Tuthill
PUMP YOUR HEART INTO IT

KINNEY®
Single Stage Rotary Vane Pumps

Manual 1865 Rev B p/n 001865 0000

WARNING: Do Not Operate Before Reading Manual

KVA Series
OPERATOR'S MANUAL

Models

KVA12	KVA40	KVA160	KVA630
KVA21	KVA63	KVA250	
KVA25	KVA100	KVA400	

Operator's Manual: Tuthill KVA Series Single Stage Rotary Vane Pumps

Tuthill Vacuum & Blower Systems | tuthillvacuumblower.com | 800.825.6937

The employees of Tuthill Vacuum & Blower Systems thank you for your purchase!

Tuthill Vacuum & Blower Systems proudly manufactures Kinney® vacuum pumps and M-D Pneumatics™ blowers and vacuum boosters in Springfield, Missouri, USA. We bring 100+ years of engineering experience and solid, hands-on care to help customers keep their processes running. Your satisfaction is important to us so please take time to provide your Tuthill sales representative with performance feedback. We love to hear from our customers!

Tuthill is a family owned business that was started by James B. Tuthill in 1892. At that time, Tuthill manufactured common brick to Chicago construction companies who were fueling the city's rapid expansion. Fast forward to today and Tuthill now serves sustaining, global markets like agriculture, chemical, construction, energy, food and beverage, pharmaceuticals and medical, transportation, and utilities. While the company has changed in what it manufactures, one thing remains throughout every Tuthill line of business – we are a company with HEART. Our slogan is "Pump Your Heart Into It" and everyday our employees do just that as they represent the Tuthill brand and dare to make better.

Thank you for making Tuthill Vacuum & Blower Systems part of your company's process!

A company with heart right from the start.

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INTRODUCTION

CONGRATULATIONS on your purchase of a new **KINNEY® KVA** oil lubricated, rotary vane vacuum pump from Tuthill Vacuum & Blower Systems. 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 KVA 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.

This manual covers KVA model vacuum pumps. Please identify the model number and serial number when ordering parts.

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

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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 TAG

⚠ 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.

SAFETY PRECAUTIONS FOR VANE PUMPS

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

- Do not operate the pump without the guards properly attached. Disconnect the pump motor from the electrical supply at the main disconnect before removing the guards. Replace the belt guard before reconnecting the power supply to the pump motor. Operating the pump without the belt guard 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 before operating 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 guards are properly installed, and all fill and drain valves are installed and closed before reconnecting the power supply. Accidental start-up or operation of the pump while maintenance is in progress could cause damage or serious bodily injury.
- Lift the 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).

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INSTALLATION

UNPACKING

Inspect the box and pump carefully for any signs of damage incurred in transit. Since all pumps are ordinarily shipped F.O.B. from our factory or regional warehouse, such damage is normally the responsibility of the carrier and should be reported to them.

The vacuum pump is bolted to the skid. To free the pump, remove the fasteners.

The inlet and exhaust of the pump are covered with plastic caps to prevent dirt and other foreign substances from entering the pump. Leave these caps in place until you are ready to pipe the pump to your equipment.

LOCATION

Install the pump in a horizontal position on a level surface so that the pump is evenly supported on its rubber feet. Leave 12 – 18 in. (30 – 46 cm) of access around the pump to allow proper cooling. Provide adequate ventilation for the fans, radiator, and motor.

Allow easy access to the oil sight glass for inspection of the oil level, and allow easy access to the exhaust port for filter changes. Do not tip over the pump if it is filled with oil.

POWER REQUIREMENTS

A schematic diagram for the electrical motor terminal connections is located in the junction box of the motor or on the motor nameplate.

Connect the motor according to the electrical codes through a fused switch in order to protect the motor against electrical or mechanical overload conditions. Set the overload of the motor starter at a level equal to the full load motor current listed on the motor nameplate.

If the pump is supplied with a motor starter, it is preset at the factory according to customer specifications. Check that these settings are in line with the voltage at your location. If the voltage is different, please contact Tuthill Vacuum & Blower Systems for motor and starter information.

Correct direction of rotation is marked by an arrow on the motor fan housing and is counterclockwise when looking at the motor from the motor's fan side.

NOTE: After electrical connections have been made but before oil has been added, check the rotation of the motor. If rotation is backward, reverse any two leads of the three at the power connection.

VACUUM CONNECTIONS

Use a pipe size that is at least equal to the size of the pump inlet connections. Smaller lines result in a reduced pump capacity and performance.

For pumps operating in parallel on a common main line, install a manual or automatic operated shut-off valve or a positive action check valve in the suction line adjacent to the pump suction flange. Do not use the built-in anti-suckback valve as a shut-off valve for the vacuum system.

Remove the plastic protective cap from the inlet port before connecting the pump to the system.

Should process gas contain dust or other foreign particles, connect a suitable inline (inlet) filter to the inlet port. Consult Tuthill Vacuum & Blower Systems for recommendations.

Design the vacuum piping so that no liquids such as condensate or liquid carried over from the process can reach the pump. If this possibility exists, install a knock-out liquid separator. Consult Tuthill Vacuum & Blower Systems for recommendations.

If an exhaust manifold is connected, install a drip leg and drain near the pump exhaust to prevent exhaust condensation from entering the exhaust box. The thread sizes in ***Table 3-1*** are standard on KVA pumps:

Table 3-1

PUMP MODEL	INLET SIZE	EXHAUST SIZE
KVA12 / KVA21	1/2 in. NPT	Open Grid
KVA25 / KVA40	1-1/4 in. NPT	1-1/4 in. NPT
KVA63 / KVA100	1-1/4 in. NPT	1-1/4 in. NPT
KVA160 / KVA250	2 in. NPT	2 in. NPT
KVA400	3 in. NPT	3 in. NPT
KVA630	3 in. NPT	3 in. NPT

FILLING THE PUMP WITH OIL

The pump is shipped without oil. After level installation and correct rotation has been established, fill the pump with the recommended motor oil through the oil fill port. The oil level should be at the 3/4 mark on the oil sight glass.

Use a non-detergent oil. Oil detergent additives can clog exhaust filters and shorten their service life. Tuthill Vacuum & Blower Systems recommends KV-100 oil for normal duty operation or S500 oil for severe duty operation.

Table 3-2 gives the approximate quantities of oil required for each model.

Table 3-2

PUMP MODEL	OIL CAPACITY
KVA12 / KVA21	0.5 qt (0.5 L)
KVA25 / KVA40	1.5 qt (1.4 L)
KVA63 / KVA100	2.6 / 2.9 qt (2.5 / 2.7 L)
KVA160 / KVA250	7.4 qt (7.0 L)
KVA400	20.0 qt (19.0 L)
KVA630	20.0 qt (19.0 L)

⚠ WARNING

Do not add or fill oil with pump running or through the inlet or exhaust ports! Do not overfill.

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OPERATION

START-UP

Check rotation of the motor as described in ***Power Requirements on page 4***. Fill the pump with oil as described in ***Filling the Pump With Oil on page 5***.

Start the pump with the inlet closed. Run the pump for a few minutes and then shut it down. Check the oil level again and make sure the oil level is between the 3/4 mark and the FULL mark on the upper oil sight glass.

Add oil, if necessary. Add pump oil only when the pump is off and circulating oil has sufficient time to return to the oil sump.

STOPPING THE PUMP

To stop the pump, turn off the power. A built-in anti-suckback valve will prevent oil in the oil reservoir from being sucked back into the cylinder after the pump is shut down. Do not use the anti-suckback valve as a check valve. Consult Tuthill Vacuum & Blower Systems for proper check valves.

GAS BALLAST

KVA pumps are equipped with a gas ballast. The gas ballast valve is located between the inlet port and the exhaust box. Its main function is to prevent water vapor from condensing in the pump, which causes emulsification of the oil that can result in pump failure.

In applications when the quantity of water vapor is moderate, Tuthill Vacuum & Blower Systems recommends running the pump for 10 minutes to its normal operating temperature prior to going on process. Also operate the pump off process for 10 minutes prior to shutdown. A slight air bleed (purge) is recommended during these 10-minute cycles to prevent the vapor from condensing in the pump.

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05 MAINTENANCE

KVA Series vacuum pumps require very little maintenance. To ensure optimum performance, perform the following maintenance procedures.

INLINE (INLET) FILTER

Check the inline (inlet) filter on a weekly basis. Clean or replace the filter cartridge when it is dirty. Consult Tuthill Vacuum & Blower Systems for replacement element information.

⚠ CAUTION

Depending on the mounting position of the filter, be careful not to allow accumulated foreign material to fall in the pump suction inlet when removing the filter cartridge. Horizontal filter installation is recommended to prevent this.

OIL LEVEL

Under normal circumstances, adding oil between oil changes should not be necessary. A significant drop in oil level means there is either an oil leak, a defective exhaust filter or O-ring, or a leaking anti-suckback valve.

If the pump is smoking excessively, the exhaust filter may be installed improperly.

It is normal for the oil to be foamy or lightly colored in an operating pump. This may be normal aeration of the oil. If the oil appears milky or dark colored, it is contaminated or burned and must be changed.

Check the oil level only when the pump is shut off. Replenish oil if it drops below the 1/4 mark of the top sight glass. Add oil through the oil fill port only.

⚠ CAUTION

Do not add oil while the pump is running, since hot oil can escape from the oil fill port.

OIL TYPE AND QUANTITY

See “Filling the Pump With Oil” on page 5 for details on oil type and quantity.

OIL CHANGE

Oil change frequency depends on the application and ambient temperature. Tuthill Vacuum & Blower Systems recommends that the customer monitor the condition of the oil. When using KV-100 oil, Tuthill Vacuum & Blower Systems recommends changing the oil every 500 – 750 operating hours. When using S500 oil, Tuthill Vacuum & Blower Systems recommends changing the oil every 750 – 1,000 operating hours.

OIL SPIN-ON FILTER

Replace the spin-on filter at every oil change. Please consult Tuthill Vacuum & Blower Systems' authorized representative for part numbers.

EXHAUST FILTER

Replace the exhaust filters every 9 to 18 months of operation or as necessary. The service life of the exhaust filters varies depending upon the application and frequency of oil change. It is necessary to change the exhaust filters only when they become clogged. Indications of clogged exhaust filters are smoke or oil mist coming from the exhaust of the pump, a higher than normal motor current, and an exhaust pressure gauge reading of 3 psig (21 kPa) or greater.

Do not clean or re-use exhaust filters. Dispose of the exhaust filters properly as they might contain toxic substances carried over from the process. Replace the O-rings on the exhaust filter when changing it.

Please consult Tuthill Vacuum & Blower Systems' authorized representative for part numbers.

OVERHAUL KIT AND ACCESSORIES

An overhaul kit contains a set of gaskets, O-rings, vanes, bearing, bearing sleeves, shaft seals, and taper pins. Please consult Tuthill Vacuum & Blower Systems' authorized representative for part numbers.

