

## TECHNICAL SERVICE MANUAL

UNIVERSAL SEAL HEAVY DUTY PUMPS  
 SERIES 124A, 4124A, 124AE, 4124AE AND 4124B CAST IRON  
 SERIES 126A AND 4126A DUCTILE IRON  
 SERIES 123A AND 4123A STEEL  
 SERIES 127A AND 4127A STAINLESS STEEL  
 SIZES H, HL, K, KK, L, LQ, LL

SECTION TSM 630  
 PAGE 1 OF 13  
 ISSUE D

### CONTENTS

Special Information .....	2
Maintenance	
Mechanical Seal Pumps.....	3
Cartridge Type	
Optional Stuffing Box Seal.....	3 - 4
Optional Behind the Rotor Seal.....	8-9-10
Packed Pumps.....	6-7
Thrust Bearing Adjustment .....	11
Installation of Carbon	
Graphite Bushings.....	11
Pressure Relief Valve Instructions.....	12-13

### INTRODUCTION

The illustrations used in this manual are for identification purposes only and cannot be used for ordering parts. Obtain a parts list from the factory or a Viking representative. Always give a complete name of part, part number and material with the model number and serial number of pump when ordering repair parts. The unmounted pump or pump unit model number and serial number are on the nameplate.

In the Viking model number system, basic size letters are combined with series number (124A, 4124A, 124AE, 4124B, 126A, 4126A, 123A, 4123A, 127A) indicating basic pump construction material.

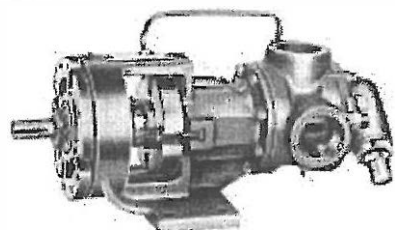


FIGURE 1  
SIZES H AND HL

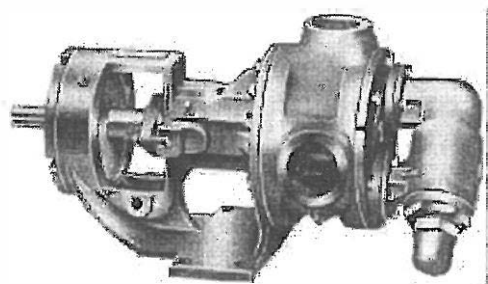


FIGURE 2  
SIZES K, KK AND L

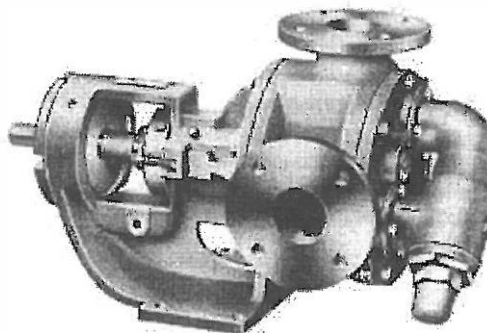


FIGURE 3  
SIZES LQ AND LL

UNMOUNTED PUMP		UNITS
PACKED	MECH. SEAL	
H124A	H4124A	A = Universal Seal Pump
	H4124B	B = Universal Seal Pump
H126A	H4126A	with mechanical seal
H123A	H4123A	behind the rotor
H127A	H4127A	
HL124A	HL4124A	AE = Universal Seal Pump
	HL4124B	with larger rotor shaft
	HL4126A	
HL123A	HL4123A	
HL127A	HL4127A	
K124A	K4124A	
	K4124B	
K126A	K4126A	Units are designated by the
K123A	K4123A	un-mounted pump model
K127A	K4127A	numbers followed by a letter
KK124A	KK4124A	indicating drive style.
	KK4124B	
KK126A	KK4126A	V = V-Belt
KK123A	KK4123A	D = Direct Connected
KK127A	KK4127A	R = Viking Speed Reducer
L124A	L4124A	P = Commercial Speed Reducer
L124AE	L4124AE	
	L4124B	
L126A	L4126A	
LQ124A	LQ4124A	
LQ124AE	LQ4124AE	
	LQ4124B	
LQ126A	LQ4126A	
LQ123A	LQ4123A	
LQ127A	LQ4127A	
LL124A	LL4124A	
LL124AE	LL4124AE	
	LL4124B	
LL126A	LL4126A	
LL123A	LL4123A	
LL127A	LL4127A	

This manual deals only with Series 124A, 4124A, 124AE, 4124AE, 4124B, 126A, 4126A, 123A, 4123A, 127A, and 4127A Heavy Duty Bracket Mounted Pumps. **Refer to Figures 1 through 13** for general configuration and nomenclature used in this manual. Pump specifications and recommendations are listed in Catalogue Section 630, Heavy Duty Bracket Mounted Pumps, with Universal Seal Type Bracket.

## SPECIAL INFORMATION

### DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, RELIEF VALVE ADJUSTING CAP FITTING ETC.) BE SURE:

1. THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. THAT YOU KNOW WHAT LIQUID THE PUMP HAS BEEN HANDLING AND THE PRECAUTIONS NECESSARY TO SAFELY HANDLE THE LIQUID. OBTAIN A MATERIAL SAFETY DATA SHEET (MSDS) FOR THE LIQUID TO BE SURE THESE PRECAUTIONS ARE UNDERSTOOD.

FAILURE TO FOLLOW ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

**ROTATION:** Viking pumps operate equally well in a clockwise or counterclockwise rotation. Shaft rotation determines which port is suction and which is discharge. Port in area where pumping elements (gear teeth) come out of mesh is suction port.

### PRESSURE RELIEF VALVES:

1. Viking pumps are positive placement pumps and must be provided with some sort of pressure protection. This may be a relief valve mounted directly on the pump, an inline pressure relief valve, a torque limiting device or a rupture disk.
2. There are relief valve options available on those pump models designed to accept a relief valve. Options may include a return to tank relief valve and a jacketed relief valve. Pumps equipped with a jacketed head plate are generally not available with a relief valve.
3. If pump rotation is to be reversed during operation, pressure protection must be provided on *both* sides of pump.
4. Relief valve adjusting screw cap must always point towards suction side of pump. If pump rotation is reversed, remove pressure relief valve and turn end for end.
5. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure.

For additional information on pressure relief valves, **refer to Technical Service Manual TSM000 and Engineering Service Bulletin ESB-31.**

### SPECIAL MECHANICAL SALES:

Extra care should be taken in repair of these pumps. Be sure to read and follow all special instructions supplied with your pump.

## MAINTENANCE

Series 124A, 4124A, 126A, 4126A, 123A, 4123A, 127A, and 4127A pumps are designed for long, trouble-free service life under a wide variety of application conditions with a minimum of maintenance. The points listed below will help provide long service life.

**LUBRICATION:** External lubrication must be applied slowly with a hand gun to all lubrication fittings every 500 hours of operation with multi-purpose grease, NLGI # 2. Do not over-grease. Applications involving very high or low temperatures will require other types of lubrication. **Refer to Engineering Service Bulletin ESB-515.** Consult factory with specific lubrication questions.

**PACKING ADJUSTMENT:** New packed pumps require initial packing adjustment to control leakage as packing "runs in". Make initial adjustments carefully and do not over-tighten packing gland. After initial adjustment, inspection will reveal need for packing gland adjustment or packing replacement. **Refer to instructions under "Disassembly," and "Assembly," page 6,** regarding repacking pump.

**CLEANING PUMP:** Keep pump as clean as possible. This will facilitate inspection, adjustment and repair work and help prevent overlooking a dirt covered grease fitting.

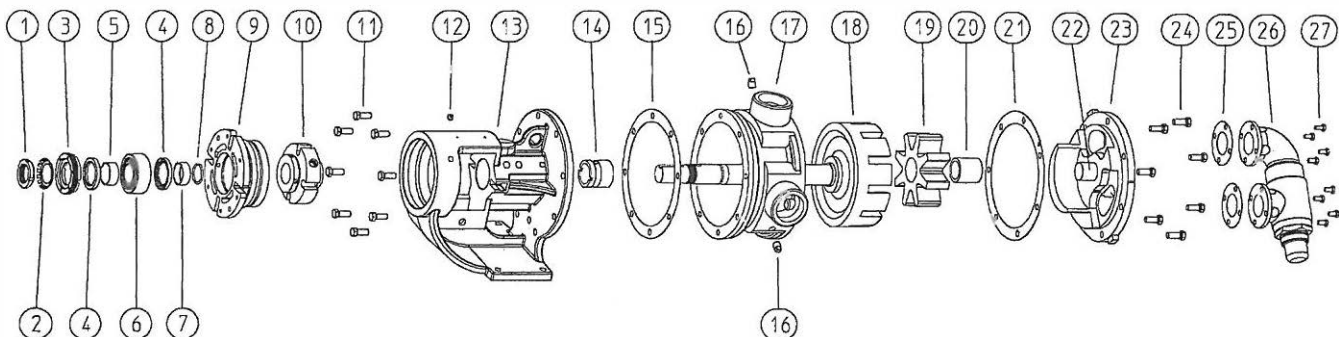
**STORAGE:** If pump is to be stored, or not used for six months or more, pump must be drained and a light coat of light oil must be applied to all internal pump parts.

Lubricate fittings and apply grease to pump shaft extension. Viking suggests rotating pump shaft by hand one complete revolution every 30 days to circulate the oil. Tighten all pump assembly bolts before putting pump in service after being stored.

**SUGGESTED REPAIR TOOLS:** The following tools must be available to properly repair series 124A, 4124A, 126A, 4126A, 123A, 4123A, 127A, and 4127A pumps. These tools are in addition to standard mechanics' tools such as open-end wrenches, pliers, screwdrivers, etc. Most of the items can be obtained from an industrial supply house.

1. Soft headed hammer
2. Allen wrenches (some mechanical seals and set collars)
3. Packing hooks, flexible (packed pumps)
4. Mechanical seal installation sleeve.  
2-751-002-900 for 1.125 inch seal; H-HL pumps.  
2-751-003-900 for 1.4375 inch seal; K-LL pumps.
5. Bearing locknut spanner wrench  
(Source: # 471 J.H. Williams & Co. or equal)
6. Spanner wrench, adjustable pin type for use on bearing housing.  
(Source: # 482 J.H. Williams & Co. or equal)
7. Brass bar
8. Arbor press

## REPAIR: MODEL H, HL, K, KK, L, LQ and LL CARTRIDGE MECHANICAL SEAL PUMPS



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	10	Cartridge Seal	19	Idler and Bushing
2	Lockwasher	11	Capscrew for Bracket	20	Idler Bushing
3	End Cap	12	Grease Fitting	21	Head Gasket
4	Lip Seal	13	Bracket and Bushing	22	Idler Pin
5	Bearing Spacer Collar (Outer)	14	Bracket Bushing	23	Head and Idler Pin
6	Ball Bearing	15	Bracket Gasket	24	Capscrew for Head
7	Bearing Spacer Collar (Inner)	16	Pipe Plug	25	Relief Valve Gasket
8	Ring Half Round (Not H, HL)	17	Casing (Tapped or Flanged)	26	Internal Relief Valve
9	Bearing Housing	18	Rotor and Shaft	27	Capscrew for Valve

FIGURE 4  
(EXPLODED VIEW PARTS FOR SERIES 4123A, 4124A, 4124AE, 4126A, AND 4127A MODELS)

## DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, RELIEF VALVE ADJUSTING CAP FITTING ETC.) BE SURE:

1. THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. THAT YOU KNOW WHAT LIQUID THE PUMP HAS BEEN HANDLING AND THE PRECAUTIONS NECESSARY TO SAFELY HANDLE THE LIQUID. OBTAIN A MATERIAL SAFETY DATA SHEET (MSDS) FOR THE LIQUID TO BE SURE THESE PRECAUTIONS ARE UNDERSTOOD.

FAILURE TO FOLLOW ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

## CARTRIDGE MECHANICAL SEAL REPLACEMENT

### MODELS:

H, HL, K, KK, L, LQ, LL4124A AND LL4124AE CAST IRON  
H, HL, K, KK, L, LQ, AND LL4126A DUCTILE IRON  
H, HL, K, KK, LQ, AND LL4123A STEEL  
H, HL, K, KK, LQ, AND LL4127A STAINLESS STEEL

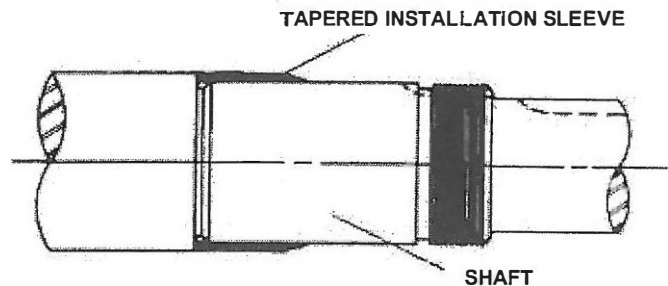
For complete pump disassembly and assembly see pages 5 and 6.

## CARTRIDGE MECHANICAL SEAL REMOVAL:

1. Bend up tang of lockwasher and with a spanner wrench, remove locknut and lockwasher from shaft.
2. Loosen two set screws in the face of the bearing housing and remove the bearing housing assembly from the bracket.
3. Remove the pair of half round rings under the inner spacer collar from the shaft. There are no half round rings on the "H" and "HL" size pumps.
4. If flush or barrier fluid tubes are connected to the seal gland, disconnect before removing seal. Loosen the set screws on the cartridge seal collar to free the cartridge seal from the shaft. Remove the two gland capscrews and slide cartridge seal out through bearing housing opening.

## CARTRIDGE MECHANICAL SEAL INSTALLATION

1. **NOTE:** Burrs left on shaft can damage O-ring on seal sleeve during installation. Inspect shaft for burrs and remove any found with a fine grade of emery cloth.



COAT ROTOR SHAFT, TAPERED INSTALLATION SLEEVE AND INNER DIAMETER OF MECHANICAL SEAL WITH LIGHT OIL BEFORE ASSEMBLY.

FIGURE 5

2. Clean rotor shaft and face of seal chamber.
3. Place tapered installation sleeve on shaft. Coat rotor shaft, tapered installation sleeve, and O-ring in the inside diameter of cartridge seal sleeve with a generous amount of light oil. **Refer to figure 5.**
4. Slide cartridge seal over installation sleeve on shaft until it contacts the seal chamber face. Remove tapered installation sleeve from shaft.
5. Place pair of half round rings in groove on shaft and turn bearing housing assembly into bracket. There are no half round rings on the "H" and "HL" size pumps.
6. Put lockwasher and locknut on shaft. Tighten locknut and bend one tang of lockwasher into slot of locknut.
7. Adjust pump end clearance as in "Thrust Bearing Adjustment" page 11.
8. Insert gland capscrews and secure gland to bracket face. **NOTE:** turn shaft several turns while gland is loose to center seal; then tighten gland tight enough to compress gasket. Tighten only enough to contain leakage and not to distort gland.
9. Lock cartridge seal drive collar to shaft and remove or turn centering clips out of the way so as to clear the drive collar.
10. Turn shaft by hand or jog motor to check drive collar for runout.
11. Connect flush line or vent stuffing box seals without flush line until liquid is present on start up.

**NOTE:** For maximum seal life, flush line should be used.

## DANGER

BEFORE STARTING PUMP, BE SURE ALL DRIVE EQUIPMENT GUARDS ARE IN PLACE.

FAILURE TO PROPERLY MOUNT GUARDS MAY RESULT IN SERIOUS INJURY OR DEATH.

## ASSEMBLY OPTIONAL MECHANICAL SEAL

### MODELS:

H, HL, K, KK, L, LQ, AND LL4124A CAST IRON  
L, LQ AND LL 4124AE CAST IRON  
H, HL, K, KK, L, LQ, AND LL4126A DUCTILE IRON  
H, HL, K, KK, LQ, AND LL4123A STEEL EXTERNALS  
H, HL, K, KK, LQ AND LL4127A STAINLESS STEEL

This seal type can be installed as an alternate to the cartridge mechanical seal. The seal is setscrew driven, is simple to install and good performance will result if care is taken during installation.

For complete pump disassembly and assembly see pages 6 and 7. For Step 6., disassembly, remove the appropriate nuts, capscrews, seal holder and seal seat. Remove the pipe plug in the bracket and loosen the setscrews holding the mechanical seal rotary member to the shaft. This must be done before the rotor is removed to avoid damage to the seal and the rotor shaft.

The following steps are for mechanical seal assembly.

