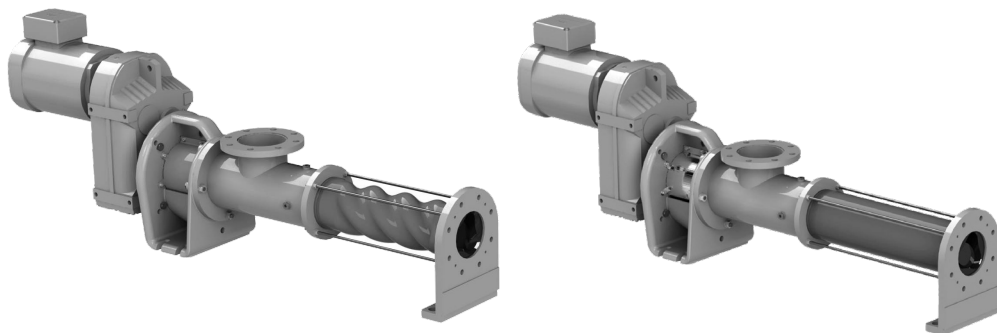


Installation, operation and maintenance instructions for Flowrox™ series E and EL progressive cavity pumps

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.

Person authorised to compile the technical file is Technology Manager Jarmo Partanen.

On behalf of Valmet Flow Control Oy

In Lappeenranta, 13 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 EL 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.

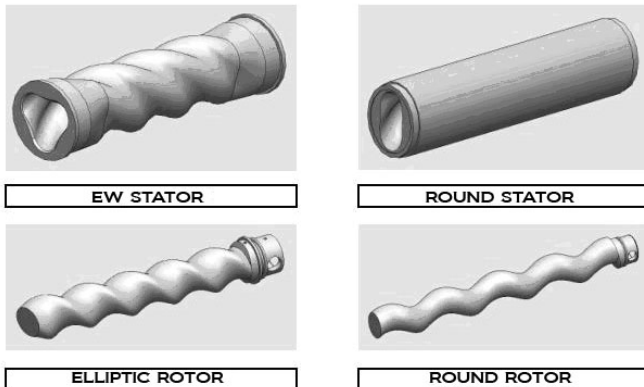
3 INTRODUCTION TO THE PUMP

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. Most progressive cavity pumps on the market use normal stators with a round metal outer surface. The thickness of the rubber inside a stator like this varies for the entire length of the stator.

The Flowrox series E progressive cavity pumps use a



Principle of operation

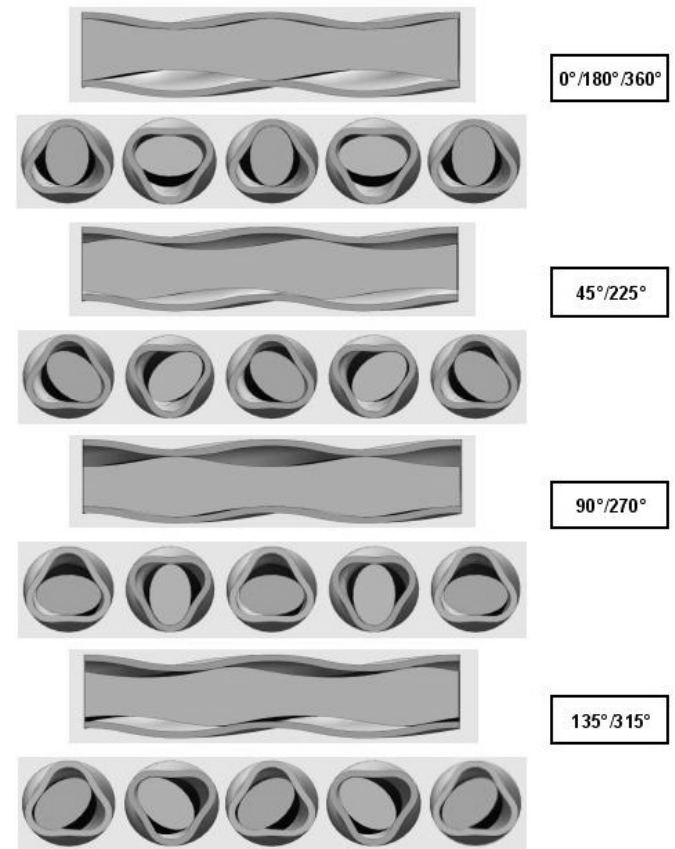
The adjacent image series presents the principle of operation of an series E Evenwall-type stator and a 2/3-type elliptical rotor.

The outer surface of the Evenwall stator is formed in the same pattern as the rotor spiral thread inside it, so the thickness of the inner rubber of the stator is constant for the entire length of the stator.

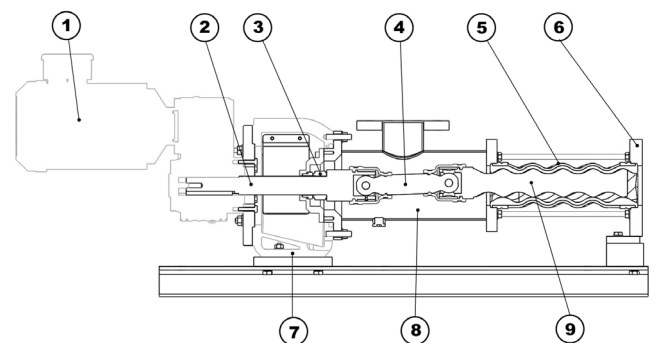
When compared to a normal stator, an EW rubber stator has a higher efficiency, lower electricity consumption, and higher pressure production capacity.

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.



3.2 Mechanical structure



The figure above depicts the cross-section of and series E pump with the parts of the pump structure visible.

The pump uses a bearingless, so-called block-model frame, in which the drive shaft (2) is supported with a bearing-

mounted sleeve inside the gear motor. The motor (1) drive shaft rotates the rotor (9) inside the stator (5) via the articulated shaft (4) and thus creates the pumping action. A bearing is not required in the support-flange (6) 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.

The block frame (7) has a seal (3) installed inside it that prevents the pumped medium from leaking from the drive-shaft end of the suction pipe (8). The series E pumps can be equipped with a single- or double-purpose seal or even a mechanical packing seal, in accordance with the customer's wishes.

The EL model, intended for wastewater applications, differs from the E model only in its stator and rotor: the stator and rotor pitch are greater than normal.


