KINNEY®

Kinney®
Dry Vacuum Pump

Manual 1861 Rev D p/n 001861 0000

WARNING: Do Not Operate Before Reading Manual

SDV Series
OPERATOR'S MANUAL

Models

SDV-120 SDV-320 SDV-800
SDV-200 SDV-430 SDV-1500 SDV-2700

Operator's Manual: SDV Series Dry Vacuum Pump

800.825.6937 | www.md-kinney.com

Original Instructions

Disclaimer Statement:
All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. Products are under a continuous improvement policy. Thus, information, illustrations and/or specifications to explain and or exemplify a product, service or maintenance improvement may be changed at any time without notice.

Product information and specifications subject to change.

Table of Contents

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01

INTRODUCTION

CONGRATULATIONS on the purchase of a new **SDV Dry Vacuum Pump from Kinney®**. Please examine the pump for shipping damage, and if any damage is found, report it immediately to the carrier. If the pump is to be installed at a later date, make sure it is stored in a clean, dry location and rotated regularly. Make sure covers are kept on all openings. If the pump is stored outdoors, be sure to protect it from weather and corrosion.

Kinney SDV vacuum pumps are built to exacting standards and, if properly installed and maintained, will provide many years of reliable service. Read and follow every step of these instructions when installing and maintaining the pump.

⚠ WARNING

Serious injury can result from operating or repairing this machine without first reading the service manual and taking adequate safety precautions.

NOTE: Record the pump model and serial numbers in the OPERATING DATA form on the inside of the back cover of this manual. Use this identification on any replacement part orders, or if service or application assistance is required.

This manual provides instructions and precautions for handling and maintenance of the Kinney SDV Dry Vacuum Pump. For best pump life longevity, read this manual carefully before installing, operating, or servicing the pump.

PRINCIPLE OF OPERATION

The SDV Dry Screw Vacuum Pump is a single-stage, dry running, non-contact, variable-pitch screw type vacuum pump.

The design principle of the SDV is simple. Two parallel variable-pitch screws, having a highly sophisticated surface profile consisting of an Archimedean and Quimby curve and an arc, rotate in opposite directions. Drive shaft rotation is CW when viewed from the motor end (drive end) of the pump. Helical-cut timing gears position these screws relative to each other.

The pumped gas is compressed into the discharged port by the rotation of the screws. A specific amount of clearance for each pump size is maintained between the two screws and between the screws and housing, which avoids metal-to-metal contact. The power of the motor is transmitted to the main shaft through a coupling or belt pulley.

Because the SDV has a variable-pitch screw design, the compression process is more efficient and the pump runs cooler.

For simplicity and space saving, models SDV-120 through SDV-800 are provided as standard with flanged adapters for mounting a C-flange motor directly to the vacuum pump, eliminating the need for a separate base frame–mounted assembly and coupling guard for the vacuum pumps.

The power of the motor is transmitted to the drive screw shaft through a V-pulley or a coupling, and further transmitted to the driven screw shaft through the timing gears.

CONSTRUCTION

Timing Gear

The timing gear is an important part of the screw vacuum pump. The tooth surface is heat-cured and polished with a special high-precision tooth-polishing machine for reduced noise during pump operation.

Bearings

The bearings on the fixed side of the SDV pump (discharge end) are angular-contact ball bearings. The bearings on the expansion side (inlet end) are roller bearings with heavy load capacity. These bearings have been designed to withstand high-speed, heavy-load service and to preserve the clearances between gears and between screws.

Oil Level Gauge

An oil level gauge (sight glass type) is located on the front end cover. Fill the oil to the top of the red mark, or OL Mark. Oil levels are indicated as follows for pumps manufactured after October 2005:

OL:	Original Line (Fill oil up to this line initially)
RH:	Running High (During the Operation) – In this case, check the pump.
RL:	Running Low (During the Operation) – In this case, check the pump.

⚠ WARNING

If the oil level is too low, gears, bearings and mechanical seals will be damaged as a result of improper lubrication.

If the pump were operated with low oil level, the gears and bearings would seize by lack of lubrications. If the oil is overfilled, the oil temperature would get elevated and cause high gear noise and possibly affect the integrity of other parts in the DE (Drive End) casing. When the pump is not in use, be sure to check the oil level and oil contamination, and then add or change the oil when needed.

During operation, the oil is splashed over the bearings and mechanical seals by rotation of the timing gears.

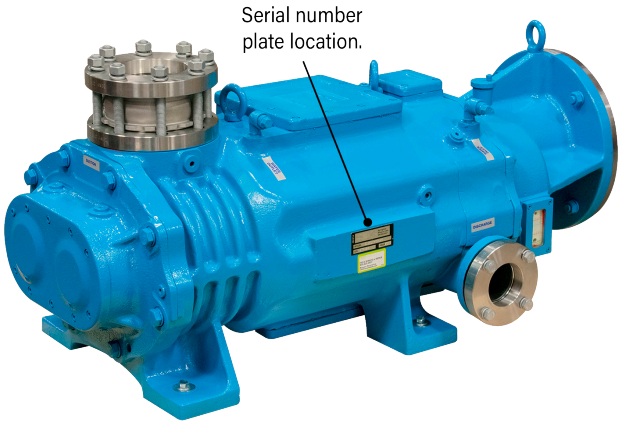
MATERIALS OF CONSTRUCTION

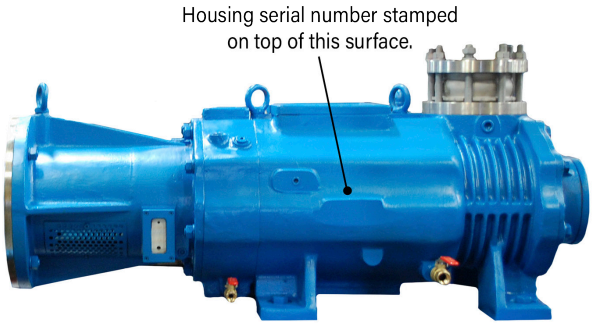
Housing	Ductile iron (A536 Grade 60-40-18) Internal process areas include PEEK corrosion protective coating.
Screw	Cast iron (A48 Class No. 30 with PEEK corrosion protective coating.)
Shaft	Cr-Mo alloy steel (AISI-SAE 4140)
Lip seals	PTFE and carbon mix (Turcon) in stainless-steel body
Slip sleeve	Ceramic-coated, stainless-steel sleeve with an O-ring for serial numbers up to: SDV-120 KIT KLRZ SN <406>548<853: 086120-0KIT SDV-200 KIT KALREZ 263<SN<376: 086200-0KIT SDV-320 KIT, KALREZ 404<SN>507: 086320-0KIT SDV-430 KIT, KALREZ 351<SN<512: 086430-0KIT SDV-800 KIT, KALREZ 241<SN>341: 086800-0KIT SDV-1500 KIT, KALREZ O-RINGS: 086150-0KIT SDV-2700 KIT, KALREZ O-RINGS: 086270-0KIT SDV-320 KIT VITON 404<SN<507: 08632V-0KIT SDV-430 KIT, VITON 351<SN>512: 08643V-0KIT Polished stainless-steel sleeves (heat fitted) for serial numbers from: SDV120 KIT KALREZ SN 406-548: 086120-1KIT SDV200 KIT KALREZ SN 263-376: 086200-1KIT SDV320 KIT KALREZ SN 404-507: 086320-1KIT SDV430 KIT KALREZ SN 352-512: 086430-1KIT SDV800 KIT KALREZ SN 241-341: 086800-1KIT SDV120 KIT VITON SN 406-548: 08612V-1KIT SDV200 KIT VITON 263<SN<376: 08620V-1KIT SDV320 KIT VITON SN 404-507: 08632V-1KIT SDV430 KIT VITON SN 352-512: 08643V-1KIT SDV800 KIT VITON SN 241-341: 08680V-1KIT
Mechanical seals	Rotor – Stainless-steel body with Carbon #5 face Stator – Stainless-steel with tungsten carbide coating

Table 1-1

IDENTIFICATION

Each unit has a serial number tag and a stamped housing serial number which are both required for correct parts identification. The housing serial number is located on the left side of the pump body (opposite side of the Kinney serial number plate) and the number is normally stamped into the housing casting and will be a 3 or four digit number. See examples below.





SPECIFICATIONS

MODEL		SDV-120		SDV-200		SDV-320		SDV-430	
		50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Nominal displacement capacity		59 CFM (100 m³/hr)	71 CFM (120 m³/hr)	88 CFM (150 m³/hr)	106 CFM (180 m³/hr)	157 CFM (267 m³/hr)	188 CFM (320 m³/hr)	211 CFM (358 m³/hr)	253 CFM (430 m³/hr)
Ultimate pressure		0.04 Torr	0.02 Torr	0.04 Torr	0.02 Torr	0.03 Torr	0.01 Torr	0.03 Torr	0.01 Torr
Motor		5 HP (3 kW)		5 HP (3.7 kW)		10 HP (7.5 kW)		15 HP (11 kW)	
Power connection type		C-flange		C-flange		C-flange		C-flange	
Minimum Speed		1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM
Speed		2,900 RPM	3,500 RPM	2,900 RPM	3,500 RPM	2,900 RPM	3,500 RPM	2,900 RPM	3,500 RPM
Port size 150 # FF	Inlet	1.5 in. (3.8 cm)		1.5 in. (3.8 cm)		2 in. (5.1 cm)		2.5 in. (6.4 cm)	
	Outlet	1.5 in. (3.8 cm)		1.5 in. (3.8 cm)		1.5 in. (3.8 cm)		2 in. (5.1 cm)	
Gear oil[1]		0.13 gal (0.5 L)		0.26 gal (1 L)		0.48 gal (1.8 L)		0.48 gal (1.8 L)	
Grease		1 oz (30 g)		1 oz (30 g)		3.5 oz (100 g)		3.5 oz (100 g)	
Cooling water @ 68°F (20°C)[2]		0.5 GPM (2 LPM)		1 GPM (4 LPM)		2.1 GPM (8 LPM)		2.9 GPM (11 LPM)	
Cooling purge[3]		None		None		None		None	
Maximum water jacket pressure rating		100 PSIG		100 PSIG		100 PSIG		100 PSIG	
Liquid Handling Capacity		1 Gallons per min		1.5 Gallons per min		2 Gallons per min		2.25 Gallons per min	
Maximum particle size		25 micron or below		25 micron or below		45 micron or below		45 micron or below	
Ambient temperature range *		0°F - 104°F		0°F - 104°F		0°F - 104°F		0°F - 104°F	
Maximum discharge pressure rating PISG / BarG		5 / 0.3		5 / 0.3		5 / 0.3		5 / 0.3	
Discharge temperature		<230°F (110°C)		<248°F (120°C)		<311°F (155°C)		<347°F (175°C)	
Maximum design temperature, inlet gas		122°F (50°C)		122°F (50°C)		122°F (50°C)		122°F (50°C)	
Maximum design temperature, discharge gas		392°F (200°C)		392°F (200°C)		482°F (250°C)		482°F (250°C)	
Maximum design temperature, oil		158°F (70°C)		158°F (70°C)		158°F (70°C)		158°F (70°C)	
Maximum design temperature, grease		176°F (80°C)		176°F (80°C)		176°F (80°C)		176°F (80°C)	
Maximum design temperature, cooling water		95°F (35°C)		95°F (35°C)		95°F (35°C)		95°F (35°C)	
Noise[4]		72 dBA		72 dBA		80 dBA		80 dBA	
Weight		396 lb (180 kg)		484 lb (220 kg)		616 lb (280 kg)		770 lb (350 kg)	
Dimensions, L x W x H[5]		24.5 × 11.8 × 10.3 in. (621 × 300 × 262 mm)		29.9 × 14.0 × 11.6 in. (760 × 355 × 294 mm)		33.8 × 15.0 × 12.8 in. (858 × 380 × 326 mm)		39.1 × 17.5 × 13.9 in. (993 × 445 × 352 mm)	

SPECIFICATIONS

MODEL		SDV-800		SDV-1500		SDV-2700	
		50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Nominal displacement capacity		368 CFM (625 m³/hr)	441 CFM (750 m³/hr)	765 CFM (1,300 m³/hr)	882 CFM (1,500 m³/hr)	1,324 CFM (2,250 m³/hr)	1,588 CFM (2,700 m³/hr)
Ultimate pressure		0.03 Torr	0.01 Torr	0.1 Torr	0.05 Torr	0.1 Torr	0.05 Torr
Motor		20 HP (15 kW)		50 HP (37 kW)		75 HP (55 kW)	
Power connection type		C-flange		Bare shaft		Bare shaft	
Minimum Speed		1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM	1,800 RPM
Speed		2,900 RPM	3,500 RPM	1,450 RPM	1,750 RPM	1,450 RPM	1,750 RPM
Port size 150 # FF	Inlet	4 in. (10.2 cm)		5 in. (12.7 cm)		6 in. (15.2 cm)	
	Outlet	2.5 in. (6.4 cm)		3 in. (7.6 cm)		4 in. (10.2 cm)	
Gear oil[1]		0.58 gal (2.2 L)		1.85 gal (7 L)		2.38 gal (9 L)	
Grease		3.9 oz (110 g)		6 oz (170 g)		8.8 oz (250 g)	
Cooling water @ 68°F (20°C)[2]		5.3 GPM (20 LPM)		9.5 GPM (36 LPM)		12.7 GPM (48 LPM)	
Cooling purge[3]		None		94.1 SCFM (160 Sm³/hr)		100 SCFM (170 Sm³/hr)	
Maximum water jacket pressure rating		100 PSIG		100 PSIG		100 PSIG	
Liquid Handling Capacity		2.5 Gallons per min		2.5 Gallons per min		2.5 Gallons per min	
Maximum particle size		45 micron or below		45 micron or below		45 micron or below	
Ambient temperature range *		0°F - 104°F		0°F - 104°F		0°F - 104°F	
Maximum discharge pressure rating PSIG / BarG		5 / 0.3		3 / 0.2		3 / 0.2	
Discharge temperature		<455°F (235°C)		<482°F (250°C)		<500°F (260°C)	
Maximum design temperature, inlet gas		122°F (50°C)		122°F (50°C)		122°F (50°C)	
Maximum design temperature, discharge gas		572°F (300°C)		572°F (300°C)		572°F (300°C)	
Maximum design temperature, oil		158°F (70°C)		158°F (70°C)		158°F (70°C)	
Maximum design temperature, grease		176°F (80°C)		176°F (80°C)		176°F (80°C)	
Maximum design temperature, cooling water		95°F (35°C)		95°F (35°C)		95°F (35°C)	
Noise[4]		85 dBA		85 dBA		90 dBA	
Weight		1,212 lb (550 kg)		2,970 lb (1,350 kg)		3,640 lb (1,650 kg)	
Dimensions, L x W x H[5]		44.5 × 18.9 × 15.3 in. (1,131 × 479 × 389 mm)		59.6 × 25.0 × 20.8 in. (1,513 × 635 × 529 mm)		66.3 × 26.9 × 23 in. (1,684 × 683 × 585 mm)	

(1) The above listed amount of oil is for reference only. Fill oil to the top level of the red mark or OL Mark. Special inert oils are available for hazardous applications.

(2) The above listed amount of cooling water is based on water temperature of 68°F (20°C). The amount of water varies when using an After Cooler. Temperature differential between cooling water supply temperature and discharge temperature shall be maintained below 12.6°F (7°C).

(3) The cooling purge flow rates are at standard conditions.

(4) Noise levels are based on the pump equipped with an exhaust silencer and are from 3 ft (1 m) away from the pump.

(5) Dimensions are for bareshaft pump (without motor) only.

* If water is cooling medium then minimum temperature should be 32°F.

Table 1-2

02 SAFETY

GRAPHIC CONVENTIONS USED IN THIS MANUAL

The following hazard levels are referenced within this manual:

⚠ DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

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

⚠ CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation that can cause damage to the engine, personal property, and/or the environment or cause the equipment to operate improperly.

NOTE: Indicates a procedure, practice, or condition that should be followed in order for the equipment to function in the manner intended.

SAFETY INSTRUCTION TAGS

⚠ WARNING

Do not operate without belt guard.

⚠ CAUTION

Do not valve or restrict pump discharge opening.

Use oil mist eliminator when operating pump, ensure adequate ventilation when discharging indoors.

Refer to manual safety instructions.

NOTICE

The above safety instruction tags were permanently affixed to your pump prior to shipment. Do not remove, paint over or obscure in any manner.

Failure to heed these warnings could result in serious bodily injury to the personnel operating and maintaining this equipment.

SAFETY PRECAUTIONS FOR DRY VACUUM PUMPS

Please read the following safety information before operating the vacuum pump.

- Do not operate the pump without the motor drive coupling guard/cover properly attached. Disconnect the pump motor from the electrical supply at the main disconnect before removing the guard/cover. Replace the guard/cover before reconnecting the power supply to the pump motor. Operating the pump without the guard/cover properly installed exposes personnel in the vicinity of the pump to risk from rotating drive components.
- Do not operate the pump with oxygen-enriched gas (greater than 21% by volume) in the suction line, unless the pump has been prepared with an inert fluid suitable for the application and equipped with seal and start/stop purge system.

