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MECHANICAL SEALS IN VERTICAL TURBINE PUMPS

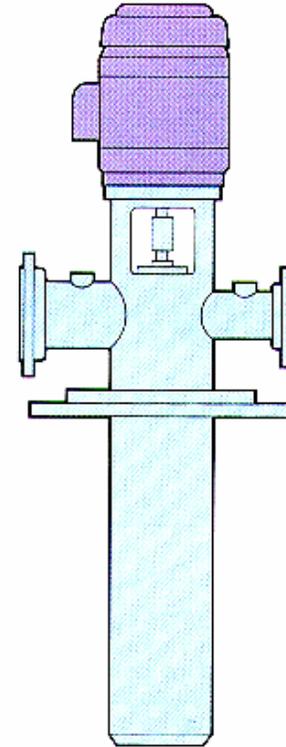
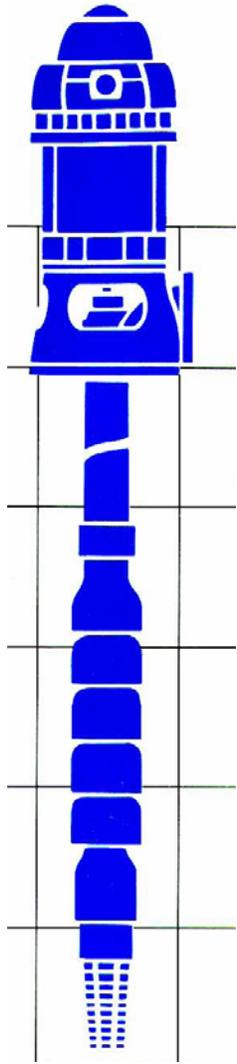
RECIPES FOR SUCCESS

OR

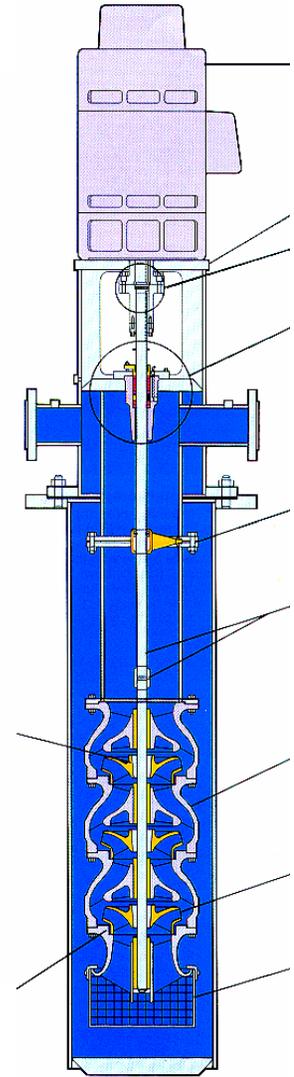
RECIPE FOR FAILURE

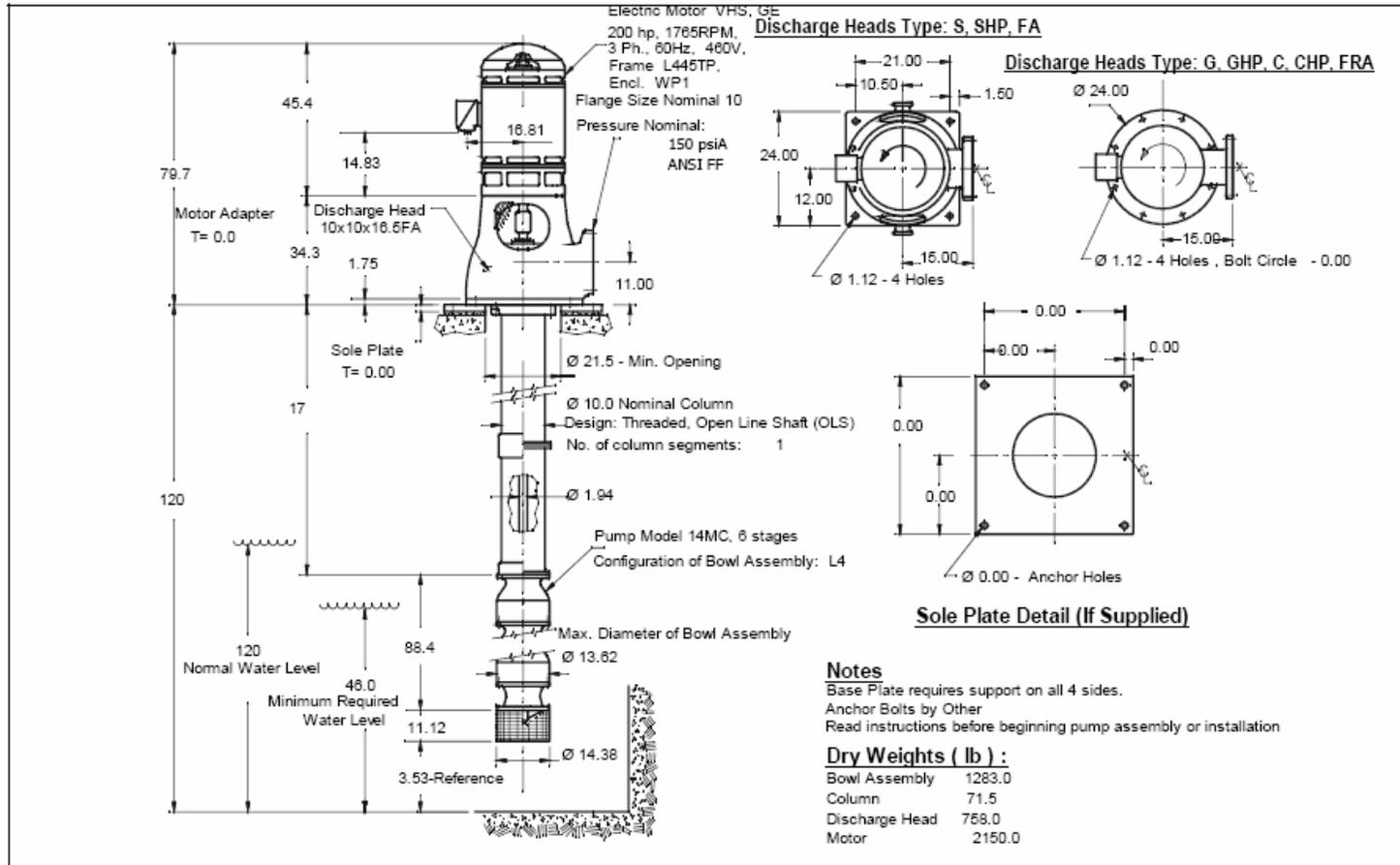
IT'S
ALL
IN THE
DETAILS





Typical configuration.
Model HE Hydro-Lines





Dimensions in (inch)

Project :	Capacity: 1500 (US gpm)	Frame/Model: L445TP
Customer:	Total Head: 350 (ft)	Elec. Spec.: Ph.
Item No.: vertical turbine	Pump Speed: 1770 (RPM)	Service Factor:
Quote No. : US-2051-256	Impeller Dia.: 9.63 (inch)	Rotation: counter-clockwise
Pump Model: Peerless Vertical - 14MC	Power: 200 (hp)	Enclosure/Type:



PumpTech Inc.
12020 SE 32nd St. Suite 2, Bellevue WA 98005
Doug W. Davidson
Phone 425-644-8501
Fax 425-562-9213

Date : Wednesday, October 05, 2005

Page No : 1



WHY USE A MECHANICAL SEAL INSTEAD OF PACKING?

REDUCE OR ELIMINATE WEAR ON THE SHAFT







- **ADDITIONAL REASONS TO USE A MECHANICAL SEAL.**
 - **REDUCE WATER USAGE**
 - **ELIMINATE WATER ON THE FLOOR -REDUCED HOUSEKEEPING**
 - **LESS FREQUENT MAINTENANCE, NO ADJUSTMENTS ONCE INSTALLED.**

 - **WHY ELSE?**
 - **WHEN YOU CAN'T HAVE THE LIQUID LEAK – SUCH AS CHEMICALS OR CORROSIVES.**



ADJUSTING THE PACKING GLAND

CAUTION

Too tight an adjustment of the packing gland can wear out the packing in only a few minutes of operation and may seriously damage the shaft.

A. With the pump in operation there will be some leakage at the top shaft packing. The packing gland must now be adjusted to allow a controlled amount of leakage while maintaining the required pressure at the discharge head. The correct leakage rate is approximately one drop per second. This amount of water passing through the packing will act as a lubricant and will carry off excessive heat of friction.

B. Turn down the gland nut only one-sixth to one-quarter turn at a time. After each adjustment, allow the packing to equalize against the increased pressure and the leakage to gradually reduce to a steady rate before making the next adjustment.

C. The amount of adjusting required will vary with the pressure developed by the pump at the discharge head. Never rush the break-in of the packing, even if it requires several days of attention to accomplish.

D. On models furnished with a grease fitting for lubrication of the packing, use a light-weight grease which will not tend to harden when in contact with water. A list of acceptable greases, by brand name and manufacturer, is given in Table 10-2. In addition to its lubrication value, the grease will act as a water barrier; thus less packing pressure will be required.

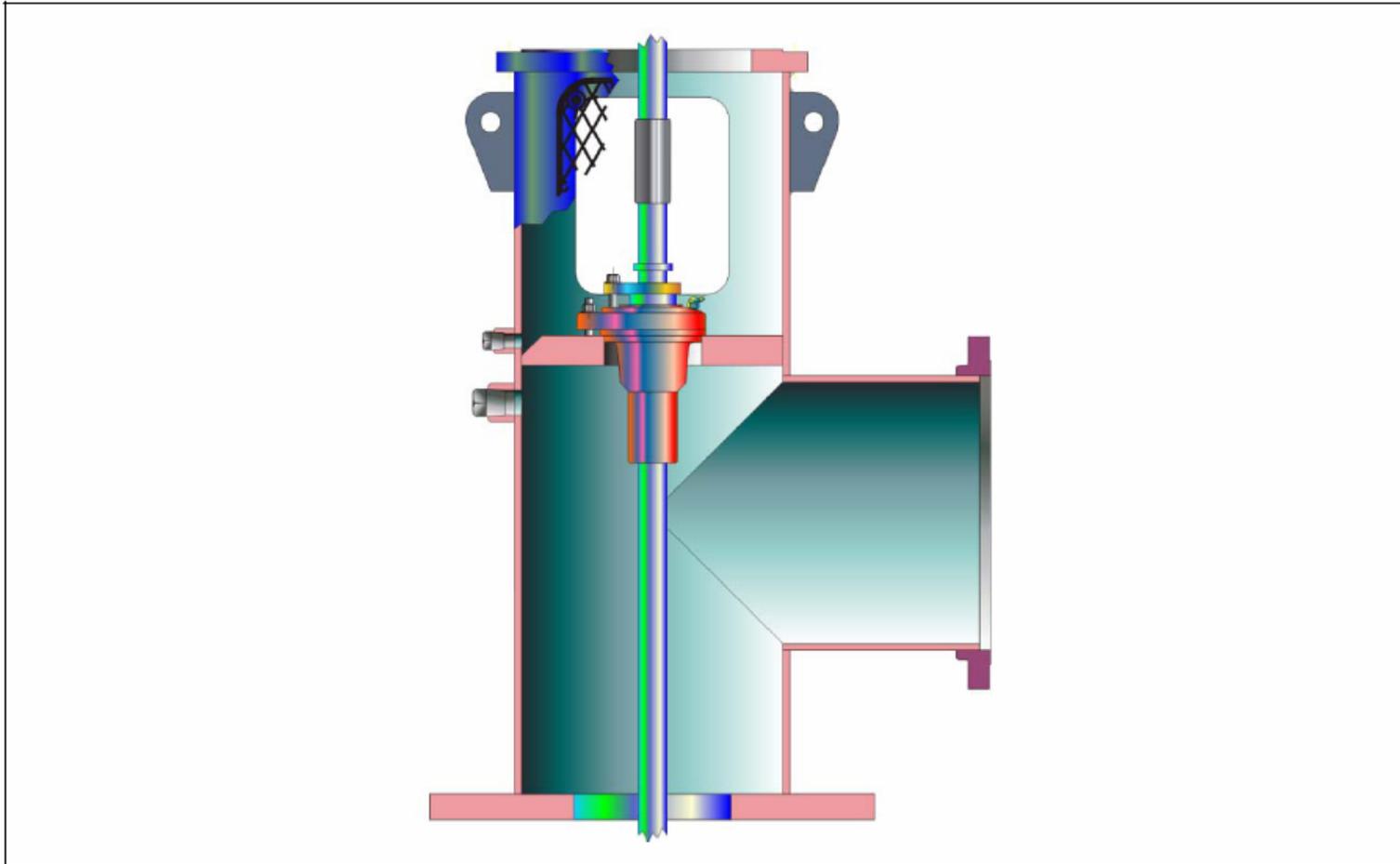


At 1 pint per minute leakage for packing you can use up to 180 gallons per day or 65,700 gallons per year.

**TABLE 4
RECOMMENDED STUFFING BOX PACKING ARRANGEMENTS**

SUCTION PRESSURE RANGE	PACKING	SHAFT SLEEVE	LEAKAGE RATE
6.0 PSIA – 60 PSIG	1) Square Braid Non-Asbestos 2) Lattice Braid Non-Asbestos 3) Plastic with end rings of Non-Asbestos	SAE 40 Bronze or stainless steel	50 drops/min.
60 – 100 PSIG	Plastic with metallic or Non-Asbestos end rings	Hardened stainless steel*	1/3 pint/min.
100 – 250 PSIG	Combination plastic and metallic packing or Teflon impregnated packing	Hardened stainless steel*	1 pint/min.