3.3 Technical data

Pump model	Nominal maximum output (m ³ /h)	Maximum pressure (bar)
E2/10	1,7	10
E4/10	3,4	10
E10/10	6,8	10
E20/10	14,1	10
E35/10	35,6	10
E70/10	69,6	10
E150/10	141,1	10
E250/10	227,6	10

Pump model	Nominal maximum output (m ³ /h)	Maximum pressure (bar)
EL50/6	38,2	6
EL100/6	71,7	6
EL200/6	133,9	6
EL330/6	187,9	6

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

Flowrox series E and EL pumps can be connected to a frequency converter that can be used to change the motor rotation speed / output in accordance with pumping process demands.



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.

Table 1. The nominal outputs and pressures of E- and EL-series pumps with a nominal rotation speed of 300 rpm

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 of 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.

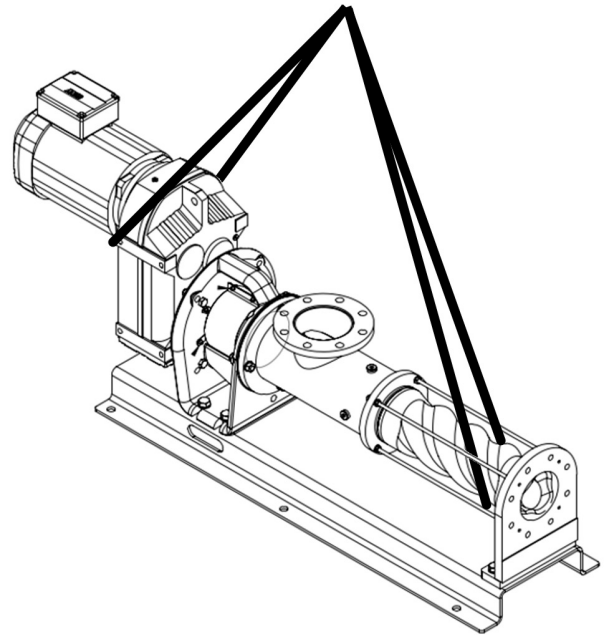
Before storage, a pump that has been in use must be cleaned carefully.

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 engine or gearbox, or to the pump body reinforcing rib. Lifting equipment attached in these locations 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.



Model	Weight (kg)
E2/10	110
E4/10	135
E10/10	178
E20/10	273
E35/10	353
E70/10	632
E150/10	1360
E250/10	2303


Model	Weight (kg)
EL50/6	325
EL100/6	543
EL200/6	1121
EL330/6	1913

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



E and EL pumps are intended for industrial applications and facilities. They must be installed indoors and protected from direct sunlight, rain, and cold.

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

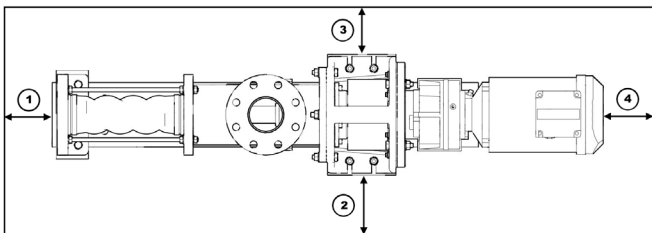
If the pump is equipped with transport supports on delivery, the supports must not be removed until the pump has been attached to the installation foundation in accordance with the instructions.

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.

Tables 1 and 2, below, provide model-specific recommendations regarding the free distances of E and EL models. 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)
E2/10	1,0	0,5	0,5	0,3	1,0
E4/10	1,0	0,5	0,5	0,3	1,0
E10/10	1,0	0,5	0,5	0,3	1,0
E20/10	1,0	0,5	0,5	0,3	1,0
E35/10	1,0	0,5	0,5	0,3	1,5
E70/10	1,5	0,5	0,5	0,3	2,0
E150/10	1,5	0,5	0,5	0,3	2,0
E250/10	1,5	0,5	0,5	0,3	2,0

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


Model	In front [1] (m)	To the right [2] (m)	On the left [3] (m)	To the rear [4] (m)	Flatness requirement (mm)
EL50/6	1,0	0,5	0,5	0,3	1,0
EL100/6	1,0	0,5	0,5	0,3	1,5
EL200/6	1,5	0,5	0,5	0,3	2,0
EL330/6	1,5	0,5	0,5	0,3	2,0


Table 3. Free distances around EL-series pumps and flatness requirements for 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 pump pedestal. Tightening torques for the screws

and nuts between the foundation and frame are listed in Appendix B, at the end of the manual.

	CAUTION!
	Crushing hazard. Do not remove any transport supports before the pump has been secured to the foundation.

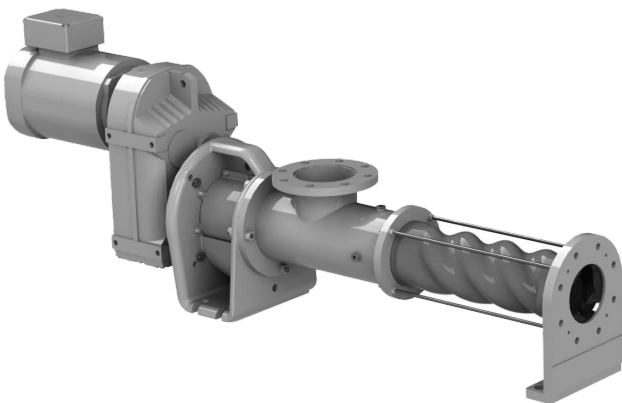
	The pump must be installed with the pedestal downward.
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	Because of the pump's vibration, all fastening screws and nuts between the pump and frame must be secured with thread sealant (e.g., Loctite 243 or corresponding).
---	---

	If the pump is installed in dirty surroundings where its motor is susceptible to fluid splashes, or dust, the motor must be equipped with protection. A motor that is not clean can overheat and become damaged.
--	--

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	Connection size	F(x,y,z) max. [N]	F(tot.) (total force) [N]	M(x,y,z) max. [Nm]	M(tot.) max. [Nm]
E2/10	DN50	295	420	145	210
E4/10	DN65	385	545	190	275
E10/10	DN80	425	600	215	315
E20/10	DN100	505	720	260	385
E35/10	DN125	610	870	325	480
E70/10	DN150	720	1020	385	565
E150/10	DN200	930	1320	500	735
E250/10	DN250	1140	1620	625	920