⚠ WARNING

Pumping oxygen-enriched gases with mineral oil or other non-inert fluids and without proper purges can cause fire or explosion in the pump, resulting in damage or serious bodily injury.

- Take precautions to avoid prolonged or excessive exposure to oil mist or process materials emanating from the discharge of the pump.
- Do not allow the pump to discharge into a closed or inadequately ventilated room. Where process vapor contains environmentally unfriendly chemical vapor, pump discharge must be connected to the properly sized scrubber system to neutralize the harmful chemicals prior to the discharge to the atmosphere. Laws and ordinances may pertain to your local area regarding discharge of oil mist, oil vapor, or chemical vapor to atmosphere. Check local laws and ordinances prior to operation of the pump with discharge to outside atmosphere.
- Do not restrict the pump discharge in any way or place valves in the discharge line. The vacuum pump is a compressor and will generate high pressures without stalling the motor when operated at low suction pressures. Excessive pressure could cause damage or serious bodily injury.
- Disconnect the pump motor from the electrical supply at the main disconnect before disassembling or servicing the pump. Make sure that the pump is completely reassembled, the belt guard is properly installed, and all fill and drain valves are installed and closed before reconnecting the power supply. Accidental starting or operation of the pump while maintenance is in progress could cause damage or serious bodily injury.
- Lift pump only by the lifting lugs supplied with the pump. Never lift equipment attached to the pump by the pump lifting lugs.
- Do not touch hot surfaces on the pump. In normal operation at low pressures, surface temperatures will not normally exceed 180°F (82°C). Prolonged operation at 200 Torr (267 mbar) may cause surface temperatures as high as 220°F (104°C).

03 PIPING

The vacuum pump casing and the front end plate have an integrated cooling water jacket. The SDV series pumps can be configured with two different types of cooling systems: Fresh Water Cooling and Circulating Cooling.

FRESH WATER COOLING

The fresh water cooling system consists of a “once-through” cooling water circuit. To monitor the adequacy of the cooling water flow and the cooling water discharge temperature, install a flow indicator, flow switch on the cooling water supply line and a temperature gauge (or switch) at the cooling water discharge line.

On SDV-120 pumps, the silencer is not jacketed. Hence, the cooling water circuit is not extended to the process exhaust silencer (***see Figure 3-1***).

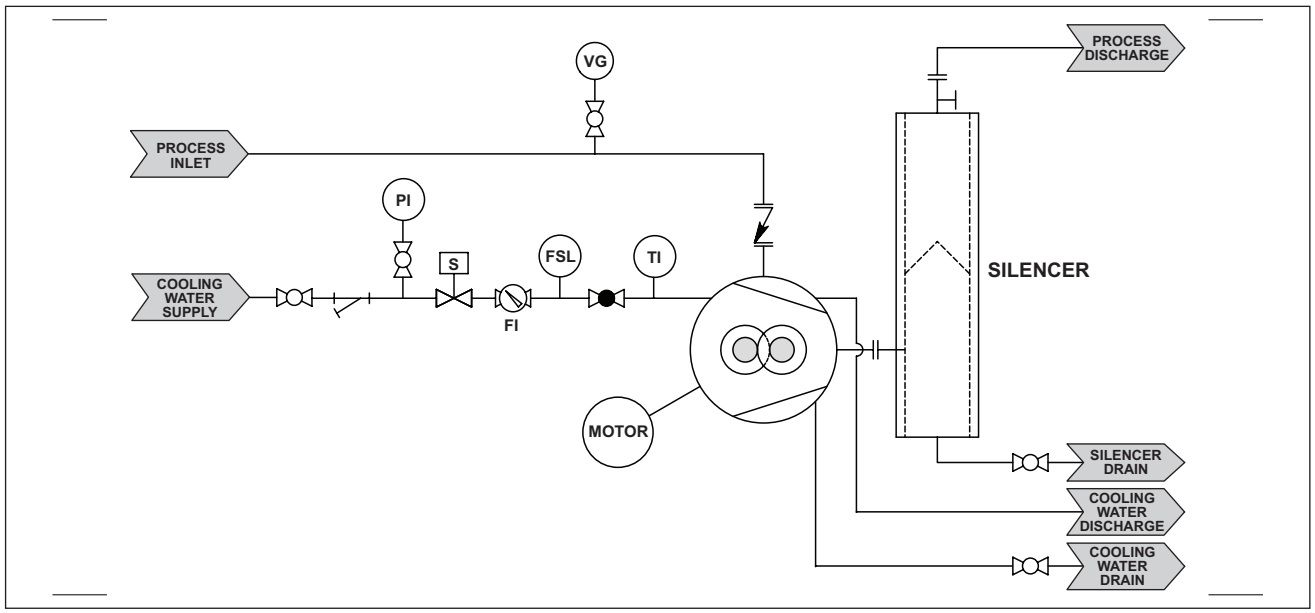


Figure 3-1 – Typical Process and Inlet Discharge for SDV-120 Models with Once-Through Cooling

On SDV-200 and larger-sized pumps, the cooling water circuit is extended to the process exhaust silencer (***see Figure 3-2***).

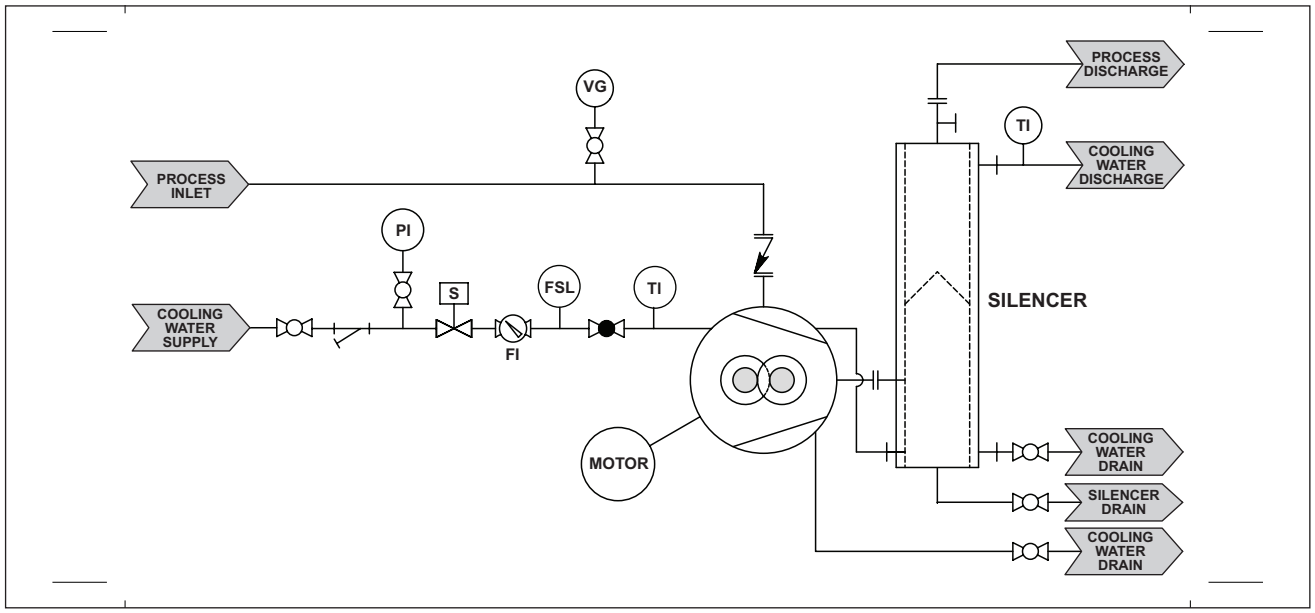


Figure 3-2 – Typical Process and Inlet Discharge for All Other SDV Models with Once-Through Cooling

AIR-WATER RADIATOR

This system is an air-cooled version with a cooling water total recovery system. A centrifugal pump circulates the cooling water from the SDV vacuum pump to a radiator-fan unit. To monitor the adequacy of the cooling water flow and the cooling water discharge temperature, install a flow indicator, flow switch on the cooling water supply line and a temperature gauge (or switch) at the cooling water discharge line.

For SDV-120, the silencer is not jacketed. Hence, the cooling water circuit is not extended to the process exhaust silencer (***see Figure 3-3***).

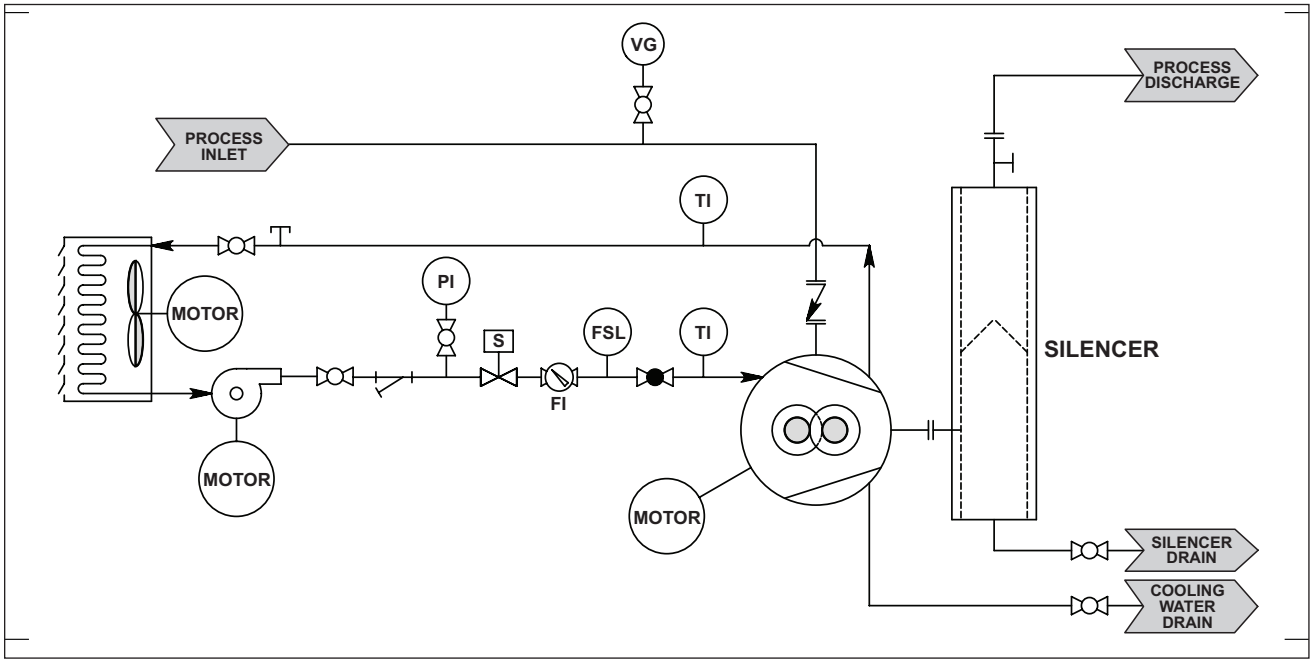


Figure 3-1 – Typical Process and Inlet Discharge for SDV-120 Models with Fan-Cooled, Re-circulated Cooling Water System

For SDV-200 and larger-sized pumps, the cooling water circuit is extended to the process exhaust silencer (***see Figure 3-4***).

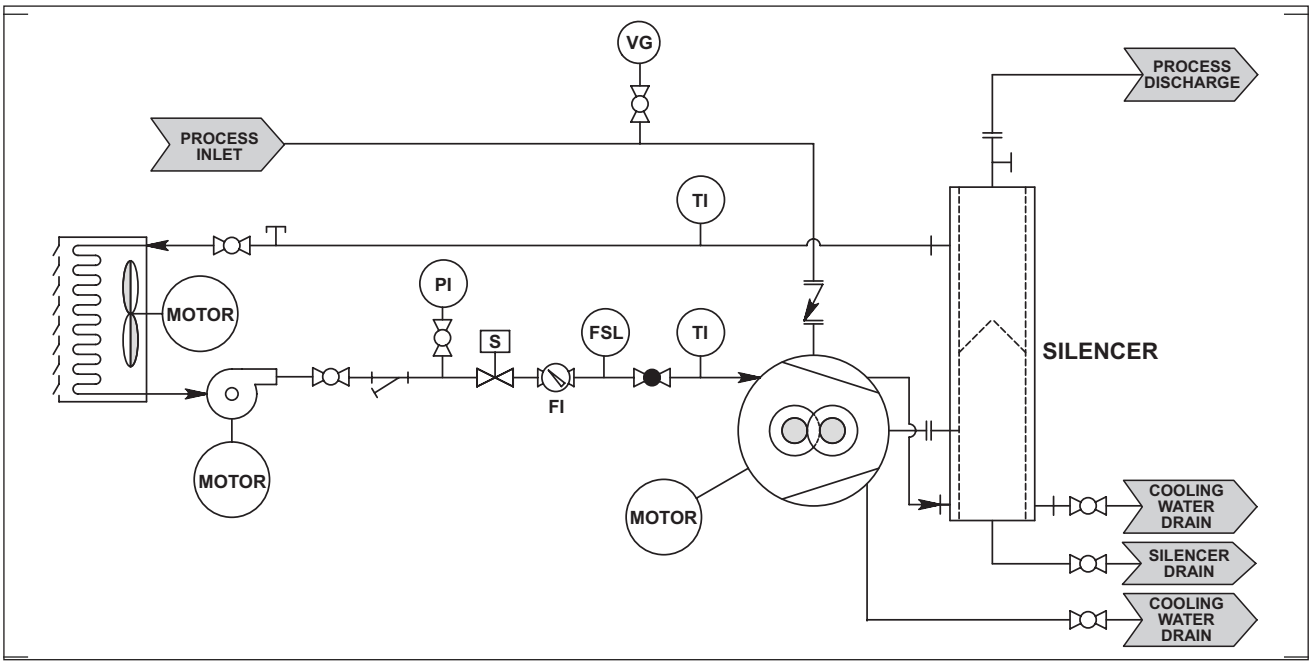
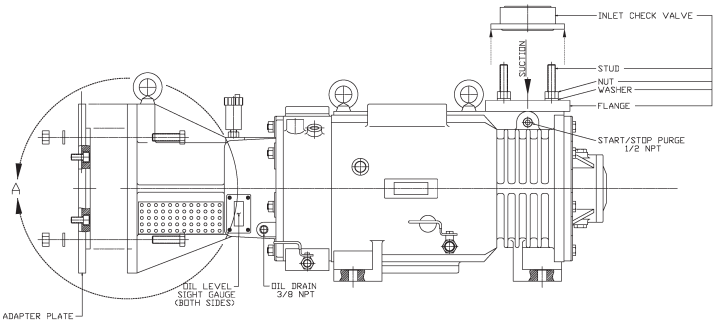
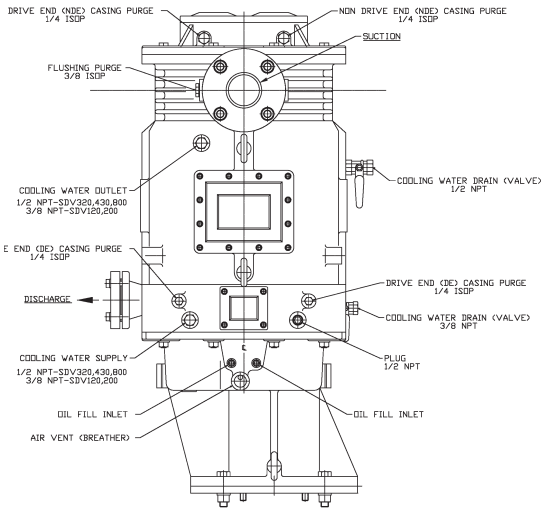


Figure 3-2 – Typical Process and Inlet Discharge for All Other SDV Models with Fan-Cooled, Re-circulated Cooling Water System



Connection Details - Side View.



Connection Details - Top View.

04 INSTALLATION

LOCATION

Mount the pump on a flat, level surface. Use a baseplate that is rigid, solidly supported, and structurally sound. Shim under the legs where necessary so that each leg of the pump supports an equal share of the pump weight. This is necessary to prevent twisting of the pump. Make sure the feet rest evenly on the mounting surface before fastening down. Twisting or cramping the pump during mounting will cause internal contact and binding during operation, resulting in a condition called “soft foot.” See Soft Foot on page 15 for further details and preventative measures. If the pump will be installed outdoors, check the motor, exterior paint, peripheral equipment, and other parts for outdoor service suitability.

Allow enough space surrounding the pump for access during maintenance and periodic inspections.

FOUNDATION

Make sure the foundation for the pump assembly and its base frame is flat and leveled with adequate load bearing capacity.

Install the pump and its base frame, peripheral equipment, and piping when the fountation concrete has been cured.

PUMP INSTALLATION

Always operate SDV pumps in a horizontal and level position on a rigid base frame. Never install SDV pumps in an upright (vertical) or angled position.

1. Place the pump assembly with the base frame on a foundation and make sure it is supported evenly.
2. Insert metal shims between the base frame and the foundation, if required for leveling. The pump assembly with the base frame should be leveled to within 0.002 in. (0.05 mm).
3. Place adequately sized anchorbolts in position.
4. Once the pump assembly is set on the foundation and anchorbolts, adequately grout the base frame before tightening the anchorbolt nuts. Tigten the anchorbolt nuts after the grout is firmly cured.

