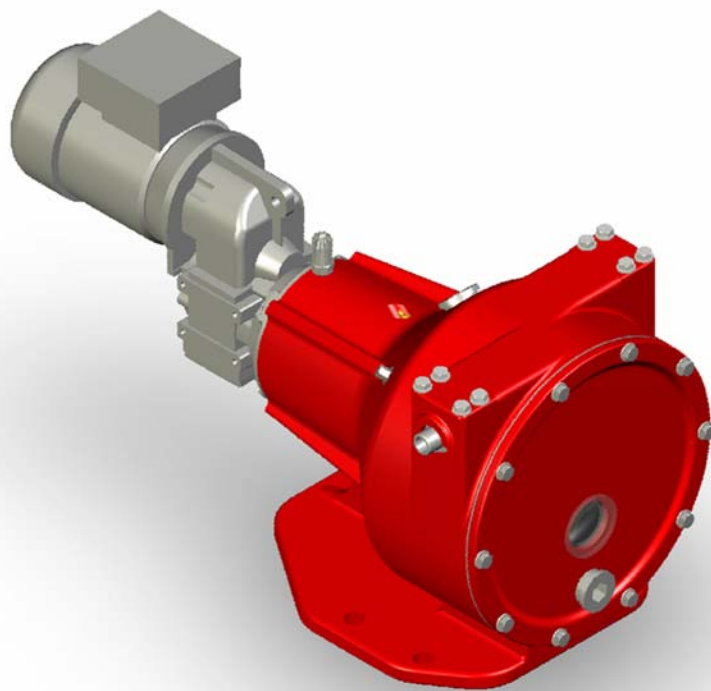


**Installation, operation and maintenance manual**  
**for**  
**LPP-D peristaltic pumps**



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## 1. GENERAL

### **DECLARATION OF CONFORMITY ( Directive Machinery 89/392/EEC, Annex II A )**

LAROX FLOWSYS OY

declares herewith that the supplied **LPP-D** pump complies with the following provisions applying to it:

EC-Directive Machinery as amended by 93/44/EEC, Annex I No. 1

Following harmonized standards have been applied:

EN 292 Part 1, EN 292 Part 2, EN 809

### **DECLARATION OF INCORPORATION ( Directive Machinery 89/392/EEC, Annex II B )**

LAROX FLOWSYS OY

declares herewith that the supplied **LPP-D** pump is intended to be incorporated into machinery or assembled with other machinery to constitute machinery covered by this directive and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the directive as amended by 93/44/EEC.

Following harmonized standards have been applied: EN 809

For Larox Flowsys Oy  
Lappeenranta, April 23, 2003



Jarmo Partanen  
Technical director

### **1.1 Mechanical warranty for LPP-D pumps**

The warranty is valid for 12 months from the date of dispatch ex works excluding:

- wearing parts like seals, bearings and hoses (for hose manufacturing fault claims, see "PUMP HOSES" below)
- pumps which the first buyer has resold without a prior written agreement with the seller about the validity of the remaining validity period
- direct or consequential damages caused by structural changes made to the pump or caused by the use of such parts that are not of original manufacture

All claims regarding the hose and/or the pump warranty must be made by the buyer in writing within thirty (30) days from the date the defect was noticed. See appendix A for the claim form.

If the conditions set in the claim form are not followed, the buyer will lose his right to the warranty.

The warranty includes new parts to replace the damaged ones. Delivery terms: ex works packed, all other costs are excluded.

Larox Flowsys Oy standard conditions of sale are described in appendix B.

#### **PUMP HOSES:**

The pump hose is in contact with the product flow and it may be subject to wearing, high temperatures, pressure shocks and chemical influences, etc. Because of these facts the pump hose is listed as a wearing part, which has to be changed from time to time.





Larox pumps have worked reliably in many difficult applications. None the less, because operating conditions vary widely, we can not give exact figures or warranties for hose life time. The warranty applies only to manufacturing faults in the hose.

In manufacturing fault cases the customer has the right to return the defected pumps or hoses to the supplier. The supplier will credit the value of the pumps/hoses excluding freight, packing and all other costs providing:

- the pumps have been used in their intended application on site
- any claim on ruptured hoses provides that the original hose and operation feed back form are sent to Larox Flowsys Oy for chemical and mechanical examination
- the replacing of the ruptured hose is made after this examination

## 1.2 General safety instructions for LPP-D pumps

The following symbols are used in this manual to point out sections which require special attention:

SYMBOL	MEANING
	<b>Personal safety risk:</b> the neglect of safety precautions may cause serious injury or death.
	<b>Electrical safety involved:</b> the neglect of safety precautions may cause serious injury or death.
	<b>Equipment or environmental risk:</b> the incorrect use or maintenance of the device may cause danger to the environment or the device itself.
	<b>Read the operation and maintenance instructions:</b> before operating the device you must read and fully understand the operation and maintenance instructions.

Observe the safety instructions given in this manual to prevent accidents and to ensure the correct operation of the pump. The installation and maintenance of the pump should only be performed by properly trained personnel.

In the pump design, the safety aspects have been taken into consideration as far as it is reasonably possible.

Never let the pump run with the front cover or sight glass open. If in certain maintenance operations the window has to be removed, proceed with the utmost caution. Do not to place any body part in danger.

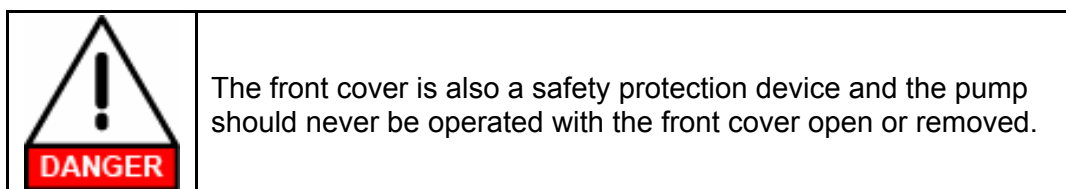
The pump is connected to high voltage. The terminal box should never be opened when supply voltage is on. Only qualified electricians should perform electrical work. The pump is capable to produce and maintain high pressures. This should be taken into consideration when the pipe connections etc. are released. It is possible that the pipeline may still have high pressure although the pump is not running.

