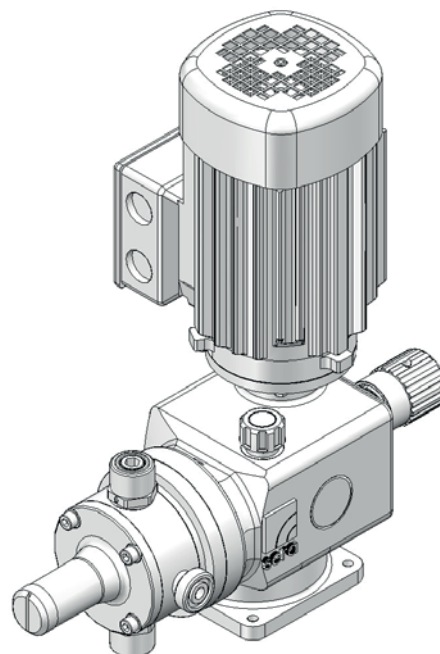
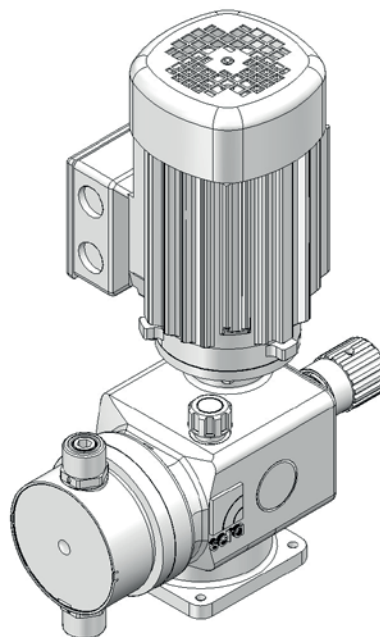


M... RF...

- ...409.2 - 2,4 e
- ...409.2 - 7,0 (e)
- ...409.2 - 12 (e)
- ...409.2 - 18 (e)
- ...409.2 - 25 (e)
- ...409.2 - 50 (e)
- ...409.2 - 75 (e)
- ...409.2 - 90 (e)
- ...409.2 - 115 (e)
- ...409.2 - 140 (e)
- ...409.2 - 180 (e)
- ...409.2 - 250 (e)
- ...409.2 - 350 (e)



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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.

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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.



DANGER!

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: -10°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 Shee) 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“).

2.12 Foreseeable misuse

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



DANGER!

Misuse can result in danger to the operating personnel!

2.12.1 Transport

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

2.12.2 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.

2.12.3 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.

2.12.4 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".

2.12.5 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. ...).

2.12.6 Cleaning

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

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.

409.2

Operating Instructions

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.

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.

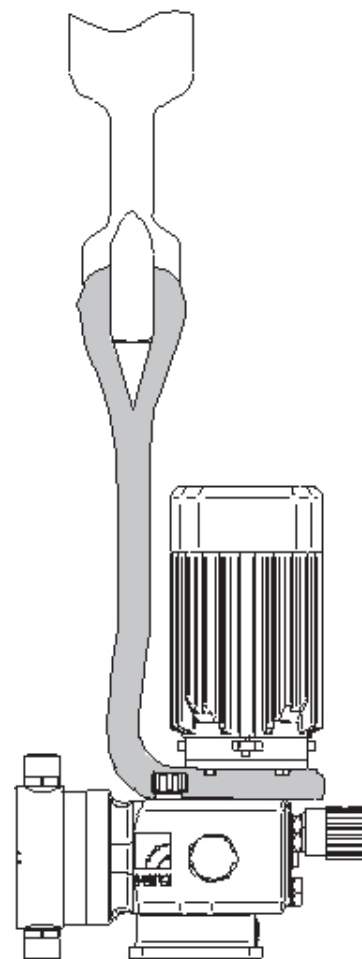


The packaging material must be disposed of appropriately!

NOTE!

3.2 Transport

Select a hoist which is adapted to the weight of the pump and attach it to the motor flange of the pump.



3.3 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 -10°C and $+45^{\circ}\text{C}$
- Relative air humidity not more than 50 %.
- The maximum storage time for the standard system is 12 months.

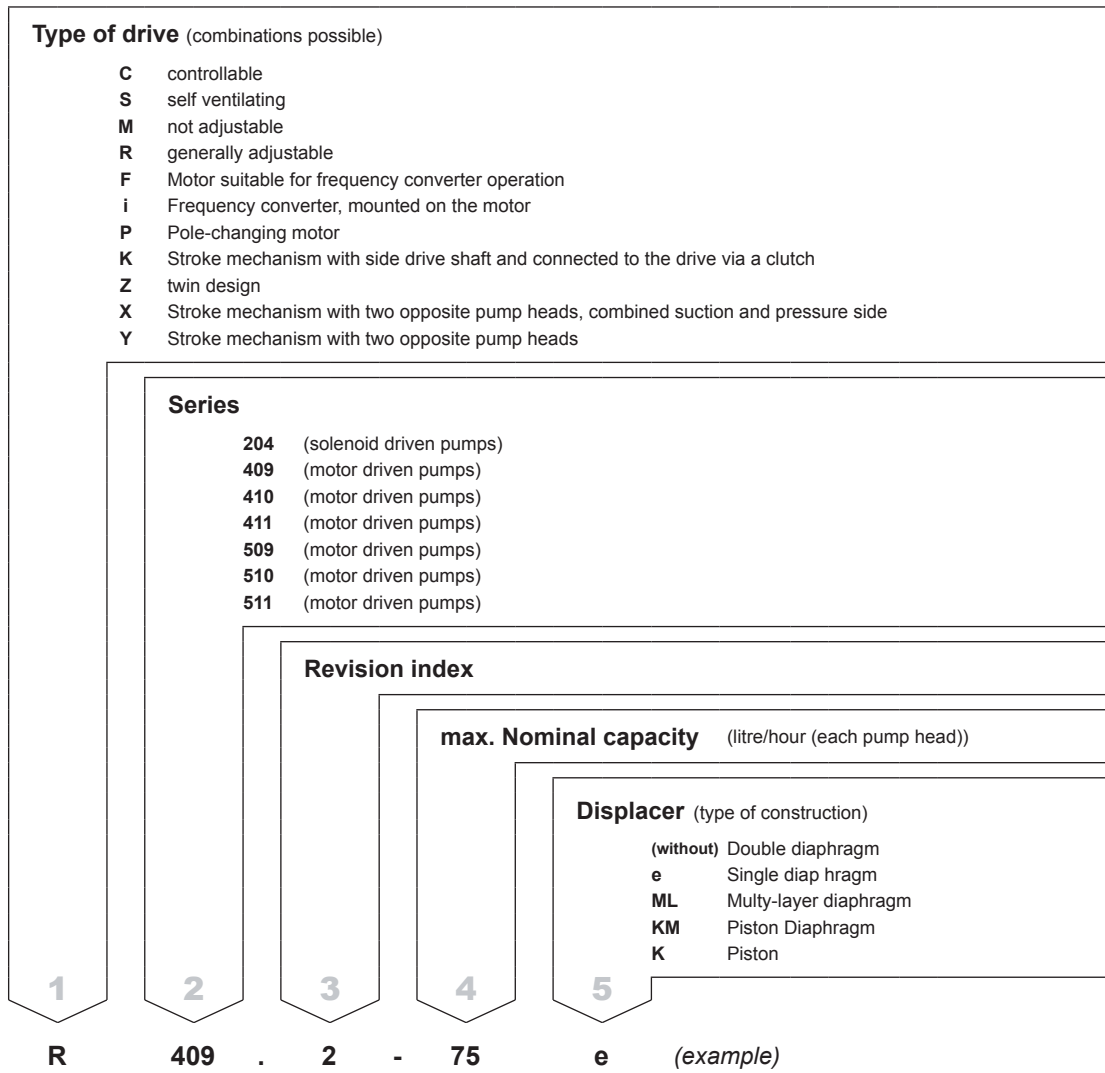
If these values are exceeded, metal products should be sealed in foil and protected from condensation water with a suitable desiccant.

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

4. Product description

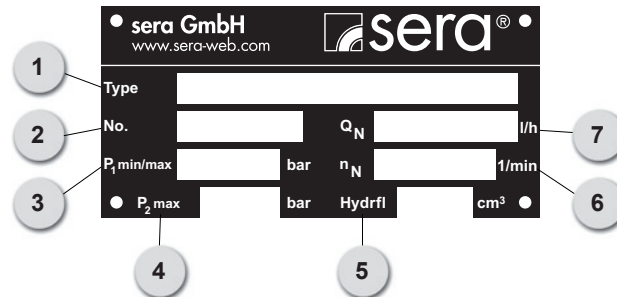
4.1 Types

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 pump is suitable for fluids with viscosities < 100 mPas.

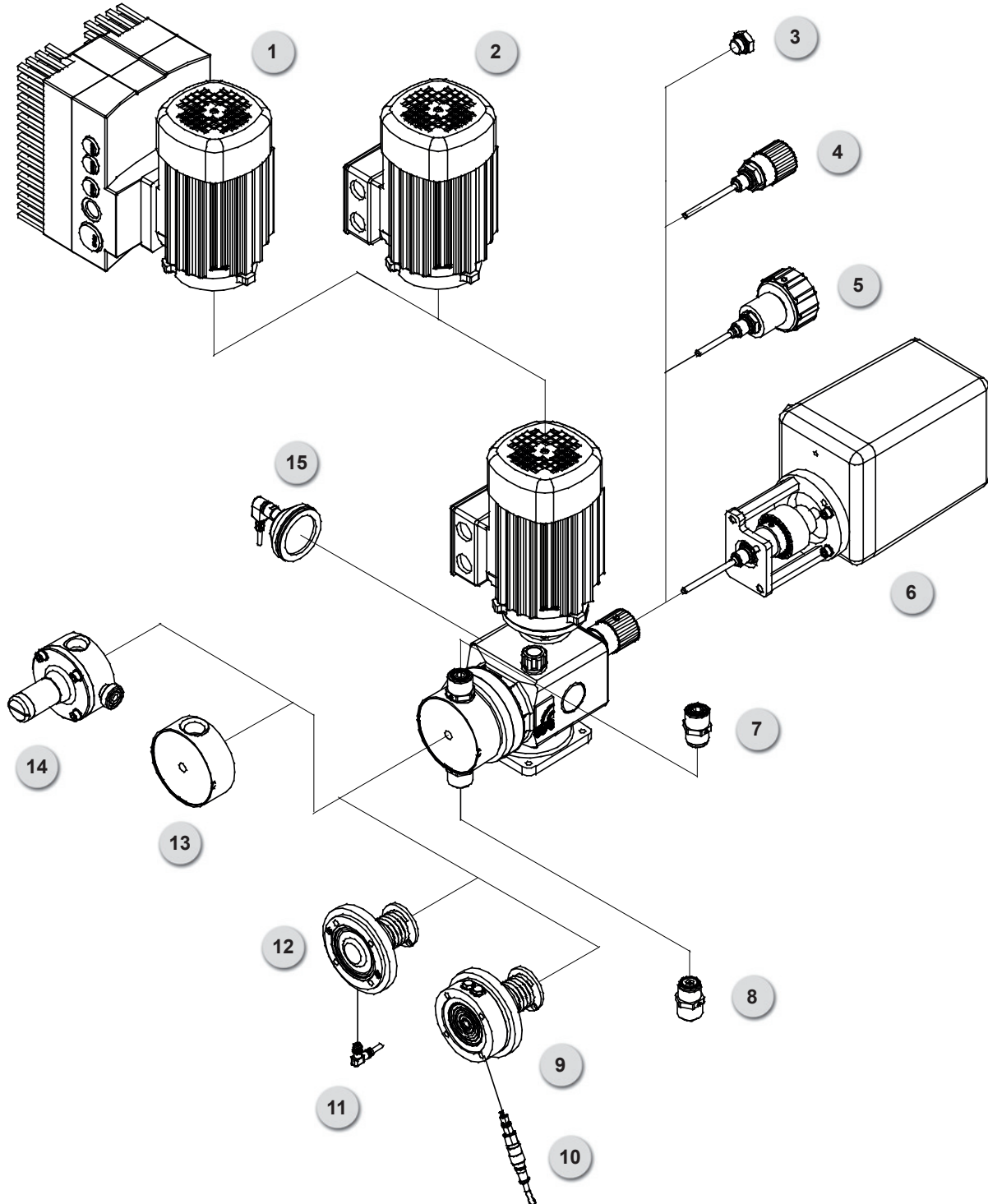
4.4 Dosing range

The delivery rate of the 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 pumps is between 50 and 65 dB (A).

4.6 Components of the diaphragm pump



Operating Instructions

No.	Designation	Remark
1	Drive motor with attached frequency converter	option
2	Drive motor (suitable for operation with frequency converter)	
3	Blind plug (M-design)	
4	Manual stroke length adjustment	
5	Manual stroke length adjustment with position indicator	option
6	Stroke length adjustment with actuator	option
7	Pressure valve	
8	Suction valve	
9	Assembly pump (double diaphragm design)	
10	Diaphragm rupture electrode MBE-03 (for double diaphragm pumps)	option
11	Diaphragm rupture electrode MBE-02 (for single diaphragm pumps)	option
12	Assembly pump (single diaphragm design)	
13	Pump body (standard design)	
14	Pump body with integrated overflow valve	
15	Stroke frequency transmitter (with inductive contact)	option
not illustrated	Actuator for Ex-area	option
	EExellT4 - motor	option
	Pneumatic actuator	option

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.