NOTE: Tighten the anchorbolts evenly to ensure the previously set level is not changed.

PIPING

Main Piping Assembly

1. Clean the interior of the process piping to remove any rust, dust, foreign matter, and weld slags.
2. Place a 40-mesh strainer, supplied along with the SDV pump, at the pump process inlet flange. After initial start-up and continued operation of the SDV pump for several hours, disassemble the process inlet piping from the pump and check the strainer for cleanliness. If there are any particulates strained, such as weld slags, etc., clean the mesh strainer and replace it at the pump process inlet flange.

NOTE: Kinney recommends regularly checking the condition of the strainer.

3. Install flexible connectors on the suction side of the pump as well as on the discharge side of the pump. These flexible connectors prevent direct application of any excessive load (primary and secondary load) to the pump assembly from the process piping structures. Properly support the piping to protect the pump from absorbing excessive load from the process piping structures.

4. If a process exhaust silencer is provided, install it on the pump discharge flange or as closely as possible to it.

5. Install a check valve as close to the process inlet flange as possible. The check valve isolates the pump from the process during the pump shutdown. The pump will turn in reverse direction if the check valve is not present at the process inlet flange by the pressure differentials.

   If it is not possible to install the recommended check valve, install a process isolation valve, such as a gate valve, and be sure to shut the valve before stopping the pump.

NOTE: Kinney recommends installing a process inlet isolation valve regardless of whether a process inlet check valve is installed.

6. If the process gas contains high condensable vapors, install a condensate recovery tank. The tank should collect the condensates and dispose of or drain them as required.

Cooling Water Piping Assembly

SDV pumps are equipped with an integrated cooling liquid jackets. A cooling medium, typically water, must be supplied to the cooling liquid supply nozzle located at the FEC (Front End Plate). The cooling medium will be circulated to the pump casing and discharged from the discharge nozzle located on the casing.

If a water-jacketed discharge silencer or after cooler is supplied with the pump, the silencer or after cooler should receive the cooling liquid, as well. A single-loop cooling liquid supply line can by employed by installing piping between the cooling liquid discharge nozzle at the pump casing and the cooling liquid supply connection nozzle on the silencer or after cooler.

The cooling medium supply piping should include the following instruments.

Cooling Liquid Supply Line:

- Manual isolation valve
- Strainer
- Pressure gauge with an isolation valve
- Liquid flow meter
- Liquid flow switch (or combined cooling liquid flow meter/switch)
- On/Off solenoid valve
- Flow regulating valve
- Temperature gauge

Cooling Liquid Discharge Line:

- Temperature gauge
- Temperature switch (Optional)

AIR VENT CAP

The air vent cap (***see Figure 4-1***) should be unscrewed until the air hole is just above the top of the thread opening. Main purpose of air vent is to release the pressure from the rotation of timing gears in front end cover.

NOTE: Do Not tighten this air vent cap to a closed position.

Figure 4-1 – SDV air vent cap.

SOFT FOOT

Soft foot is a condition in which one of the pump feet does not sit flat on the base. Soft foot is usually due to irregularities in the surface to which the pump is mounted. When the bolt on the foot gets tightened, a slight distortion occurs that can affect bearing and seal life as well as cause internal contact between parts.

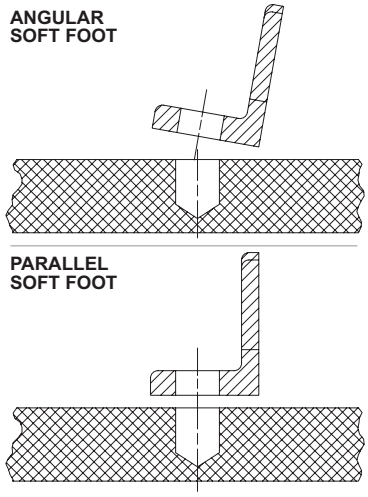


Figure 4-2 – Illustrations of Soft Foot

1. Place the pump on the base.
2. Check each foot for gaps between the foot and base (soft foot). Shim as necessary to fill the gap within 0.002 in. (0.05 mm). Figure 4-2 shows the two most common types of soft foot conditions. If either type is present at a measurement of more than 0.003 in. (0.076 mm), the pump may fail prematurely.
3. Tighten all bolts.
4. Mount a dial indicator on the base contacting one foot at 12 o'clock position.
5. Loosen the bolt on that foot. Observe indicator travel and add shims as needed to reduce "spring" to less than 0.002 in. (0.05 mm). Repeat steps 4 and 5 on the remaining feet.

05

PURGES

NOTICE

When present, coated internals are intended to aid material compatibility with process gases. They do not reduce the need for or importance of proper purging or post-process drying operations.

NOTES:

- **Seal purge pressure: 7.1 to 21.3 psig (0.5 to 1.5 kg/cm^2)**
- **Flow rates listed are minimum.**
- **Flushing purge should last for 10 – 20 minutes with the pump suction valve closed, after process operation is completed.**
- **All purge work except for flushing should be done at the same time as the process starts up.**

NOTE: Ask your Kinney channel partner about part # 820042 Purge Panel.

SEQUENCE OF OPERATIONS

A-Start/Stop Purge: This should be controlled by a solenoid valve to open and close by time. Start the pump and open the solenoid to flow N2 or other dry gas to the pump inlet. Do this for 10-30 minutes to “warm up the pump” and be sure it is clean to start. Once the 10-30 minute time is up (normally this is controlled by a timer in the panel or PLC) the solenoid closes, open main vacuum valve and run the vacuum process as needed. At the end of the day or shift, close the vacuum inlet valve to their process and open the purge solenoid valve again. This will start the N2 or dry air to run to the pump for another 10-30 minutes to “clean or dry out the pump”. Once the time is up, close the solenoid valve and stop the pump.

B-Gear Box Purge and NDE Bearing Purge: These are both controlled by a solenoid valve as well, one solenoid for the gear box and one solenoid for the NDE bearing area. Both solenoid valves open when the pump is on and close when the pump is off. Very little N2 or dry air will flow as they are designed to be a “barrier” between the process chamber and the gear box (and the NDE bearings). The idea is to have a slight positive pressure on the gear box and the bearing box to push “out” so nothing can come “in”.

START/STOP (CLEANING) PURGES

Start/Stop (Cleaning) purge is done to remove residual process gas or any incompatible substances such as moisture or atmospheric air from the interior of the pump before or after pump operation. Perform the Start/Stop (Cleaning) purge with gas that is compatible with the process gas or inert gas, such as nitrogen or argon. This Start/Stop (Cleaning) purge is especially important when pumping corrosive gases, toxic gases, or polymeric process materials such as film resin.

Start (Cleaning) Purge: With the inlet process isolation valve of the pump closed, operate the pump with purge gas to the pump for 20 to 30 minutes to remove any undesired residual gases from the pump’s interior. The inlet process isolation valve should be open to start process pumping operation upon completion of the Start (Cleaning) Purge.

Stop (Cleaning) Purge: Upon completion of process pumping operation, close the inlet process isolation valve and start supplying the purge gas to the pump while the pump is continuously operating for 20 to 30 minutes to remove residual process gas from the pump internals. The motor should be stopped upon completion of the Stop (Cleaning) Purge while the process isolation valve remains closed.

NOTES:

- **PEEK screw coating is not a substitute for purge operations or post-process dry operation.**
- **Start/Stop (Cleaning) purges should last for 20 to 30 minutes with the process isolation valve closed, prior to the start of the process operation and immediately after the completion of the process operation. The flow rates in *1* should be applied when the end user decides to start/stop (cleaning) purge to the pump.**
- **Purge pressure: 21.3 psig (1.5 kg/cm2g) maximum.**

	SDV-120	SDV-200	SDV-320	SDV-430	SDV-800	SDV-1500	SDV-2700
Start/Stop (Cleaning) purge flow rates	6.6 sgpm (25 slpm)	6.6 sgpm (25 slpm)	10.6 sgpm (40 slpm)	12.7 sgpm (48 slpm)	17.2 sgpm (65 slpm)	42.3 sgpm (160 slpm)	58.1 sgpm (220 slpm)

Table 5-1

SEAL PURGE

Depending on the application, the SDV pump may require seal purges. A seal purge is intended to prevent contamination of the lubrication oil and/or grease in the Front End Cover (FEC) and/or the Rear End Plate (REP) in order to provide a pressurized barrier within the Front End Plate (FEP) and/or Rear End Plate (REP) with gas that is compatible with the process gas and the lubrication oil/grease or inert gas, such as nitrogen or argon.

Connect the Drive End (DE) seal purge to the two purge connection nozzles on the Front End Cover.

Connect the Non Drive End (NDE) seal purge to the two purge connection nozzles on the Rear End Plate (REP).

NOTE: On SDV-120 pumps, there is only one Non Drive End (NDE) seal purge connection nozzle.

Both Drive End (DE) and Non Drive End (NDE) seal purges can be manifolded from a single source of purge gas supply. The flow rates in ***Table 5-2*** should be applied when the end user decides to seal purge.

Seal purge pressure should be below 7.11 psig (0.5 kg/cm^{2}g). The leak rate of the mechanical seals is less than 5.3 x 10^{-6} CFM (3 cc/hr), and they can sustain pressure up to 42.7 psig (3 kg/cm^{2}g).

NOTE: Kinney does not recommend NDE seal purge unless it is absolutely required. Providing NDE seal purge slightly increases the inlet pressure due to the additional mass flow into the pump. Consult Kinney for further assistance if you require seal purges.

	SDV-120	SDV-200	SDV-320	SDV-430	SDV-800	SDV-1500	SDV-2700
DE (Drive End) seal purge flow rates	0.9 sgpm (3.3 slpm)	0.9 sgpm (3.3 slpm)	1.5-1.8 sgpm (5.8-6.7 slpm)	1.5-1.8 sgpm (5.8-6.7 slpm)	2.2 sgpm (8.3 slpm)	3.1 sgpm (11.7 slpm)	3.1 sgpm (11.7 slpm)
NDE (Non Drive End) seal purge flow rates[1]	0.13 sgpm (0.5 slpm)	0.21 sgpm (0.8 slpm)	0.42 sgpm (1.6 slpm)	0.53 sgpm (2.0 slpm)	0.98 sgpm (3.7 slpm)	1.98 sgpm (7.5 slpm)	3.43 sgpm (13 slpm)

[1] Sealing purge at the non-drive end can vary slightly according to the type of process and operating condition.

Table 5-2.

COOLING PURGE

A cooling purge is done to cool the inside of the casing and the screws. The purge cools the pump & lowers the discharge temperature, but increases the non-condensable load leaving the pump. During pump operation, the process gas introduced into the casing through the suction nozzle is compressed by the rotation of the screws and transferred to the discharge side. The temperature of the process gas increases by the heat of compression. This heat energy should be removed in order to prevent the pump from seizure.

This cooling purge is required for SDV-1500 and SDV-2700 pumps. Cooling purge is not required for the smaller models: SDV-120, SDV-200, SDV-320, SDV-430 and SDV-800.

The cooling purge is normally done by atmospheric air. If the process gas is not compatible with the atmospheric air, use a different cooling medium, such as nitrogen or CDA (Clean Dry Air). For a standard pump, an air filter is provided near the discharge side of the casing.

NOTES:

- **Cooling purge is not required for SDV-120, SDV-200, SDV-320, SDV-430, and SDV-800 for typical processes manufactured after Jan. 2015.**
- **The flow rates in *Table 5-3* should be applied when the end user decides to supply cooling purge to the pump.**
- **Purge pressure:**
  - **Atmospheric pressure for process inlet pressure (operating pressure) of 150 Torr or below.**
  - **7.11 psig (0.5 kg/cm^{2}g) minimum for process inlet pressure (operating pressure) of 150 Torr or higher.**
- **Cooling purge flow rates can vary depending on the process inlet pressure.**

	SDV-120	SDV-200	SDV-320	SDV-430	SDV-800	SDV-1500	SDV-2700
Cooling purge flow rates	7.9 sgpm (30 slpm)	9.5 sgpm (36 slpm)	10.6 sgpm (40 slpm)	10.6 sgpm (40 slpm)	13.2 sgpm (50 slpm)	42.3 sgpm (160 slpm)	43.9 sgpm (170 slpm)

Table 5-3

POST-PROCESS DRY OPERATION

Operate the SDV pump for 10 to 20 minutes upon completion of process batch cycle with the process isolation valve closed where there is no Start/Stop (Cleaning) purge system and sequence in place.

This duration of dry operation without process load is done to remove any residual process gas or condensed process vapors from the inside of the pump that may have accumulated during the process operation. These residual process materials could be a source of pump motor overload when the pump is restarted.

If this residual process material has not been removed by the dry operation after the process operation and the pump is restarted, the residual process material inside the pump could cause a pump seizure by excessive frictional load to the motor or it could damage the screws and/or the casing.

STEAM FLUSHING

If there is a substantial amount of the residual process material build-up within the pump, clean out the pump interior. Steam flushing is one way to clean the residual process material build-up from the pump interior. When there is enough residual process material build-up, make sure that the pump is not forced to rotate by the motor. Especially for the processes that have a high potential for build-up and are aggressive in nature, such as processes with oligomer, monomer, polymer, resin, etc., regularly clean out the pump interior by steam flushing.

Steam pressure: Approximately 14.22 psig (1 kg/cm^{2}g)

1. System Isolation: Disconnect all electrical and control power, and place lockout tags on the motor control center (MCC) and/or control panel to ensure nobody accidentally starts the pump during the steam flushing. The process isolation valve should be closed. The discharge valve (if equipped) and silencer drain valve should be open.

2. Inject steam for 10 to 20 minutes through the pump's process inlet (suction) nozzle or one of the nozzles at the side of the pump's process inlet (suction) nozzle.

NOTE: The steam injection time can be varied based on the types and amounts of residual process material built up within the pump.

3. Rotate the pump shaft by hand to check whether the pump rotates smoothly.

NOTE: During this time, be careful not to start the motor and to observe all lockout/tagout procedures.

4. If the pump rotates smoothly by hand rotation, stop the steam injection and start the pump motor with the process isolation valve closed.

5. If the pump does not rotate smoothly by hand rotation, repeat steps 2 and 3 until the pump rotates smoothly by hand. Depending on the severity of the residual process material build-up, it may be necessary to repeat steps 2 and 3 several times.

06

OPERATION

PRESTART CHECKS

1. Ensure the pump internal and process piping are thoroughly cleaned and free from weld slags, metal chips, particulates, rust, dust, etc.
2. Ensure all the process piping connections and utility piping connections are properly installed, tightened, and supported.
3. Ensure the lubrication oil at the DE oil reservoir of the pump is filled up to the top of the red mark, or OL Mark, while the pump is not in operation.
4. Adjust and set the cooling liquid flow rate listed in ***Specifications on page 6***.
5. Ensure the electrical power connection to the motor or electrical/control panel is completed and is ready to supply power to the motor.

NOTE: The correct oil level is critical to pump performance. If the pump were operated with low oil level, the gears and bearings would seize by lack of lubrications. If the oil is overfilled, the oil temperature gets elevated and would cause high gear noise and may affect integrity of the other parts within the DE (Drive End) casing.

STARTING THE PUMP

1. Ensure the direction of the pump rotation is correct: CW (Clockwise) direction, looking from the motor. A pump rotational direction check can be done by jogging the pump a brief moment while checking the rotational direction of the motor fan. If the motor rotates CCW (Counter-Clockwise), correct the power cable connections and recheck the rotational direction to ensure the pump rotates in the correct CW direction. Perform the pump rotational direction check with the process inlet isolation valve open.
2. With the process inlet isolation valve open, operate the pump for 20 to 30 minutes and then check all pump operating parameters for any abnormality, such as excessive vibration, high oil/grease temperatures, high cooling liquid discharge temperature, high process discharge temperature noise, overcurrent draw, etc. If any abnormality is found, stop the pump and investigate the cause.

NOTE: Typical causes of abnormalities come from improper lubrication and/or improper installation of the pump.

3. Operate the pump for 2 – 3 hours under normal process load condition.
4. Recheck the pump operating parameters.
5. If any abnormal condition arises during initial operation with normal process load, shut down the pump immediately and correct the abnormal condition before restarting the pump.

The following pump operating conditions should be within the limits shown in ***Specifications on page 6***:

- Maximum Process Inlet Temperature
- Process Discharge Temperature
- Oil Temperature
- Grease Temperature

Cooling Medium Differential Temperature is determined by subtracting the Supply temperature from the Discharge temperature. For water, differential temperature must be within 12.6°F (-10.8°C).

Observe other operating conditions, as well, such as noise, vibration, and motor current draws (amps).

STOPPING THE PUMP

1. Before disconnecting the motor power, close the process inlet isolation valve.
2. If the process gas or vapor is corrosive or hazardous, introduce inert gas, such as nitrogen or argon, into the pump inlet for 20 to 30 minutes to purge out the residual process gas or vapor from the pump internals before disconnecting the motor power.

   All other pumps should undergo a 10 – 20 minute post-process drying operation before the motor power is disconnected.
3. Shut down the pump.
4. Shut off the cooling liquid supply.

