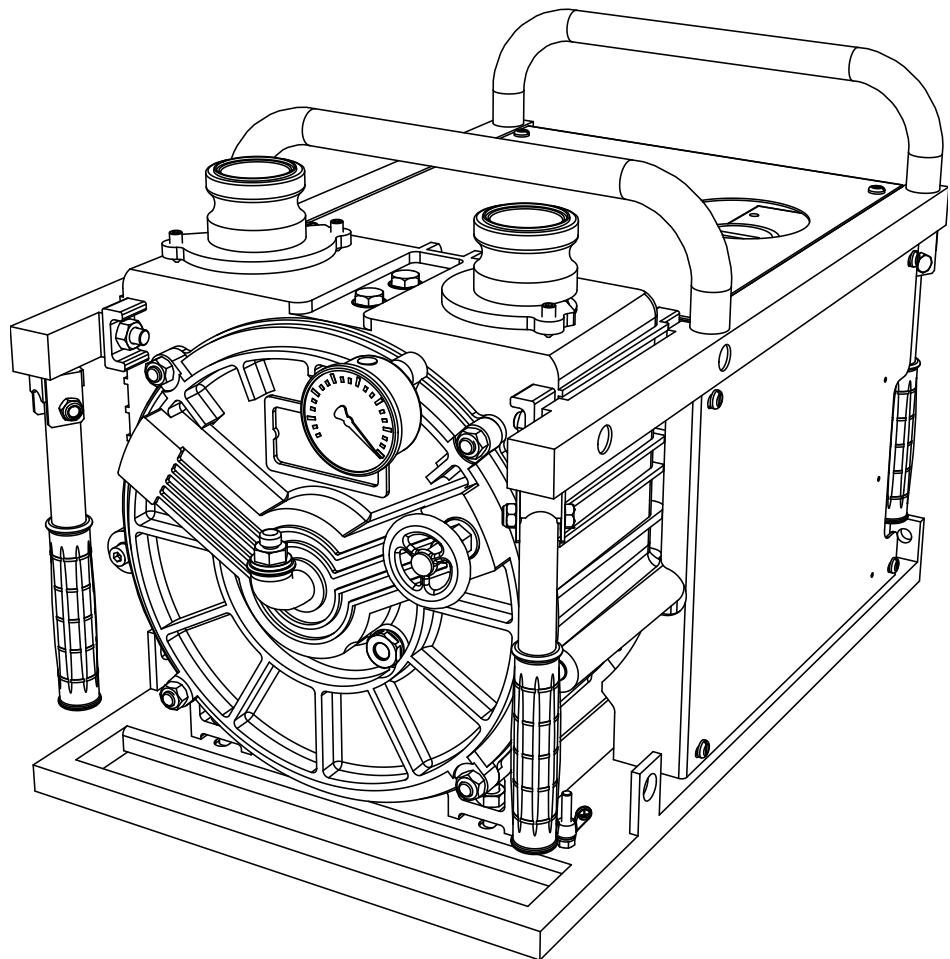


ELRO[®]

BA-M300-GB/10.19

Peristaltic Pumps Series M300 Series T300

Operating and
Installation Instructions
Installation, Operation
and Maintenance



CRANE[®]

www.cranepharmaceutical.com

**This is the translation of the original declaration of conformity
for ELRO® peristaltic pumps series M300 / T300.**



EC Declaration of Conformity

in compliance with the Machinery Directive 2006/42/EC

We hereby declare, that the pump units manufactured in series production

Designation: ELRO Peristaltic Pump and
ELRO peristaltic pump heads with/without
mounting frame

Series: M300, T300

Manufacturer: Crane Process Flow Technologies GmbH
Heerdter Lohweg 63 - 71
40549 Düsseldorf

Serial number: (see identification plate)

in the version delivered by us, is in compliance with the following applicable regulations:

EC directives: Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU

Harmonized standards: EN ISO 12100:2011-03, EN ISO 13857:2008-06,
EN 809:2012-10

Mr. Ralf Rennwanz is authorized to compile the technical documents.

Crane Process Flow Technologies GmbH
Heerdter Lohweg 63 - 71
40549 Düsseldorf

Place, date: Düsseldorf, 31.10.2019

Signature of manufacturer:

A handwritten signature in black ink, appearing to read 'Hans-D. Ptak', written over a horizontal line.

Information on signatory:

Hans-D. Ptak, Managing Director



II 2G Ex h IIB T3 Gb

EU Declaration of Conformity

in accordance with directive 2014/34/EU for equipment intended for use
in potentially explosive atmospheres

The manufacturer Crane Process Flow Technologies GmbH,
Heerdter Lohweg 63-71, 40549 Düsseldorf,

declares that the pump units manufactured in series production

Description: ELRO – Peristaltic Pump

Series: M300 including drive and accessories

Pump hose materials: NBR, CSM, NR
all hoses are electrically conductive

Connecting ports: Stainless steel, bronze; PP electrically conductive

Base frame: Fire fighter frame high-grade steel or galvanized steel

Pulsation damper: High-grade steel with CSM diaphragm electrically conductive

Suction/pressure hoses: electrically conductive

Barrels and suction accessories: Stainless steel

Drives: All drives have their own declaration of conformity issued by the
supplier

Installed electrical components: all electrical units have their own declaration of conformity issued
by the supplier

in the version delivered by us, is in compliance with the following applicable regulations:

EC Directive: Directive 2014/34/EU for equipment authorised for use in poten-
tially explosive environments.

Conformity assessment procedures: Equipment group II, category 2G, explosion group IIB
temperature class T3, equipment protection level (EPL) Gb

Harmonised standards: DIN EN 1127-1:2011-10
DIN EN ISO 80079-36:2016-12
DIN EN ISO 80079-37:2016-12

Place, date: Düsseldorf, Germany, 26/09/2019

Signature of manufacturer:

Information on signatory:

Hans-Dieter Ptak, Managing Director

Table of contents

| | Page |
|--|-----------|
| 1.0 Introduction..... | 7 |
| 1.1 Warranty | 7 |
| 1.2 Transport, storage | 8 |
| 1.3 Principle of function..... | 8 |
| 2.0 Safety | 10 |
| 2.1. General information..... | 10 |
| 2.2 Intended use | 11 |
| 2.2.1 Unintended use | |
| 2.3 Operation of pump | 11 |
| 2.4 Conversions and alterations to the pump | 12 |
| 2.5 Symbols and safety notes | 12 |
| 2.6 Maintenance work..... | 12 |
| 2.6.1 Health and safety information on electric equipment..... | 13 |
| 2.6.2 Health and safety information on lines under pressure | 14 |
| 2.6.3 Regulations and instructions on lubrication | 14 |
| 2.7 Noise emissions..... | 15 |
| 2.8 Use of pumps in potentially explosive environments | 15 |
| 3.0 Notes on installation and use..... | 16 |
| 3.1 Installation instructions for peristaltic pump heads | 16 |
| 3.2 Points to be observed before use | 16 |
| 3.2.1 Pump suction line..... | 16 |
| 3.3 Installation..... | 16 |
| 3.4 Equipotential bonding / Earthing | 17 |
| 3.5 Distance for vibration | 17 |
| 4.0 Operating instructions | 18 |
| 4.1 To be considered before commissioning | 18 |
| 4.2 Commissioning | 18 |
| 4.3 Decommissioning | 18 |
| 5.0 Maintenance..... | 19 |
| 5.1 Cleaning..... | 21 |
| 5.2 Replacement of the pumping hose..... | 21 |
| 5.3 Replacement of separating part | 24 |

| | | |
|------------|--|-----------|
| 5.4 | Replacement of abutment | 24 |
| 5.5 | V-belt drive | 25 |
| 5.5.1 | Axial safety of the belt pulleys | 25 |
| 5.5.2 | Checking the V-belt tension | 25 |
| 5.6 | Lubricant change | 25 |
| 5.6.1 | Pump housing | 25 |
| 5.6.2 | Gearbox | 25 |
| 5.6.3. | Lubricant types..... | 25 |
| 5.7 | Shaft bearing..... | 25 |
| 6.0 | Spare parts..... | 26 |
| 6.1 | Stock keeping of spare parts | 26 |
| 6.2 | Ordering spare parts | 26 |
| 7.0 | Troubleshooting..... | 27 |
| 8.0 | Appendix I | 30 |
| | Noise emissions..... | 30 |
| 9.0 | Appendix II | 31 |
| | Recommendations for use | 32 |

1.0 Introduction

ELRO® Peristaltic pumps M300/T300 are dimensioned as pumps in accordance with chapter 1, article 1, section (2), paragraph (j), point (ii) of the pressure equipment directive and are therefore no pressure equipment as defined by the EC pressure equipment directive 2014/68/EEC.