1. Clean rotor shaft and seal housing bore. Make sure they are free of dirt, grit and scratches. Gently radius leading edge of the shaft diameter over which seal is to be placed.

Never touch mechanical seal faces with anything except clean hands or clean cloth. Minute particles can scratch the seal faces and cause leakage.

2. Place tapered installation sleeve on the shaft. Coat tapered sleeve and inside of the rotary member with a generous quantity of light oil. Grease is not recommended. Start rotary member on shaft and over tapered sleeve. Refer to Figure 6.
3. Move rotary member so setscrews are directly below seal access holes on side of bracket. Tighten all setscrews securely to shaft. Some Teflon® seals are equipped with holding clips which compress the seal springs. Remove holding clips to release springs after seal is installed on shaft.

4. FOR "O-RING" GASKET TYPE MECHANICAL SEAL SEAT: Lubricate outer diameter of O-Ring seal gasket with oil. Flush sealing faces of both rotary member and seal seat with oil and press seal seat in to bore until back, unlapped face, is flush with bore. Install seal holder, capscrews, and nuts and tighten securely. Remove tapered installation sleeve.

FOR "CLAMPED-IN" TYPE MECHANICAL SEAL SEAT: Flush sealing faces of both rotary member and seal seat with oil and install seal seat and seat gasket over end of shaft against machined bracket face. Install other seal gasket, seal holder, capscrews, and nuts and tighten securely. Remove tapered installation sleeve.

5. Connect flush line or vent stuffing box for seals without flush line until liquid is present on start up.

**NOTE:** For maximum seal life, flush line should be used.

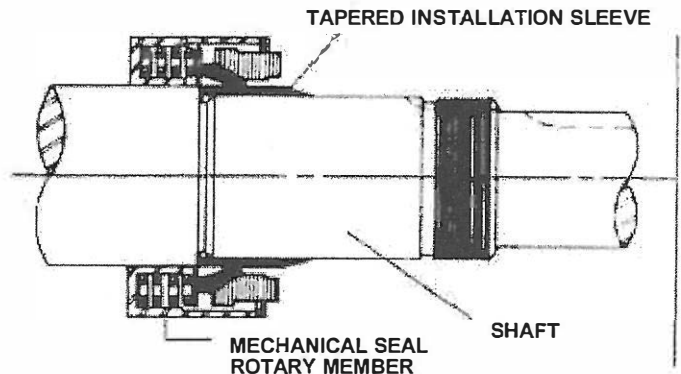
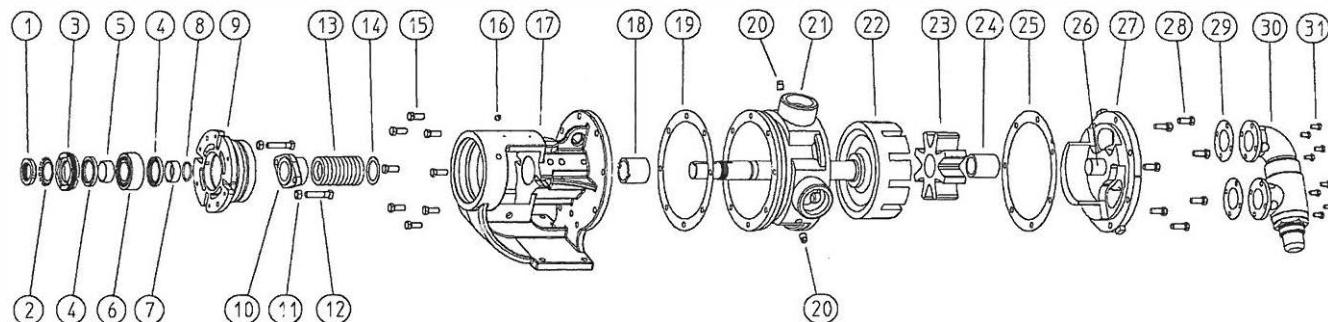


FIGURE 6

## REPAIR: MODEL H, HL, K, KK, L, LQ, AND LL

## PACKED PUMPS



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	12	Packing Gland Capscrew	23	Idler and Bushing
2	Lockwasher	13	Packing	24	Idler Bushing
3	End Cap	14	Packing Retainer Washer	25	Head Gasket
4	Lip Seal	15	Capscrew for Bracket	26	Idler Pin
5	Bearing Spacer Collar (Outer)	16	Grease Fitting	27	Head and Idler Pin
6	Ball Bearing	17	Bracket and Bushing	28	Capscrew for Head
7	Bearing Spacer Collar (Inner)	18	Bracket Bushing	29	Relief Valve Gasket
8	Ring Half Round (Not H, HL)	19	Bracket Gasket	30	Internal Relief Valve
9	Bearing Housing	20	Pipe Plug	31	Capscrew for Valve
10	Packing Gland	21	Casing (Tapped or Flg.)		
11	Packing Gland Nut	22	Rotor and Shaft		

FIGURE 7  
(EXPLODED VIEW PARTS FOR SERIES 123A, 126A, 124A AND 127A MODELS)

## DISASSEMBLY

### DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, RELIEF VALVE ADJUSTING CAP FITTING ETC.) BE SURE:

1. THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. THAT YOU KNOW WHAT LIQUID THE PUMP HAS BEEN HANDLING AND THE PRECAUTIONS NECESSARY TO SAFELY HANDLE THE LIQUID. OBTAIN A MATERIAL SAFETY DATA SHEET (MSDS) FOR THE LIQUID TO BE SURE THESE PRECAUTIONS ARE UNDERSTOOD.

FAILURE TO FOLLOW ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

1. Mark head and casing before disassembly to insure proper reassembly. The idler pin, which is offset in pump head, must be positioned toward and equal distance between port connections to allow for proper flow of liquid through the pump.

Remove head from pump. Do not allow idler to fall from idler pin. Tilt top of head back when removing to prevent this. Avoid damaging head gasket. If pump is furnished with pressure relief valve, it need not be removed from head or disassembled at this point. **Refer to Pressure Relief Valve Instruction, page 10.**

If pump has jacketed head plate, it will separate from head when it is removed. The gasket between head and jacket head plate must be totally removed. Use new gasket when assembling pump.

2. Remove idler and bushing assembly.
3. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Bend up tang of lockwasher and with a spanner wrench, remove locknut and lockwasher from shaft.
4. Loosen two setscrews in the face of the bearing housing and remove the bearing housing assembly from the bracket. **Refer to Figure 8.**
5. Remove pair of half round rings under the inner spacer collar from the shaft. There are no half round rings on the "H" and "HL" size pumps.

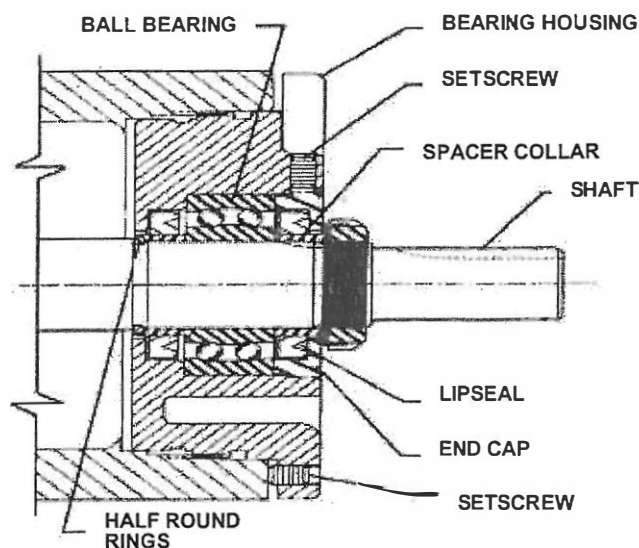


FIGURE 8

6. Remove packing gland capscrews, slide packing gland out of stuffing box, and remove packing.

**NOTE:** Reference cartridge seal replacement beginning on page 3 when disassembling seal pump.

7. Carefully remove rotor and shaft to avoid damaging bracket bushing.
8. Loosen two radial setscrews in flange of bearing housing and with a spanner wrench remove the outer end cap with closure and outer bearing spacer collar.
9. Remove the double row ball bearing, closure and inner bearing spacer collar from the bearing housing.
10. Clean all parts thoroughly and examine for wear and damage. Check lip seals, ball bearing, bushings, and idler pin and replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.

Wash bearings in clean solvent. Blow out bearings with compressed air. Do not allow bearings to spin; turn them slowly by hand. Spinning bearings will damage race and balls. Make sure bearings are clean, then lubricate with light oil and check for roughness. Roughness can be determined by turning outer race by hand.

11. Casing can be checked for wear or damage while mounted on bracket.

## ASSEMBLY

1. Install bracket bushing. If bracket bushing has a lubrication groove, install bushing with groove at 6.00 o'clock position in bracket. If carbon graphite, **Refer to Installation of Carbon Graphite Bushings, page 11.**
2. Coat shaft of rotor shaft assembly with light oil. Start end of shaft in bracket bushing turning from right to left, slowly pushing rotor in casing.
3. Coat idler pin with light oil and place idler and bushing on idler pin in head. If replacing with carbon graphite bushing, **Refer to installation of Carbon Graphite Bushings, page 11.**
4. Using a .010 to .015 inch head gasket, install head and idler assembly on pump. Pump head and casing were marked before disassembly to insure proper reassembly. If not, be sure idler pin, which is offset in pump head, is positioned toward the equal distance between port connections to allow for proper flow of liquid through pump. If pump is equipped with jacketed headplate, install at this time along with new gasket.

Tighten head capscrews evenly.

5. When assembling packed pump, use packing suitable for liquid being pumped. Install packing, staggering the joints from one side of shaft to other. Lubricate packing rings with oil, grease, or graphite to aid assembly. Install packing gland, capscrews, and nuts. Make sure gland is installed square and nuts are tightened evenly. Tighten nuts until packing gland is snug against packing.
6. Slide inner spacer collar over shaft with recessed end facing rotor. H and HL size bearing spacer collars are not recessed.

Place pair of half round rings on shaft and slide inner bearing spacer collar over half round rings to lock them in place. There is no pair of half round rings on the H and HL size pumps.

7. Install the lip seal (lip toward end of shaft) in the bearing housing and turn the bearing housing into the bracket.
8. Pack the ball bearing with grease, place on the shaft and push or drive into place in housing.
9. Install the lipseal (with lip toward end of shaft) and bearing spacer collar in the outer end cap and turn the end cap into the bearing housing until tight against the bearing. Lock in place with two set screws in the flange of the bearing housing.
10. Put lockwasher and locknut on shaft. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Tighten locknut to 50-70 ft.-lbs. Torque (H, HL) or 100-130 ft.-lbs. Torque (K, KK, L, LQ, LL). Bend one tang of lockwasher into slot of locknut. If tang does not line up with slot, tighten locknut until it does. Failure to tighten locknut or engage lockwasher tang could result in early bearing failure and cause damage to pump.  
Remove length of hardwood or brass from port opening.



11. Adjust pump end clearance as in "Thrust Bearing Adjustment" page 11.
12. Lubricate all grease fittings with multi-purpose grease, NLGI #2.

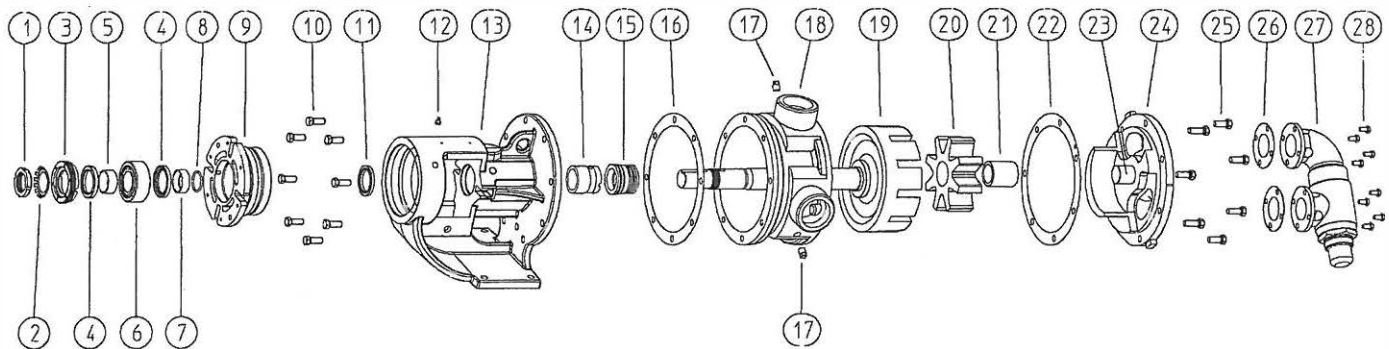
### DANGER

BEFORE STARTING PUMP, BE SURE ALL DRIVE EQUIPMENT GUARDS ARE IN PLACE.

FAILURE TO PROPERLY MOUNT GUARDS MAY RESULT IN SERIOUS INJURY OR DEATH.

## REPAIR: MODELS H, HL, K, KK, L, LQ, AND LL

## BEHIND THE ROTOR COMPONENT MECHANICAL SEAL PUMPS



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	11	Lip Seal	21	Idler Bushing
2	Lockwasher	12	Grease Fitting	22	Head Gasket
3	End Cap	13	Bracket and Bushing	23	Idler Pin
4	Lip Seal	14	Bracket Bushing	24	Head and Idler Pin
5	Bearing Spacer Collar (Outer)	15	Mechanical Seal	25	Capscrew for Head
6	Ball Bearing	16	Bracket Gasket	26	Relief Valve Gasket
7	Bearing Spacer Collar (Inner)	17	Pipe Plug	27	Internal Relief Valve
8	Ring Half Round (Not H, HL)	18	Casing (Tapped or Flg.)	28	Capscrew for Relief Valve
9	Bearing Housing	19	Rotor and Shaft		
10	Capscrew for Bracket	20	Idler and Bushing		

FIGURE 9  
(EXPLODED VIEW PARTS FOR SERIES 4124B MODELS)



## DISASSEMBLY

### DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, RELIEF VALVE ADJUSTING CAP FITTING ETC.) BE SURE:

1. THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
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1. Mark head and casing before disassembly to insure proper reassembly. The idler pin, which is offset in pump head, must be positioned toward and equal distance between port connections to allow for proper flow of liquid through the pump.

Remove head from pump. Do not allow idler to fall from idler pin. Tilt top of head back when removing to prevent this. Avoid damaging head gasket. If pump is furnished with pressure relief valve, it need not be removed from head or disassembled at this point.

**Refer to Pressure Relief Valve Instruction, page 12.**

If pump has jacketed head plate, it will separate from head when it is removed. The gasket between head and jacket head plate must be totally removed. Use new gasket when assembling pump.

2. Remove idler and bushing assembly.
3. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Bend up tang of lockwasher and with a spanner wrench, remove locknut and lockwasher from shaft.
4. Loosen two setscrews in the face of the bearing housing and remove the bearing housing assembly from the bracket. **Refer to Figure 10.**
5. Remove pair of half round rings under the inner spacer collar from the shaft. There are no half round rings on the "H" and "HL" size pumps.

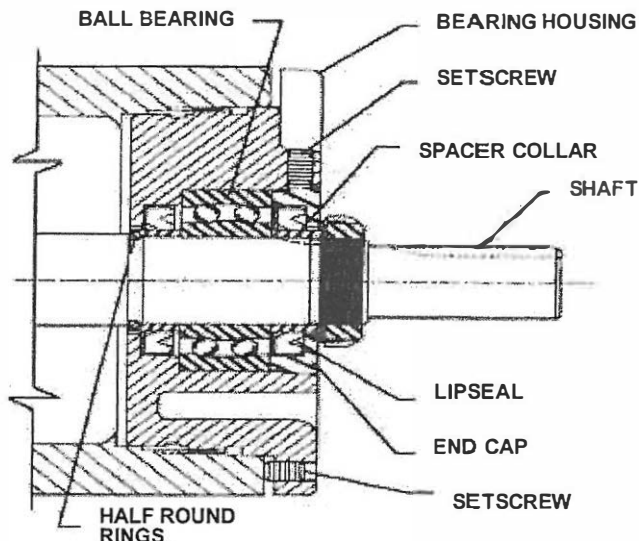


FIGURE 10

6. Carefully remove rotor and shaft to avoid damaging bracket bushing.
7. Loosen two radial setscrews in flange of bearing housing and with a spanner wrench remove the outer end cap with closure and outer bearing spacer collar.
8. Remove the double row ball bearing, closure and inner bearing spacer collar from the bearing housing.
9. Remove the rotary member of the mechanical seal from the rotor shaft. Remove the seal seat from the bracket.
10. Clean all parts thoroughly and examine for wear and damage. Check lip seals, ball bearing, bushings, and idler pin and replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.