*Metallic packing has an affinity for bronze, therefore, do not use brass or bronze shaft sleeves.



Project :	Capacity: 1500 (US gpm)	Frame/Model: L445TP
Customer:	Total Head: 350 (ft)	Elec. Spec.: Ph.
Item No.: vertical turbine	Pump Speed: 1770 (RPM)	Service Factor:
Quote No. : US-2051-256	Impeller Dia.: 8.63 (inch)	Rotation: counter-clockwise
Pump Model: Peerless Vertical - 14MC	Power: 200 (hp)	Enclosure/Type:



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Page No : 1



DISCHARGE HEAD ASSEMBLY

This is a typical cross sectional drawing and may not include exactly what is supplied.

Item No.	Part Description	Material
10	Shaft, Head	416ss
12	Shaft, Line	416ss
13A	Packing	Synth. Pkg.
17A	Gland	Bronze
17C	Stud	Steel
17E	Nut, Hex. Head	Brass
17F	Clamp, Gland	S. Steel
29	Ring, Latern	Brass
40	Deflector	Neoprene
63	Bushing, Stuffing-Box	Bronze
66	Nut, Shaft Adjusting	Stl / Brz
66A	Screw, Hex. Head Cap	Steel
70	Coupling, Shaft	Steel
73	Gasket	Vellumoid
93	Stuffing-Box	Cast Iron
93A	Screw, Hex. Head Cap	Steel
93B	Washer	Brass
93C	Fitting, Grease	Steel
101	Column Pipe	Steel
101A	Screw, Hex. Head Cap	Steel
129	Sole Plate	Steel
131	Guard, Coupling	Galv. / Stl
131A	Screw, Hex. Head Cap	S. Steel
131B	Washer	S. Steel
187	Head, Discharge	Steel
187C	Screw, Hex. Head Cap	Steel
187D	Plug, Pipe	Steel
187E	Plug, Pipe	Steel

Project :	Capacity: 1500 (US gpm)	Frame/Model: L445TP
Customer:	Total Head: 350 (ft)	Elec. Spec.: Ph.
Item No.: vertical turbine	Pump Speed: 1770 (RPM)	Service Factor:
Quote No. : US-2051-258	Impeller Dia.: 9.63 (inch)	Rotation: counter-clockwise
Pump Model: Peerless Vertical - 14MC	Power: 200 (hp)	Enclosure/Type:



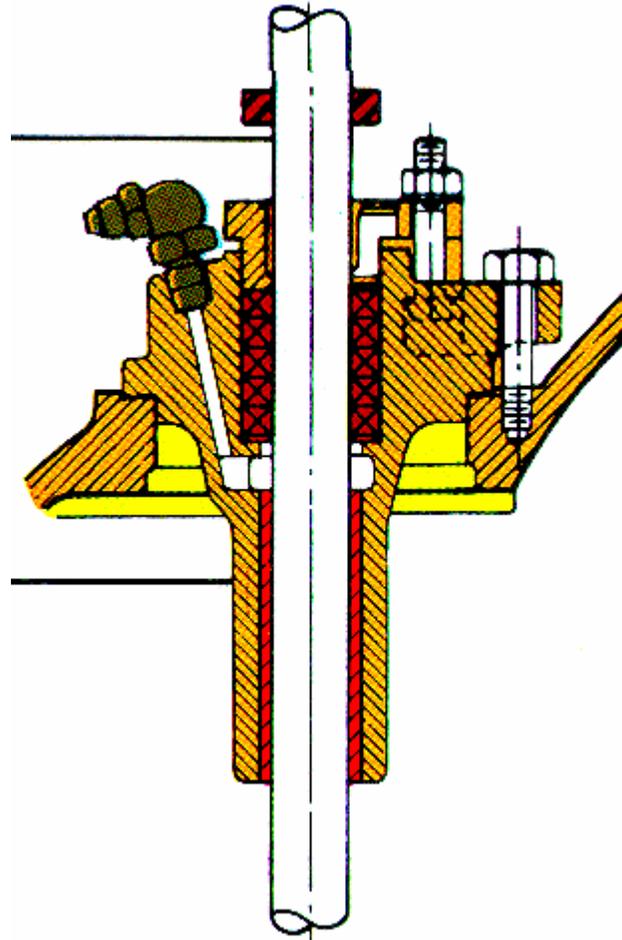
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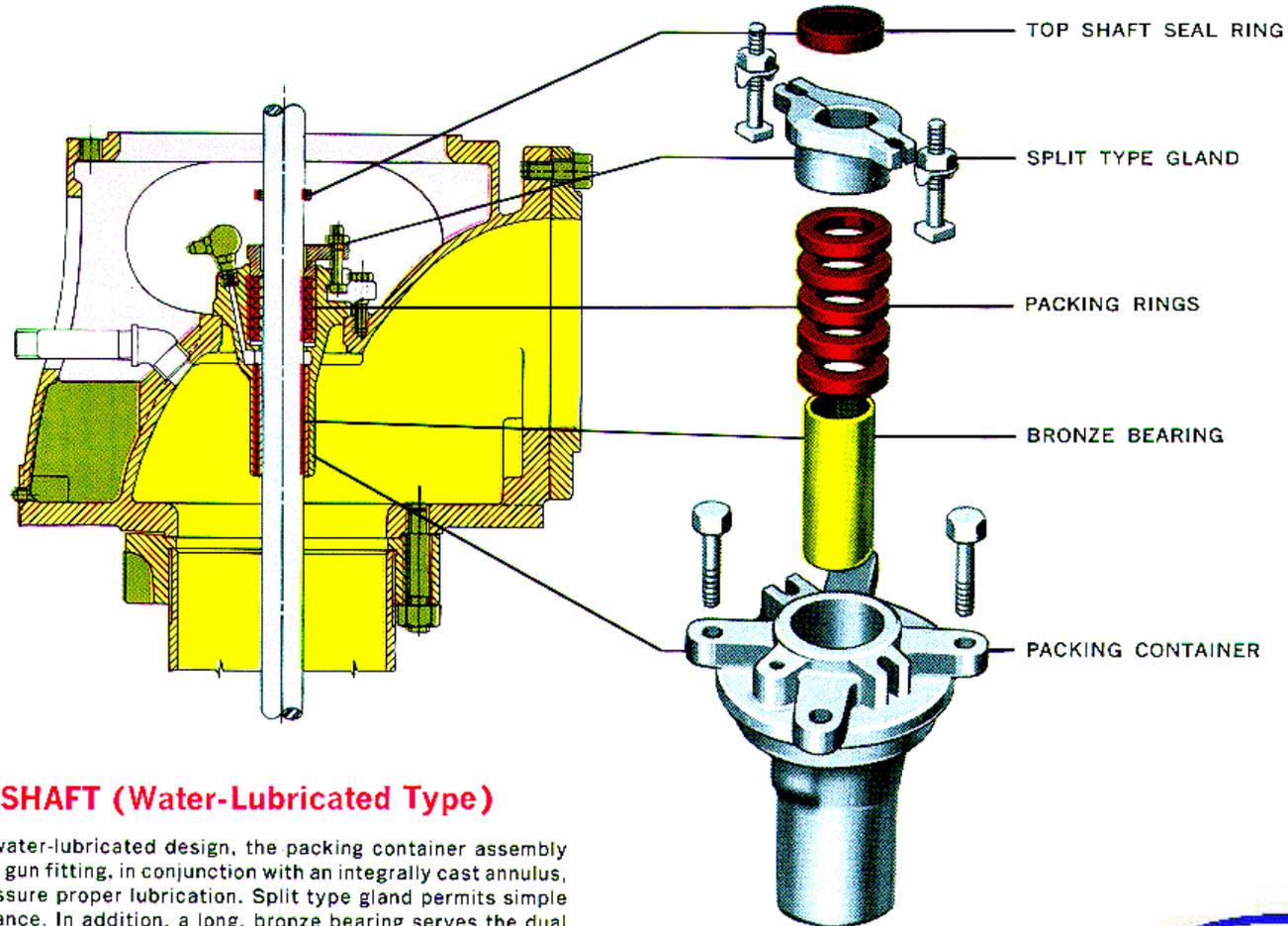
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Page No : 1



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OPEN LINESHAFT (Water-Lubricated Type)

In the Peerless water-lubricated design, the packing container assembly includes a grease gun fitting, in conjunction with an integrally cast annulus, to provide and assure proper lubrication. Split type gland permits simple packing maintenance. In addition, a long, bronze bearing serves the dual purpose of throttle bushing and bearing support.