If the pump must be shut down for a long period of time when freezing weather is expected and water is used as a cooling liquid, drain the pump cooling jacket through the cooling jacket nozzles.

LUBRICATION

Any lubricants used must be high-grade petroleum products that contain oxidation inhibitors, rust preventatives, extreme-pressure additives, etc.

NOTE: Do not use any lubricants that contains any elements of water, sulfate resin, or tar.

Gear and Bearing Lubricants	Oil	Grease
For general applications	Kinney AX Vacuum Oil	Mobil 1 Synthetic Grease (Standard) SHINETSU G 40M Nok-KLUBER HFE 552 FAG Arcanol L74V
For special applications	Fomblin 25/6, Krytox 1525	Fomblin RT-15 Nok-KLUBER Barrerta L55/2

Table 6-3

07

MAINTENANCE AND INSPECTION

OVERHEATING

During pump operation, the temperature will rise in homogeneous matter as a result of compression work done on the process gas or vapor. However, if the temperature rise is local and/or the external coating becomes scorched, there is an abnormality.

Localized hot spots are typically due to:

- Inadequate cooling liquid supply or cooling liquid cut-off
- Interference of the screws with the casing
- Pump ingestion of foreign material, such as solid particulates, metal chips, process material buildup, etc.

If a localized hot spot is observed, shut down the pump immediately for inspection.

In some cases, the screws and the casing may have become corroded. This corrosion will cause the clearance between the screws and casings to increase and increase the “slip” (internal reverse flow: flow of gas from the pump discharge to the suction). The pumping capacity of the pump is then decreased. If this happens, shut down the pump and then measure and verify clearances in order to determine the required corrective actions.

ABNORMALITIES

Kinney recommends daily inspection of the pump as a preventative maintenance. Most pump abnormalities can be discovered through routine checks of bearing temperatures, vibration, noise, etc.

INTERFERENCE

To check for interference between the pump screws or between the screws and the casing, place a stethoscope on the pump casing and listen for any abnormal sounds.

FREEZING

In cold weather, completely drain the cooling liquid after the pump is shut down to prevent the cooling liquid from freezing.

INSPECTION SCHEDULE

Daily Inspection

1. Check the electrical current load on the motor (Amps): An increase in the motor current load indicates abnormality of the pump operation.
2. Check whether the pump rotates smoothly and in the correct direction (CW).
3. Check the process inlet and discharge pressures.
4. Check the pump for any excessive noise and vibration.
5. Check the NDE (Non Drive End) grease cover temperature.
6. Check the DE (Drive End) oil reservoir cover temperature.
7. Check for any sign of cooling liquid leakage.
8. Check the oil level. High or low oil levels can damage gears and bearings.
9. Check for any sign of external oil leakage.
10. Check the cooling liquid supply flow rate and pressure.

Monthly Inspection

1. Check the oil color: If the oil color is too dark, replace the oil.
2. Check the oil level: If the oil level drops in a short period of time, check the mechanical seals.
3. Check the grease.

Quarterly Inspection

1. Check the cooling liquid flow and discharge cooling liquid color. The cooling jackets and water piping may require periodic cleaning.
2. Replace the oil at the DE (Drive End) casing.
3. Replace the grease at the NDE (Non Drive End).

Bi-annual Inspection

Check all process and utility piping and their supports.

Yearly Inspection

1. Check the pump internal surfaces, casing, and screws for any sign of rust or flaws.
2. Check all mechanical seals and lip seals.

MAINTENANCE AND INSPECTION SCHEDULE

ITEM	CHECK POINT	DAILY	MONTHLY	QUARTERLY	6 MOS.	YEARLY
Motor amperage	Any change? Amperage as specified?	X				
Rotation	Is the rotation smooth and direction correct?	X				
Suction and discharge pressure	Is the pressure as specified?	X				
Noise and vibration	Any abnormal sound or vibration?	X				
Temperatures	Any excessive oil or water temperature?	X				
Cooling liquid leak	Check for leakage of the cooling liquid.	X				
Oil level gauge	Is oil at proper level?	X				
Water contamination on free end cover	What is the color? Has it changed to reddish brown?	X				
Cooling water pressure	Is the pressure as specified or too high?	X				
Grease	Is grease color dark, contaminated, or broken down?	X				
Oil leaks	Any signs of oil leaks?	X				
Reverse cooling filter (cooler)	Any heat on suction pipe?	X				
Belt tension	Check V-belt tension.		X			
Lubricant color	Check color. If dark, replace lubricant.		X			
Oil level	If oil level drops drastically, check mechanical seal.		X			
Oil/grease change				X		
Suction and discharge piping	Is there any accumulated scale or dirt?			X		
Process and utility piping and supports					X	
Pump casing interior and screw surfaces	Any signs of rust or flaws?					X
Mechanical seal, oil seal, bearing, O-ring, V-belt, and packing	Inspect for damage and replace as needed.					X
Timing gears	Inspect for damage.					X

08

SCREW CLEARANCE

MODEL	"D" CLEARANCES	"E" CLEARANCES
SDV-120	0.0039 – 0.0047 in. (0.10 – 0.12 mm)	0.0016 – 0.0024 in. (0.01 – 0.06 mm)
SDV-200	0.0039 – 0.0047 in. (0.10 – 0.12 mm)	0.0020 – 0.0028 in. (0.05 – 0.07 mm)
SDV-320 S/N 174 and earlier	0.0039 – 0.0059 in. (0.10 – 0.15 mm)	0.0035 – 0.0043 in. (0.09 – 0.11 mm)
SDV-320 S/N 175 and later	0.0047 – 0.0059 in. (0.12 – 0.15 mm)	0.0028 – 0.0035 in. (0.07 – 0.09 mm)
SDV-430 S/N 166 and earlier	0.0039 – 0.0059 in. (0.10 – 0.15 mm)	0.0035 – 0.0043 in. (0.09 – 0.11 mm)
SDV-430 S/N 167 and later	0.0047 – 0.0059 in. (0.12 – 0.15 mm)	0.0035 – 0.0043 in. (0.09 – 0.11 mm)
SDV-800	0.0059 – 0.0071 in. (0.15 – 0.18 mm)	0.0047 – 0.0059 in. (0.12 – 0.15 mm)
SDV-1500	0.0079 – 0.0098 in. (0.20 – 0.25 mm)	0.0059 – 0.0071 in. (0.15 – 0.18 mm)
SDV-2700	0.0118 – 0.0138 in. (0.30 – 0.35 mm)	0.0071 – 0.0097 in. (0.18 – 0.22 mm)

Table 8-1

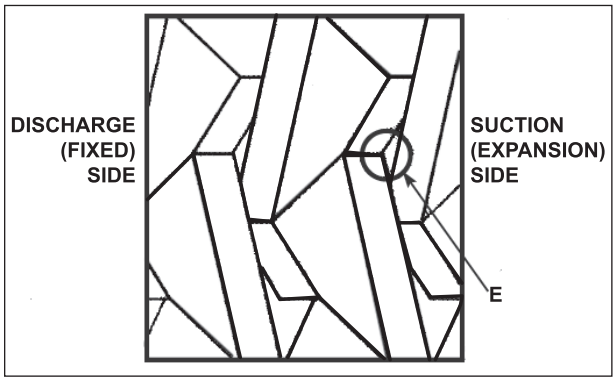


Figure 8-1 – "E" Clearance

09

TROUBLESHOOTING

Although Kinney vacuum pumps are well designed and manufactured, problems may occur due to normal wear and the need for readjustment. The following chart lists symptoms that may occur along with probable causes and remedies.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Insufficient pumping capacity	Clogged inlet filter and/or strainer	Clean or change the inlet filter and/or strainer.
	Too much clearance	Check the screw “E” clearance and reset the clearance (reset the timing gear).
Motor overload	Clogged inlet filter and/or strainer	Clean or change the inlet filter and/or strainer.
	Foreign matter is caught in the pump	Check the screw “E” clearance and reset (reset the timing gear) if needed. If the screws and/or casing are damaged by foreign material, replace the screw and/or casing.
	Significant increase of inlet pressure	Check the pressure differential between the inlet and outlet of the pump.
	Interference between screws	Reset the screw “E” clearance (reset the timing gear).
	Interference between screws and casing	Reset the “D” clearance.
	Blocked discharge nozzle or piping and increased backpressure	Drain and clean the discharge nozzle and piping.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Overheating	Excessive oil in the FEC	Check oil level and adjust the oil level if required.
	High vacuum pump inlet temperature	Reduce the inlet temperature.
	High compression ratio	Check the differential pressure between the inlet and discharge nozzle.
	Interference between screw and casing	Search for the cause of the interference.
	Problem with cooling liquid flow	Clean cooling liquid lines and pump cooling jackets.
	Blocked discharge nozzle or piping and increased backpressure	Drain and clean discharge nozzle and piping.
Knocking	Incorrect positioning of timing gears and screws	Reposition the timing gears and screws: run-out or flatness of the timing gears should be within 0.001 in. (0.03 mm).
	Improper assembly	Reassemble the pump.
	Abnormal rise of inlet pressure	Search for the cause.
	Damaged gear due to overload or improper lubrication	Replace timing gears.
Bearing or gear damage	Improper lubrication	Change oil.
	Low oil level	Add oil to the correct level.

Table 9-1– Common Symptoms and Remedies

NOTE: If problems are not resolved by the solutions in *Table 9-1*, please contact Kinney with the following information:

- **Model number, serial number, and application**
- **Information on piping (valves, strainers, number of bends)**

10

VACUUM SYSTEM CHECKLIST

CHECKPOINT		CHECK
Before operation	Opening the cooling water supply valve. Is the flow correct?	❑
	Close the vacuum suction line.	❑
	Open the discharge line.	❑
	Check the lubricant color and level. Is it acceptable?	❑
	Check belt tension (for V-belt type only).	❑
	Run the vacuum pump according to ***Start/Stop (Cleaning) Purges on page <?>*** before opening the suction line.	❑
During operation	Check the vacuum level in full vacuum. Is it normal?	❑
	Check the electric power condition (voltage and amperage) in full vacuum. Is it acceptable?	❑
	Any abnormal noise?	❑
	Check operation temperature. Is it normal?	❑
	Check the lubricant color and level. Is it acceptable?	❑
Stopping	Run the vacuum pump according to ***Start/Stop (Cleaning) Purges on page <?>*** or ***Post-Process Dry Operation on page <?>*** for the specified time period after closing the suction line.	❑
	After the appropriate pruging operatings, if foreign material remains inside the vacuum pump, clean it with cleaning solvent.	❑
	Make sure that the suction and discharge line is closed.	❑
	Make sure the power supply is cut off.	❑

NOTE: Proper purge and cleaning operations are still necessary on pumps with coated screws.

11

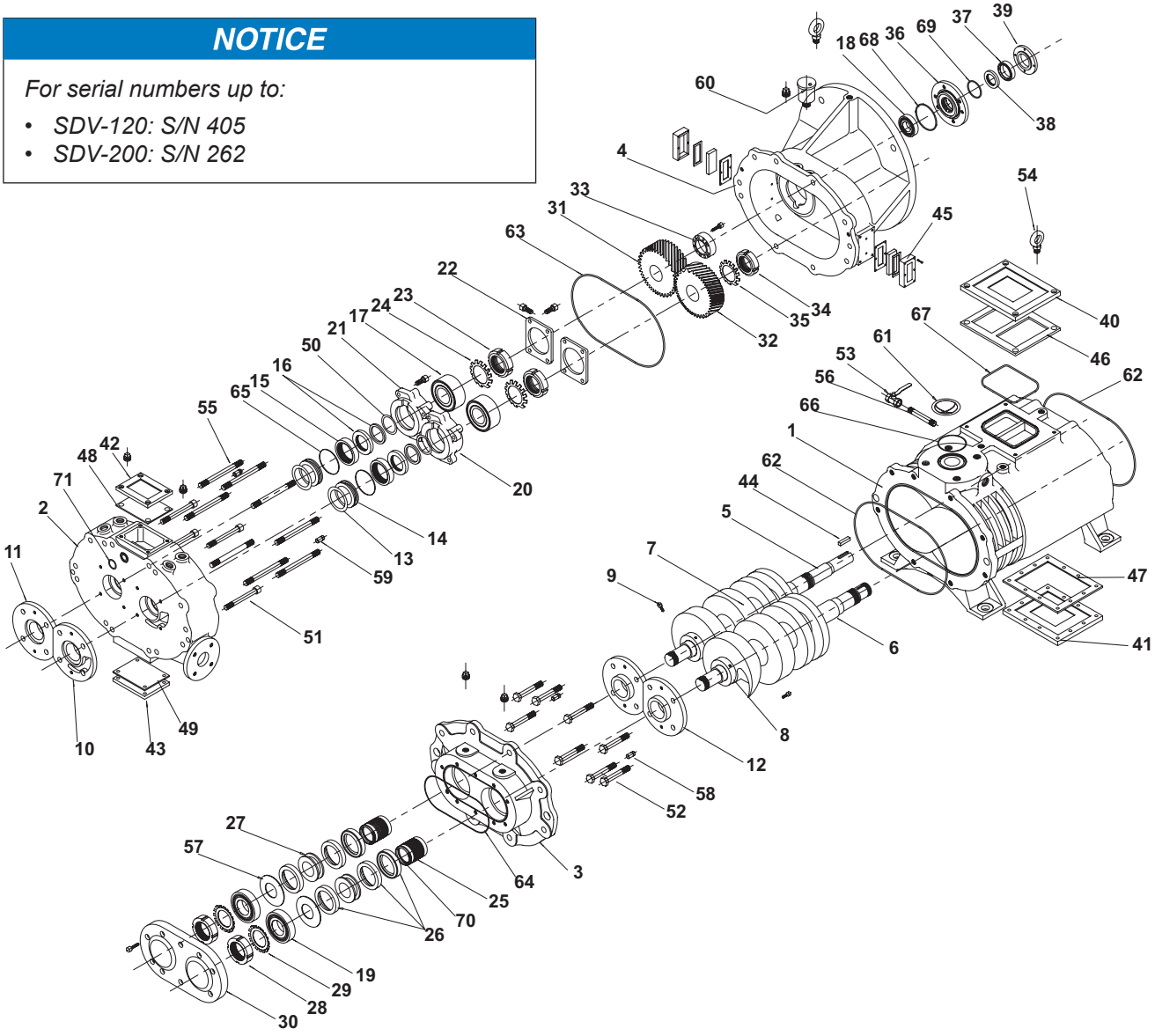
EXPLODED VIEWS AND PARTS LISTS

SDV-120-200 EXPLODED VIEW DRAWING

NOTICE

For serial numbers up to:

- *SDV-120: S/N 405*
- *SDV-200: S/N 262*



SDV-120-200 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover	1
5	Driver Shaft (A)	1
6	Driven Shaft (B)	1
7	Screw	2
8	Lock Nut	2
9	Setting Bolt	2
10	Plate Guide (A)	1
11	Plate Guide (B)	1
12	Plate Guide (C, D)	2
13	Lip Seal	2
14	Lantern Ring	2
15	Mechanical Seal Stator (A)	2
16	Mechanical Seal Rotor (A)	2
17	Ball Bearing	2
18	Ball Bearing	1
19	Roller Bearing	2
20	Bearing Holder (A)	1
21	Bearing Holder (B)	1
22	Bearing Stopper	2
23	Lock Nut	2
24	Lock Washer	2
25	Slip Sleeve	2
26	Lip Seal	6
27	Lantern Ring	2
28	Lock Nut	2
29	Lock Washer	2
30	Grease Cover	2
31	Timing Gear (A)	1
32	Timing Gear (B)	1
33	Power Lock	2
34	Lock Nut	1
35	Lock Washer	1
36	Seal Adapter Housing	1

