

Manual with Spare Parts List

DISPAX REACTOR[®]

DR 3-6/A

MODEL: **DR 3-6/A**

SERIAL NUMBER **1071**

CAUTION: Read this manual completely before using the Dispax Reactor[®].

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2.1 I. SAFETY WARNINGS

A. General Safety

1. ALWAYS wear safety glasses when using power tools to repair this equipment.
2. When dangerous fluids are being processed through the unit, wear protective gloves, glasses, etc. when working on or around the equipment.
3. DO NOT operate a unit that is leaking, damaged, corroded or otherwise unable to contain the process fluid.
4. ALWAYS make sure safety shut-off switches, regulators, pressure relief valves, gauges, etc. are working properly before starting the unit.
5. DO NOT process incompatible fluids through the unit. Consult your distributor if you are not sure about compatibility of fluids with the wetted parts or the elastomers.
6. Before starting the unit, make certain the inlet and outlet flanges are clear and safe and that all personnel are standing at a safe distance.
7. ALWAYS disconnect power mains whenever repairing or disassembling the unit.

B. Equipment Misuse Hazard

1. General Safety - Any misuse of this equipment such as over-pressurization, modifying parts, processing incompatible fluids, or using worn or damaged parts is not recommended. Any of these circumstances could result in splashing or spraying into the eyes or skin, possible serious bodily injury, fire, explosion or property damage.
2. Noise - It is recommended that proper ear protection be worn when working near this equipment.
3. Seal Failure - When processing dangerous fluids, take all precautions necessary for containment and clean-up in case of seal or elastomer failure.
4. Installation - Never allow the piping system to be supported by the unit's inlet or outlet flanges. The flanges are not designed to support any

structural weight and failure of the unit may result. The use of flexible piping connections is highly recommended.

C. Moving Parts Hazard

The generator sets within the dispersing chamber of the unit rotate at great velocities. Therefore, keep all objects clear of the inlet and outlet flanges at all times. Never attempt to repair the unit while it is operating, otherwise serious bodily injury may occur.

D. Fire or Explosion Hazard

Static electricity can be created by the flow of fluid through the unit or by the rotating action of the generators. If the unit is not properly grounded, sparking may occur, and the system may become hazardous. Sparks can ignite fumes or vapor and cause an explosion.

If you experience static sparking or even a slight shock when operating the unit, do not continue until it is properly grounded.

Unit, valves, discharge and supply lines as well as containers must be grounded. These items must be grounded when handling flammable fluids and when static electricity discharge is a hazard.

To ground the unit, connect a ground wire to any accessible point of attachment such as the base frame.

E. Sound Level Ratings

DISPAX REACTORS® should not exceed 90 dB(A) when processing pure water. Generator configurations and process fluids will tend to vary noise level readings slightly. Readings on the units are conducted using a Simpson model 886 sound level indicator %A+ scale. Readings are made at a distance of 1 meter from the unit and 0.5 meters off the floor. It is assumed that the unit will be installed at floor level.

F. Temperature Limitations

Maximum temperature limitations are based on mechanical stress only. Certain chemicals will reduce the maximum safe operating temperatures of DISPAX REACTORS®. Consult the supplier for compatibility and temperature limits.

The limiting factor on operating temperatures for DISPAX REACTORS® is the material of the o-rings in both the seal and the unit. Failure of the o-rings should occur before any damage is done to the seal faces, wetted parts, etc..

Temperature Limits of Various Elastomer Types:

Viton®:	-40°F (-40°C) to 350°F (176°C)
Teflon®:	40°F (4°C) to 220°F (105°C)
TES:	40°F (4°C) to 220°F (105°C)
Kalrez®:	-40°F (-40°C) to 500°F (260°C)
EPR:	-70°F (-57°C) to 275°F (135°C)

2.2 II. DESCRIPTION

The DISPAX REACTOR®, DR 3-6/A, is a high shear, high-speed disperser designed for in-line use. The unit is designed to create emulsions and suspensions in pilot plant/small production systems.

The machine is constructed in three sections:

A. Unit Drive

The standard unit consists of a 5 HP or 7.5 HP, 3-phase, 3600 RPM motor (other configurations are available). Through a gearbox system, the motor turns a driveshaft to approximately 8000 RPM.

2.2.1 Seal Housing

The seal housing contains alignment bearings and the double mechanical seal assembly. The latter is designed to isolate the drive and bearing items from the customer's process fluid.

2.2.2 Dispersing chamber

The jacketed, cylindrical housing contains the three (3) rotor/stator generators and spacers, which, with rotors turning at 8000 RPM, develop the turbulence necessary to achieve the desired mixing results. The inlet/outlet flanges are also part of the Dispersing chamber assembly.

NOTE: The machine may only be used with fluids that are free flowing and are able to be pumped.

This DISPAX REACTOR® unit will operate with process fluids that are fed at pressures UP TO approximately 4.5 Bar, or 65 psig, at the unit's inlet. Since the unit does not develop inlet suction, it must be provided with sufficient positive flow, either by a gravity fed system, or by a positive displacement pump. Centrifugal pumps, while they have been used successfully in the past, are not recommended since system back pressure may adversely affect flow rate and overall pump performance.

