

Operating instructions

Product: **Multi-layer diaphragm pump**

Type: **C 409.2 - 11 ML**
 C 409.2 - 17 ML
 C 409.2 - 30 ML
 C 409.2 - 45 ML
 C 409.2 - 72 ML
 C 409.2 - 110 ML
 C 409.2 - 150 ML
 C 409.2 - 220 ML



Please state here the exact type and serial number of your pump.
(can be read off the type plate on the pump)

Type:

Serial-No.:

These data are important in case of queries or for ordering spare and wearing parts and must absolutely be stated.

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CAUTION !



Carefully read and understand all precautions before installing or servicing any metering pump.

NOTE !

Keep the operating instructions for future application!

Translation of the original operating instructions!

Operating instructions

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Operating instructions

1 Quickstart

“Quickstart” is used to start-up the pump quickly without having read the operating instructions in detail.

CAUTION !



The Quickstart does not claim to be complete and does not relieve the user from reading the complete instructions!

1.1 Electric supply

The **sera** diaphragm pump is delivered ready for installation. Standard delivery includes a 2m power cable with Euro plug. The **standard version C 409.2** is designed for an operating voltage range of 100 – 120 V, 60 Hz.

CAUTION !



The specifications on the type plate must absolutely be adhered to!
 Danger of breach!

Symbol:

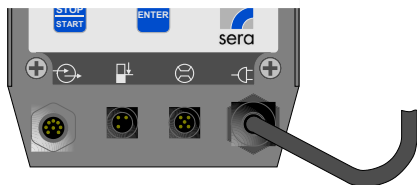


Fig. 01 (Electric supply)

CAUTION !



Only operate the pump when it is connected to an earthed power supply!
 Danger of electric shock!

CAUTION !



The pump restarts in the selected operating mode after the power supply was switched on or a power supply recovery following a mains failure!
 Danger of injury, leaking of medium!

1.2 Operating elements

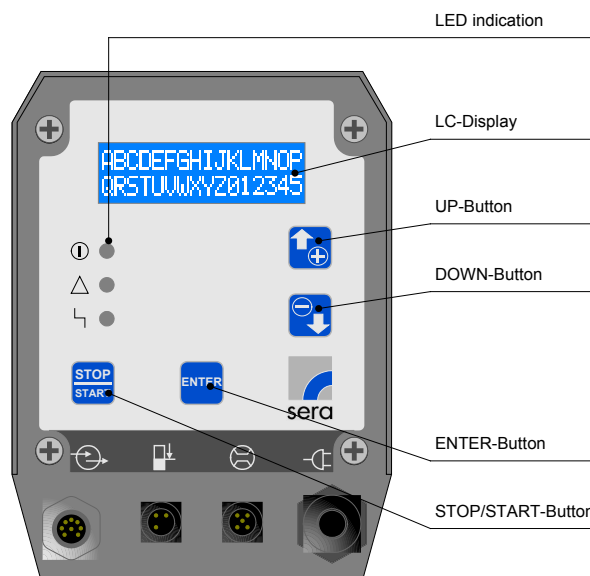


Fig. 02 (Electronics control panel)

1.3 LED operation indicators

Three light-emitting diodes (LED) indicate the status of the pump.

Green: Operation and stroke indicator



When switching on the pump, the green LED lights steadily. The operation indicator works in combination with a stroke indicator; during pump operation, the LED flashes in accordance with the current stroke frequency.

Yellow: Warning indicator



The yellow LED indicates all occurring warning messages (see Tab. 06). The warning is not only indicated by the LED but also as plain text in the LCD display.

Red: Fault indicator



The red LED indicates all occurring faults (see Tab. 06). The fault is not only indicated by the LED but also as plain text in the LCD display.

Operating instructions

1.4 Key operation

Operation of the pump is performed with 4 keys:



STOP/START key

After connection to the power supply, the pump is switched ON/OFF using the STOP/START key.



ENTER key

You can use the ENTER key to open and confirm value input fields and to select menu items.



UP / DOWN key

Using the UP/DOWN key, you can scroll the different menu items / menu levels and select the display of various operating messages.
 During parameter adjustment, the UP key is used to increase the parameter value and the DOWN key is used to decrease the parameter value.

1.5 Factory settings

The factory setting of the pump electronics is specified in Chapter 11.4.

1.6 Control inputs and outputs

1.6.1 Control via a contact signal

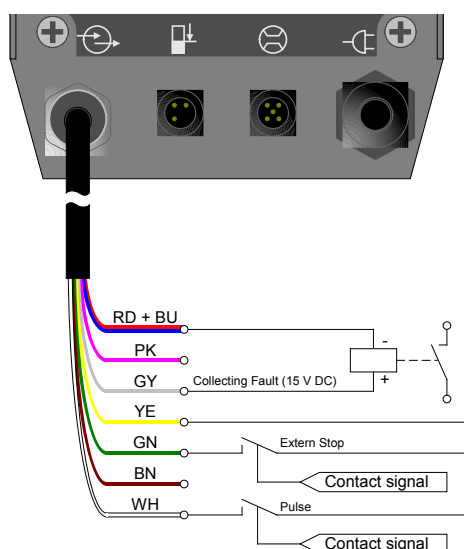


Fig. 03 (Control of digital inputs via a potential-free contact signal and control of a relay via an output of the dosing pump)

1.6.2 Control via an analog signal

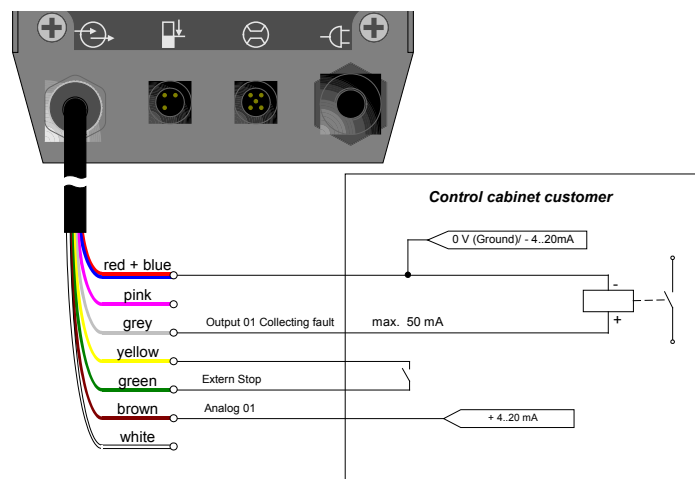
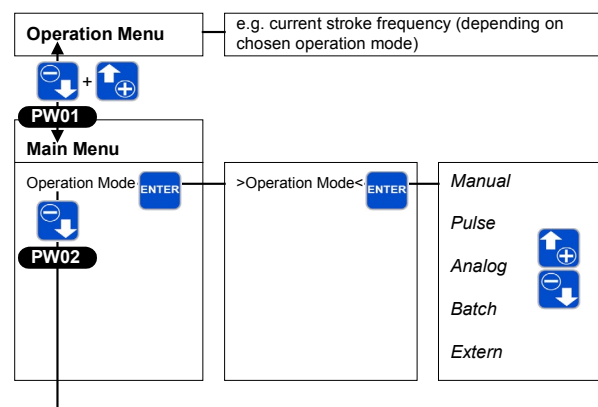


Fig. 04 (Control of analog/digital inputs via an analog signal, potential-free contact signal and control of a relay via an output of the dosing pump)

Selecting the operating mode

Proceed as follows to select the operating mode:

1. Input the password PW01 (factory setting 9990) to release the programming levels.
2. Change the operating mode.



PW01 Locking by Password 01
 (pre setting ex work: 9990,
 not activated)

PW02 Locking by Password 02
 (pre setting ex work: 9021)

Operating instructions

2 General

Before commissioning and during operation of the **sera** Multi-layer diaphragm pump it is necessary to follow the relevant local instructions.

The **sera** multi-layer diaphragm pump is delivered ready for connection. Carefully read these instructions and especially the safety instructions herein contained before putting the diaphragm pump into service.

3 Types

3.1 Model key

Example:

Multi-layer diaphragm pump Type **C 409.2-17 ML**

| | | | |
|----------|-------|----|----|
| C | 409.2 | 17 | ML |
|----------|-------|----|----|

Pump control

C controllable

| | | | |
|---|--------------|----|----|
| C | 409.2 | 17 | ML |
|---|--------------|----|----|

Indication of model range/stroke mechanism

| | | | |
|---|-------|-----------|----|
| C | 409.2 | 17 | ML |
|---|-------|-----------|----|

Indication of nominal delivery rate

This number states the nominal delivery rate in litres/hour.
(standard version referring to water)

| | | | |
|---|-------|----|-----------|
| C | 409.2 | 17 | ML |
|---|-------|----|-----------|

Indication of the execution of the plug-in pump

ML Execution Multi-layer diaphragm

3.2 Type plate

Each **sera** diaphragm pump is factory provided with a type plate. The following information can be found on this type plate.

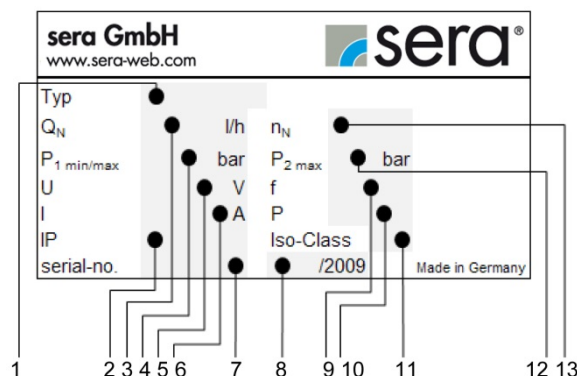


Fig. 01 Type plate

| Explanation of the indications on the type plate | | |
|--|------------------------------|--|
| 1 | Type | Pump type |
| 2 | IP | Protection category / Protection class |
| 3 | Q _N l/h | Nominal delivery rate Delivery rate which the pump was ordered for, based on the nominal rotation speed n _N , the nominal delivery height p _{2max} . and the delivery medium stated in the supply contract. |
| 4 | P _{1 min/max} [bar] | Minimum/maximum permissible pressure in the pump inlet Minimum/maximum permissible pressure in the inlet cross section which the pump can be used for. Please consider that pressure depends on rotation speed, delivery rate, temperature and static pressure at the inlet. |
| 5 | U [V] | Operating voltage range |
| 6 | I [A] | max. charging rate |
| 7 | No. | Serial number of the pump |
| 8 | Date | Date of manufacture |
| 9 | f | Supply frequency |
| 10 | P | Average power input |
| 11 | Iso-Class | Isolation class of drive |
| 12 | P _{2 max} [bar] | Maximum permissible pressure in the pump outlet Maximum permissible pressure in the outlet cross section which the pump can be used for. Please consider that pressure depends on rotation speed, delivery rate, temperature and static pressure at the outlet. |
| 13 | n _N 1/min | Nominal stroke frequency |

Table 01 Explanation of type plate

Operating instructions

3.3 Materials

The materials used are indicated in the order confirmation.

3.4 Viscosity, dosing medium

The multi-layer diaphragm pump is suitable for fluids with viscosities < 100 mPas.

3.5 Dosing range

The flow capacity of the multi-layer diaphragm pump can be controlled manually via the stroke length adjustment (0...100%)
The linear dosing range is between 20...100%

3.6 Noise test

The measured sound pressure level acc. to DIN 45635 for the diaphragms pumps is between 50 and 60 dB (A).

4 Safety instructions

4.1 Quality instructions

Observance of these operating instructions and, in particular, safety instructions, helps to

- Avoid danger to staff, machines, and environment.
- Increase the reliability and service life of the equipment and the entire installation.
- Reduce expenses for repairs and downtimes.

The **sera** quality management and quality assurance system for pumps, installations, fittings and compressors is certified according to DIN EN ISO 9001:2015.

The **sera** multi-layer diaphragm pump is compliant with the valid safety requirements and accident prevention regulations

4.2 Marking of instructions

4.2.1 Marking of instructions (operating manual)

Special notes in these operating instructions are marked with the general danger symbol



(safety symbol in compliance with
ANSI Z 535.4 or ISO 3864-2)

The safety sign appears in the following cases:

- If improper observance or non-observance of the operating manual, work instructions, specified operating procedures and similar can lead to personal injury or accidents.
- If improper observance or non-observance of the operating manual, work instructions, specified operating procedures and similar can lead to damage to property.
- Due to danger of causticization personnel must wear protective clothing (safety goggles, safety gloves and safety apron) for maintenance and repair work on parts which come into contact with hazardous products or for changing the containers.

CAUTION !



Always keep these operating instructions within reach at the place of installation of the pump!

CAUTION!



**Pay attention to the safety data sheet of the medium conveyed! Take appropriate accident prevention measures to avoid that operators are endangered by the used conveying media! The owner must take corresponding accident prevention measures to protect operating personnel from danger through the pumped media used!
Danger of breach / Danger of poisoning!**

Operating instructions

4.2.2 Marking of instructions (Product)

Information signs which are directly attached to the pump, such as arrows indicating the direction of rotation or signs for fluid connections must be adhered to and kept in a legible condition.

This especially applies to the type plate of the pump.

4.3 Qualification and training of personnel

The personnel who operate, maintain, carry out inspections or install the machine must be suitably qualified for their tasks. The operator has to define clearly the responsibility, and the supervision of the personnel. If the personnel do not have the knowledge required, then the operator has to carry out corresponding training and instructions. Such a training can be realized - if required - upon order of the operator of the machine by the manufacturer / supplier. The operator has to ensure furthermore that the personnel have understood the contents of the operating instructions completely.

4.4 Dangers in case of inobservance of the safety instructions

The inobservance of the safety instructions may result in personal injuries, hazards to the environment and damages to the pump.

The inobservance of the safety instructions may have the following consequences:

- Failure of important functions of the pump
- Failure of prescribed methods for maintenance and upkeep
- Danger to persons by electrical, mechanical and chemical influences
- Danger to the environment due to leakage of hazardous media

4.5 Safety-conscious working

The safety instructions specified in this operating manual, the national regulations for accident prevention, the safety regulations for the pumped medium valid at the place of installation as well as internal working-, operating-, and safety instructions of the owner are to be observed.

4.6 Safety instructions for the operator

Leakage of dangerous conveying media and materials must be drained off so that a risk to persons and the environment can be excluded. The legal regulations are to be adhered to.

Dangers caused by electrical energy are to be prevented.

4.7 Safety instructions for maintenance, inspection and installation

The operator has to ensure that all maintenance, inspection and installation tasks are carried out by authorized and sufficiently qualified personnel, who have carefully read and understood the operating instructions.

Only those spare parts and materials are to be used that satisfy the requirements of the relevant operating conditions.

Loosen screws and connections only when the system is not under pressure.

4.8 Arbitrary modification and spare parts production

Modifications of or changes to the machine are only allowed after previous agreement of the manufacturer. Original spare parts and accessories that are authorized by the manufacturer are essential for safety reasons.

NOTE !

Use of other parts may result in loss of guarantee for damages arising as a consequence thereof.

4.9 Improper use

The operating safety of the supplied multi-layer diaphragm pump is only guaranteed if the product is used as intended, according to the descriptions in Chapter 4.10 of these operating instructions.

Operating instructions

4.10 Proper use

The **sera** iaphragm pump is only to be deployed according to the intended purpose stated in the product description and the acceptance test certificate.

If the pump is to be used for other purposes, it is required to consult **sera** beforehand to settle whether the multi-layer diaphragm pump is suitable for the new usage!

The criteria for determining whether the multi-layer -diaphragm pump is appropriately used are:

- Characteristics of the medium conveyed (refer to the safety and product data sheet of the used medium – the safety data sheet is to be provided by the supplier / operator of the conveying medium).
- Stability of the materials which have contact with the medium conveyed
- Operating conditions at the place of installation
- Pressure and temperature of the conveying and cooling medium
- Voltage supply

CAUTION !



- **Acceptable for indoor use only!**
- **Non submersible pump!**
- **Pump not authorized for operation in Ex-Areas!**
- **Only for temperatures of medium +2...+40°C!**
- **Standard design not suitable for drinking water!**

4.11 Personal protection for service and maintenance

In order to avoid risks to health, the provisions of the German Ordinance on Hazardous Substances (GefStoffV) (§14 Safety Data Sheet) and relevant national safety regulations for the dosing medium must strictly be adhered to.

In case of accidents check whether the following substances are emitted:

- Leakage of fluids
- Leakage of fumes
- Noise emissions (sound level)

Emissions must be monitored by monitoring systems of the total installation.

CAUTION !



**Use protective clothing, gloves, breathing mask and suitable goggles for face protection!
Danger of breach / Danger of poisoning!**

NOTE !

Personal protective equipment must be provided by the equipment operator at all times!

Operating instructions

4.12 Utilities

If not agreed otherwise in the contract conditions, the **sera** multi-layer diaphragm pump will always be supplied with the necessary utilities.

(For type and quantity of utilities/lubricants, see Chapter 13)

5 Transportation and intermediate storage

5.1 General

Before shipment **sera** products are tested for proper functioning and quality.

An undamaged packaging protects the device during subsequent storage and should only be opened when the multi-layer diaphragm pump will be installed.

NOTE !

The packaging material must be disposed of appropriately!

5.2 Storage

An undamaged packaging protects the device during subsequent storage and should only be opened when the multi-layer diaphragm pump will be installed.

A proper storage will increase the service life of the pump. Proper storage means avoidance of negative influences, such as heat, humidity, dust, chemicals etc.

The following storage conditions must be observed:

- Storage place: cool, dry, dust-free and slightly ventilated.
- Storage temperature between +2°C and +40°C.
- Humidity not more than 50%.
- The maximum storage time for the standard system is 12 months.

If this value is exceeded, products made from metal should be sealed in foil and protected against condensation water using suitable desiccants.

Do not store solvents, fuels, lubricants, chemicals, acids, disinfectants and similar together with the product in the storage room.

CAUTION !

Protective Clothing



ALWAYS wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on the solution being pumped. Refer to MSDS precautions from your solution supplier.

CAUTION !

Water Pre-Prime



All **sera** pumps are pre-primed with water when shipped from the factory. If your solution is not compatible with water, disassemble the pump head assembly. Thoroughly dry the pump head, valves, seal rings, balls and Liqui-fram™ (diaphragm). Reassemble head assembly tightening screws in a crisscross pattern. Refill the pump head with the solution to be pumped before priming the pump. (This will aid in priming.)

CAUTION !

Solution Compatibility



Determine if the materials of construction included in the liquid handling portion of your pump are adequate for the solution (chemical) to be pumped. Always refer to the solution supplier for compatibility of your specific **sera** dosing pump. Contact your local **sera** distributor for further information.

Operating instructions

6 Assembly groups of multi-layer diaphragm pump

The multi-layer diaphragm pump may be assembled of the following (main) components:

- Stroke mechanism with drive
- Stroke length adjustment
- Assembly pump
- Pump body
- Valves

Options:

- Actuator

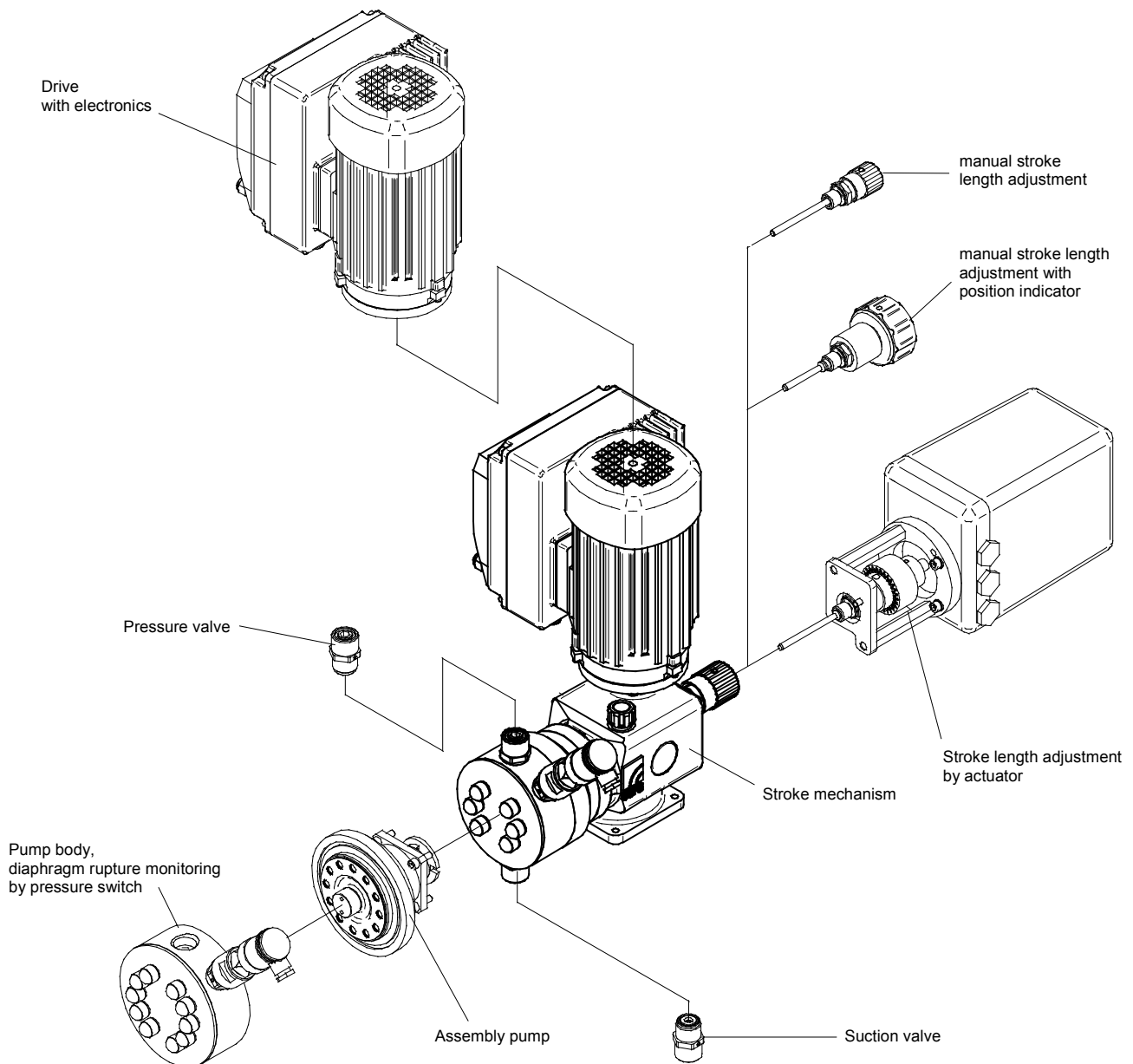
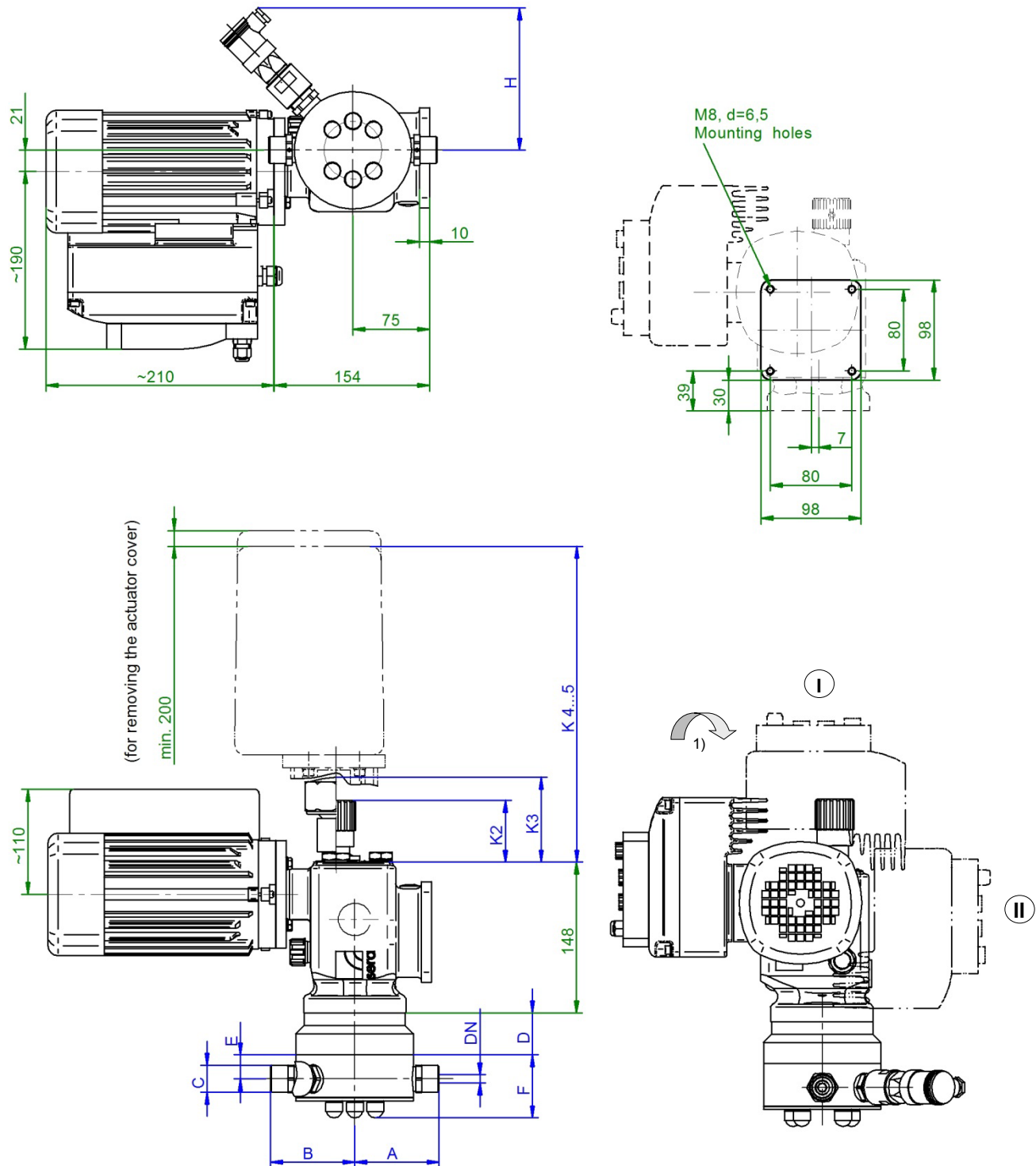


Fig. 06 Assembly - overview

Operating instructions

7 Technical data

7.1 Dimensions



Drive with electronics can be rotated throughout 90° each and can be put to the positions I and II.
(release the motor fastening screws, put the motor carefully to the desired position and fasten with screws again).

