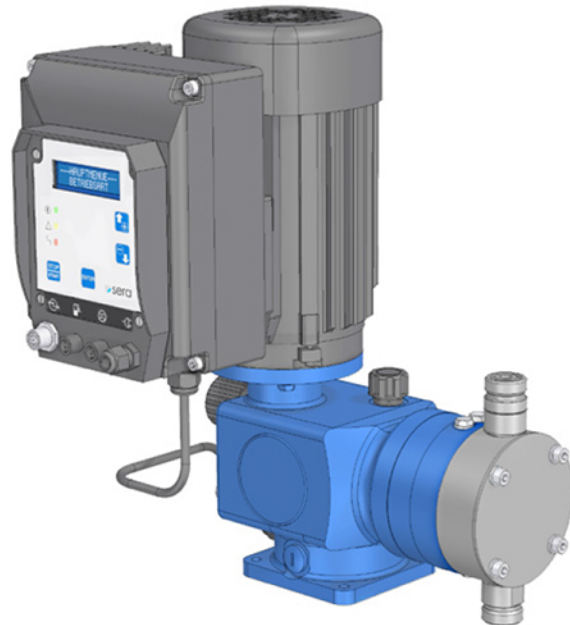


C/CS 409.2

Operating instructions

Controllable diaphragm pump

- C409.2 - 0,8 e
- C409.2 - 1,6 e
- C409.2 - 2,4 e
- C409.2 - 4,0 (e)
- C409.2 - 7,0 (e)
- C409.2 - 12 (e)
- C409.2 - 18 (e)
- C409.2 - 25 (e)
- C409.2 - 50 (e)
- C409.2 - 75 (e)
- C409.2 - 90 (e)
- C409.2 - 115 (e)
- C409.2 - 140 (e)
- C409.2 - 180 (e)
- C409.2 - 250 (e)
- C409.2 - 350 (e)



Self ventilating controllable diaphragm pump

- CS409.2 - 0,8 e
- CS409.2 - 1,6 e
- CS409.2 - 2,4 e
- CS409.2 - 4,0 (e)
- CS409.2 - 7,0 (e)
- CS409.2 - 12 (e)
- CS409.2 - 18 (e)
- CS409.2 - 25 (e)



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 Germany
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 Fax: +49 5673 999-01

info@sera-web.com
www.sera-web.com

Keep the operating manual for future use!

Record the exact type and serial number here.
 (can be read off the type plate on the pump)

Type :

Serial No. :

These data are important in the case of queries or for ordering spare and/or wear parts and must always be stated.

Operating instructions

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Operating instructions

Q. Quickstart

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



INFO!

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

Q.1 Power connection

The sera diaphragm pump is delivered ready for installation. Standard delivery includes a 2m power cable with Euro plug. The standard version C 409.2 is designed for an operating voltage range of 210 – 250 V, 50/60 Hz.



ATTENTION!

The self-venting version CS 409.2 has a limited operating voltage range. The specifications on the type plate must absolutely be adhered to!

The CS 409.2 is available in three versions:

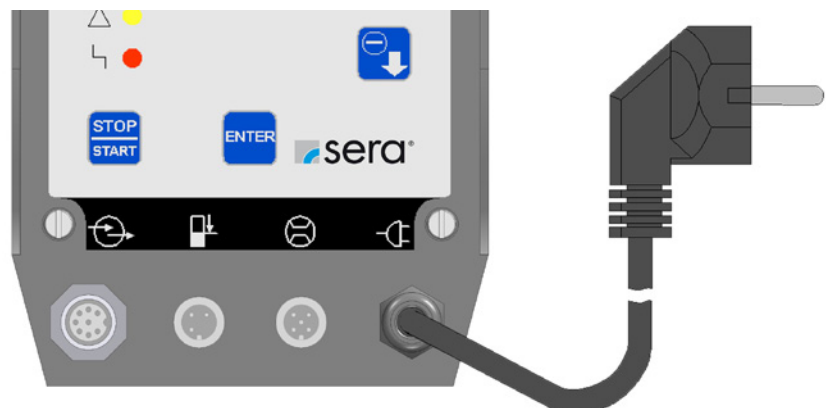
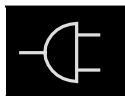
- 210 – 250 V, 50/60 Hz
- 100 – 120 V, 50 Hz
- 100 – 120 V, 60 Hz



ATTENTION!

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:



ATTENTION!

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

Q.2 Control elements

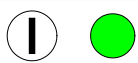


1	STOP/START key
2	LED operation indications
3	LCD-display
4	UP key
5	DOWN key
6	ENTER key

Q.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 (cp. table "Overview LED Operation Indicator" in chapter "LED Operation Indicator"). 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 (cp. table "Overview LED Operation Indicator" in chapter "LED Operation Indicator"). The fault is not only indicated by the LED but also as plain text in the LCD display.

Q.4 Key operation

Operation of the pump is performed with 4 keys:

STOP/START key



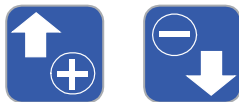
After connection to the power supply, the pump is switched ON/OFF using the STOP/START key.

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.

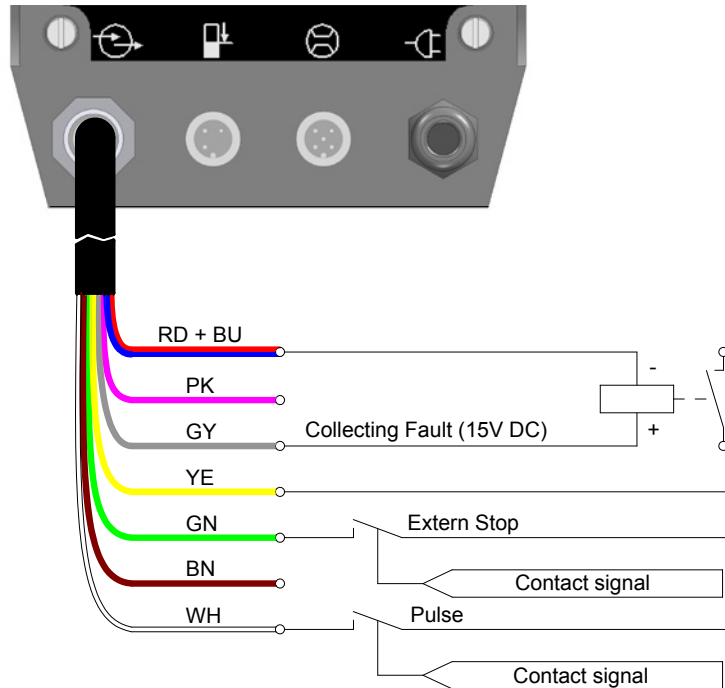
Q.5 Factory settings

The factory setting of the pump electronics is specified in Chapter "Parameter table".

Q.6 Control inputs and outputs

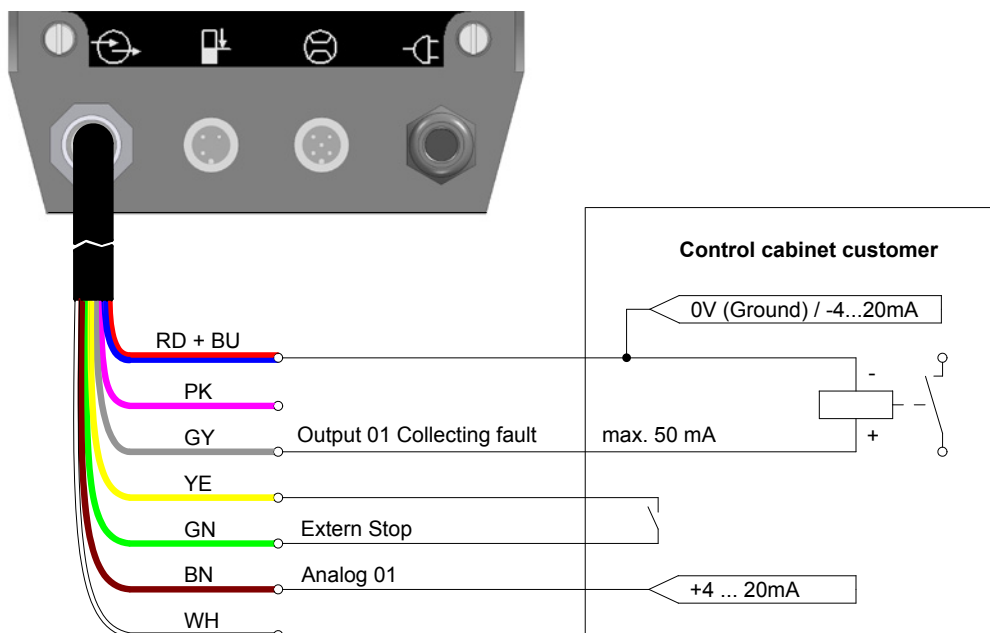
Q.6.1 Control via contact signal

Figure: "Control of digital inputs via a potential-free contact signal and control of a relay via an output of the dosing pump"



Q.6.2 Control via analog signal

Figure: "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"



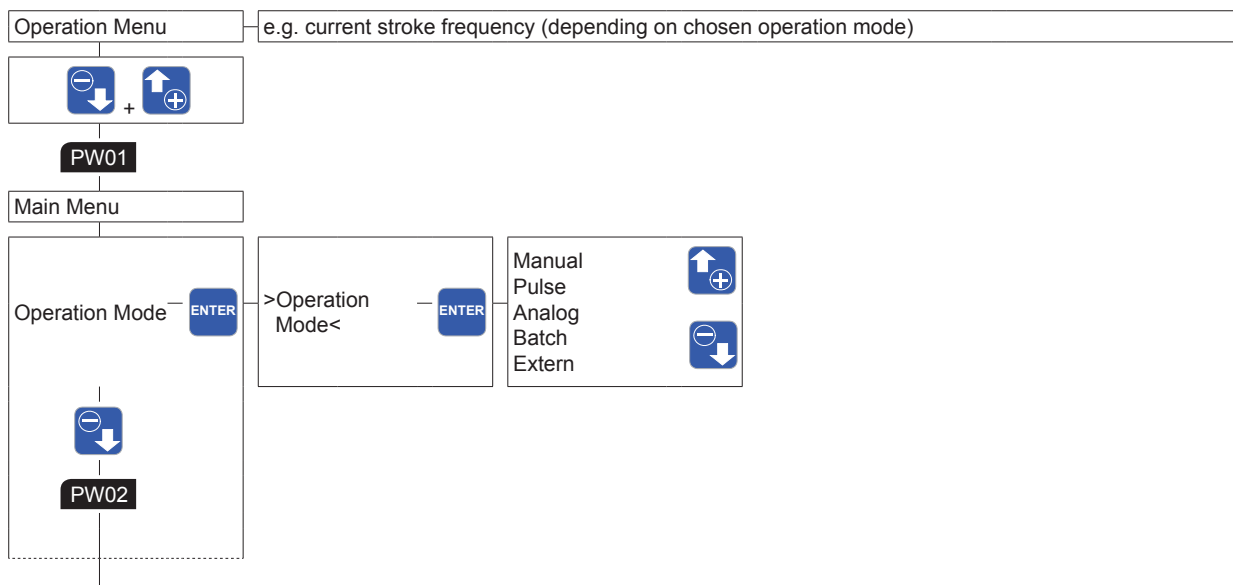
C/CS 409.2

Operating instructions

Q.7 Selecting the operating mode

Proceed as follows to select the operating mode:

- Input the password PW01 (factory setting 9990) to release the programming levels.
- 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

1. General






1.1 General user information

Before commissioning and during operation of the **sera** dosing pump the respective regulations valid at the place of installation are to be observed.

The **sera** dosing pump is delivered ready for installation. Carefully read these instructions and especially the safety instructions herein contained before installation and initial start-up of the pump.

1.2 Symbols and notes used in these operating instructions

Special notes in these operating instructions are marked with text and danger symbols.

Designation of the note (Text and symbol)	Danger type			Definition of the note (in the operating instructions)
	Danger of fatal injury	Risk of injury	Damage to property	
DANGER! 	X	X	X	Identifies an imminent danger that results in fatal or severe injuries if not avoided.
WARNING! 	X	X	X	Designates a potentially dangerous situation There might be danger to life or serious injury and damage to property if it is not avoided.
CAUTION! 		X	X	Designates a potentially dangerous situation There might be slight or minor injury or damage to property if it is not avoided.
ATTENTION! 			X	Designates a potentially dangerous situation that could lead to damage to property if not avoided.
NOTE! 				Designates information which helps to make work easier and is useful for trouble-free operation.

1.3 Notes attached to the product

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

Operating instructions

1.4 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 product 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 9001:2008.

The **sera** product meets the valid safety and accident prevention regulations.



ATTENTION!

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



WARNING!

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

2. Safety instructions

2.1 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.

2.2 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 product.

Inobservance of the safety instructions may lead to:

- Failure of important functions of the product/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.

2.3 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.

Operating instructions

2.4 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.

2.5 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.

2.6 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.

2.7 Improper operations

Operating safety of the supplied product is only guaranteed if the product is used as intended, according to the descriptions in Chapter 2.8 of these operating instructions.

2.8 Intended use

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

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

Criteria for operation in accordance with the intended use:

- Observe characteristics of the 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 medium).
- Resistance of the materials which come into contact with the medium.
- Operating conditions at the place of installation.
- Pressure and temperature of the medium.
- Voltage supply.

Operating instructions

2.9 Operating conditions

- Ambient temperature: 0°C to 40°C
- Climate: relative air humidity < 90%
- Installation altitude: max 1000m above sea level
- Pump design data for dosing and its temperature can be found in the order confirmation.

2.10 Personal protection for maintenance and service

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.



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

ATTENTION!



Personal protective equipment must be provided by the owner!

NOTE!



NOTE!



2.11 Utilities/Lubricants

If not agreed otherwise in the contract conditions, the **sera** dosing pump will always be supplied with the necessary utilities. (For type and quantity of utilities/lubricants, see Chapter 11.1 „Working materials“).

2.11 Foreseeable misuse

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



DANGER!

Misuse can result in danger to the operating personnel!

2.11.1 Transport

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

2.11.2 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.
- 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).
- The pumped medium is conveyed into the environment in the case of pumps with automatic or manual vent valve if the return pipe was improperly fitted or not fitted at all. ► Danger for the operator.
- Mains plug cut off (direct connection), safe disconnection impossible. Safe disconnection e.g. by 2-pin main switch.
- 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 ► electronics or vent valve destroyed.

2.11.3 Start-up

- Cover on vent openings (e.g. motor).
- Suction or pressure pipes closed (i.e. foreign matters, particle size, stop valves).
- Start-up with damaged system.
- Integrated overflow valve misadjusted (no protection function).
- Operation without connected return pipe of the integrated overflow valve.
- No free return flow of the overflow valve.
- Operation without connected return pipe of the vent valve.
- Sensor cable damaged (electronics <--> stroke mechanism), wrong or no recognition of the stroke length ► wrong dosing volume and resulting process error.
- Wrong parameterization of the pump ► inadvertent start.
- Distance between dosing pump and other dosing pumps or electrical consumers insufficient ► fault by electromagnetic radiation..

Operating instructions

- Control cables too long >> 30m ► malfunctions due to EMC.
- Control cable and power cable laid in parallel ► malfunctions due to EMC.

2.11.4 Operation

- Fault message ignored ► faulty dosing / process error.
- Pipes hit, pulsation damper not used ► damage to the pipes, medium is leaking.
- Pumped medium contains particles or is contaminated.
- External fuse bridged ► no cut off in case of an error.
- Ground wire removed ► no cut off by fuse in case of an error, supply voltage directly at the housing.
- Insufficient lighting of the working place.
- Suction height too high, pump capacity too low ► process error.
- Arbitrary modification of the pump (valves, internal fuse, ...).
- Integrated overflow valve misadjusted.
- No free return flow of the integrated overflow valve.
- No supervision of leakages ► MBE opening.
- Diaphragm rupture is not indicated when the MBE plug was disconnected. Medium can escape into the environment through the vent hole "Danger to the operator and the environment".

2.11.5 Maintenance / Repair

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

2.11.6 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.

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Operating instructions

- Non-observance of the safety data sheet.
- Control elements actuated.
- Poorly ventilated room.

2.12.7 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.

2.12.8 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.

2.12.9 Disposal

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

C/CS 409.2

Operating instructions

3. Transport and storage

3.1 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.



The packaging material must be disposed of appropriately!

NOTE!

3.2 Storage

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

Proper storage increases the service life of the product 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.

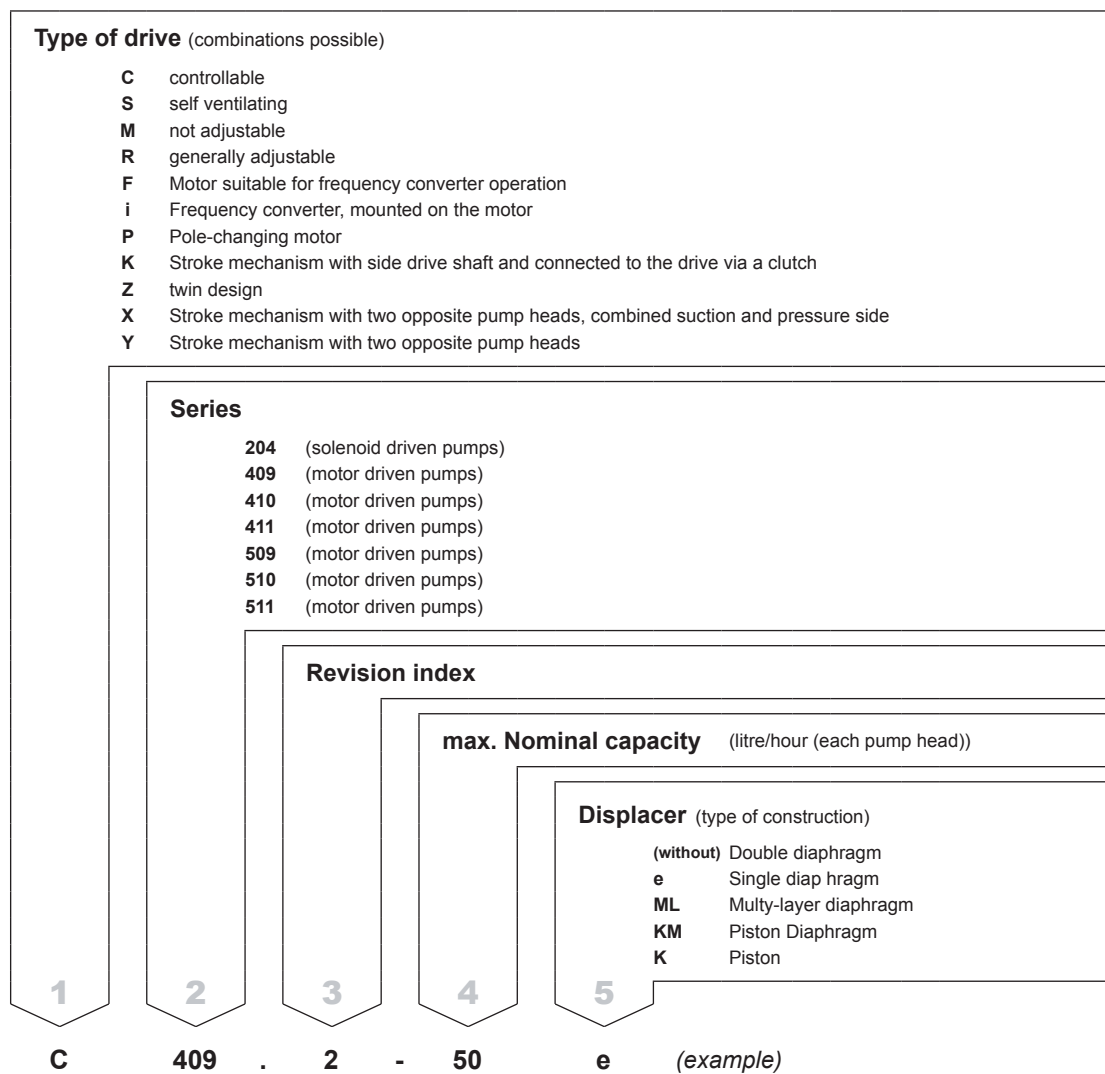
Do not store solvents, fuels, lubricants, chemicals, acids, disinfectants and similar in the storage room.

Operating instructions

4. Product description

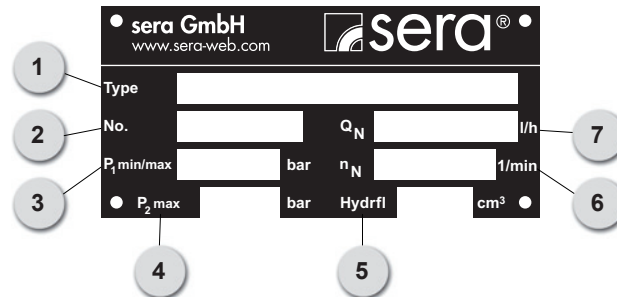
4.1 Types

4.1.1 Type key



4.1.2 Type plate

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



No.	Designation
1	Pump type
2	Serial number of the pump
3	Minimum/maximum permissible pressure in the pump inlet Minimum/maximum permissible pressure in the inlet cross section which the pump can be used for. Please consider that pressure depends on rotation speed, delivery rate, temperature and static pressure at the inlet.
4	Maximum permissible pressure in the pump outlet Maximum permissible pressure in the outlet cross section which the pump can be used for. Please consider that pressure depends on rotation speed, delivery rate, temperature and static pressure at the outlet.
5	Buffer fluid Quantity of buffer fluid in the diaphragm ring (in the case of double diaphragm pumps).
6	Nominal stroke frequency
7	Nominal delivery rate Delivery rate which the pump was ordered for, based on the nominal rotation speed n_N , the nominal delivery height p_{2max} . and the delivery medium stated in the supply contract.

4.2 Materials

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

4.3 Viscosity, pumped medium

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

4.4 Dosing range

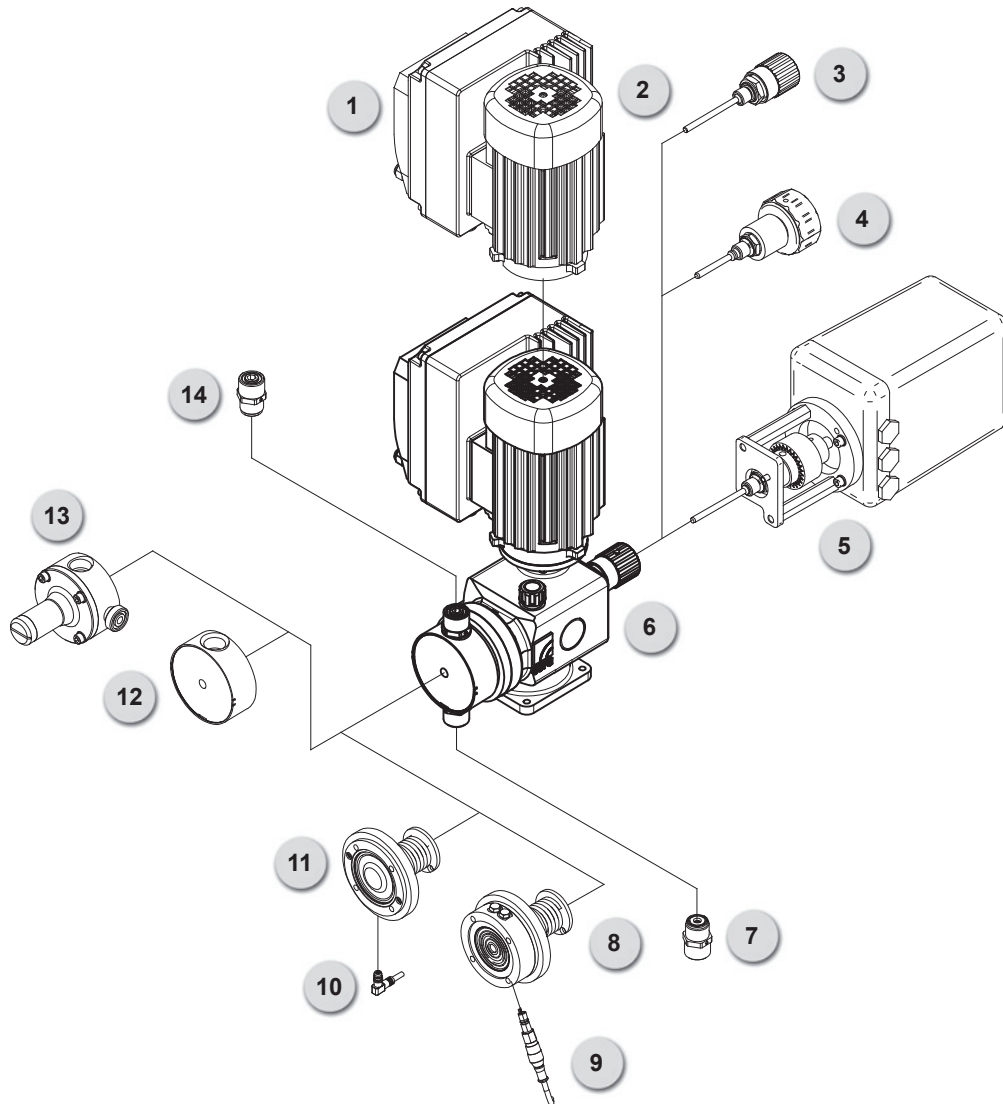
The delivery rate of the diaphragm pump can be set manually via the stroke length adjustment (0...100%). The linear dosing range is between 20% and 100%.

4.5 Noise measurement

According to DIN 45635 the sound pressure level measured of the diaphragm pumps is between 50 and 65 dB (A).

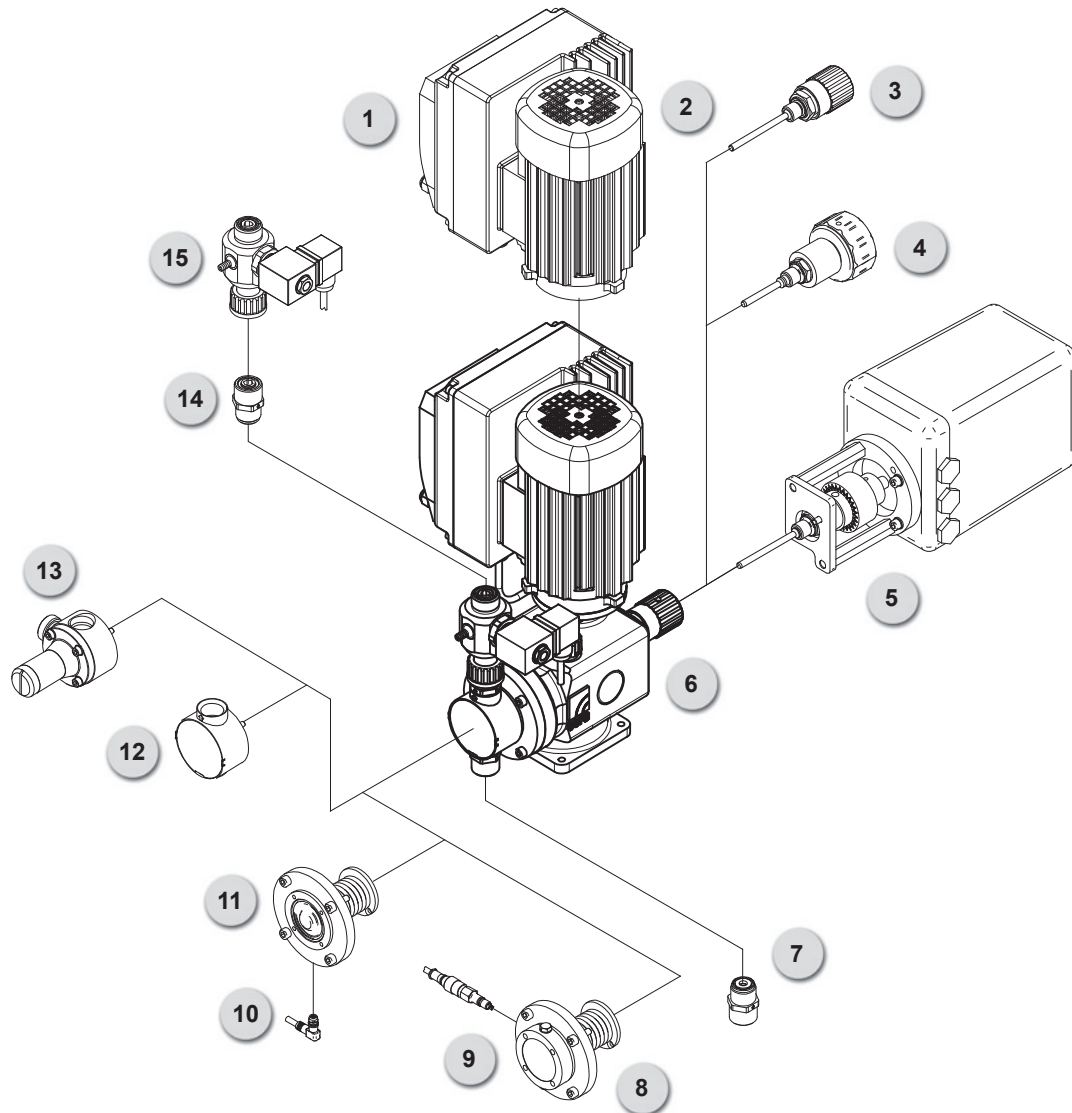
4.6 Components of the diaphragm pump

4.6.1 C409.2



No.	Designation	Remark
1	Electronics	
2	Driving motor	
3	Manual stroke length adjustment	
4	Manual stroke length adjustment with position indicator	option
5	Stroke length adjustment with actuator	option
6	Stroke mechanism	
7	Suction valve	
8	Assembly pump (double diaphragm design)	
9	Diaphragm rupture electrode MBE-03 (for double diaphragm pumps)	option
10	Diaphragm rupture electrode MBE-02 (for single diaphragm pumps)	option
11	Assembly pump (single diaphragm design)	
12	Pump body	
13	Pump body with integrated overflow valve	
14	Pressure valve	

4.6.2 CS409.2



No.	Designation	Remark
1	Electronics	
2	Driving motor	
3	Manual stroke length adjustment	
4	Manual stroke length adjustment with position indicator	option
5	Stroke length adjustment with actuator	option
6	Stroke mechanism	
7	Suction valve	
8	Assembly pump (double diaphragm design)	
9	Diaphragm rupture electrode MBE-03 (for double diaphragm pumps)	option
10	Diaphragm rupture electrode MBE-02 (for single diaphragm pumps)	option
11	Assembly pump (single diaphragm design)	
12	Pump body	
13	Pump body with integrated overflow valve	
14	Pressure valve	
15	Vent valve	

4.7 Functional description

4.7.1 General

sera dosing 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.

