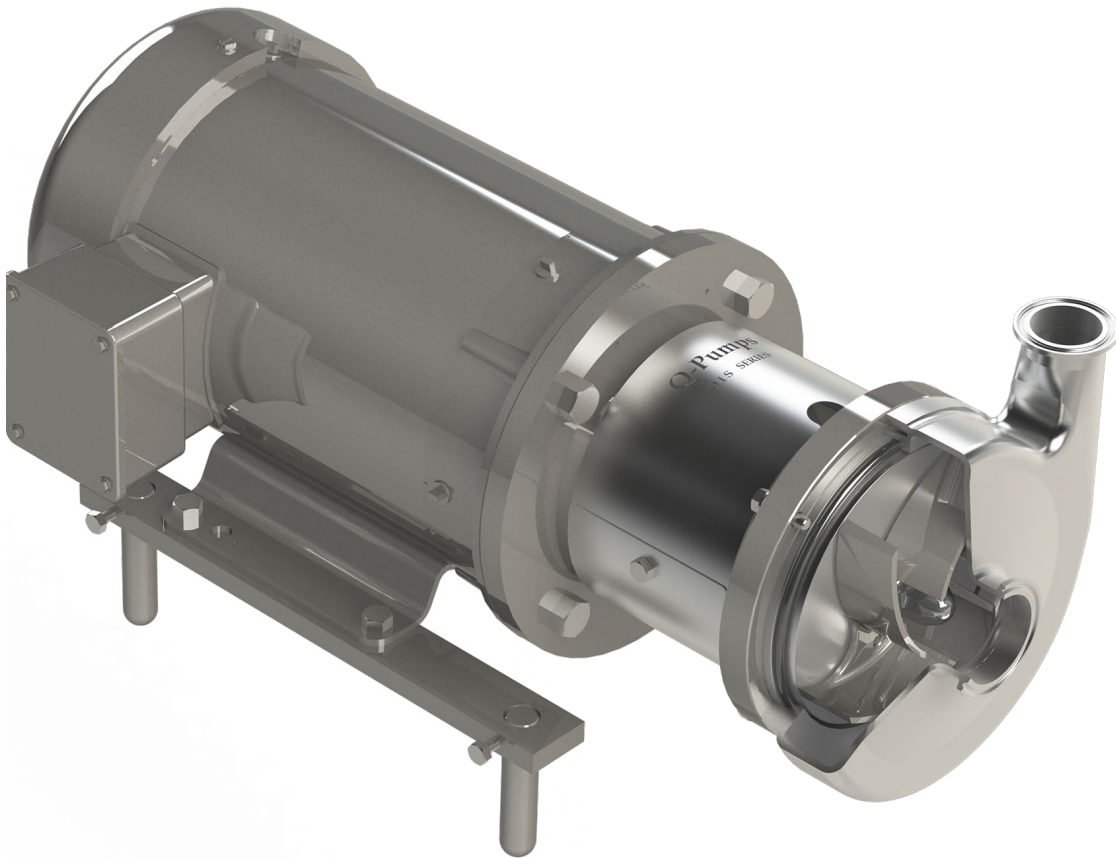




Installation, Operation, and
Maintenance Manual

TR-IS Series™

INTERNAL BALANCED MECHANICAL SEAL,
CENTRIFUGAL PUMP



Thank you for purchasing a Viking Pump product!

This manual contains installation, operation, cleaning and maintenance instructions for the TR-IS Series.

It also includes a part list as well as a troubleshooting chart to assist in determining pump malfunction and practical advices for the maintenance and operation of the equipment.

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ABOUT THIS MANUAL

To ensure the best performance of your pump, please read this manual before starting it. You will find useful information and instructions for the assembly and disassembly procedures required for the necessary pump maintenance.

For any questions related to the installation, operation, or maintenance of this pump, please contact your local distributor or Viking Pump:

Viking Pump, Inc.
406 State Street
Cedar Falls, IA 50613 U.S.A.
Call: USA (319) 268-8013 / EU +44 (0) 1323 509211
Fax: USA (803) 216-7686 / EU +44 (0) 1323 507306
vcfcs@idexcorp.com

The information in this manual may change without notice. We recommend visiting our website for any updates.

Viking Pump Warranty

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

Viking Pump 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 Pump products by the purchaser, his employees or others. Viking Pump will assume no field expense for service or parts unless authorized by it in advance.

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

THIS IS VIKING PUMP'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ARE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No officer or employee of IDEX Corporation or Viking Pump is authorized to alter this warranty.

IMPORTANT SAFETY INFORMATION

Safety is very important!

DO NOT attempt to modify any Viking Pump product, the TR-IS series centrifugal pumps have been designed to be safe and reliable, to do so could create unsafe conditions and void all warranties.

DO NOT place any Viking Pump product in an application where general product service ratings are exceeded. If the maintenance and operation personnel do not observe the instructions in this manual could result in personal injury or machine damage.

The following DANGER, WARNING, and CAUTION signs and their meanings are used within these instructions to avoid serious injury and/or possible damage to equipment.



DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. The word danger is used in the most extreme cases.

CODE 136530001
(Rotating direction ccw)



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. May also be used to alert against an unsafe operating or maintenance practice.

CODE 136530002
(Guard warning)



CAUTION

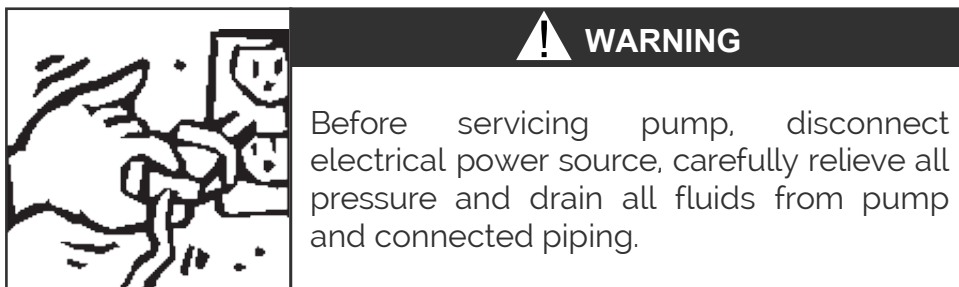
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

WARNING
ROTATING SHAFT

DO NOT OPERATE
WITHOUT GUARD IN PLACE

Safety labels are placed on every pump. DO NOT remove any labeling on any Viking Pump product. Replace any label that is missing.

DESCRIPTION



Before servicing pump, disconnect electrical power source.

The TR-IS series closed-coupled pumps are made up of two sections, power or drive section and the liquid end or pump section.

The pump is mounted to the frame of the drive motor by means of an adapter and is coupled to the motor shaft. The impeller mounts on the stub shaft and is retained by one of the three methods. The casing is fixed to the adapter with screws allowing to position the discharge outlet at 0°, 45° and 90°. The internal, balanced mechanical seal (single or double) assures long seal life. The drive motor is mounted on a frame having adjustable legs providing simple installation and leveling.

