SVM INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

ROTOS SVM – SERIES PUMP PRESENTATION

To obtain the best performance from your ROTOS pump, please read these instructions carefully. Failure to observe the recommended procedures may result in damage to your ROTOS pump, and may also invalidate the supplier's guarantee.

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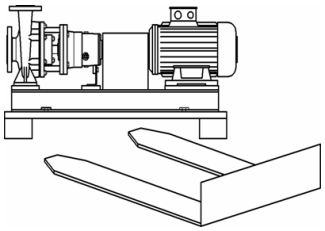
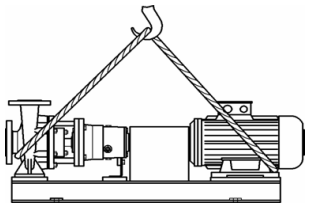
March May Ltd, Howard Road, Eaton Socon, St. Neots, Cambridgeshire, PE19 8NZ, UK
Tel: +44 (0) 1480 214444 Fax: +44 (0) 1480 405336 E-mail: sales@marchmay.co.uk Website: www.marchmay.co.uk

SVM INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

1. WHEN RECEIVING YOUR ROTOS PUMP





1.1.1 Check the nameplate on the pump against the receiving and purchase order documents to be sure that the correct size of pump and materials of construction have been supplied. If a motor has been supplied, check that the power, speed, and voltage are correct.

1.2 Prior to unpacking, check for physical damage to the packing and the pump unit and notify the forwarding agent **IMMEDIATELY** if any damage is found.

1.3 Check that the port covers are intact. If not, check whether foreign objects may have found their way into the pump casing through the ports. Remove the port covers only when you are ready to connect the pipes to the pump.

When shipped, the pumps are suitable for short-term storage only. If long-term storage is necessary before the pump will be put into operation, we suggest that you contact your pump supplier for long-term storage recommendations.

1.4 Check for free rotation of the pump. If the pump is close-coupled to the motor, remove the fan cover from the motor and rotate the fan by hand. To check long-coupled pumps for free rotation, remove the coupling guard and rotate the pump and motor shafts at the flexible coupling.

2. PUMP FOUNDATION

The foundation should be substantial in order to reduce vibrations, and rigid enough to prevent flexing which can result in mis-alignment. Foundation bolts of the correct size should be located by reference to certified drawings if the baseplate is supplied with the pump.

2.1 The pump must be mounted horizontally on a level foundation, with the discharge port vertically upwards.

2.2 Close-coupled motor-pump units without baseplates

Level the pump base accurately, using shims under the pump feet. The pump must sit firmly and evenly on its foundation. It must not be distorted by bolting to an uneven surface.

2.3 Motor-pump units on baseplates

Level the baseplate accurately, using shims under the base-plate next to the foundation bolts. The baseplate must sit firmly and evenly on its foundation: it must not be distorted by bolting to an uneven surface, which will throw the pump and motor out of alignment.

March May Ltd, Howard Road, Eaton Socon, St. Neots, Cambridgeshire, PE19 8NZ, UK
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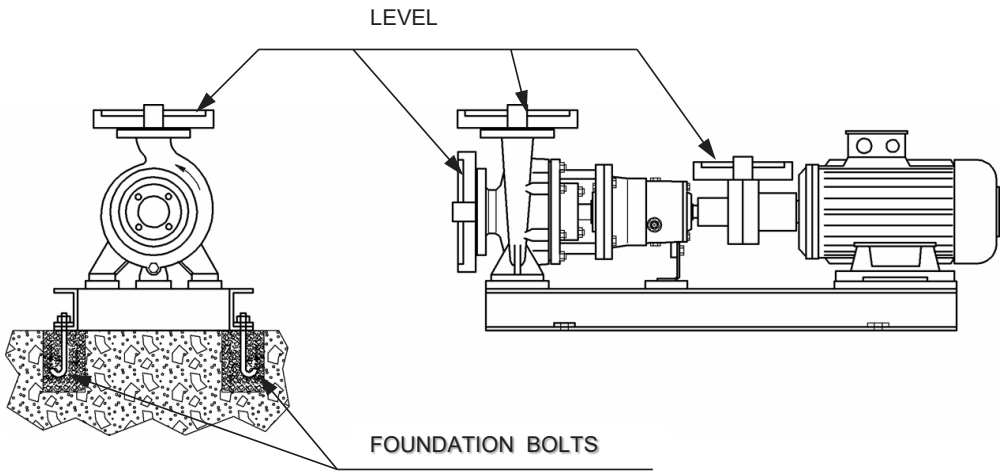
PUMP AND MOTOR ALIGNMENT (for long coupled pumps only).

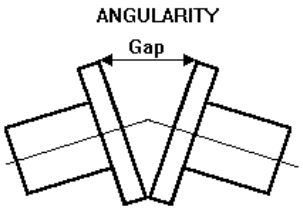


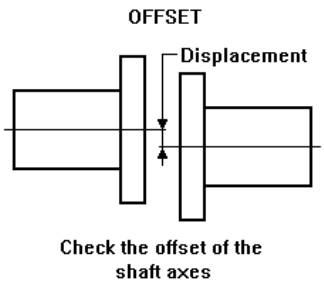
3.1 Close-coupled pumps have been aligned prior to shipment and if they turn freely by hand, no further adjustments are necessary.

3.2 Long-coupled pumps have been pre-aligned with the motor prior to shipment. If pump units receive rough treatment during shipment, they can become mis-aligned. The flexible coupling is not designed to compensate for mis-alignment. Improper alignment will cause vibration and premature bearing failure.

3.2.1 CHECK THE ALIGNMENT OF PUMP AND MOTOR BEFORE START-UP.

A final alignment check should be made after the baseplate has been grouted and set, and the foundation bolts have been tightened.





Couplings should be aligned within the following limits:

COUPLING TYPE	OFFSET	ANGULARITY
	Displacement	Gap
Short flexible coupling (3000 rpm)	0.05mm	0.04mm per 100mm coupling diameter.
Flexible spacer coupling (3000 rpm)	0.07mm per 100mm spacer length.	0.04mm per 100mm coupling diameter.

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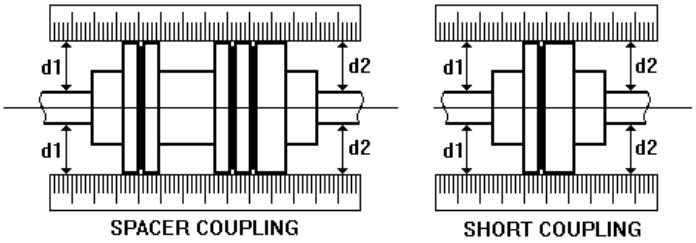
3.2.2 Methods of checking alignment

a. **Straight edge**

Using a straight edge, check the distance from the shaft at several points on the circumference of the coupling. The distances d1 and d2 should each remain constant.