WHEN NOT TO USE A MECHANICAL SEAL

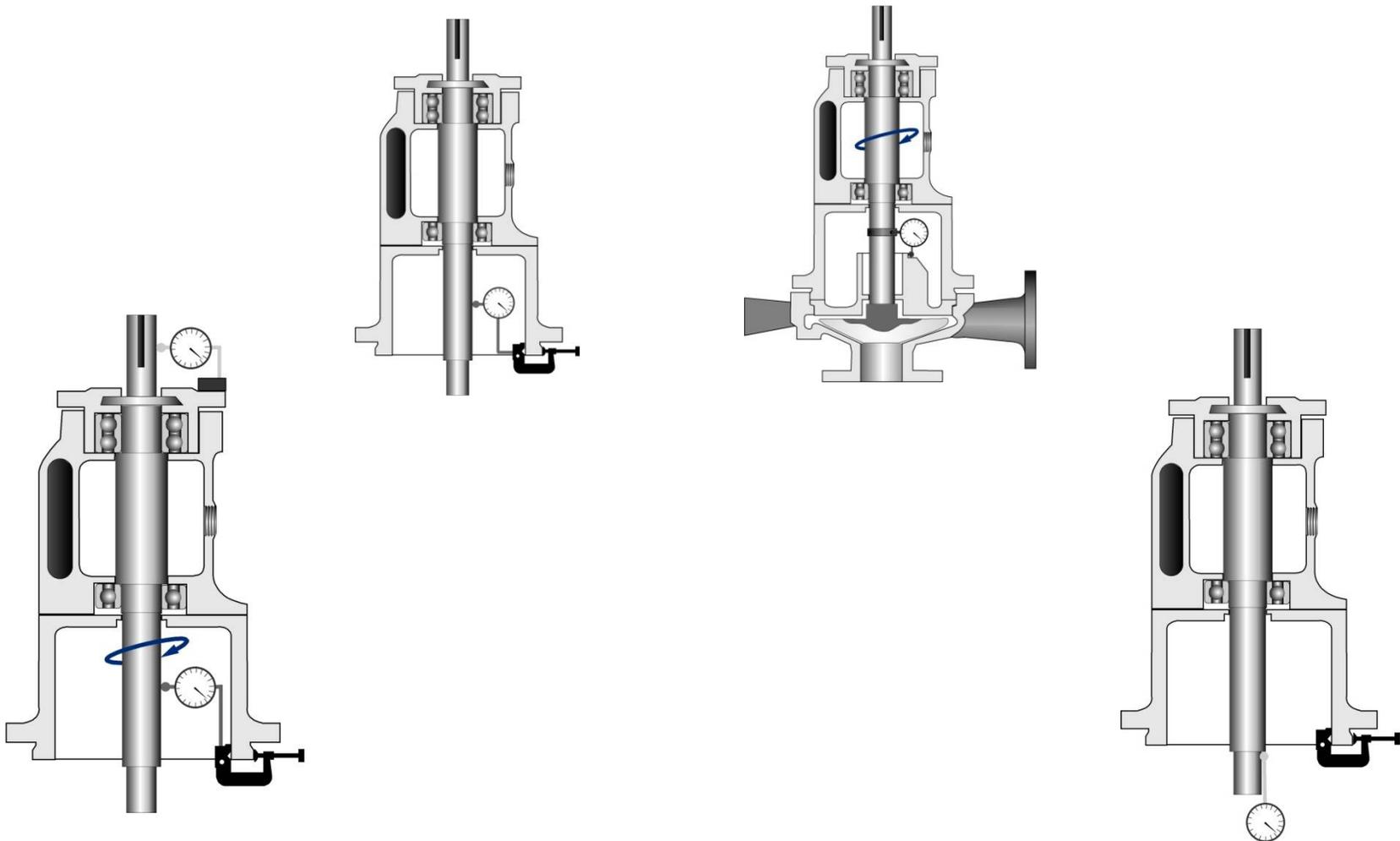
- **OLDER MACHINERY THAT IS MECHANICALLY LOOSE**



- **WHEN LIFE SAFETY IS AT STAKE, SUCH AS A DEDICATED FIRE PUMP.**

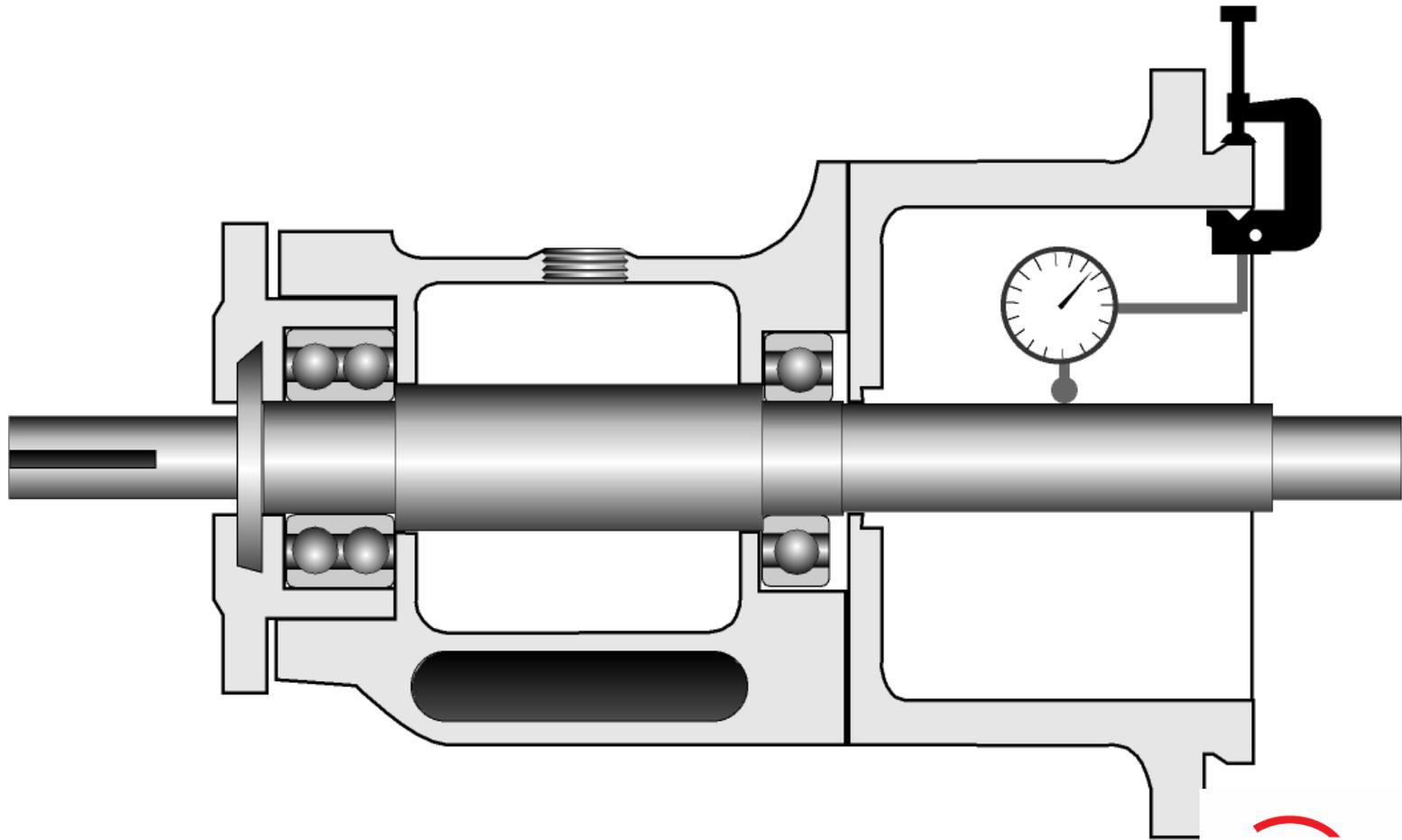


What to check before installing a mechanical seal

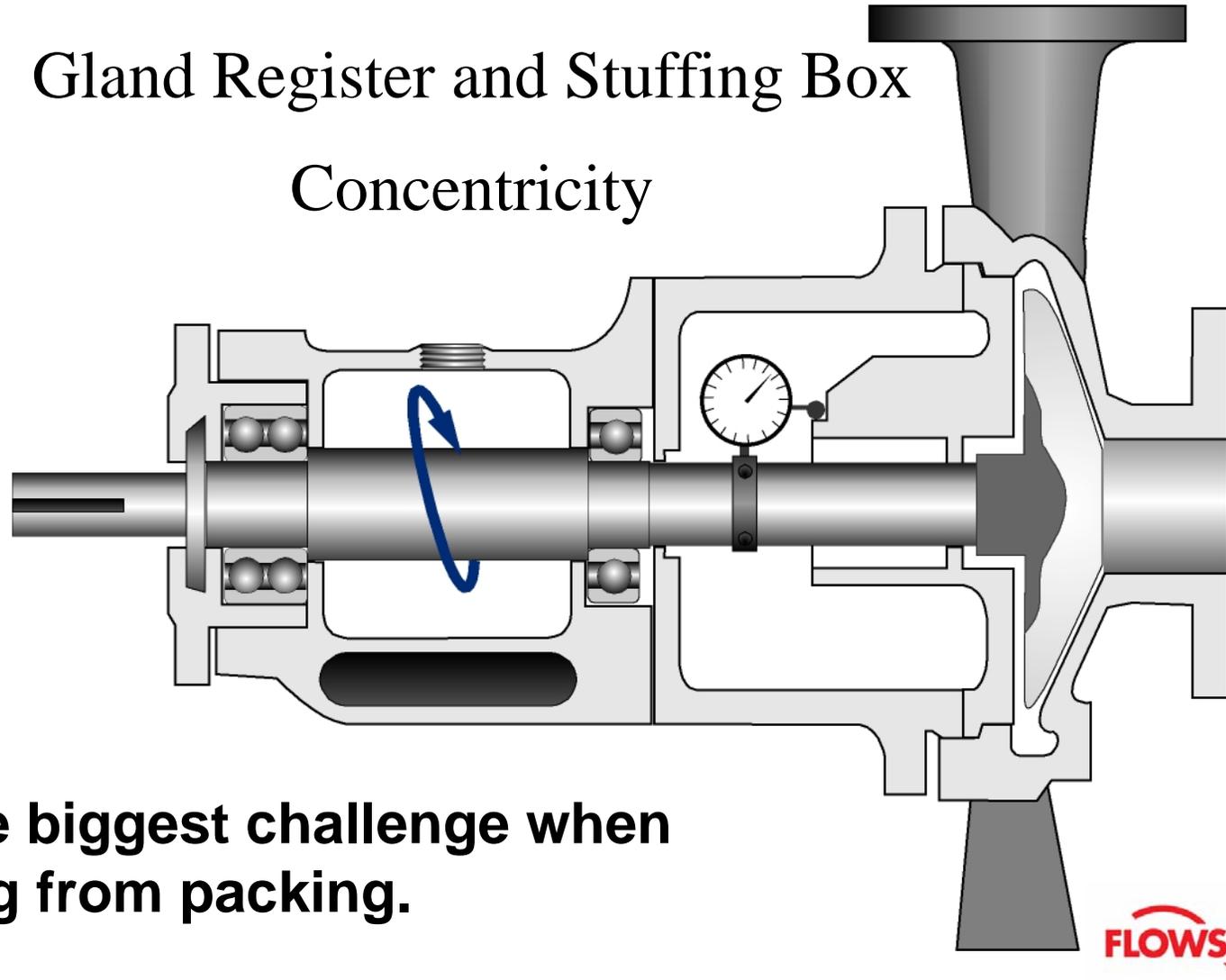




Deflection



Gland Register and Stuffing Box Concentricity

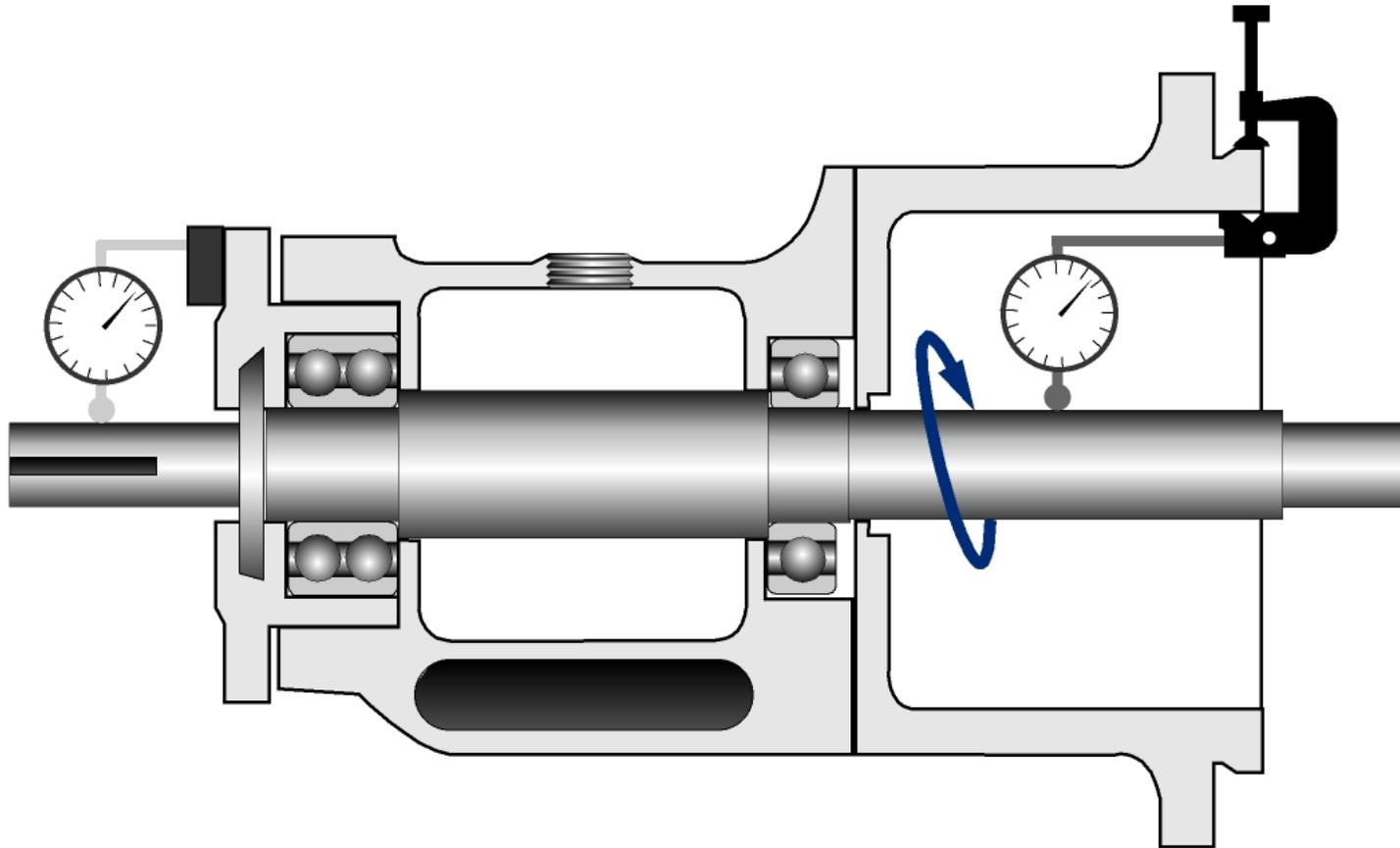


This is the biggest challenge when converting from packing.