MAINTENANCE SCHEDULE

The operating life of the pump is greatly affected by the oil quality and filter condition. Periodic maintenance will ensure a reliably operating vacuum pump.

Daily: Visually check oil level and color.

Weekly: Inspect inline (inlet) filter.

Monthly: Check the exhaust filter's function.

Every 2 – 6 months: Drain and discard oil from pump while hot. Refill with fresh oil.

Every 9 – 18 months: Replace exhaust filter elements and O-ring.

Every 500 – 2,000 Operating hours: Change the oil and oil filter. In models equipped with the float valve with a return line, check the float valve's operating conditions.

See the motor manufacturer's manual for the periodic motor maintenance.

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SPECIFICATIONS

			KVA12	KVA21	KVA25	KVA40	KVA63	KVA100	KVA160	KVA250	KVA400	KVA630
NOMINAL DISPLACEMENT	60 HZ	CFM	7	14	21	28	45	71	124	177	300	460
	50 HZ		6	12	18	24	38	60	103	147	247	388
	60 HZ	m^3/h	12	24	36	48	78	120	210	300	505	780
	50 HZ		10	20	30	40	65	100	175	250	420	660
ULTIMATE PRESSURE	Torr		1.50	1.50	0.12	0.12	0.11	0.11	0.11	0.23	0.07	0.08
	mbar		2.0	2.0	0.16	0.16	0.14	0.14	0.15	0.30	0.09	0.11
MOTOR	3 Phase	Hp	0.75	1.0	1.5	2	3	5	7.5	10	15	25
ROTATIONAL SPEED	60 Hz		1740	3480	1740	1740	1740	1740	1740	1740	1160	1160
NOISE LEVEL	dba	60 Hz	59	62	67	67	68	68	77	77	78	79
OIL CAPACITY	Quarts		0.5	0.5	1.5	1.5	2.6	2.9	7.4	7.4	20	20
	Liters		0.5	0.5	1.4	1.4	2.5	2.7	7	7	19	19
CONNECTIONS	Inlet NPT		1/2"	1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"	2"	3"	3"
	Outlet NPT		1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"	2"	3"	3"
APPROX. WEIGHT (w/pump & motor; no oil)	lbs		44	44	104	117	146	165	362	406	1,111	1,550
	kg		20	20	47	53	66	75	164	184	504	703

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TROUBLESHOOTING

Although Tuthill Vacuum & Blower Systems blowers 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
Pump smokes at the exhaust side or expels oil droplets from the exhaust.	Exhaust filters are not properly installed with O-ring.	Check exhaust filter placement and replace if needed.
	Filter media is damaged.	
	Exhaust filters are clogged with foreign particles.	Replace filter and O-ring.
	Oil is not recirculating properly.	Check oil quality and make certain oil lines are clean.
Pump is running too hot. (Typical operating temperature of KVA pumps is 120° – 200°F [49° – 93°C].)	Not enough oil in the oil reservoir or oil is badly burned or carbonized	Drain oil and refill with the proper oil. Change oil more frequently.
	Not enough air ventilation to pump	Clean radiator and motor fins. Make certain a sufficient amount of fresh air is supplied to the pump.
Pump will not operate (seized up).	Pump operated without oil and vanes broke	Call Tuthill Vacuum & Blower Systems for service and repair.
	Liquid carry over into pump cylinder broke vanes while pump was running	Install knock-out pot at inlet of pump.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Pump does not reach end pressure. This is the lower absolute (best vacuum) when running with the inlet closed.	Oil condition is most often the cause of not reaching end vacuum.	Drain oil from pump and refill with fresh oil. Run pump with fresh oil for 15 minutes, and then take a new pressure reading.
	Inlet screen clogged with debris	Clean screen and check inlet filter element.
	Shaft seal leak	Replace shaft seal, from overhaul kit, or call Tuthill Vacuum & Blower Systems for service and repair.
	Vane stuck in rotor slot	Drain oil with flushing oil. Run pump for 15 minutes and drain. Replace fluid with fresh oil, exhaust filter, and spin-on filter.
		Replace vane.
		Call Tuthill Vacuum & Blower Systems for service and repair.
	Anti-suckback valve stuck in closed position due to oil contamination	Disassemble valve and screen, and clean as required. Drain old oil and replace with fresh oil.
	No oil or low oil level in reservoir	Shut down pump, drain balance of oil, and refill with fresh oil.
	Vacuum fitting or hose is not leak-tight.	Check hose and pipe connections for leaks.
	Radial clearance between rotor and cylinder is no longer adequate.	Overhaul pump, or call Tuthill Vacuum & Blower Systems for service and repair.
Pump operation is very noisy.	Coupling insert is worn.	Replace coupling insert in motor/pump coupling.
	Vanes stuck	Replace vane, or call Tuthill Vacuum & Blower Systems for service and repair.
	Bearing noise	Replace bearings, or call Tuthill Vacuum & Blower Systems for service and repair.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Pump starts, but it labors and draws high amperage.	Oil is too viscous.	Drain and change with fresh oil.
	Exhaust filter is clogged.	Replace exhaust filters, maintain proper oil condition and oil level, and use KV-100 oil. Use S500 oil for severe duty operation. Make sure inlet filter is operational to prevent particulate carryover.
	Loose connection in motor terminal box wired for wrong voltage	Check wiring diagram for proper connections, and tighten or replace loose connections.
	Foreign particles in pump	Overhaul pump, or call Tuthill Vacuum & Blower Systems for service and repair.
	Broken vanes or seized bearings	
	The pump is overfilled with oil or the wrong kind of oil is in the pump.	Drain oil and replace with the correct type and appropriate amount of oil.
	Pump runs in wrong direction.	Check for correct rotation. If rotation is incorrect, switch any two leads.
Pump will not start.	Supply voltage is not proper or is overloaded. Motor starter overload settings are too low or improper; fuses are burned; or wire size is too small or too long, causing a voltage drop.	Check voltage supply and overload settings in motor starter for size and settings according to motor nameplate. Install proper size wire. If ambient temperature is high, use the next larger size overloads or adjust settings 5% above motor nameplate valve.
		Turn pump fan by hand. If it will not turn, remove motor from pump and check motor and pump separately. Repair or replace if needed, or call Tuthill Vacuum & Blower Systems for service and repair.

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EXPLODED VIEWS AND PARTS LISTS

For your convenience, Tuthill has prepared a variety of kits to serve all levels of routine and atypical maintenance of your KVA vane pump.

Pump Module

This is an assembled bare pumping chamber, including items 1-66 (as applicable); see Exploded Views and Parts Lists on the following pages for details.

A pump module is often an economical option to replacing a pump, which reuses the existing oil-handling assembly, motor, and accessories, while replacing the rotating components and pumping chamber.

Rebuild Kit

This kit includes (as applicable): a full set of vanes, o-rings, filters, gaskets, bearing, bearing sleeve, shaft seal, coupling boot, and inlet screen.

Gasket Kit

This kit includes (as applicable): shaft seal, end plate o-ring, oil fill o-ring, oil drain o-ring, exhaust filter o-rings, oil sump gasket, service cover gasket, exhaust cover gasket, exhaust valve seat, cylinder gasket, check valve plate o-ring, float valve o-ring.

Filter Kit

This kit includes (as applicable): a full set of exhaust filters, oil filter, oil fill o-ring, oil drain o-ring, exhaust filter o-rings, cover gasket, baffle strainer.

Coupling Kit

This kit includes (as applicable): the motor- and pump-side coupling halves and cooling fan.

Inlet Check Valve Kit

This kit includes (as applicable): inlet screen, inlet flange, o-rings, check valve spring, check valve guide, check valve plate.

Vanes

Sold individually, three required per pump; a full set is included in the Rebuild Kit.

Exhaust Filters

Sold individually, refer to Item 120 in the relevant Parts List on the following pages for quantities; a full set is included in the Filter Kit.

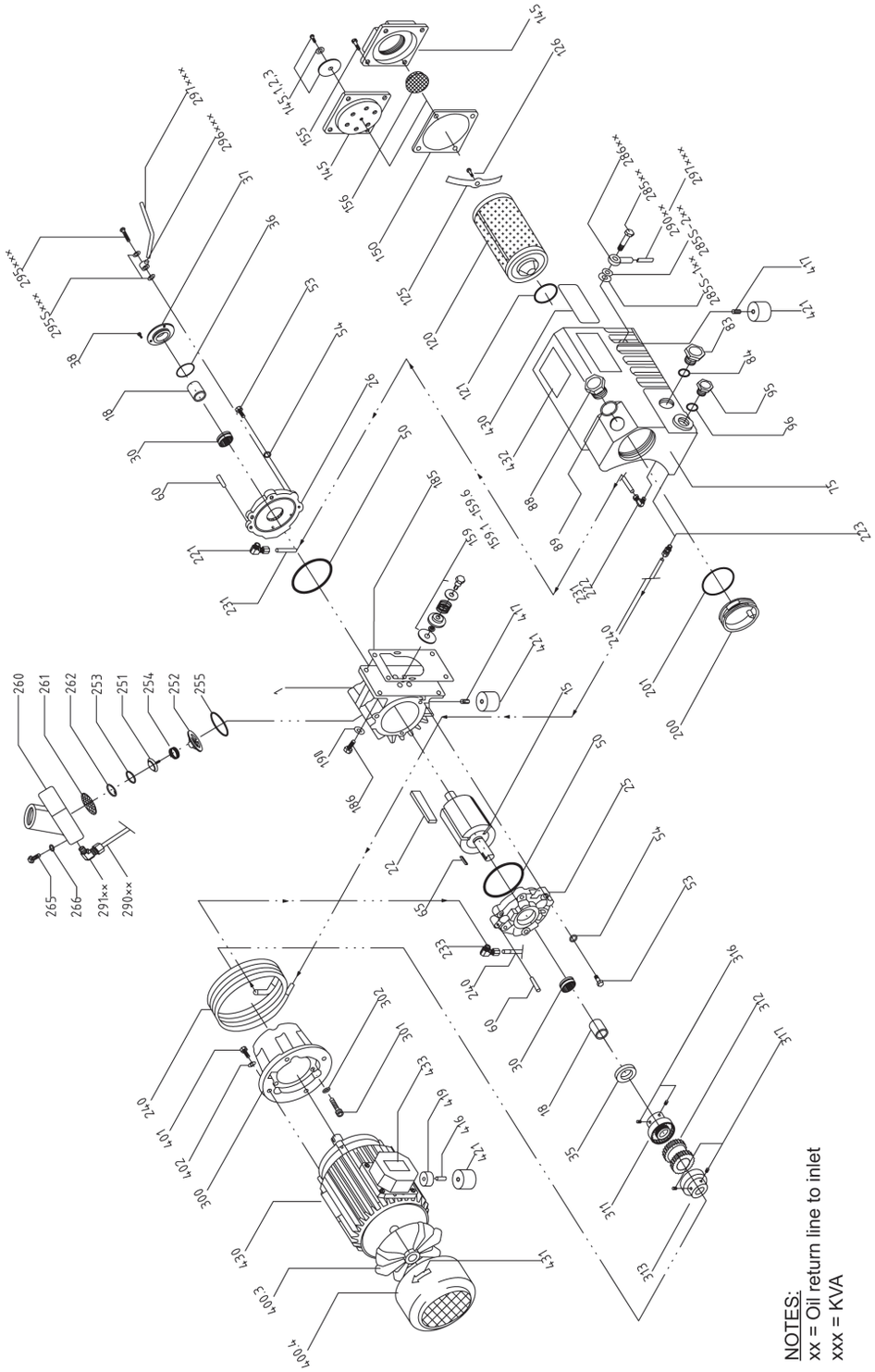
Spin-On Oil Filters

Also included in the Filter Kit.