INSTALLATION GUIDELINES

UNPACKING EQUIPMENT

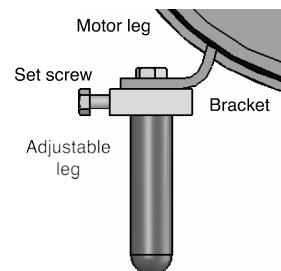
Check the contents and all wrapping when unpacking your equipment. Inspect all parts for damage that may have occurred during shipping. Report any damage to the carrier.

LOCATION AND INSTALLATION

The pump unit should be located as near as possible to the liquid source and in a position where the suction piping can be short and direct with a minimum number of elbows and fittings. It should also be readily accessible for inspection and cleaning.

The pump unit as received from the factory is ready for installation. To install it, attach a hoist if necessary, loosen the set screws in the adjusting leg brackets, and individually adjust the legs until the pump is leveled. Tighten the set screws.

Attach the suction and discharge piping. Be sure suction and discharge piping is properly supported to avoid any strain on the pump casing.



ASSEMBLY PRELIMINARIES



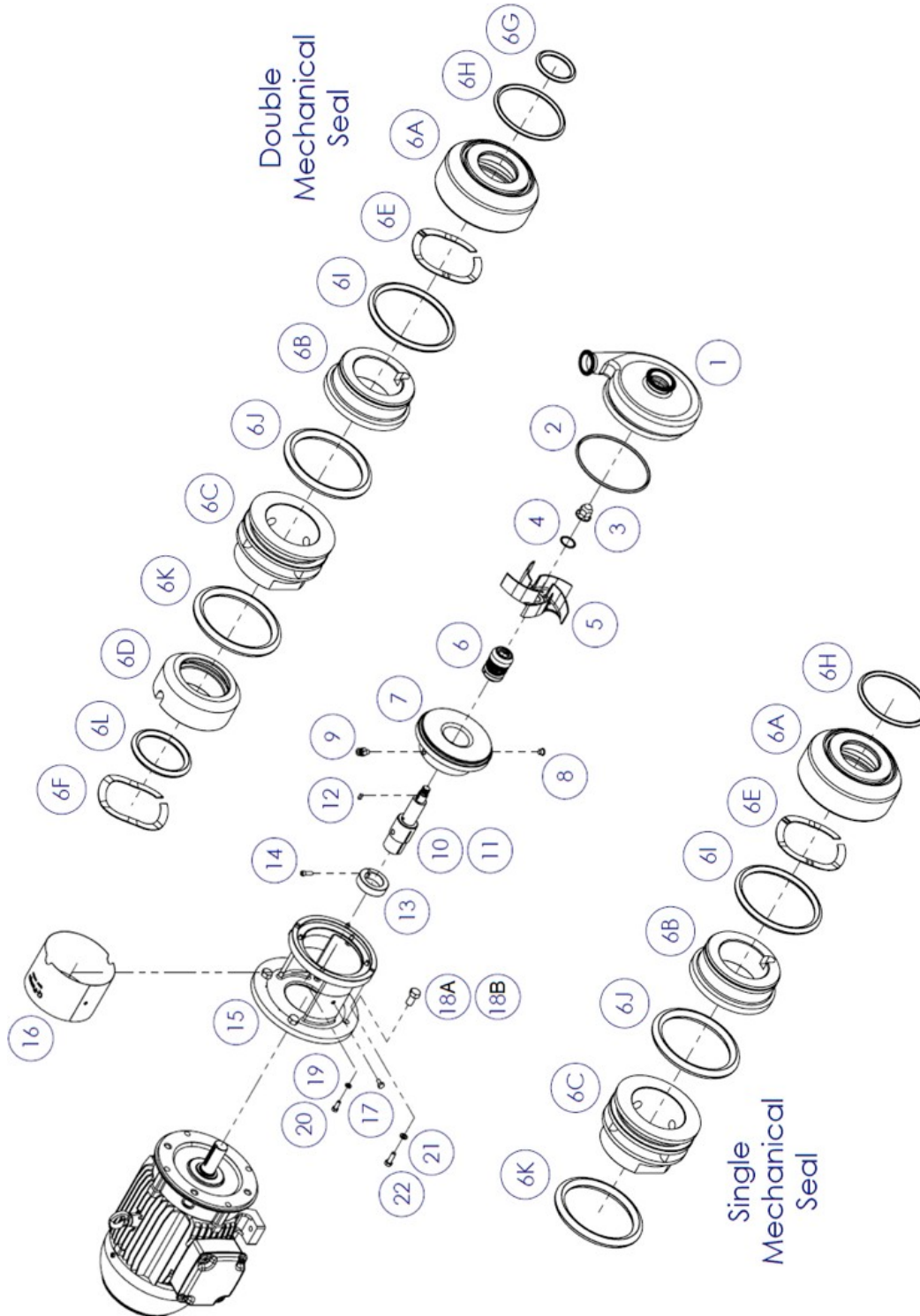
WARNING

Before servicing pump, disconnect electrical power source, carefully relieve all pressure and drain all fluids from pump and connected piping.

Before beginning the assembly procedure identify every element that is going to be installed, you can use the exploded view and part list shown in pages 7 and 8. During the assembly you may need the following tools:

1. 1", 3/4", 9/16" and 1/2" Wrenches.
2. 3/16" and 1/4" Allen wrenches.
3. Rubber mallet.
4. Shims with different thicknesses: 0.005", 0.010" and 0.020".
5. Ratchet handle and sockets 5/8" and 7/8", – for impeller nut.
6. 3/8" diameter steel rod – to avoid the stub shaft from turning.
7. Torque Wrench.

TR-IS GENERAL DIAGRAM



TR-IS PART LIST

ITEM	PART DESCRIPTION	QTY
1	CASING	1
2	CASING O-RING	1
3	IMPELLER NUT PLUS	1
4	IMPELLER NUT GASKET	1
5	IMPELLER TR-IS	1
6	MECHANICAL SEAL	1
6A	ROTARY HOLDER	1
6B	INTERNAL ROTARY FACE	1
6C	STATIC FACE	1
6D	EXTERNAL ROTARY FACE (DOUBLE MECHANICAL SEAL)	1
6E	INTERNAL ROTARY SPRING	1
6F	EXTERNAL ROTARY SPRING (DOUBLE MECHANICAL SEAL)	1
6G	O-RING INTERNAL ROTARY HOLDER (DOUBLE MECHANICAL SEAL)	1
6H	O-RING OUTBOARD ROTARY HOLDER	1
6I	O-RING STATIC FACE	1
6J	O-RING STATIC FACE FRONT	1
6K	O-RING STATIC FACE BACK	1
6L	O-RING EXTERNAL ROTARY FACE (DOUBLE MECHANICAL SEAL)	1
7	BACKPLATE	1
8	PLUG (SINGLE MECHANICAL SEAL)	2
9	RACOR FLUSH (DOUBLE MECHANICAL SEAL)	2
10	STUBSHAFT	1
11	STUBSHAFT PIN	1
12	STUBSHAFT KEY	1
13	STUBSHAFT COLLAR	1
14	COLLAR BOLT	1 OR 2
15	ADAPTER	1
16	ADAPTER GUARD	1
17	ADAPTER GUARD BOLT	1
18A	ADAPTER HEXAGONAL SCREW	4
18B	ADAPTER HEXAGONAL NUT	4
19	WASHER	4
20	CASING HEXAGONAL SCREW	4
21	WASHER	4
22	BACKPLATE HEXAGONAL SCREW	4

START THE ASSEMBLY

It is highly recommended that you use the general diagram to identify the components and thus be able to carry out the assemblies and sub-assemblies that will be explained below.

