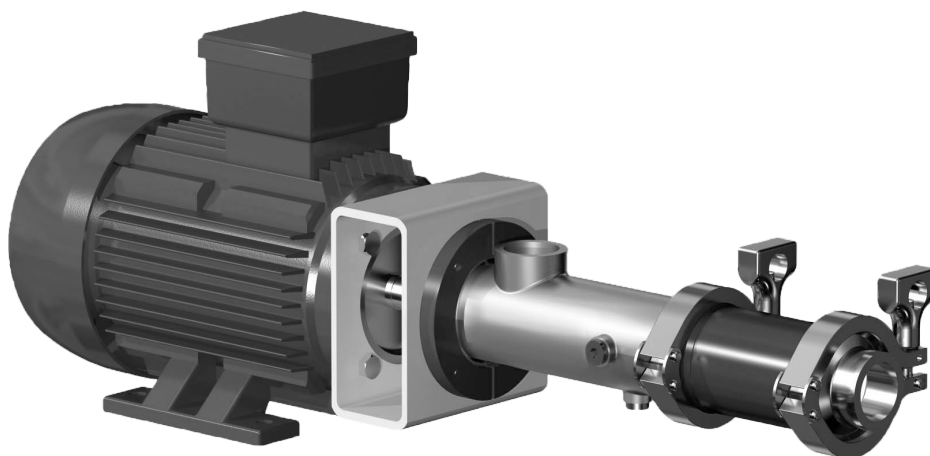


Installation, operation and maintenance instructions for Flowrox™ series D progressive cavity pumps

Installation, maintenance and operating instructions



These instructions must be read carefully and understood prior to the installation, use, and servicing of this product.

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READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the product.

If you require additional assistance, please contact the manufacturer or manufacturer's representative.

SAVE THESE INSTRUCTIONS!

Addresses and phone numbers are printed on the back cover.

1 EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of the manufacturer:

Valmet Flow Control Oy

Marssitie 1

53600 Lappeenranta

Finland

Tel. +358 (0)10 417 5000

Product model/type: Progressive Cavity Pump

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

Machinery Directive 2006/42/EC: Annex II A

Follow the pump installation, operating and maintenance instructions in this manual.

On behalf of Valmet Flow Control Oy

In Lappeenranta, 31 May 2022



Riku Salojärvi

Head of Operations

1.1 Mechanical warranty for progressive cavity pumps

The warranty is valid for 12 months from the delivery date, excluding the following:

- Wear parts, such as seals and bearings.
- Pumps that the first buyer has resold without a written agreement with the pump vendor regarding the remaining portion of the guarantee period.
- Damage caused directly or through negligence as a result of the incorrect use of the pump, of structural changes made to the pump, or of the use of parts that are not approved by the original manufacturer.

The purchaser must file a claim (see the appended claim form) for all compensation related to the pump guarantee within 30 days from detection of the fault.

If the terms indicated on the claim form are not complied with, the purchaser loses his or her right to the guarantee.

The guarantee compensates for new parts if any damaged parts must be replaced. Terms of delivery: packed at the factory, with no other costs covered.

The supplier shall reimburse the customer for the value of the parts, excluding the freight charges, packaging costs, and other expenses, upon the following conditions:

The pump must have been used only for its intended purpose.

All claims regarding a faulty part require that the part in question, along with a description of the operation conditions and operation methods used, be delivered to Valmet Flow Control for chemical and mechanical analysis

Any reimbursement for a faulty part shall be made only after the part's examination.

2 SAFETY INSTRUCTIONS

This manual provides basic instructions for the safe implementation and maintenance of the equipment. All persons working with the pump must read this manual before installing the pump and bringing it into use. The manual must be made readily available in the immediate vicinity of the machine.

2.1 General safety instructions

These instructions use the following symbols to call particular attention to key points. If the associated safety measure is neglected, this may pose a danger to the pump or the person operating it:

Hazard severity panels.

	 DANGER! DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	 WARNING! WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	 CAUTION! CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

SYMBOL	DESCRIPTION
	Risk to personal safety: Neglecting the safety measures could cause serious personal injury or death.
	ELECTRICAL SAFETY: Neglecting the safety measures could cause serious personal injury or death.

	FALLING LOAD HAZARD
	CRUSHING HAZARD
	Read the operation and maintenance instructions: Read and understand the operation and maintenance instructions before using the product.
	Mandatory action symbol: Obey these instructions to prevent machine malfunctions.

Before any maintenance operations commence, the pump must be emptied of all hazardous substances, to avoid causing danger to the personnel or the environment.

Before starting maintenance work, ensure that the pump is closed from the piping pressure with valves both from the suction and pressure side and is thus in a non-pressurised status.

To avoid accidents when beginning installation work, ensure that the equipment is disconnected from the mains.

The pumps are equipped with the safety equipment required by national/supranational regulations. Therefore, the pump unit power supply must be equipped with at least the following electrical safety equipment:

- emergency switch
- locked main switch (supply disconnect switch)
- fuses
- motor overload protection
- automatic touch voltage protection (dangerous situation due to electrical fault)

If the surface temperature of a progressive cavity pump exceeds 80°C during normal operation of the pump, the necessary measures must be taken for preventing unintentional touching of pump surfaces, to avoid burns.

Noise nuisances: Exposure to momentary intense noise can cause temporary hearing loss. In most of these cases, hearing recovers to the normal level after rest. Long-term exposure to noise can cause irreversible damage to hearing. Sensitivity to noise is individual, and some people may develop temporary hearing loss even from a noise of 75 dB (A). Continuous noise of more than 90 dB (A) nearly always causes severe hearing loss. The lower daily noise exposure action value is 80 dB, and the higher action value is 85 dB. Daily noise exposure refers to an A-weighted sound level that represents exposure to noise, including impulse noise, over an eight-hour working day without hearing protection. If the lower action value is exceeded, the employer must ensure that the person subject to the noise wears hearing protection.

In some cases, the noise of Flowrox series D progressive cavity pumps may exceed 80 dB (A) when the noise is measured from a distance of 1 m. In such a case, staying in close proximity to the progressive cavity pumps without hearing protection should be avoided.

2.2 Selecting operation, maintenance, and installation personnel

Operation, maintenance, and installation personnel must familiarise themselves with the safety and installation instructions regarding the equipment. The qualifications of the personnel, spheres of responsibility, and monitoring of the installation must be attended to. If one of the personnel does not possess the necessary information regarding the pump, training must be provided by the equipment manufacturer/supplier in accordance with the contract.

Neglecting the safety instructions may lead to serious personal harm or damage to the environment or equipment. Furthermore, neglecting the safety instructions may void the guarantee.

2.3 Safety instructions for the personnel

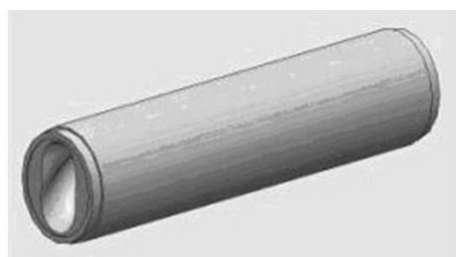
When the pump is running, protectors covering the moving parts of the pump must not be removed, in any circumstances.

3 INTRODUCTION TO THE PUMP

3.1 General description of the pump

Flowrox progressive cavity pumps belong to the class of displacement pumps. This pump type does not need to use intake or pressure valves, and it generates a steady volume flow in relation to the rotation speed. The pump can be used to pump non-homogeneous, gas-bearing, and wearing agents.

The structure of a progressive cavity pump consists of two main components: a fixed rubber stator and a spiral-threaded rotor rotating inside it. The Flowrox D-series progressive cavity pumps use normal stators with a round metal outer surface.



