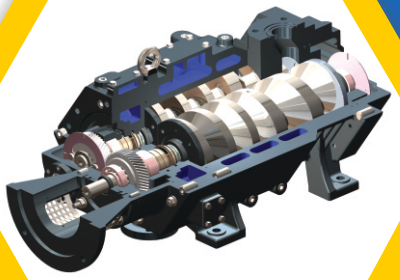
WARNING
DO NOT OPERATE WITHOUT READING MANUAL

Doc. No. OMM-Dry Screw Vacuum Pumps
Rev 01, May 2018

DRY SCREW VACUUM PUMP
USER MANUAL



INSTALLATION
OPERATION
MAINTENANCE

Models: ESPH 150 | ESPH 300 | ESPH 400
ESPH 800

EVEREST
PRESSURE & VACUUM SYSTEMS

CONTENTS

INTRODUCTION

1.1 General Description

This manual provides installation, operation and maintenance instructions for the Everest Dry Screw Vacuum Pumps (ESPH150, ESPH300, ESPH400, and ESPH800).You must operate the pump as specified in this manual.

It is strongly recommended to read this manual before you install, operate & maintain your pump. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. The specific marking (Warning & Caution) are described below.

WARNING

Warning are given where failure to observe the instruction could result in serious injuries to people.

CAUTIONS

Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.

The following IEC warning labels appear on the pump:

SAFETY INSTRUCTIONS

1. Do not operate before reading the enclosed instruction manual.
2. Use adequate safety equipment to protect against hazards involved in installation and operation of this equipment. Adhere to warning & mandatory action.


Hot Surface


Risk of Being Pulled


Electric Shock


Exhaust of hot or harmful gases


Oil Fill


Lifting Point


Direction of Rotation


Earthing

IMPORTANT SAFETY INFORMATION

WARNING

Please read the following safety instructions before operating Vacuum Pump

- Do not operate the pump without the coupling guard properly attached. Operating the pump without the coupling guard 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. 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 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 an open atmosphere. Applications where process vapour contains environmentally unfriendly chemical vapours, 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 vapour and chemical vapour to atmosphere. Check local laws and ordinances prior to operation of the pump regarding discharge to atmosphere.
- Do not restrict the pump discharge in any way. Do not place valves in the discharge line.
- Disconnect the pump motor from the electrical supply at the main before disassembling or servicing the pump. Make sure pump is completely reassembled, the coupling guard is properly installed, and that 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 injury.
- Lift pump only by the lifting lugs supplied with the pump. DO NOT lift equipment attached to 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 (80-90°C). Prolonged operation at 200 torr [267 mbar (a)] may cause surface temperatures as high as 220°F (104°C).

1.2 Intended Use

- The ESPH Series Vacuum Pumps are built to exacting standards and if properly installed and maintained shall provide many years of reliable service. We request you to take time to

read and follow every step of these instructions when installing and maintaining your pump. We have tried to make these instructions as simple as possible. We realize getting any new piece of equipment up and running in as little time as possible is imperative to production.

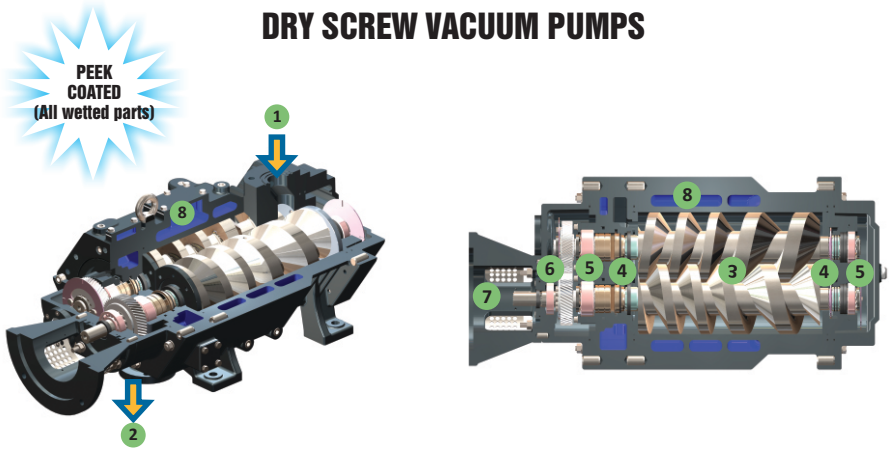
The pump should be used as per **System compatibility & Operating recommendation Report.** If you use the pump to an application for which it is not recommended you may invalidate warranties, for any doubt contact EVEREST.

1.3 Definition

- The ESPH Dry Screw Pump operates at pressures between atmospheric and ultimate vacuum without any lubricating or sealing fluid in the pumping chamber. This ensures a clean pumping system with outback-migration of oil in to the system being evacuated.

Operating Principle

The **EVEREST** ESPH Dry Screw Vacuum Pump is a hybrid variable pitch screw, dry running non contact type vacuum pump. Two parallel screws, having a highly sophisticated surface profile consisting of an archimedean and quimby curve and an arc, rotate in opposite direction. Drive shaft rotation is clock wise (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 screws and body to avoid any metal to metal contact. The power of the motor is transmitted to the main shaft through a coupling.



(1) Suction (2) Discharge (3) Screw (4) Seals (5) Bearings (6) Timing Gears
(7) Shaft / Coupling (8) Cooling Jacket

1.4 Cooling System

The pump (Casing and DSP) is cooled by water which flows through an integral cooling-jacket. The pump-motor is air-cooled by a cooling-fan which is integral to the motor.

EVEREST ESPH 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 discharge side plate which will be circulated to the pump dasing and discharged from the discharge nozzle located on the casing.

1.5 Gas system

The ESPH vacuum pumps have Shaft-Seals purge system, gas-ballast system & Inlet purge system.

Seal Purge

You must connect nitrogen supply to the shaft-seals purge at pump discharge side. The shaft-seals purge pipe line then delivers the nitrogen purge to the shaft-seals. This purge ensures that the shaft-seals are maintained at a positive pressure during pump operation & prevents the entry of corrosive or toxic process vapors in to the pump gear box, prevents contamination of the process gases with pump oil & prevents damage to the shaft-seals by debris. Refer technical specification table (Table 1) for flow and pressure requirements.

Inlet Purge

Inlet purge is used to remove residual process gas or any in compatible substances such as solvent mists, moisture, atmospheric air etc. from the inside of the pump after the pump operations. Inlet (Cleaning) purge should be done with gas which is compatible with the process gas or inert gas such as Nitrogen. This purge is especially important when pumping corrosive gases, toxic gases or polymeric process materials such as film resin. It is used while solvent flushing of pump.

Gas Blast

Where there is a risk of condensation or where there is need of a dilution of the condensable gases, air, nitrogen and process gas can be used. Gas ballast shall be connected to outlet pipe of silencer/condenser and the gas ballast port of the final stage in pump. Operate the needle valve accordingly to prevent the condensation at pump discharge. Gas ballast module consists of a needle valve, interconnecting tubing in between pump and discharge line.

TECHNICAL SPECIFICATION

2.2 General Data

Overall Dimensions	:	Ref. Table 1
Weight	:	Ref. Table 1
Rotation speed 50/60 Hz	:	2950/3500 rpm
Warm-up time	:	30 min
Ambient operating temperature range	:	5 to 40 ^{o}C, 41 to 104 ^{o}F
Maximum ambient operating humidity	:	90% RH

2.2 Material of 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 tooth-polishing machine for reduced noise during the pump operation.