1 . LEG BRACKET ASSEMBLIES

The leg bracket assemblies are optional. They allow to level the pumps adjusting the legs vertically. The size of the brackets (**209**) and legs (**207**) depend on the NEMA or IEC motor frame.

First make the sub-assemblies of the legs to the brackets with the hexagonal screws (**209A**). Next, with the hexagonal screws (**209B**) fix the brackets to the motor base; You may need to lift the motor to make this assembly. Figure A.

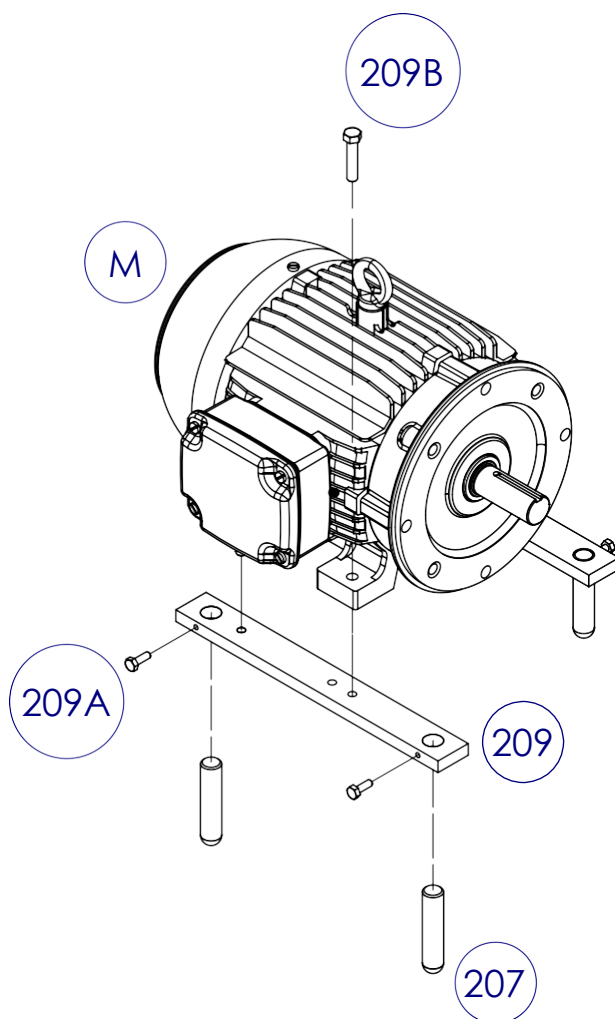


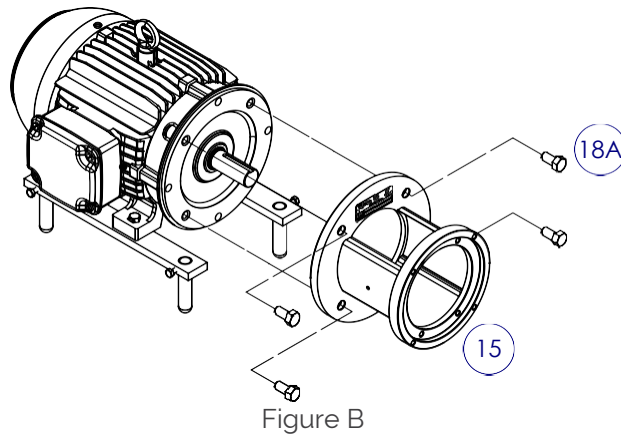
Figure A

2 . ASSEMBLY OF THE ADAPTER TO THE MOTOR

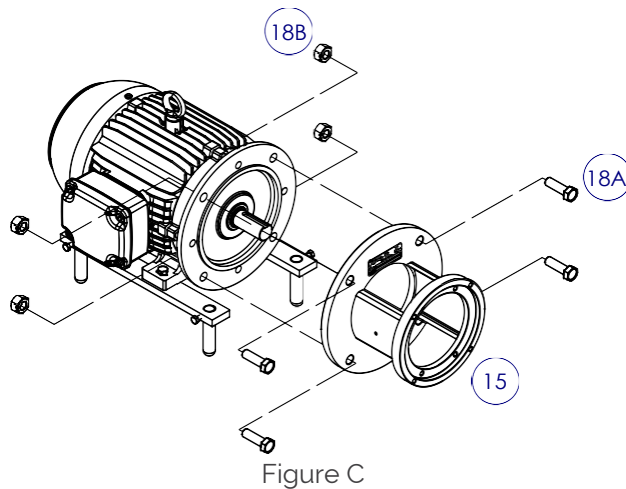
Place the stainless adapter (**15**) on the motor flange and fix it with hexagonal screws and tighten to the torque values recommended in chart 1.

Chart 1 – Torque values for tightening the adapter screws		
Torque ft-lb	Models NEMA	Models IEC
20	Frame 56 to 14	Frame 80 to 90
55	Frame 18 to 25	Frame 100 to 160
70	Frame 28	Frame 180
110	Frame 32 to 36	Frame 200 to 225

For NEMA motors "C" face use the four hexagonal screws (**18A**). Figure B.



For IEC motors "FF" face (B5 flange) use the four hexagonal screws (**18A**) and the hexagonal nuts (**18B**). Figure C.



3 . SPACING OF THE IMPELLER AND STUB SHAFT

The correct operation of the pump depends on the separation of the impeller (5) from the backplate (7) and the fixation of the stub shaft (10) on the motor shaft. Follow the next steps to fix the stub shaft on the motor shaft:

3a. Position the stub shaft collar (13) with the corresponding Allen screws (14) loosely on the stub shaft and place it on the motor shaft, it must slide in and out without problem. Figure D.

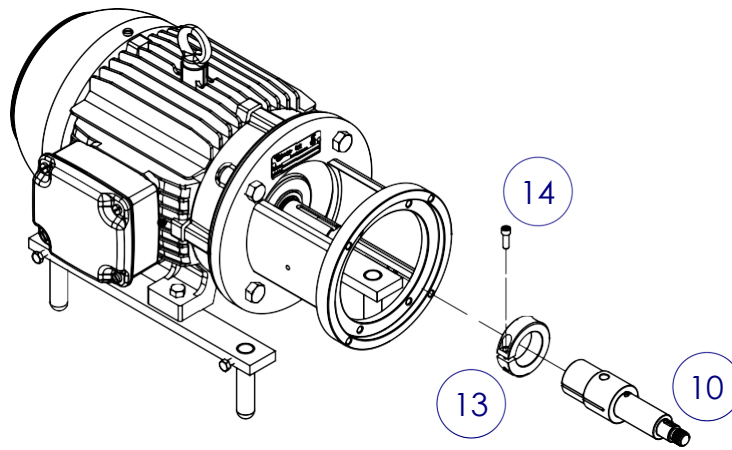


Figure D

3b. Place and fix the backplate (7) into the adapter using the four hexagonal screws (22) and washers (21). The orientation of the backplate is with the flushing holes in a vertical position; those holes are used only with the double mechanical seal and the backplate has a square shape in the back to keep the static face of the mechanical seal in place. Figure E.