Wash bearings in clean solvent. Blow out bearings with compressed air. Do not allow bearings to spin; turn them slowly by hand. Spinning bearings will damage race and balls. Make sure bearings are clean, then lubricate with light oil and check for roughness. Roughness can be determined by turning outer race by hand.

10. Casing can be checked for wear or damage while mounted on bracket.

## ASSEMBLY

1. Install bracket bushing. If bracket bushing has a lubrication groove, install bushing with groove at 6:00 o'clock position in bracket. If carbon graphite, **Refer to Installation of Carbon Graphite Bushings, page 11.** Make sure slots in the face of the bushing are towards rotor end of the bracket.

2. Clean rotor shaft and seal housing bore. Make sure they are free of dirt, grit and scratches. Gently radius leading edge of shaft diameter over which seal is to be placed.

Never touch mechanical seal faces with anything except clean hands or clean cloth. Minute particles can scratch the seal faces and cause leakage.

3. Place tapered installation sleeve on the shaft. Coat tapered sleeve and inside of the rotary member with a generous quantity of light oil. Grease is not recommended. Start rotary member on shaft and over tapered sleeve. **Refer to Figure 11.**
4. Move rotary member all the way on the rotor shaft until it is against the rotor hub. If the seal uses setscrews to secure the seal to the shaft, tighten the setscrews once the seal is in place. Some Teflon® seals are equipped with holding clips which compress the seal springs. Remove holding clips to release springs after seal is installed on shaft.
5. Lubricate outer diameter of seal seat gasket with oil. Press seal seat into bore until back, unlapped face bottoms in bore. Make sure the seat anti-rotation pins are aligned with slots in the bracket bushing.
6. Coat rotor shaft and face of mechanical seal with light oil. Start end of shaft in bracket bushing turning from right to left, slowly pushing rotor in casing.
7. Coat idler pin with light oil and place idler and bushing on idler pin in head. If replacing with carbon graphite bushing, **Refer to installation of Carbon Graphite Bushings, page 11.**
8. Using a .010 to .015 inch head gasket, install head and idler assembly on pump. Pump head and casing were marked before disassembly to insure proper reassembly. If not, be sure idler pin, which is offset in pump head, is positioned toward the equal distance between port connections to allow for proper flow of liquid through pump. If pump is equipped with jacketed headplate, install at this time along with new gasket.
9. Tighten head capscrews evenly.

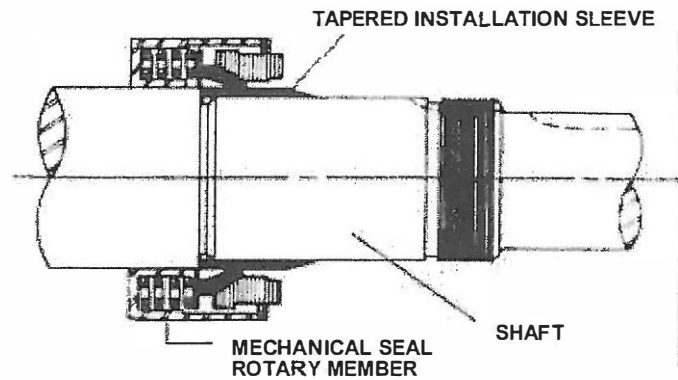


FIGURE 11

10. Slide inner spacer collar over shaft with recessed end facing rotor. H and HL size bearing spacer collars are not recessed.

Place pair of half round rings on shaft and slide inner bearing spacer collar over half round rings to lock them in place. There is no pair of half round rings on the H and HL size pumps.

11. Install the lip seal (lip toward end of shaft) in the bearing housing and turn the bearing housing into the bracket.
12. Pack the ball bearing with grease, place on the shaft and push or drive into place in housing.
13. Install the lipseal (with lip toward end of shaft) and bearing spacer collar in the outer end cap and turn the end cap into the bearing housing until tight against the bearing. Lock in place with two set screws in the flange of the bearing housing.
14. Put lockwasher and locknut on shaft. Insert length of hardwood or brass through port opening between rotor teeth to keep shaft from turning. Tighten locknut to 50-70 ft.-lbs. Torque (H, HL) or 100-130 ft.-lbs. Torque (K, KK, L, LQ, LL). Bend one tang of lockwasher into slot of locknut. If tang does not line up with slot, tighten locknut until it does. Failure to tighten locknut or engage lockwasher tang could result in early bearing failure and cause damage to pump.

Remove length of hardwood or brass from port opening.

## THRUST BEARING ADJUSTMENT SIZE H, HL, K, KK, L, LQ, LL PUMPS

1. Loosen the two set screws in the outer face of the bearing housing and turn this thrust bearing assembly clockwise until it can no longer be turned by hand. Back off counter-clockwise until the rotor shaft can be turned by hand with a slight noticeable drag.
2. For standard end clearance, back off the thrust bearing assembly the required length measured on the outside diameter of the bearing housing. **See Table 1.**
3. Tighten the two self-locking type "Allen" set screws, in the outboard face of the bearing housing, with equal force against the bracket. Your pump is now set with standard end clearances and locked.

**NOTE:** Be sure the shaft can rotate freely. If not, back off additional length on outside diameter and check again.

4. High viscosity liquids required additional end clearances. The amount of extra end clearance depends on the viscosity of the liquid pumped. For specific recommendations, consult the factory. Each additional  $\frac{1}{4}$ " turn on the outside diameter of the bearing housing is equivalent to an extra end clearance of .001".

PUMP SIZE	MODEL	STANDARD END CLEARANCE (Inch)	TURN BRG. HOUSING C.C.W. LENGTH ON O.D. (Inch)	ADDITIONAL LENGTH ON O.D. BRG. HOUSING FOR .001" END CL. (Inch)
H HL	124A	0.003	.75	.22
	4124A			
	4124B			
	126A			
	4126A			
	123A			
	4123A			
	127A	0.005	1.125	
	4127A			
K, KK L, LQ LL	124A	0.005	1.25	.25
	4124A			
	124AE			
	4124AE			
	4124B			
	126A			
	4126A			
	123A			
	4123A			
	127A	0.008	2	
	4127A			

TABLE 1

## INSTALLATION OF CARBON GRAPHITE BUSHINGS

When installing carbon graphite bushings, extreme care must be taken to prevent breaking. Carbon graphite is a brittle material and easily cracked. If cracked, the bushing will quickly disintegrate. Using a lubricant and adding a chamfer on the bushing and the mating part will help in installation. The additional precautions listed below must be followed for proper installation.

1. A press must be used for installation.
2. Be certain bushing is started straight.
3. Do not stop pressing operation until bushing is in proper position. Starting and stopping will result in a cracked bushing.
4. Check bushing for cracks after installation.

Carbon graphite bushings with extra interference fits are frequently furnished for high temperature operation. These bushings must be installed by a shrink fit.

1. Heat bracket for idler to 750°F.
2. Install cool bushing with a press.
3. If facilities are not available to reach 750°F. temperature, it is possible to install with 450°F. temperature; however the lower the temperature the greater the possibility of cracking the bushing.

Consult factory with specific questions on high temperature applications. **Refer to Engineering Service Bulletin ESB-3.**

## PRESSURE RELIEF VALVE INSTRUCTIONS

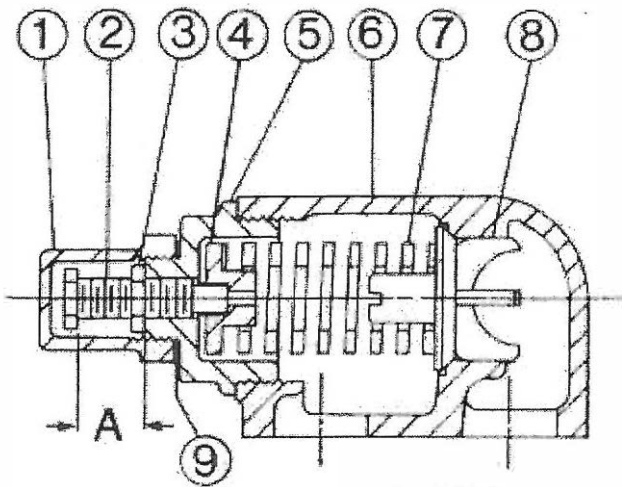


FIGURE 12  
SIZE H AND HL

### LIST OF PARTS

- |                    |                 |
|--------------------|-----------------|
| 1. Valve Cap       | 6. Valve Body   |
| 2. Adjusting Screw | 7. Valve Spring |
| 3. Lock Nut        | 8. Poppet       |
| 4. Spring Guide    | 9. Cap Gasket   |
| 5. Bonnet          |                 |

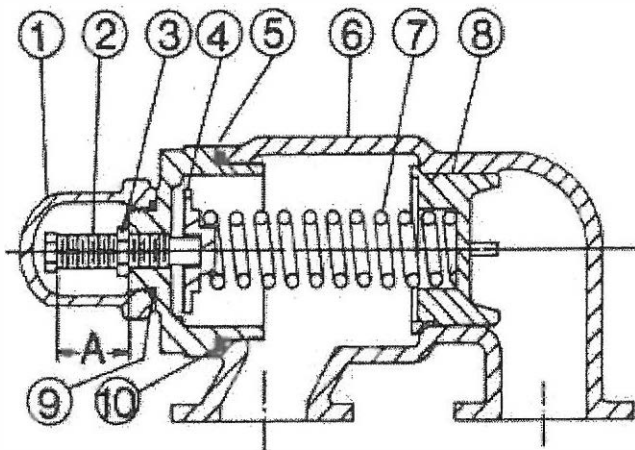


FIGURE 13  
SIZE K, K, L, LQ AND LL

### LIST OF PARTS

- |                    |                   |
|--------------------|-------------------|
| 1. Valve Cap       | 6. Valve Body     |
| 2. Adjusting Screw | 7. Valve Spring   |
| 3. Lock Nut        | 8. Poppet         |
| 4. Spring Guide    | 9. Cap Gasket     |
| 5. Bonnet          | 10. Bonnet Gasket |

## DISASSEMBLY

### DANGER

BEFORE OPENING ANY VIKING PUMP LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, RELIEF VALVE ADJUSTING CAP FITTING ETC.) BE SURE:

1. THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.
2. THAT THE DRIVING MEANS (MOTOR, TURBINE, ENGINE, ETC.) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON PUMP.
3. THAT YOU KNOW WHAT LIQUID THE PUMP HAS BEEN HANDLING AND THE PRECAUTIONS NECESSARY TO SAFELY HANDLE THE LIQUID. OBTAIN A MATERIAL SAFETY DATA SHEET (MSDS) FOR THE LIQUID TO BE SURE THESE PRECAUTIONS ARE UNDERSTOOD.

FAILURE TO FOLLOW ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY OR DEATH.

Mark valve and head before disassembly to insure proper reassembly.

1. Remove valve cap.
2. Measure and record length of extension of adjusting screw. Refer to "A" on Figure 12 and Figure 13.
3. Loosen locknut and back out adjusting screw until spring pressure is released.
4. Remove bonnet, spring guide, spring and poppet from valve body. Clean and inspect all parts for wear or damage and replace if necessary.

# VIKING PUMP

## TECHNICAL SERVICE MANUAL

UNIVERSAL SEAL HEAVY DUTY PUMPS  
SERIES 124A, 4124A, 124AE, 4124AE AND 4124B CAST IRON  
SERIES 126A AND 4126A DUCTILE IRON  
SERIES 123A AND 4123A STEEL  
SERIES 127A AND 4127A STAINLESS STEEL  
SIZES H, HL, K, KK, L, LQ, LL

SECTION TSM 630  
PAGE 13 of 13  
ISSUE D

### ASSEMBLY

Reverse procedures outlined under Disassembly. If valve is removed for repairs be sure to replace in same position. Relief valve adjusting screw cap must always point towards suction side of pump. If pump rotation is reversed, remove relief valve and turn end for end.

#### DANGER

BEFORE STARTING PUMP, BE SURE ALL DRIVE EQUIPMENT GUARDS ARE IN PLACE.

FAILURE TO PROPERLY MOUNT GUARDS MAY RESULT IN SERIOUS INJURY OR DEATH.

### PRESSURE ADJUSTMENT

If a new spring is installed or if pressure setting of pressure relief valve is to be changed from that which the factory has set, the following instructions must be carefully followed.

1. Carefully remove valve cap which covers adjusting screw.  
Loosen locknut which locks adjusting screw so pressure setting will not change during operation of pump.
2. Install a pressure gauge in discharge line for actual adjusting operation.
3. Turn adjusting screw in to increase pressure and out to decrease pressure.
4. With discharge line closed at point beyond pressure gauge, gauge will show maximum pressure valve will allow while pump is in operation.

### IMPORTANT

In ordering parts for pressure relief valve, always give model number and serial number of pump as it appears on nameplate and name of part wanted. When ordering springs, be sure to give pressure setting desired.

VIKING  
PUMP

IDEX  
CORPORATION

### Warranty

Viking warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from Viking. The warranty period for Universal Seal series pumps ONLY, shipped after July 1, 2001 (Universal Seal models listed below is three (3) years from date of startup, provide that in no event shall this warranty extend more than forty-two (42) months from the date of shipment from Viking.

If, during said warranty period, any products sold by Viking prove to be defective in workmanship or material under normal use and service, and if such products are returned to Viking's factory at Cedar Falls, Iowa, transportation charges prepaid, and if the products are found by Viking to be defective in workmanship or material, they will be replaced or repaired free of charge, F.O.B. Cedar Falls, Iowa.

Viking assumes no liability for consequential damages of any kind and the purchaser by acceptance of delivery assumes all liability for the consequences of the use or misuse of Viking products by the purchaser, his employees or others. Viking will assume no field expense for service or parts unless authorized by it in advance.

Equipment and accessories purchased by Viking from outside sources which are incorporated into any Viking product are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any.

**THIS IS VIKING'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** No officer or employee of IDEX Corporation or Viking Pump, Inc. is authorized to alter this warranty.

Universal Seal Pump Models: Sizes H, HL, K, KK, L, LQ, LL, LS, Q, QS, N and R in Series 124A, 4124A, 4124AE, 4124B, 224A, 4224A, 4224AE, 4224B, 324A, 4324A, 126A, 4126A, 226A, 4226A, 123A, 4123A, 223A, 4223A, 323A, 4323A, 127A, 4127A, 227A, 4227A, 327A and 4327A.

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# **INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS FOR 320 FRAME AND SMALLER MOTORS**

## **WARNING**

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of all persons who install, operate or maintain this equipment.

Failure to follow instructions and safe electrical procedures could result in serious injury or fatality. Disconnect all power and discharge all capacitors before servicing. Install and ground per local and national codes. Consult qualified personnel with questions or if repairs are required.

## **INSTALLATION UNCRATING AND INSPECTION**

After uncrating, check for any damage which may have been incurred in handling. The motor shaft should turn freely by hand. Repair or replace any loose or broken parts before attempting to use the motor.

Check to be sure that motor has not been exposed to dirt, grit, or excessive moisture in shipment or storage before installation.

Measure insulation resistance (see operation). Clean and dry the windings as required.

Never start a motor which has been wet without having it thoroughly dried.

## **SAFETY**

Motors should be installed, protected and fused in accordance with latest issue of National Electrical Code, NEMA Standard Publication No. MG 2 and local codes.

Eyebolts or lifting lugs are intended for lifting the motor only. These lifting provisions should never be used when lifting or handling the motor with other equipment (i.e. pumps, gear boxes, fans or other driven equipment) as a single unit. Be sure the eyebolt is fully threaded and tight in its mounting hole.

Eyebolt lifting capacity rating is based on a lifting alignment coincident with the eyebolt centerline. Eyebolt capacity decreases as deviation from this alignment increases. See NEMA MG 2.

Frames and accessories of motors should be grounded in accordance with National Electrical Code (NEC) Article 430. For general information on grounding refer to NEC Article 250.

Rotating parts such as pulleys, couplings, external fans, unusual shaft extensions should be permanently guarded. Keep hands and clothing away from moving parts. Electrical repairs should be made by trained, qualified personnel only.

## **LOCATION**

In selecting a location for the motor, consideration should be given to environment and ventilation. A motor with the proper enclosure for the expected operating condition should be selected.