If this machine is gravity fed, it will develop various levels of discharge pressure. These levels depend on the following: back pressure (head), fluid viscosity, and fluid behavior under high shear. In short, if specific flow rates (GPM) are required - a positive displacement pump should be installed ahead or upstream of the unit at a minimum distance of approximately 10 pipe diameters.

The design flow rates published, for the various generator combinations available, are based on water (cP=1), gravity fed with no backpressure.

III. COMMISSIONING THE UNIT FOR OPERATION

See Unit Assembly Drawing

A. *Foundation and Piping Connections*

The DISPAX REACTOR® may be supplied with several different baseframes, some with casters and handles for mobility. The unit may also be mounted to any firm, level surface using the bolt holes on the lower frame of the motor, itself.

Connect plant inlet/outlet piping as part of the required process scheme. Make every attempt to use pipe IDs which correspond to the inlet/outlet flange IDs (check parts list in this manual to determine flange IDs). Radically dissimilar IDs may result in improper fluid flow through the unit.

B. *Mechanical Seal Assembly*

The mechanical seal assembly is the most vulnerable part of this, or any other, high-speed mechanical device. While the machine is in operation, the seal must be cooled and pressurized. Water, or any suitable free-flowing heat transfer liquid, compatible with the process fluid, may be used. Make sure that the coolant is solids-free. If plant-cooling water is used, and chlorine is used to treat this water for bacterial or slime control, please consult the supplier before operating the unit. Do not use de-ionized water if possible. If this is unavoidable, please consult the supplier. Well-water hardness may also affect the seal. In short, softened water is recommended.

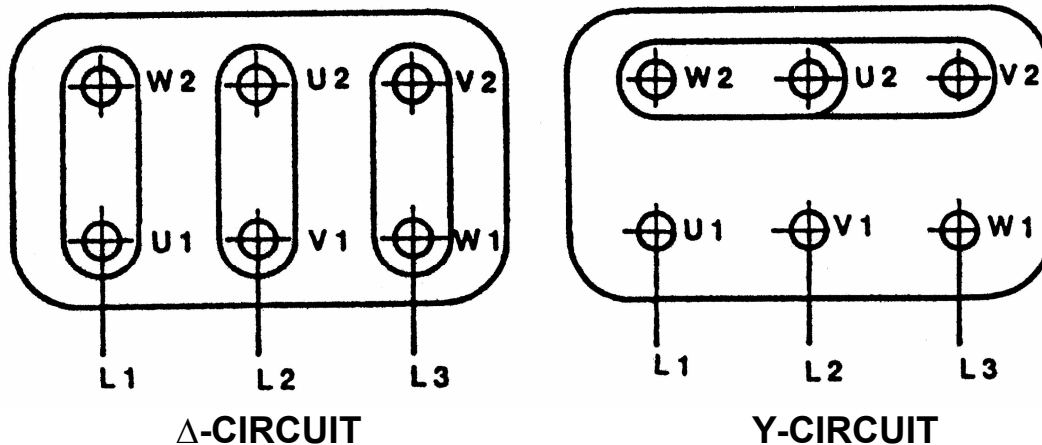
Connect metal tubing to the ¼ inch seal ports (59, 35). Coolant inlet should be the lower of the two ports. This eliminates trapped air bubbles in the seal housing. Copper or stainless steel tubing should be used. The coolant flow must be at least 20-30 psig higher than the inlet pressure of the process fluid. Further, the coolant pressure must be measured at the seal outlet (i.e.: seal backpressure is used as a standard). The seal in the DR 3-6/A can withstand up to 90 psig - therefore, maximum process fluid inlet pressure is 90-20=70 psig, but maximum 60 psig is preferable (90-30=60 psig). Should higher pressures be required, a DR 3-6/6P unit should be used instead. If so, consult your IKA Sales Engineer.

NOTE: Coolant flowrate should be about 0.5 - 1.0 gpm. As an option, thermosyphon seal cooling systems are available at an additional cost. Contact IKA® Works, Inc. for more information.

C. POWER SUPPLY

The user is responsible for connecting the power supply to the DISPAX REACTOR®. The DISPAX REACTOR® is supplied without cables and switches. Please use the wiring diagram from the illustration on page 9, as well as the note in the terminal box of the motor as a guide to connecting the machine to its power supply.

CAUTION: Trained personnel should only perform the electrical connection of the machine. The connection of the machine must correspond to any applicable standards for the country where the machine is located. When connecting the motor, ensure that the motor voltage and power supply are identical. The motor voltage can be found on the identification plate of the motor.



The connections shown in the figure above are the standard connections. Please compare these with those in the terminal box on the motor. Since there are also special motors available, the wiring diagram in the terminal box should always be followed over those in this manual, if different.

CAUTION: Quickly “bump” on the power supply to the motor to determine if the motor is turning in the proper direction according to the tag on the fan cover (5).

D. Activating the System

Once all connections have been made and the machine has been secured, begin the seal coolant flow and activate the motor. The unit can now accept the process fluid flow.

3 NOTE: Starting the DISPAX REACTOR® with process fluid already present in the chamber can be very straining on the unit’s driveshaft, especially if the process fluid is very viscous. If this situation is unavoidable, a slow motor start device should be considered for use. Contact IKA Works, Inc. for more information.