Fig. 07 Dimensions

Operating instructions

All dimensions in mm !

| All dimensions in mm ! | | | Pump type | | | | | | | | | | | | | | | |
|--------------------------------|---|---|---------------|-----|---------------|-----|---------------|-----|---------------|-----|---------------|-----|----------------|-----|----------------|-----|----------------|-----|
| | | | C 409.2-11 ML | | C 409.2-17 ML | | C 409.2-30 ML | | C 409.2-45 ML | | C 409.2-72 ML | | C 409.2-110 ML | | C 409.2-150 ML | | C 409.2-220 ML | |
| Valves | A | Single valves PVC | --- | --- | 93 | 93 | 97 | 97 | --- | 124 | --- | 124 | --- | --- | --- | --- | --- | --- |
| | | Single valves 1.4571/1.4581 | --- | --- | --- | --- | --- | --- | --- | 127 | --- | 127 | --- | --- | --- | --- | --- | |
| | | Single valves PP-FRP, PVDF-FRP | --- | --- | --- | --- | 94 | 94 | 127 | --- | 127 | --- | --- | --- | --- | --- | --- | |
| | | Double valves PP-FRP, PVDF-FRP | 83 | 83 | 90 | 90 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| | | Double valves 1.4571/1.4581 | 83 | 83 | 91 | 91 | 95 | 95 | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| | | Chamber valves PVC, 1.4571 | 88 | 88 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| | | Chamber valves 1.4571 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| | B | Single valves PVC | --- | --- | 100 | 100 | 104 | 104 | --- | 143 | --- | 143 | --- | --- | --- | --- | --- | --- |
| | | Single valves 1.4571/1.4581 | --- | --- | --- | --- | --- | --- | --- | 127 | --- | 127 | --- | --- | --- | --- | --- | --- |
| | | Single valves PP-FRP, PVDF-FRP | --- | --- | --- | --- | 94 | 94 | 127 | --- | 127 | --- | --- | --- | --- | --- | --- | --- |
| | | Double valves PP-FRP, PVDF-FRP | 83 | 83 | 90 | 90 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Double valves 1.4571/1.4581 | 83 | 83 | 91 | 91 | 95 | 95 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Chamber valves PVC, 1.4571 | 88 | 88 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Chamber valves 1.4571 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C | Connection thread suction-/pressure valve | G ¾ | G ¾ | G ¾ | G ¾ | G ¾ | G ¾ | G ¾ | G1¼ | G1 | G1¼ | G1 | G1¼ | G1 | G1¼ | G1 | G1¼ | |
| DN | Nominal diameter | 5 | 5 | 8 | 8 | 8 | 8 | 8 | 20 | 15 | 20 | 15 | 20 | 15 | 20 | 15 | 20 | |
| D | Assembly pump | 41 | 41 | 36 | 36 | 42 | 42 | 42 | 42 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | |
| Pump body (PD) | E | Centre – screw-in thread for valves (1.4571) | 16 | 16 | 18 | 18 | 21 | 21 | 21 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| | | Centre – screw-in thread for valves (PP, PVC, PVDF) | 24 | 24 | 24 | 24 | 27 | 27 | 27 | 27 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| | F | Pump body, 1.4571 (without front plate) | 49 | 49 | 51 | 51 | 54 | 54 | 54 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| | | Pump Body, PP, PVC, PVDF (with front plate) | 62 | 62 | 65 | 65 | 65 | 65 | 65 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 |
| | H | Pump body with pressure switch (1.4571) | 123 | 123 | 127 | 127 | 131 | 131 | 131 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 |
| | | Pump body with pressure switch (PVC, PP, PVDF) | 140 | 140 | 144 | 144 | 148 | 148 | 148 | 162 | 162 | 162 | 162 | 162 | 162 | 162 | 162 | 162 |
| Stroke length adjustment (SLA) | K ₂ | Manual stroke length adjustment (max.) | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| | K ₃ | Manual stroke length adjustment with position indicator | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 |
| | K ₄ | Electrical actuator | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 |
| | K ₅ | Electrical actuator with PMR3 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 |
| Stroke mechanism | Amongst others, dimensions for fastening the pump | see fig. 07 | | | | | | | | | | | | | | | | |

Tab. 02 Dimensions

Operating instructions

7.2 Technical data

7.2.1 Output data

| Type | Pump data | | | | | | | |
|------------------|--|--|--|------------------------------------|--|-----------------------------|--------------------|------------------------------------|
| | Nominal capacity ⁽²⁾ adjustable by changing lift of strokes | Maximum permissible pressure at outlet of pump | Minimum- / maximum permissible pressure at inlet of pump | max. suction height ⁽¹⁾ | recommended nominal diameter of the connecting pipes | Nominal stroke frequency | max. stroke length | Motor size (standard execution) |
| | Q _N | p ₂ max. | p ₁ min. / max. | WS | DN | | h100 | BG |
| | l/h | bar | bar | m | mm | min ⁻¹ | mm | |
| C 409.2 – 11 ML | 0-13,2 | 10 ⁽³⁾ 20 | -0,3/0 | 3 | 10 | 120 | 4 | 71 |
| C 409.2 – 17 ML | 0-20 | 10 ⁽³⁾ 20 | -0,3/0 | 3 | 10 | 180 | 4 | 71 |
| C 409.2 – 30 ML | 0-36 | 10 ⁽³⁾ 16 | -0,3/0 | 3 | 10 | 120 | 6 | 71 |
| C 409.2 – 45 ML | 0-54 | 10 ⁽³⁾ 16 | -0,3/0 | 3 | 10 | 180 | 6 | 71 |
| C 409.2 – 72 ML | 0-86 | 10 | -0,3/0 | 3 | 15 | 120 | 8 | 71 |
| C 409.2 – 110 ML | 0-132 | 10 | -0,3/0 | 3 | 15 | 180 | 8 | 71 |
| C 409.2 – 150 ML | 0-180 | 4 | -0,3/0 | 3 | 15 | 120 | 10 | 71 |
| C 409.2 – 220 ML | 0-264 | 4 | -0,3/0 | 3 | 15 | 180 | 10 | 71 |

Tab. 03 Output data

⁽¹⁾ Achievable suction height with media similar to water and filled suction line

⁽²⁾ Linear dosing range between 20 and 100% stroke length

⁽³⁾ Maximum pressure for pump bodies made of plastics

Operating instructions

7.2.2 Motor data

| Type | Drive | | | | |
|------------------|--------|-----------------|-----------------|-----------------|---|
| | Output | Mains frequency | Nominal voltage | Nominal current | Recommended supplementary protector acc. to UL 1077 (SA 22.2 No. 235) |
| | kW | [Hz] | V | A | |
| C 409.2 – ... ML | 0,37 | 60 | 100-120 | 6,0 | C10A Circuit breaker |

Table 04 Technical data / drive

¹⁾ standard-design

7.2.3 Additional data for electronics

| Type | Electronics data | | | | | |
|-----------------|-------------------------------|--|---------------------------|---|---------------------|---------------|
| | Inlet voltage / Control input | Min. contact signal time Min. distance between pulses | Analogue input resistance | Digital output | Protection category | Thermal class |
| C 409.2- ... ML | 5...30 V DC | 55 ms | 100 Ω | PNP, internal supply max. 15V DC, 50 mA external supply max. 30V DC, 350 mA | IP 55 | F |

Table 05 Electronics data

Operating instructions

8 Functional discription

8.1 General

sera multi-layer diaphragm pumps are run-dry safe oscillating displacement pumps that are characterised by high tightness of the dosing head. The liquid is conveyed by a deformable multi-layer diaphragm.

Multi-layer diaphragm pumps consist of the following (main) components:

- Driving motor
- Stroke mechanism
- Stroke length adjustment
- Assembly pump
- Pump body (with MBE)
- Suction- and pressure valve

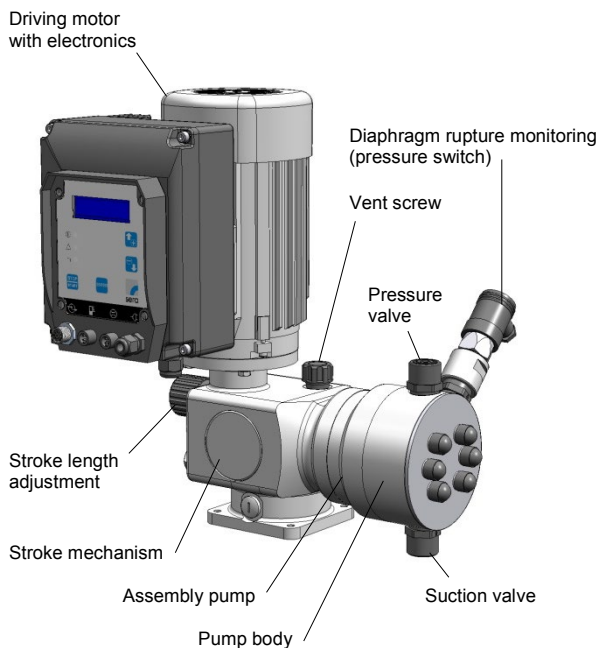


Fig. 08 Assembly groups

8.2 Assembly groups of the multi-layer diaphragm pumps

8.2.1 Stroke mechanism

Function:

Multi-layer diaphragm pumps of this type series use a rotary cam drive to transmit the rotation of the drive motor to the displacement body.

In case of the rotary cam drive, the eccentric provides the pressure stroke while the suction stroke is performed by a pressure spring (return spring).

The effective stroke length can be changed by means of an adjustable scale knob which prevents the connecting rod from following the rotary cam up to the rear dead centre during suction stroke (see stroke length adjustment).

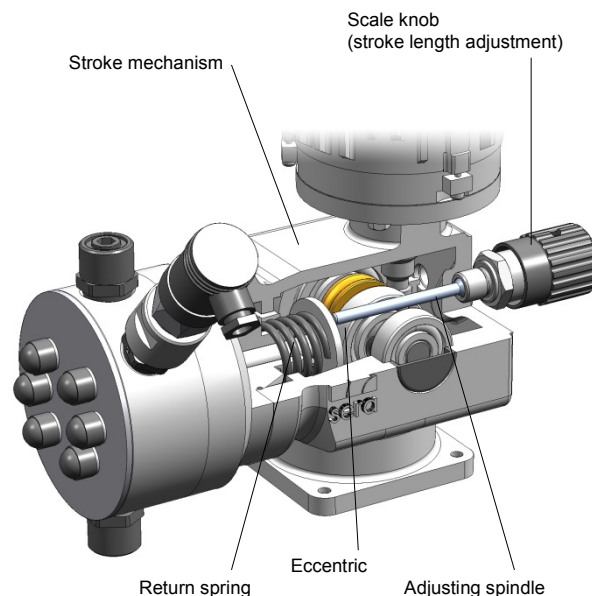


Fig. 09 Stroke mechanism

8.2.2 Stroke length adjustment

General

The delivery rate of the pump is regulated by changing the stroke length. The stroke length is infinitely variable between 20% and 100%.

A linear dosing behaviour is achieved with stroke length adjustments between 20% and 100%.

8.2.2.1 Manual stroke length adjustment (Standard)

The effective stroke length of the connecting rod is changed by turning the scale knob.

The stroke length can be adjusted both during operation and standstill (in unpressurized condition) of the pump.

The set stroke length can be read off a scale, e.g. 75% (see Fig. 10)

With the 20-steps adjustment on the scale knob, the stroke length can be set individually with a tolerance of 0.5%.

- | | |
|--|---|
| Turning counter-clockwise (see Fig. 10) | → the effective stroke length increases, the delivery rate increases. |
| Turning clockwise | → the effective stroke length decreases, the delivery rate decreases. |

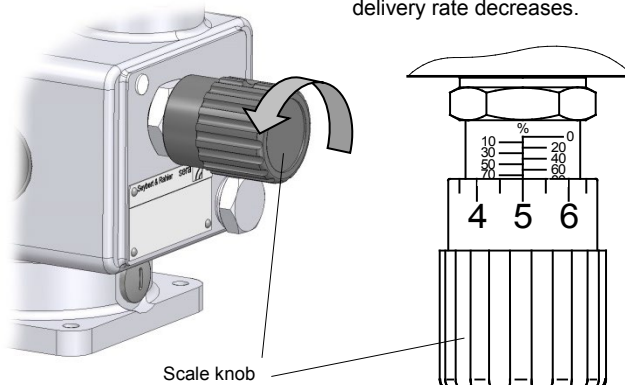


Fig. 10 Stroke length adjustment/Scale knob

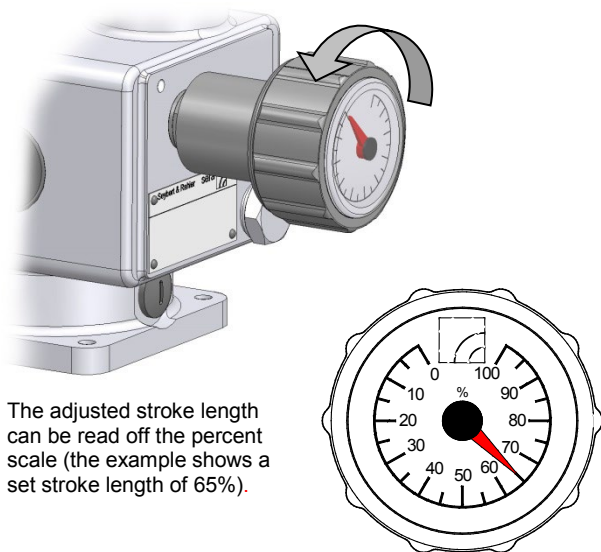
Operating instructions

8.2.2.2 Manual stroke length adjustment by a dial scale with indication of percent (option)

The stroke length is adjusted by turning the hand wheel. The stroke length can be adjusted both during operation and standstill (in unpressurized condition) of the pump.

Turning counter-clockwise → the effective stroke length increases, the delivery rate increases.

Turning clockwise → the effective stroke length decreases, the delivery rate decreases.



The adjusted stroke length can be read off the percent scale (the example shows a set stroke length of 65%).

Fig. 11 Stroke length adjustment with position indicator

In delivery state, the stroke length adjustment is factory set to 50%.

NOTE !

The dial scale with indication of percent may become misadjusted during transport. If the indicator does not match the 50% setting, then the percent scale must be re-adjusted during operation(!) of the pump!

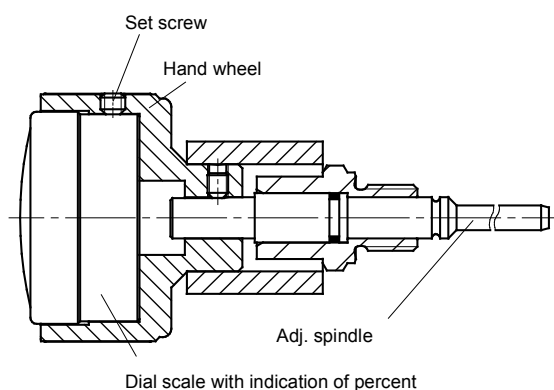


Fig. 12 Stroke length adjustment with position indicator

Adjusting the percent scale:

- switch the multi-layer diaphragm pump on
- loosen the set screw
- remove the percent scale from the hand wheel
- manually turn the percent scale to 0% setting
- use the hand wheel to set the stroke length to 0%. Turn hand wheel clockwise until there is no further stroke movement (push rod does no longer hit the adjusting spindle)
- insert percent scale again
- use the set screw to secure the percent scale to the hand wheel
- adjust desired stroke length

8.2.2.3 Automatic stroke length adjustment by an electrical actuator

The electrical actuator is directly mounted to the stroke mechanism of the dosing pump. A clutch transmits the rotary motion of the actuator driveshaft to the adjusting spindle. The axial displacement is compensated in the clutch.

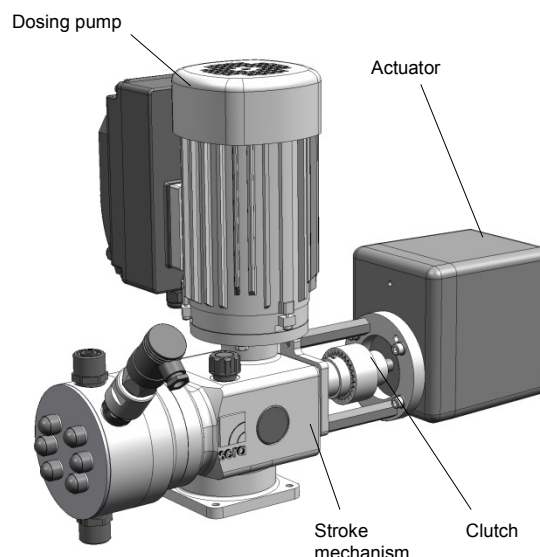


Fig. 13 Stroke length adjustment by actuator

In case of dosing pumps with electrical actuator, a manual adjustment of the stroke length on the pump is no longer possible. (Exception: actuator with hand wheel)

The actuator is standardly equipped with two integrated limit switches and a position potentiometer for position feedback. Both limit switches are factory set so that the drive will switch off at a stroke length of 0% and 100%, even if a control voltage is applied.

This guarantees that adjustments can only be made within the permissible range. The position potentiometer is driven by a safety clutch which prevents damage caused by incorrectly adjusted limit switches.

Activation is performed by appropriate control units (see **sera** accessories).

Operating instructions

The set stroke length can be read off on the pump (percent scale).
Information about the electrical connection is given inside the cover of the actuator.

NOTE !

The adjustment is only possible when the pump is running.

8.2.2.4 Automatic stroke length adjustment by an electrical actuator with integrated positioner (PMR3)

same as Chapter 8.2.2.3, additionally:

- PMR3 positioner

This PMR3 positioner integrated in the actuator enables an actuator setting from 0...100% that is proportional to the connected input signal.

As an option, the actuator can also be provided with a collective interference signal.

Information about the electrical connection is given inside the cover of the actuator.

8.2.3 Assembly pump

General

Function

The diaphragm consists of three layers and is linked with the connecting rod. Only the front layer, the so-called working diaphragm, comes into direct contact with the dosing medium. The middle layer functions as a signalling diaphragm. In case of a rupture of the working diaphragm, the medium is fed to the diaphragm rupture signalling in a controlled manner. The diaphragm rupture can be analysed either electrically or visually (local). The third membrane functions as protection diaphragm and ensures that no dosing medium will leak out, even not if the working diaphragm has ruptured.

A diaphragm rupture is indicated either by a manometer (visual) or, optionally, by a pressure switch (electrical).

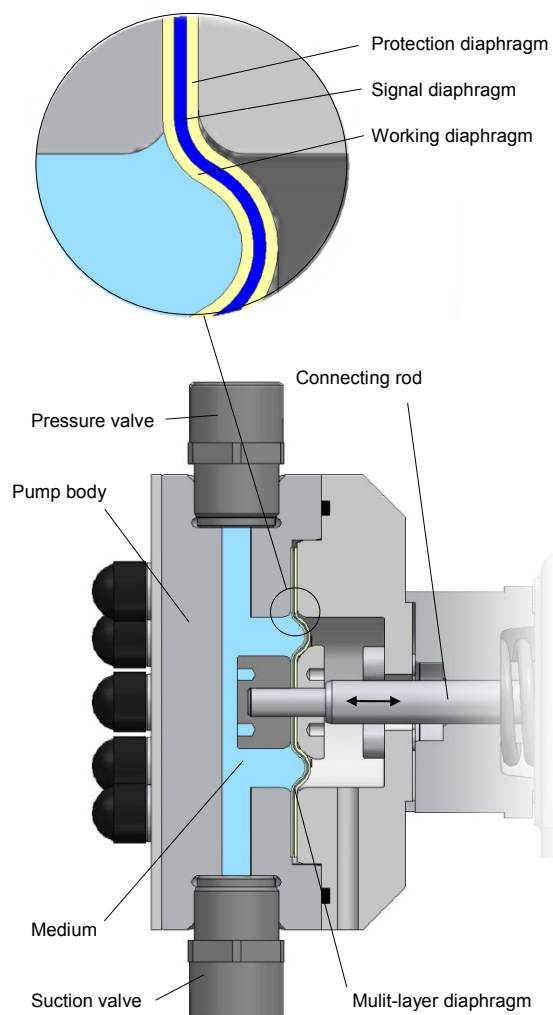


Fig. 14 Function principle of multi-layer diaphragm pump

Operating instructions

8.2.3.1 Multi-layer Diaphragm

The multi-layer diaphragm consists of a package of a total of three individual diaphragms.

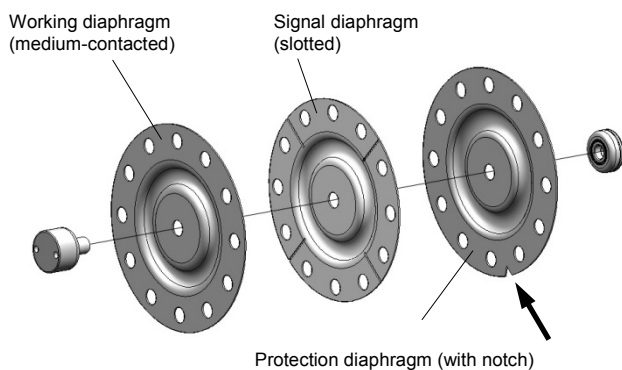


Fig. 15 Assembly of multi-layer diaphragm

The notch of the protection diaphragm indicates the correct mounting position changing the diaphragm set (see Chapter. 11.4).

