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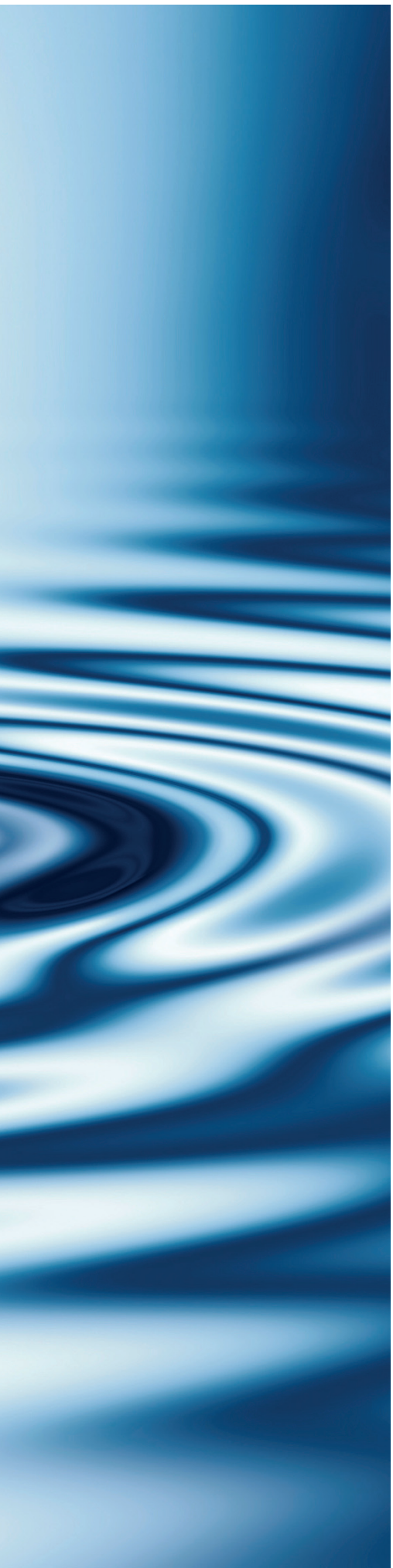
Installation and operating instructions

VM, VMC, VMN

Vertical Multistage
Centrifugal Pump, 50Hz



Approvals

EU Declaration of conformity

according to the Low Voltage Directive 2014/35/EU
and the Machinery Directive 2006/42/EC
and Electromagnetic Directive 2014/30/EU

For the following equipment:

Product:	Pump
Trademark:	Vertical Multistage Pump
Type Designation:	VM, VMC, VMN
Manufacture's Name:	Swiss Pump Company AG
Manufacture's Address:	Moosweg 36, CH-3645, Thun-Gwatt -Switzerland

is herewith confirmed to comply with the requirements set out in the Directive 2014/35/EU
And the Machinery Directive 2006/42/EC and Electromagnetic Directive 2014/30/EU.
For the evaluation of the compliance with this Directives, the following standards are applied:

EN ISO 12100:2010
EN ISO 13857:2008
EN 60204-1:2006
EN 809:1998
EN 6100-6-2:2005
EN 6100-6-4:2007
EN 60335-1:2012
EN 953:1997
EN 60335-2-41

Responsible for making this declaration is the:
Manufacture [V] Authorized representative established within the EU [ ]
Authorized representative established within the EU (if applicable):

Company Name:	Swiss Pump Company AG
Company Address:	Moosweg 36, CH-3645, Thun-Gwatt -Switzerland

Person responsible for making this declaration

Name, Surname:	Michael Bähler
Position/Title:	production Manager

(Place)	(Date)	(Company stamp and legal signature)
Switzerland	12/09/2019	

Contents

Handling

Read these instructions carefully before beginning installation. Lift and handle these pumps carefully.
VM, VMC, VMN series are vertical multi-stage non-self priming pumps coupled with standard electric motors.
This manual applies to standard version pumps and for standard applications.
Contact your supplier or the factory for information about special pump versions and applications.

Applications

VM, VMC, VMN series in-line pumps booster pumps are designed for a wide range of applications in various industries for water treatment, water boosting, water supply, cooling, cleaning, etc.

Pumped liquids

The pumps are designed for use with clean, viscous and non-explosive liquids that do not contain abrasive matter.

WARNING! These pumps are not designed to be used with abrasive, solid containing, explosive and corrosive liquids. For special application, please contact your supplier or the factory.

Technical data

Temperatures

Ambient temperature: 0°C to +40°C

Liquid temperature: -15°C to +120°C

WARNING! If ambient temperatures are above +40 degrees °C, or if the pump is located at elevations more than 1,000 meters above sea level, the motor's output must be decreased to compensate for less effective cooling, and may have to be replaced with a stronger motor.

Electrical Data

See the motor nameplate.

WARNING! Make sure that the supply voltages, phase and frequencies correspond to the motor specifications.

Number of starts per hour

Motors up to and including 4 kW: Maximum 100 times per hour.

Motors of 5.5 kW and up: Maximum 40 times per hour.

WARNING! If you use another brand of motor then check the manufacturer's instructions for the maximum frequency of starts.