While this unit is designed to process fluids at approximately 10 gpm, a flowrate range of approximately 7-12 gpm is acceptable, depending on fluid viscosity and flow behavior.

NOTES:

1. Never operate the unit without proper seal cooling
2. Never operate the unit unless the proper oil level is maintained.
3. Operate the motor only when rotating in the proper direction.

4. **Take all precautions (including the use of screens) to insure that foreign objects do not flow into the dispersing chamber.**

IV. MAINTENANCE

A. Gear and Bearings

3.1.1.1.1 See Unit Assembly Drawing

As this is a high speed gearing, it is recommended that the gearbox lubricant be changed after the first 300-400 hours of operation. To do this, first shut off and/or lock out the power supply, and then follow the directions below.

1. Loosen and remove the ventilation filter screw (43).
2. Loosen and remove the oil drain plug (11). Oil should flow freely.
3. Replace and tighten the drain plug (11).
4. Refill the gearbox with standard HP oil (30W may be used). The gearbox should be filled until the oil reaches halfway up the sight glass (15).

After the first 800 operating hours, the roller bearings (47, 51, 67) should be cleaned and greased, using grease with a drop point of 150° C, or better. Please refer to Section V - %Assembly/Disassembly+below for instructions.

B. Mechanical Seal

3.1.1.1.2 See Double Mechanical Seal Drawing

The double mechanical seal assembly should be checked approximately once every two (2) months (more often if abrasive materials are being processed). Clean all parts and check for any wear. However, do not clean seal parts with solvents without consulting your IKA® Sales Engineer.

For best results - after each production run, let the dispersing chamber drain and dry, but maintain seal coolant flow for 3-5 minutes. This will remove any residual heat from the seal and flush any solids that may have entered the seal.

Should the inspection reveal worn or cracked seal faces, replace the damaged parts. Do not reuse damaged faces, as leaking may occur.

NOTE: A leaking seal does not always indicate damaged parts. Disassemble the seal, clean all parts, and reassemble. If leakage continues, it may be necessary to replace some of the parts, however, a seal failure may not necessitate replacement of the entire seal assembly.

C. Rotor/Stator Generators

3.1.1.1.3 See Unit Assembly Drawing, pos. 60 -65

Considering the precision (and expense) of these items, do the following:

1. After a process run, flush the unit with water or appropriate cleaner, doing this while the unit is running will effectively clean the generators. This operation is essential if the process fluid tends to solidify or ~~set-up~~.
2. Preventing foreign objects from entering the dispersing chamber is the most effective way of protecting the generators. This is especially important with new piping/process systems that may contain weld slag, construction debris, etc.

3.2 V. ASSEMBLY/DISASSEMBLY

3.2.1.1.1.1 See Unit Assembly and Double Mechanical Seal Drawings

NOTE: Before proceeding, disconnect or lock out electrical supply.

A. Exchange of Generators

Each rotor/stator set is interchangeable in position within the dispersing chamber.

1. Disconnect inlet process piping.
2. Loosen and remove the four cap nuts and washers (Unit Assembly Drawing, pos. 34, 33) and remove the inlet flange (56).
3. Slide off the cooling jacket cylinder (57).
4. Loosen and remove the grease fitting (50) and rotate the shaft until the bore hole appears. Insert a metal rod through the hole to secure the drive shaft. Loosen and remove the cap nut and washer (31, 32) found on the end of the drive shaft (29).

5. Carefully remove the first stator (65), rotor (64), and rotor distance spacer (27).
6. Follow step 5 until the other two sets of generators have been removed.
7. Remove the stator distance spacer (26).

Assemble in reverse order.

B. Exchange or Inspection of the Mechanical Seal

1. Follow steps IV.A.1-7 above.
2. If necessary, loosen and remove coolant inlet and outlet ports from the unit housing (Unit Assembly Drawing, pos. 59, 35).
3. Loosen and remove the four hex head screws and washers (20, 19).
4. Slide off the dispersing chamber (55).
5. Loosen and remove the four slotted screws (22).
6. Remove the seal cover (21).
7. Remove the counter slip ring and the O-ring (Seal Assembly drawing, pos. 14,15) from the seal cover (Unit Assembly drawing, pos. 21).
8. Remove the remaining items (refer to Seal Assembly drawing, pos. 1, 2, 3, 4, 5, 6, 9, 11) from the dispersing chamber (Unit Assembly drawing, pos. 55).

Assemble in reverse order. If the process fluid is changed, consider whether the seal faces and O-rings are still suitable. If in doubt, contact the supplier or check the seal materials on other devices in the plant.

C. Disassembly/Assembly of the Gearbox and Shaft

3.2.1.1.1.1.1 See Unit Assembly Drawing

1. Follow steps IV.A.1-7, and IV.B.1-8, above.
2. Drain oil from gearbox (see Maintenance section).

3. Loosen and remove the four socket head screws and washers (Unit Assembly Drawing, pos. 6, 7, 8) and remove gearbox housing completely from the motor.

Before attempting further work, take the complete assembly (gearbox, shaft, bearings, etc.) to a clean workbench area. This will facilitate further disassembly described in the remaining steps.