### 1.2.1 Safety devices

Unauthorized persons are not allowed to be in the vicinity of the pump when it is on. The maintenance and servicing of the pump must be done by authorized personnel only.

LPP-D pumps should always be equipped with safety devices required by local law at the installation site. Despite the laws of any country, the power supply to the pump unit must always be equipped with at least the following electrical safety devices:

- an emergency switch
- a main switch
- motor over current protection
- circuit breakers/fuses



Included in the safety devices is also an optional hose leak detector. The hose leak detector can be connected to the pump and supply to ensure quick response to detected leaks.

## 2. INTRODUCTION


### 2.1 Fields of application and site conditions

The LPP-D pump series is meant for pumping pure liquids, liquids with solids, slurries and aggressive mediums. Normal pumping duties are transfer, dosing and emptying. When planning other duties, please contact our local representative for more instructions.

Table 1. Examples of industries and applications for the LPP-D.

INDUSTRY	APPLICATION
Water and Effluent Treatment	Chemical dosing and sludge transfer
Mining and Metal Industry, Mineral Processing	Slurries and chemicals
Pigments and Fillers	Paper pigments and paints
Chemical Process Industries	Pumping glues and dosing chemicals
Pulp and Paper Industry	Coatings and liquors
Building and Cement Industry	Abrasive raw material slurries
Food Industry: Breweries, Wineries, Beverage Production	Filtration and filtration aids Kieselguhr filtering

The LPP-D hose pump is self-priming and seal-less. Because the pump is seal-less it is not damaged if it runs dry even for longer periods of time. In the pump the only part in contact with the pumped medium is the hose. The hose is also the only wearing part of the pump.

	<p>Using the pump for any other purposes than pumping is strictly forbidden.</p>
---	--

The pump unit protection class (IP) depends on the accessories combined with the pump. The basic pump unit with motor has the protection class IP55.



## 2.2 General description

### 2.2.1 Operating principle

The operating principle of the pump is based on peristaltic effect, where a single bearing mounted roller presses against the hose only once per a 360° operating cycle. The roller is mounted on a crankshaft to enable the eccentric movement of the roller.

As the cylindrical rotor rotates along the hose, the process medium is pushed forward in the hose bore. At the same time, the hose behind the compression point reverts to its original shape. This creates a suction effect at the pump inlet port. As a result the hose bore is filled with the process medium. Backward flow is not possible because of the tightly set compression on the hose.

### 2.2.2 Main components

The main components of the LPP-D pumps and the location of the type plate are indicated in figure 1.

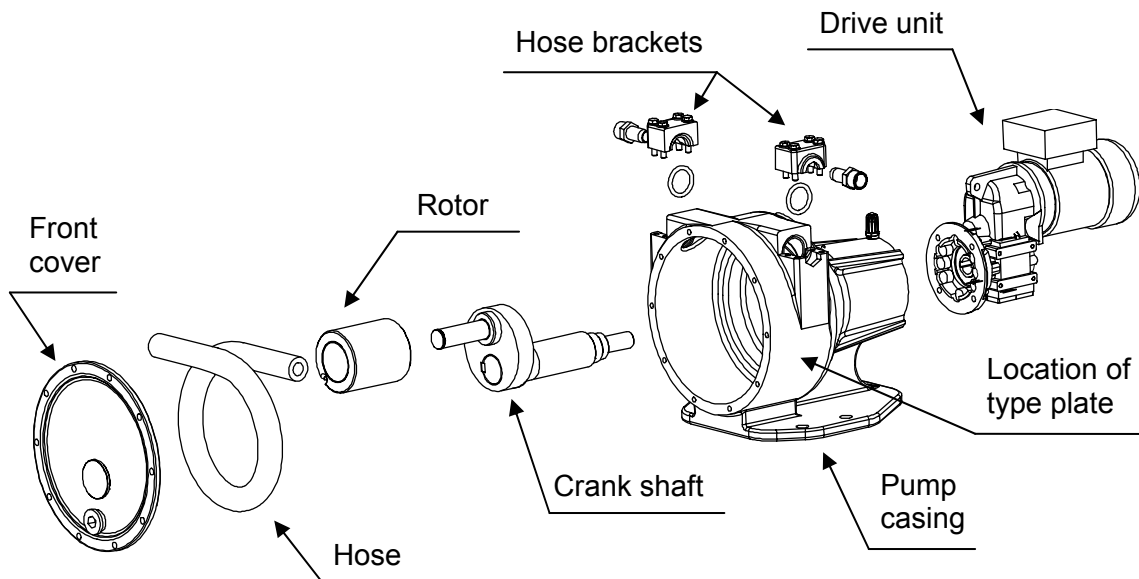


Figure 1. Main components of the pump and location of the type plate

The crankshaft is fitted with a bearing to the casing hub on the centre of the back wall of the casing. The drive unit is connected with a flange to the casing hub.

The hose material, nozzles (connections) and the drive size are the only items of the pump that will vary depending on the pumped medium and the flow pressure parameters.

The pumps can be equipped with two types of geared motors or gear units. Possible gear unit types are: helical gear box or helical-bevel gear box. Both can be offered as geared motors or gear units with IEC flange for motor.

## **2.3 Description of optional accessories**

### **2.3.1 Electrical drive control accessories**

The electrical drive control accessories are:

- hose leak detector
- revolution detector
- frequency inverter (integrated or separate)

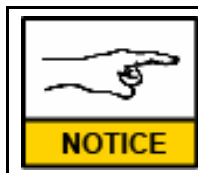
The hose leak detector is a two-wire floating type switch connected to the back wall of the pump. It is an NC type detector: when the liquid level rises inside the casing, the leak detector circuit opens.

The revolution detector is an inductive detector mounted on the back wall of the pump. The detector sends one impulse per detected revolution of the crank shaft. The detector requires a supply voltage of +24 V.

The frequency inverter is for controlling the rotation speed of the pump. The inverter can be delivered either integrated to the motor or separately.

The integrated inverter has a high protection class (IP 66) and it can be equipped with a local speed control (a potentiometer) or remote speed control (0...10V, 0/4...20mA).

The separate inverter must be installed in a cool and dry place. The set point for the separate inverter signal can be adjusted with a 0...10V signal (optionally  $\pm 10V$ , 0/4...20mA), fixed frequencies or a bus. The analogue output signal is scalable, 0 to 10V.