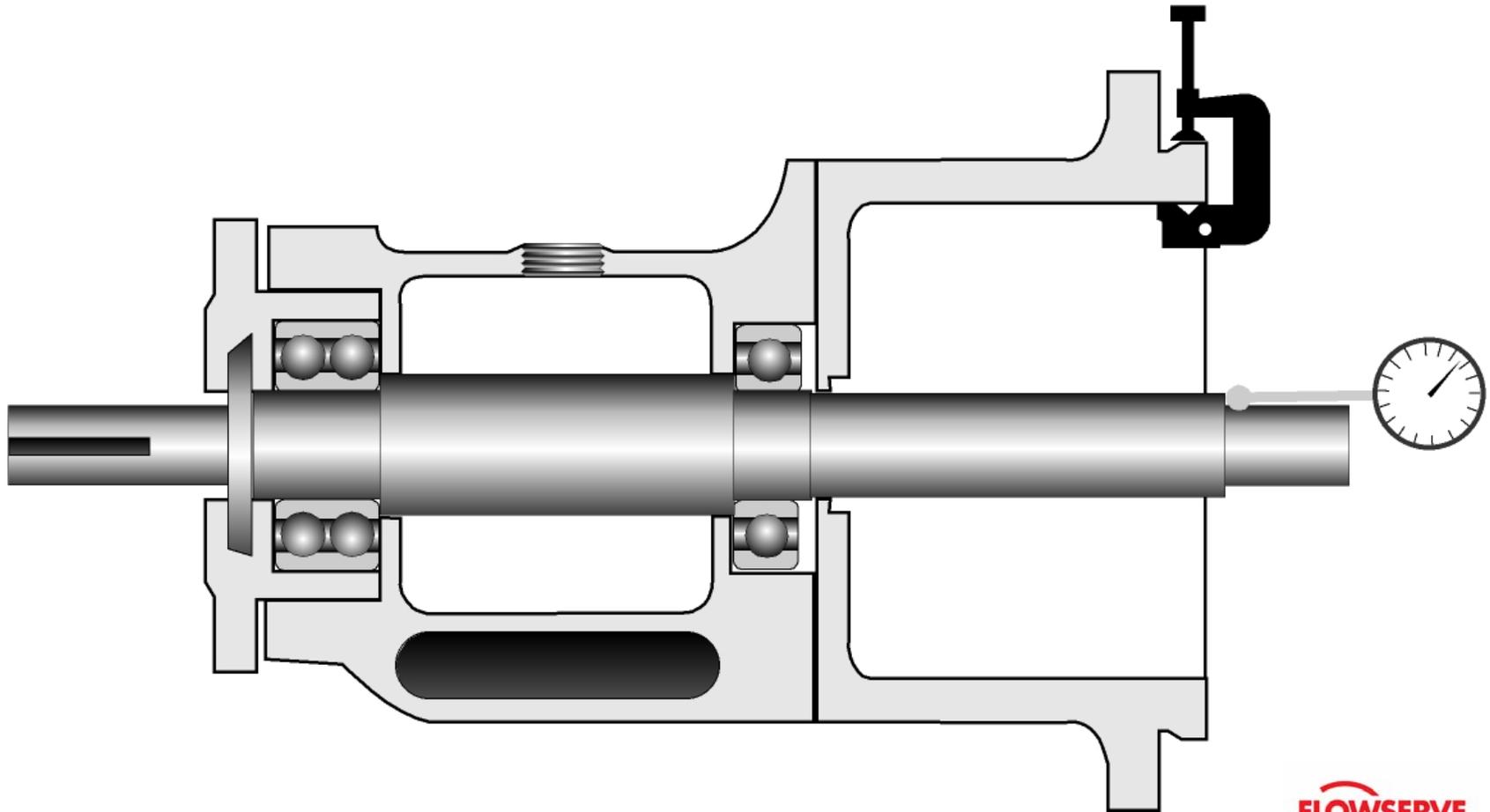
Shaft Run-Out

Bent Shaft





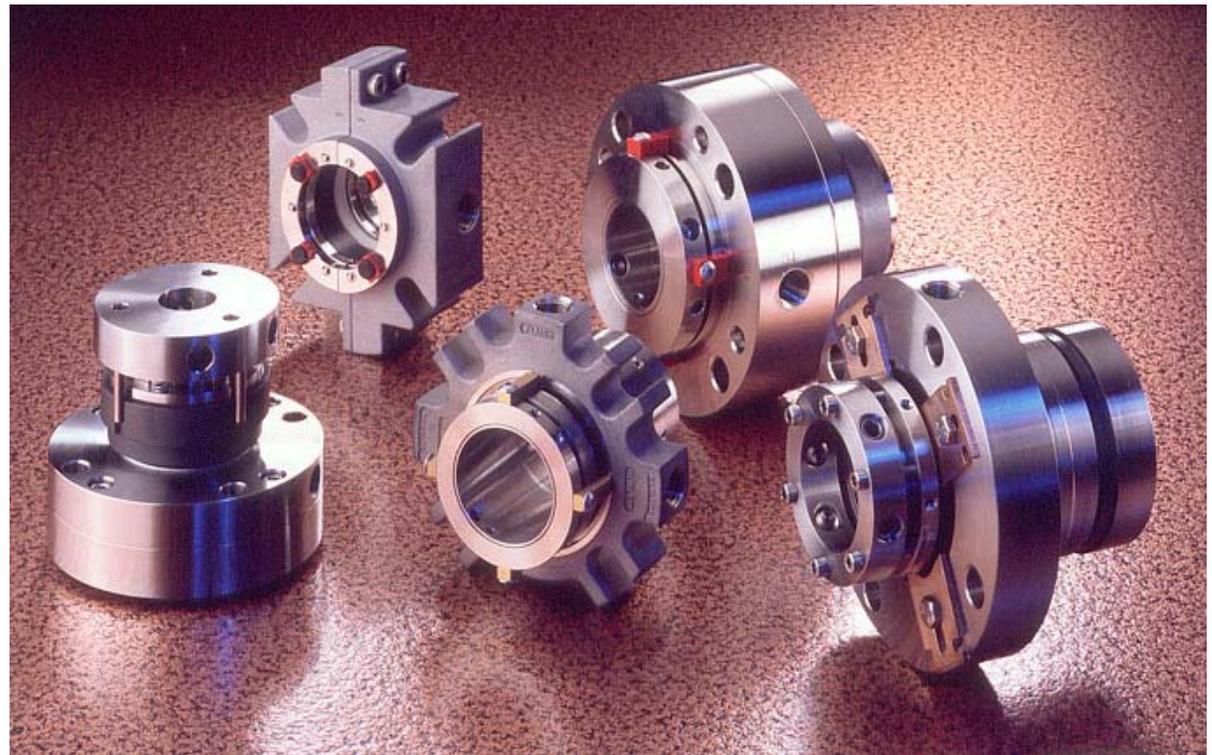
End Play





Mechanical Seal Basics

- *Single, Tandem, Double*
- *Pusher and Non-Pusher*
- *Balanced and Unbalanced*



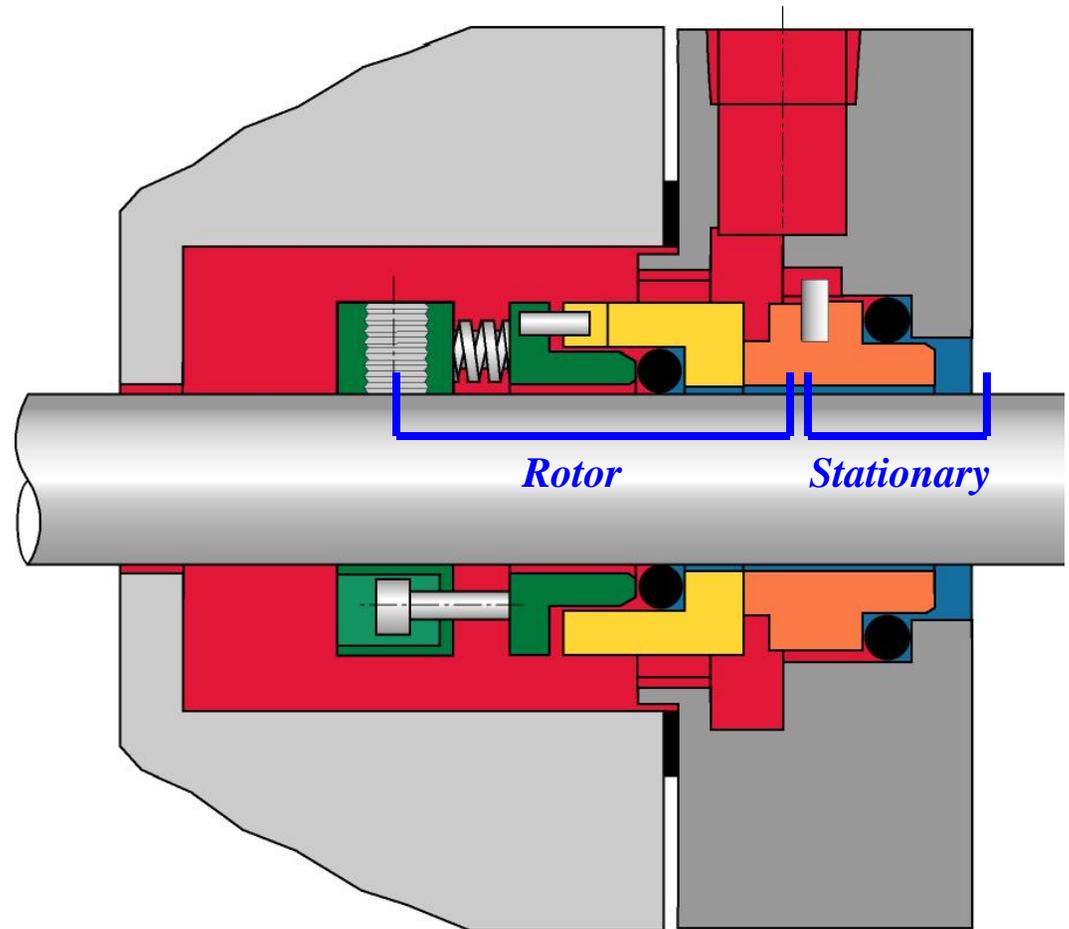


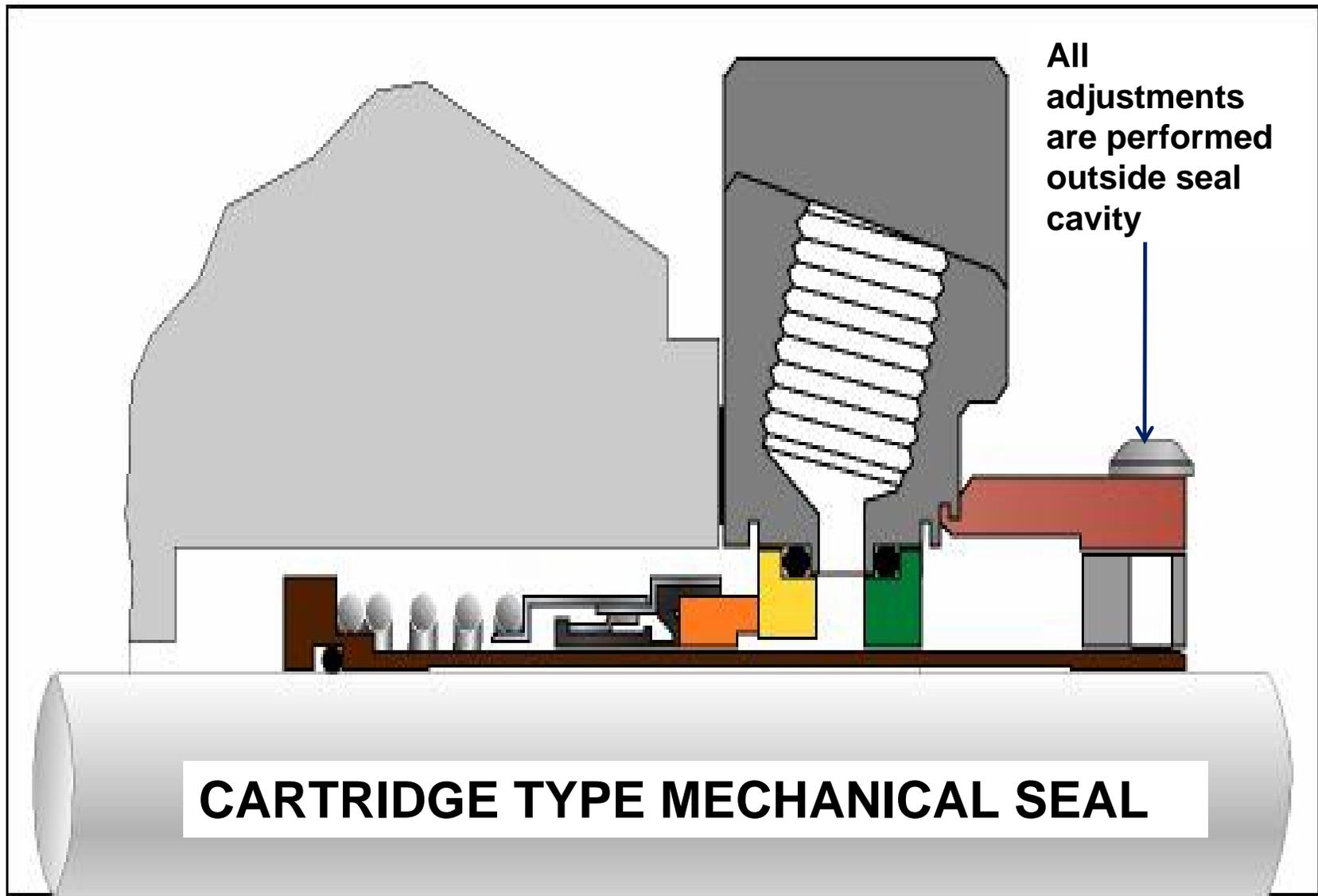
Mechanical Seal Basics

- **All Mechanical Seals have five basic components**
 - **Primary Ring**
 - **Mating Ring**
 - **Secondary Sealing Elements**
 - **Springs**
 - **Hardware**