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

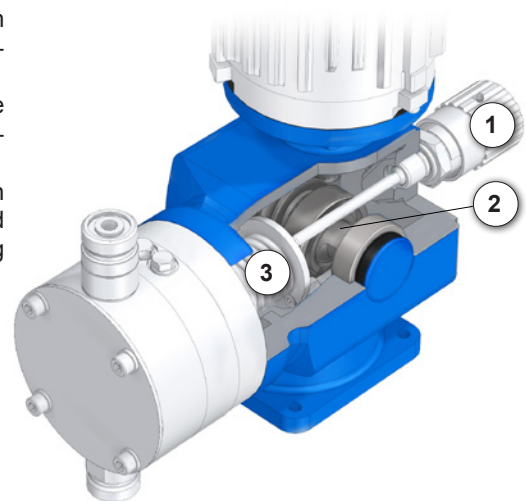
- Stroke mechanism
- Drive motor
- Electronics
- Stroke length adjustment
- Assembly pump
- Pump body
- Suction and pressure valve
- Automatic ventilation device (CS-design)

4.7.2 Stroke length adjustment

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 (2) provides the pressure stroke while the suction stroke is performed by a pressure spring (return spring) (3).

The effective stroke length can be changed by means of an adjustable scale knob (1) which prevents the connecting rod from following the rotary cam up to the rear dead centre during suction stroke (see stroke length adjustment).



4.7.3 Drive motor

A **sera** diaphragm pump of series C/CS 409.2 is driven by a three-phase-motor controlled by the electronics.

4.7.3.1 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.

4.7.4 Stroke length adjustment

The delivery rate of the pump is set by changing the stroke length. The stroke length is infinitely variable between 0% and 100%.

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

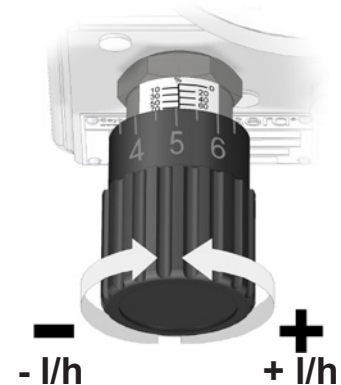
4.7.4.1 Manual stroke length adjustment (standard)

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

The stroke length should be adjusted during operation of the pump.

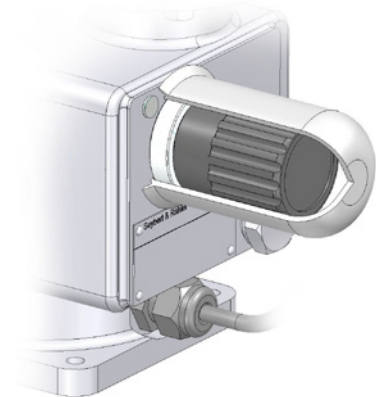
The set stroke length can be read off a scale, e.g. 75% (see Fig.).

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



Protection for stroke length adjustment (option)

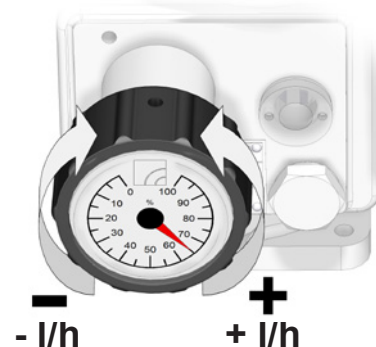
A protecting cap can be provided for the protection of the stroke length adjustment against unintentional adjustment.



4.7.4.2 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 should be adjusted during operation of the pump.

The set stroke length can be read off the percent scale (the example shows a set stroke length of 65%). In delivery state, the stroke length adjustment is factory set to 50%.

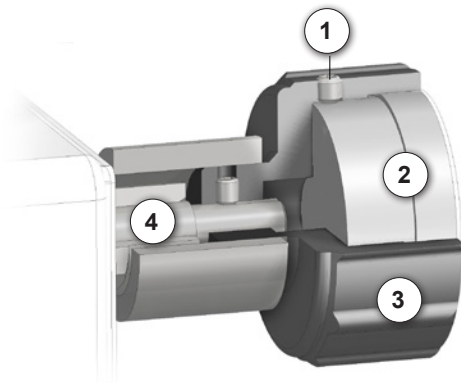


ATTENTION!

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!

Adjusting the percent scale:

- Switch on the piston diaphragm pump.
- Loosen setscrew (1).
- Remove percent scale (2) from the hand wheel (3).
- 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 (4)).
- Insert percent scale again.
- Use the setscrew to secure the percent scale to the hand wheel.
- Adjust desired stroke length.



4.7.4.3 Automatic stroke length adjustment by means of an electrical actuator

The electrical actuator is directly mounted to the stroke mechanism (1) 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 (2). In case of dosing pumps with electrical actuator, a manual adjustment of the stroke length on the pump is no longer possible.

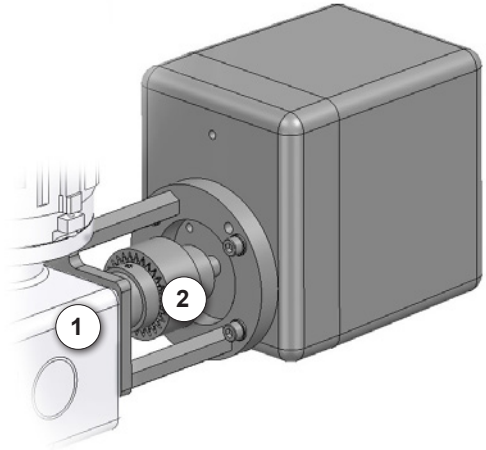
(Exception: actuator with hand wheel)

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



The adjustment is only possible when the pump is running.

ATTENTION!

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

same as Chapter 4.7.4.3, additionally:

- PMR3 positioner

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

As an option, the actuator can also be provided with a collective interference signal.
Information on the electrical connection is given inside the cover of the actuator.

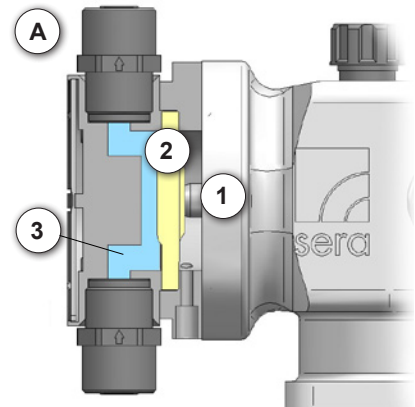
4.7.5 Assembly pump

There are two different pump types:

- Single diaphragm pump (A)
- Double diaphragm pump (B)

Single diaphragm pump (A)

The drive diaphragm (2) connected to the drive via the connecting rod (1) transmits the stroke movement directly to the pumped medium (3).

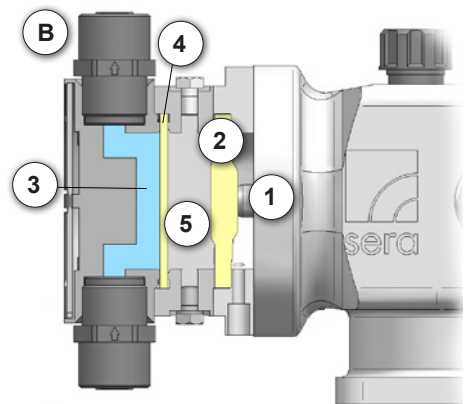


Double diaphragm pump (B)

The stroke movement of the drive diaphragm (2) is transmitted hydromechanically to the intermediate diaphragm (4) which is in contact with the medium.

The intermediate diaphragm protects the drive diaphragm from chemical affects of the pumped medium (3).

A proper function can only be guaranteed when there are no gas- or air bubbles in the hydraulic chamber and the correct volume of buffer fluid has been filled in.



4.7.6 Pump body

Depending on the applied backpressure, movements of the plastic pump body in elastic materials are possible. This does not affect the pumps's service life or operational reliability.

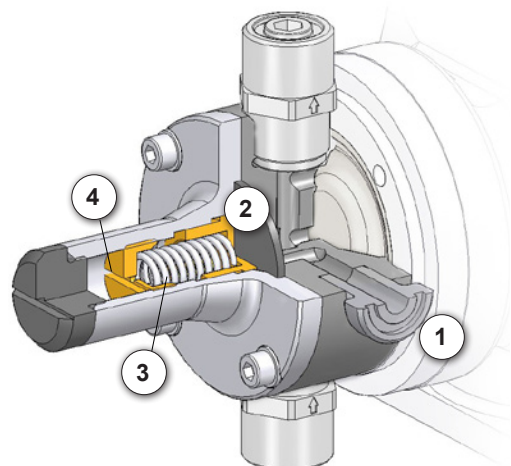
4.7.7 Pump body with integrated overflow valve

The integrated diaphragm overflow valve protects the pump from unacceptable overpressure at closed pressure line. Pipes and fittings, however, are not protected and have to be protected separately, if necessary. It can be used for liquid media without solid matters according to the manufacturer specifications.

Pump bodies with integrated overflow valve are equipped with an additional relief channel (1) through which the pumped medium is drained in case of an unacceptable overpressure. The relief channel is closed by the mechanically prestressed diaphragm (2) of the overflow valve.

The mechanical prestress which is executed by a pressure spring (3) can be adjusted with a set screw (4). If the pressure of the pumped medium on the diaphragm exceeds the set pressure, the diaphragm is lifted and the pumped medium flows into the relief channel.

When the pressure in the pump body falls below the pressure set the diaphragm closes the inlet channel again.





CAUTION!

The integrated overflow valve is always set to the maximum pump pressure (P2 max.) if no other value is specified.

4.7.8 Suction / Pressure valve

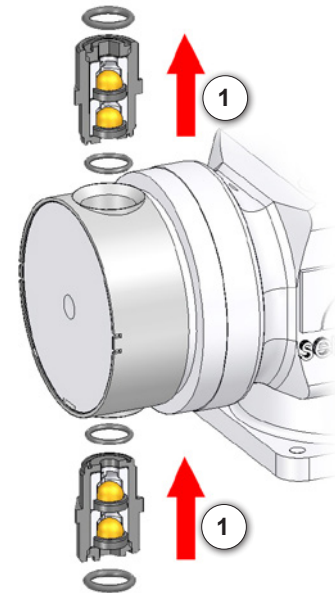
The pump valves are ball valves that only work properly in a vertical position. The condition of the valves has a deciding effect on the operating capability of the pump. Valves must be exchanged as complete units.

When replacing the valves it is important to check the flow direction (1).



ATTENTION!

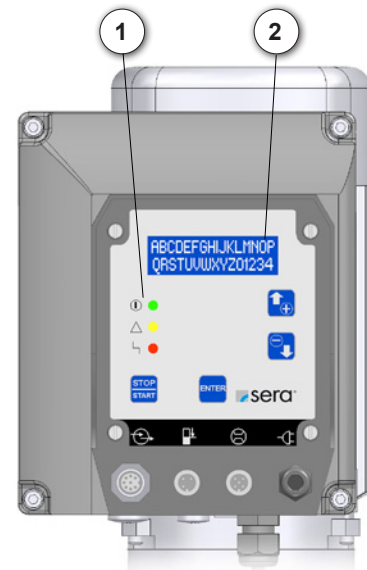
Pressure valve above; Suction valve below!



4.7.9 Electronics (operating panel)

The electronics permit proportional volumetric dosing via analogue signals 0/4 ... 20 mA or contact signals with the option of dividing or duplicating the pulse.

An integrated LCD display (2) and three LED's (1) for warning and fault display indicate the current status of the dosing pump. A connection for flow monitoring or flow measurement as well as an empty signal with pre-alarm and dry operation alarm are installed as standard (see chapter „Electric supply“).



4.7.10 Diaphragm rupture monitoring device (option)

sera - diaphragm pumps of the 409.2 series can be equipped with a conductive diaphragm rupture monitoring device as option.



NOTE!

The sensitivity of the diaphragm rupture electrode can be adapted to the conductivity of the medium via the electronics (see Chapter „Diaphragm rupture detection“ (Operation)).
Preset ex works to 50% approx. 10 $\mu\text{S}/\text{cm}$.

One must distinguish between the single and the double diaphragm pump.

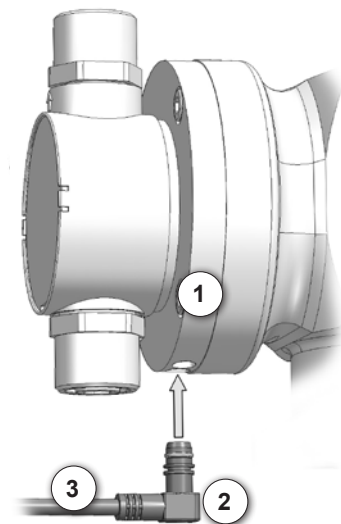
The diaphragm rupture electrode type MBE-02 is used for single diaphragm pumps, type MBE-03 or MBE-04 for double diaphragm pumps.

MBE-02

The diaphragm rupture electrode type MBE-02 is not mounted by sera due to transport. We put the MBE-02 electrode onto the cable (3) and fix it to the pump in a separate bag.

Mounting MBE-02

- Put the diaphragm rupture electrode type MBE-02 (2) is in the base ring (1) of the dosing pump from below.



MBE-03/04

The diaphragm rupture electrode type MBE-03/04 is mounted in the side of the diaphragm ring of the dosing pump. (please see Fig. in Chap. „Components of the diaphragm pump“).



4.7.11 Manual vent valve (only FRP-execution C 409.2-0,8e - ...-2,4e)

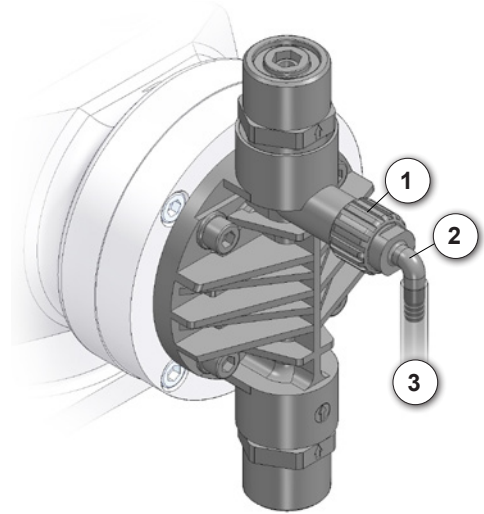
The vent valve is used to release the manual pressure in the pump body (4) during commissioning. Open vent valve when pump primes first time.

When vent valve is opened gas including medium escapes into the feedback line. The vent valve must be closed again as soon as only medium without gas constituent escapes. The pump now feeds the medium into the pressure line.

Operating instructions

Open again for another ventilation. The vent valve consists of a vent screw (1) with integrated hose nozzle (2), which must be fitted with a hose (3) (inside diameter 6 mm) as feedback line. The leaking medium incl. the gas admixtures must be disposed off properly.

The vent screw is inserted during normal operation.



ATTENTION!

Open vent screw with great caution and perform max. 1 turn. Take care that the tightness of the thread is still guaranteed.



ATTENTION!

The vent screw must always be closed during the driving process.

4.7.12 Automatic ventilation device (CS-design)

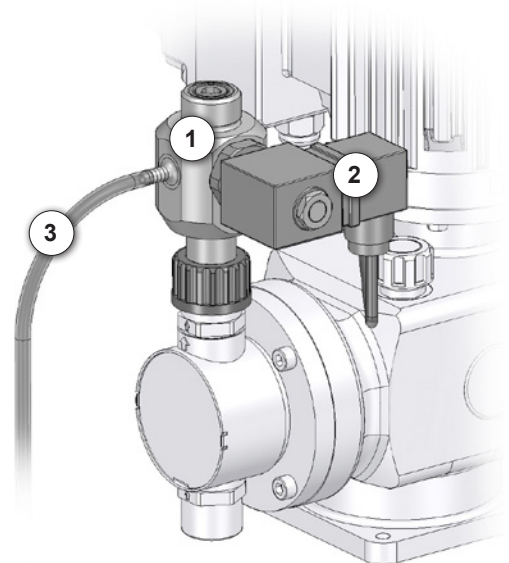
The self ventilating controllable diaphragm pumps are equipped with a vent valve which is installed on the pump pressure nozzle and which cannot be retrofitted.

The pump vents the dosing head of the pump and the suction line, either externally or manually controlled or automatically at a predefined interval.

The vent valve consists of a combination of a check valve (1), which should prevent a back-flow of the medium, and a solenoid valve (2). When the controlled solenoid valve opens the spring-loaded rotor with attached seal is lifted from the valve seat and pressure is relieved from the space between the pump valve and the integrated check valve.

Thus pump and the pipes on the suction side can be vented without pressure.

Please note that the required stroke volume is covered by the usable stroke length range.



CAUTION!

Always install the pump above the suction tank and lay the return pipe (3) with descending gradient to the suction tank!

5. Technical data

5.1 Performance data

Type	Nominal delivery (2) rate adjustable by stroke length and stroke frequency adjustment		Maximum permis- sible pressure in the pump outlet p₂ max. bar	Minimum / maxi- mum permissible pressure in the pump inlet p₁ min./max. bar	Maximum suction height (1) WC m	Usable stroke length range with self-ventilation %	Inlet nominal width DN mm	Outlet nominal width DN mm	Nominal stroke frequency min⁻¹ 50/60 Hz	Maximum stroke length h100 mm	Weight (5) kg
	Q_N l/h 50/60Hz	Q_N ml/stroke									
CS 409.2 – 0,8 e	0 - 0,8	0 - 0,13	10	-0,2/0	2	80 - 100	4	5	100	1,6	11,1
					1	40 - 100					
CS 409.2 – 1,6 e	0 - 1,6	0 - 0,27	10	-0,3/0	3	50 - 100	4	5	100	1,6	11,1
CS 409.2 – 2,4 e	0 - 2,4	0 - 0,27	10	-0,3/0	3	50 - 100	5	5	150	1,6	11,1
CS 409.2 – 4,0 (e)	0 - 4,0	0 - 0,67	10	-0,3/0	2	40 - 100 (4)	5	5	100	4	11,1
					3	60 - 100					
CS 409.2 – 7,0 (e)	0 - 7,0	0 - 0,78	10	-0,3/0	3	45 - 100 (4)	5	5	150	4	11,1
CS 409.2 – 12 (e)	0 - 12	0 - 3,0	10	-0,3/0	3	30 - 100 (3)	5	10	67	6	11,1
CS 409.2 – 18 (e)	0 - 18	0 - 3,0	10	-0,3/0	3	30 - 100 (3)	5	10	100	6	11,1
CS 409.2 – 25 (e)	0 - 25	0 - 2,8	10	-0,3/0	3	30 - 100 (3)	5	10	150	6	11,1

Type	Nominal delivery (2) rate adjustable by stroke length adjust- ment and stroke fre- quency adjustment		Maximum permis- sible pressure in the pump outlet p₂ max. bar	Minimum / maxi- mum permissible pressure in the pump inlet p₁ min./max. bar	Maximum suction height (1) WC m	Inlet / outlet nominal width DN mm	Nominal stroke frequency min⁻¹ 50/60 Hz	Maximum stroke length h100 mm	Weight (5) kg
	Q_N l/h 50/60Hz	Q_N ml/stroke							
C 409.2 – 0,8 e	0 - 0,8	0 - 0,13	10	-0,2/0	2	5	100	1,6	10,7
C 409.2 – 1,6 e	0 - 1,6	0 - 0,27	10	-0,3/0	3	5	100	1,6	10,7
C 409.2 – 2,4 e	0 - 2,4	0 - 0,27	10	-0,3/0	3	5	150	1,6	10,7
C 409.2 – 4,0 (e)	0 - 4,0	0 - 0,67	10	-0,3/0	3	5	100	4	10,6
C 409.2 – 7,0 (e)	0 - 7,0	0 - 0,78	10	-0,3/0	3	5	150	4	10,6
C 409.2 – 12 (e)	0 - 12	0 - 3,0	10	-0,3/0	3	10	67	6	10,7
C 409.2 – 18 (e)	0 - 18	0 - 3,0	10	-0,3/0	3	10	100	6	10,7
C 409.2 – 25 (e)	0 - 25	0 - 2,8	10	-0,3/0	3	10	150	6	10,7
C 409.2 – 50 (e)	0 - 50	0 - 8,3	10	-0,3/0	3	10	100	8	10,5
C 409.2 – 75 (e)	0 - 75	0 - 8,3	10	-0,3/0	3	15	150	8	12,6
C 409.2 – 90 (e)	0 - 90	0 - 15,0	8	-0,3/0	3	15	100	10	14,1
C 409.2 – 115 (e)	0 - 115	0 - 19,2	4	-0,3/0	3	15	100	10	14,1
C 409.2 – 140 (e)	0 - 140	0 - 15,6	8	-0,3/0	3	15	150	10	14,1
C 409.2 – 180 (e)	0 - 180	0 - 20,0	4	-0,3/0	3	15	150	10	14,1
C 409.2 – 250 (e)	0 - 250	0 - 41,7	3	-0,3/0	3	15	100	10	16,6
C 409.2 – 350 (e)	0 - 350	0 - 38,9	3	-0,3/0	3	15	150	10	16,6

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

(2) Linear dosing range at a stroke length between 20% and 100% and at a stroke frequency between 5 and 100%

(3) Controllable diaphragm pump with integrated overflow valve: Usable stroke length range with self-ventilation 40-100%

(4) Controllable diaphragm pump with integrated overflow valve: Usable stroke length range with self-ventilation 50-100%

(5) Standard design

The nominal data refer to water, 20°C and nominal pressure. With lower counterpressure it can come to be soaked off achievements.

5.2 Motor data

Type	Size BG	Output kW	Frequency Hz	230V, 50/60 Hz		115V, 50 Hz		115V, 60 Hz		Protection category IP	Thermal class
				Nominal voltage V	Nominal current A	Nominal voltage V	Nominal current A	Nominal voltage V	Nominal current A		
CS 409.2 – ... (e)	63	0,18	50 / 60	210 - 250	3,0	100 - 120	6,0	100 - 120	6,0	55	F

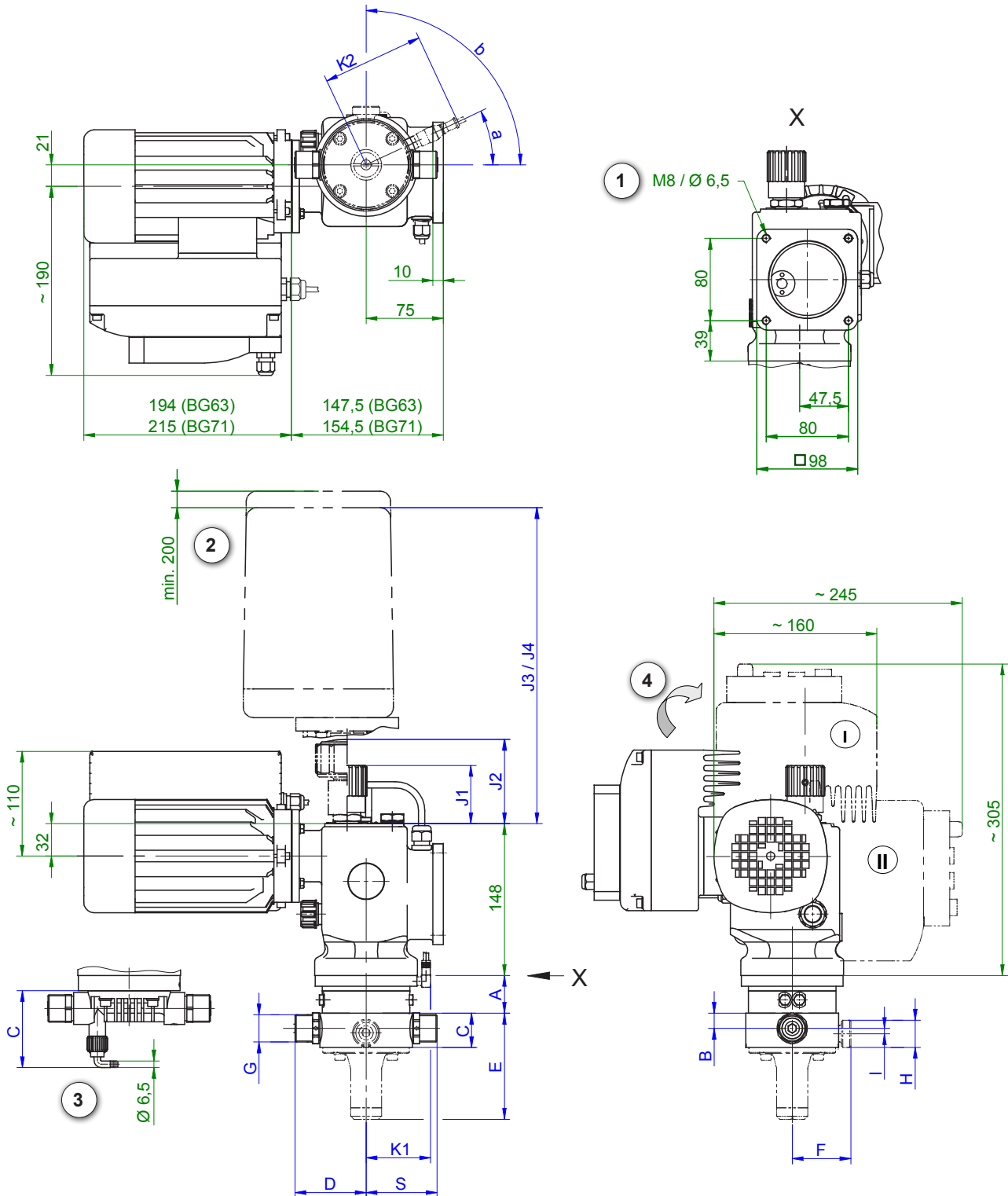
Type	Size BG	Output kW	Frequency Hz	230V, 50/60 Hz		115V, 50/60 Hz		Protection category IP	Thermal class
				Nominal voltage V	Nominal current A	Nominal voltage V	Nominal current A		
C 409.2 – 0,8 e	63	0,18	50 / 60	210 - 250	3,0	100 - 125	6,0	55	F
C 409.2 – 1,6 e	63	0,18							
C 409.2 – 2,4 e	63	0,18							
C 409.2 – 4,0 (e)	63	0,18							
C 409.2 – 7,0 (e)	63	0,18							
C 409.2 – 12 (e)	63	0,18							
C 409.2 – 18 (e)	63	0,18							
C 409.2 – 25 (e)	63	0,18							
C 409.2 – 50 (e)	63	0,18							
C 409.2 – 75 (e)	71	0,37							
C 409.2 – 90 (e)	71	0,37							
C 409.2 – 115 (e)	71	0,37							
C 409.2 – 140 (e)	71	0,37							
C 409.2 – 180 (e)	71	0,37							
C 409.2 – 250 (e)	71	0,37							
C 409.2 – 350 (e)	71	0,37							