4. Remove the retaining ring (53), using retaining ring pliers.
5. Remove the nilos ring (68).
6. Remove the bearing distance spacer (49).
7. Remove the retaining ring (52).
8. Replace the cap nut (32) on the ~~front~~ end of the drive shaft. Using a rubber-coated mallet, carefully tap the drive shaft in the direction towards the motor end. When loose, pull the shaft out, leaving both ~~front~~ ball bearings (51, 67) in place.
9. Remove bearing (51).
10. Remove the bearing distance spacer (46).
11. Remove both disc springs (66). Note the relative position of these springs. They contact each other apex-to-apex. They will eventually be reassembled in the same relative positions.
12. Remove the bearing (67).
13. From the drive shaft, remove the hex nut (39), lock washer (40), and flat washer (41).
14. Remove the small pinion gear (13) and the key (42).
15. Remove the rotary shaft seal (44).
16. Remove the retaining ring (45). Slide off the bearing (47).

Reassembly: keep the cap nut (32) attached to the shaft.

1. Slide bearing (67) onto the shaft - Note: all ball bearings should have their ~~back~~ face towards the dispersing chamber.
2. Screw the hex nut (39) onto the motor end of the shaft.

3. After placing small block of wood, etc., on table, place gearbox over it (shaft well facing vertical) and then slide the shaft with the bearing (67) down through the well until it comes to rest.
4. Replace both disc springs (66), apex-to-apex, down the shaft.
5. Press down on springs and attach spacer ring (46).
6. Slide on bearing (51) and retaining ring (52) in the groove cut into the gearbox housing.
7. Replace the bearing distance spacer (49) and retaining ring (52).
8. Replace the nilos ring (68).
9. Replace the retaining ring (53).
10. Moving to the ~~back~~ back of the unit (lift up gearbox to horizontal), replace the bearing (47) - remove the hex nut (39) for convenience.
11. Set the retaining ring (45), and rotary shaft seal (44).
12. Insert key (42) and slide on the small pinion gear (13), followed by the flat washer (41), and the lock washer (40).
13. Finally, replace and tighten the hex nut (39). After attaching gearbox to motor, refill with oil.

NOTE: The parts above are made for a “tight” fit. A little Silicon grease may be used to make the parts slide easier.

CAUTION: While firmness may be required, never use excessive force or use a tool that may damage the parts.

3.3

3.4

3.5

3.6 VI. ORDERING SPARE PARTS

When ordering spare parts, it is necessary to include the following information:

- A. Unit model, i.e. DR 3-6/A
- B. Unit Serial number.
- C. Drawing, position number and description of part(s) required.

Example:

For DISPAX REACTOR®, DR 3-6/A, serial no. 2212, one rotor, P001829, as per drawing P000296, position 60.

