



INSTALLATION & OPERATING INSTRUCTIONS



SCM PUMPS

DEC/2018/RO Max./2018-19/L1/5000 VC: 700277 SAP No. : 29000001697



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EC DECLARATION OF CONFORMITY

IN ACCORDANCE WITH LV & EC MACHINERY DIRECTIVES UNDER SELF DECLARATION

Product Designation : Horizontal multi stage centrifugal Pump
Model Reference : SCM 5 (Max. - 3HP)
Intended End Use : To transfer thin & non flammable liquids not containing solid particles
or fibers

Conforming to the requirement of following European Directives:

- a) Low Voltage Directive : 2006/95/EC
- b) EC Machinery Directive : 2006/42/EC

Applicable Harmonized Standards:

EN ISO 12100-2010, EN 809: 1998+A1:2009, EN 60335-1, EN 60335-2-41

We hereby declare that Horizontal Pressure Booster Pump set is indented to be incorporated into or assembled with other machinery to constitute relevant machinery to comply with the essential Health and Safety requirement of the mentioned directives.

This machinery, its components and sub assemblies shall not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provision of the applicable directives.

The criteria for selection, safety requirement of other associated equipment and installation guideline are detailed in the instruction manual.

- Date of Manufacturer & First CE marking : 15.07.2016
- Place of Manufacturer : Shakti Pumps India Ltd. ,Pithampur

Issued at: SHAKTI PUMPS (India) LTD. , Pithampur

Marking: **CE**

The above pump set must not put into service /usage for other than specified in the instruction Manual Date: 15.07.2016

Sanjay Bhatnagar

(Deputy General Manager QA)



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1. GENERAL DESCRIPTION

1.1 Introduction

This manual describes the installation and operation of Shakti SCM pumps. 1.2 Delivery and handling The pumps are delivered from factory in a packaging specially designed for manual transport or transport by forklift truck or a similar vehicle.

1.2 Transportation

In order to ensure safe transport, we recommend that you transport the pumps with suitable lifting tools.

1.3 Applications

The pumps are horizontal, multistage centrifugal pumps designed for pumping of clean, thin and non-flammable liquids, not containing solid particles or fibres that may attack the pump mechanically or chemically.



Warning

The pump must not be used for the transfer of flammable or toxic liquids.

2. TECHNICAL DATA

2.1 Enclosure class

- IP55 (standard)
- IPx5 (with motor drain plug removed)

2.2 Ambient temperature

Self-priming pumps:

The liquid temperature must not exceed 60 °C (140 °F).

Maximum ambient temperature	Liquid temperature
55 °C (131 °F)	90 °C (194 °F)
50 °C (122 °F)	100 °C (212 °F)
45 °C (113 °F)	110 °C (230 °F)
40 °C (104 °F)	120 °C (248 °F)

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Only the stainless-steel variant (SS AISI 304) is suitable for pumping liquids with temperatures above 90 °C (194 °F).

If the ambient temperature exceeds 55 °C do not fully load the motor due to the risk of overheating. In such cases, you may need to derate the motor output or use an oversize motor with a higher rated output. You can derate the SCM pumps in relation to the ambient temperature without any consequence.

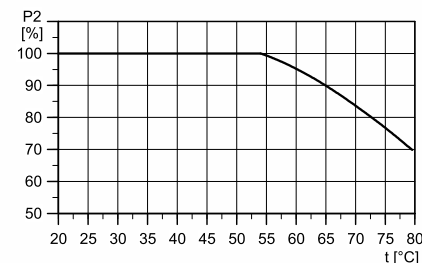


Fig. 1 Derating in relation to the ambient temperature

2.3 Minimum inlet pressure

You can calculate the minimum inlet pressure "H" in metres head required during operation to avoid cavitation in the pump from the following formula:

$$H = p_b \times 10.2 - NPSH - H_f - H_v - H_s$$

p_b = Barometric pressure in bar. The barometric pressure can be set to 1 bar. In closed systems, p_b indicates the system pressure in bar.

NPSH = Net Positive Suction Head in metres head. To be read from the NPSH curves on pages 17 to 18 at the highest flow the pump will be delivering.

H_f = Friction loss in suction pipe in metres head.