The ambient temperature of the air surrounding the motor should not exceed 40°C (104°F) unless the motor has been especially designed for high ambient temperature applications. The free flow of air around the motor should not be obstructed.

The motor should never be placed in a room with a hazardous process, or where flammable gases or combustible material may be present, unless it is specifically designed for this type of service.

1. Dripproof (open) motors are intended for use indoors where atmosphere is relatively clean, dry and non-corrosive.
2. Dripproof (open) fire pump motors are to be installed in a Type 2 dripproof environment as defined in NEMA 250.
3. Totally enclosed motors may be installed where dirt, moisture and corrosion are present.
4. Totally enclosed - severe duty motors are recommended for extreme environmental conditions.
5. Explosion proof motors are built for use in hazardous locations as indicated by Underwriters' label on motor. Consult UL, NEC, and local codes for guidance.

## **FLOOR MOUNTING**

Motors should be provided with a firm, rigid foundation, with the plane of four mounting pads flat within .010" for 56 to 210 frame; .015" from 250 through 320 frame. This may be accomplished by shims under the motor feet.

## **V-BELT DRIVE**

1. Align sheaves carefully to avoid axial thrust on motor bearing. The drive sheave on the motor should be positioned toward the motor so it is as close as possible to the bearing.
2. When adjusting belt tension, make sure the motor is secured by all mounting bolts before tightening belts.
3. Adjust belt tension to belt manufacturers recommendations. Excessive tension will decrease bearing life.
4. Sheaves should be in accordance to NEMA Spec. MG-1 or as approved by the manufacturer for a specific application.



## DIRECT CONNECTED DRIVE

Flexible or solid shaft couplings must be properly aligned for satisfactory operation. On flexible couplings, the clearance between the ends of the shafts should be in accordance with the coupling manufacturer's recommendations or NEMA standards for end play and limited travel in coupling.

Misalignment between direct connected shafts will cause increased bearing loads and vibration even when the connection is made by means of a flexible coupling. Excessive misalignment will decrease bearing life. Proper alignment, per the specifications of the coupling being used, is critical.

## ELECTRICAL CONNECTIONS

1. All wiring, fusing, and grounding must comply with National Electrical Codes and local codes.
2. To determine proper rotation and voltage connections, refer to the information and diagram on the nameplate, separate connection plate or decal. If the plate or decal has been removed, contact the manufacturer for assistance.
3. Use the proper size of line current protection and motor controls as required by the National Electrical Code and local codes. Recommended use is 125% of full load amps as shown on the nameplate for motors with 40°C ambient and a service factor over 1.0. Recommended use is 115% of full load amps as shown on the nameplate for all other motors. Do not use protection with larger capacities than recommended. Three phase motors must have all three phases protected.

Wire Size For 115 & 230 Volt Single Phase Circuits								
Distance - Motor To Fuse or Meter Box - Feet								
Motor HP	100 Ft.		200 ft.		300 Ft.		500 Ft.	
	115V.	230V.	115V.	230V.	115V.	230V.	115V.	230V.
1/4	#14	#14	#10	#12	#8	#10	#6	#8
1/3	#12	#14	#10	#12	#6	#10	#4	#8
1/2	#10	#12	#8	#10	#6	#8	#4	#6
3/4	#10	#12	#6	#10	#4	#8	#2	#6
1	#8	#10	#6	#8	#4	#6		#4
1-1/2	#4	#10	#0	#8		#6		#4
2		#8		#6		#4		#2
3		#8		#6		#4		#2
5		#6		#4		#2		#0

### WARNING

Disconnect power before working on motor driven equipment.

Motors with automatic thermal protectors will automatically restart when the protector cools. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.

Motors with manual thermal protectors may start unexpectedly after protector trips. If manual protector trips, disconnect motor from power line. After protector cools (five minutes or more) it can be reset and power may be applied to motor.

## THERMAL PROTECTOR INFORMATION

The nameplate will indicate one of the following:

1. Motor is thermally protected
2. Motor is provided with overheat protective device

For example:

1. Motors without thermal protection have nothing stamped on nameplate about thermal protection.
2. Motors equipped with built-in thermal protection have "THERMALLY PROTECTED" stamped on the nameplate. Thermal protectors open the motor circuit electrically when the motor overheats or is overloaded. The protector cannot be reset until the motor cools. If the protector is automatic, it will reset itself. If the protector is manual, press the red button to reset.
3. Motors that are provided with overheat protective device that does not open the motor circuit directly will indicate "WITH OVERHEAT PROTECTIVE DEVICE". See motor connection diagram for details

## CHANGING ROTATION

1. Keep hands and clothing away from rotating parts.
2. Before the motor is coupled to the load, determine proper rotation.
3. Check rotation by jogging or bumping. Apply power to the motor leads for a short period of time, enough to just get motor shaft to rotate a slight amount to observe shaft rotating direction.
4. Three phase - interchange any two (2) of the three (3) line leads. Single phase - reconnect per the connection diagram on the motor.

## REDUCED VOLTAGE STARTING

Motors used on reduced voltage starting, should be carefully selected based upon power supply limitations and driven load requirements. The motors starting torque will be reduced when using reduced voltage starting. The elapsed time on the start step should be kept as short as possible and should not exceed 5 seconds. It is recommended that this time be limited to 2 seconds. Refer to the manufacturer for application assistance.

### OPERATION BEFORE INITIAL STARTING

1. If a motor has become damp in shipment or in storage, measure the insulation resistance of the stator winding.

$$\text{Minimum Insulation Resistance} = 1 + \frac{\text{Rated Voltage}}{1000}$$

In Megohms

Do not attempt to run the motor if the insulation resistance is below this value. Have the motor inspected, dried and/or cleaned. Contact a qualified motor repair shop.

2. See that voltage and frequency stamped on motor and control nameplates correspond with that of the power line.
3. Check all connections to the motor and control with the wiring diagram.
4. Be sure rotor turns freely when disconnected from the load. Any foreign matter in the air gap should be removed.
5. Leave the motor disconnected from the load for the initial start (see following caution). Check for proper rotation. Check for correct voltage (within  $\pm 10\%$  of nameplate value) and that it is balanced within 1% at the motor terminals. After the machine is coupled to the load, check that the nameplate amps are not exceeded. Recheck the voltage level and balance under load per the above guidelines.

Shut down the motor if the above parameters are not met or if any other noise or vibration disturbances are present. Consult NEMA guidelines or the equipment manufacturer if any questions exist before operating equipment.

### ALLOWABLE VOLTAGE AND FREQUENCY RANGE

If voltage and frequency are within the following range, motors will operate, but with somewhat different characteristics than obtained with correct nameplate values.

1. Voltage: Within 10% above or below the value stamped on the nameplate. On three phase systems the voltage should be balanced within 1%. A small voltage unbalance will cause a significant current unbalance.
2. Frequency: Within 5% above or below the value stamped on the nameplate.
3. Voltage and Frequency together: Within 10% (providing frequency above is less than 5%) above or below values stamped on the nameplate.

### CLEANLINESS

Keep both the interior and exterior of the motor free from dirt, water, oil and grease. Motors operating in dirty places should be periodically disassembled and thoroughly cleaned.

#### NOTE

Explosion proof motors should only be disassembled by an authorized service station.

### CONDENSATION DRAIN PLUGS

All explosion proof and some totally enclosed motors are equipped with automatic drain plugs, they should be free of oil, grease, paint, grit and dirt so they don't clog up. The drain system is designed for normal floor (feet down) mounting. For other mounting positions, modification of the drain system may be required, consult the manufacturer.

### SERVICE

#### WARNING

Disconnect power before working on motor or driven equipment. Motors with automatic thermal protectors will automatically restart when the protector cools. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.

#### CAUTION

Overgreasing bearings can cause premature bearing and/or motor failure. The amount of grease added should be carefully controlled.

#### NOTE

If lubrication instructions are shown on the motor nameplate, they will supersede this general instruction.

Motors are pregreased with a polyurea mineral oil NGLI grade 2 type grease unless stated otherwise on the motor nameplate. Some compatible brands of polyurea mineral base type grease are: Chevron SRI #2, Rykon Premium #2, Shell Oil Dolium R or Texaco Polystar RB.

Motors are properly lubricated at the time of manufacture. It is not necessary to lubricate at the time of installation unless the motor has been in storage for a period of 12 months or longer (refer to lubrication procedure that follows).

#### LUBRICATION PROCEDURES

1. Stop motor. Disconnect and lock out of service.
2. Remove contaminants from grease inlet area.
3. Remove filler and drain plugs.
4. Check filler and drain holes for blockage and clean as necessary.
5. Add proper type and amount of grease. See the Relubrication Time Intervals table for service schedule and Relubrication Amounts table for volume of grease required.
6. Wipe off excess grease and replace filler and drain plugs (see following warning).
7. Motor is ready for operation.

#### WARNING

If motor is nameplated for hazardous locations, do not run motor without all of the grease or drain plugs installed.

#### RELUBRICATION TIME INTERVAL (For motors with regreasing provisions).

Service Condition and less	NEMA FRAME SIZE					
	140-180		210-360		400-510	
	1800RPM	Over 1800 RPM	1800 RPM and less	Over 1800 RPM	1800 RPM and less	Over 1800 RPM
Standard	3 yrs.	6 months	2 yrs.	6 months	1 yr.	3 months
Severe	1 yr.	3 months	1 yr.	3 months	6 months	1 month
Seasonal	See Note 2.					

#### NOTE

1. For motors nameplated as "belted duty only divide the above intervals by 3.
2. Lubricate at the beginning of the season. Then follow service schedule above.

SEASONAL SERVICE: The motor remains idle for a period of 6 months or more.

STANDARD SERVICE: Up to 16 hours of operation per day, indoors, 100°F maximum ambient.

SEVERE SERVICE: Greater than 16 hours of operation per day. Continuous operation under high ambient temperatures (100° to 150°F) and/or any of the following: dirty, moist locations, high vibration (above NEMA standards), heavy shock loading, or where shaft extension end is hot.

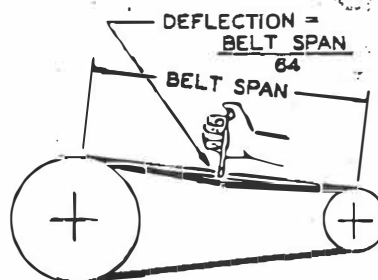
#### RELUBRICATION AMOUNTS (For motors with regreasing provisions).

NEMA FRAME SIZE	VOLUME cu. in. (fluid oz.)	NEMA FRAME SIZE	VOLUME cu. in. (fluid oz.)
140	.25 (.14)	320	1.50 (.83)
180	.50 (.28)	360	1.75 (.97)
210	.75 (.42)	400	2.25 (1.2)
250	1.00 (.55)	440	2.75 (1.5)
280	1.25 (.69)	500	3.00 (1.7)

### TENSIONING V-BELT DRIVES

#### General rules of tensioning.

1. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions.
2. Check tension frequently during the first 24 - 48 hours of operation.
3. Over tensioning shortens belt and bearing life.
4. Keep belts free from foreign material which may cause slip.
5. Make V-drive inspection on a periodic basis. Tension when slipping. Never apply belt dressing as this will damage the belt and cause early failure.



### Tension Measurement Procedure

1. Measure the belt span (see sketch).
2. Position bottom of the large "O" ring on the span scale at the measured belt span.
3. Set the small "O" ring on the deflection force scale to zero.
4. Place the tension checker squarely on one belt at the center of the belt span. Apply a force on the plunger and perpendicular to the belt span until the bottom of the large "O" ring is even with the top of the next belt or with the bottom of a straight edge laid across the sheaves.
5. Remove the tension checker and read the force applied from the bottom of the small "O" ring on the deflection force scale.
6. Compare the force you have applied with the values given in Table No. 1. The force should be between the minimum and maximum shown. The maximum value is shown for "New Belt" and new belts should be tensioned at this value to allow for expected tension loss. Used belts should be maintained at the minimum value as indicated in Table No. 1.

NOTE: The ratio of deflection to belt span is 1:64.



Table No. 1 Sheave Diameter-INCHES

Deflection Force-LBS

Cross Section	Smallest Sheave Diameter Range	RPM Range	Belt Deflection Force			
			Super Gripbelts and Unnotched Gripbands		Gripnotch Belts and Notched Gripbands	
			Used Belt	New Belt	Used Belt	New Belt
A, AX	3.0 - 3.6	1000-2500 2501-4000	3.7 2.8	5.5 4.2	4.1 3.4	6.1 5.0
	3.8 - 4.8	1000-2500 2501-4000	4.5 3.8	6.8 5.7	5.0 4.3	7.4 6.4
	5.0 - 7.0	1000-2500 2501-4000	5.4 4.7	8.0 7.0	5.7 5.1	9.4 7.6
B, BX	3.4 - 4.2	860-2500 2501-4000			4.9 4.2	7.2 6.2
	4.4 - 5.6	860-2500 2501-4000	5.3 4.5	7.9 6.7	7.1 7.1	10.5 9.1
	5.8 - 8.6	860-2500 2501-4000	6.3 6.0	9.4 8.9	8.5 7.3	12.6 10.9
C, CX	7.0 - 9.0	500-1740 1741-3000	11.5 9.4	17.0 13.8	14.7 11.9	21.8 17.5
	9.5 - 16.0	500-1740 1741-3000	14.1 12.5	21.0 18.5	15.9 14.6	23.5 21.6
D	12.0 - 16.0	200-850 851-1500	24.9 21.2	37.0 31.3		
	18.0 - 20.0	200-850 851-1500	30.4 25.6	45.2 38.0		
3V, 3VX	2.2 - 2.4	1000-2500 2501-4000			3.3 2.9	4.9 4.3
	2.65 - 3.65	1000-2500 2501-4000	3.6 3.0	5.1 4.4	4.2 3.8	6.2 5.6
	4.12 - 6.90	1000-2500 2501-4000	4.9 4.4	7.3 6.6	5.3 4.9	7.9 7.3
5V, 5VX	4.4 - 6.7	500-1749 1750-3000 3001-4000			10.2 8.8 5.6	15.2 13.2 8.5
	7.1 - 10.9	500-1740 1741-3000	12.7 11.2	18.9 16.7	14.8 13.7	22.1 20.1
	11.8 - 16.0	500-1740 1741-3000	15.5 14.6	23.4 21.8	17.1 16.8	25.5 25.0
8V	12.5 - 17.0	200-850 851-1500	33.0 26.8	49.3 39.9		
	18.0 - 22.4	200-850 851-1500	39.6 35.3	59.2 52.7		

Table No. 2 FHP Belts Deflection Force

Cross Section	Small P.D. Range	Lbs.	
		Min.	Max.
3L	1.25 - 1.75	1/2	3/4
	2.00 - 2.25	5/8	7/8
	2.50 - 3.00	3/4	1 1/8
4L	2.1 - 2.8	1 1/8	1 3/8
	3.0 - 3.5	1 1/2	2 1/8
	3.7 - 5.0	1 7/8	2 3/8
5L	3.0 - 4.2	2	2 1/8
	4.5 - 5.2	2 1/8	3 1/8

The above method of tensioning belt drives is to be used when a drive has been selected in accordance with the suggestions listed in the drive selection tables of the Browning catalog. For drives with service factor greater than 1.5, consult Browning. For exact tension calculations use the Browning EDGE® Selection Program.