IMPORTANT NOTE:The straight edge method checks static coupling alignment, not shaft alignment. It relies for its accuracy on the accurate alignment of each coupling half on its shaft. The straight edge method is a useful preliminary check, but should not be seen as an effective final alignment method.

b. **Dial gauge** ("clocking")
There are several methods, using one or two dial gauges. The lost accurate is the reverse indicator method, using two gauges, which overcomes errors due to `sag' of the gauge bars.

c. **Optical methods**
Several proprietary systems are available, such as the `OPTALIGN' system (INA Linear Systems).Mechanical errors are eliminated by optical alignment techniques. On request, your pump supplier can provide further information about suitable alignment methods, including allowances for

THERMAL EXPANSION IN HIGH TEMPERATURE USE.

4. LOCATION AND PIPING

4.1 The correct pipework sizes should be selected according to the allowable limits of liquid velocity and pressure drop at the required flow rate. Check the NPSH required by the pump at its specified duty point, and ensure that the minimum NPSH available exceeds that required.

This is particularly important for liquids near their boiling temperature (or bubble point).

4.2 Check that the pipework is **THOROUGHLY CLEAN** before the pump is installed.

4.3 Pipework connections must be accurately aligned with the pump ports, so that they can be connected to the pump without forcing. Maximum allowable bending moments are set out in the Tables on pages 4/5. These moments must not be exceeded, otherwise the pump may distort internally, or the pump and motor may become mis-aligned. Pipework must be fully and independently supported as close as practicable to the pump.

4.4 Locate the pump as close as possible to the liquid source.

March May Ltd, Howard Road, Eaton Socon, St. Neots, Cambridgeshire, PE19 8NZ, UK
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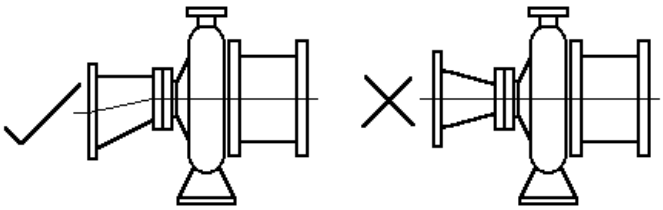
4.5 The suction line should be as short and straight as possible, with a minimum number of bends. Bends should be radiused: avoid sharp elbows. Bends and fittings should be no closer than 20 pipe diameters to the pump suction, to allow undisturbed flow to the pump impeller. Liquid velocity in the suction line should normally be between 0.7 and 2.0m/sec. If the liquid is near its boiling temperature (or bubble point), its velocity may need to reduced to 0.5-1.0m/sec. If the suction line is oversized, the reducer at the pump inlet port should be ECCENTRIC, not concentric.

ATTENTION !

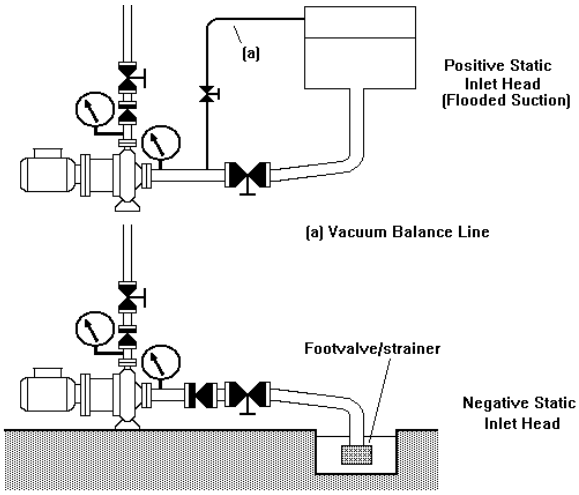


4.6 Generally, suction piping should be one or two sizes larger than the inlet bore of the pump, to keep liquid velocity low and friction losses to a minimum. This becomes more important as the distance between the pump and the liquid supply increases.

4.7 The suction line should slope so as to avoid air pockets.

Valves on the suction side should be mounted with stems horizontal, or vertically downwards. All joints in the suction line must be tight, to prevent air from entering into the system, with the risk of vapour locking. If the pump is installed with a negative static inlet head (lower diagram), the foot valve/ strainer must always be immersed at a sufficient depth to avoid entry of air into the pump. Take suitable precautions to prevent vortexing in the supply vessel

A pressure gauge should be installed in the suction line, as close as possible to the pump.



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4.8 If the supply vessel is under vacuum, a pressure balancing line should connect the supply vessel and the pump inlet port.

4.9 The discharge line should be as short and direct as possible to minimize friction losses. An air vent (if permissible) should be installed at the first high point in the discharge line.

A check valve and gate valve should be installed as close as possible to the pump discharge nozzle. The check valve is installed to protect the pump from excessive back pressure or reverse flow rotation, and to prevent back flow into the pump during shut down. The discharge (gate) valve is used to regulate the flow. The check valve should be installed between the pump and the discharge valve to allow the pump to be removed from service without emptying the discharge line.

A pressure gauge should be installed on the discharge line as close as possible to the pump.

4.10 If the pump is fitted with a STEAM HEATING JACKET, the steam must flow into the upper connection and out of the lower connection. The heating fluid may be water with a maximum temperature of 170oC or saturated steam with a maximum pressure of 7 bar (100psi).

4.11 Prior to starting the pump it is important to flush the piping to make sure that the system is free of solids such as pipe scale, welding beads, and dirt. If possible a TEMPORARY START-UP STRAINER with a 40 mesh screen should be installed in the suction line.

BE VERY CAREFUL not to allow the temporary strainer to become plugged, causing low inlet pressure with cavitation or dry running. A pressure gauge should be installed on either side of the temporary strainer to measure the pressure drop across it. If there is any risk of ingestion of solids during normal operation, once the pump has been successfully commissioned, a PERMANENT INLET STRAINER should be fitted in the inlet line.

AVOID PUMPING LIQUIDS CONTAINING SUSPENDED SOLIDS

Standard Rotos pumps are designed to handle clean liquids. Unless specifically agreed prior to purchase of the pump from your supplier, suspended solid matter must be kept out of the pump by a suitable inlet strainer. The strainer mesh size should be less than 0.5mm, with an open surface area at least 2.5 x nominal cross-sectional area of pump inlet bore. The strainer must be inspected regularly and cleaned when necessary.

DO NOT PUMP LIQUIDS CONTAINING IRON OXIDES OR FERROMAGNETIC PARTICLES, HOWEVER SMALL. THESE MAY ADHERE TO THE INTERNAL MAGNET AND CAN EVENTUALLY BUILD UP INTO DAMAGING DEPOSITS.