H_v = Vapour pressure in metres head.

t_m = liquid temperature.

H_s = Safety margin = min. 0.5 metres head.

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If the calculated value of "H" is positive, the pump can operate with a maximum suction lift of "H" metres.

If the calculated value of "H" is negative, a minimum suction head of "H" metres is required during operation to avoid cavitation.

Example

pb = 1 bar.

Pump type: SCM 3, 50 Hz.

Flow rate: 4 m³/h.

NPSH (from fig. 14, page 17): 3.3 metres head.

Hf = 3.0 metres head.

Liquid temperature: 90 °C.

Hv: 7.2 metres head.

$H = pb \times 10.2 - NPSH - H_f - H_v - H_s$ [metres head].

This means that a suction head of 3.8 metres is required during operation. Pressure calculated in bar: $3.8 \times 0.0981 = 0.37$ bar. Pressure calculated in kPa: $3.8 \times 9.81 = 37.3$ kPa.

2.4 Maximum inlet pressure

The actual inlet pressure plus the pressure when the pump is operating against a closed valve must always be lower than the maximum system pressure.

2.5 Maximum system pressure and permissible liquid temperature

Material variant	Shaft seal	Permissible liquid temperature*		Maximum system pressure	
Cast iron (CI-FG-260)	AVBx	-20 to 40 °C	(-4 to 104 °F)	10 bar	(145 psi)
	AQQx	41 to 90 °C	(105.8 to 194 °F)	6 bar	(87 psi)
Stainless steel (SS AISI 304)	AVBx	-20 to 40 °C	(-4 to 104 °F)	10 bar	(145 psi)
	AQQx	41 to 90 °C	(105.8 to 194 °F)	6 bar	(87 psi)
Stainless steel SS AISI 316)	AQQx	-20*** to 90 °C	(-4 to 194 °F)	16 bar	(232 psi)
		91 to 120 °C**	(195.8 to 248 °F)	10 bar	(145 psi)
	AVBx	-20 to 40 °C	(-4 to 104 °F)	10 bar	(145 psi)
		41 to 90 °C	(105.8 to 194 °F)	6 bar	(87 psi)
	AQQx	-20*** to 90 °C	(-4 to 194 °F)	16 bar	(232 psi)
		91 to 120 °C**	(195.8 to 248 °F)	10 bar	(145 psi)

* At liquid temperatures below 0 °C (32 °F), higher motor outputs may be needed due to increased viscosity, for instance if you have added glycol to the water. ** 120 °C applies only if the pump has an AQQE shaft seal.

*** SCM pumps for pumping liquids at temperatures below -20 °C are available on request. Please contact Shakti

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3. IDENTIFICATION

3.1 Nameplates for pump

The pump name plates are positioned on the terminal box.

3.1.1 Nameplate with pump data

The data and information on the pump nameplate are described in the table below.

Pos.	Description	Pos.	Description
1	Pump type	8	Hydraulic efficiency at best efficiency point
2	Pump model	9	Insulation class
3	Maximum ambient temperature	10	Motor protection
4	Temperature class	11	Rated flow
5	Minimum efficiency index	12	Head at rated flow
6	Maximum system pressure	13	Maximum head
7	Maximum liquid temperature		

4. INSTALLATION

Before installing the pump, check that the pump type and parts are as ordered.



Warning

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

4.1 Installation of pump

Install the pump on a plane surface using the mounting holes in the motor base plate and a minimum of four bolts. Tighten each of the four bolts to a torque of 10 Nm.

Install the pump so that air locks are avoided in the pump housing and pipework.

Figure 2 and the table below show the permissible pump positions.

Position 4 is realistic condition for the best performance for other position contact Shakti before installation.

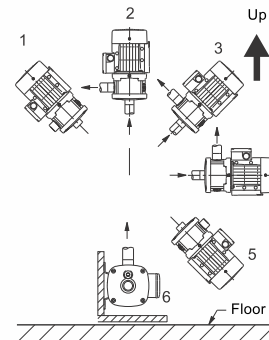


Fig. 2 Pump positions

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- Mounting in this position is allowed.

Install the pump so that inspection, maintenance and service can easily be performed. Install the pump in a well-ventilated location.