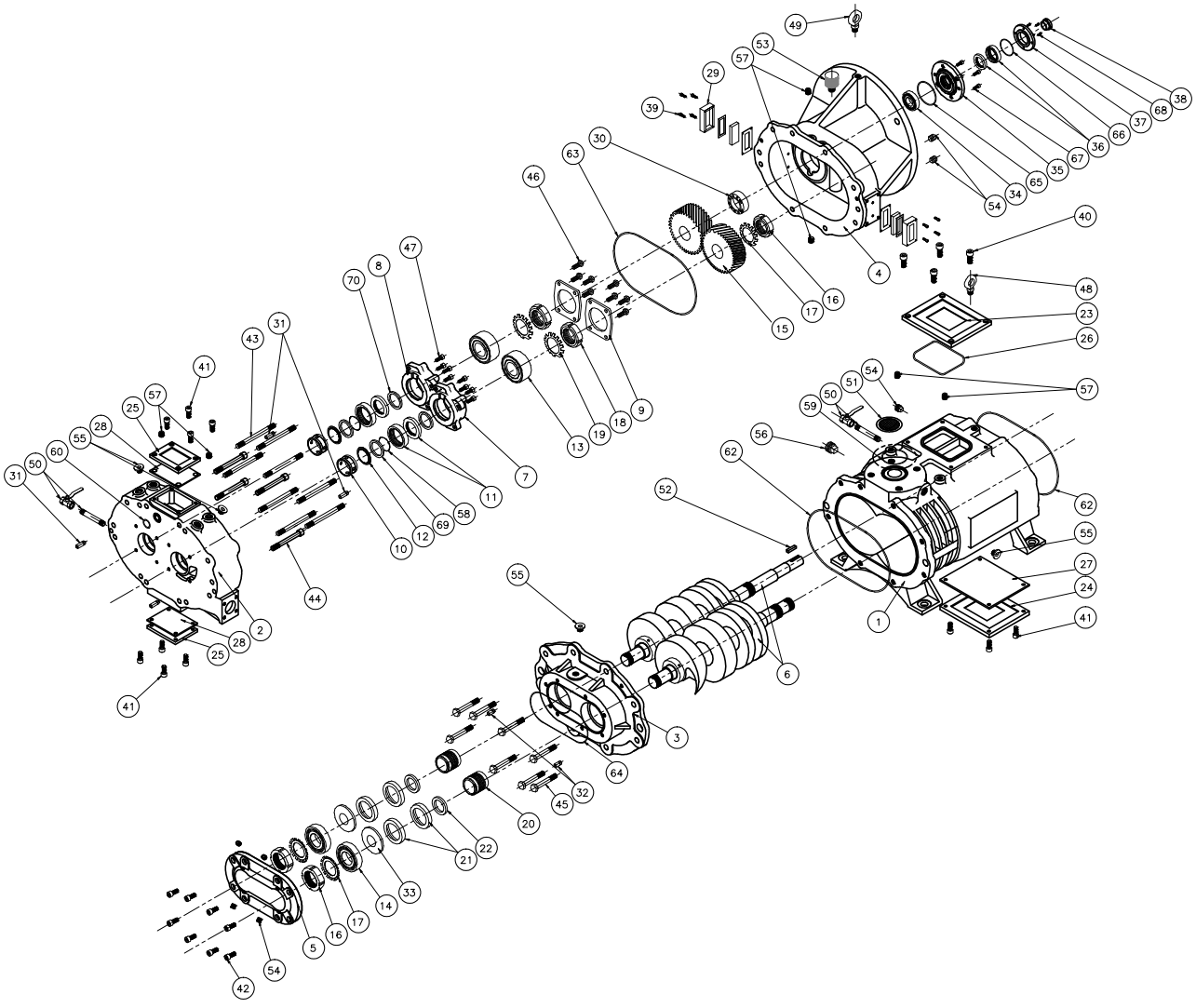
ITEM NO.	DESCRIPTION	QTY
37	Mechanical Seal Stator (B)	1
38	Mechanical Seal Rotor (B)	1
39	Seal Adapter Housing Cover	1
40	Blind Plate (A)	1
41	Blind Plate (B)	1
42	Blind Plate (C)	1
43	Blind Plate (D)	1
44	Key	1
45	Sight Glass Assembly	2
46	Blind Plate Gasket (A)	1
47	Blind Plate Gasket (B)	1
48	Blind Plate Gasket (C)	1
49	Blind Plate Gasket (D)	1
50	Spacer	2
51	Setting Bolt	4
52	Hexa Bolt	8
53	Drain Valve	1
54	Eye Bolt	2
55	Stud Bolt	16
56	Nipple	2
57	Slinger, Rear End Plate	2
58	Dowel Pin	2
59	Dowel Pin	4
60	Air Vent	1
61	Mesh Filter	1
62	O-Ring	2
63	O-Ring	1
64	O-Ring	1
65	O-Ring	2
66	O-Ring	1
67	O-Ring	1
68	O-Ring	1
69	O-Ring	1
70	O-Ring	2
71	O-Ring	1

SDV-120 EXPLODED VIEW DRAWING

NOTICE

For serial numbers from:

- *SDV-120: S/N 406*



SDV-120 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover (Industrial)	1
5	Grease Cover	1
6	Screw shaft (R, L)	1
7	Bearing Holder (A)	1
8	Bearing Holder (B)	1
9	Bearing Stopper	2
10	Lantern Ring (FEP)	2
11	Mech. Seal Ass'y (A)	2
12	Only Lip Seal (FEP)	2
13	Ball Bearing (FEP)	2
14	Roller Bearing	2
15	Timing Gear Set (A, B)	1
16	Lock Nut (REP & FEC)	3
17	Lock Wahser (REP & FEC)	3
18	Lock Nut (FEP)	2
19	Lock Wahser (FEP)	2
20	Slip Sleeve	2
21	Lip Seal (REP)	4
22	Spacer-A (REP)	2
23	Blind plate (A)	1
24	Blind plate (B)	1
25	Blind plate (C)	2
26	O-ring (Blind Plate Gasket A)	1
27	Blind Plate Gasket (B)	1
28	Blind Plate Gasket©	2
29	Sight Glass Ass'y	1
30	POWER LOCK	1
31	Dowel Pin (FEC, FEP, Casing)	4
32	Dowel Pin (REP, Casing)	2
33	REP Slinger	2
34	Ball Bearing	1
35	Seal Adaptor Housing	1

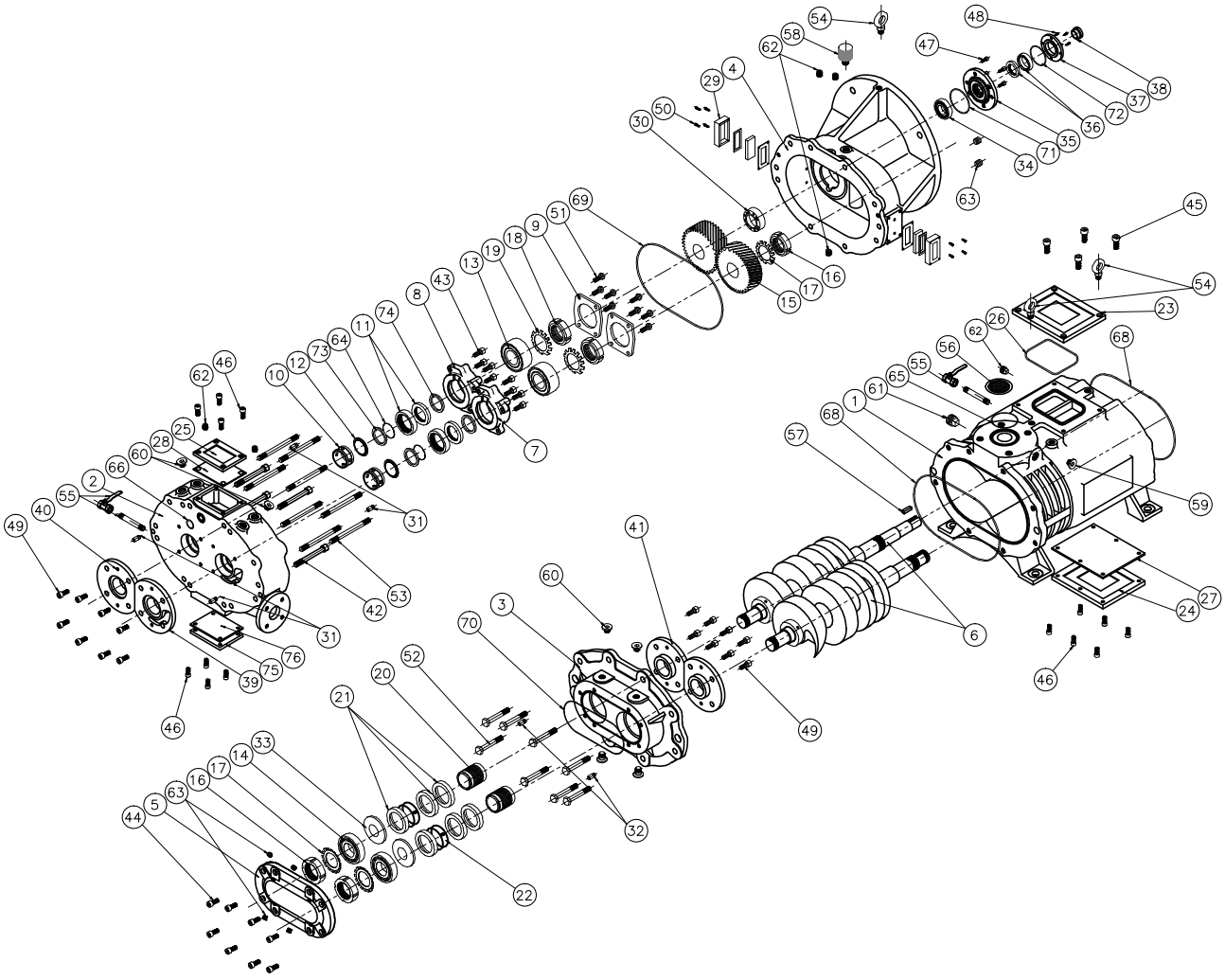
ITEM NO.	DESCRIPTION	QTY
36	Mech. Seal Ass'y (B)	1
37	Seal Adaptor Housing Cover	1
38	Push Sleeve	1
39	Socket Bolt(Sight glass)	8
40	Socket Bolt (B/P, A)	4
41	Socket Bolt (B/P, B,C)	12
42	Socket Bolt (REP + G/C)	8
43	Stud Bolt	8
44	Socket Bolt (FEP, Casing)	4
45	Hex Bolt	8
46	Hex Bolt	8
47	Socket Bolt (Sight glass)	8
48	Eye Bolt (Casing)	1
49	Eye Bolt (FECC.)	1
50	Nipple & Drain Valve	2
51	Mesh Filter	1
52	Key-Drive shaft	2
53	Air Vent	1
54	Plug (G/C, Casing, FEC)	7
55	Pkug (G/C, Casing, FEC)	4
56	PT Plug (Suction)	1
57	PT Plug (CW in & out)	6
58	O-ring (Lantern ring, FEP)	2
59	O-ring (Suction)	1
60	O-ring (FEP, CW)	1
61		
62	O-ring (Casing)	2
63	O-ring (FEP)	1
64	O-ring (Grease Cover)	1
65	O-ring (Seal Adaptor)	1
66	O-ring (Seal Adaptor Bore)	1
67	Socket Bolt (S/A/H)	4
68	Socket Bolt (S/A/H/C)	4
69	Lantern Ring (FEP)	2
70	Spacer (FEP, B)	2

SDV-200 EXPLODED VIEW DRAWING

NOTICE

For serial numbers from:

- *SDV-200: S/N 263*



SDV-200 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover	1
5	Grease Cover	1
6	Screw & Shaft Set (R, L)	1
7	Bearing Holder (A)	1
8	Bearing Holder (B)	1
9	Bearing Stopper	2
10	Lantern Ring (FEP-1)	2
11	Mech. Seal (FEP)	2
12	Only Lip Seal (FEP)	2
13	Ball Bearing (FEP)	2
14	Roller Bearing (REP)	2
15	Timing Gear Set	1
16	Lock Nut	3
17	Lock Washer	3
18	Lock Nut	2
19	Lock Washer	2
20	Slip Sleeve	2
21	Lip Seal (REP)	6
22	Lantern Ring (REP)	2
23	Blind Plate (A)	1
24	Blind Plate (B)	1
25	Blind Plate (C)	2
26	O-ring (Blind plate, A)	1
27	Blind Plate Gasket (B)	1
28	Blind Plate Gasket (C)	2
29	Sight Glass Ass'y	2
30	Power Lock	1
31	Dowel Pin (FEC,FEP,Casing)	4
32	Dowel Pin (REP, Casing)	2
33	REP Slinger	2
34	Ball Bearing (FEC)	1
35	Seal Adapter Housing	1
36	Mech. Seal (FEC)	1
37	Seal Adapter Housing Cover	1

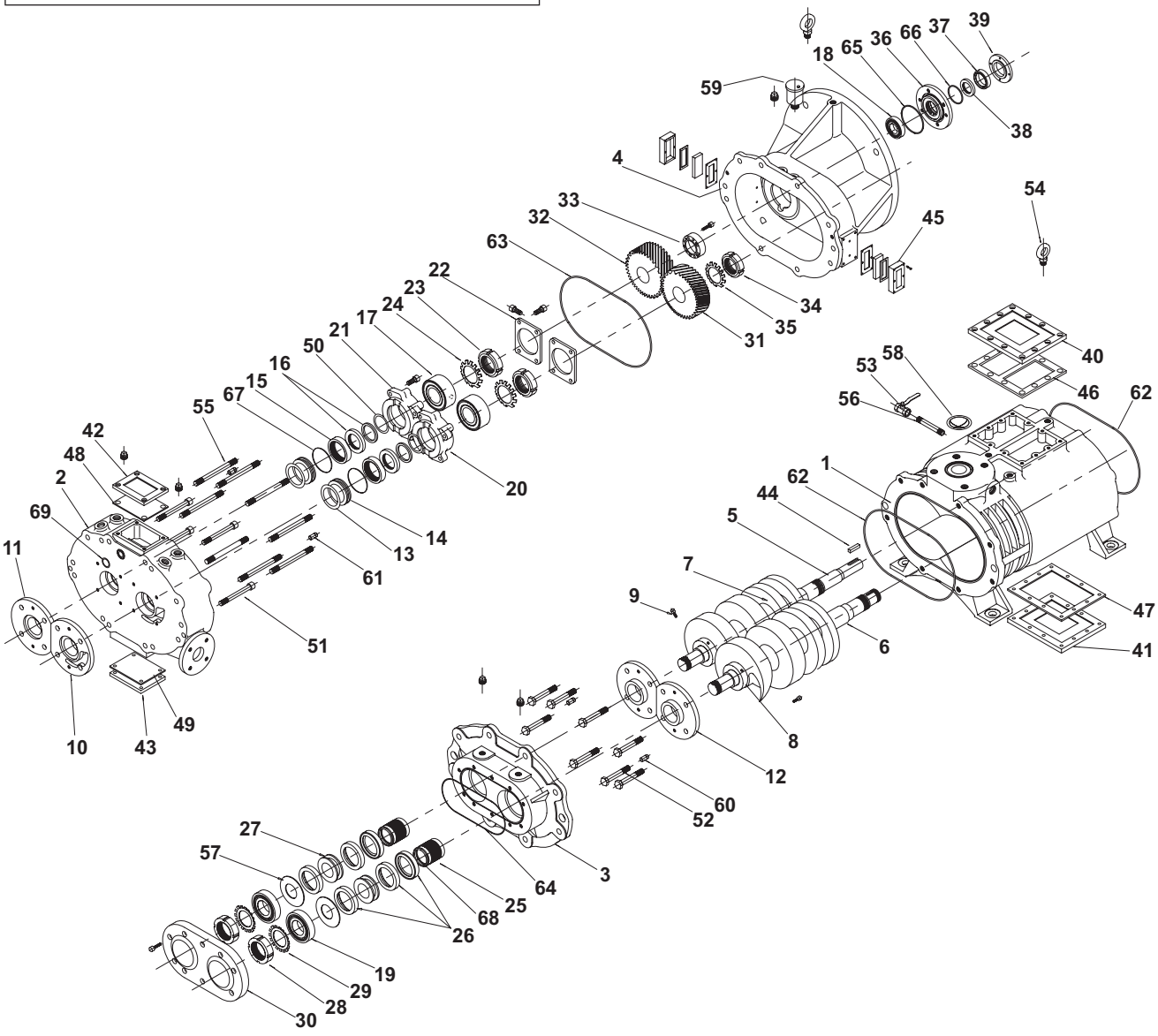
ITEM NO.	DESCRIPTION	QTY
38	Push sleeve	1
39	Plate Guide (A)	1
40	Plate Guide (B)	1
41	Plate Guide (C)	2
42	Socket Bolt (FEP, Casing)	4
43	Socket Bolt (B/H, FEP)	8
44	Socket Bolt (REP, G/C)	8
45	Socket Bolt (B/P-A)	4
46	Socket Bolt (B/P-B,C)	4
47	Socket Bolt (S/A/H)	14
48	Socket Bolt (S/A/H/C)	4
49	Socket Bolt (Plate guide)	16
50	Socket Bolt (Sight glass)	8
51	Hex Bolt (B/H, B/S)	8
52	Hex Bolt (REP, Casing)	8
53	Stud Bolt	8
54	Eye Bolt	3
55	Nipple & Drain valve	2
56	Mesh Filter	1
57	Key-Drive shaft	1
58	Air Vent	1
59	PF Plug	1
60	PT Plug (G/C & FEC)	6
61	PT Plug	1
62	PT Plug (Casing, FEP, FEC)	6
63	PF Plug (REP, FEP)	6
64	O-ring (Lantern ring) - NEW	2
65	O-ring (Suction)	1
66	O-ring (FEP, C.W)	1
67		
68	O-ring (Casing)	2
69	O-ring (FEP)	1
70	O-ring (Grease Cover)	1
71	O-ring (Seal Adpt Housing)	1
72	O-ring (Seal Adpt Housing bore)	1
73	Lantern Ring (FEP-2)	2
74	Spacer	2

SDV-320 EXPLODED VIEW DRAWING

NOTICE

For serial numbers from:

- *SDV-320: S/N 403*



SDV-320 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover	1
5	Driver Shaft (A)	1
6	Driven Shaft (B)	1
7	Screw	2
8	Lock Nut	2
9	Setting Bolt	2
10	Plate Guide (A)	1
11	Plate Guide (B)	1
12	Plate Guide (C, D)	2
13	Lip Seal	2
14	Lantern Ring	2
15	Mechanical Seal Stator	2
16	Mechanical Seal Rotor (A)	2
17	Ball Bearing	2
18	Ball Bearing	1
19	Roller Bearing	2
20	Bearing Holder (A)	1
21	Bearing Holder (B)	1
22	Bearing Stopper	2
23	Lock Nut	2
24	Lock Washer	2
25	Slip Sleeve	2
26	Lip Seal	6
27	Lantern Ring	2
28	Lock Nut	2
29	Lock Washer	2
30	Grease Cover	2
31	Timing Gear (A)	1
32	Timing Gear (B)	1
33	Power Lock	2
34	Lock Nut	1
35	Lock Washer	1

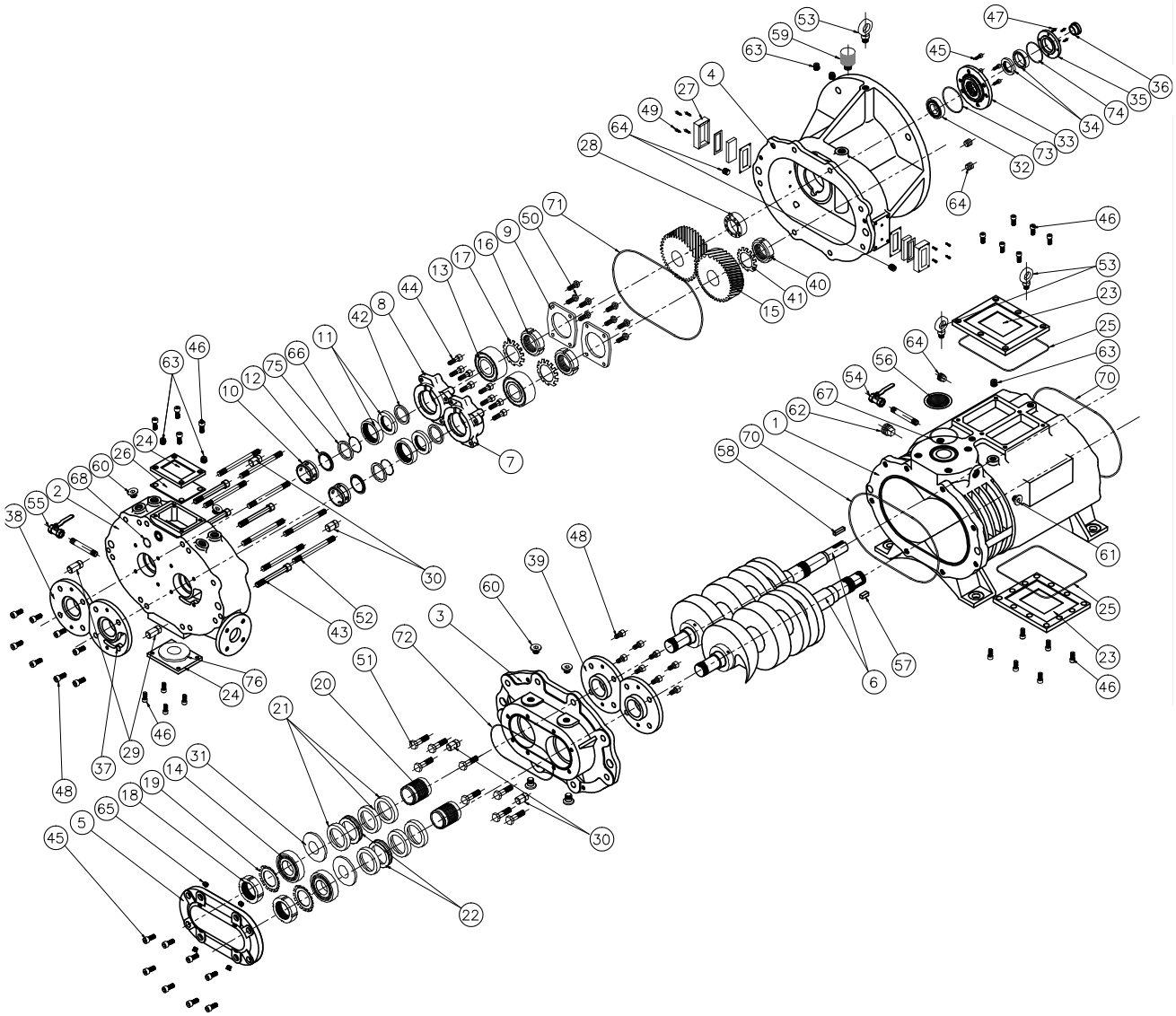
ITEM NO.	DESCRIPTION	QTY
36	Seal Adapter Housing	1
37	Mechanical Seal Stator (B)	1
38	Mechanical Seal Rotor (B)	1
39	Seal Adapter Housing Cover	1
40	Blind Plate (A)	1
41	Blind Plate (B)	1
42	Blind Plate (C)	1
43	Blind Plate (D)	1
44	Key	1
45	Sight Glass Assembly	2
46	Blind Plate Gasket (A)	1
47	Blind Plate Gasket (B)	1
48	Blind Plate Gasket (C)	1
49	Blind Plate Gasket (D)	1
50	Spacer	2
51	Setting Bolt	4
52	Hexa Bolt	8
53	Drain Valve	2
54	Eye Bolt	2
55	Stud Bolt	8
56	Nipple	2
57	Slinger, Rear End Plate	2
58	Mesh Filter	1
59	Air Vent	1
60	Dowel Pin	2
61	Dowel Pin	4
62	O-Ring	2
63	O-Ring	1
64	O-Ring	1
65	O-Ring	1
66	O-Ring	1
67	O-Ring	2
68	O-Ring	2
69	O-Ring	1

SDV-320 EXPLODED VIEW DRAWING

NOTICE

For serial numbers from:

- *SDV-320: S/N 404*



SDV-320 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover, C-face	1
5	Grease Cover	2
6	Screw shaft Ass'y set (R, L)	1
7	Bearing Holder (A)	1
8	Bearing Holder (B)	1
9	Bearing Stopper	2
10	Lantern Ring (FEP)	2
11	Mech. Seal Ass'y (FEP)	2
12	Only LIP SEAL (FEP)	2
13	Ball Bearing (FEP)	2
14	Roller Bearing (REP)	2
15	Timing Gear set	1
16	Lock Nut	2
17	Lock Washer	2
18	Lock Nut (REP)	2
19	Lock Washer (REP)	2
20	Slip Sleeve	2
21	Lip Seal (REP)	6
22	Lantern Ring (REP)	2
23	Blind Plate (A)	2
24	Blind Plate (C)	2
25	Blind Plate Gasket (A)	2
26	Blind Plate Gasket (C)	2
27	Sight Glass Ass'y	2
28	Power Lock	1
29	Dowel Pin (FEP, Casing)	2
30	Dowel Pin (FEC, REP, Casing)	4
31	REP Slinger	2
32	Ball Bearing (FEC)	1
33	Seal Adaptor Housing	1
34	Mech. Seal Ass'y (FEC)	1
35	Seal Adaptor Housing Cover	1
36	Push Sleeve	2
37	Plate Guide (A)	1
38	Plate Guide (B)	1

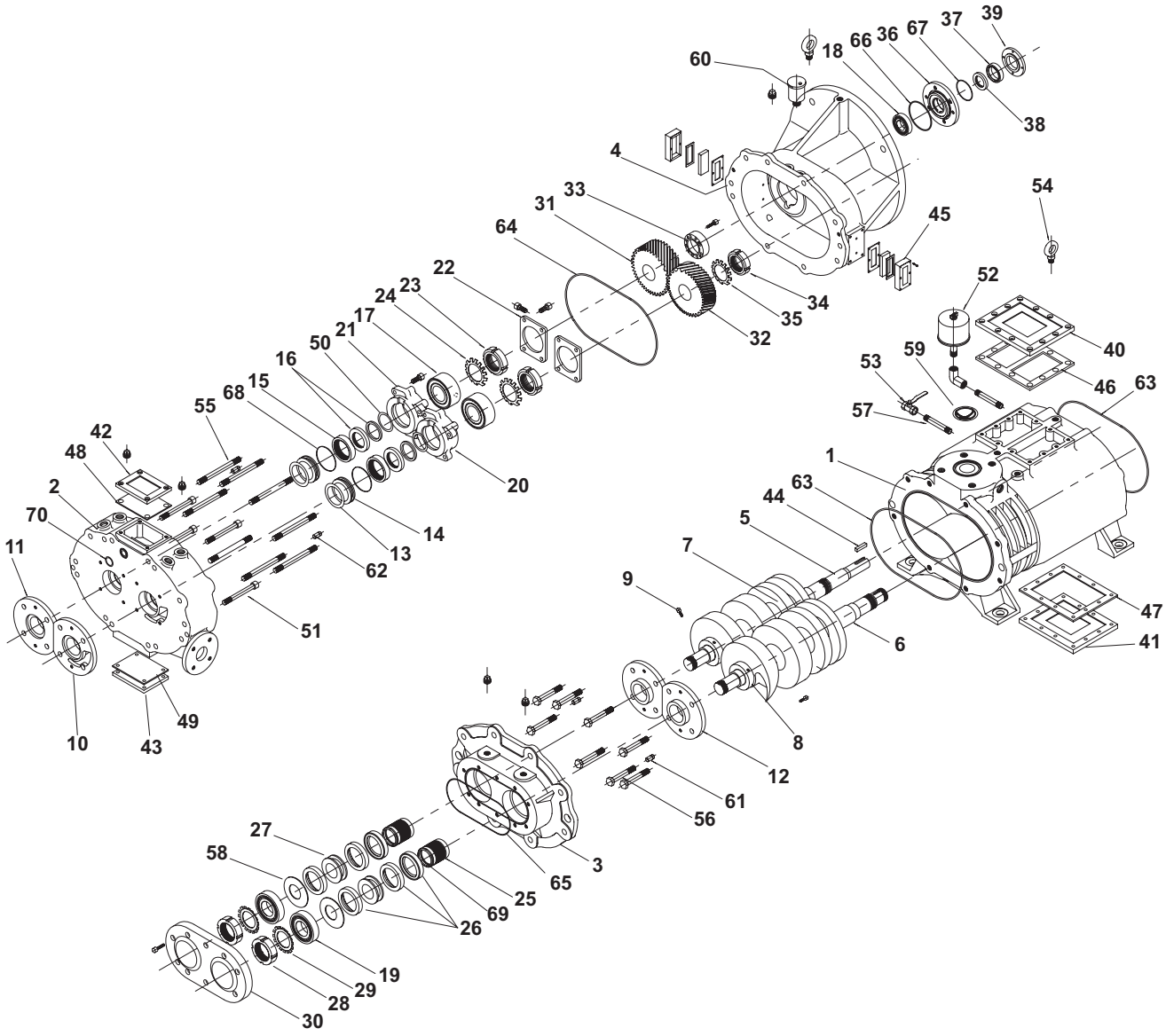
ITEM NO.	DESCRIPTION	QTY
39	Plate Guide (C)	2
40	Lock Nut (FEC)	2
41	Lock Washer (FEC)	2
42	SPACER (A)	2
43	Socket Bolt (FEP, Casing)	4
44	Socket Bolt (B/H, FEP)	8
45	Socket Bolt (REP, G/C, S/A/H)	12
46	Socket Bolt (Blind Plate)	20
47	Socket Bolt (S/A/H/C)	4
48	Socket Bolt (Plate guide)	16
49	Socket Bolt (Sight glass)	8
50	Hex Bolt (B/H, B/S)	8
51	Hex Bolt (RE, Casing)	8
52	Stud Bolt	8
53	Eye Bolt	3
54	Nipple & Drain Valve (PT 1/2)	1
55	Nipple & Drain Valve (PT 1/2)	1
56	Mesh-Filter	1
57	Key (for Gears)	1
58	Key-Drive Shaft	1
59	Air Vent	1
60	PF Plug (REP, FEP)	6
61	PF Plug	1
62	PT Plug	1
63	PT Plug (FEC, FEP, Casing)	5
64	PT Plug (FEC, Casing)	5
65	PF Plug	4
66	O-Ring (Lantern ring)	2
67	O-Ring (Suction)	1
68	O-Ring (FEP CW)	1
69		
70	O-Ring (Casing)	2
71	O-Ring (FEP)	1
72	O-Ring (Grease Cover)	1
73	O-Ring (Seal Adaptor)	1
74	O-Ring (Seal Adaptor bore)	1
75	Lantern Ring (FEP)	2
76	Metal Gasket	1

SDV-430 EXPLODED VIEW DRAWING

NOTICE

For serial numbers less than or equal to:

- *SDV-430: S/N 351*



SDV-430 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover	1
5	Driver Shaft (A)	1
6	Driven Shaft (B)	1
7	Screw	2
8	Lock Nut	2
9	Setting Bolt	2
10	Plate Guide (A)	1
11	Plate Guide (B)	1
12	Plate Guide (C, D)	2
13	Lip Seal	2
14	Lantern Ring	2
15	Mechanical Seal Stator (A)	2
16	Mechanical Seal Rotor (A)	2
17	Ball Bearing	2
18	Ball Bearing	1
19	Roller Bearing	2
20	Bearing Holder (A)	1
21	Bearing Holder (B)	1
22	Bearing Stopper	2
23	Lock Nut	2
24	Lock Washer	2
25	Slip Sleeve	2
26	Lip Seal	6
27	Lantern Ring	2
28	Lock Nut	2
29	Lock Washer	2
30	Grease Cover	2
31	Timing Gear (A)	1
32	Timing Gear (B)	1
33	Power Lock	2
34	Lock Nut	1
35	Lock Washer	1

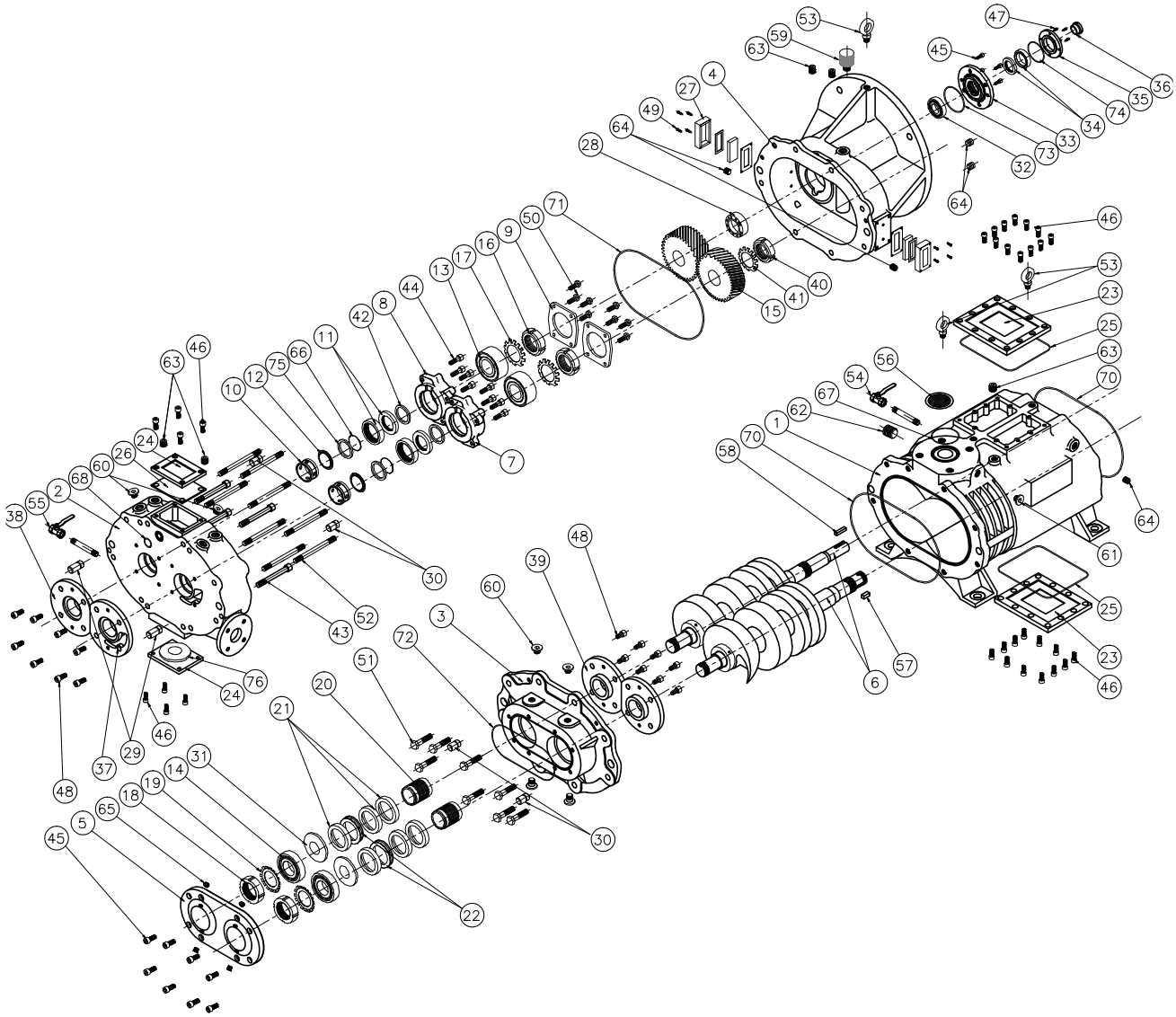
ITEM NO.	DESCRIPTION	QTY
36	Seal Adapter Housing	1
37	Mechanical Seal Stator (B)	1
38	Mechanical Seal Rotor (B)	1
39	Seal Adapter Housing Cover	1
40	Blind Plate (A)	1
41	Blind Plate (B)	1
42	Blind Plate (C)	1
43	Blind Plate (D)	1
44	Key	1
45	Sight Glass Assembly	2
46	Blind Plate Gasket (A)	1
47	Blind Plate Gasket (B)	1
48	Blind Plate Gasket (C)	1
49	Blind Plate Gasket (D)	1
50	Spacer	2
51	Setting Bolt	4
52	Air Filter	1
53	Drain Valve	2
54	Eye Bolt	3
55	Stud Bolt	8
56	Hexa Bolt	8
57	Nipple	2
58	Slinger, Rear End Plate	2
59	Mesh Filter	2
60	Air Vent	1
61	Dowel Pin	2
62	Dowel Pin	4
63	O-Ring	2
64	O-Ring	1
65	O-Ring	1
66	O-Ring	1
67	O-Ring	1
68	O-Ring	2
69	O-Ring	2
70	O-Ring	1

