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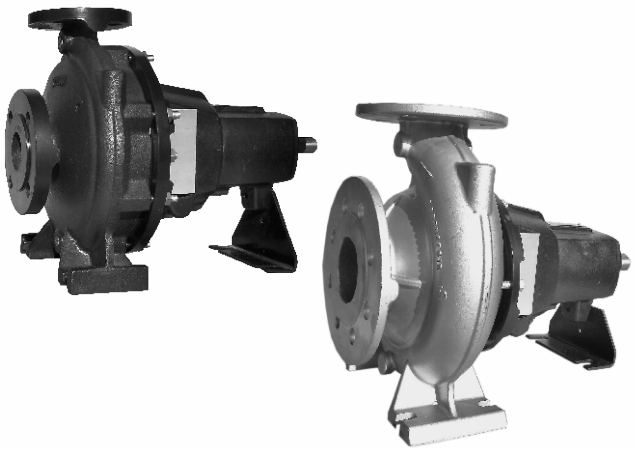
SHAKTI
PUMPING LIFE

INSTALLATION & OPERATING INSTRUCTIONS



SNK
END SUCTION PUMPS

SHAKTI
PUMPING LIFE

SHAKTI
PUMPING LIFE

CONTENTS PAGE NO.

⚠ Warning
Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. SYMBOLS USED IN THIS DOCUMENT

⚠ Warning
If these safety instructions are not observed, it may result in personal injury.
Caution If these safety instructions are not observed, it may result in malfunction or damage to the equipment.

Note
Notes or instructions that make the job easier and ensure safe operation.

2. GENERAL INFORMATION

SNK are non-self-priming, single stage, centrifugal volute pumps with axial suction port and radial discharge port.
SNK pumps comply with EN 733.

3. RECEIVING THE PRODUCT

3.1 Delivery
The pumps are tested 100 % before leaving the factory. The test includes a function test where the pump performance is measured to ensure that the pump meets the requirements of relevant standards. Test certificates are available from Shakti. After the installation, the alignment of pump and motor must be checked again. See section 6.3 Alignment.

3.2 Transporting the product
Always transport the pump in the specified position. During transport, the pump must be fastened securely to prevent damage to the shaft and shaft seal caused by excessive vibrations and knocks. The pump must not be lifted by the shaft.

⚠ Warning
Pay attention to the pump weight, and take precautions to prevent personal injury if the pump should topple or fall by accident.

3.3 Handling

⚠ Warning
Motors from 4 kW and up are supplied with lifting eyes which must not be used for lifting the entire pump unit.

Lift the pumps by means of nylon straps and shackles.

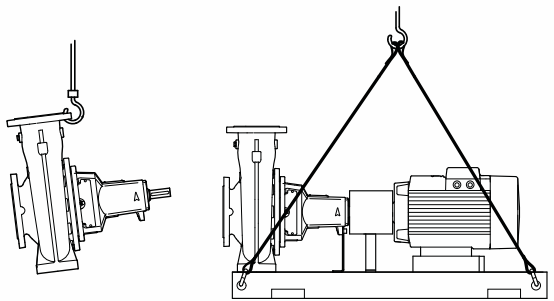


Fig. 1 Correct lifting of pump

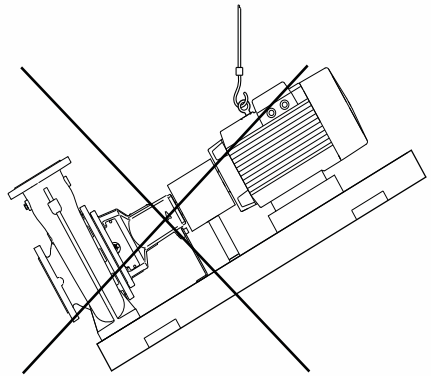


Fig. 2 Incorrect lifting of pump

4. APPLICATIONS

4.1 Pumped liquids
Clean, thin, non-explosive liquids without solid particles or fibres. The pumped liquid must not attack the pump materials chemically.

5. OPERATION CONDITION

5.1 Liquid temperature

-25 - +140 °C

The maximum liquid temperature is stated on the pump nameplate. It depends on the shaft seal chosen.
For EN-GJL-260 cast iron pump housings, local regulations may not allow liquid temperatures above +120 °C.

5.2 Maximum operating pressure

The inlet pressure + the pump pressure must be lower than the maximum operating pressure

Operation against a closed discharge valve gives the highest operating pressure.

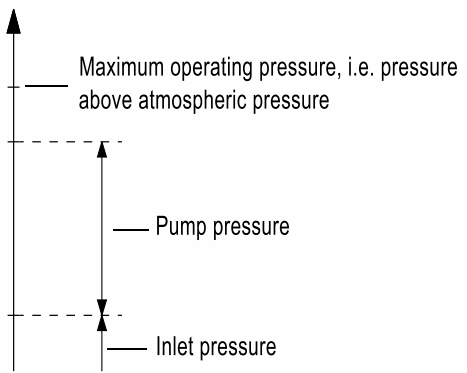


Fig. 3 Pressures in the pump

5.3 Minimum inlet pressure

Pay attention to the minimum inlet pressure to avoid cavitation.