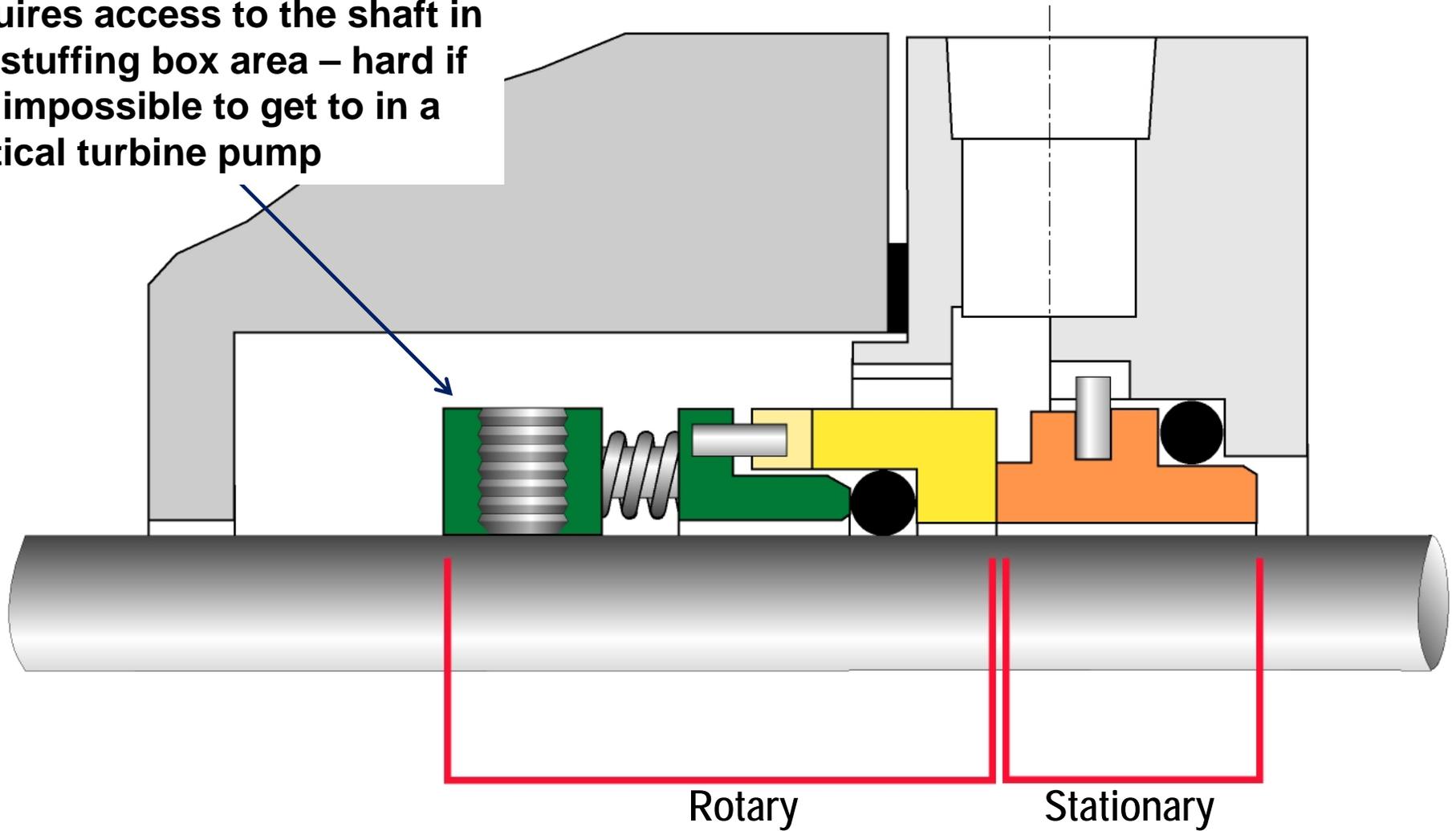
Mechanical Seal Basics

- The seal is comprised of a rotating (yellow) and stationary (orange) face. The faces are flat within 11 millions of an inch. This creates the primary sealing point in the seal.
- Process fluid provides lubrication for the seal faces.
- Closing forces (spring pressure + process pressure) keep the seal faces together.
- Small amount of opening force allows process liquid to migrate between the seal faces. This liquid is critical to seal performance. It provides cooling and lubrication.





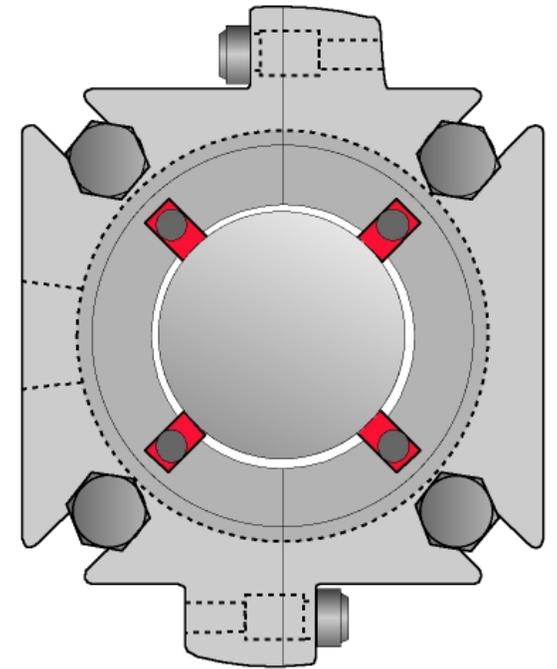
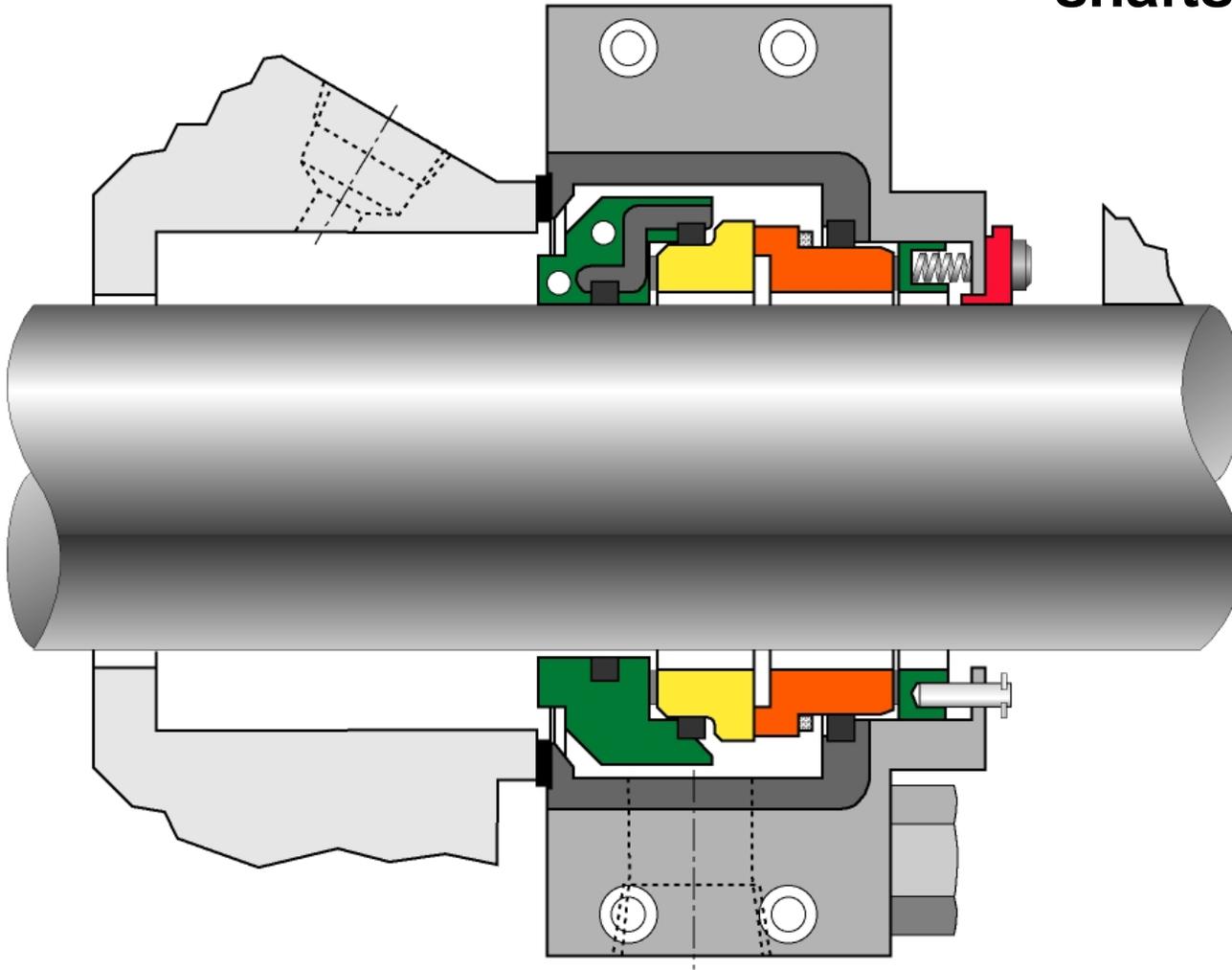
Note: setting seal tension requires access to the shaft in the stuffing box area – hard if not impossible to get to in a vertical turbine pump