4.12 Protecting the pump against DRY RUNNING

The pump must not be allowed to run dry. Dry running will result in loss of liquid film to the bearings, causing over-heating and eventual bearing failure, leading to seizure of the pump.

March May Ltd, Howard Road, Eaton Socon, St. Neots, Cambridgeshire, PE19 8NZ, UK
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Avoid the following conditions:

a. **Loss of liquid supply**. Ensure that an adequate supply of liquid is available at the pump inlet at all times. Pressure and/or flow sensors should be installed if necessary, to monitor the hydraulic conditions in the inlet pipework.

b. **Low inlet pressure** due to restriction or blockage of the inlet pipework, causing liquid vaporization and cavitation in the pump, with the risk of loss of liquid film in the bearings.

c. **`Dead-heading'** If the pump is permitted to run against a closed discharge for more than a short time (depending on the liquid, the duty, and the pump model and power), the liquid in the pump casing will heat up and evaporate with consequences as in b. above.

4.13 Electronic dry-running protection

A rapid and reliable method of stopping a centrifugal pump, in the event of loss of liquid supply or interruption of flow, is to monitor the power output of the motor. The `EL-FI' device monitors both current and phase angle, providing pump protection without pipework sensors or attachments. It is easily fitted in the power supply to the motor, in place of a normal starter. Details of power monitors are available on request from your pump supplier.

5. ELECTRICAL CONNECTION

The electrical connection to the motor should be carried out by a properly qualified electrician, using cable, cable glands and connection procedures suitable for the electrical load and for the location of the installation.

All regulations governing electrical installations in **HAZARDOUS AREAS** must be strictly followed. It is the responsibility of the pump user to ensure that a safe electrical installation is made and maintained.

5.1 Connecting the electric motor

5.1.1 Isolate the electric supply cable from the power supply.

5.1.2 Bring the cable end into the terminal box through a suitable cable gland.

5.1.3 Follow the motor manufacturer's instructions for electrical connection. These will normally be found inside the terminal box, either on a separate instruction sheet or attached to the inside of the terminal box cover.

- **Check that the terminal links are correctly positioned for the supply voltage.**
- **Ensure that the earth connection is properly and securely made.**

5.1.4 Before replacing the terminal box lid, check that the sealing surfaces and the gasket or 0-ring seal are clean and in good condition. With flameproof electric motors, the opposing metal surfaces of the terminal box seal should be lightly greased to keep out condensation and prevent corrosion.

March May Ltd, Howard Road, Eaton Socon, St. Neots, Cambridgeshire, PE19 8NZ, UK
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5.2 A proper electrical starter must be used. A starter will:

a. prevent accidental restarts after power failure

b. provide a safe, waterproof switch enclosure (IP55 `hose-protected' specification)

c. protect the motor with a correctly set thermal overload cut-out: a fuse protects only the wiring

d. withstand the heavy starting current of the motor, preventing arcing and rapid contact wear.

5.3 Electronic dry-running protection: see 4.13.

6. ROTATION CHECK AND PREPARATION FOR START-UP

WARNING! "DO NOT RUN THE PUMP DRY"

6.1 Long-coupled pumps only

Prior to starting the pump the bearing housing should be filled with one of the following oils:

Use ISO VG-46 viscosity oil for bearing temperature from 0° to 70°c
Use ISO VG-68 viscosity oil for bearing temperature 70° to 90°C.

OIL QUANTITY: BEARING BRACKET SIZE 24 0.4 lt.

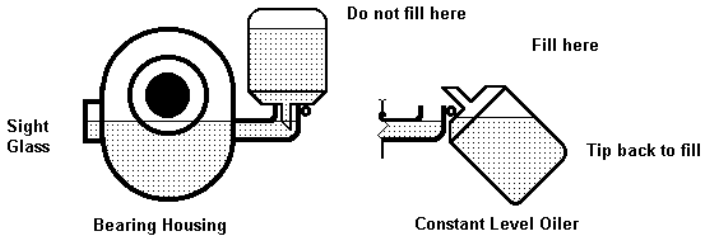
Fill to the middle of the sight glass, using the following procedure:

i) pour oil into the bearing housing, through the filler cap on top of it, until oil is just visible at the bottom of the sight glass.

ii) tip back the transparent bulb of the constant level oiler (if mounted), and fill it with oil.

iii) allow the bulb to return to its normal position. Wait for the oil to flow into the bearing housing.

iv) repeat the operation until oil no longer flows out of the bulb.



If there is a toothed spacer coupling between the pump and the motor, check whether it needs to be filled with oil. Follow the coupling manufacturer's instructions as required.

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6.2 Direction of rotation

Rotos SVM-series pumps rotate anti-clockwise when viewed from in front of the pump inlet nozzle.

To confirm the direction of rotation (refer to the rotational arrow on the pump casing) use the following procedure:

a. Open the suction and discharge valves, allowing the pump to fill with liquid.

b. Remove the coupling guard of a long-coupled pump, or the motor fan cover of a close-coupled pump.

c. `Bump' the motor by pressing the motor start and stop buttons in quick succession. If the direction of rotation is incorrect, reverse any two of the three-phase power leads to the motor.

d. After confirming correct rotation, replace the coupling guard or motor fan cover.

7. PRIMING THE PUMP

WARNING!: "DO NOT RUN THE PUMP DRY"

7.1 Check that the liquid supply is at the correct temperature, with any necessary heating/cooling in operation. Open the suction and discharge valves, allowing the pump to fill with liquid.

NOTE: If the direction of rotation has not been checked, this must be done before proceeding (see 6.2 above).

7.2 Open the discharge valve to 1/2 open.

7.3 Start the motor and immediately check the discharge pressure gauge. The pressure should rise quickly and hold steady. If the pressure rises and then falls back, there is air or vapour in the system.

STOP THE PUMP IMMEDIATELY:
Wait a few seconds before restarting the pump

7.4 If the pressure gauge does not hold steady after repeating step 7.3 several times, shut the pump down, open the discharge vent (if permissible) and check that all vapour or air is purged from the system.

7.5 Once the pump is fully primed and a steady discharge pressure is established, slowly open the discharge valve until the desired operating point is reached. Check that the electric motor current does not exceed the rated full load current shown on the motor plate.

7.6 If the pump starts to vibrate, rattle or run noisily, the flow rate has become excessive. Close the discharge valve IMMEDIATELY until the pump runs smoothly again. Vibration and noise are an indication of cavitation, which can cause rapid and severe damage if permitted to continue. If the flow rate needs to be permanently restricted, a permanent orifice in the discharge line is more secure than an adjustable valve. Your pump supplier will advise on a suitable orifice size if necessary.