Definition of Model

VM - 10 - 5 - SQQE

- SQQE — Code for shaft seal
- 5 — Number of stages
- 10 — Nominal flow (m^3/h)
- VM — Type Ranges

Minimum inlet pressure NPSH

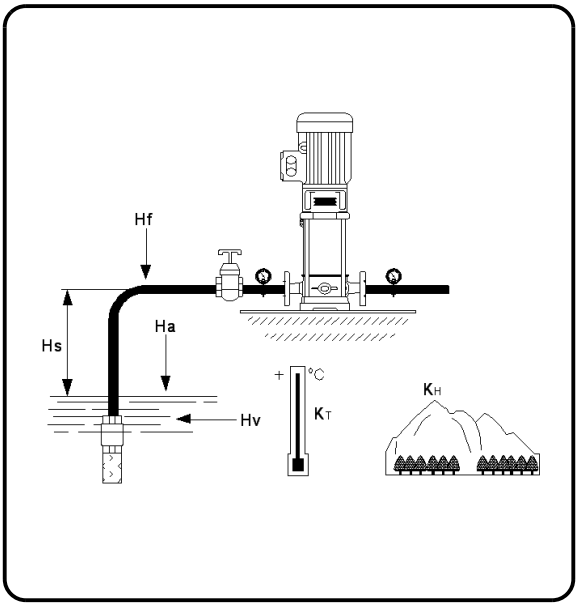
To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump.

NPSHA: Net Positive Suction head Available

The net positive suction head available is a function of the pump suction system.

NPSHR: Net Positive Suction head required
The net positive suction head required is a function of the pump design at the operating point on the pump performance curve.

NPSHA=Ha-Hs-Hf-Hv-Hst (in meters head)



Ha: Barometric pressure.(That can be set to 10.2 m.)
Hs: Suction lift.
Hf: Friction loss in suction pipe.
Hv = KT+KH: Vapor pressure
KT: Flow resistance due to liquid temperature.
KH:Flow resistance due to elevation above sea level.

If the liquid is water, you can consult the tables to determine the values of KT and KH.

T (C)	20	30	40	50	60	70	80	90	100	110	120
KT (m)	0.2	0.4	0.8	1.3	2.2	3.3	5	7.4	11	15	22
H (m)	0	500	1000	1500	2000	2500	3000				
KH (m)	0	0.55	1.1	1.65	2.2	2.75	3.3				

Hst: Safety margin. (minimum: 0.5 meters head)
$NPSH_A \geq NPSH_R$: Pump running will be fine.
$NPSH_A < NPSH_R$: The pump will be dry running or cavitating.

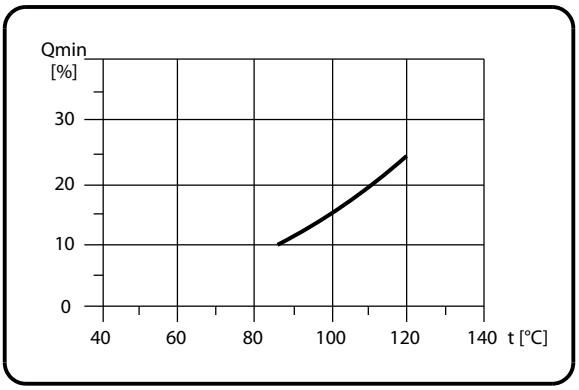
WARNING! Stop operation of the pump if cavitation occurs.
Cavitation will cause pump damage and the resultant damage is not subject to warranty.

Minimum nominal flow rate

To prevent overheating of the internal pump components, the pump should not be used at flows below the minimum flow rate.

WARNING! Do not run the pump against a closed discharge valve for longer than a few seconds.

The curve shows the minimum flow rate as a percentage of the nominal flow rate in relation to the liquid temperature.



Maximum Inlet Pressure and Operating Pressure - 50Hz

Stages	Maximum Inlet Pressures	Stages	Maximum Operating Pressure
VM, VMC, VMN 1			
2 - 36	10 bar	2 - 36	25 bar
VM, VMC, VMN 3			
2 - 29	10 bar	2 - 36	25 bar
31 - 36	15 bar		
VM, VMC, VMN 5			
2 - 16	10 bar	2 - 36	25 bar
18 - 36	15 bar		
VM, VMC, VMN 10			
1 - 6	8 bar	1 - 16	16 bar
7 - 22	10 bar	17 - 22	25 bar
VM, VMC, VMN 15			
1 - 3	8 bar	1 - 10	16 bar
4 - 17	10 bar	12 - 17	25 bar
VM, VMC, VMN 20			
1 - 3	8 bar	1 - 10	16 bar
4 - 17	10 bar	12 - 17	25 bar
VM, VMC, VMN 32			
(1 - 1)-4	4 bar	(1-1)-7	16 bar
(5-2)-10	10 bar	(8-2)-14	30bar
(11-2_-14	15bar		
VM, VMC, VMN 45			
(1-1)-2	4 bar	(1-1)-5	16 bar
(3-2)-5	10 bar	(6-2)-11	30 bar
(6-2)-(13-2	15 bar	(12-2)-(13-2)	33 bar
VM, VMC, VMN 64			
(1 - 1)-(2-2)	4 bar	(1-1)-5	16 bar
(2-1)-(4-2)	10 bar	(6-2)-(8-1)	30bar
(4-1)-(8-1)	15bar		
VM, VMC, VMN 90			
(1 - 1)-1	4 bar	(1-1)-4	16 bar
(2-1)-(3-2)	10 bar	(5-2)-6	30bar
3-6	15bar		

Maximum Inlet Pressure and Operating Pressure - 50Hz

Stage	Max. inlet pressure	Stage	Max. operating pressure
VM, VMC, VMN 120			
1-2	10 bar	1-7	30 bar
2-(5-1)	15 bar		
(6-1)-7	20 bar		
VM, VMC, VMN 150			
(1-1)-1	10 bar	(1-1)-6	30 bar
(2-1)-(4-2)	15 bar		
(5-2)-6	20 bar		