The risk of cavitation is higher in the following situations:

- The liquid temperature is high.
- The flow rate is considerably higher than the pump's rated flow rate.
- The pump is operating in an open system with suction lift.
- The liquid is sucked through long pipes.
- The inlet conditions are poor.
- The operating pressure is low.

5.4 Maximum inlet pressure

The inlet pressure + the pump pressure must be lower than the maximum operating pressure. Operation against a closed discharge valve gives the highest operating pressure.

5.5 Minimum flow rate

The pump must not run against a closed discharge valve as this will cause an increase in temperature/formation of steam in the pump. This may cause shaft damage, impeller erosion, short life of bearings and damage to mechanical shaft or vibration. The continuous flow rate must be rated flow rate.

5.6 Maximum flow rate

The maximum flow rate must not be exceeded as otherwise there is a risk of for instance cavitation and overload.

6. MECHANICAL INSTALLATION

6.1 Pump location

The pump must be sited in a well-ventilated, but frost-free location.

⚠ Warning

When pumping hot or cold liquids, make sure that persons cannot accidentally come into contact with hot or cold surfaces.

For inspection and repair, allow suitable clearances for pump or motor removal.

- Pumps fitted with motors up to and including 4 kW require a 0.3 m clearance behind the motor.
- Pumps fitted with motors of 5.5 kW and up require a 0.3 m clearance behind the motor and at least a 1 m clearance above the motor to allow the use of lifting equipment.

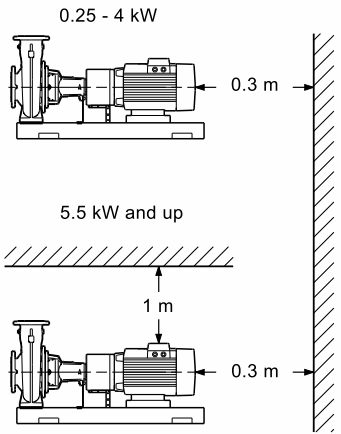


Fig. 4 Clearance behind the motor

6.2 Foundation and grouting of horizontally mounted SNK pumps with base frame

We recommend that you install the pump on a plane and rigid concrete foundation which is heavy enough to provide permanent support for the entire pump. The foundation must be capable of absorbing any vibration, normal strain or shock. As a rule of thumb, the weight of the concrete foundation must be 1.5 times the weight of the pump.

The foundation must be 100 mm larger than the base frame on all four sides. See fig. 5.

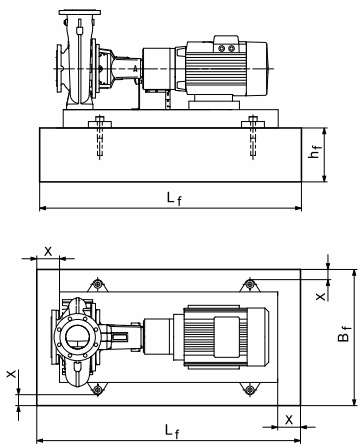


Fig. 5 Foundation, X equal to minimum 100 mm

The minimum height of the foundation, hf, can then be calculated:

$$h_f = \frac{m_{pump} \times 1.5}{L_f \times B_f \times \rho_{concrete}}$$

The density, ρ, of concrete is usually taken as 2,200 kg/m^3. Place the pump on the foundation, and fasten it. The base frame must be supported under its entire area. See fig. 6.

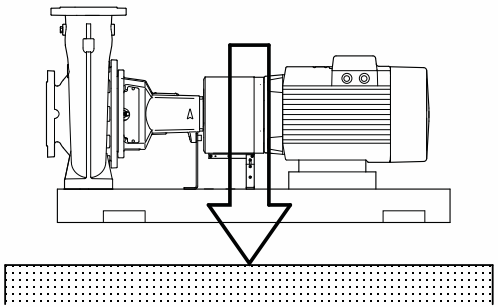


Fig. 6 Correct foundation

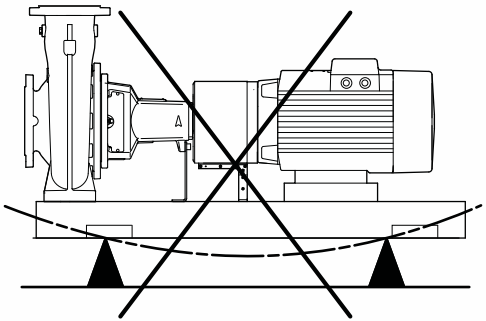


Fig. 7 Incorrect foundation

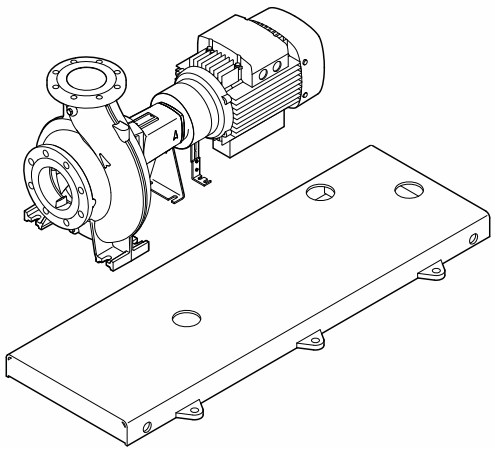


Fig. 8 Base frame with pouring holes

It is important to prepare a good foundation prior to the installation of the pump. SNK pumps with base frame are always prepared for grouting.

