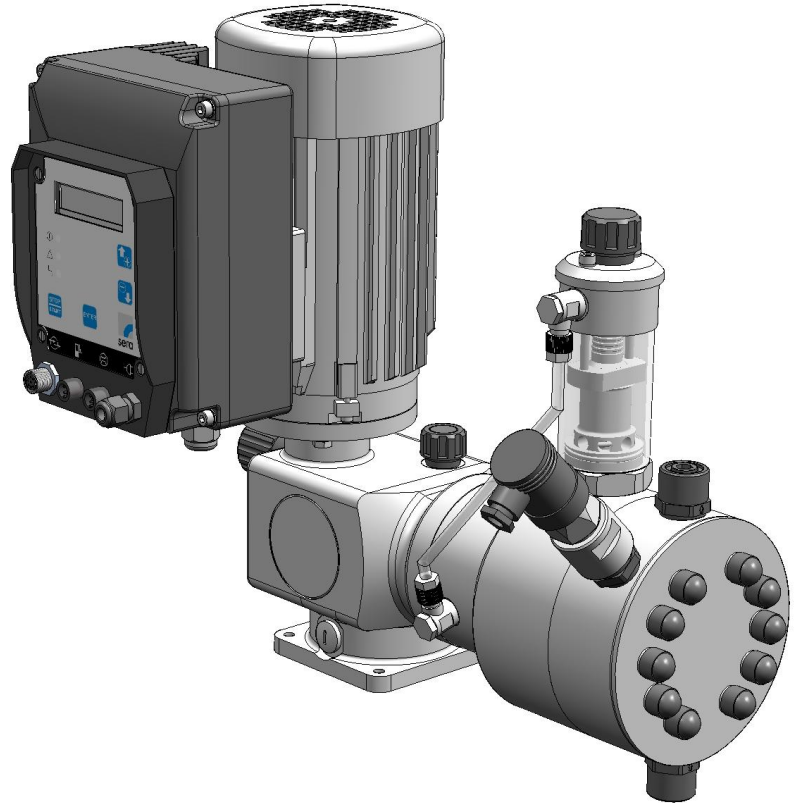


Operating instructions

Product: Piston diaphragm pump

Type:

- C 409.2 – 7,5 KM
- C 409.2 – 10 KM
- C 409.2 – 12 KM
- C 409.2 – 18 KM
- C 409.2 – 30 KM
- C 409.2 – 45 KM
- C 409.2 – 70 KM
- C 409.2 – 95 KM
- C 409.2 – 135 KM
- C 409.2 – 190 KM



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.

Manufacturer:

**Seybert & Rahier
GmbH + Co. Betriebs-KG**
sera-Straße 1
34376 Immenhausen
Germany
Tel. +49 5673 999-00
Fax. +49 5673 999-01
www.sera-web.com
info@sera-web.com

CAUTION !



Keep the operating instructions for future application!

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** magnetic 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 210 – 250 V, 50/60 Hz.

CAUTION !



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

The C 409.2 is available in two versions:

- 210 – 250 V, 50/60 Hz
- 100 – 120 V, 50/60 Hz

Symbol:

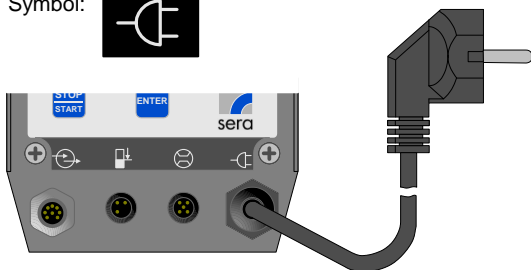


Fig. 01 (Electric supply)

CAUTION !



Only operate the pump when it is connected to an earthed power supply!

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!

1.2 Operating elements

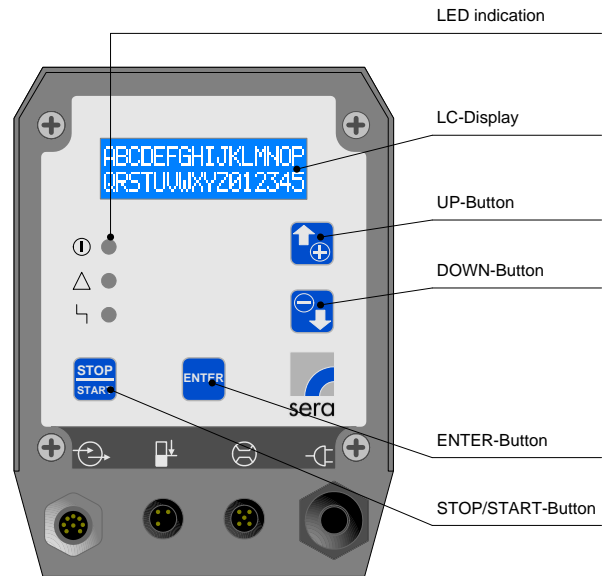


Fig. 02 (Electronics control panel)

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. 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

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

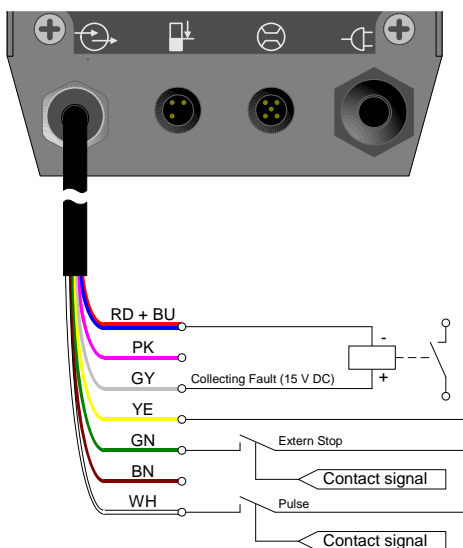


Fig. 03 (Control of digital inputs via a potential-free contact signal and control of a relay via an output of the dosing pump)

1.6.2 Control via an analog signal

C204.1 / C409.2

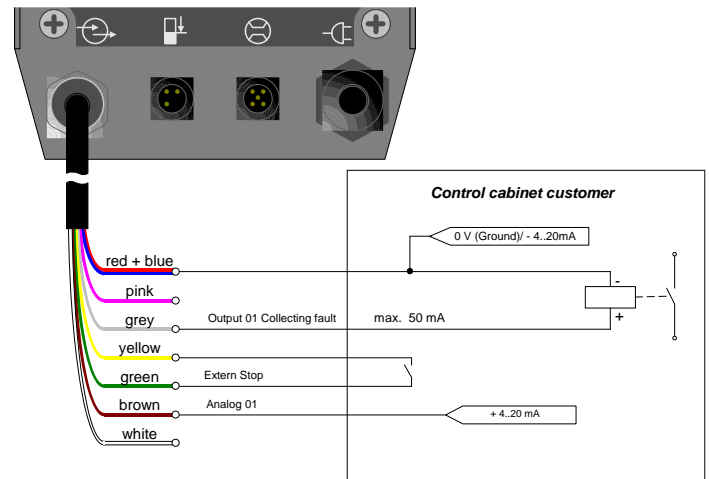
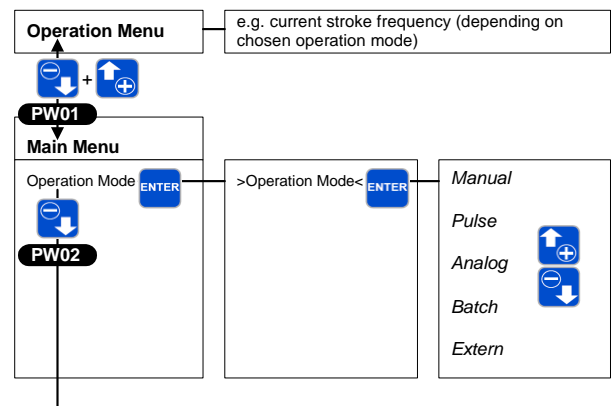


Fig. 04 (Control of analog/digital inputs via an analog signal, potential-free contact signal and control of a relay via an output of the dosing pump)

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** piston diaphragm pumps the respective regulations valid at the place of installation are to be adhered to.

The **sera** piston diaphragm pump is delivered ready for connection. Please read these instructions and especially the safety notes before you install and start up the pump.

3 Types

3.1 Type designation

Example:

Piston diaphragm pump type **C 409.2-30KM**

C	409.2	30	KM
---	-------	----	----

Information for adjustment

C controllable

C	409.2	30	KM
---	--------------	----	----

Indication of model range/stroke mechanism

C	409.2	30	KM
---	-------	----	----

Indication of nominal delivery rate

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

C	409.2	30	KM
---	-------	----	----

Indication of the execution of the pump

KM Designed as piston diaphragm pump

3.2 Type plate

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

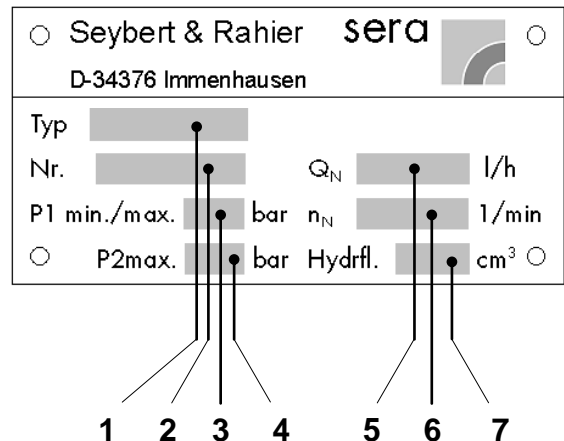


Fig. 05 Type plate

Explanation of the indications on the type plate	
1	Type Pump type
2	No. Serial number of the pump
3	$P_{1min/max}$ [bar] Minimum/maximum permissible pressure in the pump inlet Minimum/maximum permissible pressure in the inlet cross section which the pump is applicable for. Please consider that the pressure depends on rotation speed, delivery rate, temperature and static pressure at inlet.
4	P_{2max} [bar] Maximum permissible pressure in the pump outlet Maximum permissible pressure in the outlet cross section which the pump is applicable for. Please consider that the pressure depends on rotation speed, delivery rate, temperature and static pressure at outlet.
5	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 pumped medium stated in the supply contract.
6	n_N 1/min Nominal stroke frequency Stroke frequency which the pump has been designed for
7	Hydrfl. [cm^3] Buffer fluid Quantity of buffer fluid in the diaphragm ring (in the case of piston double diaphragm pumps)

Tab. 01 Designation type plate

Operating instructions

3.3 Materials

The materials used are stated in the order confirmation and the product description.

3.4 Viscosity, pumped medium

The piston diaphragm pump is suitable for fluids with viscosities < 100 mPas.

3.5 Dosing range

The rate of delivery of the piston diaphragm pump can be set manually via the stroke length adjustment (0...100%).
The linear dosing range is between 20 and 100%.

3.6 Noise measurement

The sound pressure level measured according to DIN 45635 of the piston diaphragm pumps is between 50 and 64 dB (A).

4 Safety instructions

CAUTION !



Controllable piston diaphragm pumps are not authorized for Operating in Ex-Areas!

4.1 Quality instructions

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

- avoid dangers to persons, machines and environment
- increase reliability and service life of the pump and the complete system
- reduce repair cost and downtime

The **sera** quality management and quality assurance system for pumps, systems, valves and fittings and compressors is certified according to ISO 9001:2000.

The **sera** piston diaphragm pump meets the valid safety and accident prevention regulations.

CAUTION !



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

CAUTION !



Pay attention to the safety data sheet of the pumped medium! The owner must take corresponding accident prevention measures to protect operating personnel from danger through the delivery media used!

4.2 Marking of notes

4.2.1 Marking of notes in these operating instructions

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



(safety symbol in compliance with DIN 4844 – W9)

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.

4.2.2 Marking of notes on the product

Information signs which are directly attached to the pump, e.g. arrows of direction of rotation or signs for fluid connections are to be observed and kept in legible condition.

4.3 Personnel qualification and training

The personnel for operation, maintenance, inspection and installation must be suitably qualified for their tasks. The owner must clearly define responsibility and supervision of the personnel. If the personnel do not have the knowledge required, then personnel is to be trained and instructed correspondingly. Such training can be provided by the manufacturer / supplier upon order of the owner. In addition, the owner has to ensure that personnel have understood the operating instructions completely.

4.4 Dangers in case of inobservance of the safety instructions

Inobservance of these safety instructions can result in danger to persons, hazards to the environment and damage to the pump.

Inobservance of the safety instructions may lead to:

- Failure of important functions of the pump/system
- Inobservance of prescribed methods for maintenance and servicing
- Danger to persons through electrical, mechanical and chemical influences
- Hazards to the environment through leaking dangerous media

Operating instructions

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 owner / operator

Leaking hazardous delivery media and operating supplies are to be disposed off in such a way that any danger to persons and the environment is excluded. The legal regulations are to be observed.

Danger caused by electrical energy is to be avoided.

4.7 Safety instructions for maintenance, servicing and installation work

The owner must ensure that any maintenance-, servicing- and installation work is only entrusted to authorized and suitably qualified personnel who have carefully read and understood the operating instructions.

Only those spare parts and operating supplies are to be used which meet the requirements of the specified operating conditions.

Threaded joints and connections may only be disconnected when the system is not under pressure.

4.8 Arbitrary modification and production of spare parts

Modifications of or changes to the pump are only permitted after previous agreement of the manufacturer. Original spare parts and accessories which were approved by the manufacturer are essential for safety reasons.

CAUTION !



If the pumps (e.g. drive motor) are modified without authorization of the manufacturer or spare parts are used which are not approved, any warranty claim becomes null and void.

4.9 Improper operations

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

4.10 Intended use

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

CAUTION !



Controllable piston diaphragm pumps are not authorized for Operating in Ex-Areas!

If the piston diaphragm pump is to be used for other applications, then the suitability of the pump for the new operating conditions must be discussed with **sera** beforehand!

Criteria for operation of the piston diaphragm pump in accordance with the intended use

- Observe characteristics of the pumped medium (please see safety- and product data sheet of the delivery medium – the safety data sheet is to be provided by the supplier / owner of the pumped medium)
- Resistance of the materials which come into contact with the pumped medium
- Operating conditions at the place of installation
- Pressure and temperature of the pumped medium
- Voltage supply

4.11 Personal protection for maintenance and service

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 pumped medium must strictly be adhered to.

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

- Leaking fluids
- Leaking vapours
- Noise emissions (sound level)

Emissions are to be monitored by corresponding control systems of the total installation.

CAUTION !



Wear protective clothing, gloves, breathing mask and a face protecting mask.

CAUTION !



Personal protective equipment must be provided by the owner!

Operating instructions

4.12 Utilities

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

(For type and quantity of utilities/lubricants, see Chapter 12)

5 Transport and intermediate storage

5.1 General

sera – products are checked for perfect condition and function previous to shipment.

Check for transport damage immediately after arrival of goods. If damage is found, this is to be reported immediately to the responsible carrier and the manufacturer.

CAUTION !



The packaging material must be disposed of appropriately!

5.2 Storage

An undamaged packaging protects the unit during storage and should only be opened when the piston diaphragm pump is installed.

Proper storage increases the service life of the piston diaphragm pump and includes prevention of negative influences such as heat, moisture, dust, chemicals etc.

The following storage specifications are to be observed:

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

If these values are exceeded, metal products should be sealed in foil and protected from condensation water with a suitable desiccant.

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

Operating instructions

6 Assembly groups of the piston diaphragm pump

The piston diaphragm pump may be assembled of the following (main) components:

- Stroke mechanism with drive
- Stroke length adjustment
- Assembly pump
- Pump body with diaphragm rupture electrode
- Suction- and Pressure valve

Optional accessories:

- Actuator
- Frequency converter

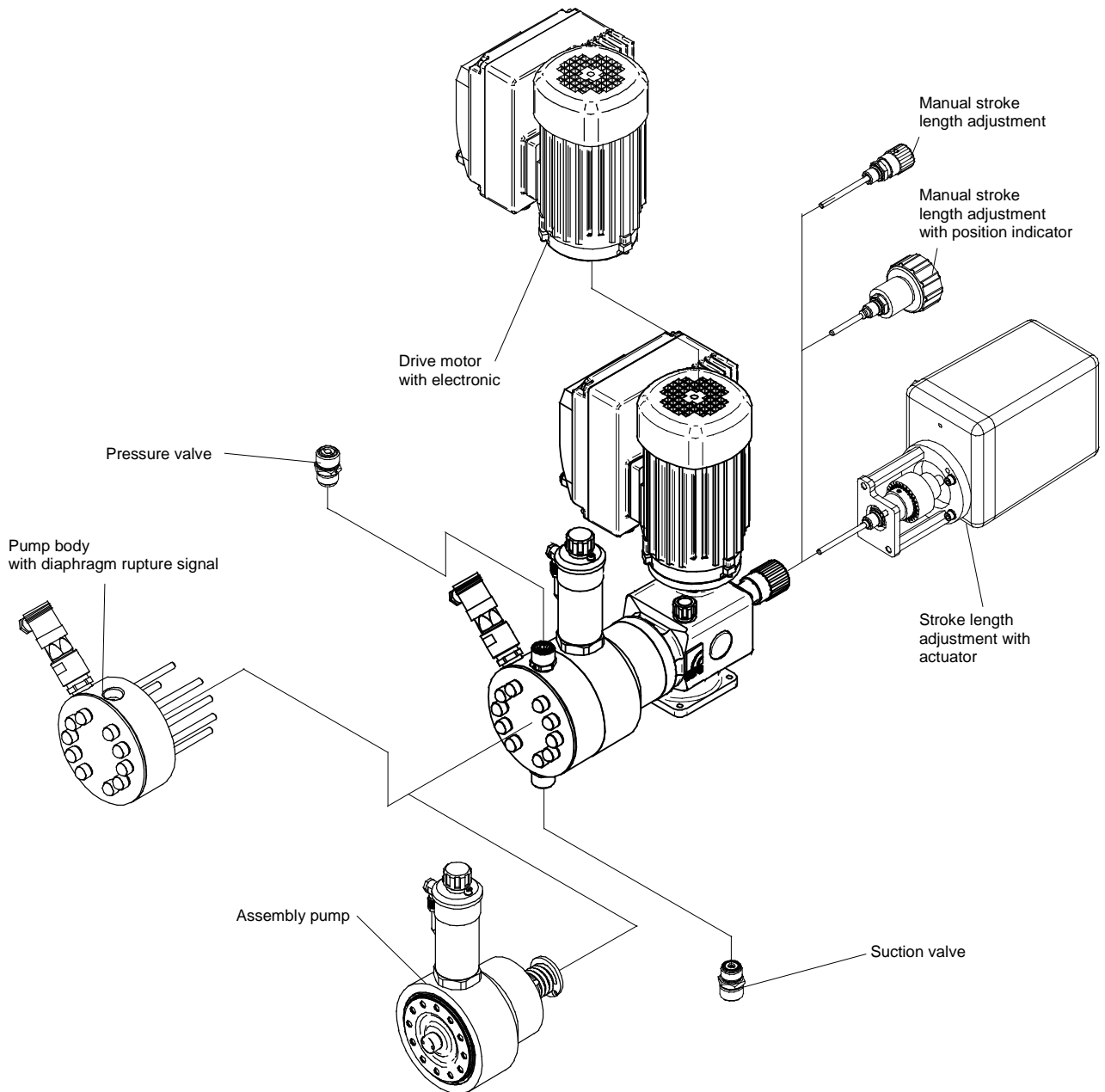


Fig. 06 Overview of assemblies

Operating instructions

7 Technical Data

7.1 Dimensions

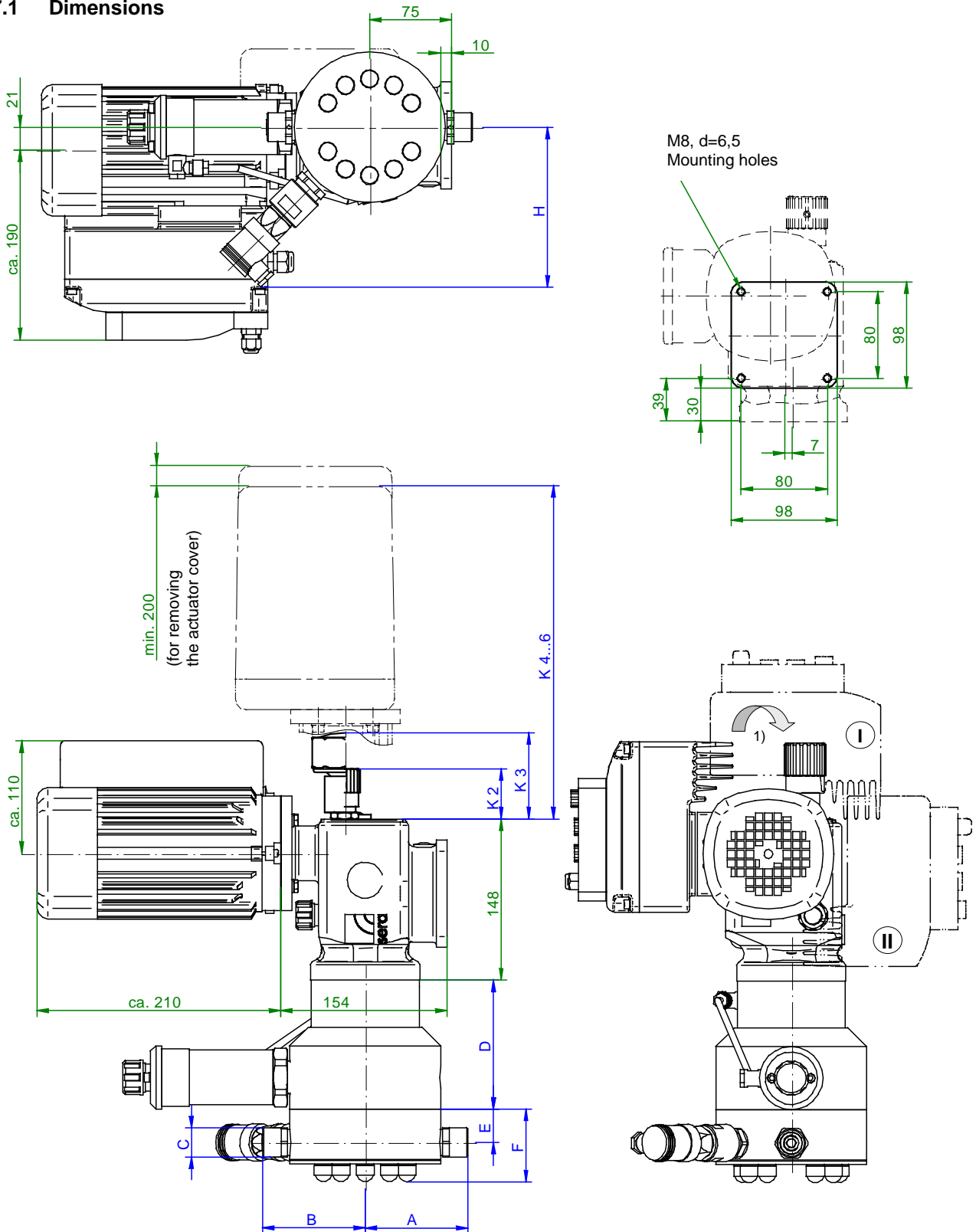


Fig. 07 Dimensions

1) 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).

Operating instructions

Tab. 02
Dimensions

All dimensions in mm !

			Pump type										
			C409.2 - 7,5 KM	C409.2 - 10 KM	C409.2 - 12 KM	C409.2 - 18 KM	C409.2 - 30 KM	C409.2 - 45 KM	C409.2 - 70 KM	C409.2 - 95 KM	C409.2 - 135 KM	C409.2 - 190 KM	
Valves	A	Single valves PVC	---	---	---	---	97	97	97	97	97	97	
		Chamber valves PVC	88	88	88	88	---	---	---	---	---	---	
		Single valves PP-FRP, PVDF-FRP	---	---	---	---	---	---	83	83	83	83	
		Double valves PP-FRP, PVDF-FRP	83	83	83	83	83	83	---	---	---	---	
		Double valves 1.4571/1.4581	84	84	84	84	95	95	95	95	95	95	
		Single valves PVC	---	---	---	---	104	104	104	104	104	104	
	B	Chamber valves PVC	88	88	88	88	---	---	---	---	---	---	
		Single valves PP-FRP, PVDF-FRP	---	---	---	---	---	---	83	83	83	83	
		Double valves PP-FRP, PVDF-FRP	83	83	83	83	83	83	---	---	---	---	
		Double valves 1.4571/1.4581	84	84	84	84	95	95	95	95	95	95	
	C	Screw-in thread Suction-/pressure valve	G ¾	G ¾	G ¾	G ¾	G ¾	G ¾	G ¾	G ¾	G ¾	G ¾	
	DN	Nominal diameter	8	8	8	8	8	8	8	8	8	8	
	Build-in pump	D	Built-in pump	76	76	76	76	118	118	118	118	118	118
	Pump body (PK)	E	Centre screw-in thread of valves	20	20	20	20	31	31	31	31	31	31
F		PK special steel (without front plate)	53	53	53	53	58	58	58	58	58	58	
		PK plastic (with front plate)	56	56	56	56	67	67	67	67	67	67	
Stroke length adjustment (HLV)	K ₁	Blind flange for execution without HLV	8	8	8	8	8	8	8	8	8	8	
	K ₂	Manual stroke length adjustment (max.)	70	70	70	70	70	70	70	70	70	70	
	K ₃	Manual HLV with position indicator	110	110	110	110	110	110	110	110	110	110	
	K ₄	Electric servo motor	240	240	240	240	240	240	240	240	240	240	
	K ₅	Electric servo motor with PMR3	320	320	320	320	320	320	320	320	320	320	
Option	T	Stroke frequency transmitter	125	125	125	125	125	125	125	125	125	125	
	H ₁	MBE Pressure switch	143	143	143	143	151	151	151	151	151	151	
Stroke mechanism		Amongst others dimensions for fastening the pump	siehe Fig. 07										

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 in the pump outlet	Min./max. permissible pressure in the pump inlet	Max. suction height	Inlet / outlet nominal width	Nominal stroke fre- quency	Max. stroke length	Motor size
	Q _N l/h 50/60 Hz	ml/Hub	p ₂ max. bar	p ₁ min. / max. bar	WS m	DN mm	min ⁻¹ 50/60 Hz	h100 mm	BG
C 409.2 – 7,5 KM	0 - 7,5	0 - 1,25	10 ⁽³⁾ 80	-0,2/0	2	10	100	10	71
C 409.2 – 10 KM	0 - 10	0 - 1,1	10 ⁽³⁾ 80	-0,2/0	2	10	150	10	71
C 409.2 – 12 KM	0 - 12	0 - 2	10 ⁽³⁾ 70	-0,2/0	2	10	100	10	71
C 409.2 – 18 KM	0 - 18	0 - 2	10 ⁽³⁾ 50	-0,2/0	2	10	150	10	71
C 409.2 – 30 KM	0 - 30	0 - 5	10 ⁽³⁾ 35	-0,3/0	3	10	100	10	71
C 409.2 – 45 KM	0 - 45	0 - 5	10 ⁽³⁾ 25	-0,3/0	3	10	150	10	71
C 409.2 – 70 KM	0 - 70	0 - 11,6	10 ⁽³⁾ 20	-0,3/0	3	15	100	10	71
C 409.2 – 95 KM	0 - 95	0 - 10,6	10 ⁽³⁾ 16	-0,3/0	3	15	150	10	71
C 409.2 – 135 KM	0 - 135	0 - 22,5	10	-0,3/0	3	15	100	10	71
C 409.2 – 190 KM	0 - 190	0 - 21,1	8	-0,3/0	3	15	150	10	71

Tab. 03 Output data

⁽¹⁾ Achievable 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

7.2.2 Motor data

Typ	Motordaten							
	Output	Frequency	230V, 50/60Hz		115V, 50/60Hz		Isolation class	Protection class
			Nominal volt- age	Nominal cur- rent	Nominal volt- age	Nominal cur- rent		
[kW]	[Hz]	[V]	[A]	[V]	[A]	[ISO]	[IP]	
C 409.2 - ... KM	0,37	50/60	210-250	3,0	100-125	6,0	F	55

Tab. 04 motor data

Operating instructions

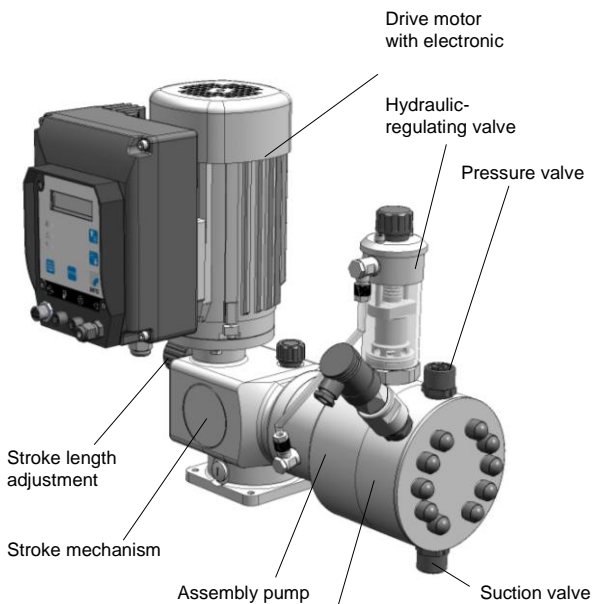
8 Functional description

8.1 General

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

Piston diaphragm pumps consist of the following (main) components:

- Drive motor
- Stroke mechanism
- Stroke length adjustment
- Built-in pump
- Pump body
- Suction- and Pressure valve



Pump body with diaphragm rupture signalization

Fig. 08 Assembly groups

8.2 Assembly groups of the piston diaphragm pumps 409.2

8.2.1 Stroke mechanism

Function

Piston 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).

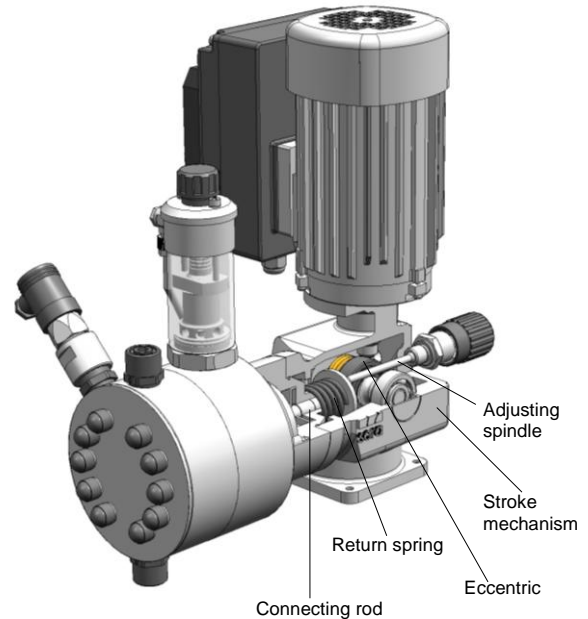


Fig. 09 Stroke mechanism

8.2.2 Stroke length adjustment

General

The delivery rate of the pump is set 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 of the pump (depressurized condition).

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 → the effective stroke length increases, the delivery rate increases.

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

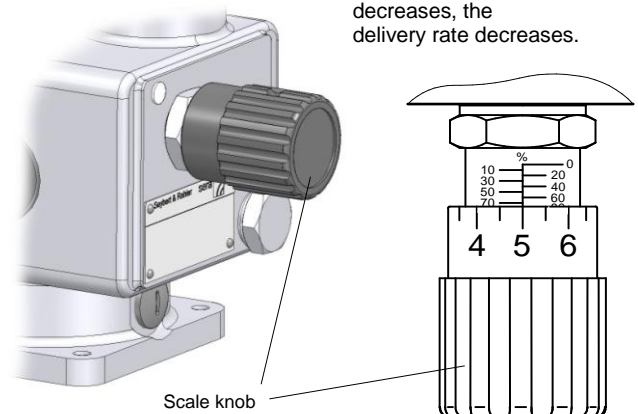


Fig. 10 Stroke length adjustment/Scale knob

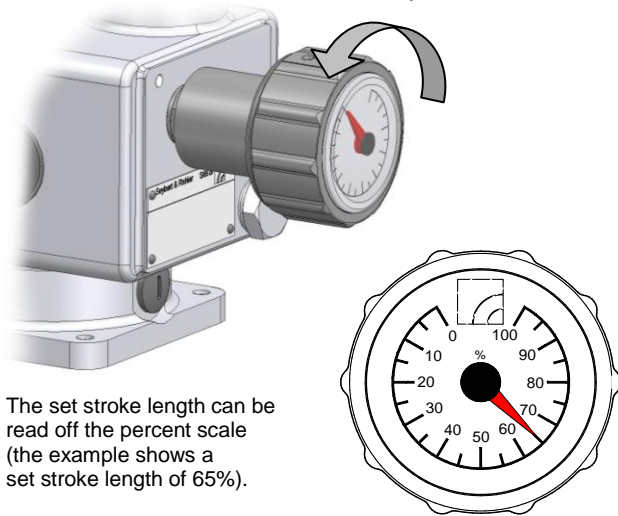
Operating instructions

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 (see Fig. 11) → the effective stroke length increases, the delivery rate increases.

Drehen im Uhrzeigersinn → the effective stroke length decreases, the delivery rate decreases.



The set 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%.

CAUTION !



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!

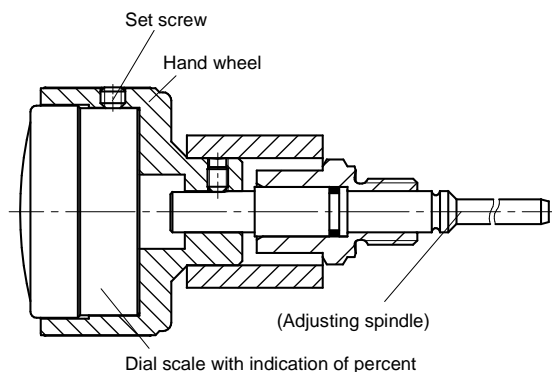


Fig. 12 Stroke length adjustment with position indicator

Adjusting the percent scale:

- Switch on the piston diaphragm pump
- Loosen setscrew
- Remove 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 (connecting rod does no longer hit the adjusting spindle)
- Insert percent scale again
- Use the setscrew to secure the percent scale to the hand wheel
- Adjust desired stroke length

8.2.2.3 Automatic stroke length adjustment by means of 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 drive shaft to the adjusting spindle. The axial displacement is compensated in the clutch.

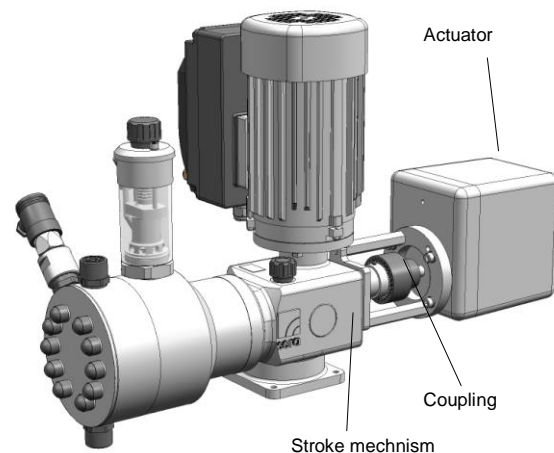


Fig. 13 Stroke length adjustment by electrical actuator

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 equipped with two integrated limit switches as well as a position potentiometer for position feedback as standard.

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)

The set stroke length can be read off on the pump (percent scale)

Operating instructions

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

CAUTION !



The adjustment is only possible when the pump is running.

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

same as Chapter 8.2.2.3, additionally:

- PMR3 positioner

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

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

8.2.3 Assembly pump

Function

The stroke movement of the mechanically linked piston is transferred hydromechanically to the intermediate diaphragm and thus to the pumped medium.

The multi-layer diaphragm touches the spherical cap (pump body or diaphragm ring) when the pressure stroke finishes in the front dead centre.

The compensating valve ensures an optimum quantity of hydraulic fluid between diaphragm and piston.

The so-called blow valve and the hydraulic discharge valve are the most important components of the compensating valve. Both valves are spring-loaded and can be adjusted according to the operating conditions (see Chapter 11.4.4.).

Minimum quantities of fluid may leak on the piston which are compensated for by the adjustable blow valve at each suction stroke.

The leaking fluids are returned to the store tank via a return pipe (see Fig. 15).

ACHTUNG !



During the operation the pump's hydraulic fluid may change the color. This will not affect the life time respectively the safety of the pump.

Thus, the system is closed and no more hydraulic fluid may leak out; during normal operation there is no need to replenish hydraulic fluid.

The blow valve always sucks in a greater quantity of hydraulic fluid than is leaking out at the piston during each suction stroke.

The excess quantity is returned into the store tank via the hydraulic discharge valve at the end of a pressure stroke when the diaphragm touches the calotte.

If a stop valve is closed in the pressure pipe during operation of the pump, the complete stroke volume of hydraulic fluid is returned into the store tank to protect the pump from overload.

If the pressure in the pressure pipe falls below the set pressure of the hydraulic discharge valve, the blow valve sucks in hydraulic fluid until the optimum volume has been reached.

This process can take up to several minutes, depending on the operating conditions.

Blow- and hydraulic discharge valve are set to the pressure specified in the order confirmation before shipment.

CAUTION !



The hydraulic discharge valve is not a safety valve according to the pressure equipment directive 97/23EC.

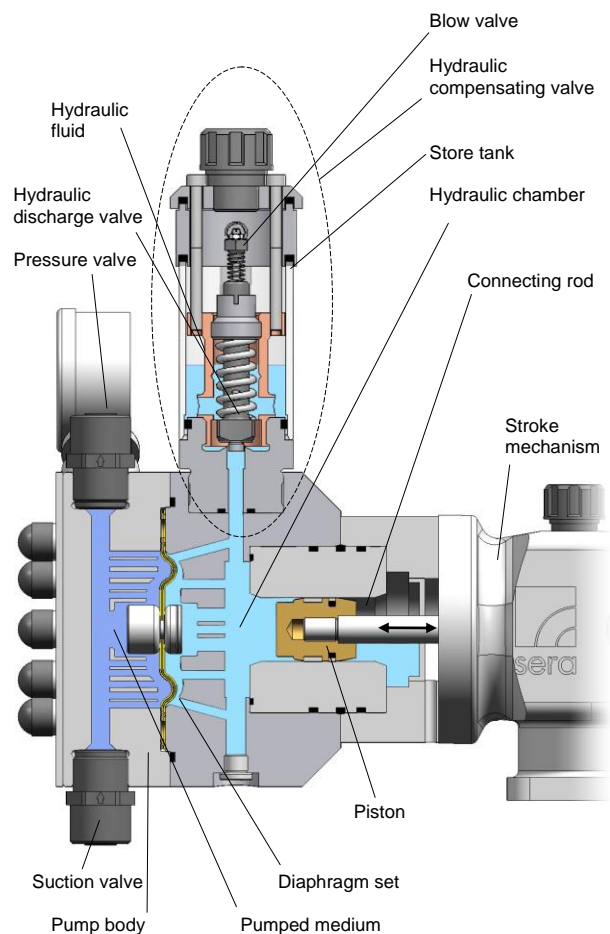


Fig. 14 Functional principle of the piston diaphragm pump

Operating instructions

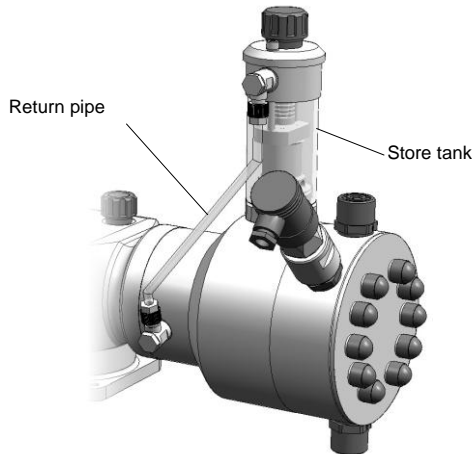


Fig. 15 Return pipe

8.2.3.1 Multi-layer Diaphragm

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

- Working diaphragm (A)
- Signal diaphragm (B)
- Protection diaphragm (C)

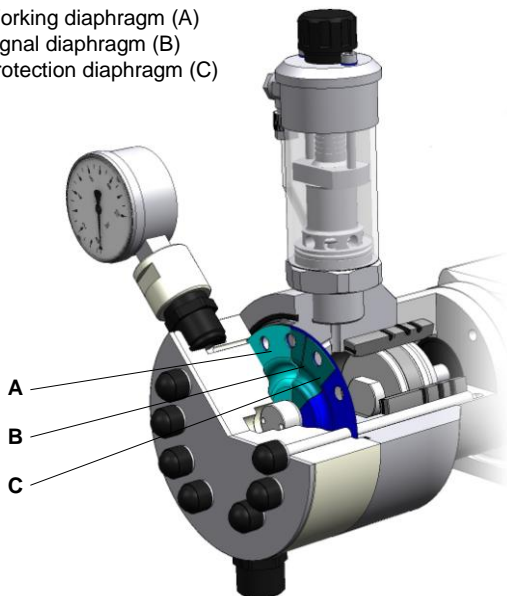


Fig. 16 Mounting position of multi-layer diaphragm

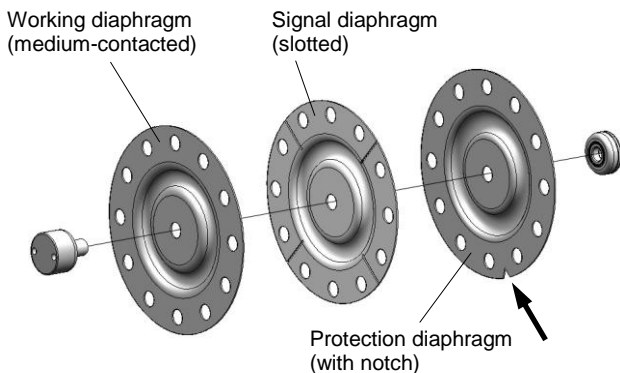


Fig. 17 Assembly of multi-layer diaphragm

The notch of the protection diaphragm indicates the correct mounting position changing the diaphragm set (see Chapter. 12.4)

8.2.4 Pump body

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

The diaphragm rupture signalization is integrated in the pump body (see kap. 7.2.7)

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. 18).