8.2.4 Pump body

Depending on the applied backpressure, movements of the plastic pump body in elastic materials are possible. This does not affect the pumps's durability or operating safety.

8.2.5 Suction-/Pressure valve

The pump valves are ball valves that only work properly in a vertical position. The condition of the valves has a deciding effect on the operating capability of the pump. Valves must be exchanged as complete units.

When replacing the valves it is important to check the flow direction (see Fig. 16).

NOTE !

Pressure valve above; Suction valve below!



Fig. 16 Double valves, FRP-Execution

Operating instructions

8.2.6 Diaphragm rupture monitoring

sera multi-layer diaphragm pumps are equipped with a diaphragm rupture monitoring.

NOTE !

For more detailed information about the indicators of the diaphragm rupture monitoring, please see enclosed Documentation!

8.2.6.1 Diaphragm rupture monitoring by Pressure switch

In case of a rupture of the working diaphragm, a pressure is generated on the pressure switch. The present signal must be evaluated and further processed in such a way that the pump is switched off instantly.

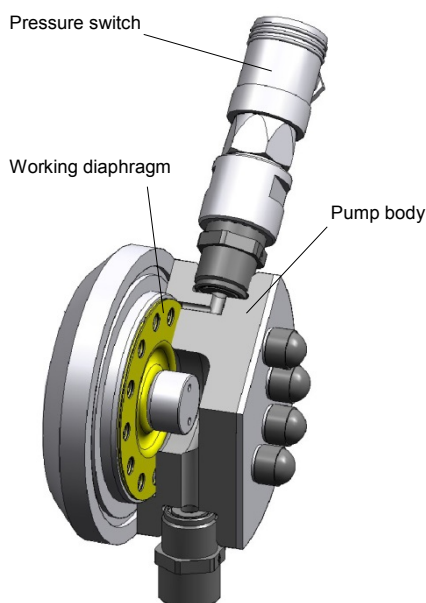


Fig. 18 Diaphragm rupture monitoring by pressure switch

8.3 Drive motor

A sera diaphragm pump of series C 409.2 is driven by a threephase-motor controlled by the electronics.

8.3.1 Start-up

Preconditions:

Make sure that voltage and frequency correspond with the specifications on the type plate of electrics.

The nominal motor power on the type plate of the motor refers to an ambient temperature of 40°C and an installation site below 1000m above sea level. Motor output will be reduced if these values are exceeded (see VDE 0530).

Adapted for "moderate" group of climates according to IEC 721-2-1.

CAUTION !



The drive motor will heat by operation of the pump.
Do not touch the motor during operation!
Danger of combustion!

8.3.2 Motor protection

A protective motor switch is not necessary due to the fact that a thermic overload protection is integrated in the pump for the protection of the motor.

8.3.3 Maintenance of the drive motor

The electric motor should always be kept clean so that neither dust, dirt, oil nor other contaminants may affect the correct operation.

In addition, we recommend to ensure that:

the motor does not produce strong vibrations
suction and blowing openings for the supply of cooling air are not closed or restricted (may lead to unnecessary high temperatures in the windings).

The ball bearings inserted in the motor are lubricated for life.

8.3.4 Restart

Restart the system as described in Chapter 8.3.1 after maintenance work or after longer periods of standstill.

Operating instructions

9 Installation

CAUTION !



The pump is designed for operation in non-hazardous areas!
Danger of explosion!

9.1 Installation instructions

- The standard model of the pump is only approved for installation in dry rooms in a non-aggressive atmosphere, at temperatures between +2°C and +40°C and at permitted humidity until approx. 90%.
- For dimensions of the pump connections and fixing holes, see Fig. 08, Table 02.
- Install the pump in such a way that there is no vibration and no tension and that it is aligned precisely.

IMPORTANT NOTE !

When the C 409.2 is installed next to a pump of series 204.1 and C 410.2 a minimum distance of 100 mm between the pumps (motor housings) has to be kept!

- Install the pump at the optimum possible operating height. Mount the pump in such a way that the valves are vertical.
- Ensure that there is sufficient space around the pump body and the suction and pressure valve so that these parts may be easily dismantled, if required.
- The stroke length adjustment, indicator scale and visual diaphragm rupture signalling must be easily accessible and readable.
- Design the nominal diameters of the downstream pipes and of the connections built into the system to be the same size or larger than the inlet / outlet nominal widths of the pump valves.
- To check the pressure ratios in the pipe system, we recommend to provide for connections for pressure gauges (e.g. manometers) near the suction and pressure attachments.
- Provide evacuation fittings
- Prior to connecting the pipes, remove the plastic caps on the suction and pressure attachments of the pump.
- Check that the fixing screws for the pump body are tightly fitted and, if necessary, retighten.

Torque for tightening the fixing screws

| | |
|---|-------|
| Pump body without mounting plate | 15 Nm |
| Pump body with mounting plate | 15 Nm |

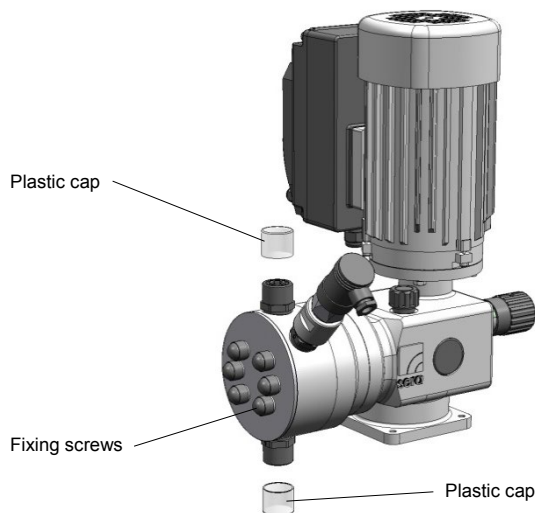


Fig. 19 Multi-layer diaphragm pump with plastic caps

- For models with a built-on actuator, ensure sufficient space for removal of the cover (see Chapter 7.1 "Dimensions")
- Connect pipes to the pump in such a way that there are no forces acting on the pump, such as e.g. misalignment, weight or stress of the pipe.
- Keep the suction lines as short as possible.
- Use pressure- and medium-resistant hoses / pipes.
- All pipes and containers connected to the pump must comply with the regulations and must be cleaned, tension-free and intact.

WARNING !



Where toxic, crystal-forming or corrosive liquids are being delivered, the pipe system must have equipment to enable it to be emptied, cleaned and, if necessary, rinsed with a suitable medium.
Danger of breach / Danger of poisoning!

CAUTION !



The multi-layer diaphragm pump must be installed in such a way that no damage can be caused if the medium leaks out.
Danger of poisoning / Danger of injury!

Operating instructions

In order to avoid cavitation, overloading and excessive delivery, the following points should be noted:

- avoid high suction heights
- keep pipes as short as possible
- choose sufficiently large nominal diameters
- avoid unnecessary choke points
- install a pulsation damper
- install a pressure relief
- install a pressure keeping valve, if necessary
- in the case of degassing media, provide for a supply

CAUTION!



The operator must take suitable precautions on the supply side (collecting tray, diaphragm rupture alarm) to ensure that the container does not run dry in the event of a diaphragm rupture.

9.1.1 Provide for an overpressure protection

if the permissible pressure in the pump head may be exceeded, e.g. when a shut-off valve is closed or if the line is blocked:

- install the overflow valve

When using an external relief valve the following is valid for the feed back pipe:

- lead the overflow line with descending gradient in the storage tank which is under atmospheric pressure or lead it in an open drain gutter (see Fig.20).
- or connect the overflow line directly to the pump suction line, but only if there is no check valve inside the suction line (e.g. foot valve of a suction lance) (see Fig. 21).

CAUTION!



Shut-off valves must not be closed when the pump is operating!
Danger of breach / Danger of poisoning by leaking medium in case of diaphragm- or pipe break!

CAUTION!



An overpressure protection (e.g. an overflow valve) should always be installed if the permissible operating pressure may be exceeded.
Danger of breach / Danger of poisoning by leaking medium in case of diaphragm- or pipe break!

CAUTION!



In the case that the pump is not equipped with an overpressure protection, it may get damaged if the permissible operating pressure is exceeded.
Danger of breach / Danger of poisoning by leaking medium in case of diaphragm- or pipe break!

CAUTION !



The pumped medium may spout out if the pump is damaged.

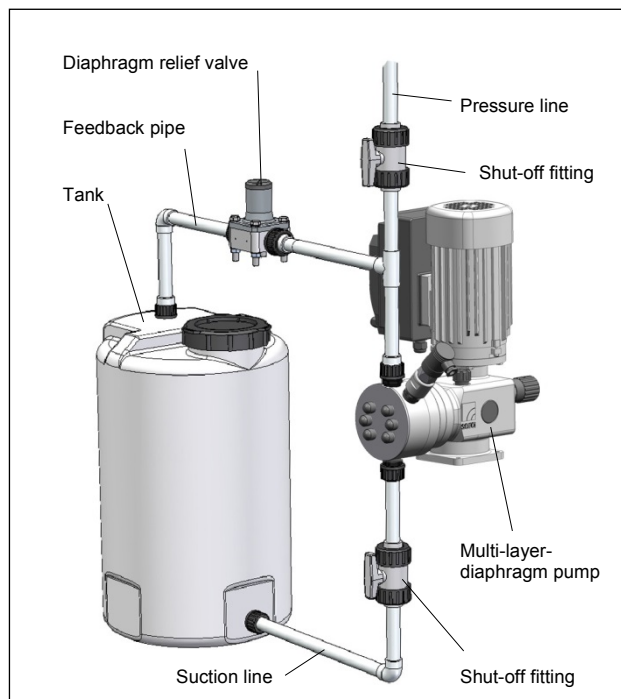


Fig. 20 Installation with diaphragm relief valve (into tank)

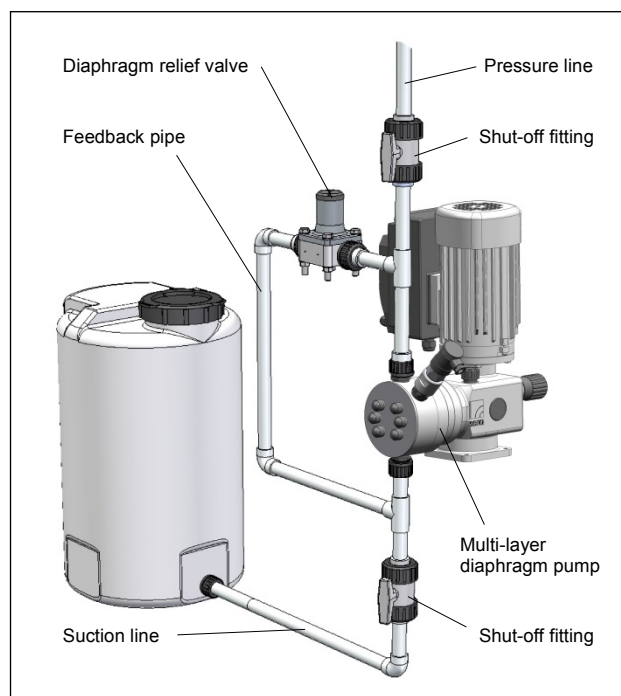


Fig. 21 Installation with diaphragm relief valve (into suction line)

Operating instructions

9.1.2 How to prevent a backflow of the dosing medium

When the dosing line is linked with a main line:

- install an injection fitting (dosing valve).

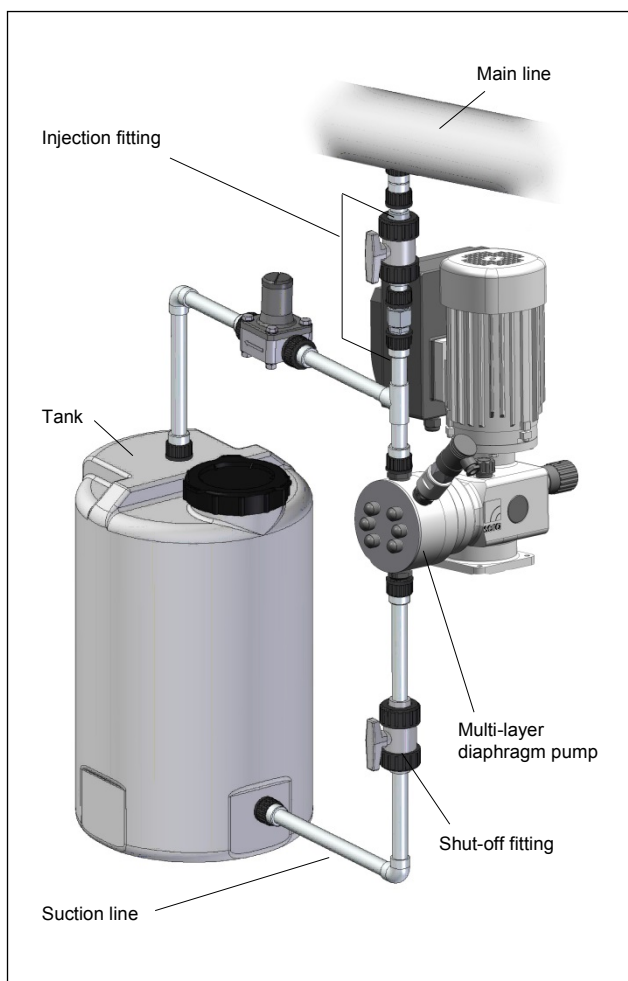


Fig. 22 Installation of injection fitting

CAUTION!



There will be an unintentional mixture in the dosing line if a possible backflow from the main line is not eliminated.

CAUTION!



Pay attention to/avoid chemical reactions arising from a backflow of the dosing medium.

9.1.3 How to eliminate undesired siphoning

When dosing into a main line with negative pressure:

- install a pressure keeping valve into the dosing line.

CAUTION!



When installing a pressure keeping valve, make sure that an uncontrolled dosing is avoided (by a positive pressure difference ($\geq 1\text{ bar}$) between pressure and suction side).
Danger of incorrect dosing!

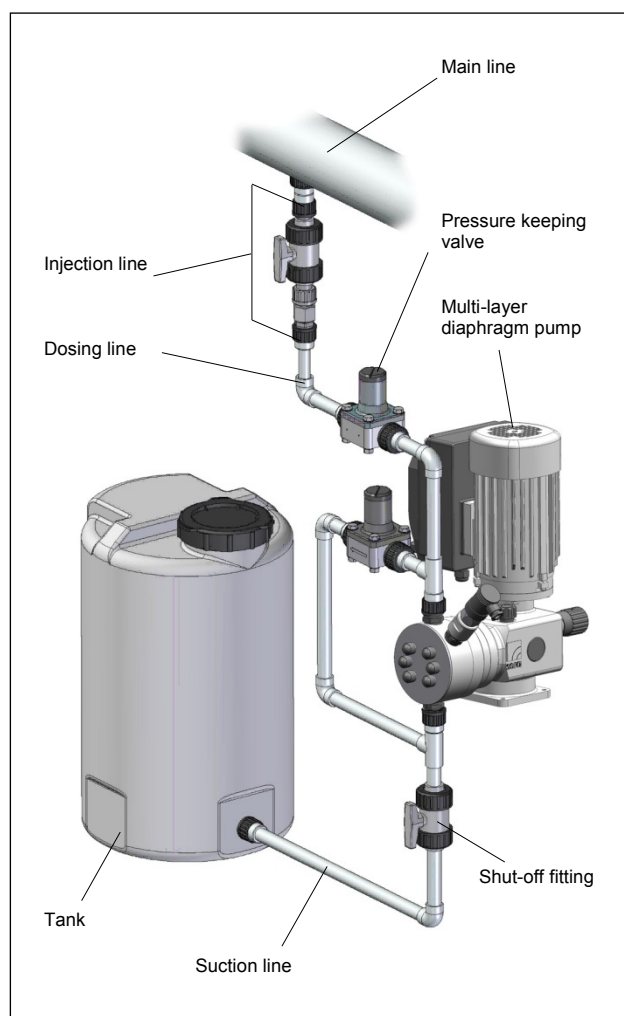


Fig. 23 Installation of pressure keeping valve

Operating instructions

9.1.4 How to ensure an airless suction

If, due to a falling fluid level in the tank, air may be drawn in and delivered to a pressurised line or against a pressure keeping valve:

- install a ventilation valve into the pressure line.

NOTE !

The delivery may get interrupted if air remains in the suction line!

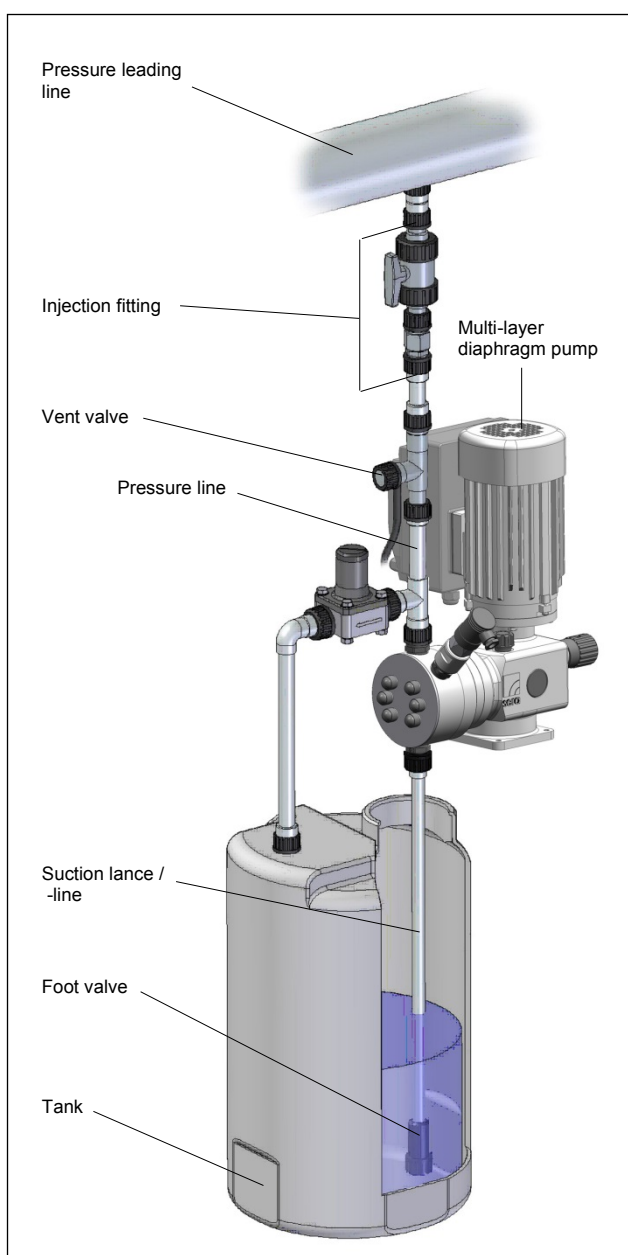


Fig. 24 Installation of ventilation valve

9.1.5 Installing the empty-tank alarm

so that the tank is refilled before air is drawn in.

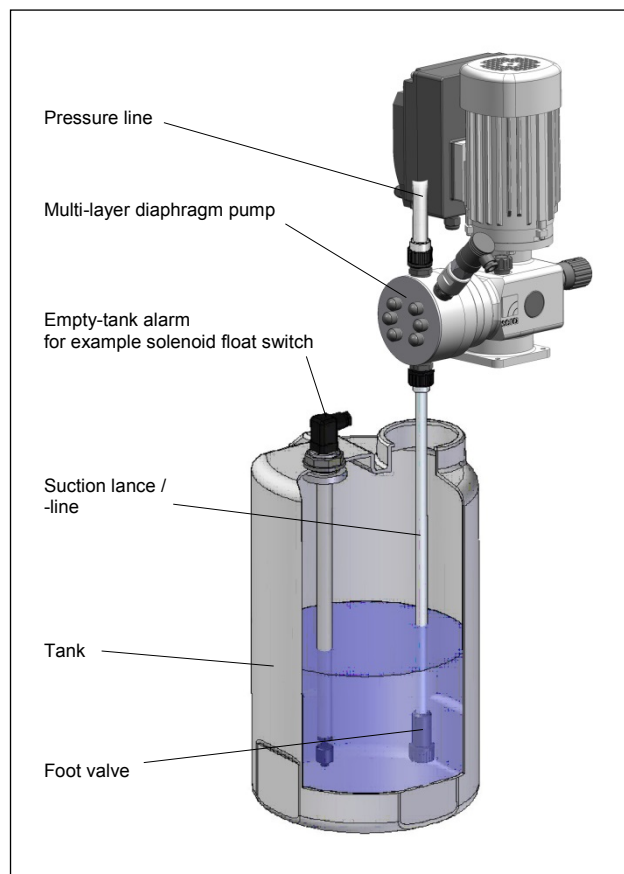


Fig. 25 Installation empty-tank-alarm

NOTE !

The delivery may get interrupted if air remains in the suction line!

Operating instructions

9.1.6 How to avoid an emptying of the suction line

- Install a foot valve at the end of the suction line if the pump is installed at a higher level than the maximum fluid level in the tank.

Based on calculations, the dimension 'H' may not exceed the number that is equal to the specified maximum suction height of the pump divided by the density of the dosing medium and under consideration of mass acceleration and viscosity of the medium.

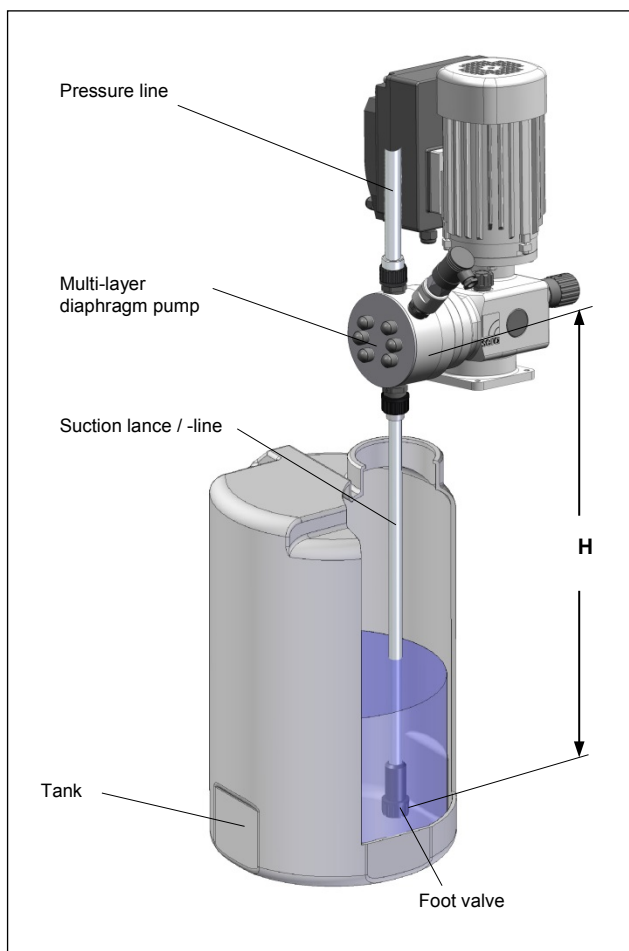


Fig. 26 How to avoid an emptying of the suction line

9.1.7 Line strainer

- Connect the suction line slightly above the bottom of the tank and install a line strainer (0.1 – 0.5mm aperture size – depending on nominal width of the valve).