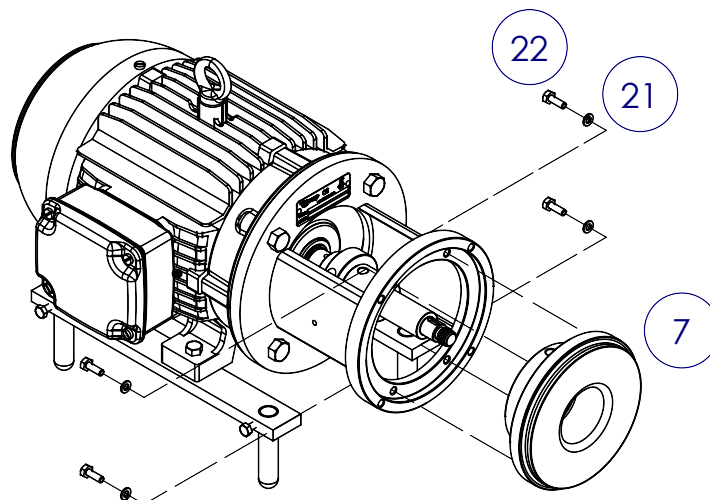


Figure E

3c. Place only the rotary holder of the mechanical seal (**6A**) together with its respective O-ring (**6H**) until it seats on the shoulder of the stub shaft. Put the impeller key (**12**) on the keyway of the stub shaft. The impeller key does not interfere with the mechanical seal rotary holder.

Take the impeller nut (**3**) and place the impeller gasket (**4**) on it, then place the impeller in the stub shaft and tighten with the impeller nut compressing the assembly. Figure F.

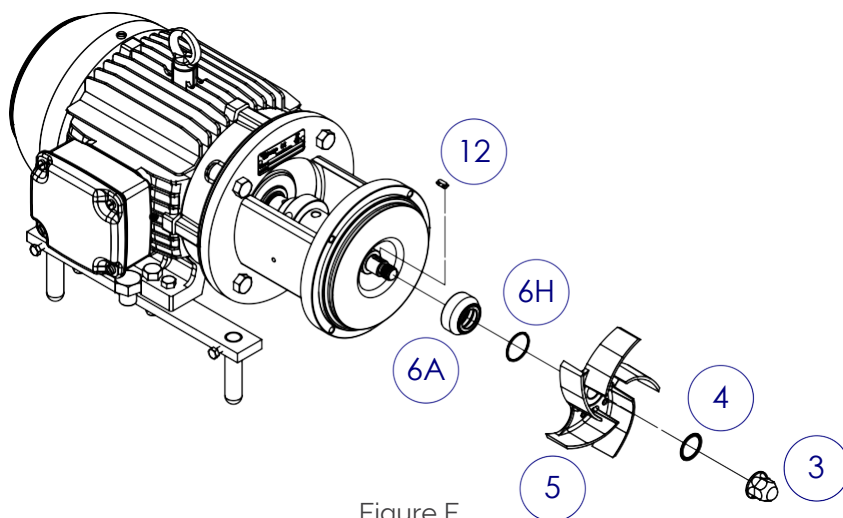


Figure F

Use a 5/8" hexagonal socket for models **114** and **214**. Use a 7/8" hexagonal socket for the rest of models to tighten the nut.

To prevent the stub shaft-impeller assembly from turning you can use a Ø3/8" rod in the bore that has the stub shaft on its side and thus be able to tighten or loosen the impeller nut. Figure G.

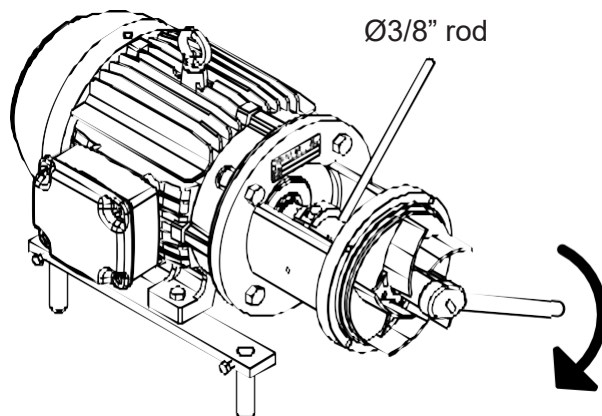


Figure G

Remember that you can use water or dishes soap to lubricate or stick the O-rings and gaskets to the metal elements to facilitate assembly.

3 d. Once the assembly is tightened, place a spacer between the back of the impeller and the front of the backplate. Use a spacer of 0.025" (0.63 mm) thru 0.030" (0.76 mm) for models **114, 214, 216 & 316**, and a spacer of 0.035" (0.89 mm) thru 0.040" (1.00 mm) for models **218, 318, 328, 428, 4410 & 6410**. You may use a caliper or some shims to set the critical distance for the correct performance of the mechanical seal. Keep aligned both, the stub shaft slot, and the collar slot before tightening the screw (or screws) on the shaft collar. Compress the impeller against the backplate with the spacer between them and proceed to tighten the screw or screws on the shaft collar. Figure H.