SDV-430 EXPLODED VIEW DRAWING

NOTICE

For serial numbers greater than:

- *SDV-430: S/N 352*



SDV-430 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover, C-face	1
5	Grease Cover	2
6	Screw Shaft Ass'y set (R, L)	1
7	Bearing Holder (A)	1
8	Bearing Holder (B)	1
9	Bearing Stopper	1
10	Lantern Ring (FEP)	2
11	Mech. Seal Ass'y (FEP)	2
12	Only Lip Seal (FEP)	2
13	Ball Bearing (DE)	2
14	Roller Bearing (N.DE)	2
15	Timing Gear set	1
16	Lock Nut (FEP)	2
17	Lock Washer (FEP)	2
18	Lock Nut (REP)	2
19	Lock Washer (REP)	2
20	Slip Sleeve	2
21	Lip Seal (REP)	6
22	Lantern Ring (REP)	2
23	Blind Plate (B)	2
24	Blind Plate (C)	2
25	Blind Plate Gasket (B)	2
26	Blind Plate Gasket (C)	2
27	Sight Glass Ass'y	2
28	Power Lock	1
29	Dowel Pin (FEP, Casing)	2
30	Dowel Pin(FEC, FEP/Casing, REP)	4
31	REP Slinger	2
32	Ball Bearing (Shaft)	1
33	Seal Adaptor Housing	1
34	Mech. Seal Ass'y (FEC)	1
35	Seal Adaptor Housing Cover	1
36	Push sleeve	1
37	Plate Guide (A)	1
38	Plate Guide (B)	1

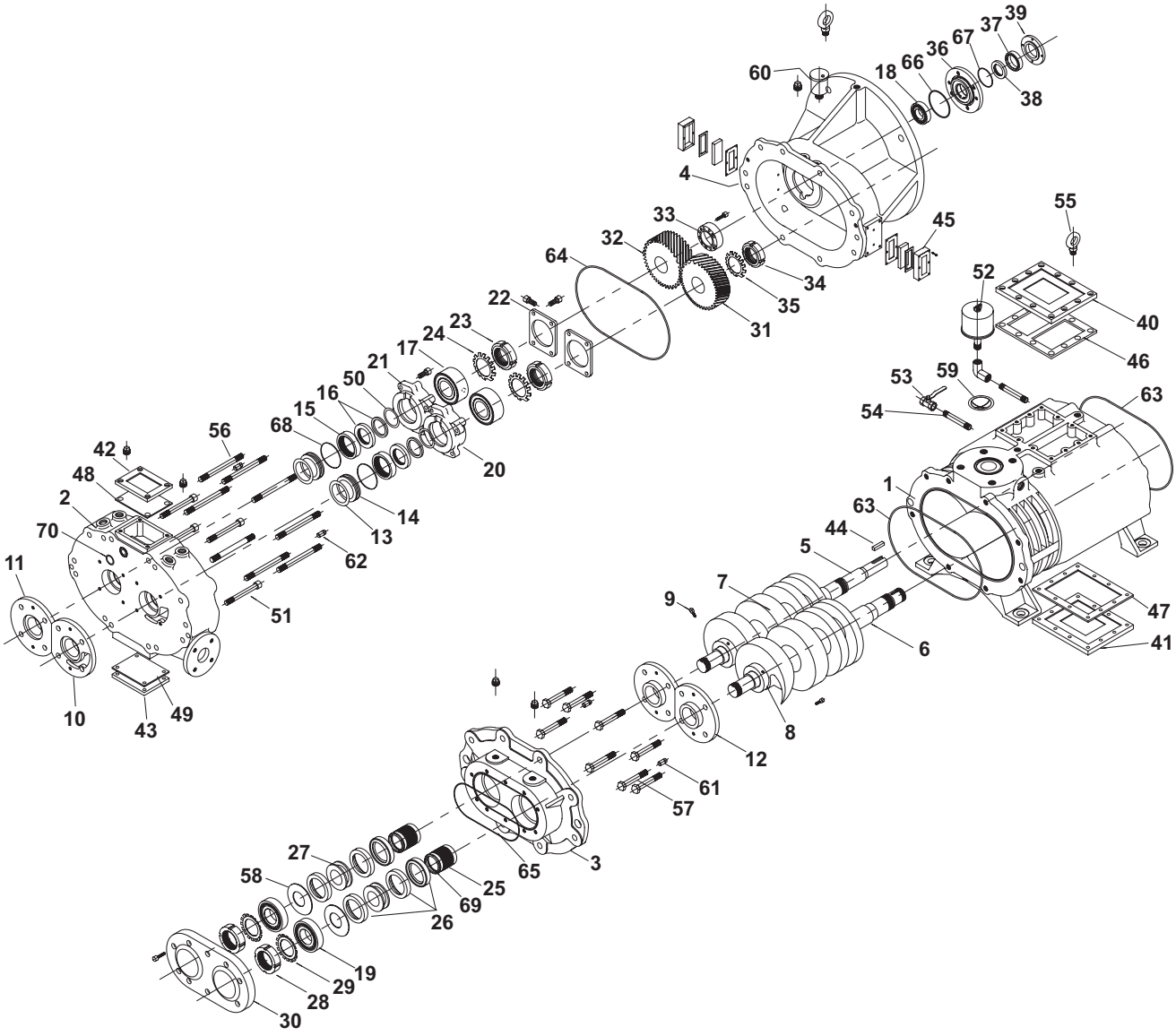
ITEM NO.	DESCRIPTION	QTY
39	Plate Guide (C)	2
40	Lock Nut (REP)	1
41	Lock Washer (REP)	1
42	Spacer	2
43	Socket Bolt (FEP, Casing)	4
44	Socket Bolt (B/H, FEP)	8
45	Socket Bolt (B/H, FEP)	12
46	Socket Bolt (Blind Plate)	32
47	Socket Bolt (S/A/H/C)	4
48	Socket Bolt (Plate guide)	16
49	Socket Bolt (Sight glass)	8
50	Hex Bolt (B/H, B/S)	8
51	Hex Bolt (REP, Casing)	8
52	Stud Bolt	8
53	Eye Bolt	3
54	Nipple & Drain valve (PT 1/2)	1
55	Nipple & Drain valve (PT 3/8)	1
56	Mesh-Filter	1
57	Key (for Gears)	1
58	Key-Drive shaft	1
59	Air Vent	1
60	PF Plug (FEP, REP)	6
61	PF Plug	1
62	PT Plug	1
63	PT Plug (FEC, FEP, Casing)	5
64	PT Plug (FEC, Casing)	5
65	PT Plug	4
66	O-ring (Lantern Ring)	2
67	O-ring (Suction)	1
68	O-ring (FEP, CW)	1
69		
70	O-ring (Casing)	2
71	O-ring (FEP)	1
72	O-ring (Grease Cover)	1
73	O-ring (Seal Adpt Housing Bore)	1
74	O-ring (Seal Adaptor housing)	1
75	Lantern Ring (FEP)	2
76	Metal Gasket	1

SDV-800 EXPLODED VIEW DRAWING

NOTICE

For serial numbers greater than:

- *SDV-800: S/N 240*



SDV-800 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover	1
5	Driver Shaft (A)	1
6	Driven Shaft (B)	1
7	Screw	2
8	Lock Nut	2
9	Setting Bolt	2
10	Plate Guide (A)	1
11	Plate Guide (B)	1
12	Plate Guide (C, D)	2
13	Lip Seal	2
14	Lantern Ring	2
15	Mechanical Seal Stator (A)	2
16	Mechanical Seal Rotor (A)	2
17	Ball Bearing	2
18	Ball Bearing	1
19	Roller Bearing	2
20	Bearing Holder (A)	1
21	Bearing Holder (B)	1
22	Bearing Stopper	2
23	Lock Nut	2
24	Lock Washer	2
25	Slip Sleeve	2
26	Lip Seal	6
27	Lantern Ring	2
28	Lock Nut	2
29	Lock Washer	2
30	Grease Cover	2
31	Timing Gear (A)	1
32	Timing Gear (B)	1
33	Power Lock	2
34	Lock Nut	1
35	Lock Washer	1

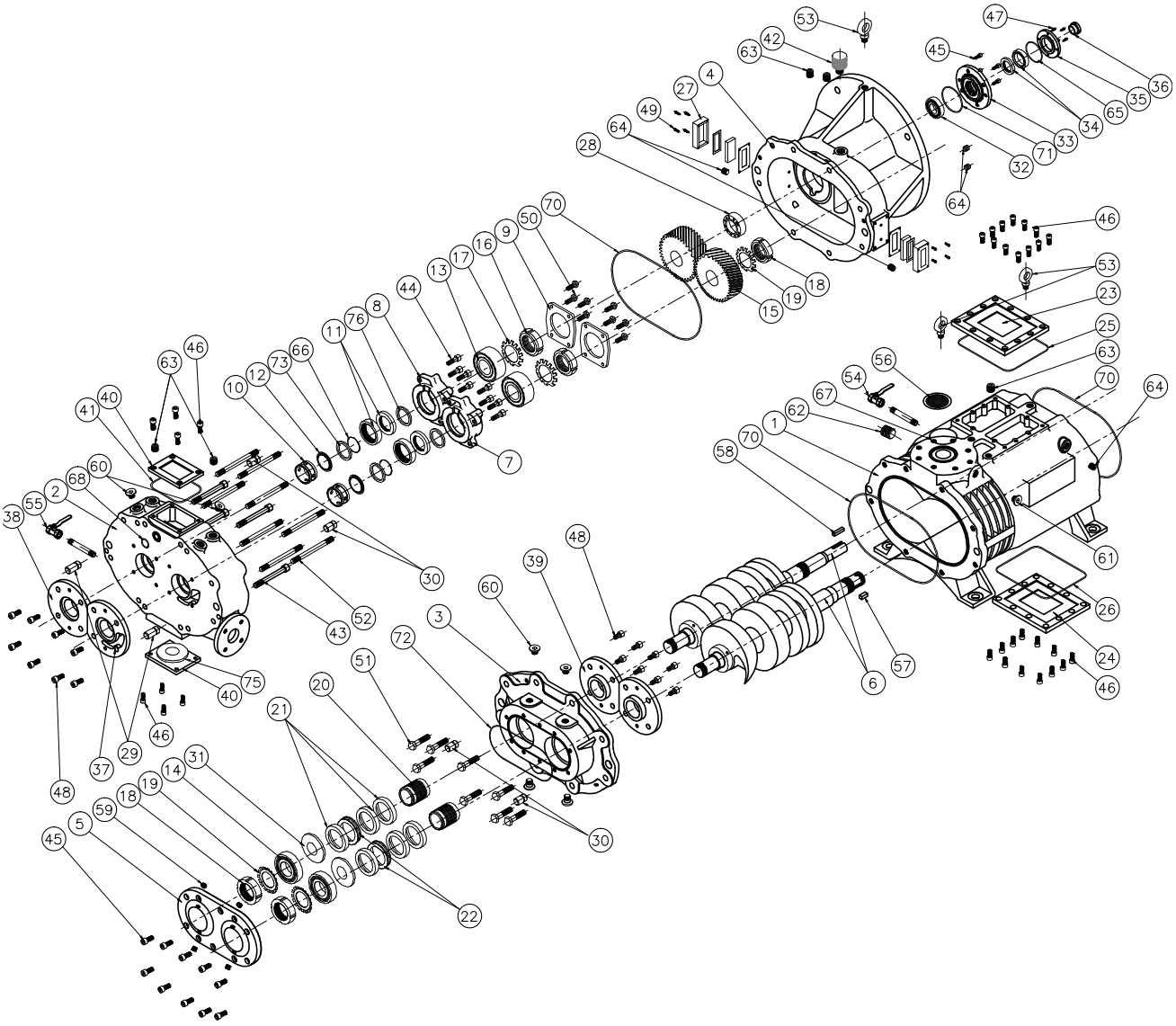
ITEM NO.	DESCRIPTION	QTY
36	Seal Adapter Housing	1
37	Mechanical Seal Stator (B)	1
38	Mechanical Seal Rotor (B)	1
39	Seal Adapter Housing Cover	1
40	Blind Plate (A)	1
41	Blind Plate (B)	1
42	Blind Plate (C)	1
43	Blind Plate (D)	1
44	Key	1
45	Sight Glass Assembly	2
46	Blind Plate Gasket (A)	1
47	Blind Plate Gasket (B)	1
48	Blind Plate Gasket (C)	1
49	Blind Plate Gasket (D)	1
50	Spacer	2
51	Setting Bolt	4
52	Air Filter	1
53	Drain Valve	2
54	Nipple	2
55	Eye Bolt	3
56	Stud Bolt	8
57	Hexa Bolt	8
58	Slinger, Rear End Plate	2
59	Mesh Filter	2
60	Air Vent	1
61	Dowel Pin	2
62	Dowel Pin	4
63	O-Ring	2
64	O-Ring	1
65	O-Ring	1
66	O-Ring	1
67	O-Ring	1
68	O-Ring	2
69	O-Ring	2
70	O-Ring	1

SDV-800 EXPLODED VIEW DRAWING

NOTICE

For serial numbers from:

- *SDV-800: S/N 241*

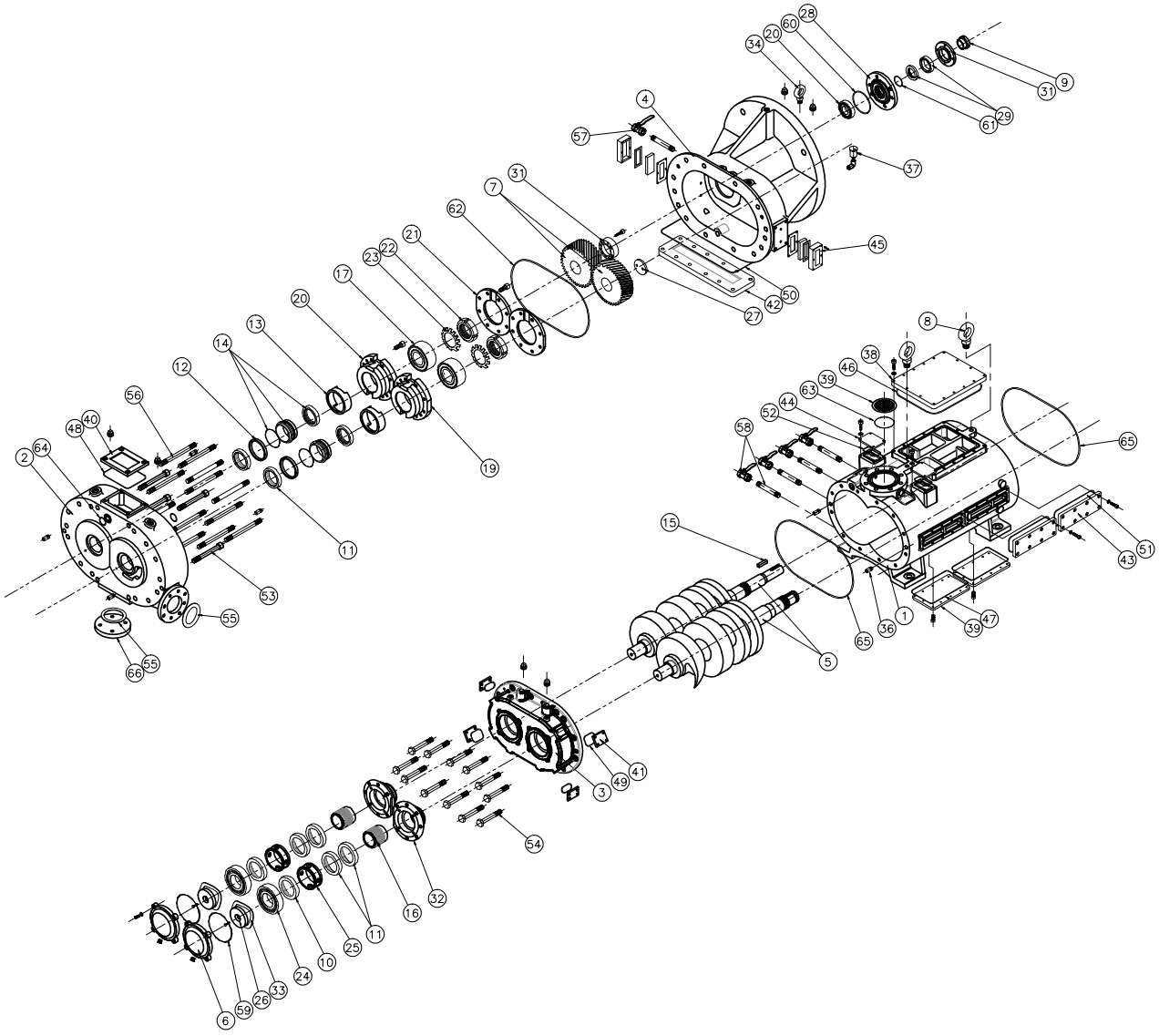


SDV-800 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover	1
5	Grease Cover	1
6	Screw shaft set (R, L)	1
7	Bearing Holder (A)	1
8	Bearing Holder (B)	1
9	Bearing Stopper (A)	2
10	Lantern Ring (FEP)	2
11	Mech. Seal Ass'y (FEP)	2
12	Only Lip Seal (FEP)	2
13	Ball Bearing (DE)	2
14	Roller Bearing (N.DE)	2
15	Timing Gear set	1
16	Lock Nut	2
17	Lock Washer	2
18	Lock Nut (REP, FEC)	3
19	Lock Washer (REP, FEC)	3
20	Slip Sleeve (REP)	2
21	Lip Seal (REP)	6
22	Lantern Ring (REP)	2
23	Blind Plate (A)	1
24	Blind Plate (B)	1
25	Blind Plate Gasket (A)	1
26	Blind Plate Gasket (B)	1
27	Sight Glass Ass'y	2
28	Power Lock	1
29	Dowel Pin (FEP, Casing)	2
30	Dowel Pin (FEC, FEP/Casing, REP)	4
31	REP Slinger	2
32	Ball Bearing (Shaft)	1
33	Seal Adaptor Housing	1
34	Mech. Seal Ass'y (FEC)	1
35	Seal Adaptor Housing Cover	1
36	Push Sleeve	1
37	Plate Guide (A)	1
38	Plate Guide (B)	1