Model	Connection size DN	F(x,y,z) max. [N]	F(tot.) (total force) [N]	M(x,y,z) max. [Nm]	M(tot.) max. [Nm]
EL50/6	DN125	610	870	325	480
EL100/6	DN150	720	1020	385	565
EL200/6	DN200	930	1320	500	735
EL330/6	DN250	1140	1620	625	920

	To prevent damaging the pump, great external forces or moments must not be directed at the pump's suction and pressure flanges.
---	---

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)

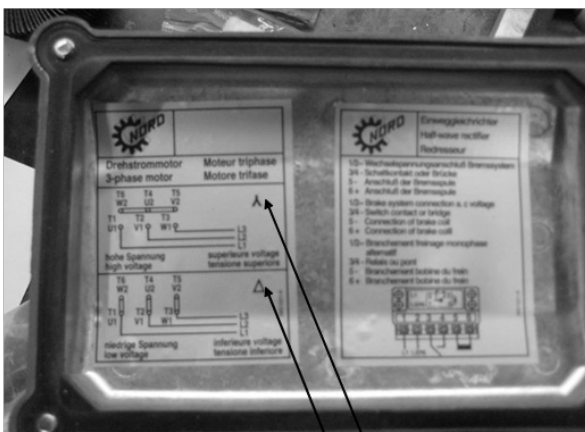
	WARNING!
	Electrocution hazard. Before installation or maintenance, ensure that the supply voltage has been turned off. Only an authorised electrician is permitted to perform the required connection work.

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:

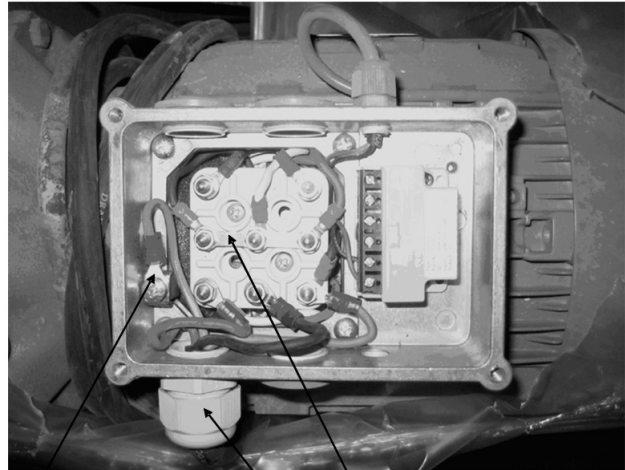


Connection bridges as a star

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:



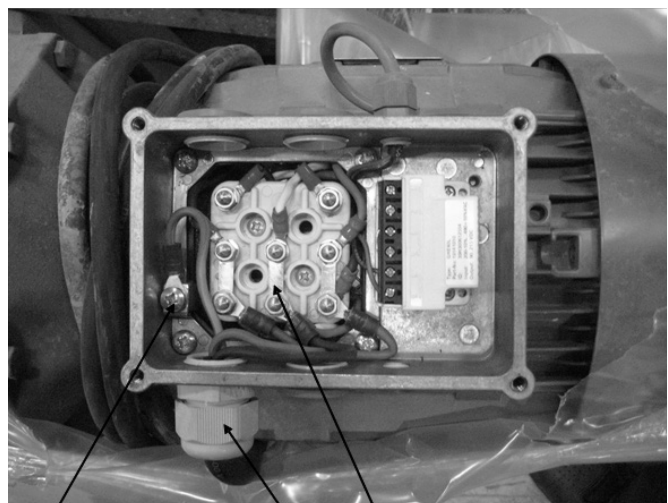
Earth conductor (PE)

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)

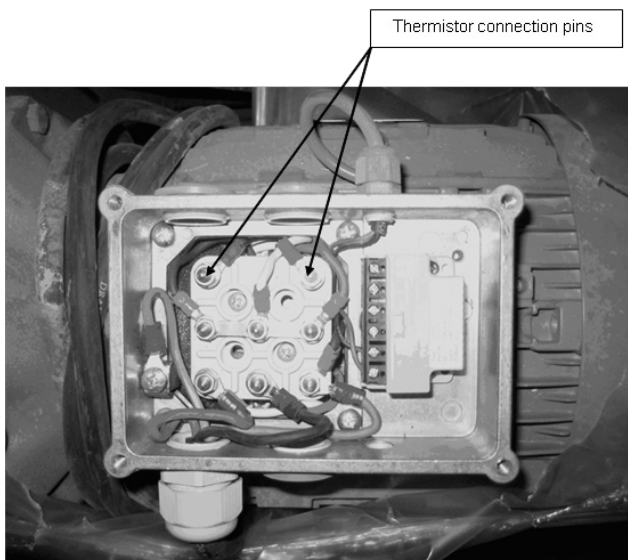
CONNECTION OF THERMISTORS (PTC thermistor)

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:

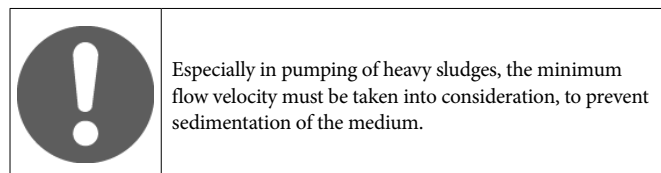
To minimise pressure loss, the nominal size of the piping should be at least one size bigger than the nominal size of the pump.

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.



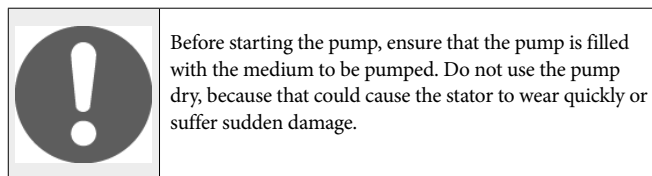
6.1 Commissioning

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.

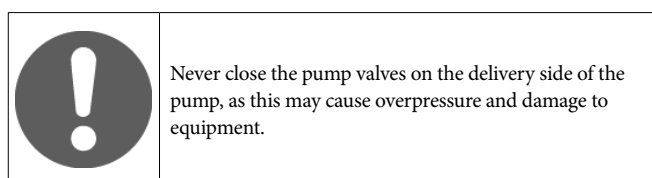
- If the pump is equipped with a frequency converter, the minimum frequency set is sufficient to ensure the cooling of the pump in all conditions. If the required minimum frequency is below 20 Hz, the pump must always be equipped with an additional cooling fan.