ROUND STATOR



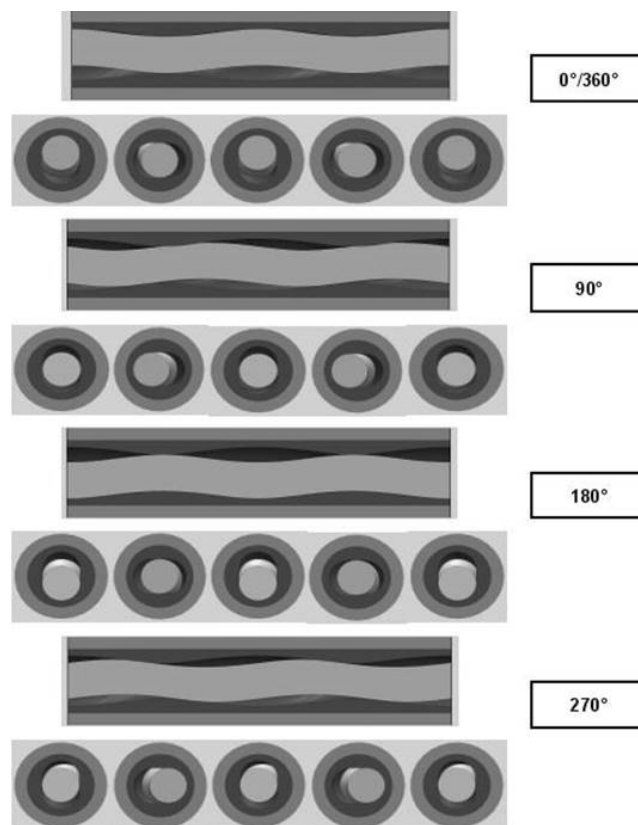
ROUND ROTOR

Principle of operation

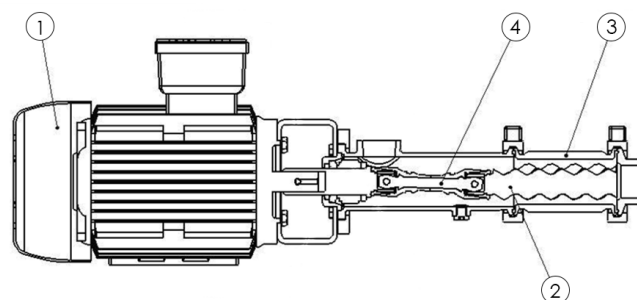
The adjacent image series presents the principle of operation of a series D progressive cavity pump.

As the rotor rotates inside the stator, there is room for liquid transfer between the stator and rotor surfaces. This transfer space moves from the suction side of the pump towards the pressure side as the rotor rotates, enabling the liquid being pumped to move forward.

The series D pumps are designed for use in a range of dosing applications.



3.2 Mechanical structure



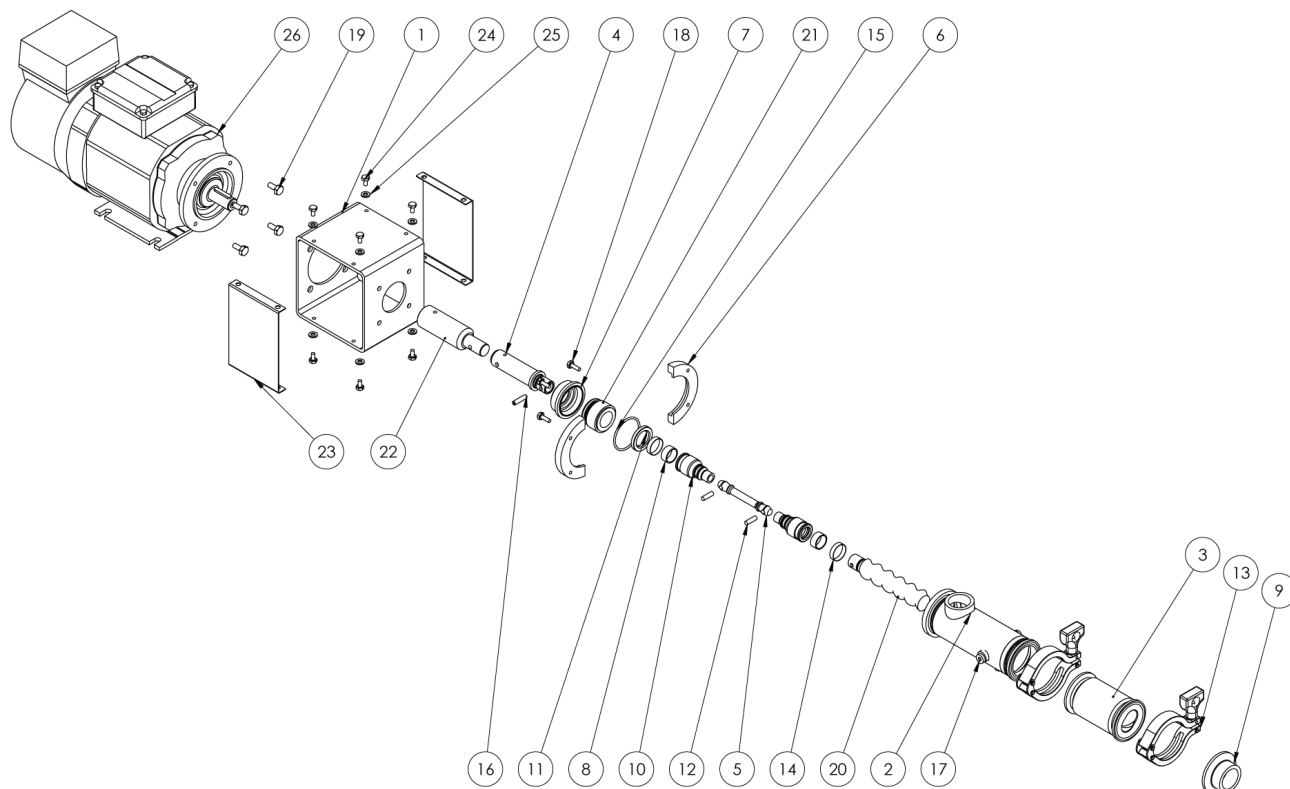
The figure above depicts the cross-section of a series D dosing pump with the parts of the pump structure visible.

A series D progressive cavity pump has a single-purpose seal installed inside the suction pipe to prevent the pumped medium from leaking from the motor end of the suction pipe.

The pump uses a bearingless, so-called block-model frame and a gearless motor. The motor (1) rotates the rotor (2) inside the stator (3) via the articulated shaft (4) and thus

creates the pumping action. A bearing is not required in the stator end of the pump, because the stator and rotor structure act together as the articulated shaft's bearing.

As the articulated shaft rotates, its angle changes because of the rotor's non-centred structure. The ball-like and oiled joints of the articulated shaft are protected by rubber seals suitable for the liquid being pumped.



Item no.	Description	Qty
1	Frame	1
2	Suction pipe	1
3	Stator	1
4	Shaft	1
5	Articulated shaft	1
6	Flange	2
7	Bushing	1
8	Bushing	2
9	Flange	1
10	Shaft rubber	1
11	Flange	1
12	Joint pin	2
13	Clamp connector	2

Item no.	Description	Qty
14	Preformed clamp	2
15	Gasket ring	1
16	Spring pin	1
17	Plug	3
18	Hex screw	4
19	Hex screw	4
20	Rotor	1
21	Mechanical seal	1
22	Coupling	1
23	Guards	2
24	Hex screw	8
25	Washer	8
26	Electric motor	1

Parts and quantities may vary depending on the pump size and model.

3.3 Technical data

Pump model	Nominal maximum output (m3/h)	Maximum pressure (bar)
D0,04/12	0,04	12
D0,1/12	0,1	12
D0,25/12	0,25	12
D0,75/12	0,75	12

Table 1. The nominal outputs and pressures of D-series pumps with a nominal rotation speed of 400 rpm

Progressive cavity pumps belong to the class of displacement pumps, which means that their output depends on the rotation speed.

Flowrox series D progressive cavity pump are gearless; the pump is rotated by the electric motor alone. The nominal rotation speed of the motor is approximately 1,000 rpm, but the rotation speed / output can be adjusted with either a separate or integrated frequency converter in accordance with the pumping process requirements.



The actual output of the progressive cavity pump depends on, for example, the following factors:

- The viscosity of the pumped medium.
- Suction height
- The counter-pressure caused by volume flow in the piping.

DIMENSIONS AND WEIGHTS

The final dimensions and weight of the pump are determined in part by the pump drive unit and optional equipment installed. The main pump dimensions are shown in "Appendix A: Nominal measurements of series D pumps".