5.3 Additional data for electronics

Typ	Inlet voltage / Control input	Min. contact signal time Min. distance between pulses	Analogue input resistance	Digital output	Recommended fuse	
					230V AC	115V AC
C/CS 409.2 – ... (e)	5...30 V DC	55 ms	100 Ω	PNP, internal supply max. 15V DC, 50 mA external supply max. 30V DC, 350 mA	C6A Circuit breaker	C10A Circuit breaker

5.4 Dimensions

5.4.1 C 409.2



1	Mounting holes
2	for removing the actuator cover
3	Manual vent valve (...409.2-0,8e - 2,4e, FRP-design)
4	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

All dimensions in mm!		Single diaphragm pump						
		C 409.2-0,8e	C 409.2-1,6e	C 409.2-2,4e	C 409.2-4,0e	C 409.2-7,0e	C 409.2-12e	
S	Single valves PVC	---	---	---	52	52	52	
	Double valves ...FRP PK (PP-FRP / PVDF-FRP)	80	80	80	56	56	56	
	Double valves ...FRP PK (PP / PVDF)	---	---	---	57	57	60	
	Double valves 1.4571/1.4581	---	---	---	57	57	61	
	Chamber valves PVC, PP, PVDF, 1.4571	70	70	70	---	---	---	
	D	Single valves PVC	---	---	---	65	65	65
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	80	80	80	64	64	64
		Double valves ...FRP PK (PP / PVDF)	---	---	---	57	57	60
		Double valves 1.4571/1.4581	---	---	---	57	57	61
		Chamber valves PVC, PP, PVDF, 1.4571	70	70	70	---	---	---
G	Connection thread Suction/pressure valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	
A	Assembly pump	16	16	16	17	17	14	
	B	Centre of valve thread	17	17	17	15	15	16
		C	PB (without front plate)	43	43	43	36	36
	PB (with front plate)		45	45	45	38	38	38
	PB (FRP-design)		---	---	---	33	33	35
	PB (FRP-design) with manual vent valve		75	75	75	---	---	---
E	Pump body with integrated over-flow valve	---	---	---	97	97	97	
	F	Overflow valve socket (PVC, PP, PVDF) max.	---	---	---	47	47	47
		Overflow valve socket (1.4571) max.	---	---	---	52	52	52
	H	Connection thread socket over-flow valve	---	---	---	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$
	I	Distance: centre of valve thread – centre of overflow valve socket	---	---	---	0	0	0
b	Angle, socket overflow valve	---	---	---	90°	90°	90°	
	J1	Manual stroke length adjustment (SLA) (max.)	70	70	70	70	70	70
		J2	Manual SLA with position indicator	110	110	110	110	110
		J3	Electrical actuator	240	240	240	240	240
J4		Electrical actuator with PMR3	320	320	320	320	320	
MBE	K1	Diaphragm rupture signalling MBE-02	67	67	67	67	67	
Stroke mechanism	a. o. Dimensions for fastening of the pump	see dimensional drawing						

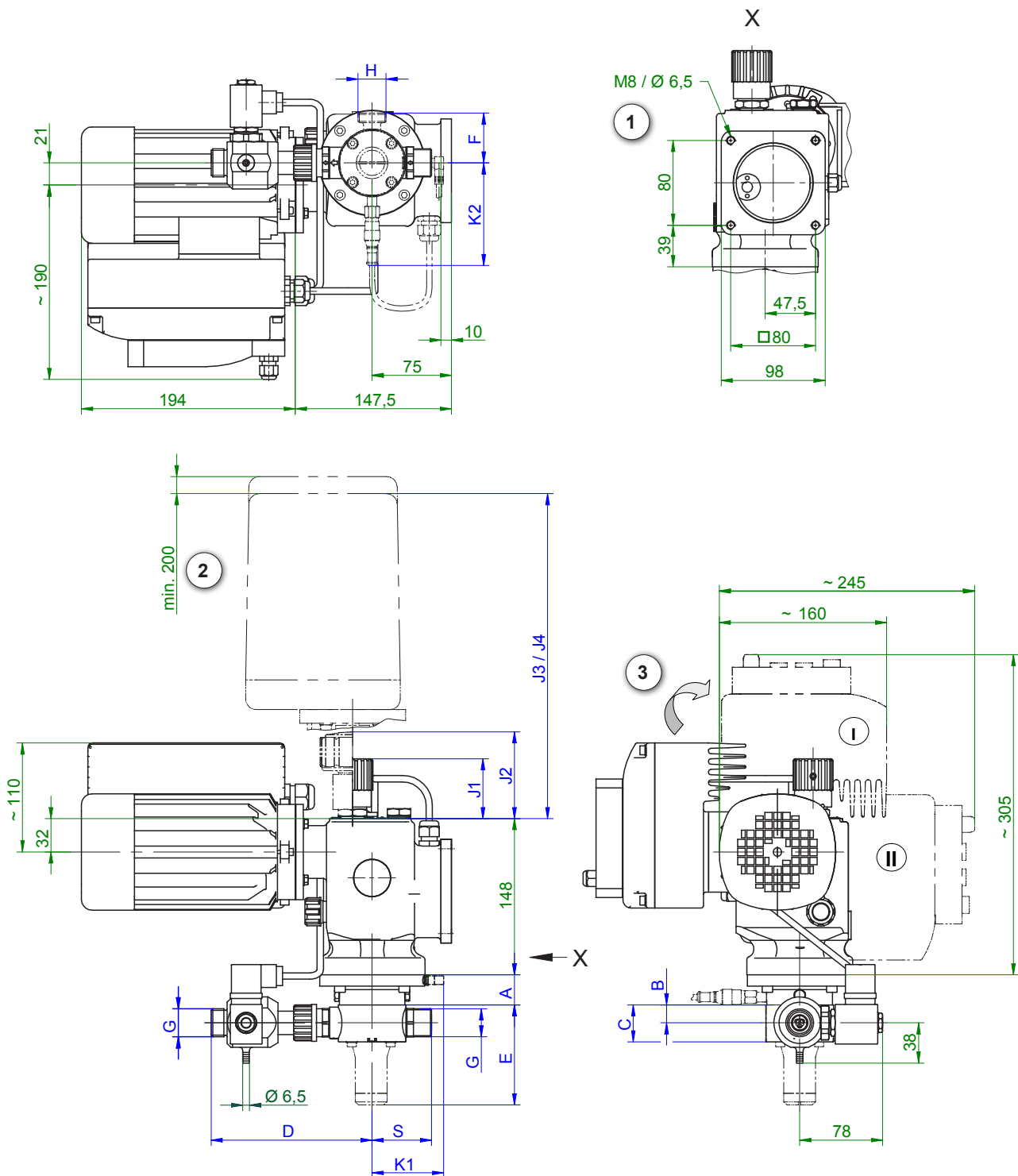
Operating instructions

All dimensions in mm!		Double diaphragm pump				
		C 409.2-4,0	C 409.2-7,0	C 409.2-12		
	S	Single valves PVC	52	52	52	
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	56	56	56	
		Double valves ...FRP PK (PP / PVDF)	57	57	60	
		Double valves 1.4571/1.4581	57	57	61	
	D	Single valves PVC	65	65	65	
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	64	64	64	
		Double valves ...FRP PK (PP / PVDF)	57	57	60	
		Double valves 1.4571/1.4581	57	57	61	
	G	Connection thread Suction/pressure valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	
	A	Assembly pump	29	29	28	
	Pump body (PB)	B	Centre of valve thread	15	15	16
		C	PB (without front plate)	36	36	36
PB (with front plate)			38	38	38	
PB (FRP-design)			33	33	35	
PB with integrated overflow valve	E	Pump body with integrated over-flow valve	97	97	97	
	F	Overflow valve socket (PVC, PP, PVDF) max.	47	47	47	
		Overflow valve socket (1.4571) max.	52	52	52	
	H	Connection thread socket over-flow valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	
	I	Distance: centre of valve thread – centre of overflow valve socket	0	0	0	
b	Angle, socket overflow valve	90°	90°	90°		
SLA	J1	Manual stroke length adjustment (SLA) (max.)	70	70	70	
	J2	Manual SLA with position indica-tor	110	110	110	
	J3	Electrical actuator	240	240	240	
	J4	Electrical actuator with PMR3	320	320	320	
MBE	K2	Diaphragm rupture signalling MBE-03/04	95	95	95	
	a	Angle MBE-03/04	90°	90°	90°	
Stroke mechanism	a. o. Dimensions for fastening of the pump	see dimensional drawing				

Operating instructions

All dimensions in mm!			Double diaphragm pump												
			C 409.2-18	C 409.2-25	C 409.2-50	C 409.2-75	C 409.2-90	C 409.2-115	C 409.2-140	C 409.2-180	C 409.2-250		C 409.2-350		
¹⁾ Connection thread G1 for single valves PVC															
S	Single valves PVC	52	52	70	70	78	78	78	78	78	---	119	---	119	
	Single valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	69	69	76	76	76	76	76	---	---	---	---	
	Single valves ...FRP PK (PP / PVDF)	---	---	67	67	75	75	75	75	75	122	---	122	---	
	Single valves 1.4571/1.4581	---	---	---	---	---	---	---	---	---	122	---	122	---	
	Double valves ...FRP PK (PP-FRP / PVDF-FRP)	56	56	69	69	76	76	76	76	76	---	---	---	---	
	Double valves ...FRP PK (PP / PVDF)	60	60	67	67	75	75	75	75	75	152	---	152	---	
	Double valves 1.4571/1.4581	61	61	68	68	76	76	76	76	76	152	---	152	---	
	D	Single valves PVC	65	65	77	77	85	85	85	85	85	---	138	---	138
		Single valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	69	69	76	76	76	76	76	---	---	---	---
		Single valves ...FRP PK (PP / PVDF)	---	---	67	67	75	75	75	75	75	122	---	122	---
		Single valves 1.4571/1.4581	---	---	---	---	---	---	---	---	---	122	---	122	---
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	64	64	69	69	76	76	76	76	76	---	---	---	---
		Double valves ...FRP PK (PP / PVDF)	60	60	67	67	75	75	75	75	75	152	---	152	---
		Double valves 1.4571/1.4581	61	61	68	68	76	76	76	76	76	152	---	152	---
G	Connection thread Suction/pressure valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{1}{4}$	G1	G $\frac{1}{4}$	G1	
A	Assembly pump	28	28	37	37	41	41	41	41	41	58	58	58	58	
Pump body (PB)	B	Centre of valve thread	16	16	15	15	15	15	15	15	30	30	30	30	
	C	PB (without front plate)	36	36	38	38	37	37	37	37	37	74	74	74	
		PB (with front plate)	38	38	40	40	39	39	39	39	39	77	77	77	
		PB (FRP-design)	35	35	33	33	33	33	33	33	33	---	---	---	
PB with integrated overflow valve	E	Pump body with integrated over- flow valve	97	97	102	102	109	109	109	109	158	158	158	158	
	F	Overflow valve socket (PVC, PP, PVDF) max.	47	47	57	57	73	73	73	73	73	102	102	102	
		Overflow valve socket (1.4571) max.	52	52	62	62	77	77	77	77	77	110	110	110	
	H	Connection thread socket over-flow valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G1	G1	G1	G1	G1	G $\frac{1}{4}$	G1	G $\frac{1}{4}$	
	I	Distance: centre of valve thread – centre of overflow valve socket	0	0	0	0	5	5	5	5	5	0	0	0	
	b	Angle, socket overflow valve	90°	90°	90°	90°	90°	90°	90°	90°	90°	45°	45°	45°	
SLA	J1	Manual stroke length adjustment (SLA) (max.)	70	70	70	70	70	70	70	70	70	70	70	70	
	J2	Manual SLA with position indica-tor	110	110	110	110	110	110	110	110	110	110	110	110	
	J3	Electrical actuator	240	240	240	240	240	240	240	240	240	240	240	240	
	J4	Electrical actuator with PMR3	320	320	320	320	320	320	320	320	320	320	320	320	
MBE	K2	Diaphragm rupture signalling MBE-03/04	95	95	102	102	107	107	107	107	145	145	145	145	
	a	Angle MBE-03/04	90°	90°	25°	25°	25°	25°	25°	25°	25°	70°	70°	70°	
Stroke mechanism	a. o. Dimensions for fastening of the pump	see dimensional drawing													

5.4.2 CS 409.2



1	Mounting holes
2	for removing the actuator cover
3	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)

C/CS 409.2

Operating instructions

All dimensions in mm!			Single diaphragm pump								
			CS 409.2-0,8e	CS 409.2-1,6e	CS 409.2-2,4e	CS 409.2-4,0e	CS 409.2-7,0e	CS 409.2-12e	CS 409.2-18e	CS 409.2-25e	
	S	Single valves PVC	---	---	---	52	52	52	52	52	
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	---	56	56	56	56	56	
		Double valves ...FRP PK (PP / PVDF)	---	---	---	57	57	60	60	60	
		Chamber valves PVC, PP, PVDF, 1.4571	70	70	70	---	---	---	---	---	
	D	Single valves PVC	---	---	---	153	153	153	153	153	
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	---	152	152	152	152	152	
		Double valves ...FRP PK (PP / PVDF)	---	---	---	145	145	148	148	148	
		Chamber valves PVC, PP, PVDF, 1.4571	158	158	158	---	---	---	---	---	
	G	Connection thread Suction/pressure valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	
	A	Assembly pump	16	16	16	17	17	14	14	14	
	Pump body (PB)	B	Centre of valve thread	17	17	17	15	15	16	16	16
		C	Pump body (PVC, PP, PVDF)	34	34	34	38	38	38	38	38
Pump body (FRP- design)			---	---	---	33	33	33	35	35	
PB with ÜV	E	Pump body with integrated overflow valve (ÜV)	---	---	---	97	97	97	97	97	
	F	Overflow valve socket max.	---	---	---	47	47	47	47	47	
	H	Connection thread socket overflow valve	---	---	---	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	
SLA	J1	Manual stroke length adjustment (SLA) (max.)	70	70	70	70	70	70	70	70	
	J2	Manual SLA with position indica-tor	110	110	110	110	110	110	110	110	
	J3	Electrical actuator	240	240	240	240	240	240	240	240	
	J4	Electrical actuator with PMR3	320	320	320	320	320	320	320	320	
MBE	K1	Diaphragm rupture signalling MBE-02	67	67	67	67	67	67	67	67	
Stroke mechanism	a. o. Dimensions for fastening of the pump		see dimensional drawing								

C/CS 409.2

Operating instructions

All dimensions in mm!		Double diaphragm pump					
		CS 409.2-4,0	CS 409.2-7,0	CS 409.2-12	CS 409.2-18	CS 409.2-25	
	S	Single valves PVC	52	52	52	52	52
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	56	56	56	56	56
		Double valves ...FRP PK (PP / PVDF)	57	57	60	60	60
	D	Single valves PVC	153	153	153	153	153
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	152	152	152	152	152
		Double valves ...FRP PK (PP / PVDF)	145	145	148	148	148
	G	Connection thread Suction/pressure valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$
	A	Assembly pump	29	29	28	28	28
	Pump body (PB)	B	Centre of valve thread	15	15	16	16
C		Pump body (PVC, PP, PVDF)	38	38	38	38	38
		Pump body (FRP- design)	33	33	33	35	35
PB with ÜV	E	Pump body with integrated overflow valve (ÜV)	97	97	97	97	97
	F	Overflow valve socket max.	47	47	47	47	47
	H	Connection thread socket overflow valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$
SLA	J1	Manual stroke length adjustment (SLA) (max.)	70	70	70	70	70
	J2	Manual SLA with position indica-tor	110	110	110	110	110
	J3	Electrical actuator	240	240	240	240	240
	J4	Electrical actuator with PMR3	320	320	320	320	320
MBE	K2	Diaphragm rupture signalling MBE-03/04	95	95	95	95	95
Stroke mechanism	a. o. Dimensions for fastening of the pump	see dimensional drawing					

6. Assembly / Installation

- The standard model of the pump is only approved for installation in dry rooms in a non-aggressive atmosphere, at temperatures between 0°C and 40°C and at permitted humidity until approx. 90%, altitude 1000 m above sea level.



DANGER!

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.



WARNING!

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



ATTENTION!

When the C/CS pump is installed next to a controllable pump a minimum distance of 100 mm between the pumps (motor housings) has to be kept!



ATTENTION!

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

- Protect the pump against any sources of heat and against the direct irradiation of sun and ultraviolet light.
- For dimensions of the pump connections and fixing holes, see Chap. „Dimensiones“.
- Install the pump in such a way that there is no vibration and no tension and that it is aligned precisely.
- 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 and indicator scale 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 nominal inlet and outlet diameters of the pump.
- 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 sockets.
- Drain cocks are to be provided.
- Prior to connecting the pipes, remove the plastic caps on the suction and pressure sockets of the pump.
- Check that the fixing screws for the pump body are tightly fitted and, if necessary, retighten (please see Chapter “Overview of the tightening torques”).
- If the pump is equipped with an actuator provide for sufficient space to remove the cover (please see Chapter “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.
- Mount the pump in such a way that electronics, operating panel and electric connections are easy accessible.
- Inlet nominal widths of CS-pumps see chapter „Technical data“.
- With CS pumps or pumps with manual venting, connect a hose for reflow of the pumped medium.

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.
- In the case of degassing media, provide for a supply, respectively use the CS-series.



WARNING!

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.



NOTE!

Illustrations in this chapter!

The names of the shown modules/components are based on the following assignment:



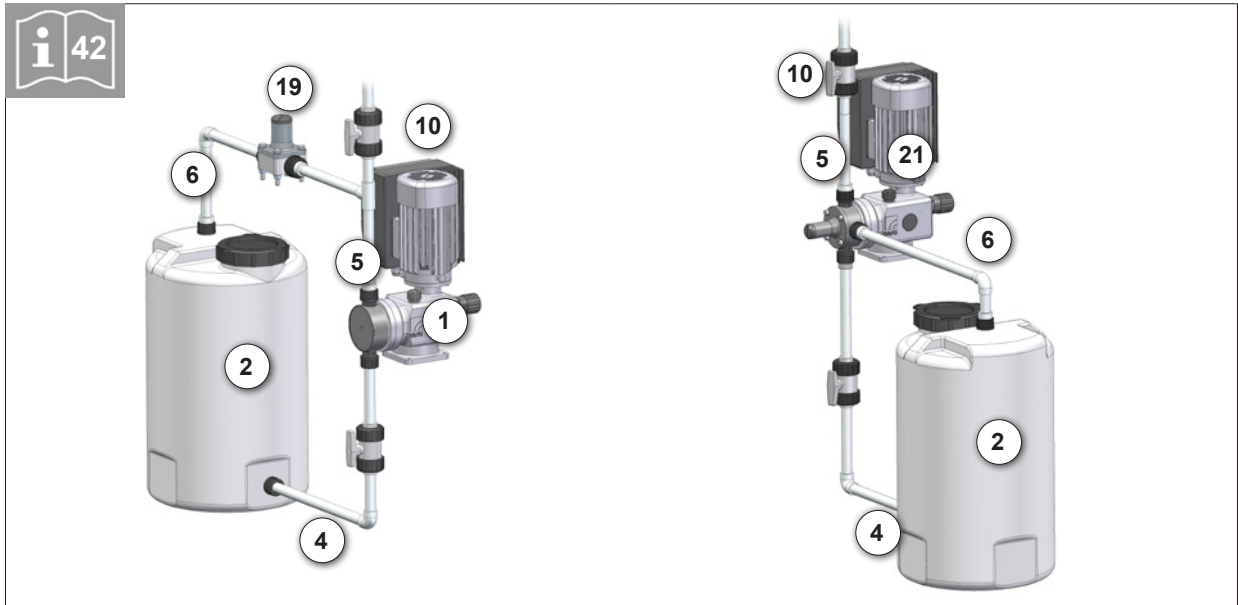
1	Dosing pump
2	Tank
3	Main line / process line
4	Suction line
5	Pressure line
6	Feedback line
7	Check valve
8	Vent valve (ball valve)
9	Injection fitting
10	Shut-off valve
11	Strainer

12	Tank empty alarm
13	Drain fitting
14	Priming aid / Siphon vessel
15	Hand vacuum pump
16	Pulsation damper
17	Flushing medium
18	Safety valve
19	Diaphragm relief valve
20	Pressure keeping valve
21	Dosing pump with integrated relief valve
22	Dosing pump CS...

6.1 Provide overpressure protection

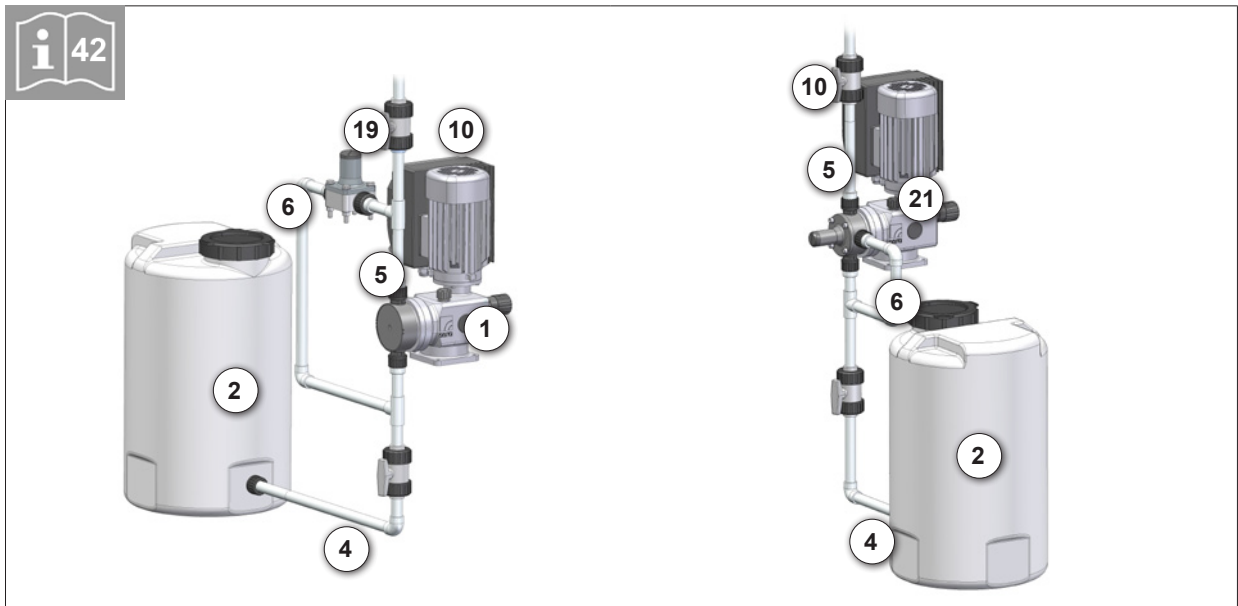
If the permissible pressure in the system may be exceeded, e.g. when a shut-off valve is closed or if the line is blocked:

- Install the overflow valve (19).
- Use **sera** - diaphragm pump with integrated 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.
- 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).





ATTENTION!

Shut-off valves must not be closed when the pump is running!



CAUTION!

Provide an overpressure protection (e.g. overflow valve) if the permissible operating pressure may be exceeded.



ATTENTION!

If the permissible operating pressure is exceeded and the pump is not equipped with an overpressure protection the pump can get damaged.



DANGER!

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

6.2 Prevent a backflow of the pumped medium

If the dosing line is linked with a main line:

- Install an injection fitting (9).



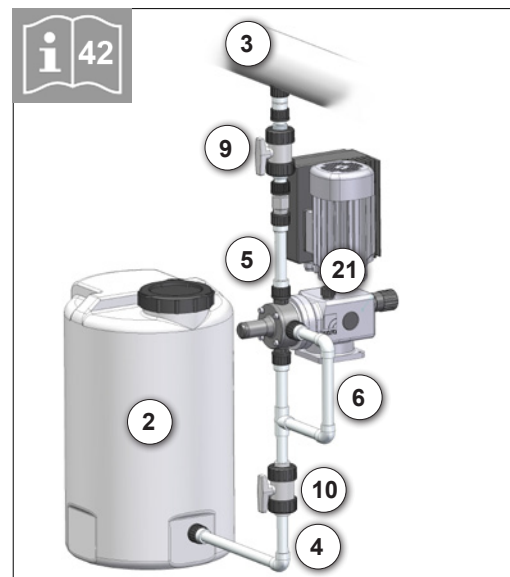
DANGER!

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



DANGER!

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



6.3 Eliminate undesired siphoning

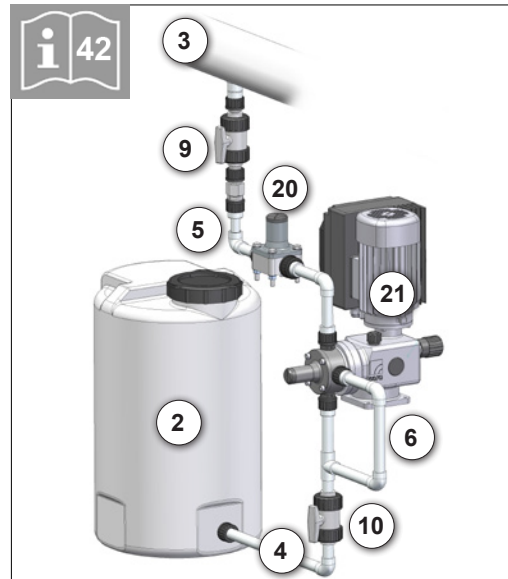
When dosing into a main line with negative pressure:

- Install a pressure keeping valve (20) into the dosing.



ATTENTION!

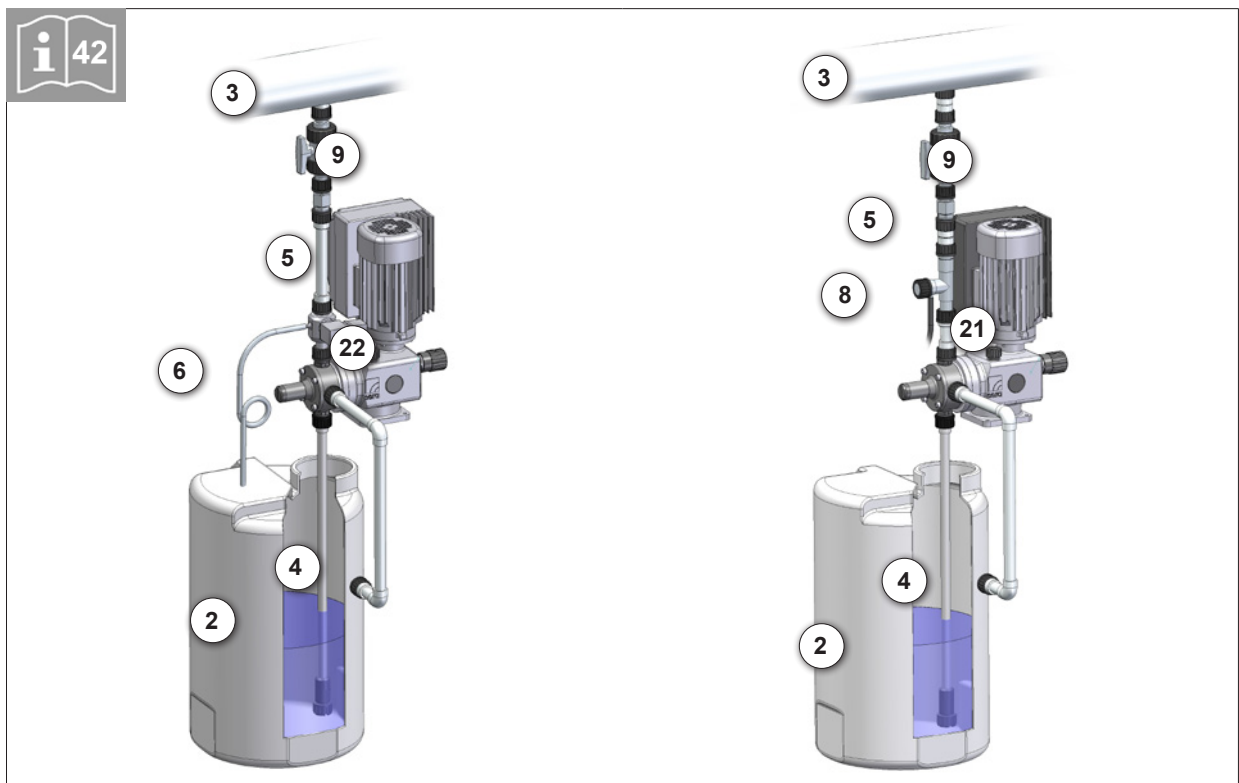
When installing a pressure keeping valve, make sure that an uncontrolled dosing is prevented (by a positive pressure difference (≥ 1 bar) between pressure and suction side).