4.2 Pipework

We recommend that you fit isolating valves on either side of the pump. It is thus not necessary to drain the system if the pump needs service.

If the pump is installed above the liquid level, a non-return valve must be fitted in the suction pipe below the liquid level.

Note

Self-priming pumps:

We recommend an opening pressure of the non-return valve which is lower than 0.05 bar. Otherwise the additional resistance will reduce the suction capability of the pump.

If the pump is to be used for pumping rainwater or well water, we recommend that you fit a filter to the inlet of the suction pipe.

The pump must not be stressed by the pipework. The pipework must be correctly sized taking due account of the pump inlet pressure. Install the pipes so that air locks are avoided, especially on the suction side of the pump. See fig.

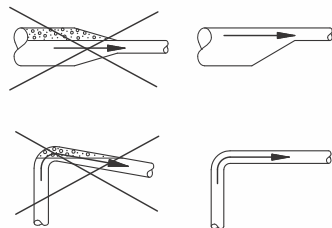


Fig. 3 Pipework

4.2.1 Pipe connection (non-self-priming pumps)

CAUTION

Take care not to damage the pump when connecting the suction and discharge pipes.

Torque: 50-60 Nm. The stated torque must not be exceeded.

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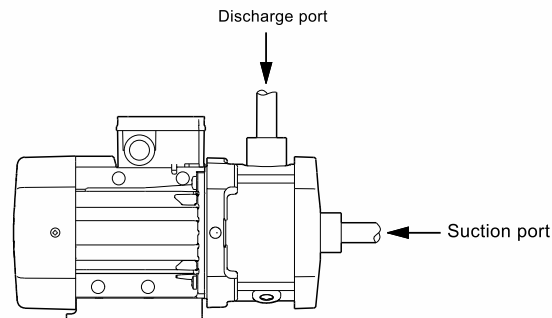


Fig. 4 Suction and discharge ports

4.2.2 Pipe connection (self-priming pumps)

The pump must be installed correctly to ensure that it can self-prime.

Take the following precautions:

See fig. 5.

- The minimum height from the centre of the suction port to the first tapping point (H1) must be observed. If a pressure manager is installed in the system, H1 is the height from the centre of the pump suction port to the pressure manager. Minimum heights appear from the table below.
- The suction pipe must be at least 0.5 metres below the liquid level (H3).

For optimum suction capability, the pump must be located near the well or tank to ensure that the suction pipe is as short as possible. This will reduce the self-priming time, especially in the case of a high suction lift.

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We recommend that you install a filling plug in the discharge pipe. This facilitates liquid filling before startup.

See fig. 5, pos. A.

Suction lift [m]	Minimum height [m]
(H2)	(H1)
4	0.2
5	0.35
6	0.5
7	0.6
8	0.7

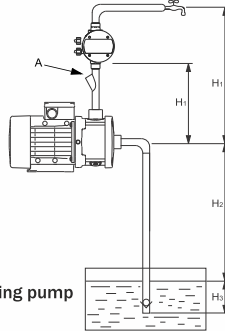


Fig. 5 Recommended pipework for a self-priming pump

4.2.3 Suction Pipe

The suction pipe should be adequately sized and run as straight as possible to keep friction losses to a minimum (minimum of four pipe diameter straight run prior to the suction flange.) Avoid using unnecessary fittings, valves or accessory items.

Butter fly or gate valves should only be used in the suction line when it is necessary to isolate a pump because of a flooded suction condition. This would occur if the water source is above the pump. Flush piping prior to pump installation to remove debris.

4.3 Alternative connection positions

The pump is available with various connection positions on special request. See fig. 6.

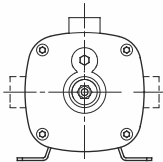


Fig. 6 Alternative connection positions

Self-priming pumps:

Note These pumps are only available with the discharge port pointing upwards, i.e. in the same direction as the filling hole.

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4.4 Terminal box positions

The pump is available with various terminal box positions on special request. See fig. 7.