6.2 Use

The nominal rotation speed of Flowrox series E progressive cavity pumps is approximately 300 rpm. However, the economical rotation speed of the pump is between 50 and 300 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.

After start-up, the pump motor starts rotating at its nominal speed, unless it is equipped with a frequency converter. The rotation speeds of pumps equipped with a frequency converter depend on the value set for the frequency converter. 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.



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.


	Because of the viscosity and temperature of the pumped liquid or particles in the liquid, process parameters may vary during use.
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	The motor surface must be kept clean from oil and dirt. If the cooling ribs of the motor are covered with dirt, the motor could overheat and become damaged.
---	--

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

	Any given model of pump may be subject to alterations after delivery of a pump of that designation to the customer, in which case the serial number issued in connection with the order guarantees delivery of the correct part.
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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.

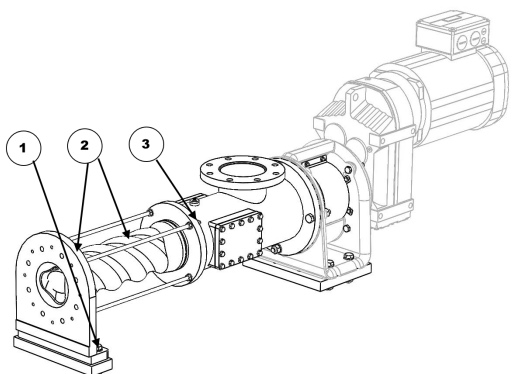
7.3 Disconnecting the stator and suction pipe

STATOR

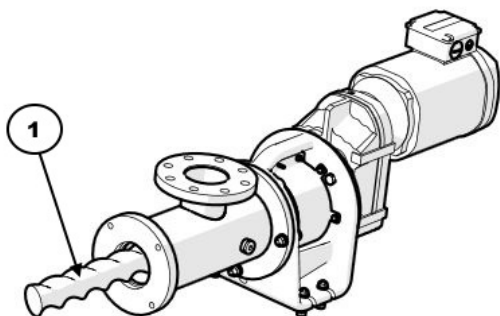
Progressive cavity pumps are displacement pumps, so their output can be adjusted by changing the rotation speed.

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 nuts of the frame and end flange (1) and connection flange screws (3). After this, with the aid of lifting equipment, pull the stator from the top of the rotor.



- When one will be removing the stator, the rotor (1) should be supported with, for example, a hoist, to prevent damage during maintenance work.

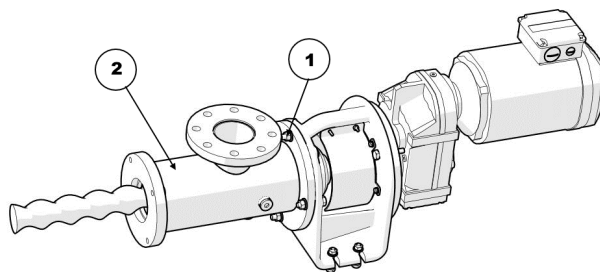


Reinstallation of the stator is performed in the reverse order of disassembly. To facilitate the installation work, you can use glycerine as a lubricant in the stator installation.

SUCTION PIPE

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

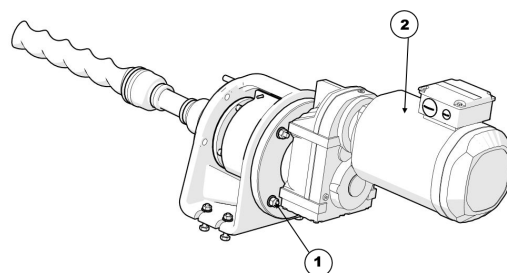
- First, disconnect the stator in accordance with the instructions above. Support the suction pipe (2) with a hoist, and remove the screws (1) and loosen the nuts slightly and remove the suction pipe, being careful not to damage the rotor.



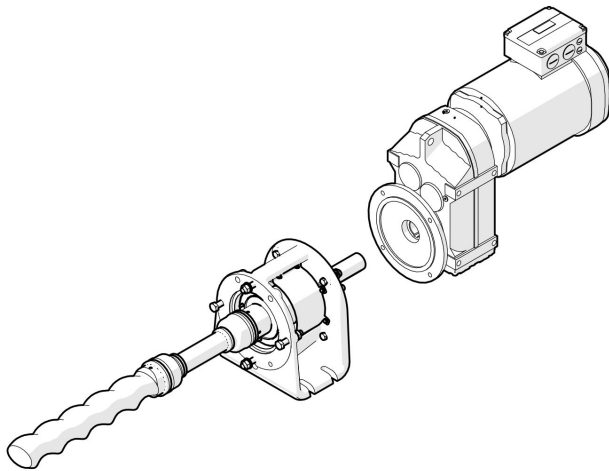
7.4 Disconnecting the motor and coupling

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.

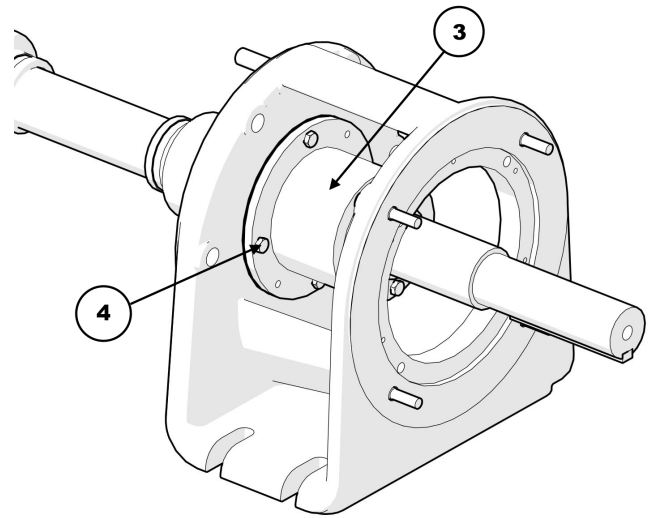
- Support the motor (2) with a hoist, and remove the motor flange fastening screws (1). After this, the motor can be moved aside with the lifting hook and the hoist.



