Piston diaphragm pump
Series ...509.1-...KM

Operating instructions

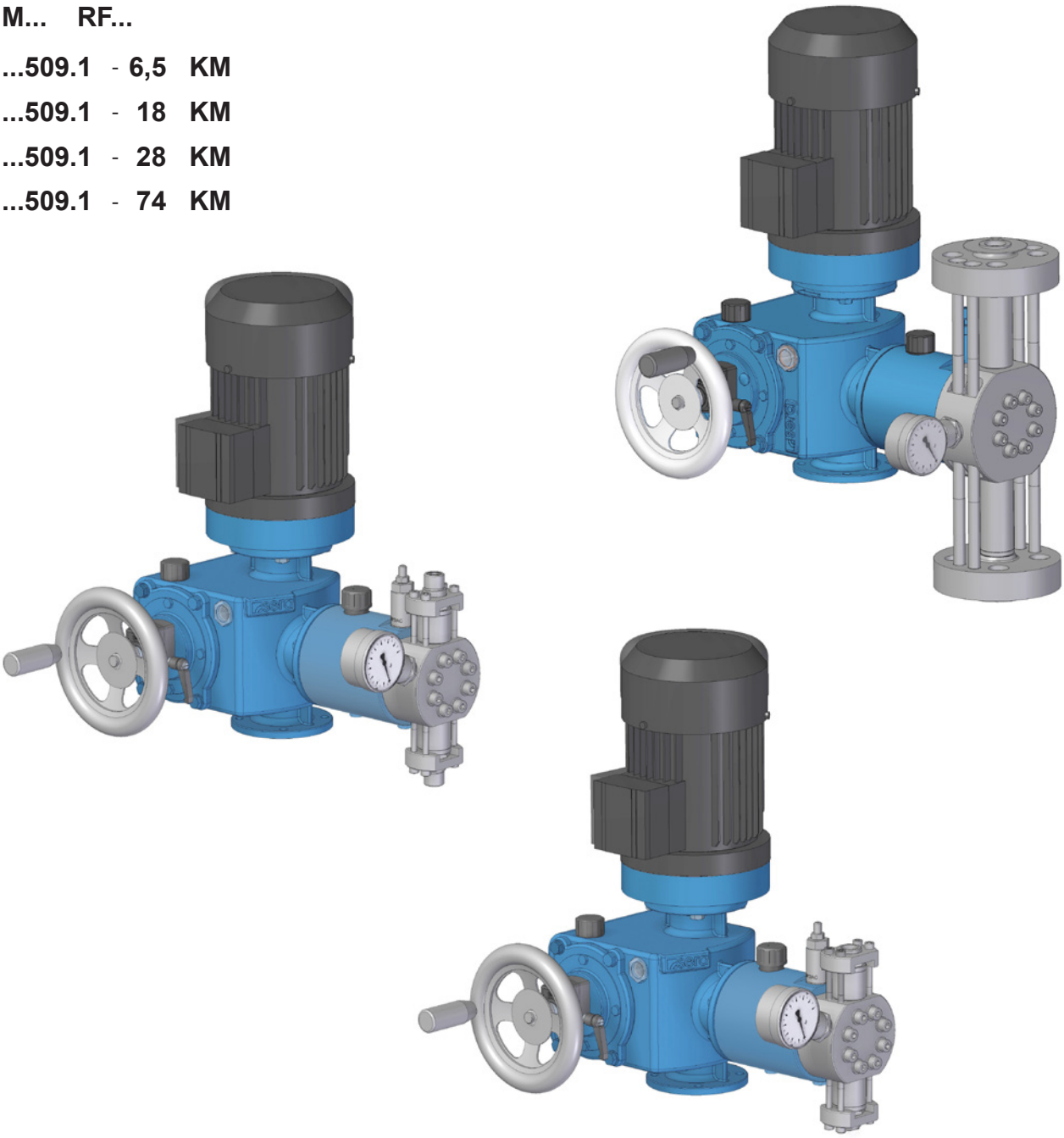
M... RF...

...509.1 - 6,5 KM

...509.1 - 18 KM

...509.1 - 28 KM

...509.1 - 74 KM



Manufacturer:

sera GmbH
sera-Straße 1
34376 Immenhausen
Germany
Tel.: +49 5673 999-00
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

Inhalt

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: Danger of fatal injury	Danger type: Risk of injury	Danger type: Damage to property	Definition of the note (in the operating instructions)
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.

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.

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 changements 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 au-thorization 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.

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 controly systems of the total installation.

ATTENTION!

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

NOTE!

Personal protective equipment must be provided by the owner!

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 quantitiy 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).
- Before initiation the operator has to fit a pressure-sided manometer for checking the operating and set pressure.

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.
- Wrong setting of the hydraulic compensating valve

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, …).
- Setting of the hydraulic compensating valve misadjusted.

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.