Shaft Seals

Also included in the Rebuild Kit.

KVA12 / KVA21 EXPLODED VIEW DRAWING

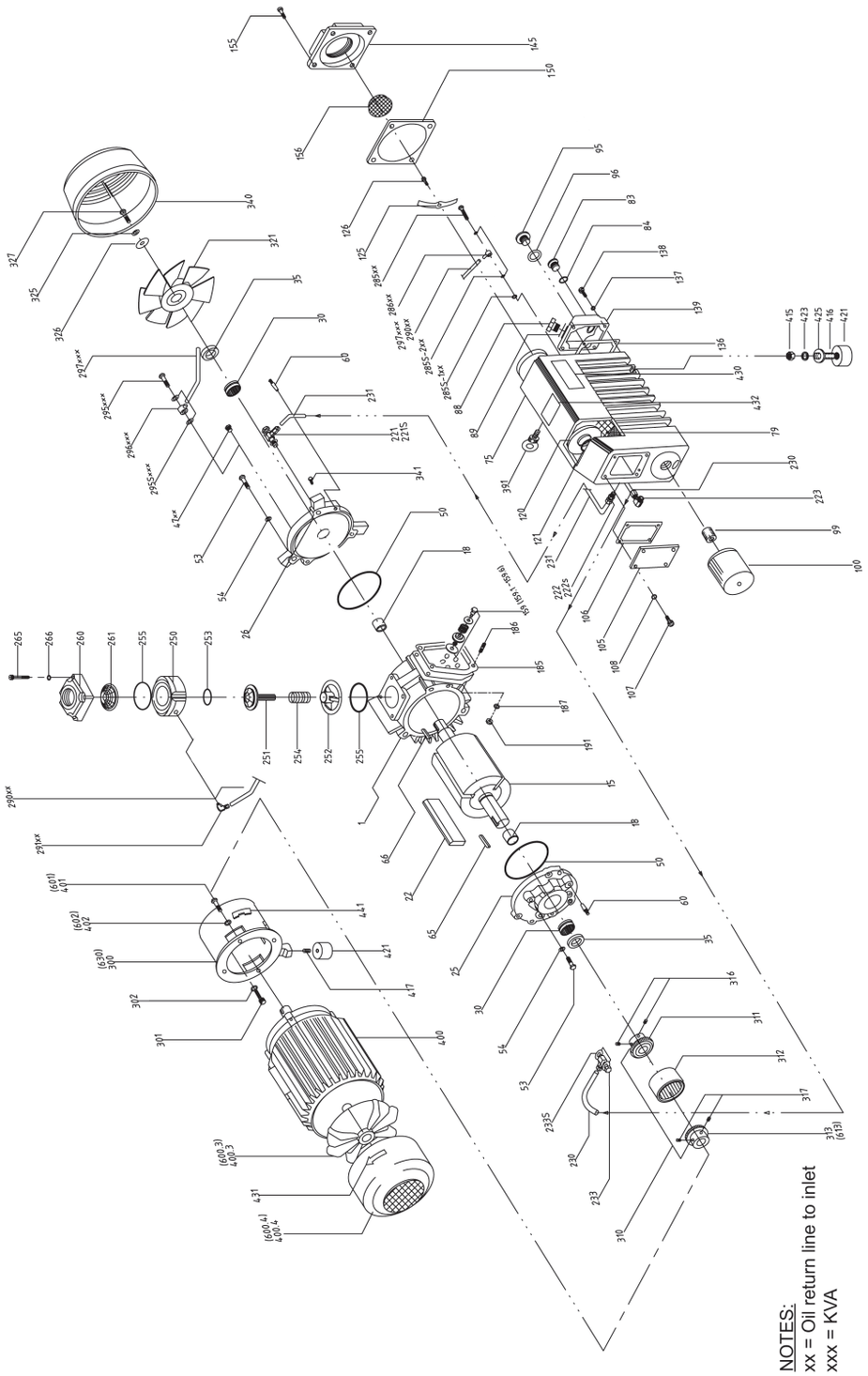


KVA12 / KVA21 PARTS LIST

ITEM NO.	DESCRIPTION	12 QTY	21 QTY
1	Cylinder	1	1
15	Rotor	1	1
18	Sleeve, Bearing	2	2
22	Vane	3	3
25	A-end Plate	1	1
26	B-end Plate	1	1
30	Bearing	2	2
35	Shaft Seal	1	1
36	O-Ring, Bracket	1	1
37	Bracket	1	1
38	Hexagon Head Screw	3	3
50	O-Ring, End Plate	2	2
53	Hexagon Head Screw	6	6
54	Spring Lock Washer	6	6
60	Taper Pin	4	4
65	Shaft Key	1	1
75	Oil Sump	1	1
83	Oil Sight Glass	1	1
84	Gasket, Oil Sight Glass	1	1
88	Plug, Oil Fill	1	1
89	O-Ring, Oil Fill Plug	1	1
95	Plug, Oil Drain	1	1
96	O-Ring, Oil Drain Plug	1	1
120	Exhaust Filter	1	1
121	O-Ring, Exhaust Filter	1	1
125	Filter Spring	1	1
126	Slotted Cheese Head Screw	1	1
145	Exhaust Cover (w/ Threaded Flange)	1	1
145-1	Rubber Flap for 02145	1	1
145-2	Washer for 02145	1	1
145-3	Slotted Cheese Head Screw for 02145	1	1
150	Gasket, Exhaust Cover	1	1
155	Allen Bolt	4	4
156	Outlet Screen	1	1
159	Exhaust Valve Assembly (159.1~ 159.6)	1	1
159-1	Exhaust Valve Fixed Bolt	1	1
159-2	Exhaust Valve Washer	1	1
159-3	Exhaust Valve Spring	1	1
159-4	Exhaust Valve Plate	1	1
159-5	Exhaust Valve Lock Nut	1	1
159-6	Exhaust Valve Seat Plate	1	1
186	Allen Bolt	4	4
190	Spring Lock Washer	4	4
200	Plug, Drum	1	1
201	O-Ring, Drum Plug	1	1
221	Elbow Hydraulic Fitting	1	1

ITEM NO.	DESCRIPTION	12 QTY	21 QTY
222	Elbow Hydraulic Fitting	1	1
223	Straight Hydraulic Fitting	1	1
231	Oil Tube (B)	1	1
233	Elbow Hydraulic Fitting	1	1
240	Cooling Spiral	1	1
251	Check Valve Plate	1	1
252	Check Valve Guide	1	1
253	O-Ring, Check Valve Plate	1	1
254	Check Valve Spring	1	1
255	O-Ring, Inlet Part	1	1
260	Inlet Flange, KVA Type	1	1
260	Inlet Flange, ORL to Inlet Only	1	1
261	Inlet Screen	1	1
262	Retaining Ring for Bores	1	1
265	Hexagon Head Screw	4	4
266	Spring Lock Washer	4	4
285	Oil Recirculating Screw	1	1
286	Banjo Fitting	1	1
285S-1**	Sealing Ring for 285**	1	2
285S-2**	Sealing Ring for 285**	2	2
290	Oil Return Tube	1	1
291	Elbow Hydraulic Fitting	1	1
295S***	Sealing Ring for 295**	2	2
295	Oil Return Valve	1	1
296	Banjo Fitting	1	1
297	Oil Return Tube	1	1
300	Motor Mounting Bracket	1	1
301	Allen Bolt	3	3
302	Spring Lock Washer	3	3
310	Coupling Set (311 ~313)	1	1
311	Coupling, Pump Side	1	1
312	Coupling, Sleeve	1	1
313	Coupling, Motor Side	1	1
316	Set Screw (Pump Side)	2	2
317	Set Screw (Motor Side)	2	2
400.3	Motor Fan Blade	1	1
400.4	Motor Fan Cover	1	1
401	Hexagon Head Screw	4	4
402	Spring Lock Washer	4	4
416	Slotted Set Screw	1	1
417	Foot Mounting Screw	2	2
419	Sleeve	1	1
421	Rubber Foot	3	3
430	Motor	1	1
431	Directional Arrow Label	1	1
433	Nameplate	1	1