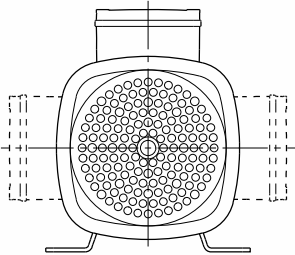


Fig. 7 Terminal box positions

4.5 Avoiding condensation in the motor

If the liquid temperature falls below the ambient temperature, condensation may form in the motor during standstill. Condensation can occur in moist surroundings or areas with high humidity.

Open the bottom drain hole in the motor flange by removing the plug. See fig. 8. This reduces the motor enclosure class to IPX5.

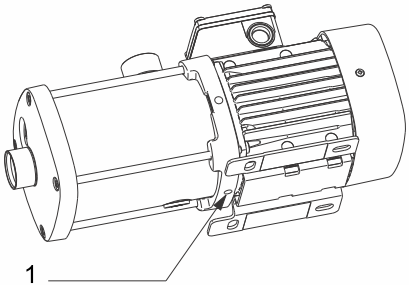


Fig. 8 Motor drain plug

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Pos.	Description
1	Motor drain plug

The open drain hole helps prevent condensation in the motor as it makes the motor self-venting and allows water and humid air to escape.

When you install the pump outdoors, provide the motor with a cover to avoid condensation. See fig. 9

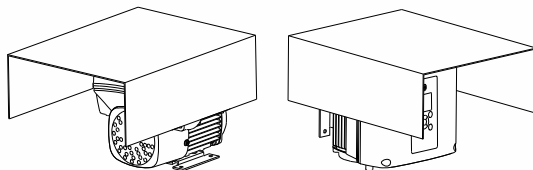


Fig. 9 Examples of covers (not supplied by Shakti)

5. ELECTRICAL INSTALLATION

Carry out the electrical connection according to local regulations.

Check that the supply voltage and frequency correspond to the values stated on the nameplate.



Warning

The electrical connection must be carried out in accordance with local regulations. Before starting work on the pump, switch off the power supply. Make sure that the power supply cannot be accidentally switched on.

The pump must be connected to an external all-pole mains switch according to local regulations. The product must be earthed and protected against indirect contact in accordance with local regulations.

Wires connected to supply terminals, must be separated from each other and from the supply by reinforced insulation.

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5.1 Power supply cable

In order to comply with the EN 60335-1 standard, the power supply cable must at minimum be rated for an operating temperature of 105 °C (221 °F).

5.2 Motor protection

Single-phase motors, 1 x 115 / 230 V, 60 Hz These motors do not incorporate motor protection and must be connected to a motor-protective circuit breaker which can be manually reset.

Three-phase motors up to 3 kW These motors must be connected to a motor-protective circuit breaker which can be manually reset. Set the motor-protective circuit breaker to maximum

1.15 times full-load current.

5.3 Electrical connection

Carry out the electrical connection as shown in the diagram inside the terminal box cover.

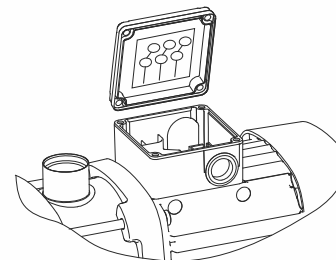


Fig. 10 Wiring diagram

5.4 Checking the direction of rotation

* To reverse the direction of rotation, switch off the power supply and interchange any two of the incoming supply wires.

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6. STARTING

If there is a risk of condensation in the motor, remove the motor drain plug before startup and keep the drain hole open during operation. See fig. 8.

6.1 Non-self-priming pumps

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

6.1.1 Liquid filling



Warning

Pay attention to the direction of the vent hole, and make sure that the escaping hot or cold liquid does not cause injury to persons or damage to the equipment.

1. Close the isolating valve on the discharge side of the pump.
2. Open the isolating valve in the suction pipe completely before starting the pump.
3. Remove the filling plug. See fig. 11.
4. Fill the pump housing and the suction pipe completely with liquid until a steady stream of liquid runs out of the filling hole.
5. Fit and tighten the filling plug.
6. Start the pump and slowly open the discharge isolating valve while the pump is running. This ensures venting and pressure build-up during startup.

Note

If there is a risk of condensation in the motor, remove the motor drain plug before

The discharge isolating valve must be opened immediately after startup of the pump. Otherwise the temperature of the pumped liquid may become too high and cause damage to the equipment.