Dosing pumps consist of the following (main) components:

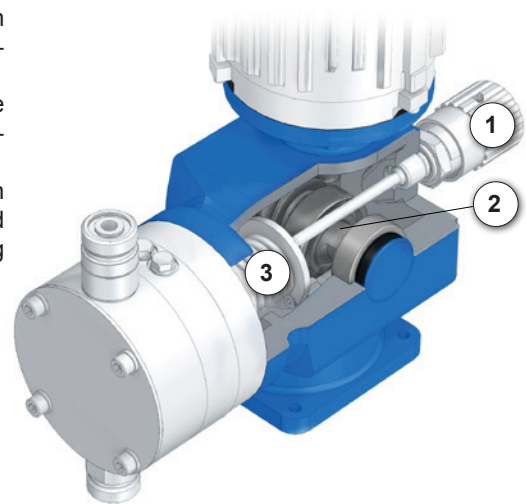
- Drive motor
- Stroke mechanism
- Stroke length adjustment
- Assembly pump
- Pump body
- Suction and Pressure valve

4.7.2 Stroke mechanism

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 Driving motor

sera - dosing pumps are driven either by a three-phase motor.

(Information about connecting the drive motor, see Chapter „Electrical connection / Interfaces“).

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)

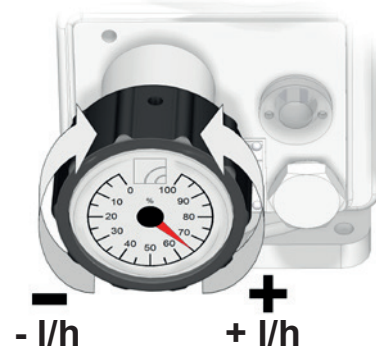
The effective stroke length of the connecting rod is changed by turning the scale knob. The stroke length should be adjusted during operation of the pump. The set stroke length can be read off a scale, e.g. 75% (see Fig.). With the 20-steps adjustment on the scale knob, the stroke length can be set individually with a tolerance of 0.5%.



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%.

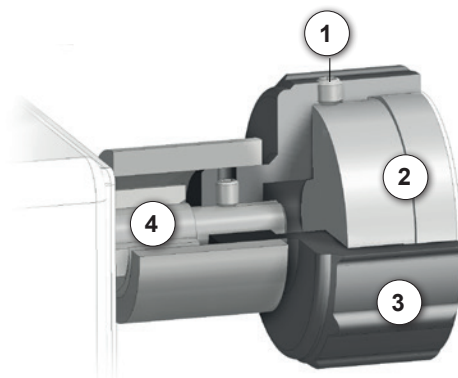


ATTENTION!

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.

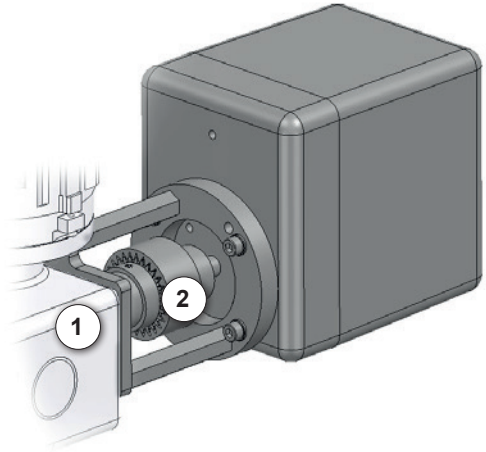
(Exception: actuator with hand wheel)

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.



ATTENTION!

The adjustment is only possible when the pump is running.

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.

4.7.4.5 Automatic stroke length adjustment by means of an electrical actuator (Ex-design)

Pay attention to the documents attached to the actuator.

4.7.4.6 Automatic stroke length adjustment by means of a pneumatic actuator

Pay attention to the documents attached to the actuator.

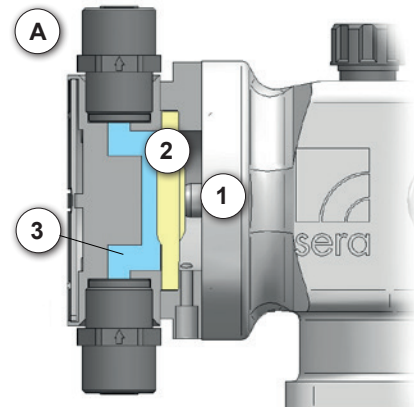
4.7.5 Assembly pump

There are two different pump types:

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

Single diaphragm pump (A)

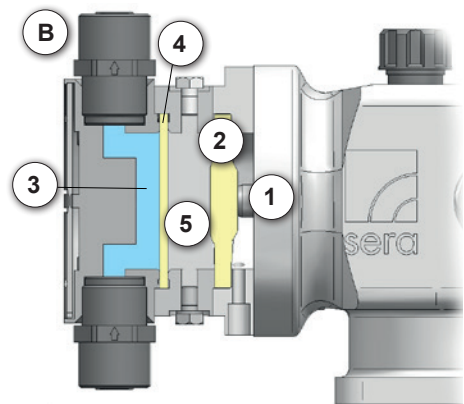
The drive diaphragm (2) connected to the drive via the connecting rod (1) transmits the stroke movement directly to the pumped medium (3).



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

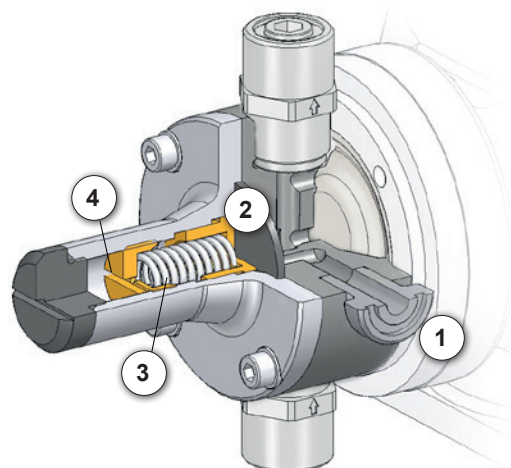
Depending on the applied backpressure, movements of the plastic pump body in elastic materials are possible. This does not affect the pumps's service life or operational reliability.

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.

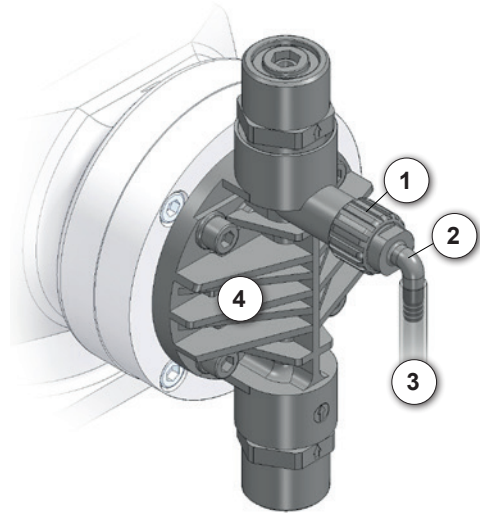
4.7.8 Manual vent valve (only FRP-execution ...409.2-2,4e)

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.

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.

4.7.9 Suction / Pressure valve

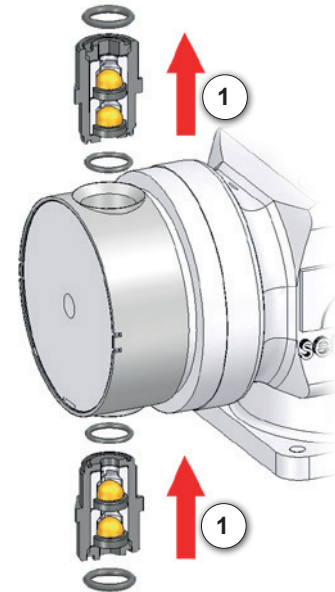
The pump valves are ball valves that only work properly in a vertical position. The condition of the valves has a deciding effect on the operating capability of the pump. Valves must be exchanged as complete units.

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



ATTENTION!

Pressure valve above; Suction valve below!

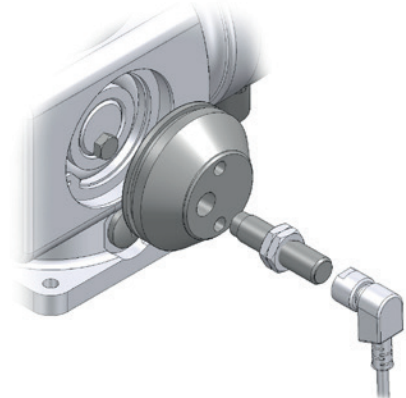


4.7.10 Stroke frequency transmitter (option)

sera dosing pumps are oscillating displacement pumps with an exactly defined stroke volume per each pump stroke.

If these dosing pumps should be used for automatic filling processes or charge dosing, then the single pump strokes must be determined and converted into electrical signals.

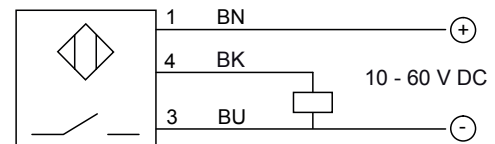
For this purpose, a stroke frequency transmitter (inductive contactor (1)) is added to the pump (the option cannot be mounted additionally) and reports each single pump stroke to the evaluation unit (e.g. preselection counter, SPC-control unit, etc.).



Technical data

Rated voltage:	10 - 60 V DC
Constant current:	< 200 mA
short circuit-proof	
Connection mode:	plug connector with 2 m cable
LED (green):	indicates supply voltage
LED (yellow):	indicates switching status

Wiring diagram





ATTENTION!

When switching inductive loads (protectors, relays, etc.), surge protectors (varistors) must be fitted owing to the high self-induction voltage.



WARNING!

When the pump is deployed in explosion-hazardous areas a NAMUR type stroke frequency transmitter (II2G EExia IICT6, gem. ATEX95) is to be provided.

4.7.11 Diaphragm rupture monitoring device (option)

sera diaphragm pumps can be equipped with a conductive diaphragm rupture monitoring device as option.



ATTENTION!

The pumped medium must have a minimum conductivity of at least 5 $\mu\text{S}/\text{cm}$!

An electrode together with an appropriate evaluation unit (option, e.g. sera diaphragm rupture relay, type ER-104 (or ER-142 for Ex-areas respectively) is used for monitoring.

The diaphragm rupture electrode is mounted directly to the pump, the evaluation unit inside the switch cabinet.

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

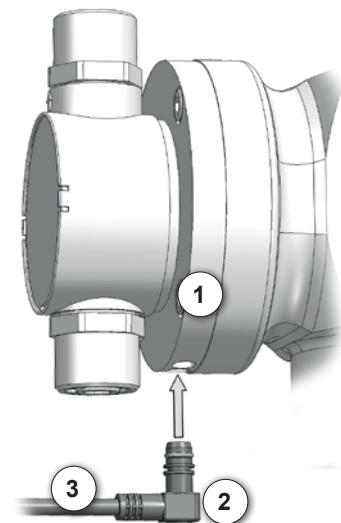
The diaphragm rupture electrode type MBE-02 is used for single diaphragm pumps, type MBE-03 or MBE-04 for double diaphragm pumps.

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.

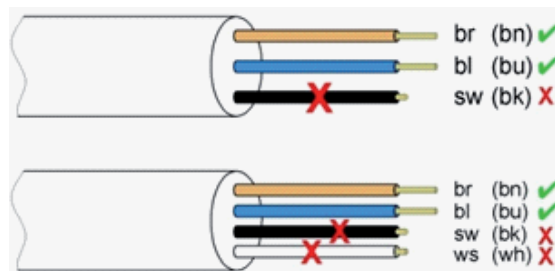


MBE-03/04

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“)



NOTE!



NOTE!

sera - dosing pumps can be retrofitted with a dia-phragm rupture electrode.

Maintenance of the diaphragm rupture electrodes is limited to cleaning (e.g. during an exchange, please see chapter „Changing the Diaphragm“).