- The adjacent figure depicts the motor detached from the pump and the block frame. When disconnecting the motor, take care not to lose the cotter at the end of the shaft.



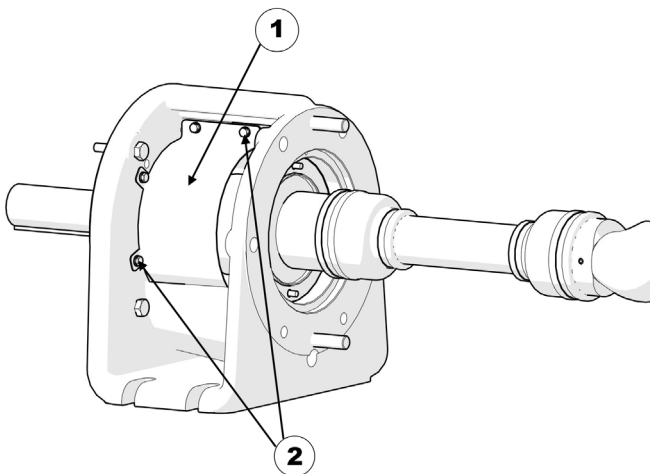
- Next, remove the screws (4) in the shaft seal and locking ring under the guard.



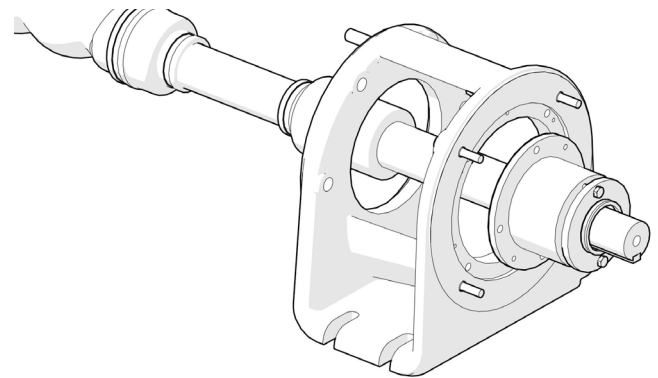
7.5 Replacing the shaft seal

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

- Disconnect the gear motor in accordance with the instructions for this in Subsection 7.4, and then remove the guard (1) that is attached to the pump frame with fastening screws (2).



- Once the shaft seal flange screws have been removed, the shaft seal and its locking ring (3) can be pulled along the drive shaft from inside the frame. To guarantee uninterrupted operation of the pump, also the plane seal (5) between the frame and seal flange should be replaced in conjunction with replacement of the seals.



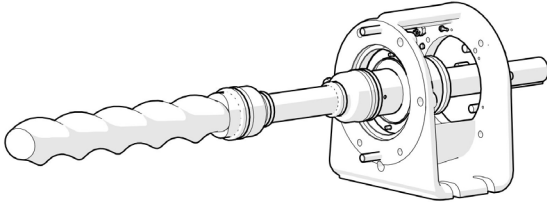
7.6 Disconnecting and lubricating the articulated shaft

If the articulated shaft rubber seals become damaged, they must be replaced. In connection with replacement of the rubber seals, the lubricating oil inside these must be changed. In some models, the condition of the articulated shaft rubber elements can be observed through a service hatch in the suction pipe.

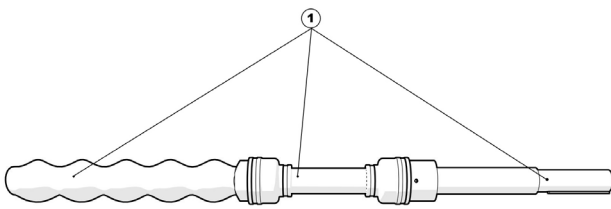
The maintenance procedure requires a tool for the installation and removal of Band-It band clamps.

DISCONNECTING THE ARTICULATED SHAFT

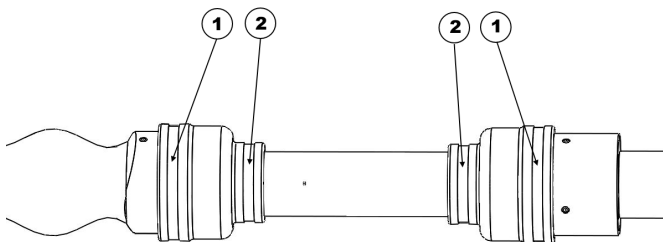
- First, disconnect the stator and suction pipe in accordance with the instructions for this in Subsection 7.3, and the guard (1) and electric motor as is described in section 7.4.



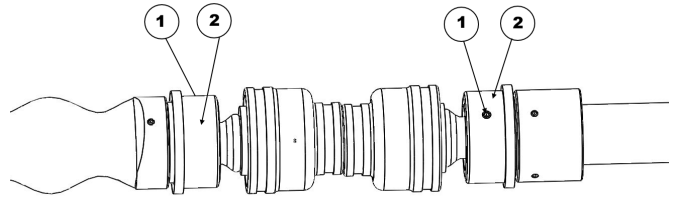
- Pull the drive shaft, rotor, and articulated shaft assembly off the pump frame, and carefully lift the articulated shaft with its drive shaft (1) onto a maintenance table.



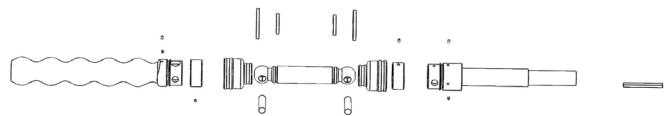
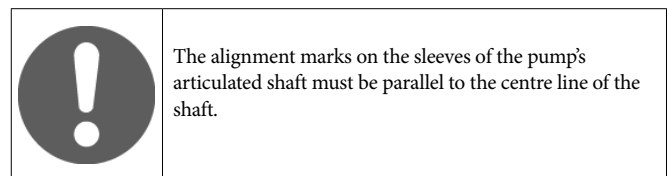
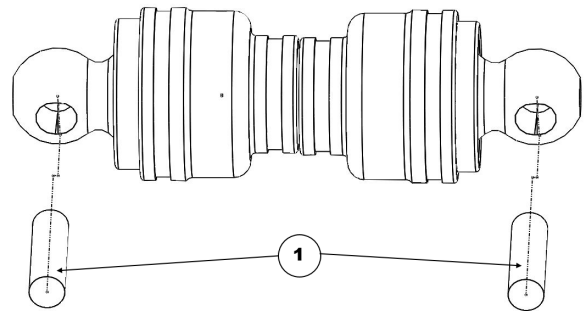
- Cut the Band-It band clamps (1 and 2) on top of the rubber seals, and slide the rubbers to the middle of the shaft, revealing the joints.