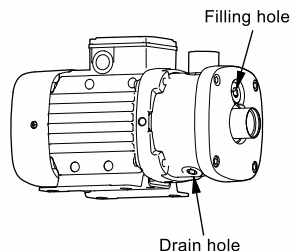


Fig. 11 Position of filling hole and drain hole

If it is difficult for the pump to build up pressure, it may be necessary to repeat steps 1 to 6.

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6.2 Self-priming pumps

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

6.2.1 Liquid filling



Warning

Pay attention to the direction of the vent hole, and make sure that the escaping hot or cold liquid does not cause injury to persons or damage to the equipment.

1. Make sure that the discharge pipe is empty and that the height from the centre of the suction port to the first tapping point (H1) meets the requirements.
2. Open the isolating valves in the suction and discharge pipes.
3. Open a tap close to the pump so that air can escape.
4. Remove the filling plug in the pump. See fig. 12.
5. If a filling plug has been installed in the discharge pipe, remove this plug and use this hole for filling. Otherwise use the filling hole in the pump.
6. Fill the pump housing and the suction pipe completely with liquid until a steady stream of liquid runs out of the filling hole.
7. Fit and tighten the filling plug(s).
8. Start the pump and wait until liquid is pumped. If you have used the filling hole in the pump, it may be necessary to repeat steps 1 to 8 to ensure that the pump is completely filled with liquid.
9. If the pump does not operate properly after several start attempts, see section 9. Fault finding.

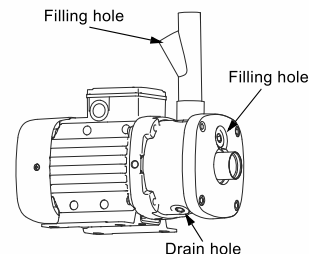




Fig. 12 Position of filling holes and drain hole

The pump is allowed to run for 5 minutes to attempt to suck liquid. If the pump does not build up pressure and flow, repeat steps 1 to 8

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7. MAINTENANCE

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

 **Warning** - Make sure that the escaping water does not cause injury to persons or damage to the equipment.

The internal pump parts are maintenance-free. You must keep the motor clean in order to ensure adequate cooling of the motor. If the pump is installed in dusty environments, clean and check the pump regularly. Take the enclosure class of the motor into account when cleaning. The motor has maintenance-free, greased-for-life bearings.

7.1 Frost protection

Pumps which are not being used during periods of frost must be drained to avoid damage. Remove the filling and drain plugs from the pump. Do not refit the plugs until the pump is taken into operation again.

Caution Before startup after a period of inactivity, the pump and the suction pipe must be completely filled with liquid.

7.2 Cleaning

Prior to a long period of inactivity, flush the pump with clean water to prevent corrosion and deposits in the pump.

7.3 Maintaining the pump's motor:

Warning do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation, and maintenance

7.4 Motor Inspection:

Inspect the motor at regular intervals, approximately every 500 hours of operation or every three months, whichever ever occurs first. Keep the motor clean and the ventilation opening clear.

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The following steps should be performed at each inspection:

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper, pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly
2. Use a Ohm meter (Megger) periodically to ensure that the integrity of the winding insulation has been maintained. Record the Ohm meter readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

8. SERVICE

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

Before the pump is returned to Shakti for service, the safety declaration at the end of these instructions must be filled in by authorised personnel and attached to the pump in a visible position.

If shakti is requested to service the pump, it must be cleaned before it is returned.

If proper cleaning is not possible, all relevant information about the pumped liquid must be provided.

If the above is not fulfilled, Shakti can refuse to accept the pump for service.

Possible costs of returning the pump are to be paid by the customer.

The safety declaration can be found at the end of these instructions (only in English).

9. FAULT FINDING



Warning

Before removing the terminal box cover, switch off the power supply. Make sure that the power supply cannot be accidentally switched on.



Warning

The pumped liquid may be scalding hot and under high pressure. Before any removal or dismantling of the pump, the system must therefore be drained, or the isolating valves on either side of the pump must be closed.