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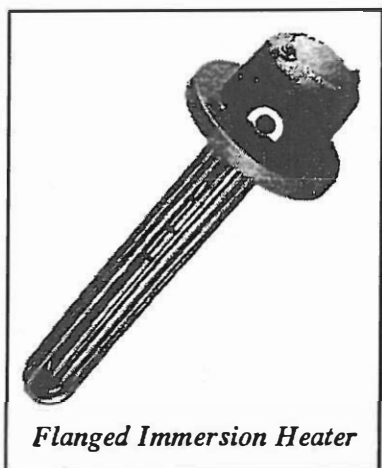


# WARREN ELECTRIC CORPORATION

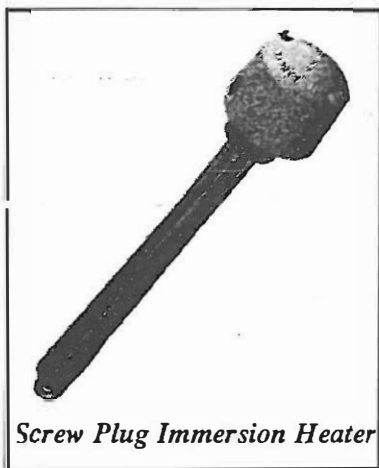
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Page 1 of 4

36 Franklin Street, P.O. Box 86, Warren, Rhode Island 02885  
TEL: (401) 245-3700 FAX: (401) 2459331

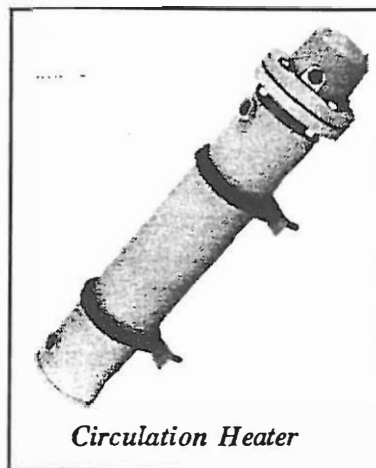
## Installation, Operation and Maintenance Instructions for Electric Immersion Heaters



*Flanged Immersion Heater*



*Screw Plug Immersion Heater*



*Circulation Heater*

PLEASE READ AND FOLLOW ALL INSTRUCTIONS BEFORE INSTALLING

### PRE-INSTALLATION

1. Unpack each heater upon delivery. Inspect each heater carefully for shipping damages. Report any claims to the carrier. Do not operate damaged equipment. Consult WARREN ELECTRIC CORPORATION for instructions.
2. Compare the wattage, voltage rating and phase listed on each nameplate against your supply voltage, phase and the requirements of your installation. Confirm that the sheath material and watt density of each heater is compatible with the material being heated. Check packing list.

### WARNING

ALL ELECTRICAL WORK MUST BE DONE BY QUALIFIED PERSONNEL IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND APPLICABLE STATE AND LOCAL CODES.

BEFORE WIRING, SERVICING OR CLEANING THE HEATER(S), TURN OFF POWER AND INSTALL A LOCKOUT ON THE HEATER CIRCUITS AT THE SERVICE PANEL. FAILURE TO DO SO COULD ALLOW OTHERS TO TURN ON POWER UNEXPECTEDLY, WHICH MAY CAUSE FATAL ELECTRICAL SHOCK.

# FLANGE AND SCREW PLUG HEATER INSTALLATION INSTRUCTIONS

## MOUNTING

Each heater shall be installed so that the heated section is totally immersed at all times. The liquid level must always be above the heated portion of the heater elements by at least several inches. **Failure of the heater could occur if this is not done as the heater may overheat and damage the heating element sheaths or resistance wire inside the sheaths.**

Do not bend the heating elements. Consult Warren Electric Corporation if bending is necessary.

## INSTALLATION

**INSPECTION:** Thoroughly inspect each heater prior to installation by checking the elements, terminal box, thermostat and thermocouple (if included). Immediately report any damage to the freight carrier who delivered the heater(s). Any sign of moisture or water stains on the packaging could be a sign of possible moisture damage. (See paragraph MOISTURE OR WETNESS before proceeding or wiring.)

**MECHANICAL:** Install each heater (with gasket provided if flanged, or quality pipe sealant if NPT) in the tank or vessel. Horizontal installation is preferred, and proper air venting of flow is essential. If the heater is installed horizontally, the discharge must be at the top (12 o'clock) at either end, at or beyond the heated section. The inlet should be at or beyond the heated section at the opposite end. **IMPORTANT: The heated portion of the heater elements must remain completely immersed and completely flooded whenever energized.** If the heater is installed vertically, the direction of flow shall be upward and no air pockets should exist above the discharge.

Clean the gasket surface before seating the heater. Be sure each heater is installed properly with a gasket or pipe sealant. Observe "Top" Stamp on the flange (if any). Tighten all flange and electrical connections.

**ELECTRICAL:** The applied voltage should not exceed 10% of the highest heater nameplate voltage. Each heater circuit should have at least one temperature limiting control. (See paragraph TEMPERATURE CONTROL.) If there is a potential of a pressure build up, possibly due to a closed inlet and/or outlet valve, or

temperature run away due to a control failure, a pressure relief valve, set at a pressure rating below the rating of the pressure vessel and exceeding the BTU capacity of the heaters by a minimum of 50% must be installed directly to the vessel containing the heater.

EXAMPLE based on water: (If other, consult valve supplier.)

$$100 \text{ kw} \times 3412 \text{ BTU/kw-hr} = 341,200 \text{ BTU/hr}$$

$$341,200 \text{ BTU/hr} \times 1.5 = 511,800 \text{ BTU/hr}$$

At least one temperature sensor or, preferably, a high limit control should be in close proximity to the heating element.

Multiple circuit heaters are to be wired to the color coded or numbered electrical terminals inside the terminal enclosure.

All wiring shall be done by qualified personnel in accordance with the National Electrical Code and applicable state and local codes. Each heater shall be **grounded in accordance with the National Electrical Code.** (REF: NEC Articles 427, 250, etc.)

Refer to the wiring diagram found on the inside of the terminal enclosure of each heater and the typical wiring diagrams on the back page of these instructions.

**CONTACTORS:** All heaters operated over 250 VAC must be contactor operated. Definite purpose contactors are usually the most economical. Selection of the 'proper contactor involves:

Select one or more contactors to handle each circuit or heater(s). The contactor ampere rating must exceed the total amperage applied to the contactor contacts and shall not be rated less than 125 percent of the total load of the heaters. The contactor coil voltage must match the control circuit voltage and be limited to 250 VAC. (See page 4 for typical wiring diagrams.)

Select a contactor enclosure(s) to match the size of the contactor selected. Also consider whether the enclosure should be general purpose, weather or explosion-resistant.

We recommend using only UL recognized components such as Square D types DP, DPA & SYD.

**MOISTURE OR WETNESS:** Warren Electric heating elements are manufactured with high quality magnesium oxide. (Continued on page 3...)

## WARREN ELECTRIC CORPORATION



# FLANGE AND SCREW PLUG HEATER INSTALLATION INSTRUCTIONS

**MOISTURE OR WETNESS cont...** As added protection, each Warren Electric element terminal end normally has a flexible silicone moisture barrier just under the terminal insulator. All heaters manufactured and shipped by Warren Electric Corporation are electrically tested in accordance with UL specifications.

Exposure to weather conditions while transporting or storage at a job site in an open or unprotected area can cause water, excessive moisture or condensation to collect in the terminal area. Drying a heater internally usually requires baking the entire unit at 250 - 300 degrees F for 24 hours. This will usually correct a moisture problem. Drying a heater by operating at low voltage has rarely proven successful as the moisture stays in the cold lead section of the electrical elements in most cases. An ordinary hair dryer can sometimes be used to surface dry a terminal area.

If baking is not practical, consult our factory.

**No heater shall be operated with a resistance to ground reading of less than 50 megohms. A qualified electrician can check the megohm reading.**

**TERMINAL ENCLOSURES:** The heater has either a general purpose, weather or explosion-resistant terminal enclosure which should have been selected based on the most extreme operating environment at the heater terminal area.

That is, a general purpose terminal enclosure can be used where there is no risk of water or other contamination, hazardous or explosive fumes, etc. It is dangerous to use a general purpose enclosure if the terminal area could be subjected to extreme conditions such as dripping water or an occasional washdown. The terminal enclosure selection is the sole responsibility of the purchaser and installer. Weather or explosion-resistant terminal enclosures are available but must be specified at the time of the heater order.

Weather or explosion-resistant terminal enclosures must be tightly sealed at the cover, conduit openings, fasteners and all other openings before exposure to adverse conditions. Gasket(s) and weather resistant washers are provided with weather resistant covers. Some models have an alternate screw-on terminal cover and these should have a gasket (included) or a non-hardening compound shall be put on the cover threads and the cover must be tightened after wiring.

## TEMPERATURE CONTROL

The heater may have a thermostat(s), thermocouple or both. **Each heater circuit must have a temperature control to prevent overheating of each circuit.** Secondary safety high-limit manual reset temperature controls are also recommended except where a possible condition such as freezing or total loss of heat could become a major problem. Do not exceed the amperage and voltage rating of the thermostat. If a thermocouple is used, the type ("J", "IS", etc.) must be matched to the thermocouple temperature controller.

## OPERATION and MAINTENANCE

**BEFORE WIRING, SERVICING OR CLEANING THE HEATER(S), TURN OFF POWER AND INSTALL A LOCKOUT ON THE HEATER CIRCUITS AT THE SERVICE PANEL. FAILURE TO DO SO COULD ALLOW OTHERS TO TURN ON POWER UNEXPECTEDLY, WHICH MAY CAUSE FATAL ELECTRICAL SHOCK.**

**DO NOT OPERATE HEATER IF DRY. DO NOT OPERATE THE HEATER UNLESS THE HEATED SECTION OF THE ELEMENT BUNDLE IS COMPLETELY IMMERSED AT ALL TIMES.**

**CORROSION:** After some use, each heater should be periodically removed from the tank or vessel and the heater element bundle (the immersed portion of the heater) should be inspected and checked for coatings and corrosion. Remove deposits from each heater before returning heater to service.

The tank and vessel should also be checked and sludge deposits should be removed. The heaters must not be operated in sludge.

We suggest that periodic inspections be made to determine the appropriate frequency for cleaning and that a new heater flange gasket be installed whenever the heater flange is removed. The frequency of inspections will depend on use and fluid conditions.

**ELECTRICAL:** Electrical connections must also be checked periodically. All connections must be tight. All terminal ends and connections should be clean of all contaminants. (Continued on page 4...)

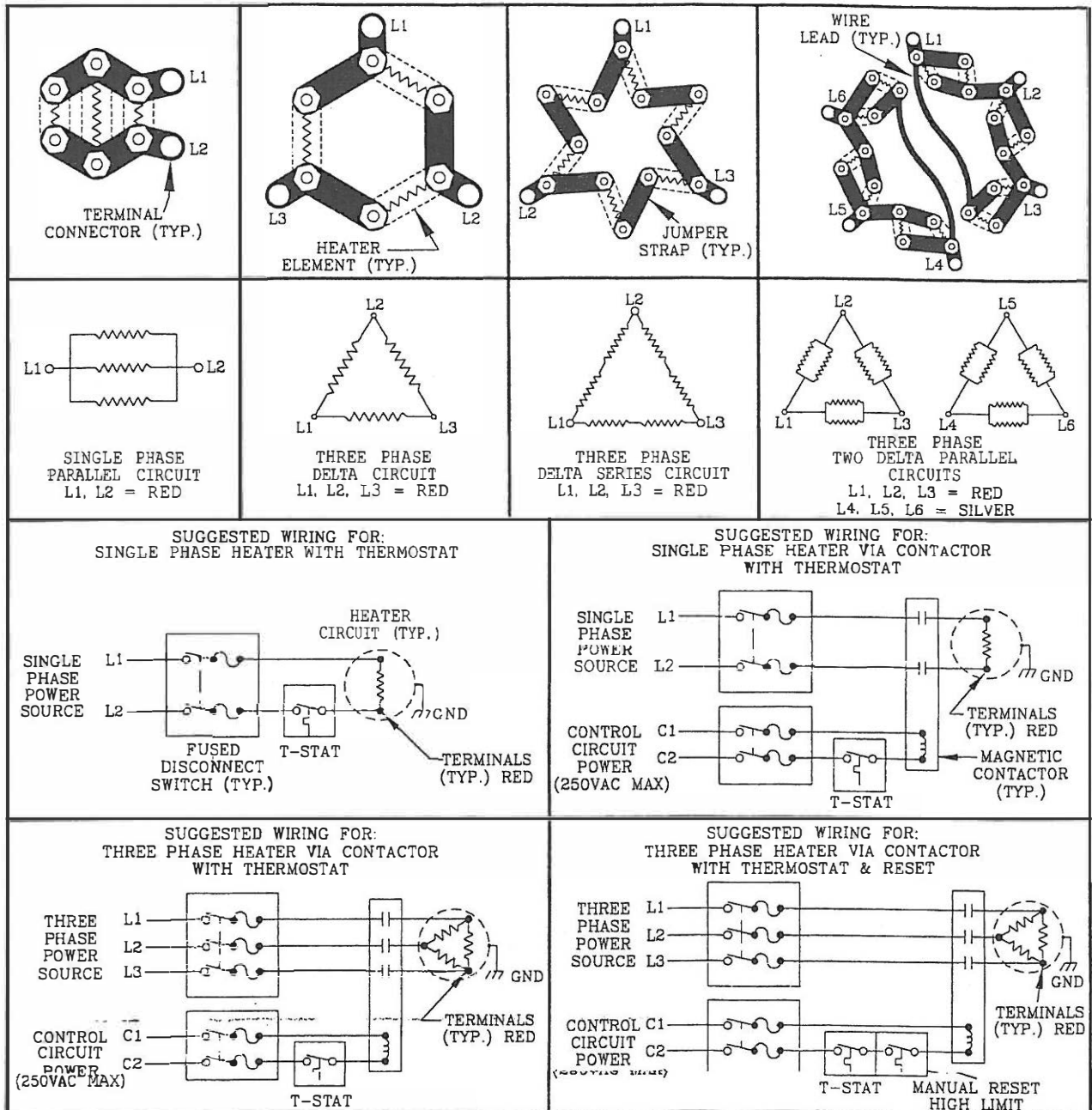
**WARREN ELECTRIC CORPORATION**

TEE: (401) 2453700 FAX: (401) 245-933 1

Page 3 of 4

# FLANGE AND SCREW PLUG HEATER INSTALLATION INSTRUCTIONS

## TYPICAL WIRING DIAGRAMS

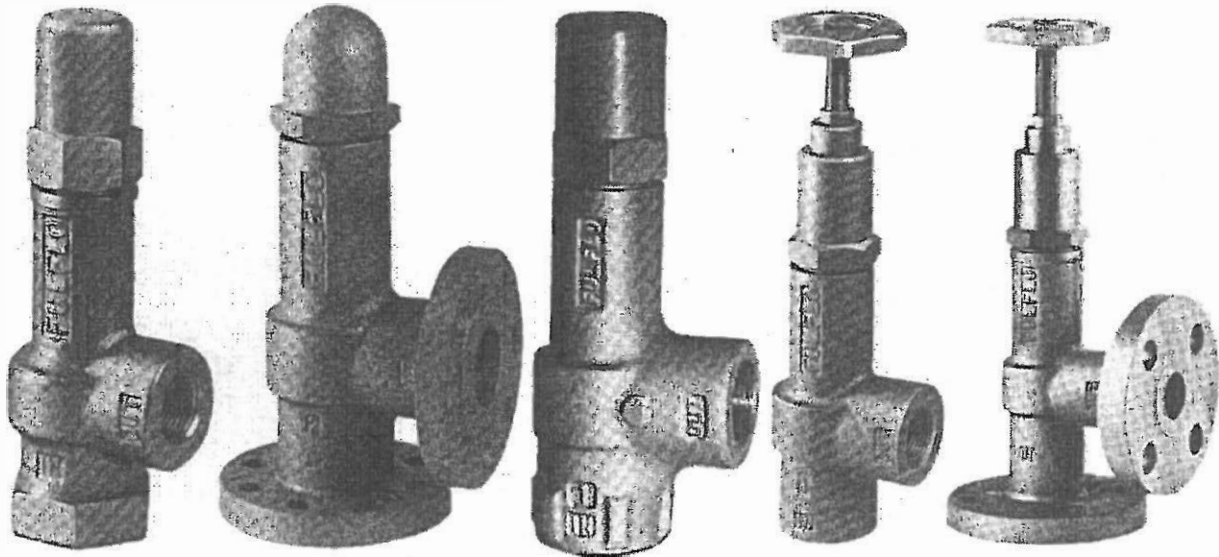


## WARRANTY

**WARRANTIES:** There is no representation, warranty, or condition, of any kind, express or implied, unless otherwise expressly stipulated hereunder. Seller's sole representation as to equipment sold hereunder is that such equipment is under warranty, for a period of fifteen (15) months from the date of delivery to buyer, to be free from manufacturing defects if used in accordance with seller's recommendations, except that this warranty does not cover switches or elements damaged by short circuit wiring or unauthorized servicing beyond normal adjustment, and such switches or elements will not be replaced without charge. The obligation of the seller hereunder is limited to making the replacement or repair, whichever the seller may elect, of any equipment sold by the seller, or any part thereof, acknowledged by seller to be defective. This warranty does not include or cover reimbursement of expenses incurred by reason of normal use and service of the equipment, or the expenses incurred in connection with the inspection or transportation of equipment or any part thereof to be repaired or replaced pursuant to this warranty.