For SNK pumps with 2-pole motors equal to or bigger than 55 kW, grouting of the base frame is mandatory in order to prevent vibration energy from the rotating motor and liquid flow to evolve.

	P_2 lower than or equal to 45 kW	P_2 equal to or higher than 55 kW
2-pole	Grouting optional	Grouting mandatory
4-pole	Grouting optional	

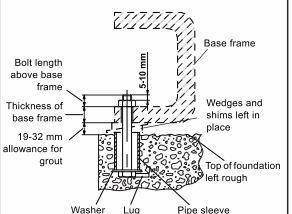
6.2.1 Procedure

1. Preparing the foundation
2. Levelling of the base frame
3. Preliminary alignment
4. Grouting
5. Final alignment according to section 6.3 Alignment.

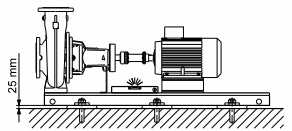
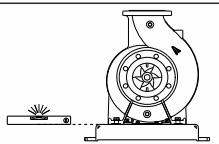
1: Preparing the Foundation

We recommend the following procedure to ensure a good foundation.

SHAKTI PUMPING LIFE

Step	Action	Illustration
1	Use an approved, non-shrinking concrete. Contact your concrete supplier for advice if any doubts. Pour the foundation without interruptions to within 19 to 32 mm of the final level. Use vibrators to ensure that the concrete is evenly distributed. The top surface must be well scored and grooved before the concrete sets. This provides a bonding surface for the grout.	
2	Embed foundation bolts in the concrete. Allow enough bolt length to reach through grout, shims, lower base frame, nuts & washers.	
3	Let the foundation cure for several days before the base rame is levelled and grouted.	

2: Levelling of the base frame

Step	Action	Illustration
1	Lift/jack up the base frame to the final level 19-32 mm above the concrete foundation, and support the base frame by means of blocks and shims both at the foundation bolts and midway between bolts.	
2	Level the base frame by adding or removing shims under the base frame.	
3	Tighten the foundation bolt nuts against the base frame. Make sure the piping can be aligned to the pump flanges without putting strain on pipes or flanges.	

3: Preliminary alignment

⚠ Warning

Before starting work on the pump, make sure that the power supply has been switched off and cannot be accidentally switched on again.

The pump and motor are pre-aligned on the base frame from the factory. Some deformation of the base frame may occur during transport and it is therefore essential to check the alignment at the installation site prior to final grouting.

A flexible coupling will only compensate for minor misalignments and must not be used to compensate for excessive misalignment of the pump and motor shafts. Inaccurate alignment results in vibration and excessive wear on the bearings, shaft or wear rings.

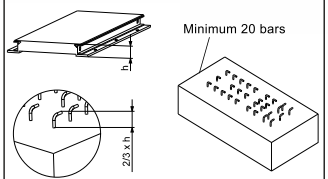
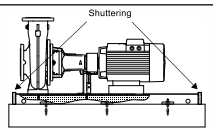
⚠ Warning

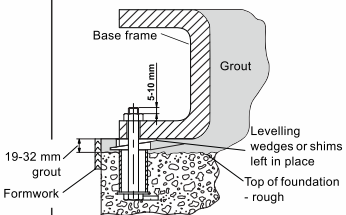
Carry out alignment of the motor only, as pipe strain will occur if the pump is shifted.

Carry out alignment of the motor by placing shims of different thickness under the motor. If possible, replace several thin shims with one thick shim. See section 6.3 Alignment.

4: GROUTING

Grouting compensates for an uneven foundation, distributes the weight of the unit, dampens vibrations and prevents shifting. Use an approved, non-shrinking grout. If you have questions or doubts about the grouting, please contact an expert on grouting.

Step	Action	Illustration
1	Embed reinforcing steel bars into the foundation by means of 2K anchor adhesive glue. The number of steel bars depends on the size of the base frame, but it is advisable to distribute a minimum of 20 bars evenly over the whole area of the base frame. The free end of the steel bar must be 2/3 the height of the base frame to ensure a proper grouting.	
2	Soak top of concrete foundation thoroughly, then remove surface water.	
3	Ensure proper shuttering at both ends of the base frame.	

4	If necessary, check the levelling of the base frame again before grouting. Pour non-shrinking grout through the openings of the base frame until the space underneath the base frame has been filled completely. Fill the formwork with grout up to the base frame top level. Allow the grout to dry thoroughly before attaching piping to the pump. 24 hours is sufficient time with approved grouting procedure. When the grout has thoroughly hardened, check the foundation bolt nuts, and tighten, if necessary. Approximately two weeks after the grout has been poured, or when the grout has thoroughly dried, apply an oil-based paint to the exposed edges of the grout to prevent the grout from getting into contact with air and moisture.	