Maximum Inlet Pressure and Operating Pressure - 60Hz

Stages	Maximum Inlet Pressures	Stages	Maximum Operating Pressure
VM, VMC, VMN 1			
2 - 25	10 bar	2 - 27	25 bar
27	15 bar		
VM, VMC, VMN 3			
2 - 15	10 bar	2 - 25	25 bar
17 - 25	15 bar		
VM, VMC, VMN 5			
2 - 9	10 bar	2 - 24	25 bar
10 - 24	15 bar		
VM, VMC, VMN 10			
1 - 5	8 bar	1 - 10	16 bar
6 - 18	10 bar	12 - 17	25 bar
VM, VMC, VMN 15			
1 - 2	8 bar	1 - 8	16 bar
3 - 12	10 bar	9 - 12	25 bar
VM, VMC, VMN 20			
1	8 bar	1 - 7	16 bar
2 - 10	10 bar	8 - 10	25 bar
VM, VMC, VMN 32			
(1-1)-(2)	4 bar	(1-1)-(5)	16 bar
(3-2)-(6)	10 bar	(6-2)-(10-2)	30 bar
(7-2)-(10-2)	15bar		30 bar
VM, VMC, VMN 45			
(1-1)-1	4 bar	(1-1)-4	16 bar
(2-2)-3	10 bar	(5-2)-7	30 bar
(4-2)-7	15bar		
VM, VMC, VMN 64			
(1-1)	4 bar	(1-1)-3	16 bar
1-(2-1)	10 bar	(4-2)-(5-2)	30 bar
2-(5-2)	15bar		30 bar
VM, VMC, VMN 90			
(1-1)-(2-2)	10 bar	(1-1)-3	16 bar
(2-1)-(4-2)	15 bar	(4-2)	30 bar

Maximum Inlet Pressure and Operating Pressure - 60Hz

Stage	Max. inlet pressure	Stage	Max. operating pressure
VM, VMC, VMN 120			
1	10 bar	1-(5-2)	30 bar
(2-2)-(3-1)	15 bar		
3-(5-2)	20 bar		
VM, VMC, VMN 150			
(1-1)	10 bar	(1-1)-(4-2)	30 bar
(1-2)	15 bar		
(3-2)-(4-2)	20 bar		

Installation

Always refer to the local or national regulations and codes relating to the selection of the installation site, the water and power connections, etc.

Position

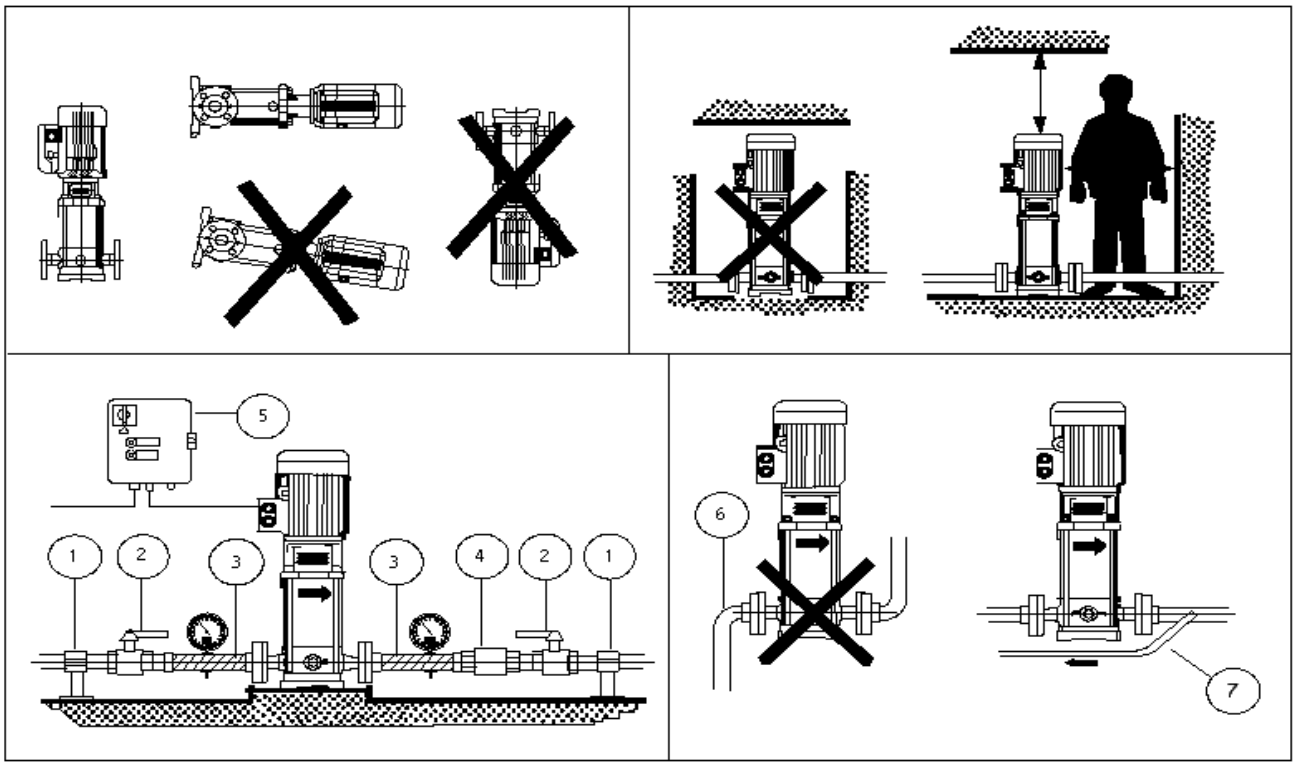
Pumps should be installed in a protected environment, not exposed to weather.
Make sure that there are no obstructions to prevent proper motor cooling.