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

2.11.7 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.

2.11.8 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.

2.11.9 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.

NOTE!

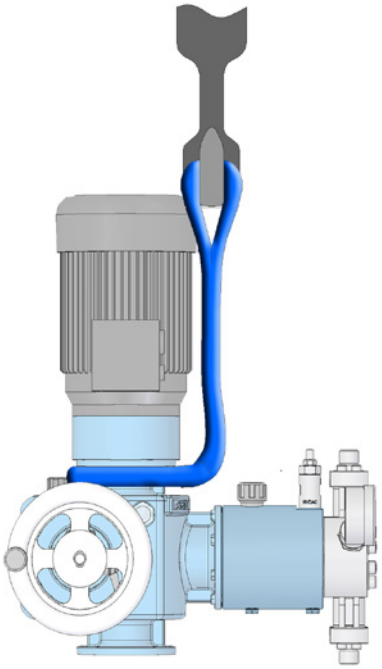
The packaging material must be disposed of appropriately!

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.

ATTENTION!

Do not squeeze cable (when it is connected)



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 obsered:

- Storage place: cool, dry, dustfree and slightly ventilated
- Storage temperature between -10°C and +45°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

Type of drive (combinations possible)

C	Controllable
M	Mechanical not adjustable (without stroke length adjustment)
R	Mechanical adjustable (with stroke length adjustment)
F	Motor suitable for frequency converter operation
i	Frequency converter, mounted on the motor
P	Pole-changing motor
K	Stroke mechanism with side drive shaft and connected to the drive via a clutch
Z	Twin design
X	Stroke mechanism with two opposite pump heads, combined suction and pressure side
Y	Stroke mechanism with two opposite pump heads

Series

204	(solenoid driven pumps)
409	(motor driven pumps)
410	(motor driven pumps)
411	(motor driven pumps)
509	(motor driven pumps)

Revision index

max. Nominal capacity (litre/hour (each pump head))

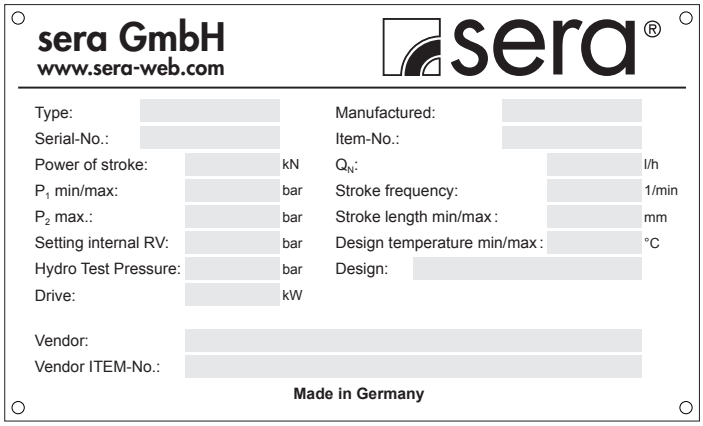
Displacer (type of construction)

(without)	Double diaphragm
e	Single diap hragm
ML	Multy layer diaphragm
KM	Piston diaphragm
K	Piston

1	2	3	4	5	
RF	**509**	**. 1**	**- 18**	**KM**	*(example)*

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.



1	Pump type
2	Serial-No.
3	Power of connecting rod
4	min./max. permissible pressure in the pump inlet
5	Maximum permissible pressure in the pump outlet
6	Setting pressure of the hydraulic compensating valve
7	Hydro test pressure
8	Power of drive motor
9	Year of manufacture (MM/YYYY)
10	**sera** Project-/Article-No.
11	Nominal delivery rate
12	Nominal stroke frequency
13	Stroke length
14	Design Temperature
15	Design (e.g. API)
16	Customer (name)
17	Customer (order-/article-No.)

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.
Permissible temperature range of the pumped medium -10°C ... +100°C.