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8. PUMP OPERATION

8.1 Operators should make frequent visual inspections to check that the pump is running smoothly without noise or vibration, and that the discharge pressure is holding steady, without fluctuation, at the correct figure. Over-heating of the pump or motor bearings is cause for alarm. The bearing housing should not be more than 50°C above ambient temperature, nor should it exceed 80°C (too hot to touch) in any event. If the bearings over-heat, shut the pump down immediately, investigate the cause, and take corrective action.

8.2 Care must be taken to make sure that the sleeve bearings in the pump are replaced in sufficient time to prevent mechanical rubbing between the inner magnet and the rear casing of the pump. This condition can be detected by an increase in power consumption and loss of pump performance. In addition the pump may vibrate or operate noisily.

IF LEFT UNATTENDED, THE RUBBING WILL EVENTUALLY BREAK THE REAR CASING CAUSING LEAKAGE OF THE LIQUID INTO THE ENVIRONMENT.

Be sure to maintain properly the ball bearings supporting the outer magnet in the external bearing housing (or the motor bearings in the case of close-coupled pumps).

BEARING FAILURE WILL RESULT IN THE OUTER MAGNET MECHANICALLY RUBBING ON THE OUTSIDE OF THE REAR CASING, WHICH IF LEFT UNATTENDED WILL CAUSE THE REAR CASING TO FAIL, WITH LIQUID LEAKAGE INTO THE ENVIRONMENT.

Follow the motor manufacturer's recommendations and keep the motor bearings maintained.

ATTENTION!:
Never throttle the pump by closing a valve in the suction line. Throttling the suction line can cause serious damage to the pump.

ATTENTION!:
Do not allow the pump to run against a closed discharge valve for more than a few seconds. This will cause rapid heating of the liquid in the pump casing, with vaporization and dry running of the bearings, risking serious damage to the pump.

8.3 Rotos pumps are dynamically balanced during manufacture and are tested prior to dispatch to ensure that they run smoothly and without vibration. Replacement impellers are also balanced prior to dispatch.

Vibration monitoring in service can detect poor hydraulic conditions, bearing wear, internal erosion or chemical attack before it seriously damages the pump. Vibration may be monitored on the internal pump bearings and/or the external bearing housing and/or the motor bearings. Your supplier will advise you on vibration monitoring on request.

8.4 If a temperature sensor is fitted to the pump, check regularly to ensure that it is working properly.

8.5 **IMPORTANT SAFETY NOTE:** When the pump is stopped, unless a non-return valve is fitted in the discharge line, liquid will drain back through the pipeline. Allow ample time for complete drainage of the pipeline before the pump is restarted.

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9. MAINTENANCE SCHEDULE

Provided the pumped liquid is clean and free of suspended solids, and the pump is operated within the manufacturer's stated performance limits and is not allowed to run dry, your ROTOS pump is capable of running for very long periods with minimal attention. Please read paragraph 8.1.

Parts to be inspected	Action to be taken	Frequency
External bearing housing (long-coupled units)	Fill with appropriate oil to the middle of the sight glass	Weekly. Change the oil every 5000 hours.
Internal carbon cartridge	Check vanes, staotor, front flange and rear flange for wear. On reassembly use new 0-rings.	After 2500 hours of operation, check for premature wear. Thereafter, check every 5000 hours or once a year, whichever is shorter
Motor bearings	Unless otherwise specifically stated in the pump instructions, motor bearings are grease-filled and sealed for life. We recommend regular checks on motor bearing condition, and replacement when necessary.	Check otor manufacturer manuals or require it if not provided.

10. DECOMMISSIONING THE PUMP

Before the pump is decommissioned, it should be flushed out with clean water or another suitable liquid.

Thorough flushing out will help to ensure that:

a. if the pump stands idle for an extended period, it is not damaged by precipitation or encrustation of solids.

b. the pump does not contain dangerous amounts of corrosive, toxic or otherwise hazardous liquids when dismantled.

If there is any risk of FREEZING in cold weather, the pump and pipework should be drained down carefully after heating in order to prevent ice forming inside the pump casing.

It is the pump user's responsibility to ensure that the pump is in a safe condition before it is opened or worked on. If the pump is removed and stored, or returned to its supplier or to a third party for repair or overhaul, it must be clearly LABELLED, stating what substances or residues it may contain, warning the recipient of any possible hazard to health.

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11. DISASSEMBLING THE PUMP

These operations should be carried out only by skilled personnel. Damage caused by careless or improper disassembly or reassembly is excluded from the supplier's guarantee.

WORK IN A CLEAN AREA!!!

DO NOT ALLOW MAGNETIC MATERIALS TO CLING TO THE PUMP MAGNETS.

DO NOT USE FORCE!

The pump should be taken apart with the help of the labeled sectional drawing(s) supplied with it. If necessary the internal assembly of the pump can be removed from the pump casing without disturbing the pipework. If a spacer coupling is fitted between pump and motor, the pump can be dismantled without disturbing the motor.

11.1 Check that the pump has been fully drained and flushed out, before you start work on it.

11.2 Isolate the motor from its electrical supply.

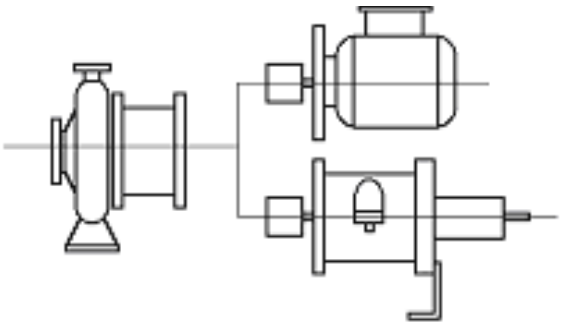
11.3 Isolate the pump from the rest of the hydraulic system. Isolate and disconnect any jacketing or other auxiliary pipework from the pump.

11.4 Discharge the oil from the bearing housing. Replace the oil chamber plugs.

11.5 Remove the spacer element of the coupling, or if no spacer is present, remove the motor. With close-coupled pumps, the motor and external magnet assembly must be removed carefully, without damaging the magnet. See 11.7.2 below.