All connections must be made only by authorized persons.  
See the spare parts catalogue for the part codes.

## 2.4 Technical specifications

### 2.4.1 Pump parameters

Table 2. Pump parameters

Pump model	Size range (DN)	Flow capacity (m <sup>3</sup> /h)	Flow / revolution (litres)	Max. Operating pressure (bar)	Hose bore and connection
LPP-D15	15	0,06...0,6	0,1	7,5	15 mm, R ½"
LPP-D20	20	0,1...1,1	0,18	7,5	20 mm, R ¾"
LPP-D25	25	0,2...2	0,3	7,5	25 mm, R 1"


The optional hose and auxiliary specifications for all the pump sizes are indicated below.

Hose materials (optional):

- EPDM
- NR
- NBR
- SBRT

Pump control (auxiliaries):

- hose leakage detector
- revolution detector
- frequency inverter (integrated or separate)

	<p>The flow rate of the pump can vary from the values mentioned above.</p> <p>There can be many reasons for this, such as:</p> <ul style="list-style-type: none"> <li>- high viscosity of the pumped medium can reduce the flow/revolution if the pressure on suction side is less than the ambient pressure</li> <li>- high suction which reduces the flow capacity per revolution</li> </ul>
---	--

### 2.4.2 Dimensions and weights

The final dimensions and weight of the pump depend on the drive and accessories mounted on the pump.

Table 3. Approximate weights for the LPP-D pumps

MODEL	PUMP (kg)	DRIVE (kg)	TOTAL (kg)
LPP-D15	33	14	47
LPP-D20	33	14	47
LPP-D25	42	20	62

## 3. TRANSPORTATION, STORAGE and LIFTING

The LPP-D pump is delivered in its own transportation box. Store and transport the pump in the original delivery box until the final installation. Store the pump unit in a dry cool place protected from the sunlight.

Before taking the pump out from its transportation casing make sure that the foundation for the pump is ready and is of the required dimensions and materials.

If storage is required after the pump has been in use, observe following the instructions:

- flush the pump clean from the medium
- remove the hose from the pump to avoid it going flat during storage
- clean the pump housing
- store the pump in a dry place in standard temperature, protected from sunlight



Only lift the pump with approved lifting equipment of sufficient capacity, when necessary. Before handling, make sure that the equipment is capable and suitable for the task. Always follow the instructions of the lifting equipment

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The right method of connecting the halyards is shown in figure 2. The halyards must not be connected to the lifting eye of the gearbox or the motor.

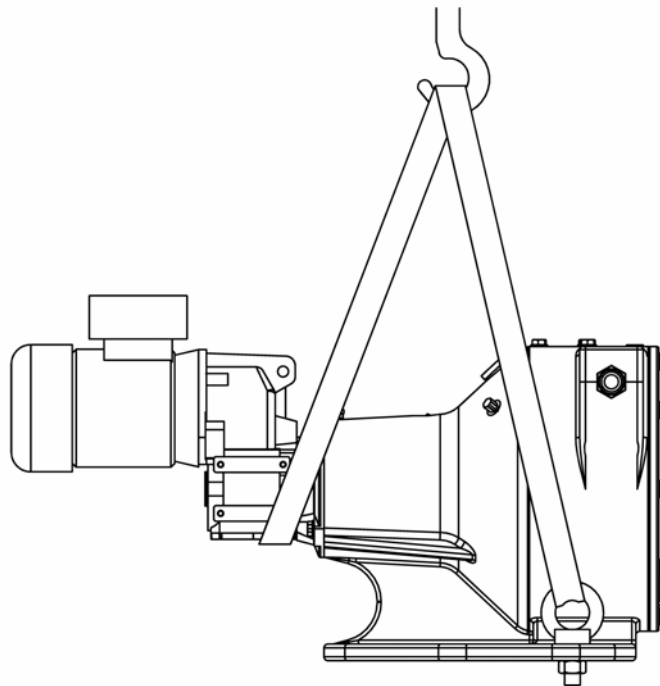


Figure 2. Lifting the pump

## 4. INSTALLATION

### 4.1 General



The LPP-D pumps are for industrial use only. The pump should be installed indoors or it must be protected from direct sunlight or high moisture and rain.

The installation of the LPP-D pump is only allowed to be performed by professionals and properly trained persons. All installation and maintenance tools and values are in accordance with the metric system.

Installation of the pump requires:

- a complete set of spanners
- a complete set of Allen keys
- a torque wrench (up to 300 Nm)
- screw drivers (for the electrical connections)

The pump must be mounted on the pump foot which is a part of the cast pump casing.

The LPP-D pumps are normally delivered fully assembled (except if the pump is delivered with an IEC flanged gear unit without motor) and ready for use. The hose with lubricant is installed in the pump.

### 4.2 Installing the pump

The pump is delivered in a transportation package to protect the pump during transport. For more information see chapter 3 "Transportation, storage and lifting".

Table 4. Needed distances around the pump (for maintenance and cooling)

Model	Front (m)	Right side (m)	Left side (m)	Back (m)
LPP-D15, 20 & 25	1	0,5	0,5	0,15

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Mount the pump onto a proper foundation that has either base bolts or threads for base bolts, see section 2.4.2 Dimensions and weights for the basic pump dimensions. The pump must be bolted with base bolts through the pump foot to the foundation, no other mounting points are allowed. Make sure the foundation is firm enough to withstand the weight and vibrations that might occur during pump operation.



 <b>NOTICE</b>	The only allowed mounting position is the “foot down” position.
--	---


Table 5. Pump base bolts and tightening torque

Model	Bolt	Tightening torque (Nm)
LPP-D15, 20 & 25	M16x70	210

When the foundation is ready for installation:


- Lift the pump, according to the instructions mentioned in chapter 3, and lower the pump to the foundation.
- Bolt the base bolts to the foundation and tighten the bolts using a torque wrench and the torque tightness mentioned in Table 6. (Pump base bolts and tightening torque).
- Remove possible transportation supports.

