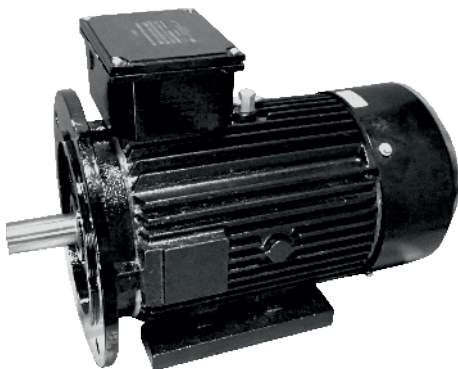




INSTALLATION & OPERATING INSTRUCTIONS



SMG (STEERING/ COMPRESSOR)

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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.

Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

Warning

The surface of the product may be so hot that it may cause burns or 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.

1.1 Safety

Observe the safety instructions to ensure correct installation, operation and maintenance of the motor. The instructions must be known by any person installing, using or maintaining the motor. Failure to observe the instructions may invalidate the warranty.

Safety equipment required to prevent accidents must be made available according to local safety instructions.

2. INTRODUCTION

These installation and operating instructions apply to these Shakti SMG motors.

STEERING / COMPRESSOR MOTOR									
Material Code	AC (CAST IRON)		AC (ALUMINIUM)		IPMSM (ALUMINIUM)				
	SMG 100	SMG 112	P2	P2	P7	P7	P7	P3	P3
	9000030780	9000030706	9000032671	9000032597	9000032670	9000032916	9000033674	9000033574	9000033642
MOTOR POWER (kW)	2.2	3.7	2.2	3.7	1.5	2.2	2.2	3	5
Volts (V)	415	415	415	415	120	234	238	353	353
Rated RPM	1452	1457	1455	1455	1500	1200	1500	1500	1500
Type	AC	AC	AC	AC	IPMSM	IPMSM	IPMSM	IPMSM	IPMSM
Poles	4	4	4	4	6	6	6	8	8
Frame	100	112	112	112	112	112	112	100	100
Cooling Method	Fan cooled	Fan cooled	Fan cooled	Fan cooled	Fan cooled	Fan cooled	Fan cooled	Natural Cooling	Natural Cooling

Table 1

3. DELIVERY AND HANDLING

3.1 Delivery

Immediately after the receipt, check the motor for external damage. If this is the case, contact the shipping agent immediately. Check whether all nameplate data are according to specifications, especially as regards the voltage and check also whether the winding has been connected correctly according to the wiring diagram in the terminal box cover and the nameplate data.

3.1.1 Unpacking

 **Caution:** Do not use sharp tools when unpacking the motor.

The motor should not be exposed to unnecessary impact and shocks.

Remove transport protectors, if any. Turn the shaft by hand to check that it rotates freely.

3.2 HANDLING

3.2.1 Lifting the motor

Lift the motor in the eye bolts. Take care not to damage additional equipment and cables. The table shows the number of eye bolts and the maximum permissible weight. (Refer. Table 2)

3.2.2 Storage

Until installation, Shakti motors should be stored in the packaging in which they were delivered. Store the motors in an enclosed, dry and well-ventilated room.

For protection, treat unprotected machine surfaces (shaft ends and flanges) with a corrosion inhibitor.

 **Caution:** If SMG motors are stored, the shaft must be turned by hand at least once a month to prevent it from getting stuck and to distribute the bearing grease. If the motor has been stored for more than two years before installation, the rotating parts must be dismantled and checked. Relubricate motors with lubricating nipples. Replace the greased-for-life bearings.

Storage Temperature

-20 °C to +60 °C

4. IDENTIFICATION

4.1 Nameplate

The motor nameplates has electrical & mechanical data.

The nameplates are positioned on the terminal box cover

5. CONSTRUCTION

FOOT MOUNTED MOTOR

INSTALLATION AND OPERATING INSTRUCTIONS

5.1 Motor Bearings

For information about lubrication and maintenance of bearings, section 11.2 Motor bearings.

5.2 Balancing

The rotor is dynamically balanced. As standard, the rotor has been balanced with a half key inserted (cylindrical shaft).