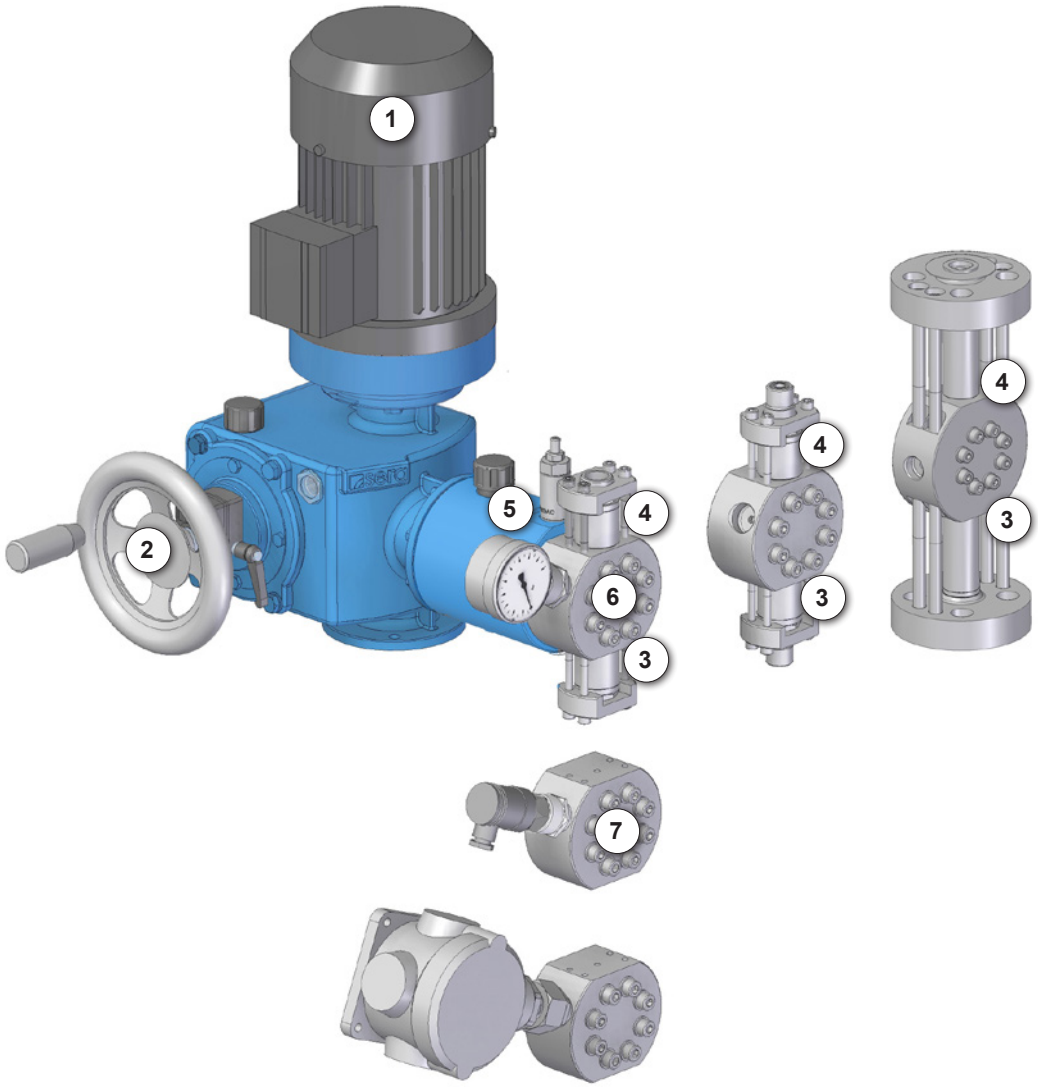
4.4 Dosing range

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 Assembly groups of the dosing pump



No.	Designation	Remark
1	Stroke mechanism with driving motor	
2	Manual stroke length adjustment	
3	Suction valve (for execution please refer to pump type)	
4	Pressure valve (for execution please refer to pump type)	
5	Assembly pump	
6	Pump body (with diaphragm rupture monitoring, Manometer)	
7	Pump body (with diaphragm rupture monitoring, pressure switch)	option
8	Pump body (with diaphragm rupture monitoring, pressure switch (Ex-Area))	option
without Illustration	Stroke frequency transmitter	option
	Stroke length adjustment with 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.

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

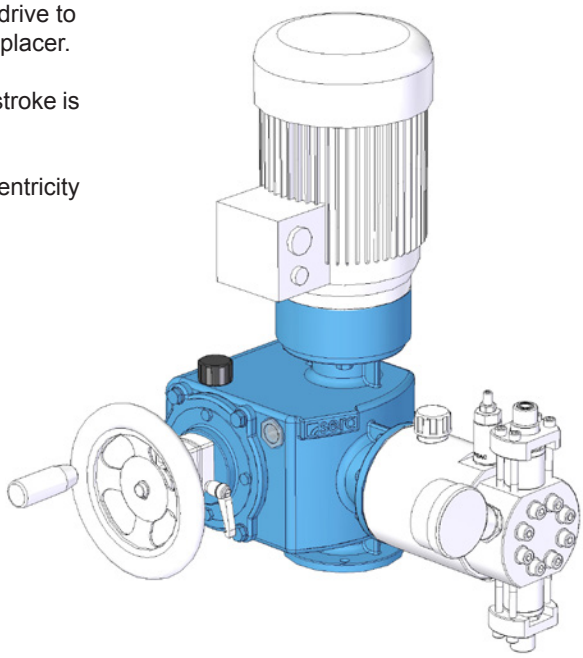
- Drive motor
- Stroke mechanism
- Stroke length adjustment
- Assembly pump
- Pump body
- Suction and Pressure valve
- Diaphragm rupture monitoring

4.7.2 Stroke mechanism

Dosing pumps of this type series use a variable eccentric drive to transmit the rotation of the drive motor positively to the displacer.