5. Technical Data

5.1 Output data

Type	Nominal capacity adjustable by changing lift of strokes		Maximum permissible pressure in the pump outlet	Min./max. permissible pressure in the pump inlet	Max. suction height ⁽¹⁾	recommended nominal diameter of the connecting pipes	Nominal stroke frequency		Max. stroke length	Weight ⁽⁴⁾	Motor size (standard design)							
	Q_z l/h						p ₂ max. bar	p ₁ min./max. bar				WC m	DN mm	min ⁻¹		h100 mm	kg	BG
	50Hz	60Hz												50Hz	60 Hz			
...409.2 – 2,4 e	0 - 2,4 ⁽³⁾	0 - 2,9 ⁽²⁾	10	-0,3/0	3	5	150	180	1,6	8,6	63							
...409.2 – 7,0 (e)	0 - 7,0 ⁽²⁾	0 - 8,4 ⁽³⁾	10	-0,3/0	3	5	150	180	4	8,6	63							
...409.2 – 12 (e)	0 - 12 ⁽²⁾	0 - 14,4 ⁽³⁾	10	-0,3/0	3	10	67	80	6	8,6	63							
...409.2 – 18 (e)	0 - 18 ⁽²⁾	0 - 21,5 ⁽²⁾	10	-0,3/0	3	10	100	120	6	8,6	63							
...409.2 – 25 (e)	0 - 25 ⁽²⁾	0 - 30 ⁽²⁾	10	-0,3/0	3	10	150	180	6	8,6	63							
...409.2 – 50 (e)	0 - 50 ⁽²⁾	0 - 60 ⁽²⁾	10	-0,3/0	3	10	100	120	8	8,4	63							
...409.2 – 75 (e)	0 - 75 ⁽²⁾	0 - 90 ⁽²⁾	10	-0,3/0	3	15	150	180	8	8,4	71							
...409.2 – 90 (e)	0 - 90 ⁽²⁾	0 - 108 ⁽²⁾	8	-0,3/0	3	15	100	120	10	10,5	71							
...409.2 – 115 (e)	0 - 115 ⁽²⁾	0 - 138 ⁽²⁾	4	-0,3/0	3	15	100	120	10	9,0	71							
...409.2 – 140 (e)	0 - 140 ⁽²⁾	0 - 168 ⁽²⁾	8	-0,3/0	3	15	150	180	10	10,5	71							
...409.2 – 180 (e)	0 - 180 ⁽²⁾	0 - 216 ⁽²⁾	4	-0,3/0	3	15	150	180	10	9,0	71							
...409.2 – 250 (e)	0 - 250 ⁽²⁾	0 - 300 ⁽²⁾	3	-0,3/0	3	15	100	120	10	13,0	71							
...409.2 – 350 (e)	0 - 350 ⁽²⁾	---	3	-0,3/0	3	15	150	---	10	13,0	71							

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

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

⁽³⁾ Linear dosing range at a stroke length between 30% and 100%.

⁽⁴⁾ 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

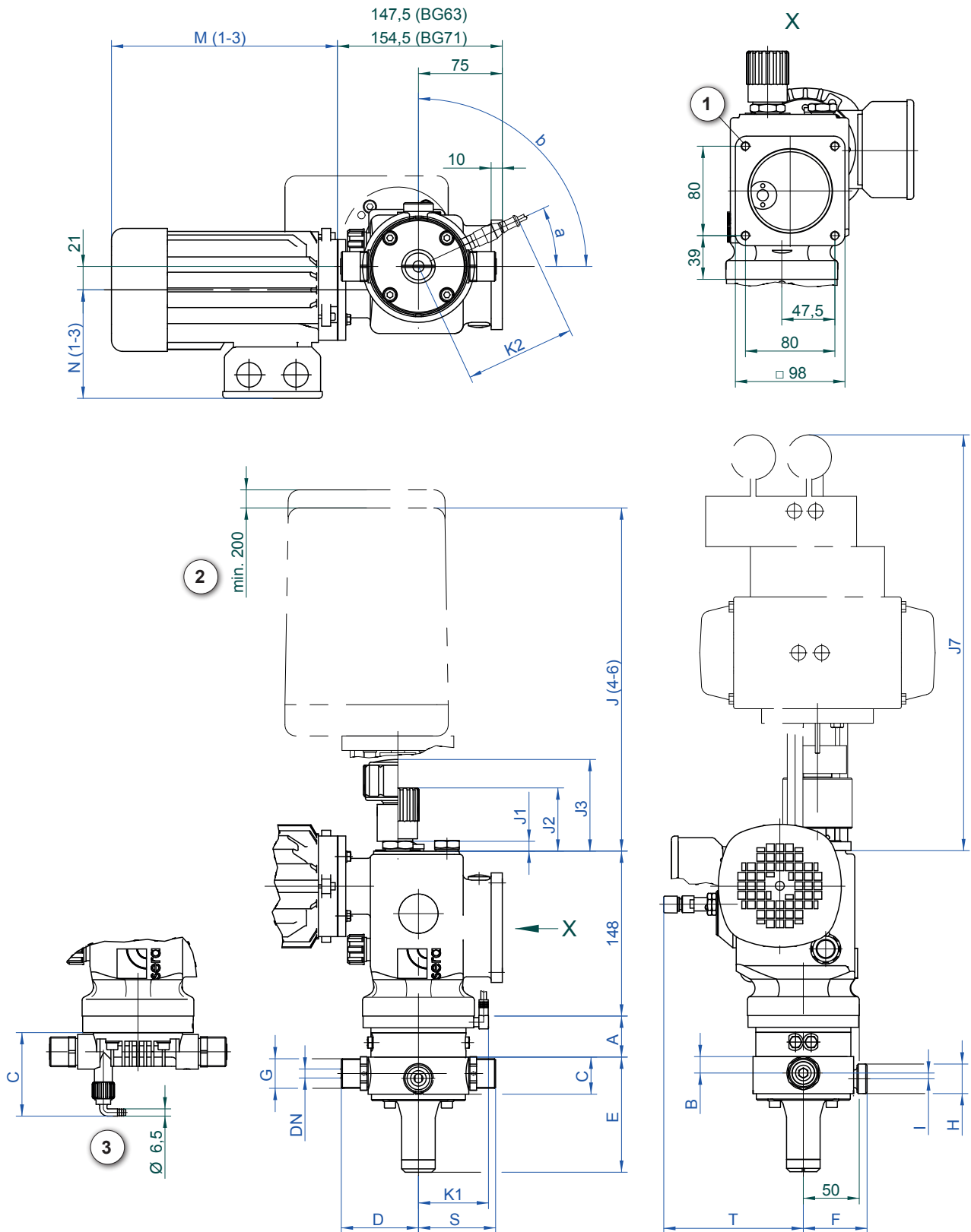
BG63									
Motor type	Output kW	Motor speed min-1		Mains frequency Hz	Voltage range V	Nominal current A	Protection category IP	Thermal class	ATEX-design
		50Hz	60Hz						
		Standard	0,18						
AC motor	0,18	1.500	---	50	55	F	---		
EExelIT4- motor	0,12	1.500	---	50	54	F	II2G EExe IIT4		
EExdelIT4-motor (pressure-tight enclosed))	0,18	1.500	---	50	54	F	II2G EExde ICT4		

⁽¹⁾ The data can be read off the type plate on the drive motor of the respective pump!

BG71									
Motor type	Output kW	Motor speed min-1		Mains frequency Hz	Voltage range V	Nominal current A	Protection category IP	Thermal class	ATEX-design
		50Hz	60Hz						
		Standard	0,37						
AC motor	0,37	1.500	---	50	55	F	--		
EExelIT4- motor	0,25	1.500	---	50	54	F	II2G EExe IIT4		
EExdelIT4-motor (pressure-tight enclosed)	0,37	1.500	---	50	54	F	II2G EExde ICT4		

⁽¹⁾ The data can be read off the type plate on the drive motor of the respective pump!

5.3 Dimensions



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

Operating Instructions

All dimensions in mm!		Single diaphragm pump				
		...409.2-2,4e	...409.2-7,0e	...409.2-12e		
Valves	S	Single valves PVC	---	52	52	
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	80	56	56	
		Double valves ...FRP PK (PP / PVDF)	---	57	60	
		Double valves 1.4571/1.4581	---	57	61	
		Chamber valves PVC, PP, PVDF, 1.4571	70	---	---	
	D	Single valves PVC	---	65	65	
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	80	64	64	
		Double valves ...FRP PK (PP / PVDF)	---	57	60	
		Double valves 1.4571/1.4581	---	57	61	
		Chamber valves PVC, PP, PVDF, 1.4571	70	---	---	
	G	Connection thread Suction/pressure valve	G $\frac{3}{4}$	G $\frac{3}{4}$	G $\frac{3}{4}$	
	DN	Nominal width	5	5 ⁽¹⁾	8 ⁽²⁾	
	Pump body (PB)	A	Assembly pump	16	17	14
		B	Centre of valve thread	17	15	16
C		PB (without front plate)	43	36	36	
		PB (with front plate)	45	38	38	
		PB (FRP-design)	---	33	35	
	PB (FRP-design) with manual vent valve	75	---	---		
PB with integrated overflow valve	E	Pump body with integrated over-flow valve	---	97	97	
	F	Overflow valve socket (PVC, PP, PVDF) max.	---	47	47	
		Overflow valve socket (1.4571) max.	---	52	52	
	H	Connection thread socket over-flow valve	---	G $\frac{3}{4}$	G $\frac{3}{4}$	
	I	Distance: centre of valve thread – centre of overflow valve socket	---	0	0	
b	Angle, socket overflow valve	---	90°	90°		
MBE	K1	Diaphragm rupture signalling MBE-02	67	67	67	
	T	Stroke frequency transmitter	125	125	125	
Stroke mechanism	a.o. Dimensions for fastening of the pump	see dimensional drawing				

⁽¹⁾ DN 8 for double valves 1.4571/1.4581

⁽²⁾ DN 5 for single valves PVC

Operating Instructions

All dimensions in mm!		Single diaphragm pump												
		...409.2-18e	...409.2-25e	...409.2-50e	...409.2-75e	...409.2-90e	...409.2-115e	...409.2-140e	...409.2-180e	...409.2-250e		...409.2-350e		
Valves	S	Single valves PVC	52	52	70	70	78	78	78	78	---	119	---	119
		Single valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	69	69	76	76	76	76	---	---	---	---
		Single valves ...FRP PK (PP / PVDF)	---	---	67	67	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	---	---	---	---
		Double valves ...FRP PK (PP / PVDF)	60	60	67	67	75	75	75	75	152	---	152	---
	Double valves 1.4571/1.4581	61	61	68	68	76	76	76	76	152	---	152	---	
	D	Single valves PVC	65	65	77	77	85	85	85	85	---	138	---	138
		Single valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	69	69	76	76	76	76	---	---	---	---
		Single valves ...FRP PK (PP / PVDF)	---	---	67	67	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	---	---	---	---
		Double valves ...FRP PK (PP / PVDF)	60	60	67	67	75	75	75	75	152	---	152	---
	Double valves 1.4571/1.4581	61	61	68	68	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 $\frac{3}{4}$	G1 $\frac{1}{4}$	G1	G1 $\frac{1}{4}$	G1
	DN	Nominal width	8	8	8	8	8	8	8	8	20	15	20	15
	Pump body (PB)	A	Assembly pump	14	14	15	15	19	19	19	19	32	32	32
		B	Centre of valve thread	16	16	15	15	15	15	15	15	30	30	30
C		PB (without front plate)	36	36	38	38	37	37	37	37	74	74	74	
		PB (with front plate)	38	38	40	40	39	39	39	39	77	77	77	
	PB (FRP-design)	35	35	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	
	F	Overflow valve socket (PVC, PP, PVDF) max.	47	47	57	57	73	73	73	73	102	102	102	
		Overflow valve socket (1.4571) max.	52	52	62	62	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 $\frac{1}{4}$ ⁽¹⁾	G1 $\frac{1}{4}$ ⁽¹⁾	G1 $\frac{1}{4}$ ⁽¹⁾	
	I	Distance: centre of valve thread – centre of overflow valve socket	0	0	0	0	5	5	5	5	0	0	0	
	b	Angle, socket overflow valve	90°	90°	90°	90°	90°	90°	90°	90°	45°	45°	45°	
MBE	K1	Diaphragm rupture signalling MBE-02	67	67	67	67	67	67	67	67	102	102	102	
	T	Stroke frequency transmitter	125	125	125	125	125	125	125	125	125	125	125	
Stroke mechanism	a.o. Dimensions for fastening of the pump	see dimensional drawing												

⁽¹⁾ Connection thread G1 for single valves DN15

Operating Instructions

All dimensions in mm!		Double diaphragm pump		
		...409.2-7,0	...409.2-12	
Valves	S	Single valves PVC	52	52
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	56	56
		Double valves ...FRP PK (PP / PVDF)	57	60
		Double valves 1.4571/1.4581	57	61
	D	Single valves PVC	65	65
		Double valves ...FRP PK (PP-FRP / PVDF-FRP)	64	64
		Double valves ...FRP PK (PP / PVDF)	57	60
		Double valves 1.4571/1.4581	57	61
	G	Connection thread Suction/pressure valve	G $\frac{3}{4}$	G $\frac{3}{4}$
	DN	Nominal width	5 ⁽¹⁾	8 ⁽²⁾
Pump body (PB)	A	Assembly pump	29	28
	B	Centre of valve thread	15	16
	C	PB (without front plate)	36	36
		PB (with front plate)	38	38
	PB (FRP-design)	33	35	
PB with integrated overflow valve	E	Pump body with integrated over-flow valve	97	97
	F	Overflow valve socket (PVC, PP, PVDF) max.	47	47
		Overflow valve socket (1.4571) max.	52	52
	H	Connection thread socket over-flow valve	G $\frac{3}{4}$	G $\frac{3}{4}$
	I	Distance: centre of valve thread – centre of overflow valve socket	0	0
	b	Angle, socket overflow valve	90°	90°
MBE	K2	Diaphragm rupture signalling MBE-03/04	95	95
	a	Angle MBE-03/04	90°	90°
	T	Stroke frequency transmitter	125	125
Stroke mechanism	a.o. Dimensions for fastening of the pump	see dimensional drawing		