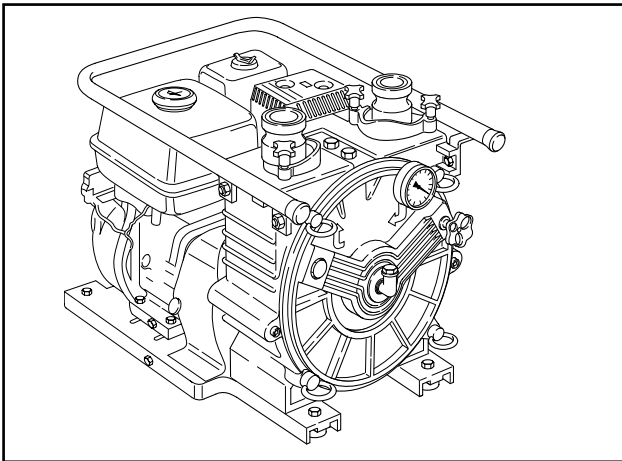


Fig. 1: Exemplary installation for peristaltic pumps

The following instructions refer only to the peristaltic pumps M300 and T300.



Caution!

Since the pumps will be used in combination with other assemblies, such as combustion engines and electric motors, you must also strictly observe and comply with the operating and maintenance instructions for these components as well as the corresponding notes on safe and reliable operation.

These instructions contain information for installation, operation and maintenance of peristaltic pumps ELRO M300 and T300.

You should therefore thoroughly read these instructions before use and always follow the information contained therein.



Caution!

All personnel involved in activities on pump or equipment must have read this manual, especially the

chapter "Safety" before starting work. This is too late once work has started. This applies especially for persons who work on the pump only occasionally, e.g. for maintenance and cleaning work.

Each pump is subject to stringent inspections and function tests before leaving the factory.

You should always bear in mind that a correct function, a long lifetime and optimal operational reliability of the pump mainly depend on

- correct installation
- correct commissioning
- and proper maintenance.

Enquiries concerning service, spare parts or repairs should be addressed to the manufacturer or an authorized dealer.

Always provide the following information:

- Pump type
- Serial number of pump

This information is stamped on the identification plate on the base of the pump.

When returning pumps or pump parts to the manufacturer or an authorized dealer for repair or overhaul, the delivery must be accompanied by a certificate stating that the pump is free of product or other aggressive or hazardous substances (see page 37).

1.1 Warranty

The correct function of each ELRO peristaltic pump is checked in the factory before shipment. The manufacturer assumes warranty for his product as specified in the effective terms of sales and delivery. Faults resulting from the non-compliance with the aforementioned regulations and notes can only be rectified at the cost of the customer.

1.2 Transport, storage

In order to avoid any problems you should

- check the delivered goods against the delivery note for completeness and correctness,
- make sure that for pumps with electric motor, combustion engine, water turbine, hydraulic motor or pneumatic motor the respective operating instructions for the drive are available.

Be careful when unpacking the pump and proceed as follows:

- Examine the packaging for transport damage.
- Take the pump carefully out of the packaging.
- Examine the pump for any visible damage.
- Remove all plugs from the pump ports.
- Make sure that accessories, such as seals and flushing lines, are free of damage.



Caution!

Consider the indicated weight before attempting to lift the pump. Use only lifting gear of appropriate capacity.

Do not step or stand under suspended loads.

Fasten the lifting gear so that the pump (or pump with drive unit) can be safely lifted (see example).

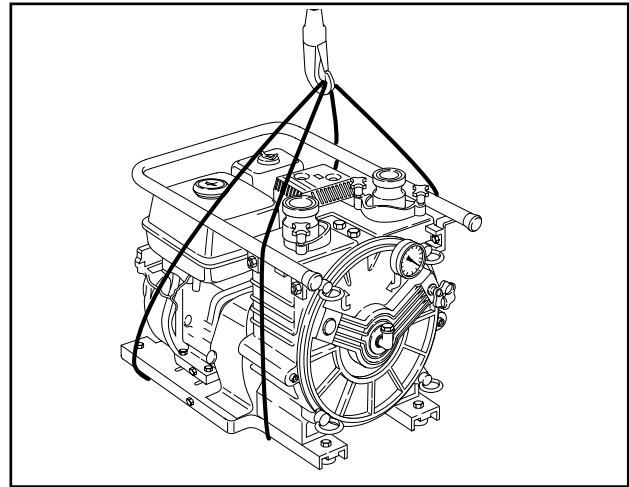


Fig. 2 - Attaching the lifting ropes

1.3 Function

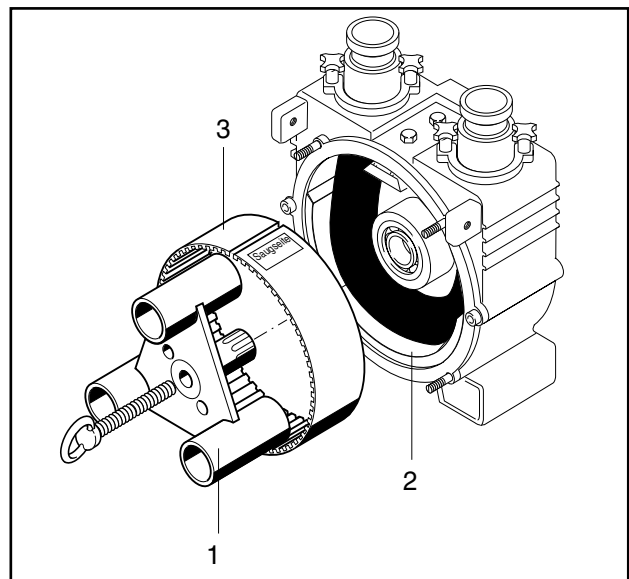


Fig. 3
1 Rotor
2 Abutment
3 Separating part

The priming properties of the peristaltic pump are based on the vacuum backed restoring force of its hose. Due to its special design a vacuum is permanently generated inside the hose on the suction side of the pump. This vacuum always restores the hose to its original size. This way the pump achieves maximum pumping power.

The abutment 2 (Fig. 3) is an elastomer part and is installed in the pump section where the hose is squeezed to maximum extend.

At the same time this abutment protects the pump housing against damage caused by solid particles in case of a hose breakage. In case of wear the abutment can be easily replaced.

The separating part (Pos. 3, Fig. 3) separates the suction area from the inside of the pump and protects the pumping hose. In case of hose breakage it additionally protects the rotor (Pos. 1, Fig. 3) against damage caused by abrasive or coarse particle product. The separating part can be replaced by simply unscrewing two screws.

The pump is filled with 1-2 litres of glycerine or silicone, which works as lubricant, barrier and coolant.

The vacuum gauge (Fig. 3a), which is connected with the suction room (Pos. 4, Fig. 4) not only shows the current suction head of the pump, but also serves as warning element in case of possible defects. If the vacuum gauge does not indicate any vacuum during operation, the pump most certainly needs servicing.

Maintenance can be carried out without any special tools.