6.3 Alignment

6.3.1 General information

When a complete unit is supplied assembled from the factory, the coupling halves have been accurately aligned by means of foil inserted under the pump and motor mounting surfaces as required.

As the pump/motor alignment may be affected during transport and installation, it must always be checked again before starting the pump.

It is important to check the final alignment when the pump has obtained its operating temperature under normal operating conditions.

Basic tips to known for aligning the pump and motor :

It is very important that the pump/motor alignment is carried out correctly. Follow the procedure below :

1. Make a rough alignment of pump and motor, and tighten the screws in the base frame to the correct torque. See the table tightening torques.
2. Adjust the position of the motor. Loosen the screws that hold the motor in place.
3. Insert shims with the required thickness.
4. Tighten the screws to the correct torque. And check the alignment once more.
5. Alignment of unit to check by laser method also.

Tightening Torque

Description	Dimensions	Tightening torque [Nm]
Hexagon head screw	M6	10 ± 2
	M8	12± 2.4
	M10	23 ± 4.6
	M12	40 ± 8
	M16	80 ± 16
	M20	120 ± 24
	M24	120 ± 24

6.4 Pipework

6.4.1 Piping

When installing the pipes, make sure that the pump housing is not stressed by the pipework. The suction and discharge pipes must be of an adequate size, taking the pump inlet pressure into account. Install the pipes so that air locks are avoided, especially on the suction side of the pump.

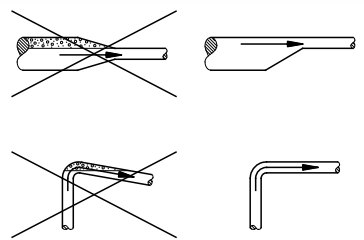


Fig. 9 Pipeline mounting

Fit isolating valves on either side of the pump to avoid having to drain the system if the pump needs to be cleaned or repaired.
Make sure the pipes are adequately supported as close to the pump as possible, both on the suction and the discharge side. The counter-flanges must lie true against the pump flanges without being stressed as stress would cause damage to the pump.

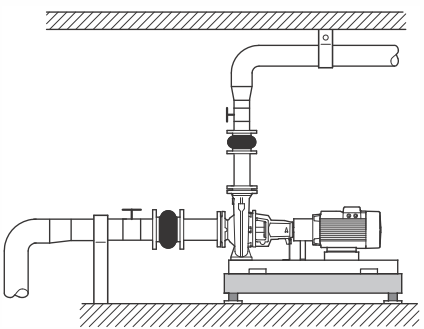


Fig. 10 Pipelines

6.4.2 Bypass

⚠ Warning
The pump is not allowed to run against a closed valve as this will cause an increase in temperature/ formation of steam in the pump which may cause damage to the pump.

If there is any danger of the pump running against a closed discharge valve, ensure a minimum liquid flow through the pump by connecting a bypass or drain to the discharge pipe. The minimum flow rate must be at least 10 % of the maximum flow rate. The flow rate and head are stated on the pump nameplate.

6.5 Vibration damping

6.5.1 Elimination of noise and vibrations

In order to achieve optimum operation and minimum noise and vibration, consider vibration damping of the pump. Generally, always consider this for pumps with motors of 11 kW and up. Vibration damping is mandatory for motors of 90 kW and up. Smaller motor sizes, however, may also cause undesirable noise and vibration.
Noise and vibration are generated by the revolutions of the motor and pump and by the flow in pipes and fittings. The effect on the environment is subjective and depends on correct installation and the state of the rest of the system.
Elimination of noise and vibrations is best achieved by means of a concrete foundation, vibration dampers and expansion joints. See fig. 10.

6.5.2 Vibration dampers

To prevent the transmission of vibrations to buildings, we recommend isolating the pump foundation from building parts by means of vibration dampers.
The selection of the right vibration damper requires the following data:

- forces transmitted through the damper
- motor speed, taking speed control, if any, into consideration
- required damping in % - suggested value is 70 %.
  The selection of vibration damper differs from installation to installation. In certain cases, a wrong damper may increase the vibration level. Vibration dampers must therefore be sized by the supplier of the vibration dampers. If you install the pump on a foundation with vibration dampers, always fit expansion joints on the pump flanges. This is important to prevent the pump from "hanging" in the flanges.

6.6 Expansion joints

Expansion joints provide these advantages:

- absorption of thermal expansion and contraction of pipework caused by variations in liquid temperature
- reduction of mechanical influences in connection with pressure surges in the pipework
- isolation of structure-borne noise in the pipework; this applies only to rubber bellows expansion joints.

Note : Do not install expansion joints to make up for inaccuracies in the pipework, such as centre displacement or misalignment of flanges.