- Remove the locking screws (1) of the sleeves (2) that were revealed from under the rubber seals, and pull the sleeves aside.



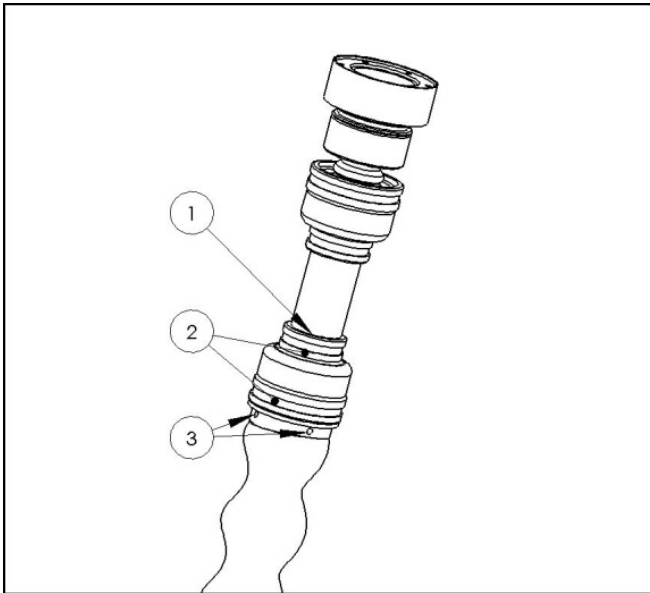
- With the aid of a mandrel, remove the pins (1). Note that both the pins and the ends of the shaft have alignment marks, which must match when the pins are reinserted. Before installing the pins



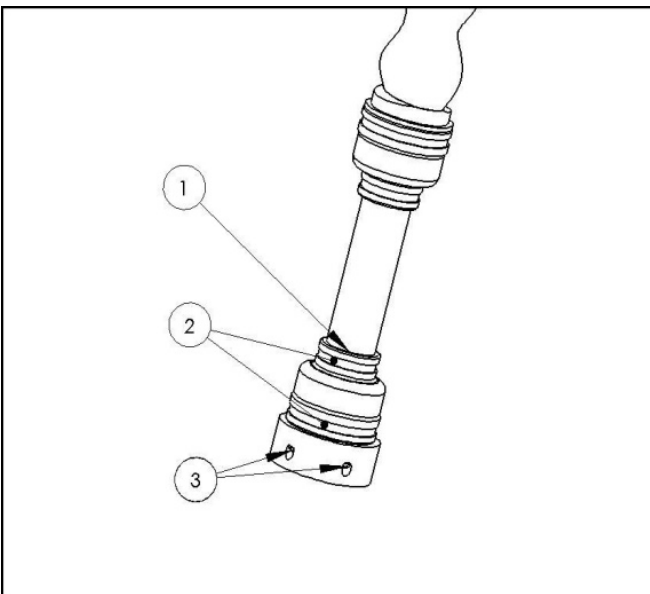
Exploded view of the articulated shaft and rotor.

LUBRICATION OF THE ARTICULATED SHAFT

- For assembly of the articulated shaft, the shaft is lifted into an upright orientation with the rotor facing downward. Note that the alignment marks on the guide pins at the ends of the shaft must be aligned with each other. Attach the larger Band-It band clamp (2), which is lower, around the rubber. After this, stretch the rubber seal and fill the inside of the rubber with oil from the location (1) indicated in the figure. At the end of this work phase, tighten the second, smaller Band-It band clamp. An alternative method is to attach both Band-It band clamps and fill the oil cavity, with the two lubrication holes (3) for assistance.



- For assembly of the other end, the shaft is turned and the same procedures are performed. The shaft is now ready for reinstallation.



- If the protective rubber is 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 Valmet Flow Control 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 plane 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			
											Too great sticking friction.				1
											Worn coupling.				2
											Incorrect seal type for the pumped medium.				3
											Pump running dry.				4
											Pump values not corresponding to the electric motor values.				5
											Too high temperature.				6
											Leaking shaft seal.				7
											Air entering the suction pipe.				8
											Worn joints.				9
											The mechanical shaft seal is worn.				10
											The mechanical shaft seal is worn.				11
											The viscosity of the pumped medium is too high.				12
											The stator has become brittle.				13
											Worn stator.				14
											Pressure is too high.				15
											Stator is swollen. The material is unable to take the pumped fluid.				16
											Leaking suction pipe.				17
											Suction height is too great or intake height too low.				18
											Undersized rotor: Operating temperature too low.				19
											Too high rotation speed.				20
											The specific weight of the pumped fluid is too high.				21
											Incorrectly tightened gland packing.				22
											Damaged roller bearings.				23
											The pump has moved with respect to its shaft.				24
											Too low rotation speed.				25
											Hardening of the pumped liquid.				26
											A foreign object in the pump.				27
											Too high solids content in the liquid: Blockage				28
											Worn rotor.				29

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
Replace the bearing according to the instructions in Subsection 7.7. For higher temperatures, pay attention to the bearing air and lubricant.		23
Installation error: Straighten the pump.		24
Adjustable use: Increase the rotation speed; otherwise, change the use.		25
Clean and rinse the pump after every use.		26
Remove the foreign object, and repair damage.		27
Increase the fluid volume of the pumped medium.		28
Replace the rotor, and assess the cause: Wear, corrosion or cavitation. Replace the rotor material or coating.		29

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.