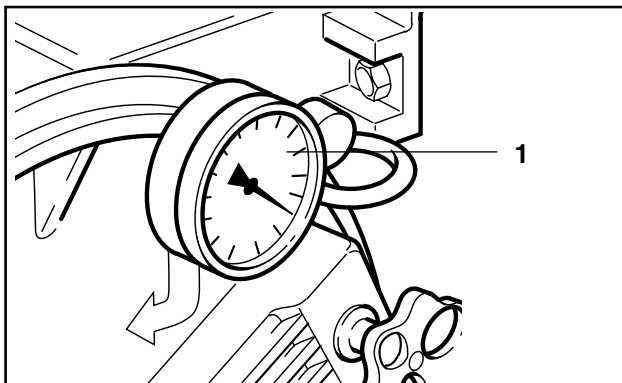


Fig. 3a 1 Vacuum meter

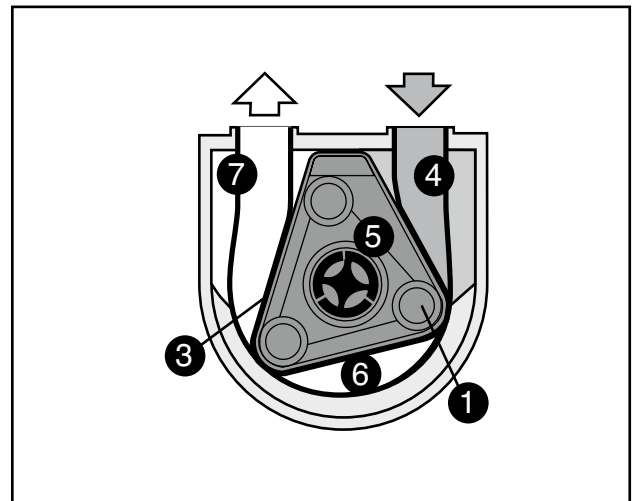


Fig. 4 1 Rotor 3 Separating part 4 Suction area 5 Inside area 6 Hose chamber 7 Pressure area

The rotor 1 rotates inside the separating part 3, which is tightly bolted to the housing. This separates the suction area 4 from the inside of the pump 5.

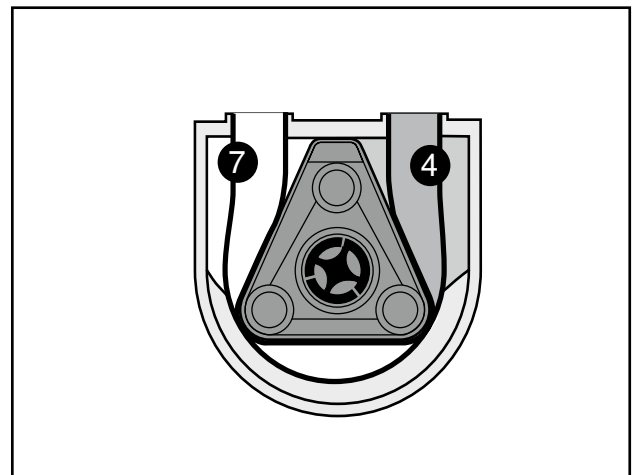


Fig. 5 4 Suction area 7 Pressure area

The sliding tube of the rotor enlarges the volume of the suction area (4). At the same time the pressure area (7) is decreased and the air is forced out through a channel in the pump cover.

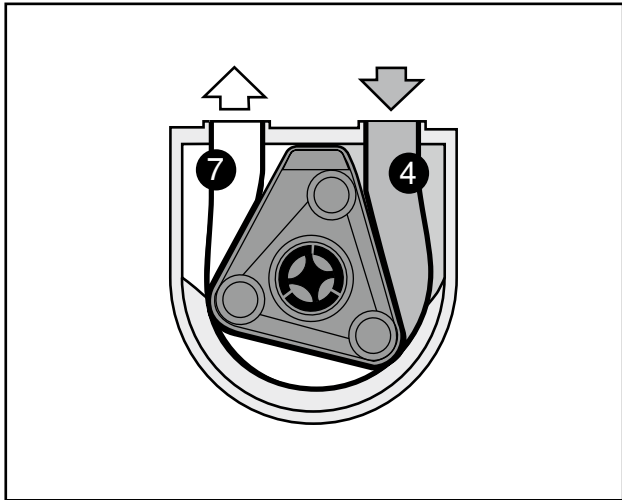


Fig. 6 4 Suction area
7 Pressure

As the rotor rotates further the suction area becomes bigger. The fast rotation of the rotor generates a permanent vacuum of down to -1 bar (Fig. 6).

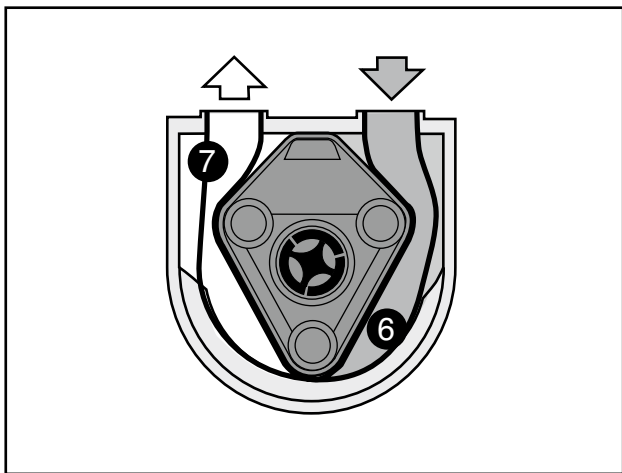


Fig. 7 6 Hose chamber
7 Pressure area

Since the hose chamber Pos. 6 remains constant, the pressure area Pos. 7 is decreased by rotation of the rotor, which results in a volumetric pumping process (Fig. 7).

2.0 Safety

2.1 General information

Make sure that the pump is installed in compliance with all applicable national safety regulations.

Always observe all applicable accident prevention instructions and implementing regulations.



Transfer of media of Explosion Group IIA and IIB is only permitted outdoors or in well ventilated rooms.

The following precautions must be applied before performing maintenance work. If the product to be pumped is a hazardous or noxious substance, the system must be neutralized and vented.



Danger of burning!
Depending on operating conditions the pump may reach temperatures too high to touch. You should therefore switch off the pump and let it cool down before touching it.

- Disconnect main drive unit and pump from the electric power supply (e.g. pull out the mains plug).
- Depressurize the pump head.
- It is not permitted to run the pump after removing the pump cover. When cleaning the pump manually make sure that all necessary precautions have been applied.

All incorrectly installed, unprofessionally operated or insufficiently serviced machines and pumps are potential safety hazards.

The non-observance of relevant safety measures may cause injury to operating personnel or damage to the pump.

On pump systems with protective covering and guards these must be properly assembled again before restarting.

The pump must be shut down or should not be restarted if any defects are found which could affect the operating safety and reliability of the pump.

2.2 Intended use

The peristaltic pumps of series M300 and T300 are designed for mobile use and for short-time operation (up to max. 5 hours).



Check the pumping capabilities of the medium (freezing point) before commissioning.



Pumps without explosion protected drive must not be used in explosive environments.

Temperatures

The permissible ambient temperature range is -20 °C to +40°C.

Pumps with glycerine lubricant

Not permitted to be pumped or stored in the same room: Substances which react severely up to explosively with glycerine.

Examples:

- Calcium hypochloride
- Chlorine
- Chromium trioxide
- Potassium permanganate
- Sodium peroxide
- Phosphorus pentoxide
- Phosphorus triiodide
- Nitric acid
- Sulphuric acid
- Hydrogen peroxide



Please check before using the peristaltic pump that no chemical reactions can occur when

the product comes into contact with the silicone or glycerine lubricant.



When changing the delivery medium, make sure that no chemical reactions can occur with existing residual fluid.



When changing delivery media in Explosion Groups IIa and IIB, for safety reasons install a new delivery hose.



Pumped products which lead to chemical reactions on contact with aluminium may on no account be pumped with a peristaltic pump.

2.2.1 Unintended use

The operating safety and reliability of the supplied pump can only be assured if it is used for the purpose it is intended for. The limits mentioned in the technical data sheet must not be exceeded under any circumstances.