The expansion joints must be fitted at a minimum distance of 1 to 1 1/2 pipe diameters away from the pump on the suction and the discharge side. This prevents turbulence in the joints, thus ensuring optimum suction conditions and minimum pressure loss on the discharge side. At flow velocities greater than 5 m/s, we recommend fitting larger expansion joints matching the pipework.
Figures 11 and 12 show examples of rubber bellows expansion joints with or without limiting rods.

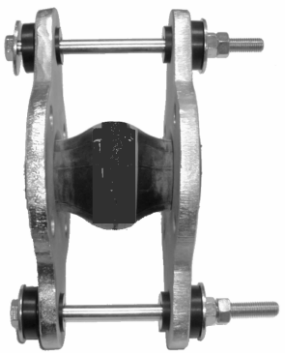


Fig. 11 Rubber bellows expansion joint with limiting rods

Fig. 12 Rubber bellows expansion joint without limiting rods

Expansion joints with limiting rods can be used to reduce the effects of the expansion/contraction forces on the pipework. We always recommend expansion joints with limiting rods for flanges larger than DN 100.
Anchor the pipes in such a way that they do not stress the expansion joints and the pump. Follow the supplier's instructions and pass them on to advisers or pipe installers.

Figure 13 shows an example of a metal bellows expansion joint with limiting rods.

Due to the risk of rupture of the rubber bellows, metal bellows expansion joints may be preferred at temperatures above +100 °C combined with high pressure.

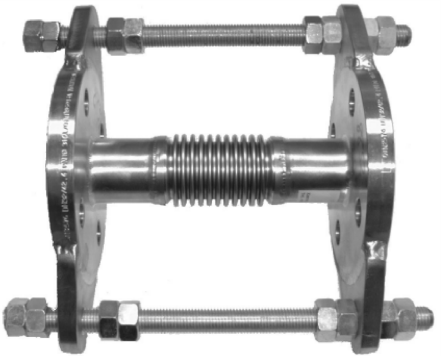


Fig. 13 Metal bellows expansion joint with limiting rods

7. ELECTRICAL CONNECTION

The electrical connection must be carried out by a qualified electrician in accordance with local regulations.

⚠ Warning

Before removing the terminal box cover and before removing/dismantling the pump, make sure that the power supply has been switched off and that it cannot be accidentally switched on again. The pump must be connected to an external mains switch.

The operating voltage and frequency are stated on the nameplate. Make sure that the motor is suitable for the power supply of the installation site.
The electrical connection must be carried out as shown in the wiring diagram inside the terminal box cover.

⚠ Warning
Whenever powered equipment is used in explosive surroundings, the rules and regulations generally or specifically imposed by the relevant responsible authorities or trade organisations must be observed.

7.1 Motor protection

Three-phase motors must be connected to a motor-protective circuit breaker. All three-phase Shakti SMG motors of 3 kW and up incorporate a thermistor. See the instructions in the motor terminal box. Carry out the electrical connection as shown in the wiring diagram on the back side of the terminal box cover.

⚠ Warning
Before starting any repair work on motors incorporating a thermal switch or thermistors, make sure that the motor cannot restart automatically after cooling.

7.2 Frequency converter operation

All three-phase motors can be connected to a frequency converter. Frequency converter operation will often expose the motor insulation system to a heavier load and cause the motor to be more noisy than usual due to eddy currents caused by voltage peaks. A large motor driven via a frequency converter will be loaded by bearing currents.

Check these operating conditions if the pump is driven via a frequency converter:

Check these operating conditions if the pump is driven via a frequency converter:

Operating conditions	Action
2-, 4- and 6-pole motors, frame size 225 and larger	Check that one of the motor bearings is electrically isolated. Contact Shakti.
Noise critical applications	Fit an output filter between the motor and the frequency converter; this reduces the voltage peaks and thus the noise.
Particularly noise critical applications	Fit a sinusoidal filter.
Cable length	Fit a cable that meets the specifications laid down by the frequency converter supplier. The length of the cable between motor and frequency converter affects the motor load.
Supply voltage up to 500 V	Check that the motor is suitable for frequency converter operation.
Supply voltage between 500 V and 690 V	Fit a sinusoidal filter between the motor and the frequency converter which reduces the voltage peaks and thus the noise, or check that the motor has reinforced insulation.
Supply voltage of 690 V and higher	Fit a sinusoidal filter and check that the motor has reinforced insulation.

8. COMMISSIONING AND STARTUP

Do not start the pump until it has been filled with liquid and vented.

9.1 General information

⚠ Warning

When pumping drinking water, the pump must be flushed through with clean water before startup in order to remove any foreign matters such as preservatives, test liquid or grease.

9.2 Commissioning

8.2.1 Flushing the pipe system

Caution

The pump is not designed to pump liquids containing solid particles such as pipe debris and welding slag.
Before starting up the pump, the pipe system must be thoroughly cleaned, flushed and filled with clean water.
The warranty does not cover any damage caused by flushing the pipe system by means of the pump.