Bearings

The bearings on the fixed side of the ESPH pump (discharge end) are angular contact ball bearings and on the expansion side (inlet end) are deep groove ball bearings. These bearings have been selected to with stand high speed and heavy load service and to assure the accurate clearances between gears and between screws.

Oil Level Gauge

An oil level gauge (sight glass type) is located on the oil chambers (front end and rear end cover) are so positioned to avoid the damage impact of falling objects. Oil should be filled to the top level of the upper mark.

Process contact material	
Pump and Rotors	Cast iron FG 260, SG450/10
Lip Seals	PTFE and Carbon mix (Turcon) in stainless steel body

2.3 Lubrication

ESPH series pumps are oil lubricated at gearbox side as well as rear end side. Use only recommended oil.

Recommended oil

For general application	:	Shell Turbo T46
Corrosive (CX Series) application	:	Shell Corena S4 R68

Table 1: Oil capacity of different screw pump models.

Pump Model	Gear Box	Rear End Side	Total Oil Consumption
ESPH 150	0.42	0.23	0.65 Ltrs.
ESPH 300	0.85	0.30	1.15 Ltrs.
ESPH 400	1.10	0.42	1.52 Ltrs.
ESPH 800	1.70	0.55	2.25 Ltrs.

2.4 Specification Table

Table 2: Technical specifications of screw pump models.

DESCRIPTION		UNIT	ESPH150	ESPH300	ESPH400	ESPH800
Pumping Speed (50Hz/60Hz)		m^3/hr	110/130	250/300	330/400	660/800
Ultimate Vacuum		torr	≤ $7.5x10^{-}$	≤ $7.5x10^{-2}$	≤ $7.5x10^{-2}$	≤ $7.5x10^{-2}$
		mbar	≤ 1	≤ $1x10^{-1}$	≤ $1x10^{-1}$	≤ $1x10^{-1}$
		Pa	≤ 100	≤ 10	≤ 10	≤ 10
Motor Power requirement		Kw	3.7	7.5	11	15
Rotational speed (50 Hz/60Hz)		RPM	2900/3500	2900/3500	2900/3500	2900/3500
Pump Connection	Inlet	mm	40	50	65	100
	Outlet	mm	40	50	50	65
Cooling Water	—	°C	5-35	5-35	5-35	5-35
	▪ Flow Rate	LPM	5-10	10-15	10-15	15-20
	▪ Pressure	$Kg/cm^2(g)$	2	2	2	2
	▪ Connection Size	BSP	3/8"	1/2"	1/2"	1/2"
Seal Purge Gas	▪ Flow Rate	LPM	5-15	5-15	5-15	5-15
	▪ Pressure	$Kg/cm^2(g)$	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Inlet Purge Gas	▪ Flow Rate	LPM	300	300	300	300
	▪ Pressure	$Kg/cm^2(g)$	0.3-0.5	0.3-0.5	0.3-0.5	0.3-0.5
Noise	50Hz (Typical/Max)	dB(A)	≤77/82	≤77/82	≤77/82	≤77/82
	60Hz (Typical/Max)	dB(A)	≤81/85	≤81/85	≤81/85	≤81/85
Vibration	60Hz (Max)	mm/s	2.8			
Lubrication	Type	For General application : Shell Turbo T46. For Corrosive application: Shell Corena S4R 68.				
	Volume	Liters	1	1.6	2	2.75
Weight		Kg	155	320	440	587
Pump Dimensions	Length		773	938	1070	1166
	Width	mm	327	433	482	502
	Height	mm	270	360	380	466

*Water supply temperature is a process dependent selection. As standard it is 28-32 °C.

INSTALLATION

3.1 Safety

WARNING

Follow the safety instruction given below and take appropriate precautions. if not followed, can cause injury to people and damage to equipment.

- Suitably trained and supervised technician must install the pump.
- Ensure that the installation technician is familiar with the safety precautions related to the products pumped. Wear the appropriate safety-clothing when in contact with contaminated components. Dismantle and clean contaminated components inside a fume-cupboard.
- Vent and purge the process system before you start any installation work.
- Check that a required components are available and of the correct type before starting.· Disconnect the other components in the process system from the electrical supply so that they can not be operated accidentally.
- Do not work unsupervised.
- Do not use damaged O-rings & Seals.

3.2 Unpacking and inspection

WARNING

Use suitable lifting equipment to move the pump. Refer to table 1 for the pump weight.

- Unpack the pump and remove the packing material around the pump.
- Inspect the pump. If the pump or any other item is damaged, notify your supplier and the carrier in writing within three days; state the UIC (Punched on plate on skid/Pump) together with your order number and your suppliers invoice number. Retain all packing materials for inspection. Do not use the pump if damaged.
- Check the information shown on the pump motor data plate to make sure that the pump is suitable for use with your electrical supply voltage and frequency. Do not continue to install and use the pump if it is not suitable for use with your electrical supply.
- If the pump is not to be used immediately, it should be covered with suitable packing material & kept in a dry place.

3.3 Locating The Pump

Note: Ensure that the cooling-air flow around the pump-motor is not restricted. Ensure that there is sufficient room to allow safe maintenance work and periodic inspections.

Lifting & Transportation Instruction

The pump or assembly must always be moved and transported in the horizontal position. Prior to moving the unit, the following in specification table:

- Total weight
- Center of gravity
- Maximum outside dimensions
- Lifting point location

  (a) Take care when moving the pump. Rough treatment of lifting in an unsuitable way may cause permanent damage. Pump should be lifted through the lifting point (Eye bolts) provided on it. The safe lifting method are illustrated bellow (shown in fig.1).

  (b) Make sure that the eyebolt is in faultless condition (replace a damaged, e.g. bent eyebolt with a new one)

  (c) Make sure that the eyebolt is fully screwed in and tightened by hand.

- Use suitable lifting-equipment attached to the lifting bolts and move the pump close to its final operating position.
- EVEREST ESPH pumps should always be operated in a horizontal and level position. The pumps should never be installed in an upright (vertical) or angled position and should be installed on a rigid base frame.
- Pump assembly with the base frame should be placed on a foundation and should be supported evenly. Metal shims should be interested between the base frame and the foundation, if required for leveling. Pump assembly with the base frame should be leveled to within 0.5 mm (0.02") in 1 meter span (3.28 ft.)
- Upon completion of the setting of the pump assembly on the foundation and anchor bolts, the base frame should be adequately grouted prior to tightening the anchor bolt nuts. Anchor bolt nuts should be tightened after the grout is firmly cured. Anchor bolts should be tightened evenly to ensure the previously set level is not changed.

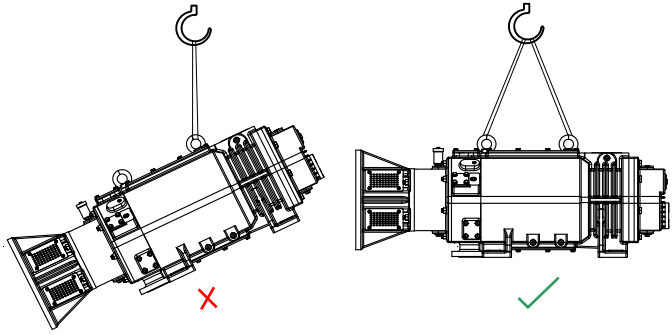


Fig. 1 : Careless lifting of screw pumps may be harmful to pump operation & workers.