Anchoring

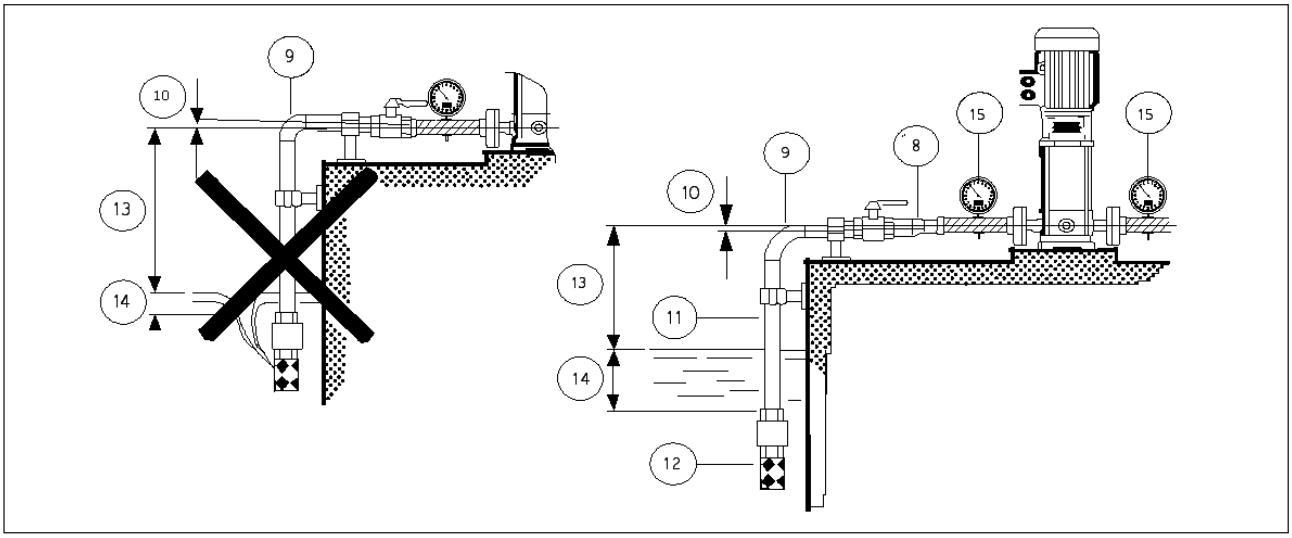
The pump must be secured to a solid foundation by bolts through the holes in the flange or base plate.

Installation example

When positioning and installing the pump, follow the installation examples next page in order to avoid damaging the pump.



No.	Description
1	Pipe support: Support piping system properly to avoid stresses on connections.
2	On-off valves: Install on-off valves for easy access, before the pump intake and after the pump discharge.
3	Use flexible piping on both input and output sides of the pump to reduce vibration and transmission of noise.
4	Check valves will prevent return flow of pumped liquid when pump is stopped, reducing the danger of pump damage.
5	Control Panel: Use high quality components. Make sure that the panel conforms to local standards and regulations.
6	Do not place elbows next to the pump intake and discharge.
7	If pump needs to be operated with on-off valve closed, install a by-pass line to avoid damaging the pumping system.



No.	Description
8	If it is necessary to increase the diameter of the suction pipe, place an eccentric reducer between the check valve and the flexible pipe section.
9	Using elbows will increase the flow resistance. Wide bends will result in lesser flow resistance.
10	The piping must have a level or positive gradient to prevent the formation of air pockets.
11	The diameter of the drop pipe must be bigger than the diameter of the pump's suction port.
12	Use a foot valve in case of negative suction head.
13	Size pump for correct head.
14	Place the intake of the suction pipe so that the intake is always submerged to prevent entry of air.
15	Install a compound gauge at the pump suction and a pressure gauge at the pump discharge.

Electrical connection

- All electrical connection should be in accordance with the local regulations and made by a qualified electrician.
- Make sure that the supply voltages and frequencies, and phase are suitable for the motor used.
- Before proceeding, make sure that all the connections are grounded and well insulated.
- Overload protection should be provided.
- To connect, proceed as shown on the inside of the terminal board cover.
- The terminal box can be turned to four positions.
- Check the direction of rotation (Three-phase motor only).
- Make sure that the controls are properly grounded.
- To avoid the possibility of dry running, we strongly recommend installing dry running protection.

Start-up

The pump and suction pipe should be filled with the liquid to be pumped before start-up to prevent dry running at start-up.

WARNING! Dry running can damage the pump bearing and shaft seal.

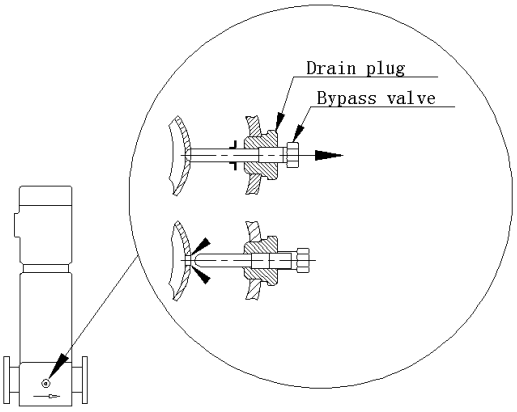
- Start the pump and check the direction of rotation of the motor (Three –Phase motors).
- Start the pump, keeping the on-off valve of the discharge side of the pump closed. Then, open the on-off valve slowly. The pump must run smoothly and noiselessly. If not, then it may be necessary re-prime the pump.
- Check the current drawn of the motor. If necessary, adjust the setting of the thermal relay.
- Any air pockets trapped inside the pump may be released by adjusting the air screw.