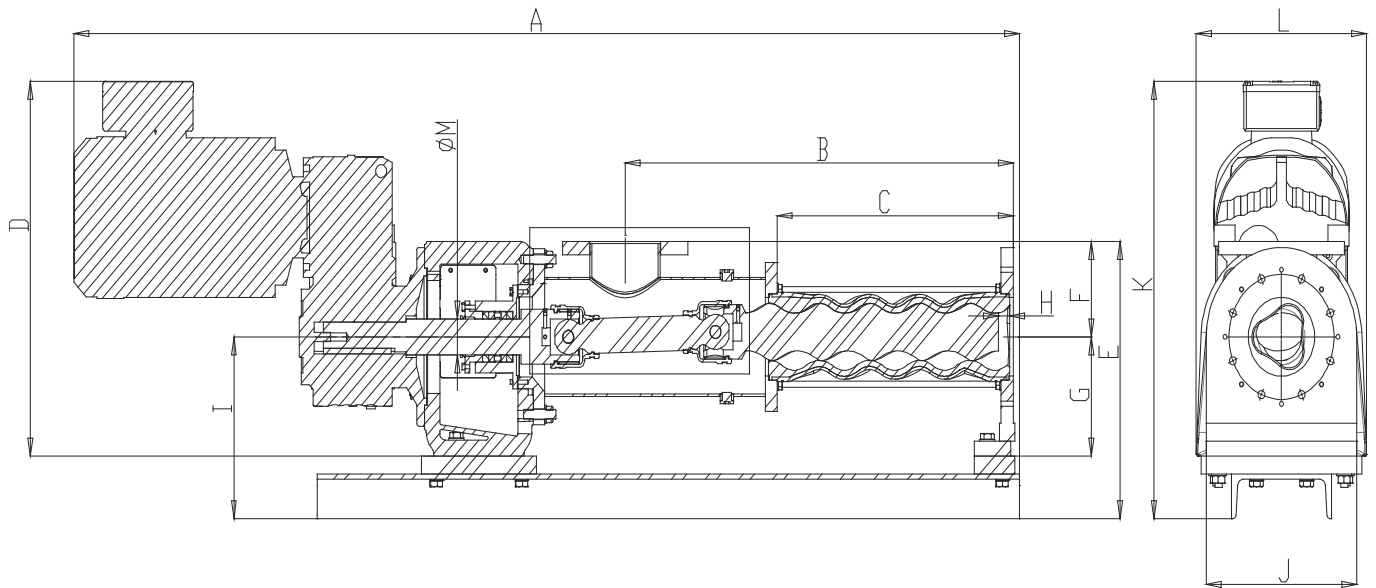
Within the EU:

- 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 E and EL pumps



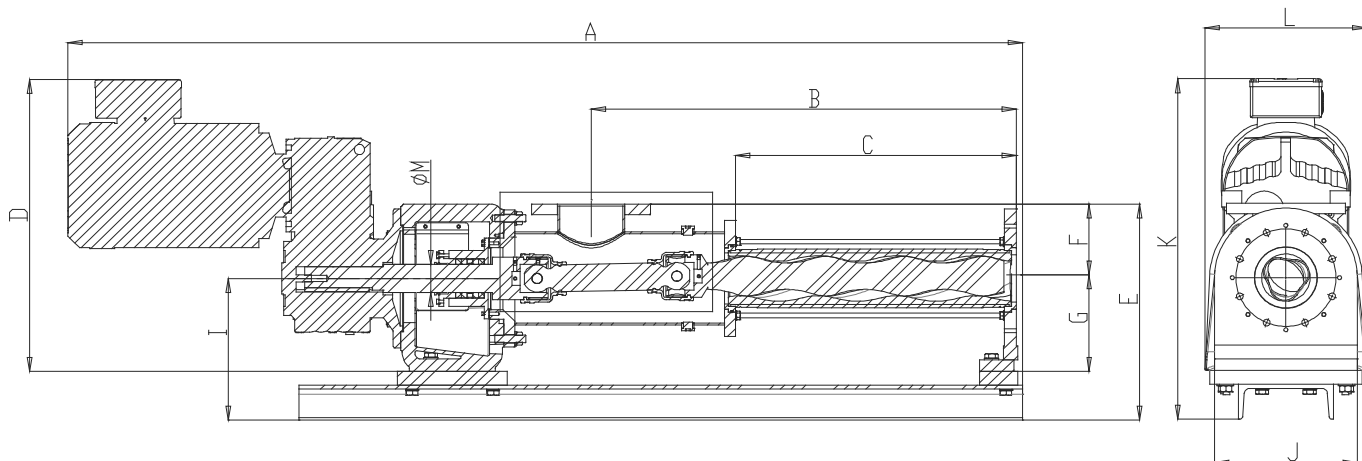
Model	A	B	C	D	E	F	G	H	I	J	K	L	M	Weight (kg)
E2/10	1260	433	229	423	368	128	125	14	240	165	508	290	35	110
E4/10	1273	433	381	444	368	128	125	15,2	240	184	509	290	35	135
E10/10	1358	519	315	440	380	140	125	20	240	200	525	290	40	178
E20/10	1723	698	395	566	420	160	155	15	260	250	566	340	50	273
E35/10	1886	774	471	629	465	160	200	21,6	305	300	734	340	60	353
E70/10	2254	862	569,5	848	525	170	250	28	355	300	924	405	80	632
E150/10	2683	994	616	1095	667	207	315	30	460	350	1240	555	90	1360
E250/10	2902	1128	675	1170	770	230	390	29	524,5	400	1320	665	110	2303

All measurements in the table are in millimetres.

Model	Suction flange (D1)	Pressure flange (D2)	Fixing hole (D3) [mm]	Fixing bolt (D4)
E2/10	DN50	DN50	18	M16
E4/10	DN65	DN65	18	M16
E10/10	DN80	DN80	18	M16
E20/10	DN100	DN100	18	M16
E35/10	DN125	DN125	18	M16
E70/10	DN150	DN150	24	M20
E150/10	DN200	DN200	28	M24
E250/10	DN250	DN250	28	M24

E-MODEL dimensions [mm]; G* & L* = Normative dimensions

The suction and pressure coupling sizes are in compliance with standard EN1092-1 PN10.