WARNING

- Make sure that the unit cannot roll or fall over and injure people or damage property.
- These pumps might use carbon or ceramic silicon carbide components. Do not drop the pump or subject it to shock loads as this can damage the internal carbon/ceramic components.

3.4 Storage Instructions

After receipt and inspection, if not immediately installed, the unit must be repackaged and stored. For a proper storage proceed as follows:

- Store the pump in a location that is closed, clean, dry and free from vibration.
- Do not store in area with less than 5^{o}C temperature (for lower temperature it is necessary to completely drain the pump of any liquids that are subject to freezing)

Freezing Danger

Where the ambient temperature is less than 5^{o}C it is recommended to drain the pump, piping, separator, heat exchanger, etc. or add an anti-freeze solution to prevent damage to the equipment.

- Fill the pump with a halfway anti rust liquid but compatible with gaskets and elastomers materials, rotate the pump shaft by hand so that all internal parts get wet and then drain the pump of the excessive anti-rust liquid.
- Plug all the openings that connect the pump internals to atmosphere.
- Protect all machining surfaces with an anti-rust material (grease, oils etc.)
- Cover the unit with plastic sheet or similar protective material.
- Rotate pump shaft at least once every three months to avoid possible rust build-up which may result in seizing of the pump.
- Pump accessories should be subjected to similar procedure

3.5 Electrical Installation

WARNING

Ensure that the electrical installation of the pump confirms to your local and national safety requirements. It must be connected to a suitably fused and protected electrical supply and a suitable earth (ground) point.

- Electrical power connection should be carried out by a qualified electrical engineer.
- Check for wiring connections on motor terminal box and electrical control panel. 3Ø 415 V, 50 Hz is the standard supply for EVEREST supplied motors.
- Rotation of screw pump shall be clockwise when seen from motor end.
- It is recommended to use VFD (Inverter Drive) for soft start-up of Dry Screw Vacuum pump.

WARNING

You must ensure that the direction of rotation of the pump is correct before you operate the pump. If you do not, It can damage the pump internals, inlet pipeline, injury, fire or explosion.

3.6 Check the direction of pump rotation

For checking the direction of rotation of motor and pump, please follow the following steps.

- Look at the pump's motor colling-fan, switch on the pump for one or two seconds and switch the pump off again.
- If the cooling-fan rotates anticlockwise when viewed from the pump's motor end, the direction of rotation is incorrect. If the direction of rotation is incorrect:

(1) Isolated the pump's motor from the electrical supply.
(2) Reverse the electrical supply phase-wires in the pump-motor terminal box.
(3) Recheck to ensure that the direction of rotation is now correct.
(4) When the direction of rotation is correct, refit the cover to the pump-motor terminal-box.

3.7 Connect the cooling water supply

CAUTION

If your pump is to be installed in an area where the ambient temperature falls close to or below freezing point, take all appropriate precautions to prevent the cooling water freezing inside the pump cooling-jacket.

CAUTION

Make sure you connect the cooling-water supply and return pipelines to the correct connectors on the pump. If the cooling-water pipelines are incorrectly fitted, the pump may overheat and may be damaged.

The vacuum pump casing and the discharge side plate have an integrated cooling water jacket. The EVEREST ESPH series pumps can be configured with two different types of cooling systems, fresh water cooling and re-circulating cooling.

Fresh Water Cooling

The fresh water cooling, systems consists of a “once through” cooling water circuit as shown in Fig.2. A flow indicator (optional), flow switch, strainer on the cooling water supply line should be installed to monitor the adequacy of the cooling water flow. A temperature gauge/element (optional) can be installed for discharge temperature monitoring.

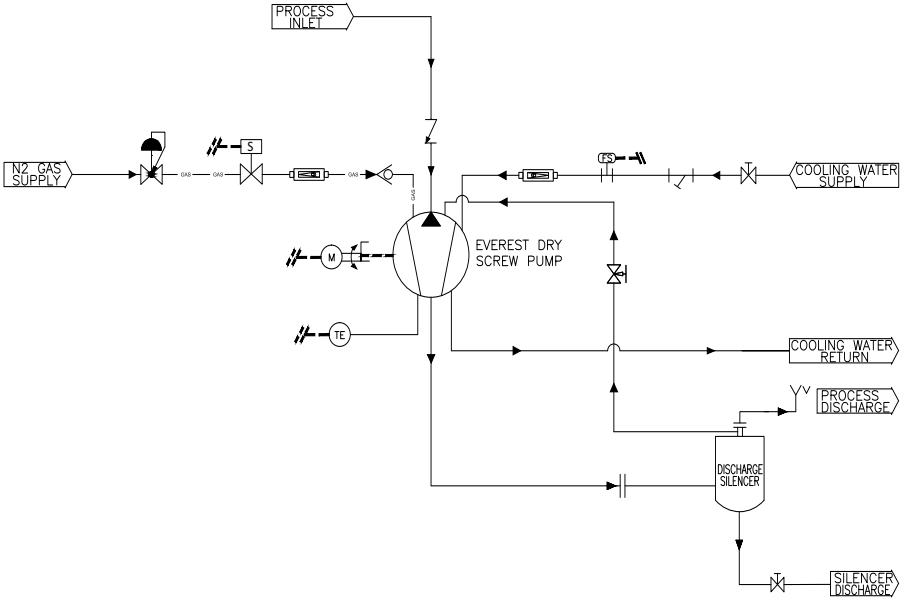


Fig. 2: Schematic connection of water-cooling circuit.

Re-circulating cooling

This system is a water cooled version with a cooling water total recovery system as shown in Fig.3. A centrifugal pump circulates the cooling water from the Dry Screw Vacuum Pump to a heat exchange unit. A flow indicator (optional), flow switch, strainer on the cooling water supply line should be installed to monitor the adequacy of the cooling water flow. A temperature gauge/element (Optional) can be installed for discharge temperature monitoring.

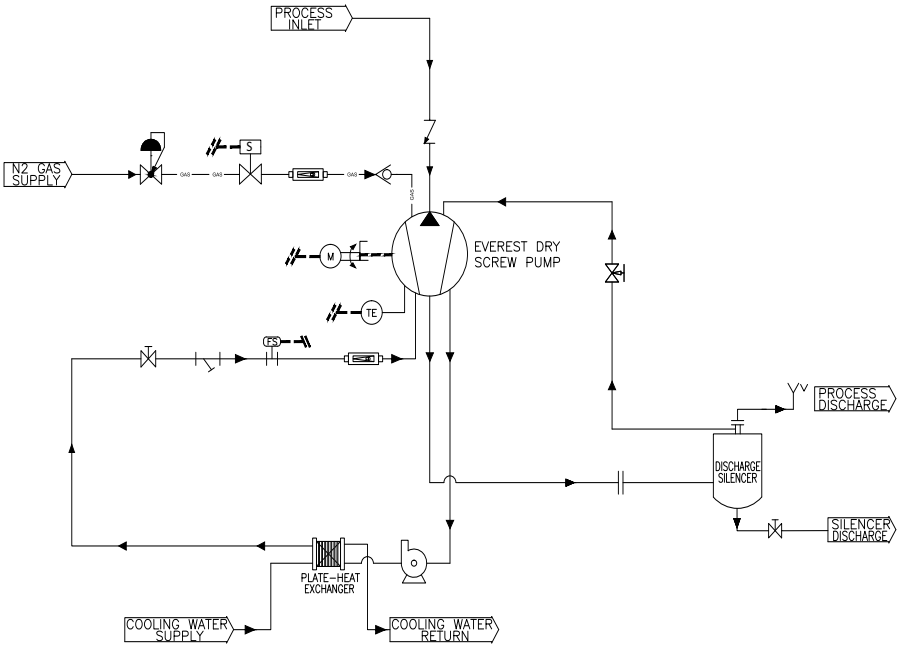


Fig. 3: Schematic connection of cooling water recovery circuit.

