ROOZEBOOM & VAN DEN BOS
KENNERS VAN HET ZUIVERSTE WATER

Peristaltic Pump Concept 420

User Manual

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1. Basic equipment / features

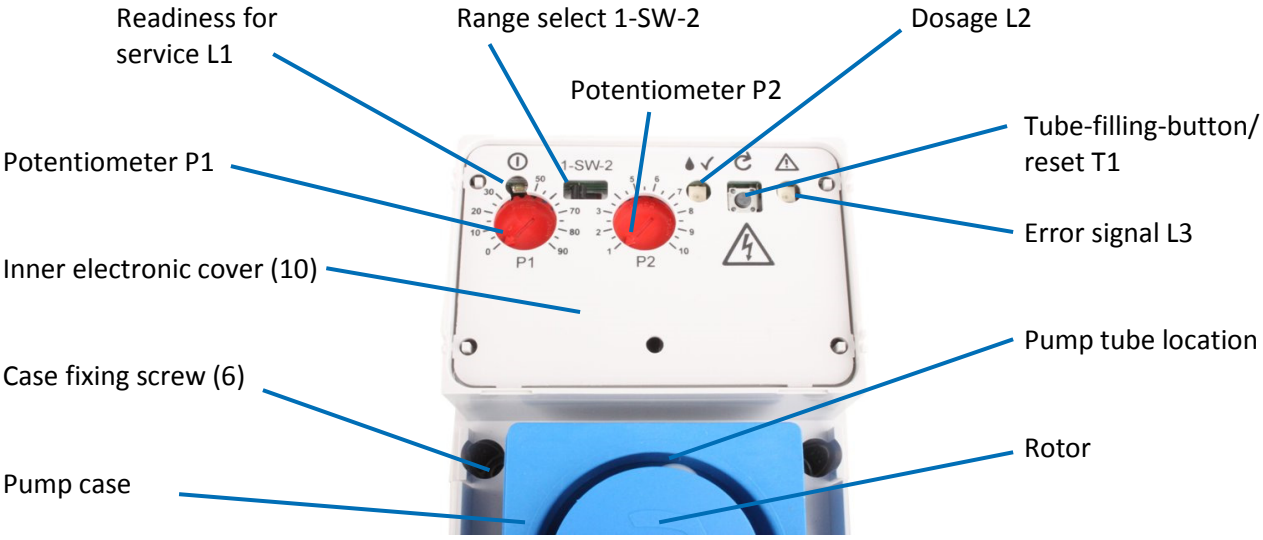
- Self-priming peristaltic pump with spring-loaded rotor and snap-in cover for easy change of the pump tube.
- Drive with strong stepper-motor (brushless) and without gearbox for enhanced life cycle.
- Revolution control by electronic stepper-drive: pump can be driven by a desired angle.
- Rotor stays exactly on the adjusted value independent from material and state of the pump tube, viscosity, suction height and independent from fluctuations of ambient temperature and operating voltage within the specified ranges.
- Rate of delivery adjustable up to 9960 ml/h, dependent on pump tube.
- High torque reserves of the stepper motor ensure that many different tube materials can be used.
- Special pump case cover for easy and fast changing of the pump tube.
- Modes of operation:
  - Adjustable rate of delivery with two potentiometers
  - Controlled by 4..20 mA or 20..4 mA
  - Controlled by 0..20 mA or 20..0 mA
  - Controlled by pulses
  - Controlled by pulse width modulation (PWM)