4 TRANSPORTATION, STORAGE, AND LIFTING

4.1 Transportation and storage

The pump is delivered to the orderer in a transport container equipped with appropriate handling labels. Use the original container for storing and moving the pump.

Before unpacking the pump from the transport container, ensure that the pump foundation is finished and of the correct size and materials. Some Flowrox pumps are delivered equipped with transport supports to ensure the pump's stability. The transport supports must not be removed until after the pump's final attachment to its foundation.

Should the pump be taken out of commission for a longer period or not brought into use immediately, the following should be borne in mind:

Long-term immobility of the rotor may cause deformation in the stator. These deformations may lead to the need for greater starting torque in connection with the next start-up, or to reduction in pump output. Therefore, the stator should remain detached from the pump for the duration of storage and kept in a dry, cool place, shielded from sunlight.

If the rotor or other unpainted parts are not of precious metal, they should be covered with protective grease for the duration of storage, to prevent corrosion.

Before storage, a pump that has been in use must be cleaned carefully.

4.2 Lifting



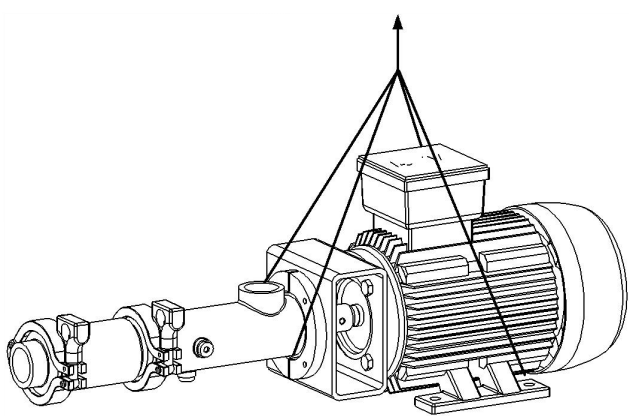
WARNING!

Falling load hazard. Lift the pump only with approved lifting equipment of sufficient carrying capacity. Always follow the instructions of the lifting equipment manuals.

Note that in lifting of the entire pump, neither the lifting equipment nor its ropes are to be attached to the lifting eye of the motor. Lifting equipment attached via the motor's lifting eye could cause damage to the pump.

The figure and table below clarify the weights of the

various pump sizes and provide an example of a safe lifting procedure.

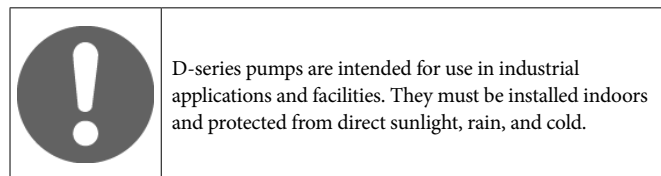


To achieve adequate safety level in lifting the pumps, the pump lifting equipment must endure at least 1.5 times the weight specified in table 2, above. The following standards include instructions for personnel with respect to lifting and handling the pumps:

- ISO 15513:2000
- ISO 23813:2007
- ISO 23853:2004

5 PUMP INSTALLATION

5.1 General



Only professional personnel with appropriate training are allowed to install the pump. All installation and servicing tools and values are given in the metric system of measurement.

- Tools needed in the installation:
- Torque wrench
- Allen wrench set
- Combination wrench set
- Torque wrench

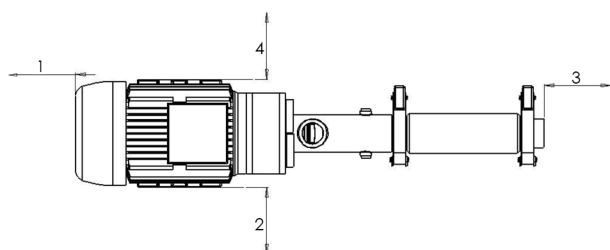
If the pump is equipped with transport supports on delivery, the supports must not be removed until the pump has been attached to the installation foundation in accordance with the instructions.

In connection to pump installation, the pump unit must be protected with an earthing terminal against the creation of a positive charge.

5.2 Installation

It is recommendable to store the pump in its transport container until installation; see Chapter 4, 'Transportation, storage and lifting'.

When planning the location and installation foundation of the pump, take note of the space required around the pump for safe and easy maintenance and installation.



Pump installation must cater for the space requirements on the pump's suction side in order for the stator to be moved the amount of its entire length to the front side of the pump when it is detached, and for it to be possible to disconnect the stator if necessary. For cooling of the motor, there must be space behind the gear motor.

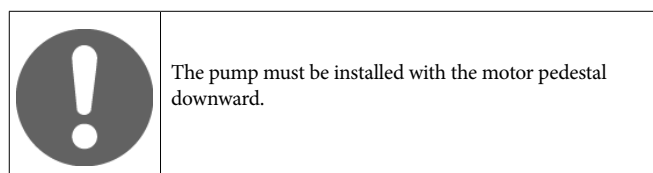
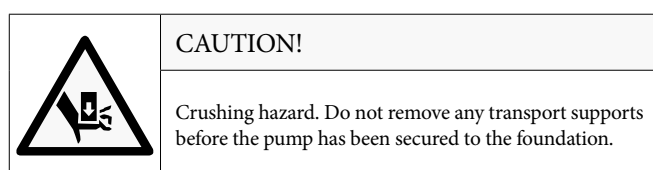
Table 1, below, provides model-specific recommendations regarding the free distances for the D series. In addition, the tables include the requirements for levelness of the pump foundation, to ensure the pump's reliable operation.

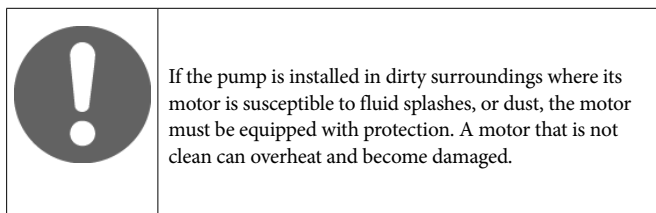
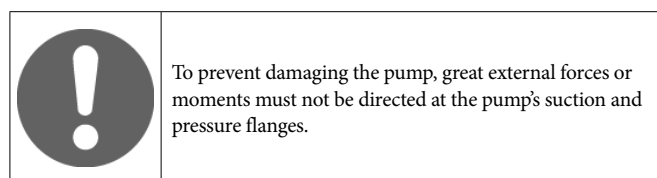
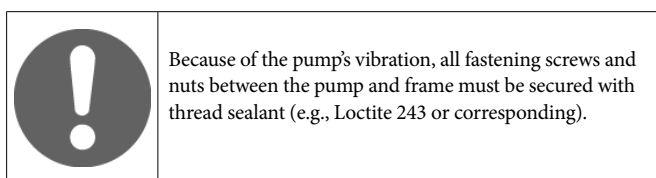
Model	In front [1] (m)	To the right [2] (m)	On the left [3] (m)	To the rear [4] (m)	Flatness requirement (mm)
D0,04/12	0,5	0,5	0,5	0,3	1,0
D0,1/12	0,5	0,5	0,5	0,3	1,0
D0,25/12	0,5	0,5	0,5	0,3	1,0
D0,75/12	0,5	0,5	0,5	0,3	1,0

Table 2. Free distances around the D-series pumps and flatness requirement of the pump foundation

The pump must be installed on a sufficiently strong foundation (in view of the pump weight and load during use) manufactured from concrete or steel, for example. The foundation must be higher than the floor level, to prevent any water on the floor from making contact with the pump.

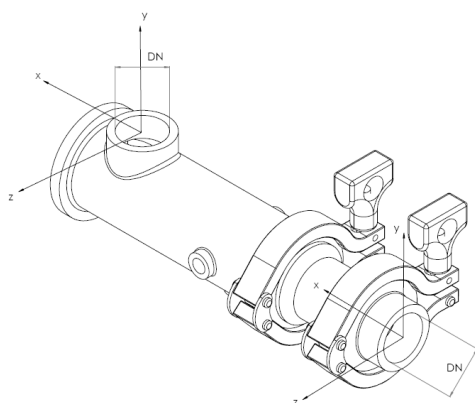
The pump must be secured by means of the mounting holes on the motor pedestal. Tightening torques for the screws and nuts between the foundation and motor are listed in Appendix B, at the end of the manual.