 <b>WARNING</b>	If the pump is located in a dirty environment, where it can be exposed to liquid, sprays or dust settling on the motor, the motor must be protected with a cover. An unclean motor can overheat and be damaged.
---	---

 <b>NOTICE</b>	If installing a pump with an IEC flanged gear unit, the motor can be mounted on the gear unit after the pump is bolted to the foundation. Motor installation must be performed according to the instructions given by the manufacturer.
--	---

### 4.3 Electrical connections


For easier maintenance and operation, the pump control should be equipped with a local rotation direction switch. The motor connection must be done according to instructions provided by the manufacturer. The instructions are delivered with the motor unit.

	<p>Always make sure that existing power supply voltage is correct for the pump and control unit. Only qualified electricians are allowed to make the wiring connections.</p>
---	--

### 4.4 Pipe work

#### 4.4.1 General

Flow direction of the pump is from left to right when looking at the front of the pump.

	<p>If the flowing medium contains heavy particles, minimum velocity of the medium must be maintained to avoid sedimentation and line blockage.</p>
---	--

Connected pipes should fulfil the following requirements:

- The connection lines should be oversized to reduce pressure loss in the pipeline
- The pump should be connected to pipelines with connector hoses or there should be a short part (500 mm) of pipeline easy to remove to allow enough space for hose change and maintenance
- The pipelines must be properly connected to protect the pump from stresses that may come from the pipeline
- The pipelines must be properly connected and secured to withstand pulsations from the suction and discharge flows of the pump. Value of pulsating pressure difference depends for example on: pumped pressure, pumped flow rate, S.G. of pumped medium, pipeline dimensions, etc. The pulsation effect can be reduced by using pulsation dampeners.
- If the pump discharge pipeline includes valves, then a pressure relief valve must be installed between pump and that valve to avoid overpressure.



Both pump suction and discharge connections are threaded nozzles. See the following table for the connection sizes.

Table 6. Suction and discharge connection sizes

Model	Connection nozzles (inch)
LPP-D15	R ½"
LPP-D20	R ¾"
LPP-D25	R 1"

#### 4.4.2 Allowable forces on the inlet and outlet connection

The pump should be connected to the pipelines with hoses for easy maintenance and to isolate possible forces from the pipeline. If the pump is connected to a pipeline directly with inflexible pipes, the pipelines must be fixed so that the pump connection is free from stress and vibrations from the pipeline.

## 5. USING THE PUMP

LPP-D pumps are normally delivered with the hose and lubricant already installed. Also the drive unit (gearbox with motor) is installed before the pump is delivered. In this case the pump is ready for use with the nominal parameters stated in the pump nameplate. If the pump is delivered without a motor, the motor must be installed according to the instructions provided by the manufacturer.

### 5.1 Commissioning

Before start-up always check that the pump is installed according to the instructions in this manual and the existing safety regulations.

At the very least, check the following:

- The pump is to be used only for the purposes it has been sold for.
- The installed hose and the LPP-lubricant are compatible with the pumped medium.
- The pumping parameters, stated in the pump nameplate, are suitable for the pipeline the pump is connected to.
- The required relief valve/safety devices to avoid overpressure are connected and operational.
- The electric connections have been made by authorized persons.
- Starting the pump does not cause danger to other persons or other equipment in the pipeline.
- The pump is connected to the pipe work and all the connections are tight and secure.
- All valves on both sides of the pump are open. Pay special attention to the valve on the discharge pipe.
- If the pump is equipped with a variable speed drive, the minimum operating frequency must be high enough to guarantee pump cooling. If the motor speed is too low for cooling or ambient temperature is high, the motor has to be equipped with an electric drive fan.

### 5.2 Operation and shutdown

All of the LPP-D pump models can be operated with a maximum speed of 100 rpm. If higher speeds are required, please consult our local representative.

When turned on, the pump starts to rotate at its nominal speed (unless equipped with a variable speed drive). The nominal rotation speed produces the nominal flow rate.




LAROX FLOWSYS OY  
P.O. BOX 338, FI-53101 LAPPEENRANTA  
TEL. +358 201 113 311, FAX +358 201 311 300  
E-MAIL: [info@larox.fi](mailto:info@larox.fi), [www.larox.fi](http://www.larox.fi)


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If the pump is equipped with a variable speed drive, the minimum speed must be limited. The limitation is necessary, so as not to overheat the motor by running it at low speeds for a long period of time.

	Never close discharge valves when the pump is operating; risk of over-pressurization and pipeline/pump failure.
---	---

To avoid pipeline/pump blockage, the pump and discharge lines must be washed every time the pump is stopped. When the pump is started after interruptions, all valves in the charge line must be re-opened and the pipeline must be clear of any blockages.

	The pump unit can be delivered with a hose leak detector. The device must be connected to the control system for it to work properly.
---	---

The need for hose replacement can be monitored during pump operation by controlling the produced flow rate vs. pump speed. If the flow rate per revolution is less than the nominal flow per revolution, the hose must be replaced.

## 6. MAINTENANCE AND SERVICE

### 6.1 General maintenance and inspections


Hose pumps are often critical machines in process operations. In order to guarantee the problem-free and reliable operation of the pump, basic monitoring and inspection must be done on a daily basis.

The only wearing part in the pump is the hose. A certain amount of hose lubricant is required for each hose. Also new O-rings for the hose end connections to the pump are required.


#### 6.1.1 Monitoring during operation

The condition of the hose must be controlled regularly. Controlling must be carried out both physically on-site and also by monitoring the operation parameters of the control system.

When monitoring the hose condition the current pumped flow rate (l/min) is divided by the current pump speed (rpm). If the result is significantly less than the given flow per revolution in the pump datasheet (difference >5%), the hose must be replaced. The given flow rate also depends on the process parameters (suction height, medium viscosity). A reduced flow rate per revolution may indicate backflow through the compression point.


 <b>NOTICE</b>	The process parameters can vary during operation.
--	---


The gear unit and bearing seal condition can be controlled visually for any oil or grease leaks. If any leaks are noticed, seals (and bearings if needed) must be changed.

 <b>WARNING</b>	The motor surface must be clear from dust and dirt. If the motor cooling ribs are covered with dust, the motor can overheat and be damaged.
---	---

## 6.1.2 Lubrication

The LPP-D pump hose is lubricated with LPP hose lubricant to minimize friction. The lubricant has a temperature range from  $-20^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  and must be poured into the pump casing when the hose is installed or replaced. The correct amount of lubrication is 0,4 litres. This is the same for all of the pump models.