3.8 Pump inlet and outlet connections

WARNING

Take all necessary precautions while pumping toxic, flammable or explosive gases. If not taken, can cause injury to people.

3.8.1 Pump inlet connection to the process

When you connect the pump to the process system.

- Support process pipelines to stop the transmission of stress & vibrations to pipeline joints.
- A mesh strainer supplied along with the EVEREST ESPH pump should be placed at the pump process inlet nozzle. After initial start-up and continued operation of the 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 to the pump process inlet nozzle. **It is highly recommended to check this strainer regularly for its integrity and cleanliness.**
- You must be able to isolate the pump from the atmosphere and from your process system if you have pumped or produced dangerous chemicals.
- In very dusty applications, in corporate an inlet filter in the inlet pipe line, to minimize the ingress of dust into the pump.
- To get the best pumping speed, ensure that the pipeline which connects the process system to the pump is as short as possible and has an internal diameter not less than the pump-inlet.

3.8.2 Pump outlet connection

WARNING

The exhaust pipeline will be hot and must be suitably protected to prevent contact by people.

WARNING

Pipe the exhaust to a suitable treatment plant to prevent the discharge of vapors to the surrounding atmosphere.

WARNING

Incorporate safety devices to prevent operation of the pump when the exhaust pipeline is restricted or blocked. If you do not, the exhaust pipe line may become over-pressurized and may burst.

CAUTION

Install an outlet catch pot to prevent the drainage of condensate back into the pump. If you do not, condensate which drains back into the pump may damage it or cause it to seize.

Incorporate flexible bellows in the exhaust pipeline to reduce the transmission of vibration and to prevent loading of coupling-joints. Use flexible bellows above design pressure and temperature at discharge of screw pump.

OPERATION

WARNING

During operation, some parts of the pump become hot. Do not touch these areas of the pump and avoid accidental contact between these areas of the pump and electrical cables and wires.

The procedures in the following sections assume that you have a pump-inlet isolation-value fitted to the Dry Screw Vacuum Pump.

4.1 Starting the pump

CAUTION

Allow the pump to warm up and use full gas-ballast and inlet purge (if fitted) before pumping condemnable vapors. If not done, the vapors may condense in the pump and corrode, abrade or damage the pump.

Use the procedure below to start the pump:

- Ensure the pump internal and process piping is thoroughly cleaned and free from weld slags, metal chips, particulate, rust, dust etc.
- Turn on your cooling-water supply, shaft-seals purge air or nitrogen supply, gas-ballast nitrogen supply (if fitted).
- Check oil level of gearbox & non-drive end side from the sight glass attached to the pump.
- Switch on the pump.
- With the process inlet isolation valve closed, operate the pump for 20 to 30 minutes. At this stage, all pump operating parameters should be checked for any abnormality; such as excessive vibration, high oil temperature, high cooling liquid discharge temperature, high process discharge temperature, noise, over current drawn etc. In case of observation of any abnormality, stop the pump and investigate for the cause of the abnormality. **Typical causes of abnormalities come from improper lubrication and/or improper installation of the pump. (Refer Table 2)**

* SOP is available with pump manual also. Sometimes Sop changes according to process parameters.

OPERATION

4.2 Purge pressures and flows

WARNING

Do not touche the casing while adjusting the gas ballast value. During operation, parts of the pump can become hot.

Do the following checks immediately after starting the pump:-

- Check that the pressure of your shaft-seals purge air or nitrogen supply is correct and adjust if necessary. (Refer Table 1)
- If necessary, adjust the gas-ballast flow valve to achieve the required gas-ballast flow into the pump.

4.3 Shutting down the pump

CAUTION

Solvent flush, purge & dry run the pump before shutting it down. If not done, process vapors may condense in the pump and corrode/damage it.

- Isolated the pump-inlet from the process gases.
- Purge the pump with inert gas (like nitrogen), then solvent flush the pump with miscible solvent to process contamination.
- Operate the pump further for dry running and complete pump down period.
- Switch off the pump and turn off the shaft -seals purge air or nitrogen supply.
- When the pump has cooled down, turn off the cooling- water supply.

Note: *If the pump is to be shut down for a long time in an environment where the temperature is close to freezing, We recommended to drain the cooling-water from the pump to prevent damage to the pump.*

MAINTENANCE

5.1 Safety

WARNING

Follow the safety instructions and take note of appropriate precautions. If not taken, can cause injury to people and damage the equipment.

It is recommended a maintenance plan and schedule to be adopted as per instruction given.

- A suitably trained and supervised technician must maintain the pump.
- Ensure that the maintenance technician is familiar with the safety procedures related to the synthetic oils and the products pumped. Wear the appropriate safety-clothing when in contact with contaminated components and pump oil. Dismantle and clean contaminated components inside a fume-cupboard.
- Allow the pump to cool to ambient temperature before you start maintenance work.
- Isolate the pump and other components in the process system from the electrical supply so that they can not be operated accidentally.
- Do not reuse O-rings or gaskets if they are damaged.
- Protect sealing-faces from damages.
- Do not touch or in hale the thermal break down products of fluorinated materials which might be present if the pump has overheated to 260 °C (500 °F) and above. These breakdown products are very dangerous.

5.2 Maintenance plan

The plan shown in Table 2 details the maintenance operations necessary to maintain the pump in normal operation. Instructions for each operation are given in the section shown. In practice, the frequency of maintenance depends on the process. In clean processes, the frequency of maintenance operations may be decreased; in harsh processes, the frequency of maintenance operations may be increased. Adjust the maintenance plan according to the process:

- During normal operation, the temperature in the pump will increase as a result of compression work done on the process gas or vapour. It is abnormal if the temperature rise is localized in the pump and/or the external painting becomes scorched, however, the localized hot spots are typically due to the inadequate cooling liquid supply or cooling liquid cut-off, rubbing of the screws with casing, or pump has ingested foreign material, such as solid particulate, metal chips, process material build up etc. If a localized hot spot is observed, the pump must be shut down 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. In this case, the pump must be shut down and clearances must be measured and verified in order to determine required corrective actions.

- Most of pump abnormalities can be noted by routine checks of bearing temperatures, vibration and noise etc. Daily inspection of the pump is highly recommended as a preventative maintenance.
- Interference between the pump screws or between the screws and the casing can be detected by listening through stethoscope on the pump casing.
- Whenever the pump is stopped, completely drain the cooling liquid if the pump is located in a cold region or in the winter to prevent freezing of the cooling liquid in the cooling jacket.

Table 4: Maintenance schedule of screw pumps.

Operation	Frequency	Refer Section
Check the Gearbox & Rear end oil-level	Weekly	5.3
Inspect the pipelines and connections	6 to12 Months	5.5
Replacement of inlet filter	6 to12 Months	5.6
Change oil in gear box & Rear end side and clean sight glass for oil level.	6 Month or Check colour if dark, replace lubricating oil	-
Replace the bearings	Every 25000 hours of operation	-
Cleaning by solvent	As required	5.8
Flush the cooling - jacket	As required	5.9

5.3 Check oil-level

If the pump is operated with low oil level, the gears and bearings would seize by lack of lubrications; Mechanical seal face can damage. If the oil is overfilled, the oil temperature would get elevated and cause high gear noise (Gearbox side) and may affect integrates of the other parts within the DE (Drive End) and NDE (Non Drive End) Casing. When pump is not in use, be sure to check the oil is splashed by rotation of the timing gears and lubricates the bearings and mechanical seals.