With the variable eccentric drive the suction and pressure stroke is generated by the eccentric via an oscillating piston.

The effective stroke length is changed by adjusting the eccentricity of the driving eccentric.



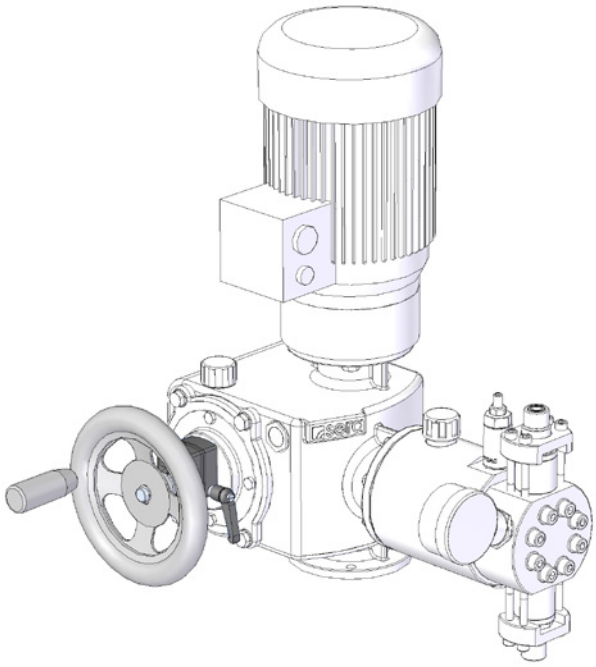
4.7.3 Drive motor

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

4.7.4.1 Manual stroke length adjustment (Standard)



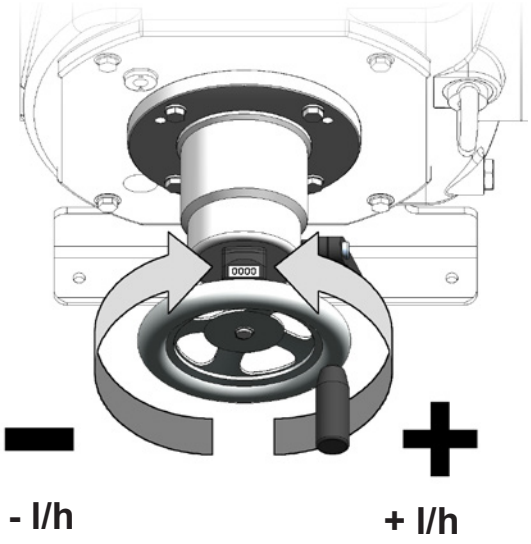
The delivery rate of the pump is regulated by changing the stroke length.
The stroke length is infinitely variable between 0% and 100%.

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

The effective stroke length of the connecting rod is changed by turning the hand wheel.

The stroke length can be adjusted both during operation and standstill of the pump.

The set stroke length can be read off on a digital display.

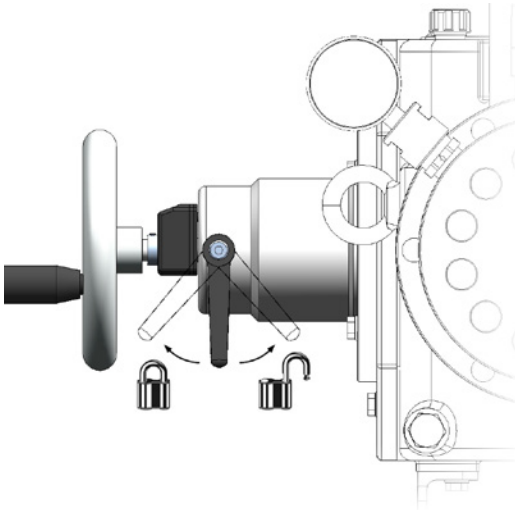


NOTE!

Release the clamping lever for adjustment.

Tighten the lever when adjustment is finished.

This ensures that the set stroke length does not change during operation.



NOTE!

When the clamping lever is not actuated the pump controls automatically towards the zero position.