KVA25 / KVA40 EXPLODED VIEW DRAWING

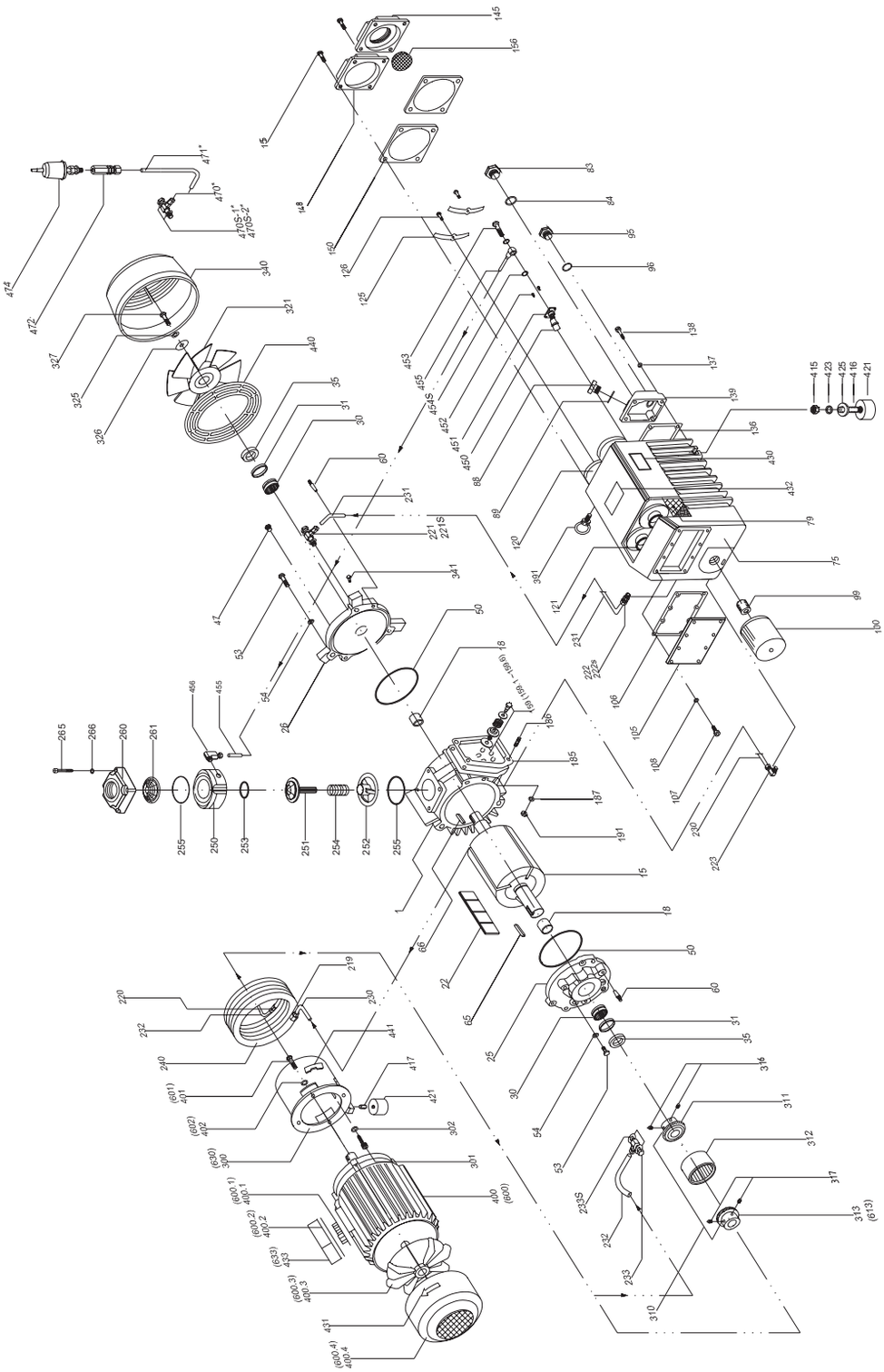


KVA25 / KVA40 PARTS LIST

ITEM NO.	DESCRIPTION	25 QTY	40 QTY
1	Cylinder	1	1
15	Rotor	1	1
18	Sleeve, Bearing	2	2
22	Vane	3	3
25	A-End Plate	1	1
26	B-End Plate	1	1
30	Bearing	2	2
35	Shaft Seal	2	2
47	Plug	1	1
50	O-Ring, End Plate	2	2
53	Hexagon Head Screw	6	6
54	Spring Lock Washer	6	6
60	Taper Pin	4	4
65	A-Shaft Key	1	1
66	B-Shaft Key	1	1
75	Oil Sump	1	1
79	Sheet Metal Baffle	1	1
83	Oil Sight Glass	1	1
84	Gasket, Oil Sight Glass	1	1
88	Plug, Oil Fill	1	1
89	O-Ring, Oil Fill Plug	1	1
95	Plug, Oil Drain	1	1
96	O-Ring, Oil Drain Plug	1	1
99	Theaded Fitting	1	1
100	Oil Filter	1	1
105	Oil Sump Cover Plate	1	1
106	Gasket, Oil Sump Cover	1	1
107	Allen Bolt	4	6
108	Sealing Ring	4	4
120	Exhaust Filter	1	1
121	O-Ring, Exhaust Filter	1	1
125	Filter Spring	1	1
126	Slotted Cheese Head Screw	1	1
136	Gasket, Service Cover	1	1
137	Sealing Ring	4	4
138	Allen Bolt	4	4
139	Service Cover	1	1
145	Exhaust Cover (w/ Threaded Flange)	1	1
150	Gasket, Exhaust Cover	1	1
155	Allen Bolt	4	4
156	Outlet Screen	1	1
159	Exhaust Valve Assembly (159.1 ~ 159.6)	2	2
159-1	Exhaust Valve Fixed Bolt	2	2
159-2	Exhaust Valve Washer	2	2
159-3	Exhaust Valve Spring	2	2
159-4	Exhaust Valve Plate	2	2
159-5	Exhaust Valve Lock Nut	2	2
159-6	Exhaust Valve Seat Plate	2	2
185	Gasket, Cylinder	1	1
186	Stud	4	4
187	Spring Lock Washer	4	4
191	Hexagon Nut	1	4
221	Bslm Hydraulic Fitting	1	1
221S	Sealing Ring for 221	2	2
222	Straight Hydraulic Fitting	1	1
222S	Sealing Ring for 222		
223	Elbow Hydraulic Fitting	1	1
233	Bslm Hydraulic Fitting	1	1
230	Oil Tube (A)	1	1
231	Oil Tube (B)	1	1
233	BSLM Hydraulic Fitting	1	1
233S	Sealing Ring for 233	2	2
251	Check Valve Plate	1	1
252	Check Valve Guide	1	1
253	O-Ring, Check Valve Plate	1	1
254	Check Valve Spring	1	1

ITEM NO.	DESCRIPTION	25 QTY	40 QTY
250	Inlet Flange, Lower Housing	1	1
255	O-Ring, Inlet Part	2	2
260	Inlet Flange, Upper Housing	1	1
261	Inlet Screen	1	1
265	Allen Bolt	4	4
266	Spring Lock Washer	4	4
285	Oil Recirculating Screw	1	1
286	Banjo Fitting	1	1
285S-1**	Seal Ring for 285**	1	1
285S-2**	Sealing for 285**	3	3
290	Oil Return Tube	1	1
291	Elbow Fitting	1	1
295S***	Sealing Ring for 295**	2	2
295	Oil Return Valve	1	1
296	Banjo Fitting	1	1
297	Oil Return Tube	1	1
300	Motor Mounting Bracket (IEC)	1	1
301	Allen Bolt	3	3
302	Spring Lock Washer	3	3
310	Coupling Set (311 ~ 313), 1Ph	1	1
311	Coupling, Pump Side	1	1
312	Coupling Insert	1	1
313	Coupling, Motor Side	1	1
310A	Coupling Set (311 ~ 313), 3Ph	1	1
311A	Coupling, Pump Side	1	1
312A	Coupling, Sleeve	1	—
313A	Coupling, Motor Side	1	1
316	Set Screw (Pump Side)	2	2
317	Set Screw (Motor Side)	2	2
321	Fan, Pump Shaft End	1	1
325	Washer, Spring Lock	1	1
326	Washer, Plain	1	1
327	Hexagon Head Screw	1	1
340	Fan Hood	1	1
341	Hexagon Head Screw	3	3
391	Eye Bolt	1	1
400	Motor (IEC)-50Hz	1	1
400	Motor (IEC)-60Hz	1	1
400.3	Motor Fan (IEC)	1	1
400.4	Motor Fan Cover (IEC)	1	1
401	Hexagon Head Screw	4	4
402	Spring Lock Washer	4	4
415	Hexagon Nut	1	1
416	Slotted Set Screw	1	1
417	Slotted Set Screw	2	2
421	Rubber Foot	3	3
423	Spring Lock Washer	1	1
425	Washer	1	1
430	Nameplate	1	1
431	Directional Arrow Label	1	1
470	BSLM Hydraulic Fitting	1	1
470S-1	Sealing Ring for 470	1	1
470S-2	Sealing Ring for 470	1	1
471	Oil Tube	1	1
472	Non Return Valve	1	1
474	Air Filter	1	1
600	Motor (NEMA)	1	1
600.3	Motor Fan (NEMA)	1	1
600.4	Motor Fan Cover (NEMA)	1	1
601	Hexagon Head Screw (NEMA)	1	1
602	Spring Lock Washer (NEMA)	4	4
612A	Coupling Set (313A + 312C = 613), NEMA	1	1
613	Coupling, Motor Side (NEMA)	1	1
630	Motor Mounting Bracket (NEMA)	1	1