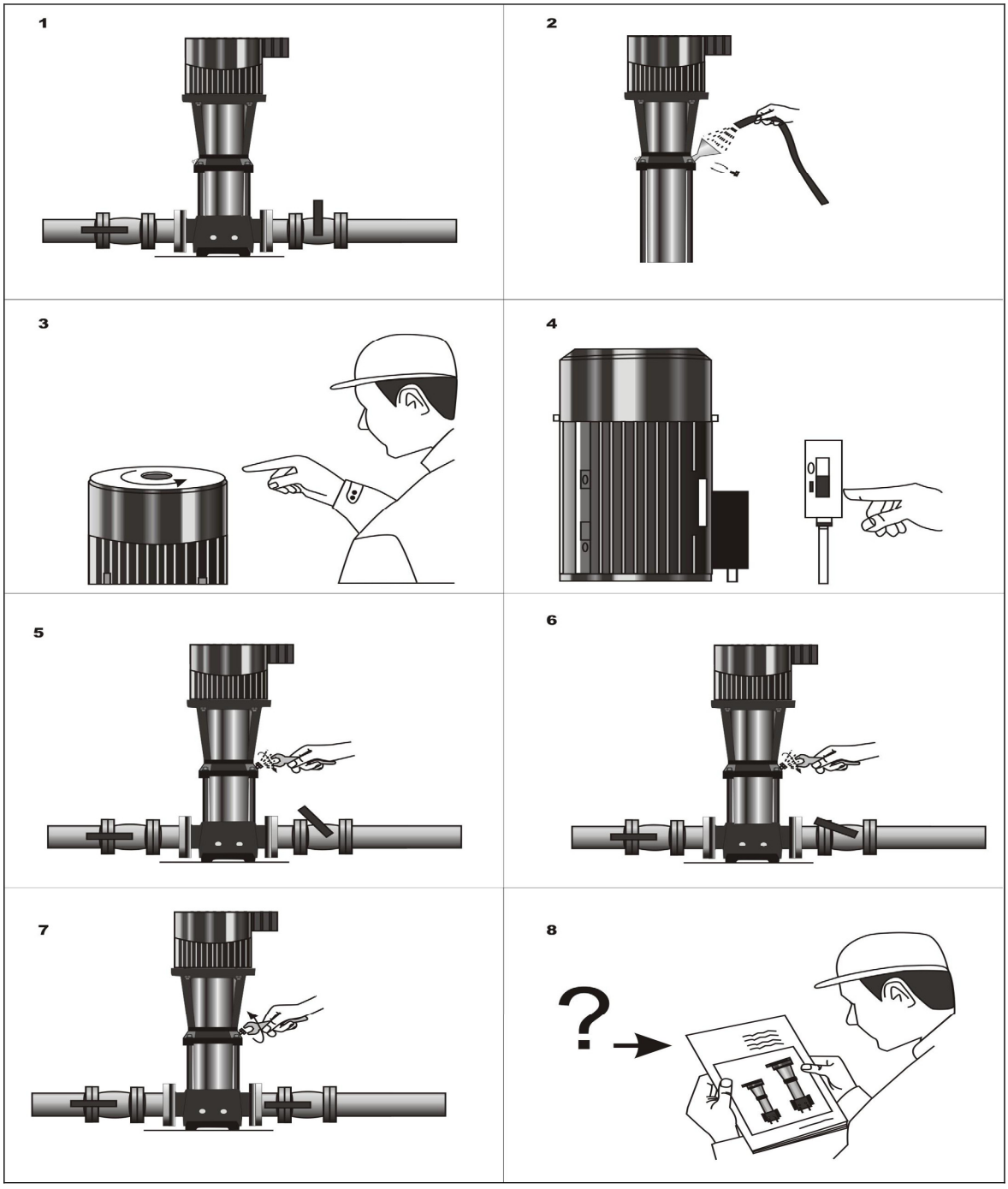
WARNING! If the pump is installed in a location where it is subject to freezing when not in operation, then the pump and the pipe system should be drained to prevent damage from freezing.

For VM, VMC, VMN 1, 3, 5 series

For these pumps, it is advisable to open the bypass valve during start-up. The bypass valve connects the suction and discharge sides of the pump, thus making the filling procedure easier. When the operation is stable, the bypass valve can be closed.

- If the pumped liquids contains air, it is advisable to leave the bypass valve open if the operating pressure is lower than 6 kg/cm^2. If the operating pressure constantly exceeds 6 kg/cm^2, the bypass valve must be closed. Otherwise the material at the opening will be worn because of the high liquid velocity.