1.1. Technical Data

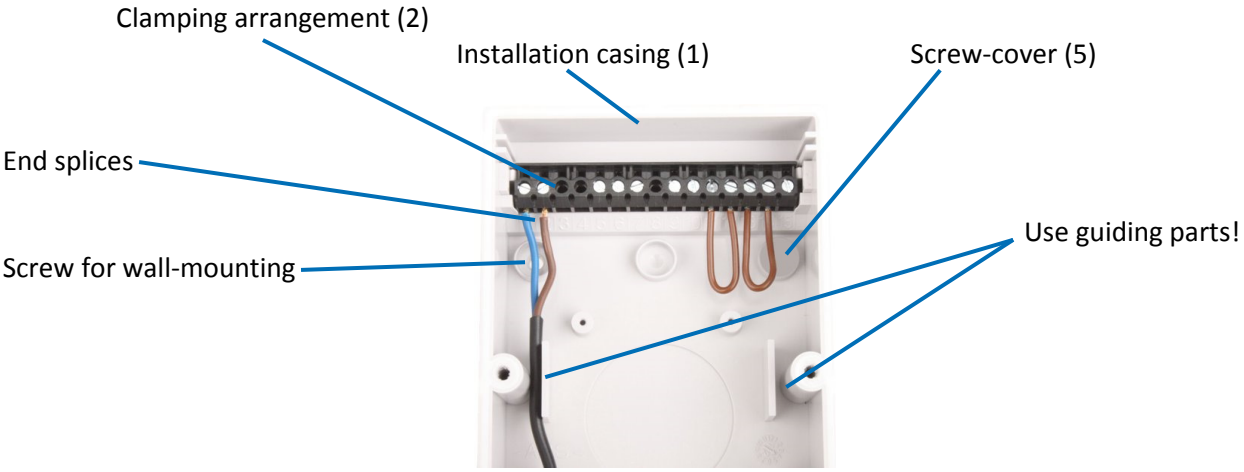
Rate of delivery (water, suction height 1.70 m)	0-200 ml/min (tube PS 140 - 4,8 x 1,6 PH PH) 0-100 ml/min (tube PS 138 - 3,2 x 1,6 PH) 0-28 ml/min (tube PS 138 - 1,6 x 1,6 PH) 0-7 ml/min (tube PS 138 - 0,8 x 1,6 PH)
Duty cycle	100%/h up to 2/3 of the max. rotor speed of 100 rev/min, maximum rotor speed when mounted as a single device
Counterpressure (recommended)	1,5 bar (tube PS 140 - 4,8 x 1,6 PH) 2,0 bar (tube PS 138 - 3,2 x 1,6 PH) 2,5 bar (tube PS 138 - 1,6 x 1,6 PH) 3,7 bar (tube PS 138 - 0,8 x 1,6 PH)
Ambient temperature	10 - 40 °C (50 - 104 °F)
Operating Voltage	180 - 264 V, 50-60 HZ (200 - 240 V, +/- 10%)
Fuse	200 mA, semi-delay, 5 x 20 mm
Power consumption	16 VA
Tube connection	4 x 6 mm
Dimensions	92 x 170 x 130 mm
Weight	1,2 kg