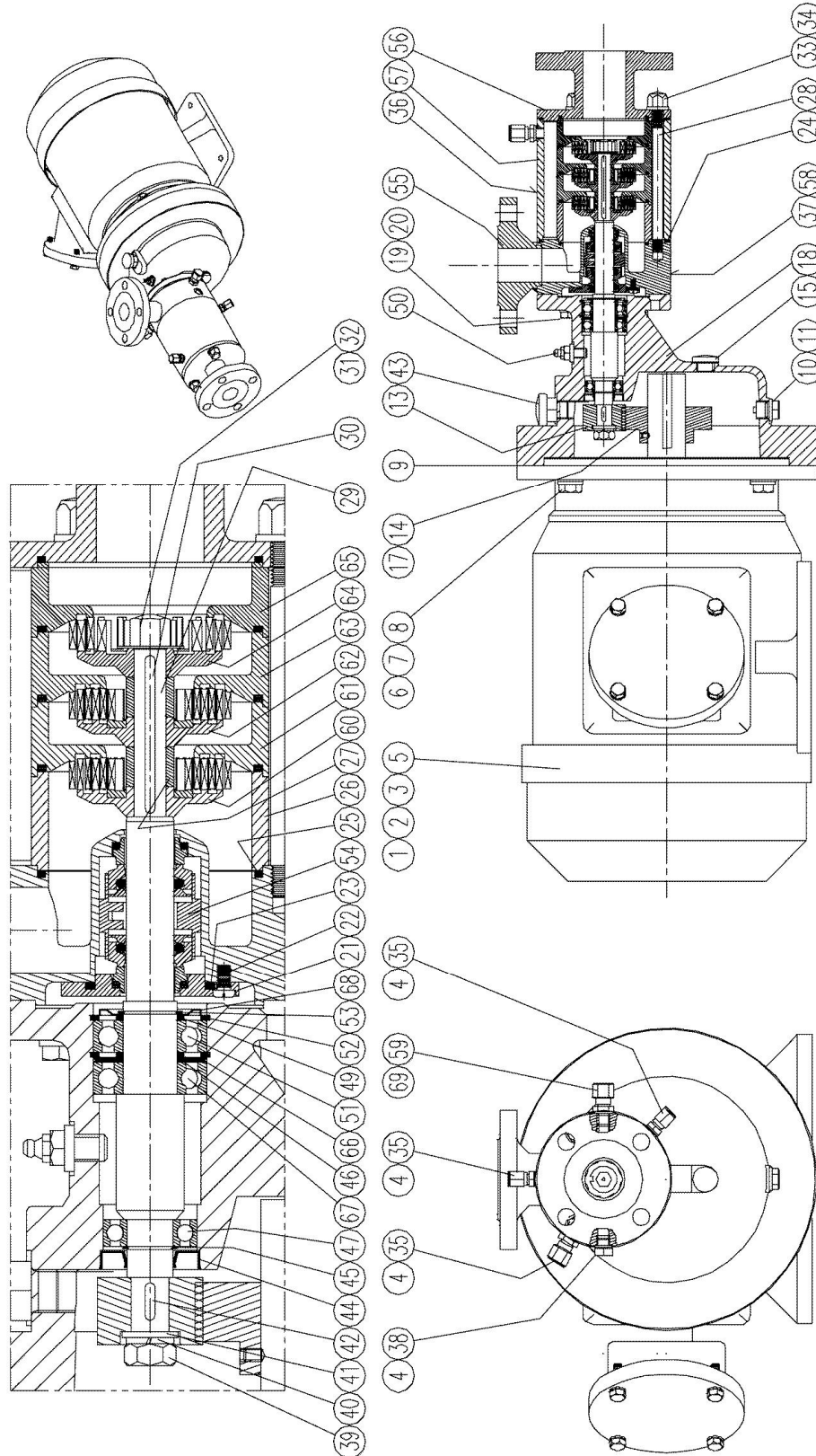
VII. APPENDICES

- A. DR 3-6/A Unit Assembly Print . **P000296**
- B. DR 3-6/A Spare Parts List . **P006216**
- C. DR 3-6/A Unit Installation Print . **P002351**
- D. Flange Adapter Parts List . **P002267**
- E. Flange Adapter Assembly Print. **P002267**
- F. R4269/18 Mechanical Seal Assembly Print . **P000325**
- G. R4269/18 Mechanical Seal Parts List . **P004156**

- H. *Miscellaneous Product Information*

3.6.1.1.1.1.1.1 DR 3-6/A Unit Assembly Print – P000296

3.6.1.1.1.



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DR 3-6/A Spare Parts List – P000296