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Fault	Cause	Remedy
1. The pump does not run.	a) Supply failure.	Switch on the switch. Check cables and cable connections for defects and loose connections.
	b) Motor protection tripped.	See 2. a), b), c), d), e).
	c) Control-current circuit defective.	Repair or replace the control-current circuit.
2. Motor-protective circuit breaker has tripped (trips immediately when power supply is switched on).	a) Contacts of the motor-protective circuit breaker or magnet coil defective.	Replace the contacts of the motor-protective circuit breaker, the magnet coil or the entire motor-protective circuit breaker.
	b) Cable connection is loose or faulty.	Check cables and cable connections for defects, and replace the fuses.
	c) Motor winding is defective.	Repair or replace the motor.
	d) The pump is mechanically blocked.	Switch off the power supply, and clean or repair the pump.
	e) The setting of the motor-protective circuit breaker is too low.	Set the motor-protective circuit breaker according to the rated current of the motor (I_{1N}). See nameplate.
3. The motor-protective circuit breaker trips occasionally.	a) The setting of the motor-protective circuit breaker is too low.	See 2. e).
	b) Periodic supply fault.	See 2. b).
	c) Periodically low voltage.	Check cables and cable connections for defects and loose connections. Check that the power supply cable of the pump is correctly sized.
4. The motor-protective circuit breaker has not tripped, but the pump is inadvertently out of operation.	a) See 1. a), b), c) and 2. d).	
5. The pump performance is unstable.	a) Pump inlet pressure too low.	Check the inlet conditions of the pump.
	b) Suction pipe is partly blocked by impurities.	Remove and clean the suction pipe.
	c) Leakage in suction pipe.	Remove and repair the suction pipe.
	d) Air in suction pipe or pump.	Vent the suction pipe or pump. Check the inlet conditions of the pump.
6. The pump performance is unstable, and the pump is noisy.	Self-priming pumps only:	
	a) The differential pressure across the pump is too low.	Close the tap gradually until the discharge pressure is stable and the noise has ceased.

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Fault	Cause	Remedy
7. The pump runs, but gives no water.	a) Pump inlet pressure too low.	See 5. a).
	b) The suction pipe is partly clogged by impurities.	See 5. b).
	c) The foot or non-return valve is stuck in its closed position.	Remove and clean, repair or replace the valve.
	d) Leakage in suction pipe.	See 5. c).
	e) Air in suction pipe or pump.	See 5. d).
8. When startup is attempted, the pump will start, but delivers no pressure or flow.	Self-priming pumps only:	
	a) Liquid column above non-return valve in discharge pipe prevents the pump from self-priming.	Empty the discharge pipe. Make sure that the non-return valve does not hold back liquid in the discharge pipe.
	b) Suction pipe draws in air.	Make sure that the suction pipe is airtight from pump to liquid level.
9. The pump runs, but does not deliver the rated flow.	Self-priming pumps only:	
	a) The internal valve did not close.	Close the tap gradually until a sudden rise in pressure or flow can be seen. Then open the tap gradually until the required flow is reached.
10. The pump runs backwards when switched off.	a) Leakage in suction pipe.	See 5. c).
	b) Foot or non-return valve defective.	See 7. c).
	c) The foot valve is stuck in completely or partly open position.	See 7. c).
11. The pump runs with reduced performance.	a) Wrong direction of rotation.	Three-phase pumps only: Switch off the power supply with the external circuit breaker, and interchange two phases in the pump terminal box.
	b) See 5. a), b), c), d).	

10. DISPOSAL

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Shakti company or service workshop.

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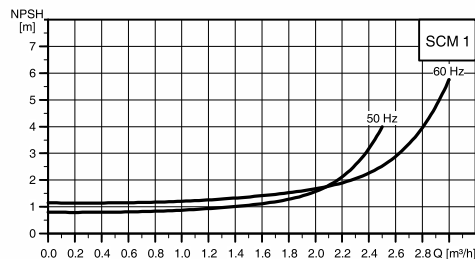