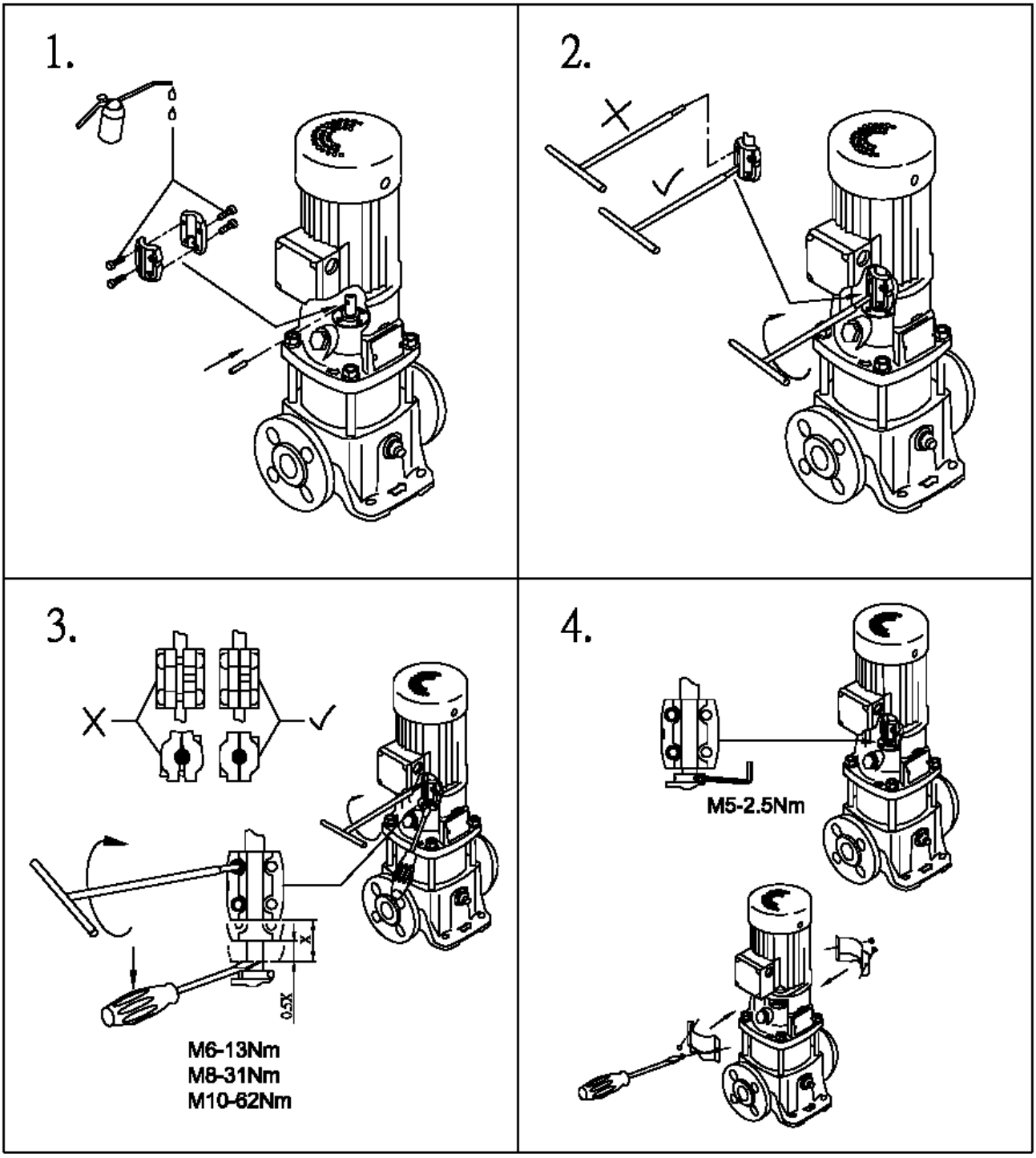


Maintenance

WARNING! Before starting maintenance work on the pump, the motor, or other parts of the system, make sure that the power supply has been switched off.

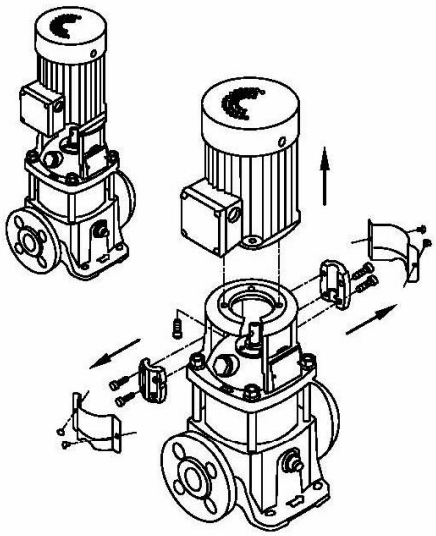
- The pump does not have a recommended scheduled maintenance schedule.
- If the motor is fitted with grease nipples, then the motor should be lubricated with a high temperature lithium-based grease. If not, then the motor does not require regular maintenance.
- If the pump and motor are used infrequently with long intervals of non-operation, then we recommend that the motor be greased.