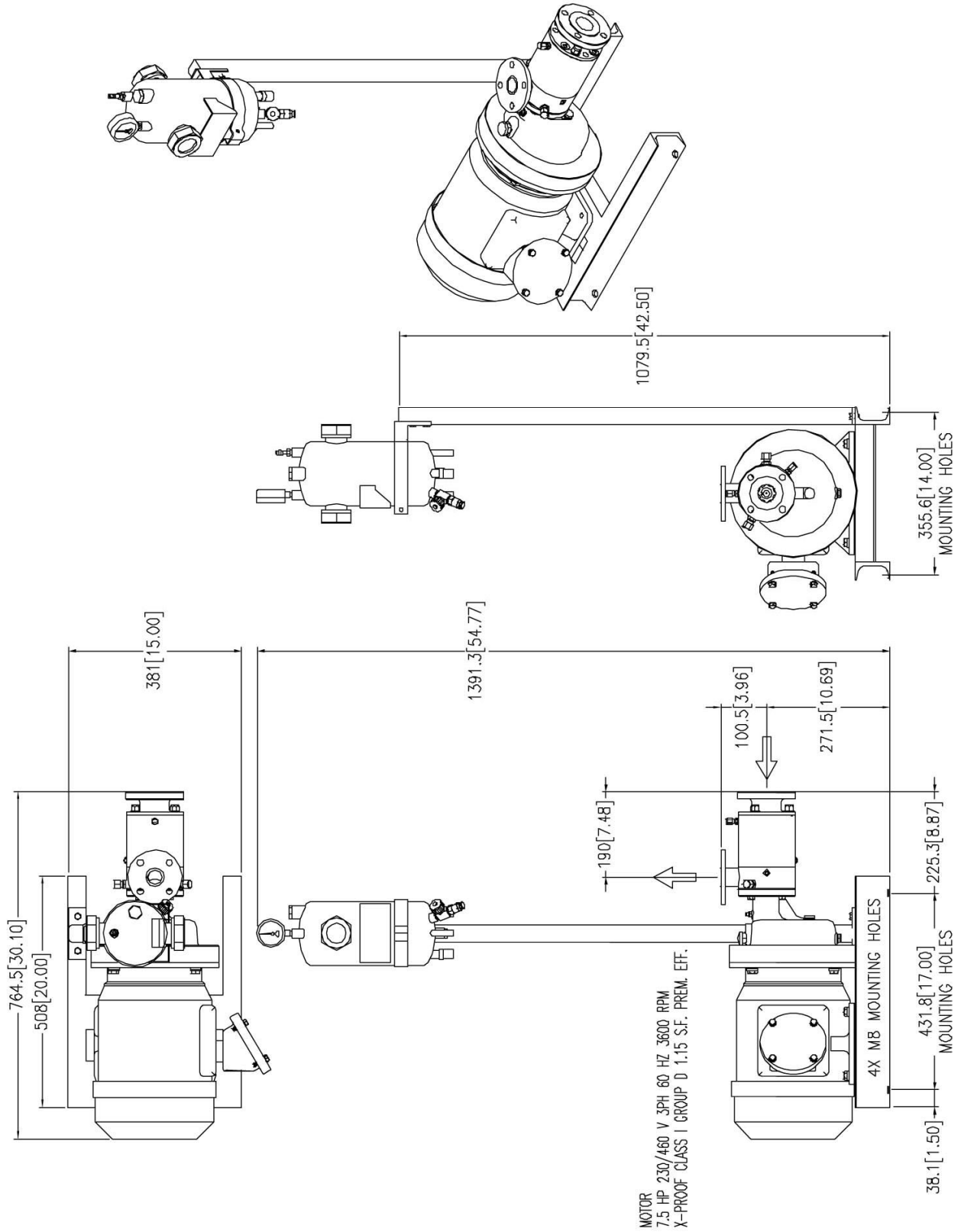
Pos	s/a/i	Part .	Qty	Description
1	s	P000576		MOT,7.5HP,213TC,230-460/3/60
2	s	P001067	1	LABEL,SERIAL NO,DISPAX REACTOR
3	s	P001070	1	LABEL,PROCESSING EQUIP,IKA WORKS
4	s	P001005	5	GASKET,COP,10X13.5X1,M10
5	s	P001066	1	LABEL,DIRECTION ARROW
7	a	P002267	1	FLG,ADPTR,ASSY,213-256TC/184-215TD
8	s	P001393	4	SCREW,SHC,304SS,M12X30
10	s	P001011	2	GASKET,COP,16X20X1.5,M16
11	s	P001330	1	FTG,PIPE,PLUG,HHC,ZINC,MAG,M16X1.5
13	s	R04-02252	1	GEAR,PINION,3600RPM,DR3-6,UTL60
14	s	R04-02466	1	GEAR,DR,1.375IN,3600RPM,DR3-6,UTL60
15	s	R02-08792	1	GLASS,OIL LVL,PLSTC,M16X1.5,W/ GSKT
17	s	P001427	1	SCREW,SKT SET,CUP PT,BLK STL,M6X10
18	s	P001031	1	GEARBOX,DR3-6A
19	s	P001587	4	WASHER,SPR LOCK,304SS,M8
20	s	P001376	4	SCREW,HHC,304SS,M8X25
21	s	R04-03329	1	COVER,SEAL,DR3-6A,UTL60
22	s	P001433	4	SCREW,SLTD CHSE HD,304SS,M5X10
23	s	P001185	1	O-RING,TES,42X3
24	s	P001160	2	O-RING,TES,116X3
25	s	P001193	5	O-RING,TES,78X3
26	s	P002481	1	SPACER,STATOR DISTANCE,DR3-6A,316SS
27	s	P000280	2	SPACER,ROTOR DISTANCE,DR3-6,316SS
28	s	P001544	3	STUD,316SS,M10X130(142),DR3-6A
29	s	P000047	1	SHAFT,DRIVE,DR3-6A
30	s	P001052	1	KEY,PARALLEL,CS,5X5X14
31	s	P001580	4	WASHER,FLAT,304SS,M8
31	s	P002918		WASHER,FLAT,C276,M8
32	s	P001078	1	NUT,HEX CAP,316SS,M8
33	s	P001593	3	WASHER,SEALING,THREAD,M10X18X1.5
34	s	P001073	3	NUT,HEX CAP,316SS,M10
35	s	P000395	1	FTG,TB,CONN,SS,6MMXM10 M
35		P000971	2	FTG,TB,CONN,SS,1/4INXM10X1MM,SPCL
36	s	P001065	1	LABEL,ATTENTION,PRESSURIZE SEAL
37	s	P001069	1	LABEL,OUTLET,SEALING-FLUID
38	s	P001325	2	FTG,PIPE,PLUG,HHC,SS,M10X1
39	s	P001079	1	NUT,HEX,304SS,M10
40	s	P001584	1	WASHER,SPR LOCK,304SS,M10
41	s	P001573	1	WASHER,FLAT,304SS,M10
42	s	P001052	1	KEY,PARALLEL,316SS,5X5X14
43	s	R01-05036	1	SCREW,VENTILATION FILTER,CS,M16X1.5
44	s	P001500	1	SEAL,RDL SFT,NBR,17X37X7

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45	s	P001335	1	RING,RTNG,EXT,BLK SPR STL,17X1
46	s	R30-05744	1	SPACER,BRG DIST,CS,20X25X3.5,DR3-6A
47	s	P000784	1	BEARING,BALL,17X35X10
49	s	R30-05745	1	SPACER,BRG DIST,CS,20X25X2.0,DR3-6A
50	s	R01-00127	1	FTG,GREASE,ZINC PLD,M12X1,FORM A
51	s	P000788	1	BEARING,BALL,1XPLSTC SHLD,20X42X12
52	s	P001342	2	RING,RTNG,INT,BLK SPR STL,42X1.75
53	s	P001336	1	RING,RTNG,EXT,BLK SPR STL,20X1.2
54	a	P004156		SEAL,DM,R4269/18,U20U20KGG-S17A0
55	s	P000825	1	CHAMBER,DISP,1.5IN S-FTG,DR3-6A
56	s	P000949	1	FLG,INLET,1.5IN,S-FTG,DR3-6A
57	s	R30-03307	1	JACKET,THERMAL,DR3-6A
58	s	P001068	1	LABEL,INLET,SEALING-FLUID
59	s	P000396	1	FTG,TB,CONN,SS,8MMXM12 M
60	s	P000340	1	ROTOR,SUPFINE,316SS,DR3-6
61	s	P000354	1	STATOR,SUPFINE,316SS,DR3-6
62	s	P000340	1	ROTOR,SUPFINE,316SS,DR3-6
63	s	P000354	1	STATOR,SUPFINE,316SS,DR3-6
64	s	P000340	1	ROTOR,SUPFINE,316SS,DR3-6
65	s	P000354	1	STATOR,SUPFINE,316SS,DR3-6
66	s	P000837	2	DISK,CONICAL SPRING,K6302
67	s	P000791	1	BEARING,BALL,20X42X12
68	s	R30-08781	1	RING,NILOS,20X38,6004 AV
69	s	P001007	1	GASKET,COP,12X16X1.5,M12