5.3 External supporting forces and moments directed at the pump

The piping connected to the suction and pressure connections of Flowrox progressive cavity pump must be constructed in such a manner that no great external forces or moments that might break the pump are directed at the pump's connection flanges.



The allowed maximum forces and moments concurrently affecting the pump flanges have been described in the table below:

Model	Conne- ction size	F(x,y,z) max. [N]	F(tot.) (total force) [N]	M(x,y,z) max. [Nm]	M(tot.) max. [Nm]
D0,04/12	R1"	250	355	110	165
D0,1/12	R1"	250	355	110	165
D0,25/12	R1"	250	355	110	165
D0,75/12	R1"	250	355	110	165

5.4 Electrical connections

The motor connections must be performed by an authorised electrician in accordance with the manufacturer’s instructions. The motor power supplies must be equipped in accordance with safety regulations, however, at least with:

- Emergency stop switch
- Locked main switch (supply disconnecter switch)
- Fuses
- Motor overload protection
- Automatic touch voltage protection (dangerous situation due to electrical fault)



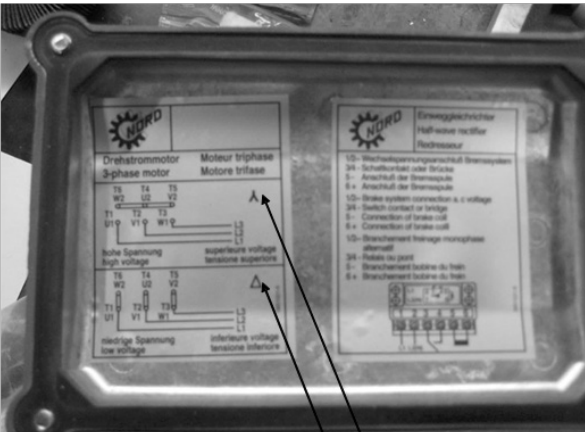
WARNING!

Electrocution hazard. Before installation or maintenance, ensure that the supply voltage has been turned off. Only an authorised electrician is permitted to perform the required connection work.

Power supply (L1, L2, L3) of PC pump gear motors is now possible to be connected with connection bridges:

- To a shape of a star
- Triangle

The electrical connection depends on the motor’s voltage system (must be bridged in accordance with the operating voltage stated in the motor label). Connection instructions can be found under the cover of the connection housing:

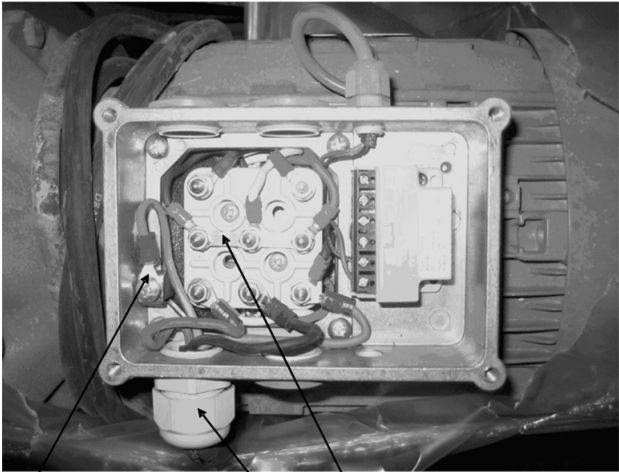


Connection bridges as a star

Connection bridges as a triangle

STAR CONNECTION

If the power supply of the electric motor must be connected to the shape of a star, the form of the connection corresponds to the adjacent figure. The motor must always be carefully earthed with a PE conductor:



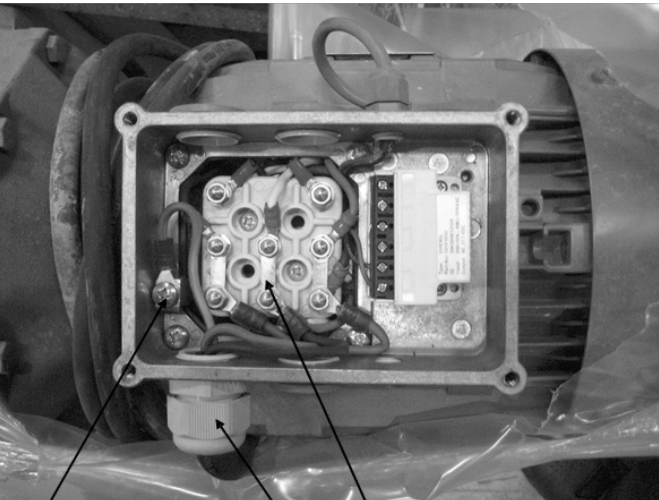
Earth conductor (PE)

Connection bridges as a star

Power supply (L1, L2, L3)

TRIANGLE CONNECTION

If the power supply of the electric motor must be connected to the shape of a triangle, the form of the connection corresponds to the adjacent figure.



Earth conductor

Connection bridges as a triangle

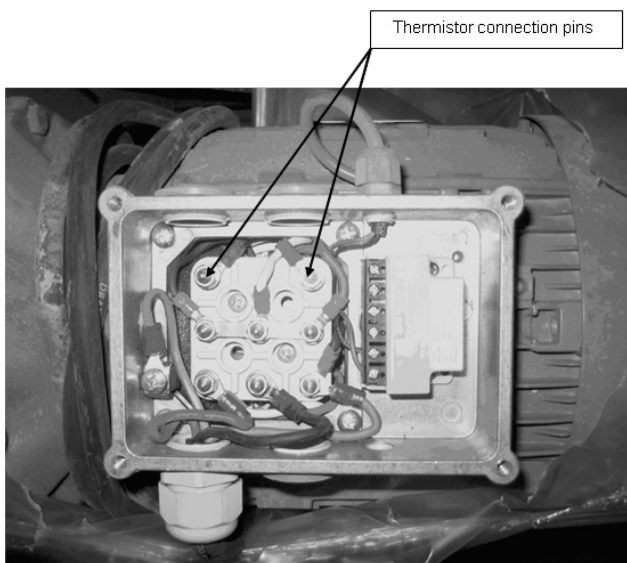
Power supply (L1, L2, L3)

CONNECTION OF THERMISTORS (PTC thermistor)

The motor can be protected against overheating by using PTC thermistors (resistors) that are connected to the optional digital input of the frequency converter.

The figure below describes the thermistor connection pins inside the electric motor connection housing. The thermistor connections can be separated by the three delivery methods of the Flowrox pump:

- Deliveries with an integrated frequency converter (inverter)
- Cabinet control centre deliveries
- Pump deliveries without a frequency converter



Pump deliveries with an integrated frequency converter

In the integrated frequency converter drives delivered by Valmet Flow Control, the thermistor is ready connected and requires no connection measures from the customer.

Pump deliveries with cabinet control centres

In the cabinet frequency converter options delivered by Valmet Flow Control, the thermistor is ready connected and requires no connection measures from the customer.

Pump deliveries without a frequency converter

The customer connects the thermistor to its system.

5.5 Piping connections

The rotation direction set as standard for the pump is anti-clockwise when the pump is viewed from the side of the motor.

Connected piping should meet the following requirements:

To minimise pressure loss, the nominal size of the piping should be at least one size bigger than the nominal size of the pump.

The piping must not transfer strain to the pump's locking rings.

The pressure and suction connections of the pump consist of standards-compliant flange connection surfaces. Their boring is customer-specific.

6 PUMP OPERATION

In a normal delivery, the pumps are delivered with the joints, seals, and bearings pre-installed and greased. Moreover, in a normal delivery, the drive unit (gearbox and motor) is installed prior to the delivery of the pump. In this case, the pump is ready to be used with the nominal parameters indicated on the pump's type plate.

	Especially in pumping of heavy sludges, the minimum flow velocity must be taken into consideration, to prevent sedimentation of the medium.
--	---

6.1 Commissioning

Before commissioning the pump, ensure that it has been installed in accordance with the instructions in this manual and the applicable safety regulations.