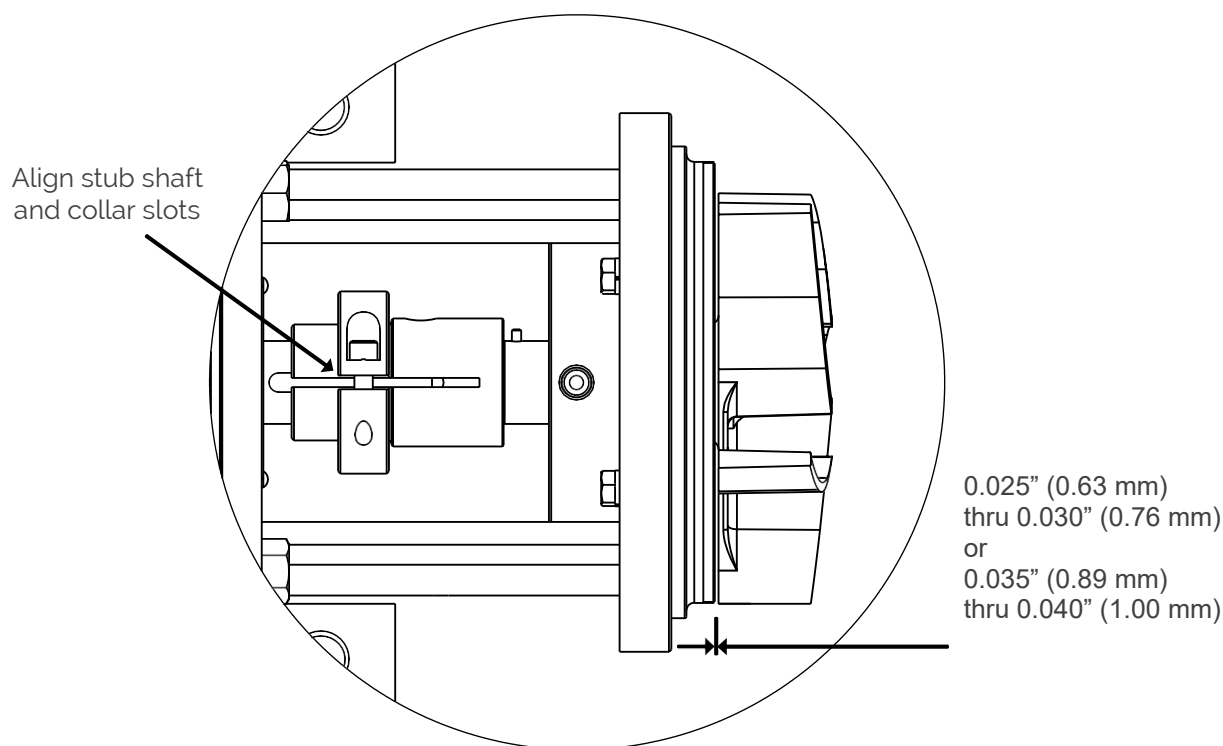


Figure H

Use the torque values shown in chart 2 to tighten the collar screws. Now turn the impeller by hand, it must turn with no restriction. Check that every blade is separated the distance indicated.

Chart 2 – Torque values for tightening the stub shaft collar Allen screws		
Torque ft-lb	Models NEMA	Models IEC
15	Frame 56 to 18	Frame 80 to 112
30	Frame 21 to 25	Frame 132 to 160
40	Frame 28 to 32	Frame 180 to 225

3 e. Use the 3/8" rod, the hexagonal socket and wrench to untighten the impeller nut in order to remove the elements previously assembled. Take the impeller nut, impeller gasket, impeller and impeller key off. Do not forget to remove also the spacer used to determinate the stub shaft position. Finally remove the backplate and continue assembling the mechanical seal (6). Figure I.

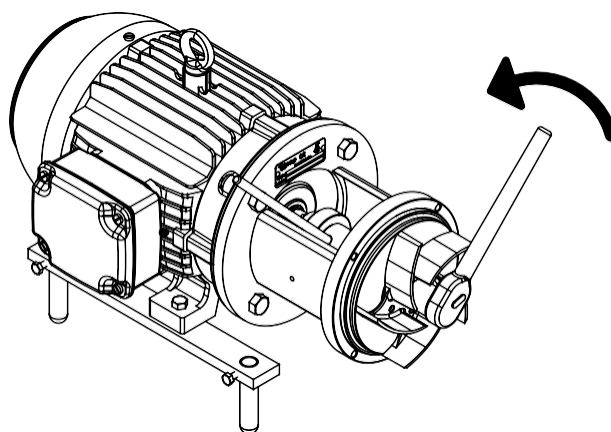


Figure I

Continue to step 4 to assemble the single mechanical seal or go to step 5 if you are going to install a double mechanical seal.

4. ASSEMBLING THE SINGLE MECHANICAL SEAL

4a. Place into the backplate seal housing the stationary face of the mechanical seal (6C) with its O-rings (6J & 6K). First place the O-ring (6J) on the stationary face groove, then the O-ring (6K) on the back. The square shape in both parts must be aligned. Push until the first O-ring fully seats in the housing. Figure J.

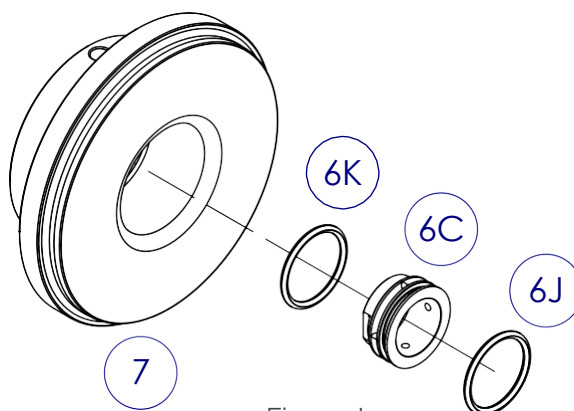
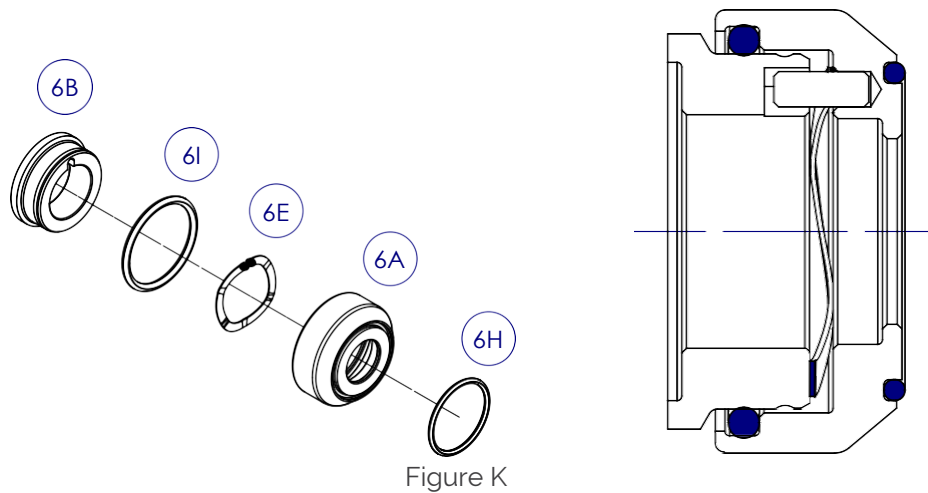


Figure J

Place and fix the backplate with the stationary seal into the adapter as in step 3b. Use torque value to fix the backplate of **6 ft.lb** for all the models. Be careful not to hit the seal with the stubshaft end.

4 b. Internal Rotary Seal Sub-Assembly

First place the spring (**6E**) into the rotary holder (**6A**), the cut side has to be centered with the pin inside the rotary holder; it is recommended to place the tips of the spring touching the rotary holder inside surface. Then place the O-ring (**6I**) in the groove on the rotary holder. Put the internal rotary seal face (**6B**) into the rotary holder. The pin must fit in the slot of the rotary seal face. Then compress until the rotary seal face is inserted. Finally place the rotary holder O-ring (**6H**) in the groove on the front of the holder. Figure K.



4c. Insert the whole rotary seal sub-assembly into the stub shaft, this will contact the stationary seal face placed previously in the backplate. Push to compress the assembly and then insert the impeller key into the stubshaft. Assemble the impeller and tight it with the impeller nut. Do not forget to place the impeller gasket into the impeller nut. Figure L.