6.4 How to ensure a gas-free suction

If slightly degassing media are conveyed and the medium is pumped in a pressurised pipe or against a pressure keeping valve:

- The CS 409.2 series (22) should be employed.
- Install a ventilation valve (8) in the pressure line.
- The nominal width of the suction line (14) shall not exceed the input nominal width with CS-design.
- Consider usable stroke length range with self-ventilation (see chapter „Technical data“).





NOTE!

The delivery flow may be interrupted if air/gas enters the suction line!



NOTE!

In the case of media which are lightly crystallizing when they come in contact with air, the return line should be laid with a loop. Thus a contact between the medium and air in the outlet area of the vent valve is prevented.

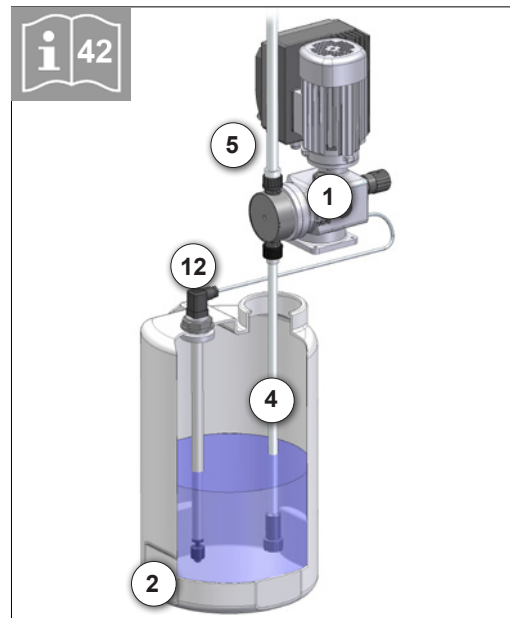
6.5 Install the empty-tank alarm

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



NOTE!

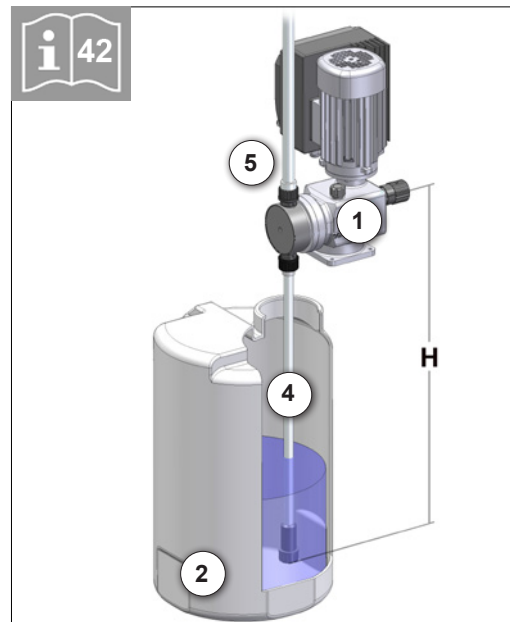
The delivery may be interrupted if air enter in the suction line!



6.6 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.



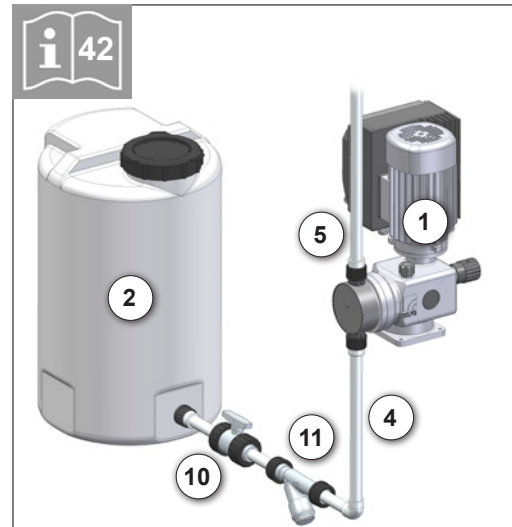
6.7 Line strainer

- 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).



ATTENTION!

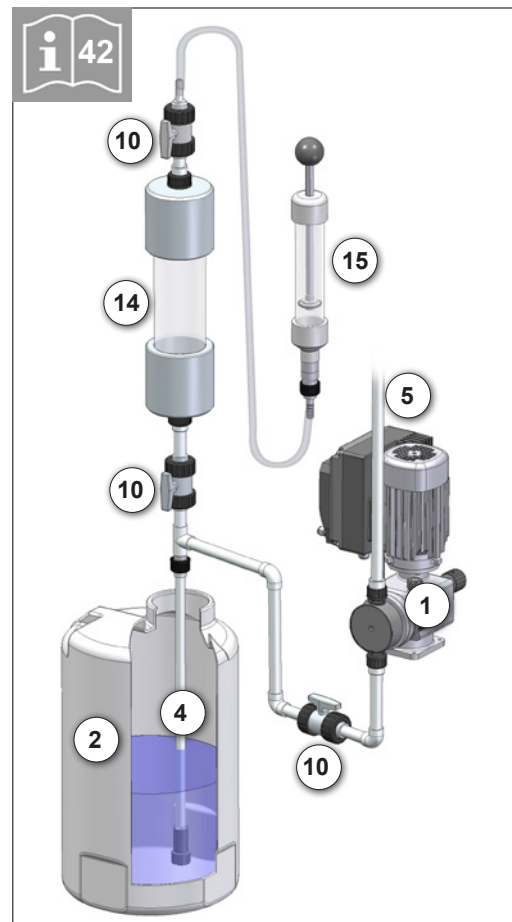
Pump and system may not function properly if contaminants are not collected.



6.8 Suction via a siphon pipe

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.



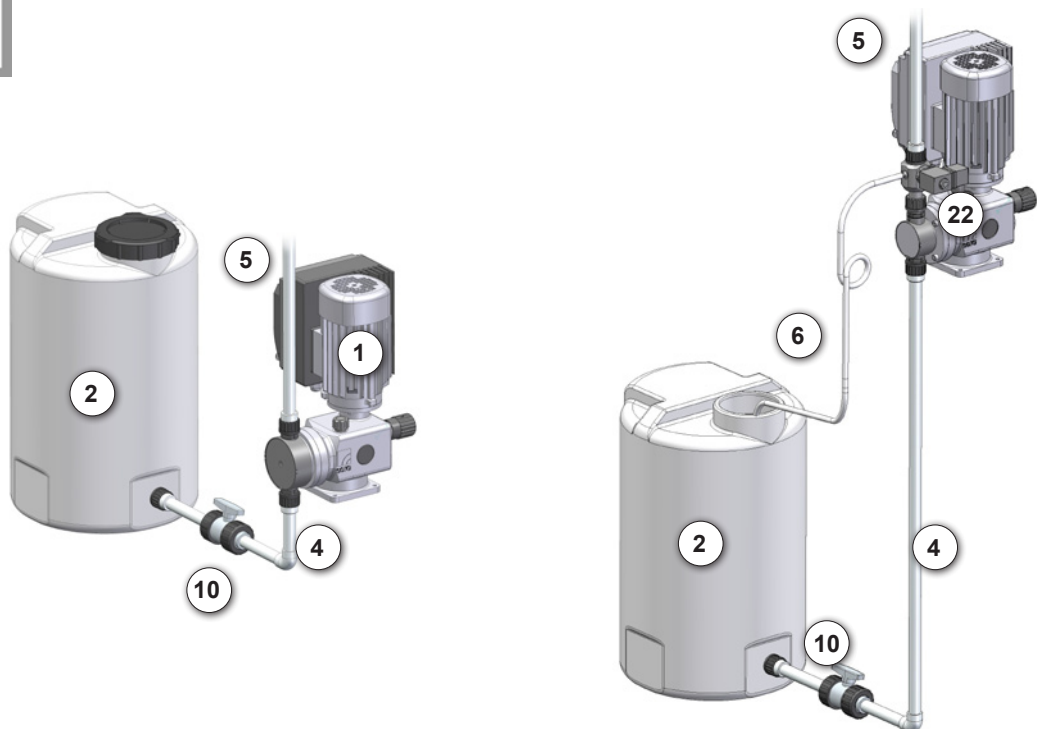
6.9 In case of slightly degassing dosing media

- Install the pump so that it can be operated with afflux.
- Bzw. CS-Ausführung (22) einsetzen.



CS-Ausführung muss immer oberhalb des Behälters montiert werden, damit am Ausgang der Entlüftungsautomatik kein Gegendruck ansteht.

HINWEIS!



6.10 Dosing of suspensions

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

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



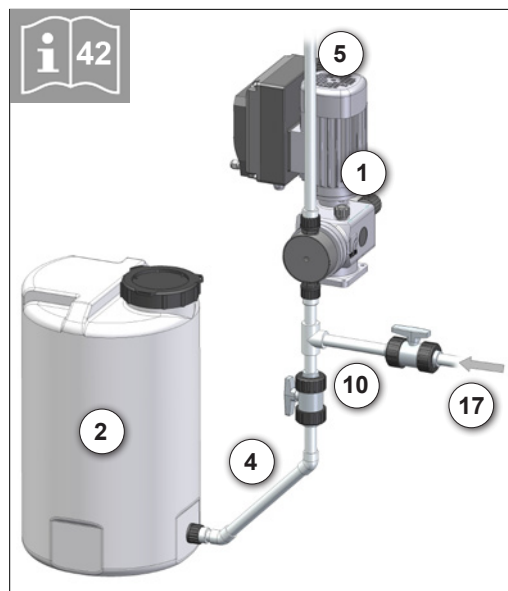
ATTENTION!

Rinsing is absolutely required after the dosing pump was switched off!



NOTE!

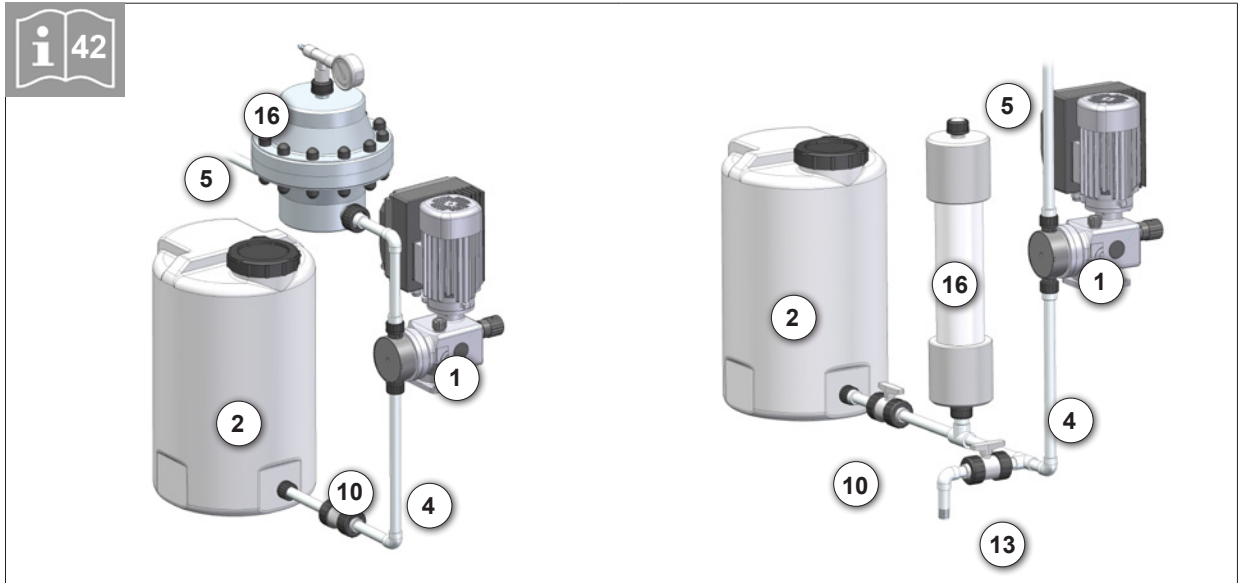
The rinsing process should be automated.



6.11 Damping of the pulsation

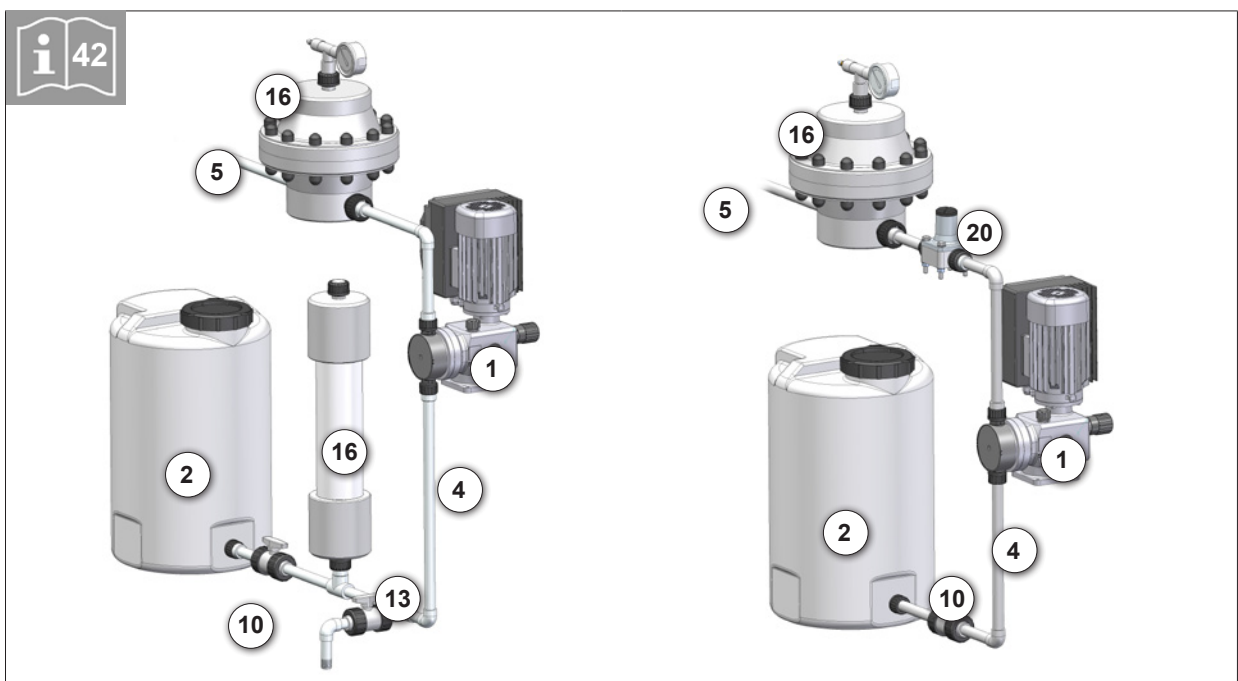
By installing pulsation dampers if:

- for procedural reasons, a pulsation-poor flow rate is desired,
- accelerating forces which arise due to the pipe geometry must be reduced.



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

- If both pulsation damper and pressure keeping valve (20) should be integrated install the pressure keeping valve between pump and pulsation damper.





WARNING!


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.
- Damage to the pipe and in the pipe installed fittings.

7. Electrical connections

7.1 Electric supply

The **sera** diaphragm pump is delivered ready for installation. Standard delivery includes a 2m power cable with Euro plug. The standard version C 409.2 is designed for an operating voltage range of 210 – 250 V, 50/60 Hz.




ATTENTION!

The self-venting version CS 409.2 has a limited operating voltage range. The specifications on the type plate must absolutely be adhered to!


The CS 409.2 is available in three versions:

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



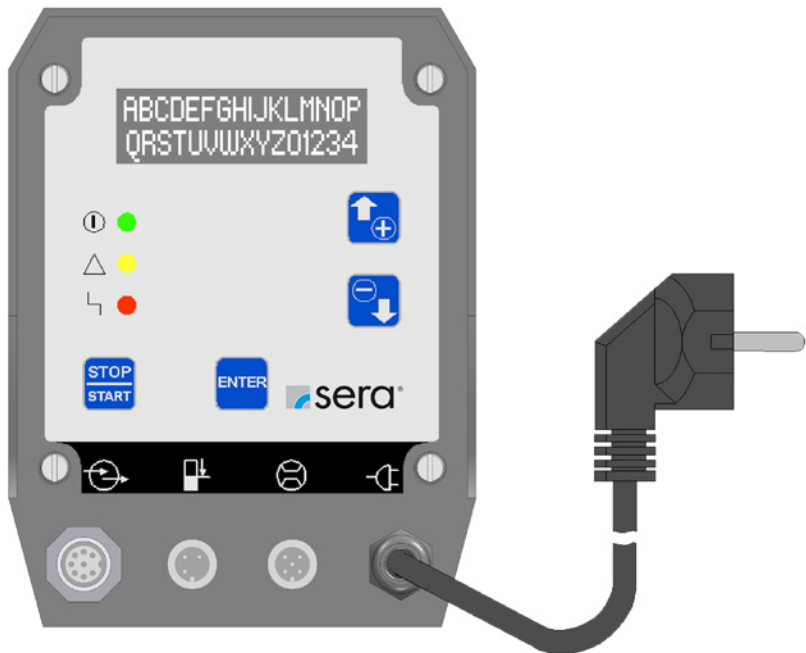
ATTENTION!


Switching the voltage supply on and off temporarily is to be avoided.



ATTENTION!

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





ATTENTION!

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

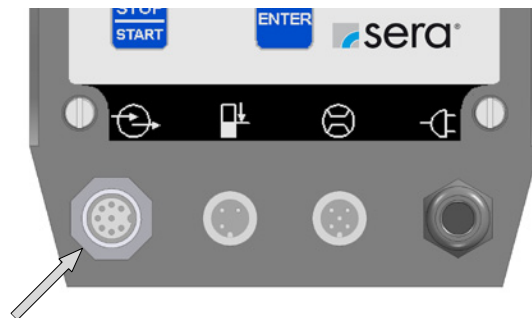
7.2 Electrical interfaces

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

7.2.1 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 „Digital/analog inputs 02 and 03“). When leaving the factory, the inputs and outputs are preset as described in table.

Symbol:



Connector socket for 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. Following table shows the identification of the individual leads of the control cable.

Lead colour	Pin	Function (ex works setting)
WH (white)	1	Input 01 (pulse)
BN (brown)	2	Input 02 (analogue 01)
GN (green)	3	Input 03 (external ON)
YE (yellow)	4	Output + / signal + / 15 V DC
GY (grey)	5	Output 01 (collective fault)
PK (pink)	6	Output 02 (stroke signal)
RD (red)	7	Ground
BU (blue)	8	Ground

The digital inputs can not only be switched by a potentialfree contact signal but also directly via a control voltage signal (e.g. 24V DC) (see Fig. „Control of digital inputs via a potential-free contact signal“).

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



ATTENTION!

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. „Direct activation of digital inputs via a control voltage signal of a programmable logic controller“).
Connect the anode with 24V DC.
Connect the cathode with the yellow lead of a cable.
Use the diode type 1N4007 or the like.

Operating instructions

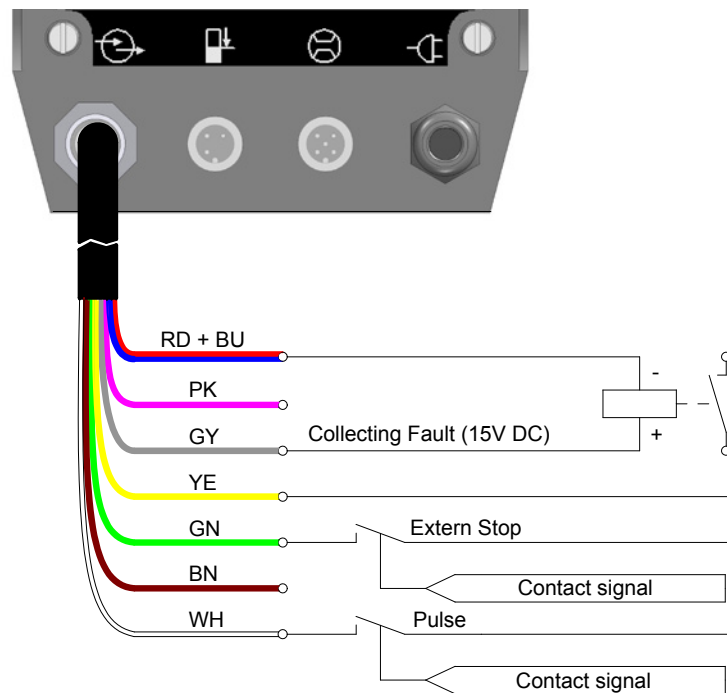
Following fig. shows exemplarily the control of the digital inputs 01 and 03 via a potential-free contact signal.



ATTENTION!

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.

Fig: „Control of digital inputs via a potential-free contact signal“



ATTENTION!

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)



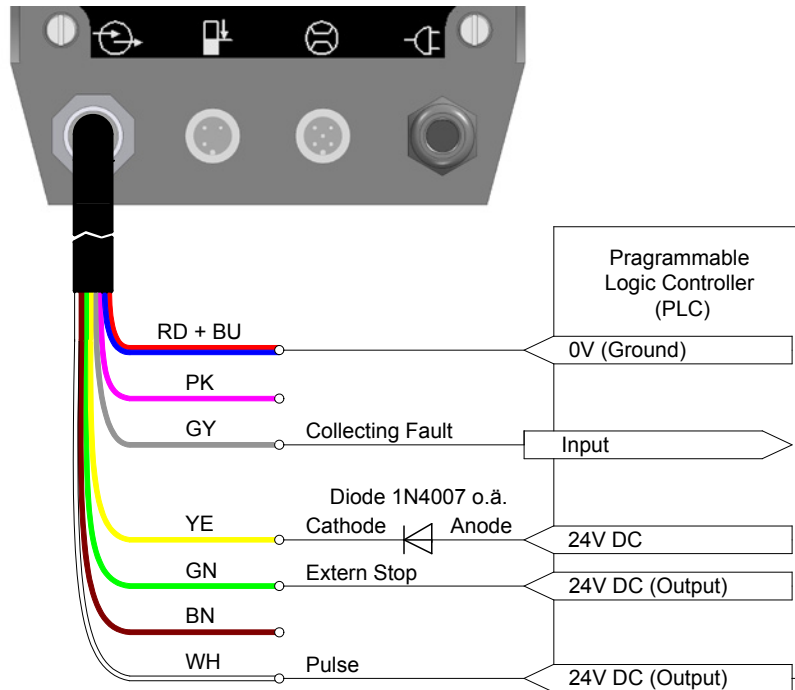
ATTENTION!

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)!

Operating instructions

Following Fig. 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.: „Direct activation of digital inputs via a control voltage signal of a programmable logic controller“



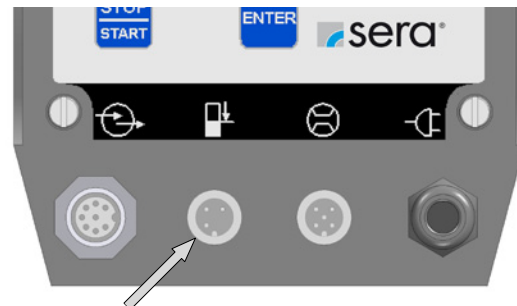
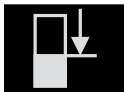
7.2.2 Level input with pre-alarm and dry run



NOTE!

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

Symbol:



Jack for level input

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).

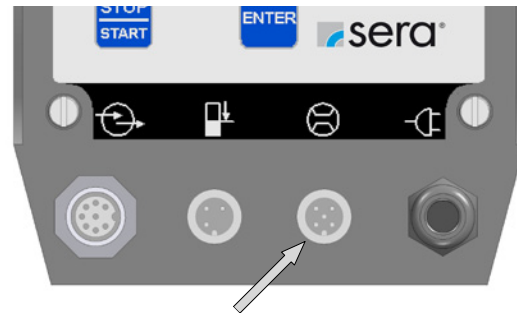
7.2.3 Input for flow control and flow meter



ATTENTION!

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.

Symbol:



Jack 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).

8. Operation in non-hazardous areas



ACHTUNG!

Die Pumpe ist nur für den Betrieb außerhalb des Ex-Bereiches ausgelegt!

C/CS 409.2

Operating instructions

9. Start-Up

9.1 Driving Motor

Preconditions:

Make sure that voltage and frequency correspond with the indications on the type plate of the motor.
Permissible voltage tolerance (DIN VDE 0530)

for rated voltage	+ 10 %
for rated voltage range	± 5 %

The connecting cable must be dimensioned according to the motor characteristics.
Secure connecting cable with a strain relief.

The nominal motor power 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" groupe of climates according to IEC 721-2-1.



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

NOTE!

9.2 Initial start / Restart

Controls for start-up

- Check whether all connections for tightness; if applicable, retighten.
- Check that the fixing screws for the pump body are tightly fitted and, if necessary, retighten (see table Chap. „Overview of the tightening torques“).
- Check whether all electrical connections are correct.
- Check whether the information of the mains voltage on the type plate with the local circumstances agrees.

10. Operation

10.1 Operating elements

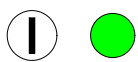


1	STOP/START-Button
2	LED-Indication
3	LCD-Display
4	UP-Button
5	DOWN-Button
6	ENTER-Button

10.2 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 following Tab). 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 following Tab.). The fault is not only indicated by the LED but also as plain text in the LCD display.

Operating instructions

Overview of LED indicators			
	Green LED  	Yellow LED  	Red LED  
Ready	ON		
Stroke confirmation	flashing		
Internal error			ON
Supply voltage too low / too high		ON	
No mains			
Level monitoring			
Level pre-alarm		flashing	
Dry run			flashing
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	flashing		ON
Analog mode			
mA signal < 3,5 mA			ON
mA signal > 20,5 mA			ON



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.

10.3 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.

10.4 Parameter table

Following table 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 „Selecting the operation mode“) and, in case of external control, to connect the respective input (see Chapter „Control inputs and outputs“).

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.

Overview of preset parameters					
	Factory settings	Chapter	Adjustment	Modification 1	Modification 2
Impulsbetrieb					
Pulse mode	1/1	10.7.2			
Pulse factor	1	10.7.2			
Pulse memory	ON	10.7.2			
Analog mode					
Analog mode	Auto	10.7.1			
Analog signal	4-20mA	10.7.1			
Adjustment: Analog I1	4mA	10.7.1			
Adjustment: Frequency f1	0%	10.7.1			
Adjustment: Analog I2	20mA	10.7.1			
Adjustment: Frequency f2	100%	10.7.1			
Batch mode					
Batch control	manual	10.7.3			
Batch quantity	100%	10.7.3			
Batch start	1min	10.7.3			
External mode					
Stroke freq.	100 %	10.7.4			
Input 01					
Function E1	Pulse	10.8.1			
Contact E1	NO	10.8.1			
Input 02					
Function E2	Analog 01	10.8.2			
Contact E2	NO	10.8.2			
Input 03					
Function E3	External ON	10.8.2			
Contact E3	NO	10.8.2			
Output 01					
Function A1	Collective fault	10.8.3			
Contact A1	NC	10.8.3			
Output 02					
Function A2	Stroke signal	10.8.3			
Contact A2	NO	10.8.3			
Dosing monitor.					
Sensor	OFF	10.15.2			
Function	Message	10.15.2			
Fault stroke	10	10.15.2			
Alarm limit	80 %	10.15.2			

Operating instructions

Overview of preset parameters					
	Factory settings	Chapter	Adjustment	Modification 1	Modification 2
Level					
Pre-alarm	NO	10.15.4			
Dry run	NO	10.15.4			
System					
Language	English	10.11			
Calibration	OFF	10.11			
SLOW-Mode					
Slow-Mode	OFF	10.15.1			
Speed	80%	10.15.1			
Password					
PW01-Mode	OFF	10.13			
Password 01	9990	10.13			
Password 02	9021	10.13			
Diaphragm rupt. ⁽¹⁾					
Input signal	NO	10.15.3			
Sensitivity	50%	10.15.3			
Venting ⁽²⁾					
Venting control	OFF	10.15.5			
Venting time	10 sec	10.15.5			
Interval time	40 min	10.15.5			

⁽¹⁾ only with MBE option

⁽²⁾ only with CS

C/CS 409.2

Operating instructions

10.5 Menu

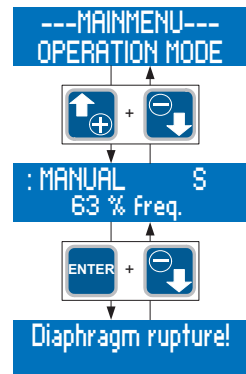
You can switch between the following three screens:

- Operating messages,
- Main menu and
- 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.