CAUTION!



Pressure valve above; Suction valve below !

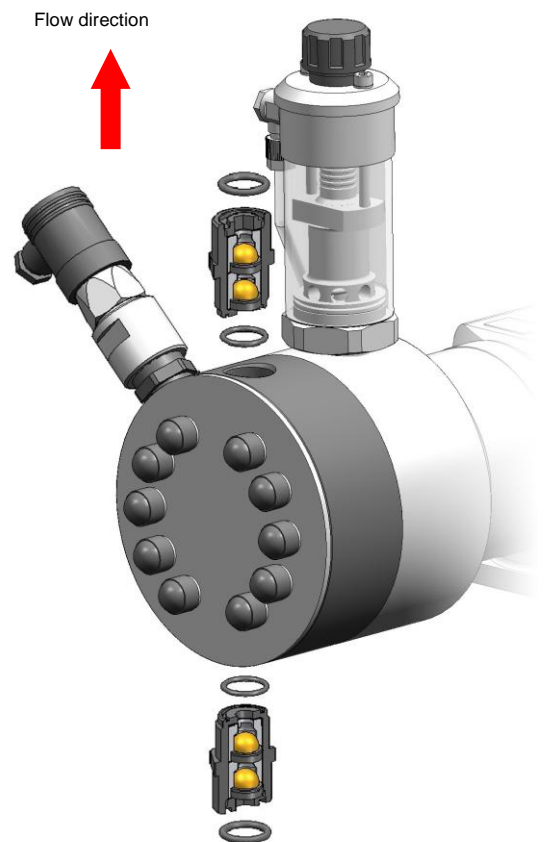


Fig. 18 Mounting position of valves, flow direction

Operating instructions

8.2.6 Diaphragm rupture monitoring

sera - piston diaphragm pumps of the series C 409.2 are equipped with a diaphragm rupture monitoring.

CAUTION!



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

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.

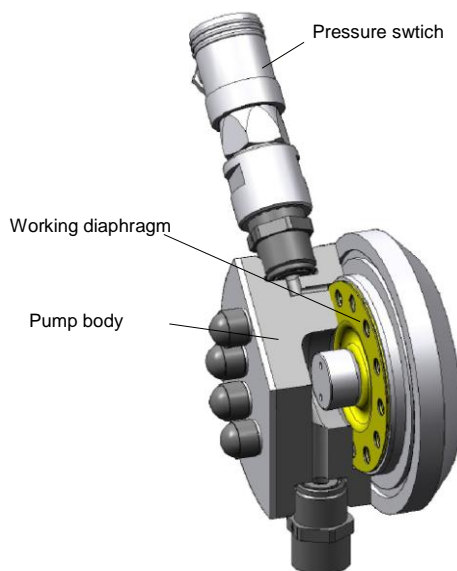


Fig. 20 Diaphragm rupture monitoring by pressure switch

8.3 Drive motor

A sera – diaphragm pump of series C 409.2 is driven by a three-phase-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!

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 9.3.1 after maintenance work of after longer periods of standstill.

9 Installation

CAUTION !



Controllable piston diaphragm pumps are not authorized for Operating in Ex-Areas!

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, permitted humidity until approx. 90%, altitude 1000 m above sea level
- For dimensions of the pump connections and fixing holes, see Fig. 07, Table 02.
- Install the pump in such a way that there is no vibration and no tension and that it is aligned precisely.

Operating instructions

CAUTION !



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.

CAUTION !



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

Torque for tightening the fixing screws	
Pump type	Torque (Nm)
..409.2 – 7,5 KM	15,0
..409.2 – 10 KM	
..409.2 – 12 KM	
..409.2 – 18 KM	
..409.2 – 30 KM	
..409.2 – 45 KM	
..409.2 – 70 KM	
..409.2 – 95 KM	
..409.2 – 135 KM	
..409.2 – 190 KM	

Tab.05 Torque for tightening

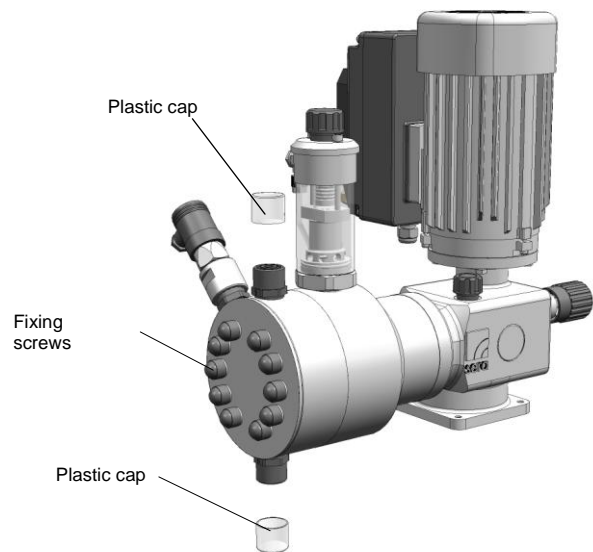


Fig. 21 Piston diaphragm pump with plastic caps

- 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.
- Exchange the plug in the compensating valve for the vent screw in the bag.
- Keep the adjusting key (included in the delivery scope) in close proximity to the pump.

CAUTION !



When toxic, crystal-forming or corrosive liquids are being delivered, the pipe system must be equipped with devices so that it can be emptied, cleaned and, if necessary, rinsed with a suitable medium.

CAUTION !



The piston diaphragm pump must be installed in such a way that no damage can be caused if medium is leaking out.

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 electrode) 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 system 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 store tank which is under atmospheric pressure or in an open drain gutter (see Fig. 22)
- 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. 23).

The hydraulic discharge valve installed in the pump protects the pump from overload. Under certain circumstances an external discharge- or safety valve mounted on the pump pressure side is not required.

In general, however, an external overpressure protection should be provided.

CAUTION !



Do not connect shut-off valves when the pump is operating.

CAUTION !



An overpressure protection (e.g. discharge valve) should always be installed if the permissible operating pressure may be exceeded.

CAUTION !



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

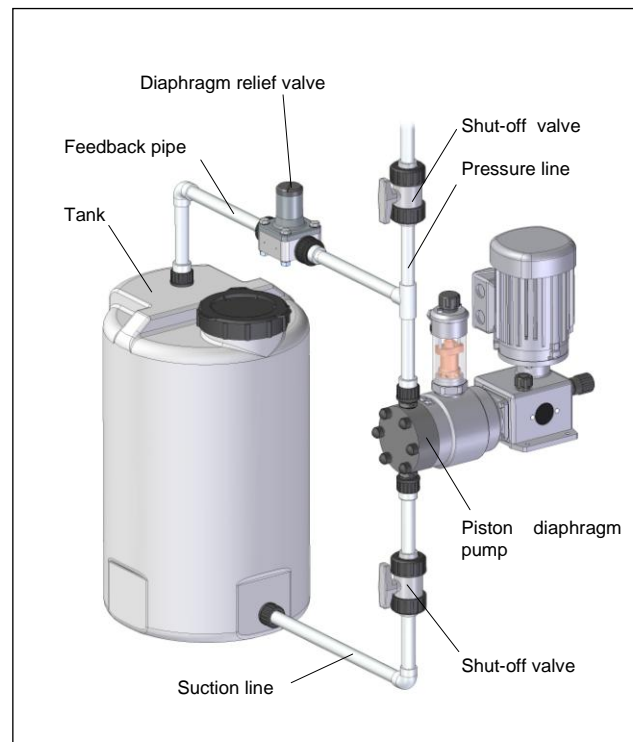


Fig. 22 Installation with (external) relief valve

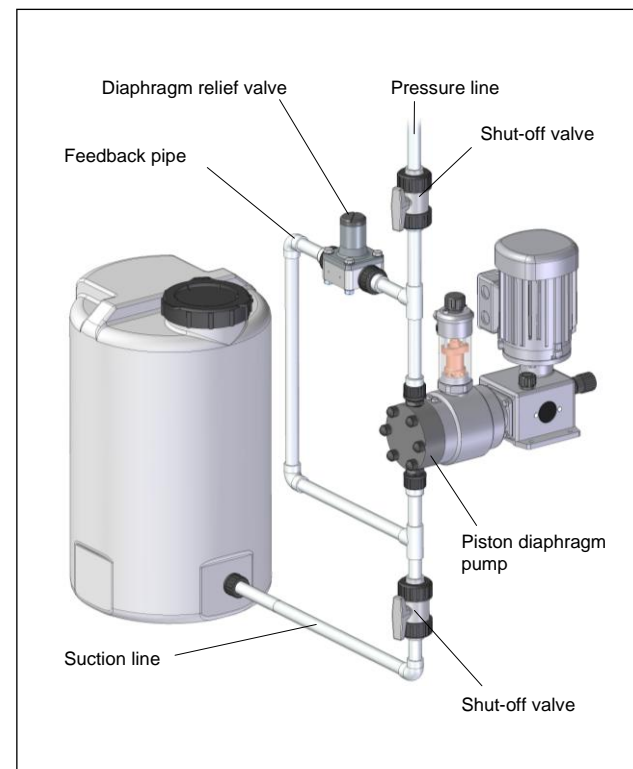


Fig. 23 Installation with (external) relief valve

Operating instructions

9.1.2 Preventing a backflow of the pumped medium

If the dosing line is linked with a main line:

- install an injection fitting (dosing valve).

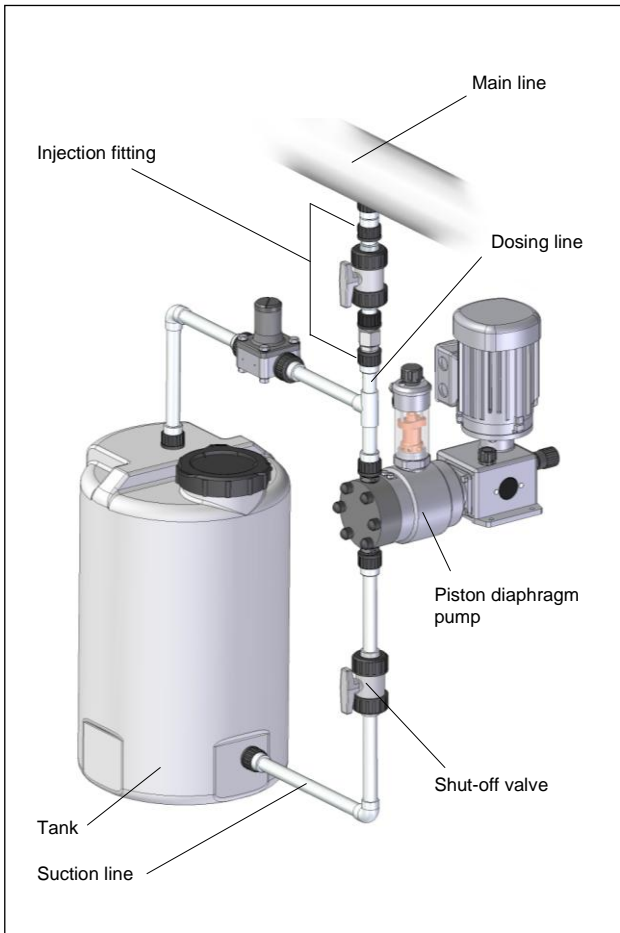


Fig. 24 Installation of an injection fitting

CAUTION !



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

CAUTION !



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

9.1.3 Eliminating 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 prevented (by a positive pressure difference (≥ 1 bar) between pressure and suction side).

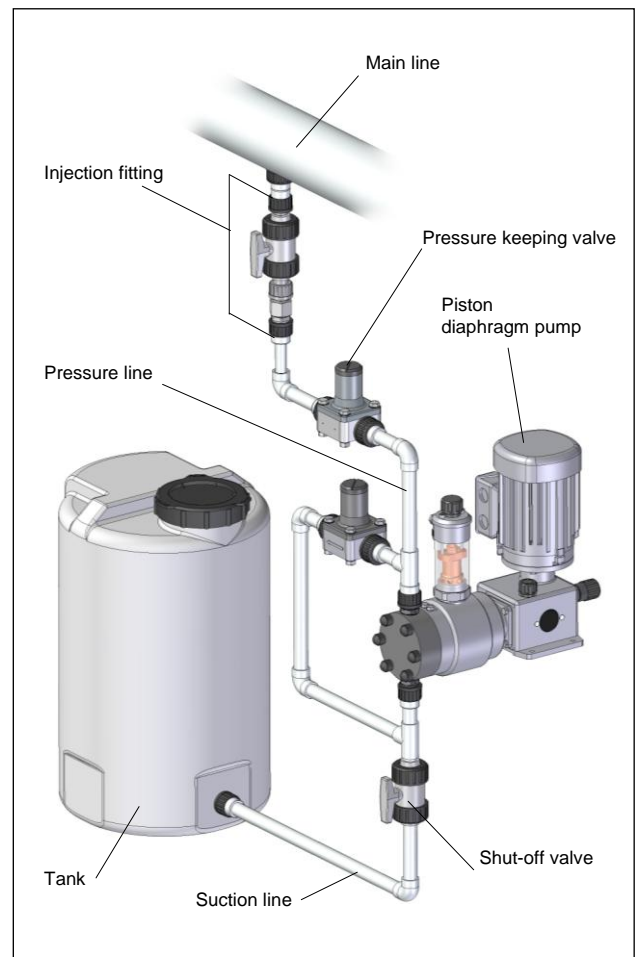


Fig. 25 Installation of a pressure keeping valve

Operating instructions

9.1.4 How to ensure suction free from air

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 vent valve into the pressure line.

CAUTION !



The delivery may be interrupted if air enter in the suction line!

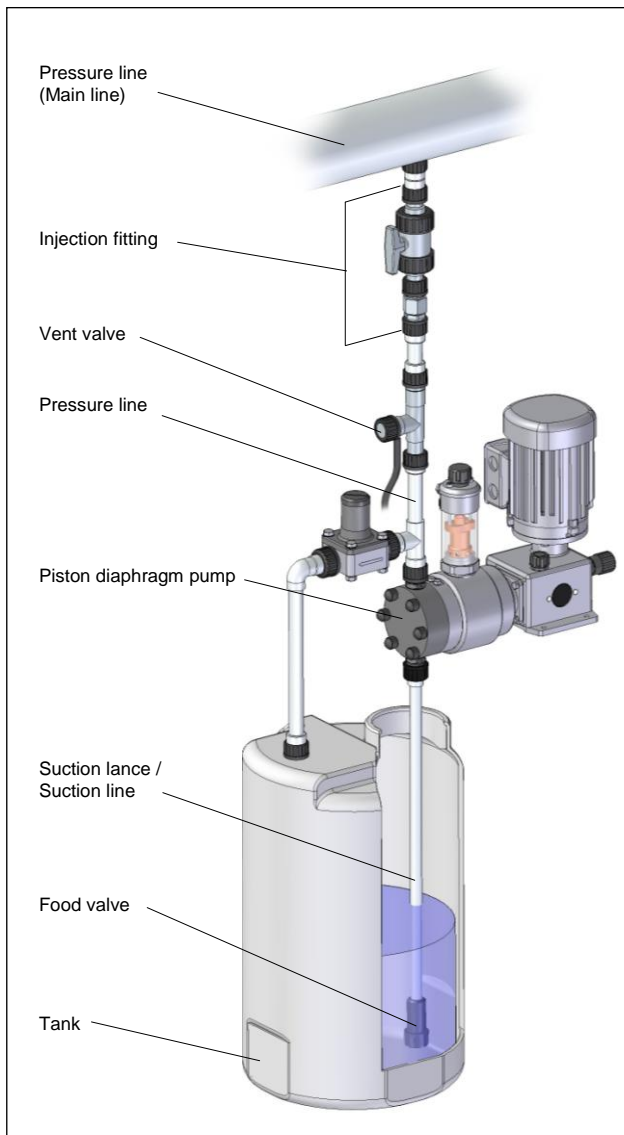


Fig. 26 Installation of a vent valve

9.1.5 Install the empty-tank alarm

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

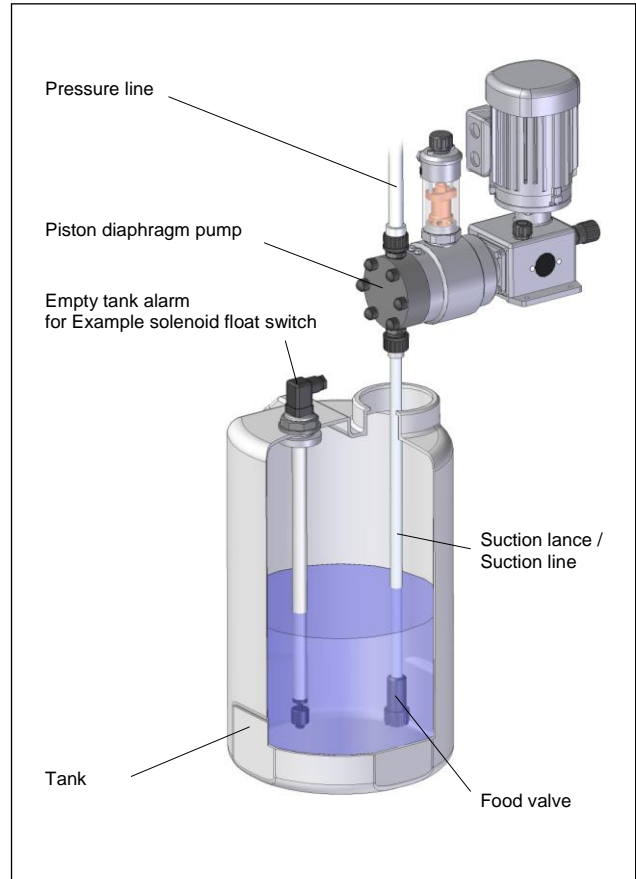


Fig. 27 Installation of the empty-tank alarm

CAUTION !



The delivery may be interrupted if air enter 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

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 pumped medium and in consideration of mass acceleration and viscosity of the medium.