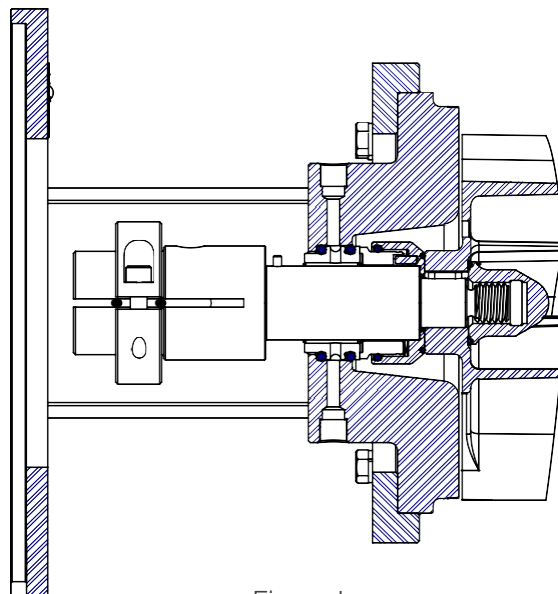


Figure L

4d. Tight the assembly as it is indicated in step **3c**. For models **114** and **214** use a torque of **25 ft.lb** and a torque of **40 ft.lb** for the rest of the models when tightening the impeller nut. Figure **M**.

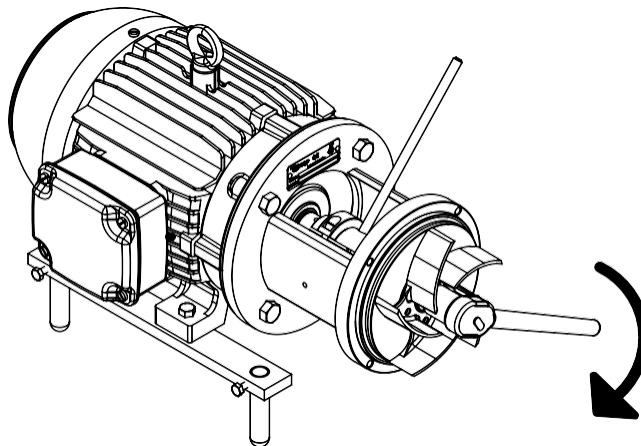


Figure **M**

5. ASSEMBLING THE DOUBLE MECHANICAL SEAL

5a. To install a double mechanical seal, you must have already performed steps **1** to **3** and continue with the following instructions.

Place the external rotary face (**6D**) with its O-ring (**6L**) and external spring (**6F**) onto the stubshaft (**10**). The stubshaft has a pin (**11**) which locks the external rotary seal of the double mechanical seal.

First insert the O-ring (**6L**) inside the rotary face (**6D**) groove, continue placing the spring (**6F**) onto the stubshaft until reaching the shaft shoulder passing the spring at the back of the pin. Finally place the rotary face and O-ring onto the stubshaft and push. The pin must fit the machined slot in the rotary seal face. Figure **N**.

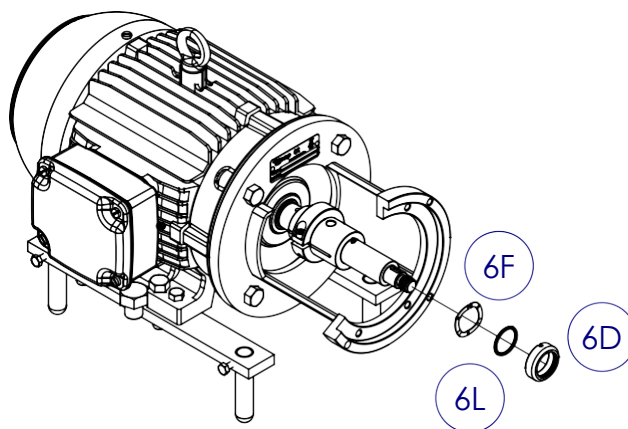


Figure **N**

5 b. Place into the backplate seal housing the stationary face of the mechanical seal (**6C**) with its O-rings (**6J** & **6K**). First place the O-ring (**6J**) on the stationary face groove, then the O-ring (**6K**) on the back. The square shape in both parts must be aligned. Push until the first O-ring fully seats on the housing. Figure O.

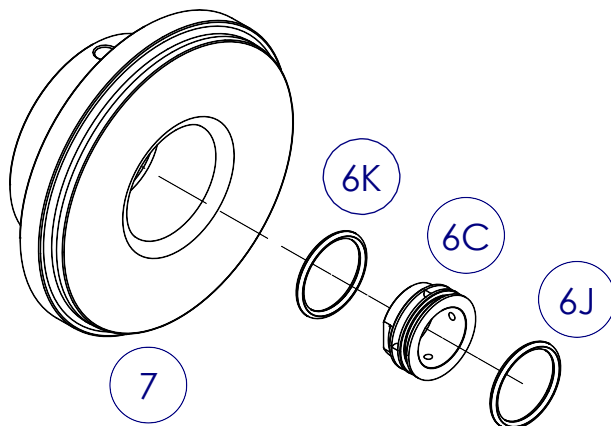


Figure O

Place and fix the backplate with the stationary seal into the adapter as in step **3b**. For all models, use the torque value of **6 ft.lb** to fix the backplate. Be careful not to hit the seal with the stubshaft end.

5c. Internal Rotary Seal Sub-Assembly

First place the spring (**6E**) into the rotary holder (**6A**), the cut side has to be centered with the pin inside the rotary holder; it is recommended to place the tips of the spring touching the rotary holder inside surface. Then place the O-ring (**6I**) in the groove on the rotary holder. Put the internal rotary seal face (**6B**) into the rotary holder. The pin must fit in the slot of the rotary seal face. Then compress until the rotary seal face is inserted. Finally place the rotary holder O-ring (**6H**) in the groove on the front of the holder. Figure P.

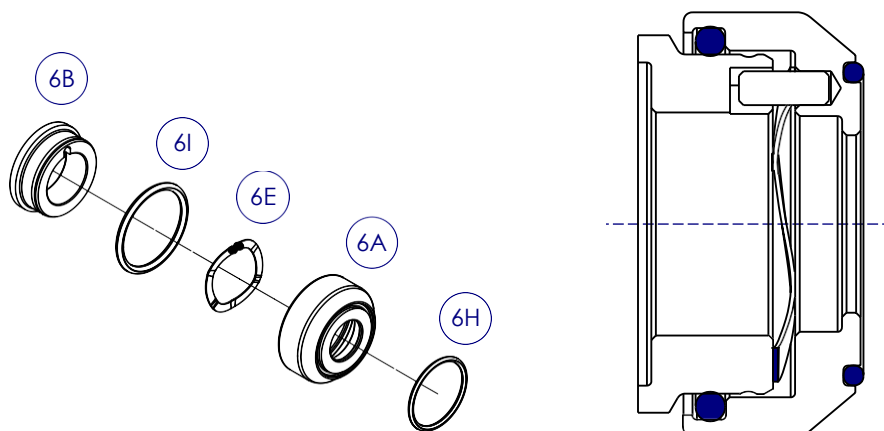


Figure P

5d. Now insert the whole rotary seal sub-assembly into the stub shaft, this will contact the stationary seal face placed previously in the backplate. Push to compress the assembly and then insert the impeller key into the stubshaft. Place the O-ring (**6G**) onto the stubshaft end; this O-ring seals between the stubshaft, the rotary holder and impeller. Now insert the impeller and tight it with the impeller nut. Do not forget to place the impeller gasket into the impeller nut. Figure Q.