At least the following must be ensured:

- The pump is used only for the purpose specified at the time of sale.
- The pump components and piping parts connected to the pump that are in contact with the pumped medium are compatible with the medium.
- The parameters on the type plate are suitable for the process values required of the pump. The piping the pump is connected to has sufficient ability to withstand pressure.
- If, due to the operating conditions, there is a danger that the greatest allowed operating pressure of the pump will be exceeded, the piping must be connected with a pressure relief valve that prevents the pressure from increasing over the allowed operating pressure.
- The required pressure relief valves have been connected properly and work correctly.
- All electrical work has been carried out by an authorised electrician.
- Starting the pump does not put personnel or equipment in danger.
- The pump is correctly connected to the piping and all connections can withstand the required pressure.
- All of the valves in the pump piping are open.
- The pump settings are correct.
- The direction of rotation is correct: anti-clockwise when the pump is viewed from the motor side.

- If the pump is equipped with a frequency converter, the minimum frequency set is sufficient to ensure the cooling of the pump in all conditions. If the required minimum frequency is below 20 Hz, the pump must always be equipped with an additional cooling fan.

	Before starting the pump, ensure that the pump is filled with the medium to be pumped. Do not use the pump dry, because that could cause the stator to wear quickly or suffer sudden damage.
---	--

6.2 Use

Progressive cavity pumps belong to the class of displacement pumps, and their output depends on the rotation speed.

The Flowrox D-series progressive cavity pump are gearless; the pump is rotated by the electric motor alone. The nominal rotation speed of the motors is approximately 1,000 rpm, but the rotation speed can be adjusted either with a separate frequency converter or with an integrated one.

The economical rotation speed of the D-series pump is between 50 and 400 rpm. With this speed, the stator heats and wears less, which, in turn, leads to lower maintenance costs. As a general rule regarding the rotation speed, it should be mentioned that when one is pumping media with heavy viscosity, the pump rotation speed should be low while, correspondingly, weak solutions can be pumped with a higher rotation speed.

If the pump is controlled with a frequency converter using slow rotation speeds, ensure that the pump gear motor does not overheat. In a normal delivery, the pump gear motor is equipped with an internal mechanical fan that caters for the cooling of the motor when it runs at medium and high speeds. When the pump is used at slow rotation speeds (under 20 Hz), the rotation speed of the mechanical fan decreases to such an extent that it no longer provides adequate cooling. In such a case, the motor must be equipped with a separate electric fan.

	Never close the pump valves on the delivery side of the pump, as this may cause overpressure and damage to equipment.
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7 SERVICING AND MAINTENANCE

7.1 General maintenance and checks

The process functions of progressive cavity pumps are often critical. To guarantee problem-free and reliable operation, the pump must be monitored, and a basic check must be performed daily.

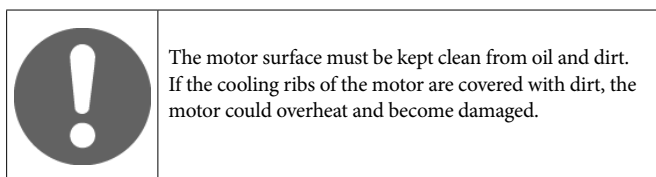
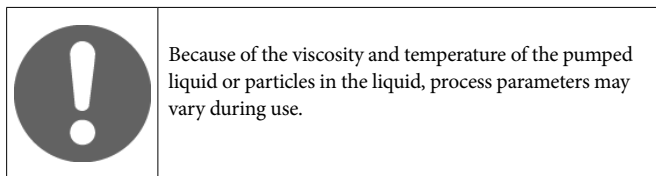
The pipeline and the pump's surroundings should be checked at least once a day, to allow detection of possible leaks. The part that most often needs servicing and replacement is the shaft seal. When certain media are pumped, the seal surfaces may become separated and thus cause leaks. In particular, this critical factor must be carefully checked when toxic or otherwise hazardous media are pumped, because a leak could endanger the environment and the personnel working with the pump.

Observation during use

When observing the condition of the pump, take note of unusual sounds, leaks, or sudden decreases in the flow parameters that could indicate a future fault in the pump.

The condition of the seals is checked visually. If a seal is damaged, this can be noticed by the pumped liquid leaking from between the suction pipe and seal. We recommend that, when changing the seal, you also check the condition of the articulated shaft rubber seals inside the suction pipe.

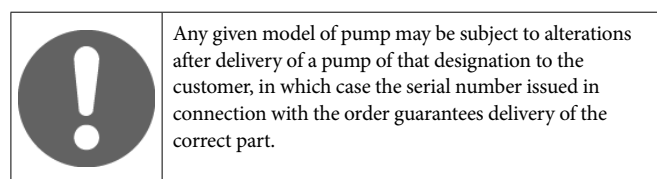
In addition, the pump's operating sound should be monitored: non-specific hard and high sounds may point to bearing damage.



7.2 Spare parts

The progressive cavity pumps delivered by Valmet Flow Control may feature customer-specific differences. To ensure correct and quick delivery of spare parts for the pump, the order must contain at least the following information:

- Pump serial number
- Year of manufacture
- Pump type and model
- Number and name of the spare part itemised in the assembly and part list
- The revision ID found in the drawing



Spare parts for Flowrox progressive cavity pumps, their part numbers, and the location of the parts can be found in the appendices and the drawing at the end of this manual.

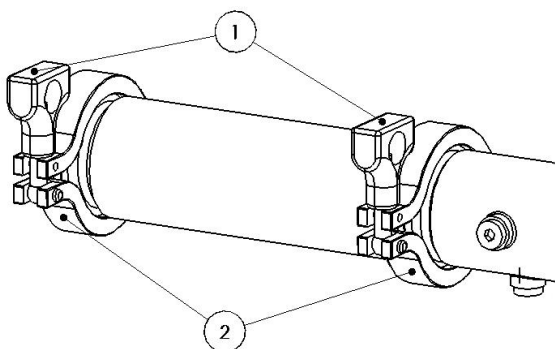
7.3 Disconnecting the stator and suction pipe

STATOR

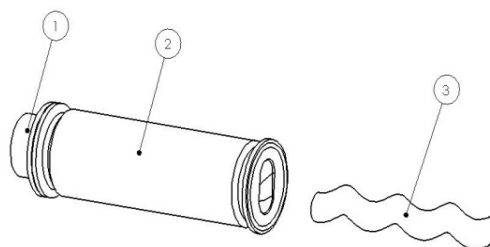
Progressive cavity pumps are displacement pumps, so their output can be adjusted by changing the rotation speed.

In long-term and demanding use, the pump's stator undergoes mechanical wear, which can be detected by the decreased volume flow produced by the pump. This decreased volume flow can be rectified by adjusting the pump's rotation speed. However, if the pump's stator is so worn that adjusting the rotation speed does not suffice for reaching the necessary volume flow, the pump's stator must be replaced. Before disconnecting the stator, ensure that the pump and the pipes connected to it are pressure-free and empty. Work phases related to the disassembly of the stator are described in the figures below.

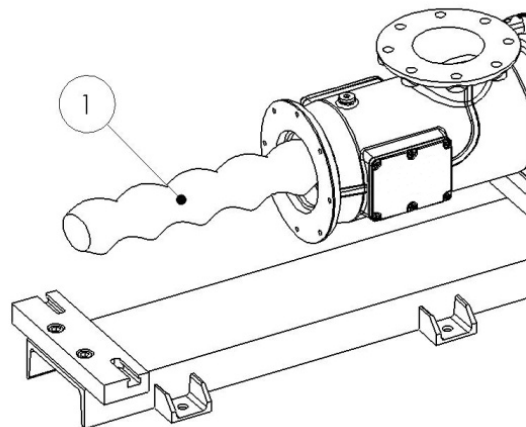
- Remove the band couplings (1 and 2) with butterfly nuts holding down the stator.



- Slide the piping connection flange (1) and stator (2) off the rotor (3).