2. Indication of components

2.1. Cover of electronic removed



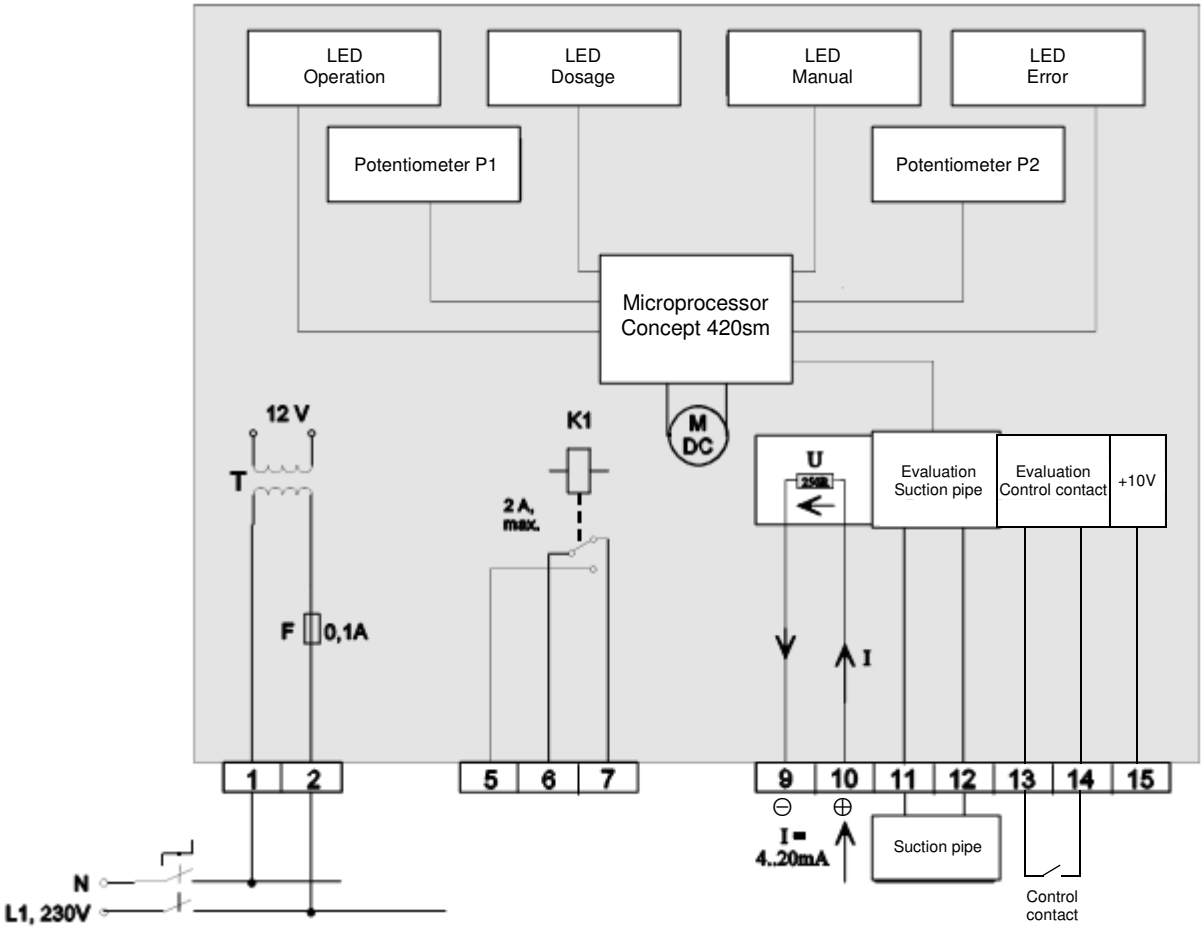
2.2. Wired installation casing



2.3. Dismantling of front-cover

Insert screwdriver here

2.4. Overview printed circuit board



3. Mounting and safety regulations

- Pump must be installed in a place protected from mechanical damage, vapours, acids and lyes.
- Pump must be installed above the level of the barrel or package drum, containing the product.
- Pump casing vertical, tube connections facing downwards.
- Warning: when pumping dangerous products such as acids, bases, chlorous or biotechnological products all regulations concerning the product have to be obeyed and all safety measures have to be carried out. Especially safety measures (e.g. collecting basin) necessary in case of a damage of the pump tube have to be carried out to prevent damages and to inhibit any danger to persons and environment. The pump must not be used for inflammable products!
- The use of this pump in systems, where the malfunction or the defect of this device would cause a critical process state is forbidden.
- In case of large delivery heights pump must be mounted in a manner, that suction height is small and the pressure height is higher. Peristaltic pumps work better when stressed on pressure. Each meter of height increases the resulting pressure by 0,1 bar multiplied by the density of the conveyor product.
- An operational and installation manual which must be stored discoverable on site is to be handed over to the operator of the arrangement. The operator is to be pointed out in particular to the observance of the assembly and security regulations. Also a security data sheet of the conveyor product is to be handed over to the operator of the arrangement so that he can carry out the additional security measures, that are necessary to prevent damage from man and material, caused by the liquid.
- The operator of the arrangement is so to be trained that he can take the dosage system out of operation or replace it by himself respectively when required by consulting a company electrician in the case of false functions or failures. Likewise "on site" a responsible person must be determined who can carry out necessary set work and exchange spare and wearing parts.
- Basic condition for all possible liability and guarantee cases is the purpose-engaged use of the device, the professional installation according to the operational and installation manual under additional attention of local circumstances, electric regulations and chemical security data sheets, the regular conscientious realisation the described servicing work, the careful attention of the manual and the observance of the given duty-cycles and the other technical limitations.

3.1. Electrical connection

- All installation must be done with the mains disconnected.
- Installation should proceed in accordance with local regulations.
- Putting the unit into service and carrying out adjustments must be left entirely to appropiately instructed personnel.
- If the machine control doesn't supply a special terminal for the pump, the device must be installed with a multipolar switch with a contact distance of at least 3 mm.
- Electrical connection should proceed in accordance with the terminal designations in the device.

3.2. Installing the unit

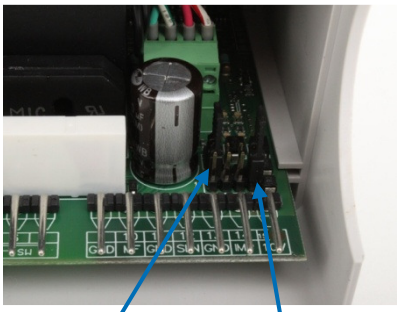
See pictures on page 4.