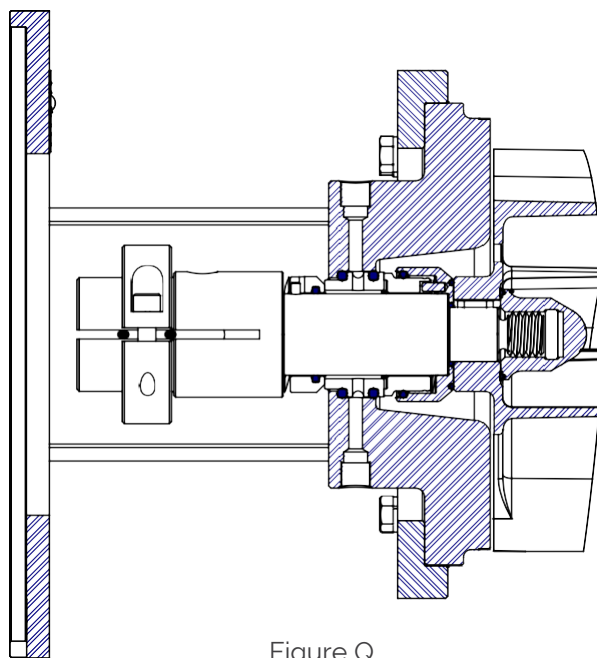


Figure Q

5e. When placing the rotary seal onto the stubshaft, it is normal to require some force to push the assembly due to the action of the two springs. Tight the assembly as it is indicated in step **3c**. For models **114** and **214** use a torque of **25 ft.lb** and a torque of **40 ft.lb** for the rest of the models when tightening the impeller nut. Figure R.

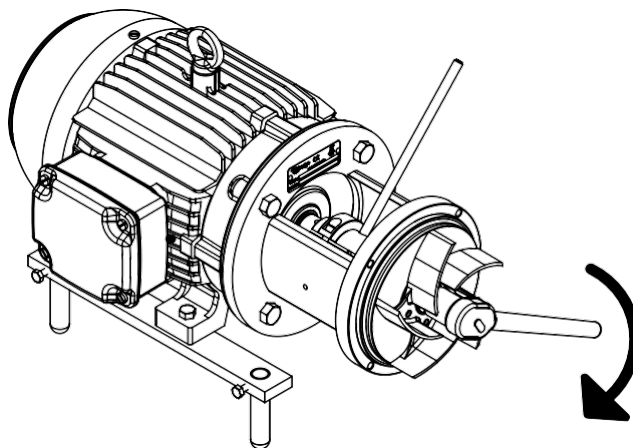


Figure R

5 f. Finally place the racor flushes (9) on to the backplate, one on top and one at the bottom. It is recommended to feed from an external line clean water to the double mechanical seal with a pressure of 10 to 15 psi maximum. Use the bottom racor as inlet and the top as outlet. Figure S.

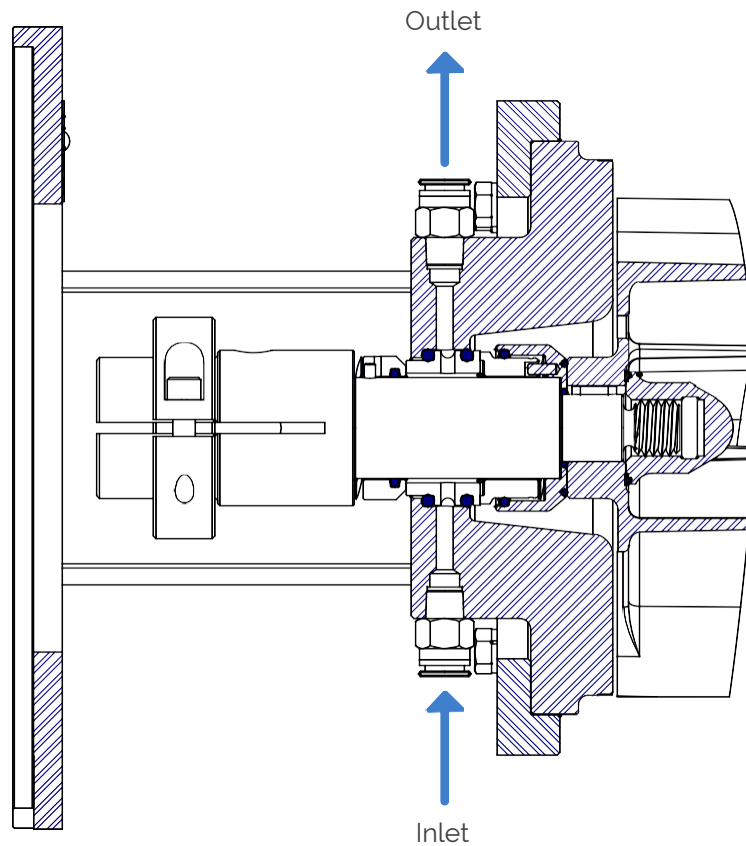


Figure S

6 . ASSEMBLING THE CASING

6a. Once the mechanical seal has been installed and the impeller and impeller nut assembly has been tightened, place the casing O-ring (2) onto the groove on the front of the backplate. Take the casing (1) and place it onto the adapter. Position the discharge at the desired location and use the four hexagonal screws (20) and washers (19) to fix the casing. Figure T.