11.6 Remove the external cooling/recirculation pipe by disconnecting the pipe unions at each end.

11.7 Dismantling the magnetic drive



SAFETY NOTE

See PRECAUTIONS WHEN WORKING WITH STRONG MAGNETS
Take care not to trap your fingers as the two halves of the magnetic coupling are separated

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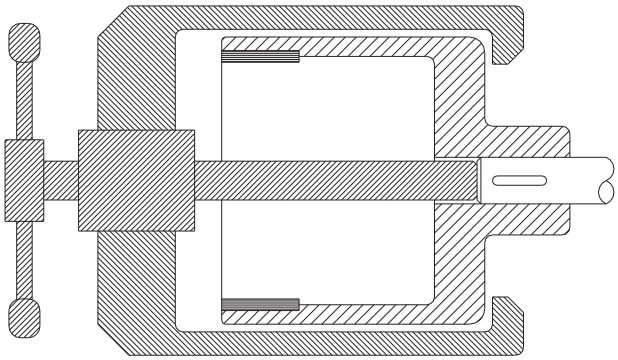
Remove the bolts securing the bearing housing to the bracket and carefully withdraw the external bearing housing with the external magnet attached.
Withdraw the external bearing housing and external magnet slowly and progressively, taking care to avoid damaging the brittle magnetic elements inside the external magnet.

11.8 Removing the external magnet from the motor shaft or the external bearing shaft

First loosen the grub screws securing the external magnet. Then use a puller to extract the magnet slowly and progressively from the shaft. If a suitable puller is not available, use wooden levers.

MAGNET PULLER



DO NOT STRIKE THE MAGNET! The magnetic elements are brittle and are easily damaged.

DO NOT ALLOW THE MAGNET TO FALL TO THE FLOOR!

11.15 Disassembly and re-assembly of the EXTERNAL BEARING HOUSING (long-coupled units only)

Drain oil from the pedestal housing. Loosen the grub screw and remove the external magnet from the shaft using a suitable extractor tool.

SEE SECTION DRAWING

Undo bolts and remove bearing covers (items 3261.1/2). Using a bench press, press out shaft (2130) together with outer bearing (3011.2). Press out the inner bearing (3011.1). Inspect bearings for wear and replace if necessary. Remove any burrs from shaft keyway.

Re-assembly

Using a bench press, insert inner bearing (3011.1) into pedestal housing. Assemble outer bearing (3011.2) and shaft (2130). Press shaft and bearing assembly into pedestal housing. Locate bearing covers onto pedestal housing, ensuring the oil ways are at the bottom. Replace and tighten bolts.

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12. INSPECTION PRIOR TO REASSEMBLY

Clean all the parts carefully. Ball bearings should be washed in a clean solvent and allowed to dry, then oiled. Check all pump parts and replace worn ones.

12.1 Check the clearances for pump parts and bearing frame where long coupled pumps are supplied.

13. REASSEMBLING THE PUMP

WORK IN A CLEAN AREA!
DO NOT ALLOW MAGNETIC MATERIALS TO CLING TO THE PUMP MAGNETS.

SEE PRECAUTIONS WHEN WORKING WITH STRONG MAGNETS.

IF LUBRICANTS OR THREADLOCKING COMPOUNDS (e.g.`LOCTITE') ARE USED ON ANY INTERNAL THREAD OR OTHER WETTED SURFACE IN THE PUMP, THEY MUST BE COMPATIBLE WITH THE PUMPED LIQUID. (If in doubt consult the manufacturer of the compound)

13.3.2 Stand the assembly with the free end of the shaft upwards.

Turn the rotor shaft by hand to check for free rotation, before reassembling the unit.

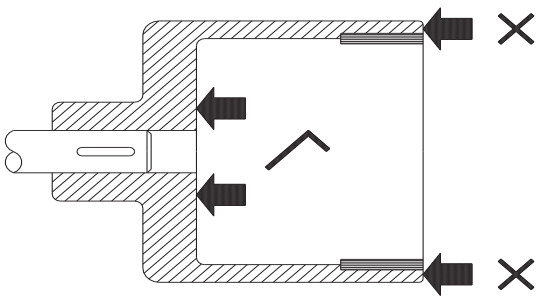
13.4 REASSEMBLY OF THE COMPLETE PUMP

13.4.6 A hydrostatic pressure test may now be carried out with water, to test for leaks. The standard pump is suitable for use at system pressures up to 16 bar. Test pressure must be performed at 24 bar.

13.5 REPLACING THE EXTERNAL MAGNET AND MOTOR OR BEARING HOUSING

13.5.1 Long-coupled units: Rebuild the external bearing housing if necessary: see 11.15.

13.5.2 Fit the external magnet on to the external bearing shaft or the motor shaft. First, clean the bore of the drive magnet hole and the surface of the shaft with fine emery paper, and lightly oil both surfaces. Fit the shaft key into the keyway. Push the magnet on to the shaft: it should be a smooth interference fit. If necessary, use a light hydraulic press to push the magnet into position, pressing on the inside base of the magnet hub. See Table below for correct positioning of the magnet on the shaft. - DO NOT STRIKE THE MAGNET!
The magnetic elements are brittle and are easily damaged.



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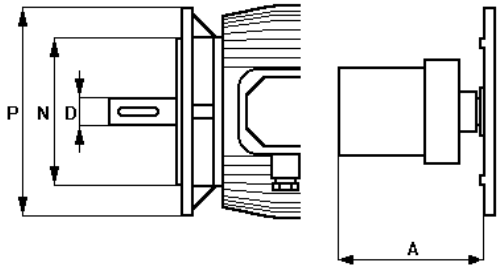
LOCATION OF EXTERNAL MAGNET ON MOTOR OR PEDESTAL SHAFT

CLOSE COUPLED UNITS						LONG COUPLED UNITS	
Pump SVM Model	Motor frame size	Dimensions			A		A
		P	N	D	mm		mm
SVM 1x…	71	160	110	14	90		
SVM 1,5x..	80	200	130	19	115		
SVM 2x…	90	200	130	24	147,5		



CLOSE-COUPLED UNIT

Insert key into shaft keyway and locate the outer magnet on the shaft in accordance with dimension "A" shown above, and tighten the grub-screw.

FOR LONG COUPLED PUMPS ONLY: Fill the bearing housing with oil to the middle of the sight-glass.

13.5.3 Refitting the external magnet (with its bearing housing or motor) to the pump
SAFETY NOTE - See PRECAUTIONS

Check the magnetic elements of the external magnet, and remove any loose metal particles attached to them. The magnet must be clean internally.

Fit the external magnet with its attached bearing housing or motor, into the pump bracket, using three JACKING BOLTS to bring the two magnets together progressively in a controlled manner. JACKING BOLT sizes are:

SVM series pumps: **M10 x 150mm**

Take care to avoid damaging the brittle magnetic elements inside the external magnet.
When the pump is fully assembled, turn it over by hand to check for free rotation.
The pump should turn over evenly, with no noise or extra resistance at any point.

13.6 Refitting the coupling **(long-coupled units only)**

Fit the two coupling halves to their shafts, checking that they run concentrically. Fit the spacer (if present). Check the coupling carefully for correct ALIGNMENT (see section 3).