It is prohibited to operate the pump without a sufficient quantity of lubricant. For the necessary fill quantities, refer to Ch. 5.6.



Temperature of pumped product:- max. permissible 80°C

Speed of drive shaft n₂ max.: 2303 min⁻¹



Speed n₂ max.: 1920 min⁻¹. It is prohibited to operate the pump for more than 0.5 h without delivery medium.

2.3 Operation of pump

The pump must only be operated by trained, instructed and authorized persons. Any responsibilities must be clearly appointed before starting operation and should always be complied with.

Strictly observe the operating instructions for the drives in chapter “Appendix”.

2.4 Conversions and alterations to the pump

Conversions and alterations to the pump are strictly prohibited.

However, this does not include minor changes that do not affect safety and reliability, or measures that even enhance the safety. Safety installations must not be made ineffective or changed or used in a way contradicting their purpose.

2.5 Symbols and notes on safety



Note on danger, which, if not observed, may lead to severe injury or even death.



Note on danger, which, if not observed, may lead to severe injury or even death.



Note on danger, insecure handling and working procedures may cause injury or extensive damage to equipment and property.

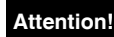


Warning – dangerous electric voltage. Contact with live parts can cause immediate death. Doors and covers (e.g. hoods and lids) marked with this sign must only be opened by “specialists or/and instructed persons” after the respective operating voltage (input terminal voltage, operating voltage or external input voltage) has been switched off.



Operating safety of equipment at risk.

The non-observance of this note affects the operational reliability and can lead to pump damage.



In this manual the Attention symbol precedes all safety notes referring to instructions, regulations or work sequences, which must be strictly complied with.



Danger of explosion: Special instructions apply when handling explosive products or in an explosive environment.

2.6 Maintenance work

applies particularly for all work on electric, hydraulic and pneumatic equipment.

Keep unauthorized persons away from the pump.

Mechanical and electrical repairs and maintenance work must only be carried out by qualified specialists. The professional execution of this work must be examined and approved by a highly skilled and responsible “Inspector”.

Before starting repair and maintenance work the equipment must be switched off and shut down and secured against unintended or unauthorized restarting.

Before starting work on electrical systems and equipment make sure that the system is reliably de-energized.

Apart from this the pump/system must be reliably secured against unexpected restarting.

■ Pull out the mains plug.

The customer (or an "authorized person" appointed by him) is responsible for the compliance with all accident prevention instructions applicable at the place of use.

As a measure to avoid injury all maintenance, adjustment and repair work should only be carried out using permitted and appropriate tools and working aids.

Blown fuses must not be repaired or bridged and may only be replaced by fuses of the same type.

Cooling facilities, such as ventilation slots or fans, must not be covered or made permanently ineffective.

Rotating or moving parts must be reliably stopped before starting work. It must be assured that these parts will not start to move while work is in progress.

Do not touch rotating parts and always keep a safe distance to avoid clothing or hair being caught.

Always wear protective clothing suitable for the job and the related dangers.

This applies especially to cleaning, maintenance and repair work. Depending on the type of work to be performed sufficient protection can be provided by e.g. wearing the following protective clothing: protective goggles, ear defenders, working boots, safety gloves, etc.

Protective clothes should be of tight fit.

If your face may get in contact with chemicals, metal splinters or dust during work, you should wear a full face protection with safety goggles.

Always wear safety boots if there is a risk of heavy objects tipping over, slipping or coming loose for any other reason, thereby causing danger for your feet.

2.6.1 Health and safety information on electric equipment

Depending on the version, the pumps may be equipped with electric accessories (controls, motor drives).

Severe damage to health and property can be caused by:

- unauthorized removal of covers
- inappropriate use of pump
- inadequate maintenance

Before starting installation work on electrical equipment this equipment must be reliably zero potential.

Cover non-insulated live power lines and plug connections against unintended contact.

Electric components stored and not used for a longer period of time should be carefully inspected before use, to ensure that the insulation is still intact.

On wet electric assemblies or components parts, which would be perfectly zero potential in dry condition, may still be live.

Before touching damp or wetted electric components check by measuring whether parts that could be touched are still live.

Never attempt to insert any objects through the openings on the pump or attached equipment. This may cause short circuits and electric shocks with danger to limb and life.

2.6.2 Health and safety information for work on lines under pressure

Always relieve the pressure before starting work on pressure lines.

- Close shut-off valves
- Vent lines



Be careful when checking for leaks on lines under pressure. Fluids or air escaping under pressure can penetrate clothes and skin.

Be careful when loosening or changing pressure lines; lines mixed up by mistake may reverse the function.

Take care when handling hazardous (caustic, harmful) fluids.

- Always wear your personal protective outfit (e.g. gloves, goggles, tight fitting clothes).
- In case of skin contact, inhalation of harmful vapours or eye injury you should immediately contact a physician.

2.6.3 Regulations and instructions on lubrication

Lubrication work must only be carried out by authorized personnel. The professional execution of this work must be examined and approved by a highly skilled "Inspector".

Unauthorized persons must not be permitted to work on machines or units or in their vicinity.

Lubricants and oils must not come in contact with naked flames or glowing parts.

When working on assemblies and components (e.g. motor, gearbox) you must also consider the specific instructions and lubri-

cation instructions for these assemblies and components (see chapter "Appendix").

The complete system must generally be switched off and secured against unintended and unauthorized restarting before starting lubrication work.

(Exception: Lubrication work that can only be performed when the system is running).

As a measure to avoid injury all lubrication work should only be carried out using permitted and appropriate tools and working aids.

Rotating or mobile parts must be shut down and reliably secured against restarting before starting work.

Do not touch rotating parts and always keep a safe distance to avoid clothing or hair being caught.

Strict cleanliness is of utmost importance during initial filling and when topping up or changing lubricant so that no foreign matter will enter through the lubrication point.

- Overflowing and spilling of oil must be avoided.
- Wipe off excessive and emerging grease.
- Avoid skin contact with oils and grease, wear protective clothes.

With certain lubricants, e.g. low flammability hydraulic fluids, the special safety instructions for these substances must be observed.

(See notes on packaging and instructions of manufacturer).

2.7 Noise emissions

In a room with several pumps you may experience an extreme development of noise. Depending on the sound pressure level the following measures must therefore be applied:

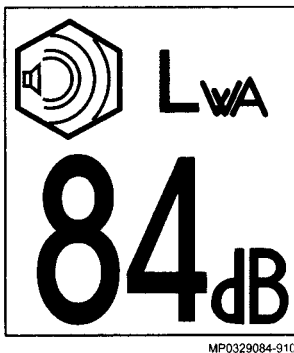
below 70 dB (A): No special measures

above 70 dB (A): Persons who are permanently in the room must wear ear defenders.

above 85 dB (A): Room with dangerous noise level! Each door must have a clearly noticeable warning sign to warn persons from entering the room without ear defenders.

Measured sound pressure level as per appendix I on page 32.

All M300/T300 pumps with motor delivered by the manufacturer have been subjected to a sound pressure measurement according to EC-directive 200/14/EC.



e.g. sample sticker

2.8 Use of pumps in potentially explosive environments

When using pumps in explosive environments or when pumping combustible liquids, you must check that the unit is suitable according to the declaration of conformity in terms of the 94/9 EC directive (ATEX) for the intended area of use.

The chapter “Equipotential bonding/earthing” and “Vibration distance” must be observed when installing the pumps.

Earthing of the pump by means of earthing screw or discharging hoses must take place before bringing the pump into the explosion endangered area.

All connected pipelines, components and hoses must be electrically conductive (specific volume resistivity $<1 \text{ M}\Omega\text{m}$; surface resistance $<1 \text{ G}\Omega\text{m}$).

3.0 Notes on installation and use

3.1 Installation instructions for peristaltic pump heads

For the installation of peristaltic pumps ELRO M300 without drive the following conditions must be met, so that the pump can be properly assembled together with components to a complete machine, without affecting the health and safety of persons.