- An oil level gauge (sight glass type) is located on the front & rear end cover. Oil should be filled to the top level to the upper mark as shown in Fig. 3 avoid dry running condition (No oil or low level of oil) of bearing and gears which result in rise in temperature, bearing and seal damage.
- If you need to pour oil into the gearbox frequently, or if there is a sudden loss of a large amount of oil, the seals may be faulty: shutdown the pump and contact EVEREST.

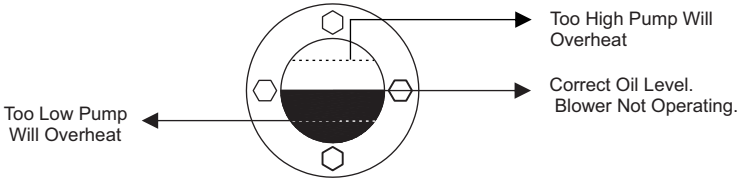


Fig. 4: Oil level indicator on both oil chambers of screw pump

5.4 Vacuum pump inspection schedule

Table 5: Inspection schedule table for screw pumps.

ITEM	CHECK POINT	DAILY	MONTHLY	QUARTERLY	6 MONTHS	YEARLY
Motor amperage	Any Change or amperage as specified?	✓				
Rotation	Is the rotation smooth and direction correct?	✓				
Suction & discharge pressure	Is the pressure as specified?	✓				
Noise & vibration	Any abnormal sound or vibration?	✓				
Temperatures	Any excessive oil or water temperature?	✓				
Cooling water leak	Check for leakage of the cooling water .	✓				
Oil level gauge	Is oil at proper level?	✓				
Cooling water pressure	Is the pressure as specified or too high?	✓				
Oil leaks	Any signs of oil leaks?	✓				
Coupling alignment	Check coupling alignment and bolt tightness.		✓			
Lubricant color	Check color; if dark, replace lubricant		✓			
Oil level	If oil level drops rapidly check mechanical seal.		✓			
Suction & discharge piping	Is there any accumulated scale or dirt?			✓		
Process and utility piping ring.	Inspect for damage				✓	
Mech. seal, oil seal, bearing, O-ring	Inspect for damage & replace as needed.					✓
Timing gears	Inspect for damage					✓
Pump casing internal and screws surfaces	Any sign of rust and flaw found?					✓

5.5 Inspection of the pipelines and connections

- Inspect all cooling-water pipelines, all air or nitrogen supply pipelines and their respective connections; check that they are not corroded or damaged. Replace the pipelines and connections that are corroded or damaged. Check that all cooling-water connections are securely tighten.

- Inspect all electrical cables; check that they are not damaged and are not overheated. Replace any cables that are damaged or overheated. Check that all electrical connections are secure. Tighten any connections that are loose.

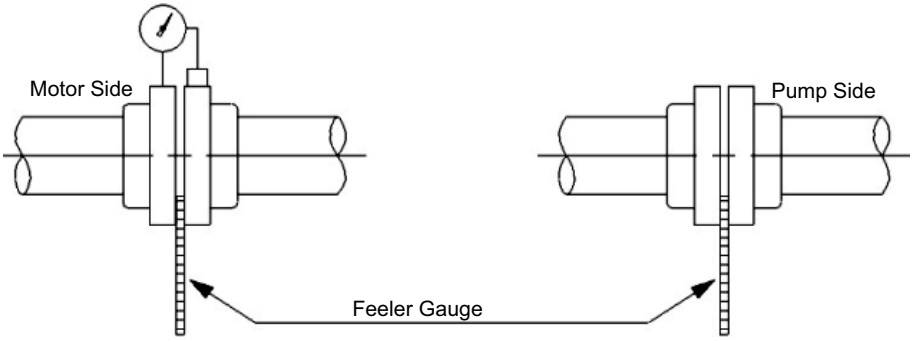
5.6 Cleaning / Replacement of Inlet filter

If pump is equipped with pump inlet filter, filter should be removed for cleaning or changing or changing after one month. Otherwise, pumping capacity will be decreased. Follow the procedure given below.

- Disconnect the pump inlet from the process system.
- Remove the inlet filter from the pump inlet.
- Clean / replace the filter.
- Reconnect the pump inlet to the process system.

5.7 Coupling drive alignment

The concentricity should be as follows:



Gap Between Couplings 3mm
For Star & HRC Couplings Motor
Frame Size up to M132
for 160 Frame Size

Max. Misalignment
Less than 0.3mm
Less than 0.4mm

Fig. 5: Schematic illustration of the alignment requirements for coupling drive.

5.8 Solvent cleaning

Choose suitable solvent for pumping material. For cleaning, suitable amount of solvent is needed. (Approx. 10L ~ 20L, or as per requirement).

5.8.1 Pump cleaning in operation

Note: In case pump is full of solvent, shut off the pump. It can bring serious damage to the pump or lead to an accident.

- Ensure that exhaust pipeline of pump is free from any blockage, put a suitable container under the drain.
- If the system has pump suction isolation valve, close it. In the other case, separate pump inlet from process system and fix blind flange to pump suction line.
- Pour the miscible flushing solvent in the pump inlet and pour until clear/same color solvent comes out from discharge of screw pump.
- Pump is ready for next operation.

5.8.2 Stuck pump cleaning

In case pump is full of solvent, don't start the pump. It can bring serious damage to the pump or lead to an accident.

1 If the system has pump suction isolated valve, close it. In the other case, separate pump inlet from process system and fix blind flange to pump suction line. Blind the pump from discharge port also.

2 Pour suitable solvent slowly into suction flush port. Wait about few minutes until that pump is full of solvent.

3 Leave the pump for at least one hour.

4 Insert chain wrench into running device hub. Rotate pump clockwise.

5 If you can rotate it, keep going to next step.

6 Put suitable container under the pump exhaust then remove the blind flange.

7 Rotate pump three or four times completely by chain wrench. It is possible that pump can't rotate due to pressure lock of pump.

8 If necessary, repeat steps 7 & 8.

9 Separate blind flange in pump suction line. Reconnect pump suction line to process system or open the suction valve.

10 Reconnect pump discharge line to discharge port.

11 If necessary, turn on power of pump motor.

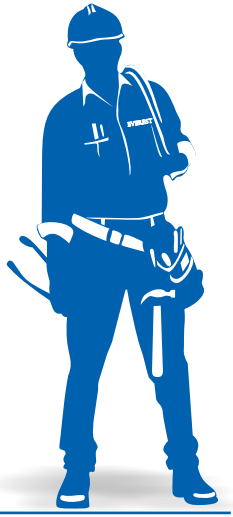
12 Remove used solvent and precipitate.