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

NOTE!

10.5.1 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).



The flow indicator (*) is only active when a flow control / flow meter is connected and the dosing monitoring is activated (see Chapter . „Slow-Mode“).

NOTE!

Operating instructions

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). 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.). The value input is described in Chapter „Value entry“.

Operating messages in dependence on the selected operation mode

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				●	
Manual start				●	

● = Indication

○ = Indication and setting option

⁽¹⁾ = not with a calibrated pump

⁽²⁾ = only with a calibrated pump

⁽³⁾ = only with CS

10.5.2 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:



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

NOTE!

Operating instructions

10.5.3 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.

Example for the display of superordinate menu items

---MAINMENU---
OPERATION MODE

---PARAMETER---
ANALOG-MODE

Example for the display of parameters

>OPERATION MODE<
ANALOG

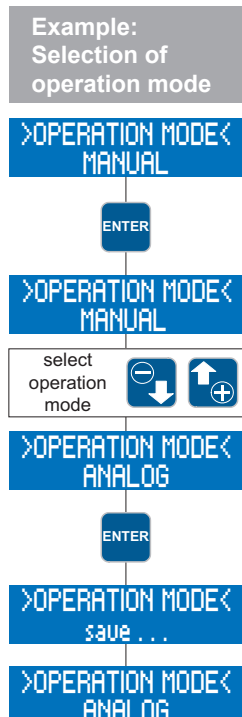
>ANALOG SIGNAL<
4-20mA

10.5.4 Value entry

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

Assignment of settings

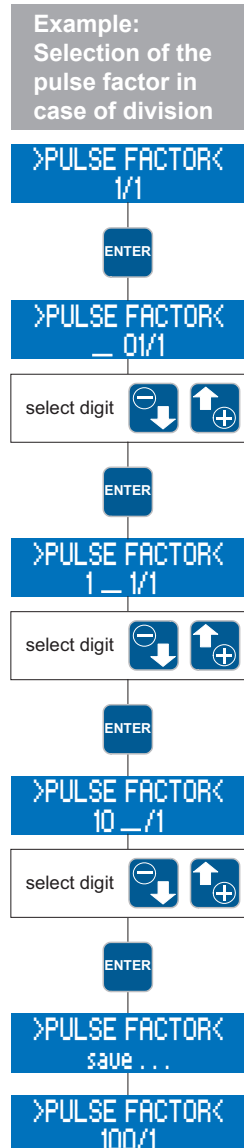
- Display of the current setting (in this example: MANUAL operation mode).
- Value entry is enabled after pressing the ENTER key.
- Then, the operation mode indicator flashes and a setting can be selected (in this example: operation modes) using the UP and DOWN keys.
- After a setting has been selected (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).



Operating instructions

Assignment of values

- 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).



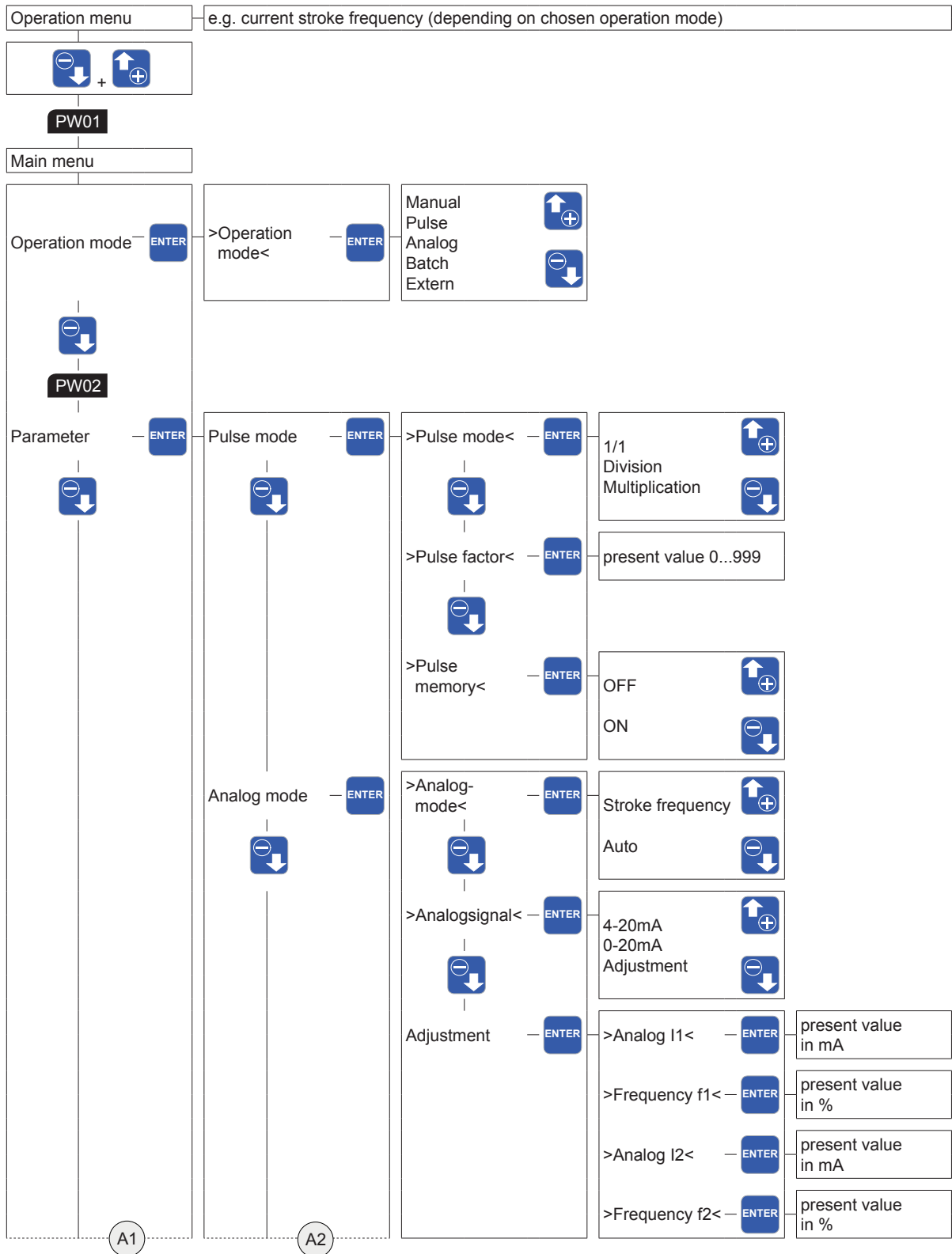
The value entry (flashing indication) can be exited by simultaneously pressing the UP and DOWN keys. In this case, the previous value / previous setting will be maintained.



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!

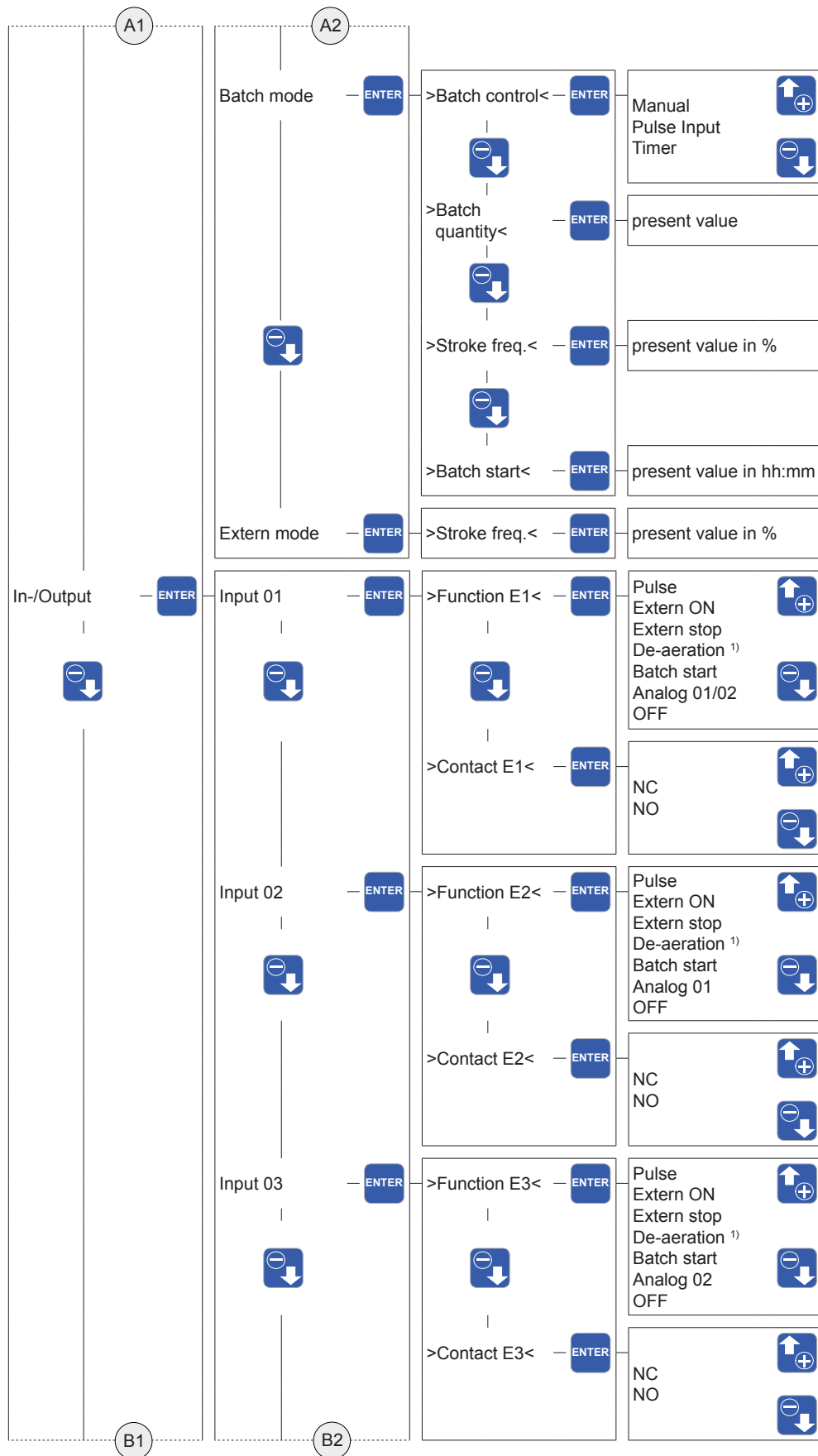
10.5.5 Menu guide

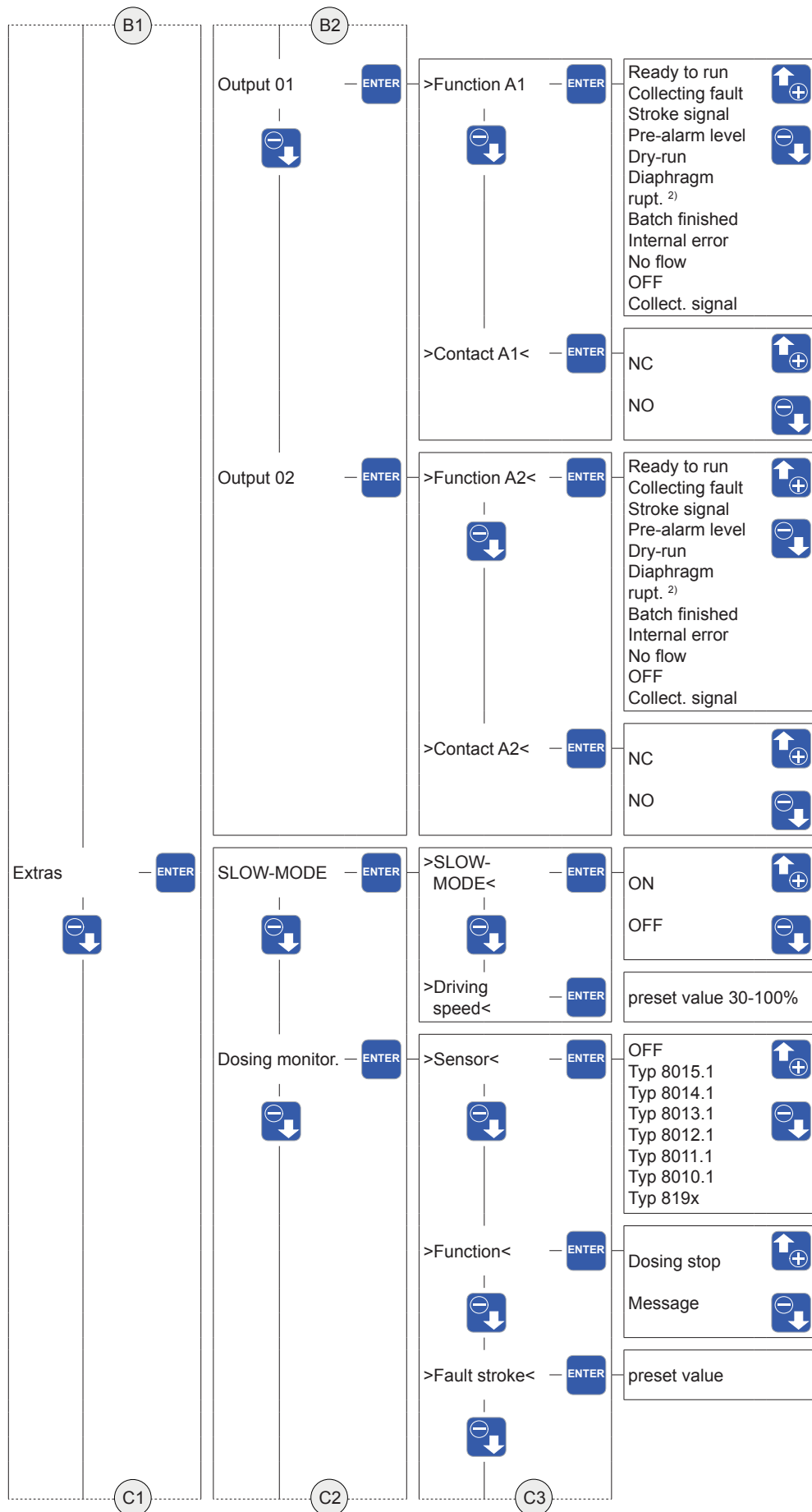


PW01 Locking by password 01 (pre setting ex work: 9990, not activated)

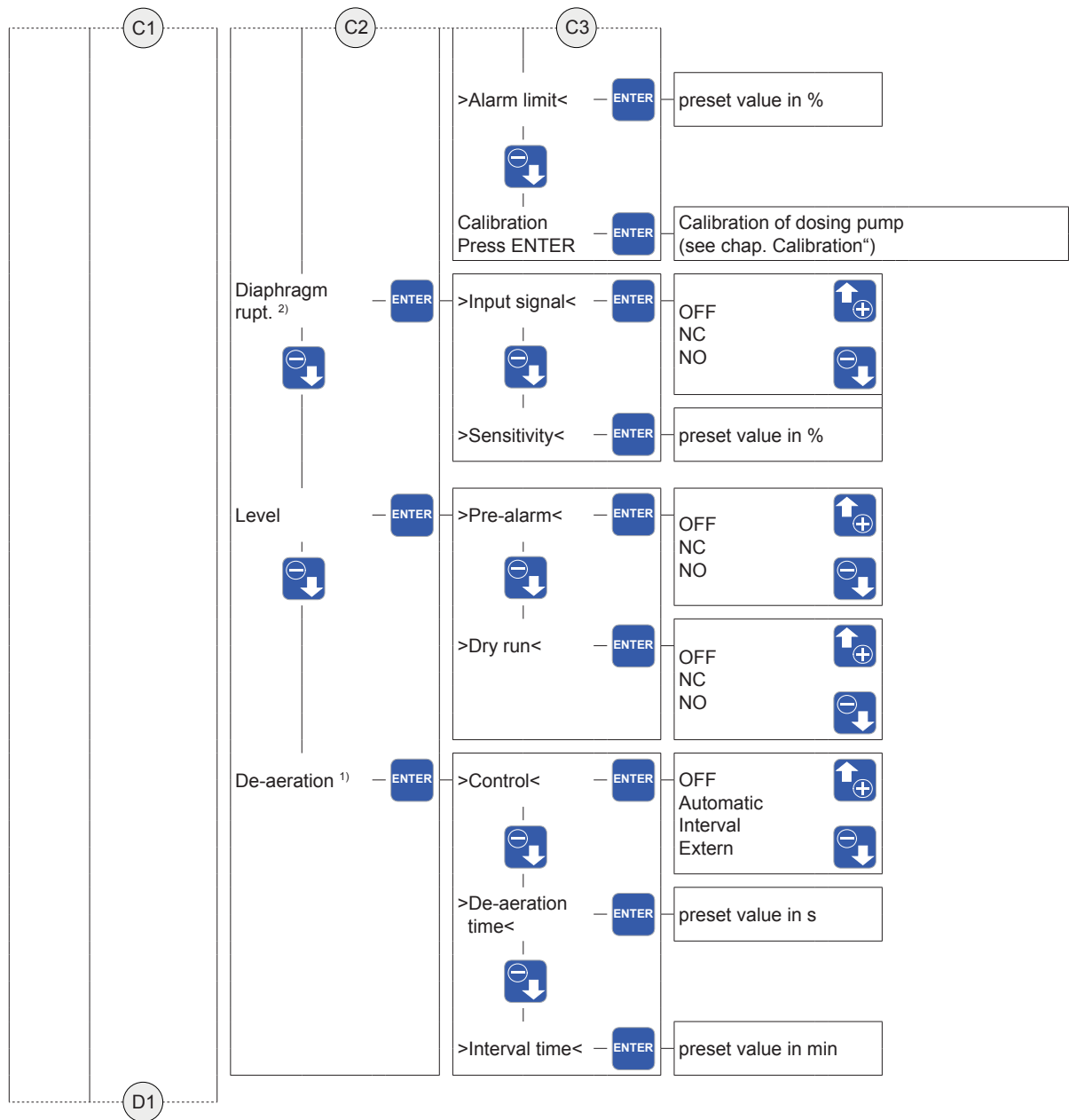
PW02 Locking by password 02 (pre setting ex work: 9021)

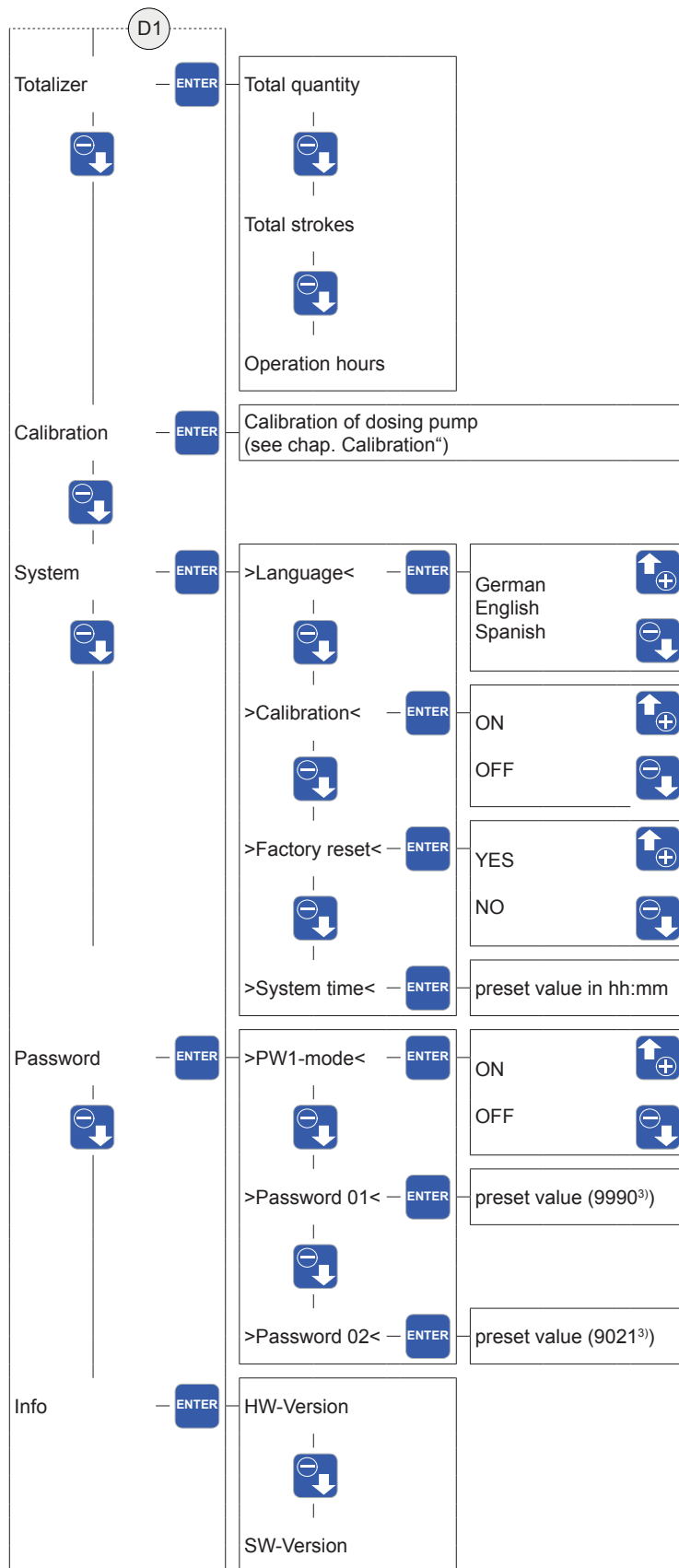
Operating instructions





Operating instructions





¹⁾ only CS 409.2

²⁾ only with option MBE

³⁾ pre setting ex work

10.6 Selecting the operation mode

You can select among five different operation modes:

- MANUAL
- PULSE
- ANALOG
- BATCH
- EXTERNAL

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 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<
MANUAL

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 „Settings for the EXTERNAL operation mode“).

>OPERATION MODE<
EXTERN

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. „Additional settings for the BATCH mode“).

>OPERATION MODE<
BATCH

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. „Additional settings for the ANALOG operation mode“):

>OPERATION MODE<
ANALOG

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. „Additional settings for the ANALOG operation mode“).

>OPERATION MODE<
PULSE

Setting diagram

- Go to the ---MAIN MENU--- and select the menu item OPERATION MODE (if necessary, use the UP / DOWN keys).
- Pressing the ENTER key will open the >OPERATION MODE< submenu.
- Here, the currently set operation mode is indicated (in this example: MANUAL).

---MAINMENU---
OPERATION MODE

ENTER

>OPERATION MODE<
MANUAL

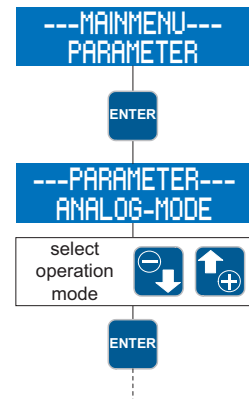
The adjustment of an operation mode is done in accordance with the description in Chapter „Value entry“.

Operating instructions

10.7 Additional settings for the operation mode

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

- Go to the ---MAIN MENU--- and select the menu item PARAMETER (if necessary, use the UP / DOWN keys).
- Pressing the ENTER key will open the --- PARAMETER --- submenu.
- Here, the currently set operation mode is indicated (in this example: ANALOG MODE).
- The DOWN key is used to move to the respectively next operation mode. The UP key is used to move to the previous operation mode. When in the PULSE MODE, the UP key is used to move back to the ---MAIN MENU---.



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



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

NOTE!

10.7.1 Additional settings for the ANALOG operation mode



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 „Digital/analog inputs 02 and 03“). Input 02 (see Chapter „Control inputs and outputs“) is factory preset to analog input (ANALOG 01).

NOTE!

Choose the ANALOG MODE

Two different analog modes can be chosen:

- Auto
- Stroke frequency

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

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

>ANALOG-MODE<
AUTO

>ANALOG-MODE<
STROKE FREQUENCY

Operating instructions

Selecting the ANALOG SIGNAL

You can select among three different analog signals.

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

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 (see following Fig.).

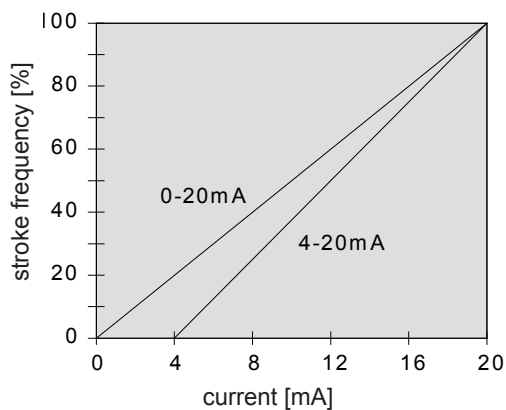
If the input signal is < 3.5mA, then the pump emits the error message "Analogsignal < 4mA". Thus, a wire breakage (control current = 0mA) can be detected.

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

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 (see following Fig.).

>ANALOGSIGNAL<
4-20mA

>ANALOGSIGNAL<
0-20mA



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

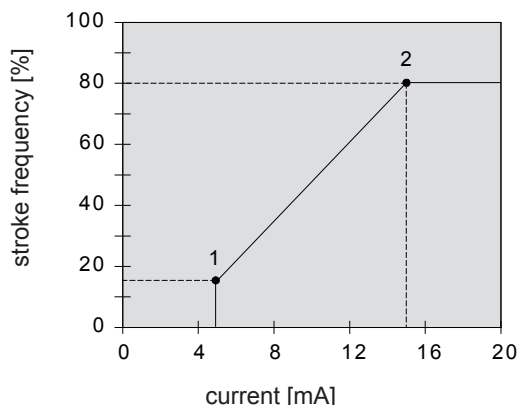
Two points are given that reflect a proportional relation between control current and stroke frequency of the pump. In addition, these two points restrict the stroke frequency range of the pump as shown in the following Fig.

>ANALOGSIGNAL<
ADJUSTMENT

Example: adjustment of the analog signal

- 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%:

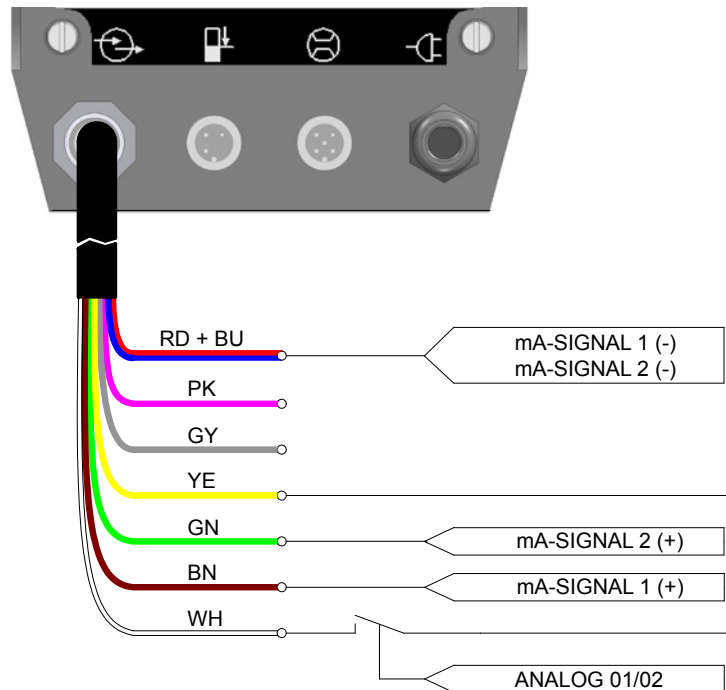




ATTENTION!