## WARREN ELECTRIC CORPORATION

# V-SERIES VALVES



Standard  
with Screw  
Connections

Standard  
with Flange  
Connections

Stainless Steel  
with Screw  
Connections

Handwheel  
with Screw  
Connections

Handwheel  
with Flange  
Connections

V-SERIES  
VALVES

## APPLICATION

The Fulflo "V" Series range in size from 1/4" through 2" and operate efficiently with liquids of any viscosity at pressures from 2 to 1000 P.S.I. The "V" series valves are available in flange or screw type...cartridge or handwheel in a choice of brass, cast iron, steel and stainless steel.

Widely used in a variety of applications, the "V" series valves are ideally suited in hydraulic and lubricating systems for load regulation and system protection. Special trim or packings are available for use with fire resisting fluids and other liquids of this type. Unusual applications and special requirements should be referred to our engineering staff for recommendation.

## INSTALLATION

Fulflo valves can be mounted in any position. A tee may be inserted in the pump discharge line to mount the valve. The correct size of valve should be installed, preferably matching the pump discharge line. Screw the valve into the nipple in the tee, or in the case of the flange style, bolt the valve to the companion flange screwed into the nipple. When the valve is used for frequent bypassing of oil pressure, its outlet

should be piped back to the tank. Care must be taken to have the discharge well below the oil level in the tank to prevent air entrainment and erratic operation.

Only if the valve is used as safety or overload relief and operates infrequently may its discharge be piped back into the pump suction line. Frequent or continuous operation under these conditions will cause excessive heating of the oil and possible damage.

# V-SERIES

## V-SERIES VALVES

### SETTING VALVES

Valves may be set with a hydraulic hand pump for cracking pressure. If a test stand is available, valve should be connected to the discharge header with the pump bypass open, and the bypass gradually closed until the desired pressure registers on the gauge. Adjust valve adjusting screw until valve slightly bleeds at the set bypass pressure and lock adjusting screw.

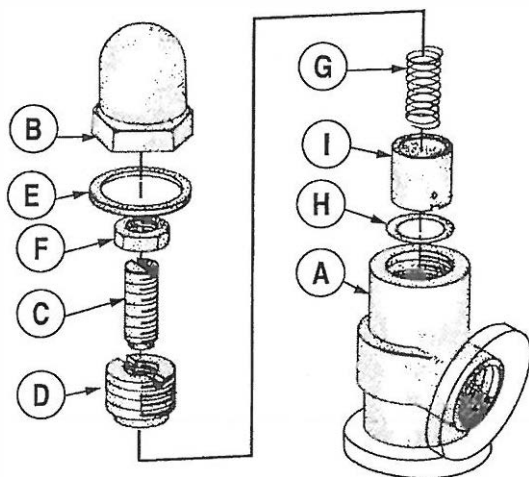
Fulflo valves are not designed to be positive shut-off, and will pass a minimal amount of leakage before the set pressure. If a valve is required to bypass a given amount of fluid at a given pressure, a test stand

having a flow meter in the pump discharge line must be available. With a valve adjusted for cracking pressure as above, continue closing bypass until the required flow registers on the flow meter and observe pressure. Readjust pressure, if necessary, to obtain desired pressure at desired flow.

### MAINTENANCE

Fulflo valves provide reliable "chatter-free" operation when the system is free of abrasives and foreign matter. Continuous filtration of the liquid used is strongly recommended.

### TYPICAL DISASSEMBLY OF STANDARD TYPE VALVE

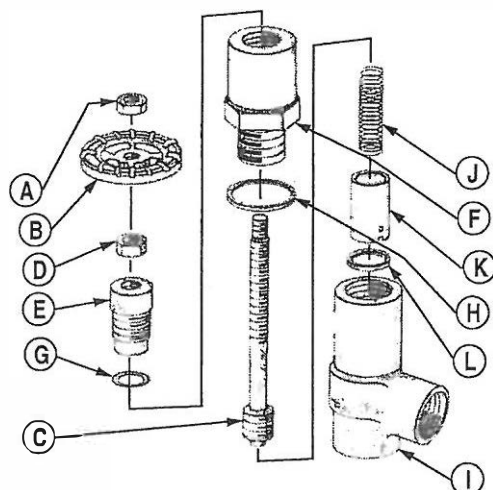


To dismantle valve for inspection or cleaning:

1. Remove cap "B"
2. Remove O-Ring "E"
3. Remove lock nut "F"
4. Remove adjusting screw "C"
5. Remove retainer "D"
6. Remove spring "G"
7. Remove piston "I"
8. Remove stop ring "H" (Not Recommended)  
(Special tooling is required to install new stop ring.)

Inspect valve bore and piston for wear and scoring. Replace broken or damaged parts. Clean all parts thoroughly and re-assemble by reversing the above procedure.

### TYPICAL DISASSEMBLY OF HANDWHEEL TYPE VALVE



To dismantle the valve for inspection or cleaning:

1. Release spring tension by backing off handwheel as far as it will go.
2. Remove lock nut "A" or set screw and take off handwheel "B"
3. Remove lock nut "D"
4. Unscrew and remove gland "E"
5. Unscrew and remove bonnet "F"
6. Remove O-Ring "H"
7. Remove adjusting screw "C" (turn clockwise and pull out from bottom of bonnet "F")
8. Remove O-ring packing "G"
9. Remove spring "J"
10. Remove piston "K"
11. Remove stop ring "L" (Not Recommended)  
(Special tooling is required to install new stop ring.)

Inspect valve bore and piston for wear or scoring. Replace broken or damaged parts. Clean all parts thoroughly and re-assemble by reversing the above procedure.

# V-SERIES

## ASSEMBLY NUMBER IDENTIFICATION CHART

Symbol No.	Designation	Code	Description
1	Style	None H	Standard Model Handwheel Model
2	Series	V	
3	Material	J B S SS	Cast iron Brass Steel 316 Stainless Steel
4	Connections	None F	Screw Connections Flange Connections 300# Flange Class Standard (250# Flange Class - Cast Iron Standard)
5	Size	-1 -2 -3 -4 -5 -6 -7 -8	1/4" 3/8" 1/2" 3/4" 1" 1 1/4" 1 1/2" 2"
6,7,8	ASA Flange Rating	None -150 -600	300# Flange Standard (no designation required)
9	Flange Style 150# & 600# Only	A B C D	Raised Face, Staggered Bolt Centers (standard on all Flange rating) Smooth Face, Staggered Bolt Centers Raised Face, Bolts on Valve Centerline Smooth Face, Bolts on Valve Centerline
10	O-Ring Material	R RV RS RT RA	Buna O-Ring Cap Seal (standard) Viton O-Ring Cap Seal Silicone O-Ring Cap Seal Teflon O-Ring Cap Seal (standard on VSS Series) Aflas O-Ring Cap Seal
11	Options	SP P	Steel Parts (used on cast iron only) Panel Mount on Handwheel Series
12	Piston Material	/HS /SS /3SS	Hardened Steel 416 Stainless Steel 303 Stainless Steel
13	Spring	AS US WS XS YS ZS	
14	Setting		Desired Pressure Setting

### EXAMPLES:

V	J	-1	RV	SP	/HS	WS
Series	Cast Iron	1/4"	Viton O-Ring	Steel Parts	H.S. Piston	WS Spring

V	J	F	-5	R	/HS	WS
Series	Cast Iron	Flanged	1"	Buna O-Ring	H.S. Piston	WS Spring

V	J	F	-5	-150	A	R	/HS	WS
Series	Cast Iron	Flanged	1"	Rating	Style	Buna O-Ring	H.S. Piston	WS Spring

NOTE: Stainless steel pistons are supplied on brass valves, unless hardened steel is specified. Hardened steel pistons are supplied on cast iron or steel unless stainless steel is specified. Buna O-Rings are supplied as standard unless other material is specified.

## STANDARD PRESSURE RANGE CHART

Valve Pipe Size	Valve Flange Size	SPRING PRESSURE AND IDENTIFICATION NO.															
		BLACK-AS		RED-US		GREEN-WS		YELLOW-XS		WHITE-YS		BLUE-ZS		PURPLE-TS		BROWN-RS	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1/4"		3	15	7	35	30	100	60	175	150	350	300	500	400	600	550	750
3/8"		3	15	7	35	30	100	60	175	150	350	300	500	400	600	550	750
1/2"		3	15	7	35	30	100	60	175	150	350	300	500	400	600	550	750
3/4"		3	15	7	35	30	100	60	175	150	350	300	500				
1"	1"	3	15	7	35	30	100	60	175	150	350	300	500				
1 1/4"	1 1/4"	3	15	7	35	30	100	60	175	150	350	300	500				
1 1/2"	1 1/2"	3	15	7	35	30	100	60	175	150	350	300	500				
2"	2"	3	15	7	35	30	100	60	175	150	350	250	600				



# V-SERIES

VJ Cast Iron

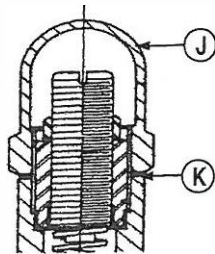
VB Brass

VS Steel

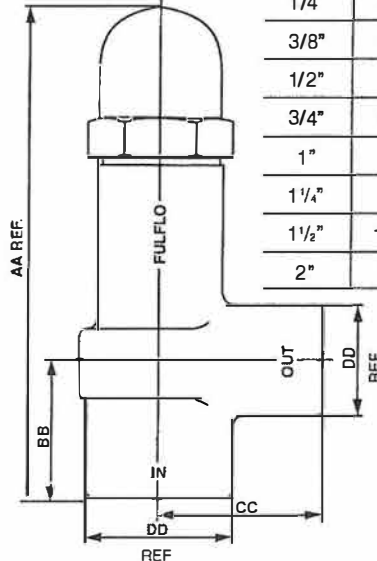
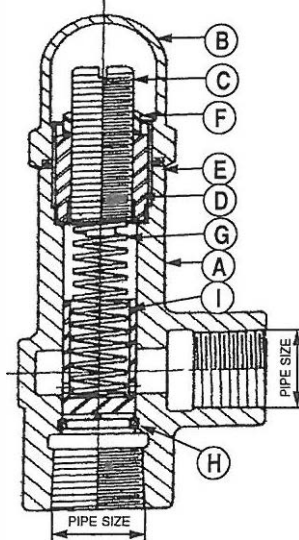
VSS Stainless Steel

VJ-SP Cast Iron with Steel Parts

## DIMENSIONS



CAP  
(GASKET SEAL)



Valve Size	DIMENSIONS IN INCHES			
	AA	BB	CC	DD
1/4"	5 <sup>11</sup> / <sub>32</sub>	1 <sup>11</sup> / <sub>32</sub>	1 <sup>11</sup> / <sub>32</sub>	1 <sup>3</sup> / <sub>8</sub>
3/8"	5 <sup>11</sup> / <sub>32</sub>	1 <sup>11</sup> / <sub>32</sub>	1 <sup>11</sup> / <sub>32</sub>	1 <sup>3</sup> / <sub>8</sub>
1/2"	6 <sup>2</sup> / <sub>16</sub>	1 <sup>15</sup> / <sub>16</sub>	1 <sup>7</sup> / <sub>16</sub>	1 <sup>7</sup> / <sub>16</sub>
3/4"	6 <sup>15</sup> / <sub>16</sub>	1 <sup>15</sup> / <sub>16</sub>	1 <sup>13</sup> / <sub>16</sub>	1 <sup>11</sup> / <sub>16</sub>
1"	8 <sup>7</sup> / <sub>32</sub>	2 <sup>2</sup> / <sub>32</sub>	2 <sup>2</sup> / <sub>32</sub>	2 <sup>1</sup> / <sub>16</sub>
1 1/4"	9 <sup>9</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>
1 1/2"	11 <sup>1</sup> / <sub>16</sub>	2 <sup>11</sup> / <sub>16</sub>	2 <sup>11</sup> / <sub>16</sub>	2 <sup>7</sup> / <sub>8</sub>
2"	13	3	3	3 <sup>1</sup> / <sub>4</sub>

## PARTS LIST

SYM.	NAME	MODEL	VALVE SIZE							
			1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
A	BODY	VJ, VJ-SP	100	200	300	400	500	600	700	800
		VB	100-B	200-B	300-B	400-B	500-B	600-B	700-B	800-B
		VS	100-S	200-S	300-S	400-S	500-S	600-S	700-S	800-S
		VSS	100-SS	200-SS	300-SS	400-SS	500-SS	600-SS	700-SS	800-SS
B	CAP (O-RING SEAL)	VJ, VJ-SP	201-SR	201-SR	301-SR	401-R	501-R	601-R	701-R	801-R
		VB	201-BR	201-BR	301-BR	401-BR	501-BR	601-BR	701-BR	801-BR
		VS	201-SR	201-SR	301-SR	401-SR	501-SR	601-SR	701-SR	801-SR
		VSS	201-SSR	201-SSR	301-SSR	401-SSR	501-SSR	601-SSR	701-SSR	801-SSR
C	ADJUSTING SCREW	VJ, VB	202-B	202-B	302-B	402-B	502-B	602-B	702-B	802-B
		VS, VJ-SP	202-S	202-S	302-S	402-S	502-S	602-S	702-S	802-S
		VSS	202-SS	202-SS	302-SS	402-SS	502-SS	602-SS	702-SS	802-SS
D	RETAINER	VJ, VB	203-B	203-B	303-B	403-B	503-B	603-B	703-B	803-B
		VS, VJ-SP	203-S	203-S	303-S	403-S	503-S	603-S	703-S	803-S
		VSS	203-SS	203-SS	303-SS	403-SS	503-SS	603-SS	703-SS	803-SS
E	O-RING †	VJ, VJ-SP, VB, VS	204-*	204-*	304-*	404-*	504-*	604-*	704-*	804-*
		VSS	204-RT	204-RT	304-RT	404-RT	504-RT	604-RT	704-RT	804-RT
F	LOCK NUT	VJ, VJ-SP, VB, VS	205-S	205-S	305-S	405-S	505-S	605-S	705-S	805-S
		VSS	205-SS	205-SS	305-SS	405-SS	505-SS	605-SS	705-SS	805-SS
G	SPRING †	ALL MODELS	207-*	207-*	307-*	407-*	507-*	607-*	707-*	807-*
H	STOP RING	VJ, VB	208-B	208-B	308-B	408-B	508-B	608-B	708-B	808-B
		VS, VJ-SP	208-S	208-S	308-S	408-S	508-S	608-S	708-S	808-S
		VSS	208-SS	208-SS	308-SS	408-SS	508-SS	608-SS	708-SS	808-SS
I	PISTON †	HARDENED STEEL	206	206	306	406	506	606	706	806
		416 STAINLESS STEEL	206-A	206-A	306-A	406-A	506-A	606-A	706-A	806-A
		303 STAINLESS STEEL	206-SS	206-SS	306-SS	406-SS	506-SS	606-SS	706-SS	806-SS
J	CAP (GASKET SEAL)	VJ, VJ-SP	201-S	201-S	301-S	401	501	601	701	801
		VB	201-B	201-B	301-B	401-B	501-B	601-B	701-B	801-B
		VS	201-S	201-S	301-S	401-S	501-S	601-S	701-S	801-S
K	GASKET †	VJ, VB	204	204	304	404	504	604	704	804
		VS, VJ-SP	204-S	204-S	304-S	404-S	504-S	604-S	704-S	804-S

\* See o-ring selection chart

\*\* See spring pressure chart

† Recommended spare parts

# V-SERIES

VJF Cast Iron

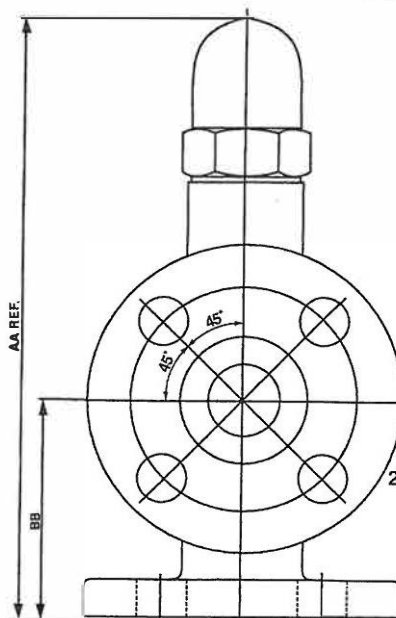
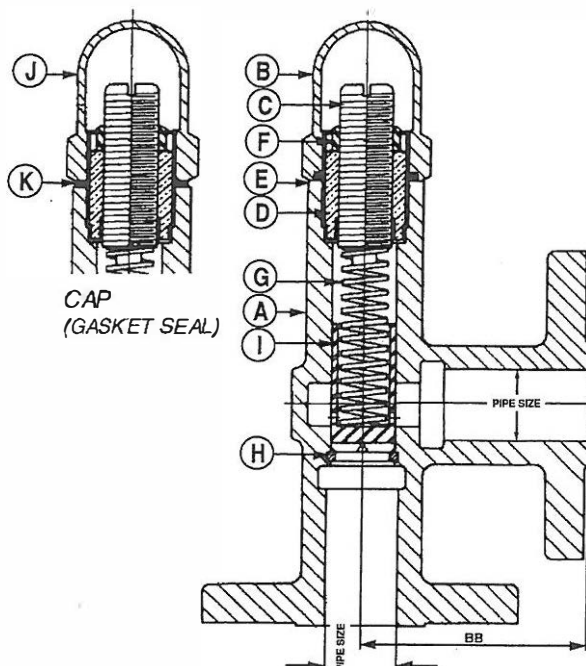
VSF Steel