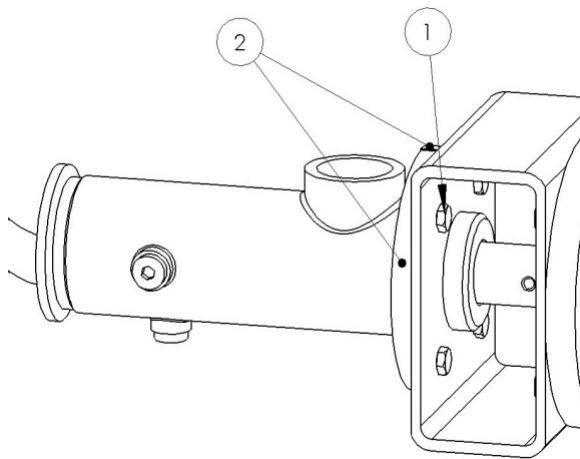
- When you are removing the stator, the rotor (1) should be supported, to prevent damage during maintenance work.



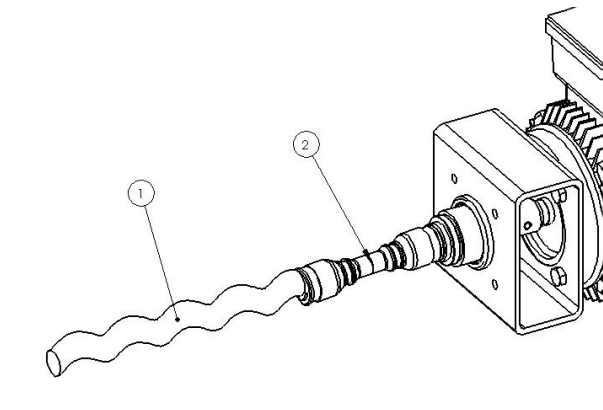
SUCTION PIPE

Disconnection of the Flowrox series D progressive cavity pump suction pipe should be performed in connection with the maintenance of the articulated or main shaft.

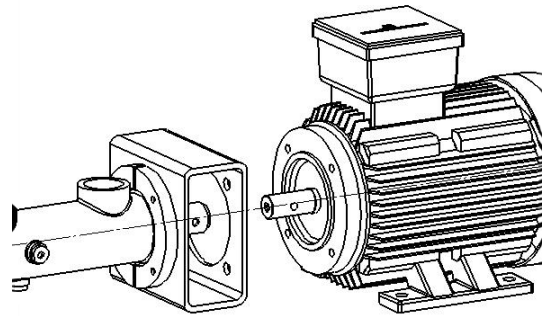
- Remove the suction pipe support flanges (2) and their fastening screws (1), after which the suction pipe can be slid off the articulated shaft.



- Once the suction pipe has been disconnected, the rotor (1) and articulated shaft (2) can be disconnected for maintenance procedures.



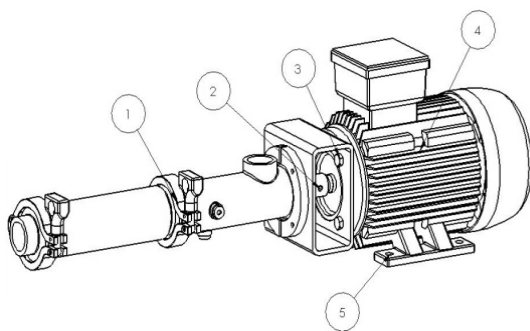
- Diagram showing the disconnected motor.



7.4 Disconnecting the motor and coupling

Before servicing and removing the motor, ensure that the power has been disconnected from the main switch. If electrical connections need to be disconnected, an authorised electrician must perform all of the disconnection and reinstallation work.

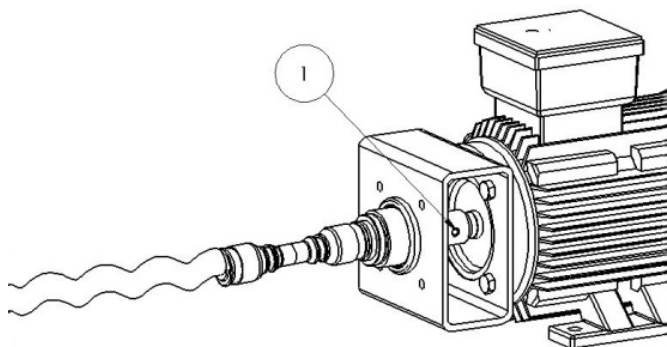
- Support the suction pipe and stator (1) before commencing the motor disconnection work. Remove the motor (4) fastening screws (3) and the locking pin (2) that connects the main shaft and motor to each other.
- After removal of the motor base screws (5), the motor can be disconnected from the pump shaft by pulling.



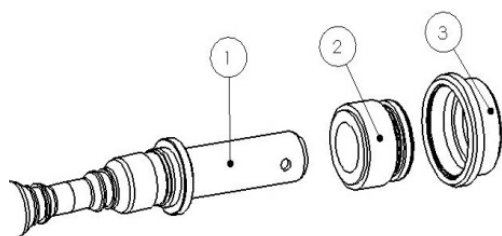
7.5 Replacing the shaft seal

As the pump ages, the shaft seal wears and causes leakage. When this occurs, the seal must be removed and replaced.

- Perform the disconnection of the stator and suction pipe in accordance with section 7.3. Remove the keen pin locking the motor shaft and main shaft together, and remove the rotor, articulated shaft, and seal with flanges.



- Pull the sleeve (3) and seal package (2) off the main shaft (1), and replace the seal.

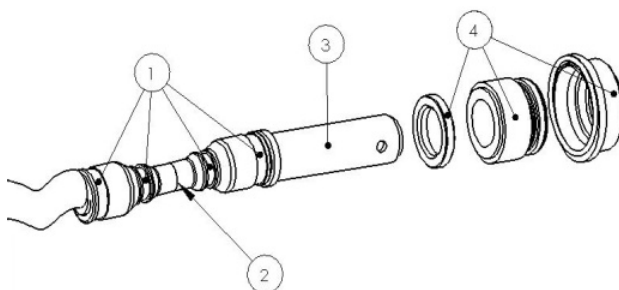


7.6 Disconnecting and lubricating the articulated shaft

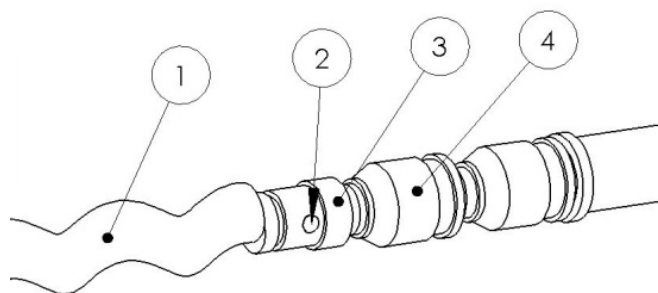
If the articulated shaft's rubber seals become damaged, they must be replaced. In connection with replacement of the rubber seals, the lubricating oil inside these must be changed.

DISCONNECTING THE ARTICULATED SHAFT

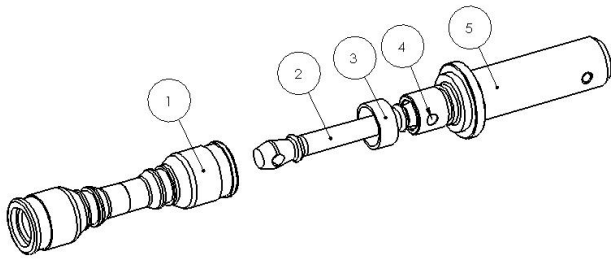
- Perform the disconnection of the stator and suction pipe in accordance with section 7.3 and the disconnection of the shaft in accordance with section 7.5. Slide the seal and flanges (4) off the drive shaft (3), and remove the articulated shaft rubber seal (2) band clamps (1).



- Turn the rubber seal (4) twice over the articulated shaft, which exposes the articulated shaft and the sleeve (3) from underneath the rubber. Move the sleeve aside, and remove the pin (2) by hand or with a soft mandrel, after which the rotor (1) detaches from the articulated shaft.

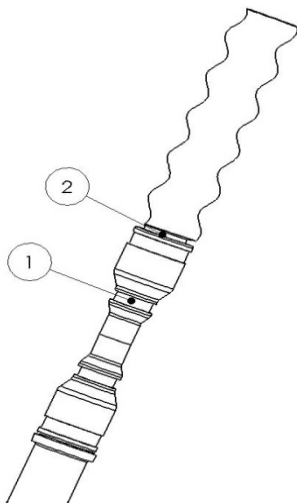


- Straighten the rubber seal (1), and pull it off the articulated shaft (2). Move the sleeve (3) aside, and remove the pin (4) by hand or with a soft mandrel. Now the articulated shaft and drive shaft (5) become detached and the rubber seal or articulated shaft can be replaced.