⁽¹⁾ DN 8 for double valves 1.4571/1.4581

⁽²⁾ DN 5 for single valves PVC

Operating Instructions

All dimensions in mm!		Double diaphragm pump												
		...409.2-18	...409.2-25	...409.2-50	...409.2-75	...409.2-90	...409.2-115	...409.2-140	...409.2-180	...409.2-250	...409.2-350			
Valves	S	Single valves PVC	52	52	70	70	78	78	78	78	---	119	---	119
		Single valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	69	69	76	76	76	76	---	---	---	---
		Single valves ...FRP PK (PP / PVDF)	---	---	67	67	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	---	---	---	---
		Double valves ...FRP PK (PP / PVDF)	60	60	67	67	75	75	75	75	152	---	152	---
		Double valves 1.4571/1.4581	61	61	68	68	76	76	76	76	152	---	152	---
	D	Single valves PVC	65	65	77	77	85	85	85	85	---	138	---	138
		Single valves ...FRP PK (PP-FRP / PVDF-FRP)	---	---	69	69	76	76	76	76	---	---	---	---
		Single valves ...FRP PK (PP / PVDF)	---	---	67	67	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	---	---	---	---
		Double valves ...FRP PK (PP / PVDF)	60	60	67	67	75	75	75	75	152	---	152	---
		Double valves 1.4571/1.4581	61	61	68	68	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 $\frac{3}{4}$	G1 $\frac{1}{4}$	G1	G1 $\frac{1}{4}$	G1	
	DN	8	8	8	8	8	8	8	8	20	15	20	15	
EP	A	Assembly pump	28	28	37	37	41	41	41	41	58	58		
Pump body (PB)	B	Centre of valve thread	16	16	15	15	15	15	15	15	30	30		
		PB (without front plate)	36	36	38	38	37	37	37	37	74	74		
	C	PB (with front plate)	38	38	40	40	39	39	39	39	77	77		
		PB (FRP-design)	35	35	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		
	F	Overflow valve socket (PVC, PP, PVDF) max.	47	47	57	57	73	73	73	73	102	102		
		Overflow valve socket (1.4571) max.	52	52	62	62	77	77	77	77	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 $\frac{1}{4}$ ¹⁾	G1 $\frac{1}{4}$ ¹⁾		
	I	Distance: centre of valve thread – centre of overflow valve socket	0	0	0	0	5	5	5	5	0	0		
b	Angle, socket overflow valve	90°	90°	90°	90°	90°	90°	90°	90°	45°	45°			
MBE	K2	Diaphragm rupture signalling MBE-03/04	95	95	102	102	107	107	107	107	145	145		
	a	Angle MBE 03/04	90°	90°	25°	25°	25°	25°	25°	25°	70°	70°		
	T	Stroke frequency transmitter	125	125	125	125	125	125	125	125	125	125		
Stroke mechanism		a.o. Dimensions for fastening of the pump	see dimensional drawing											

⁽¹⁾ Connection thread G1 for single valves DN15

Operating Instructions

All dimensions in mm!			Diaphragm pump						
			...409.2-2,4 e	...409.2-7,0 (e)	...409.2-12 (e)	...409.2-18 (e)	...409.2-25 (e)	...409.2-50 (e)	...409.2-75 (e)
Stroke length adjustment (SLA)	J1	Blind flange for pump without SLA	8	8	8	8	8	8	8
	J2	Manual stroke length adjustment (max.)	70	70	70	70	70	70	70
	J3	Manual SLA with position indicator	110	110	110	110	110	110	110
	J4	Electric actuator	240	240	240	240	240	240	240
	J5	Electric actuator with PMR3	320	320	320	320	320	320	320
	J6	Electric actuator, Ex-design	413	413	413	413	413	413	413
	J7	Pneumatic actuator	---	372	372	372	372	372	372
Drive motor	M1	Standard motor	180	180	180	180	180	180	180
	N1		101	101	101	101	101	101	101
	M2	AC motor	183	183	183	183	183	219	219
	N2		104	104	104	104	104	112	112
	M3	EExellT4 - motor	156	156	156	156	156	176	176
	N3		114	114	114	114	114	122	122

All dimensions in mm!			Diaphragm pump					
			...409.2-90 (e)	...409.2-115 (e)	...409.2-140 (e)	...409.2-180 (e)	...409.2-250 (e)	...409.2-350 (e)
Stroke length adjustment (SLA)	J1	Blind flange for pump without SLA	8	8	8	8	8	8
	J2	Manual stroke length adjustment (max.)	70	70	70	70	70	70
	J3	Manual SLA with position indicator	110	110	110	110	110	110
	J4	Electric actuator	240	240	240	240	240	240
	J5	Electric actuator with PMR3	320	320	320	320	320	320
	J6	Electric actuator, Ex-design	413	413	413	413	413	413
	J7	Pneumatic actuator	372	372	372	372	372	372
Drive motor	M1	Standard motor	210	180	210	180	210	210
	N1		111	101	111	101	111	111
	M2	AC motor	219	219	219	219	219	219
	N2		112	112	112	112	112	112
	M3	EExellT4 - motor	176	176	176	176	176	176
	N3		122	122	122	122	122	122

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 -10°C and +40°C and at permitted humidity until approx. 90%, altitude 1000 m above sea level.



DANGER!

In case of operation in explosion-hazardous areas, the instructions in Chapter „Operation in explosion-hazardous areas“ must also be followed!



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.



ATTENTION!

If the system is operated on a 60Hz mains it is essential to consider the possible higher stroke frequency when designing the pipe geometry.



WARNING!

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

- 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.

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.



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...

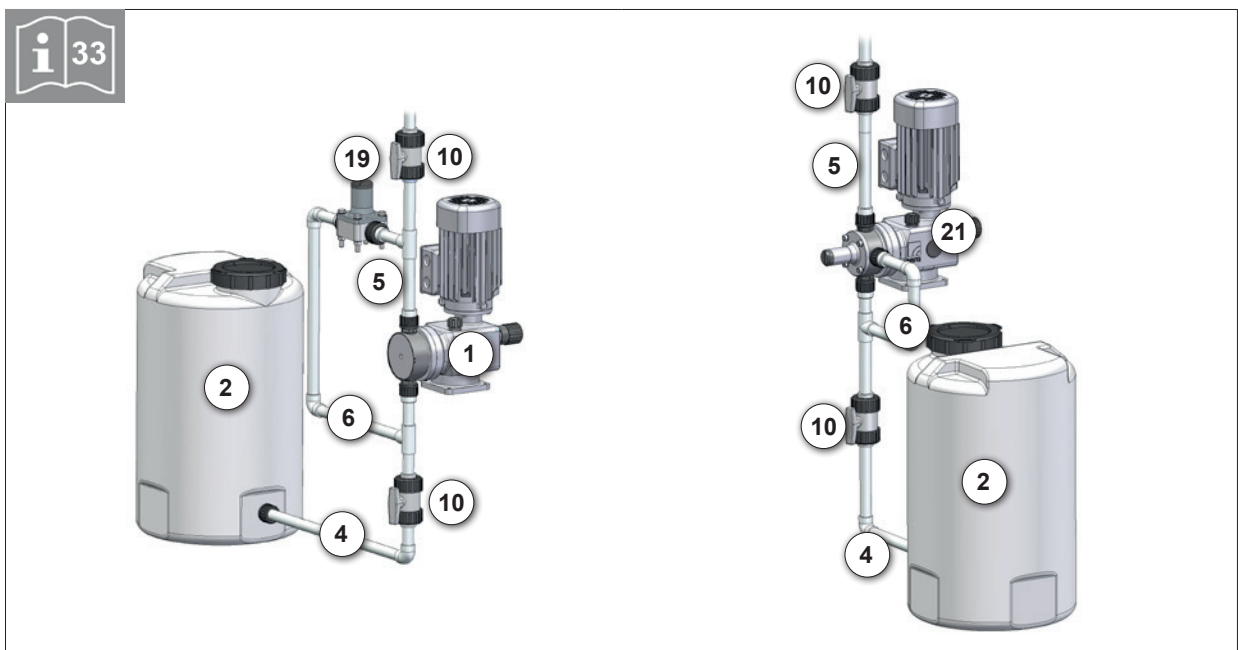
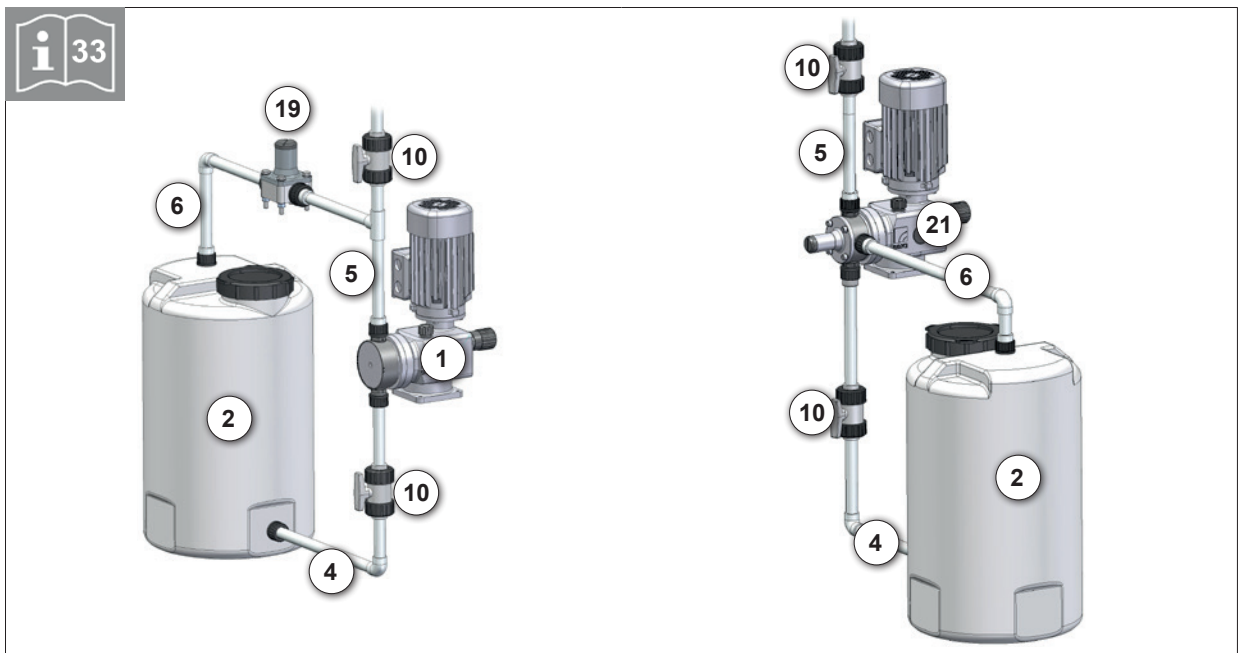
6.1 Provide for an overpressure protection

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

- Install the overflow valve (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 Preventing a backflow of the pumped medium

If the dosing line is linked with a main line:

- Install an injection fitting (9).



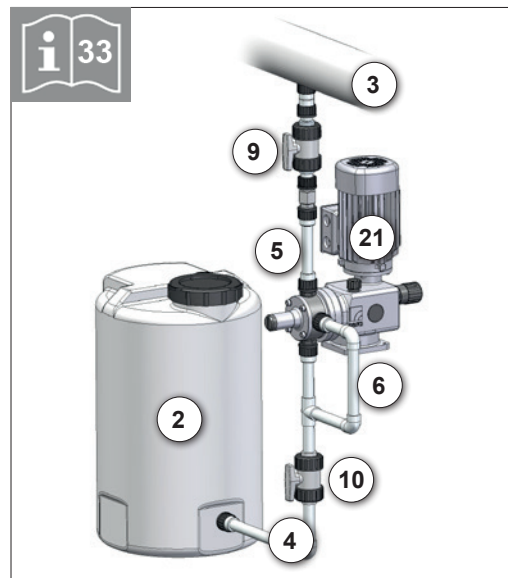
DANGER!