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SVM INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

INSTALLATION RUNNING AND MANTENANCE INSTRUCTIONS for SVM PUMPS SLIDING VANE MAGNETIC DRIVE

TO OBTAIN THE BEST PERFORMANCE FROM YOUR "SVM" PUMP, PLEASE READ THESE NOTES CAREFULLY

- **Failure to observe the recommended procedures may result in early and severe damage to your pump and may also invalidate the guarantee.**
- **Locate the pump on a firm base close to the liquid source and not more than 1.5- 2.0 metres above it.**
- **Mount the pump horizontally if possible. If mounted vertically, the unit must be motor downwards.**
- **Keep the inlet pipe as short and straight as possible. If self-priming is required, ensure that the inlet line is completely airtight.**
- **The bore of the inlet and discharge pipes should be at least as large as the nominai bore of the pump ports.**
- **Use rigid or reinforced inlet pipe that will not deform or collapse under suction conditions.**
- **Align rigid pipes accurately with the pump ports, to ensure that the pump head is not distortedor damaged.**
- **Fit an inlet strainer of approx. 0.2 mm mesh if there is any risk of solid particles entering the pump.**
- **Use of an electrical starter is recommended. A simple switch is often inadequate for starting and stopping electric motors.**

  APPROPRIATE STARTER WILL: prevent accidental restarts after power-failure; provide a safe, waterproof switch enclosure; protect the motor with a correctly set overload cut-cut (a fuse protects only the wiring); withstand the heavy starting current of the motor, preventing arcing and rapid contact wear.

ESSENTIAL RUNNING PRECAUTIONS

a) *DO NOT RUN THE PUMP DRY*
Severe damage is liable to result from lack of lubrication to the rotor shaft and carbon cartridges.

b) *AVOID PUMPING LIQUIDS CONTAINING SUSPENDED* SOLIDS
Rotos SVM pumps are designed to handle clean liquids. The use of a 50-100 micron inlet strainer is strongly recommended. In particular, avoid pumping liquids containing iron oxides or other ferromagnetic particles, however small. If in doubt, please contact the Factory.

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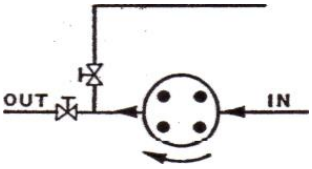
c) ***NEVER RESTRICT EITHER THE INLET OR DISCHARGE PIPE***

Restriction of the inlet is liable to cause the pump to cavitate leading to loss of efficiency and rapid wear. Restriction of the discharge - in the SVM pumps - is liable to overload the electric motor, reduced flow can be obtained, if required, by running a branch from the discharge back to the liquid source. (BY-PASS).

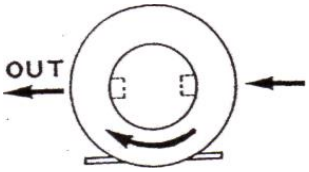


IF THE PUMP IS TO BE SHUT DOWN FOR AN EXTENDED PERIOD, ITIS ADVISABLE TO CIRCULATE CLEAN WATER FOR SEVERAL MINUTES TO AVOID THE RISK OF INTERNALINCRUSTATIONS OR PRECIPITATIONS.
(other solvents compatible with pump material can be used).

d) **Fill the pump body with liquid before starting the pump.**

THIS PROTECTS THE VANES AND INTERNAL PARTS AGAINST DRY RUNNING

e) **start the pump briefly to check the direction of rotation. The motor should rotate in the directionshown, viewed from in front of pump.**



IMPORTANT: do not run the pump in reverse. Reverse rotation will lead to accelerated wear and eventual failure.

The direction of flow may be reversed simply by rotating the pump and adaptor through 180° on the motor flange.

f) When running the pump, check that priming has taken place. If the pump does not prime rapidly, stop the motor and check for air leaks in the inlet line. If flow is poor or non-existent, check for adequate liquid supply, correct rotation of the motor.

To alter the direction of rotation of a three-phase motor changes any two connections. (SeeFig. 1).

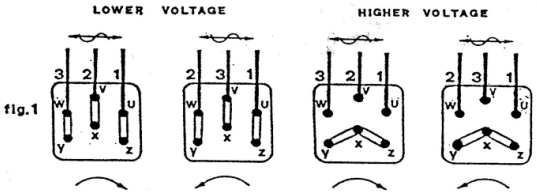


fig.1

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For a single-phase motor, reverse the polarity of the start winding in relation to the main winding. (See Fig. 2).

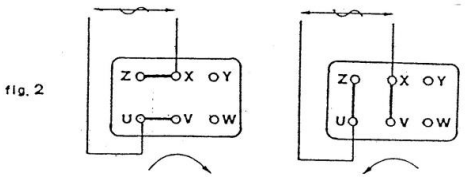


fig. 2

IF IN DOUBT OR DIFFICULTY, OBTAIN THE ASSISTENCE OF A QUALIFIED ELECTRICIAN

MAINTENANCE OF "SVM"

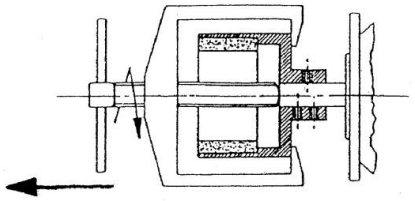
In general, Rotos "SVM" series pumps do not require routine maintenance, and therefore do not need to be dismantled frequently. If the recommended procedures are observed, the pump should give lengthy and trouble-free service. Worn graphite vanes and stator components may ultimately need to be replaced. Follow carefully the instructions for dismantling and re-assembling the pump, or retum to the Factory for overhaul.

NOTE: IT IS NOT ADVISABLE TO DISMANTLE THE PUMP IN-SITU: SMALL INTERNAL PARTS ARE EASILY LOST.

DESASSEMBLY SVM PUMPS

1. Isolate the pump from the rest of the liquid System.
2. Isolate the motor from the electrical supply.
3. Detach the motor and external magnet from the pump by removing the four bolts from the rearflange of the pump/motor adaptor.

LOOSEN LOCKING SCREWS ON THE SHAFT AND EXTRACT THE EXTERNAL MAGNET BY AN EXTRACTOR TOOL.



EXTERNAL MAGNET EXTRACTION

4. Remove the four screws attaching the pump head to the motor adaptor bracket.
5. The complete pump casing can now be removed from the adaptor, together with the O-ring seal.
6. Remove the four end screws from the pump head. Remove the end cover and the front O-ring seal.
7. Stand the rear surface of the internal magnet on a clean flat surface and press down gently and evenly on the pump body, which will slide down to expose the front graphite disc.
8. Remove the graphite disc, exposing the internal rotating assembly.