Standard (not cartridge) mechanical seal

PSS Seal

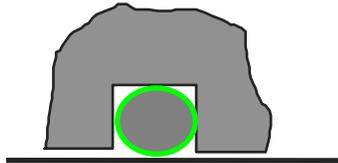
Split seal for 3" >
shafts



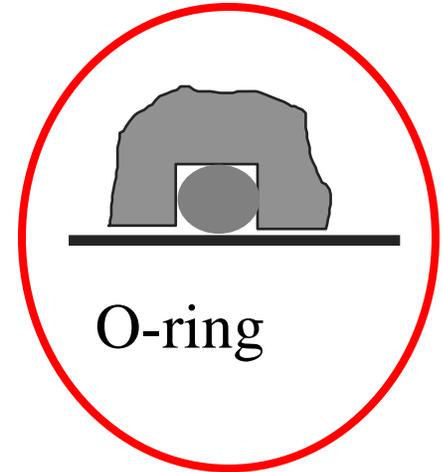
Mechanical Seal Basics



Wedge



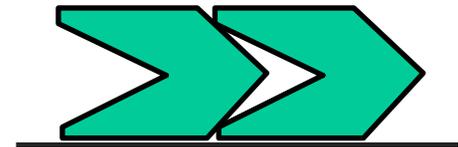
Encapsulated
O-ring



O-ring



U-cup



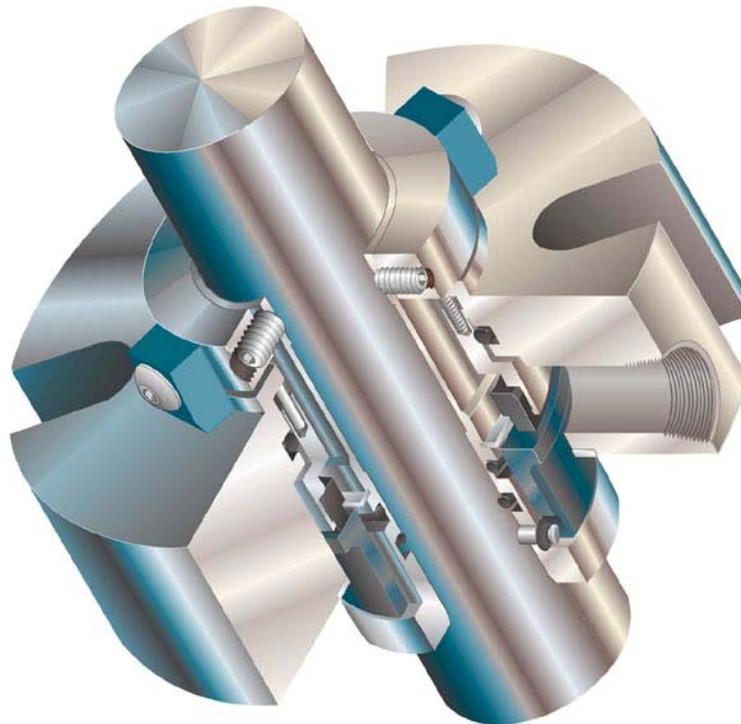
V-rings

Secondary Sealing Elements



What features to require for mechanical seals for Vertical turbine pumps

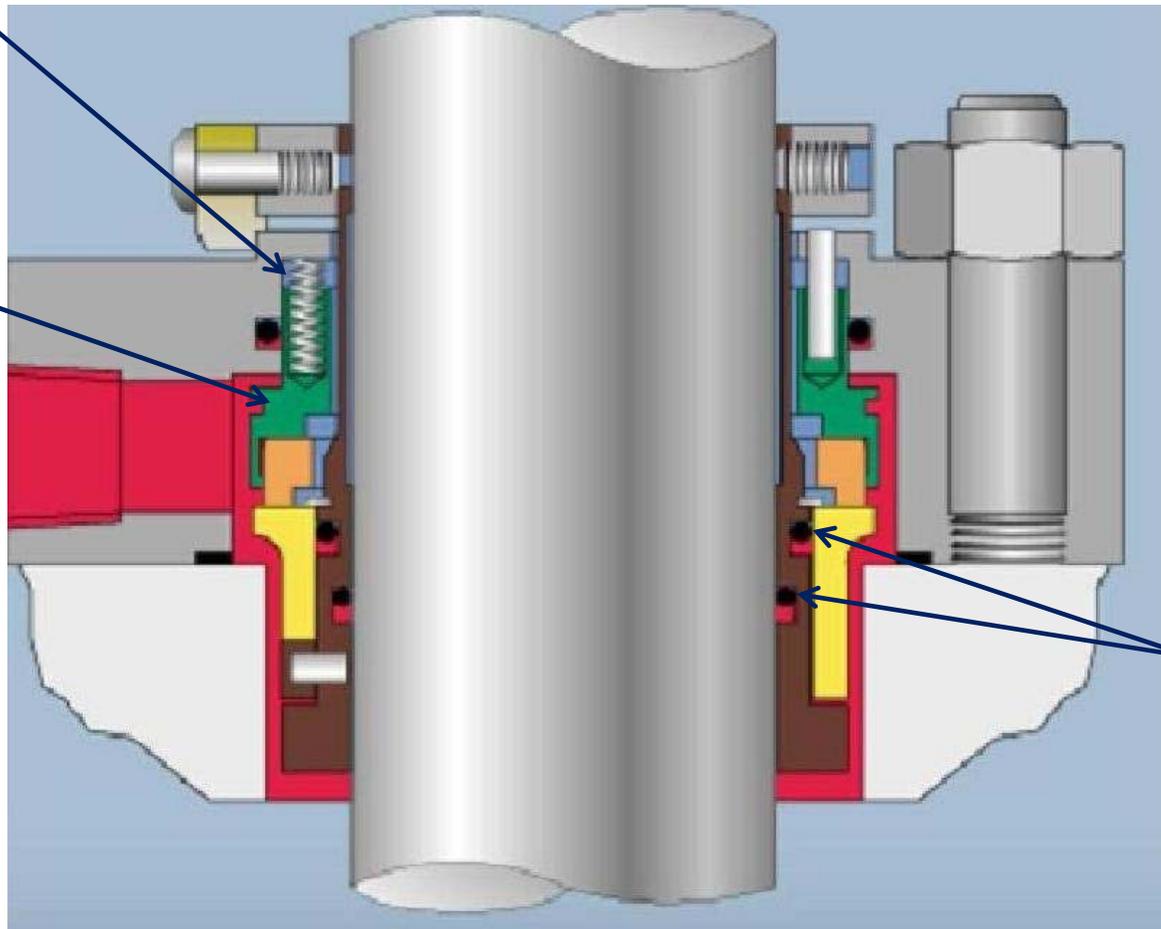
- Cartridge type Mechanical seal always





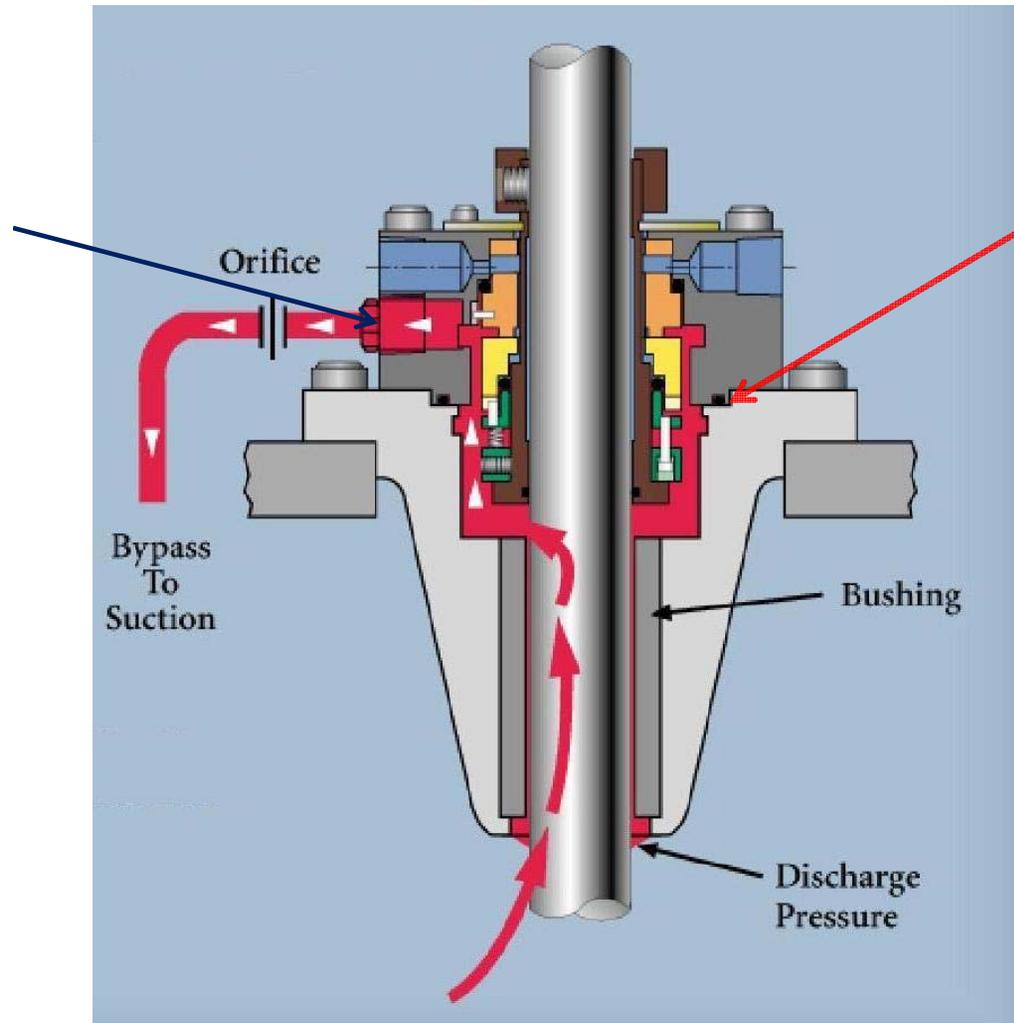
**Multiple
springs**

**Flexible
Stator
design**



**No sliding
elastomers**

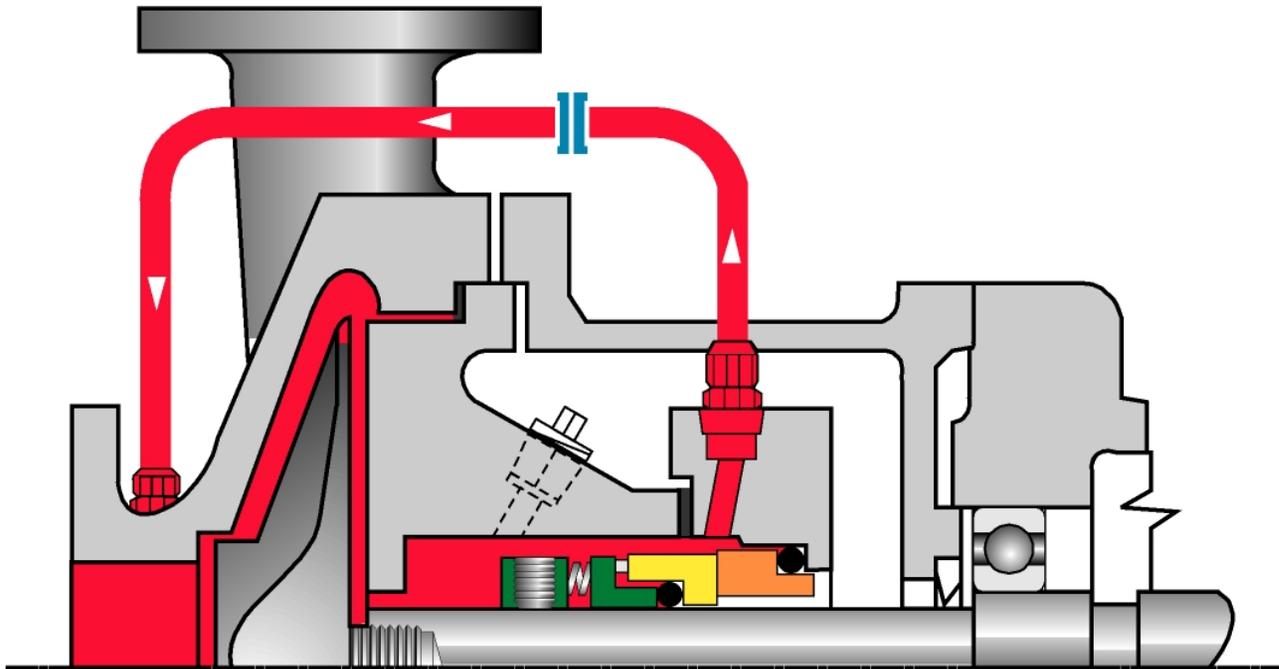
Vent & or flush port to allow air out and provide cooling flow from seal.



Piloted or rabbet for centering gland in stuffing box or seal container.

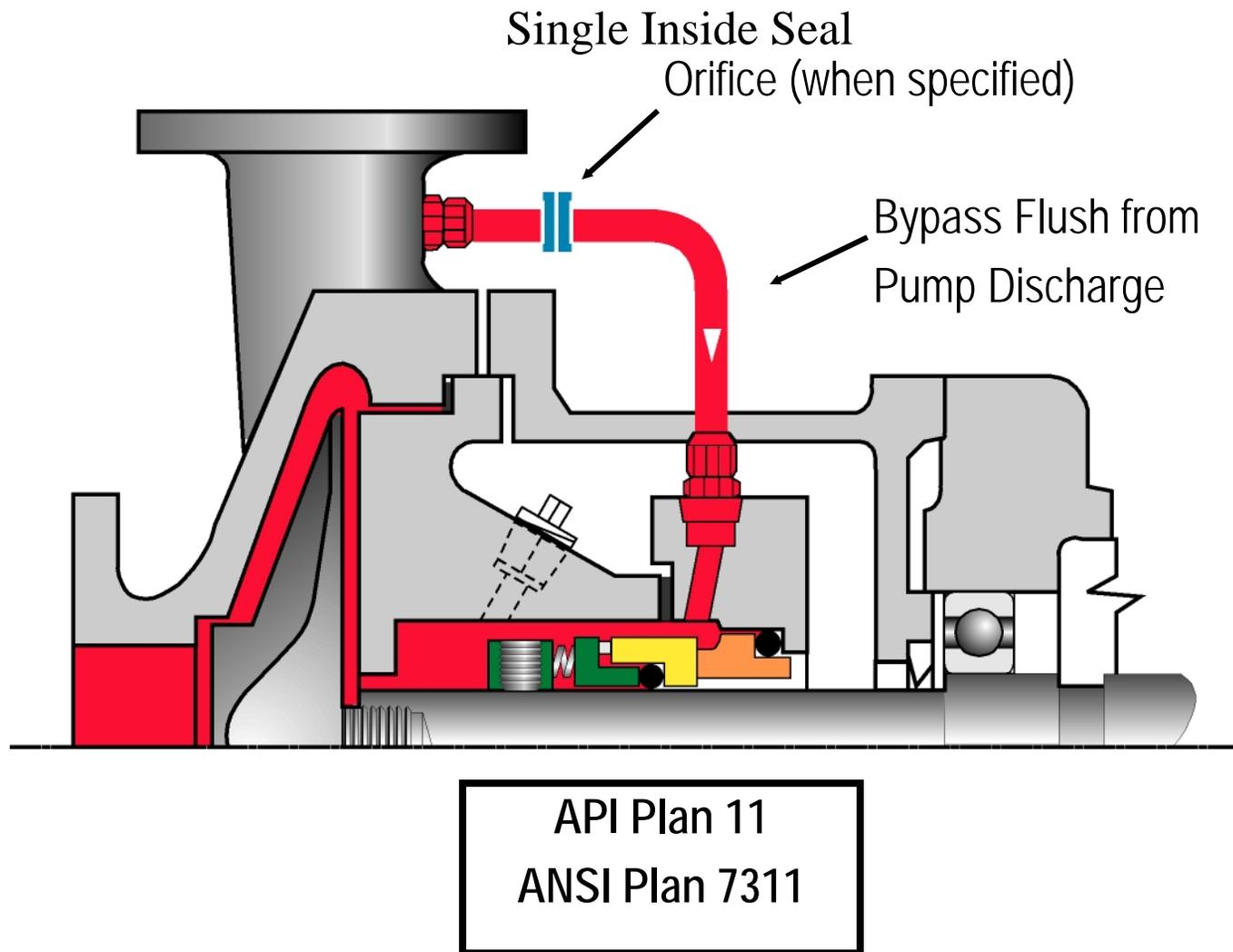
Recirculation from Seal Chamber to Suction