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 Eliminating undesired siphoning

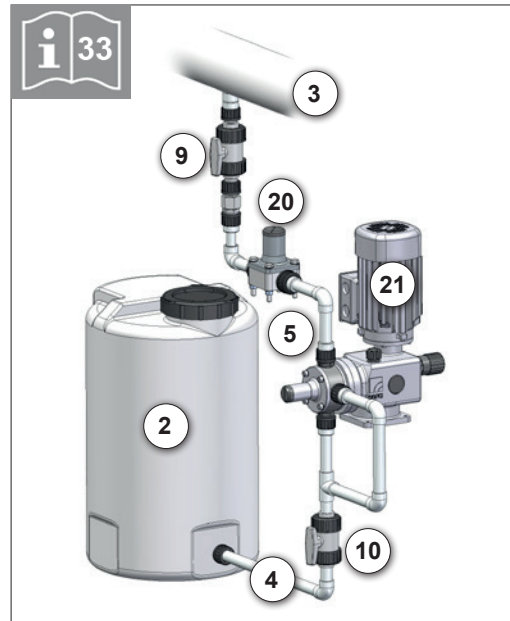
When dosing into a main line with negative pressure:

- 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 suction free from air

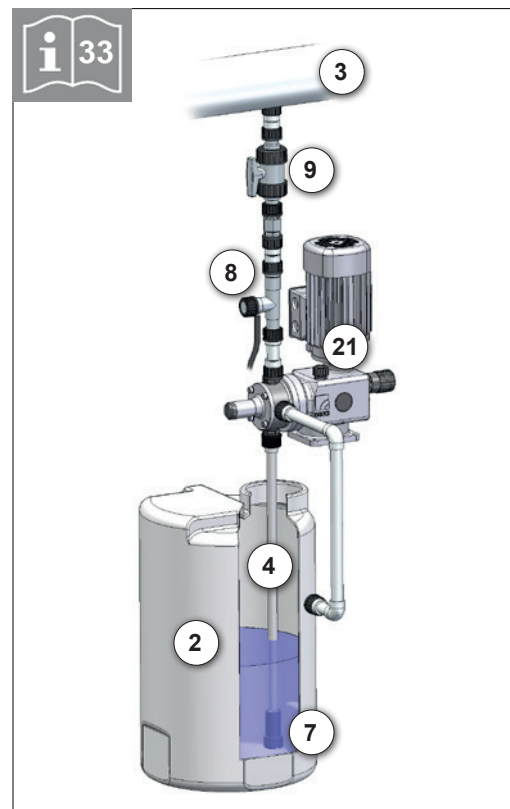
If, due to a falling fluid level in the tank, air may be drawn in and delivered to a pressurised line or against a pressure keeping valve:

- Install a vent valve (8) into the pressure line



NOTE!

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



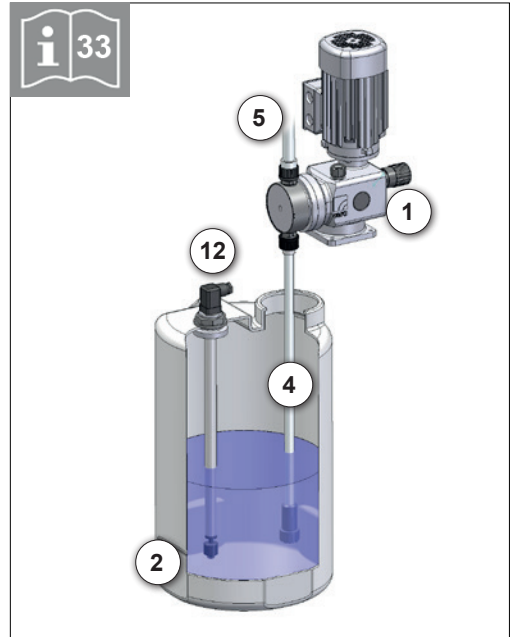
6.5 Install the empty-tank alarm

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



NOTE!

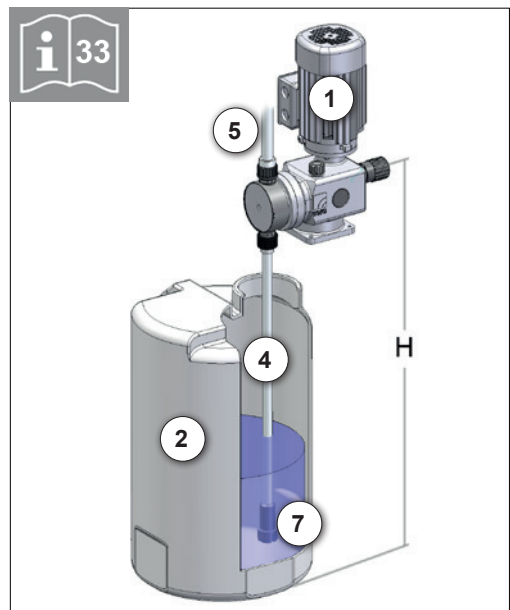
The delivery may be interrupted if air enter in the suction line!



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.



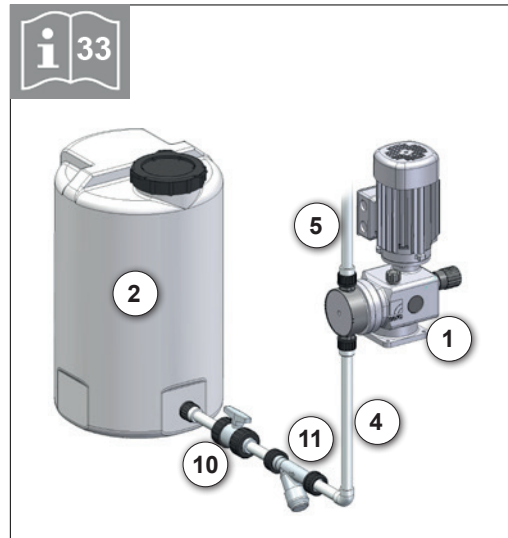
6.7 Line strainer

- 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!

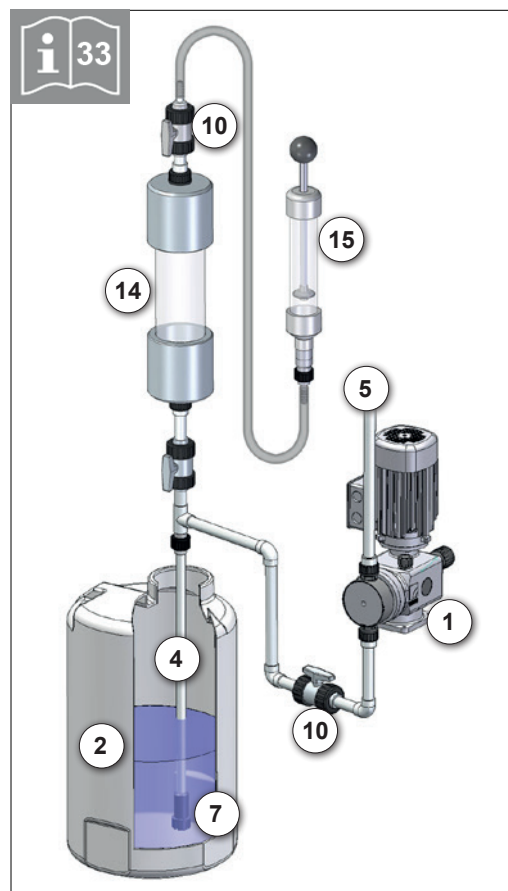
Pump and system may not function properly if contaminants are not collected.



6.8 Suction via a siphon vessel

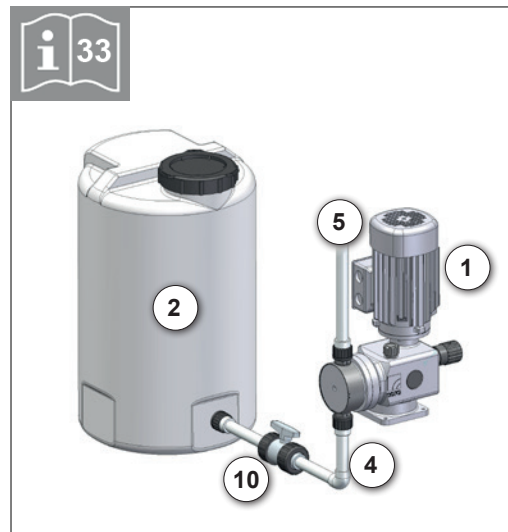
For use with high tanks without connection on the tank bottom:

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



6.9 In case of easily degassing pumped media

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



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.



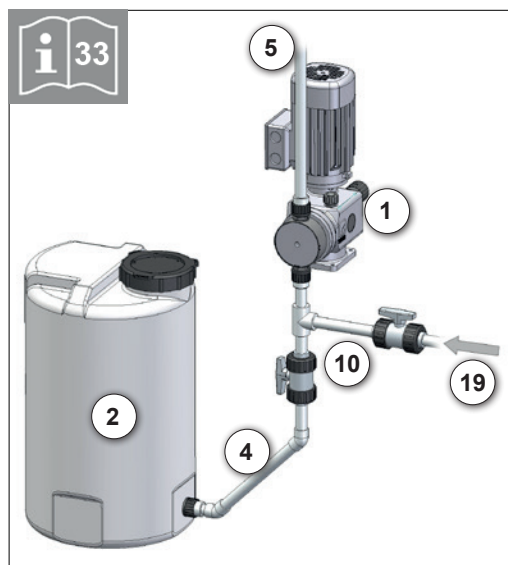
ATTENTION!

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



NOTE!

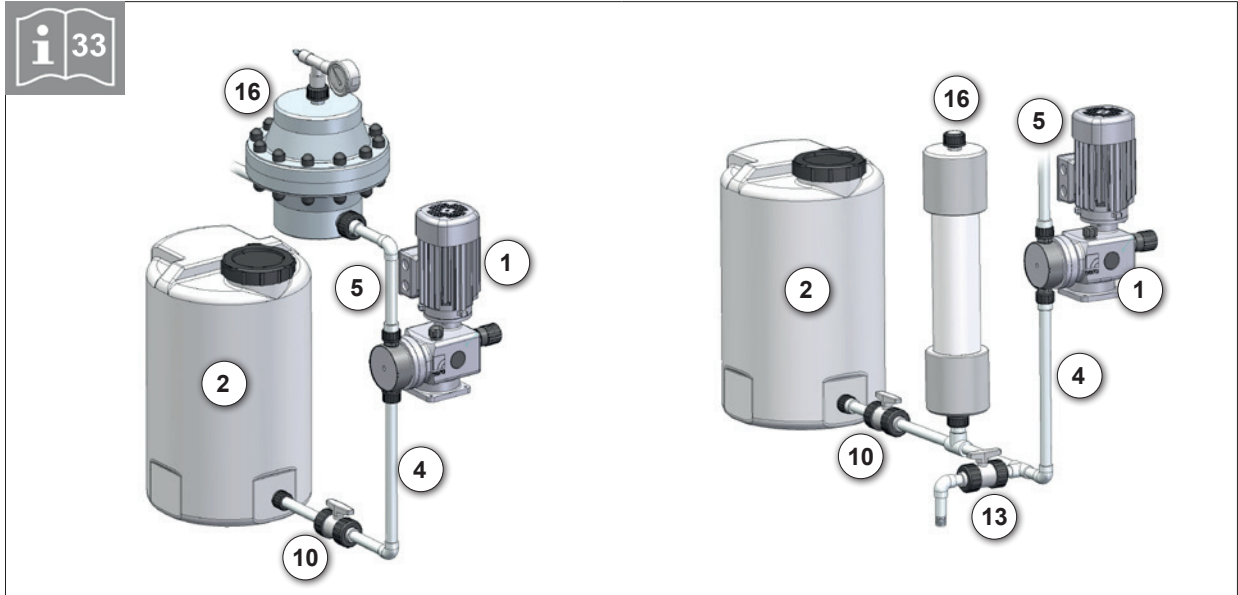
The rinsing process should be automated.



6.11 Damping of the pulsation

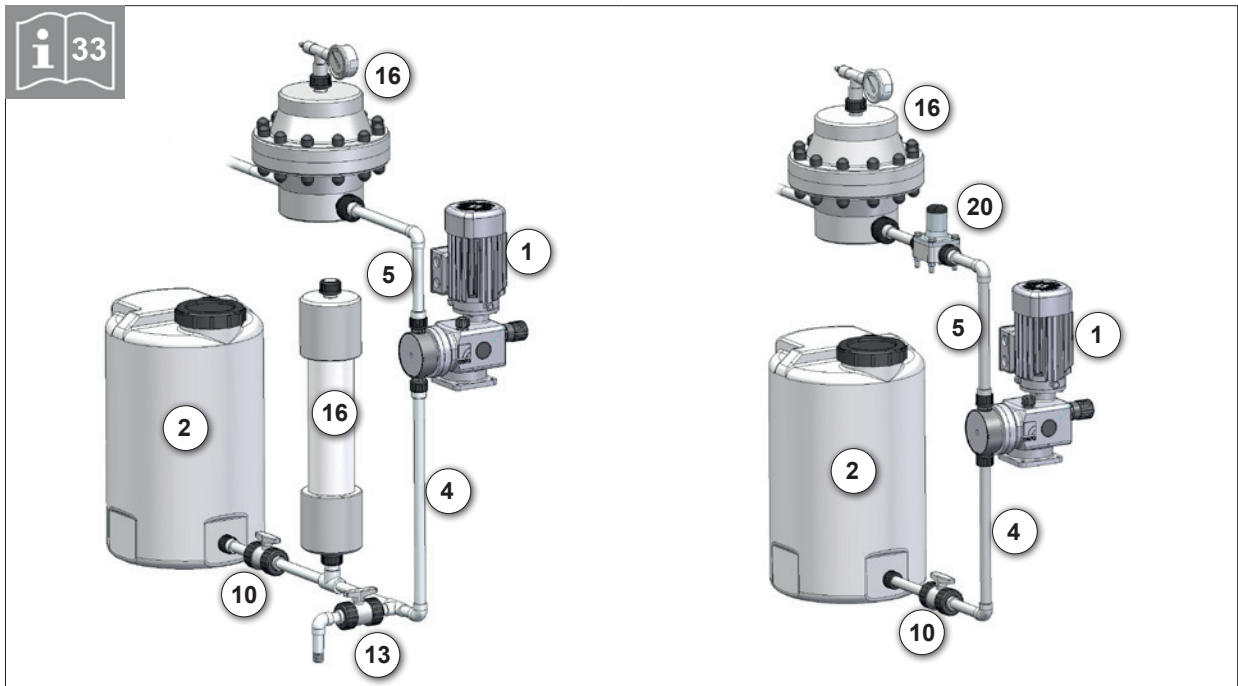
By installing pulsation dampers if:

- 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.

