproof.
Dial:	True Anti-Parallax dial, easy-to-read from any angle, minimizes reading errors. Anodized aluminum with large black numbers and graduations.
Lens:	Glass.
Bimetal Coil:	Helix coil is silicone coated on ranges below 500°F for vibration dampening and to maximize heat transfer and response time.
Accuracy:	±1% full span per ASME B40.3 Grade A. When using maximum or minimum temperature indicator, accurate to within 1½% full span.
Over Temperature Limits:	Up to 250°F 100%; 250°F to 550°F, 50%; 550°F to 1000°F, continuous use up to 800°F, intermittent use over 800°F.





Tel-Tru Manufacturing Company

408 St. Paul St., Rochester, New York 14605 USA

Phone: 585.232.1440 • 800.232.5335 • Fax: 585.232.3857 • E-mail: info@teltru.com • Web: www.teltru.com

➤ **STANDARD RANGES:**

Fahrenheit	°/Div.	Celsius	°/Div.	Dual	
				Fahrenheit	Celsius
-100/100°	2°	-75/175°	5°	-100/100	-75/40
-50/120°	2°	-70/70°	1°	-40/160	-40/70
-40/160°	2°	-50/100°	1°	-0/140	-18/60
0/140°	1°	-50/25°	1°	0/180	-18/82
0/180°	2°	-50/50°	1°	0/220	-10/100
0/200°	2°	-40/70°	1°	0/250	-20/120
0/220°	2°	-20/120°	1°	20/240	-10/110
0/250°	2°	-10/110°	1°	25/125	-5/50
0/300°	5°	0/50°	1/2°	50/300	10/150
0/500°	10°	0/60°	1°	50/400	0/200
20/240°	2°	0/80°	1/2°	50/500	10/260
25/125°	1°	0/100°	1°	150/750	50/400
50/250°	2°	0/150°	1°	* 200/1000	*100/550
50/300°	2°	0/200°	2°		
50/400°	5°	0/250°	2°		
50/500°	5°	0/300°	5°		
50/550°	5°	0/400°	5°		
100/800°	10°	0/450°	5°		
150/750°	10°	100/400°	5°		
* 200/1000°	10°	*100/550°	5°		

(Additional Ranges Available – Consult factory)

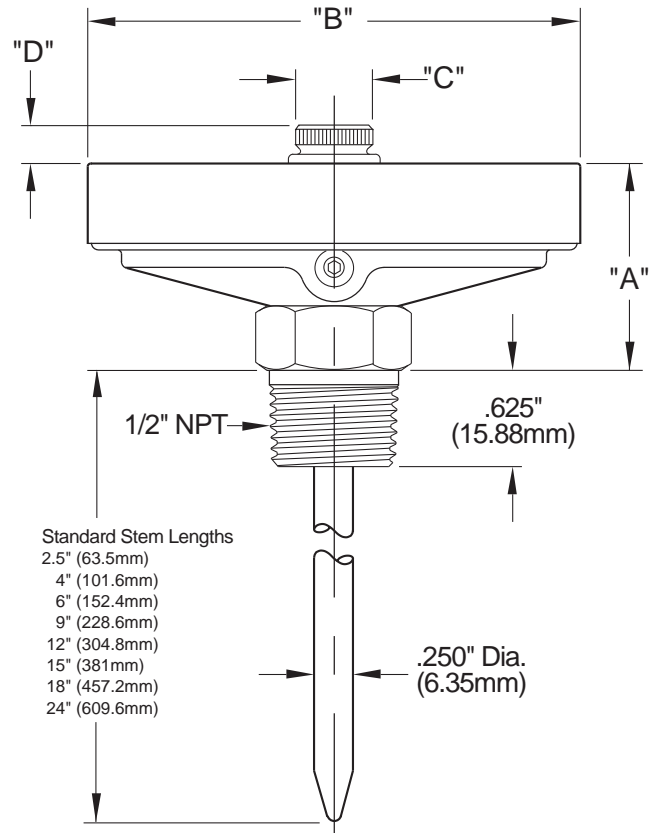
* Thermometers with temperature ranges 200/1000°F and 100/550°C are NOT RECOMMENDED FOR CONTINUOUS USE ABOVE 800°F/425°C (FOR INTERMITTENT USE ONLY).

➤ **OPTIONS:**

- Union connection or other connection types and sizes.
- Silicone filled.
- Other lenses are acrylic, polycarbonate, shatterproof glass or tempered glass (acrylic only for MX and MM models).
- Other stem diameters .236" (6mm), .315" (8mm), .375" (9.5mm).
- 316SS wetted parts.
- Other configuration combinations available upon request.
- Some ranges NSF® certified.

MODEL	Estimated Shipping Weights	
	DRY	SILICONE FILLED
GT-300 and GT-300R	11 oz.	14 oz.
GT-400 and GT-400R	1 lb.	1 lb. 6 oz.
GT-500 and GT-500R	1 lb. 4 oz.	1 lb. 14 oz.
MX-325R and MM-325R	11 oz.	N/A
MX-525R and MM-525R	1 lb. 4 oz.	N/A

➤ **GT-300, GT-300R, GT-400, GT-400R, GT-500, GT-500R, MX-325R, MM-325R, MX-525R AND MM-525R**



MODEL	"A"	"B"	"C"	"D"
GT-300, GT-300R	1.375" (34.93mm)	3.187" (80.95mm)	N/A	N/A
GT-400, GT-400R	1.375" (34.93mm)	4.115" (104.50mm)	N/A	N/A
GT-500, GT-500R	1.718" (43.63mm)	5.040" (128.02mm)	N/A	N/A
MX-325R, MM-325R	1.375" (34.93mm)	3.187" (80.95mm)	.500" (12.70mm)	.275" (6.99mm)
MX-525R, MM-525R	1.718" (43.63mm)	5.040" (128.02mm)	.500" (12.70mm)	.275" (6.99mm)

➤ **FOR HOW TO ORDER, SEE PAGE 6**

➤ **IMPORTANT NOTES:**

- 1) Thermowells are recommended for pressure, corrosive fluid or high velocity applications.
- 2) ASME B40.3— Bimetal thermometers manufactured by Tel-Tru and offered in this brochure are designed to meet or exceed this Standard issued by the American Society of Mechanical Engineers.

Notes

Process Heating Company, Inc.

With Over Fifty Years of Designing & Manufacturing Lo-Density Automatic Electric Heating Systems