Fig. 13 NPSH curve for SCM 1

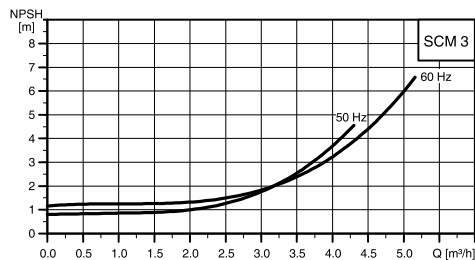


Fig. 14 NPSH curves for SCM 3

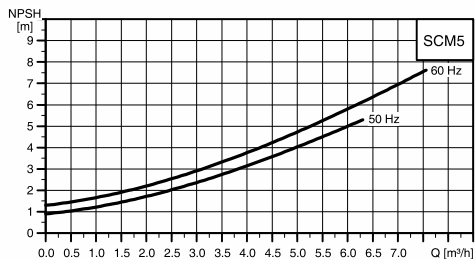


Fig. 15 NPSH curves for SCM 5

INSTALLATION AND OPERATING INSTRUCTIONS

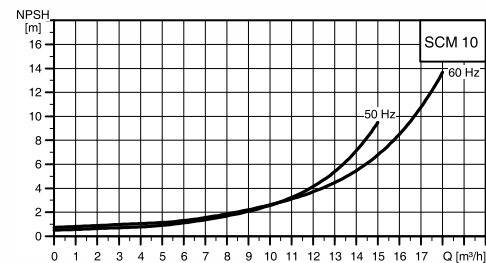


Fig. 16 NPSH curves for SCM 10

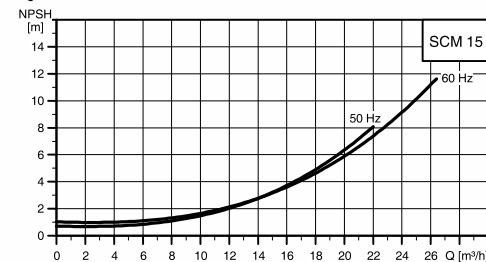


Fig. 17 NPSH curves for SCM 15

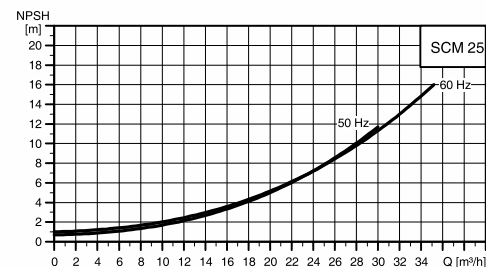


Fig. 18 NPSH curves for SCM 25

INSTALLATION AND OPERATING INSTRUCTIONS

WARRANTY CERTIFICATE

Dear Customer.

Congratulation, for purchasing our product

Shakti Pump and Motor are warranted against defects in workmanship and material under normal use, service and specific duty conditions. We provide one time warranty service for twelve months from the date of purchase by the first user.

Shakti pumps (India) Ltd warrants this product to be free from damage / defects in material and workmanship under normal use and service for twelve month from the date of purchase by the first user.

The user shall produce valid and original copy of invoice for availing warranty. In this warranty period, the product and its parts must be brought and taken at the nearest service center by the customer on to his own expenses.

The warranty does not cover any loss or damage / defect of any nature resulting from wrong product selection / improper installation or install by unauthorized / untrained person / sandy condition / dry running and improper use of the pump set.

The warranty also does not cover consequential losses / transportation damage / damage arising due to failure of pump / motor.

No warranty will be provided on Mechanical seal rubber parts, fasteners, cables in Pump, Motor/ pump set. Our obligation is limited to recycling or repairing or replacing product / 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

For any dispute Indore (M.P.) jurisdiction will be applicable.

Customer name:Customer's phone:

Customer Address.....

Invoice No.....Invoice DateModel Name:

No. of Stage:Model Serial No.Motor H.P.....

Dealer Name:Dealer Ph. :

Dealer Address.....

INSTALLATION AND OPERATING INSTRUCTIONS

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 m³/hr: _____

Liquid:- _____ Temp.: _____

Voltage:- _____ Current: _____

Packing Condition:- _____

Remarks: _____

Date:- _____

Customer's Signature

BOOK-POST

SHAKTI PUMPS (INDIA) LIMITED

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Sector - 3, Pithampur - 454774, Dist. - Dhar, (M.P.) - INDIA,
Fax: +91-7292 410645, E-mail: info@shaktipumps.com,
sales@shaktipumps.com, Visit us at : www.shaktipumps.com

Stamp