VBF Brass

VSSF Stainless Steel

VJF-SP Cast Iron with Steel Parts

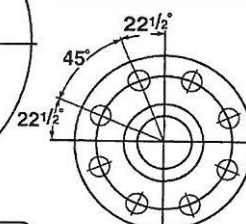
## DIMENSIONS



## DIMENSIONS IN INCHES

Valve Size	AA	BB
1"	9 1/2"	3 1/2"
1 1/4"	10 13/16"	3 3/4"
1 1/2"	12 7/16"	4 1/16"
2"	14 3/16"	4 9/16"

Note: Dimensions reflect 150# and 300# only



FOR 2" VALVE ONLY

## PARTS LIST

SYM.	NAME	MODEL	VALVE SIZE			
			1"	1 1/4"	1 1/2"	2"
A	BODY	VJF, VJF-SP	500-F	600-F	700-F	800-F
		VBF	500-BF	600-BF	700-BF	800-BF
		VSF	500-SF	600-SF	700-SF	800-SF
		VSSF	500-SSF	600-SSF	700-SSF	800-SSF
B	CAP (O-RING SEAL)	VJF, VJF-SP	501-R	601-R	701-R	801-R
		VBF	501-BR	601-BR	701-BR	801-BR
		VSF	501-SR	601-SR	701-SR	801-SR
		VSSF	501-SSR	601-SSR	701-SSR	801-SSR
C	ADJUSTING SCREW	VJF, VBF	502-B	602-B	702-B	802-B
		VSF, VJF-SP	502-S	602-S	702-S	802-S
		VSSF	502-SS	602-SS	702-SS	802-SS
D	RETAINER	VJF, VBF	503-B	603-B	703-B	803-B
		VSF, VJF-SP	503-S	603-S	703-S	803-S
		VSSF	503-SS	603-SS	703-SS	803-SS
E	O-RING †	VJF, VJF-SP	504*	604*	704*	804*
		VBF, VSF	504-*	604-*	704-*	804-*
		VSSF	504-RT	604-RT	704-RT	804-RT
F	LOCK NUT	VJF, VJF-SP	505-S	605-S	705-S	805-S
		VBF, VSF	505-S	605-S	705-S	805-S
		VSSF	505-SS	605-SS	705-SS	805-SS
G	SPRING †	ALL MODELS	507-*	607-*	707-*	807-*
H	STOP RING	VJF, VBF	508-B	608-B	708-B	808-B
		VJF-SP, VSF	508-S	608-S	708-S	808-S
		VSSF	508-SS	608-SS	708-SS	808-SS
I	PISTON †	HARDENED STEEL	506	606	706	806
		416 STAINLESS STEEL	506-A	606-A	706-A	806-A
		303 STAINLESS STEEL	506-SS	606-SS	706-SS	806-SS
J	CAP (GASKET SEAL)	VJF, VJF-SP	501	601	701	801
		VBF	501-B	601-B	701-B	801-B
		VSF	501-S	601-S	701-S	801-S
K	GASKET †	VJF, VBF	504	604	704	804
		VJF-SP, VSF	504-S	604-S	704-S	804-S

\* See o-ring selection chart

\*\* See spring pressure chart

† Recommended spare parts

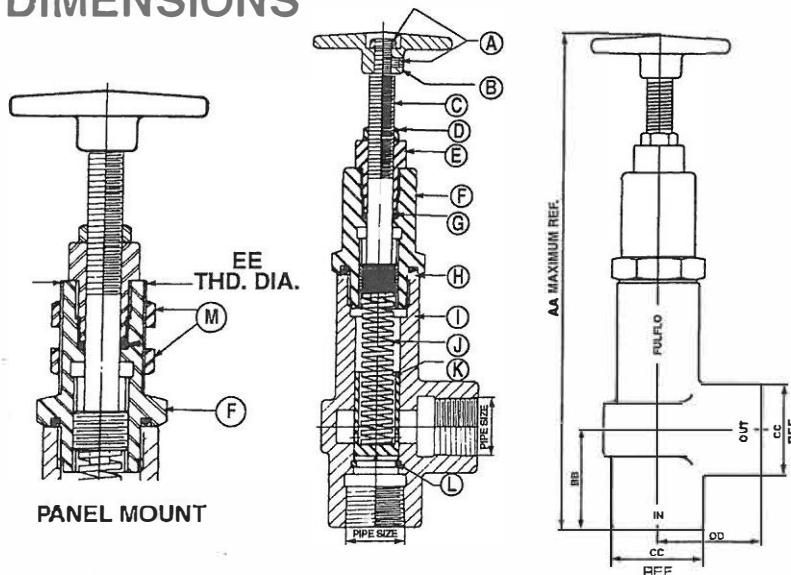


# V-SERIES

**HVJ** Cast Iron  
**HVS** Steel  
**HVB** BRASS  
**HVSS** Stainless-Steel

**HVJ-P** Cast-Iron  
**HVS-P** Steel  
**HVB-P** Brass  
**HVSS-P** Stainless Steel

## DIMENSIONS



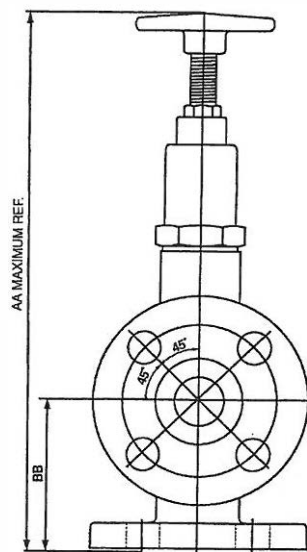
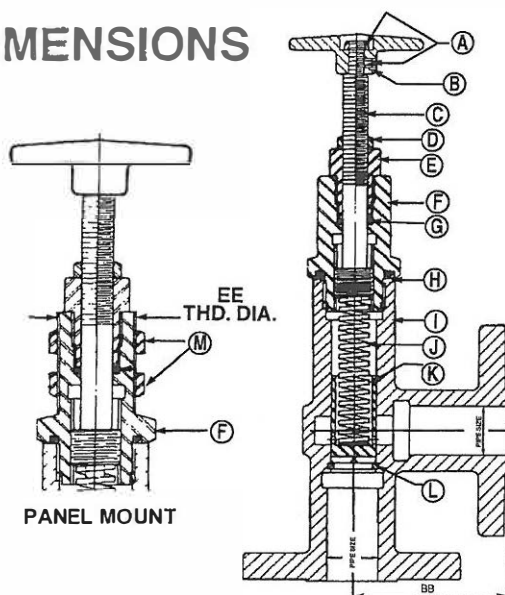
Valve Size	DIMENSIONS IN INCHES				
	AA	BB	CC	DD	EE
1/4"	8 1/8	1 1/32	1 1/16	1 3/8	7/8
3/8"	8 1/8	1 1/32	1 1/16	1 3/8	7/8
1/2"	9 5/8	1 1/16	1 7/16	1 7/8	1 1/8
3/4"	9 3/16	1 5/16	1 11/16	1 13/16	1 3/8
1"	12 7/16	2 9/32	2 1/16	2 9/32	1 3/8
1 1/4"	13 7/16	2 9/16	2 1/2	2 9/16	1 5/8
1 1/2"	17 1/16	2 11/16	2 7/8	2 11/16	2 1/4
2"	17 1/10	3	3 3/8	3	2 1/4

## PARTS LIST

SYM.	NAME	MODEL	VALVE SIZE							
			1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
A	LOCK NUT OR SET SCREW	ALL MODELS	1/4"-20 COMM.	1/4"-20 COMM.	1/4"-20 COMM.	205-S	205-S	1/4"-20 COMM.	1/4"-20 COMM.	1/4"-20 COMM.
B	HANDWHEEL	ALL MODELS	229	229	229	429	429	629	629	629
C	ADJUSTING SCREW	HVJ(P), HVS(P) HVB(P) HVSS(P)	222-S 222-B 222-SS	222-S 222-B 222-SS	322-S 322-B 322-SS	422-S 422-B 422-SS	522-S 522-B 522-SS	622-S 622-B 622-SS	722-S 722-B 722-SS	822-S 822-B 822-SS
D	LOCK NUT	HVJ(P), HVS(P) HVB(P) HVSS(P) only	205-S 205-S 205-SS	205-S 205-S 205-SS	205-S 205-S 205-SS	305-S 305-S 305-SS	305-S 305-S 305-SS	655-S 655-S 655-SS	655-S 655-S 655-SS	655-S 655-S 655-SS
E	GLAND	HVJ(P), HVS(P) HVB(P) HVSS(P)	225-S 225-B 225-SS	225-S 225-B 225-SS	325-S 325-B 325-SS	525-S 525-B 525-SS	525-S 525-B 525-SS	625-S 625-B 625-SS	725-S 725-B 725-SS	825-S 825-B 825-SS
F	BONNET	HVJ, HVS HVB HVSS HVJP, HVSP HVBP HVSSP	223-SR 223-BR 223-SSR 228-SR 228-BR 228-SSR	223-SR 223-BR 223-SSR 228-SR 228-BR 228-SSR	323-SR 323-BR 323-SSR 328-SR 328-BR 328-SSR	423-SR 423-BR 423-SSR 428-SR 428-BR 428-SSR	523-SR 523-BR 523-SSR 528-SR 528-BR 528-SSR	623-SR 623-BR 623-SSR 628-SR 628-BR 628-SSR	723-SR 723-BR 723-SSR 728-SR 728-BR 728-SSR	823-SR 823-BR 823-SSR 828-SR 828-BR 828-SSR
G	O-RING †	HVJ(P), HVS(P) HVB(P) HVSS(P) only	224* 224* 224-RT	224* 224* 224-RT	224* 224* 224-RT	424* 424* 424-RT	424* 424* 424-RT	624* 624* 624-RT	624* 624* 624-RT	624* 624* 624-RT
H	O-RING †	HVJ(P), HVS(P) HVB(P) HVSS(P) only	204* 204* 204-RT	204* 204* 204-RT	304* 304* 304-RT	404* 404* 404-RT	504* 504* 504-RT	604* 604* 604-RT	704* 704* 704-RT	804* 804* 804-RT
I	BODY	HVJ(P) HVB(P) HVS(P) HVSS(P)	100 100-B 100-S 100-SS	200 200-B 200-S 200-SS	300 300-B 300-S 300-SS	400 400-B 400-S 400-SS	500 500-B 500-S 500-SS	600 600-B 600-S 600-SS	700 700-B 700-S 700-SS	800 800-B 800-S 800-SS
J	SPRING †	ALL MODELS	207-**	207-**	307-**	407-**	507-**	607-**	707-**	807-**
K	PISTON †	HARDENED STEEL 416 STAINLESS STEEL 303 STAINLESS STEEL	206 206-A 206-SS	206 206-A 206-SS	306 306-A 306-SS	406 406-A 406-SS	506 506-A 506-SS	606 606-A 606-SS	706 706-A 706-SS	806 806-A 806-SS
L	STOP RING	HVJ(P), HVS(P) HVB(P) HVSS(P)	208-S 208-B 208-SS	208-S 208-B 208-SS	308-S 308-B 308-SS	408-S 408-B 408-SS	508-S 508-B 508-SS	608-S 608-B 608-SS	708-S 708-B 708-SS	808-S 808-B 808-SS
M	LOCK NUTS 2 REQ'D	HVJP, HVSP, HVBP HVSSP	505-S 505-S 505-SS	505-S 505-S 505-SS	605-S 605-S 605-SS	705-S 705-S 705-SS	705-S 705-S 705-SS	805-S 805-S 805-SS	745-S 745-S 745-SS	745-S 745-S 745-SS

\* See o-ring selection chart  
\*\* See spring pressure chart  
† Recommended spare parts

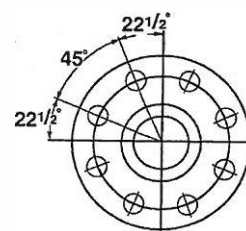
## DIMENSIONS



### DIMENSIONS IN INCHES

Valve Size	AA	BB	EE
1"	13 <sup>11</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	1 <sup>7</sup> / <sub>8</sub>
1 <sup>1</sup> / <sub>4</sub> "	14 <sup>11</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	1 <sup>9</sup> / <sub>8</sub>
1 <sup>1</sup> / <sub>2</sub> "	18 <sup>7</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>
2"	18 <sup>5</sup> / <sub>8</sub>	4 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>

Note: Dimensions reflect 150# and 300# only



FOR 2" VALVE ONLY

## PARTS LIST

SYM.	NAME	MODEL	DIMENSIONS IN INCHES			
			1"	1 <sup>1</sup> / <sub>4</sub> "	1 <sup>1</sup> / <sub>2</sub> "	2"
A	LOCK NUT OR SET SCREW	ALL MODELS	205-S	1/4"-20 COMM.	1/4"-20 COMM.	1/4"-20 COMM.
B	HANDWHEEL	ALL MODELS	429	629	629	629
C	ADJUSTING SCREW	HVJF(P) HVSF(P) HVBF(P) HVSSF(P)	522-S 522-B 522-SS	622-S 622-B 622-SS	722-S 722-B 722-SS	822-S 822-B 822-SS
D	LOCK NUT	HVJF(P), HVSF(P) HVBF(P) HVSSF(P) only	305-S 305-S 305-SS	655-S 655-S 655-SS	655-S 655-S 655-SS	655-S 655-S 655-SS
E	GLAND	HVJF(P), HVSF(P) HVBF(P) HVSSF(P)	525-S 525-B 525-SS	625-S 625-B 625-SS	725-S 725-B 725-SS	825-S 825-B 825-SS
F	BONNET	HVJF, HVSF HVBF HVSSF HVJPF, HVSPF HVBPf HVSSFP	523-SR 523-BR 523-SSR 528-SR 528-BR 528-SSR	623-SR 623-BR 623-SSR 628-SR 628-BR 628-SSR	723-SR 723-BR 723-SSR 728-SR 728-BR 728-SSR	823-SR 823-BR 823-SSR 828-SR 828-BR 828-SSR
G	O-RING †	HVJF(P), HVSF(P) HVBF(P) HVSSF(P) only	424* 424* 424-RT	624* 624* 624-RT	624* 624* 624-RT	624* 624* 624-RT
H	O-RING †	HVJF(P), HVSF(P) HVBF(P) HVSSF(P) only	504* 504* 504-RT	604* 604* 604-RT	704* 704* 704-RT	804* 804* 804-RT
I	BODY	HVJF(P) HVBF(P) HVSF(P) HVSSF(P)	500-F 500-BF 500-SF 500-SSF	600-F 600-BF 600-SF 600-SSF	700-F 700-BF 700-SF 700-SSF	800-F 800-BF 800-SF 800-SSF
J	SPRING †	ALL MODELS	507-**	607-**	707-**	807-**
K	PISTON †	HARDENED STEEL 416 STAINLESS STEEL 303 STAINLESS STEEL	506 506-A 506-SS	606 606-A 606-SS	706 706-A 706-SS	806 806-A 806-SS
L	STOP RING	HVJF(P), HVSF(P) HVBF(P) HVSSF(P)	508-S 508-B 508-SS	608-S 608-B 608-SS	708-S 708-B 708-SS	808-S 808-B 808-SS
M	LOCK NUTS 2 REQ'D	HVJFP, HVSPF, HVBPf HVSSFP	705-S 705-S 705-SS	805-S 805-S 805-SS	745-S 745-S 745-SS	745-S 745-S 745-SS