 <b>NOTICE</b>	Make sure there is lubricant in the pump before it is started.
--	--

 <b>DANGER</b>	Always check the compatibility of the lubricant for the pumped medium. Although the LPP hose lubricant is a very stable compound it can react with oxidizing mediums like some acids. If unsure, always contact your local LPP representative for further information.
--	--

The rotor and main bearings are lubricated for 6 months use. 5% of the grease must be added every 6 months. In high ambient temperatures, the life-span of the grease can be shortened and more frequent greasing is recommended. The bearing grease type must be:

### **SKF LGHP2 or an equivalent**

Lubrication of the gear unit must be carried out according to the instructions provided by the manufacturer (delivered with the unit).


## 6.2 Changing the hose

### 6.2.1 Preparations


Always clean the surroundings of the pump and the outer surface of the pump before beginning maintenance work. This is to avoid any dirt getting into the pump. Also drain the pipelines on both sides of the pump and close the pump inlet and outlet valves.

### 6.2.2 Removing the hose


1. Switch off the electric supply to the pump.
2. Open the drain valve or the front panel to drain the pump casing. Protect yourself against possible splashes of the medium from inside the pump.

	<p>If the pump has been used to pump harmful mediums, the pump casing can contain substances which may be harmful to you and to the environment. Use proper waste disposal procedures set by your facility.</p>
--	---

3. Remove the front cover by opening the bolts on the cover.
4. Turn the rotor to its lowest position.
5. Unbolt the hose brackets on both sides of the pump.
6. Remove the nozzles from the hose ends
7. Pull in the hose ends through the pump ports.
8. Take off the o-ring.
9. Pull the hose out of the casing.

	<p>Make sure that no unauthorized persons are near the pump when changing the hose.</p>
---	---

10. Clean the pump casing properly.

	<p>Any particles or material inside the pump can destroy the pump or the hose and reduce the maintenance-span of the pump and hose.</p>
---	---

### 6.2.3 Replacing the hose

1. Lubricate the hose ports in the pump with LPP hose lubricant to make the installation easier and slide the hose ends to the ports from inside the casing.
2. Install new o-rings at the pump ports.
3. Push the hose ends through the ports so that the hose end is in contact with the shoulder of the groove in front of the port.

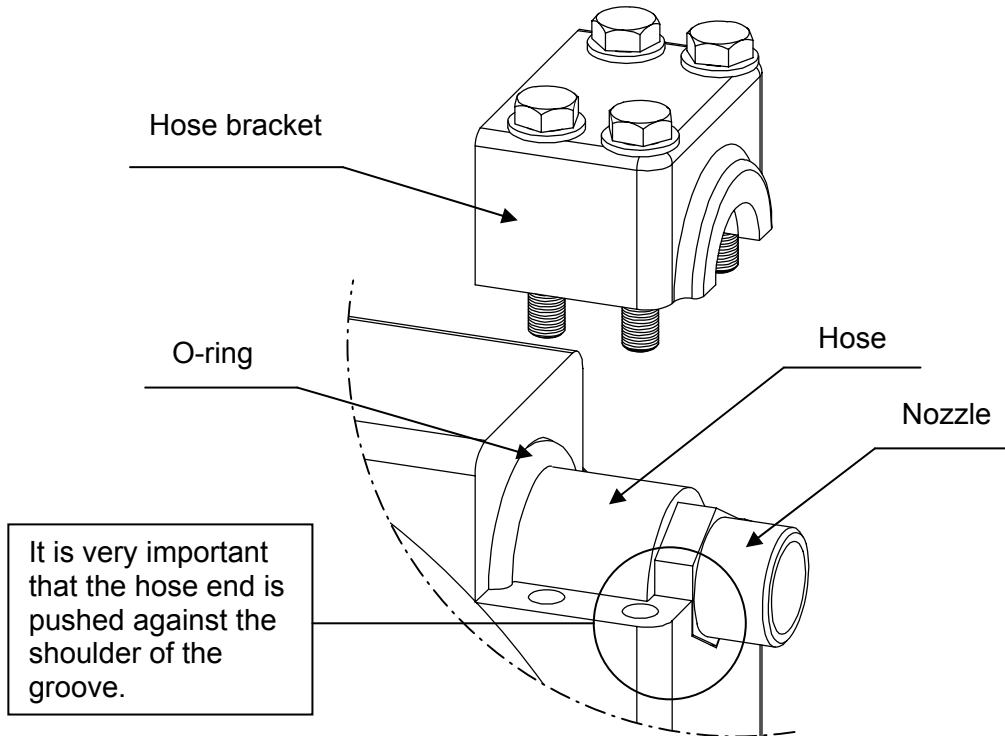


Figure 3. Hose connections

4. Push the nozzle into the hose. Take care that the hose remains in its position.
5. Place the hose bracket and in its bolts in their place on both sides.
6. Push the lower part of the hose into the pump casing between the rotor and the casing. You can help the mounting by rotating the rotor by hand.
7. Check that the nozzles are in the correct position in the corresponding grooves.
8. Close the front cover and pour in the hose lubricant through the plug on top of the pump casing. The correct amount of lubricant is 0,4 litres.
9. Close the plug.

## 6.3 Servicing

### 6.3.1 Rotor assembly and bearing replacement

Before starting this maintenance operation, make sure that you have all required spare parts.

The disassembly of the rotor and the rotor bearings can be done according to the following steps:

1. Disconnect the power to the pump unit.
2. Remove the front cover by opening the bolts on the cover.
3. Take out the hose according to the instructions in chapter "6.2.2 Removing the hose".
4. Remove the seal plug from the centre of the rotor.
5. Remove the locking ring and the supporting ring.
6. Pull out the rotor assembly from the crank shaft.