LUBRICATION OF THE ARTICULATED SHAFT

- For assembly of the articulated shaft, the shaft is lifted into an upright orientation. Attach the lower (1) Band-It band clamp in place, after which you can fill the rubber with oil by stretching the rubber seal (see Section 2). Finally, attach the upper Band-It band clamp.



- For assembly of the other end, the shaft is turned and the same procedures are performed. The shaft is now ready for reinstallation in the pump.
- If the rubber seal is of NBR rubber, the oil must be Teboil Pressure Oil ISO VG 460, or corresponding. However, the oil used may differ from this if the pumped medium requires a different kind of rubber material. In such a case, please contact Neles sales staff, who will inform you of the suitable oil quality for the rubber elements.

The articulated shaft is assembled in reverse order to the disassembly. We recommend that, when you are assembling the pump, you also replace all of its plain seals and rubber seals.

7.7 Troubleshooting

FAULT TYPE										
The pump won't start.	The pump won't suck.	The volume flow is too low.	The pressure is too low.	There is uneven volume flow.	Operation causes noise.	The pump is stuck.	The motor overloads.	The stator wears too quickly.	The rotor wears too quickly.	The pump leaks.
U		K								
Fault in a new pump being deployed		Fault occurring during use and operation								
CAUSE OF THE FAULT				U	K					
										1
										2
										3
										4
										5
										6
										7
										8
										9
										10
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T		
Typical fault.		
CORRECTIVE ACTION	T	
Fill the pump with the pumped medium, and rotate the motor by hand with a suitable tool.		1
Installation error: Replace the coupling, and check whether the pump has moved.		2
Replace the seal type with a suitable model.		3
Fill the pump, install protection against running dry, and check the piping.		4
Check the power needed for the pump and the power produced by the motor. Contact the supplier.		5
If the temperature of the pumped medium cannot be lowered, an undersized rotor must be used.		6
Tighten or replace the box seal. In the rotary seals: replace the sliding rings and seals. Remove deposits.		7
Elevate the suction fluid surface, prevent formation of a suction vortex, and prevent air occlusions.		8
Disconnect the articulated shaft joints in accordance with the instructions in Subsection 7.6, seal, and lubricate carefully. If necessary, replace.		9
Replace intermediate rings, and check that the seal type is suitable for the pumped medium.		10
Grind or replace the rings.		11
Measure the viscosity, and compare to the value given in the order. Change the viscosity or use.		12
Replace the stator, and check that the pumped medium corresponds to the order. Change the material if this is necessary.		13
Replace the stator.		14
Measure the pressure and compare to the values given in the order. Lower the pressure or intensify operation.		15
Check that the pumped medium corresponds to the order. Change the material of the stator if necessary.		16
Check seals, and tighten pipe connections.		17
Decrease suction resistance, lower the temperature of the pumped medium, and install the pump to be deeper.		18
Preheat the stator to operating temperature.		19
Adjustable use: Lower the rotation speed. Otherwise, the pump must be replaced with a larger one.		20
Measure the specific weight, and compare to the value stated in the order. Change the specific weight or use.		21
Service the seal according to the instructions in Subsection 7.5. Replace the shaft if that is necessary.		22
Installation error: Straighten the pump.		23
Adjustable use: Increase the rotation speed; otherwise, change the use.		24
Clean and rinse the pump after every use.		25
Remove the foreign object, and repair damage.		26
Increase the fluid volume of the pumped medium.		27
Replace the rotor, and assess the cause: Wear, corrosion or cavitation. Replace the rotor material or coating.		28

8 DISPOSING OF THE PUMP

The customer who has purchased a progressive cavity pump supplied by Valmet Flow Control is always responsible for disposal of the pump after its service life is complete. Disposal must be carried out as specified below.

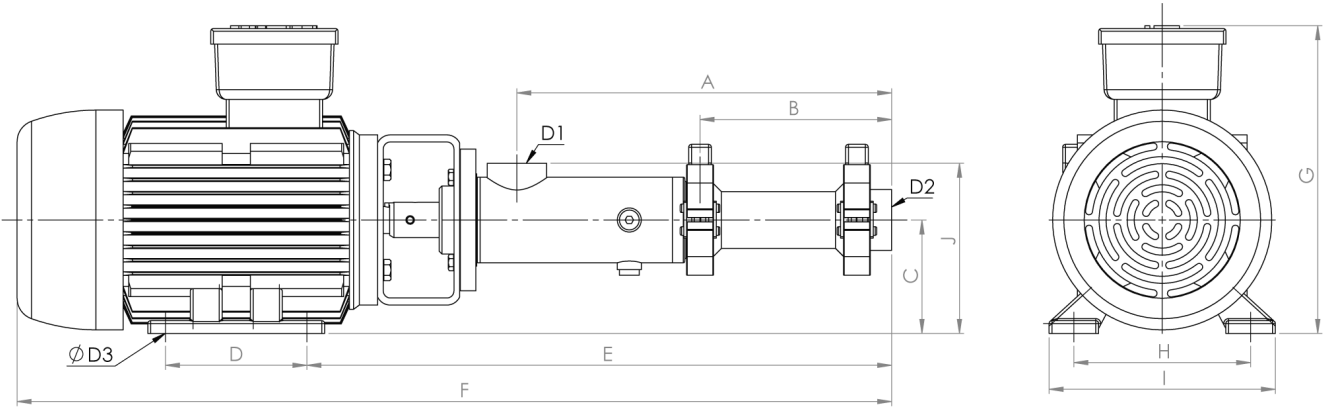
Within the EU:

- In accordance with EU legislation and national standards that are prepared on the basis of the mandate issued by the European Commission and European Free Trade Association to the CEN and that support the EU directives in accordance with the essential requirements

Outside the EU:

- In accordance with national legislation in the customer's country of destination.

Appendix A: Nominal measurements of series D pumps



Model	A	B	C	D	E	F	G	H	I	J	D1, D2	D3 (Ø)
D004/12	215	85	80	100	364	569	218	125	160	120	R1"	Ø 10
D01/12	265	135	80	100	414	619	218	125	160	120	R1"	Ø 10
D025/12	255	125	80	100	404	609	218	125	160	120	R1"	Ø 10
D075/12	345	215	90	100	580	904	240	140	174	130	R1"	Ø 10

Dimensions are in mm. Dimensions can vary based on selected gear motor.

Model	A	B	C	D	E	F	G	H	I	J	D1, D2	D3 (Ø)
D004/12	8.47	3.35	3.15	3.94	14.33	22.4	8.58	4.92	6.30	4.72	R1"	Ø 0.39
D01/12	10.43	5.31	3.15	3.94	16.30	24.37	8.58	4.92	6.30	4.72	R1"	Ø 0.39
D025/12	10.04	4.92	3.15	3.94	15.91	23.98	8.58	4.92	6.30	4.72	R1"	Ø 0.39
D075/12	13.58	8.46	3.54	3.94	22.83	35.59	9.45	5.51	6.85	5.12	R1"	Ø 0.39

Dimensions in inches. Dimensions can vary based on selected gear motor.

Appendix B: Tightening torques for series D pumps

The bolts used in all pumps must be of stainless or acid-proof steel. The table below provides the tightening torques of the screw connection for the various screw sizes.

STRENGTH CLASS OF THE SCREW	THREAD SIZE OF THE SCREW CONNECTION								
	M4	M5	M6	M8	M10	M12	M16	M20	M24
	TIGHTENING TORQUE, in Nm (1 Nm = 0.1 kpm)								
A 4 - 70	2	4,1	7	17	33	57	140	273	472
A 4 - 80	2,7	5,4	9,3	22	44	76	187	364	629

Appendix C: Claim form

The purchaser must file a written claim for all compensation related to the pump guarantee within 30 days after detection of the fault.

The details indicated in the form below must be attached to the claim. Fill in the form with block letters, or inform of the details in some other manner. The notification must be performed in writing.