Single Inside Seal



API Plan 13
ANSI Plan 7313

Bypass Flush from Pump Discharge



External Flush

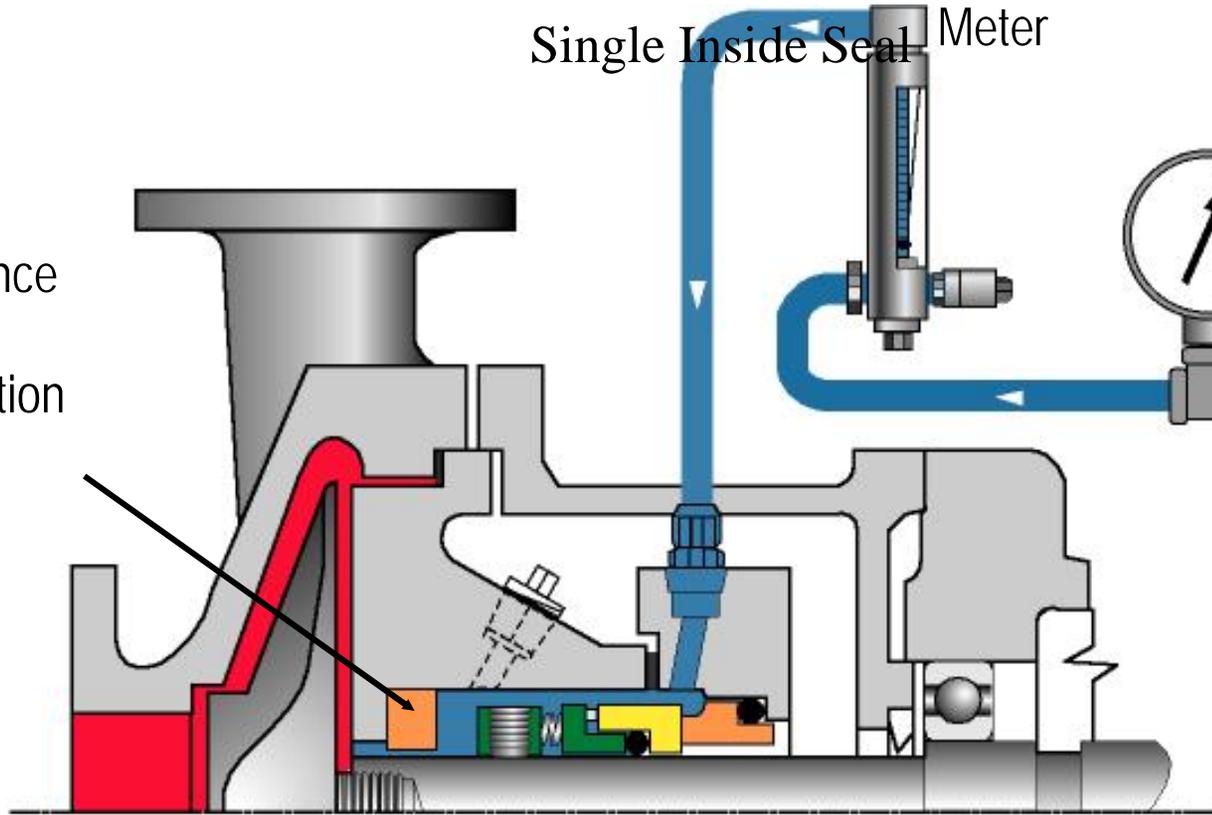
Flow

Single Inside Seal Meter

Close
Clearance
Throat
Restriction

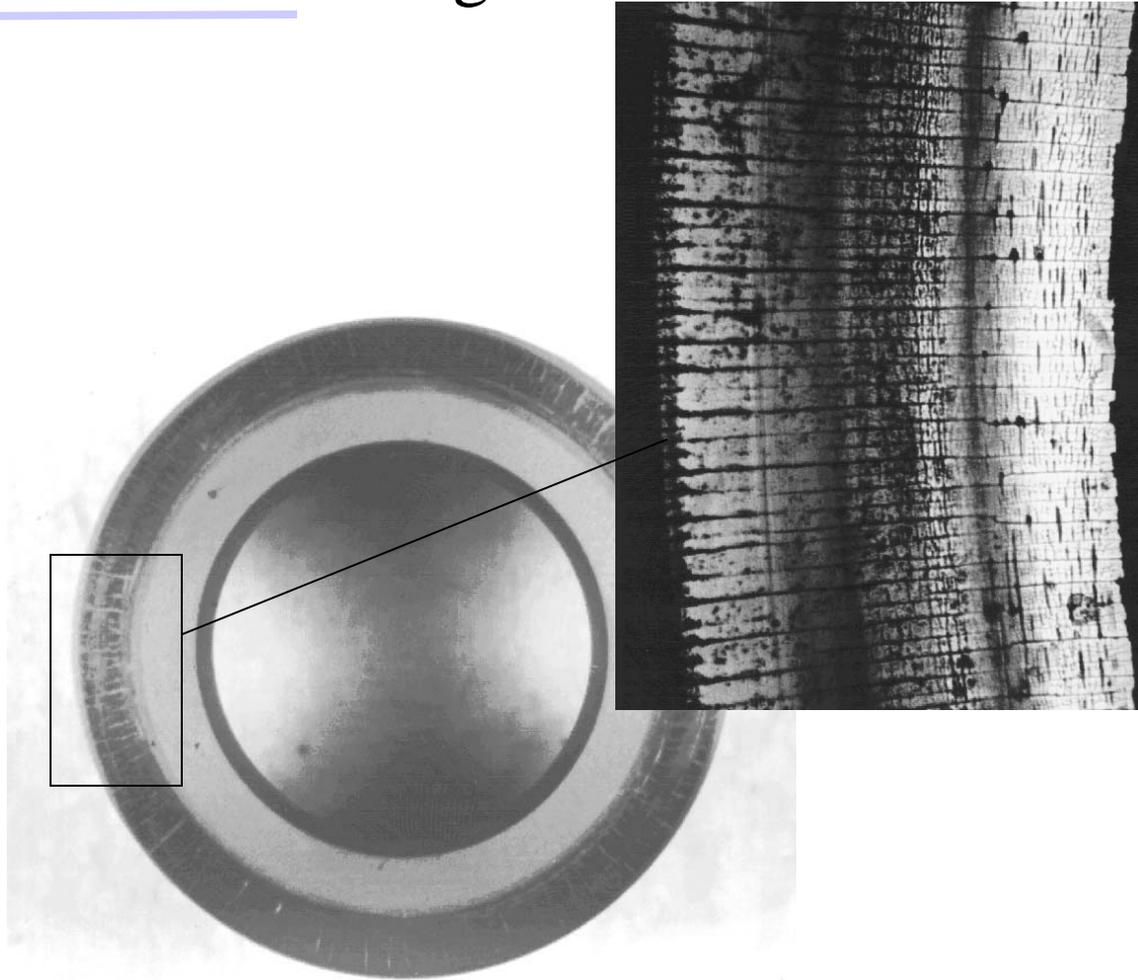
Pressure Gauge

External
Flushing
Source

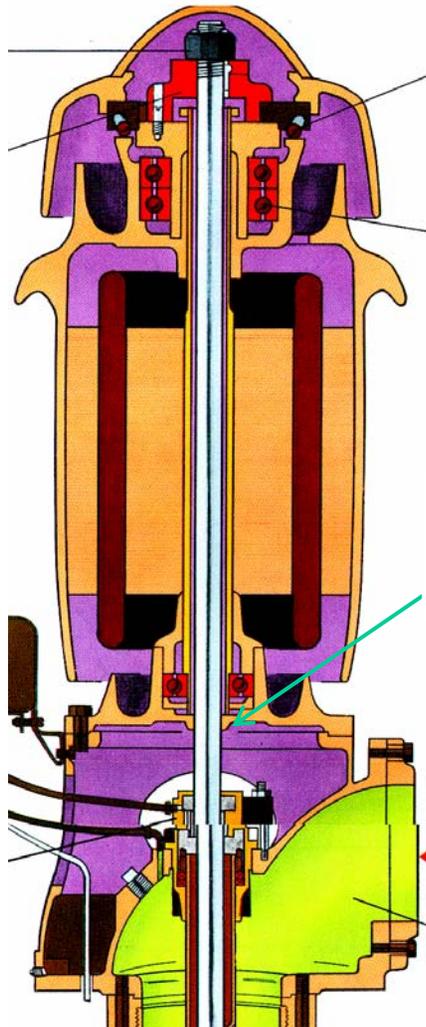


API Plan 32
ANSI Plan 7332

Heat Checking



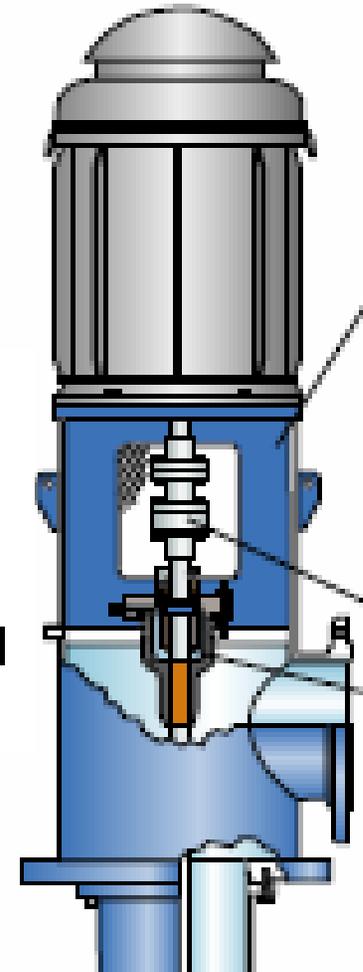
Hollow shaft motor



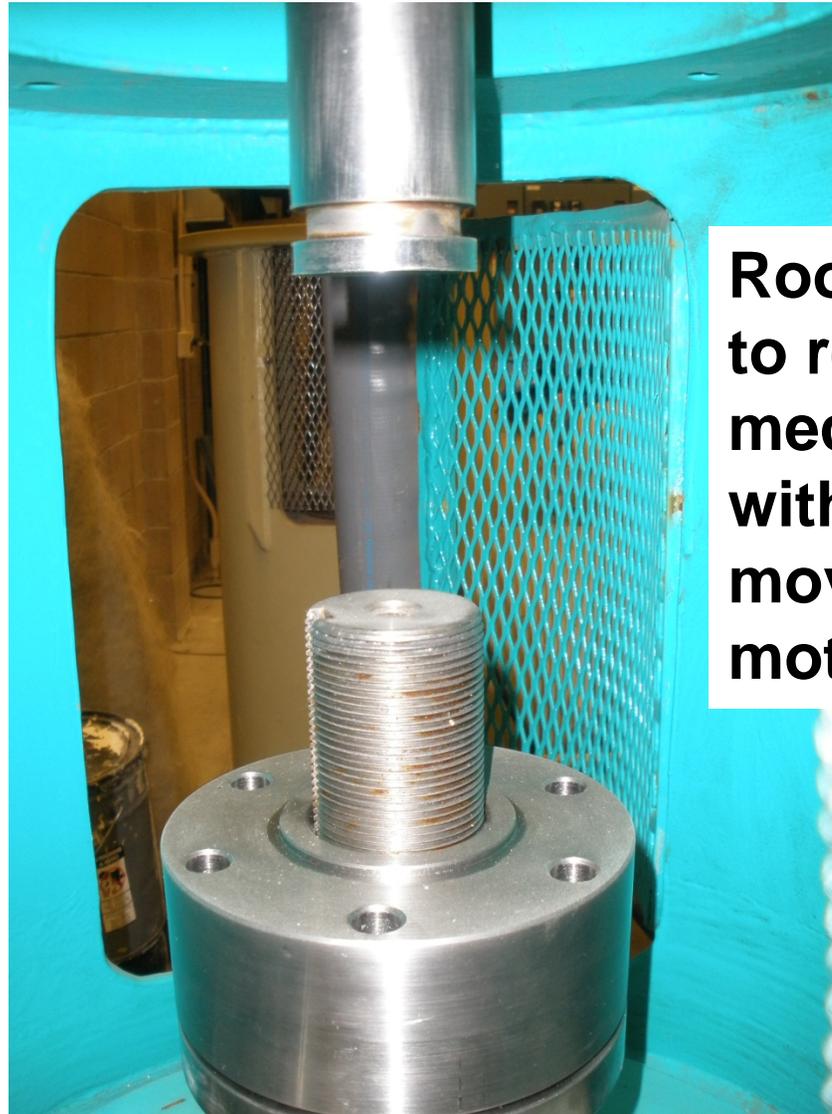
Steady
bushing

Head too short
to allow
mechanical
seal removal

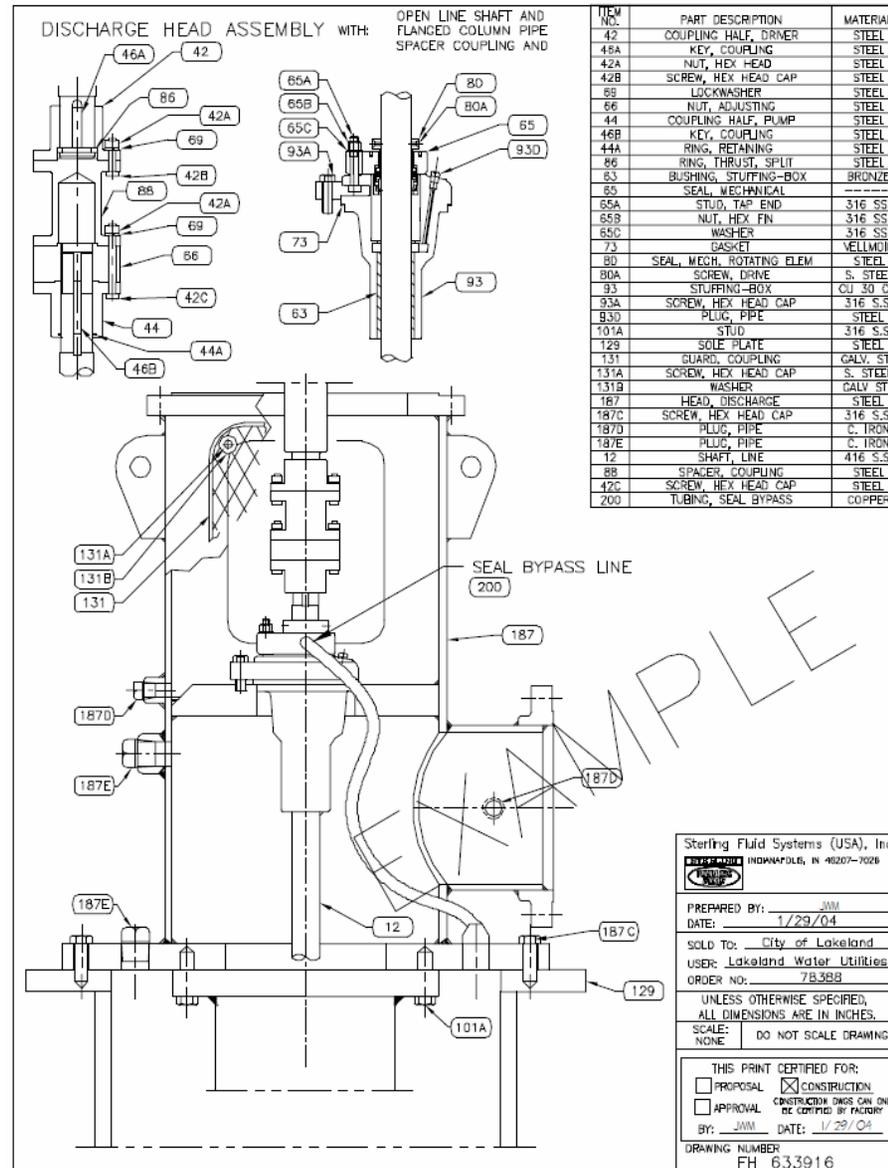
Solid shaft motor



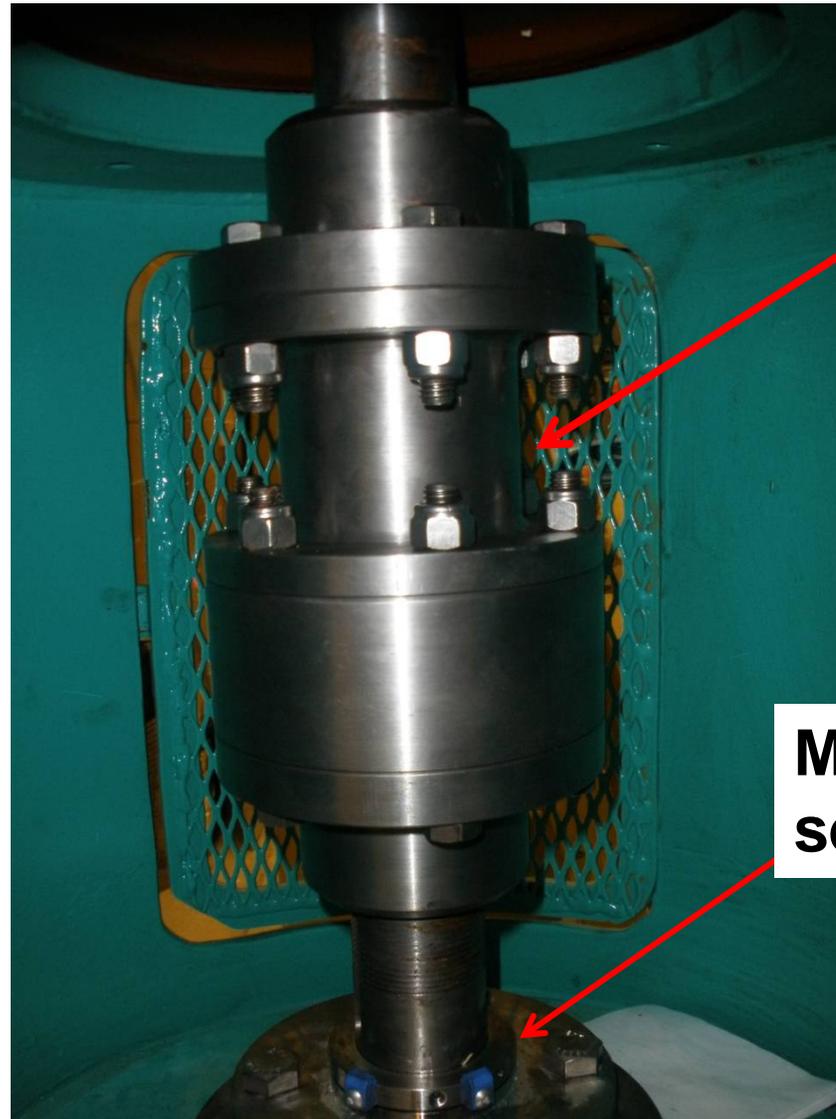
Head tall
enough to
allow
removal of
mechanical
seal



**Room to be able
to remove
mechanical seal
without lifting or
moving the
motor**



Always use a spacer coupling if you use a solid shaft motor- otherwise you will have to remove the motor to repair or replace the seal.



Spacer to allow removal of seal

Mechanical seal



Ordering a new pump with mechanical seal?

Be sure to specify the following:

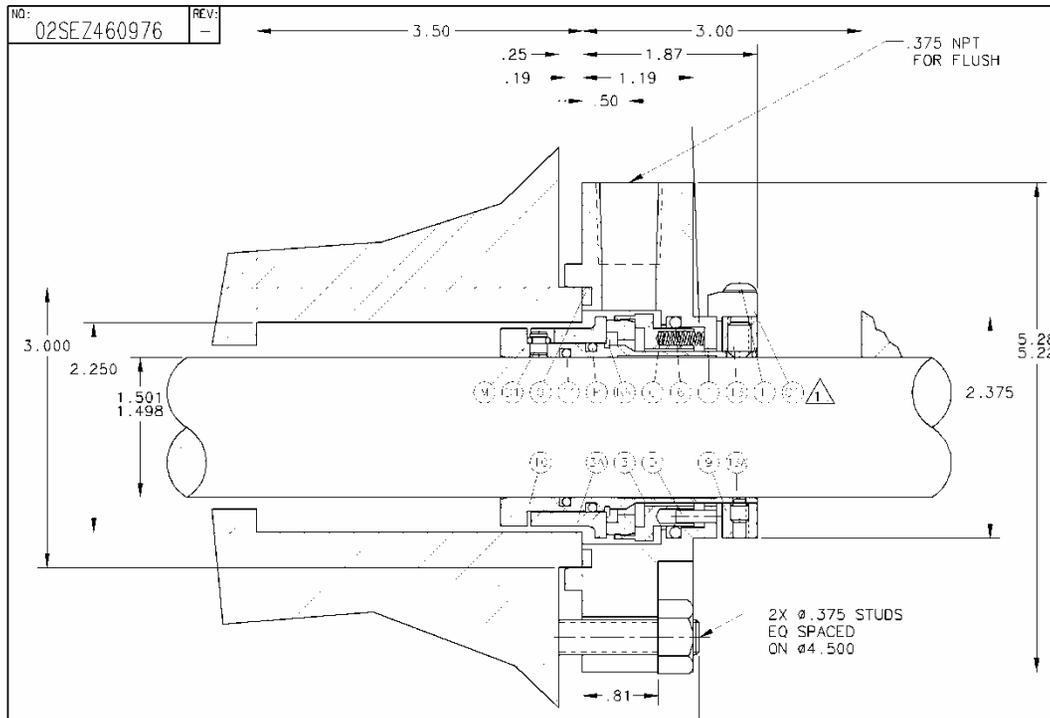
- **Solid shaft motor.**
- **If using a hollow shaft motor require a steady bushing.**
- **Tall enough head to allow spacer coupling.**
- **4 piece spacer coupling**
- **Cartridge Mounted mechanical seal with silicon carbide/silicon carbide faces at a minimum**
- **Piloted or rabbeted gland and matching fit on stuffing box or seal container**
- **Vent and or flush port on SS gland.**
- **Port on discharge head to receive vent or flush**
- **Drain in the building for water from vent or flush if not going back to suction or sump.**



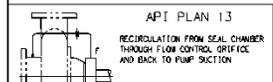
Retrofitting an existing packed pump to mechanical seal

- **If hollow shaft motor be sure to install steady bushing.**
- **Make sure stuffing box is big enough to accommodate the seal diameter as well as the required clearance.**
- **Machine stuffing box to provide a flat and clean surface for gland to mate to.**
- **Machine stuffing box with pilot or rabbet to match gland**
- **Provide for venting of seal and for small flow of water for cooling.**
- **Be prepared to remove motor or top shaft to remove or repair seal**