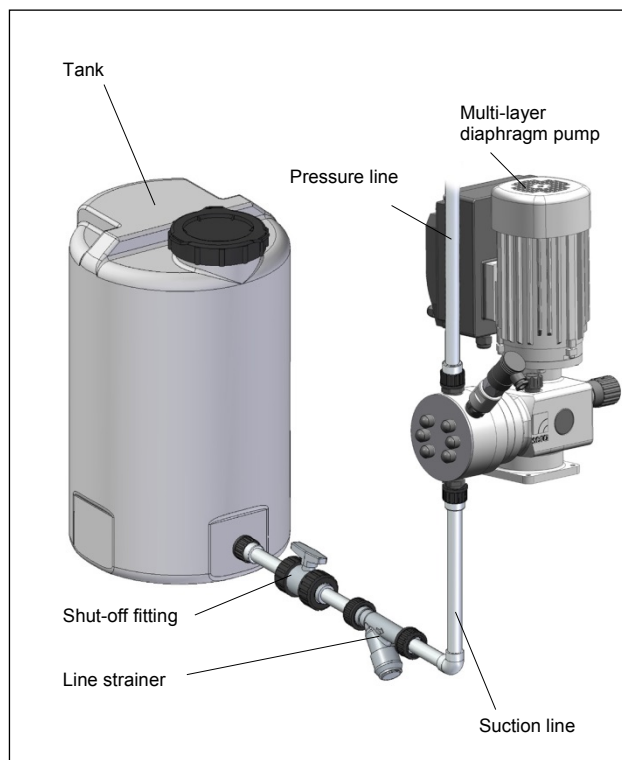


Fig. 27 Installation of a line strainer

NOTE !

Pump and system may malfunction if contaminants are not collected.

Operating instructions

9.1.8 Suction via a siphon pipe

For use with high tanks without connection on the bottom of the tank:

- install the siphon vessel
- pay attention to acceleration forces which may be generated in a long suction line.

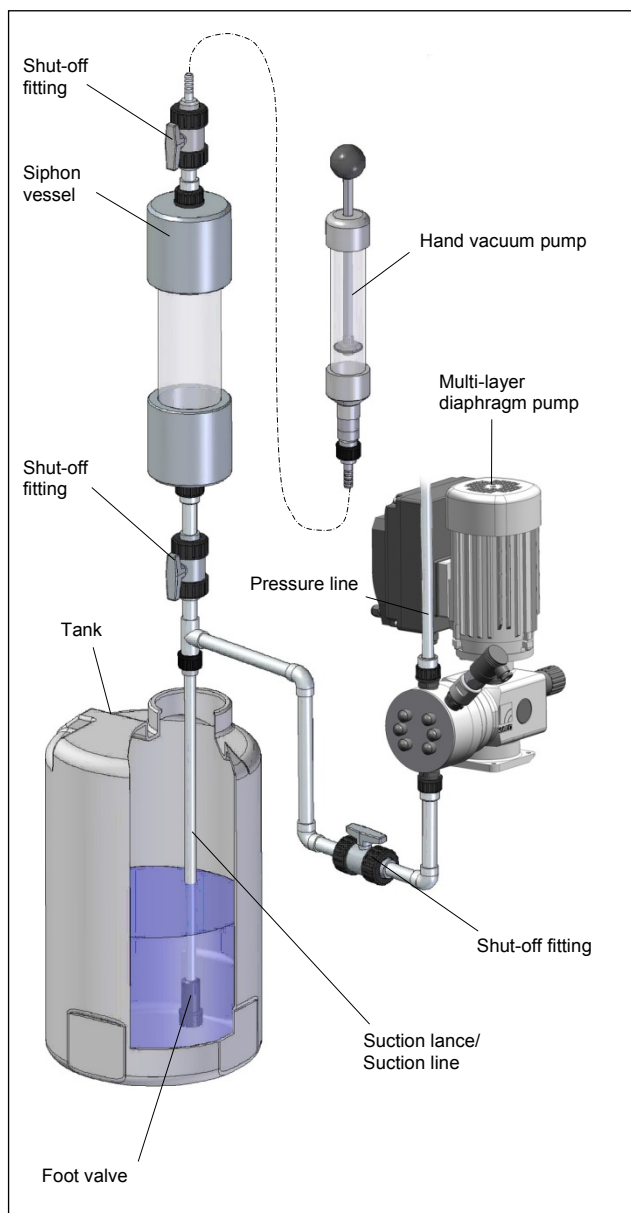


Fig. 28 Installation of siphon vessel (sera fitting)

9.1.9 In case of slightly degassing dosing media

- Install the pump so that it can be operated with afflux

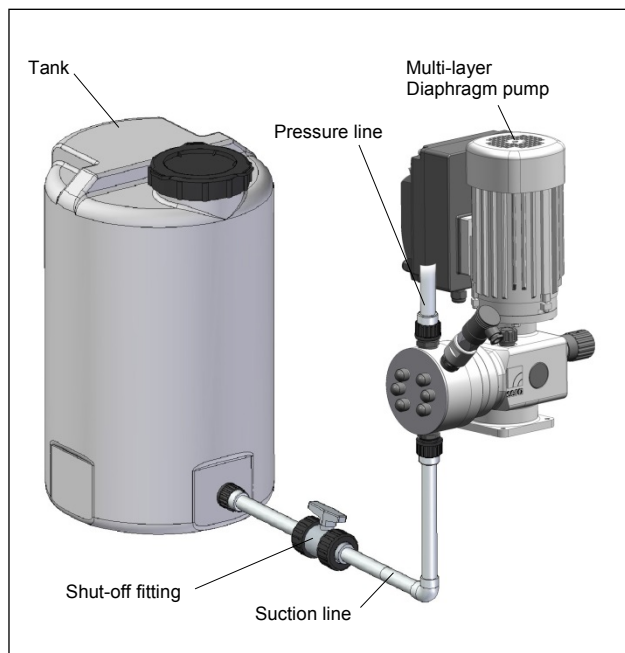


Fig. 29 Installation under afflux

9.1.10 Damping of the pulsation

By installing pulsation dampers if:

a pulsation-poor dosing flow is desired for procedural reasons

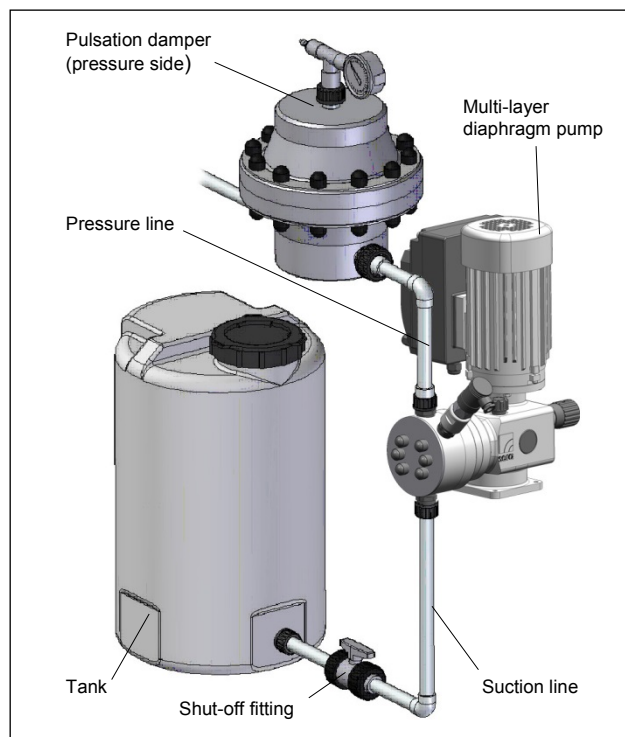


Fig. 30 Installation of pulsation damper (I)

Operating instructions

Acceleration forces which arise due to the pipe geometry must be reduced.

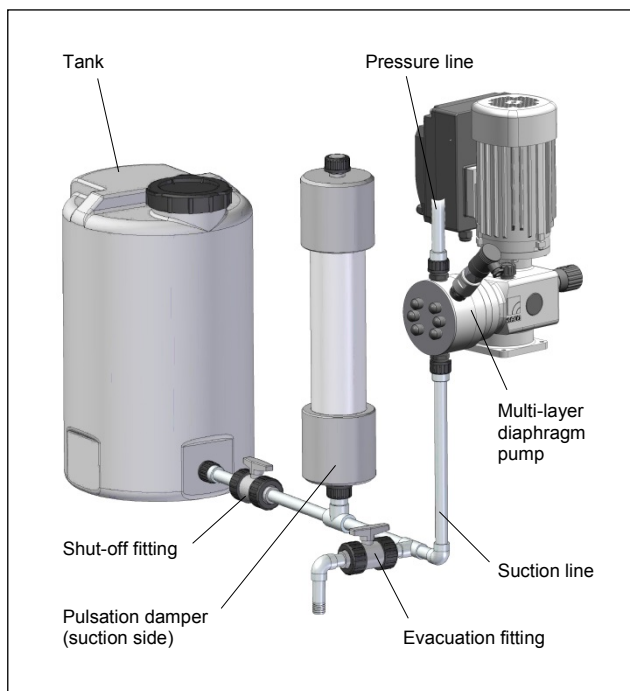


Fig. 31 Installation of pulsation damper (II)

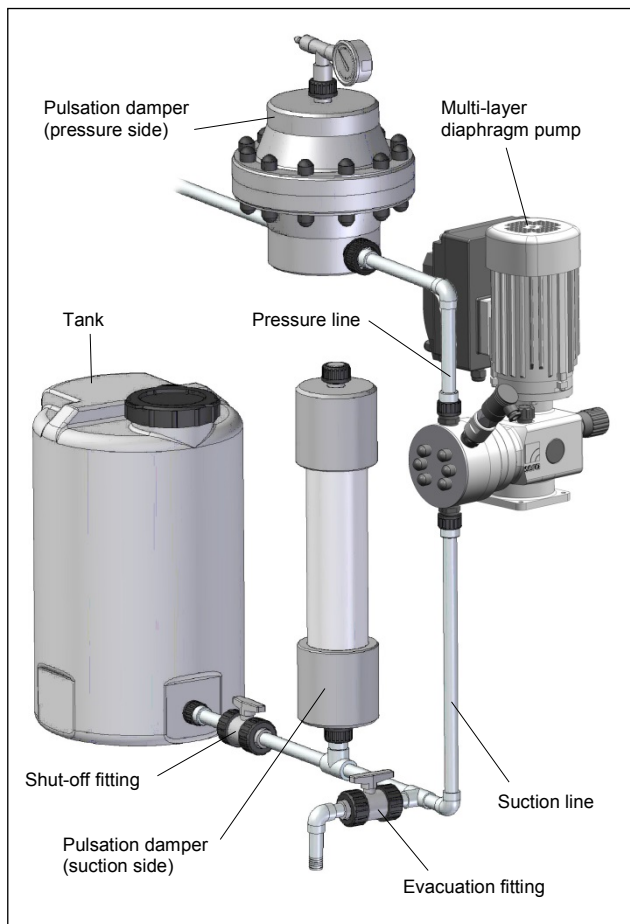


Fig. 32 Installation of pulsation damper (III)

CAUTION!



Undampened acceleration forces can cause the following problems/damage:

Fluctuations in the delivery rate
Dosing errors
Pressure thrusts
Valve wobbles
Increased wear on the suction and pressure side of the pump;

Mechanical breakdown of the pump
Leaks and valve wobbles as a result of the maximum pressure on the pressure side of the pump being exceeded.
Danger of breath / Danger of poisoning by leaking of medium!

Installation of suction and/or pressure pulsation dampers near the pump head.

If both pulsation damper and pressure keeping valve should be integrated install the pressure keeping valve between pump and pulsation damper.

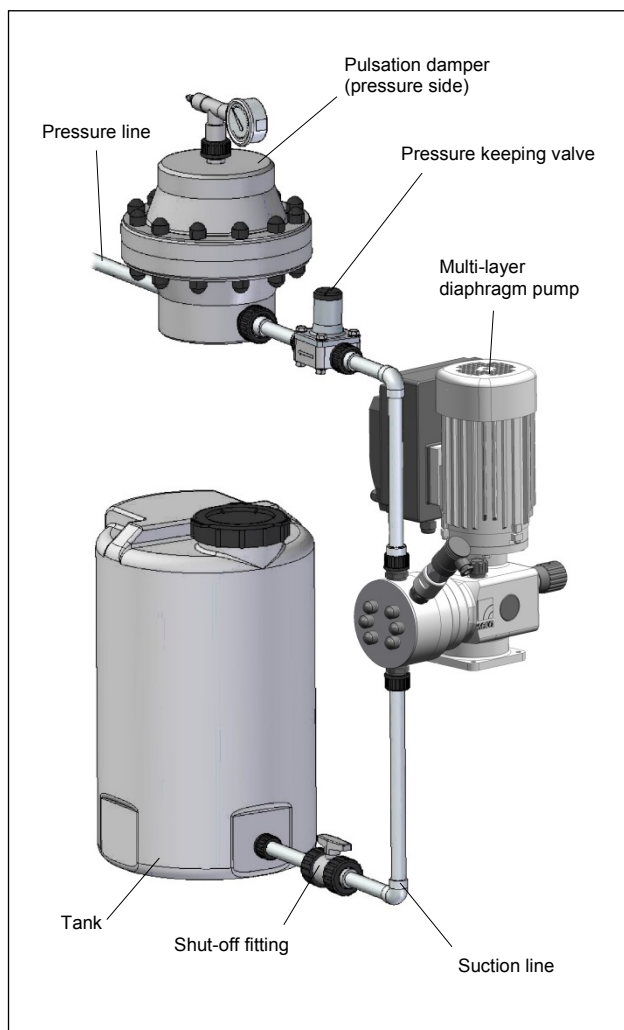


Fig. 33 Installation of pulsation damper and pressure keeping valve

Operating instructions

10 Electrical connections

10.1 Electric supply

The **sera** diaphragm pump is delivered ready for installation. Standard delivery includes a 2m power cable with Euro plug. The **standard version C 409.2** is designed for an operating voltage range of 100 – 120 V, 60 Hz.

CAUTION !



The specifications on the type plate must absolutely be adhered to!

NOTE !

Temporary activate and deactivate of supply voltage is to be avoided!

CAUTION !



The pump restarts in the selected operating mode after the power supply was switched on or a power supply recovery following a mains failure!

CAUTION !



The pump must only be connected to the power supply with the mains plug.
The mains plug should always be accessible.
For safety reasons the pump must be disconnected from the power supply by pulling the mains plug (e.g. for maintenance work).

Symbol:



Fig. 01 (Electric supply)

CAUTION !



Only operate the pump when it is connected to an earthed power supply!
Danger of electric shock!

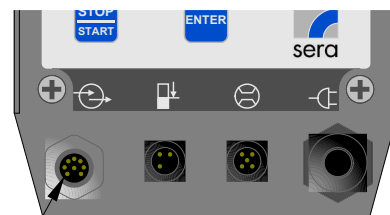
10.2 Electrical interfaces

The connectors for the electrical interfaces are located on the back of the pump below the control panel.

10.2.1 Control inputs and outputs

The pump is equipped with three control inputs and two control outputs. They can be programmed with different functions. All three inputs can be used as digital inputs, whereas two of them can optionally be configured as analog inputs (inputs 02 and 03, see Chapter 11.8.2). When leaving the factory, the inputs and outputs are preset as described in Tab 06.

Symbol:



Connector socket for control inputs and outputs

Fig. 35 (Connection of control inputs and outputs)

Standard delivery of the dosing pump includes a 5m control cable, which is to be connected to the 8-pin socket of the control inputs and outputs. Tab. 05 shows the identification of the individual leads of the control cable.

| Lead colour | Pin | Function (ex works setting) |
|-------------|-----|--------------------------------|
| WH (white) | 1 | Eingang 01 (Impuls) |
| BN (brown) | 2 | Eingang 02 (Analog 01) |
| GN (green) | 3 | Eingang 03 (Extern EIN) |
| YE (yellow) | 4 | Ausgang + / Signal + / 15 V DC |
| GY (grey) | 5 | Ausgang 01 (Sammelstörung) |
| PK (pink) | 6 | Ausgang 02 (Hubsignal) |
| RD (red) | 7 | Masse |
| BU (blue) | 8 | Masse |

Tab 06 (Identification of the leads of the control cable)

The digital inputs can not only be switched by a potential-free contact signal but also **directly via a control voltage signal** (e.g. 24V DC).

This enables, for example, the direct connection of a programmable logic controller to the dosing pump.

IMPORTANT NOTE !

When an external supply (for example, 24 V DC) is connected to the pin output + (colour of cable lead: yellow) the following has to be considered:

A protective diode is necessary in the feeding pipe of the external supply in order to exclude a feeding back of the pump (see fig. 37).

Connect the anode with 24V DC.

Connect the cathode with the yellow lead of a cable.

Use the diode type 1N4007 or the like.

Operating instructions

Fig. 36 shows exemplarily the control of the digital inputs 01 and 03 via a potential-free contact signal.

IMPORTANT NOTE !

The outputs 01 and 02 are not potential-free! In order to enable a potential-free switching via the outputs, the use of a relay is necessary (see example in fig. 36).

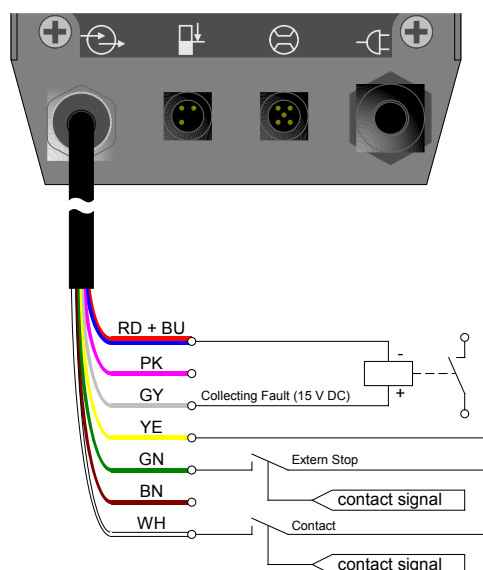


Fig. 36 (Control of digital inputs via a potential-free contact signal)

NOTE !

The maximum voltage/maximum current withstand capability of the control inputs and outputs is as follows:

Inputs: 30V DC / 50mA
Outputs: 15V DC / 50mA (internal supply)
30V DC / 350mA (external supply)

NOTE !

The output + / signal + connection pin (lead colour: yellow) is not short-circuit proof! In case of a short-circuit, the control electronics may get damaged!

Therefore, please make absolutely sure that the signal + connection pin is not directly connected with the earth connections (lead colour: red and blue)!

Fig. 37 shows exemplarily the direct activation of the digital inputs 01 and 03 via a control voltage signal (in this example: 24V DC) of a programmable logic controller.

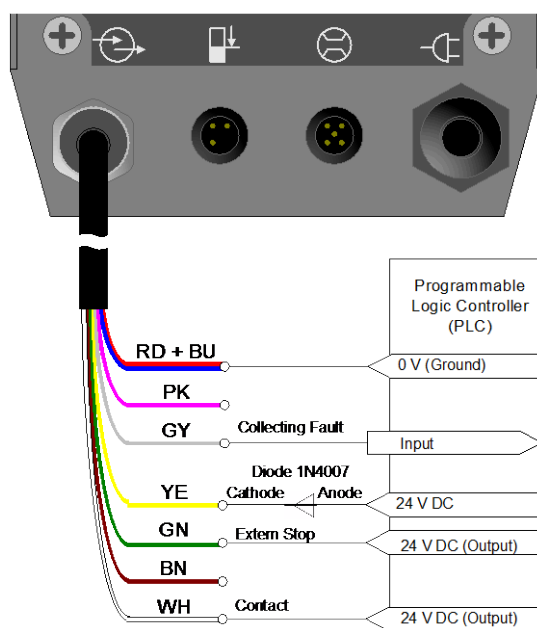


Fig. 37 (Direct activation of digital inputs via a control voltage signal of a programmable logic controller)

Operating instructions

10.2.2 Level input with pre-alarm and dry run

NOTE !

Pre-alarm and dry run are connected to the same jack. When leaving the factory, both inputs are preset to “closing when floating down”. However, if necessary, they can be freely configured (see Chapter. 11.15.4).

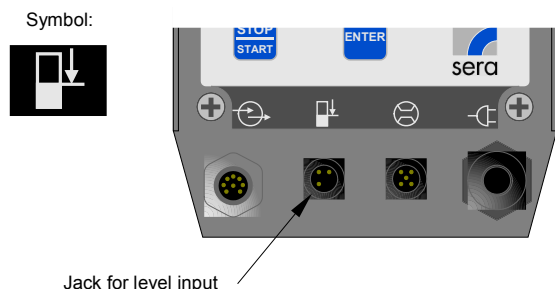


Fig. 38 (Connection for leader contact / main contact)

Suction lances that are compatible with types R/C 203 or C 408.1/409.1 can be connected to the pump using an adapter plug M8/M12, 3-pin (Item No. 90025005).

10.2.3 Input for flow control and flow meter

IMPORTANT NOTE !

Only flow controllers and flow meters made by sera may be connected to the dosing pump. If you use other than sera products, the electronics might get damaged.

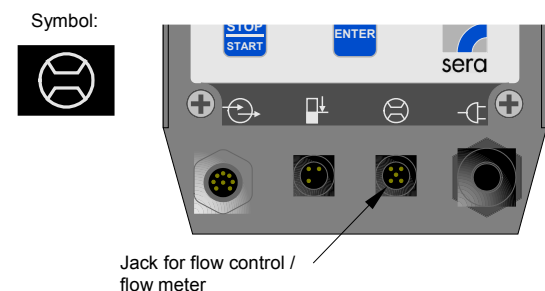


Fig. 39 (Connection for flow control / flow meter)

sera flow controllers and flow meters are delivered completely with cable and plug. Electrical connection is made directly to the 5-pin socket.

sera flow controllers that are compatible with types R/C 203 or C 408.1/409.1 can be connected to the pump using an adapter plug M8/M12, 4-pin (Item No. 90025006).

11 Operation

11.1 Operating elements

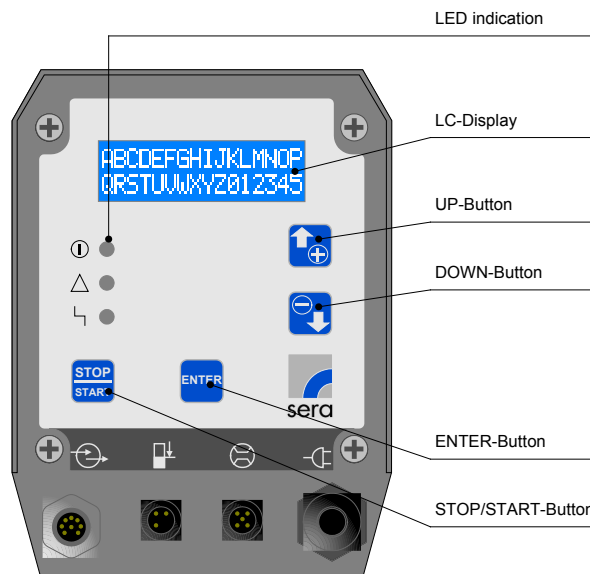


Fig. 40 (Electronics control panel)

11.2 LED operation indicators

Three light-emitting diodes (LED) indicate the status of the pump.

Green: Operation and stroke indicator



When switching on the pump, the green LED lights steadily. The operation indicator works in combination with a stroke indicator; during pump operation, the LED flashes in accordance with the current stroke frequency.

Yellow: Warning indicator



The yellow LED indicates all occurring warning messages (see Tab. 07). The warning is not only indicated by the LED but also as plain text in the LCD display.

Red: Fault indicator



The red LED indicates all occurring faults (see Tab. 07). The fault is not only indicated by the LED but also as plain text in the LCD display.

Operating instructions




| | Green LED  | Yellow LED  | Red LED  |
|--|---|--|---|
| Ready | On | | |
| Stroke confirmation | Flashes | | |
| Internal error | | | On |
| Supply voltage too low / too high | | On | |
| No mains | | | |
| Level monitoring: | | | |
| Level pre-alarm | | Flashes | |
| Dry run | | | Flashes |
| Dosing control (flow controller or flow meter): | | | |
| No flow - with warning message | | On | |
| No flow - with shut-off | | | On |
| Flow too low - with warning message | | On | |
| Flow too low - with shut-off | | | On |
| Optional diaphragm rupture monitoring: | | | |
| Diaphragm rupture | | | On |
| Vent valve (CS 409.2): | | | |
| Venting | Flashes | | On |
| Analog mode: | | | |
| mA signal < 3.5mA | | | On |
| mA signal > 20.5mA | | | On |

Table 07 (Overview of LED indicators)

NOTE !