DR 3-6/A Unit Installation Print . P002351



IKA® Works, Inc.

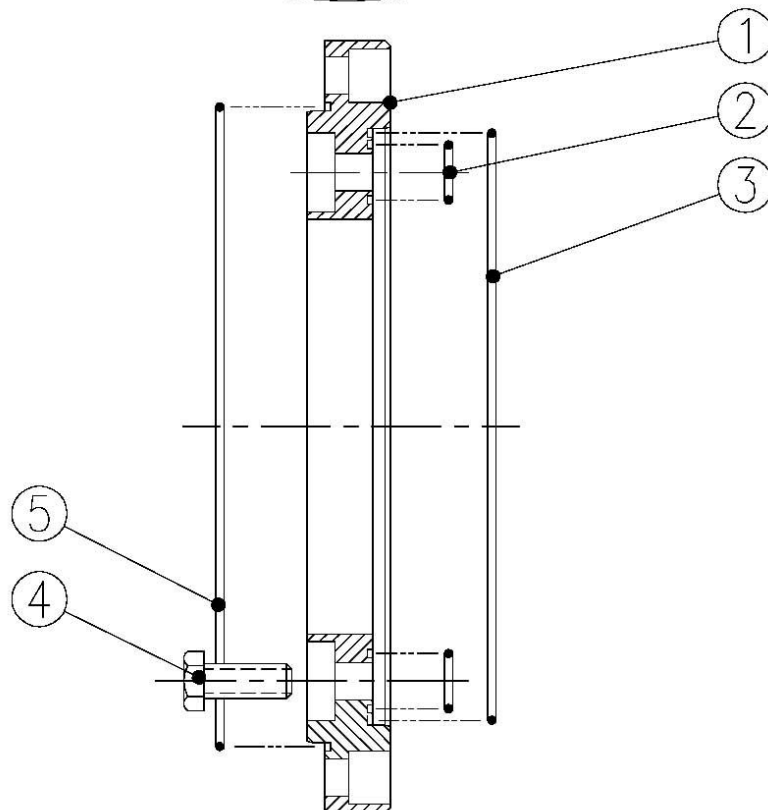
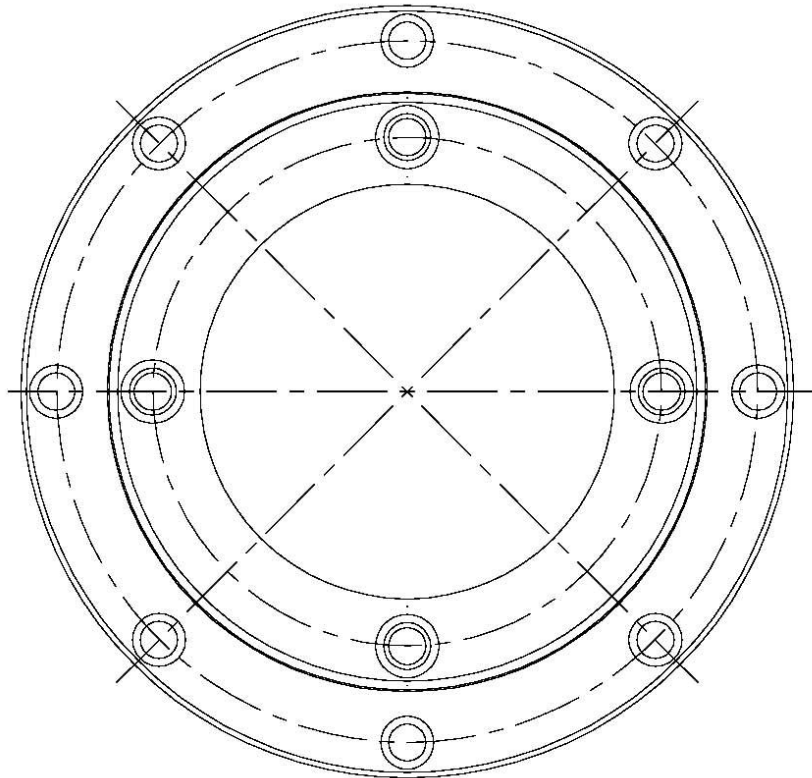
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3.6.1.1.1.1.1.3 FLG Adapter Parts List P002267