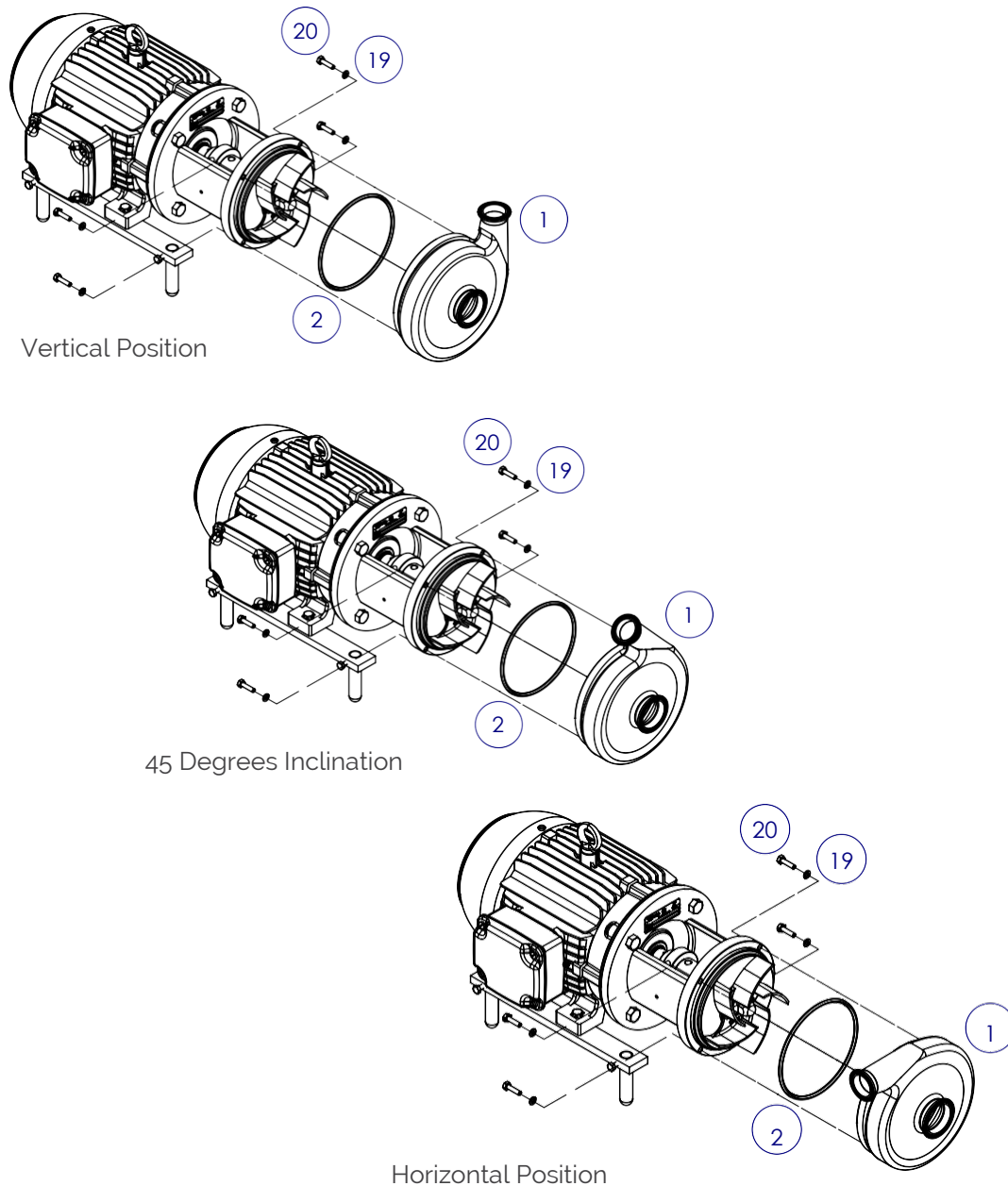


Figure T

To fix the casing use the torque value of **6 ft.lb** for models **114, 214, 216 & 316**, and **11 ft.lb** for models **218, 318, 328, 428, 4410 & 6410**.

6 b. Turning by hand the impeller, check that it does not rubs against the casing. The assembly may turn easily without restriction. If there is any sound or sensation of rubbing, you need to check the whole assembly, disassemble and start again.

6c. To complete the assembly place the protective guard (16) that is fixed with a hexagonal screw (17) into the adapter. It is highly recommended for safety reasons not to operate the equipment if the guard is not placed in the adapter. Figure U and V.

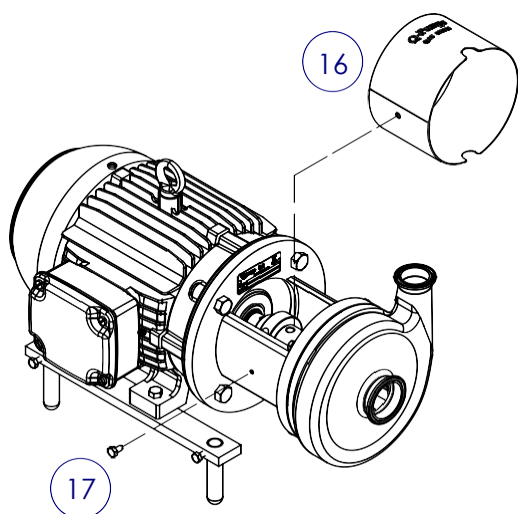


Figure U

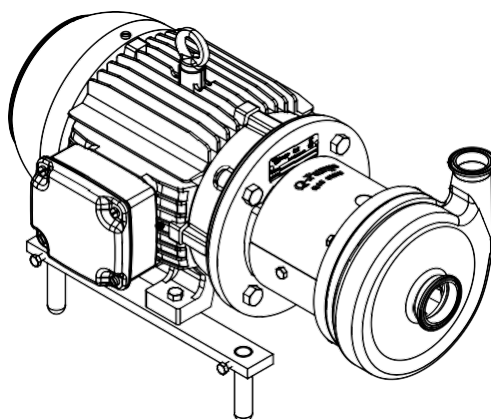


Figure V

Important Notes For Operation

Before starting the pump check that the motor turns in a counterclockwise direction. Keep the suction line flooded and the mechanical seal lubricated with the fluid which is going to be pumped. Never operate the pump when dry or it may damage the seal. Maintain enough NPSH available in the suction line to avoid the pump to cavitate. Do not support the weight of the pipe on the pump casing, the pipe must be adequately supported to avoid this.

QUICK GUIDE FOR SOLVING COMMON PROBLEMS

Viking Pump products are relatively easy to maintain with the exception of the sanitary process. Just as with any other element of machining, problems may arise. This section offers a guide for identifying and correcting the majority of the pumping problems. For problems with you motor, contact the manufacturer directly for best assistance.

The following table illustrates the problems and probable causes, assuming that the pump was correctly selected for a specific application. If none of the listed solutions provided in the table resolves the problem, the most likely cause is cavitation. Cavitation may be caused by an incorrect pump selection and its symptoms include: excessive noise, insufficient pressure, fluid leak and vibration. If these symptoms are present, please re-evaluate your application.

1. NO FLOW a) Motor speed too low. b) Incorrect rotation direction. c) Obstruction in discharge piping or closed valves.	SOLUTIONS a) Check electric connections and motor. b) Reverse one of the motors three phases. If direction does not change, contact manufacturer. c) Remove obstruction and open valves.
2. INSUFFICIENT FLOW a) Motor speed too low. b) Incorrect rotation direction. c) Obstruction in discharge piping or closed valves. d) Impeller damaged.	a) Check electric connections and motor. b) Reverse one of the motors three phases. If direction does not change, contact manufacturer. c) Remove obstruction and open valves. d) Replace impeller.
3. EXCESSIVE POWER CONSUMPTION a) Motor speed too high. b) Impeller damaged. c) Motor shaft is bended or worn.	a) Motor wires are bad, replace motor. b) Remove casing and replace impeller. c) Replace motor shaft.
4. EXCESSIVE NOISE a) Magnetic problem with motor. b) Motor bearings damaged. c) Foreign particles in impeller. d) Impeller damaged. e) Cavitation.	a) Consult motor manufacturer. b) Replace bearings. c) Remove casing and extract particles. d) Replace impeller. e) Check system's available NPSH. d) Cavitation.
5. EXCESSIVE VIBRATION a) Pump is not leveled. b) Impeller damaged. c) Piping lacks supports. d) Cavitation.	a) Level the pump. b) Replace impeller. c) Support suction and discharge piping. d) Check system's available NPSH.
6. FLUID LEAK a) Disposable o-rings. b) Disposable carbons. c) Insufficient seal compression. d) Damaged casing suction/discharge. e) Disposable casing gasket. f) Loose clamp assembly.	a) Replace o-rings. b) Replace carbons. c) Replace spring. d) Replace casing. e) Replace casing gasket. f) Tighten clamp assembly.



Operation and Maintenance Manual
Centrifugal pump
TR-C Series

vikingpump.com