The “dry run” fault message suppresses the “pre-alarm” warning. This means that if the pump runs dry while the 2-stage level monitoring is activated, then only the red LED will flash.

11.3 Key operation

Operation of the pump is performed with 4 keys:



STOP/START key

After connection to the power supply, the pump is switched ON/OFF using the STOP/START key.



ENTER key

You can use the ENTER key to open and confirm value input fields and to select menu items.



UP / DOWN key

Using the UP/DOWN key, you can scroll the different menu items / menu levels and select the display of various operating messages.

During parameter adjustment, the UP key is used to increase the parameter value and the DOWN key is used to decrease the parameter value.

Operating instructions

11.4 Parameter table

Tab. 08 shows the factory settings of the controllable diaphragm pump. With these defaults, the user can start standard applications such as manual operation, analog operation with 4-20mA, 1/1 pulse operation and external operation with External ON, without having to make further adjustments. It is only necessary to select the operation mode from the respective menu (see Chapter 11.6) and, in case of external control, to connect the respective input (see Chapter 10.2.1).

The references to the respective chapters facilitate the adjustment of the settings to special applications and dosing tasks.

In addition, the parameter table offers the possibility to document the changes that have been made in the settings. Thus, the current settings of the pump can be viewed quickly at any time.

| | Factory settings | Chapter | Modification 1 | Modification 2 | Modification 3 |
|--|------------------|---------|----------------|----------------|----------------|
| Pulse operation: | | | | | |
| Pulse mode | 1/1 | 11.7.2 | | | |
| Pulse factor | 1 | 11.7.2 | | | |
| Pulse memory | ON | 11.7.2 | | | |
| Analog mode: | | | | | |
| Analog mode | Auto | 11.7.1 | | | |
| Analog signal | 4-20mA | 11.7.1 | | | |
| Adjustment: Analog I1 | 4 mA | 11.7.1 | | | |
| Adjustment: Frequency f1 | 0 % | 11.7.1 | | | |
| Adjustment: Analog I2 | 20 mA | 11.7.1 | | | |
| Adjustment: Frequency f2 | 100 % | 11.7.1 | | | |
| Batch mode: | | | | | |
| Batch control | Manual | 11.7.3 | | | |
| Batch quantity | 0 strokes | 11.7.3 | | | |
| Batch start | 00:00 h | 11.7.3 | | | |
| External mode: | | | | | |
| Stroke freq. | 100 % | 11.7.4 | | | |
| Input 01: | | | | | |
| Function E1 | Pulse | 11.8.1 | | | |
| Contact E1 | NO | 11.8.1 | | | |
| Input 02: | | | | | |
| Function E2 | Analog 01 | 11.8.2 | | | |
| Contact E2 | NO | 11.8.2 | | | |
| Input 03: | | | | | |
| Function E3 | External ON | 11.8.2 | | | |
| Contact E3 | NO | 11.8.2 | | | |
| Output 01: | | | | | |
| Function A1 | Collective fault | 11.8.3 | | | |
| Contact A1 | NC | 11.8.3 | | | |
| Output 02: | | | | | |
| Function A2 | Stroke signal | 11.8.3 | | | |
| Contact A2 | NO | 11.8.3 | | | |
| Dosing monitor.: | | | | | |
| Sensor | OFF | 11.12 | | | |
| Function | Message | 11.12 | | | |
| Fault stroke | 10 | 11.12 | | | |
| Alarm limit | 80% | 11.12 | | | |
| Level: | | | | | |
| Pre-alarm | NO | 11.15.4 | | | |
| Dry run | NO | 11.15.4 | | | |
| System: | | | | | |
| Language | German | 11.11 | | | |
| Calibration | OFF | 11.11 | | | |
| SLOW-Mode: | | | | | |
| Slow-Mode | OFF | 11.15.1 | | | |
| Speed | 80 % | 11.15.1 | | | |
| Password: | | | | | |
| PW01 mode | OFF | 11.13 | | | |
| Password 01 | 9990 | 11.13 | | | |
| Password 02 | 9021 | 11.13 | | | |
| Diaphragm rupt. ⁽¹⁾: | | | | | |
| Input signal | NC | 11.15.3 | | | |
| Sensitivity | 70% | 11.15.3 | | | |

Tab. 08(Overview of preset parameters)

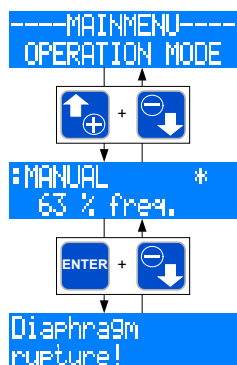
Operating instructions

11.5 Menu

You can switch between the following three screens:

- Operating messages
- Main menu
- Fault and warning messages

A change to the screen "Fault and warning messages" is only possible when a fault or warning is present.



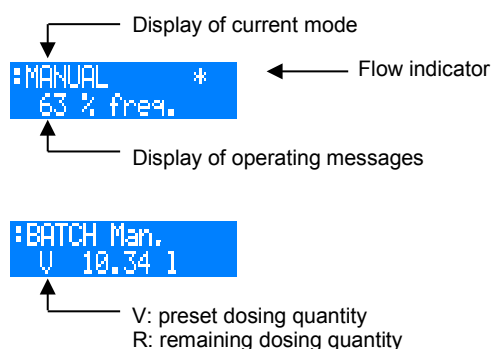
A change between the screens "Operating messages" and "Main menu" is done by simultaneously pressing the UP and DOWN keys.

A change between the screens "Operating messages" and "Fault and warning messages" is done by simultaneously pressing the ENTER and DOWN keys.

NOTE !

After, in the main menu, no key has been pressed for 3 min. the screen "Operating messages" is automatically displayed.

11.5.1 Screen "Operating messages"



Display of the current operation mode

The first line in the screen "Operating messages" shows the currently set operation mode.

Flow indicator

A star-symbol (*) in the first line on the right-hand side is used as flow indicator. The star symbol indicates the response of a connected dose monitoring instrument (flow control or flow meter).

NOTE !

The flow indicator (*) is only active when a flow control / flow meter is connected and the dosing monitoring is activated (see Chapter 11.15.1).

Display of operating messages

The second line of the display shows, dependent on the set operation mode, a variety of operating messages (e.g. the current stroke frequency, total strokes – see Tab. 09). The operating messages can be scrolled using the UP and DOWN keys.

You can use the ENTER key to open the value input fields of the editable operating messages (see Tab. 09). The value input is described in Chapter 11.5.4.

| Operating messages | Operation mode | | | | |
|---|------------------|--------|-------|-------|----------|
| | Manual | Analog | Pulse | Batch | External |
| Current stroke frequency | ○ ⁽¹⁾ | ● | ● | ● | ● |
| Current dosing performance ⁽²⁾ | ○ | ● | | | |
| Total strokes | ○ | ○ | ○ | ○ | ○ |
| Total dosing quantity ⁽²⁾ | ○ | ○ | ○ | ○ | ○ |
| Venting ON/OFF ⁽³⁾ | | ● | | | |
| Current control current | | | ● | | |
| Pulse factor | | | ● | ● | |
| Memory | | | | ● | |
| Dosing quantity / strokes | | | | ● | |
| Remaining dosing quantity / remaining strokes | | | | ● | |

● = Indication
 ○ = Indication and setting option
⁽¹⁾ = not with a calibrated pump
⁽²⁾ = only with a calibrated pump

Tab. 09 (Operating messages in dependence on the selected operation mode)

11.5.2 Fault and warning messages

When a fault or warning has occurred, the dosing pump shows a message in plain text format on the LCD display.

NOTE !

The message disappears automatically when the cause of the fault or warning has been eliminated.

Operating instructions

11.5.3 Screen “Main menu”

The upper line shows the superordinate menu items or editable parameters. The lower line shows the subordinate menu items or selectable values and settings.

Superordinate menu items are marked with “---”. Superordinate means that no values or settings can be assigned to this item. It is, for example, possible to select a variety of subordinate menu items (e. g. ANALOG MODE) in the ---PARAMETER--- menu but these items cannot be assigned to the superordinate menu as a fixed value.



Parameters which can be assigned different values or settings are marked with “>” and “<”. Such parameters are, for example, the operation mode, the analog signal or the pulse mode. Each parameter should be assigned a definitive value or setting. The >OPERATION MODE< can, for example, be assigned the ANALOG setting.

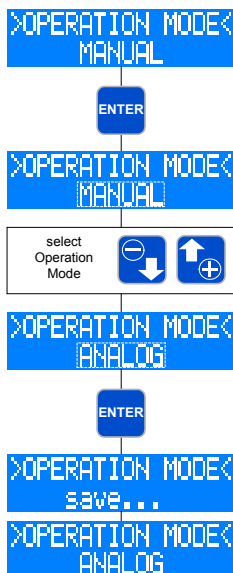


11.5.4 Value entry

The assignment of values and settings to a parameter is described in the following, using two exemplary illustrations.

Assignment of settings

(Example: Selection of operation mode)



Display of the current setting (in this example: MANUAL operation mode).

Value entry is enabled after pressing the ENTER key.

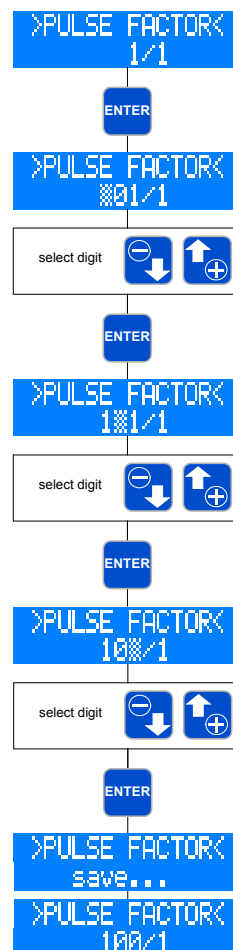
Then, the operation mode indicator flashes and a setting can be selected (in this example: operation modes) using the UP and DOWN keys.

After a setting has been selected (in this example: ANALOG mode), pressing the ENTER key will confirm and save the choice.

Display of the current setting (in this example: ANALOG mode)

Assignment of values

(Example: Selection of the pulse factor in case of division)



Display of the current value (in this example: pulse factor 1/1)

Value entry is enabled after pressing the ENTER key.

Then, the first digit of the pulse factor flashes.

The desired figure can be set using the UP and DOWN keys (in this example: 1).

After having selected the desired figure, pressing the ENTER key will confirm the choice.

Then, the second digit of the pulse factor starts to flash.

The desired figure can be set using the UP and DOWN keys (in this example: 0).

After having selected the desired figure, pressing the ENTER key will confirm the choice.

Then, the third digit of the pulse factor starts to flash.

The desired figure can be set using the UP and DOWN keys (in this example: 0).

After having selected the desired figure, pressing the ENTER key will confirm the choice.

Afterwards, the entered value will be saved.

Display of current value (in this example: pulse factor 100/1)

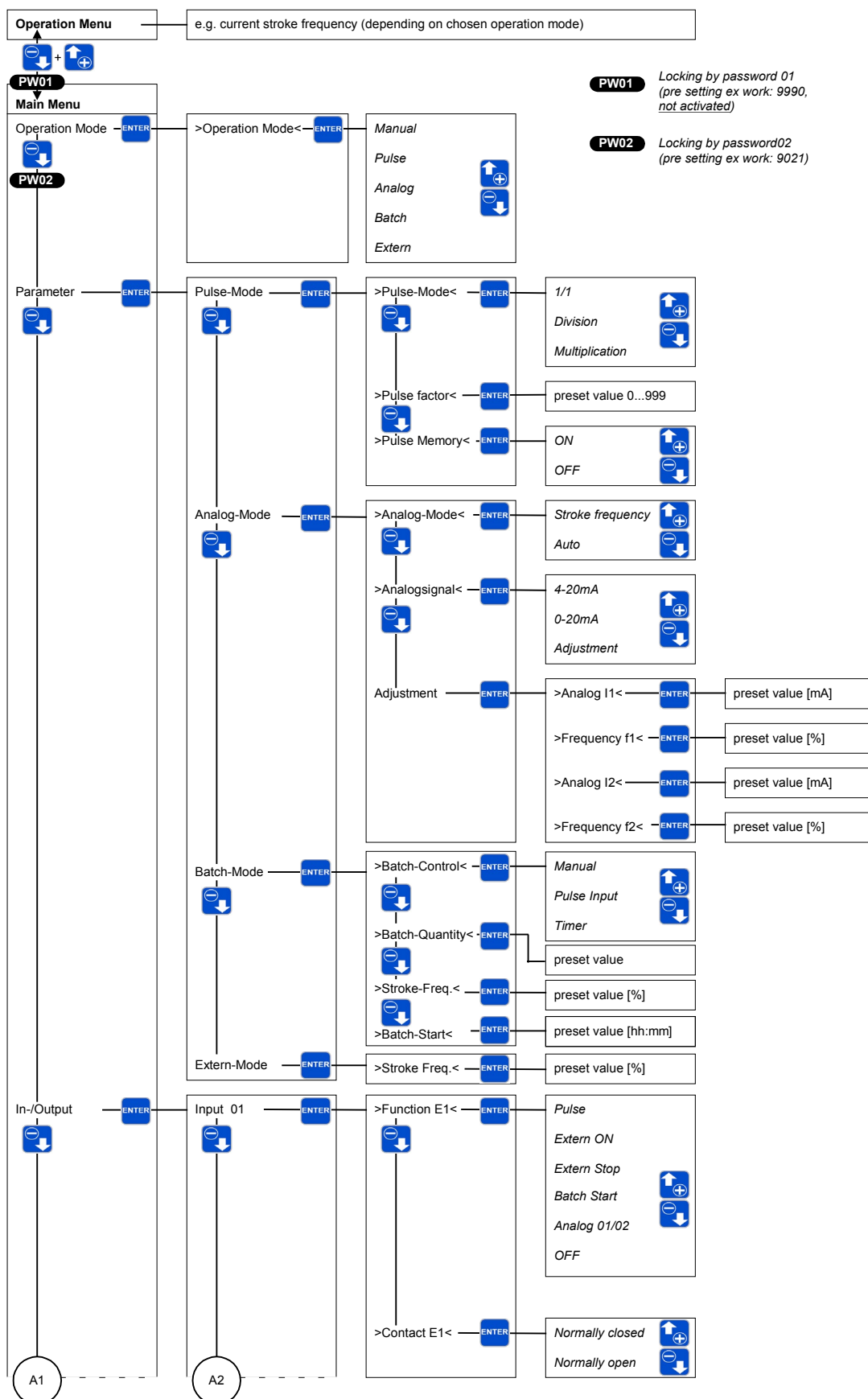
The value entry (flashing indication) can be exited by simultaneously pressing the UP and DOWN keys. In this case, the previous value / previous setting will be maintained.

NOTE !

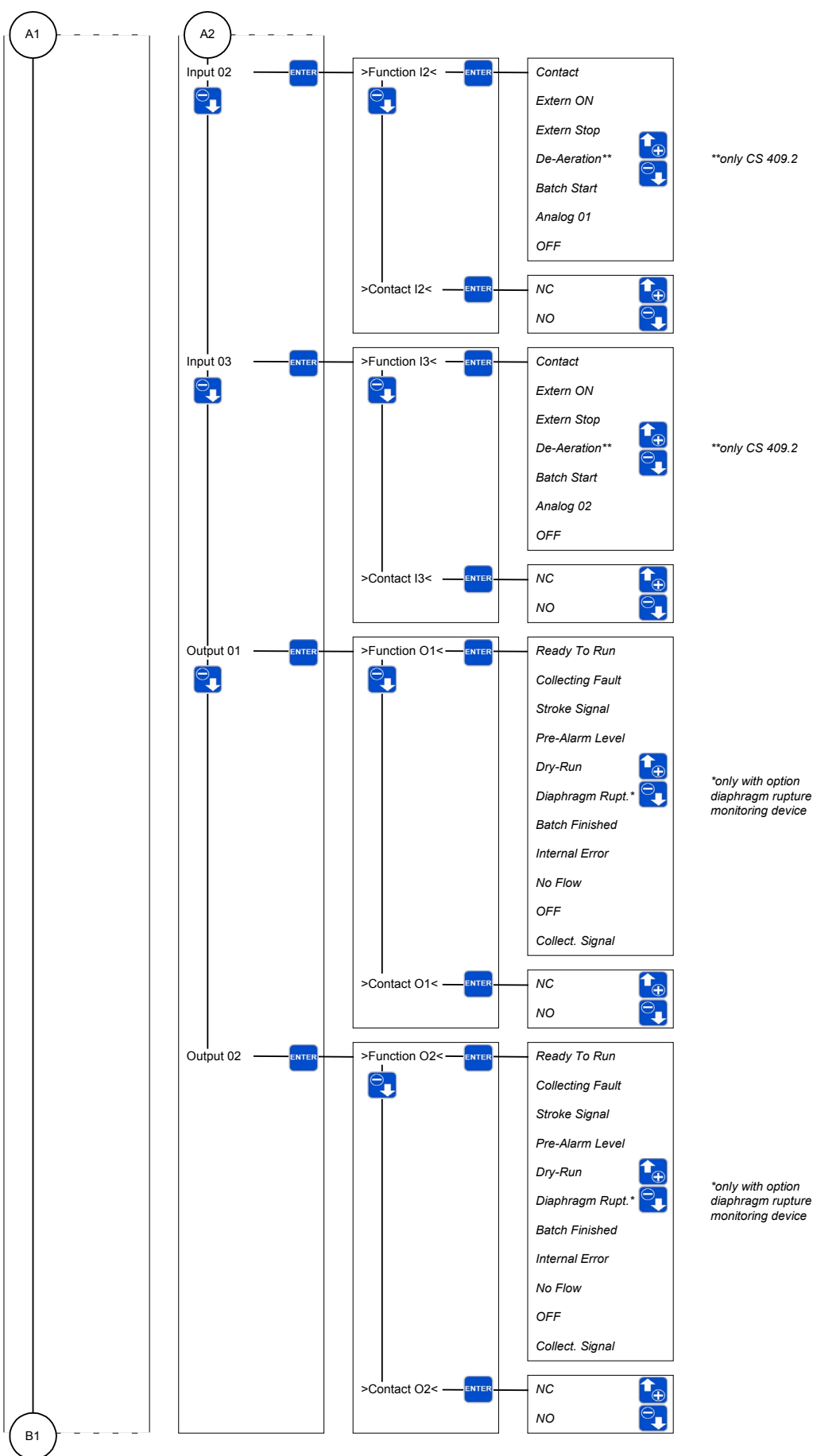
If, during the value entry (flashing indication), no key has been pressed for 30 sec. the entry mode is exited automatically and the previous value / previous setting is maintained.

Operating instructions

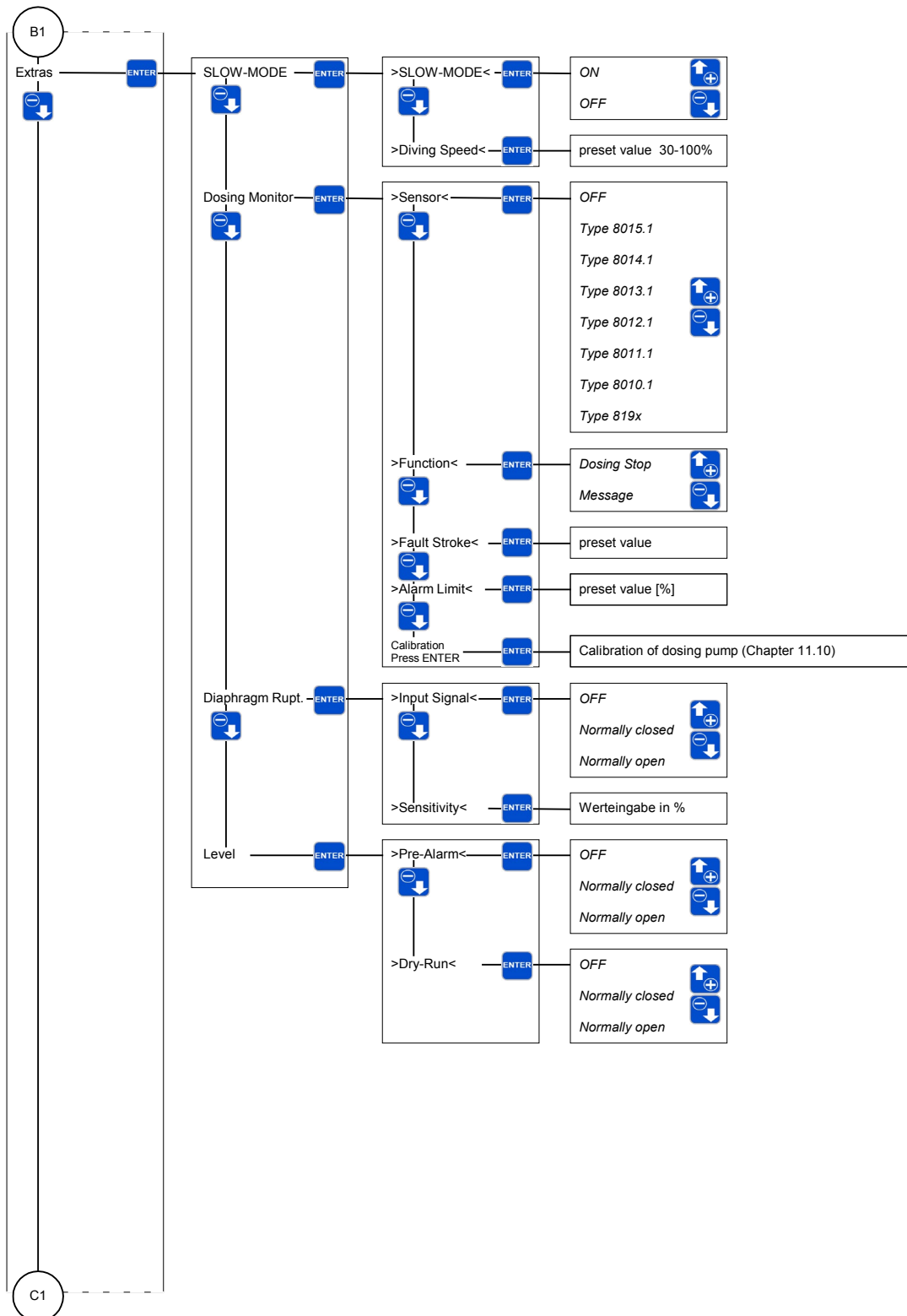
11.5.5 Menu guide



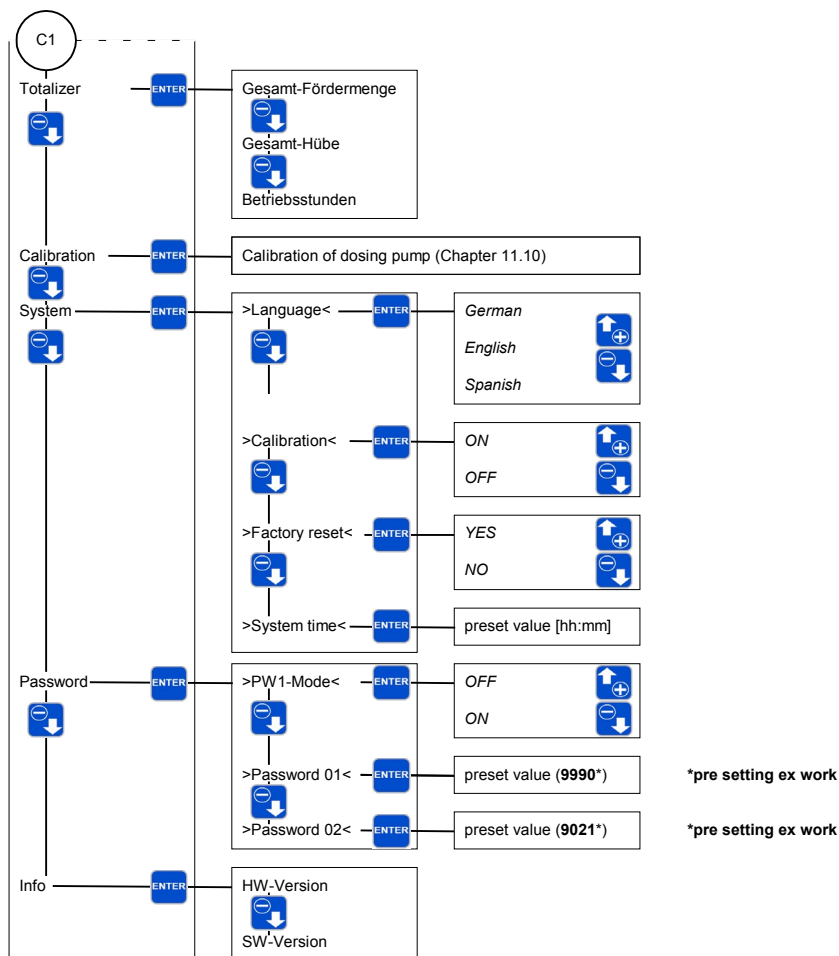
Operating instructions



Operating instructions



Operating instructions



Operating instructions

11.6 Selecting the operation mode

You can select among five different operation modes:

- MANUAL
- PULSE
- ANALOG
- BATCH
- EXTERNAL

>OPERATION MODE<
MANUAL

On-site operation and on-site control of the pump without external control. The flow rate can be set via the manual stroke length adjustment (10.6) and/or by presetting a stroke frequency. With a calibrated pump, the delivery rate is set in l/h instead of via the stroke frequency.