5.9 Flushing the cooling-jacket

Flush the cooling-jacket to clean it; allow water to flow rapidly through the cooling-jacket in the reverse direction of normal flow. Use the following procedure:

1. Turn off the cooling-water supply.
2. Place a suitable container under the cooling-water drains, disconnect your cooling-water supply pipeline. Allow the water to drain out of the pump then empty the container.
3. Disconnect the cooling-water return pipeline from the cooling-water outlet.
4. Connect the flushing-water supply pipeline to the pump cooling-water outlet.
5. Reposition the container under the cooling-water inlet; alternatively, if required, fit a waste water pipeline to the inlet.
6. Turn on the flushing-water supply. The pressure and flow rate of the supply should be equal to or higher than the normal cooling-water pressure and flow rate. Do not exceed the figures stated in Table 1.
7. Allow the water to flow for a few minutes, then turn off the flushing-water supply.
8. Disconnect the flushing-water supply pipeline and the waste pipeline, if fitted. Allow the water to drain out of the pump, then empty the container.
9. Reconnect your cooling-water supply and return pipelines to the cooling-water inlet and outlet connection.

- Turn on the cooling-water supply.
- Allow the cooling-water to flow for five or six minutes to ensure that the cooling- jacket is full of water.
- Inspection the water connections and check that there are no leaks.



DISMANTLING & ASSEMBLY PROCEDURE

6.1 Dismantling procedure

1. Disconnect all process, utility pipelines and electrical connections. Remove coupling guard (21), motor, coupling, and key (58).
2. Open the cooling water jacket drain valve in body, and drain cooling water completely.
3. Open oil drain plug in gear cover and suction side cover (4, 7) and drain oil from pump.
4. Remove hex nuts in stud bolts (68) and separate motor bracket(8).
5. Loosen allen bolts for fixing seal adaptor housing (15) using hexagonal wrench and separate seal adaptor housing from gear cover (4). Remove the oil seal (23) along with seal adaptor housing (15), ensuring no damage to lip seal.
6. Remove hex nuts in stud bolts (67) and separate gear cover (4). Punch mark the gears for teeth meshing while assembly.
7. Separate power lock (52) from timing gear driver(9) using the hexagonal wrench. Remove locknut (61) using locknut wrench to separate the timing gear (Driven).
8. Separate suction side cover (7) from suction side by removing the hex bolt (69). Loosen the hex bolt (71) and remove the oil splasher disc (NDE) (36) and remove locknut (62) from both shafts.
9. Loosen the Allen bolt (75) and remove the bearing housing(NDE) (14) from suction side plate after fastening hexagonal bolts into jacking holes in bearing housing.
10. Separate bearing (53), slip sleeve (30), piston bush(NDE) (33), flinger (38), double lip seal (24) and spacer B (35) from the suction side.
11. Loosen the allen bolt (73) and separate suction side plate (3) from body(1).
12. Loosen allen bolt (76) and remove guide plates(12) from suction side plate (3).This is the final step for disassembling suction side.
13. Lift up the pump Body(1) after installing eye bolts to the discharge side plate (2) using the lifting device (hoist, chain block) and reposition the pump with discharge side plate on top on the work bench. Adjust the height of supporting fixture on the workbench to prevent contacting the screw rotor shaft (5) and (6) with the top surface of the workbench.
14. Remove allen bolt (72) to separate discharge side plate (2) from body(1). After fastening one eye bolt to the discharge side plate (2), separate discharge side plate (2) from body(1) using the lifting device. Relocate the discharge side plate with screw rotor shaft (5)&(6) to the screw rotor shaft supporting fixture.
15. Separate bearing stopper (16) after removing allen bolt (74).
16. Remove lock nut (62) using lock nut wrench and separate lock washer (64).
17. Separate both bearing housing (de)(13) from the discharge side plate after fastening hexagonal bolts to the jacking holes in bearing housing.
18. Pull out angular contact bearing (55) from the disassembled bearing housing (de)(13). then, separates spacer a (34), slip sleeve (31), mechanical seal (22) (rotator and mechanical seal stator part) from screw rotor shaft.

19 Remove compression plates (11, 10) and lip seal (25) after separating from the screw rotor shaft (5, 6) using the eye bolt assembled in discharge side plate (2) with the hoist.

20 Separate cover, plate and blind plate of water jacket from body.

- All disassembled part are cleaned by solvent and parts which has abrasion or damage should be changed with factory approved parts which is indicated by manufacturer.
- Every disassembly and assembly, new bearing, seals, gasket, and o-ring should be used.

6.2 Assembly Procedure

Precautions:

- Check all parts for wear or damage during assembly. Especially, damage of mating parts or sub-assembly which join or fit together will deteriorate the proper operation of the pump after it is assembled. Therefore, Utmost care must be taken for inspection of those parts, joints, fittings and sub-assembly. If found worn or damaged, change or repair the part.
- Clean bearing with light oil (T-46). Then apply lubricant. Always clean hands and tools before handle bearing.
- Remove dust from fittings by solvent or soft and clean cloth. Then apply oil. In case key or shaft has rust and it is too difficult to separate, apply Molybdenum disulfide (Clean the inside of gear by solvent or clean cloth).
- Use new shims/spacer, when packing is damaged. Measure the thickness of new packing and ensure it is same as old packing.

Fastener	Screw Size	Torque (Nm)
All except where otherwise stated	M5	10
	M8	35
	M10	60
	M12	90
Power Lock - ESPH 150, 300,400	M6	17

Procedure:

(1) Assemble gasket and blind plate of water jacket, double lip seal (17,18,19, 25, 26, 20, 27, 28, 29) to body (1) and discharge side plate (2) using hexagonal bolt.

(2) Assemble compression plates (10) and (11) to discharge side plate(2) using allen bolt.

(3) Place the screw rotor shaft supporting fixture on the workbench and secure firmly. The key way slot in the drive and driven screw shafts (5) and (6) should be located in top position when upright screw shafts, install slip sleeve (31) on shafts.

(4) Start assemble from the discharge side plate (2).

(5) Assemble the discharge side plate (2) to the screw rotor shaft (5) and (6) using the lifting device after fastening the eye bolt. During this step, discharge side plate (2) should be tightly contacted with the surface of the screw rotor shaft.

(6) After installing bearing housing(13), inject few drops of oil into o-ring of mech. seal stator, then press fit to the drive and driven shaft (5) and (6) and secure the mechanical seal stator using the installation tool.

(7) Next, install mechanical seal rotator to the drive (5)& driven shaft (6) after oil injection to the carbon face in mechanical seal rotator. Secure firmly mechanical seal rotator on the drive (5) & driven shaft (6) using the installation tool. Remove the installation tool and press the mechanical seal using fingers to check the proper tension of the mechanical seal bellow. then, check whether o-ring is positioned in proper place by rotating the seal a little bit.

(8) Place spacer a (34) & shims in drive & driven shaft. The spacer a (34) was made specially to meet the required allowable tolerance of the drive and driven side. Care should be taken not to change should be assemble an same shaft as was before.

(9) Insert ball bearing (55) into the bearing housing (13).

(10) Secure ball bearing on drive and driven shaft (5) and (6) with lock washer (64), lock nut (62) using the lock nut wrench and bend one edge of lock washer (64) to fix the locations. Prior to securing lock nuts, insert a copper plate or soft metal shim between the screws to protect the drive & driven shaft (5) and (6) from rotating.

(11) Secure bearing stopper (16) to bearing housing(13) with Allen bolt (74).

(12) Lift the sub-assembly of discharge side plate and screw rotor shaft using the eye bolt with hoist to separate from the supporting fixture on workbench. Check the clearance between side surface of screw and surface of compression plate (10) and (11). Insert o-ring (46) into the discharge side plate (2).