5.3 Cable entry/screwed connection

Motors are supplied with screwed cable entries. The table below shows the number and size of the cable entry holes of the terminal box. (Refer. Table 2)

	MOTOR TYPE	Material Code	MOTOR POWER (kW)	Frame	NUMBER OF EYE BOLTS/PERMISSIBLE WEIGHT	GLAND HOLE	DESCRIPTION
STEERING MOTOR	AC (CAST IRON)	9000030780	2.2	100	1XMB, 100KG(0.98kN)	M32	HOLE CLOSED WITH RUBBER PROTECTION CAP
		9000030706	3.7	112	1XMB, 100KG(0.98kN)	M32	HOLE CLOSED WITH RUBBER PROTECTION CAP
	AC (ALUMINIUM)	9000032671	2.2	112	2XMB, 90KG(0.88kN)	HV CONNECTOR	CONNECTOR CAPPED WITH RUBBER PROTECTION CAP
		9000032597	3.7	112	2XMB, 90KG(0.88kN)	HV CONNECTOR	CONNECTOR CAPPED WITH RUBBER PROTECTION CAP
		9000032670	1.5	112	NA	NA	CONNECTOR CAPPED WITH RUBBER PROTECTION CAP
	IPMSM (ALUMINIUM)	9000032916	2.2	112	NA	NA	CONNECTOR CAPPED WITH RUBBER PROTECTION CAP
		9000033674	2.2	112	NA	NA	CONNECTOR CAPPED WITH RUBBER PROTECTION CAP
		9000033574	3	100	NA	NA	CONNECTOR CAPPED WITH RUBBER PROTECTION CAP
		9000033642	5	100	NA	NA	CONNECTOR CAPPED WITH RUBBER PROTECTION CAP

Table 2

6. OPERATING CONDITION

6.1 Ambient temperature and installation altitude

Shakti motors are designed for operation at temperature up to 55 ° C. See section 11.2 Motor bearings.

6.2.2 Speed

Basically, SMG motors are not suitable for over synchronous operation. Contact Shakti if over synchronous operation is required.

7. MECHANICAL INSTALLATION

The installation must be carried out by authorised personnel in accordance with local regulations. Check by hand that the shaft rotates freely.

7.1 Clearance

To ensure sufficient air circulation, a clearance of minimum 50 mm must be available over/around the motor.

7.2 Air Circulation

Minimum air flow velocity should be around 1.5 m/s to 2 m/s.

7.3 Foundation

Shakti recommends to install motor on a foundation which is heavy enough to provide permanent and rigid support. The foundation must be capable of absorbing any vibration, normal strain or shock.

Caution:- Non-compliance may result in functional faults which will damage the motor components.

7.4 Alignment

Correct alignment is important to avoid problems with bearings, vibrations and possible fracture of shaft ends.

7.5 Fitting of coupling parts and pulleys

Fit coupling parts, pulleys and similar components using suitable equipment and tools that do not damage the motor bearings. Never knock a coupling part or pulley into position. Always carry out removal without pressing against the motor.

8. ELECTRICAL INSTALLATION



Warning

Make sure that the power supply cannot be accidentally switched on during the electrical installation.

8.1 General information

Operating voltage and operating frequency are stated on the motor nameplate. Check that the motor is suitable for the power supply available at the installation site.



Warning

The motor must be connected to an external mains switch.

8.1.1 Motor protection

Three-phase motors

Three-phase motors must be protected by a motor-protective circuit breaker according to local regulations.



Warning

Whenever motors incorporating a thermal switch or thermistors are to be repaired, make sure that the motor cannot start automatically after cooling.

8.2 Electrical connection

The electrical installation should be carried out by authorised personnel in accordance with local regulations. The wiring diagram is located in the terminal box cover.

 Warning

Before removing the terminal box cover and before any dismantling of the motor, switch off the power supply.

The Terminal box of single-speed motors normally contains six winding terminals and at least one earth terminal.

 Warning

The motor must be earthed.

Do not connect the motor to the voltage supply until the connection to earth has been carried out in accordance with local regulations.

Motors shall be capable of delivering rated output with:

- a) Terminal voltage differing from its rated value by not more than ± 10 percent,
- b) Frequency differing from its rated value by not more than ± 5 percent, or
- c) Combined variation — The sum of absolute percent variations of (a) and (b) not exceeding 10 percent.

9. START-UP

9.1 Measuring the insulation resistance

Measure the insulation resistance before start-up and in case of any risk of moisture in the windings.



Warning

When measuring the insulation resistance, carefully follow the safety regulations of IS12615 (operation of power plants) and the instruction manual for measuring and test equipment.

The minimum permissible insulation resistance, R_M , should be greater than $30M\Omega$

Stop using the motor immediately if the insulation resistance falls below this value.

Measure the minimum permissible insulation resistance at a winding temperature of $25\text{ }^{\circ}\text{C}$ ($\pm 15\text{ }^{\circ}\text{C}$).

Procedure:

Connect the megohm meter between phase and earth at a measuring voltage of 500 V DC.

Read the value on the megohm meter.