1. Before installation of the pump the supplied ventilation valve (Fig. 12, part-no. 1012) must first be mounted to the elbow in the pump cover.
2. Fasten the pump head in its place by observing the specified suction side and sense of rotation (see sticker). The pump must only be operated in upright position with suction and pressure ports pointing up.
3. Max. drive speed $n_{\max} = 2800$ rpm
Min. drive torque $M_{\min} = 7$ Nm
Max. drive torque $M_{\max} = 116$ Nm

3.2 Points to be observed before use

The pump must only be used by professionals and in compliance with the safety regulations (see chapter 2).

1. Before start-up make sure that pump and drive unit are in perfect condition. The pump must only be operated in upright position with suction and pressure ports pointing up. Pipe lines must be routed in a way that the weight of the pipes does not rest on the pump.
2. The pump is delivered ready for operation.

To prevent frictional heat and protect the delivery hose, the pump must be filled as standard using silicone oil M 350 or, as requested, glycerine DAB10; 99.9% ignition temperature 400 °C. Other anti-friction fluids have not been approved by the manufacturer.

For the fill quantities, refer to Ch. 5.6)



Before using the peristaltic pump you should make sure that your pumped product will not cause any chemical reaction when coming into contact with the glycerine or silicone, in case of a hose damage.

3. Check the pump arrangement to ensure that suction lift and discharge head are not exceeded.

3.2.1 Pump suction line

If the fluid to be pumped contains solid particles with a size of more than 8 mm, a filter, e.g. flat suction box, suction strainer should be used. This filter must be permanently monitored and cleaned when necessary.

3.3 Installation

The pump unit must be placed on a level base of sufficient load bearing capacity for the weight of the pump.



Because the pump is a positive displacement pump it must be assured that no shut-off elements are installed in the pressure side. Components reducing the cross-section of the piping or instable hoses which could cause blockage of the piping system must not be used.

The pump is fitted with Camlock quick couplings DN 50 (male part) for the connection

of hoses. Camlock couplings DN 50 (female part) with 2" external thread should be used as matching parts. It is recommended to continue with a 2" elbow each, in order to avoid buckling of suction and pressure hoses. Couplings normally used by the customers, such as

- fire fighting couplings C (system Storz) (DIN 14307),
- screw couplings DN 50 (DIN 11851) or
- tank truck couplings VK or MK 50 (DIN 28450) can then be connected to these elbows.

All connecting parts are available made of the following materials as standard:

Aluminium (AlMgSi), red brass (copper zinc alloy), conductive plastic (PP), stainless steel (1.4571).

Pumps with electric drive motors are delivered from the factory with motor circuit breaker and connecting plug.

The necessary connecting line must be fitted with a matching socket.



Warning!

Electrical installations and connections must only be made by a qualified electrician.



Pumps and drives with combustion engines must only be started up by following the operating instructions of the engine manufacturer (see chapter Appendix).

3.4 Vibration distance

When installing and operating, a distance of a minimum of 10 cm between pump and other components, excluding connections, must be adhered to.

3.5 Equipotential bonding / Earthing

In principle, pumps and accessories must be earthed or provided with equipotential bonding if there is the possibility of electro-static charging and for use in potentially explosive environments.

4.0 Operating instructions

4.1 Points to be observed before commissioning

Please check:

- whether the pump is correctly installed and connected.
- whether the sense of pump rotation is correct. The sense of rotation is “clock-wise” (when viewed from the pump head cover). An arrow on the pump housing marks the sense of rotation.
- that a pump without explosion protected drive will be under no circumstances used in an explosive environment.
- whether the pumping hose inside the pump is suitable for the product to be pumped.
- whether the pump is properly earthed to avoid electro-static charging.

4.2 Commissioning

The pump must only be operated in upright position with suction and pressure ports pointing up.

The vacuum gauge mounted to the pump housing shows the vacuum on the suction side. After a short time running the vacuum gauge should indicate vacuum.

The vacuum indicated by the vacuum meter depends on suction head and pumped product. This vacuum meter must show at least -0.7 bar to achieve max. pumping capacity. This can be achieved by placing the pump at a more distant point and thus lengthening the hose.

If no vacuum is reached, check pump and couplings for leak tightness (see chapter maintenance and troubleshooting).

Check the lubrication of the drive unit.

Make sure that all safety features are fastened and fully functional.

Attention! **Camlock couplings must not be used without being locked (additional locking pins or O-ring).**



The peristaltic pump must under no circumstances be operated against closed shut-off valves.

The drive unit is to be started up in accordance with the respective operating instruction.

4.3 Taking out of service

Attention! **Always observe the safety instructions in chapter 2 in this manual and the operating instructions for the drive unit in the chapter “Appendix”.**

The shut-down procedure for maintenance, installation or cleaning work must only be performed by authorized and trained personnel.

1. Switch off the electric power supply or the respective drive and secure against unintended restarting.
2. Close shut-off valves on suction and discharge side.
3. Relieve the pressure in suction and pressure lines.



Danger!

Fluids escaping under pressure can cause severe injury.

Take care when loosening pressure fittings, wear protective clothing.

Be extremely careful when handling hazardous fluids.

You should immediately consult a doctor if you had contact with such substances.

4. Loosen suction and pressure fittings carefully. The system may still be under pressure or tension.
5. Disconnect suction and discharge lines from the pump and disassemble the rinsing line (if present).

If wear symptoms are detected when inspecting the pump, the respective parts must be replaced.

5.0 Maintenance

Attention!

Always observe the safety regulations in chapter 2 when performing maintenance work!



Before working on the pump, it must be removed from the potentially explosive area to a safe working area.



Danger!

No work on the pumps in the EX-area.

Regularly check all lines and fittings for signs of leaks and external damage! Repair any damage immediately!

Handling peristaltic pumps M300/T300 requires special safety measures and reliable maintenance after each application!

Explicit reference is made to the test and operating regulations in accordance with Ordinance on Hazardous Substances (GefStoffV) and the Industrial Safety Regulations (BetrSichV).

Fundamentally, before starting maintenance work, the pump must be switched off and disconnected from the electric supply.

General maintenance is limited to a professional visual inspection. During this inspection, pay special attention to affected components, loose connecting parts or electrical connections!

- Check the equipment plug and connecting cable for secure connection and damage.
- Defective cables and equipment plugs

can only be replaced by the manufacturer.

- Loose connections and damaged parts must be tightened and damaged parts must be replaced (designation see spare parts list).
- Repair corroded components.
- Make sure that the pump is thoroughly flushed and the pumped product completely drained (refer to Chapter 4.3: Decommissioning).

We recommend the operator of the peristaltic pump to maintain an application and operation logbook, to provide evidence of the operating hours of the pump and pumping hose.

During general maintenance, check to see whether the pumping hose must be replaced for safety reasons (refer to maintenance instructions).

Explicit reference is made to accident prevention regulations (UVV).