>OPERATION MODE<
EXTERN

The pump is released or blocked via an external switch. If the pump is released, it will run at the preselected stroke frequency (see Chapter 11.7.4).

>OPERATION MODE<
BATCH

Batch dosing that can either be started manually, via an external pulse signal or by time control. The batch quantity can be entered in strokes or in liters (only with a calibrated pump) (see Chapter 11.7.3).

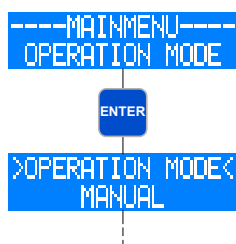
>OPERATION MODE<
ANALOG

The stroke frequency of the pump is controlled via the received analog signal. The pump can optionally be controlled with a control current of either 0...20mA or 4...20mA. In addition, there is the possibility to adjust the receiving analog signal according to needs (see Chapter 11.7.1).

>OPERATION MODE<
PULSE

Three pulse modes are offered. The pump can either be operated in the 1/1 mode or with multiplication or division of the input pulses (see Chapter 11.7.2).

Setting diagram:



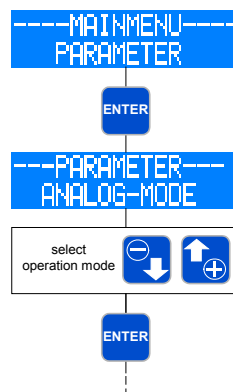
Go to the ---MAIN MENU--- and select the menu item OPERATION MODE (if necessary, use the UP / DOWN keys). Pressing the ENTER key will open the >OPERATION MODE< submenu.

Here, the currently set operation mode is indicated (in this example: MANUAL).

The adjustment of an operation mode is done in accordance with the description in Chapter 11.5.4.

11.7 Additional settings for the operation mode

Depending on the selected operation mode, specific settings can be made.



Go to the ---MAIN MENU--- and select the menu item PARAMETER (if necessary, use the UP / DOWN keys). Pressing the ENTER key will open the --- PARAMETER --- submenu.

Here, the currently set operation mode is indicated (in this example: ANALOG MODE).

The DOWN key is used to move to the respectively next operation mode. The UP key is used to move to the previous operation mode. When in the PULSE MODE, the UP key is used to move back to the ---MAIN MENU---.

After having selected the operation mode, the ENTER key can be used to move to the specific settings for the selected operation mode.

NOTE !

In the ---PARAMETER--- menu, there is no adjustment possibility for the MANUAL operation mode.

11.7.1 Additional settings for the ANALOG operation mode

NOTE !

In order to be able to use the ANALOG operation mode, at least one input must be assigned the ANALOG 01 or ANALOG 02 function (see Chapter 11.8.2). Input 02 (see Chapter 10.2.1) is factory preset to analog input (ANALOG 01).

Choose the ANALOG MODE

Two different analog modes can be chosen:

- Auto
- Stroke frequency

>ANALOG-MODE<
AUTO

The motor speed is adjusted corresponding to the stroke frequency. If the stroke frequency falls below 30% operation changes to Stop&Go..

>ANALOG-MODE<
STROKE FREQUENCY

Stop&Go operation covering the whole stroke frequency range, that means every stroke is performed with full motor speed.

Operating instructions

Selecting the ANALOG SIGNAL

You can select among three different analog signals:

- 4-20mA
- 0-20mA
- ADJUSTMENT

>ANALOGSIGNAL<
4-20mA

A signal with a control current of 4mA corresponds to 0% stroke frequency; a signal with 20mA corresponds to 100% stroke frequency. In this range, the stroke frequency behaves proportionally to the control current (Fig. 41).

If the input signal is < 3.5mA, then the pump emits the error message "Analogsignal < 4mA". Thus, a wire breakage (control current = 0mA) can be detected.

If the input signal is > 20.5mA, then the pump stops and the error message "Analogsignal > 20 mA" is emitted.

>ANALOGSIGNAL<
0-20mA

A signal with a control current of 0mA corresponds to 0% stroke frequency; a signal with 20mA corresponds to 100% stroke frequency. In this range, the stroke frequency behaves proportionally to the control current (Fig. 41).

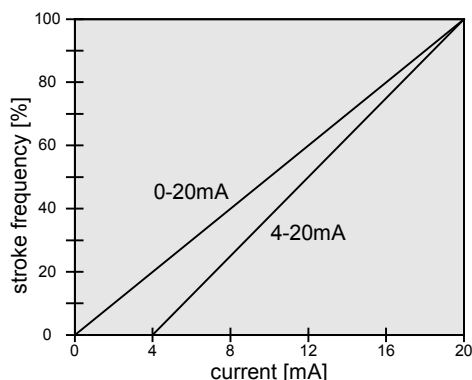


Fig. 41 (Stroke frequency in dependency on the control current at 4-20mA / 0-20mA)

>ANALOGSIGNAL<
ADJUSTMENT

The analog control signal can be adjusted according to needs. This is, for example, necessary if a connected regulator provides a limited output signal.

Two points are given that reflect a proportional relation between control current and stroke frequency of the pump. In addition, these two points restrict the stroke frequency range of the pump as shown in Fig 42.

Example: Point 1: 15% stroke frequency at 5mA
 Point 2: 80% stroke frequency at 15mA

If the control current is < 5mA, then the stroke frequency of the pump is 0%.

If the control current is > 15mA, then the stroke frequency of the pump is 80%.

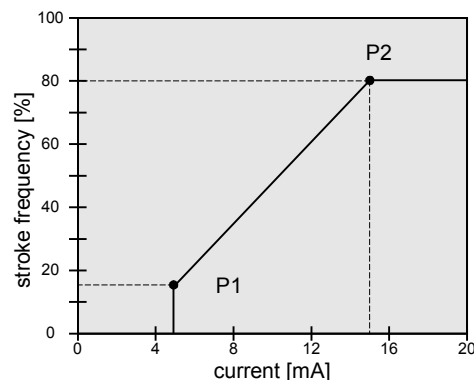


Fig. 42 (Exemplary adjustment of the analog signal)

NOTE !

If the input signal is greater than 25 mA, the pump stops and a fault indicator „analog signal > 25 mA“ is emitted. Additionally in this case, the appropriate input will be switched off as protective measure. The input is reactivated after the dosing pumps is switched off and started again via the button STOP/START.

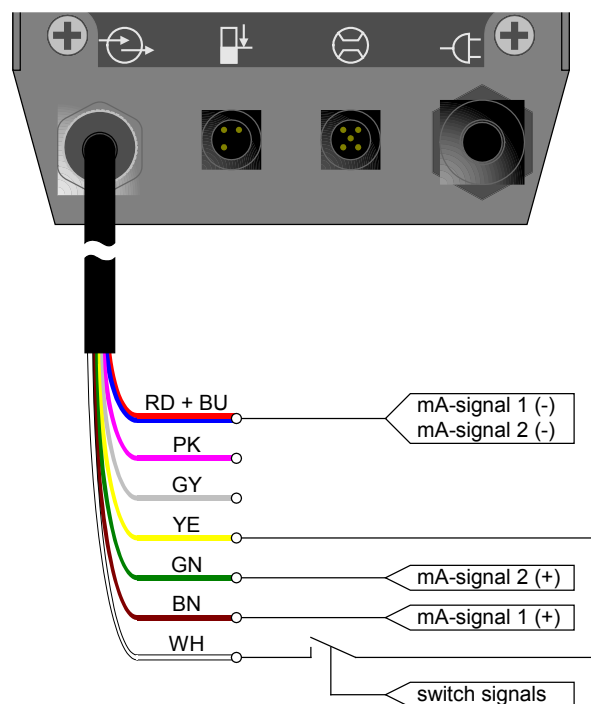


Fig. 43 (Connection of two analog signals with switch-over)

Operating instructions

ADJUSTMENT of the analog signal

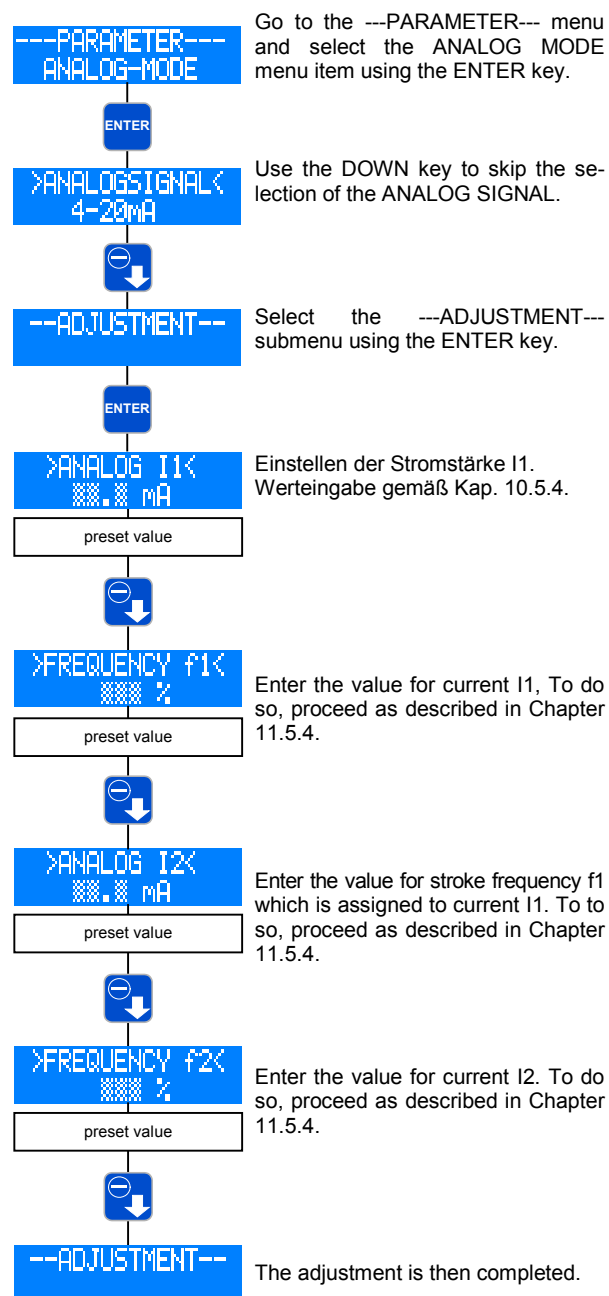
The adjustment of the analog signal is done under consideration of two default points. These two points are two value pairs which assign control currents to stroke frequencies:

Point 1 (I1, f1)

Point 2 (I2, f2)

The following diagram shows the procedure to determine the points.

Setting diagram:



11.7.2 Additional settings for the PULSE mode

NOTE !

In order to be able to use the PULSE operation mode, at least one input must be assigned the PULSE function (see Chapter 11.8). Input 01 (see Chapter 10.2.1) is factory preset to pulse input (ANALOG 01).

Selecting the PULSE MODE

You can select among three different pulse modes:

- 1/1
- DIVISION
- MULTIPLICATION

>PULSE MODE<
1/1

In this mode, the pump performs exactly one stroke for each received pulse.

>PULSE MODE<
DIVISION

In this mode, a division of the received pulses is performed. This means that a stroke will only be performed after an adjustable number of pulses (division factor) has been received.

>PULSE MODE<
MULTIPLICATION

In this mode, a multiplication of the received pulses is performed. This means that the pump will perform an adjustable number of strokes (multiplication factor) after every received pulse.

Selecting the PULSE FACTOR

Depending on the selected pulse mode, the pulse factor corresponds either to the division factor or the multiplication factor.

>PULSE FACTOR<
50/1

The **division** factor can be selected between 1 and 999. If, for example, the division factor is 50, then the pump will perform a stroke only with every 50th received pulse.

>PULSE FACTOR<
1/ 50

The **multiplication** factor can be selected between 1 and 999. If, for example, the multiplication factor is 50, then the pump will perform 50 strokes with every received pulse.

For setting the pulse factor, please see the description in Chapter 11.4.3 (Assignment of values).

Operating instructions

Switching ON/OFF the **PULSE MEMORY**

The pump is equipped with a pulse memory, which can optionally be switched ON and OFF. 999 strokes max can be saved. If the number of received pulses exceeds the number that can be handled by the pump, then the pulses will be buffered and the strokes will be performed later.

Example: With the setting 1:50, 5 pulses are in the memory → perform. of 5 x 50 strokes = 250 strokes.

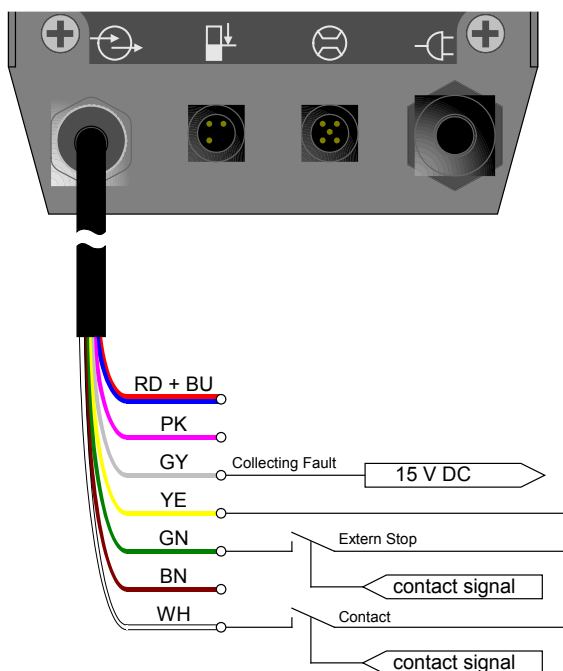


Fig. 44 (Connection of a pulse signal with External stop and response of the stroke signal)

11.7.3 Additional settings for the **BATCH** mode

Selecting the type of **CONTROL**

You can select among three different types of control:

- MANUAL
- TIMER
- PULSE INPUT

>CHARGE CONTROL<
MANUAL

With this type of control, the batch is started manually in the "operating messages" screen by pressing the ENTER key.

>CHARGE CONTROL<
TIMER

With this type of control, the batch is started **daily** at a fixed adjustable time (system time of the pump).

CAUTION !



The pump starts the batch when the preset time matches the system time of the pump. When the supply voltage is switched off, then the system time will be reset to 0:00. Danger of abrupt pump start.

NOTE !

If the **TIMER** control is set, then the batch dosing will be repeated **daily** at the set time.

>CHARGE CONTROL<
PULSE INPUT

With this type of control, the batch is started via an external pulse at the pulse input.

NOTE !

In order to be able to use the **PULSE INPUT** control, at least one input must be assigned to the **START BATCH** function (see Chapter 11.8).

Determining the **BATCH QUANTITY**

The type of entry for the batch quantity depends on the calibration (see Chapter 11.10):

- Entry in strokes if the pump is not calibrated
- Entry in liters if the pump is calibrated

Operating instructions

Adjusting the **STROKE FREQUENCY**

The stroke frequency at which the pump works during batch dosing can be adjusted.

The value input is described in Chapter 11.5.4.

Determining the **BATCH START**

>BATCH-START<
 16:30 h

The pumps starts the batch dosing when the system time of the pump matches the value entered under BATCH START.

The value input is described in Chapter 11.5.5.

NOTE !

In order to enable time-controlled batch dosing, **TIMER control must be set under BATCH MODE.**

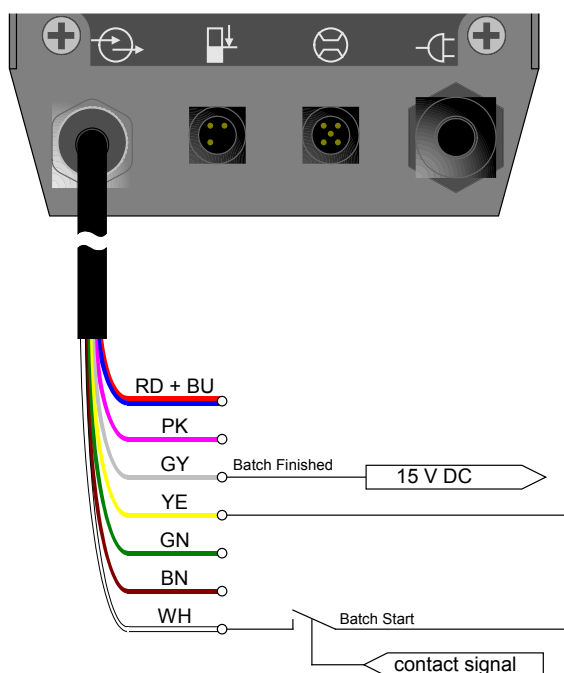


Fig. 45 (Possible connector pin assignment in batch mode)

11.7.4 Settings for the **EXTERNAL** operation mode

NOTE !

In order to be able to use the **EXTERNAL** operation mode, at least one input must be assigned the **EXTERNAL ON** function (see Chapter 11.8). Input 03 (see Chapter 10.2.1) is factory preset to External ON.

>STROKE FREQ.<
 63 %

In the **EXTERNAL** operation mode, only one stroke frequency (e.g. 63%) can be set. As soon as an external ON signal is received, the pump will start running at this stroke frequency.

The value input is described in Chapter. 11.5.5.

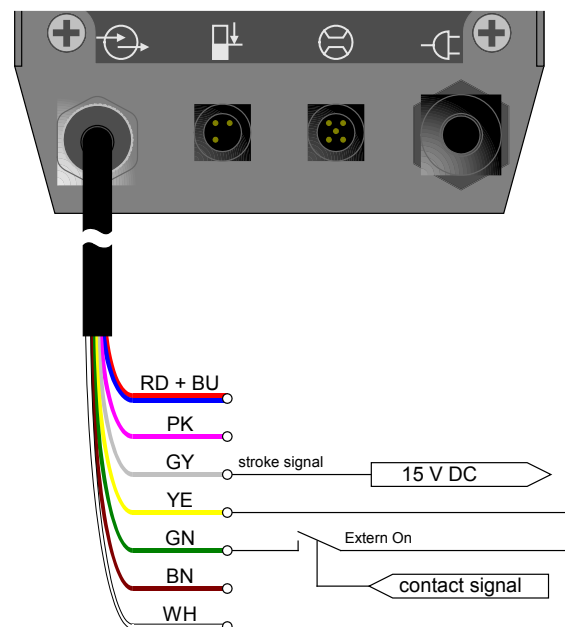


Fig. 46 (Possible connector pin assignment in External operation mode)

11.8 Configuring the inputs and outputs

The pump is equipped with three inputs and two outputs, which can be configured via a menu and thus be adapted to the given operating conditions.

It is possible to assign the same functions to all three inputs.

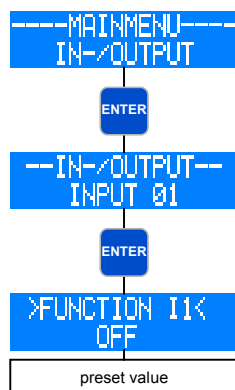
NOTE !

If several inputs are configured identically, then the input signals will be evaluated via **OR-operation**. This means that the function will be performed as soon as one of the inputs fulfils the condition.

Exception: Pulse input with pulse memory. If the pulse memory is switched on, then the received pulses will be summed up.

Operating instructions

Setting diagram:



Go to the ---MAIN MENU--- and select the menu item IN-/OUTPUT (if necessary, use the UP / DOWN keys).

Pressing the ENTER key opens the ---IN-/OUTPUT--- submenu.

Here, you can select among the individual inputs and outputs.

Pressing the ENTER key opens the menu level for setting the individual inputs and outputs.

>FUNCTION I1<
DE-AERATION

Function for the external control of the charge via the respective input.

>FUNCTION I1<
ANALOG 01/02

This function is used to switch over between the two analog inputs Analog 01 and Analog 02 (input 02 and 03) via input 01. Selection of the analog input is done in accordance with the following Tab. 10.

| Configuration Contact E1 | Applied signal | Selected analog input |
|-----------------------------|-------------------|-----------------------|
| NC | High | Analog 01 (input 02) |
| NC | Low | Analog 02 (input 03) |
| NO | High | Analog 02 (input 03) |
| NO | Low | Analog 01 (input 02) |

Tab. 10 (Analog input switchover)

11.8.1 Digital input 01

Input 01 can be assigned one of six different functions. Optionally, it can also be switched off.

- Pulse
- External On
- External Stop
- Venting (only with the "venting" option!)
- Batch Start
- Analog 01/02
- OFF

In addition, it is possible to configure the contact signal of the input as NC or NO.

>FUNCTION I1<
PULSE

Configuration of the respective input as pulse input.

>FUNCTION I1<
EXTERN ON

Function for externally switching on the pump via the respective input (only with the EXTERNAL operation mode).

>FUNCTION I1<
EXTERN STOP

Function for externally switching off the pump via the respective input (independent of the operation mode).

NOTE !

If the dosing pump is switched off via External Stop, then an "S" will be indicated in the 1. line of the display on the right-hand side.

MANUELL S
63 % freq.

>FUNCTION I1<
OFF

The respective input is not assigned a function.

11.8.2 Digital/analog inputs 02 and 03

Basically, input 02 and input 03 have the same functions as input 01 (see Chapter 11.8.1). In addition, they can also be used as analog inputs. However, the function "Analog 01/02", which is used to switch over between the analog inputs is not available.

In addition, it is possible to configure the contact signals of the inputs as NC or NO.

>FUNCTION I2<
ANALOG 01

or.

>FUNCTION I3<
ANALOG 02

Respective input is configured as analog input.

11.8.3 Outputs 01 and 02

Each of the outputs 01 and 02 can be assigned one of ten different functions. Optionally, they can also be switched off.

- Ready to run
- Collective fault
- Collect. signal
- Stroke signal
- Pre-alarm level
- Dry run
- Diaphragm rupture
- Batch finished
- Internal error
- No flow
- OFF

Operating instructions

In addition, it is possible to configure the contact signals of the outputs as NC or NO.

>FUNCTION 01<
 READY TO RUN

Message from the respective output indicating the readiness of the dosing pump.

>FUNCTION 01<
 COLLECTING FAULT

Message if one of the following faults occurs:

- Diaphragm rupture
- Dry run
- Internal error
- No flow (with DOSING STOP function)

>FUNCTION 01<
 COLLECT. SIGNAL

Message indicating that one of the following faults has occurred:

- All faults of the collective faults
- Pre-alarm level
- No flow (with MESSAGE function)

>FUNCTION 01<
 STROKE SIGNAL

Message from the respective output indicating that a stroke has been performed.