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.: „Connection of two analog signals with switch-over“



Operating instructions

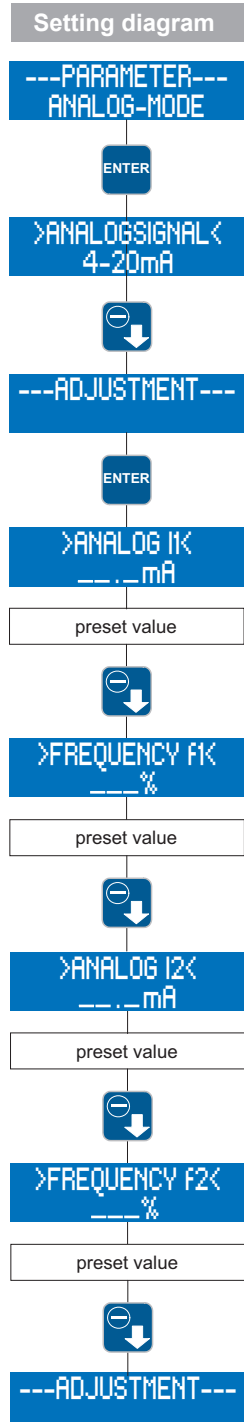
ADJUSTMENT of the analog signal

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:

- Go to the ---PARAMETER--- menu and select the ANALOG MODE menu item using the ENTER key.
- Use the DOWN key to skip the selection of the ANALOG SIGNAL.
- Select the ---ADJUSTMENT---submenu using the ENTER key.
- Enter the value for current I1. To do so, proceed as described in Chapter „Value entry“.
- Enter the value for stroke frequency f1 which is assigned to current I1. To do so, proceed as described in Chapter. „Value entry“.
- Enter the value for current I2. To do so, proceed as described in Chapter „Value entry“.
- Enter the value for stroke frequency f2 which is assigned to current I2. To do so, proceed as described in Chapter „Value entry“.
- The adjustment is then completed.



10.7.2 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 „Configuring the inputs and outputs“).

Input 01 (see Chapter „Control inputs and outputs“) is factory preset to pulse input (ANALOG 01).

Selecting the PULSE MODE

You can select among three different pulse modes:

- 1/1
- DIVISION
- MULTIPLICATION

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

```
>PULSE MODE<
  1/1
```

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<
  DIVISION
```

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.

```
>IMPULSMODUS<
  MULTIPLICATION
```

Selecting the PULSE FACTOR

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

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<
  50/1
```

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.

```
>PULSE FACTOR<
  1/50
```

For setting the pulse factor, please see the description in Chapter „Value entry“ (Assignment of values).

Switching ON/OFF the PULSE MEMORY

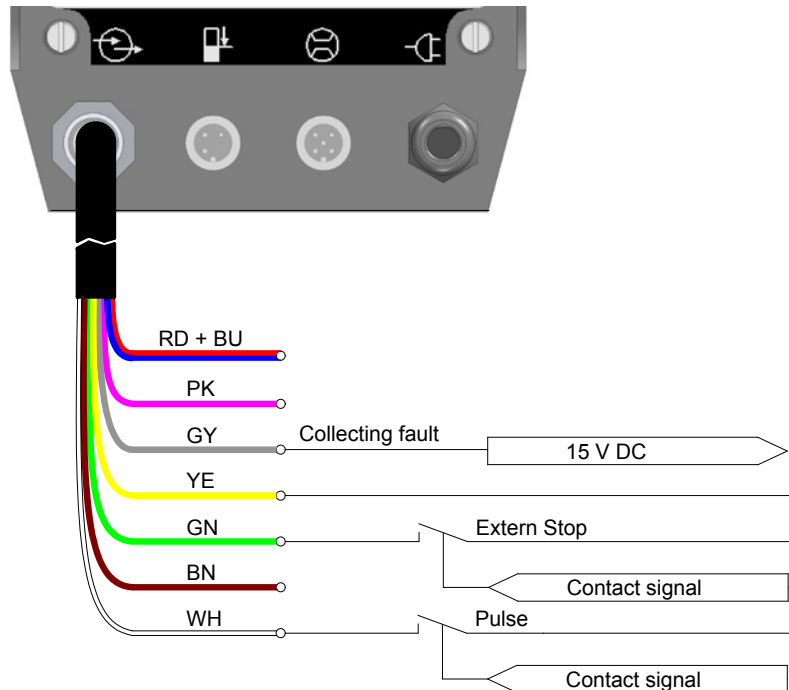
The pump is equipped with a pulse memory, which can optionally be switched ON and OFF. 999 strokes max can be saved.

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.

Operating instructions

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

Fig.: „Connection of a pulse signal with External stop and response of the stroke signal“



10.7.3 Additional settings for the BATCH mode

Selecting the type of CONTROL

You can select among three different types of control:

- MANUAL
- TIMER
- PULSE INPUT

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

>CHARGE CONTROL<
MANUAL

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

>CHARGE CONTROL<
TIMER



ATTENTION!

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.



ATTENTION!

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

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

>CHARGE CONTROL<
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 „Configuring the inputs and outputs“)

Determining the BATCH QUANTITY

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

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

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 „Value entry“.

Determining the BATCH START

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

>BATCH START<
16:30 h

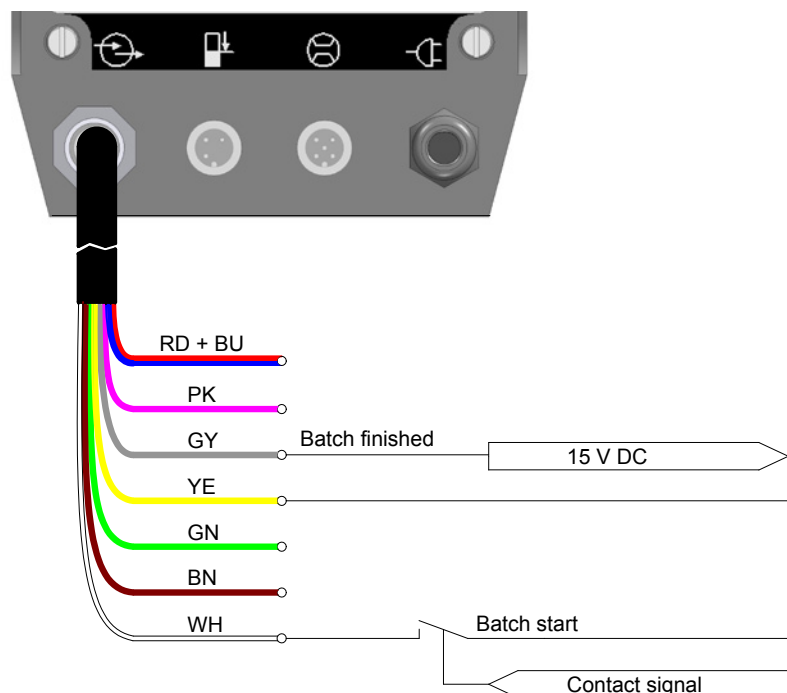
The value input is described in Chapter „Menu guide“.



NOTE!

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

Fig.: „Possible connector pin assignment in batch mode“



10.7.4 Settings for the EXTERNAL operation mode



NOTE!

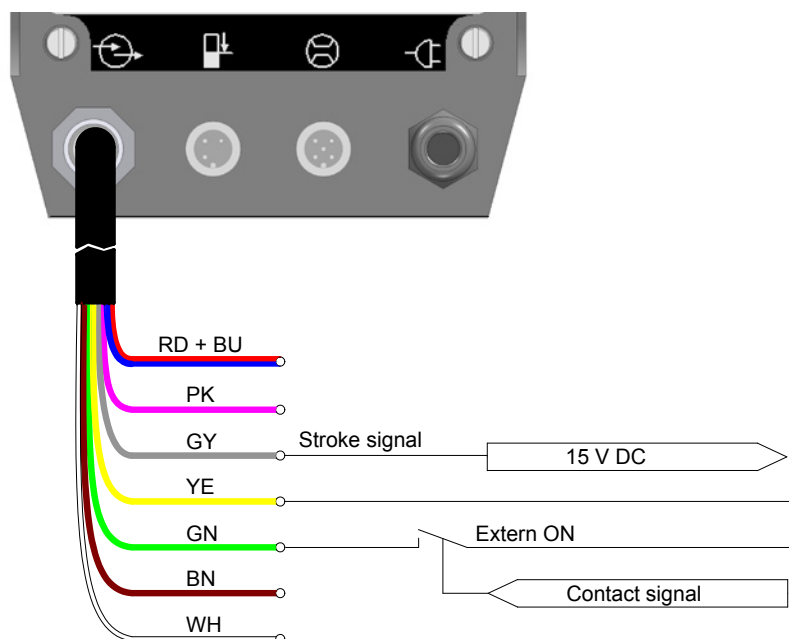
In order to be able to use the EXTERNAL operation mode, at least one input must be assigned the EXTERNAL ON function (see Chapter „Configuring the inputs and outputs“).
Input 03 (see Chapter „Control inputs and outputs“) is factory preset to External ON.

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 „Menu guide“.

Fig.: „Possible connector pin assignment in External operation mode“



10.8 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!

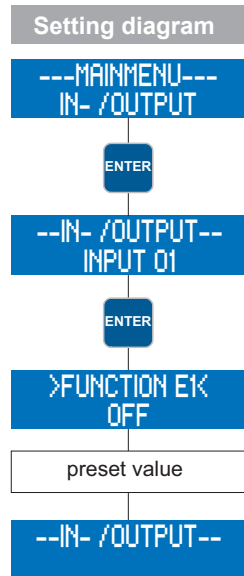
If several inputs are configured identically, then the input signals will be evaluated via OR-operation. This means that the function will be performed as soon as one of the inputs fulfils the condition.

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

Operating instructions

- 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.



10.8.1 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.

Configuration of the respective input as pulse input.

>FUNCTION E1<
PULSE

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

>FUNCTION E1<
EXTERN ON

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

>FUNCTION E1<
EXTERN STOP



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:

: MANUAL S
63 % freq.

Operating instructions

Function for the external control of the venting automatic via the respective input; this automatic is only installed in the self-venting version CS.

>FUNCTION E1<
DE-AERATION

Function for externally starting the batch via the respective input.

>FUNCTION E1<
START BATCH

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 Table.

>FUNCTION E1<
ANALOG 01/02

Analog input switchover		
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)

The respective input is not assigned a function.

>FUNCTION E1<
OFF

10.8.2 Digital/analog inputs 02 and 03

Basically, input 02 and input 03 have the same functions as input 01 (see Chapter „Digital input 01“). 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 E2<
ANALOG 01

The respective input is not assigned a function.

bzw.

>FUNCTION E3<
ANALOG 02

10.8.3 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 rupt. (only with option MBE!)
- Batch finished
- Internal error
- No flow
- OFF

In addition, it is possible to configure the contact signals of the outputs as NC or NO. Message from the respective output indicating the readiness of the dosing pump.

>FUNCTION A1<
READY TO RUN

Message if one of the following faults occurs:

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

>FUNCTION A1<
COLLECTING FAULT

Operating instructions

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 A1<
COLLECT. SIGNAL

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

>FUNCTION A1<
STROKE SIGNAL

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

>FUNCTION A1<
PRE-ALARM LEVEL

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

>FUNCTION A1<
DRY RUN

With activated diaphragm rupture monitoring, message from the respective output indicating a diaphragm rupture. (only with MBE option!)

>FUNCTION A1<
DIAPHRAGM RUPT.

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

>FUNCTION A1<
BATCH FINISHED

Signal when one of the following listed faults occurs (fault analysis/- causes see chapter „Analysis of the plain text error messages“):

>FUNCTION A1<
INTERNAL ERROR

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

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

>FUNCTION A1<
NO FLOW

10.9 Flow rate indicator



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

NOTE!

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

MANUAL operation mode

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 „Screen Operating messages“), the stroke frequency indicator is replaced by the flow rate indicator. In addition, the total dosing quantity is indicated in litres.

: MANUAL
7.2 l/h

: MANUAL
10.34 l

ANALOG operation mode

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.

: ANALOG
7.2 l/h

: MANUAL
7.2 l/h

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Operating instructions

BATCH operation mode

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

: BATCH Man.
U 10.34 l

: BATCH Man.
R 10.34 l

PULSE operation mode

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

: PULSE
10.34 l

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.



ATTENTION!

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



ATTENTION!

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.

10.10 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.



ATTENTION!

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:



ATTENTION!

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



ATTENTION!

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

Operating instructions

- 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.
- When the suction line is empty the dosing medium must be drawn in (MANUAL operation mode, keep the pump running).
- Set the stroke length with which the pump should be calibrated (can also be done via the manual stroke length adjustment)
- Note the filling level in the calibration pot (= base quantity).

- Go to the main menu and select the --CALIBRATION--menu:

- Press the ENTER key to access the field for entering the number of calibration strokes.

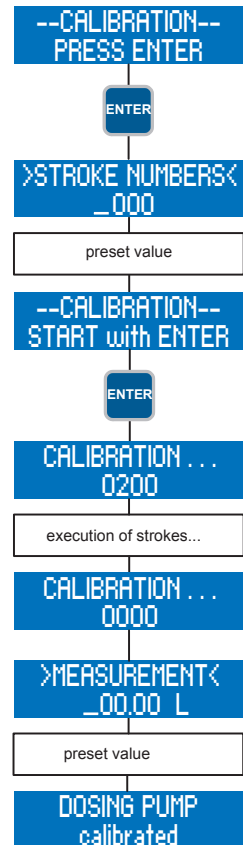
- At first, enter the desired stroke number (at least 200!) ► the higher the stroke number the more accurate the calibration!

- To start the calibration, press the ENTER key.

- The dosing pump performs the preset number of strokes.
- Determination of the pumped quantity
(= difference between base quantity and remaining quantity in the calibration pot).

- Entry of the determined quantity.

- Calibration of the dosing pump is then completed!



NOTE!

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



ATTENTION!

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!

Operating instructions

10.11 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 „Calibration“) 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. „Overview of preset parameters“, Chapter „Parameter table“) can be restored. To do so, adjust YES.



ATTENTION!

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

>SYSTEM TIME<

The system time must be adjusted manually.



ATTENTION!

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

10.12 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.

10.13 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.

Operating instructions



NOTE!

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



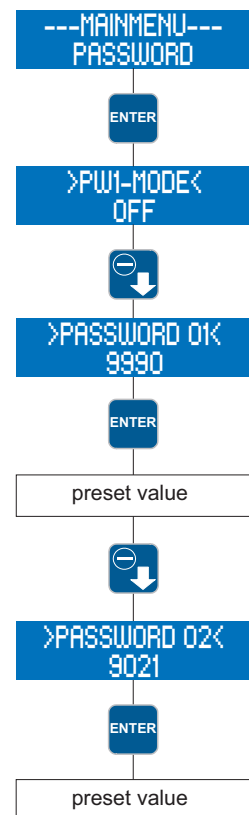
ATTENTION!

The passwords are factory set as follows:

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

- Go to the ---MAIN MENU--- and select the menu item PASSWORD.
- Pressing the ENTER key opens the setting menu for the PW01 mode.
- Press the DOWN key to access the setting for Password 01.
- Value entry for Password 01 is enabled after pressing the ENTER key.
- After having entered Password 01, press the DOWN key to access the setting for Password 02.
- Value entry for Password 02 is enabled after pressing the ENTER key.

Setting diagram



ATTENTION!

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



ATTENTION!

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.

Operating instructions

10.14 Info

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

10.15 Extras

10.15.1 Slow-Mode

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

---EXTRAS---
SLOW-MODE

Adjustments can be made to the following points:

- SLOW-MODE
- Speed

>SLOW-MODE<

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

>SPEED<

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



NOTE!

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

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

10.15.2 Dosing monitoring

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 „Flow rate indicator“).

---EXTRAS---
DOSING MONITOR.



ATTENTION!

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

Operating instructions

>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 „Calibration“.

10.15.3 Diaphragm rupture detection (OPTION)

The diaphragm rupture detection (see also Chapter „Diaphragm rupture monitoring device (option)“) is an optional feature for the dosing pump. It is used to monitor the diaphragm.

---EXTRAS---
DIAPHRAGM RUPT.

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.



ATTENTION!

The contact type “switch normally closed” is to be set for conductive media when using single and double diaphragm pumps. When single diaphragm pumps are used the diaphragm rupture signalisation only functions with conductive media. The contact type “switch normally open” is for non-conductive media when using double diaphragm pumps with conductive buffer solution. The setting is ex works.

>SENSITIVITY<

Entry of the sensitivity of the diaphragm rupture electrode in percent. This enables an adaptation to the conductivity of the pumped medium. In case of poorly conductive media, the sensitivity must be set to a high value (e.g. 100% at approx. 4µS/cm); in case of highly conductive media, the sensitivity must be set to a low value (e.g. 10% at approx. 50µS/cm).



NOTE!

When leaving the factory, the sensitivity is preset to 50%. This corresponds to a minimum conductivity of the dosing medium of approx. 10 µS/cm. The minimum conductivity at 100% sensitivity is 4µS/cm.

10.15.4 Level monitoring

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

---EXTRAS---
LEVEL

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:

Configuration of the level input		
Configuration	Pre-alarm	Dry run
1	NO	NO
2	NO	NC
3	NC	NC

Configuration 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.

Configuration 2

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

Configuration 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.

10.15.5 Venting automatic (only with CS 409.2)

The self-venting version CS is equipped with a venting automatic (see also Chapter „Automatic ventilation device CS-design“), which is directly triggered by the control electronics of the dosing pump.

---EXTRAS---
DE-AERATION

It is possible to make adjustments to following items:

- Charge control
- Venting time
- Interval time

>CONTROL<

Selection of the type of control for triggering the venting. The venting can either be triggered via an external signal (EXTERNAL), after a preset interval time (INTERVAL), or automatically upon the (re)start of the pump after at least 30 min of inactivity (AUTOMATIC). Optionally, it can also be switched off (OFF).



ATTENTION!

In addition to the adjustable type of control, a manual venting is also possible at any time:

Go to the operating message “VENTING: OFF” and press the ENTER key – then, the venting will be active (“VENTING: ON”) until the ENTER key is pressed again respectively the max. Venting time (5 min) is reached.

: MANUAL
DE-AERATION: OFF

After termination the minimum interval time of 15 min the venting may be started again.



ATTENTION!

After pump and suction line have been vented, there might be the possibility (depending on the backpressure) that small fluid quantities are already conveyed into the pressure line although the vent valve is still open.

The venting period must therefore be coordinated with the possible gas volume on the suction side of the pump.



NOTE!

In all operating modes of the venting valve the maximum venting time is 5 min and the minimum interval time is 15 min. If the venting is triggered via an external signal pay attention to this designing the external control unit!

>VENTING TIME<

Entry of the venting time in seconds. During each venting procedure, the vent valve will be opened for this time. The factory setting is 10 sec (range: 5 to 300 sec).

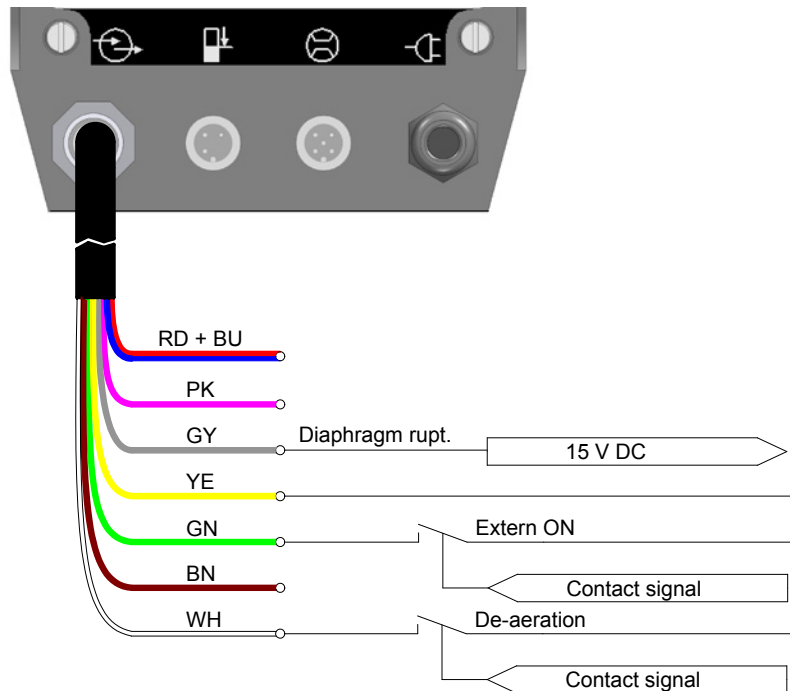
C/CS 409.2

Operating instructions

>INTERVAL TIME<

Entry of the interval time (in minutes) at which the venting is repeated (with INTERVAL control). The factory setting is 40 min (range: 15 to 100 min).

Fig.: „Possible connector pin assignment for external control of the vent valve along with diaphragm rupture message“



11. Maintenance

The following safety instructions apply to all service and are sure to follow.



WARNING!

Carry out all maintenance work only on non-pressurized system!



WARNING!

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



WARNING!

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.



WARNING!

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



WARNING!

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

Dosing pump with a suitable detergent rinse so that no delivery medium remains in the pump body. Otherwise, steps out on dismantling pumped. The flushed fluid absorb contact and disposed of safely!

This measure must also take place before any delivery to a dosing pump repair purposes.



WARNING!

During maintenance or repair work, switch off the drive motor of the dosing pump and secure it against inadvertent or unauthorised reactivation!



WARNING!

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

Check the following at regular intervals:

- Check oil level regularly (oil eye)
- 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 „Overview of the tightening torques“.

11.1 Working materials

	Pump type	Specification	sera use	Quantity
LUBRICANT	C/CS 409.2-...	CLP VG220 DIN51517-3	ARAL Degol BG220	0,3 Litres

	Pump type	Type	Quantity			
			intermediate diaphragm			
			FPM	CSM	PTFE	PTFE-laminated
HYDRAULIC FLUID	C/CS 409.2-4,0	Glyzerin DAB87 ¹⁾	6,5 cm ³	6,5 cm ³	7,5 cm ³	---
	C/CS 409.2-4,0 mit MBE-03		9 cm ³	9 cm ³	10 cm ³	---
	C/CS 409.2-7,0		6,5 cm ³	6,5 cm ³	7,5 cm ³	---
	C/CS 409.2-7,0 mit MBE-03		9 cm ³	9 cm ³	10 cm ³	---
	C/CS 409.2-12		12 cm ³	12 cm ³	13,5 cm ³	---
	C/CS 409.2-12 mit MBE-03		14 cm ³	14 cm ³	15,5 cm ³	---
	C/CS 409.2-18		12 cm ³	12 cm ³	13,5 cm ³	---
	C/CS 409.2-18 mit MBE-03		14 cm ³	14 cm ³	15,5 cm ³	---
	C/CS 409.2-25		12 cm ³	12 cm ³	13,5 cm ³	---
	C/CS 409.2-25 mit MBE-03		14 cm ³	14 cm ³	15,5 cm ³	---
	C 409.2-50		37 cm ³	37 cm ³	40 cm ³	---
	C 409.2-50 mit MBE-03		37 cm ³	37 cm ³	40 cm ³	---
	C 409.2-75		37 cm ³	37 cm ³	40 cm ³	---
	C 409.2-75 mit MBE-03		37 cm ³	37 cm ³	40 cm ³	---
	C 409.2-90		55 cm ³	55 cm ³	62 cm ³	---
	C 409.2-90 mit MBE-03		55 cm ³	55 cm ³	62 cm ³	---
	C 409.2-115		52 cm ³	52 cm ³	57 cm ³	---
	C 409.2-115 mit MBE-03		52 cm ³	52 cm ³	57 cm ³	---
	C 409.2-140		55 cm ³	55 cm ³	62 cm ³	---
	C 409.2-140 mit MBE-03		55 cm ³	55 cm ³	62 cm ³	---
	C 409.2-180		52 cm ³	52 cm ³	57 cm ³	---
	C 409.2-180 mit MBE-03		52 cm ³	52 cm ³	57 cm ³	---
	C 409.2-250		---	---	---	240 cm ³
	C 409.2-250 mit MBE-04		---	---	---	240 cm ³
C 409.2-350	---	---	---	240 cm ³		
C 409.2-350 mit MBE-04	---	---	---	240 cm ³		

¹⁾ If no other specification is stated in the product description.

11.2 Drive unit

11.2.1 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.

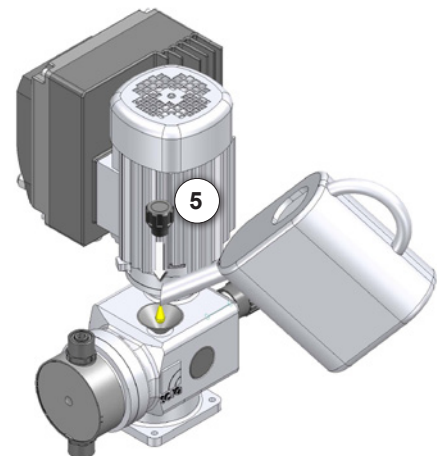
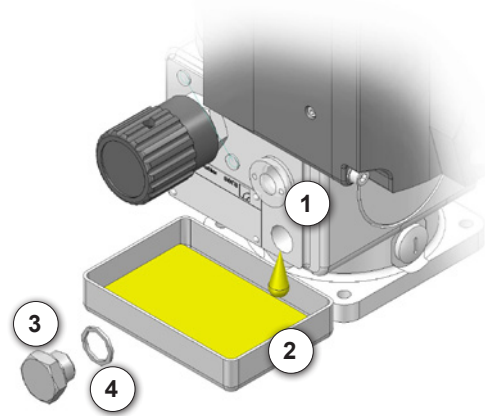
11.2.2 Oil change

- Check oil level at regular intervals (oil sight glass (1))

Perform an oil change once a year.

To do so, proceed as follows:

- Unscrew the venting screw (5).
- Prepare an appropriate container (2).
- Open the screw plug (3) and drain off oil.
- Close hole with screw plug (pay attention to the sealing ring (4)!).
- Fill oil in threaded hole of the venting screw.
- For type and quantity of the gear oil, please see Chapter "Working materials".
- Screw in venting screw (5).

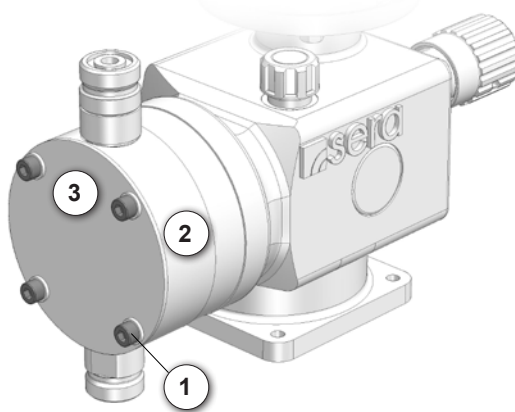


C/CS 409.2

Operating instructions

11.3 Dosing unit

11.3.1 Overview of the tightening torques



	Pump type	Pump body (2) without front plate (3)	Pump body (2) with front plate (3)
		Nm	
TIGHTENING TORQUES OF THE FIXING SCREWS (1)	C/CS 409.2-08 e	5,0	4,5
	C/CS 409.2-1,6 e		
	C/CS 409.2-2,4 e		
	C/CS 409.2-4,0 (e)	4,0	4,5
	C/CS 409.2-7,0 (e)		
	C/CS 409.2-12 (e)		
	C/CS 409.2-18 (e)		
	C/CS 409.2-25 (e)		
	C 409.2-50 (e)	7,0	8,0
	C 409.2-75 (e)		
	C 409.2-90 (e)		
	C 409.2-115 (e)		
	C 409.2-140 (e)		
	C 409.2-180 (e)		
	C 409.2-250 (e)	15,0	15,0
	C 409.2-350 (e)		

11.3.2 Changing the Diaphragm

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



WARNING!

Observe and follow the safety instructions in Chapter 11 „Maintenance“ by all means.

Man, machine and environment are endangered if the safety instructions are not observed.

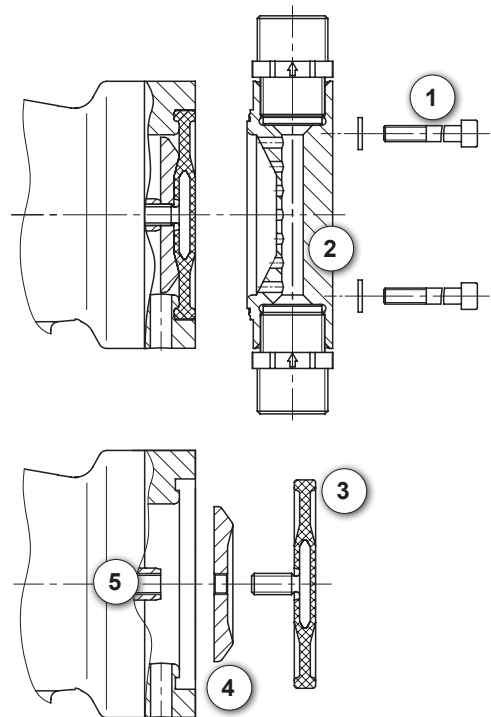


WARNING!

For replacing the diaphragm, the system must be depressurised!