4.7.4.2 Electrical actuator (option)

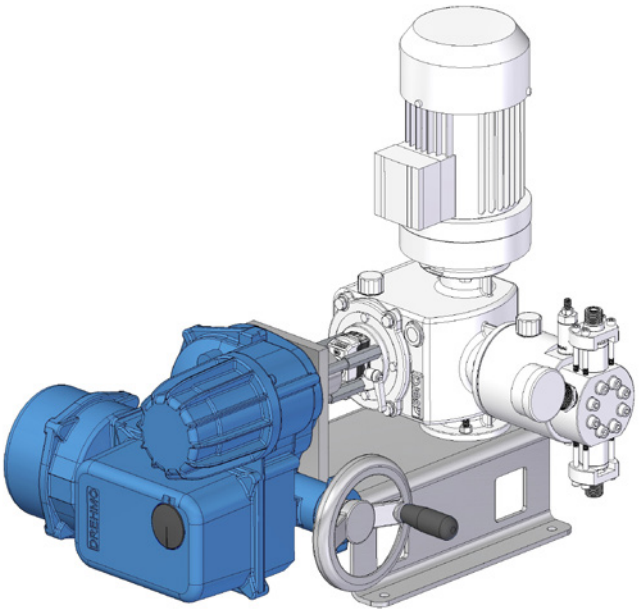
The electrical actuator (with hand wheel) is directly mounted to the stroke mechanism of the dosing pump. A clutch transmits the rotary motion of the actuator drive shaft to the adjusting spindle.

Eine manuelle Verstellung ist über das Handrad am Stellantrieb möglich.

The actuator is equipped with two integrated limit switches as well as a position potentiometer for position feedback (4-20 mA) 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.

Activation is performed by appropriate control units (see **sera** accessories).
The set stroke length can be read off on the pump (digital counter).



NOTE!

Pay attention to the documents attached to the actuator.

4.7.4.3 Electrical actuator with integrated positioner (option)

same as Chapter „Electrical actuator“ additionally:

- Positioner

The positioner which is integrated in the actuator allows an actuator setting from 0…100% that is proportional to the connected input signal.
Optionally, the actuator can also be equipped with a collective fault signal.

4.7.4.4 Electrical actuator, Ex-Area (option)

Pay attention to the documents attached to the actuator.

4.7.5 Assembly pump

The stroke movement of the mechanically driven piston is transmitted hydromechanically to the multilayer diaphragm and thus to the pumped medium. The suction stroke is generated by vacuum and support of a pressure spring.
The hydraulic compensating valve ensures an optimum quantity of hydraulic fluid between diaphragm and piston. It is spring loaded and can be adapted to the operating conditions.

Minimum leakage can occur near the piston which are compensated for by the check valve at each suction stroke and are recirculated into the storage tank.

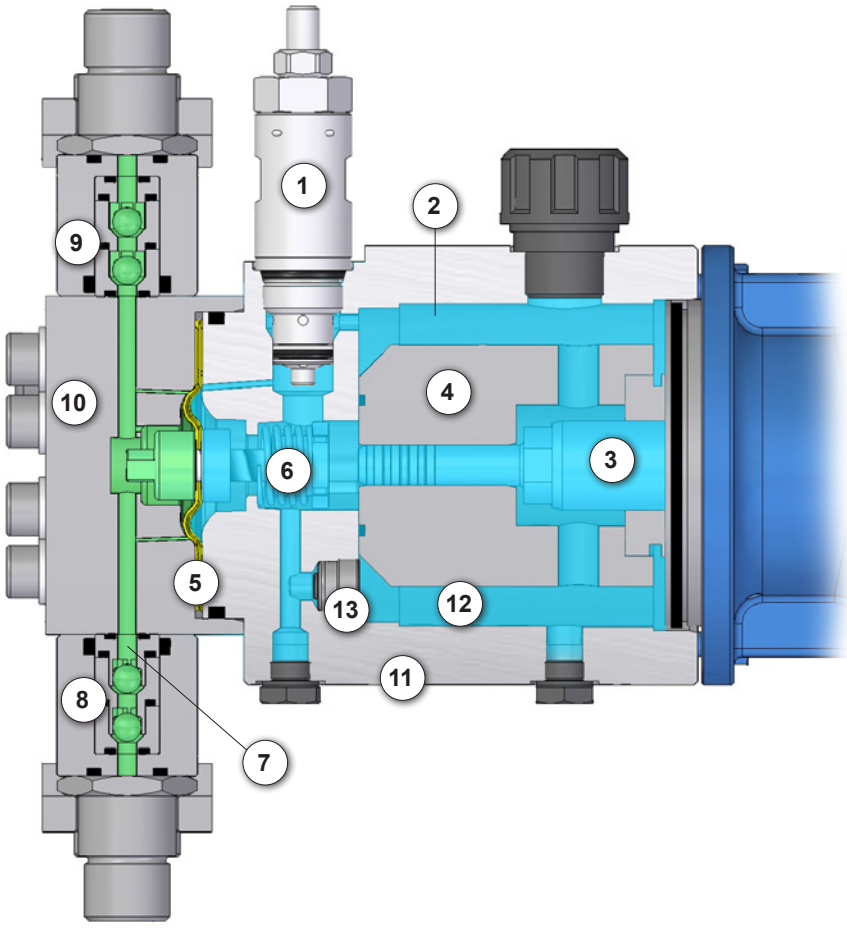
It is not necessary to refill any hydraulic fluid during operation since the system is closed and hydraulic fluid cannot escape.
During each suction stroke the check valve sucks in that quantity of hydraulic fluid which escapes at the piston.