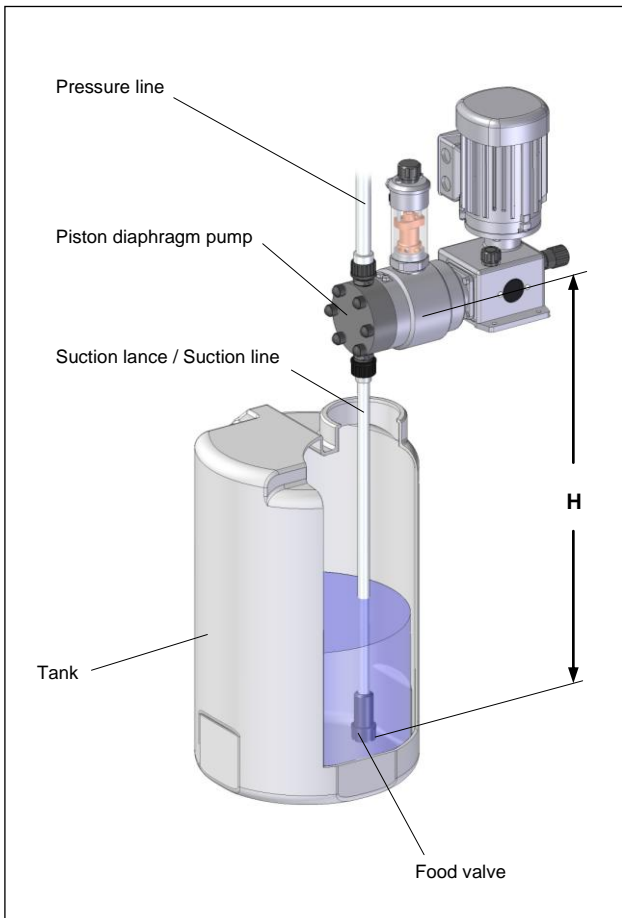


Fig. 28 How to avoid emptying of the suction line

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).

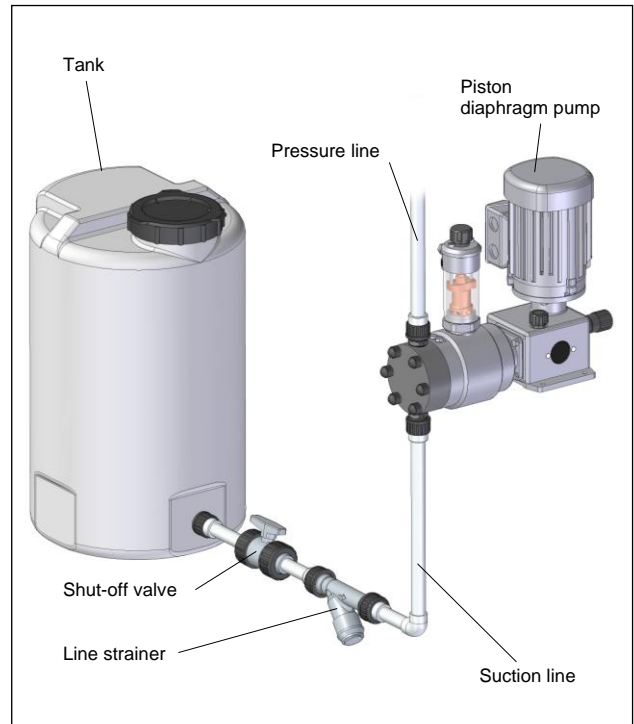


Fig. 29 Installation of a line strainer

CAUTION !

Pump and system may not function properly if contaminants are not collected.



Operating instructions

9.1.8 Suction via a siphon vessel

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

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

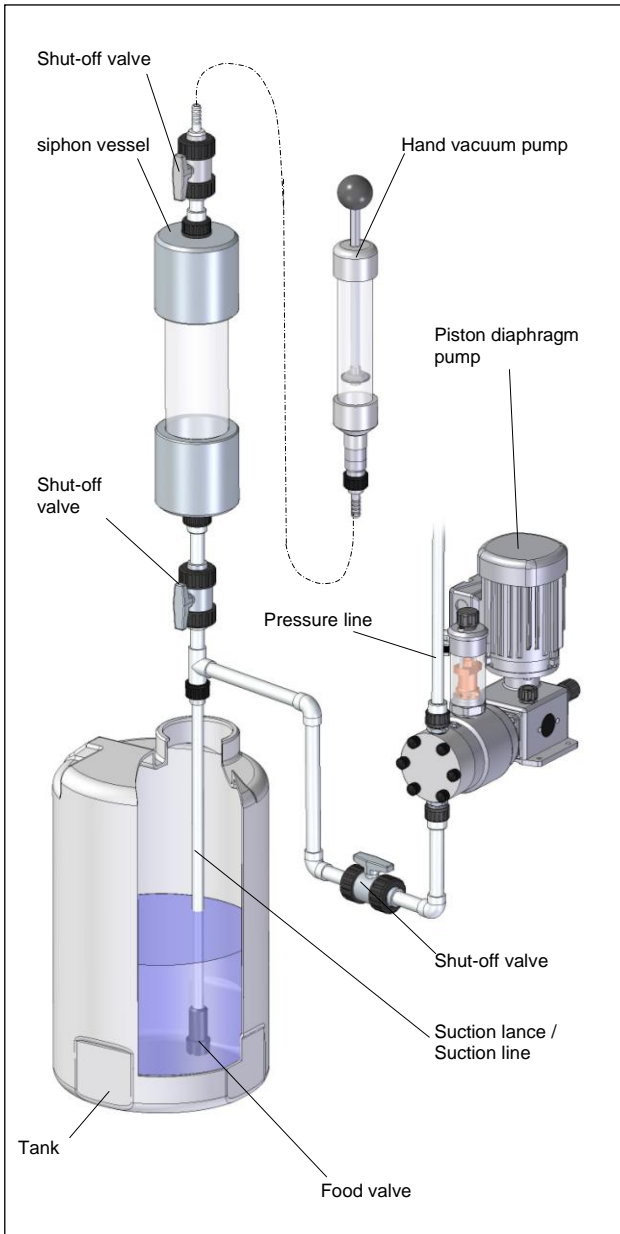


Fig. 30 Installation siphon vessel (sera - fitting)

9.1.9 In case of easily degassing pumped media

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

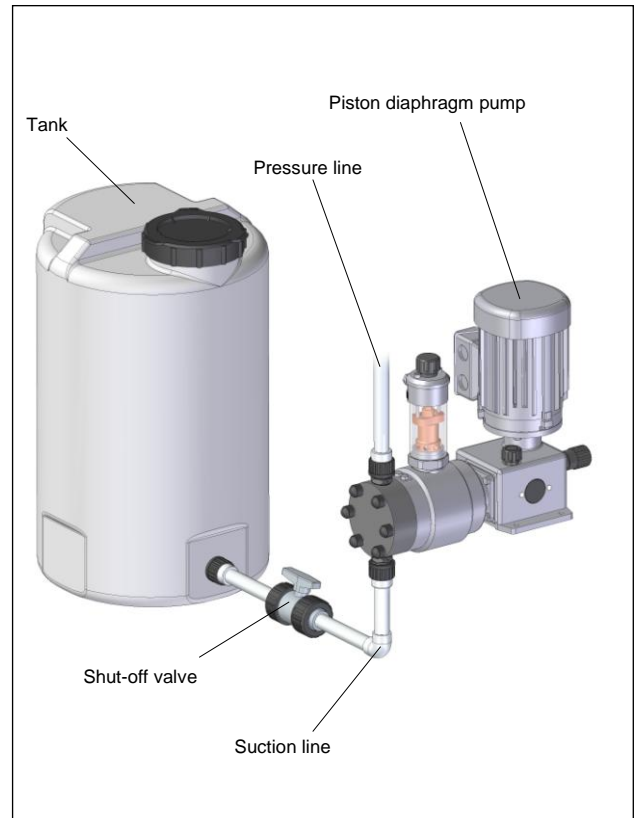


Fig. 31 Installation under afflux

Operating instructions

9.1.10 Dosing of suspensions

Pump head must be cleaned to avoid precipitation, e.g. as:

- intermittent rinsing
- or
- rinsing when pump was switched off

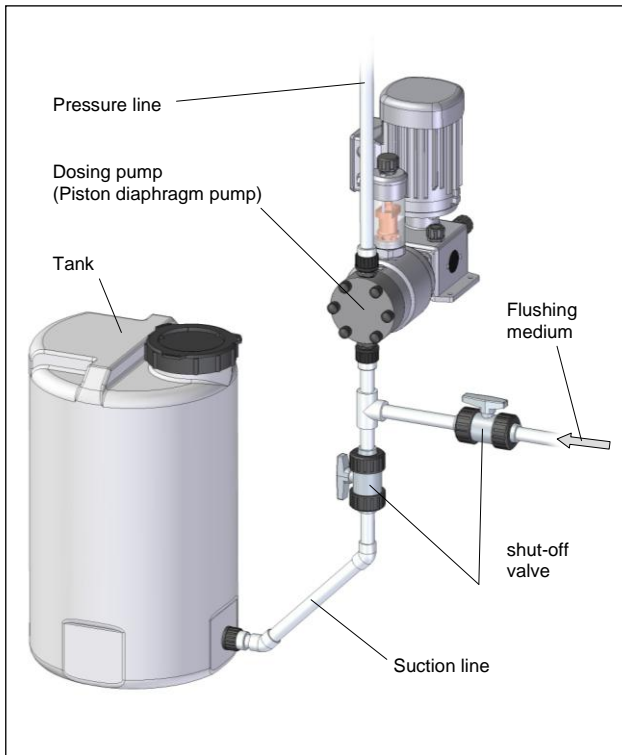


Fig. 32 Dosing of suspensions

CAUTION !

The rinsing process should be automated.



9.1.11 Damping of the pulsation

By installing pulsation dampers if:

for procedural reasons, a pulsation-poor flow rate is desired.

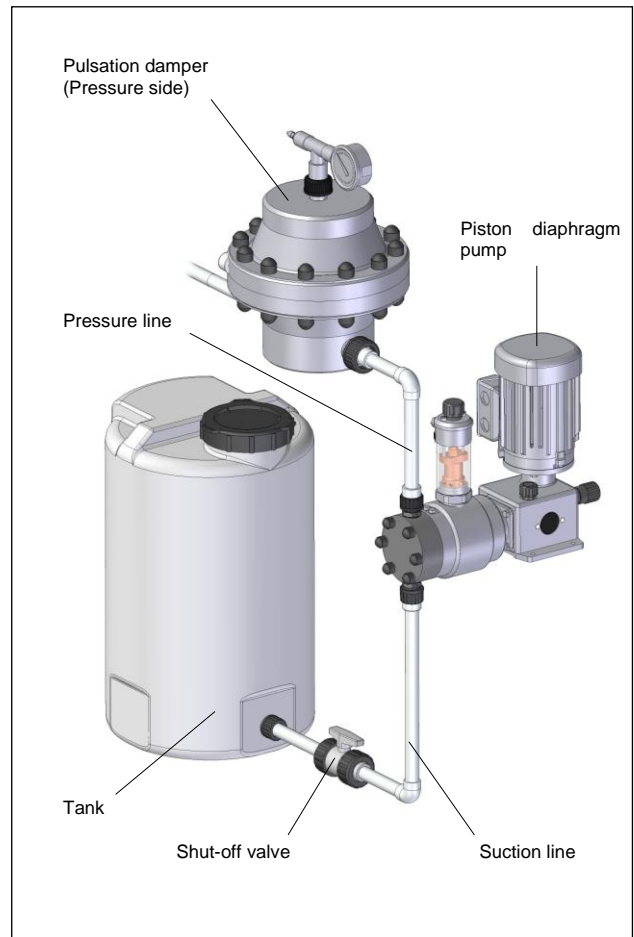


Fig. 33 Installation of a pulsation damper (I)

Operating instructions

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

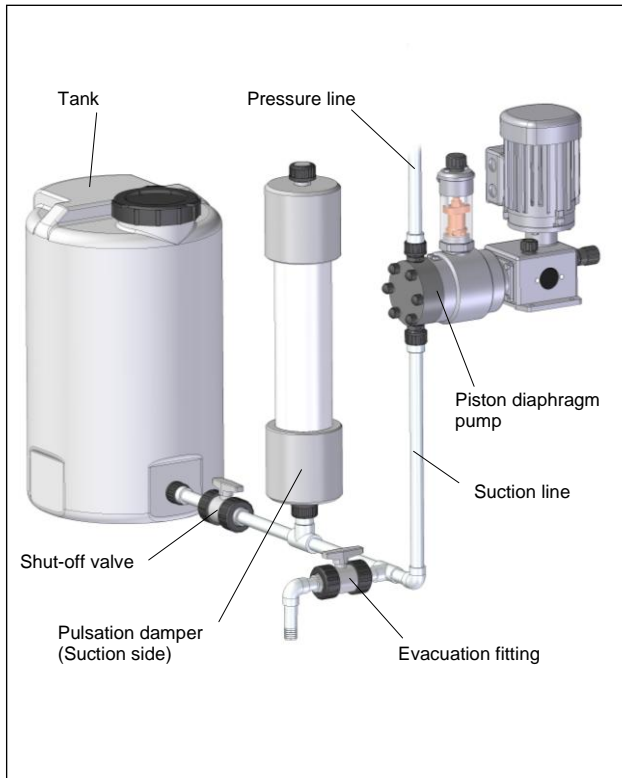


Fig. 34 Installation of a pulsation damper (II)

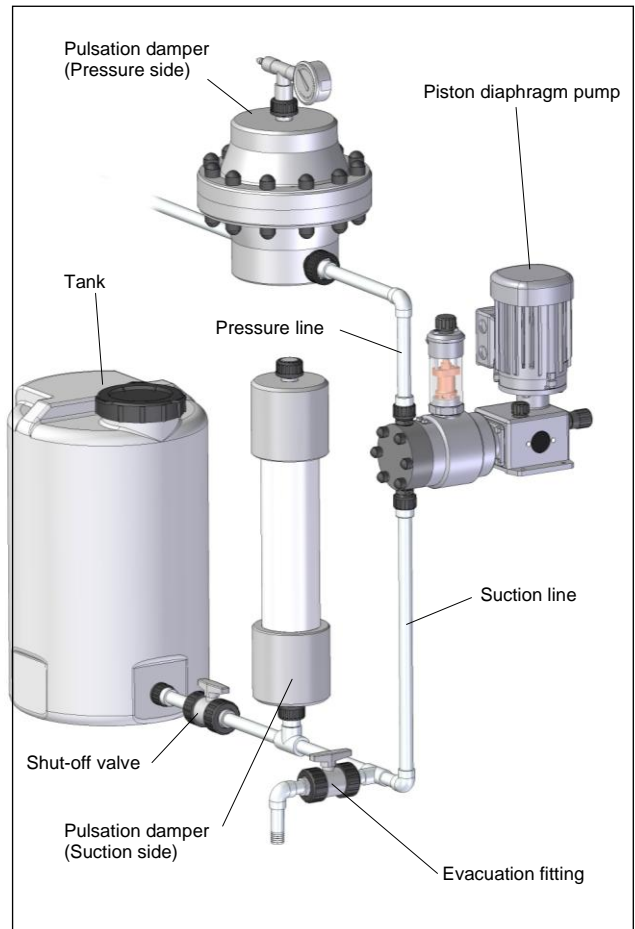


Fig. 35 Installation of a pulsation damper (III)

Operating instructions

CAUTION !



Undamped accelerating forces can cause the following malfunctions / damage:

Fluctuations of 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,
leakage and valve wobbles as a result of the maximum pressure on the pressure side of the pump being exceeded.

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.

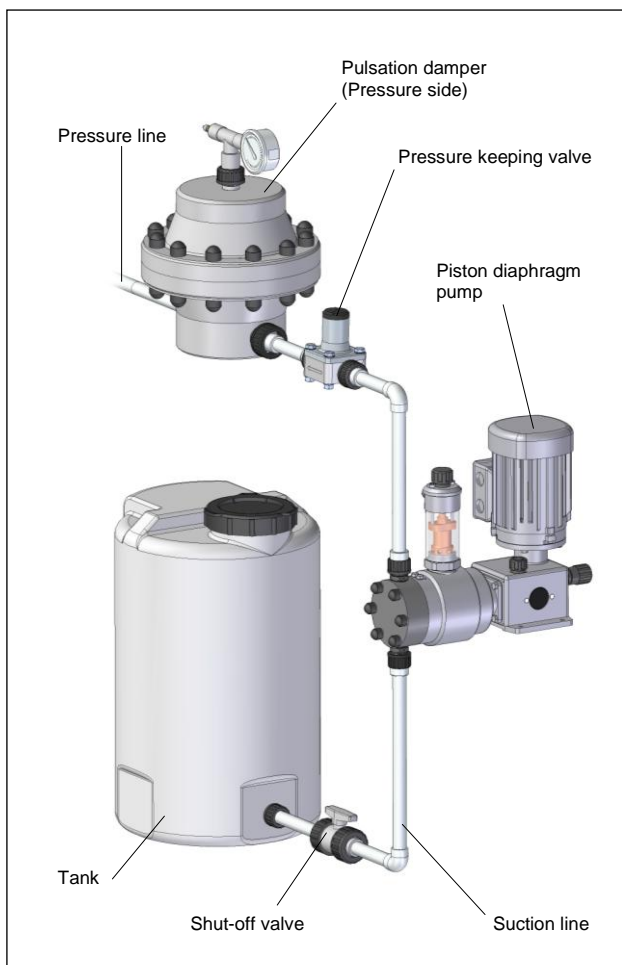


Fig. 36 Installation of pulsation damper and pressure keeping valve

Operating instructions

10 Electrical connections

10.1 Electric supply

The **sera** magnetic 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 210 – 250 V, 50/60 Hz.

CAUTION !



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

The C 409.2 is available in two versions:

- 210 – 250 V, 50/60 Hz
- 100 – 120 V, 50/60 Hz

CAUTION !



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!

Symbol:

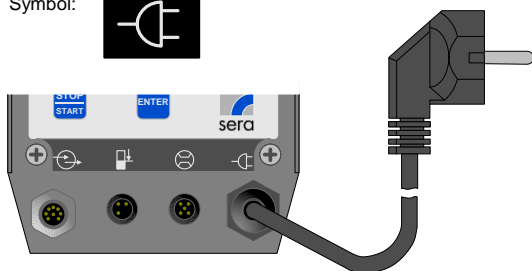


Fig. 37 (Electric supply)

CAUTION !

Only operate the pump when it is connected to an earthed power supply!

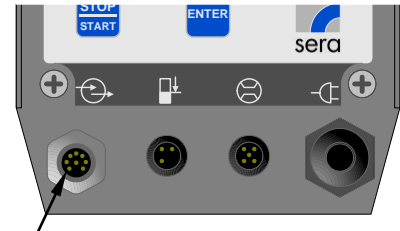
10.2 Electrical interfaces

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. 38 (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. 06 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) (see Fig. 40).

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

CAUTION !



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. 39).

Connect the anode with 24V DC.

Connect the cathode with the yellow lead of a cable.

Use the diode type 1N4007 or the like.

Fig. 40 shows exemplarily the control of the digital inputs 01 and 03 via a potential-free contact signal.

CAUTION !



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. 40).