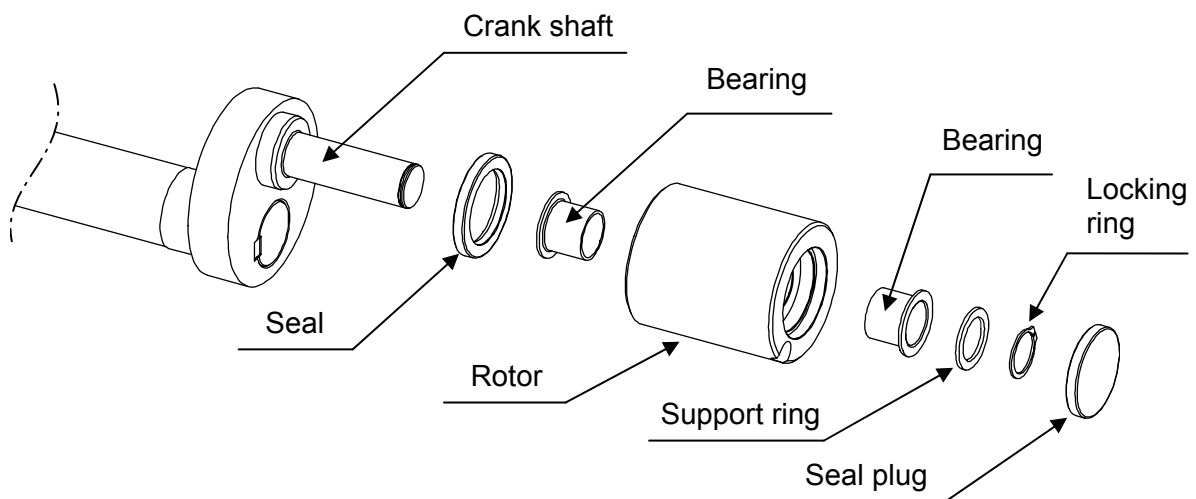


Figure 4. Rotor and bearing assembly

7. Remove the seal and the bearings from the rotor.

The assembly of the rotor and the rotor bearings can be done according to the following steps:

1. Insert the bearings into the rotor and replace the seal.
2. Mount the rotor onto the crank shaft.
3. Fasten the supporting ring and the locking ring into the rotor.
4. Replace the seal plug onto the centre of the rotor.



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5. Add grease to the rotor hub.
6. Replace the hose according to the instructions in chapter "6.2.3 Replacing the hose"
7. Close the front cover by tightening the bolts.



Do not use any hammering tools at any point during this installation. Prelubricate all the bearings with grease before installation.

### 6.3.2 Gearbox assembly

For dismantling the gearbox, observe the following steps:

1. Isolate the power supply and disconnect the wiring from the motor.
2. Support the gear unit and the motor with a lifting device
3. Remove the gearbox flange bolts.
4. Pull the gearbox/motor unit apart from the pump and lower the gearbox/pump unit on to a table.

The gear unit is assembled in the opposite order.



Add the same amount of grease that was removed during the process and replace the paper seal.

### 6.3.3 Crankshaft and main bearing assembly

First dismantle the rotor and gear unit as described above.

1. Make sure the power supply has been isolated and the wires have been disconnected.
2. Rectify the bent part of the locking washer out from the groove in the locking nut and remove both parts from the crank shaft.
3. Remove the crank shaft from the pump casing by pushing it from the gearbox side and set it on a table.
4. Remove the locking ring from the casing hub and pull out the rear bearing.
5. Pull out the shaft sealing and the front bearing.
6. Clean all parts and the pump casing, paying special attention that no foreign particles or materials get inside the pump.
7. Grease the bearings and check all removed parts for wear and replace if necessary with original spare parts.

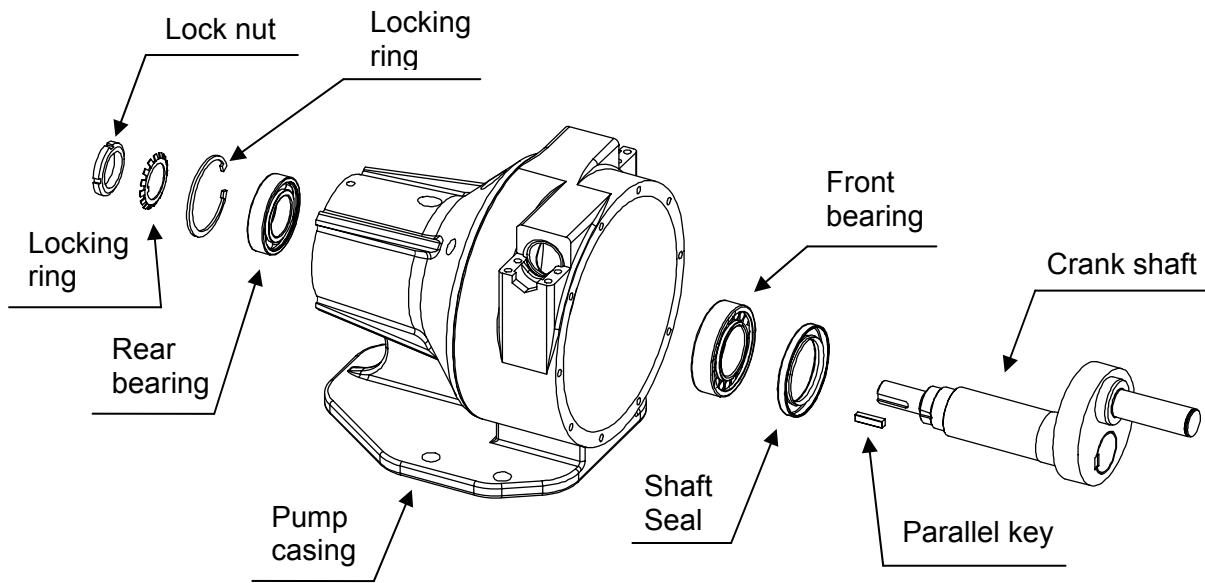


Figure 5. Crank shaft and main bearing assembly

#### Assembly of the crankshaft:

1. The assembling process of the crankshaft is opposite to the dismantling process.
2. Make sure the bearings have been greased before installation. Take the bearing bushing out of the front bearing and mount the bushing onto the crank shaft.
3. Mount the front bearing into the casing.
4. Press the shaft sealing into the casing.
5. Mount the rear bearing into the casing.
6. Replace the locking ring.
7. Insert the crank shaft into the pump unit through the front.
8. After tightening the locking nut, lock the nut with the locking washer and fill the bearing housing with grease. Locking nut tightening torques are given in appendix C "Tightening torques for screw threads".
9. Assemble the rotor (with new bearings) and gear unit according to the instructions given in chapters 6.4.1 and 6.4.2.