Spare parts kit

Consists of the following positions:

- 1 x Pumping hose M 300 connected with
- 2 x Connecting sockets
- 1 x 1 silicone or glycerine
- 1 x Set of O-rings (incl. 1 x O-ring for pump cover and 2 x O-rings for connecting sockets)

| Description | Lubricant | Quantity | Article-No. |
|---|-----------|----------|-------------|
| Hose material | | | |
| Connection socket ALUMINIUM | | | |
| Nitrile - NBR | Silicone | 1 Set | ESK-M-ABS |
| Nitrile - NBR | Glycerine | 1 Set | ESK-M-ABG |
| Hypalon - CSM | Silicone | 1 Set | ESK-M-ACS |
| Hypalon - CSM | Glycerine | 1 Set | ESK-M-ACG |
| Natural rubber - NR | Silicone | 1 Set | ESK-M-ANS |
| Natural rubber - NR | Glycerine | 1 Set | ESK-M-ANG |
| Connection socket POLYPROPYLENE | | | |
| Nitrile - NBR | Silicone | 1 Set | ESK-M-KBS |
| Nitrile - NBR | Glycerine | 1 Set | ESK-M-KBG |
| Hypalon - CSM | Silicone | 1 Set | ESK-M-KCS |
| Hypalon - CSM | Glycerine | 1 Set | ESK-M-KCG |
| Natural rubber - NR | Silicone | 1 Set | ESK-M-KNS |
| Natural rubber - NR | Glycerine | 1 Set | ESK-M-KNG |
| Connection socket BRONZE | | | |
| Nitrile - NBR | Silicone | 1 Set | ESK-M-RBS |
| Nitrile - NBR | Glycerine | 1 Set | ESK-M-RBG |
| Hypalon - CSM | Silicone | 1 Set | ESK-M-RCS |
| Hypalon - CSM | Glycerine | 1 Set | ESK-M-RCG |
| Natural rubber - NR | Silicone | 1 Set | ESK-M-RNS |
| Natural rubber - NR | Glycerine | 1 Set | ESK-M-RNG |
| Connection socket HIGH-GRADE STEEL | | | |
| Nitrile - NBR | Silicone | 1 Set | ESK-M-SBS |
| Nitrile - NBR | Glycerine | 1 Set | ESK-M-SBG |
| Hypalon - CSM | Silicone | 1 Set | ESK-M-SCS |
| Hypalon - CSM | Glycerine | 1 Set | ESK-M-SCG |
| Natural rubber - NR | Silicone | 1 Set | ESK-M-SNS |
| Natural rubber - NR | Glycerine | 1 Set | ESK-M-SNG |



Pumps with electric drive must generally be switched off and disconnected from the electric power supply before starting maintenance work!



Life hazard!

On pumps with combustion engines the spark plug socket must be pulled off after the engine has been shut down.



Caution!

Danger of cauterization!

If the pump is used for aggressive, caustic or toxic media, the pump must generally be flushed with a neutral agent before opening the pump housing.



Caution!

Danger or burning!

Depending on operating conditions the pump may reach temperatures too high to touch. You should therefore switch off the pump and let it cool down before touching it.

5.1 Cleaning

The following generally applies:

Wherever possible mechanical cleaning procedures should be preferably used, rather than cleaning with chemical aids.



Pumps for use in explosive areas must always be kept clean of dust deposits.

After each use, the pump should only be stored with completely empty and clean pumping hose. This can be carried out by using appropriate hose cleaning balls or small cloths.



Caution!

Always wear protective clothing when working with solvents or cleansing agents.

Housing, cooling fins, openings and covers on equipment components are very often not just protections, but have additional functions such as cooling, insulation, noise reduction, splash protection, etc.

Some of these functions can be impaired or may become totally ineffective by excessive deposits of dirt.

Here some advice on how to remove dirt.



Caution!

Danger of injury!

Loose dirt should not fall on rotating parts, from which it could be thrown away.

Non-observance may cause injury to persons or damage to property.

Do not touch pump or pipes. Danger or burning!



Caution!

Always wear your personal protective outfit when handling chemicals.

Always flush the system thoroughly after.

Always observe the applicable regulations when storing or handing out chemicals.

5.2 Replacment of the pumping hose (see also Fig. 10-13, page 25)

Peristaltic pumps may be fitted with hoses of various qualities, depending on the application.

The following materials are available:

Colour code

| | |
|----------------------|--------|
| Natural rubber (NR) | yellow |
| Nitrile rubber (NBR) | red |
| Hypalon (CSM) | black |

Before installing a new hose you should make sure that the hose material suits the intended application (see appendix: Materials for pumping hoses). If the hose inside the pump has not been damaged by normal mechanical wear, but by chemical influences, you should use a hose of different material.

1. Completely empty the pumping hose, for this purpose lay the pump on its side with the pressure side down.
2. Stand the pump with the pump cover facing forward.
3. Place a container to collect the sliding fluid.
4. Loosen and unscrew four nuts (part-no.1016, Fig. 8) from the pump cover. Take off the washers.
5. Take the pump cover carefully off, let the lubricant flow into the container.

Attention!

If the pumping hose is damaged, pumped product and lubricant will have mixed. In this case the inside of pump housing and cover must be cleaned. After changing the hose the lubricant must be refilled.

6. Unscrew the rotor retaining screw (part-no. 1018, Fig. 8). If necessary force the rotor off by turning the

fastening screw into the forcing bore M 10 (Fig. 10).

7. Loosen and remove both holding clamps and pumping hose (Fig. 11).
8. Pull the pumping hose on the pressure side back into the housing, then pull it back on the suction side and take it out (Fig. 12 and Fig. 12).
9. The connection ports are firmly attached to the hose using metal bands. We recommend bonding using a bonding device, or bonding at the factory. Alternatively, special hose clamps are available. The hose must be pushed onto the socket, so that the end of the hose touches the collar around the complete circumference. Each socket is fastened with one hose clamp.

After assembly the strap must be parallel to the end of the hose, on side of the loop (buckle) must be flush with the end of the hose. Please make sure that the loops of the socket fastening on a hose are on the same side. In the pump the sockets must be assembled in such a way, that the loops are always furthest away from the rotor.

Notes on the correct use of the hose assembly unit can be found in the respective operating instructions.