8.3 Priming

Closed systems or open systems where the liquid level is above the pump inlet

1. Close the discharge isolating valve and slowly open the isolating valve in the suction pipe. Both the pump and the suction pipe must be completely filled with liquid.
2. Loosen the priming plug in order to vent the pump. Once liquid runs out, tighten the priming plug.

⚠ Warning

Pay attention to the orientation of the priming hole to ensure that the escaping water does not cause personal injury or damage to the motor or other components.
In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid. In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.

Suction operation with non-return valve

The suction pipe and the pump must be filled with liquid and vented before the pump is started.

1. Close the discharge isolating valve and slowly open the isolating valve in the suction pipe.
2. Remove the priming plug, M.
3. Pour liquid through the hole until the suction pipe and the pump are completely filled with liquid.
4. Fit the priming plug, M.

The suction pipe may be filled and vented via the priming plug. See fig. 15. Alternatively a priming device with funnel can be installed before the pump.

Open systems where the liquid level is below the pump inlet

1. If an isolating valve is fitted on the suction side of the pump, the valve must be fully open.
2. Close the discharge isolating valve and tighten the priming and drain plugs.

3. Connect a manual venting pump instead of a priming device with funnel.
4. Install a slide valve between the venting pump and the centrifugal pump in order to protect the venting pump against excessive pressure.
5. Once the slide valve at the manual venting pump has been opened, vent the suction pipe using short, rapid pump strokes until the liquid runs out on the discharge side.
6. Close the valve at the venting pump.

E Drain plug
M Priming plug

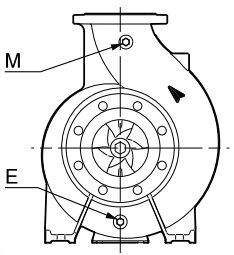


Fig. 15 Drain and priming plug

8.4 Checking the direction of rotation

Warning
The pump must be filled with liquid when checking the direction of rotation.

The correct direction of rotation is shown by arrows on the pump housing. Seen from the pump end, the direction of rotation must be counter-clockwise. See fig. 15.

8.5 Startup

Before starting the pump, completely open the isolating valve on the suction side of the pump and leave the isolating valve on the discharge side almost closed.

Start the pump.
Vent the pump during startup by loosening the air vent screw in the pump head/cover until a steady stream of liquid runs out of the vent hole.

Warning
Pay attention to the orientation of the vent hole to ensure that the escaping water does not cause personal injury or damage to the motor or other components.

In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid.
In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.

When the pipework has been filled with liquid, slowly open the isolating valve on the discharge side until it is completely open.

caution

If the pump is fitted with a motor with an output selected on the basis of a specific maximum flow rate, the motor may be overloaded if the differential pressure is lower than anticipated.

Check for overload by measuring the motor current consumption and comparing the value with the rated current stated on the motor nameplate. In case of overload, throttle the valve on the discharge side until the motor is no longer overloaded. Always measure the motor current consumption during startup.

Note:

At the moment of start, the input current of the pump motor is up to six times higher than the full-load current stated on the motor nameplate.

8.6 Shaft seal run-in period

The seal faces are lubricated by the pumped liquid, meaning that there may be a certain amount of leakage from the shaft seal. When the pump is started for the first time, or when a new shaft seal is installed, a certain run-in period is required before the leakage is reduced to an acceptable level. The time required for this depends on the operating conditions, i.e. every time the operating conditions change, a new run-in period will be started.

Under normal conditions, the leaking liquid will evaporate. As a result, no leakage will be detected.
Liquids such as kerosene will not evaporate, and drops will be visible, but this is not a shaft seal failure.

Mechanical shaft seals
Mechanical shaft seals are precision components. If the mechanical shaft seal of a recently installed pump fails, this will normally happen within the first few hours of operation. The main cause of such failures is improper installation of the shaft seal or the pipe for barrier liquid and/or mishandling of the pump during installation.

8.7 Motor start/stop

Max. number of motor starts per hour			
Frame Size	Number of poles		
	2	4	6
56-71	100	250	350
80-100	60	140	160
112-132	30	60	80
160-180	15	30	50
200-225	8	15	30
250-315	4	8	12

8.8 Reference readings of monitoring equipment We recommend taking initial readings of these parameters:

- vibration level - use SPM measuring points
- bearing temperature - if sensors have been fitted
- inlet and outlet pressure - use pressure gauges.

The readings can be used as reference in case of abnormal operation.

9. MAINTENANCE

Warning
Before starting work on the product, switch off the power supply. Make sure that the power supply cannot be accidentally switched on.

9.1 Pump

The pump is maintenance-free.

9.1.1 Mechanical shaft seals

Mechanical shaft seals are maintenance-free, working almost without any leakages. If any considerable and increasing seepage occurs, the mechanical shaft seal must be checked immediately. If the sliding surfaces are damaged, the entire shaft seal must be replaced. Mechanical shaft seals must be treated with the greatest care.

9.2 Monitoring equipment

It is advisable to take weekly readings of these parameters:

- vibration level - use SPM measuring points
- bearing temperature - if sensors have been fitted
- inlet and outlet pressure - use pressure gauges.