\* See o-ring selection chart

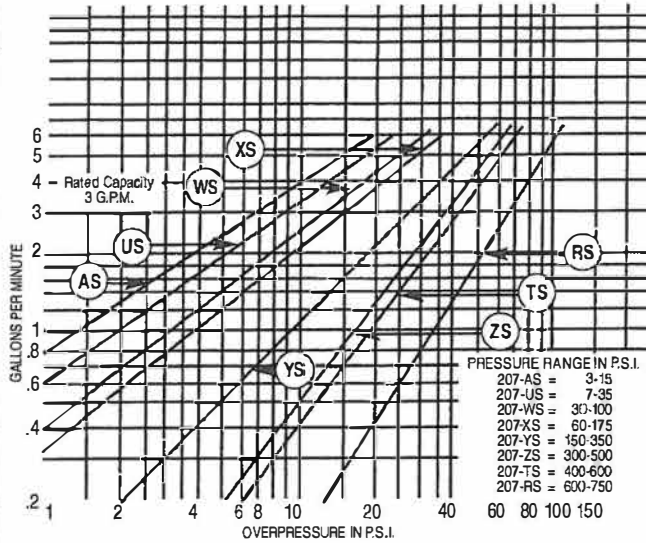
\*\* See spring pressure chart

† Recommended spare parts

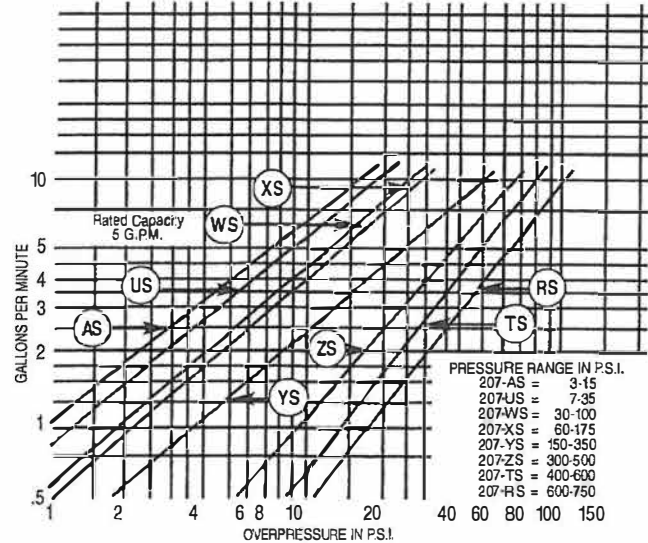
# V-SERIES PERFORMANCE CHARTS

All valve tests 110°F. to 120°F. Oil Viscosity 150 S.S.U. at 100°F.  
(Charts good from 30 to 500 S.S.U.)

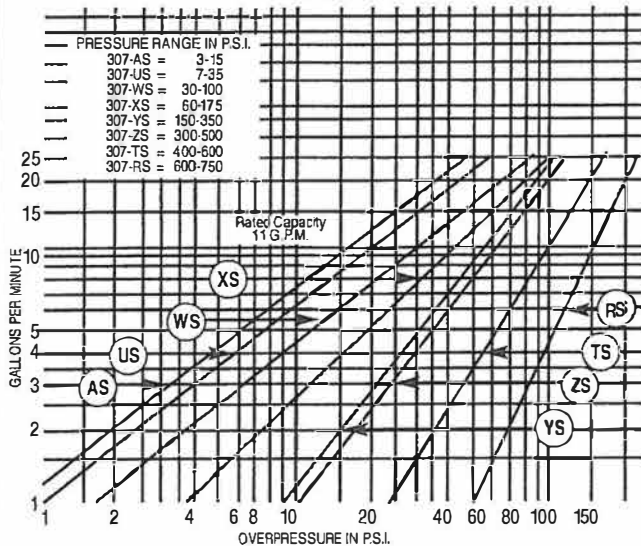
1/4" VALVE TESTS



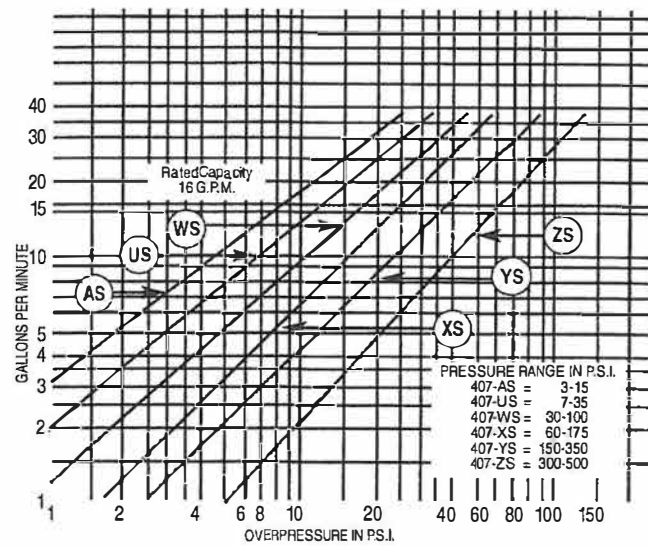
3/8" VALVE TESTS



1/2" VALVE TESTS



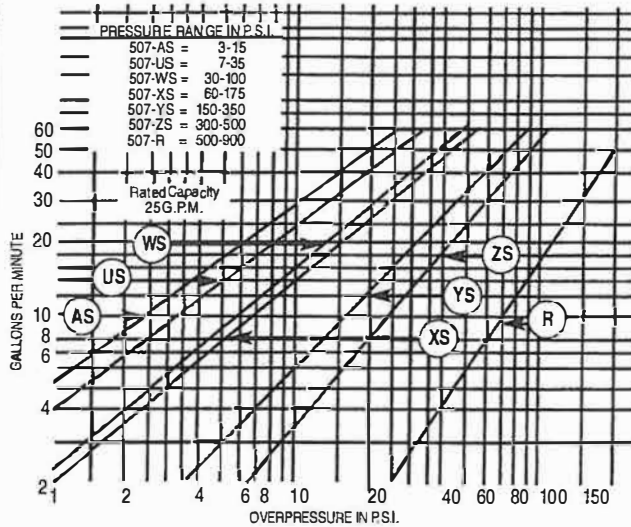
3/4" VALVE TESTS



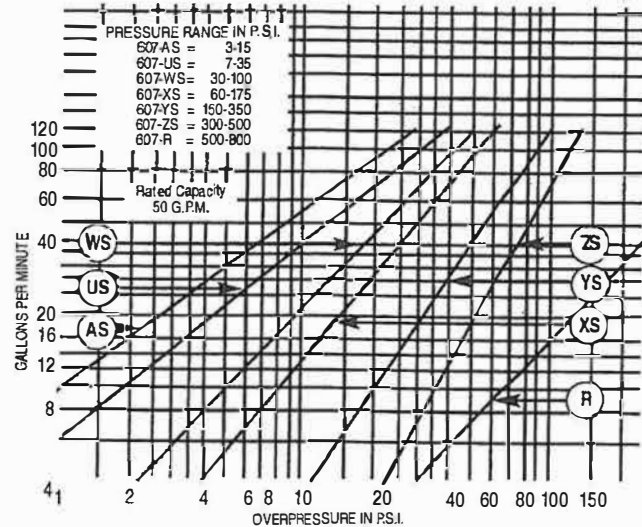
# V-SERIES PERFORMANCE CHARTS

All valve tests 110°F. to 120°F. Oil Viscosity 150 S.S.U. at 100°F.  
(Charts good from 30 to 500 S.S.U.)

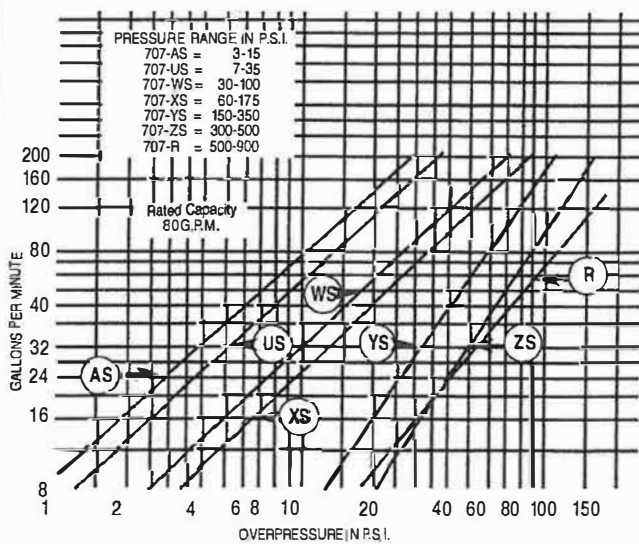
1" VALVE TESTS



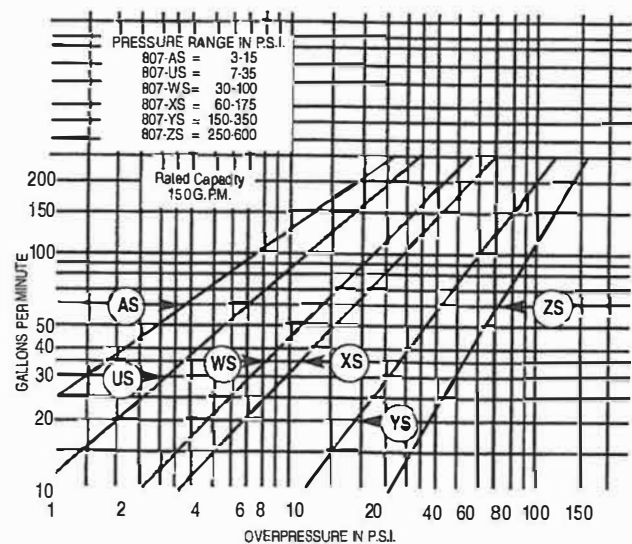
1 1/2" VALVE TESTS



1 1/2" VALVE TESTS



2" VALVE TESTS



V-SERIES  
VALVES

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## Installation and Troubleshooting

### Models 11AV, 12AV and 13AV

#### Free Floating Lever Air/Gas Vents - All Stainless Steel Construction

*This bulletin should be used by experienced personnel as a guide to the installation of Armstrong Air/Gas Vents. Selection or installation of equipment should always be accompanied by competent technical assistance. You are encouraged to contact Armstrong International, Inc. or your local sales representative for additional information.*

Install air vents at the high points on liquid service systems, hydronic systems, or any liquid storage or distribution system. See Figures 1, 2 and 3 for typical installations.

#### **INSTALLATION PROCEDURES:**

1. Do not exceed the maximum allowable pressure noted on the label on the side of the air vent body. Also, check to see if the air/gas vent has the proper maximum differential pressure for your particular application.
2. Be certain the vent is installed properly. Note the direction of flow arrow on the label and the red label indicating UP for air and gas venting service.
3. Before installing the vent, flush out the line to remove loose dirt. Use pipe dope or teflon tape sparingly and on male threads only. Leave the end thread exposed to avoid introducing sealant into the system.
4. When tightening a pipe into either the inlet or outlet fittings of an 11AV, 12AV or 13AV use only the hex-shaped fittings as wrenching surfaces. Do not use other parts of the vent for wrenching as unnecessary stress may be placed on the vent body.
5. The inlet and outlet piping should be the same size as the air vent connections. Do not reduce the size of the inlet on light loads; however, smaller pipe or tubing may be used on the outlet. Keep the piping as short as possible, with a minimum of valves and fittings. **If you are installing an air vent without an equalizing connection, do not use elbows in the inlet line from the equipment to the vent.**
6. Install gate valves or full ported ball valves (**Do Not Use Globe Valves**) so the air vent can be isolated from the system to permit servicing. If the air vent is installed in a closed piping arrangement, install a union on each side of the air vent.
7. **Do Not** use a pipeline strainer in the line leading to the vent.
8. Air vents should be installed so that they can be checked periodically. A drain line should be piped to a floor drain or to a visible location where it can be regularly checked for leakage.

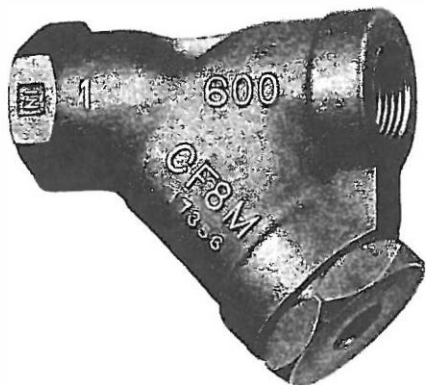
**Caution:** *Do not install air vents with an open discharge where a malfunction could cause damage e.g. above false ceilings.*

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# CAST CARBON STEEL & 316 STAINLESS "Y" STRAINERS

## THREADED & SOCKET WELD 531 SERIES/533 SERIES



Durable carbon or stainless steel, threaded or socket, in sizes 1/4" through 3".

### • WORKING PRESSURE (Non-Shock)

#### Carbon Steel

600 psi @ 839° F. Steam

1480 psi @ 100° F. Water, Oil, & Gas

#### Stainless Steel

600 psi @ 1124° F. Steam

1440 psi @ 100° F. Water, Oil, & Gas

### • MATERIALS OF CONSTRUCTION:

CARBON STEEL				
No.	Part	Material	ASTM Spec	Remarks
1	Body	Carbon Steel	A216	Grade WCB
2	Plug (1/4" - 1 1/4")	Carbon Steel		Multi-Cut Biz®
2	Plug (1-1/2" - 2")	Carbon Steel	A216	Grade WCB
2	Cover (2-1/2" - 3")	Carbon Steel	A515	Grade 60
3	*Screen	Stainless Steel		Type 304
4	*Gasket (1/4" - 1-1/2")	Copper		
4	*Gasket (2")	304 SS/Grafoil®		Spiral Wound
4	*Gasket (2-1/2" - 3")	Grafoil®		
5	Bolting	Carbon Steel		Grade 5

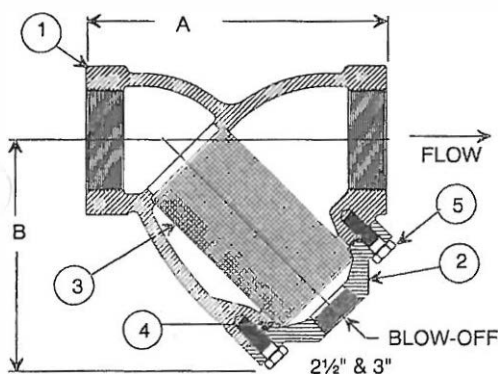
STAINLESS STEEL				
No.	Part	Material	ASTM Spec	Remarks
1	Body	Stainless Steel	A351	Grade CF8M (316)
2	Plug (1/4" - 1 1/4")	Stainless Steel	A296	Grade 316
2	Cover (1-1/2" - 2")	Stainless Steel	A351	Grade CF8M (316)
3	*Screen	Stainless Steel		Type 304
4	*Gasket (1/4" - 2")	304 SS/Grafoil®		Spiral Wound
4	*Gasket (2-1/2" - 3")	Grafoil®		
5	Bolting	Stainless Steel		Type 316

\* Recommended Spare Parts

### • STANDARD SCREENS:

1/4" Thru 2" - 20 Mesh/304 Stainless Steel

2 1/2" & 3" - .045 Perf./304 Stainless Steel



### MODEL NUMBERS/SELECTION INFORMATION

#### Carbon Steel Sizes 1/4" - 3"

Model "531-S" NPT

Model "531-SW" Socket Weld

#### Stainless Steel Sizes 1/4" - 2"

Model "533-S" NPT

Model "533-SW" Socket Weld

### DIMENSIONAL SPECIFICATIONS

Note: Dimensions shown are subject to change. Contact factory for certified prints (exact dimensions) when required.

Size	A	B	Blow-Off NPT	Weight LBS	Screen Area in²
1/4"	2-11/16	2-1/16	1/4	1	2.5
3/8"	2-11/16	2-1/16	1/4	1	2.5
1/2"	3-3/8	2-3/4	3/8	1-1/2	5.4
3/4"	4-7/16	3-5/8	3/8	2-1/2	8.7
1"	4-7/8	3-3/4	1/2	3-1/2	12.7
1-1/4"	5-3/8	4-3/8	3/4	5-1/4	18.1
1-1/2"	6-3/8	5-1/8	3/4	8-1/4	25.3
2"	7-1/2	6	1	12-3/4	39.2
2-1/2"	10-9/16	7	1-1/4	37	58.3
3"	10-15/16	8-1/8	1-1/4	48	76.7

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