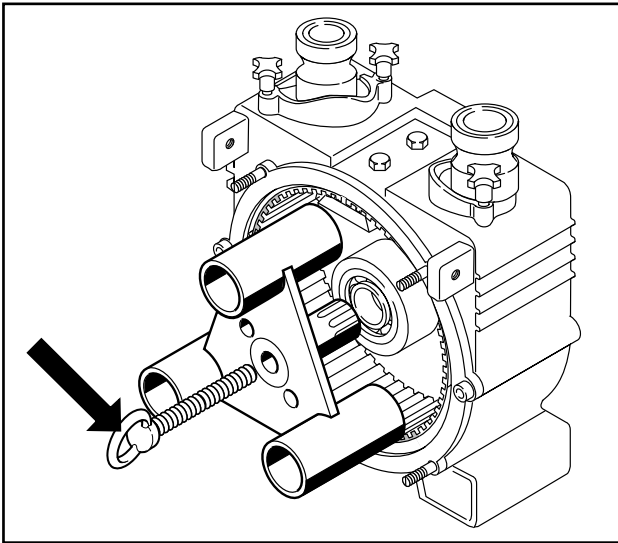


Fig. 10 Disassembly of rotor

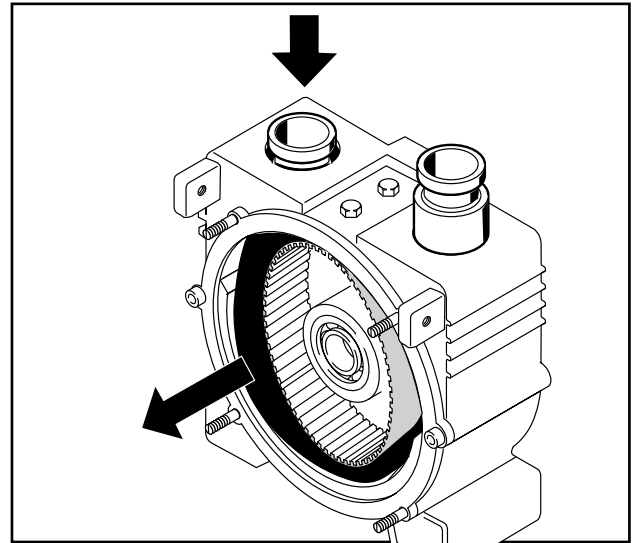


Fig. 12 Disassembly of pumping hose

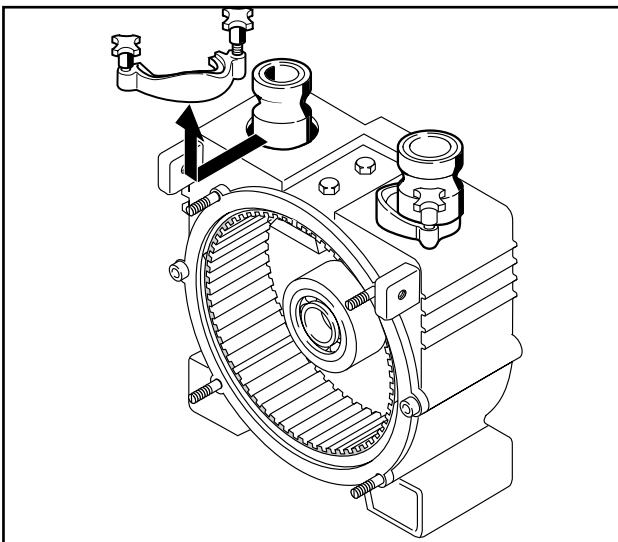


Fig. 11 Disassembly of holding claws

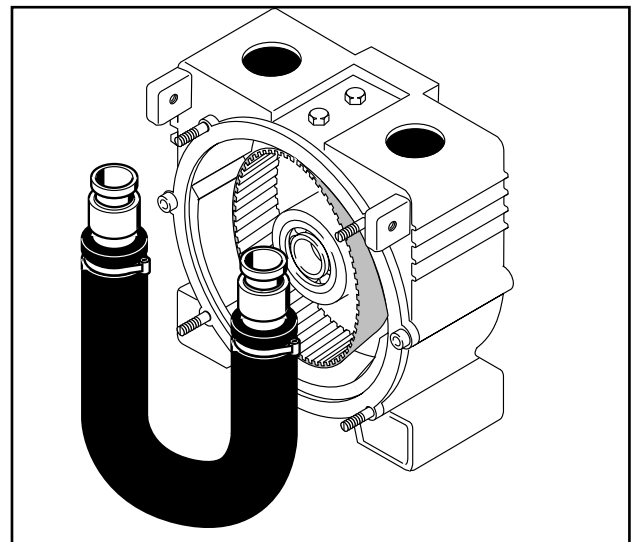


Fig. 13 Disassembly of pumping hose

10. Slide the O-rings over both connecting sockets.
11. Install the new pumping hose into the housing.
12. Place the pump with the pump head facing upward. Fill the housing with 1-2 litres of lubricant. Attach the pump cover with the new O-ring and fasten it with washers and nuts.



The O-rings at the hose ends must be properly in their grooves. The pumping hose must not be twisted around its longitudinal axis.

Attach and tighten both holding brackets. Assemble and tighten the rotor. If lubricant has been lost, top up the same quantity. Close the pump cover and tighten the screws crosswise.

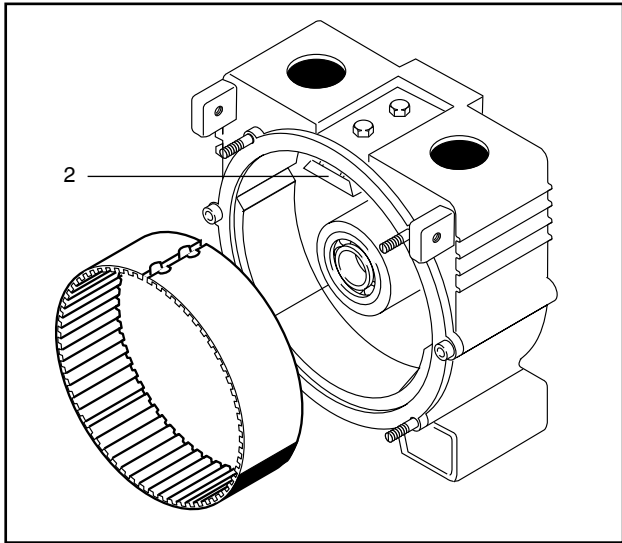


Fig. 14 1 Separating part
2 Holder for separating part

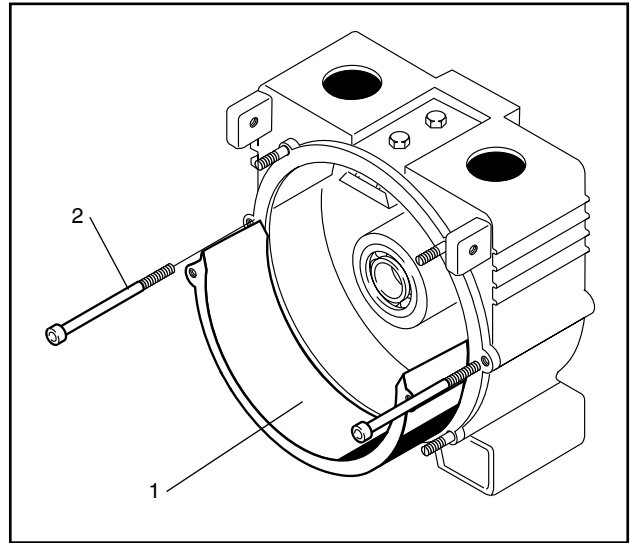


Fig. 15 1 Abutment
2 Abutment fastening screws

5.3 Replacement of separating part

The installed separating part has the function of creating the vacuum in the pump housing and provides a protective layer between rotor and pumping hose. When changing a hose the separating part should always be examined for possible damage. This should be done before installing the hose. If damaged it must also be replaced.

1. After removing the pumping hose loosen both hexagon screws (part-no. 1019, Fig. 8) on top of the pump so far that the split separating part can be taken out of the holder.
2. Insert the new separating part into the holder with the gearing towards the inside (Fig. 14).

Make sure that the separating part neatly rests against the housing wall and is flush at the joint.

3. Tighten by hand to allow the separating part to align itself.

Fasten the holder only after the pump cover has been assembled.



Important:

The separating part must rest properly against pump cover and back wall of housing.

5.4 Replacement of abutment

When replacing the hose you should also examine the abutment for damage.

If the polyurethane (PUR) hose (no longer available) is replaced with a hose of different material, the abutment must also be changed.

Please note that abutments are available with two different dimensions, i.e the abutment for the PUR hose is approx. 5 mm thicker than the abutment for all other hose materials.

1. Remove both side plates (if present).
2. Unscrew both abutment fastening

screws (part-no.1020, Fig. 8) and lift the abutment out of the housing (Fig. 15).



Clean the housing thoroughly before assembling the new abutment.

Do not forget to assemble the abutment fastening screws with copper washers.

5.5 V-belt drive

Depending on the version the pump may be driven by a V-belt.

The installed V-belt has been designed for a power transfer of up to 3 kW under permanent operation.

5.5.1 Axial safety of the belt- pulleys

In order to prevent the grub screws from loosening, install using thread adhesive Loctite 243 or Tuflok 180.

5.5.2 Checking the V-belt tension

If the V-belt tension slackens (V-belt can be depressed for more than 1 cm), the V-belt needs to be tightened.

1. Remove both side plates from the pump (if present).
2. Loosen four fastening screws on the motor foot.
3. Loosen the counter nut on the V-belt tensioning device and tighten the tensioning screw until the correct V-belt tension is achieved.
4. Lock the tensioning screw with the counter nut.
5. Tighten the fastening screws on the motor foot and make sure that the V-belt is properly aligned.

6. Reassemble the side plates.

5.6 Lubricant change, lubricant qualities

5.6.1 Pump housing

The pump housing is filled with 1-2 litres of lubrication fluid. Due to the ageing of the oil, the oil should be changed at intervals of 3 years.

The filling quantity depends on the pump type:

| Type | Fill quantity |
|------------------|---------------|
| M5 | 2 litres |
| M10 | 1,5 litres |
| M15/M20/M21/T300 | 1 litre |

5.6.2 Gearbox

The gearbox is lifetime lubricated by 0.25 litres of low viscosity oil.

The oil only needs to be changed in case of an oil loss.

5.6.3 Lubricant types

We recommend using following lubricants:

Pump: Silicone EL420-001-BG
Glycerine oil EL430-001-BG

Gearbox: Renolyn CLP100
Fuchs Europe GmbH

5.7 Shaft bearings

The shaft bearings are designed for an expected lifetime of at least 15.000 hours.