02SEZ460976 1 (IN) REV: - KAL ENG FRATHBURN FEB-14-2005 14:00:33



BILL OF MATERIAL NO: 403641					*SUGGESTED SPARE PARTS	
(NO)	PART NUMBER	QTY	DESCRIPTION	MATERIAL		REVISION
3	KERD1500P33	1	STATOR ASSY/P-50	316 SS NO 5 CBN	X	
	KR3D1500E33	1	STATOR ELEMENT	NO 5 CBN		
3A	K23D1500Q33	1	ROTOR/P-50	SILICON CARBIDE	2	X
C	MTAXB840305	6	SPG NO 00	HAST C		X
P	568128GU	1	O-RING	FLUOROELASTOMER		X
6	568227GU	1	O-RING	FLUOROELASTOMER		X
G	568232GU	1	O-RING	FLUOROELASTOMER		X
I	GE84036351A	1	GLD RG	316 SS		
D	MKAXB840213	2	PN 0.125X0.44	20 SS		
10	EKB2661031	1	SLV/P-50	316 SS		
D1	MTA27827633	1	PN/0.188 X 0.25	HAST C		
B	LE3D1500P33	1	SLV COL/P-50	316 SS		
13	MCAXB840405	4	SSCP 0.25X0.375	416 SS		X
13A	MCAXB840503	2	SSHDP 10-24X0.25	304 SS		X
11	568128GU	1	O-RING	FLUOROELASTOMER		X
RR	MCAXB8408JR	1	RET RG	302 SS		X
CT	MLA25464133	4	CENTERING TAB	GF NYLON		X
K	MLA21392205	4	BHCS 10-24X0.50	PLATED STL		
	MLA21806133	1	INSTALLATION KIT			
	MNA21617201	1	SHORT SHANK HEX	STL		
			KEY/0.125			
	MNA21617202	1	SHORT SHANK HEX	STL		
			KEY/0.054			
	MLA214R0433	1	DOW CORNING 111			
			LUBE			
M	568006GU	1	O-RING	FLUOROELASTOMER		X



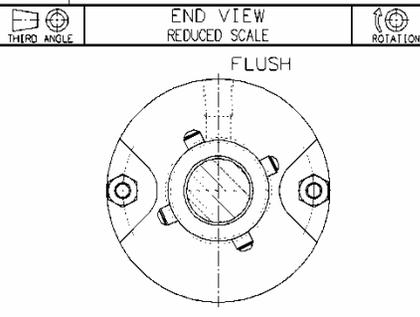
NOTES:
1. REMOVE CENTERING TABS AFTER SEAL INSTALLATION.

FLUSH (INJECTION) RATE: 1.5 GPM [5 LPM]
PIPING REQUIREMENTS

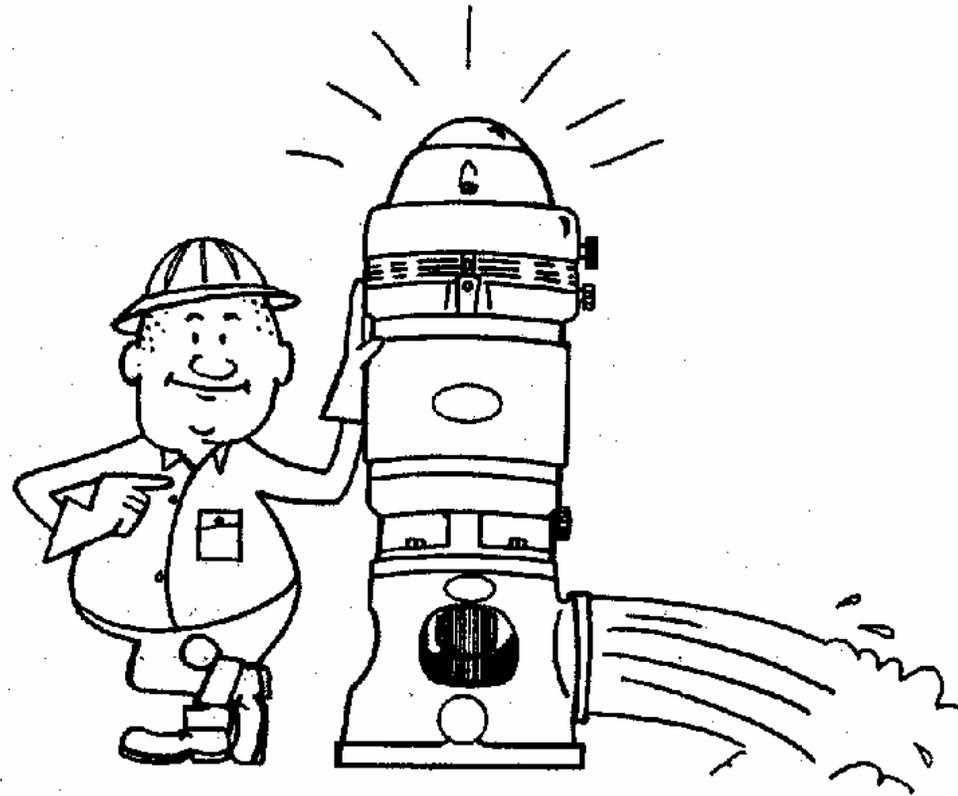
REVISION: - DATE: 12-FEB-2002 BY: MSPAID
REVISION NOTE: RELEASE TO MANUFACTURING

CHKO: MSPAID ECN NO:

DIM'S ARE REF UNLESS SPECIFIED OTHERWISE
DIM'S IN: INCHES



CUSTOMER: PUMPTech	TEMP: 200°F MAX
ADDRESS: BELLEVUE, WA	SEAL CHAMBER PRES: 300 PSIG MAX
CUSTOMER ORDER NO.: D-11651	RPM: 3600
PRODUCT: UNKNOWN FLUID	API PLAN: 13
SEAL TYPE: P-50	SEAL SIZE: 1.500
SEAL CONFIG: SINGLE INSIDE CARTRIDGE	SIZE CODE:
MATL CODE: E R 2 E F V V	WEIGHT:
EQUIP MFR: PEERLESS	INSTR: FT5112
EQUIP MODEL: VERTICLE / 1.500	DESIGN:
EQUIP DWG:	
FLOWSERVE	SCALE: 10 SCALE
Flow Solutions Division	DRAWN: MSPAID
Kalamazoo, MI USA	DATE: 12-FEB-2002
	FORM DWG:
	CHKO: MSPAID
	ASSY/ORDER NO: 02SEZ460976
	REV: 1 of 1
	APPVD:
	F.O. NO: 02SEZ460976



A little forethought and proper installation will contribute to maximum efficiency and long trouble free life.



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