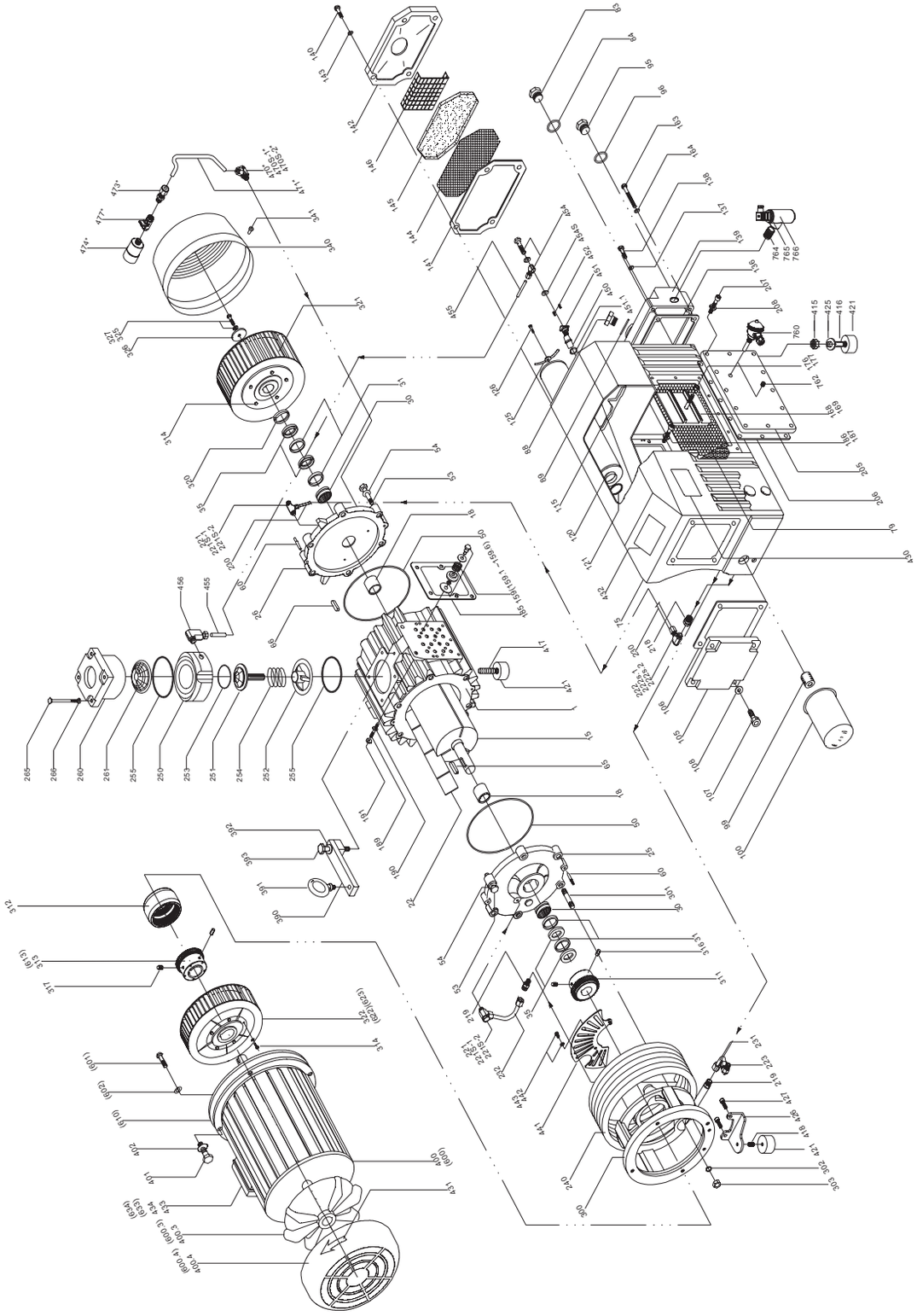
KVA63 / KVA100 EXPLODED VIEW DRAWING



KVA63 / KVA100 PARTS LIST

ITEM NO.	DESCRIPTION	63 QTY	100 QTY
1	Cylinder	1	1
15	Rotor	1	1
18	Sleeve, Bearing	2	2
22	Vane	3	3
25	A-End Plate	1	1
26	B-End Plate	1	1
30	Bearing	2	2
35	Shaft Seal	2	2
42	Supporting Ring	2	2
43	Hexagon Head Screw	4	4
47	Plug	1	1
50	O-Ring, End Plate	2	2
53	Hexagon Head Screw	6	6
54	Spring Lock Washer	6	6
60	Taper Pin	4	4
63	Plug	1	1
65	A-Shaft Key	1	1
66	B-Shaft Key	1	1
75	Oil Sump	1	1
78	Steel Demister	1	1
79	Sheet Metal Baffle	1	1
83	Oil Sight Glass	1	1
84	Gasket, Oil Sight Glass	1	1
88	Plug, Oil Fill	1	1
89	O-Ring, Oil Fill Plug	1	1
95	Plug, Oil Drain	1	1
96	O-Ring, Oil Drain Plug	1	1
99	Theaded Fitting	1	1
100	Oil Filter	1	1
105	Oil Sump Cover Plate	1	1
106	Gasket, Oil Sump Cover	1	1
107	Allen Bolt	8	8
108	Sealing Ring	8	8
120	Exhaust Filter	2	2
121	O-Ring, Exhaust Filter	2	2
125	Filter Spring	2	2
126	Slotted Cheese Head Screw	2	2
136	Gasket, Service Cover	1	1
137	Sealing Ring	4	4
138	Allen Bolt	4	4
139	Service Cover	1	1
145	Exhaust Cover (Threaded Flange)	1	1
148	Exhaust Cover (Blocked)	1	1
150	Gasket, Exhaust Cover	2	2
155	Allen Bolt	8	8
156	Outlet Screen	1	1
159	Exhaust Valve Ass'y (159.1 ~ 159.6)	2	2
159.1	Exhaust Valve Fixed Bolt	2	2
159.2	Exhaust Valve Washer	2	2
159.3	Exhaust Valve Spring	2	2
159.4	Exhaust Valve Plate	2	2
159.5	Exhaust Valve Lock Nut	2	2
159.6	Exhaust Valve Seat Plate	2	2
185	Gasket, Cylinder	1	1
186	Stud	4	4
187	Spring Lock Washer	4	4
191	Hexagon Nut	4	4
219	St Hydraulic Fit. WOVP-200 Only	0	1
220	St Hydraulic Fit. WOVP-200 Only	0	1
221	BSLM Hydraulic Fitting	1	1
221S	Sealing Ring for 221	2	2
222	Straight Hydraulic Fitting	1	1
223	Elbow Hydraulic Fitting	1	0
230	Oil Tube (A)	1	1
231	Oil Tube (B)	1	1
232	A-Oil Tubing (B) (WOVP-200 Only)	0	1
233	BSLM Hydraulic Fitting	1	1
233S	Sealing Ring for 233	2	2
240	Cooling Coil (WOVP-200 Only)+(219+220)	0	1
250	Inlet Flange, Lower Housing	1	1
251	Check Valve Plate	1	1
252	Check Valve Guide	1	1
253	O-Ring, Check Valve Plate	1	1
254	Check Valve Spring	1	1
255	O-Ring, Inlet Part	2	2
260	Inlet Flange, Upper Housing	1	1
261	Inlet Screen	1	1
265	Allen Bolt	4	4
266	Spring Lock Washer	4	4
300	Motor Mounting Bracket (IEC)	1	1
301	Allen Bolt	3	3
302	Spring Lock Washer	3	3
310A	Coupling Set (311 ~ 313)	1	1
311A	Coupling, Pump Side	1	1
312A	Coupling, Sleeve	1	1
313A	Coupling, Motor Side	1	1
316	Set Screw (Pump Side)	2	2
317	Set Screw (Motor Side)	2	2
321	Fan, Pump Shaft End	1	1
325	Washer, Spring Lock	1	1
326	Washer, Plain	1	1
327	Hexagon Bolt	1	1
340	Fan Hood	1	1
341	Hexagon Head Screw	3	3
391	Eye Bolt	1	1
400	Motor (IEC)-50Hz	1	1
400	Motor (IEC)-60Hz	1	1
400.3	Motor Fan (IEC)	1	0
400.4	Motor Fan Cover (IEC)	1	0
401	Hexagon Head Screw	4	4
402	Spring Lock Washer	4	4
415	Hexagon Nut	1	1
416	Slotted Set Screw	1	1
417	Slotted Set Screw	2	2
421	Rubber Foot	3	3
423	Spring Lock Washer	1	1
425	Washer	1	1
430	Name Plate	1	1
431	Directional Arrow Label	1	1
450	Float	1	1
451	Nozzle Assembly	1	1
452	Bolt	2	2
453	Bolt for Banjo Fitting, Oil Return	1	1
454S	Sealing Ring for 454	2	2
455	Oil Return Tube with Banjo Fitting	1	1
456	Elbow Hydraulic Fitting	1	1
470	BSLM Hydraulic Fitting	1	1
470S-1	Sealing Ring for 470	1	1
470S-2	Sealing Ring for 470	1	1
471	Oil Tube (C)	1	1
472	Gas Ballast (Non Return Valve)	1	1
474	Air Filter	1	1