Alternatively, follow the maintenance plan laid out for your application.

9.3 Motor

Check the motor at regular intervals. It is important to keep the motor clean in order to ensure adequate ventilation. If the pump is installed in a dusty environment, it must be cleaned and checked regularly.

9.3.1 Lubrication

Motors up to and including frame size 180 have maintenance free, greased-for-life bearings.
Motors of frame sizes larger than 180 must be greased.
Grease specifications: See section 10. .3.2 Bearing grease.

9.3.2 Bearing grease

Lithium-based grease according to the following specifications must be used:

- NLGI class 2 or 3
- viscosity of basic oil: 70-150 cSt at +40 °C
- temperature range: -30 - +140 °C during continuous operation.

10. PERIODS OF INACTIVITY AND FROST PROTECTION

Pumps which are not being used during periods of frost must be drained to avoid damage.
Drain the pump by removing the drain plug. See fig. 15.
Do not tighten the priming plug or replace the drain plug until the pump is to be used again.

⚠ Warning
Care must be taken to ensure that the escaping liquid does not cause personal injury or damage to the motor or other components. In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid.
In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.

If the pump is to be drained prior to a long period of inactivity, inject a few drops of silicone oil on the shaft at the bearing bracket. This will prevent the shaft seal faces from seizing up.

11. SERVICE

⚠ Warning
If a pump has been used for a liquid which is injurious to health or toxic, the pump will be classified as contaminated.

If Shakti is requested to service such a pump, Shakti must be contacted with details about the pumped liquid, etc. before the pump is returned for service. Otherwise Shakti can refuse to accept the pump for service.
Possible costs of returning the pump are paid by the customer.

12. TECHNICAL DATA

12.1 Belt drive

If the unit is belt-driven, the following data must not be exceeded:

Max. motor power [kW] for shaft end			
Speed n [min-1]	Ø24	Ø32	Ø42
1500	5	10	25
3000	10	20	-

For higher power outputs, mount an intermediate shaft with pedestal bearings.

12.2 Operation with combustion engine

⚠ Warning

When operating with petrol or diesel engines, the engine manufacturer's installation and operating instructions must be strictly observed. Particularly the direction of rotation is very important. Viewed from the drive shaft end, the pump rotates to the right, clockwise. Viewed from the drive shaft end, the motor must therefore rotate to the left, counterclockwise. The correct direction of rotation is indicated by the arrow on the pump housing.

If the engine is installed in a closed area, the combustion air data as well as data for exhaust gases must be particularly noted.

When draining the tank, make sure to have containers of adequate size ready for this purpose.

12.3 Sound pressure levels

The values stated are maximum sound pressure levels.
Tolerances are according to ISO 4871.
50 Hz
2-pole: n = 2900 min-1
4-pole: n = 1450 min-1

Maximum sound pressure level [dB(A)] - ISO 3743		
	Three-phase	
motors	2-pole	4-pole
0.25	56	41
0.37	56	45
0.55	57	42
0.75	56	42
1.1	59	50
1.5	58	50
2.2	60	52
3	59	52
4	63	54
5.5	63	57
7.5	60	58
11	60	60
15	60	60
18.5	60	63
22	66	63
30	71	65
37	71	-
45	71	-
55	71	-
75	73	-
90	73	-
110	76	-

13. FAULT FINDING

Warning : Before removing the terminal box cover and before removing/dismantling the pump, make sure that the power supply has been switched off and that it cannot be accidentally switched on again.