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9. If the pump is now inverted, the vanes should fall out, together with the internal locating pin. If the vanes do not fall out, they should be carefully extracted with a suitable pair of tweezers.

10. The graphite stator will now slide out of the pump body.

HEAT WITH HOT WATER THE PUMP HEAD TO FACILITATE STATOR EXTRACTION

To remove the rotor, together with the vane spacing pins, the internal magnet must first be detached from the rotor. The securing pin must be tapped out, with the rotor shaft held on a suitable support.

ROTOR SHAFT SUPPORT

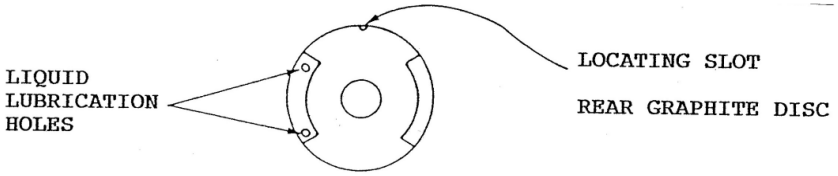
11. Slide the magnet off the rotor shaft. The rotor and vane spacing pins can now be removed fromthe pump body, together with the rear graphite disc.

RE-ASSEMBLY "SVM" PUMPS

1. Place the stainless steel body of the pump, front end uppermost, on a clean flat surface.

2. Using a wire guide (see below), insert the rear graphite disc into the pump body. (The rear discdiffers from the front disc in having no peripheral O-ring groove). To locate the disc correctly ensure that the port slots are aligned with the pump ports, with the liquid lubrication holes onthe side corresponding to the discharge.

HEAT WITH HOT WATER THE PUMP HEAD TO FACILITATE GRAPHITE INSERTION



Use a stiff wire (approx. 1 mm) guide to assist in correct alignment of the carbon stator components. Insert the wire into the locating hole near the outer edge of the rear inner flange of the stainless steel body. Then slide the rear disc into position, using the wire as a guide for the locating slot in the periphery of the disc.

3. Slide the carbon stator gently into position, using the wire guide in the same way. Do not strike or tap it, as this is likely to damage the graphite.

4. Pick up the rotor and hold it vertically, shaft downwards. Using tweezers, insert the two vane spacing pins at 90° to each other through the centre of the rotor. Ensure that the flat surfaces ofthe pins face each other.

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5. Carefully lower the rotor assembly halfway into the graphite stator.

6. Insert the four graphite vanes into the rotor slots. The vanes should be a close sliding fit; if they are too tight abrade the sides lightly with fine emery paper (on a flat surface) until a good fit isobtained.
ENSURE THAT THE CURVED EDGES OF THE VANES FACE OUTWARDS Push the rotar assembly fully home into the graphite stator.

7. Apply finger pressure to prevent rotation, remove the wire guide substitute the stainless steel locating pin.

8. Insert the front graphite disc, taking care to fit the upper end of the locating pin into the matching groove in the disc periphery.

9. Ensure that the O-ring and its seat are clean, then locate the O-ring on the graphite disc.

10. Replace the end cover, tightening the four screws uniformly.

11. Now slide the internal magnet on the rotor shaft and secure it with the expanding shaft pin. When inserting the pin, ensure that the shaft is correctly supported. (See Disassembly n. 8).

12. Locate the rear pump body in the pump motor adaptor, put the rear O-ring seal in place andinsert the pump head assembly, and screw it into place with four screws.

13. Attach the pump to the motor, taking care that the extemal magnet is correctly positioned onthe motor shaft.

N.B. The drain hole in the adaptor should be at the bottom centre.

PUMPING DENSE AND/OR VISCOUS LIQUIDS

- The flow rate vs. total head curves quoted is based on the performance test conducted with water at ambient temperature.
- If liquids of higher density or viscosity are pumped, the power taken by the electric motor will be correspondingly increased.
- Rotos "SVM" series sliding vane pumps will perform satisfactorily with liquids of specific gravity up to 2.0 and viscosity up to 2000 cps.

THESE VALUES ARE PURELY INDICATIVE. CONTACT ROTOS TECHNICAL DEPARTMENT FOR ADVICE ON PARTICULAR APPLICATIONS

Service kits are available for all Rotos SVM series sliding vane pumps, containing the complete internal rotating and static assembly together with static seal and gasket.

SEE DATA SHEET AND SECTIONAL DRAWING FOR PUMP MODEL CONCERNED
REPAIR OF ROTOS 'SVM" SERIES PUMPS

ROTOS DISTRIBUTOR OFFERS A COMPREHENSIVE REPAIR SERVICE SHOULD YOU REQUIRE IT. PLEASE CONTACT TECHNICAL DEPARTMENT FOR DETAILS

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14. PUMP OPERATING PROBLEMS: CAUSES AND REMEDIES

- **Provided your ROTOS pump is correctly installed and is operated within its designed performance envelope, it is capable of running for very long periods with minimal attention.**
- **Regular inspection, and preventive maintenance when necessary, will help to prevent breakdowns.**
- **There are many possible reasons why a pump may not run properly. If your ROTOS pump does not run satisfactorily, be prepared to look critically at the system as well as at the pump itself.**

This section lists some possible pumping problems and indicates how they may be overcome. Your pump supplier will do his best to assist you further if necessary.

14.1	**INSUFFICIENT FLOW or PRESSURE**	
	Causes	**Remedies**
14.1.1	Actual total discharge head exceeds rated head of pump.	Increase speed of rotation if possible. Reduce total head of system. Increase discharge pipework size. Check that discharge valve is fully open. Replace pump: seek advice from your pump supplier.
14.1.2	Pump rotating in reverse.	Check direction of rotation. Refer to section 6.2 of this manual.
14.1.3	Air or vapour trapped in inlet pipework.	Check for trapped air or vapour. Refer to section 4.4 of this manual.
14.1.4	Liquid contains entrained air or vapour. Liquid is foaming.	Check for vortexing in the inlet line. Fit baffles in supply tank to prevent vortexing. Fit a settling tank in the inlet line to allow entrained gas to separate from the liquid.
14.1.5	Low inlet pressure, giving rise to cavitation and loss of efficiency.	Decrease suction lift (negative head). Increase static suction (positive head). Check for inlet obstructions or restrictions. Reduce liquid temperature. Increase inlet pipework bore. Decrease length of inlet pipework. Open inlet valve fully. Check for excessive liquid viscosity: increase liquid temperature if necessary.
14.1.6	Wear on the carbon cartridges.	Remove the pump and replace the worn parts with new ones
14.1.7		Reduce liquid temperature.