## 6.4 Troubleshooting

Table 7. Troubleshooting table

FAULT	POSSIBLE REASON	ACTION
The pump will not start	<p>The power is OFF</p> <p>The supply is not connected</p> <p>Problem with the electric supply</p> <p>Safety devices activated</p>	<p>Turn power ON</p> <p>Connect supply (authorized person only)</p> <p>Check the power supply (correct supply voltage and frequency, authorized person only)</p> <p>Reset any alarms</p>
Pump running with no flow	<p>Suction valve closed</p> <p>Blockage in suction line</p>	<p>Open suction valve</p> <p>Clean suction line</p>
Pump running with flow lower than expected	<p>Too high viscosity/S.G. in pumped medium</p> <p>Suction line partly blocked</p> <p>Too high suction lift</p>	<p>Check pump sizing parameters vs. medium properties</p> <p>Clean the suction line</p> <p>Check pumping arrangement</p>
Short hose life	<p>Too little or wrong lubricant</p> <p>Big particles in slurry disturbing the hose</p>	<p>Add/change lubricant</p> <p>Prevent big particles from entering the pump</p>
Reduced flow during operation	Suction line partly blocked	Clean the suction line
Pump does not start after shutdown	<p>Too high pressure in discharge line</p> <p>Blockage in discharge line</p> <p>Blockage in the pump</p>	<p>Run the pump backwards to reduce discharge pressure</p> <p>Flush the discharge pipeline</p> <p>Empty/replace the pump hose</p>
Pump casing filled with liquid	Hose leakage	Clean pump casing and change the hose.



## APPENDIX A

**CLAIM FORM**

All claims regarding the hose and pump warranty must be made in writing by the buyer within thirty (30) days from the date the defect was noticed.

The following information must be included. Either fill out the form **in print**, or send the same information to the manufacturer by other means; however the claims must be **in writing**.

<b>PUMP SERIAL MANUFACTURING NUMBER:</b>	
<b>DATE THE DEFECT WAS NOTICED (dd.mm.yyyy):</b>	
<b>OPERATING CONDITIONS UNDER WHICH THE DEFECT WAS FOUND:</b>	
<b>DESCRIPTION OF THE FLOWING MEDIA:</b>	
<b>DETAILED DESCRIPTION OF THE DEFECT:</b>	

**If all of the above information is not sent to the manufacturer in writing, the buyer will lose his right to the warranty.**

LAROX FLOWSYS OY  
P.O. BOX 338, FI-53101 LAPPEENRANTA  
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E-MAIL: [info@larox.fi](mailto:info@larox.fi), [www.larox.fi](http://www.larox.fi)



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**LAROX FLOWSYS OY STANDARD CONDITIONS OF SALE**

v. 2003.12

The following terms and conditions form a part of each quotation or proposal (the PROPOSAL) submitted by Larox Flowsys Oy ("LAROX") for the sale of equipment and services to a purchasing customer (the PURCHASER) and any contract made by and between the parties includes as a part thereof these terms and conditions.

**1. ACCEPTANCE.** If not otherwise stated in writing, this proposal shall lapse automatically upon the expiration of a period of 30 days after its date of submission set forth below unless it has been previously accepted by PURCHASER or revoked by LAROX. Such notice of revocation shall be deemed to have been given when mailed by certified mail, postage prepaid. This proposal shall become a binding contract, as accepted by PURCHASER, only when approved in writing hereon by LAROX.

**2. COMPLETION AND DELIVERY.** LAROX will make every effort to make delivery or complete the work within the time specified in the proposal, but LAROX shall not be liable for any loss or damage if delivery or completion is delayed as a result of causes of any kind beyond the reasonable control of LAROX, such as, but not limited to, strikes or other labour difficulties, war, riots, acts of governmental authorities, inclement weather, fire, flood, unavoidable causalities, delays in transportation of materials, or inability to obtain timely delivery of materials from suppliers. In the event of any such delay, it is agreed that the time for delivery or completion shall be extended for a period of time at least equal to the time lost by reason of the delay. If LAROX is responsible for the delay due to any other reason as mentioned above, the PURCHASER is entitled to the liquidated damages as defined below after two weeks from the date on which delivery should have taken place. The liquidated damages shall be payable at a rate of 0.5 percent of the value of the delayed part of the delivery for every whole delayed week. The liquidated damages shall not exceed 7.5 percent of the value of the delayed part of the delivery. The liquidated damages are the only compensations available to the PURCHASER in the case of delay on the part of LAROX. When the amount of the liquidated damages have reached the level of 7.5 percent, a delay in delivery or completion of work shall not give rise to cancellation by PURCHASER until thirty days after written notice of such intention to cancel shall have been actually received by LAROX and PURCHASER shall be obligated to accept any equipment shipped or delivered or work completed by LAROX for fulfilment of the delivery during such period. Any claims by the PURCHASER for compensation due to delay in delivery or completion of work shall be waived unless made in writing and delivered to LAROX within five days after delivery or completion of work.

**3. WARRANTY.** LAROX provides an assurance to the PURCHASER that the equipment purchased is free from defects in material and workmanship under normal use and service for a period of twelve (12) months, such period to commence on the date of delivery provided however that the warranty period shall not extend longer than eighteen (18) months from the date of shipment of the material parts. Any part of the machinery supplied by LAROX, which is proven unfit for use owing to faulty



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workmanship or material will, within sole discretion of LAROX either be substituted free of charge or repaired; the free substitution or repair being limited to parts only and excluding any work at PURCHASER's site. This warranty shall not cover any defects originating from ordinary wear and tear or molestation, from use of unsuitable lubricants, negligent attendance, faulty operation or adjustment, nor shall it be valid in case of working troubles (derangement) caused by errors on the part of the PURCHASER with respect to the suitability of the premises in which the plant is installed or other incorrect information, inadequate foundation works, defective protection against exterior influence or similar circumstances for which LAROX is not responsible. This warranty of material and workmanship is the only warranty or guarantee made by LAROX and LAROX disclaims any and all implied warranties of merchantability, fitness, suitability or performance.