>FUNCTION 01<
 PRE-ALARM LEVEL

With activated 2-stage level monitoring, message from the respective output indicating a pre-alarm.

>FUNCTION 01<
 DRY RUN

With activated level monitoring, message from the respective output indicating the dry run.

>FUNCTION 01<
 DIAPHRAGM RUPT.

(only with MBE option!)

With activated diaphragm rupture monitoring, message from the respective output indicating a diaphragm rupture.

>FUNCTION 01<
 BATCH FINISHED

With activated BATCH operation mode, message from the respective output indicating that the batch is finished.

>FUNCTION 01<
 INTERNAL ERROR

Signal when one of the following listed faults occurs (fault analysis/- causes see chapter 14.1):

- Fault drive
- Fault stroke sensor
- No stroke recognition
- Set value not attained

>FUNCTION 01<
 NO FLOW

With activated flow control, message from the respective output indicating that the permitted number of fault strokes has been exceeded.

11.9 Flow rate indicator

NOTE !

If the dosing pump has not been calibrated, then the flow rate indicator will not be activated.

The flow rate indicator is activated via the calibration of the pump (see Chapter 11.10). The display depends on the operation mode.

MANUAL operation mode

:MANUAL
 7.2 l/h

:MANUAL
 10.34 l

After calibration of the dosing pump, the flow rate is entered directly as target value in l/h instead of via the stroke frequency adjustment. In the screen "operating messages" (see Chapter 11.5.1), the stroke frequency indicator is replaced by the flow rate indicator. In addition, the total dosing quantity is indicated in litres.

ANALOG operation mode

:ANALOG
 7.2 l/h

:ANALOG
 10.34 l

The calibration of the pump activates the flow rate indicator and the stroke frequency remains also visible. In addition, the total dosing quantity is indicated in litres.

BATCH operation mode

:BATCH Man.
 V 10.34 l

:BATCH Man.
 R 10.34 l

After calibration of the dosing pump, dosing quantity and remaining dosing quantity are indicated in litres.

PULSE operation mode

:PULSE
 10.34 l

After calibration of the dosing pump, the total dosing quantity is also indicated in litres.

Operating instructions

Standard flow rate indicator

With the standard flow rate indicator, the entered target value is converted into the corresponding stroke frequency. The maximum adjustable target value is limited by the internally determined stroke length.

Example: The calibration at 50% stroke length results in a flow rate of 10l/h (at 100% stroke frequency). If a target value of 8l/h is entered, then the stroke frequency is accordingly reduced to 80%. The maximum target value in this case is 10l/h. It can be changed via the stroke length adjustment (+/- 10%).

Internal calculation:
100% stroke frequency → Measure in litres: 10l/h
Target value: 8l/h → 80% stroke frequency

Flow rate indicator with flow meter

The flow meter records the actual value, and if the flow rate deviates from the entered target value, the dosing pump will readjust it.

NOTE !

If the pump already works with 100% stroke frequency, there is no possibility of an additional capacity adjustment upwards. If the set value is fallen below, the warning signal "flow too low" appears.

The maximum adjustable target value is limited by the internally determined stroke length.

Example: The calibration at 50% stroke length results in a delivery rate of 10l/h (at 100% stroke frequency). If a target value of 8l/h is entered, then the stroke frequency is at first accordingly reduced to 80%. The flow meter measures a delivery rate of 7.9l/h. The internal control increases the stroke frequency to 81% in order to achieve 8l/h. The maximum target value in this case is 10l/h. It can be changed via the stroke length adjustment (+/- 10%).

Internal control:
100% stroke frequency → Measure in litres: 10l/h
Target value: 8l/h → 80% stroke frequency
80% stroke frequency → Actual value: 7.9l/h
8l/h → 81% stroke frequency

NOTE !

In order to enable an effective capacity adjustment, pay attention that the given set value is attained when having a stroke frequency of < 100 %. A max. nominal stroke frequency of approx. 80 % is recommended in order to enable an adjustment of the capacity when the set value is fallen below.

NOTE !

The set value in l/h can be preset manually (operating mode MANUAL) or by analog signal (ANALOG) as soon as the dosing pump is calibrated.

11.10 Calibration

The calibration is used to activate the flow rate indicator. Calibration is always done in the same way, no matter whether a flow meter is connected or not.

NOTE !

Calibration is performed with a fixed stroke length. The calibration remains valid even if the stroke length is changed by up to +/- 10%. If this calibration range is exceeded, then the warning message "Out of range" will be displayed.

Sequence of calibration:

NOTE !

Prior to the calibration of the flow rate indicator with connected flow meter, the sensor type (>SENSOR<) must be set (see Chapter 11.15.1). If no sensor type is set (OFF), then the calibration will only activate the standard flow rate indicator.

CAUTION !



Pay attention to the safety data sheet relating to the dosing medium!
Danger of breath / Danger of poisoning by leaking medium.

Operating instructions

1. Lead the suction line into a calibration pot filled with the dosing medium – the pressure line must be installed in final position, i.e. the operating conditions (backpressure, etc.) must be fulfilled.
2. When the suction line is empty the dosing medium must be drawn in (MANUAL operation mode, keep the pump running).
3. Set the stroke length with which the pump should be calibrated (can also be done via the manual stroke length adjustment)
4. Note the filling level in the calibration pot (= base quantity)
5. Go to the main menu and select the --CALIBRATION-- menu:



6. Press the ENTER key to access the field for entering the number of calibration strokes.
 7. At first, enter the desired stroke number (at least 200!) → the higher the stroke number the more accurate the calibration!
 8. To start the calibration, press the ENTER key.
 9. The dosing pump performs the preset number of strokes.
 10. Determination of the pumped quantity (= difference between base quantity and remaining quantity in the calibration pot).
 11. Entry of the determined quantity.
- Calibration of the dosing pump is then completed!

NOTE !

After the dosing pump has been calibrated, calibration (see Chapter 11.11) will automatically be set to ON.

CAUTION !

If the operating conditions are changed (supply line, backpressure, etc.), then the dosing pump must be newly calibrated. Otherwise, the flow rate indicator might be inaccurate!

11.11 System

The system settings do not depend on the operation mode. These include:

- Language
- Calibration
- Factory reset
- System time

>LANGUAGE<

You can select between GERMAN; ENGLISH and SPANISH menu texts.

>CALIBRATION<

The calibration of the pump (see Chapter 11.10) can be switched ON and OFF. If the calibration is set to ON and the dosing pump has been calibrated, then the flow rate indicator is activated.

If the calibration is set to OFF and/or the pump has not been calibrated, then the flow rate indicator is not activated.

>FACTORY RESET<

The factory settings (see Tab. 08, Chapter 11.4) can be restored. To do so, adjust YES.

IMPORTANT NOTE !

After restoring the factory default settings, all previous user-defined settings are irrevocably overwritten.

>SYSTEM TIME<

The system time must be adjusted manually.

NOTE !

If the supply voltage is switched off, then the system time will be reset to 0:00. This means it must be set again.

Operating instructions

11.12 Totalizer

The totalizer indicates the total quantity conveyed, the total strokes and the pump's operating hours. These values are for information purposes and cannot be reset.

11.13 Password

Two password levels are provided to increase the operating safety of the pump. The passwords for these levels consist of a four-digit number code and are individually selectable. Password 01 (PW01) is used to protect the setting of the operation mode (Level 01). This password can be activated and deactivated (when leaving the factory, it is deactivated). Password 02 (PW02) protects all further setting options of the main menu (Level 02, see "Menu guide"). This password protection cannot be deactivated.

NOTE !

If, during the 1. password request (Level 01), password 02 has been entered, then Level 02 is also automatically activated.

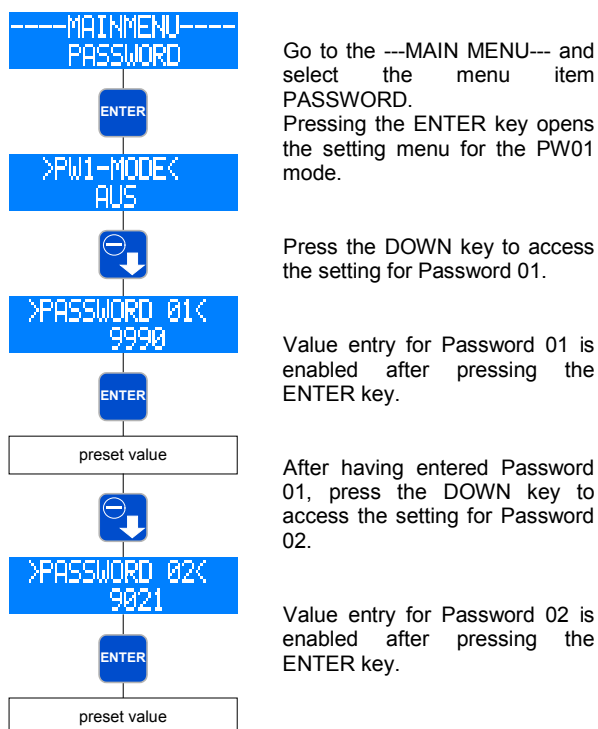
NOTE !

The passwords are factory set as follows:

Password 01: 9990 (deactivated)

Password 02: 9021 (cannot be deactivated!)

Setting diagram:



NOTE !

There is an automatic "Logout" after 5 min of inactivity in the "operation modes" screen. Afterwards, the password must be entered again.

IMPORTANT NOTE !

Please write down the passwords and keep them in a safe place. When the passwords are lost the pump cannot be configured on site again. In this case, the pump must be sent to the manufacturer's works for configuration release.

11.14 Info

The Info menu item contains information about the hardware and software version of the pump.

11.15 Extras

11.15.1 Slow-Mode



In Slow Mode the pump is operated with reduced speed. This is, for example, reasonable for the feeding of very viscous media.

Adjustments can be made to the following points:

SLOW-MODE
Speed

>SLOW-MODE<

Switching-on/Switching-off of the Slow Mode.

> SPEED <

Input of the speed when Slow Mode is activated. The speed can be set between 100 and 30 %.

NOTE !

The entered speed in Slow Mode corresponds to the maximum stroke frequency the pump is operated. The maximal possible capacity is reduced correspondingly.

The following is valid for the pulse and analog operation: Every stroke is performed with this speed.

Operating instructions

11.15.2 Dosing monitoring

--EXTRAS-- DOSING MONITOR.

The connection of a **sera** flow controller to the dosing pump will enable the monitoring of the flow rate.
The connection of a **sera** flow meter to the dosing pump will provide a more detailed flow rate indication with regulation of the flow rate (see Chapter 11.9).

NOTE !

Prior to the calibration of the flow rate indicator with connected flow meter, the sensor type (>SENSOR<) must be set.
If no sensor type is set (OFF), then the sensor signal will not be considered during calibration.

It is possible to make adjustments to following items:

- Sensor
- Function
- Fault stroke
- Alarm limit
- Calibration

SENSOR<

Selection of the connected **sera** flow controller or **sera** flow meter.

>FUNCTION<

Selection of the dosing monitoring function. It can be selected whether the dosing monitoring should trigger a warning message (MESSAGE) or a switch-off of the pump (DOSING STOP).

>FAULT STROKE<

Number of fault strokes at which a connected **flow controller** triggers the dosing monitoring.

The factory setting is 10 fault strokes. This means that the dosing monitoring will react if the flow controller does not give a stroke confirmation to the pump for the duration of ten consecutive strokes.

>ALARM LIMIT<

Alarm limit at which a connected **flow meter** triggers the dosing monitoring. The entered value corresponds to the percental part of the target flow rate.

The factory setting is 80%. This means that the dosing monitoring will react if a connected flow meter measures a flow rate which is lower than 80% of the set target flow rate.

---CALIBRATION---

see Chapter 11.10.

11.15.3 Diaphragm rupture detection (OPTION)

--EXTRAS-- DIAPHRAGM RUPT.

The diaphragm rupture detection (see also Chapter 8.2.7) is an optional feature for the dosing pump. It is used to monitor the diaphragm.

It is possible to make adjustments to following items:

Input signal
Sensitivity

>INPUT SIGNAL<

Selection between switch-off (OFF) of the diaphragm rupture electrode and a configuration as NO or NC.

CAUTION !



When leaving the factory, the contact type is preset to "switch normally closed".

This setting must not be changed!
Danger of loss of diaphragm rupture detection!

>SENSITIVITY<

CAUTION !



When leaving the factory, the sensitivity is preset to 70%.

This value must not be changed!
Danger of loss of diaphragm rupture detection!

11.15.4 Level monitoring



The connection of a **sera** suction lance enables the monitoring of the filling level in the dosing tank.

It is possible to make adjustments to following items:

Pre-alarm
Dry run

>PRE-ALARM< or >DRY RUN< respectively

Configuration of the two level inputs. It can be selected between either the switch-off (OFF) of the input and a configuration as NC (opening when floating down) or NO (closing when floating down).

When leaving the factory, both level inputs are configured as NO.

| Config. | Pre-alarm | Dry run |
|---------|-----------|---------|
| 1 | NO | NO |
| 2 | NO | NC |
| 3 | NC | NC |

Tab. 11 (Configuration of the level input)

Config. 1

When leaving the factory, this configuration is preset. A 1- or 2-stage level monitoring with "closing when floating down" contacts (pre-alarm and dry run or dry run only) can be connected.

Config. 2

This configuration must be selected when a 1-stage level monitoring (dry run only) with "opening when floating down" contact is connected.

Config. 3

This configuration must be selected when a 2-stage level monitoring with "opening when floating down" contacts (pre-alarm and dry run) is connected.

Operating instructions

12 Maintenance

WARNING !



Electronics and stroke mechanism shall only be repaired by sera! The pump shall only be opened by sera or after prior arrangement with sera.

Danger of a electric shock in case of opened electronic.
Danger of poisoning by incorrect decomposition of mechanics.

NOTE !

Before starting maintenance make sure that the wearing parts and the spare parts required are available.
Deposit the parts so that they will not get damaged.

IMPORTANT NOTE !

All wearing parts are to be checked for perfect condition at regular intervals and exchanged if necessary.

Check the following at regular intervals:

- tight fit of piping
- tight fit of pressure and suction valve
- proper condition of the electrical connections
- tight fit of the screws for fastening the pump body (check this at least every three months)
- For the tightening torques of the mounting screws, please see Chapter 9.1 "Installation".

Repairs on the stroke mechanism may only be performed by sera.

NOTE !

Data of internal microfuse:
250 V AC 6,3A delay-action, 5x20mm
extra disconnect threshold, with UL-/CSA license

CAUTION !



Only use fuses with the same data and properties!
Exchange of fuses only by sera or sera authorized staff.

12.1 Wearing parts

Depending on their use and period of use, wearing parts must be replaced at regular intervals in order to ensure a safe operation of the multi-layer diaphragm pump.

We recommend to replace the intermediate diaphragm after 3000 operating hours or at least once a year.

In case of a premature diaphragm rupture caused by difficult operating conditions, switch off the multi-layer diaphragm pump and replace the multi-layer diaphragm (see Chapter 12.4).

The following parts are considered as wearing parts of the multi-layer diaphragm pump:

- multi-layer diaphragm
- suction valve
- pressure valve

12.2 Spare parts

The following parts are considered as spare parts of the multi-layer diaphragm pump:

- pump body
- manometer
- pressure
- switch

12.3 Spare- and wearing parts

...409.2 – 11 ML
...409.2 – 17 ML
...409.2 – 30 ML
...409.2 – 45 ML
...409.2 – 72 ML
...409.2 – 110 ML
...409.2 – 150 ML
...409.2 – 220 ML

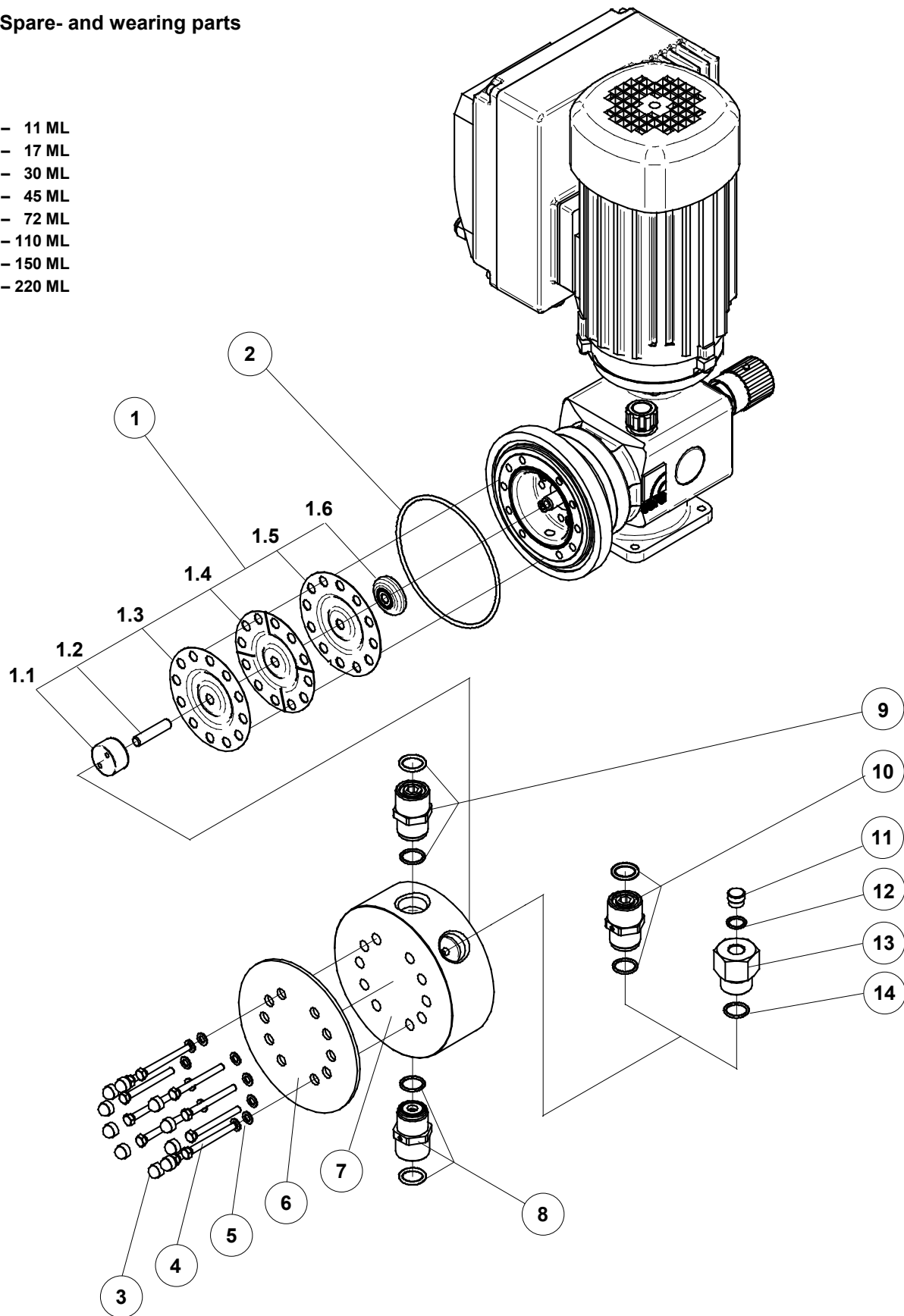


Fig. 47 Spare- and wearing parts

Operating instructions

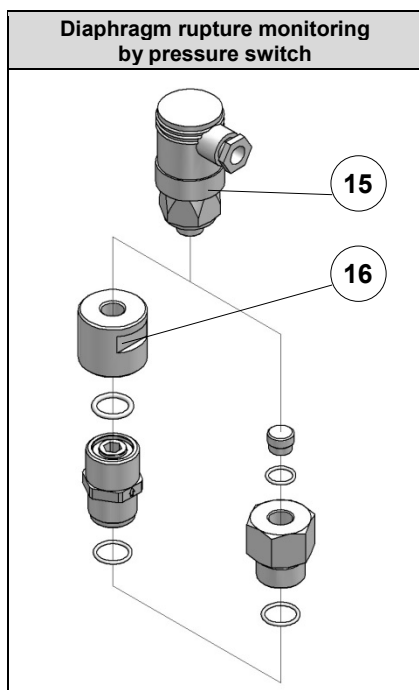


Fig. 48 spare- and wearing parts

Overview of the spare and wearing part kits

| Pump body-Set (plastic) | |
|-------------------------|------------------------------|
| Pos. | Designation |
| 3 | Protection cap(s) |
| 4 | Hexagon head cap screw(s) |
| 5 | Disk(s) |
| 6 | Front plate |
| 7 | Pump body |
| 10 | Pressure valve (check valve) |
| 16 | Transition piece |

| Pump body-Set (stainless steel) | |
|---------------------------------|---------------------------|
| Pos. | Designation |
| 3 | Protection cap(s) |
| 4 | Hexagon head cap screw(s) |
| 5 | Disk(s) |
| 7 | Front plate |
| 11 | Check valve |
| 12 | O-ring |
| 13 | Joint |
| 14 | O-ring |

| Suction valve (Set) | |
|---------------------|-------------------------------|
| Pos. | Designation |
| 8 | Suction valve (incl. O-rings) |

| Pressure valve (Set) | |
|----------------------|--------------------------------|
| Pos. | Designation |
| 9 | Pressure valve (incl. O-rings) |

| Diaphragm set | |
|---------------|--|
| Pos. | Designation |
| 1 | Multi-layer diaphragm package |
| (1.1) | Pressure plate (front, medium contacted) |
| (1.2) | Set screw |
| (1.3) | Working diaphragm |
| (1.4) | Signal diaphragm |
| (1.5) | Protection diaphragm |
| (1.6) | Pressure plate (behind) |
| 2 | Multi-layer diaphragm package |

| Pressure switch | |
|-----------------|-----------------|
| Pos. | Designation |
| 15 | Pressure switch |

Tab. 12 Spare- and wearing parts

Operating instructions

12.4 Replacing the diaphragm

12.4.1 General

In order to ensure a correct function of the multi-layer diaphragm pump and to fulfill the required safety and protective provisions it is absolutely necessary to check and replace the multi-layer diaphragms at regular intervals.

WARNING !



**Prior to replacing the diaphragm, empty the pump and, if necessary, rinse it with appropriate fluid in order to avoid the contact with aggressive and/or toxic media!
Danger of breath / Danger of poisoning by leaking medium!**

WARNING !



For replacing the diaphragm, the system must be de-pressurised!

- During maintenance or repair work, switch off the drive motor of the multi-layer diaphragm pump and secure it against inadvertent or unauthorised reactivation.
- Take appropriate precautions: wear protective clothing, breathing protection and protective goggles. Prepare a container with appropriate fluid right beside the pump to be able to remove splashes of the dosing medium.
- Use an appropriate detergent to rinse the multi-layer diaphragm pump until no residues of the dosing medium can be detected in the pump body. Otherwise, dosing medium may leak when disassembling the pump. Collect the rinsed liquid in a safe way (avoid contact with it) and dispose of it in an environmentally compatible way. This measure is also necessary if the multi-layer diaphragm pump should be returned for repair.

12.4.2 Diaphragm change

The multi-layer diaphragm is to be exchanged as complete pre-assembled diaphragm.

- Set the stroke length adjustment to 0% stroke length (front point)
- Release the fixing screws at the pump body
- Remove the pump body forward as well as the front plate, if necessary.