(13) Insert dowel pin (65) and o-ring (49) into the body(1) at the supporting fixture on the workbench. secure allen bolt (72) after attaching the sub-assembly of discharge side plate and screw rotor shaft to body(1) with care to prevent body from any internal damage. Locate the pump assembly in horizon position with facing the suction side of pump on front side.

(14) Lift the assembly using eye bolt with hoist and locate the pump in vertical position by securing suction side upwards.

(15) Place dowel pin (65) and o-ring (49) into the body(1) and place guide plates (12) into suction side plate (3) and secure with allen bolts(73) to body(1).

(16) Insert o-ring (48) in suction side plate (3) and install bearing housing (NDE) (14) on suction side plate (3) and secure with allen bolts(75).

(17) Insert flinger (38) into the screw shaft and spacer b (35), double lip seal and piston bush (33) with piston rings (39) into bearing housing (NDE) (14).

(18) Secure ball bearing (53) into the bearing housings (NDE) (14) at driver and driven shaft with lock washer (64), lock nut (62) using the lock nut wrench and bend one edge of lock washer (64) to fix the locations.

(19) Install oil splashes disc (NDE) (36) driver shaft (5) end at suction side of pump.

(20) Insert o-ring (50) on suction side plate (3) and secure suction oil chamber (7) with hex bolt (69).

(21) Lift up the pump assembly and place it on the workbench horizontally with pointing the discharge side to the worker.

22) Insert key (57) into the driven shaft (6) and replace timing gear driven onto the driven shaft (6) next, place timing gear driver (9) and power lock (52) onto the drive shaft (5).

(23) Replace stud bolt (67), dowel pin (65), and o-ring (47) in sequence into the discharge side plate (2).

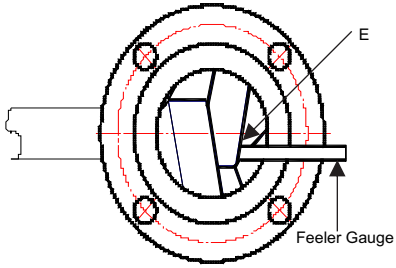


Fig. 6: Technique of using feeler gauge

Insert Feeler Gauge as per table below (Feeler gauge with thickness as per table) into the suction port as shown in Figure 5. Then, rotate the timing gear driver to secure the feeler gauge. After that secure the timing gear driver (9) using the wrench bolt at power lock and remove the thickness gauge. the timing gear run-out or flatness should be within 0.02 mm.

Table 7: Allowable clearance at suction port in various models of screw pumps.

Model	ESP-H-150	ESP-H-300	ESP-H-400	ESPH-800
E (um)	0.05~0.07	0.07~0.09	0.09~0.11	0.12~0.15

(24) Attach gear cover (4) to discharge side plate (2) and secure the nut (85) to the stud bolt (67).

(25) Place ball bearing (54) into the driver shaft (5).

(26) Install oil seal (23) into the seal adapter housing (15), and insert o-ring (45) into the groove. then, place the seal adapter housing (15) to gear cover (4).

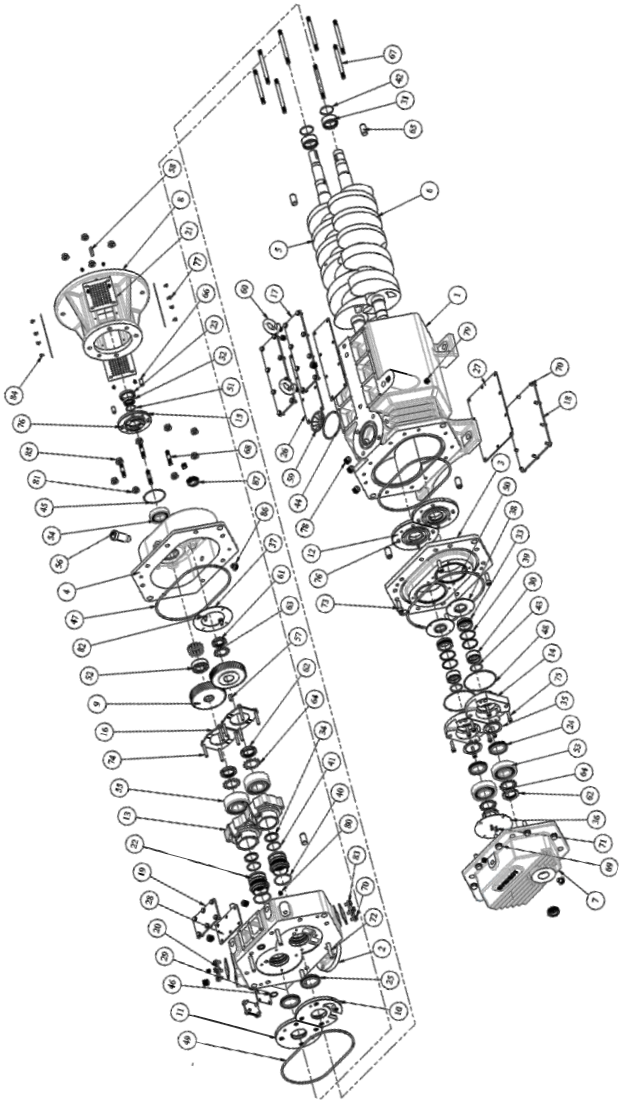
(27) Insert slip sleeve (32) with o-ring (51) on driver shaft (5).

(28) Insert dowel pin (66) into gear cover (4) and secure motor bracket (8) to gear cover with stud bolt (68) and tightened with nut (85).

(29) Attach gear cover (4) and replace keys, coupling and motor.

(30) Fill oil up to the green line on oil level gauge in the gear cover (4) & suction side cover (7) then, attach air vent (56).

6.3 Exploded drawing



Part List

ITEM NO.	DESCRIPTION	QTY.
1	BODY	1
2	DISCHARGE SIDE PLATE	1
3	SUCTION SIDE PLATE	1
4	GEAR COVER	1
5	DRIVE SCREW ROTOR	1
6	DRIVEN SCREW ROTOR	1
7	SUCTION SIDE COVER	1
8	MOTOR BRACKET	1
9	TIMING GEAR ASSEMBLY	1
10	COMPRESSION PLATE DRIVEN	1
11	COMPRESSION PLATE DRIVER	1
12	GUIDE PLATE	2
13	BEARING HOUSING(DE)	2
14	BEARING HOUSING(NDE)	2
15	SEAL ADAPTER HOUSING	1
16	BEARING STOPPER	2
17	BLIND PLATE (A)	2
18	BLIND PLATE (B)	1
19	BLIND PLATE (C)	1
20	BLIND PLATE (D)	3
21	COUPLING GUARD	4
22	MECHANICAL SEAL	2
23	OIL SEAL (40x55x8)	1
24	DOUBLE LIP SEAL	2
25	DOUBLE LIP SEAL	2
26	BLIND PLATE GASKET A	2
27	BLIND PLATE GASKET B	1
28	BLIND PLATE GASKET C	1
29	BLIND PLATE GASKET D	3
30	SLIP SLEEVE	2
31	SLIP SLEEVE	2
32	SLIP SLEEVE	1
33	PISTON BUSH(NDE)	2
34	SPACER A	2
35	SPACER B	2
36	OIL SPLASHER DISC(NDE)	1
37	OIL SPLASHER DISC(DE)	1
38	FLINGER	2
39	PISTON RINGS	4
40	O - RING (M-SEAL STATOR)	2
41	O - RING (M-SEAL ROTATOR)	2
42	O - RING (SLIP SLEEVE)	2
43	O - RING (SLIP SLEEVE)	2
44	O - RING (SUCTION)	1
45	O - RING (SEAL HOUSING)	1
46	O - RING (WATER JACKET)	1