PUMP MODEL:	
SERIAL NUMBER:	
DATE OF APPEARANCE OF FAULT (DD. MM.YYYY):	
FAULT: USE, DESCRIPTION OF THE PUMPED MEDIUM, AND PRECISE DESCRIPTION OF THE FAULT	
DETAILS OF THE CONTACT PERSON:	

If not all of the above information is sent to the manufacturer in writing, the purchaser loses the right of guarantee.

APPENDIX D: General safety warnings

Lifting

1. Always use a lifting plan created by a qualified person to lift this equipment. Lifting guidance is provided in this IMO (Installation, Maintenance and Operation manual) to assist in lifting plan development. Think about the center of gravity (CG) of the equipment being lifted. Make sure the CG is always under the central lifting point.
2. Use only correct and approved lifting devices. Ensure that lifting devices and straps are securely attached to the equipment prior to lifting.
3. Check, that lifting devices are not damaged and in good condition with a valid check stamp prior to use.
4. Workers must be trained for lifting and handling pumps.
5. Never lift an assembly by the instrumentation (drive unit). Failure to follow the lifting guidance provided may result in damage and personal injury from falling objects.

Work activities on the pump

1. Wear your personal safety equipment. Personal safety equipment includes but is not limited to protective shoes, protective clothing, safety glasses, helmet, hearing protection and working gloves.
2. Always follow the local safety instructions in addition to the Valmet instructions. If Valmet instructions conflict with local safety instructions, stop work and contact Valmet for more information.
3. Before beginning service on the equipment, make sure that the drive unit is disconnected from any kind of power source (hydraulic, and/or electric), and no stored energy is applied on the drive unit.
4. Make sure that there is a LOTOTO (Lock Out / Tag Out / Try Out) procedure in place for the system in which the pump is installed and strictly follow it.
5. Always make sure that the pipeline is depressurized and in ambient temperature condition before maintenance work is started.
6. Keep hands and other body parts out of the flow port when the pump is being serviced and the drive unit is connected to the pump. There is a high risk of serious injury to hands and/or fingers due to malfunction if the pump suddenly starts to operate.

General disclaimers

Recieve, handle and unpacking

1. Respect the safety warnings above!
2. Pumps are critical components for pipelines to control high pressure fluids and must therefore be handled with care.
3. Store pumps and equipment in a dry and protected area until the equipment is installed.
4. Do not exceed the maximum storage temperatures given in the IMO (installation, maintenance, and operating instructions).
5. Keep the original packaging on the pumps as long as possible to avoid environmental contamination by dust, water, dirt, etc.
6. FOR YOUR SAFETY IT IS IMPORTANT THE FOLLOWING PRECAUTIONS BE TAKEN PRIOR TO REMOVAL OF THE PUMP FROM THE PIPELINE OR BEFORE ANY DISASSEMBLY:
 - Be sure you know what fluid is in the pipeline. If there is any doubt, confirm with the proper supervisor.
 - Wear any personal protective equipment (PPE) required for working with the fluid involved in addition to any other PPE normally required.
 - Depressurize the pipeline, bring to ambient temperature, and drain the pipeline fluid.
 - Cycle the pump to relieve any residual pressure in the body cavity.
 - After removal but before disassembly, cycle the pump again until no evidence of trapped pressure remains.

Operating

1. The type plate (nameplate, or engraved markings) on the pump gives the information of max. process conditions to the pump.
2. Temperatures and pressures must never exceed values marked on the pump. Exceeding these values may cause uncontrolled release of pressure and process fluid. Damage or personal injury may result.
3. Valmet pumps typically are designed to be used in atmospheric conditions. Do not use pumps under external pressurized conditions unless specifically designed and explicitly marked for this service.
4. Avoid Pressure shocks or water hammer. Systems with high pressure pumps should be equipped with a bypass to reduce the differential pressure before opening the pump to avoid pressure shock.
5. Avoid thermal shock. High temperature, Low temperature pumps should be operated in a way that limits the rate of increase or decrease in temperature. The pump should be thermally stabilized before being pressurized.
6. Materials of the pump are carefully selected for the process conditions. Changes to the process media can have a major impact on function and safety of the pump. Always confirm the materials are suitable for the service prior to installation.
7. As the use of the pump is application specific, a number of factors should be taken into account when selecting a pump for a given application. Therefore, some situations in which the pumps are used are outside the scope of this manual.
8. It is the end user's responsibility to confirm compatibility of the pump materials with the intended service, however if you have questions concerning the use, application, or compatibility of the pump for the intended service, contact Valmet for more information.
9. Never use a pump with enriched or pure oxygen if the pump is not explicitly designed and cleaned for oxygen. Selected materials and design have a major impact on the safety to operate the pump with oxygen.
10. Pumps intended for use in or with explosive atmospheres must be equipped with a grounding device and marked according ATEX (or equivalent international standards).

Maintenance

1. Respect the safety warnings above!
2. Plan service and maintenance actions, that spare parts, lifting devices and service personnel is available.
3. Maintain the pump within the recommended minimum maintenance intervals or within the recommended maximum operating cycles.
4. Always make sure that the pump and the pipeline is depressurized before starting any kind of maintenance work at a pump.
5. Always check the position of the pump before starting maintenance work. Follow the Lock out /tag out (LOTO) rules at the site before starting any maintenance activity.
6. Sealing materials (soft sealing parts) should be changed when the pump is maintained. Always use original equipment manufacturers (OEM) spare parts to ensure proper performance of the repaired pump.
7. All pressure containing parts must be inspected visually for damage or corrosion. Damaged parts must be replaced.
8. Pump pressure bearing parts and all internals must be inspected for corrosion or erosion which may result in reduced wall thickness on pressure bearing parts. Damaged pressure bearing parts must be replaced with original equipment manufacturers (OEM) replacement parts or repaired to factory specifications by an authorized Valmet service partner in order to maintain the warrantee.
9. Do not use sharp tools, grinding machines, or files to work on functional surfaces such as sealing, seating or bearing surfaces as this can damage these surfaces.
10. Check the condition of sealing surfaces on the seats. Replace parts if there are significant wear, scratches, or damage.
11. Check the wear of bearings and bearing contact surfaces on the shaft and replace damaged parts if necessary.
12. Do not weld on pressure bearing parts without an ASME and PED qualified procedure and personnel.
13. Pressure bearing parts of pumps in high temperature applications must be carefully examined for the effects of material creep and fatigue.
14. Make sure that the pump is positioned in the correct flow direction into the pipeline.
15. If the pumps are marked to be suitable for explosive atmospheres, the correct function of the discharging device must be tested before returning to service.

16. Always work in a clean environment. Avoid getting particles inside the pump due to machining, grinding, or welding nearby.
17. Never store a maintained pump without flow port protection.
18. When pressure testing pumps, never exceed the maximum operating pressure of the system on the pump identification plate.
19. Drive unit mounting and unmounting:
 - Before installing the drive unit on to the pump, be sure the drive unit is properly indicating the pump position. Failure to assemble these to indicate correct pump position may result in damage or personal injury.
 - When installing or removing an adapter set, best practice is to remove the entire drive assembly, including couplings which may fall off the pump during lifting or when position changes.
 - Adapter sets have been designed to support the weight of the Valmet drive unit and recommended accessories. Use of the adapter sets to support additional equipment or additional weight such as people, ladders, etc. may result in equipment damage or personal injury.
20. The pump should be installed between flanges using appropriate gaskets and fasteners that are compatible with the application, and in compliance with applicable piping codes and standards. Center the gaskets carefully when fitting the pump between the flanges. Do not attempt to correct pipeline misalignment by means of the flange bolting.
21. Repairs on pump for special service like Oxygen, Chlorine, and Peroxide, have special requirements.
 - Parts must be cleaned appropriate to the service and protected from contamination prior to assembly.
 - Assembly areas and tools must be clean and dry to prevent contamination of the parts during assembly.
 - Test equipment must be clean and dry to prevent contamination during testing. This includes the test equipment internals that may allow particles or other contamination into the test fluid during the test.
 - Lubrication shall be used only if specifically required in the instructions. Where lubrication is required, the lubricant must be approved for the service by the end user.

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