Operating instructions

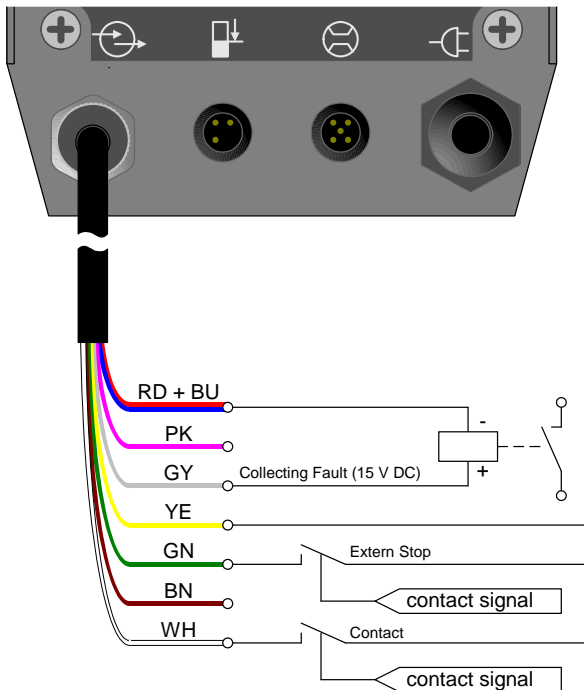


Fig. 39 (Control of digital inputs via a potential-free contact signal)

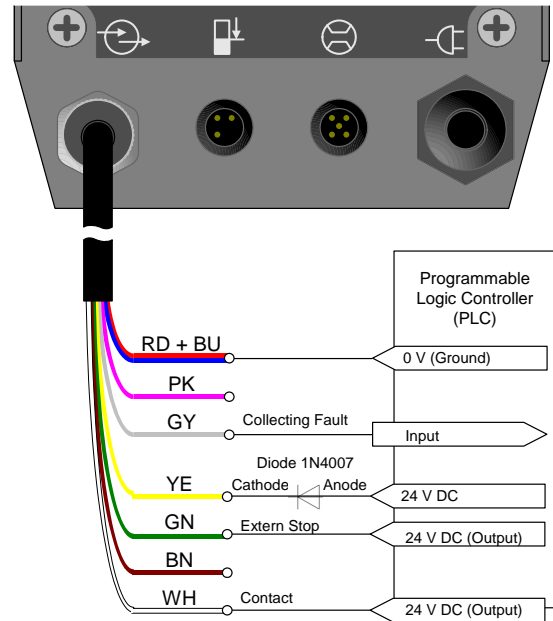




Fig. 40 (Direct activation of digital inputs via a control voltage signal of a programmable logic controller)

10.2.2 Level input with pre-alarm and dry run


CAUTION ! 

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 ! 

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).

CAUTION ! 

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. 40 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.

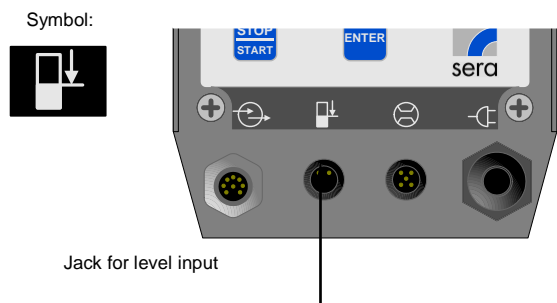



Fig. 41 (Connection for leader contact / main contact)

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).

Operating instructions

10.2.3 Input for flow control and flow meter

CAUTION ! 

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.

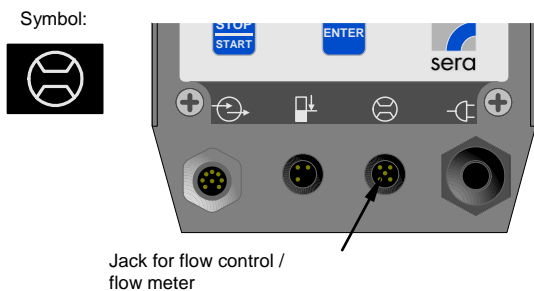


Fig. 42 (Connection for flow control / flow meter)

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

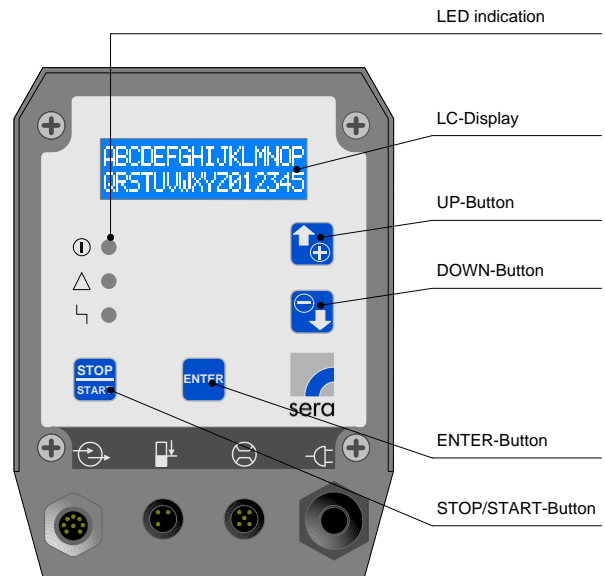


Fig. 41 (Electronics control panel)

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. 15). 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 9.2.1).

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	11.14			
Function	Message	11.14			
Fault stroke	10	11.14			
Alarm limit	80%	11.14			
Level:					
Pre-alarm	NO	10.15.4			
Dry run	NO	10.15.4			
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)

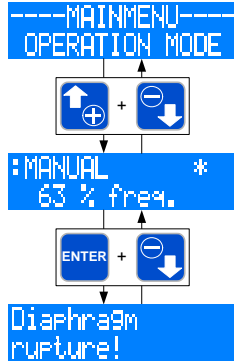
Operating instructions

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.

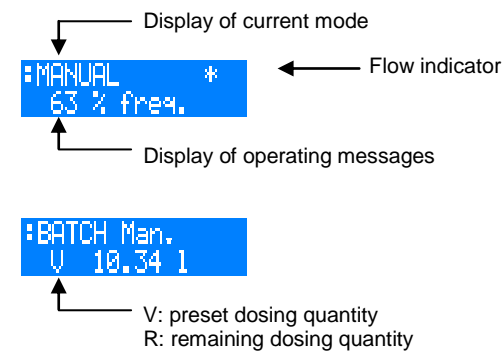
A change between the screens "Operating messages" and "Fault and warning messages" is done by simultaneously pressing the ENTER and DOWN keys.

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.

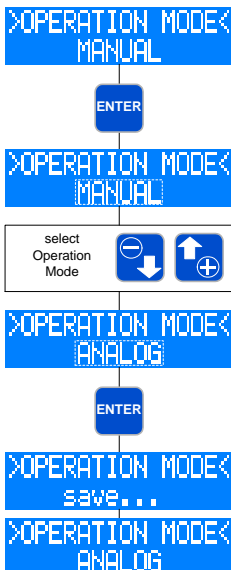


11.5.4 Value entry

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.

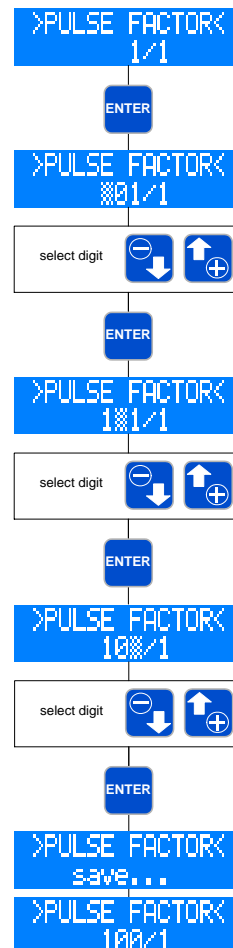
Then, the operation mode indicator flashes and a setting can be selected (in this example: operation modes) using the UP and DOWN keys.

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.

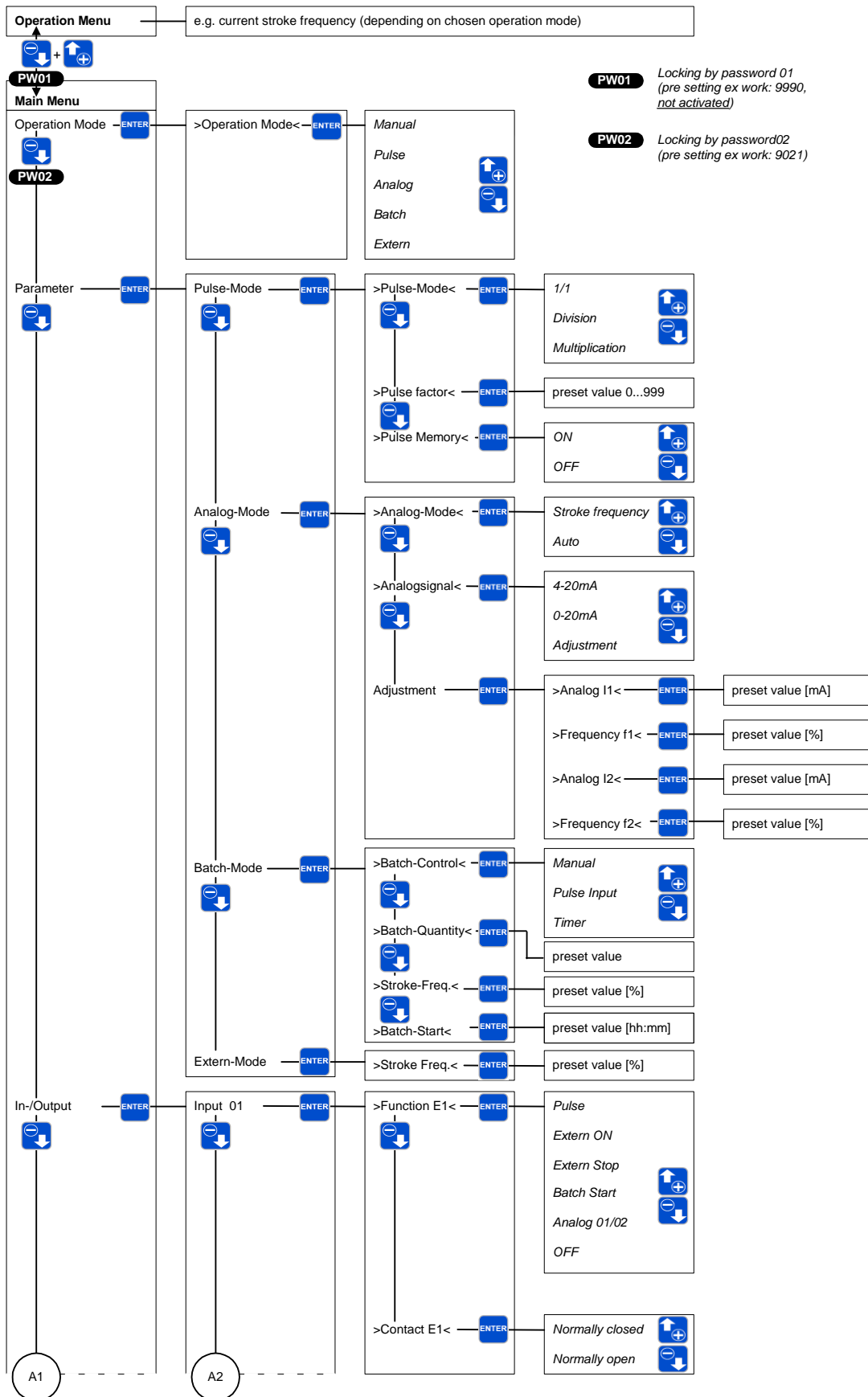
NOTE !



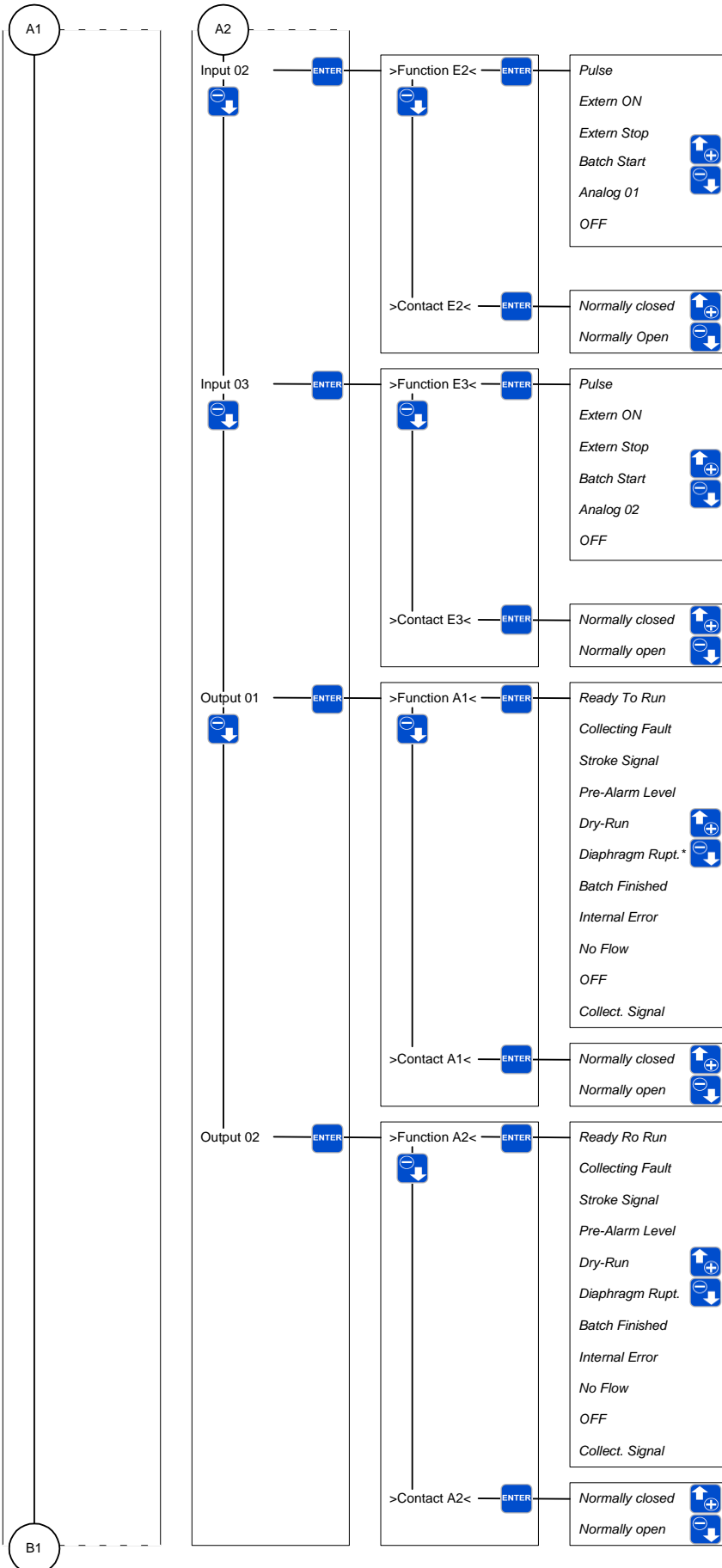
If, during the value entry (flashing indication), no key has been pressed for 30 sec. the entry mode is exited automatically and the previous value / previous setting is maintained.

Operating instructions

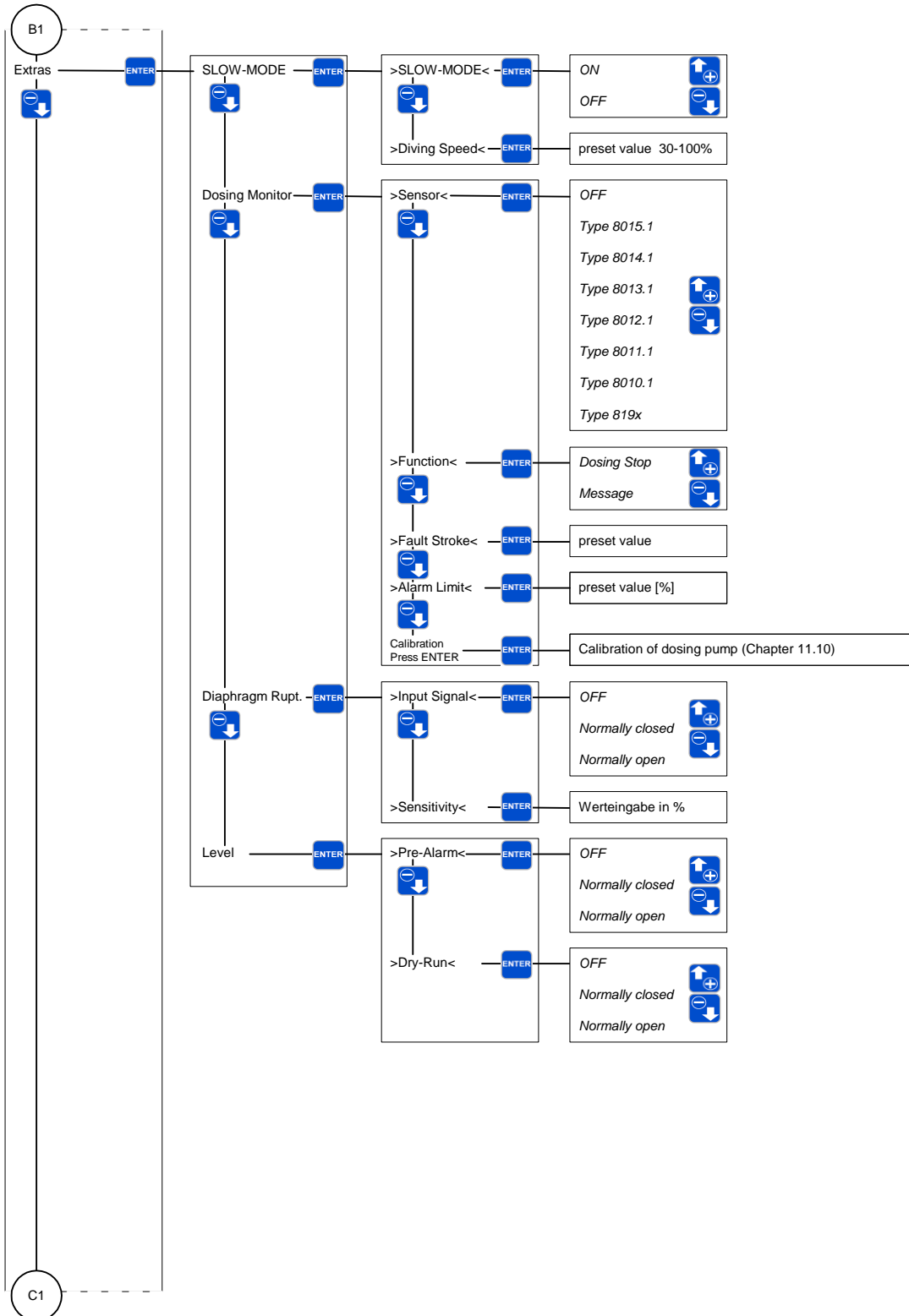
11.5.5 Menu guide



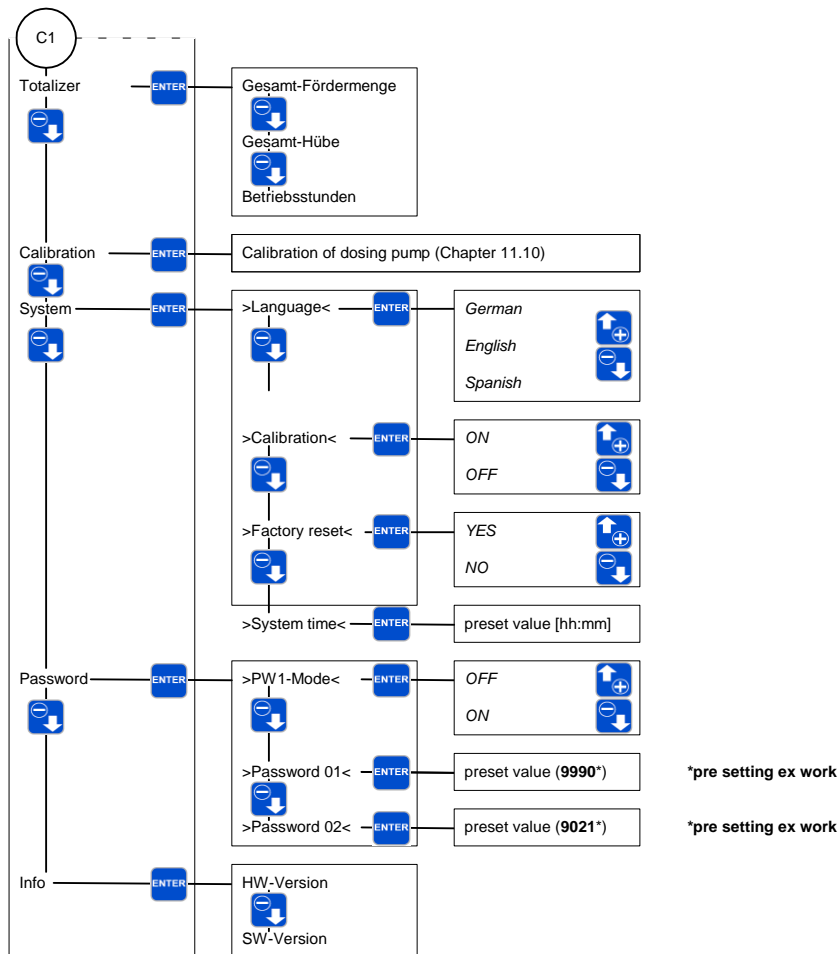
Operating instructions



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).