Fault	Cause	Remedy
1. Pump delivers no or too little liquid.	a) Wrong electrical connection, for instance two phases.	Check the electrical connection and remedy, if necessary.
	b) Wrong direction of rotation.	Interchange two phases of the power supply.
	c) Air in suction pipe.	Vent and fill the suction pipe and pump.
	d) Counter-pressure too high.	Set the duty point in accordance with the data sheet. Check the system for impurities.
	e) Inlet pressure too low.	Increase the liquid level on the suction side. Open the isolating valve in the suction pipe. Make sure that all the conditions in section *7.4 Pipework* are complied with.
	f) Suction pipe or impeller blocked by impurities.	Clean the suction pipe or pump.
	g) Pump draws in air due to defective seal.	Check the pipeline seals, pump housing gaskets and shaft seals, and replace, if necessary.
	h) Pump draws in air due to low liquid level.	Increase the liquid level on the suction side and keep it as constant as possible.
2. Motor-protective circuit breaker has tripped because the motor is overloaded.	a) Pump blocked by impurities.	Clean the pump.
	b) Pump running above rated duty point.	Set the duty point in accordance with the data sheet.
	c) Density or viscosity of liquid higher than specified when ordering.	If less flow is sufficient, reduce the flow on the discharge side. Or fit a more powerful motor.
	d) Motor-protective circuit breaker overload setting incorrect.	Check the setting of the motor-protective circuit breaker and replace, if necessary.
	e) Motor runs on two phases.	Check the electrical connection. Replace the fuse, if defective.
3. Pump makes too much noise. Pump runs unevenly and vibrates.	a) Inlet pressure too low, i.e. pump cavitates.	Increase the liquid level on the suction side. Open the isolating valve in the suction pipe. Make sure that all the conditions in section *7.4 Pipework* are complied with.
	b) Air in suction pipe or pump.	Vent and fill the suction pipe or pump.
	c) Counter-pressure lower than specified.	Set the duty point in accordance with the data sheet.
	d) Pump draws in air due to low liquid level.	Increase the liquid level on the suction side and keep it as constant as possible.
	e) Impeller out of balance or clogged impeller blades.	Clean and check the impeller.
	f) Inner parts worn.	Replace the defective parts.
	g) Pump stressed by pipework thus causing starting noise.	Mount the pump so that it is not stressed. Support the pipes.
	h) Defective bearings.	Replace the bearings.
	i) Defective motor fan.	Replace the fan.
	j) Defective coupling.	Replace the coupling. Align the coupling. See section *7.3.2 How to align the unit*.
	k) Foreign bodies in pump.	Clean the pump.
	l) Frequency converter operation	See section *9.2 Frequency converter operation*.
4. Leaking pump, connections, shaft seal	a) Pump stressed by pipework thus causing leaks in pump housing or connections.	Mount the pump so that it is not stressed. Support the pipes.
	b) Pump housing gaskets and gaskets at connections defective.	Replace pump housing gaskets or gaskets at connections.
	c) Mechanical shaft seal dirty or stuck together.	Check and clean the mechanical shaft seal.
	d) Mechanical shaft seal defective.	Replace the mechanical shaft seal.
	f) Shaft surface or shaft sleeve defective.	Replace the shaft or the shaft sleeve.

SHAKTI PUMPING LIFE

Fault	Cause	Remedy
5. Too high temperature in pump or motor.	a) Air in suction pipe or pump.	Vent the suction pipe or the pump and replenish.
	b) Inlet pressure too low.	Increase the liquid level on the suction side. Open the isolating valve in the suction pipe. Make sure that all the conditions in section *7.4 Pipework* are complied with.
	c) Bearings lubricated with too little, too much or unsuitable lubricant.	Replenish, reduce or replace the lubricant.
	d) Pump with bearing seat stressed by pipework.	Mount the pump so that it is not stressed. Support the pipes. Check the alignment of the coupling. See section *7.3.2 How to align the unit*.
	e) Axial pressure too high.	Check the relief holes of the impeller and the lock rings on the suction side.
	f) Motor-protective circuit breaker defective or setting incorrect.	Check the setting of the motor-protective circuit breaker and replace, if necessary.
	g) Motor overloaded.	Reduce the flow rate.

14. DISPOSAL

Disposal of this product or parts of it must be carried out according to the following guidelines:

1. Use the local public or private waste collection service.

2. In case such waste collection service does not exist or cannot handle the materials used in the product, please deliver the product or any hazardous materials from it to your nearest Shakti service workshop.

WARRANTY CERTIFICATE

Dear Customer,
Congratulation, for purchasing our product.

Pump and Motor are warranted against defects in workmanship and material under normal use, service & specified duty conditions. We provide one time warranty service for twelve months from the date of purchase by the first user.
Shakti Pumps (India) Limited warrants this product to be free from damage/ defects in material and workmanship under normal use and service for Twelve Months from the date of purchase by the first user. The user shall produce valid and original copy of invoice for availing warranty. The user shall carry defective pump set to nearest authorized service center

This warranty does not cover any loss or damage/ defect of any nature resulting from wrong product selection/ improper installation or installation by unauthorized/ untrained person/ sandy condition/ dry running and improper use of the pump sets.
The warranty also does not cover consequential losses/ damages arising due to failure of pump/ motor.
Our obligation is limited t to recycling or repairing or replacing product/ parts ex-factory. Equipment for repairs should be returned free of cost to us.
The forgoing is subject to the provision that the user does not open the unit and make any change or repair without prior approval of authorized service center during the warranty period.
This warranty excludes every condition whether statutory or otherwise, whatsoever not herein expressly set out.

Customer name: .....Customer's phone:.....

Customer Address: .....

Invoice number: .....Invoice date:.....

Model Name: .....Model Serial Number:.....

Dealer's Name: .....Dealer's phone:.....

Dealer's Address:.....

APPROVED BY:

DATE OF ISSUE

17-05-2016

SHAKTI PUMPING LIFE

INSTALLATION REPORT

Customer's Name: - _____

Customer's Address: - _____

Customer's Ph. No.: _____

Dealer's Name: - _____

Dealer's Address: _____

Dealer's Ph. No. _____

Pump Model:- _____ S.L.No: _____

Project/Application: _____

Pressure In Kg:- _____ Flow in m^3/hr: _____

Liquid:- _____ Temp.: _____

Voltage:- _____ Current: _____

Packing Condition:- _____

Remarks: _____

_____

_____

Date:- _____

_____

Customer's Signature

BOOK-POST

SHAKTI PUMPS (INDIA) LIMITED

Stamp

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