If e.g. a shut-off valve is closed in the pressure pipe during operation, the total stroke volume of hydraulic fluid is recirculated into the storage tank to protect the pump from overload.

If the pressure in the pressure pipe falls below the set pressure of the compensating valve, the check valve sucks in hydraulic fluid until the optimum volume is again reached.
This process can take up to several minutes depending on the operating conditions.

NOTE!

The hydraulic compensating valve is not a safety valve according to the pressure equipment directive 2014/68/EU.

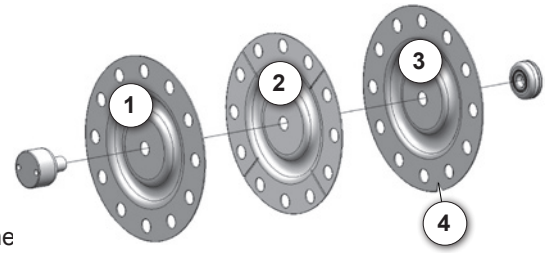


1	Hydraulic compensating valve
2	Hydraulic fluid
3	Piston
4	Piston bushing
5	Multi-layer diaphragm
6	Pressure spring
7	Conveying medium
8	Suction valve
9	Pressure valve
10	Pump body
11	Cylinder
12	Storage tank
13	Check valve

4.7.5.1 Multi-layer diaphragm

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

- Working diaphragm (medium-contacted) (**1**)
- Signal diaphragm (slotted) (**2**)
- Protection diaphragm (with notch) (**3**)



The notch (**4**) of the protection diaphragm indicates the correct mounting position changing the diaphragm set (see Chapter „Replacing the diaphragm“).

NOTE!

The direction of the notch (4) does not matter.

4.7.6 Pump body

The dosing unit consists of the pump body with the assembly pump and the suction and pressure valves .
The pump body is filled with medium during the suction stroke of the diaphragm and emptied again during the pressure stroke.

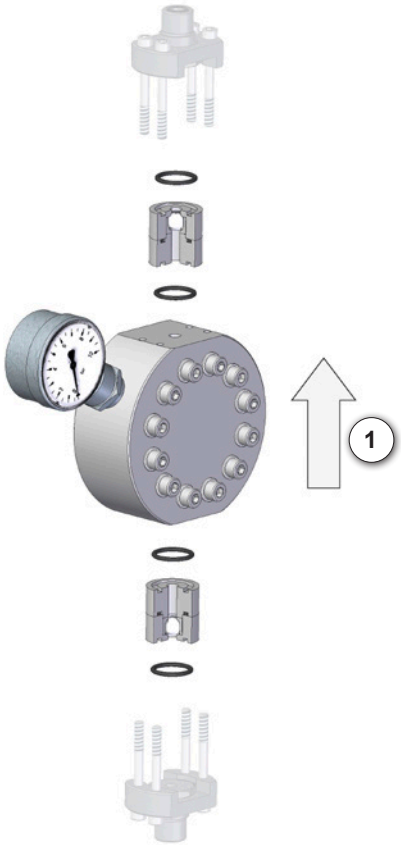
4.7.7 Suction- and pressure valve

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!

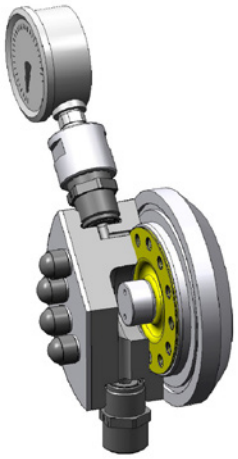


4.7.8 Diaphragm monitoring

These **sera** pumps are equipped with diaphragm monitoring.

4.7.8.1 Diaphragm monitoring by manometer (standard)

Standard execution



In case of a rupture of the working diaphragm, the medium under pressure flows through a bore in the pump body to the signalling manometer and causes a pointer deflection.

- Switch off the pump immediately.
- Replace the diaphragm.
- Clean the diaphragm monitoring.

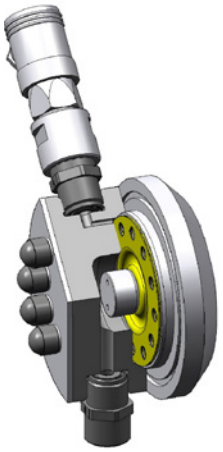
NOTE!

If the pump is operated with a backpressure that is only slightly higher than the permissible minimum pressure of p2=1bar, then the deflection of the pointer on the manometer will also be slight!

During normal operation with intact membrane, the manometer shows 0bar.