Operating Instructions

7. Electrical connection / Interfaces

sera diaphragm pumps are driven either by a three-phase motor or an AC motor.
Standard: three-phase motor (with PTC thermistor; suitable for operation with frequency converter)

7.1 Motor connection

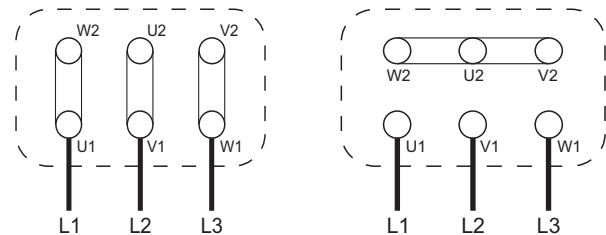
In case of a three-phase motor

The motor connection depends on the voltage indication on the type plate and the applied supply voltage.

Example:

Indication on the type plate: 230/400 V
Three-phase power system on site: 400 V

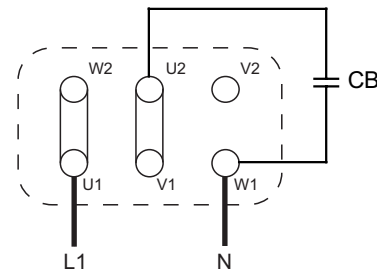
Correct motor connection:
Star connection (Y)



Δ Delta connection Y Star connection

In case of an AC motor

The AC motor has a main and an auxiliary winding. The running capacitor is switched in series to the auxiliary phase.



7.2 Direction of rotation

The direction of rotation of the drive motor is arbitrary.

7.3 Terminal box

Before closing the terminal box, please check that:

- all terminal connections are tightly fitted.
- the interior is clean and free of foreign bodies.
- unused cable entries are closed and screw plugs are tightened.
- the sealing is correctly inserted in the cover of the terminal box; check proper condition of all sealing surfaces so that the demands of the protection category are fulfilled.

7.4 Motor protection

Provide for adequate motor protective equipment in order to protect the motor from overload (e.g. motor protection switch with thermal overcurrent release).
Connect the ground wire to the marked earth screw in accordance with VDE 0100.



Fuses do not protect the motor!

CAUTION!

8. Operation in explosion-hazardous areas



DANGER!

The prerequisite for the use in explosion-hazardous areas is an appropriate design of the pump.

The product supplied by sera meets the requirements of directive 2014/34/EU if it is correspondingly marked. This guarantees safe operation in explosion-hazardous areas.



DANGER!

It is the operator's task to define the field of application and to check whether the pump is suited for this application. He/she must clearly define the zone, the device category, the explosion group and the temperature class.



DANGER!

Avoid build up electrostatic conditions!



ATTENTION!

To avoid contamination of the valves strainers in the suction line have to be installed.

8.1 Identification

The pump has a label stating the zone/device category /explosion group/temperature class in compliance with directive 2014/34/EU.

- Ex II2G c IIBT4 or
- Ex II2G c IICT4

(note special specifications in the confirmation of order).

8.2 Installation

The intended operating conditions in explosion-hazardous areas according to directive 2014/34/EU are stated in the confirmation of order or the product description. The indicated limit values should not be fallen below or exceeded.

Installation regulations given in the operating instructions must be adhered to.



DANGER!

Use only suitable tools for performing assembly and maintenance work on machines or plants in explosion-hazardous areas.

Directive 99/92/EC must be observed.

Operating Instructions

8.3 Potential equalization

After mounting the pump the proper connection to the site potential equalization is to be ensured. The max. bleed resistor (1M Ω) has to be checked and documented.

8.4 Start-up

After installation, the pump must immediately be used for the suction of fluids, i.e. the pump must immediately be started after the tank has been installed and filled.

8.5 Operation

The intended operating conditions in explosion-hazardous areas according to directive 2014/34/EU are stated in the confirmation of order or the product description. The indicated limit values should not be fallen below or exceeded.

Details about explosion zone, device category, explosion group and temperature class can be seen from the Declaration of Conformity.

8.5.1 Degassing of the pumped medium

Never let the pump run dry. Check the liquid level in the tank during operation of the pump. Make sure that the pump is switched off when the liquid level in the tank falls below the minimum level required (explosive atmosphere may be carried over).

Vapour bubbles from the pumped medium are harmless as they have no explosive potential.



DANGER!

Formation of an explosive gas mixture must be prevented.

8.5.2 Temperature indications

Permissible ambient temperature

$$-10^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$$

8.6 Maintenance

The maintenance notes listed in Chapter 10 are generally applicable.

Exception:



CAUTION!

The oil level in the stroke mechanism of the pump and the level of the hydraulic fluid of the pump must be checked once a week!

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 General



NOTE!

As soon as the drive motor is supplied with voltage the pumps starts to work.

The (standard) dosing pump is without an I/O switch. Any devices to switch the dosing pumps on or off have to be installed by the operator.

10.2 Setting the delivery rate

The flow capacity of the dosing pump is set via the stroke length control (see chapter „Stroke length adjustment“).



NOTE!

When using an electrical actuator or frequency converter please take note of the separate operating instructions!

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	...409.2-...	CLP VG220 DIN51517-3	ARAL Degol BG220	0,3 Litres

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

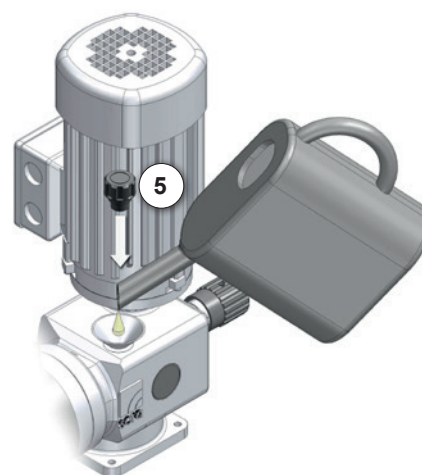
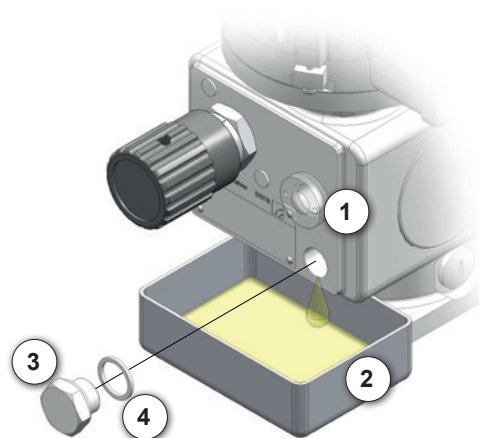
11.2.2 Oil change

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

Perform an oil change once a year.

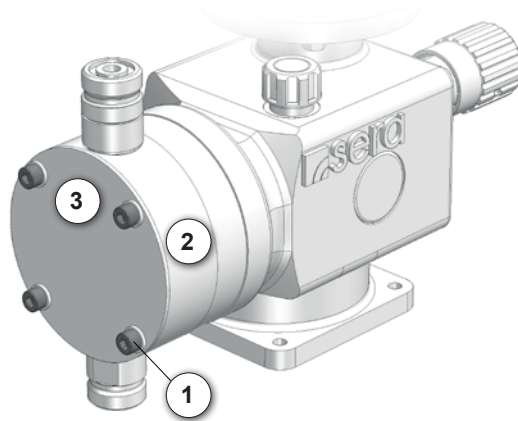
To do so, proceed as follows:

- 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).



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)	...409.2-2,4 e	5,0	4,5
	...409.2-7,0 (e)	4,0	4,5
	...409.2-12 (e)		
	...409.2-18 (e)		
	...409.2-25 (e)		
	...409.2-50 (e)	7,0	8,0
	...409.2-75 (e)		
	...409.2-90 (e)		
	...409.2-115 (e)		
	...409.2-140 (e)		
	...409.2-180 (e)		
	...409.2-250 (e)	15,0	15,0
	...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.



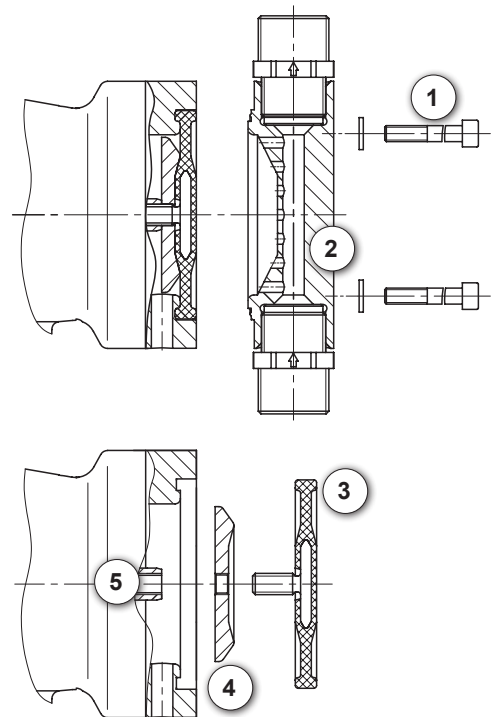
WARNING!

For replacing the diaphragm, the system must be depressurised!

11.3.2.1 Single diaphragm pump

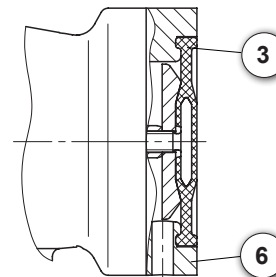
- Set the stroke length adjustment to a stroke length of 0% (front position).
- Loosen fixing screws (1) or –nuts on the pump body.
- Remove pump body (2) and front plate (if installed) to the front

- 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

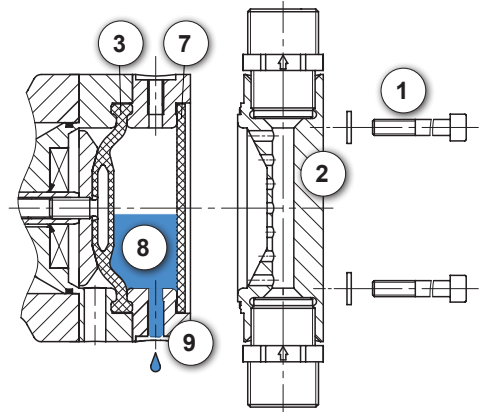
- Set the stroke length to 50%. Move diaphragm (3) to the base ring (6) – the diaphragm must be in the middle position.
- If the pump is not equipped with a stroke length adjustment (M-design), move the diaphragm to the middle position by turning the fan blade of the drive motor.
- When assembling the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

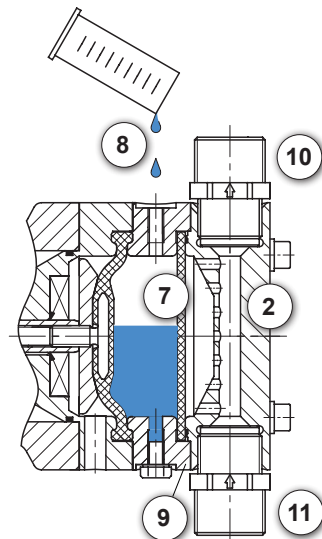
11.3.2.2 Double diaphragm pump

- 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.

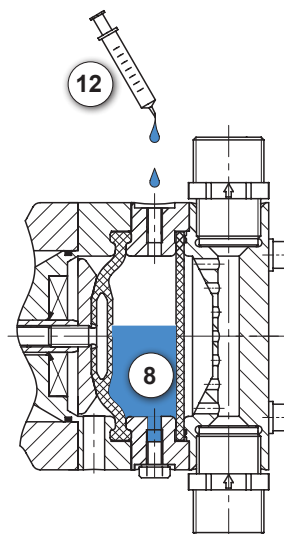


Assemble the pump in reversed order

- 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.

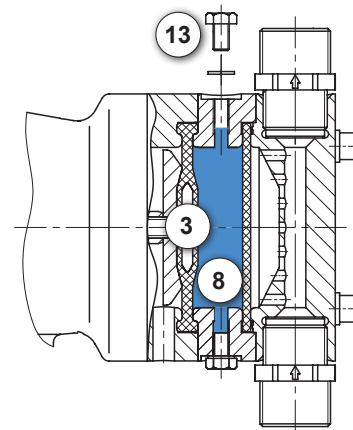


409.2

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

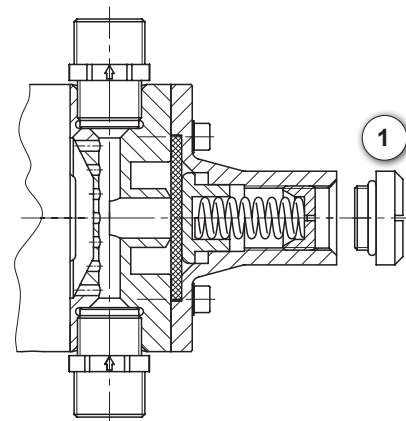
Proceed as follows to change the diaphragm of the overflow valve (only dosing pumps with integrated overflow valve).