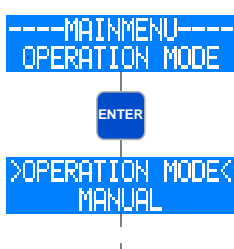
```
>OPERATION MODE<
  ANALOG
```

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:



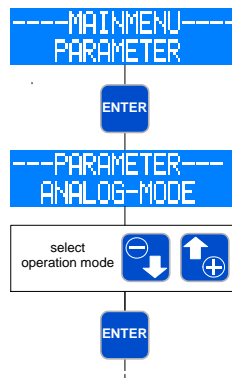
Go to the ---MAIN MENU--- and select the menu item OPERATION MODE (if necessary, use the UP / DOWN keys). Pressing the ENTER key will open the >OPERATION MODE< sub-menu.

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 --- sub-menu.

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 Fehler! Verweisquelle konnte nicht gefunden werden.). Input 02 (see Chapter Fehler! Verweisquelle konnte nicht gefunden werden.) 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. 44).
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. 44).

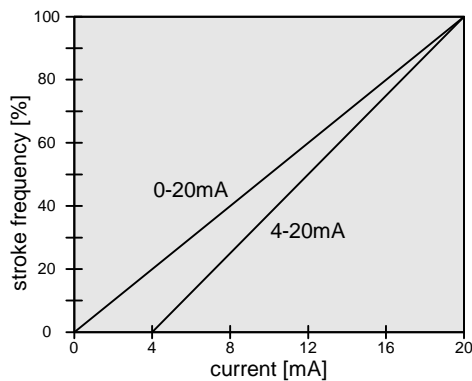


Fig. 44 (Stroke frequency in dependency on the control current at 4-20mA / 0-20mA)

```
>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 45.

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%.

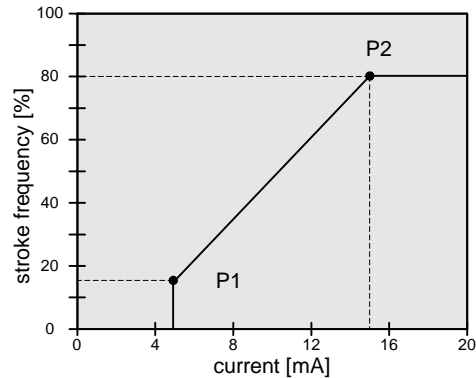


Fig. 45 (Exemplary adjustment of the analog signal)

CAUTION !

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.

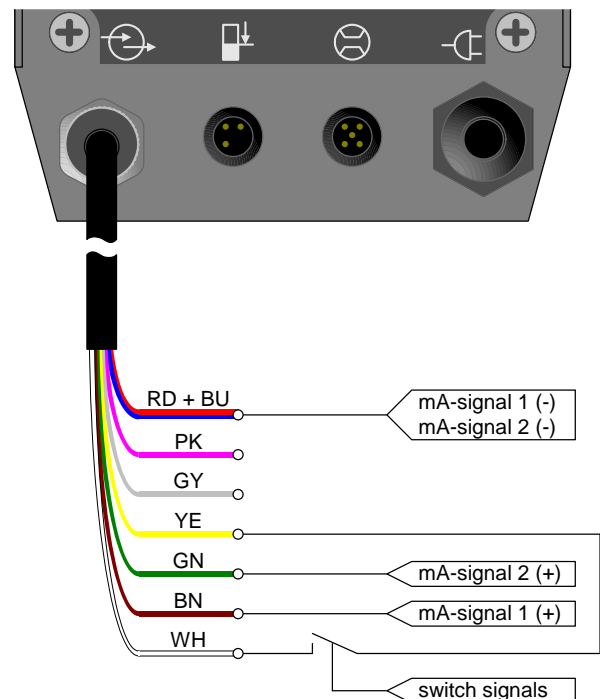


Fig. 46 (Connection of two analog signals with switch-over)

Operating instructions

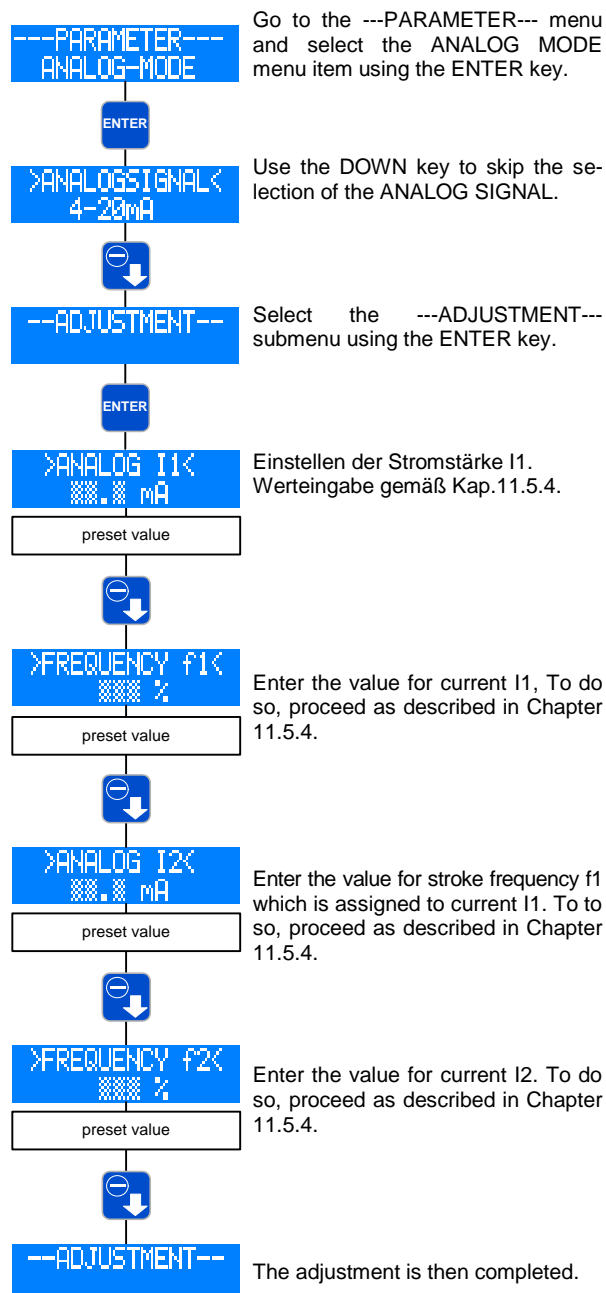
ADJUSTMENT of the analog signal

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 Fehler! Verweisquelle konnte nicht gefunden werden.).

Input 01 (see Chapter Fehler! Verweisquelle konnte nicht gefunden werden.) 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.

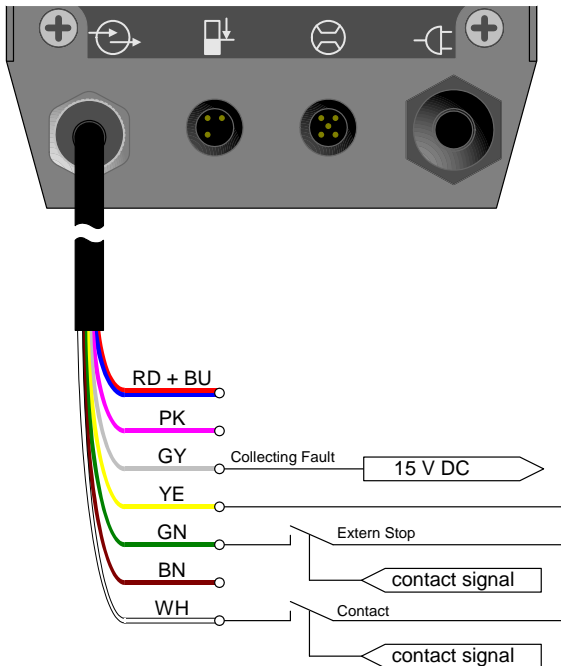


Fig. 47 (Connection of a pulse signal with External stop and response of the stroke signal)

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.

CAUTION !



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.**

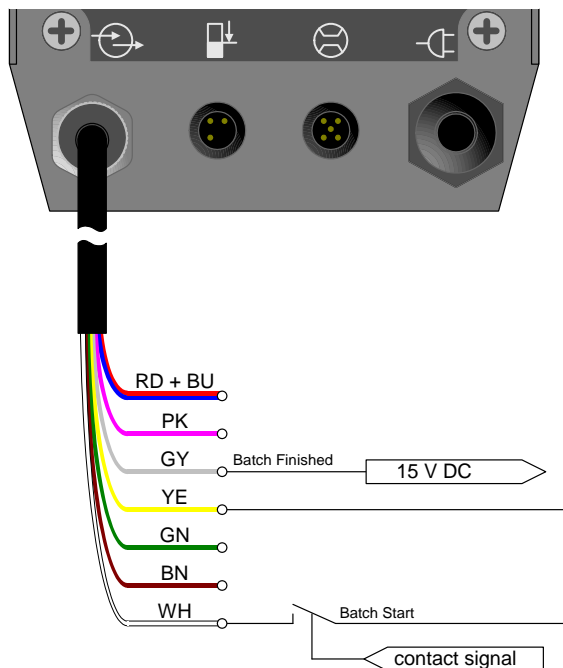


Fig. 48 (Possible connector pin assignment in batch mode)

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

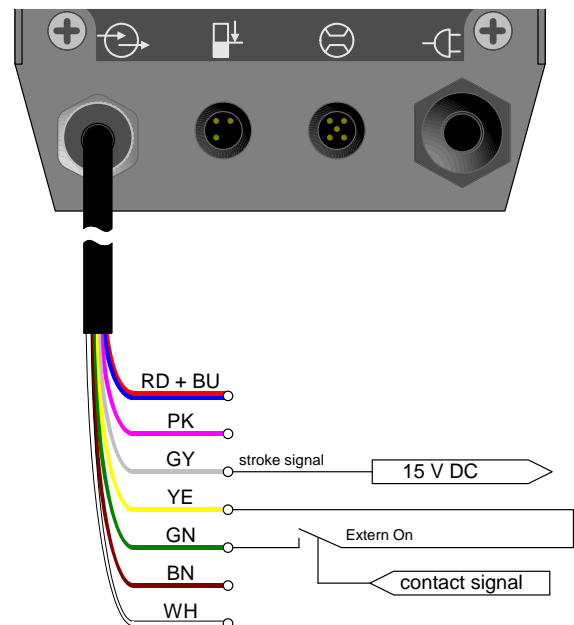


Fig. 49 (Possible connector pin assignment in External operation mode)

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.

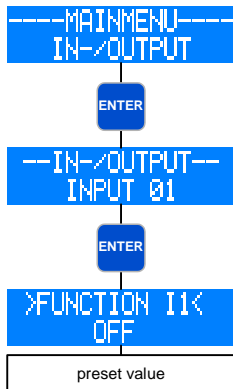
NOTE !

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.

CAUTION !



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

CAUTION !



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.

CAUTION !



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:

CAUTION !



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.

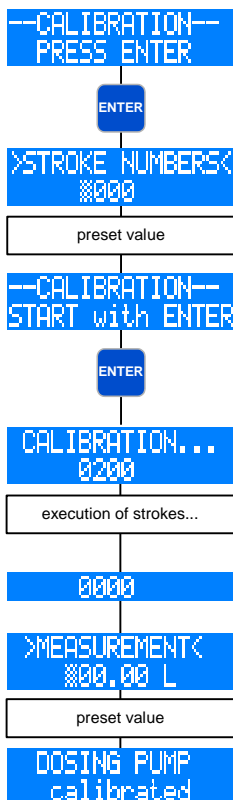
CAUTION !



Pay attention to the safety data sheet relating to the dosing medium!

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. 16, Chapter 11.4) can be restored. To do so, adjust YES.

CAUTION !



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

>SYSTEM TIME<

The system time must be adjusted manually.

CAUTION !



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 ! 

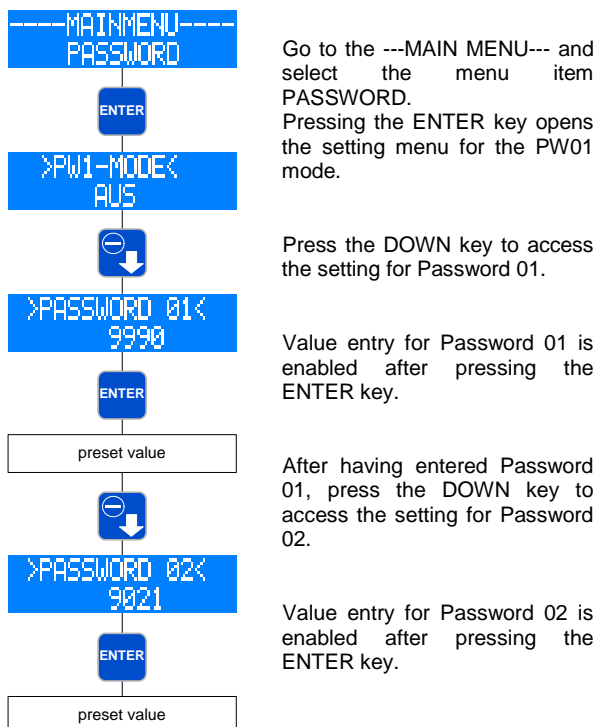
If, during the 1. password request (Level 01), password 02 has been entered, then Level 02 is also automatically activated.

CAUTION ! 

The passwords are factory set as follows:

- Password 01: 9990 (deactivated)
- Password 02: 9021 (cannot be deactivated!)

Setting diagram:



CAUTION ! 

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

CAUTION ! 

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 maximum 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).

CAUTION !



**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!

>SENSITIVITY<

NOTE !



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

This value must not be changed!

Operating instructions

11.15.4 Level monitoring

--EXTRAS--
LEVEL

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. 19 (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

CAUTION !



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.

CAUTION !



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/Table 07 "Installation".

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

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 function of the piston 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 piston diaphragm pump and replace the diaphragms (see Chapter 11.4).

The following parts are regarded as wearing parts of the piston diaphragm pump:

- intermediate diaphragms
- suction valve
- pressure valve

12.2 Spare parts

The following parts are regarded as spare parts of the piston diaphragm pump:

- pump body
- Manometer
- compensating valve
- piston
- cylinder and cylinder sleeve

Operating instructions

12.3 List of spare and wearing parts

12.3.1 Piston diaphragm pump ...409.2-...KM

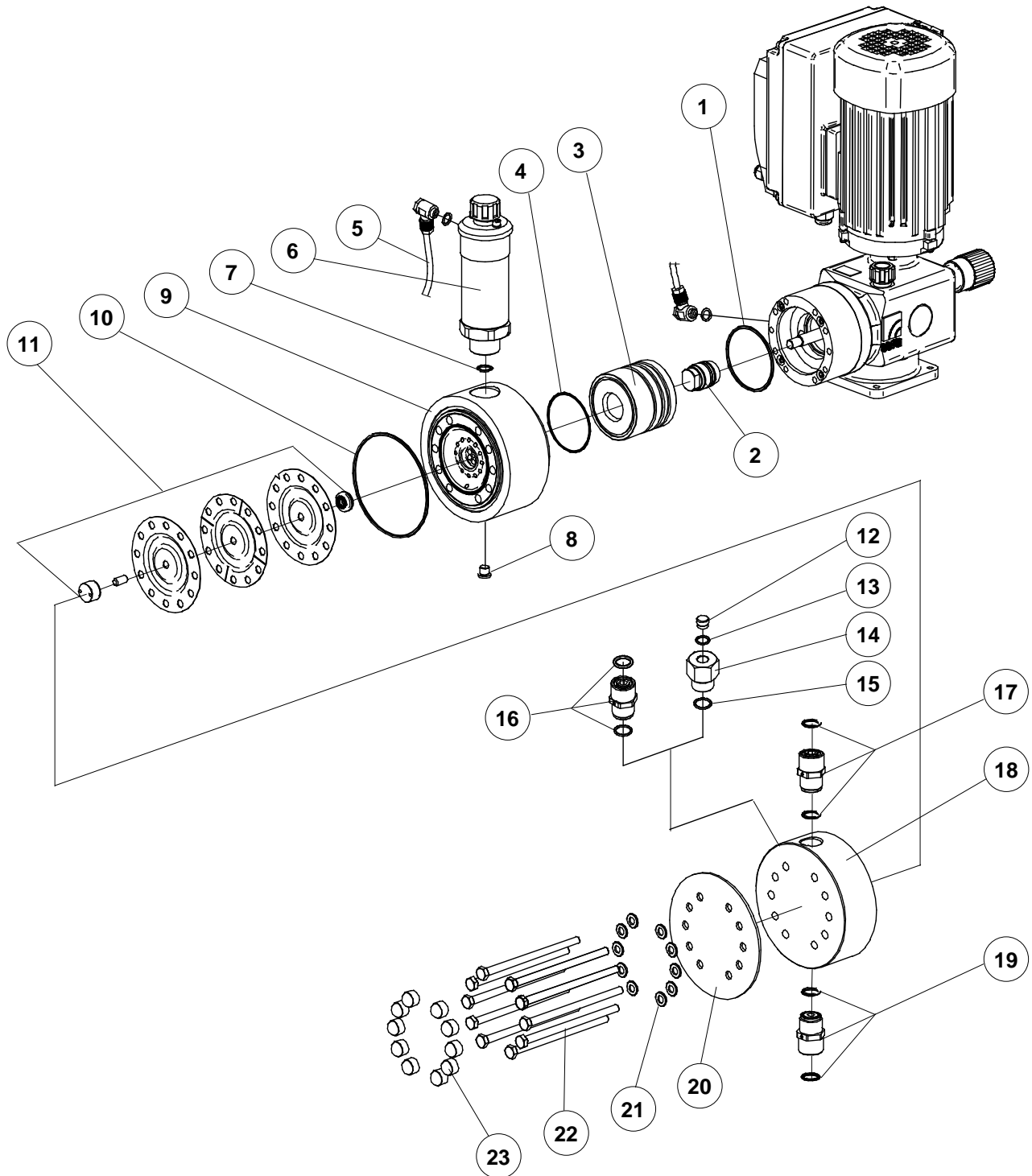


Fig. 50 List of spare and wearing parts

Operating instructions

Overview of spare and wearing part kits

Piston diaphragm pump ...409.2- ... KM

Hydraulic compensating valve	
Item	Designation
6	Hydraulic compensating valve, complete
5	Return line, complete
7	O-ring

Piston-Set	
2	Piston, complete

Cylinder kit	
Item	Designation
9	Cylinder
8	Screw plug

Cylinder bushing kit	
3	Cylinder bushing
1	O-ring
4	O-ring

Suction valve (kit)	
Item	Designation
19	Saugventil (inkl. O-Ringe)

Pressure valve (kit)	
Item	Designation
17	Druckventil (inkl. O-Ringe)

Diahpragm kit	
Item	Designation
11	Multi-layer diaphragm set
	Hydraulic oil

Pump body kit (Plastic)	
Item	Designation
18	Pump body
20	Front plate
21	Disk(s)
22	Hexagon nut(s)
23	Protective cap(s)

Pump body kit (Special steel)	
Item	Designation
18	Pump body
21	Disk(s)
22	Hexagon nut(s)
23	Protective cap(s)

Operating instructions

12.4 Replacing the diaphragm

12.4.1 General

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

CAUTION !



Prior to replacing the diaphragm, empty the pump and, if necessary, rinse it with appropriate fluid in order to avoid contact with aggressive and/or toxic media!

CAUTION !



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

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

12.4.2 Piston diaphragm pump

- Drain off hydraulic fluid by opening the screw plug and the vent screw and press on the blow valve using a screwdriver.
- Loosen nuts on the pump body.
- Remove pump body and front plate (not illustrated) to the front.

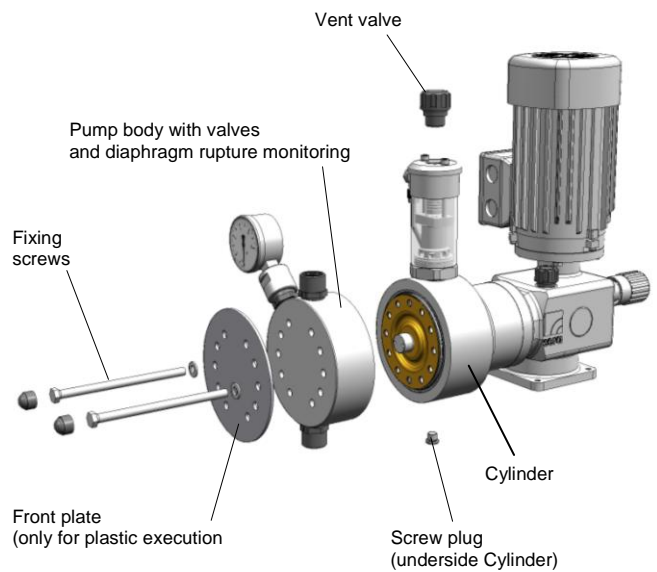


Fig. 51

- Remove intermediate diaphragm out of the cylinder.
- Check all components of the hydraulic system incl. the compensating valve for damage and soiling if these have come into contact with the medium in case of a diaphragm rupture.

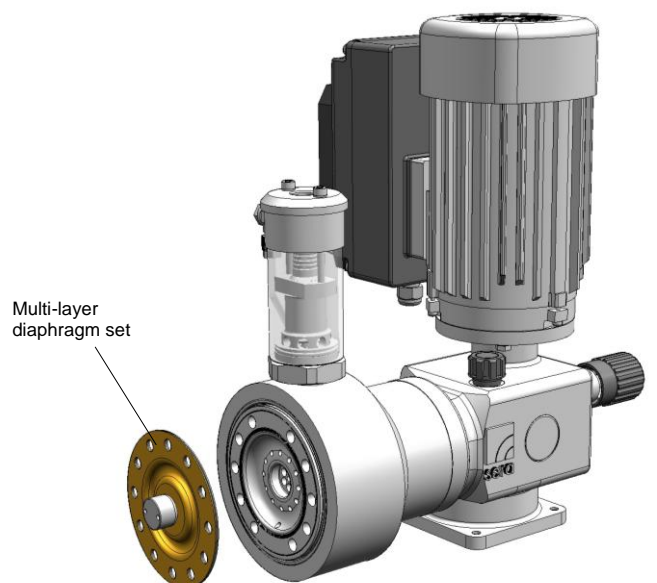


Fig. 52

Operating instructions

Assemble the pump in reverse order

- Insert the multi-layer diaphragm to the cylinder that the notch of protection diaphragm is in the direction of the cylinder. (see chapter 8.2.3.1)
- When assembling the pump body, please note: suction valve below, pressure valve above!
- Pay attention to tightening torques (see Chapter 9.1, Table 05). Secure the nut crosswise.
- Fill hydraulic fluid in store tank (type and quantity are indicated in Chapter 12.2)
- Set maximum stroke length.
- Fill hydraulic fluid in store tank and make sure not to over-fill in first stage.
- Start pump and press on blow valve with a screwdriver at each stroke of the pump. Hydraulic fluid is sucked in.
- Fill remaining hydraulic fluid in store tank.
- Press again on the blow valve with a screwdriver and repeat process until no bigger air bubbles escape from the hydraulic chamber.
- Switch pump off again.
- Screw in vent valve.

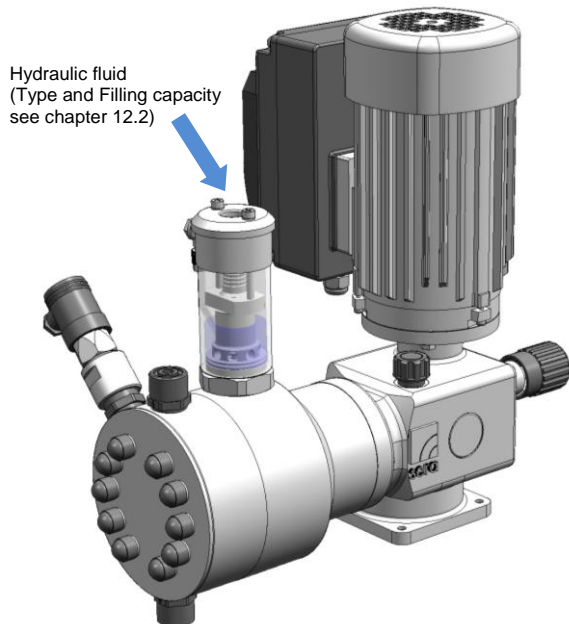


Fig. 53 Filling of the hydraulic fluid

- Reset stroke length to the initial value.
- Connect suction- and pressure line.

CAUTION !



Fill in new hydraulic fluid after every diaphragm change.

12.4.3 Ventilation after diaphragm replacement

Before reactivating the pump after a diaphragm replacement, remove the air between the diaphragm layers.

a) diaphragm rupture signalization by manometer or pressure switch:

- 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

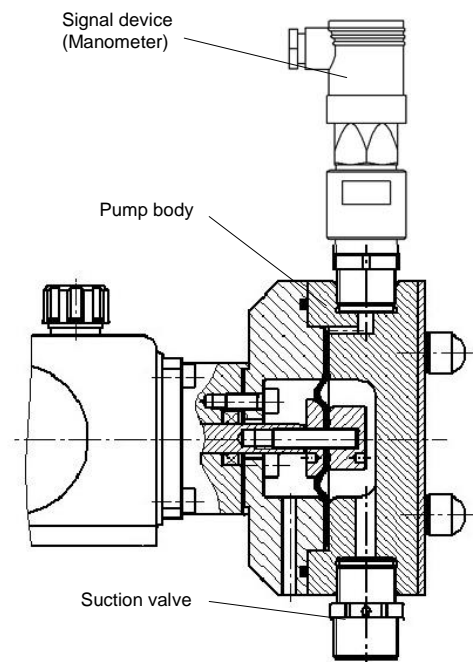


Fig. 54

Operating instructions

12.4.4 Setting the compensating valve

Blow valve and hydraulic discharge valve are factory-set to the values for suction height and counterpressure stated in the confirmation of order. If operating data on-site deviate from these values the compensating valve is to be reset according to the actual operating conditions while adhering to the maximum permissible pressures.

12.4.4.1 Blow valve

Set the spring tension of the blow valve with the rifle nut so that a stroke movement of appr. 0,5 to 1 mm is achieved at every suction stroke.

Proceed as follows when the pump is switched off:

- Put socket spanner on rifle nut and hold in place.
- Put smaller socket spanner through bigger socket spanner, loosen lock nut and remove socket spanner (see Fig 55).

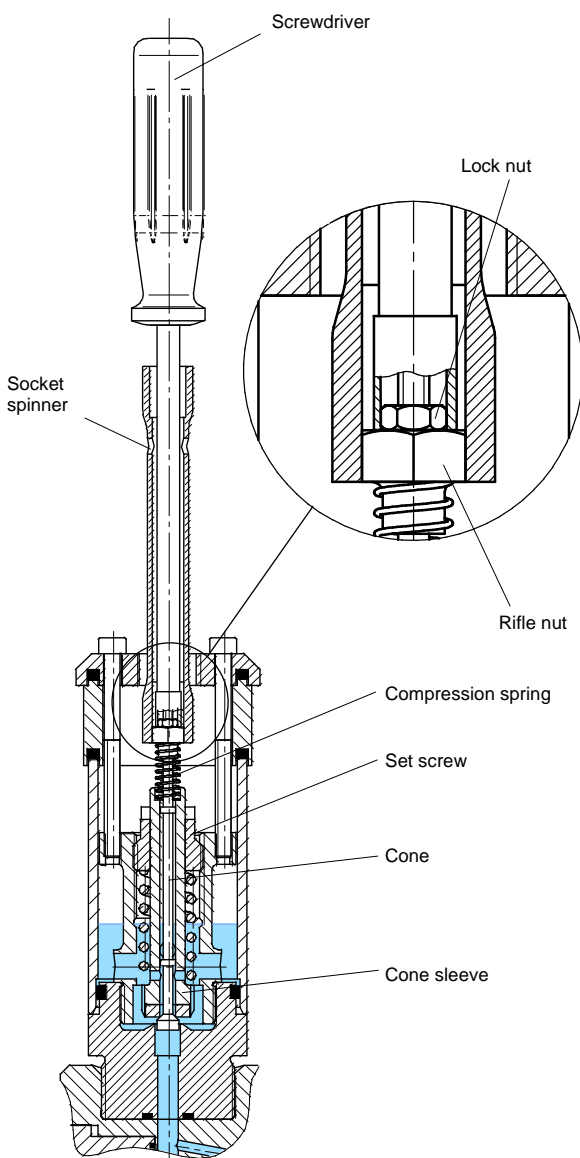


Fig. 55

- Secure cone of blow valve with a screwdriver against distortion and turn rifle nut using the socket spanner (see Fig. 56).

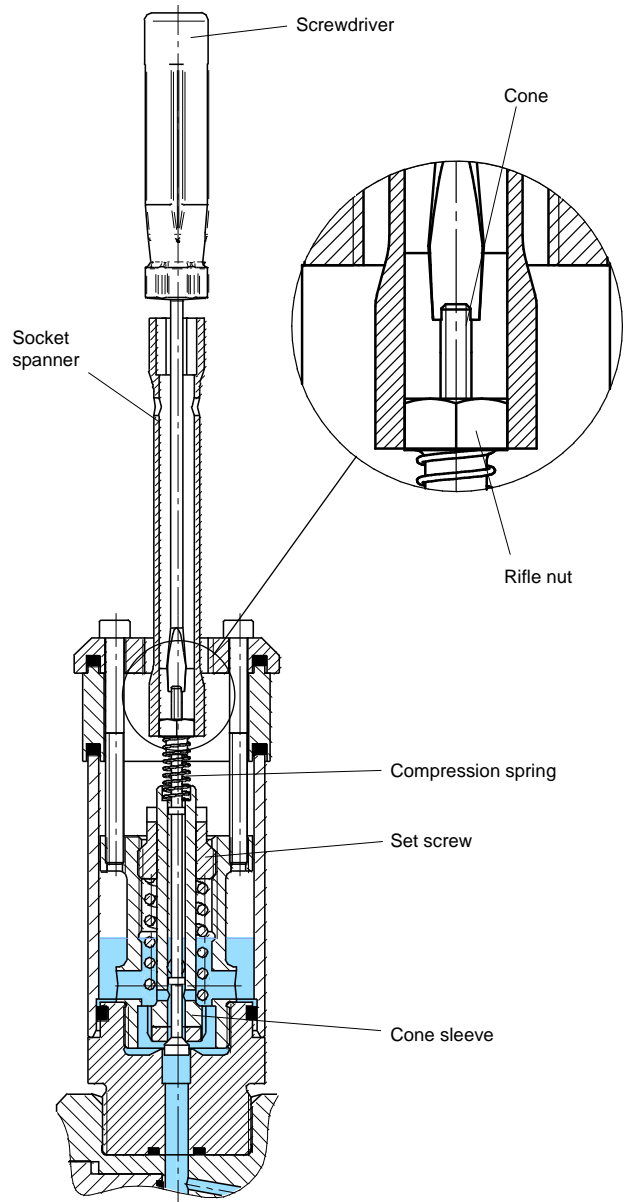


Fig. 56

Clockwise: spring tension is increased (= higher suction height)

Counterclockwise: spring tension is reduced (= lower suction height or supply)

- Remove socket spanner and screwdriver and switch pump on
(pump is operated within the system).
- Check correct stroke movement of the blow valve. If stroke movement is not correct, repeat setting and check stroke movement again.
- If the defined values are kept, switch pump off and tighten lock nut while holding the rifle nut in place.

Operating instructions

12.4.4.2 Hydraulic compensating valve

Set the pressure of the hydraulic compensating valve in such a way that it is appr. 10 – 15% higher than the maximum operating pressure of the system.

CAUTION !



The set pressure must not exceed the maximum permissible counterpressure of the pump.

Proceed as follows when the pump is switched on:

a) factory-set pressure too high:

- Turn slowly the adjusting screw anti-clockwise by means of an adjusting spanner with the pump running (see Fig. 57) until the fluid level in the store tank rises suddenly - > hydraulic discharge valve opens.

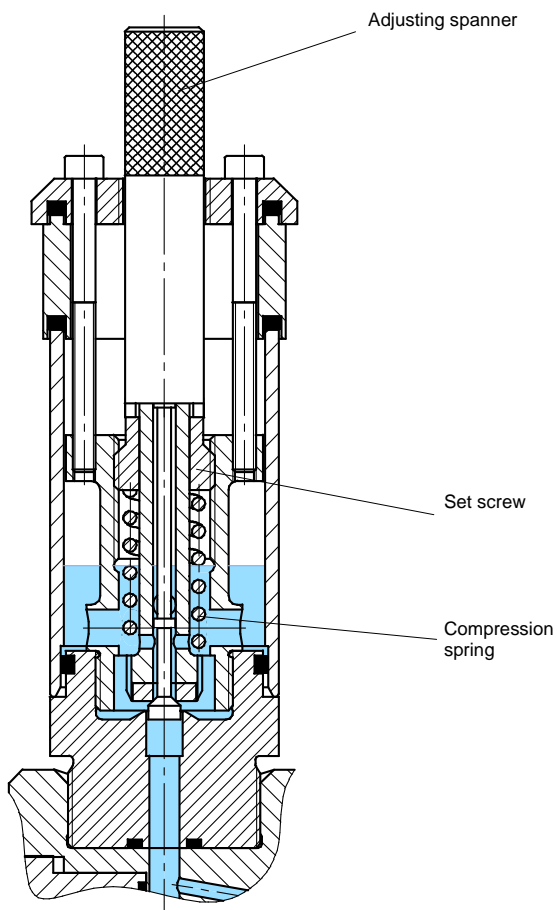


Fig. 57

CAUTION !



The adjusting screw of the hydraulic relief valve must never be screwed in such a way that the pressure spring is pressed together to solid length.

- Turn set screw slowly clockwise until the fluid level lowers again and reaches the level before opening.
- Turn the set screw a ½ turn further to the right. Hydraulic discharge valve is now set to the operating conditions.