Pos	s/a/i	R	Part #	Qt.	Description	Class
1	s		P002479	1	FLG,ADPTR,213-256TC TO 184-215TD	
2	s		P002258	4	O-RING,VITON,17.12X2.62	
3	s		P002268	1	O-RING,VITON,209.5X3	
4	s		P000161	4	SCRW,SEALING,304SS,1/2INNCX1.25	VITON SEALS
5	s		P000167	1	O-RING,VITON,228.27X2.62	
	i	R	P002267	1	FLANGE ADAPTER ASSEMBLY DRWG	

3.6.1.1.1.1.1.4

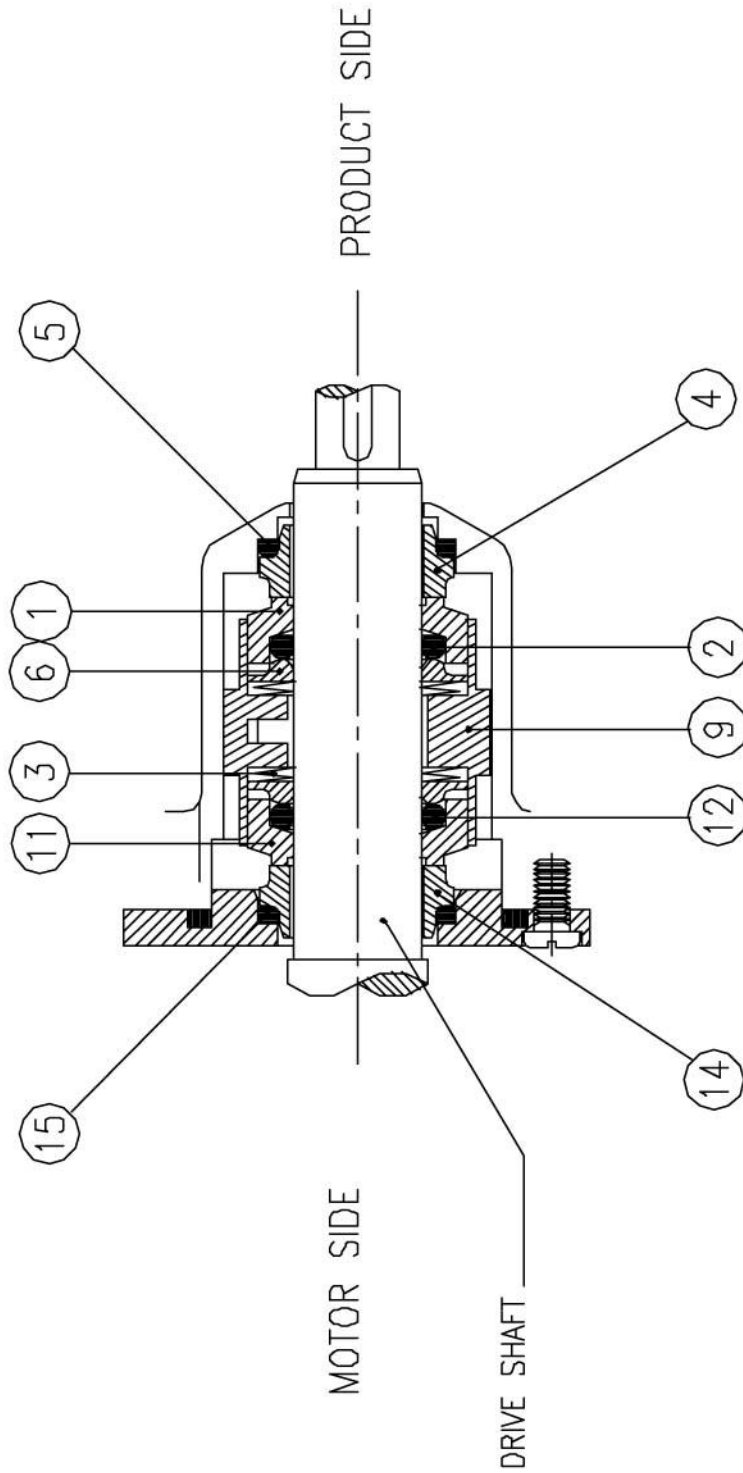
Flange Adapter Assembly Print. P002267



3.6.1.1.1.1.1.5

R4269/18 Mechanical Seal Assembly Print – P000325

3.6.1.1.1.1.1.6



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Mechanical Seal Parts List P004156

Pos	s/a/i	R	Part #	Qt.	Description	Class
1	s		P000881	1	FACE,SEAL,RTG,U20,R4269/18	Tungsten Carbide
2	s		P001260	1	O-RING,VITON,18X3.5	
2	s		P001101	1	O-RING,KALREZ,18.64X3.53	
3	s		P001524	8	SPRING,HLCL,G30,R4269/18	
4	s		P000921	1	FACE,SEAL,STA,U20,R4269/18	Tungsten Carbide
5	s		P001103	1	O-RING,KALREZ,21.82X3.53	
6	s		P000845	2	DISK,PRESSURE,316SS,R4269/18	
9	s		P000811	1	CARTRIDGE,RH FINS,316SS,R4269/18	
11	s		P000850	1	FACE,SEAL,RTG,A01,R4269/18	Carbon
12	s		P001101	1	O-RING,KALREZ,18.64X3.53	
14	s		P000912	1	FACE,SEAL,STA,S17,R4269/18	Chromium
15	s		P001103	1	O-RING,KALREZ,21.82X3.53	