NOTE!

All diaphragms should be replaced completely.

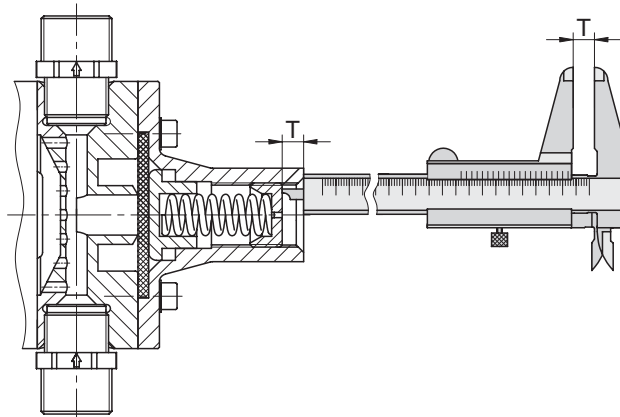
Loosen and unscrew the lid (1) of the overflow valve.



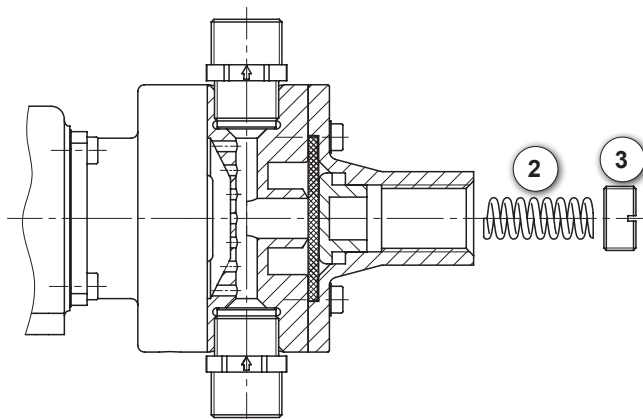


NOTE!

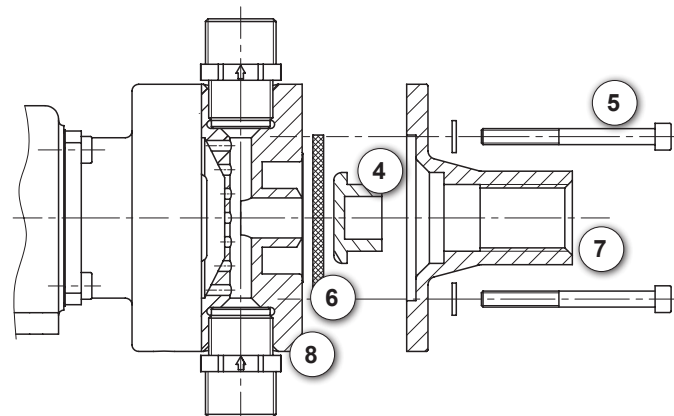
Before the set screw is unscrewed the dimension T (distance between top edge of the cover and the set screw) is to be determined and documented. This ensures that the overflow valve can be reset to the same pressure during subsequent assembly.



- 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 pressure 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

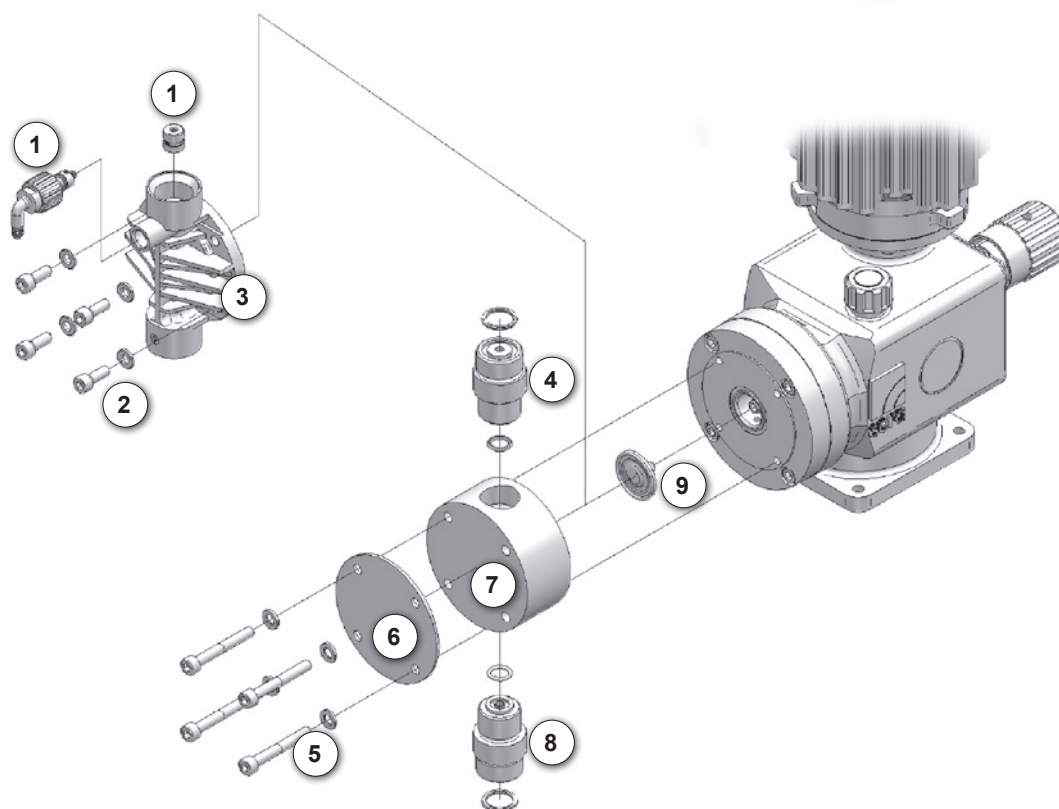
The following parts are considered as spare parts of the diaphragm pump:

- Pump body
- Diaphragm ring (only for double diaphragm pump)

12.3 Spare and wearing parts

12.3.1 Diaphragm pump ...409.2- 2,4 e

...409.2 - 2,4 e



Overview of the spare and wearing part kits Diaphragm pump ...409.2- 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

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

...409.2 - 7,0 (e)

...409.2 - 12 (e)

...409.2 - 18 (e)

...409.2 - 25 (e)

...409.2 - 50 (e)

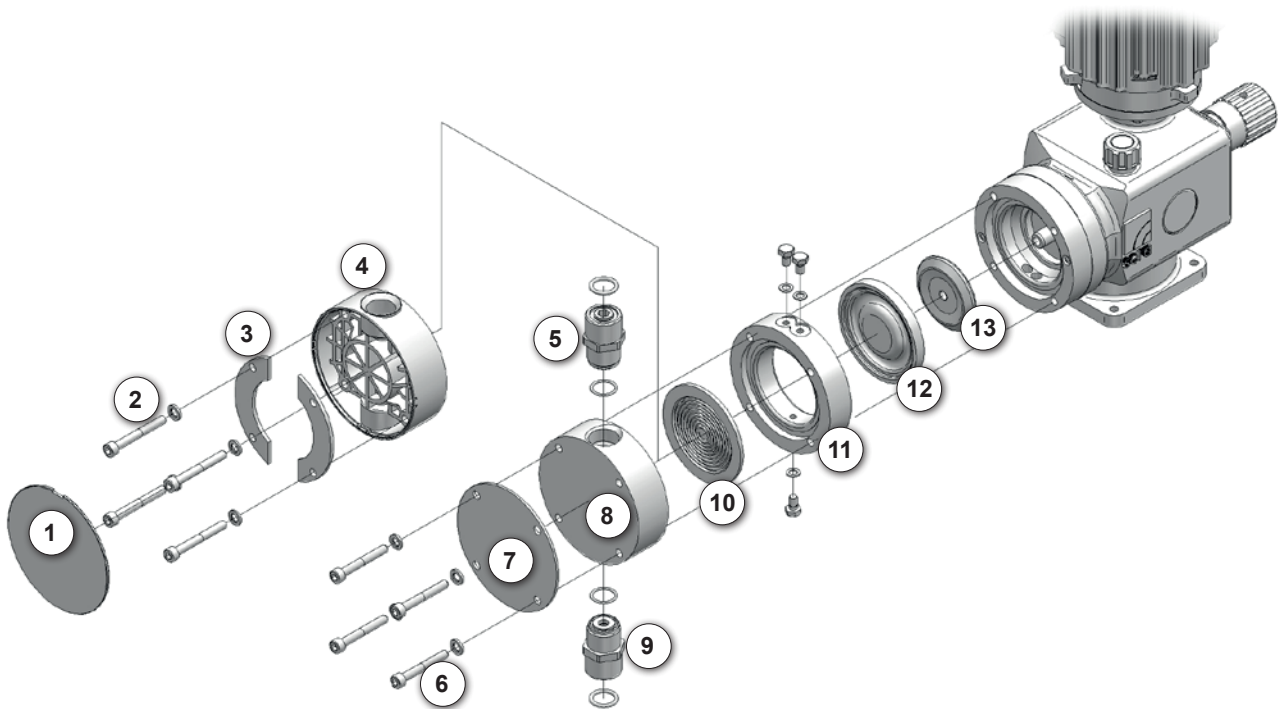
...409.2 - 75 (e)

...409.2 - 90 (e)

...409.2 - 115 (e)

...409.2 - 140 (e)

...409.2 - 180 (e)



409.2

Operating Instructions

Overview of the spare and wearing part kits Diaphragm pump ...409.2- 7,0 (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

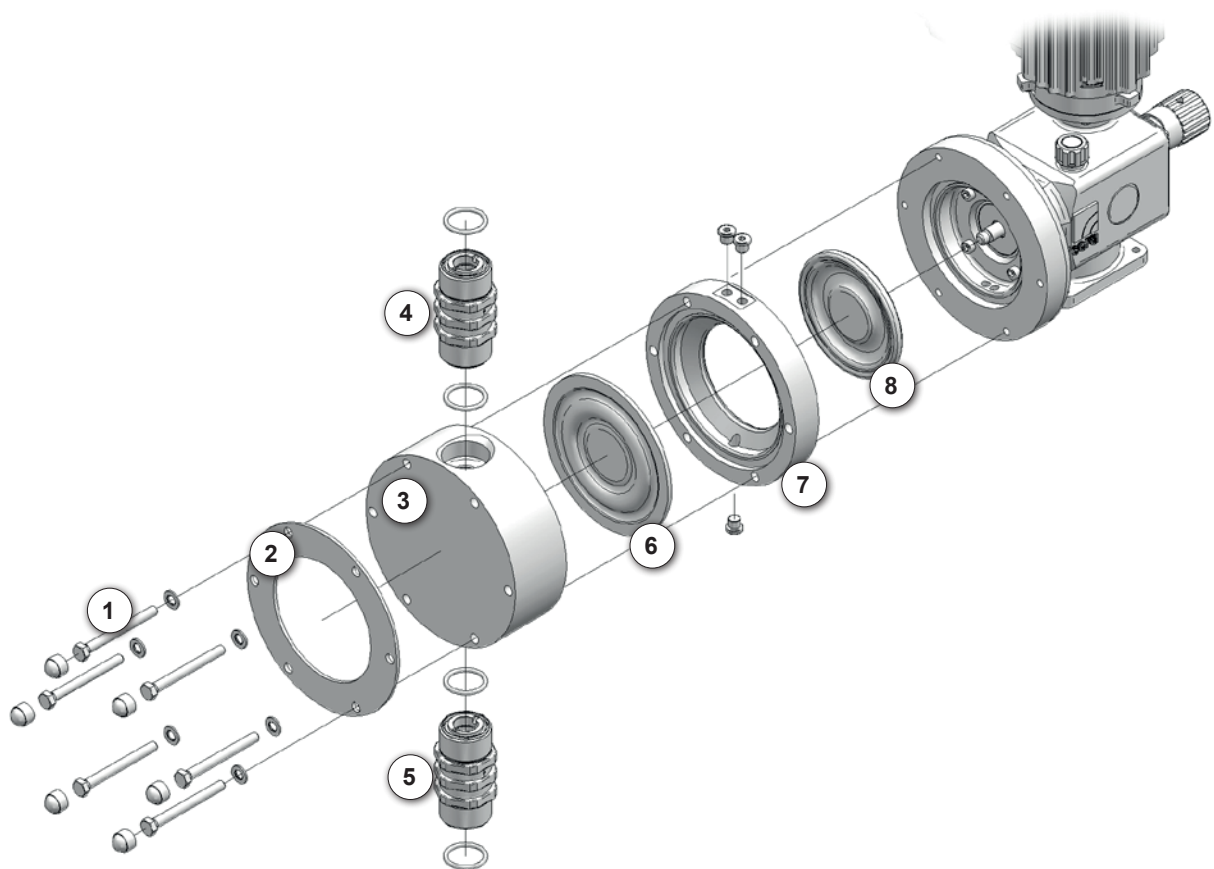
Pump body kit (plastic)	
Pos.	consisting of
6	Screws, complete
7	Front plate
8	Pump body