ITEM NO.	DESCRIPTION	QTY
39	Plate Guide (C)	2
40	Blind Plate (C)	2
41	Blind Plate Gasket (C)	2
42	Air Vent	1
43	Socket Bolt (FEP, Casing)	4
44	Socket Bolt (B/H, FEP)	8
45	Socket Bolt (REP, G/C, S/A/H)	14
46	Socket Bolt (Blind Plate)	32
47	Socket Bolt (S/A/H/C)	4
48	Socket Bolt (Blind Plate)	16
49	Socket Bolt (Sight Glass)	8
50	Hex Bolt (B/H, B/S)	8
51	Hex Bolt (REP, Casing)	8
52	Stud Bolt	8
53	Eye Bolt	3
54	Nipples & Drain valve (PT 1/2)	1
55	Nipples & Drain valve (PT 3/8)	1
56	Mesh Filter	1
57	Key (for Gears)	1
58	Key-Drive Shaft	1
59	PT Plug	4
60	PF Plug (FEP, REP)	6
61	PF Plug	6
62	PT Plug	1
63	PT Plug (FEC&FEP&Casing)	5
64	PT Plug (FEC & Casing)	6
65	O-ring (Seal Adaptor Bore)	1
66	O-ring (Lantern ring)	2
67	O-ring (Suction)	1
68	O-ring (FEP, CW)	1
69		
70	O-ring (Casing, FEP)	3
71	O-ring (Seal Adaptor)	1
72	O-ring (Grease Cover)	1
73	Lantern Ring (FEP)	2
74	Spacer	2
75	Metal Gasket	1

SDV-1500 EXPLODED VIEW DRAWING

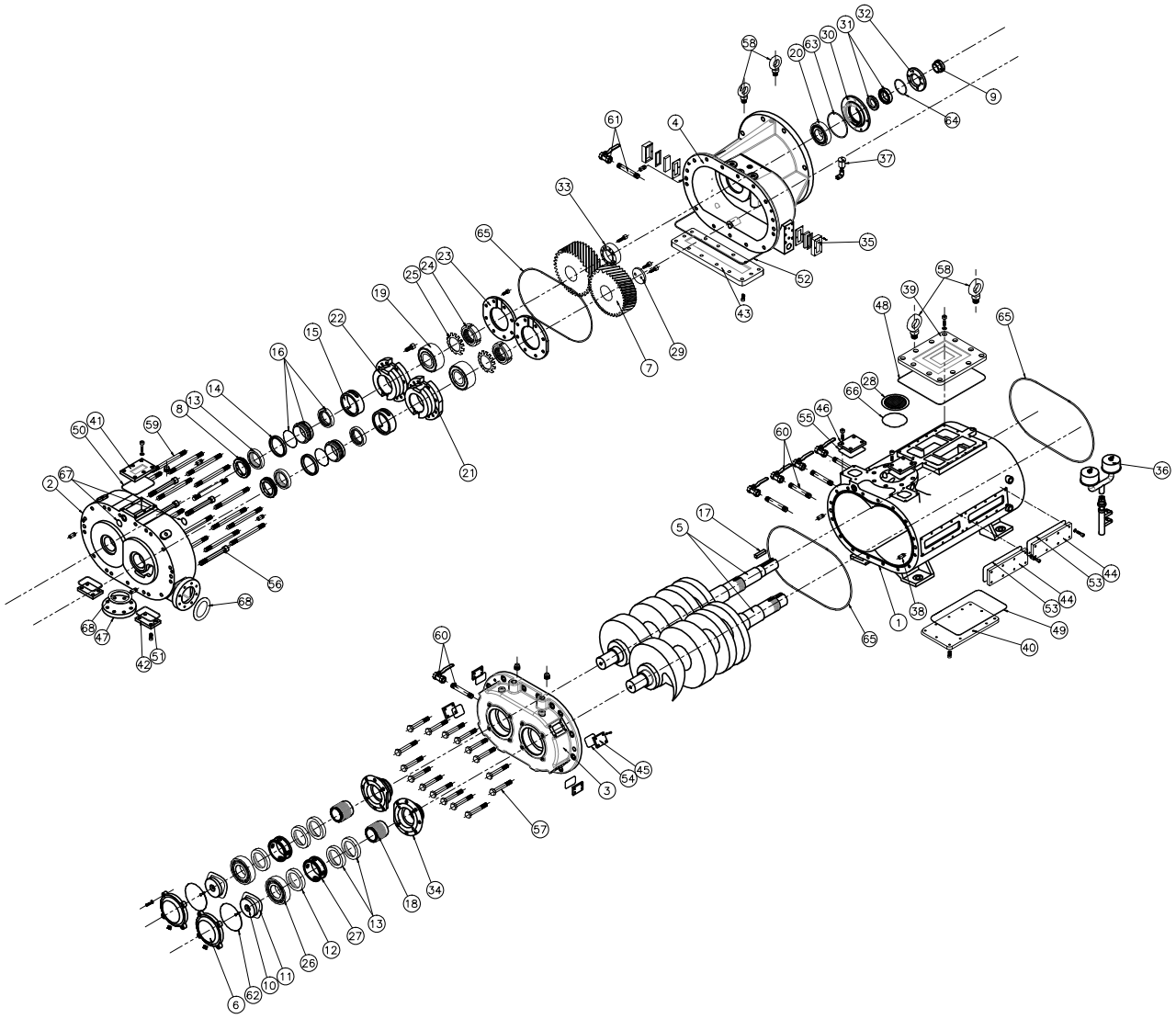


SDV-1500 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Plate	1
3	Rear End Plate	1
4	Front End Cover	1
5	Screw & Shaf set (R, L)	1
6	Grease Cover	2
7	Timing Gear Set	1
8	Eye Bolt	2
9	Push Sleeve	1
10	Single Lip Seal (REP)	2
11	DOUBLE LIP SEAL (FEP & REP)	6
12	Spacer (E)	2
13	Seal Kit Ass'y	2
14	Mech. Seal Ass'y (A)	2
15	Key-Drive shaft	1
16	Slip Sleeve	2
17	Ball Bearing	2
18	Ball Bearing	1
19	Bearing Holder (A)	1
20	Bearing Holder (B)	1
21	Bearing Stopper (A)	2
22	Lock Nut	2
23	Lock Washer	2
24	Roller Bearing	2
25	Lantern Ring (REP)	2
26	Bearing Push Plate	2
27	Gear Stopper	1
28	Seal Adapter Housing	1
29	Mech. Seal Ass'y (B)	1
30	Seal Adapter Housing Cover	1
31	Power Lock	1
32	Bearing Holder (C,D)	1
33	Wave Washer	2

ITEM NO.	DESCRIPTION	QTY
34	Eye Bolt	1
35	Air Vent	1
36	Dowel Pin	6
37	Mesh Filter	1
38	Blind Plate (A)	1
39	Blind Plate (B)	1
40	Blind Plate (C)	2
41	Blind Plate (D)	4
42	Blind Plate (E)	1
43	Blind Plate (F)	2
44	Blind Plate (G)	2
45	Sight Glass Ass'y	2
46	O-ring (Blind Plate, A)	1
47	O-ring (Blind Plate, B)	2
48	O-ring (Blind Plate, C)	1
49	O-ring (Blind Plate, D)	4
50	O-ring (Blind Plate, E)	1
51	O-ring (Blind Plate, F)	2
52	O-ring (Blind Plate, G)	2
53	Setting Bolt	4
54	Hex Bolt	4
55	Metal Gasket	1
56	Stud Bolt	12
57	Nipple & Drain Valve (PT 1)	1
58	Nipple & Drain Valve (PT 3/4)	4
59	O-ring (Grease Cover)	2
60	O-ring (Seal Adaptor)	1
61	O-ring (Seal Adaptor Bore)	1
62	O-ring (FEP)	1
63	O-ring (Suction)	1
64	O-ring (FEP)	2
65	O-ring (Casing)	2
66	Blind Plate (H)	1

SDV-2700 EXPLODED VIEW DRAWING



SDV-2700 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Casing	1
2	Front End Cover	1
3	Rear End Plate	1
4	Front End Cover	1
5	Screw shaft Set (R, L)	1
6	Grease Cover	2
7	Timing Gear Set	1
8	Lantern Ring (REP)	2
9	Push Sleeve	1
10	Bearing Push Plate	2
11	Wave Washer	2
12	Single Lip Seal (REP)	2
13	Double Lip Seal (FEP, REP)	6
14	Spacer (E)	2
15	Seal Kit Ass'y	2
16	Mech. Seal Ass'y (FEP)	2
17	Key-Drive shaft	1
18	Slip Sleeve (REP)	2
19	Ball Bearing	2
20	Ball Bearing	1
21	Bearing Holder (A)	1
22	Bearing Holder (B)	1
23	Bearing Stopper (A)	2
24	Lock Nut	2
25	Lock Washer	2
26	Roller Bearing	2
27	Lantern Ring (REP)	2
28	Mesh Filter	1
29	Gear Stopper	1
30	Seal Adpt. Housing	1
31	Mech. Seal Ass'y (FEC)	1
32	Seal Adpt. Housing Cover	1
33	Power Lock	1
34	Bearing Holder (C, D)	1

ITEM NO.	DESCRIPTION	QTY
35	Sight Glass Ass'y	2
36	Air Filter Ass'y	2
37	Air Vent	2
38	Dowel Pin	6
39	Blind Plate (A)	1
40	Blind Plate (B)	1
41	Blind Plate (C)	1
42	Blind Plate (D)	2
43	Blind Plate (E)	1
44	Blind Plate (F)	4
45	Blind Plate (G)	4
46	Blind Plate (H)	2
47	Blind Plate (I)	1
48	O-ring (Blind Plate, A)	1
49	O-ring (Blind Plate, B)	1
50	O-ring (Blind Plate, C)	1
51	O-ring (Blind Plate, D)	2
52	O-ring (Blind Plate, E)	1
53	O-ring (Blind Plate, F)	4
54	O-ring (Blind Plate, G)	4
55	O-ring (Blind Plate, H)	2
56	Setting Bolt	4
57	Hex Bolt	15
58	Eye Bolt	4
59	Stud Bolt	15
60	Nipple & Drain Valve (PT 3/4)	5
61	Nipple & Drain Valve (PT 1)	1
62	O-ring (Grease Cover)	2
63	O-ring (Seal Adaptor)	1
64	O-ring (Seal Adaptor bore)	1
65	O-ring (FEP, Casing)	3
66	O-ring (Suction)	1
67	O-ring (FEP, CW)	2
68	Metal Gasket	1

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WARRANTY – VACUUM PRODUCTS

Subject to the terms and conditions hereinafter set forth and set forth in General Terms of Sale, Kinney (the Seller) warrants products and parts of its manufacture, when shipped, and its work (including installation and start-up) when performed, will be of good quality and will be free from defects in material and workmanship. This warranty applies only to Seller's equipment, under use and service in accordance with Seller's written instructions, recommendations and ratings for installation, operating, maintenance and service of products, for a period as stated in the table below. Because of varying conditions of installation and operation, all guarantees of performance are subject to plus or minus 5% variation. (Non-standard materials are subject to a plus or minus 10% variation).

PRODUCT TYPE	WARRANTY DURATION
New (Non-Piston Pumps)	15 months after date of shipment or 12 months after initial startup date, whichever occurs first
New (Piston Pumps)	30 months after date of shipment, on all units sold after June 1, 2014.
Repair	6 months after date of shipment or remaining warranty period, whichever is greater
Remanufactured	9 months after date of shipment or 6 months after initial startup date, whichever occurs first

THIS WARRANTY EXTENDS ONLY TO BUYER AND/OR ORIGINAL END USER, AND IN NO EVENT SHALL THE SELLER BE LIABLE FOR PROPERTY DAMAGE SUSTAINED BY A PERSON DESIGNATED BY THE LAW OF ANY JURISDICTION AS A THIRD PARTY BENEFICIARY OF THIS WARRANTY OR ANY OTHER WARRANTY HELD TO SURVIVE SELLER'S DISCLAIMER.

All accessories furnished by Seller but manufactured by others bear only that manufacturer's standard warranty.

All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event within one (1) year from date of shipment of the applicable item and all claims for defective work must be made in writing immediately upon discovery and in any event within one (1) year from date of completion thereof by Seller. Unless done with prior written consent of Seller, any repairs, alterations or disassembly of Seller's equipment shall void warranty. Installation and transportation costs are not included and defective items must be held for Seller's inspection and returned to Seller's Ex-works point upon request.

THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OF PURPOSE.

After Buyer's submission of a claim as provided above and its approval, Seller shall at its option either repair or replace its product, part, or work at the original Ex-works point of shipment, or refund an equitable portion of the purchase price.

The products and parts sold hereunder are not warranted for operation with erosive or corrosive material or those which may lead to build up of material within the product supplied, nor those which are incompatible with the materials of construction. The Buyer shall have no claim whatsoever and no product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action nor for problems resulting from build-up of material within the unit nor for problems due to incompatibility with the materials of construction.

Any improper use, operation beyond capacity, substitution of parts not approved by Seller, or any alteration or repair by others in such manner as in Seller's judgment affects the product materially and adversely shall void this warranty.

No employee or representative of Seller other than an Officer of the Company is authorized to change this warranty in any way or grant any other warranty. Any such change by an Officer of the Company must be in writing.

The foregoing is Seller's only obligation and Buyer's only remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under the General Terms of Sale in the sections on CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE and the PATENTS Clause hereof, the foregoing is BUYER'S ONLY REMEDY HEREUNDER BY WAY OF BREACH OF CONTRACT, TORT OR OTHERWISE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERED OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT OR WORK. In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within one (1) year after the cause of action has occurred.

June, 2014

OPERATING DATA FORM / PRODUCT REGISTRATION

It is to the user's advantage to have the requested data filled in below and available in the event a problem should develop in the vacuum booster, vacuum pump or the system. This information is also helpful when ordering spare parts.

Model No. _____ V-Belt Size _____ Length _____

Serial No. _____ Type of Lubrication _____

Startup Date _____ _____

Pump RPM _____ Operating Vacuum _____

Pump Sheave Diameter _____ Any other Special Accessories Supplied or in use:

Motor Sheave Diameter _____ _____

Motor RPM _____ HP _____ _____

NOTES: _____

_____

_____

_____

IMPORTANT

All vacuum boosters and vacuum pumps manufactured by Kinney are date coded at time of shipment. In order to assure you of the full benefits of the product warranty, please complete, tear out and return the product registration card. You may also register your product online at www.md-kinney.com or contact Customer Service.

KINNEY®

For Service & Repair, Technical Support, or Product Sales contact:

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Springfield, Missouri USA 65803-8702
O 417.865.8715 800.825.6937
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MEMBER OF CAGI Compressed Air & Gas Institute

AVEM Association of Vacuum Equipment Manufacturers

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