ITEM NO.	DESCRIPTION	QTY.
47	O - RING (GC)	1
48	O - RING (BEARING HOUSING)	2
49	O - RING (BODY,DSP)	2
50	O - RING (SSP)	1
51	O - RING (SLIP SLEEVE)	1
52	POWER LOCK	1
53	SINGLE BALL BEARING	2
54	SINGLE BALL BEARING	1
55	ANGULAR BALL BEARING	2
56	AIR VENT	1
57	PARALLEL KEY	1
58	PARALLEL KEY	1
59	MESH FILTER	1
60	EYE BOLT	2
61	LOCK NUT KM7	1
62	LOCK NUT KM8	4
63	LOCK WASHER MB7	1
64	LOCK WASHER MB8	4
65	DOWEL PIN	6
66	DOWEL PIN	2
67	STUD BOLT	8
68	STUD BOLT	4
69	HEX BOLT	8
70	HEX BOLT	46
71	HEX BOLT	2
72	ALLEN BOLT	4
73	ALLEN BOLT	4
74	ALLEN BOLT	8
75	ALLEN BOLT	8
76	ALLEN BOLT	20
77	ALLEN BOLT	16
78	GRUB SCREW	8
79	GRUB SCREW	4
80	GRUB SCREW	2
81	PUNCHED WASHER	20
82	PUNCHED WASHER	2
83	PUNCHED WASHER	52
84	PUNCHED WASHER	16
85	HEX NUT	12
86	MAGNETIC DRAIN PLUG	2
87	SIGHT GLASS	2

6.4 Troubleshooting

Table 8: Steps of troubleshooting the common problems that may occur in screw pumps.

Problem	Causes	Solutions
Insufficient pumping capacity	Clogged inlet filter and/or strainer	Clean or change the inlet filter and/or strainer
	Too large clearance	Check the screw “E” clearance and rest the clearance (reset the timing gear)
Motor overload	Foreign matter is caught in the pump	Check the Screw “E” clearance and reset (reset the timing gear) if needed. If the screw and/or casing are damaged by foreign material, replace the screw and/or casing. Do flushing.
	Significant increase of inlet pressure	Check the pressure differential between the inlet & outlet of the pump
	Interference between screws	Reset the screw “E” clearance (reset the timing gear)
	Interference between screw and casing	Reset the inner clearance
	Blocked discharge nozzle or piping & increased back pressure	Drain & clean discharge nozzle & piping
Overheat	Excessive oil in oil chambers	Check oil level & adjust the oil level if required
	High vacuum pump inlet temperature	Reduce the inlet temperature
	High compression ratio	Check the differential pressure between inlet and discharge nozzle
	Interference between screw and casing	Search for the cause interferences
	Problem with cooling liquid flow	Clean cooling liquid lines and pump cooling jackets
	Blocked discharge nozzle or piping and increased back pressure	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 0.02 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 lubrications	Change oil
	Low oil level	Refill oil to the correct level

Disposal Note:

If you have any doubts about the disposal requirements for specific substances or components, contact your supplier or Everest for advice.

Dispose of the Dry Screw Vacuum Pump, cleaning solution, deposits removed from the pump, used pump oil and any components safely in accordance with all local and national safety and environment requirements.

Take particular care with the following:

- Flouro elastomers which may have decomposed as the result of being subjected to high temperatures
- Oil or components which have been contaminated with dangerous process substances.

Dearest Everest Customer,

Thank you for your purchase of Everest Products. To help us improve the products and services we provide you, please complete and return this questionnaire by fax / mail.

Fax : +91-11- 28114944, 28114955, 28117469, 28116307
Email: service@everestvacuum.com

EVEREST WANTS TO KNOW WHAT YOU THINK

1. How did you first become aware of Everest's Products?

(a) Advertisement (b) Colleague's Recommendation ☐ (c) Internet ☐

(d) Trade Show ☐ (e) Others _____

2. What Industry are you in ? _____

_____

3. What convinced you to purchase Everest Products?

(a) Prior Experience using Everest Products

(b) Product quality

(c) Technical Support

(d) Knowledgeable sales people

(e) Service support

(f) Product Reliability

All complete feedback forms received by us get a free desk top accessory with compliments from EVEREST

4. Please Indicate what Everest products do you use.

_____

5. (a) Did you find it easy to place your order with us — Yes ☐ No ☐

(b) Did you receive your order on time? — Yes ☐ No ☐

(c) Is the shipment complete and free from damage? — Yes ☐ No ☐

(d) Are you satisfied with the workmanship? — Yes ☐ No ☐

(e) Is the documentation complete — Yes ☐ No ☐

(f) Is it performing to your expectations? — Yes ☐ No ☐

6. With respect to the above items, would you please indicate by its corresponding question number, in which areas can Everest most improve?

5 (a) ☐ 5 (b) ☐ 5 (c) ☐ 5 (d) ☐ 5 (e) ☐ 5 (f) ☐ 5 (g) ☐

7. In order for us to maintain accurate records and minimize duplication of this questionnaire, we would appreciate if you will complete the following:

QUESTIONNAIRE, WE WOULD APPRECIATE IF YOU WILL COMPLETE THE FOLLOWING:

Name : _____

Company : _____

Designation : _____

Address : _____

City : _____

State : _____

Country : _____

Postal Code : _____

Phone : _____

Fax : _____

Email : _____

Website : _____

8. Comments : _____

_____

_____

_____

Thank you for your time and input.

For internal use only:

Received By :	Received on (Date):
Opportunity For Improvement / Complaint	
Signature (Service Head):	Signature (Unit Head):
Signature (COO):	Signature (Director):

Thank you for purchasing your equipments from Everest. In our pursuit of complete customer satisfaction we would appreciate your comments on the usefulness and readability of this manual. Please fax or mail this sheet to Everest Blower Systems Pvt. Ltd., Plot No. 6, Sec 16, HSIIDC, Bahadurgarh - 124507, Haryana, India. Mail: service@everestblowers.com. If we can be of any assistance to you, feel free to contact us at 91-11-45457777 , +91 9992333011, 8199936400, Monday to Saturday, 9:00AM to 5:30 PM Indian standard time. Our weekly off day is Sunday.
Thanking you once again,

Manager
Technical Publications.

Everest Dry Screw Vacuum Pump Model No. _____ Order No. _____

Revision Date of Manual _____

Please rate the following items :

Compared to similar manuals, this manual is	Good ☐	Fair ☐	Poor ☐
Ease of reading is	Good ☐	Fair ☐	Poor ☐
Level of information is	Good ☐	Fair ☐	Poor ☐
Photographs and / or illustrations are	Good ☐	Fair ☐	Poor ☐
The amount of information was.....	Good ☐	Fair ☐	Poor ☐

Comments:

Please Fax to +91 11 28114944, 28114955, 28117469
Your cooperation is greatly appreciated.

Thank You for your time and inputs.

NOTES

INSTALLATION
OPERATION
MAINTENANCE

EVEREST
PRESSURE & VACUUM SYSTEMS

Corporate Off:
B-44, Mayapuri Industrial Area, Phase 1, New Delhi 110064, India
Tf: +91-11- 45457777, E: enquiry@everestblowers.com | W: www.everestblowers.com

Group Companies:
Everest Blowers Private Limited | Everest Blower Systems Private Limited