After this time, the bearings must be replaced.

6.0 Spare parts

6.1 Spare parts storage

Since the extent of the recommended spare parts storage depends on the period of use and the different operating conditions for the pumps, you should consult the manufacturer or an authorized dealer.

6.2 Ordering spare parts

Please state the following when ordering spare parts:

- Pump type
- Construction year and serial number
- Spare parts article number

Should subsequent material changes for different parts of the pump have taken place, this information is mandatory. The required spare parts and their article numbers can be found in the spare parts lists.

These can be found under www.cranchempharma.com.

Liability when using non-genuine spare parts:

Installation and/or use of non-original spare parts or accessories can negatively alter and consequently impair the design-related features of the peristaltic pump. For damage caused by the use of non genuine spare parts and accessories on pump, system or product all liability and warranty is excluded.

7.0 Troubleshooting

| Fault | Possible cause | Remedy |
|--|---|--|
| No pump flow | Pressure and suction valves closed Wrong direction of rotation Suction line blocked Leaks in suction pipe (entering of air) Suction lift too high No operating voltage | Open valves Reverse direction of rotation, Check supply line (phase) Remove blockage Check for leaks and seal Change pump arrangement Connect voltage supply |
| Pump loses suction capacity, or pumping capacity too low | Excessive counter-pressure Leaks in suction pipe Speed too low Suction line blocked Insufficient suction pressure Pump parts worn Dosing valve open not enough sliding fluid in the pump | Change pump arrangement, if necessary use different hose cross-sections Find and eliminate leaks Check speed and electric wiring Remove blockage Change pump arrangement Replace these parts Close dosing valve Fill up sliding fluid |
| Pump makes noises | Pump worn or defective | Examine and replace |
| Drive heats up or is overloaded | A certain amount of heating with electric motors is normal Discharge pressure too high | Replace parts, if necessary Check current input for safety reasons Change pump arrangement |

ELRO® Peristaltic Pumps Series M300 / T300

| Fault | Possible cause | Remedy |
|---------------------------------|---|---|
| Pump loses suction abilities | <p>Leaks in suction line</p> <p>Suction head too high or air or gas in fluid</p> <p>Pump worn</p> <p>Speed too low</p> | <p>Find and seal leaks</p> <p>Increase suction pressure, degas fluid</p> <p>Examine, if necessary replace parts</p> <p>Increase speed</p> |
| Pump makes noises | <p>Cavitation</p> <p>Pump worn or defective</p> <p>Air or gas in fluid</p> <p>Solids in fluid</p> | <p>Increase suction pressure</p> <p>Examine, if necessary replace defective parts</p> <p>Degas fluid</p> <p>Install dirt catcher in suction line</p> |
| Drive heats up or is overloaded | <p>A certain amount of heating with electric motors is normal</p> <p>Discharge pressure too high</p> <p>Fluid more viscose than intended</p> <p>Speed too high</p> <p>Pump parts eroded or stick</p> <p>Motor incorrectly connected</p> <p>Suction or ventilation pipes leaking or squashed</p> | <p>Check the current consumption to be sure</p> <p>Reduce the pressure, check the pressure gauge</p> <p>Install a stronger motor</p> <p>Drehzahl reduzieren (depending on type of pump)</p> <p>Examine and release, as necessary, replace</p> <p>Check connection and change, if necessary</p> <p>Reseal or renew</p> |

| Fault | Possible cause | Remedy |
|--|---|--|
| Pumping hose service life insufficient | Chemical attack. Hose swollen or peeling | Check chemical compatibility of hose material on the basis of the resistance list, if necessary contact the authorized dealer or manufacturer. |
| | Too high speed | Reduce speed (depending on type of pump) |
| | Too high pumping pressure | Raise the hose service life by changing the pressure side conditions (reduction). |
| | Abrasive solids-containing medium | Check pumping hose and, if necessary, reduce speed, as necessary, change material of hose. |
| | Washouts in pump hose | as necessary, reduce product return, delivery pressure. |
| | Pumping hose defective on pressure side (pressure stop) | Pump operated against closed shut-off valve. |
| | Pumping hose burnt externally | Too little or wrong lubricating fluid. |

8.0 Appendix I

| Type | Noise emission | |
|--------|-----------------|-----------------|
| | [dB] | |
| | L _{pA} | L _{WA} |
| 5 E | 67 | 80 |
| 7,5 E | 67 | 80 |
| 10 E | 67 | 80 |
| 10 Ex | 67 | 80 |
| 10 EW | 71 | 84 |
| 15 E | 67 | 80 |
| 15 EX | 67 | 80 |
| 15 R | 67 | 80 |
| 20 E | 67 | 80 |
| T300 E | 67 | 80 |
| 21 E | 67 | 80 |
| 21 EX | 67 | 80 |
| 15 D | 91 | 104 |
| 20DF | 91 | 104 |
| 20 D | 91 | 104 |
| 20HD | 91 | 104 |
| 20 B | 83 | 96 |
| T300 B | 83 | 96 |
| 20 H | 71 | 84 |
| 20 W | 71 | 84 |
| 20 L | 101 | 114 |

9.0 Appendix II

Please observe also the operating instructions for the respective drive unit.

| | |
|-------------------|------------------------------------|
| M300 pump series: | Electric motor |
| | Electric motor explosion protected |
| | Gasoline engine |
| | Diesel engine |
| | Water turbine |
| | Hydraulic motor |
| | Pneumatic motor |

Recommendations for use

Rubber materials for pumping hoses

| Designation | Properties | chemically resistant ¹ | dependent resistant ² | not resistant | thermally usable | Recommendation |
|--------------------|--|--|--|---|------------------|--|
| Natural rubber NR | Natural material high-polymeric isoprene: tenacious elastic, cold resistant. | diluted acids and alkaline solutions, alcohols, warm water. | - | concentrated acids and alkaline solutions, mineral oil, fuel. | - 20 to + 80°C | Sewage plants, treatment plants |
| Hypalon CSM | Elastomer, resulting from polymerization of chlorosulfonated ethylene: wear resistant, electr. conductive, chemically resistant. | acids and alkaline solutions, alcohols, paints foaming agents, hot water, steam up to 120°C. | Gasoline, benzene. fuel oil, gear oil. | - | - 20 to + 80°C | Fire brigades Use with hazardous substances |
| Nitrile rubber NBR | Copolymer from butadiene and acrylonitrile: wear resistant, oil resistant | mineral oil, alcohols, gasoline kerosene fuel oil, gear oil, water up to 100 °C. | - | Benzene, acids and alkaline solutions, ester, solvents. | - 10 to + 80°C | Mineral oil industry |

¹ The chemical resistances only apply for a product temperature of up to 20°C.

² Conditionally resistant means: sufficient for pumping quantities up to min. 40 m³.

Please observe also the detailed compatibility information for the individual media in the compatibility list. If necessary, please contact the authorised dealer or manufacturer for checking and advice.

Note on Declaration of no Objection

We want to protect our employees against dangers through contaminated devices and allow the timely handling of your return.

Please understand for this reason that we can only accept your shipment upon submission of our declaration of no objection including return number.

When returning goods to our plant in Düsseldorf please contact our contact person at the following phone number before shipping the goods: 0211 / 5956-218 or service@craneflow.com.

Here you can obtain the declaration of no objection necessary for a return shipment as well as a return number assigned to your shipment.

Please affix the same then to the package readily visible from the outside.

This is the translation of the original operating and installation instructions for ELRO® peristaltic pumps series M300 / T300.

For the original version in German, please refer to www.cranchempharma.com



Crane Process Flow Technologies GmbH

P.O.Box 11 12 40, D-40512 Düsseldorf
Heerdter Lohweg 63-71, D-40549 Düsseldorf
Phone +49 211 5956-0
Fax +49 211 5956-111
infoDus@cranecpe.com
www.elropumps.com
www.cranecpe.com

We reserve the right to change all technical information.

CRANE®