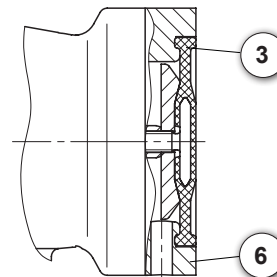
11.3.2.1 Single diaphragm pump

- Set the stroke length adjustment to a stroke length of 0% (front position).
- Loosen fixing screws (1) or –nuts on the pump body.
- Remove pump body (2) and front plate (if installed) to the front
- Screw the drive diaphragm (3) out of the connecting rod (5).
- Unscrew pressure plate (4) from the set screw of the diaphragm (not with a laminated drive diaphragm).
- Clean pressure plate and screw plate on the new diaphragm.



Assemble the pump in reversed order

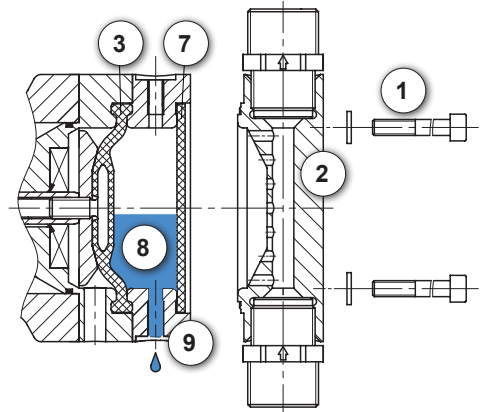
- Set the stroke length to 50%. Move diaphragm (3) to the base ring (6) – the diaphragm must be in the middle position.
- If the pump is not equipped with a stroke length adjustment (M-design), move the diaphragm to the middle position by turning the fan blade of the drive motor.
- When assembling the pump body, please note: suction valve below, pressure valve above!



Add the suction and pressure line and connect pump to the power supply. The diaphragm pump is then again ready for operation.

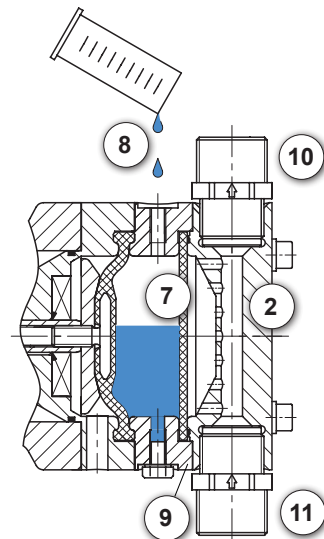
11.3.2.2 Double diaphragm pump

- Drain buffer fluid (8) (by opening the screw plug).
- Loosen fixing screws (1) on the pump body (2) and remove intermediate diaphragm (7).
- Remove the diaphragm ring (9) to the front if the drive diaphragm (3) is to be replaced, too.

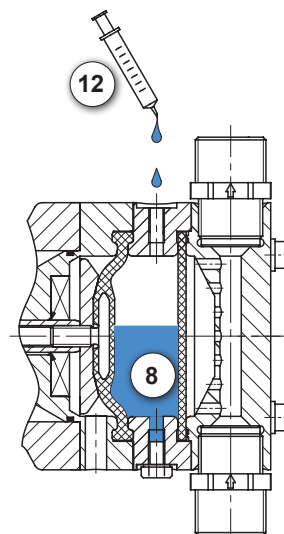


Assemble the pump in reversed order

- Installation of the drive diaphragm (see Chapter „Single diaphragm pump“ (Changing the Diaphragm)).
- Insert intermediate diaphragm (7) in the diaphragm ring (9) (in case of a PTFE-laminated intermediate diaphragm the PTFE-coated side must point towards the pump body (2)).
- When assembling the pump body, please note: suction valve (11) below, pressure valve (10) above!
- Observe the tightening torques (see Chapter „Overview of the tightening torques“).
- Set the stroke length to 100%. If the pump is not equipped with a stroke length adjustment (M-design), move the diaphragm to the rear position by turning the fan blade of the drive motor.
- Fill buffer fluid (8) in the diaphragm ring (type and quantity are indicated on the type plate).



- If the dosing pump has a small conveying capacity the buffer fluid (8) is to be filled in with a disposable syringe (12).
- Venting the buffer fluid chamber: wait for appr. 2 minutes after filling in until the air dissolved in the buffer fluid has outgassed.

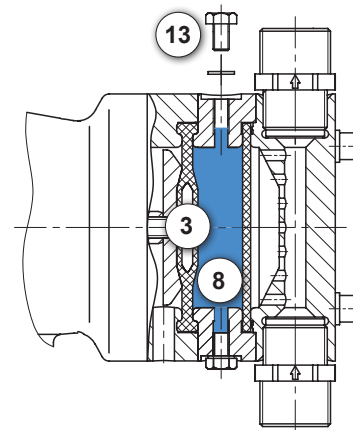


C/CS 409.2

Operating instructions

- Move the drive diaphragm (3) to the front by turning the stroke length adjustment (in clockwise direction) until the buffer fluid (8) level has reached the top edge of the filling hole(s).
- Screw in the screw plug(s) (13).
- Reset the stroke length to the initial value.

Add the suction and pressure line and connect pump to the power supply. The diaphragm pump is then again ready for operation.



11.3.2.3 Overflow valve

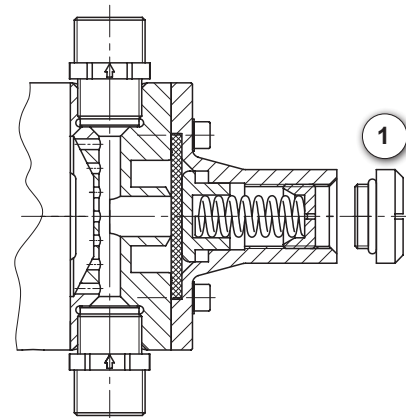
Proceed as follows to change the diaphragm of the overflow valve (only dosing pumps with integrated overflow valve).



NOTE!

All diaphragms should be replaced completely.

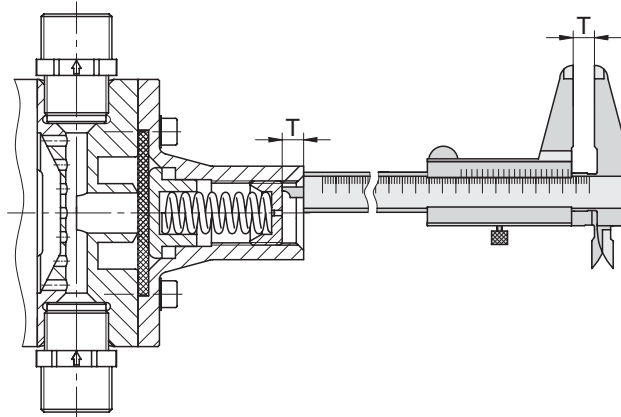
Loosen and unscrew the lid (1) of the overflow valve.



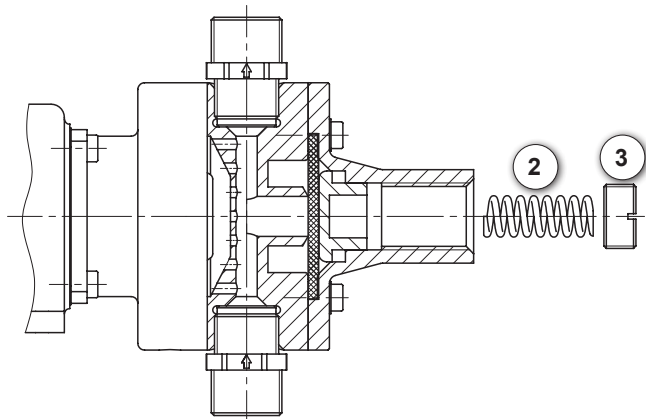


NOTE!

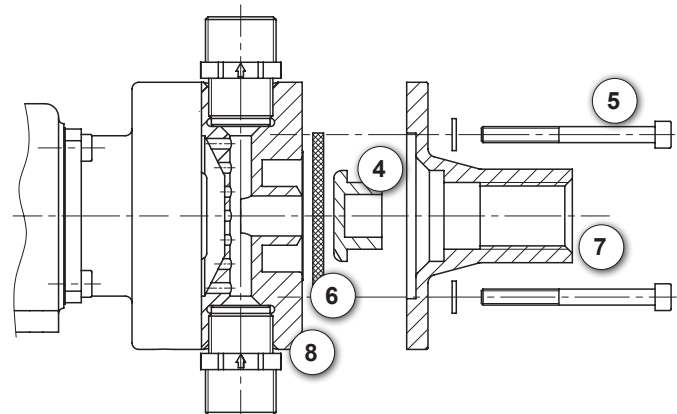
Before the set screw is unscrewed the dimension T (distance between top edge of the cover and the set screw) is to be determined and documented. This ensures that the overflow valve can be reset to the same pressure during subsequent assembly.



- Unscrew the set screw (3).
- Remove pressure spring (2).



- Loosen and unscrew fixing screws (5).
- Remove cover (7) and pump body (8) to the front.
- Remove pressure disk (4) and diaphragm (6).



- Check overflow valve for damage and contamination.
- Insert a new diaphragm. In case of PTFE-laminated diaphragms the PTFE-coated side must point towards the pump body.
- Assemble the pump in reversed order.



NOTE!

The individual components should be cleaned thoroughly before assembly!



NOTE!

When the set nut is screwed in the dimension "T" which was determined beforehand is of great importance.

The initial opening pressure of the overflow valve is only reached when the set screw is screwed in exactly according to dimension "T"!



ATTENTION!

The screw-in depth of the set screw must not exceed the initial value. If the set pressure is increased, sera has to be consulted beforehand!



ATTENTION!

Never screw in the set screw to a depth so that the pres-sure spring is compressed to solid length!

12. Spare and wearing parts

12.1 Wearing parts

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

- Drive diaphragm
- Intermediate diaphragm (only for double diaphragm pump)
- Diaphragm of the integrated overflow valve (if installed)
- Suction valve
- Pressure valve

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 diaphragm pump.

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

In case of a premature diaphragm rupture caused by hard operating conditions, switch off the diaphragm pump and replace the diaphragms (see Chapter „Changing the diaphragm“).

As an option, the diaphragm pump can be equipped with a diaphragm rupture monitoring device MBE-... (please see Chapter "Diaphragm rupture monitoring device " (Functional description)).

12.2 Spare parts

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

- Pump body
- Diaphragm ring (only for double diaphragm pump)
- Automatic ventilation device (CS 409.2)

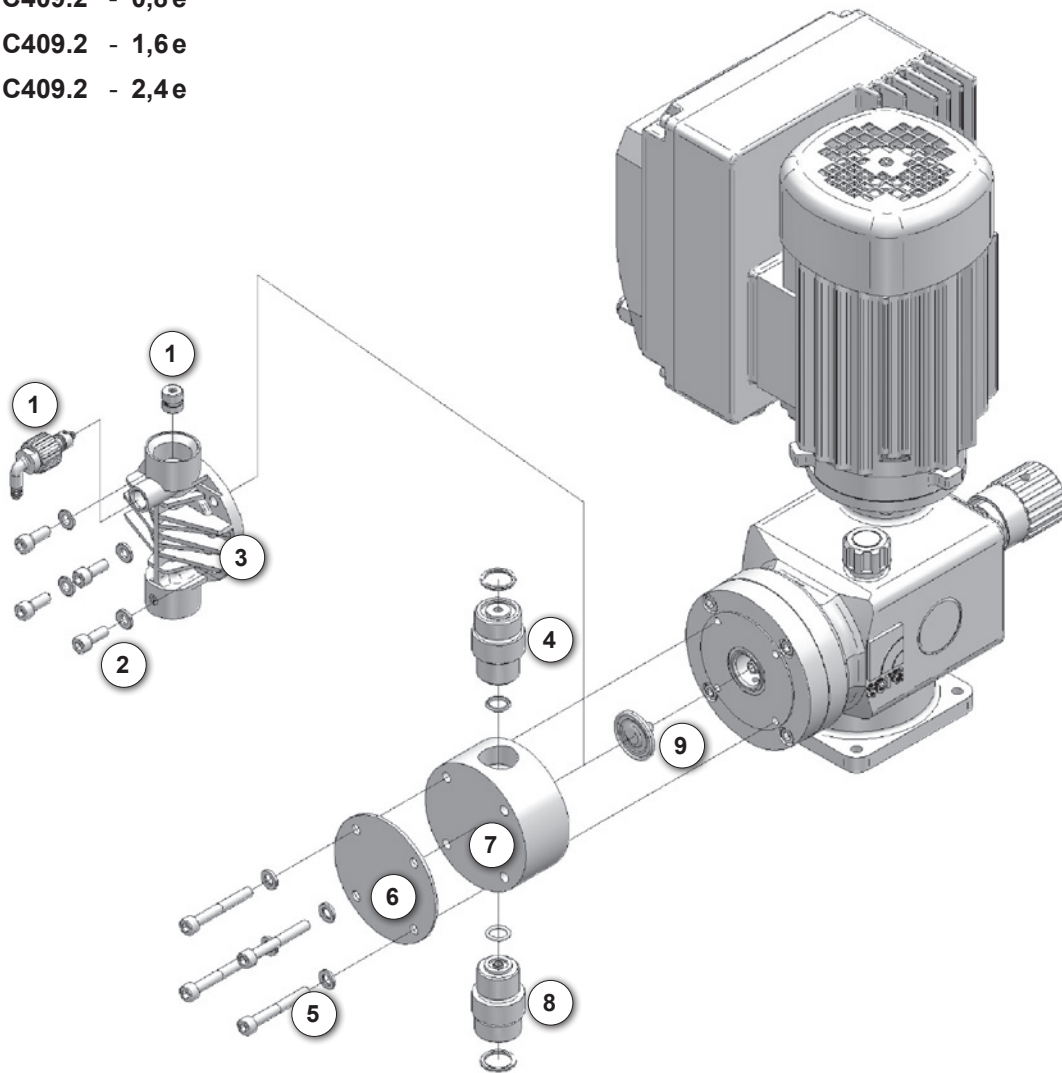
12.3 Spare and wearing parts

12.3.1 Diaphragm pump C 409.2- 0,8 e ...-2,4 e

C409.2 - 0,8 e

C409.2 - 1,6 e

C409.2 - 2,4 e



Overview of the spare and wearing part kits Diaphragm pump C 409.2- 0,8 e ...-2,4 e

Suction valve (kit)	
Pos.	consisting of
8	Suction valve (incl. o-rings)

Pressure valve (kit)	
Pos.	consisting of
4	Pressure valve (incl. o-rings)

Diaphragm kit	
Pos.	consisting of
9	Drive diaphragm

Pump body kit (plastic, FRP-design)	
Pos.	consisting of
1	Vent valve
2	Screws, complete
3	Pump body

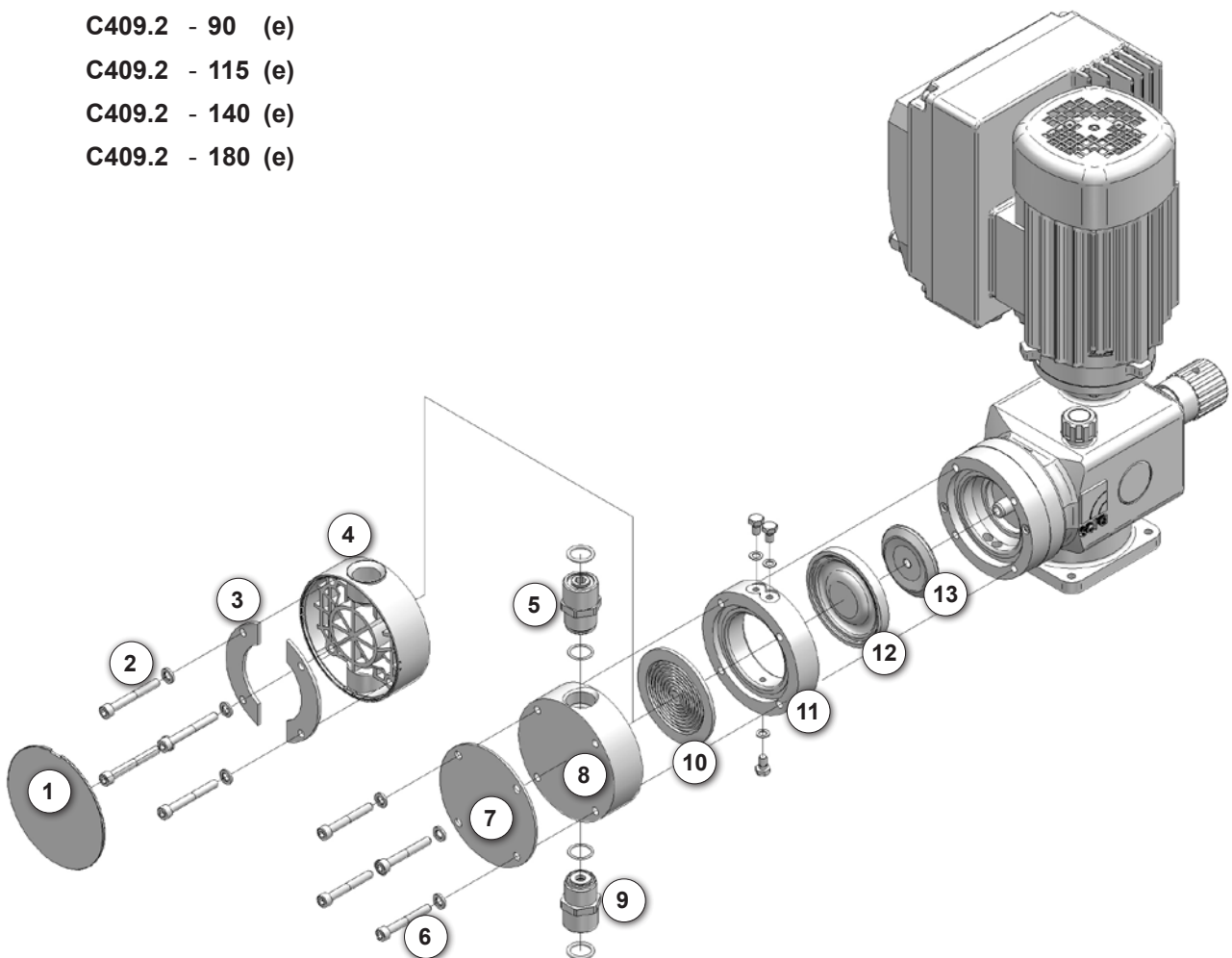
Pump body kit (plastic)	
Pos.	consisting of
5	Screws, complete
6	Front plate
7	Pump body

C/CS 409.2

Operating instructions

12.3.2 Diaphragm pump C 409.2- 4,0 (e) ...-180 (e)

- C409.2 - 4,0 (e)
- C409.2 - 7,0 (e)
- C409.2 - 12 (e)
- C409.2 - 18 (e)
- C409.2 - 25 (e)
- C409.2 - 50 (e)
- C409.2 - 75 (e)
- C409.2 - 90 (e)
- C409.2 - 115 (e)
- C409.2 - 140 (e)
- C409.2 - 180 (e)



C/CS 409.2

Operating instructions

Overview of the spare and wearing part kits Diaphragm pump C 409.2- 4,0 (e) ...-180 (e)

Suction valve (kit)	
Pos.	consisting of
9	Suction valve (incl. o-rings)

Pressure valve (kit)	
Pos.	consisting of
5	Pressure valve (incl. o-rings)

Diaphragm kit (single diaphragm pump)	
Pos.	consisting of
12	Drive diaphragm
13	Pressure plate (not with a laminated drive diaphragm)

Diaphragm kit (double diaphragm pump)	
Pos.	consisting of
10	Intermediate diaphragm
12	Drive diaphragm
13	Pressure plate (not with a laminated drive diaphragm)
	Buffer fluid

Diaphragm ring kit (only for double diaphragm pump)	
Pos.	consisting of
11	Diaphragm ring, complete

Pump body kit (plastic, FRP-design)	
Pos.	consisting of
1	Cover plate
2	Screws, complete
3	Insertion plate(s), if applicable
4	Pump body

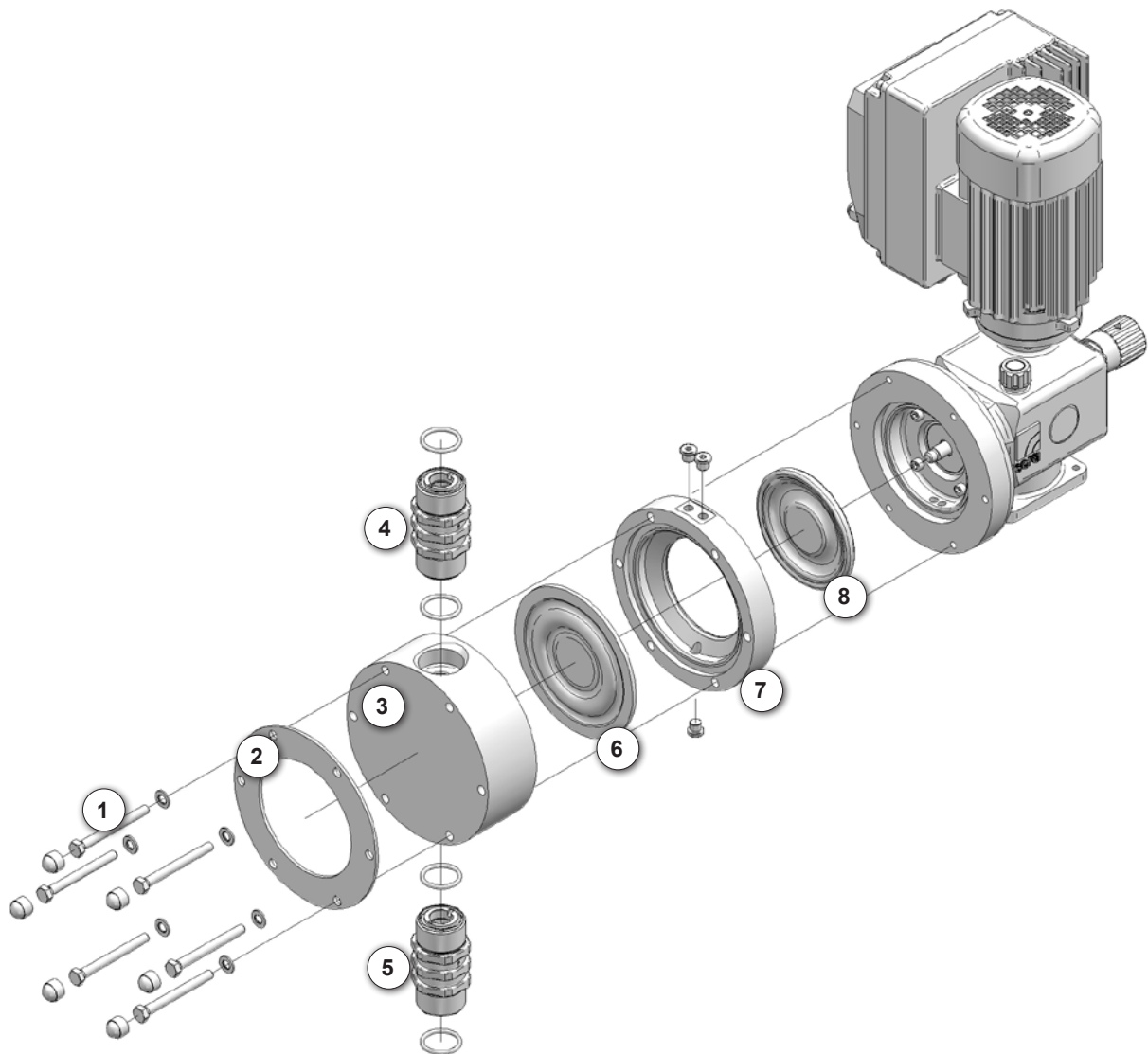
Pump body kit (plastic)	
Pos.	consisting of
6	Screws, complete
7	Front plate
8	Pump body

Pump body kit (special steel)	
Pos.	consisting of
6	Screws, complete
8	Pump body

12.3.3 Diaphragm pump C 409.2-250 (e) ...-350 (e)

C409.2 - 250 (e)

C409.2 - 350 (e)



Operating instructions

Overview of the spare and wearing part kits Diaphragm pump C 409.2-250 (e) ...-350 (e)

Suction valve (kit)	
Pos.	consisting of
5	Suction valve (incl. o-rings)

Pressure valve (kit)	
Pos.	consisting of
4	Pressure valve (incl. o-rings)

Diaphragm kit (single diaphragm pump)	
Pos.	consisting of
8	Drive diaphragm

Diaphragm kit (double diaphragm pump)	
Pos.	consisting of
6	Intermediate diaphragm
8	Drive diaphragm
	Buffer fluid

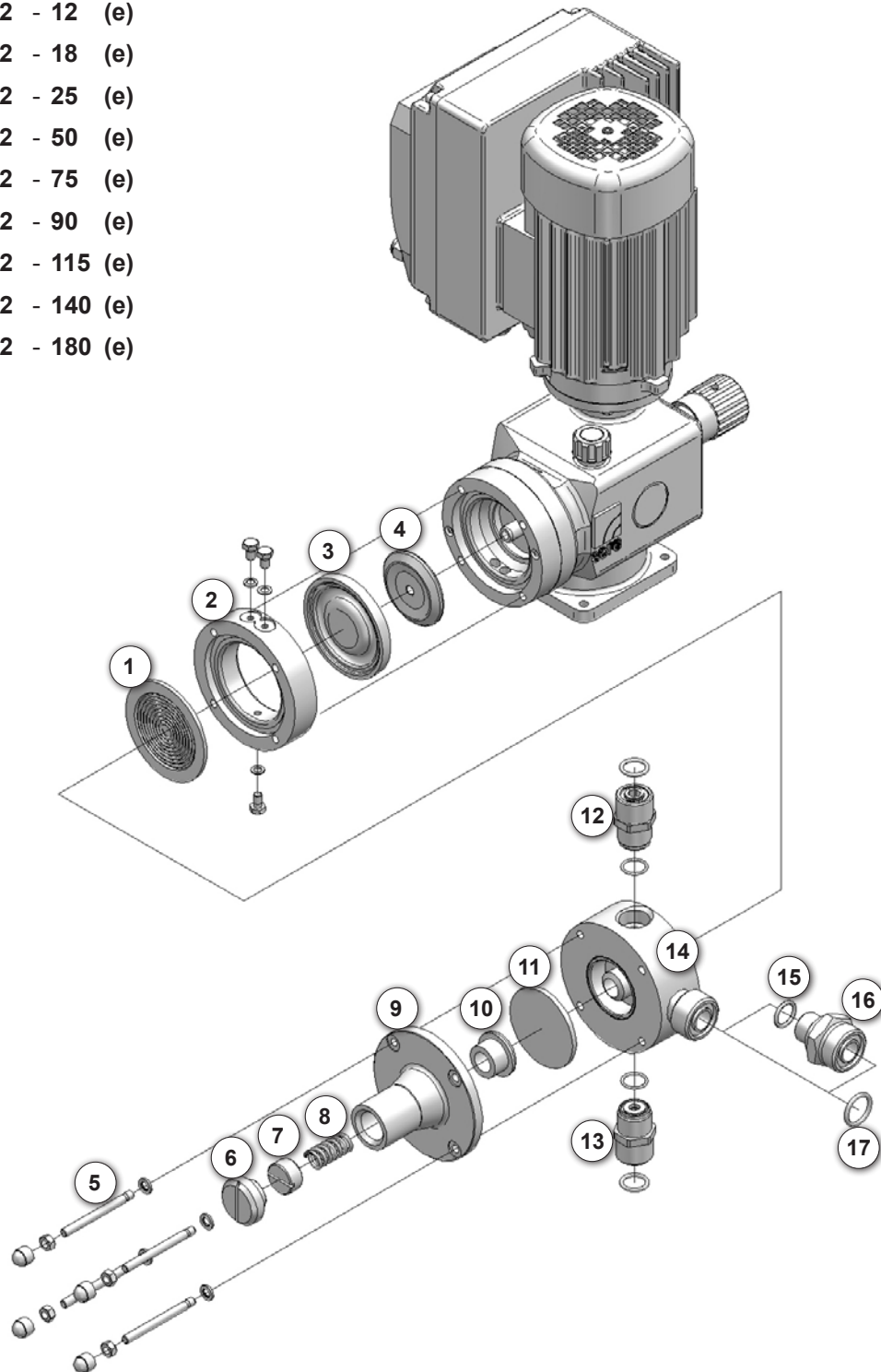
Diaphragm ring kit (only for double diaphragm pump)	
Pos.	consisting of
7	Diaphragm ring, complete

Pump body kit (plastic)	
Pos.	consisting of
1	Screws, complete
2	Front plate
3	Pump body