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

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

...409.2 - 250 (e)

...409.2 - 350 (e)



409.2

Operating Instructions

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

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

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

Diaphragm kit (single diaphragm pump)	
<i>Pos.</i>	<i>consisting of</i>
8	Drive diaphragm

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

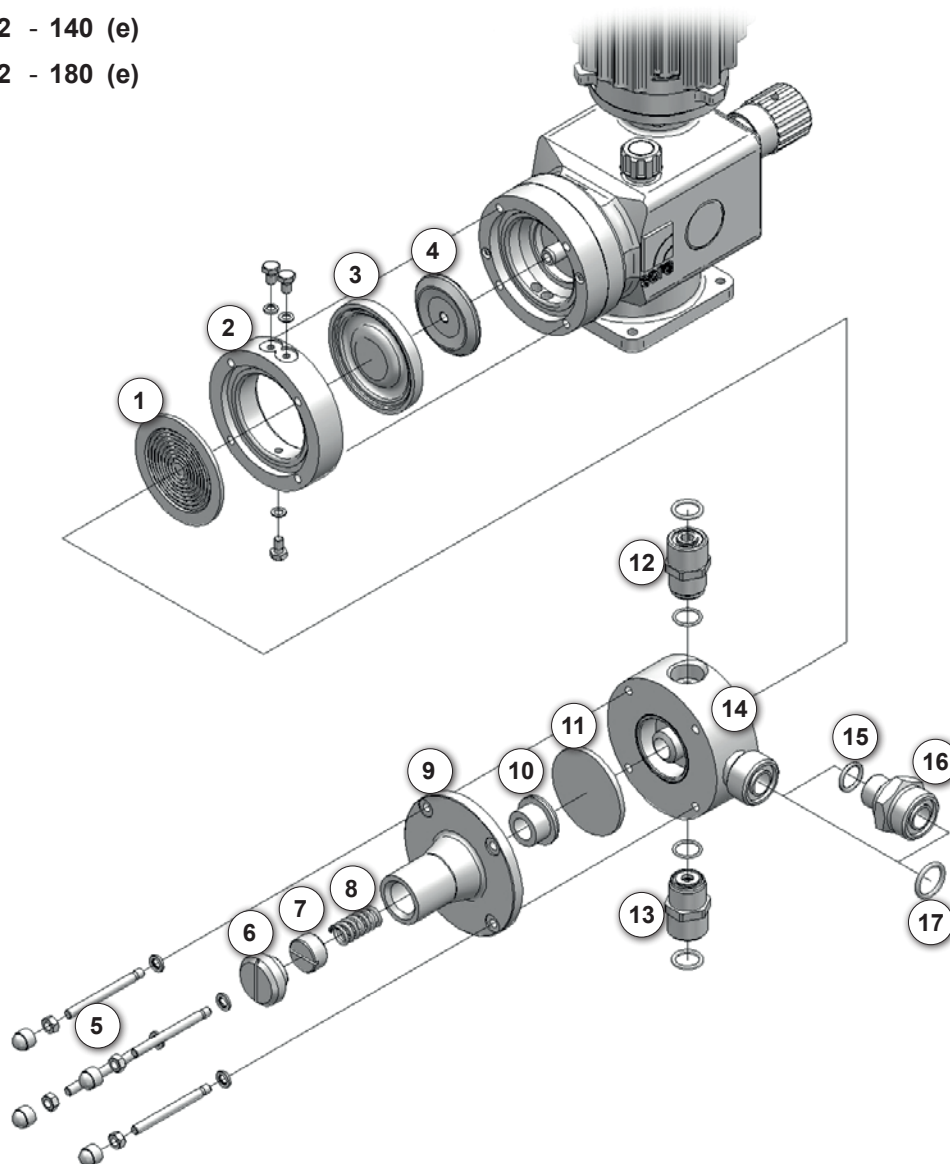
Diaphragm ring kit (only for double diaphragm pump)	
<i>Pos.</i>	<i>consisting of</i>
7	Diaphragm ring, complete

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

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

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

- ...409.2 - 7,0 (e)
- ...409.2 - 12 (e)
- ...409.2 - 18 (e)
- ...409.2 - 25 (e)
- ...409.2 - 50 (e)
- ...409.2 - 75 (e)
- ...409.2 - 90 (e)
- ...409.2 - 115 (e)
- ...409.2 - 140 (e)
- ...409.2 - 180 (e)



Operating Instructions

**Overview of the spare and wearing part kits
Diaphragm pump ...409.2- 7,0 (e) ...-180 (e) with integrated overflow valve**

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

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

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

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

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

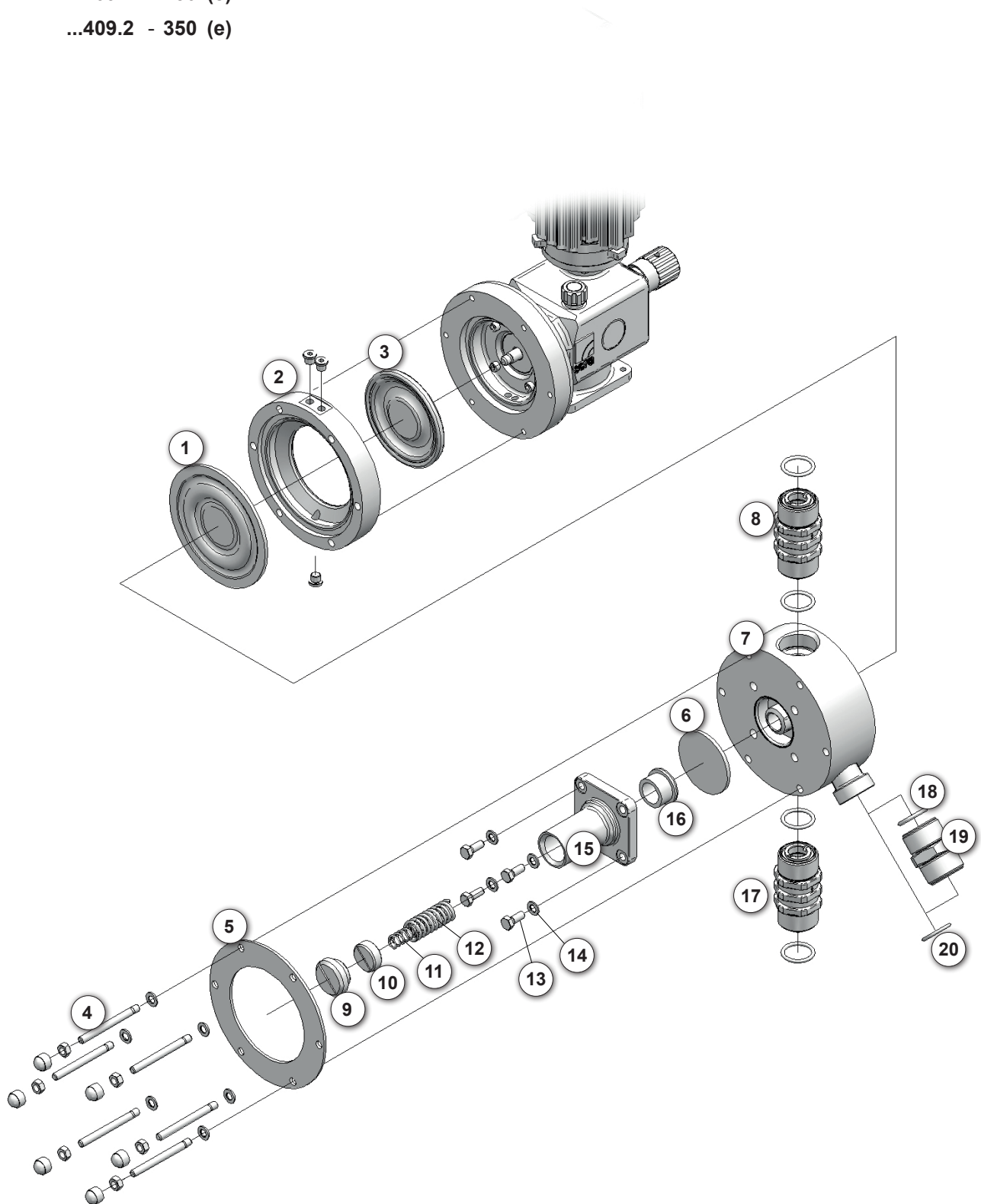
Pump body kit (plastic)	
<i>Pos.</i>	<i>consisting of</i>
5	Screws, complete
14	Pump body
17	O-ring

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

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

...409.2 - 250 (e)

...409.2 - 350 (e)



Operating Instructions

**Overview of the spare and wearing part kits
Diaphragm pump ...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

13. Fault analysis and corrective action

sera - products are proven technical products which are only shipped after an extensive final test in our works. Should any malfunctions occur, these can be located and corrected easily with the help of the following reference guide .

Type of fault											Possible cause of problem	Rectifying the problem		
Pump does not prime	Pump does not deliver	Capacity not attained	Delivery pressure not reached	Capacity fluctuates	Capacity greater than specified	Motor does not start	Too much vibration in piping	Pump too noisy	Service life of working diaphragms too short	Motor is overloaded	Damage to stroke mechanism / drive	Leaks at pumphead		
■	■	■											Suction height too great.	Reduce suction height or suction resistance.
■	■	■		■									Suction connection not tight.	Check pipe seals and tighten connections.
■	■					■						■	Closed shut-off valve in pipe.	Open shut-off valves resp. check opening status ► dismount pump and check on poss. damages replace damaged parts
■	■	■											No liquid in dsing tank.	Fill supply tank.
■	■	■	■	■									Pump valves leaking.	Remove and clean pump valves.
■	■		■	■									Pump valves (valve seats) damaged.	Remove pump valves ► check replace if necessary.
■	■												Valves wrongly mounted or valve ball missing.	Check against sectional drawing to ensure correct assembly. Replace or refit faulty parts.
■	■												Filter in suction pipe clogged.	Clean suction filter.
						■						■	Electrical data of the drive motor do not comply with the network.	Check order data. Check electrical installation. Adjust motor to the network on site.
		■	■	■		■	■	■	■	■		■	Delivery pressure too high.	Check pressure directly above pressure valve with manometer and compare order data resp. with perm. counterpressure.
■	■	■	■	■									Foreign bodies in valves.	Remove pump valves and clean.
				■	■								Delivery on suction side is greater than pressure at the end of delivery line.	Check geodesic conditions and insert float valve or pressure retaining valve.
		■	■	■	■	■	■	■	■	■		■	Velocity too high owing to geometry of pipework.	With a pressure gauge check the velocity on the suction and pressure side of the pump. Compare with order data. If necessary fit pulsation damper.

Operating Instructions

Type of fault											Possible cause of problem	Rectifying the problem		
Pump does not prime	Pump does not deliver	Capacity not attained	Delivery pressure not reached	Capacity fluctuates	Capacity greater than specified	Motor does not start	Too much vibration in piping	Pump too noisy	Service life of working diaphragms too short	Motor is overloaded	Damage to stroke mechanism / drive	Leaks at pumphead		
									■			■	Contact materials not resistant and unsuitable.	Check medium against original order and quote. If necessary select different wetted parts.
■		■	■	■									Viscosity too high.	Check viscosity and compare with order confirmation. If necessary reduce concentration and/or raise temperature.
	■	■		■									Medium gasses off in suction line.	Check geodesic conditions (pipework layout). Increase suction pressure and/or reduce temperature of medium.
■													Air in suction pipe whilst pressure is present in delivery line.	Ventilate pressure side.
■	■	■	■	■								■	Pipe connection leaking.	Retighten connections according to the type of material. Take care with plastic parts and do not fracture.
■	■	■										■	Temperature too low.	Check flowability of the dosing medium. Temperature of the medium may not be lower than -10°C.
■	■					■					■	■	Medium frozen in pipe.	Dismount pump from system and check for damages ► raise temperature.
■	■	■	■	■					■			■	Diaphragm rupture.	Replace the diaphragm according to the descriptions in Chapter „Replacing 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!

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)

Clearance Certificate



Product

Type Serial-No.

the product was carefully emptied before shipping / delivery, and cleaned inside and outside. YES

Conveying medium

Designation Concentration %

Properties

Please tick!

Harmless

Toxic Corrosive Flammable Oxidising Unhealthy

Explosive Dangerous for the environment Irritant Bio-hazardous Radioactive

If either of the listed properties, then enclose the appropriate safety and handling instructions.

The product was used with health or water-polluting substances and came up with labeling requirements and pollution prone media in contact. YES NO

Special security arrangements with respect to health or water-hazardous media are in the further handling not required required

The following safety precautions regarding rinsing, residual liquids and waste disposal are required:

Process data

The product was used with the following operating conditions described conveying medium:

Temperature °C Pressure bar

Sender

Company: _____ Telephone: _____

Contact person: _____ FAX: _____

Address: _____ E-mail: _____

Zip code, City: _____ Your order No: _____

We confirm that we have the information in this safety certificate (Clearance Certificate) have been correctly and completely and that the returned parts were carefully cleaned.

The parts are sent free of residues of dangerous amount.

_____ Place, Date _____ Department _____ Signature (and company stamp)

409.2

Operating Instructions

NOTE