4.7.8.2 Diaphragm monitoring by pressure switch (option)

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



4.7.8.3 Diaphragm monitoring by pressure switch; Ex-Area (option)

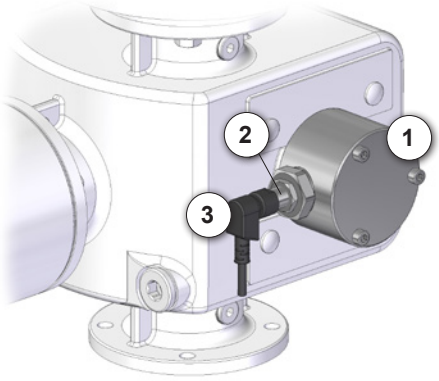
ATTENTION!

The pressure switch is factory set to a switching pressure of ≤ 1bar. For this reason and in order to guarantee a correct dosing function, the pump should always be operated with a pressure of ≥ 1bar!

4.7.9 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 mounted additionally) and reports each single pump stroke to the evaluation unit (e.g. preselection counter, SPC-control unit, etc.).

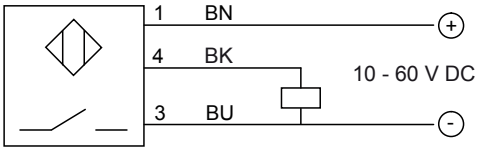
1	Cover
2	inductive conductor
3	plug with cable



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 exlosion-hazardous areas a NAMUR type stoke frequency transmitter (II2G EExia IICT6, gem. ATEX95) is to be provided.

5. Technical data

5.1 Performance data

Type	Nominal capacity (2) adjustable by changing lift of strokes Q_N l/h		Maximum permissible pressure in the pump outlet p_2 max.	Min./max. permissible pressure in the pump inlet p_1 min./max.	Max. suction height (1) WS	recommended nominal diameter of the connecting pipes DN	Nominal stroke frequency min^{-1}		Drive size FS
	50Hz	60Hz	bar	bar	m	mm	50Hz	60Hz	
...509.1 - 6,5 KM	0 - 6,5	0 - 8	300	-0,2/0	2	4	168	202	80
...509.1 - 18 KM	0 - 18	0 - 22	250	-0,2/0	2	4	168	202	80
...509.1 - 28 KM	0 - 28	0 - 34	125	-0,3/0	3	8	168	202	80
...509.1 - 74 KM	0 - 74	0 - 89	60	-0,3/0	3	8	168	202	80

(1) Achievable height with media similar to water and filled suction line.
(2) Linear dosing range between 20 and 100% stroke length.
For design according to API an output reserve to 10% has ti be considered.
The nominal data refer to water, 20°C and nominal pressure. With lower counterpressure it can come to be soaked off achievements..

5.2 Design data

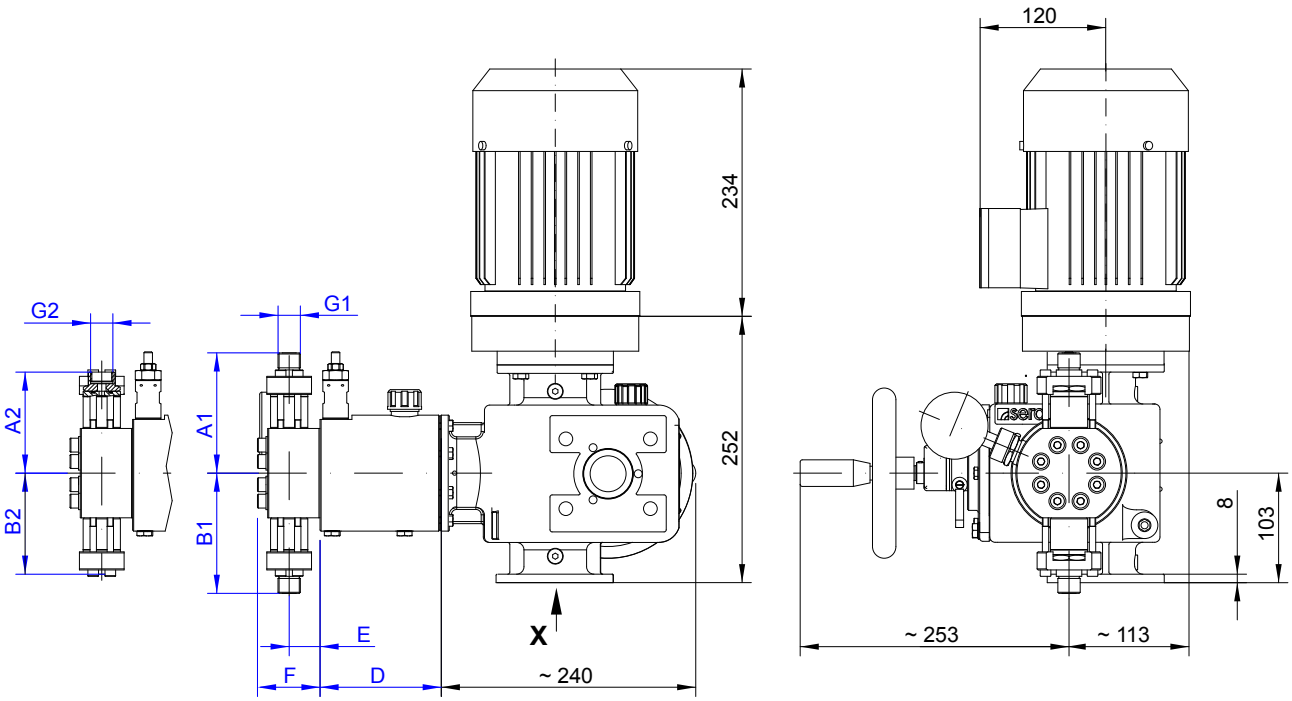
Design pressure p_{2max}	acc. to technical data	see Chapter 5.1	Performance data
Design temperature	-10°C ... +100°C		
Operating temperature	-10°C ... +40°C	see Chapter 2.9 see Chapter 6	Operating conditions Installation instructions
Medium temperature	-10°C ... +100°C	see Chapter 4.3	Viscosity, pumped medium
Storage temperature	-10°C ... +45°C	see Chapter 3.3	Storage