Warning

During and immediately after the measurement, there will be a risk of electric shock. Do not touch the terminals until the windings are de-energised.

If the minimum insulation resistance is not attained, the windings are too moist and must be oven- dried. The oven temperature must be 90 °C for 12-16 hours and then 105 °C for 6-8 hours.

Note

Remove any drain plugs before heating.

9.2 Direction of rotation

The direction of rotation is clockwise, seen from the motor drive end when the mains conductors are connected in accordance with the diagram located in the terminal box cover. The direction of rotation can be changed by switching two random mains conductors.



Caution

Some SMG motors have a properly directed fan. The direction of rotation must be as stated on the motor.

10. OPERATION



Warning

During operation, the motor surface may be so hot that it may cause personal injury.

10.1 Max. number of starts per hour see page 18.

11. MAINTENANCE

11.1 Motor

Inspect the motor at regular intervals, determined by the environment in which the motor is installed. To ensure adequate ventilation, it is important to keep the motor clean. If the motor is installed in a dusty environment, it must be cleaned and checked more often than if it is installed in non-dusty environment.

11.2 Motor bearings

The bearings are greased for life. The expected life is at least 30000 operating hours at an bearing operating temperature of up to 80°C. A higher bearing operating temperature reduces life.

SR. NO.	MODEL	NO. OF POLES	POWER(k W)	SPEED (RPM)	RADIAL LOAD (kN)	AXIAL LOAD (kN)	BEARING TEMPERATURE (°C)	LIFE (Hrs.)
1	SMG 100	4	2.2	1500	0.1	0	80	30000
2	SMG 112	4	3.7	1500	0.1	0	80	30000
3	SMG 112	6	2.2	1000	0.1	0	80	30000
4	SMG 132	6	3.7	1000	0.1	0	80	30000
5	SMG 100	8	3	1500	0.1	0	80	30000
6	SMG 100	8	5	1500	0.1	0	80	30000

Note: At every 10000 km/12 months, check for noise, vibration and replace if necessary

Table 3

11.2.2 Oil Seal Replacement

Oil Seal Routine Change		
Motors	DE (Drive End Side)	NDE (Non Drive End Side)
P2 / P7	24 Months*	12 Months
P3	24 Months*	NA
REST ALL	12 Months	12 Months

* Shaft seal enclosed with Pump Housing

Table 4

12. FAULT FINDING

Warning



Before starting fault finding, switch off the power supply. Make sure that the power supply cannot be accidentally switched on. Motor service and fault finding must be carried out by qualified personnel. The table below covers the most frequent faults. Contact Shakti if the table does not cover the specific fault.

SER	FAULT	CAUSE
1	Motor does not start.	(a) Power supply disconnected.
		(b) Fuses blown.
		(c) Automatic circuit breakers cut out.
		(d) Motor-protective circuit breaker tripped.
		(e) Thermal protection tripped.
		(f) Contacts of motor-protective circuit breaker or magnet coil defective.
		(g) Control circuit defective.
		(h) Blocked rotor.
		(i) Motor defective.
2	Motor-protective circuit breaker trips immediately when supply is switched on.	(a) A fuse blown.
		(b) Contacts of motor-protective circuit breaker defective.
		(c) Blocked rotor.
		(d) Cable connection loose or faulty.
		(e) Motor winding defective.
		(f) Motor-protective circuit breaker setting is too low.
3	Motor-protective circuit breaker trips occasionally.	(a) Motor-protective circuit breaker setting is too low.
		(b) Mains voltage periodically too low.
		(c) Voltage asymmetry.

13. SERVICE

All repairs must be carried out in accordance with IEC 60079-19. Observe the provisions of EN 50110-1 until all maintenance work has been completed, and the motor has been assembled.

13.1 Motor bearings

Take care when replacing the motor bearings.

Caution:- Do not expose the bearings to impacts or shocks.

13.2 Service documentation

If you have any questions, please contact the nearest Shakti company.

14. 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 not possible, contact the nearest Shakti company or service workshop.

Subject to alteration.

Appendix

Maximum number of starts per hour

4/6/8 Pole Motors	
Type Designation	Maximum Number of Starts Per Hour
SMG 100	60
SMG 112	60
SMG 132	60

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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

To,
SHAKTI PUMPS (INDIA) LIMITED
Regd. Office & Works : Plot No. 401, Sector - 3,
Pithampur - 454774, Dist.- Dhar (M.P.) - INDIA
Tel: +91-7292 410500, Fax: +91-7292 410645,
E-mail : info@shaktipumps.com, sales@shaktipumps.com
Visit us at : www.shaktipumps.com

Stamp





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