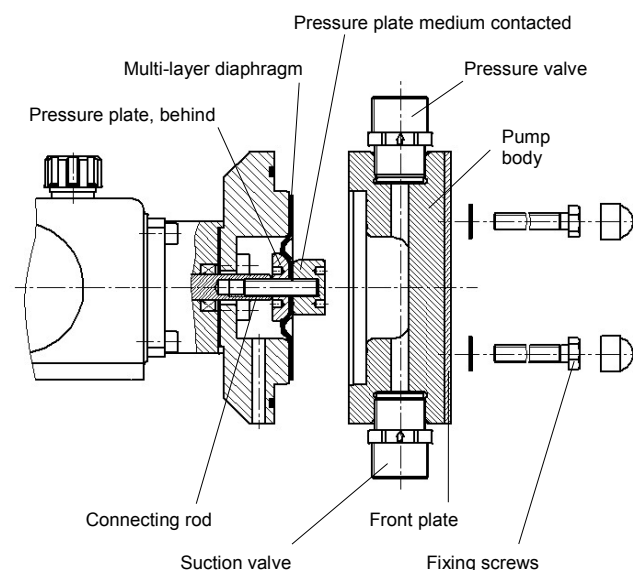


Fig. 49

- Screw the multi-layer diaphragm out of the connecting rod

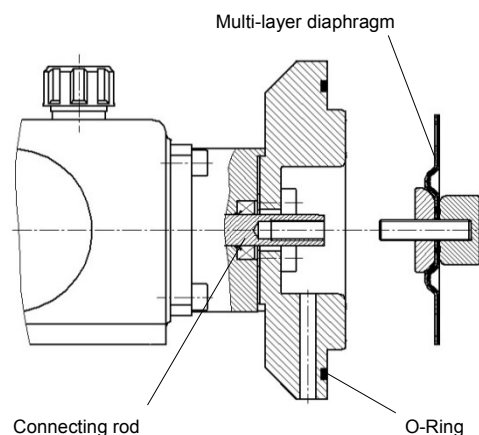


Fig. 50

- O-Ring take out of the base ring
- Check signal device visually for any sign of damage

Operating instructions

Assemble the pump in reversed order

- Insert the new O-Ring into the base ring
- The new multi-layer diaphragm is screwed in the connecting rod until it stops. If the holes in the diaphragm are not congruent with the threaded holes in the base ring, then the diaphragm must again be screwed out until it is congruent with the threaded holes.
- Diaphragm central position should be equal to a stroke length of 50%; this can for example be achieved by turning the motor fan.

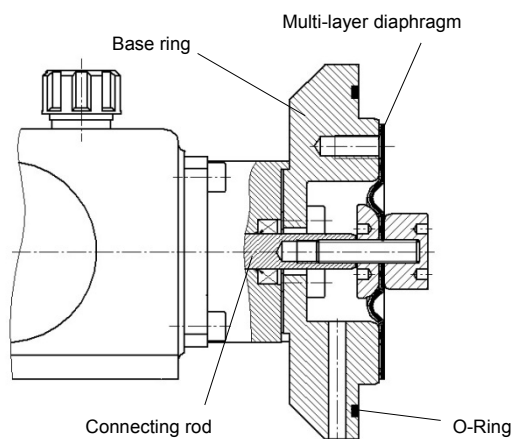


Fig. 51

- Screw on the pump body (tightening torques are mentioned in Chapter 9.1)

When assembling the pump body, please note:
 suction valve below, pressure valve above!

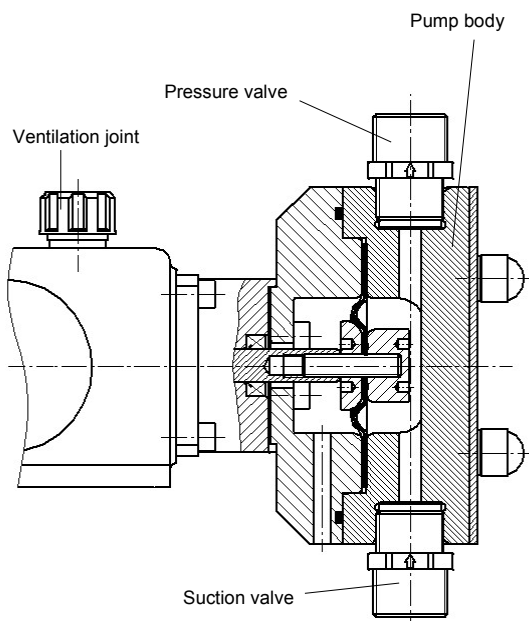


Fig. 52

- Connect the signal devices.

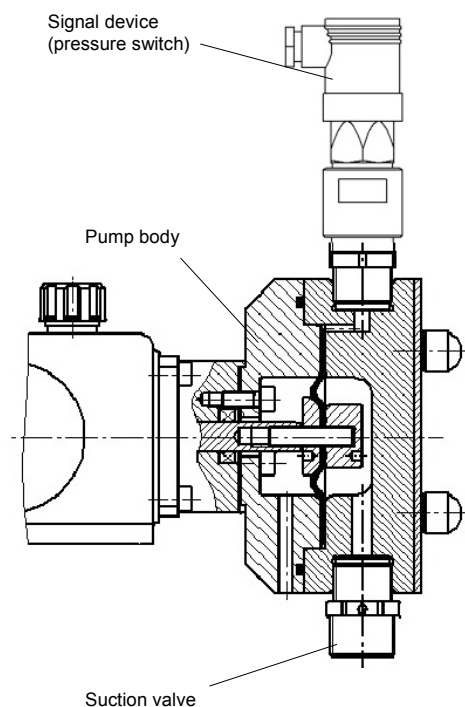


Fig. 53

Before reactivating the pump after a diaphragm replacement, remove the air between the diaphragm layers. Proceed as follows:

- Screw out the signal device
- Apply delivery pressure and have the pump run for a short period (30s)
- Switch off the pump
- Screw in the signal device (see Fig. 53).

Operating instructions

12.5 Oil change

- Check oil level in regular intervals (oil sight glass)

Perform an oil change once a year.

To do so, proceed as follows:

- Open the vent screw (see Fig. 09).
- Prepare an appropriate container. Open the screw plug and drain off the oil.

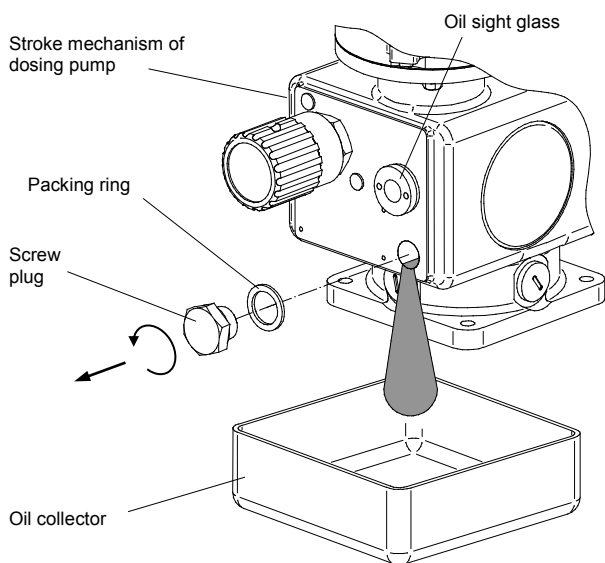


Fig. 54 Drain off oil

- Subsequently, close (fingertight fastening) the boring with screw plug (note the packing ring !)
- Fill the oil into the thread boring of the vent nozzle.
- Type and quantity of the gear box oil see chapter 13
- Screw in the vent screw

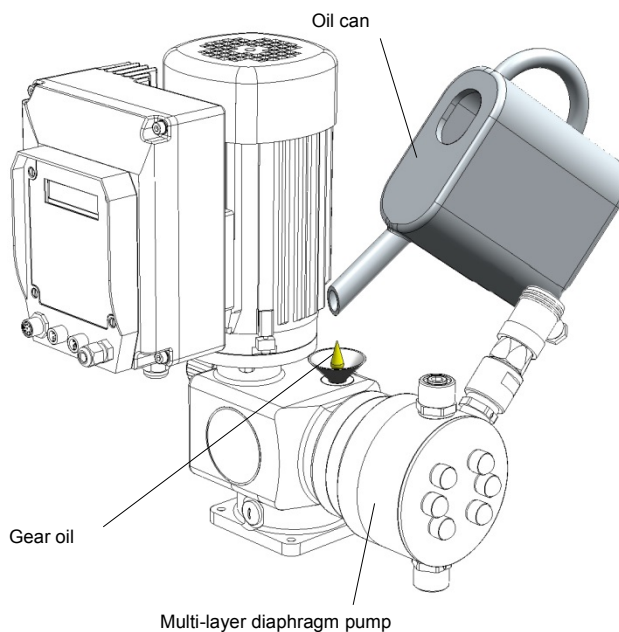


Fig. 55 Filling (Oil)

13 Lubricant

13.1 Lubricant in stroke mechanism

| Pump type | Lubrication | Quantity |
|------------------|---------------------------------|-----------|
| C 409.2 – 11 ML | Gear oil ARAL Degol BG220 | 0,3 Litre |
| C 409.2 – 17 ML | | |
| C 409.2 – 30 ML | | |
| C 409.2 – 45 ML | | |
| C 409.2 – 72 ML | | |
| C 409.2 – 110 ML | | |
| C 409.2 – 150 ML | | |
| C 409.2 – 220 ML | | |

Tab. 13 Lubricant in stroke mechanism

14 Fault analysis and corrective action

sera products are proven technical products which are only shipped after an extensive final test in our works. Should any

malfunctions occur, these can be located and corrected easily with the help of the following reference guide (Tab. 14-16).

14.1 Analysis of the plain text error messages

| Error message | | | | | | | | Possible cause | Corrective action |
|---|---|---|---|---|---|---|---|---|---|
| Analog signal < 4 mA! | | | | | | | | | |
| Analog signal > 20 mA! | | | | | | | | | |
| Analog signal > 25 mA! | | | | | | | | | |
| Flow too low! | | | | | | | | | |
| Cycle-delay memory full! | | | | | | | | | |
| Leave the calibration range! | | | | | | | | | |
| No stroke recognition! (internal fault) | | | | | | | | | |
| No flow! | | | | | | | | | |
| ● | | | | | | | | Wire break of the analog signal line | Check analog signal line and repair, if necessary |
| ● | | | | | | | | The set analog signal (e.g. 4-20mA) does not match the actual analog signal (e.g. 0-20mA). | Check the set analog signal and adapt to the actual analog signal, if necessary. |
| ● | ● | ● | | | | | | Fault of the analog signal transmitter (sensor, controller) | Check the analog signal transmitter and eliminate fault of the transmitter if necessary |
| | | | ● | | | | ● | Drive diaphragm defective | Replace drive diaphragm |
| | | | ● | | | | ● | Suction height too high | Reduce suction height or suction resistance. |
| | | | ● | | | | ● | Suction line leaky | Check gaskets, tighten pipe connections |
| | | | ● | | | | ● | Shut-off valves in pipe closed | Open shut-off valves or check opening – check pump for damage |
| | | | ● | | | | ● | Few or no conveying medium in store tank | Fill store tank |
| | | | ● | | | | ● | Pump valves leaky | Remove valves and clean |
| | | | ● | | | | ● | Foreign matter in pump valves or Pump valves (ball seats) damaged | Remove and clean valves, check function; replace valves if necessary. |
| | | | ● | | | | ● | Pump valves incorrectly mounted or valve balls missing | Check installation position and completeness – replace missing parts or install correctly |
| | | | ● | | | | ● | Filter in suction line clogged | Clean filter |
| | | | ● | | | | ● | No stroke movement of the drive diaphragm | Increase stroke frequency / stroke length; check connecting rod motion. |
| | | | ● | | | | ● | Counter-pressure too high | Measure pressure with manometer directly above pressure valve and compare with permissible counter-pressure |
| | | | ● | | | | ● | Acceleration height too high due to pipe geometry | Check acceleration height on suction- and pressure side and compare with design data – install a pulsation damper if necessary |
| | | | ● | | | | ● | Too high viscosity of the pumped medium | Check viscosity of the pumped medium and compare with the design data – reduce concentration or increase temperature if necessary |
| | | | ● | | | | ● | Pumped medium outgasses in suction line and/or pump body | Check geodetic conditions and compare with the data of the pumped medium. Operate pump with suction side supply, reduce temperature of the pumped medium. |
| | | | ● | | | | ● | Air in suction line while pressure applied to the pressure valve ball | Vent pressure side resp. open vent valve (only FRP-design, see chap. 8.2.7). |
| | | | ● | | | | ● | Pipe connections leaky | Tighten connection according to type of material. Be careful with plastic – risk of fracture |
| | | | ● | | | | ● | Pumped medium frozen in pipe | Remove diaphragm pump and check for damage – increase temperature of the pumped medium |
| | | | ● | | | | ● | Pump valves are dry | Moisten pump body and valves. Open vent valve. |
| | | | | ● | | | | Frequency of the received pulses is (permanently) higher than the maximum stroke frequency of the dosing pump | Check process parameters. |
| | | | | ● | | | | Pulse factor too high | Check process parameters. |
| | | | | | ● | | | After calibration of the dosing pump the stroke length was adjusted by more than +/- 10% | Check the stroke length adjustment, set the set value again, calibrate again, if necessary |
| | | | | | ● | | | Stroke length was set to below 15% approx., the stroke length is out of the linear dosing range. | Check the stroke length adjustment, increase the stroke length |
| | | | | | | ● | | Sensory mechanism of dosing pump is defective | Contact the manufacturer |

Table 14 (Analyze and eliminate faults on the basis of the error messages – part I)

Operating instructions

| Error message | | | | | | | | | Possible cause | Corrective action |
|---------------|--------------------|------------------------------|-------------------------|------------------|--|--------------------------------|--|-----------------------------|---|--|
| Time lost ! | Diaphragm rupture! | Mains voltage too g too low! | Mains voltage too high! | Pre-alarm level! | Set value not attainable! (internal fault!!) | Fault drive! (Internal fault!) | Fault stroke sensor!! (internal fault!!) | Dry running of dosing pump! | | |
| ● | | | | | | | | | Drive diaphragm defective | Replace drive diaphragm |
| | ● | ● | | | | | | | Electric data of the dosing pump do not match mains data | Check order data. Check electric installation. |
| | | | | ● | | | | ● | Few or no conveying medium in store tank | Fill store tank |
| | | | | | ● | | | | Only for calibrated pump: Set stroke length is too low to attain the preset set value | Check the stroke length and the set value, calibrate the pump again, if necessary. |
| | | | | | | ● | | | Integrated excess temperature protection (posistor) of drive motor released. | Let the temperature of the drive motor go down. Check the ambient temperature |
| | | | | | | | ● | | No stroke movement of the drive diaphragm | Increase stroke frequency / stroke length; check connecting rod motion. |
| | | | | | | | ● | | Shut-off valves in pipe closed | Open shut-off valves or check opening – check pump for damage |
| | | | | | | ● | | | Drive motor overloaded (example: excessive counter pressure) | Check counter pressure |
| ● | | | | | | | | | Breakdown supply voltage by mode of operation „Charge-Timer“ | Adjustment of system time |

Table 15 (Analyze and eliminate faults on the basis of the error messages – part II)

Operating instructions

14.2 Analysis of other faults

| Type of fault | | | | | | | | | | | | | Possible cause | Corrective action |
|--------------------|-----------------------|------------------------------|--------------------------------|----------------------|---|----------------------------|-------------------------|---------------------|---|------------------|--------------------------------|-------------------|---|--|
| Pump does not suck | Pump does not deliver | Delivery rate is not reached | Delivery height is not reached | Delivery rate varies | Delivery rate exceeds permissible value | Drive motor does not start | Tube oscillates heavily | High noise emission | Service life of drive diaphragm too short | Drive overloaded | Stroke mechanism/drive damaged | Pump head leaking | | |
| ● | ● | ● | | | | | | | | | | | Suction height too great | Reduce suction height or suction resistance |
| ● | ● | ● | | ● | | | | | | | | | Suction pipe leaky | Check seals, tighten tube connections |
| ● | ● | | | | | ● | | | | | | ● | Shut-off valves in tube closed | Open shut-off valves or check whether they are open – check pump for damage |
| ● | ● | ● | | | | | | | | | | | Store tank empty | Fill store tank |
| ● | ● | ● | ● | ● | | | | | | | | | Pump valves leaky | Remove and clean pump valves |
| ● | ● | | ● | ● | | | | | | | | | Pump valves (ball seats) damaged | Remove and clean valves, check for proper function; fit new valves if required |
| ● | ● | | | | | | | | | | | | Pump valves not correctly mounted or valve balls missing | Check installation and completeness, replace missing parts or install correctly |
| ● | ● | | | | | | | | | | | | Filter in suction pipe clogged | Clean filter |
| | | | | | | ● | | | | | ● | | Electric data of motor do not correspond with mains data | Check order details. Check electrical installation. Adjust motor to actual mains conditions. |
| | | ● | ● | ● | | ● | ● | ● | ● | ● | | ● | Counterpressure too high | Measure pressure with manometer directly above pressure valve and compare with permissible counterpressure |
| ● | ● | ● | ● | ● | | | | | | | | | Foreign particles in pump valves | Remove and clean pump valves |
| | | | | ● | ● | | | | | | | | Pressure on suction side higher than at the end of the pressure pipe | Check geodetic conditions, fit float valve or pressure keeping valve, if necessary |
| | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | Acceleration too high due to pipe geometry | Check acceleration on pressure- and suction side with manometer and compare with layout data. Install pulsation damper, if necessary |
| | | | | | | | | | ● | | | ● | Material which come in contact with medium are not suitable for the pumped medium | Check whether pumped medium corresponds with layout specifications; choose other material if required |
| ● | | ● | ● | ● | | | | | | | | | Too high viscosity of pumped medium | Check viscosity of pumped medium and compare with layout data; reduce concentration or increase temperature if required. |
| | ● | ● | | ● | | | | | | | | | Pumped medium outgasses in suction pipe | Check geodetic conditions and compare with data of pumped medium. Operate pump with suction-side supply, reduce temperature of pumped medium |
| ● | | | | | | | | | | | | | Air in suction pipe while pressure is applied on pressure valve ball | Vent pressure side |
| ● | ● | ● | ● | ● | | | | | | | | ● | Pipe connections leaky | Tighten connections according to material type. Be careful with plastic – danger of breakage |
| ● | ● | ● | | | | | | | | | | ● | Temperature too low | Check flow characteristics of pumped medium. Temperature of pumped medium must not fall below -10°C. |
| ● | ● | | | | | ● | | | | | ● | ● | Pumped medium in pipe frozen | Remove pump and check for damage – increase temperature of pumped medium |
| ● | ● | ● | ● | ● | | | | | ● | | | ● | Diaphragm rupture | Replace diaphragm according to Chapter 11.4 |
| ● | ● | ● | | ● | | | | | | | | | Air between the diaphragm layers | Remove the air between the diaphragm layers |

Tab. 16 (Fault analysis and corrective action)

Operating instructions

15 Foreseeable misuse

The following misuse is assigned to the life cycles of the machine.

CAUTION !



Misuse can result in danger to the operating personnel!

15.1 Transport

- Tipping behavior during transport, loading and unloading ignored.
- Weight for lifting underestimated.

15.2 Assembly and installation

- Power supply not fuse protected (no fuse/fuse too large, power supply not conforming to standards).
- No or improper fastening material of the pump.
- Improper connection of the pressure pipes, wrong material i.e. PTFE tape and unsuitable connection pieces.
- Liquid pipes confused.
- Threads overturned/damaged.
- Pipes bent during connection in order to compensate for alignment errors.
- Supply voltage connected without earthed conductor.
- Socket for safe disconnection of the power supply difficult to reach.
- Mains plug cut off (direct connection), safe disconnection impossible. Safe disconnection e.g. by 2-pin main switch.
- Wrong connecting cables for supply voltage (cross-section too small, wrong insulation).
- Parts damaged (e.g. vent valve, flow meter broken off).
- Wrongly dimensioned pressure and suction pipe.
- Incorrect dimensioned and improperly fastened pump panel (panel broken off).
- Short circuit of the internal power supply (15V DC) at the control cable during installation.
- Admissible current load of the digital outputs exceeded.
- No **sera** sensors for flow or filling level → damage to the electronics.
- No diode for external control power supply connection → electronics overloaded/destroyed.
- Electronics opened in order to connect the mains cable directly to the power supply → electric shock or damage to the electronics.
- Connection of wrong supply voltage or mains frequency.

15.3 Start-up

- Cover on vent openings (e.g. motor).
- Suction or pressure pipes closed (i.e. foreign matters, particle size, stop valves).
- Sensor cable damaged (electronics ↔ stroke mechanism), wrong or no recognition of the stroke length → wrong dosing volume and resulting process error.
- Start-up with damaged system.
- Wrong parameterization of the pump → inadvertent start.
- Distance between dosing pump and other dosing pumps or electrical consumers insufficient → fault by electromagnetic radiation.
- Control cables too long >> 30m → malfunctions due to EMC.
- Control cable and power cable laid in parallel → malfunctions due to EMC.

15.4 Operation

- Fault message ignored → faulty dosing / process error.
- Pipes hit, pulsation damper not used → damage to the pipes, medium is leaking.
- Pumped medium contains particles or is contaminated.
- External fuse bridged → no cut off in case of an error.
- Ground wire removed → no cut off by fuse in case of an error, supply voltage directly at the housing.
- Insufficient lighting of the working place.
- Suction height too high, pump capacity too low → process error.

15.5 Maintenance/Repair

- Works carried out which are not described in the operating instructions (works on the stroke mechanism and the assembly pump, electronics opened).
- Prescribed maintenance schedules ignored.
- Use of wrong spare parts/oils (e.g. no **sera** original spare parts, wrong viscosity).
- Improper mounting of spare and wearing parts (e.g. wrong tightening torque for pump body).
- Oil level not checked.
- Use of cables with damaged insulation.
- No shut down / no protection against a restart before maintenance work.
- Pumped medium or utilities during an oil change insufficiently removed.
- Restart without sufficient fastening.
- Valves confused.
- Sensor pipes confused.
- Pipes not connected (e.g. suction- and pressure pipes, gas pipes).
- Gaskets damaged, medium is leaking.
- Gaskets not fitted, medium is leaking.
- Wearing of unsuitable protective clothing / no protective clothing at all.
- Operation of an uncleaned system.
- Pumped medium contaminated with oil.
- Poorly ventilated room.

Operating instructions

15.6 Cleaning

- Wrong rinsing medium (material changed, reaction with the medium).
- Wrong cleaning agent (material changed, reaction with the medium).
- Cleaning agent remains in the system (material changed, reaction with the medium).
- Protective clothing insufficient or missing.
- Use of unsuitable cleaning utensils (material changed, mechanical damage by high pressure cleaner).
- Untrained personnel.
- Vent openings clogged.
- Parts torn off.
- Sensors damaged.
- Non-observance of the safety data sheet.
- Control elements actuated.
- Poorly ventilated room.

15.7 Shut-down

- Pumped medium not completely removed.
- Disassembly of pipes with the pump running/with residual pressure.
- Disconnection of the electrical connections in a wrong sequence (ground wire first).
- Disconnection from the power supply not ensured → danger through electricity.
- Poorly ventilated room.

15.8 Disassembly

- Residues of the pumped medium and utilities in the system.
- Use of wrong disassembly tools.
- Wrong or no protective clothing at all.
- Poorly ventilated room.

15.9 Disposal

- Improper disposal of the pumped medium, utilities and materials.
- No marking of hazardous media.
- Wrong disposal of the electronic.

16 Decommissioning

Switch off multi-layer diaphragm pump.

Remove dosing medium from pump head by means of flushing. The flushing agent must be suitable for dosing medium and pump head material.

17 Disposal

Switch the pump off, please see chapter 'De-commissioning'.

17.1 Dismounting and transport

- Remove all remaining fluid out of the pump, clean neutralize and decontaminate the pump carefully.
- Pack the pump properly and arrange everything for transport.

17.2 Complete disposal

- Drain off all remaining fluid and dispose of them in accordance with the regulations.
- Drain off all lubricants and dispose of them in accordance with the regulations!
- Dismount all materials and send them to a suitable processing company.

CAUTION!



**The consignor is liable for any defects resulting from leaking lubricants or residual fluids!
Danger of breath / Danger of poisoning in case of leaking medium.**



Notes



Operating instructions

Notes