- If a manometer is installed on the pump pressure side the set pressure can be checked via the manometer.

b) factory-set pressure too low (hydraulic fluid level rises in the store tank when the pump was switched on):

- Turn set screw slowly clockwise until the fluid level lowers again and reaches the level before the pump was switched on.
- Turn the set screw a ½ turn further to the right. Hydraulic discharge valve is now set to the operating conditions.
- If a manometer is installed on the pump pressure side the set pressure can be checked via the manometer.

CAUTION !



If an external discharge valve or a safety valve is installed on the pump pressure side the set pressure of the hydraulic discharge valve should be by 10% higher than the set pressure of the discharge / safety valve.

CAUTION !



The set pressure must not exceed the maximum counterpressure of the pump (see Chapter 7.2, Tab. 03).

CAUTION !



High dosing precision and a long service life of the piston diaphragm pump are ensured if the compensating valve (hydraulic discharge valve and blow valve) is set according to the operating conditions.

Operating instructions

12.5 Oil change

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

Change oil once a year.
To do so, proceed as follows:

- Unscrew vent screw.
- Prepare an appropriate container. Open screw plug and drain off oil.

- Close bore hole with screw plug (pay attention to packing ring).
- Fill oil in threaded hole of the vent screw.
- Oil type and quantity are specified in Chapter 12.1
- Screw in vent screw.

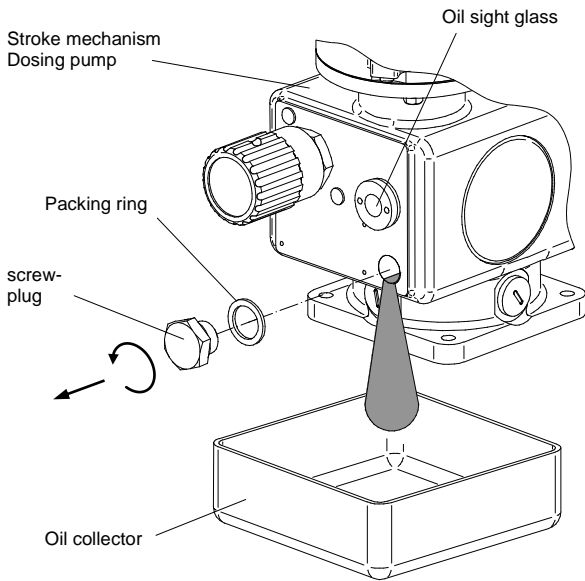


Fig. 58 . (Drain off oil)

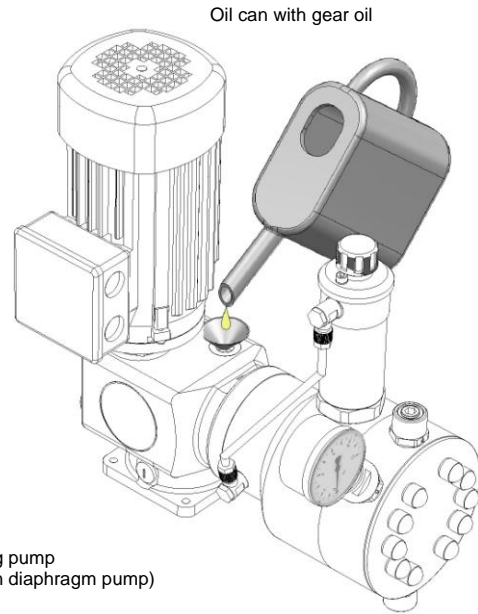


Fig. 59 . (Refilling oil)

13 Lubricants

13.1 Lubricant in stroke mechanism

Pump type	Specification	sera use	Quantity
C 409.2 – 7,5 KM	CLP VG 220 DIN51517-3	ARAL Degol BG220	0,3 Liter
C 409.2 – 10 KM			
C 409.2 – 12 KM			
C 409.2 – 18 KM			
C 409.2 – 30 KM			
C 409.2 – 45 KM			
C 409.2 – 70 KM			
C 409.2 – 95 KM			
C 409.2 – 135 KM			
C 409.2 – 190 KM			

Tab. 12 Lubricant in stroke mechanism

Operating instructions

13.2 Hydraulic fluid

Pump type	Hydraulic fluid	Quantity
C 409.2 – 7,5 KM	Silicone oil AK100 or Paraffin oil P180	50 cm ³
C 409.2 – 10 KM		50 cm ³
C 409.2 – 12 KM		50 cm ³
C 409.2 – 18 KM		50 cm ³
C 409.2 – 30 KM		120 cm ³
C 409.2 – 45 KM		120 cm ³
C 409.2 – 70 KM		120 cm ³
C 409.2 – 95 KM		120 cm ³
C 409.2 – 135 KM		150 cm ³
C 409.2 – 190 KM		150 cm ³

Tab. 13 Hydraulic fluid

14 Fault analysis and corrective action

sera products are sophisticated technical products which are only shipped after a comprehensive test.

Faults which should occur can be easily recognized and corrected with the help of the notes in table 14-16.

Operating instructions

14.1 Fault analysis and corrective action

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!	Diaphragm rupture!		
	●								●	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.
							●			Counter-pressure too high	Measure pressure with manometer directly above pressure valve and compare with permissible counter-pressure
							●			Shut-off valves in pipe closed	Open shut-off valves or check opening – check pump for damage
									●	Drive diaphragm defective	Replace drive diaphragm
●										Breakdown supply voltage by mode of operation „Charge-Timer“	System time adjustment

Tab. 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
●	●	●	●										Compensating valve not adjusted to operating conditions	Set compensating valve according to operating conditions
●	●	●	●	●									Air in buffer fluid chamber or buffer fluid level too high or too low	Check buffer fluid level and refill, see Chapter 11.4.3

Tab. 16 (Fehleranalyse und –Behebung)

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 destroyed.

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.
- Wrong setting of the hydraulic compensating valve.

15.4 Operation

- Fault message ignored → faulty dosing / process error.
- Setting of the hydraulic compensating valve misadjusted.
- 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.

Operating instructions

15.5 Maintenance/Repair

- Works carried out which are not described in the operating instructions (works on the stroke mechanism and the built-in 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.

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 electronics.

16 Shut-down

Switch off piston diaphragm pump.

Rinse pump head and remove pumped medium; make sure that the rinsing agent is suitable for pumped medium and pump head.

17 Disposal

Shut-down system. Please see "Shut-down".

17.1 Dismantling and transport

- Remove all fluid residues from pump body, clean thoroughly, neutralize and decontaminate.
- Package unit and ship.

17.2 Complete disposal

- Remove all fluid residues from unit.
- Drain off lubricants and dispose of according to regulations!
- Dismount materials and send them to a suitable waste disposal company!

CAUTION !



The consignor is responsible for leaking lubricants or fluids!

- Pressure switch (Type 0186)

Bedienungsanleitung	Operating instructions
Für künftige Verwendung aufbewahren	Please keep carefully for future use
<p>Membran-/ Kolbendruckschalter</p> <p style="text-align: right; font-size: 2em;">D</p> <p>Baureihe 0180 / 0181 Baureihe 0186 / 0187</p> <p>Einbau und Inbetriebnahme sind nach dieser Bedienungsanleitung und nur von autorisiertem Fachpersonal vorzunehmen</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <div style="text-align: center; margin: 10px 0;">   </div> <p>Robert-Scheuffele GmbH & Co. KG Keplerstraße 12-14 D-74321 Bietigheim-Bissingen Telefon (07142) 597-0 Telefax (07142) 597-19 www.suco.de E-Mail info@suco.de</p>	<p>Diaphragm-/ Piston Pressure Switch</p> <p style="text-align: right; font-size: 2em;">GB</p> <p>Series 0180 / 0181 Series 0186 / 0187</p> <p>Installation and commissioning must be carried out in accordance with these operating instructions and by authorized, qualified personnel only.</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <div style="text-align: center; margin: 10px 0;">   </div> <p>Robert-Scheuffele GmbH & Co. KG Keplerstraße 12-14 D-74321 Bietigheim-Bissingen Telephone (07142) 597-0 Telecopy (07142) 597-19 www.suco.de e-mail info@suco.de</p>
Funktion und Anwendung	Operating and use
<p>Die Baureihe 0180 / 0181 und 0186 / 0187 öffnet oder schließt einen elektrischen Stromkreis beim Erreichen eines einstellbaren Druckwerts. Durch das Ansteigen des Drucks wird eine Membrane bzw. ein Kolben bewegt. Die Auslenkung Membrane bzw. der Hub des Kolbens hängt von der Druckkraft und der einstellbaren Federvorspannung ab. Bei einer definierten Auslenkung der Membrane bzw. einem definierten Hub des Kolbens wird ein Mikroschalter betätigt, der die elektrischen Kontakte öffnet bzw. schließt (Wechsler).</p> <p> Der Druckschalter überwacht einen eingestellten Druckwert.</p>	<p>The series 0180 / 0181 and 0186 / 0187 switch opens or closes an electrical circuit when a certain (adjustable) pressure is reached. A diaphragm or piston is moved by the increase in pressure. The amount of the diaphragm deflection or piston travel depends on the force of the pressure applied and the (adjustable) spring tension. At a predetermined deflection of the diaphragm or movement of the piston, a micro switch is actuated which opens or closes the electrical contacts (changeover).</p> <p> The pressure switch monitors a preset pressure.</p>
Voraussetzungen für den Produkteinsatz	Conditions governing the use of the product
<p>Allgemeine, stets zu beachtende Hinweise für den ordnungsgemäßen und sicheren Einsatz des Druckschalters:</p> <p> • Halten Sie die angegebenen Grenzwerte wie z.B. Drücke, Kräfte, Momente und Temperaturen ein.</p> <p>• Berücksichtigen Sie die vorherrschenden Umgebungsbedingungen (Temperatur, Luftfeuchte, Luftdruck etc.).</p> <p>• Beachten Sie die Vorschriften der Berufsgenossenschaften, des Technischen Überwachungsvereins (TUV) oder die entsprechenden nationalen Bestimmungen.</p> <p>• Beachten Sie unbedingt die Warnungen und Hinweise in der Bedienungsanleitung.</p> <p>• Setzen Sie den Druckschalter niemals starken Stößen oder Vibrationen aus.</p> <p>• Verwenden Sie das Produkt nur im Originalzustand. Nehmen Sie keine eigenmächtige Veränderungen vor.</p> <p>• Entfernen Sie die alle Transportvorkehrungen wie Schutzfolien, Kappen oder Kartonagen.</p> <p> • Die Entsorgung der einzelnen Werkstoffe in Recycling-Sammelbehältern ist möglich.</p>	<p>The following general instructions are to be observed at all times to ensure the correct, safe use of the pressure switch:</p> <p> • Do not exceed the specified limits for e.g. pressures, forces, moments or temperatures under any circumstances.</p> <p>• Give due consideration to the prevailing ambient conditions (temperatures, atmospheric humidity, atmospheric pressure, etc.).</p> <p>• Observe the applicable safety regulations laid down by the regulatory bodies in the country of use.</p> <p>• Observe without fail the warning notices and other instructions laid down in the operating instructions.</p> <p>• Never subject pressure switch to intense blows or high vibrations.</p> <p>• Never expose the pressure switch to severe side impacts or vibrations.</p> <p>• Use the product only in its original condition. Do not carry out any unauthorized modifications.</p> <p>• Remove all items providing protection in transit such as foils, caps or cartons.</p> <p> • Disposal of the above-named materials in recycling containers is permitted.</p>

Diaphragm rupture monitoring:

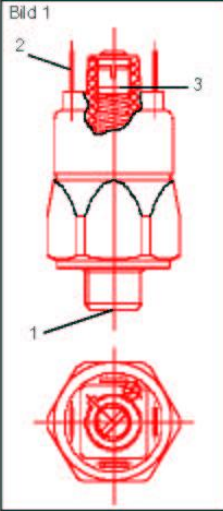
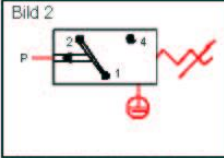
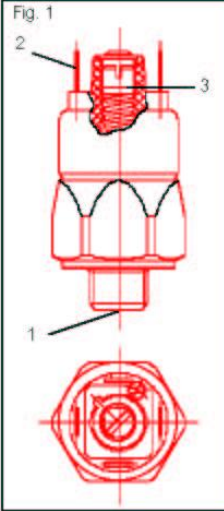
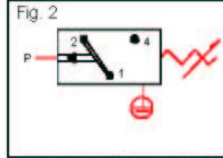
- Pressure switch (Type 0186)

Operating instructions

Betriebsbedingungen			Operating conditions		