VM, VMC, VMN 1, 3, 5 Coupling adjustments



VM, VMC, VMN 10, 15, 20 Coupling adjustments

1



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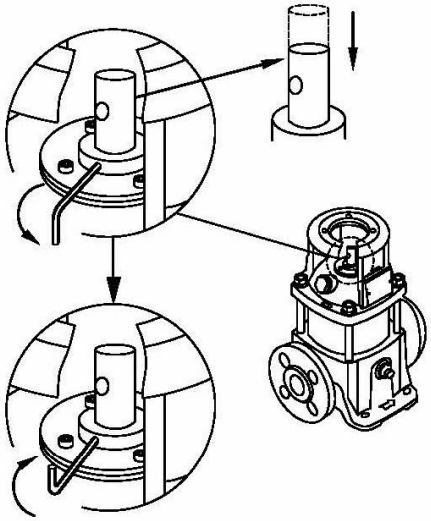
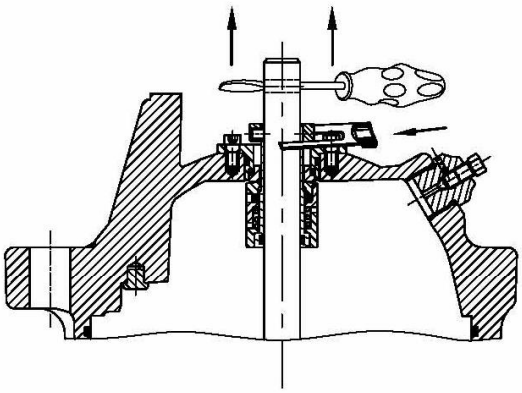


M5-2.5Nm

3



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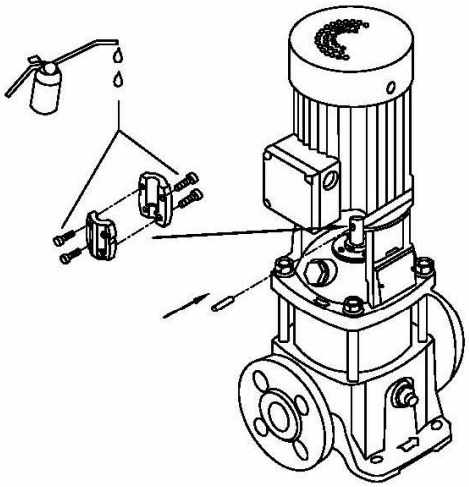

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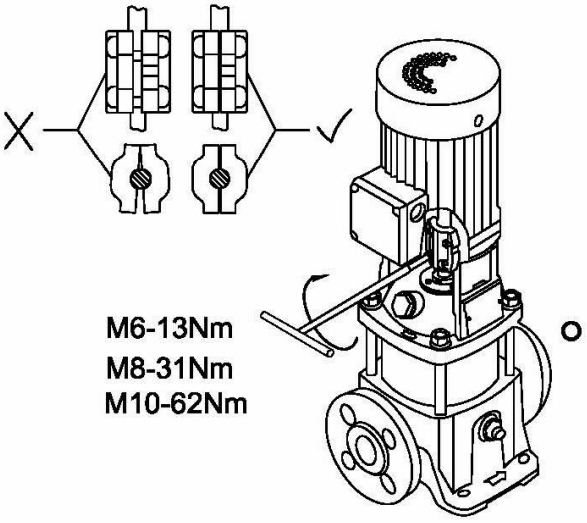
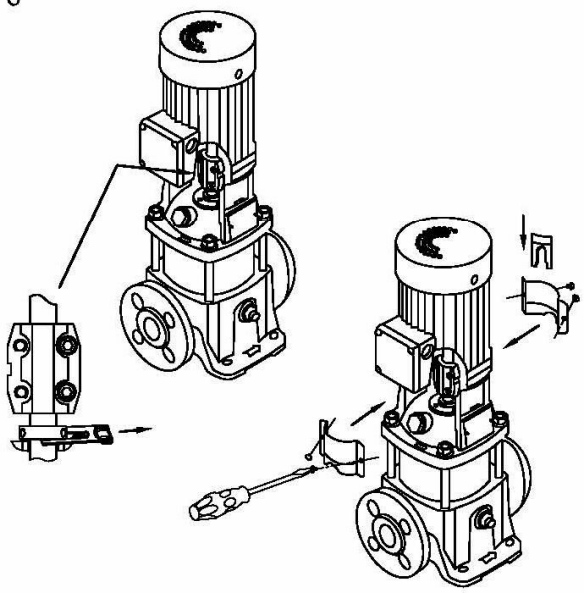
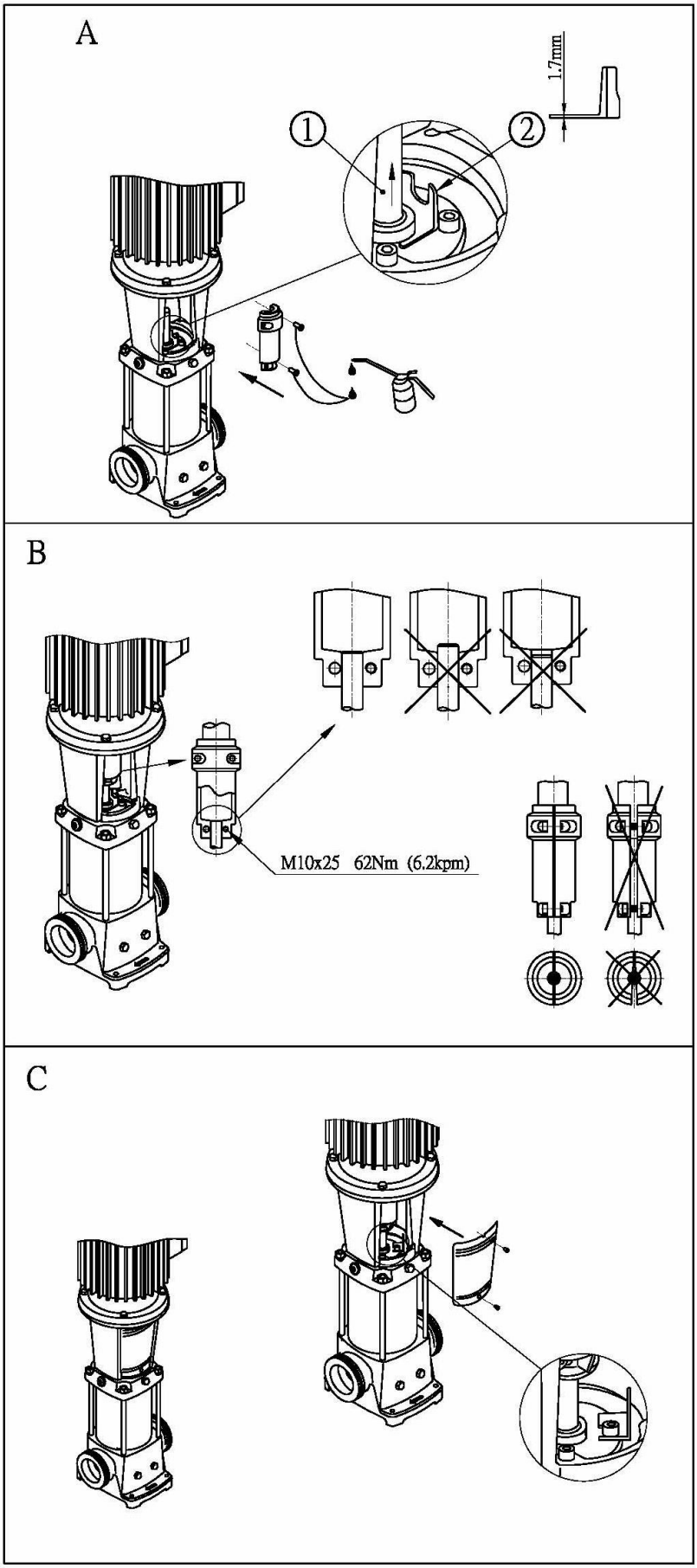