**4. DAMAGES.** Under no circumstances, whether due to a breach of any warranty or guarantee hereunder or any other cause arising out of performance or non-performance of this proposal, shall LAROX be liable (1) for consequential or indirect loss or damage, including but not limited to, loss of profits, loss of production, plant down-time, or liabilities to customers or other third parties, or (2) for loss or damage arising out of the sole or contributory negligence of the PURCHASER, its employees and agents, or any third party, or (3) for any special or punitive damages of any nature. If LAROX incurs any liability towards a third party for any damage, the PURCHASER shall indemnify, defend and hold LAROX harmless. In respect of those legal regulations which can not be derogated or due to any other grounds the maximum limit of responsibility on the part of LAROX for damages and losses of any sort and for whatever reason, resulting from or in any case connected with use and delivery of the Product, parts or services supplied by LAROX will consist of a credit for the amount of the total sum of a separate delivery.

**5. TAXES.** The price quoted in the proposal includes the Finnish taxes (excluding VAT) and other public duties in Finland, but the price is exclusive of all other taxes, duties, and levies of other countries including sales or use taxes, which may be payable in respect of the sale, purchase or use of the equipment or part furnished by LAROX. The payment of all such taxes and duties shall be the responsibility of the PURCHASER. If LAROX is required by applicable law to collect any such taxes from the PURCHASER, it may pay the same and add the amount thereof to its invoice. The PURCHASER will furnish LAROX with appropriate tax exemption certificates, if applicable.

**6. RISK OF LOSS.** The PURCHASER shall bear the risk of loss of or damage to the equipment in accordance with the agreed terms of Incoterms 2000. If no terms of Incoterms 2000 are agreed, the risk will pass according to the EXW LAROX's factory (Incoterms 2000).

LAROX has the right to take out insurance for the delivery during the consignment and storage relating to the consignment.

**7. SECURITY INTEREST.** The delivery shall remain the property of LAROX until paid for it in full. Without waiving any rights to elect to proceed under applicable lien laws, LAROX reserves a security interest in the equipment furnished by it until the agreed price (including any notes therefore) has been fully paid in cash, and in the event of

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default in payment, LAROX shall have all rights of repossession and other rights available to a secured party under the laws applicable thereto. The PURCHASER agrees that no part of the equipment furnished under this proposal shall be considered a fixture of a part of any realty by reason of its being attached to real estate, and any part may be separated from real estate for purpose of repossession by LAROX or by our agent without liability for such removal if the PURCHASER is in default in payment of the purchase money. The interest on overdue payment shall be eight (8) percent per annum over the current Marginal Lending Facility of European Central Bank.

**8. DEFAULT.** In the event that the PURCHASER becomes insolvent, commits an act of bankruptcy or default in the performance of any term or condition of this contract, the entire unpaid portion of the purchase price shall, without notice or demand, become immediately due and payable. In any such event, LAROX, at its option, without notice or demand, shall be entitled (1) to sue for said balance and for reasonable attorneys' fees plus out-of-pocket expenses and interest; (2) to enter any place where said equipment is located and to take immediate possession of and remove said equipment with or without legal process; (3) to retain all payments therefore made as compensation for the use of said equipment; (4) to resell said equipment at public or private sale without notice or demand for and on behalf of the PURCHASER; and (5) to apply the net proceeds from such sale (after deduction from the sale price of all expenses of such sale and all expenses of retaking possession, repairs necessary to put said equipment in saleable condition, storage charges, taxes, liens, collection and attorneys' charges and all other expenses in connection therewith) to the balance then due to LAROX for said equipment and to receive from the PURCHASER the deficiency between such net proceeds of sale and such balance. The PURCHASER hereby waives all trespass, damage and claims resulting from any such entry, repossession, removal, retention, repair, alteration and sale. The remedies provided in this paragraph are in addition to and not in limitation of any other available remedy or remedies of LAROX, but each and every such remedy shall be cumulative and shall be in addition to every other remedy under this proposal or now or hereafter existing at law or in equity or by statute. No delay or omission to exercise any right or power accruing upon any default shall impair any such right or power or shall be construed as a waiver thereof, but any such right or power may be exercised from time to time and as often as may be deemed expedient.

**9. CHANGES.** If pursuant to the PURCHASER's written direction or request any change is made in the equipment to be furnished or the work to be performed, the agreed price shall be increased or decreased to reflect such change and the time for completion under the contract shall be extended to the extent required to make such change.

**10. GOVERNING LAW.** This contract shall be governed by the Finnish laws.

**11. ARBITRATION.** Any dispute, controversy or claim arising out of or relating to this contract, or the breach, termination or validity thereof shall be finally settled by arbitration in accordance with the Arbitration Rules of the Finnish Central Chamber of



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Commerce. The Arbitration proceedings shall be conducted in Helsinki, Finland and the language of the proceeding shall be English.

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Notwithstanding the foregoing, the Principal shall, at its discretion, have the right to initiate legal proceedings against the PURCHASER in any competent Court of Law on matters of industrial property rights or for collecting any outstanding invoices or for obtaining injunctive reliefs.

**12. WAIVER.** No claimed waiver of any of the provisions of the proposal or contract shall be valid unless signed by a duly authorized representative of LAROX and waiver of one provision shall not constitute waiver of other provision. LAROX shall not be bound by any additional or different terms unless those terms are accepted in writing by an authorized representative of LAROX.

**13. INTEGRATION CLAUSE.** By acceptance of the proposal, the PURCHASER acknowledges (1) that it has not relied on any previous written, oral or implied representation, inducement or understanding of any kind or nature, (2) that the proposal, including the general terms and conditions and any drawings incorporated in the proposal by reference, embodies the entire agreement between the PURCHASER and LAROX and supersedes all prior agreements and understandings, both written and oral among the parties with respect to the subject matter hereof, and (3) that the contract entered into by acceptance of the PURCHASER may not be modified or terminated except by a writing signed by a duly authorized representative of LAROX.

2.12.2003



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**Torques for the most important bolts:**

1. Torque rating for the hose clamp brackets bolts:

LPP-D15/LPP-D20:	25 Nm
LPP-D25:	25 Nm

2. Torque rating for the front cover bolts:

LPP-D15/LPP-D20:	1 Nm
LPP-D25:	1 Nm

3. Torque rating for the gear motor mounting bolts:

LPP-D15/LPP-D20:	10 Nm
LPP-D25:	20 Nm



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## Contact information

Your local Larox Flowsys representative is ready to help you with any questions you might have about your pump.

Your local representative:



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