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	Liquid temperature too close to boiling.	
14.1.8	Reversed ports	Rotate pump assembly 180°
14.1.9	Vanes sticking in the rotor	Extract the rotor and check the inside clearances of the vanes for evidence of chemical attack or surface deposition
14.1.10	Excessive suction head	Decrease the suction height. Check whether the suction pipe and foot valve has too small diameter. Inspect the suction pipe and foot valve to see whether there are any obstructions Open suction valve completely
14.1.11	Insufficient NPSH	Increase NPSH available to the figure on the contract. Check diameter of the suction pipe Remove any obstruction fron the suction pipe Check temperature of the pumped liquid

14.2	**NO FLOW**	
	Causes	**Remedies**
14.2.1	See 14.1.1 to 14.1.7	As in 14.1.1 to 14.1.7
14.2.2	Pump has lost its prime due to leackage of air into suction.	Reprime pump. Refer to section 7 of this manual. Check inlet line for air leaks. Check for loss of liquid supply.
14.2.3	Blocked inlet line.	Check for blocked pipework or strainers, and closed valves.
14.2.4	Insufficient depth of immersion of the suction pipe end under the level of the liquid (vortexing)	Increase the depth of immersion of the suction pipe.
14.2.4	Magnetic drive de-couples	Reduce discharge head: partly open discharge valve. Reduce liquid density. Check for free rotation of pump: inspect pump internally if it does not rotate freely. Discharge control valve closing too quickly Excessive internal wear Reduce motor power (check first with your pump supplier). Soft-start motor.
14.2.5	Motor has stopped.	Check power supply. Check motor conditions.

14.3	**EXCESSIVE FLOW**	
	Causes	**Remedies**
	Actual total discharge head is below rated head of pump.	Reduce speed of rotation if possible.

14.4	**MOTOR OVERHEATS AND/OR CUTS OUT**	
	Causes	**Remedies**
14.4.1	See 14.3.	As in 14.3.
14.4.2	Vanes stiking in the rotor	Extract the rotor and check. See above 14.1.9
14.4.3	Excessive liquid density or viscosity.	Reduce flow rate by reducing pump speed if possible.
14.4.4	Pump has seized or is about to seize.	Check pump for free rotation. Check pump internally for obstructions.

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14.4.5	Motor and pump miss-aligned.	Refer to section 3 of this manual.
14.4.6	Motor bearings are failing.	Replace motor bearings. Investigate cause of overload/failure.
14.4.7	Undersized motor.	Fit a larger motor: check first with your pump supplier.
14.4.8	Incorrectly set motor overload cut-out.	Check motor overload cut-out setting.
14.4.9	Electronic dry-running protector has tripped.	Check for loss of flow or loss of liquid supply.

14.5	**PUMP RUNS NOISILY AND/OR VIBRATES**	
	Causes	**Remedies**
14.5.1	Low inlet pressure, with cavitation, loss of efficiency, and loss of liquid film in pump bearings (and mechanical damage if allowed to continue). **STOP THE PUMP MMEDIATELY**	Refer to sections 14.1.5 and 14.1.7.
14.5.2	Worn, eroded, fouled or damaged internal parts.	Check pump internally for wear, damage or obstruction.
14.5.3	Motor and pump mis-aligned.	Refer to section 3 of this manual.
14.5.4	Worn coupling.	Replace coupling. Check alignment of motor and pump.
14.5.5	Worn external pump bearings or motor bearings.	Check bearings and replace if necessary.
14.5.6	Pump feet or motor feet or baseplate not firmly secured.	Check for 'soft-foot'. Refer to section 2 of this manual.
14.5.7	Mis-aligned or badly secured pipework.	Check pipework alignment and support. Refer to section 4 of this manual.
14.5.8	Pump started while rotating in reverse.	Stop pump immediately, reverse sense of rotation and re-start pump.

14.6	**OVERHEATED (EXTERNAL) PUMP BEARINGS (Long-coupled units only)**	
	Causes	**Remedies**
14.6.1	See 14.5.1 to 14.5.7.	As in 14.5.1 to 14.5.7.
14.6.2	Lack of oil, or incorrect oil in bearing housing.	Check oil level: refill, or drain and replace oil if necessary. Replace bearings if necessary.
146.3	Excessive temperature of pumped liquid.	Refill bearing housing with the correct oil for the working temperature of the pump.

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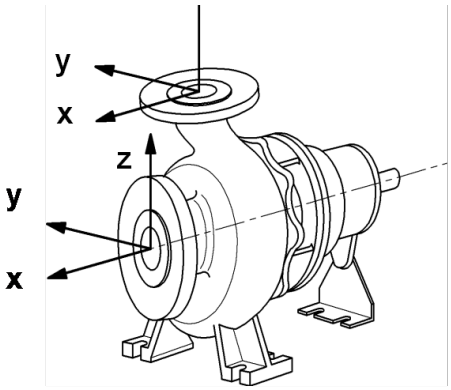
SVM INSTALLATION, OPERATION, AND MAINTENANCE MANUAL



TYPE	Flange	Torques - *(daN)*				Moments - *(daN.m)*			
		Fx	Fy	Fz	(F	Mx	My	Mz	(M
SVM 1x...	Suction	150	190	125	275	50	24	40	70
	Delivery	150	190	125	275	50	24	20	70
SVM 1,5x...	Suction	235	285	190	415	100	48	80	140
	Delivery	235	285	190	415	100	48	80	140
SVM 2x...	Suction	310	385	250	555	140	70	110	190
	Delivery	310	385	250	555	140	70	110	190

NOISE LEVELS

The following table reports the noise level produced by SVM pumps running with in their operating limits and installed according to the instructions given in this manual (average values measured in free field at 1 meter from the pump set and elaborated according to ISO standard R1680 – curve A).
The values are referred to groups with Aturia standard electric motors. For other motors the table values shall be compared to the actual used motors.

MOTOR SIZE	NOISE LEVEL dB (A)	
	4 POLES	6 POLES
63	60	58
71	60	58
80	61	59
90	62	60
100	62	60

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W A R N I N G

WORKING WITH STRONG MAGNETS

ESSENTIAL PRECAUTIONS

1	**Magnets can produce strong mechanical forces.**
2	**There is a danger of injury when two magnets are brought together by hand.**
3	**Magnets are brittle and are easily damaged. Breakage can occur when a magnet is placed near another magnet or iron object without mechanical guidance and special care.**
4	**If magnetic particles get into the eyes, get medical help immediately.**
5	**Heart pacemakers can be damaged.**
6	**Tools or other iron objects can be attracted suddenly.**
7	**Credit cards etc with magnetically stored information can be damaged.**
8	**Watches can be damaged.**

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