<p>Bei Medientemperaturen außerhalb der Raumtemperatur (20°C):</p> <p>Extreme Temperatureinflüsse (abweichend von der Raumtemperatur) können zu einer starken Schaltpunktabweichung oder zum Ausfall des Druckschalters führen</p> <p><u>Schutzart IP65:</u></p> <p>Die Typenprüfung ist nicht uneingeschränkt auf alle Umweltbedingungen übertragbar.</p> <p>Die Überprüfung, ob die Steckverbindung anderen als den angegebenen Bestimmungen und Vorschriften entspricht bzw. ob diese in speziellen, von uns nicht vorgesehenen Anwendungen eingesetzt werden kann, obliegt dem Anwender.</p> <p><u>Sauerstoffeinsatz:</u></p> <p>Membrandruckschalter: Beim Einsatz von Sauerstoff sind die einschlägigen Unfallverhütungsvorschriften zu beachten. Außerdem empfehlen wir, einen maximalen Betriebsdruck von 10 bar nicht zu überschreiten.</p> <p>Kolbendruckschalter: Kolbendruckschalter sind für gasförmige Medien, insbesondere für Sauerstoff nicht geeignet.</p> <p><u>Überdrucksicherheit:</u></p> <p>In den Technischen Daten ist die statische Überdrucksicherheit angegeben. Sie bezieht sich auf den hydraulischen bzw. pneumatischen Teil des Druckschalters. Der dynamische Wert ist 30 bis 50 % niedriger.</p>			<p>Media temperatures other than room temperature (20°C):</p> <p>The effects of extreme temperatures (relative to the room temperature) can lead to pronounced variations in the switching point or failure of the pressure switch.</p> <p><u>Type of protection IP65:</u></p> <p>Type testing does not apply to all ambient conditions without limitations. The user is responsible for verifying that the plug-and-socket connection complies with the specified rules and regulations of CE, or whether it may be used for specialized purposes other than those intended by us.</p> <p><u>Use with oxygen:</u></p> <p>Diaphragm pressure switch: If oxygen is used, the applicable accident prevention regulations must be observed. In addition, we recommend a maximum operating pressure of 10 bars, which should not be exceeded.</p> <p>Piston pressure switch: Piston pressure switches are not suitable for gaseous media, particularly oxygen.</p> <p><u>Protection against overpressure:</u></p> <p>The static overpressure safety is included in the technical data. The overpressure safety corresponds to the hydraulic, pneumatic part of the pressure switch. The dynamic rating of the overpressure safety is smaller than 30 to 50%.</p>		
Technische Daten			Technical data		
Bemessungs- triebsspannung U_e	Bemessungs- triebsstrom I_e	Gebrauchs- kategorie	Rated operating voltage U_e	Rated operating current I_e	Utilization category
250 Volt AC 50/60 Hz	4 Ampere	AC12	250 Volt AC 50/60 Hz	4 Amps	AC12
250 Volt AC 50/60 Hz	1 Ampere	AC14	250 Volt AC 50/60 Hz	1 Amp	AC14
30 Volt DC	4 / 4 Ampere	DC12 / DC13	30 Volt DC	4 / 4 Amps	DC12 / DC13
50 Volt DC	2 / 1 Ampere	DC12 / DC13	50 Volt DC	2 / 1 Amp	DC12 / DC13
75 Volt DC	1 / 0,5 Ampere	DC12 / DC13	75 Volt DC	1 / 0,5 Amp	DC12 / DC13
125 Volt DC	0,3 / 0,2 Ampere	DC12 / DC13	125 Volt DC	0,3 / 0,2 Amp	DC12 / DC13
250 Volt DC	0,25 / 0,2 Ampere	DC12 / DC13	250 Volt DC	0,25 / 0,2 Amp	DC12 / DC13
Bemessungsisolationsspannung U_i	300 Volt		Rated insulation voltage U_i	300 volts	
Bemessungsstoßspannungsfestigkeit U_{imp}	2,5 kV		Rated surge capacity U_{imp}	2,5 kV	
konventioneller thermischer Strom I_{th}	5 Ampere		Rated thermal current I_{th}	5 Amps	
Schaltüberspannung:	< 2,5 kV		Switching over voltage:	< 2,5 kV	
Bemessungsfrequenz:	DC und 50 / 60 Hz		Rated frequency:	DC and 50 / 60 Hz	
Nennstrom der Kurzschlussleinrichtung:	bis 5 Ampere		Rated current of short-circuit protective device:	Up to 5 Amps	
Bedingter Kurzschlussstrom:	< 350 Ampere		Rated short-circuit current:	< 350 Amps	
IP-Schutzart nach EN 60 529:1991:	IP65 mit Stecker		IP protection to EN 60 529:1991:	IP65 with plug	
Anzugsdrehmoment der Anschlussschrauben:	< 0,35 Nm		Tightening torque for terminal screws:	< 0,35 Nm	
Anschlussquerschnitt:	0,5 bis 1,5 mm ²		Connection size:	0,5 to 1,5 mm ²	
Schalzhäufigkeit:	< 200 min ⁻¹		Operating frequency:	< 200 per min ⁻¹	
Schalthysterese:	10-30%, im Werk einstellbar		Switching hysteresis:	10-30% adjustable by the factory	
mechanische Lebensdauer:			mechanical life:		
Membranausführung:	10 ⁶ Schaltspiele (bei Schaltdrücken bis 40 bar)		Diaphragm type:	10 ⁶ operation cycles (at trip pressure up to 40 bars)	
Kolbenausführung:	10 ⁶ Schaltspiele		Piston type:	10 ⁶ operation cycles	
Gehäusewerkstoff:	verzinkter Stahl (Fe/Zn120C)		Body material:	Zinc plated steel (Fe/Zn120C)	
Temperaturbeständigkeit:	NBR -30°C bis +100°C EPDM -30°C bis +120°C FKM -5°C bis +120°C		Temperature range:	NBR -30°C to +100°C EPDM -30°C to +120°C FKM -5°C to +120°C	
Überdrucksicherheit:			Over pressure safety:		
Membrandruckschalter:	100 bar (0,3...1,5 bar, 1...10 bar) 300 bar (1...10 bar m. Endnummer 040, 041, 042, 340, 341, 342 und restliche Druckbereiche)		Diaphragm pressure switch:	100 bars (0,3 to 1,5 bar, 1 to 10 bar) 300 bars (1 to 10 with end number 040, 041, 042, 340, 341, 342 and residual pressure range)	
Kolbendruckschalter:	600 bar		Piston pressure switch:	600 bars	

- Pressure switch (Type 0186)



















Operating instructions

Bedienteile und Anschlüsse	Operating controls and connections																
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Bild 1</p>  </div> <div style="width: 45%;"> <p>Bild 2</p>  <p>(1) Hydraulischer / Pneumatischer Anschluss (2) Elektrischer Anschluss (AMP 6,3x0,8) (3) Einstellschraube für den Schaltpunkt</p> </div> </div>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Fig. 1</p>  </div> <div style="width: 45%;"> <p>Fig. 2</p>  <p>(1) Hydraulic / Pneumatic connection (2) Electrical connection (AMP 6,3x0,8) (3) Switching point adjusting screw</p> </div> </div>																
<p>Einbau</p> <p><u>Mechanisch, pneumatisch, hydraulisch:</u> Drehen Sie den Druckschalter an dem sechskantförmigen Ansatz mit einem Maulschlüssel der Schlüsselweite 27 (nach DIN 894 o. ä.) in den vorgesehenen Druckanschluss (Anzugsdrehmomente siehe nachfolgende Tabelle).</p> <p>➡ Zum Abdichten des Systems verwenden Sie einen Standard-Kupferdichtung mit den entsprechenden Abmessungen.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Anschlussgewinde</th> <th>Drehmoment</th> </tr> </thead> <tbody> <tr> <td>M10x1keg. und NPT1/8"</td> <td>Einschrauben bis System abgedichtet ist</td> </tr> <tr> <td>M10x1zyl.</td> <td>35 Nm</td> </tr> <tr> <td>Restliche</td> <td>50 Nm</td> </tr> </tbody> </table> <p><u>Elektrisch:</u> Verkabeln Sie den Druckschalter gemäß dem Schaltbild (Bild 2).</p> <p>➡ Verwenden Sie die Gerätesteckdose 1-1-80-652-002 (nicht im Lieferumfang enthalten).</p>	Anschlussgewinde	Drehmoment	M10x1keg. und NPT1/8"	Einschrauben bis System abgedichtet ist	M10x1zyl.	35 Nm	Restliche	50 Nm	<p>Installation</p> <p><u>Mechanical / pneumatic / hydraulic:</u> With a size 27 open-ended wrench (to DIN 894 or similar), install the pressure switch, by means of the hexagon connector, in the corresponding pressure socket (tightening torque G1/4": 50 Nm).</p> <p>➡ For sealing the system use a standard copper gasket of the appropriate dimensions.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Connecting thread</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>M10x1keg. and NPT1/8"</td> <td>Tighten until system is hermetically sealed</td> </tr> <tr> <td>M10x1 straight</td> <td>35 Nm</td> </tr> <tr> <td>Others</td> <td>50 Nm</td> </tr> </tbody> </table> <p><u>Electrical:</u> Connect up the pressure switch in accordance with the cruit diagram (Fig. 2).</p> <p>➡ Use a connector type 1-1-80-652-002 (not include in the delivery specification).</p>	Connecting thread	Torque	M10x1keg. and NPT1/8"	Tighten until system is hermetically sealed	M10x1 straight	35 Nm	Others	50 Nm
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Diaphragm rupture monitoring:

- Pressure switch (Type 0186)

Operating instructions

<p>Inbetriebnahme</p> <ol style="list-style-type: none"> 1. Verkabeln Sie die elektrischen Anschlüsse 1 und 4 mit einem Durchgangsprüfer (Bild 2). <p> Bei Verwendung einer Prüflampe als Durchgangsprüfer: Achten Sie auf die max. zulässige Schaltleistung (siehe technische Daten).</p> <ol style="list-style-type: none"> 2. Drehen Sie die Einstellschraube (3) zunächst ganz ein. Verwenden Sie zum Einstellen des Druckschalters einen Schraubendreher mit 6,3 mm Klingenbreite. <p> Beachten Sie bitte, dass die Einstellschraube (3) nur beim Eindrehen einen Anschlag besitzt.</p> <ol style="list-style-type: none"> 3. Beaufschlagen Sie den Druckschalter mit dem gewünschten Schalldruck (Kontrollmanometer erforderlich). 4. Drehen Sie die Einstellschraube (3) so weit heraus, bis der Druckschalter umschaltet (Durchgangsprüfer reagiert). 5. Korrigieren Sie gegebenenfalls den Schalldruck durch Verdrehen der Einstellschraube (3). <p> Bei der Inbetriebnahme des Druckschalters beachten Sie bitte die entsprechenden Sicherheitsvorschriften der Berufsgenossenschaften oder die entsprechenden nationalen Bestimmungen.</p> <p> Die Einstellung der Hysterese ist nur werkseitig durchführbar. Bei unsachgemäßer Vorgehensweise kann der Druckschalter beschädigt werden.</p>	<p>Entry into service</p> <ol style="list-style-type: none"> 1. Using a continuity tester, wire up the electrical connections 1 and 4 (Fig. 2). <p> If using a testing lamp as a continuity tester, observe the maximum permissible switching capacity (see technical data)</p> <ol style="list-style-type: none"> 2. First, screw in the adjusting screw (3) as far as it will go. To adjust the pressure switch use a screwdriver with a 6,3 mm wide blade. <p> Take care to ensure that the adjusting screw (3) does not seize at any point other than when it is fully tightened down.</p> <ol style="list-style-type: none"> 3. Adjust the pressure switch to the desired actuating pressure (a test pressure gauge is required). 4. Ease off the adjusting screw (3) to a sufficient extent to cause the pressure switch to trip (continuity tester reacts). 5. If necessary, adjust the trip pressure setting by turning the adjusting screw (3). <p> When putting the pressure switch into service, please observe the applicable safety regulations laid down by the governing bodies in the country of use.</p> <p> The adjustment of Hysteresis can only be carried out in the factory. If this is inexpertly undertaken, damage may be caused to the pressure switch.</p>
<p>Ausbau</p> <p> Beachten Sie folgende wichtige Punkte beim Ausbau des Druckschalters:</p> <ul style="list-style-type: none"> • Das Drucksystem, aus dem der Druckschalter ausgebaut werden soll, muss sich in drucklosem Zustand befinden. • Es müssen alle relevanten Sicherheitsbestimmungen beachtet werden. • Drehen Sie den Druckschalter mit einem Maulschlüssel der Schlüsselweite 27 (nach DIN 894 o.ä.) aus dem Druckanschluss. 	<p>Removing the pressure switch</p> <p> When removing the pressure switch, observe the following important instructions:</p> <ul style="list-style-type: none"> • The pressurized system from which the pressure switch is intended to be removed must be entirely of pressure. • All the relevant safety regulations must be observed. • Use a size 27 open-ended wrench (to DIN 894 or similar), to remove the pressure switch.
<p>Zeichenerklärung</p> <p> Achtung  Hinweis, Bemerkung  Recycling  Gefahr</p>	<p>Key to drawings:</p> <p> Caution  Note  Recycling  Danger</p>
<p>Art.-Nr.: 1-1-80-628-014_2 06 / 02</p>	<p>Art.-No.: 1-1-80-628-014_2 06 / 02</p>

Operating instructions

Notes