Pump body kit (special steel)	
Pos.	consisting of
1	Screws, complete
3	Pump body

12.3.4 Diaphragm pump C 409.2- 4,0 (e) ...-180 (e) with integrated overflow valve

- C409.2 - 4,0 (e)
- C409.2 - 7,0 (e)
- C409.2 - 12 (e)
- C409.2 - 18 (e)
- C409.2 - 25 (e)
- C409.2 - 50 (e)
- C409.2 - 75 (e)
- C409.2 - 90 (e)
- C409.2 - 115 (e)
- C409.2 - 140 (e)
- C409.2 - 180 (e)



Operating instructions

Overview of the spare and wearing part kits Diaphragm pump C 409.2- 4,0 (e) ...-180 (e) with integrated overflow valve

Suction valve (kit)	
Pos.	consisting of
13	Suction valve (incl. o-rings)

Pressure valve (kit)	
Pos.	consisting of
12	Pressure valve (incl. o-rings)

Diaphragm kit (single diaphragm pump)	
Pos.	consisting of
3	Drive diaphragm
4	Pressure plate (not with a laminated drive diaphragm)
11	Diaphragm (overflow valve)

Diaphragm kit (double diaphragm pump)	
Pos.	consisting of
1	Intermediate diaphragm
3	Drive diaphragm
4	Pressure plate (not with a laminated drive diaphragm)
11	Diaphragm (overflow valve)
	Buffer fluid

Diaphragm ring kit (only for double diaphragm pump)	
Pos.	consisting of
2	Diaphragm ring, complete

Overflow valve (kit)	
Pos.	consisting of
6	Lid
7	Set screw
8	Pressure spring
9	Cover
10	Pressure disk

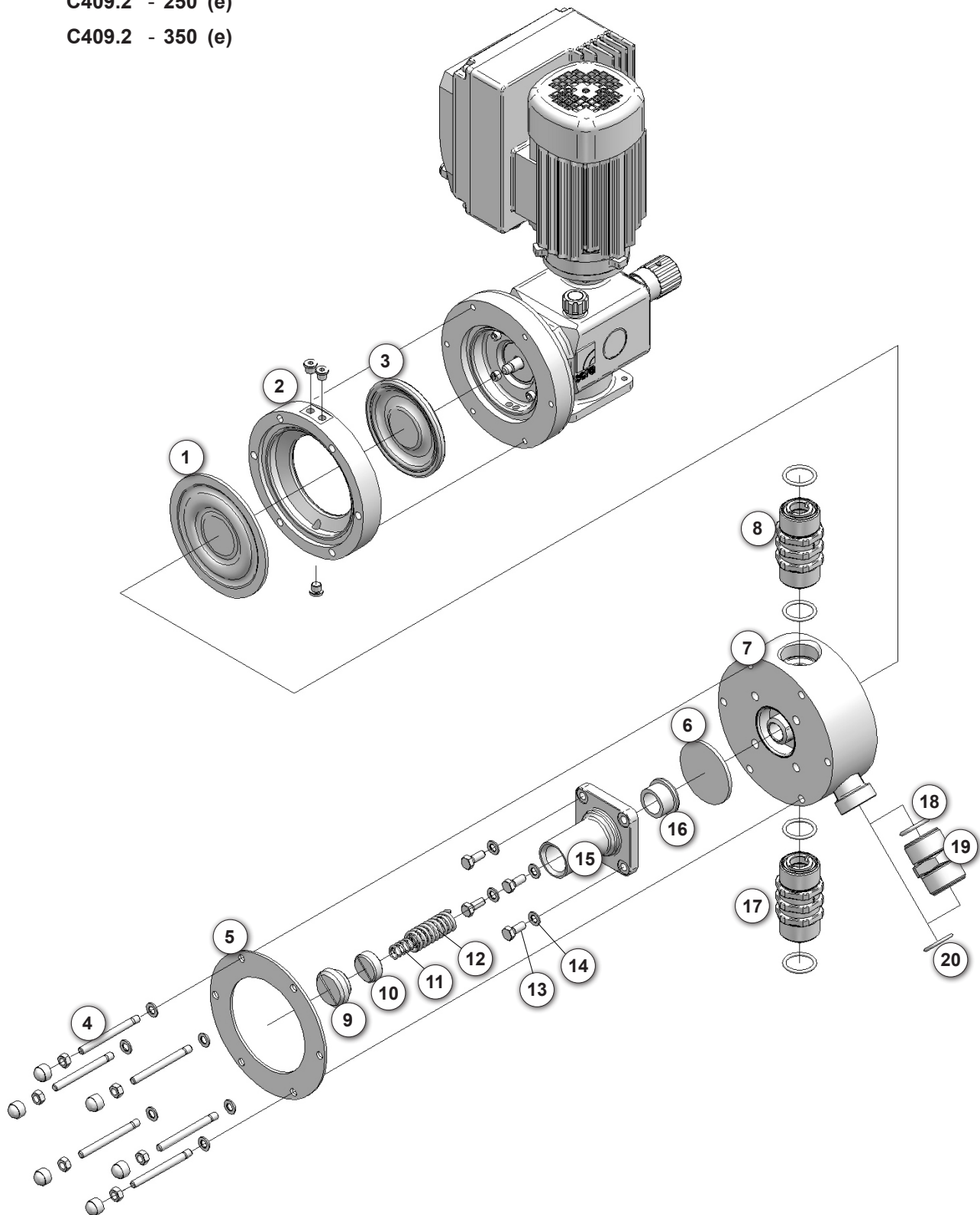
Pump body kit (plastic)	
Pos.	consisting of
5	Screws, complete
14	Pump body
17	O-ring

Pump body kit (special steel)	
Pos.	consisting of
5	Screws, complete
14	Pump body
15	O-ring
16	Socket
17	O-ring

12.3.5 Diaphragm pump C 409.2-250 (e) ...-350 (e) with integrated overflow valve

C409.2 - 250 (e)

C409.2 - 350 (e)



Operating instructions

**Overview of the spare and wearing part kits
Diaphragm pump C 409.2-250 (e) ...-350 (e) with integrated overflow valve**

Suction valve (kit)	
<i>Pos.</i>	<i>consisting of</i>
17	Suction valve (incl. o-rings)

Pressure valve (kit)	
<i>Pos.</i>	<i>consisting of</i>
8	Pressure valve (incl. o-rings)

Diaphragm kit (single diaphragm pump)	
<i>Pos.</i>	<i>consisting of</i>
3	Drive diaphragm
6	Diaphragm (overflow valve)

Diaphragm kit (double diaphragm pump)	
<i>Pos.</i>	<i>consisting of</i>
1	Intermediate diaphragm
3	Drive diaphragm
6	Diaphragm (overflow valve)
	Buffer fluid

Diaphragm ring kit (only for double diaphragm pump)	
<i>Pos.</i>	<i>consisting of</i>
2	Diaphragm ring, complete

Overflow valve (kit)	
<i>Pos.</i>	<i>consisting of</i>
9	Lid
10	Set screw
11	Pressure spring
12	Pressure spring
13	Hexagon screw(s)
14	Disk(s)
15	Cover
16	Pressure disk

Pump body kit (plastic)	
<i>Pos.</i>	<i>consisting of</i>
4	Screws, complete
5	Front plate
7	Pump body
20	O-ring

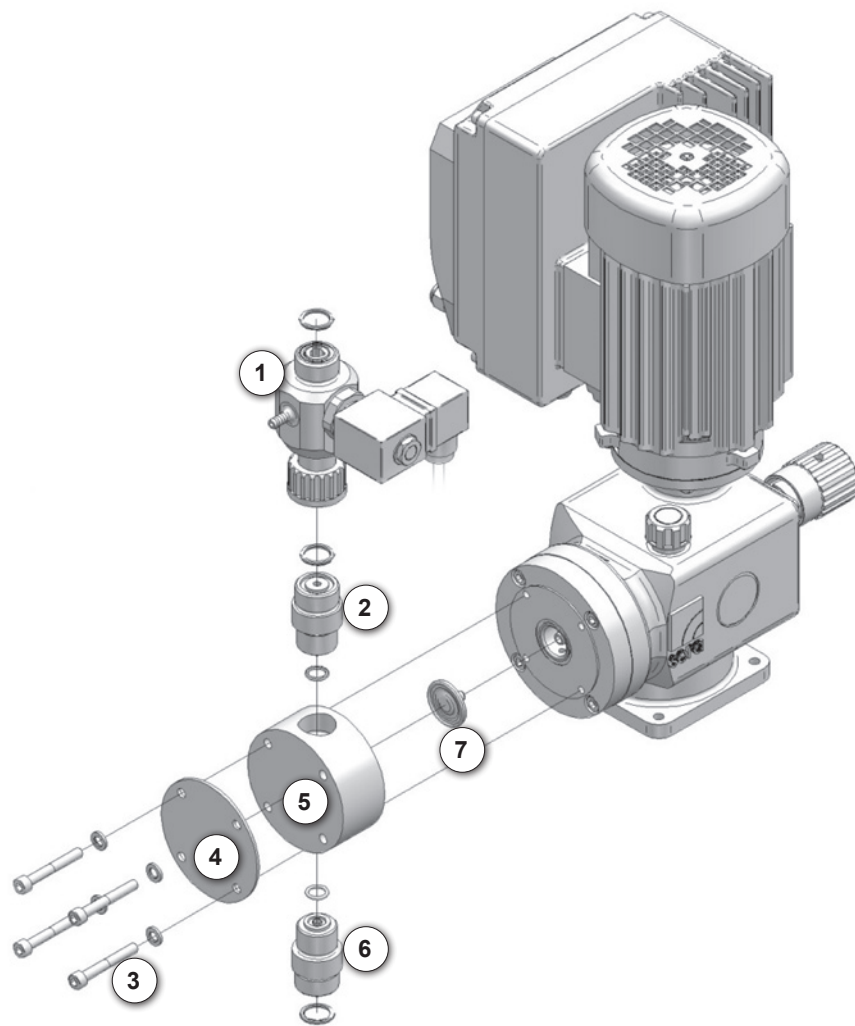
Pump body kit (special steel)	
<i>Pos.</i>	<i>consisting of</i>
4	Screws, complete
7	Pump body
18	O-ring
19	Socket
20	O-ring

12.3.6 Diaphragm pump CS 409.2- 0,8 e ...-2,4 e

CS409.2 - 0,8 e

CS409.2 - 1,6 e

CS409.2 - 2,4 e



C/CS 409.2

Operating instructions

Overview of the spare and wearing part kits Diaphragm pump CS 409.2- 0,8 e ...-2,4 e

Suction valve (kit)	
Pos.	consisting of
6	Suction valve (incl. o-rings)

Pressure valve (kit)	
Pos.	consisting of
2	Pressure valve (incl. o-rings)

Diaphragm kit	
Pos.	consisting of
7	Drive diaphragm

Pump body kit (plastic)	
Pos.	consisting of
3	Screws, complete
4	Front plate
5	Pump body

Automatic ventilation device -kit	
Pos.	consisting of
1	Automatic ventilation device (incl. o-ring)

12.3.7 Diaphragm pump CS 409.2- 4,0 (e) ...-25 (e)

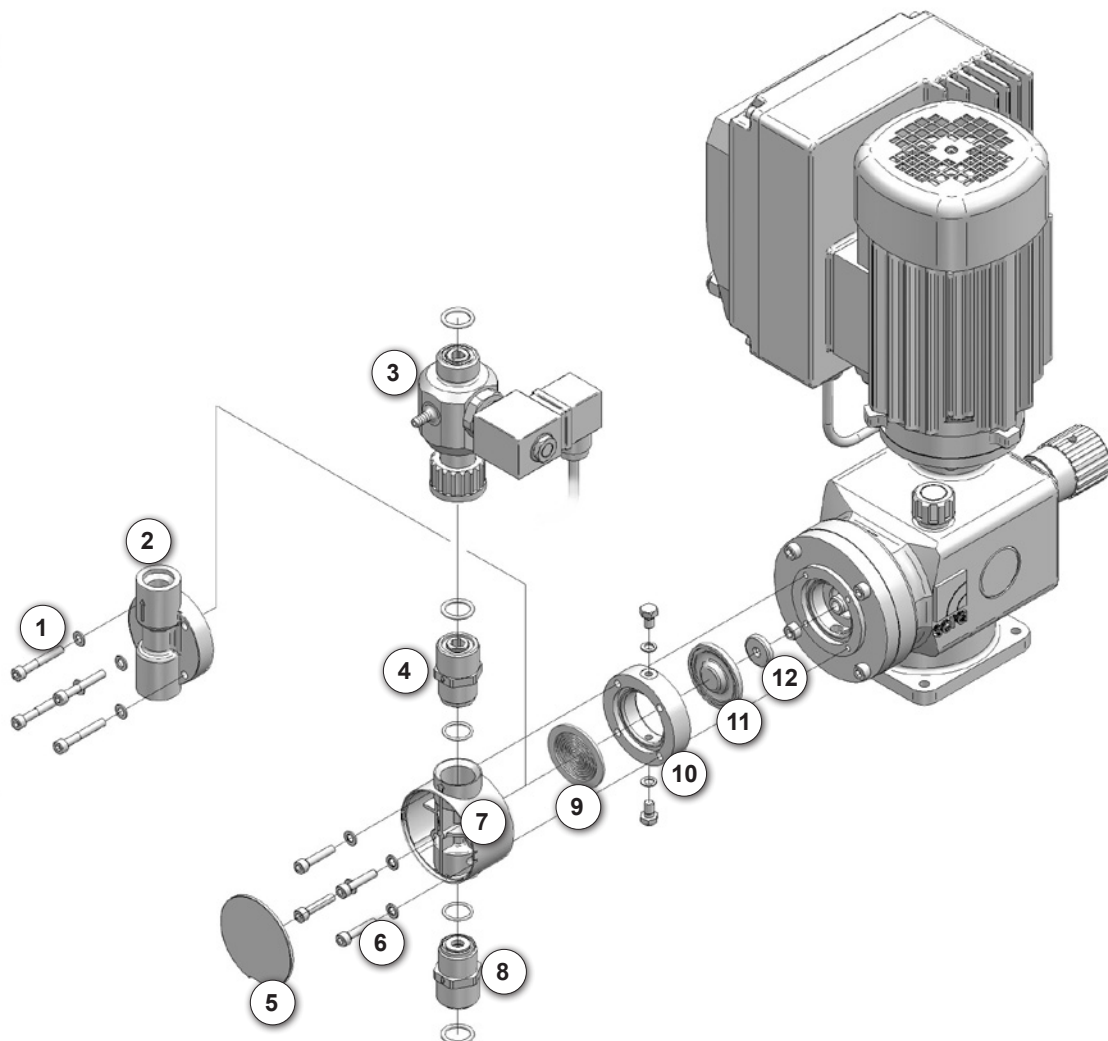
CS409.2 - 4,0 (e)

CS409.2 - 7,0 (e)

CS409.2 - 12 (e)

CS409.2 - 18 (e)

CS409.2 - 25 (e)



Operating instructions

Overview of the spare and wearing part kits Diaphragm pump CS 409.2- 4,0 (e) ...-25 (e)

Suction valve (kit)	
Pos.	consisting of
8	Suction valve (incl. o-rings)

Pressure valve (kit)	
Pos.	consisting of
4	Pressure valve (incl. o-rings)

Diaphragm kit (single diaphragm pump)	
Pos.	consisting of
11	Drive diaphragm
12	Pressure plate (not with a laminated drive diaphragm)

Diaphragm kit (double diaphragm pump)	
Pos.	consisting of
9	Intermediate diaphragm
11	Drive diaphragm
12	Pressure plate (not with a laminated drive diaphragm)
	Buffer fluid

Diaphragm ring kit (only for double diaphragm pump)	
Pos.	consisting of
10	Diaphragm ring, complete

Pump body kit (FRP-design)	
Pos.	consisting of
5	Cover plate
6	Screws, complete
7	Pump body

Pumpenkörper-Set (PVC)	
Pos.	consisting of
1	Screws, complete
2	Pump body

Entlüftungsautomatik-Set	
Pos.	consisting of
3	Automatic ventilation device (incl. o-ring)

12.3.8 Diaphragm pump CS 409.2- 4,0 (e) ...-25 (e) with integrated overflow valve

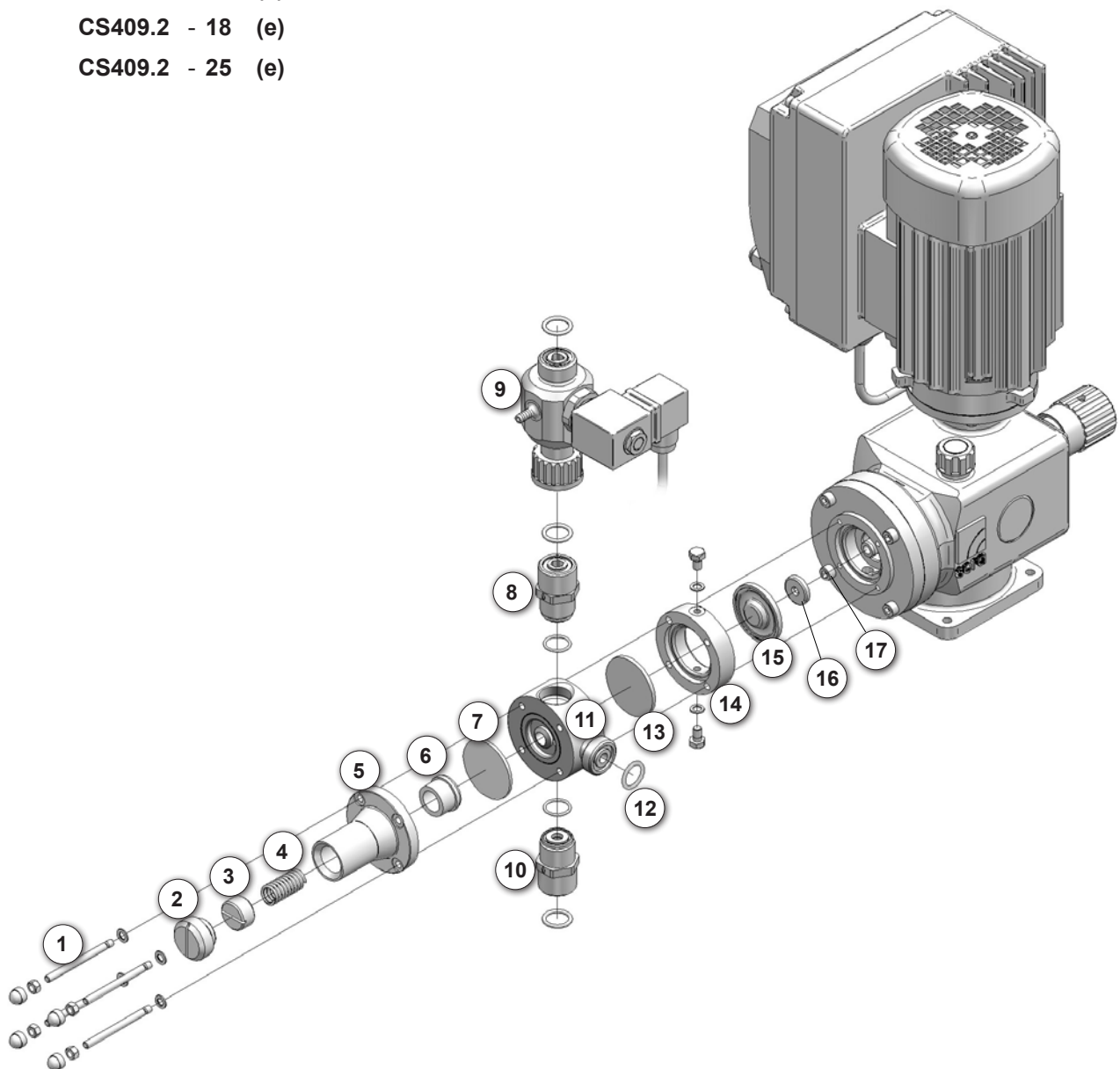
CS409.2 - 4,0 (e)

CS409.2 - 7,0 (e)

CS409.2 - 12 (e)

CS409.2 - 18 (e)

CS409.2 - 25 (e)



Operating instructions

Overview of the spare and wearing part kits Diaphragm pump CS 409.2- 4,0 (e) ...-25 (e) with integrated overflow valve

Suction valve (kit)	
Pos.	consisting of
10	Suction valve (incl. o-rings)

Pressure valve (kit)	
Pos.	consisting of
8	Pressure valve (incl. o-rings)

Diaphragm kit (single diaphragm pump)	
Pos.	consisting of
15	Drive diaphragm
16	Pressure plate (not with a laminated drive diaphragm)
7	Diaphragm (overflow valve)

Diaphragm kit (double diaphragm pump)	
Pos.	consisting of
13	Intermediate diaphragm
15	Drive diaphragm
16	Pressure plate (not with a laminated drive diaphragm)
7	Diaphragm (overflow valve)
	Buffer fluid

Diaphragm ring kit (only for double diaphragm pump)	
Pos.	consisting of
14	Diaphragm ring, complete

Overflow valve (kit)	
Pos.	consisting of
2	Lid
3	Set screw
4	Pressure spring
5	Cover
6	Pressure disk

Pump body kit (plastic)	
Pos.	consisting of
1	Screws, complete
11	Pump body
12	O-ring

Automatic ventilation device -kit	
Pos.	consisting of
9	Automatic ventilation device (incl. o-ring)

Operating instructions

13. Fault analysis and corrective action

sera products are sophisticated technical products which are only shipped after having been thoroughly tested and checked at our factory.

Should there be any faults, these can be – on account of fault announcement on LCD-display – detected and rectified easily and quickly if the steps in Tables are carried out.

13.1 Analysis of the plain text error messages

Error message								Possible cause	Corrective action
Analog signal < 4 mA!	Analog signal > 20 mA!	Analog signal > 25 mA!	Flow too low!	Cycle-delay memory full!	Leave the calibration range!	No stroke recognition! (internal fault)	No flow!		
■								Wire break of the analog signal line.	Check analog signal line and repair, if necessary.
■								The set analog signal (e.g. 4-20mA) does not match the actual analog signal (e.g. 0-20mA).	Check the set analog signal and adapt to the actual analog signal, if necessary.
■	■	■						Fault of the analog signal transmitter (sensor, controller).	Check the analog signal transmitter and eliminate fault of the transmitter if necessary.
			■				■	Drive diaphragm defective.	Replace drive diaphragm.
			■				■	Suction height too high.	Reduce suction height or suction resistance.
			■				■	Suction line leaky.	Check gaskets, tighten pipe connections.
			■				■	Shut-off valves in pipe closed.	Open shut-off valves or check opening – check pump for damage.
			■				■	Few or no conveying medium in store tank.	Fill store tank.
			■				■	Pump valves leaky.	Remove valves and clean.
			■				■	Foreign matter in pump valves or Pump valves (ball seats) damaged.	Remove and clean valves, check function; replace valves if necessary.
			■				■	Pump valves incorrectly mounted or valve balls missing.	Check installation position and completeness – replace missing parts or install correctly.
			■				■	Filter in suction line clogged.	Clean filter.
			■				■	No stroke movement of the drive diaphragm.	Increase stroke frequency / stroke length; check connecting rod motion.
			■				■	Counter-pressure too high.	Measure pressure with manometer directly above pressure valve and compare with permissible counter-pressure.
			■				■	Acceleration height too high due to pipe geometry.	Check acceleration height on suction- and pressure side and compare with design data – install a pulsation damper if necessary.
			■				■	Too high viscosity of the pumped medium.	Check viscosity of the pumped medium and compare with the design data – reduce concentration or increase temperature if necessary.

Operating instructions

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!		
			■				■	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. „Manual vent valve“ (Functional description)).
			■				■	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.

Operating instructions

Error message								Possible cause	Corrective action
Diaphragm rupture!	Mains voltage too g too low!	Mains voltage too high!	Pre-alarm level!	Set value not attainable! (Internal fault!!)	Fault drive! (Internal fault!)	Fault stroke sensor! (Internal fault!!)	Dry running of dosing pump!		
■								Drive diaphragm defective.	Replace drive diaphragm.
	■	■						Electric data of the dosing pump do not match mains data.	Check order data. Check electric installation.
			■				■	Few or no conveying medium in store tank.	Fill store tank.
				■				Only for calibrated pump: Set stroke length is too low to attain the preset set value.	Check the stroke length and the set value, calibrate the pump again, if necessary.
					■			Integrated excess temperature protection (posistor) of drive motor released.	Let the temperature of the drive motor go down. Check the ambient temperature.
						■		No stroke movement of the drive diaphragm.	Increase stroke frequency / stroke length; check connecting rod motion.
						■		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.

13.2 Analysis of other faults

Type of fault												Possible cause	Fault clearance	
Diaphragm pump does not draw in	Diaphragm pump does not deliver	Delivery rate is not reached	Delivery height is not reached	Delivery rate fluctuates	Maximum delivery rate exceeded	Drive motor does not start	Pipe oscillates heavily	High noise development	Low service life of the drive diaphragm	Drive is overloaded	Damage in stroke mechanism / drive	Leakage on pump head		
■	■	■											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.
■	■	■											No conveying medium in store tank.	Fill store tank.
■	■	■	■	■									Pump valves leaky.	Remove valves and clean.

Type of fault											Possible cause	Fault clearance		
Diaphragm pump does not draw in	Diaphragm pump does not deliver	Delivery rate is not reached	Delivery height is not reached	Delivery rate fluctuates	Maximum delivery rate exceeded	Drive motor does not start	Pipe oscillates heavily	High noise development	Low service life of the drive diaphragm	Drive is overloaded	Damage in stroke mechanism / drive	Leakage on pump head		
■	■		■	■									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.
						■					■		Electric data of the electronics do not match mains data.	Check order data. Check electric installation.
		■	■	■		■	■	■	■	■		■	Counter-pressure too high.	Measure pressure with manometer directly above pressure valve and compare with permissible counter-pressure.
■	■	■	■	■									Foreign matter in pump valves.	Remove and clean valves.
				■	■								Pressure on suction side higher than at the end of the pressure line.	Check geodetic conditions, install float valve or pressure keeping valve if necessary.
		■	■	■	■	■	■	■	■	■	■	■	Acceleration height too high due to pipe geometry.	Check acceleration height on suction- and pressure side with manometer and compare with design data – install a pulsation damper if necessary.
									■			■	Material which is in contact with the medium not suitable for the pumped medium.	Check whether the pumped medium corresponds with the design data and select other materials 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.	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 C409.2-0,8e- ...2,4e).
■	■	■	■	■								■	Pipe connections leaky.	Tighten connection according to type of material. Be careful with plastic – risk of fracture.
■	■	■										■	Temperature too low.	Check flowability of the pumped medium. Temperature of pumped medium and ambient temperature must not fall below -10°C.
■	■					■						■	Pumped medium frozen in pipe.	Remove diaphragm pump and check for damage – increase temperature of the pumped medium.
■	■	■	■	■					■			■	Diaphragm rupture.	Replace diaphragm according to Chapter „Changing the Diaphragm“.

Operating instructions

14. 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.

15. Disposal

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

15.1 Dismantling and transport

- Shut-down system. Please see "Shut-down".
- Remove all fluid residues from pump body, clean thoroughly, neutralize and decontaminate.
- Package unit and ship.



NOTE!

A clearance certificate must be filled in when systems are returned to the manufacturer (see Chapter 16).

Acceptance will be rejected if this clearance certificate is not attached.



WARNING!

The consignor is responsible for leaking lubricants or fluids!

15.2 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!



WARNING!

The consignor is responsible for leaking lubricants or fluids!

Operating instructions

16. Clearance Certificate



NOTE!

Inspection / repair of machines and machine parts is only carried out after the opposite clearance certificate was filled in correctly and completely by authorized and qualified personnel.



NOTE!

Acceptance will be refused if parts are returned to the manufacturer without a proper clearance certificate.

All industrial companies are obligated by the legal provisions for occupational health, e.g. the workplaces ordinances, the Ordinance on Hazardous Substances, the regulations for prevention of accidents and the environmental protection regulations such as the Waste Management Act and the German Household Water Act to protect their employees or man and the environment from detrimental effects when handling hazardous substances.

Should special safety precautions be necessary despite careful draining and cleaning of the product the necessary information are to be provided.

Machines which are operated with radioactive media shall only be inspected and/or repaired in the safety area of the owner by a sera specialized fitter.

The clearance certificate is part of the inspection-/repair order.
sera reserves the right to refuse acceptance of the order for other reasons.



NOTE!

Please make a copy and leave the original with the operating instructions!
(can also be downloaded from: www.sera-web.com)