KVA160 EXPLODED VIEW DRAWING

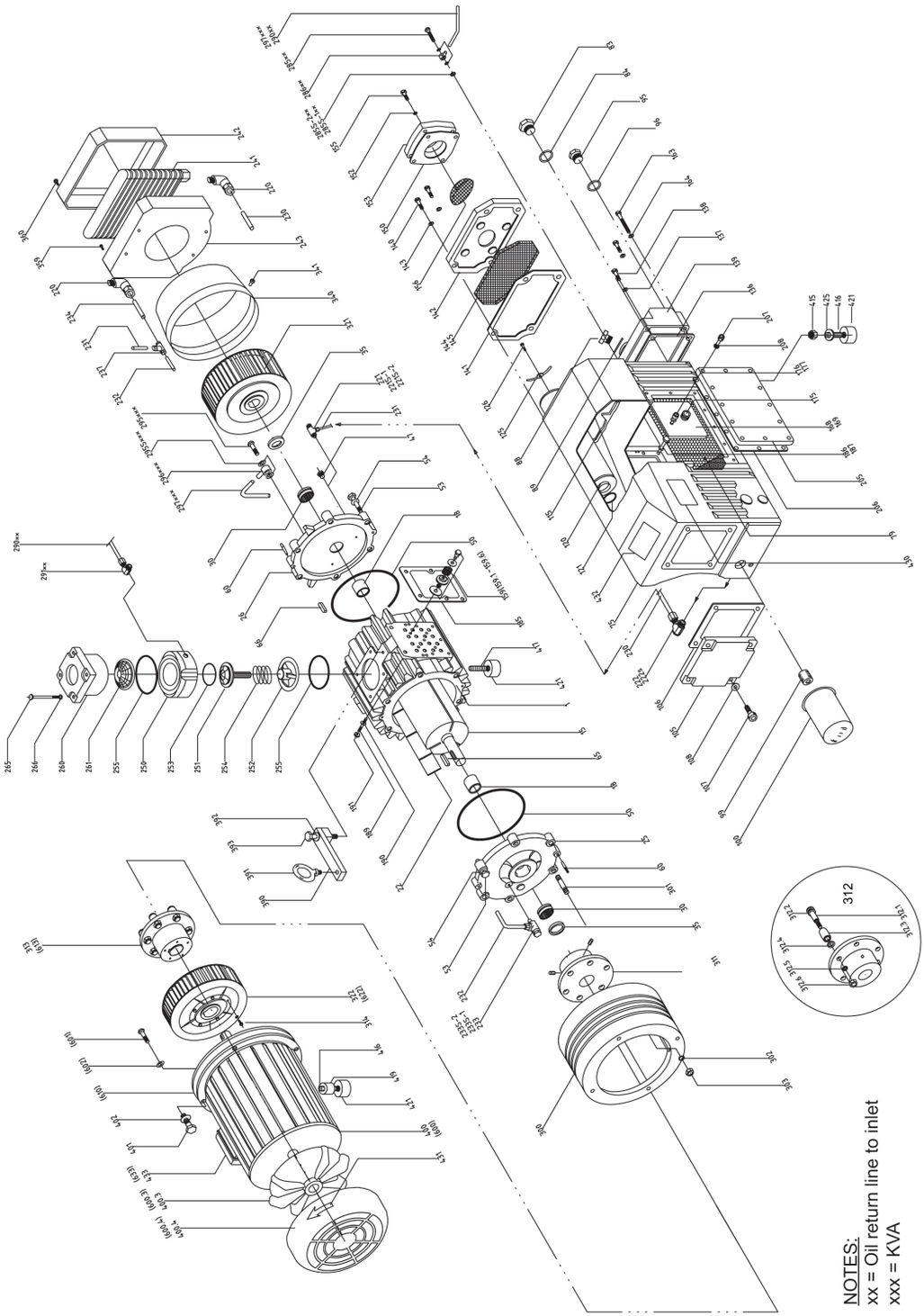


KVA160 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Cylinder	1
15	Rotor	1
18	Sleeve, Bearing	4
22	Vane	3
25	A-End Plate	1
26	B-End Plate	1
30	Bearing	2
35	Shaft Seal	2
50	O-Ring, End Plate	2
53	Hexagon Head Screw	9
54	Spring Lock Washer	9
60	Taper Pin	4
65	A-Shaft Key	1
66	B-Shaft Key	1
75	Oil Sump	1
79	Sheet Metal Baffle	1
83	Oil Sight Glass	1
84	Gasket, Oil Sight Glass	1
88	Plug, Oil Fill	1
89	O-Ring, Oil Fill Plug	1
95	Plug, Oil Drain	1
96	O-Ring, Oil Drain Plug	1
99	Threaded Fitting	1
100	Oil Filter	1
105	Oil Sump Cover Plate	1
106	Gasket, Oil Sump Cover	1
107	Allen Bolt	4
108	Sealing Ring	4
115	Filter Bracket	1
120	Exhaust Filter	4
121	O-Ring, Exhaust Filter	4
125	Filter Spring	4
126	Slotted Cheese Head Screw	4
136	Gasket, Service Cover	1
137	Sealing Ring	2
138	Allen Bolt	2
139	Service Cover	1
140	Allen Bolt	4
141	Gasket, Separator Cover	1
142	Separator Cover / Exhaust Cover	1
143	Sealing Ring	4
144	Perforated Metal Screen	1
145	Strainer, Baffle	1
146	Perforated Metal Screen	1
159	Exhaust Valve Ass'y (159.1 ~ 159.6)	4
159.1	Exhaust Valve Fixed Bolt	4
159.2	Exhaust Valve Washer	4
159.3	Exhaust Valve Spring	4
159.4	Exhaust Valve Plate	4
159.5	Exhaust Valve Lock Nut	4
159.6	Exhaust Valve Seat Plate	4
163	Allen Bolt	2
164	Sealing Ring	2
168	O-Ring, Valve Cover Plate	1
169	Valve Cover Plate	1
176	Hex Nut	1
177	Stud Bolt	1
185	Gasket, Cylinder	1
186	Allen Bolt	5
187	Spring Lock Washer	5
189	Stud	2
190	Spring Lock Washer	2
191	Hex Nut	2
205	Side Cover Plate	1
206	Gasket, Side Cover Plate	1
207	Allen Bolt	12
208	Sealing Ring	12
218	Socket (NEW)	1
219	Straight Hydraulic Fitting	2
221	BSLM Hydraulic Fitting (NEW)	2
221S.1	Sealing Ring for 221	2
221S.2	Sealing Ring for 221	2
222	BSLM Hydraulic Fitting (NEW)	1
222S.1	Sealing Ring for 222	1

ITEM NO.	DESCRIPTION	QTY
222S.2	Sealing Ring for 222	1
223	Elbow Hydraulic Fitting	1
230	Oil Tube (A)	1
231	Oil Tube (B)	1
232	Oil Tube (A-1)	1
240	Cooling Spiral Coil	1
250	Inlet Flange, Lower Housing	1
251	Check Valve Plate	1
252	Check Valve Guide	1
253	O-Ring, Check Valve Plate	1
254	Check Valve Spring	1
255	O-Ring, Inlet Part	2
260	Inlet Flange, Upper Housing	1
261	Inlet Screen (Conical)	1
265	Allen Bolt	4
266	Spring Lock Washer	4
300	Motor Mounting Bracket (IEC)	1
301	Stud	3
302	Spring Lock Washer	3
303	Hex Nut	3
310	Coupling Set (311 ~ 313), IEC	1
311	Coupling Half, Pump Side	1
312	Coupling Sleeve	1
313	Coupling Half, IEC Motor Side	1
314	Hexagon Head Screw for 50322B	10
316	Set Screw (Pump Side)	2
317	Set Screw (Motor Side)	2
320	Spacer for Fan	1
321	Pump Shaft End Fan	1
322	Motor Shaft End Fan for IEC/NEMA Motor	1
325	Washer, Spring Lock	1
326	Washer, Plain	1
327	Hexagon Bolt	1
340	Fan Hood	1
341	Hexagon Head Screw	3
390	Adapter for Eye Bolt	1
391	Eye Bolt	1
392	Spring Lock Washer	1
393	Hexagon Head Screw	1
400	Motor (IEC)	1
400.3	Motor Fan (IEC)	1
400.4	Motor Fan Cover (IEC)	1
401	Hexagon Head Screw	4
402	Spring Lock Washer	4
415	Hex Nut	1
416	Slotted Set Screw	1
417	Slotted Set Screw	1
418	Slotted Set Screw	1
421	Rubber Foot	3
425	Washer	1
426	Bracket for Rubber Foot	1
427	Allen Bolt	2
430	Name Plate	1
431	Directional Arrow Label	1
432	Label Maintenance	1
433	Terminal Board	1
434	Rubber Gasket	1
441	Protection Cover	1
442	Hexagon Head Screw M6x12	2
443	Washer, Spring Lock	2
450	Float	1
451	Nozzle Assembly	1
451.1	O-Ring for Nozzle Assy	1
452	Bolt	2
454	Hydraulic Fitting BSLM	1
454S	Sealing Ring for 454	2
455	Oil Return Tube	1
456	Elbow Hydraulic Fitting	1
470	BSLM Hydraulic Fitting	1
470S.1	Sealing Ring for 470	1
470S.2	Sealing Ring for 470	1
471	Oil Tube (C)	1
473	Fitting	1
474	Gas Ballast	1
477	Ball Valve	1

KVA250 EXPLODED VIEW DRAWING

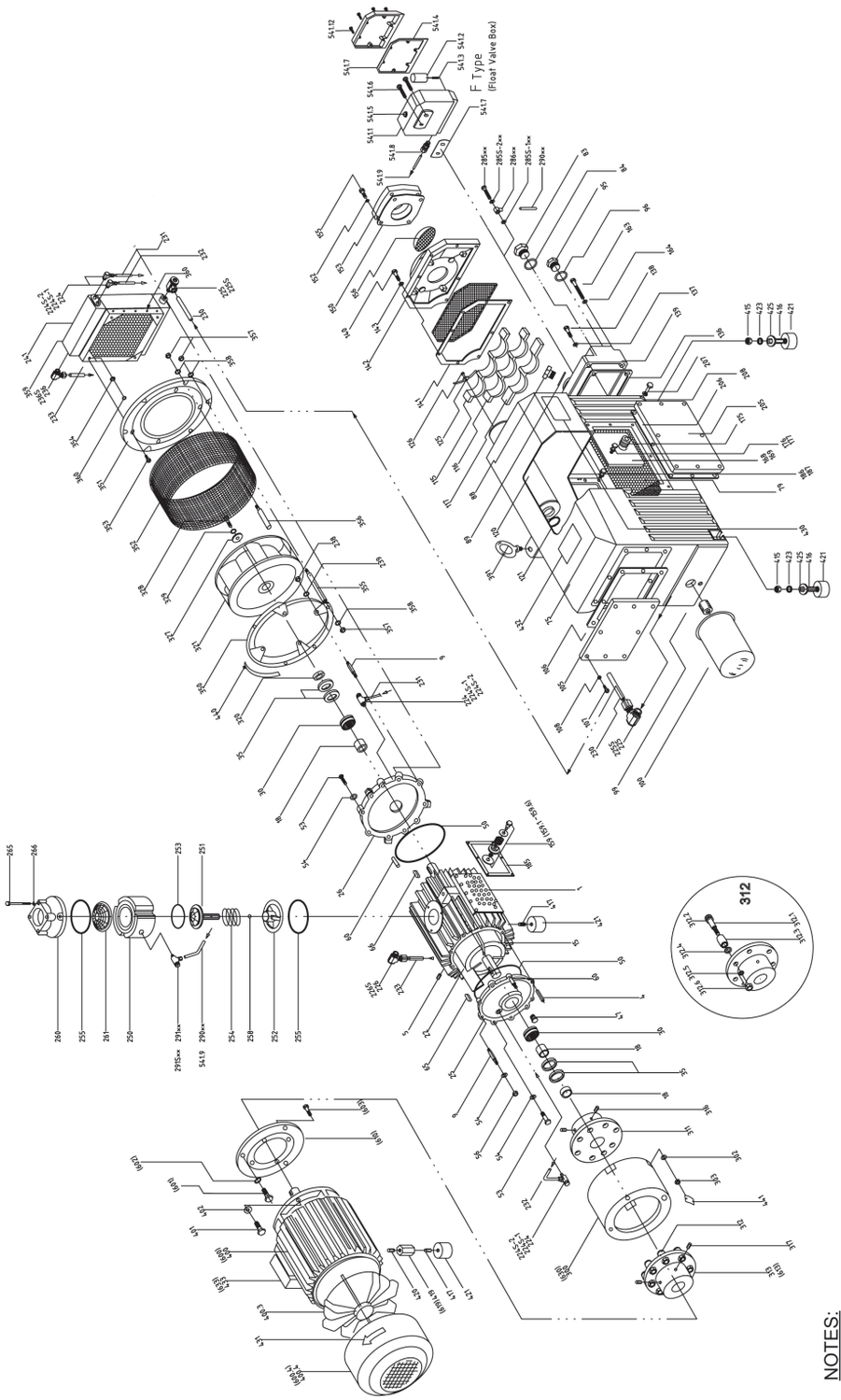


KVA250 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Cylinder	1
15	Rotor	1
18	Sleeve, Bearing	2
18-1	Sleeve, Bearing	—
18-2	Sleeve, Bearing	—
22	Vane	3
25	A-End Plate	1
26	B-End Plate	1
30	Bearing	2
35	Shaft Seal	2
47	Plug	1
50	O-Ring, End Plate	2
53	Hexagon Head Screw	9
54	Spring Lock Washer	9
60	Taper Pin	4
65	A-Shaft Key	1
66	B-Shaft Key	1
75	Oil Sump	1
79	Sheet Metal Baffle	1
83	Oil Sight Glass	1
84	Gasket, Oil Sight Glass	1
88	Plug, Oil Fill	1
89	O-Ring, Oil Fill Plug	1
95	Plug, Oil Drain	1
96	O-Ring, Oil Drain Plug	1
99	Threaded Fitting	1
100	Oil Filter	1
105	Oil Sump Cover Plate	1
106	Gasket, Oil Sump Cover	1
107	Allen Bolt	4
108	Sealing Ring for Oil Sump Pump	4
115	Filter Bracket	1
120	Exhaust Filter	4
121	O-Ring, Exhaust Filter	4
125	Filter Spring	4
126	Slotted Cheese Head Screw	4
136	Gasket, Service Cover	1
137	Sealing Ring	2
138	Allen Bolt	2
139	Service Cover	1
140	Allen Bolt	4
141	Gasket, Separator Cover	1
142	Separator Cover Plate	1
143	Sealing Ring	4
144	Perforated Metal Screen	2
145	Strainer, Baffle	1
150	Gasket, Exhaust Cover	1
152	Sealing Ring	4
153	Exhaust Threaded Cover	1
155	Allen Bolt	4
156	Outlet Screen	1
159	Exhaust Valve Assembly (159.1 ~ 159.6)	4
159-1	Exhaust Valve Fixed Bolt	4
159-2	Exhaust Valve Washer	4
159-3	Exhaust Valve Spring	4
159-4	Exhaust Valve Plate	4
159-5	Exhaust Valve Lock Nut	4
159-6	Exhaust Valve Seat Plate	4
163	Allen Bolt	2
164	Sealing Ring	2
168	O-Ring, Valve Cover Plate	1
169	Valve Cover Plate	1
175	Plug	1
176	Hex Nut	1
177	Stud Bolt	1
185	Gasket, Cylinder	1
186	Allen Bolt	5
187	Spring Lock Washer	5
189	Stud	2
190	Spring Lock Washer	2
191	Hex Nut	2
205	Side Cover Plate	1
206	Gasket, Side Cover Plate	1
207	Allen Bolt	12
208	Sealing Ring	—
218	Socket	—
219	Straight Hydraulic Fitting	—
220	Straight Hydraulic Fitting	2
221	BSLM Hydraulic Fitting	1
221S-1	Sealing Ring for 221	1
221S-2	Sealing Ring for 221	1
222	BSLM Hydraulic Fitting	1
222S	Sealing Ring	2
222S-1	Sealing Ring for 222	—