- On the inner sides of the big coloured front hood in the region of the tube retainer there are two slots of about 9 mm length. Loosen front hood carefully with a screw driver and with the help of these slots and remove front hood by hand.
- After removing the front hood four casing screws (recessed head screws) are visible. Unscrew and pull off device from installation casing.
- Mount installation casing e.g. with the shipped screws and fixings at the wall. Make sure the installation casing is not twisted when fastened on an uneven surface with screws. Important: Use the four screw-caps (5) to seal the case against moisture.
- Peel off connection cable, strip the insulation of the stranded conductors and fix end splices. If thicker cables are used, dismantling should begin at the inner side of the screwed cable gland. Introduce cable into the screwed cable gland. Insert cable or stranded conductors in the sides of the installation casing and lead them using the little guiding parts, so that the cables cannot touch the motor. Caution: Depending on the drive type the motor can warm up and get hot - what is not a malfunction!
- Wire clamping arrangement in the upper part of the installation casing.
- Screw union nut of the screwed cable gland. Caution: A high IP-Protection class is only achieved in this way.
- Do the Jumper-setting according to the desired mode of operation (chapter 4).
- Place device on installation casing and push onto it. When doing this take care that no cables or stranded conductors are squeezed.
- Fasten device with the four casing screws at the installation casing. Caution: Turn screws only till the gasket is pressed. If the screws are turned too wide, the plastic thread in the installation casing is twisted off!
- Remove cover of the pump by pulling off in the lower region.
- Attach feeding tube on the left and output tube on the right side of the tube retainer.
- Fasten tubes wit tube clips respectively threaded joints.
- If required replace stopper in the middle of the tube retainer by the drain-off-connection piece and attach additional tube which drains the pump case back into the packaging drum of the product in case of a damage of the pump tube.
- Attach cover of the pump case and press until it catches.
- Remove cover of electronic and make adjustments (see chapter 4). Put in cover of electronics again.
- Place front hood and press till it catches.
- Important: Examine if there are any measures to be carried out that are described in the safety regulations of the delivery product. If so, carry out the necessary measures.

3.3. Putting into service

After connecting the device to the mains, the pump works steadily with the rate of delivery preset by the factory. If necessary, the rate of delivery can be adjusted by a potentiometer in the range, that is specified in chapter 1.1. (Technical Data).

4. Setting the mode of operation



The desired mode of operation is selected with a jumper / two jumpers (small electrical bridge) on the electronic circuit board at jumper block K5 by simply putting it / them onto the corresponding pin couple. Default setting of the device is mode of operation 1. A photograph of jumper block K5 is shown on the left. It becomes accessible, if the main device is torn from the installation casing. If another mode of operation is necessary, pull jumper upwards with a forceps and put it onto the pin couple that corresponds to the desired mode of operation. Check that the jumper was put on both pins of the pin couple and really bridges the pins. A second jumper as a reserve is not fixed to a pin couple, but to a single pin and therefore without any function.

4.1. Mode of operation 1 (adjustable rate of delivery)

With mode of operation 1 the revolutions of the rotor of the pump can be adjusted to a fixed value. With potentiometers P1 the speed is adjusted coarsely, with potentiometer P2 the adjusted value can be corrected finely. The range select switch is out of function.

- Set jumper on printed circuit board to position 1 (if not default).
- Put neutral conductor to terminal 1 and phase / mains (230 V) to terminal 2.
- Connect terminals 13 and 14 as your control with a "potential free shutter" as an output. If the pump shall work independent from a control with the main connected, terminals 13 and 14 must be bridged.

4.1.1. Adjusting the control

The number of revolutions per minute is controlled by the potentiometers P1 and P2 and the range-select-button 1-SW-2 corresponding to the following term:

- Button in left position (1): number of revolutions (U) = (value of scale P1 + value of scale P2) x 0,1.
  With this procedure an adjustable range of 0,1 to 10 revolutions per minute is possible.
- Button in right position (2): number of revolutions (U) = value of scale P1 + value of scale P2.
  With this procedure an adjustable range of 1 to 100 revolutions per minute is possible.