Model	A	B	C	D	E	F	G	I	J	K	L	M	Weight (kg)
EL50/6	2005	893	590	629	465	152,5	207,5	305	300	734	340	60	325
EL100/6	2108	972	679,5	755	525	170	250	355	300	830	405	65	543
EL200/6	2636	1174	796	883	667	207	315	460	350	1029	555	90	1121
EL330/6	3202	1428	975	1170	770	230	390	540	400	1320	665	110	1913

EL-MODEL dimensions [mm]; G* & L* = Normative dimensions

Model	Suction flange (D1)	Pressure flange (D2)	Fixing bolt (D3) [mm]	Fixing bolt (D4)
EL50/6	DN125	DN125	18	M16
EL100/6	DN150	DN150	24	M20
EL200/6	DN200	DN200	28	M24
EL330/6	DN250	DN250	28	M24

Appendix B: Tightening torques for series E and EL 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

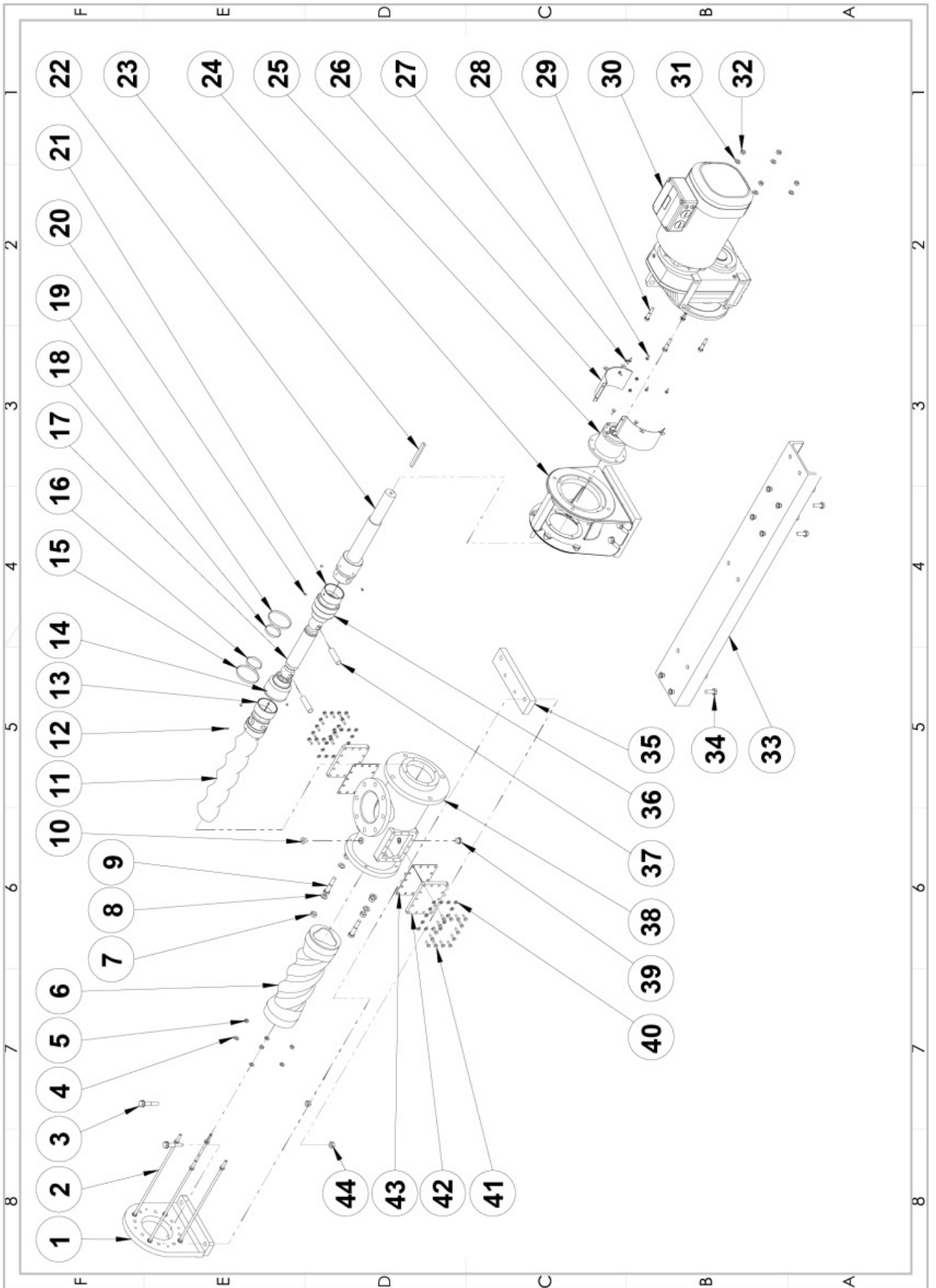
Appendix D: Claim form

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.



ITEM NO.	NIMITYS	DESCRIPTION	QTY.
1	Kannatinlaippa	Support flange	1
2	Kannatinlaipan ruuvi	Connection flange screws	4
3	Kuusioruuvi	Hexagon head bolt	2
4	Aluslaatta	Washer	4
5	Kuusiomutteri	Hexagon nut	4
6	Staattori	Stator	1
7	Kuusiomutteri	Hexagon nut	4
8	Aluslaatta	Washer	4
9	Kuusioruuvi	Hexagon head bolt	4
10	Tulppa	Plug	1
11	Roottori	Rotor	1
12	Pidätinruuvi	Set screw	3
13	Nivelholkki	Articulated sleeve	1
14	Kumitiiviste	Rubber seal	1
15	Kiristyspanta	Preformed clamp	1
16	Kiristyspanta	Preformed clamp	1
17	Nivelakseli	Articulated shaft	1
18	Kiristyspanta	Preformed clamp	1
19	Kiristyspanta	Preformed clamp	1
20	Pidätinruuvi	Set screw	3
21	Nivelholkki	Articulated sleeve	1
22	Akseli	Shaft	1
23	Kiila	Key	1
24	Runko	Frame	1
25	Tiiviste	Seal	1
26	Suoja	Guard	2
27	Kuusioruuvi	Hexagon head bolt	2
28	Kuusioruuvi	Hexagon head bolt	4
29	Kuusioruuvi	Hexagon head bolt	4
30	Vaihdemoottori	Parallel shaft geared motor	1
31	Aluslaatta	Washer	4
32	Kuusiomutteri	Hexagon nut	4
33	Peti	Chassis	1
34	Kuusioruuvi	Hexagon head bolt	6
35	Peti	Chassis	1
36	Kumitiiviste	Rubber seal	1
37	Niveltappi	Joint pin	2
38	Imuputki	Suction pipe	1
39	Tulppa	Plug	1
40	Aluslaatta	Washer	14
41	Kuusioruuvi	Hexagon head bolt	14
42	Luukku	Hatch	1
43	Tiiviste	Seal	1
44	Kuusiomutteri	Hexagon nut	2

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