ITEM NO.	DESCRIPTION	QTY
223	Elbow Hydraulic Fitting	—
230	Oil Tube (160: A) (250: A-1)	1
231	Oil Tube (160: B) (250: B-1)	1
232	Oil Tube (160: A-1) (250: B-2)	1
233	BSLM Hydraulic Fitting	
233S-1	Sealing Ring For 233	
233S-2	Sealing Ring For 233	
234	Oil Tube (A-2)	1
237	Blt Hydraulic Fitting	1
240	Cooling Spiral	—
241	Radiator	1
242	Cover (Front), Radiator	1
243	Cover (Rear), Radiator	1
250	Inlet Flange, Lower Housing	1
251	Check Valve Plate	1
252	Check Valve Guide	1
253	O-Ring, Check Valve Plate	1
254	Check Valve Spring	1
255	O-Ring, Inlet Part	2
260	Inlet Flange, Upper Housing	1
261	Inlet Screen (Conical)	1
265	Allen Bolt	4
266	Spring Lock Washer	4
285	Oil Recirculating Screw	1
286	BSLM Hydraulic Fitting	1
286	Banjo Fitting	—
285S-1**	Sealing Ring for 285**	1
285S-1**/***	Sealing Ring for 285**	—
285S-2**	Sealing Ring for 285**	3
285S-2**/***	Sealing Ring for 285**	—
290	Oil Return Tube	1
291	Elbow Hydraulic Fitting	1
295S***	Sealing Ring for 295**	2
295	Oil Return Valve	1
296	Banjo Fitting	1
297	Oil Return Tube	1
300	Motor Mounting Bracket (IEC)	1
301	Stud	3
302	Spring Lock Washer	3
303	Hex Nut	3
310	Coupling Set (310 ~ 313)	1
311	Coupling Half, Pump Side	1
312	Connection Bolt with Rubber Boot	6
312.3	Rubber Boot	6
313A	Rubber Boot	
313	Coupling Half, Motor Side	1
314	Hexagon Head Screw for 50322B	5
316	Set Screw (Pump Side)	2
317	Set Screw (Motor Side)	2
321	Pump Shaft End Fan	1
322	Motor Shaft End Fan	1
340	Fan Hood	—
341	Hexagon Head Screw	3
345	Fan Cover	1
359	Allen Bolt	4
360	Allen Bolt	4
390	Adapter for Eye Bolt	1
391	Eye Bolt	1
392	Spring Lock Washer	1
393	Hexagon Head Screw	1
400	Motor (IEC) (160: 50Hz) (250: 60Hz)	1
400,3	Motor Fan (IEC)	1
400,4	Motor Fan Cover (IEC)	1
401	Hexagon Head Screw	4
402	Spring Lock Washer	4
415	Hex Nut	1
416	Slotted Set Screw	2
417	Slotted Set Screw	1
419	Sleeve	1
421	Rubber Foot	3
423	Spring Lock Washer	1
425	Washer	1
600	Motor (NEMA)	1
600.3	Motor Fan (NEMA)	1
600.4	Motor Fan Cover (NEMA)	1
601	Allen Bolt (NEMA)	4
602	Spring Lock Washer (NEMA)	4
610	Motor Mounting Flange (NEMA)	1
612	Coupling Set (311 + 312 + 613), NEMA	—
613	Coupling Half, Motor Side (NEMA)	1
622	Motor Shaft End Fan for NEMA Motor	1
623	Collar for Fan (# 622), for NEMA Motor	—