4.2. Mode of operation 2: Controlling the rotor speed by current signal 4..20 mA or 20..4 mA

4.2.1. 4..20 mA

- Set jumper on printed circuit board to position 2 (default is position 1). With the jumper in position 2 the rotor speed increases with a rising current signal.
- Put neutral conductor to terminal 1 and phase / mains (230 V) to terminal 2.
- The maximum speed for a current signal of 20 mA is set with the potentiometers as follows:
  Number of revolutions (U) = value of scale P1 + value of scale P2.
  With this procedure an adjustable range of 1 to 100 revolutions per minute is possible.
  The range-select button has no function in this mode of operation.
- The rotor speed (rate of delivery) results form a beam between the two operational points which are set with potentiometers P1 and P2 at 20 mA and 0 revolutions for 4 mA. With this feature it is possible

to adapt the pump to different working conditions and a desired behaviour of the controlling is achieved.
- With a current signal 4,12 mA and below, the drive of the pump is stopped.
- On terminal 11 and 12 a suction pipe with float switch for package-drum-empty-detection can be installed. If a package-drum-empty is detected, the signal LED L3 blinks and an external voltage at terminal 6 is switched from terminal 7 to terminal 5 for example to drive an external optical (SWB 8009) or acoustic warning signal.
- If no suction pipe with float switch is installed, terminals 11 and 12 must stay bridged!

4.2.2. 20..4 mA

- Set jumper on printed circuit board to position 3 (default is position 1). With the jumper in position 3 the rotor speed decreases with a rising current signal.
- Follow instructions in "Mode of operation 2" with the following differences: The number of revolutions (rate of delivery) is calculated as a beam between a maximum number of revolutions, which is set for a signal of 4 mA with the potentiometers P1 and P2 and zero revolutions per minute for a signal of 20 mA. The number of revolutions so decreases with increasing current signal. The pump starts at a signal current of 4,12 mA with the preset maximum speed and stops with signal currents of more than 20 mA.

4.3. Mode of operation 3: Controlling the rotor speed by current signal 0..20 mA or 20..0 mA

4.3.1. 0..20 mA

- Set two jumpers on printed circuit board to position 1 and position 2 (default is position 1).
- Put neutral conductor to terminal 1 and phase / mains (230 V) to terminal 2.
- The maximum speed for a current signal of 20 mA is set with the potentiometers as follows:
  Number of revolutions (U) = value of scale P1 + value of scale P2.
  With this procedure an adjustable range of 1 to 100 revolutions per minute is possible.
  The range-select button has no function in this mode of operation.
- The rotor speed (rate of delivery) results form a beam between the two operational points which are set with potentiometers P1 and P2 at 20 mA and 0 revolutions for 0 mA. With a current signal smaller than 0,12 mA the drive of the pump is stopped. With this feature it is possible to adapt the pump to different working conditions and a desired behaviour of the controlling is achieved.
- On terminal 11 and 12 a suction pipe with float switch for package-drum-empty-detection can be installed. If a package-drum-empty is detected, the signal LED L3 blinks and an external voltage at terminal 6 is switched from terminal 7 to terminal 5 for example to drive an external optical (SWB 8009) or acoustic warning signal.
- If no suction pipe with float switch is installed, terminals 11 and 12 must stay bridged!

4.3.2. 20..0 mA

- Set jumper on printed circuit board to position 1 and position 3 (default is position 1). With the jumper in position 3 the rotor speed decreases with a rising current signal.
- Follow instructions in "Mode of operation 3" with the following differences: The number of revolutions (rate of delivery) is calculated as a beam between a maximum number of revolutions, which is set for a signal of 0 mA with the potentiometers P1 and P2 and zero revolutions per minute for a signal of 20 mA. The number of revolutions so decreases with increasing current signal. The pump starts at a signal current of 0,12 mA with the preset maximum speed and stops with signal currents of more than 20 mA.

4.4. Mode of operation 4: Control by pulses

In the mode of operation "Control by pulses" the quantity of the dosed product is proportional to the amount of pulses, detected at terminals 13 and 14. Therefore with flow-meters, that generate pulses as an output signal proportional to the quantity of a basic liquid, it is possible to achieve a constant concentration of the dosing product in the "basic" liquid (e.g. water) which is measured with the flow-meter.

Wiring the unit: remove the front hood and loosen the 4 casing screws (recessed head screws). Pull off device from installation casing. Set jumper on printed circuit board to position 4 (default is position 1). Connect the operational voltage to terminals 1 (neutral) and 2 (phase). Do not forget to branch the terminal 11 and 12 if no suction pipe with float switch is connected. Connect the flow-meter or pulse generator to terminals 13 and 14. Terminals 5, 6 and 7 can be used to drive external electrical equipment in case of an error. (See wiring scheme in "Mode of operation 1".)