M6-13Nm
M8-31Nm
M10-62Nm

6



VM, VMC, VMN 32, 45, 64, 90 Coupling adjustments



Troubleshooting

Fault	Cause	Solution
Pump does not run when the motor starter is activated	Supply failure or no power supply	Check connections or restart the power supply
	Main contacts in motor starter are not making contact or the motor coils are defective	Reconnect or replace contacts or magnetic coil
	Pump or piping system may be obstructed causing a jam	Clean the obstruction and restart pump
	Pump or auxiliary circuits protection fuses blown	Replace fuses
	Tripping of anti-dry running protection	Check the water level in the tank or the water system pressure. If everything is in order, check the protection device and its cables
	Motor protector or thermal relay has tripped out	Reset the motor or thermal protector
	Motor may have failed	Replace the motor
Starter overload trips immediately when the power is switched on	Overload setting is too low	Set the motor starter correctly
	The cable connection is loose or faulty	Fasten or replace the cable connection
	One fuse is blown	Replace fuse and try starting again
	Pump is jammed by an obstruction	Check and clean obstruction from system
	Contacts in overload are faulty	Replace motor starter contacts
	The motor winding is defective	Replace the motor
	Low voltage (Especially at peak time)	Check the power supply
The pump starts up but, after a period of time, the thermal protector trips out or the fuses blow.	Worn motor bearings causing motor to overheat	Replace motor bearings
	The pump's delivery rate is higher than the specified rate on the pump nameplate	Partially close the on-off valve located discharge side until the delivery rate returns to within the specified limits
	There are obstructions inside the pump or pumping system	Disassemble and clean the pump and piping
	Less viscous liquids may cause the motor to work too hard and overload the motor, causing the motor to overheat	Check the actual power requirements based on the characteristics of the liquid being pumped, and replace the motor accordingly
The pump start, but after a short time the thermal protector trips	The voltage is not within the motor's operating limits	Check the operating of the pump
	The control panel is situated in an excessively heated area or is exposed to direct sunlight	Protect the control panel from heat sources and from the sun
	A phase in the power supply is missing	Check the power supply

Fault	Cause	Solution
Pump runs but no water delivered	Pump is not primed with liquid	Fill the pump with the liquid to be pumped
	The pump, suction or discharge pipes are blocked by solids in the liquid being pumped	Clean the pump, suction or discharge pipe
	The foot or check valve is blocked or has failed	Replace the foot or check valve
	The suction pipe leaks	Repair or replace the suction pipe
	The air is in the suction pipe or pump	Remove trapped air from system
	Motor operating in wrong direction (three-phase motor)	Change the direction of rotation of the motor by reversing motor connections
The pump capacity is not constant	The pump draws in air or the inlet pressure is too low	Improve the suction conditions
	The pump or the suction side of the piping system partly blocked by foreign bodies	Clean the pump or suction pipe
The pump rotates in the wrong direction when switched off	The foot or the check valve has failed	Check and replace check valve
	Leakage in the suction pipe	Repair or replace the suction pipe
The system's general protection cuts in	Short circuit	Check electrical system
The frequency of Pump start-up is too high	Leakage in the foot valve, check valve or system	Repair or replace the components
	Ruptured membrane or no air pre-charge in surge tank	See relevant instructions in surge tank's manual
Vibration and noise	Cavitation	Reduce the required flow or improve the operating conditions of the pump (suction conditions, head, flow resistance, liquid temperature)
	Make sure that pump and motor shafts are properly aligned	Adjust the pump and/or motor shafts
	Worn motor bearings	Replace the bearings or the motor
	Operation with frequency converter	Consult a qualified engineer form the supplier of the frequency converter
	Check vibration and noise damping devices	Replace vibration & noise dampers, if worn

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