KVA400 EXPLODED VIEW DRAWING

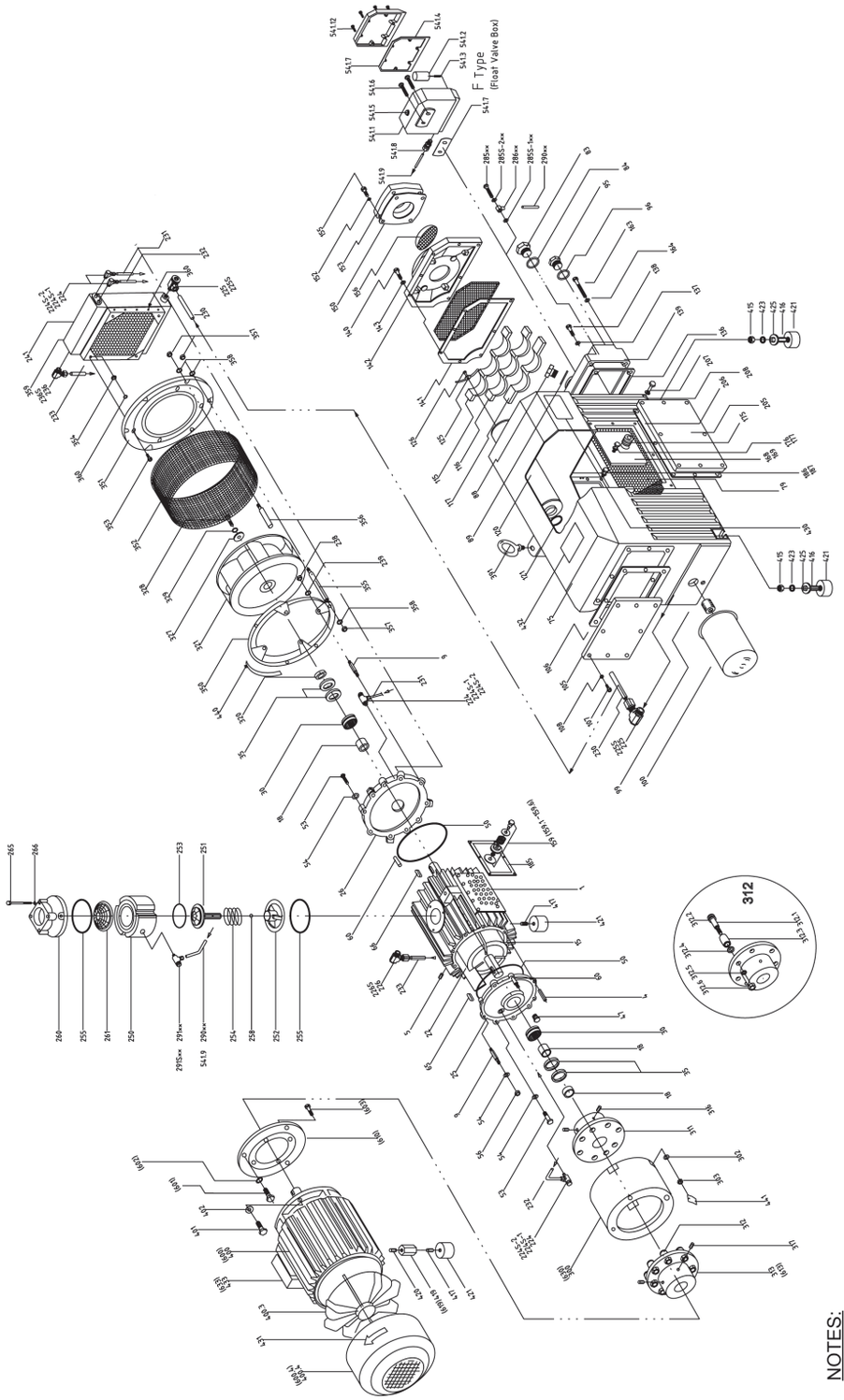


NOTES:
xx = Oil return line to inlet
xxx = KVA

KVA400 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Cylinder	1
4	Stud	4
5	Set Screw	6
9	Stud	6
15	Rotor	1
18-1	Sleeve, Bearing	2
18-2	Sleeve, Bearing	2
22	Vane	3
25	A-End Plate, Motor Side	1
26	B-End Plate, Fan Side	1
30	Bearing	2
35	Shaft Seal, Viton	4
46	Plug (for KVA Type)	1
47	Plug	1
50	O-Ring, End Plate	2
53	Hexagon Head Cap Screw	10
54	Spring Lock Washer	12
56	Hex Nut	2
60	Taper Pin	4
65	A-Shaft Key, Motor Side	1
66	B-Shaft Key, Fan Side	1
75	Oil Sump	1
79	Sheet Metal Baffle	1
83	Oil Sight Glass	1
84	Gasket, Oil Sight Glass	1
88	Plug, Oil Fill	1
89	O-Ring, Oil Fill Plug	1
95	Plug, Oil Drain	1
96	O-Ring, Oil Drain Plug	1
99	Pipe Nipple	1
100	Oil Filter	1
105	Oil Sump Cover Plate	1
106	Gasket, Oil Sump Cover	1
107	Allen Bolt	8
108	Sealing Ring for Oil Sump Cover Plate	8
115	Exhaust Filter Bracket, Upper	1
116	Exhaust Filter Bracket, Medium	1
117	Exhaust Filter Bracket, Lower	1
120	Exhaust Filter	8
121	O-Ring, Exhaust Filter	8
125	Exhaust Filter Spring Assembly	8
126	Slotted Cheese Head Machine Screw	8
136	Gasket, Service Cover	1
137	Sealing Ring	2
138	Allen Bolt	2
139	Service Cover	1
140	Allen Bolt	8
141	Gasket, Separator Cover	1
142	Separator Cover Plate	1
143	Sealing Ring	8
144	Perforated Metal Screen	2
145	Strainer, Baffle	1
150	Gasket, Exhaust Cover	1
152	Sealing Ring	4
153	Exhaust Cover (Threaded)	1
155	Allen Bolt	4
156	Outlet Screen	1
159	Exhaust Valve Assembly (159.1 ~ 159.6)	7
159.1	Exhaust Valve Fixed Bolt	7
159.2	Exhaust Valve Washer	7
159.3	Exhaust Valve Spring	7
159.4	Exhaust Valve Plate	7
159.5	Exhaust Valve Lock Nut	7
159.6	Exhaust Valve Seat Plate	7
163	Allen Bolt	2
164	Sealing Ring	2
168	O-Ring, Exhaust Valve Cover Plate	1
169	Exhaust Valve Cover Plate	1
175	Plug	1
176	Hex Nut	1
177	Stud Bolt	1
185	Gasket, Cylinder	1
186	Allen Bolt	8
187	Spring Lock Washer	8
205	Oil Sump Side Cover Plate	1
206	Gasket, Oil Sump Side Cover Plate	1
207	Allen Bolt (Socket Head Cap Screw)	9
208	Sealing Ring	9
224	BSLM, Hydraulic Fitting	4
224S-1	Sealing Ring for 224	4
224S-2	Sealing Ring for 224	4
225	BSLM, Hydraulic Fitting	2
225S	Sealing Ring for 225	2
226	BSLM, Hydraulic Fitting	1
226S	Sealing Ring for 226	2
230	Oil Tube (A)	1
231	Oil Tube (B-1)	1
232	Oil Tube (B-2)	1
233	Oil Tube	1
236	BSLM, Hydraulic Fitting	1
236S	Sealing Ring	1
238	Hex Nut	1
239	Spring Lock Washer	1
241	Oil Cooler (Top & Bottom Opening)	1
241	Oil Cooler (STD)	1
250	Inlet Flange, Lower Housing	1
251	Check Valve Plate	1
252	Check Valve Guide	1
253	O-Ring, Check Valve Plate	1
254	Spring, Check Valve	1
255	O-Ring, Inlet Flange	2
258	Rubber Ball	1
260	Inlet Flange, Upper Housing	1
261	Inlet Screen (Conical)	1
265	Allen Bolt	3
266	Spring Lock Washer	3
285	Oil Recirculating Screw	1
286	BSLM Hydraulic Fitting	1
285S-1	Sealing Ring for 285	1
285S-2	Sealing Ring for 285	1
290	Oil Return Tube	1
291	BSLM Hydraulic Fitting	1
291S	Sealing Ring, for 291	2
300	Motor Mounting Bracket	1
302	Spring Lock Washer	4
303	Hex Nut	4
310	Coupling Set (310 ~ 313)	1
311	Coupling Half, Pump Side	1
312	Connection Bolt with Rubber Boot	8
313	Coupling Half, Motor Side	1
316	Set Screw (Pump Side)	2
317	Set Screw (Motor Side)	2
320	Spacer for Fan	1
321	Fan	1
327	Locking Disc	1
328	Hex Head Cap Screw	1
329	Spring Lock Washer	1
350	Fan Support Ring (Pump Side)	1
351	Fan Support Ring (Radiator Side)	1
352	Fan Guard	1
353	Allen Bolt	4
354	Hex Nut	4
355	Fan Supporting Bolt	5
356	Fan Supporting Bolt	1
357	Hex Nut	11
358	Spring Lock Washer	11
359	Mounting Bracket for Radiator	1
360	Cheese Head Cap Screw	12
391	Eye Bolt	1
400	Motor (IEC)-60Hz	1
400	Motor (IEC)-50Hz	1
400.3	Motor Fan Blade	1
400.4	Motor Fan Cover	1
401	Hexagon Head Screw	4
402	Spring Lock Washer	4
415	Hex Nut	2
416	Stud	2
417	Slotted Set Screw	2
419	Spacer for Foot, for IEC Motor	2
420	Slotted Set Screw	1
421	Rubber Foot	5
423	Spring Lock Washer	2
425	Washer	2
430	Nameplate	1
431	Directional Arrow Label	1
600	Motor (NEMA) - 60Hz	1
600.3	Motor Fan Blade	1
600.4	Motor Fan Cover	1
601	Hex Head Bolt	3
602	Spring Lock Washer	3
603	Allen Bolt	4
610	Motor Mounting Flange Adapter (NEMA)	1

KVA630 EXPLODED VIEW DRAWING



NOTES:
xx = Oil return line to inlet
xxx = KVA

KVA630 PARTS LIST

ITEM NO.	DESCRIPTION	QTY
1	Cylinder	1
4	Stud	4
5	Set Screw	6
9	Stud	6
15	Rotor	1
18-1	Sleeve, Bearing	2
18-2	Sleeve, Bearing	2
22	Vane	3
25	A-End Plate, Motor Side	1
26	B-End Plate, Fan Side	1
30	Bearing	2
35	Shaft Seal, Viton	4
46	Plug (for KVA Type)	1
47	Plug	1
50	O-Ring, End Plate	2
53	Hexagon Head Cap Screw	10
54	Spring Lock Washer	12
56	Hex Nut	2
60	Taper Pin	4
65	A-Shaft Key, Motor Side	1
66	B-Shaft Key, Fan Side	1
75	Oil Sump	1
79	Sheet Metal Baffle	1
83	Oil Sight Glass	1
84	Gasket, Oil Sight Glass	1
88	Plug, Oil Fill	1
89	O-Ring, Oil Fill Plug	1
95	Plug, Oil Drain	1
96	O-Ring, Oil Drain Plug	1
99	Pipe Nipple	1
100	Oil Filter	1
105	Oil Sump Cover Plate	1
106	Gasket, Oil Sump Cover	1
107	Allen Bolt	8
108	Sealing Ring for Oil Sump Cover Plate	8
115	Exhaust Filter Bracket, Upper	1
116	Exhaust Filter Bracket, Medium	1
117	Exhaust Filter Bracket, Lower	1
120	Exhaust Filter	8
121	O-Ring, Exhaust Filter	8
125	Exhaust Filter Spring Assembly	8
126	Slotted Cheese Head Machine Screw	8
136	Gasket, Service Cover	1
137	Sealing Ring	2
138	Allen Bolt	2
139	Service Cover	1
140	Allen Bolt	8
141	Gasket, Separator Cover	1
142	Separator Cover Plate	1
143	Sealing Ring	8
144	Perforated Metal Screen	2
145	Strainer, Baffle	1
150	Gasket, Exhaust Cover	1
152	Sealing Ring	4
153	Exhaust Cover (Threaded)	1
155	Allen Bolt	4
156	Outlet Screen	1
159	Exhaust Valve Assembly (159.1 ~ 159.6)	7
159.1	Exhaust Valve Fixed Bolt	7
159.2	Exhaust Valve Washer	7
159.3	Exhaust Valve Spring	7
159.4	Exhaust Valve Plate	7
159.5	Exhaust Valve Lock Nut	7
159.6	Exhaust Valve Seat Plate	7
163	Allen Bolt	2
164	Sealing Ring	2
168	O-Ring, Exhaust Valve Cover Plate	1
169	Exhaust Valve Cover Plate	1
175	Plug	1
176	Hex Nut	1
177	Stud Bolt	1
185	Gasket, Cylinder	1
186	Allen Bolt	8
187	Spring Lock Washer	8
205	Oil Sump Side Cover Plate	1
206	Gasket, Oil Sump Side Cover Plate	1
207	Allen Bolt (Socket Head Cap Screw)	9
208	Sealing Ring	9
224	BSLM, Hydraulic Fitting	4
224S-1	Sealing Ring for 224	4
224S-2	Sealing Ring for 224	4
225	BSLM, Hydraulic Fitting	2

ITEM NO.	DESCRIPTION	QTY
225S	Sealing Ring for 225	2
226	BSLM, Hydraulic Fitting	1
226S	Sealing Ring for 226	2
230	Oil Tube (A)	1
231	Oil Tube (B-1)	1
232	Oil Tube (B-2)	1
233	Oil Tube	1
236	BSLM, Hydraulic Fitting	1
236S	Sealing Ring	1
238	Hex Nut	1
239	Spring Lock Washer	1
241	Oil Cooler (Top & Bottom Opening)	1
241	Oil Cooler (STD)	1
250	Inlet Flange, Lower Housing	1
251	Check Valve Plate	1
252	Check Valve Guide	1
253	O-Ring, Check Valve Plate	1
254	Spring, Check Valve	1
255	O-Ring, Inlet Flange	2
258	Rubber Ball	1
260	Inlet Flange, Upper Housing	1
261	Inlet Screen (Conical)	1
265	Allen Bolt	3
266	Spring Lock Washer	3
285	Oil Recirculating Screw	1
286	BSLM Hydraulic Fitting	1
285S-1**	Sealing Ring for 285	1
285S-2**	Sealing Ring for 285	1
290	Oil Return Tube	1
291	BSLM Hydraulic Fitting	1
291S**	Sealing Ring, for 291	2
300	Motor Mounting Bracket	1
302	Spring Lock Washer	4
303	Hex Nut	4
310	Coupling Set (310 ~ 313)	1
311	Coupling Half, Pump Side	1
312	Connection Bolt with Rubber Boot	8
313	Coupling Half, Motor Side	1
316	Set Screw (Pump Side)	2
317	Set Screw (Motor Side)	2
320	Spacer for Fan	1
321	Fan	1
327	Locking Disc	1
328	Hex Head Cap Screw	1
329	Spring Lock Washer	1
350	Fan Support Ring (Pump Side)	1
351	Fan Support Ring (Radiator Side)	1
352	Fan Guard	1
353	Allen Bolt	4
354	Hex Nut	4
355	Fan Supporting Bolt	5
356	Fan Supporting Bolt	1
357	Hex Nut	11
358	Spring Lock Washer	11
359	Mounting Bracket for Radiator	1
360	Cheese Head Cap Screw	12
391	Eye Bolt	1
400	Motor (IEC)-60Hz	1
400	Motor (IEC)-50Hz	1
400.3	Motor Fan Blade	1
400.4	Motor Fan Cover	1
401	Hexagon Head Screw	4
402	Spring Lock Washer	4
415	Hex Nut	2
416	Stud	2
417	Slotted Set Screw	2
419	Spacer for Foot, for IEC Motor	2
420	Slotted Set Screw	1
421	Rubber Foot	5
423	Spring Lock Washer	2
425	Washer	2
600	Motor (NEMA) - 60Hz	1
600.3	Motor Fan Blade	1
600.4	Motor Fan Cover	1
601	Hex Head Bolt	3
602	Spring Lock Washer	3
603	Allen Bolt	4
610	Motor Mounting Flange Adapter (NEMA)	1

WARRANTY – VACUUM PRODUCTS

Subject to the terms and conditions hereinafter set forth and set forth in General Terms of Sale, Tuthill Vacuum & Blower Systems (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	TYPE OF APPLICATION
New	15 months after date of shipment or 12 months after initial startup date, whichever occurs first
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

HIS 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 blower or the system. This information is also helpful when ordering spare parts.

Model No. _____ V-Belt Size _____ Length _____

Serial No. _____ Type of Lubrication _____

Start-up 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 blowers manufactured by Tuthill Vacuum & Blower Systems 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, or register online at **tuthillvacuumblower.com**.

Technical Support: 1-877-955-TECH (8324)

Service & Repair or Product Sales:

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tuthillvacuumblower.com

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