Operating area of the pump: For the Concept 420sm a pulse is defined as a shortcut at the terminals 13 and 14 for a minimal period of 50 milliseconds. The pump control senses the rising edge of the pulse and is able to process 5 pulses (5 falling edges) as a maximum, corresponding 300 pulses per minute. Each rising edge initiates the rotation of the rotor.

Adjusting the control: The total angle of the rotation per pulse is controlled by the potentiometers P1 and P2 and the range-select-button 1-SW-2 corresponding to the following term:

- Button in left position (1): number of revolutions (U) = (value of scale P1 + value of scale P2) x 0,01.
  With this procedure an adjustable range of 0,01 to 1 revolutions per pulse is possible.
- Button in right position (2): number of revolutions (U) = (value of scale P1 + value of scale P2) x 0,1.
  With this procedure an adjustable range of 0,1 to 10 revolutions per pulse is possible.

In standard operation the pump works with 5 rev/min (revolutions per minute) as a base velocity. If the distance between two pulses becomes shorter, so that - in dependence of the adjusted rev/pulse - the base value of 5 rev/min is exceeded, the angle velocity (rev/min) is enlarged and pulses are buffered. The amount of buffered revolutions is at least one and maximum 2.5 times the adjusted rev/pulse. If there are more pulses than can be buffered (more than 2.5 times the adjusted rev/pulse) these pulses are ignored, so that the maximum buffer of 2.5 times the adjusted rev/pulse is not exceeded. The signal LED "dosing" indicates by fast blinking, that there are more pulses than can be processed.

5. Maintenance / Wearing parts / Spare parts

The maintenance of the metering system is reduced to a regularly changing of the pump tube, and - in longer periods, also of the rotor. Best replace wearing parts during a service of the machine.
The pump tube is a wearing part. Before installing the device the chemical compatibility of the tube with the dosage product has to be examined. Life span of the pump tube depends on the chemical compatibility and the actual periods of operation. Available pump tubes (delivery quantity / revolutions only valid for a new pump tube) are shown in chapter 1.1. (Technical Data).

Type of the rotor (original equipment): rotor 47-13, blue (item code 43061)
In case of mechanical, electrical or chemical damage etc. spare parts can be ordered as well. When ordering spare parts please specify the type of the unit and the serial number.

5.1. Security in case of a damage of the pump tube

When using electrical conductive media, a damage of the pump tube is detected with the help of the detection electrodes. If the level of the escaping media in the pump case achieves the electrodes, the pump is switched off and an error signal is on. In case of a medium with very low electrical conductivity in the event of a damage of the tube inside the pump casing, the escaping product can be drained with the help of an additional tube, that is fixed to a connecting piece in the middle of the tube retainer.

5.2. Changing of the tube and measures of security

Warning: Read the security data sheet of the delivery product and obey the prescribed measures of security!

Important: Use original pump tube only! Other parts may damage the drive. Never grease the tube!

Caution: before changing the tube always ensure, that the tubes don't contain rests of the dosage product: Acids and bases may cause dangerous injuries to your eyes and to your skin. Wear protection glasses and gloves and protect the environment from escaping dosage product with a cloth if necessary.

Warning: The turning rotor can cause dangerous contusions! Always first ensure, that the pump stays disconnected from the operational voltage during the changing of the tube. (Switch off main-switch of the machine!)

The pump case is a wearing part and must be changed after reasonable periods of time by the following description:
Take off front-cover as shown in chapter 2.3., remove cover of pump case and rotor-cap. Then pull out tube retainer with old pump tube while turning the rotor by hand. If the pump case is wet or dirty because of escaping product, the rotor must be dismantled and the inside of the pump case must be cleaned and dried carefully. Remove old pump tube from tube retainer and put in new tube without twisting it. Use the tube fixings. Introduce tube retainer with new tube into pump case. Introduce tube into the track inside pump case by turning the rotor by hand. Fasten cover of pump case.

5.3. Suction pipes (not included)

Suction pipes, equipped with float switch, check valve and strainer. Material: PVC.

Item code	Description
LASP/1V4	Insertion length 450 mm
LASP/1V6	Insertion length 600 mm
LASP/1V7	Insertion length 720 mm
LASP/1V9	Insertion length 1000 mm

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