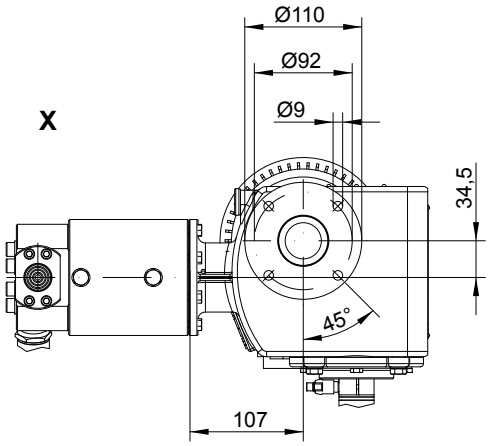
5.3 Motor data

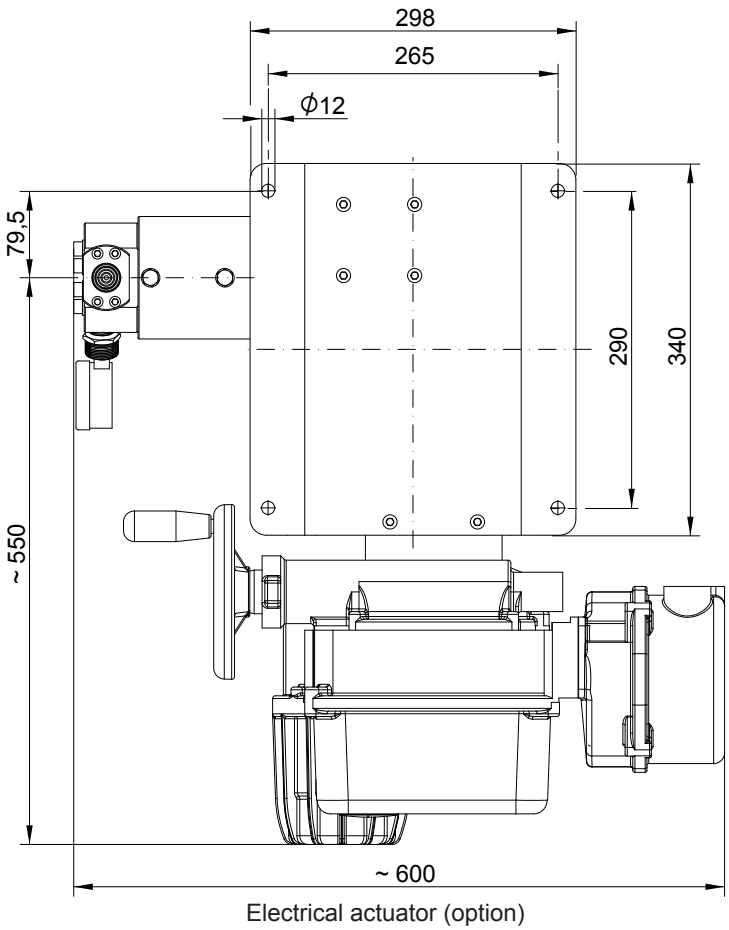
Motor type	Pump type	Size FS	Power kW	Motor speed min-1		Mains frequency Hz	Voltage range V	Rated current A	Protection rating IP	Thermal class
				50Hz	60Hz					
Standard IE2	...509.1 - 6,5 KM	80	0,55	1.395	1.674	50/60	**PAY ATTENTION TO THE TYPE PLATE !** (1)		55	F
	...509.1 - 18 KM	80	0,55	1.395	1.674					
	...509.1 - 28 KM	80	0,55	1.395	1.674					
	...509.1 - 74 KM	80	0,55	1.395	1.674					

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

5.4 Dimensions (Process connection: Thread)





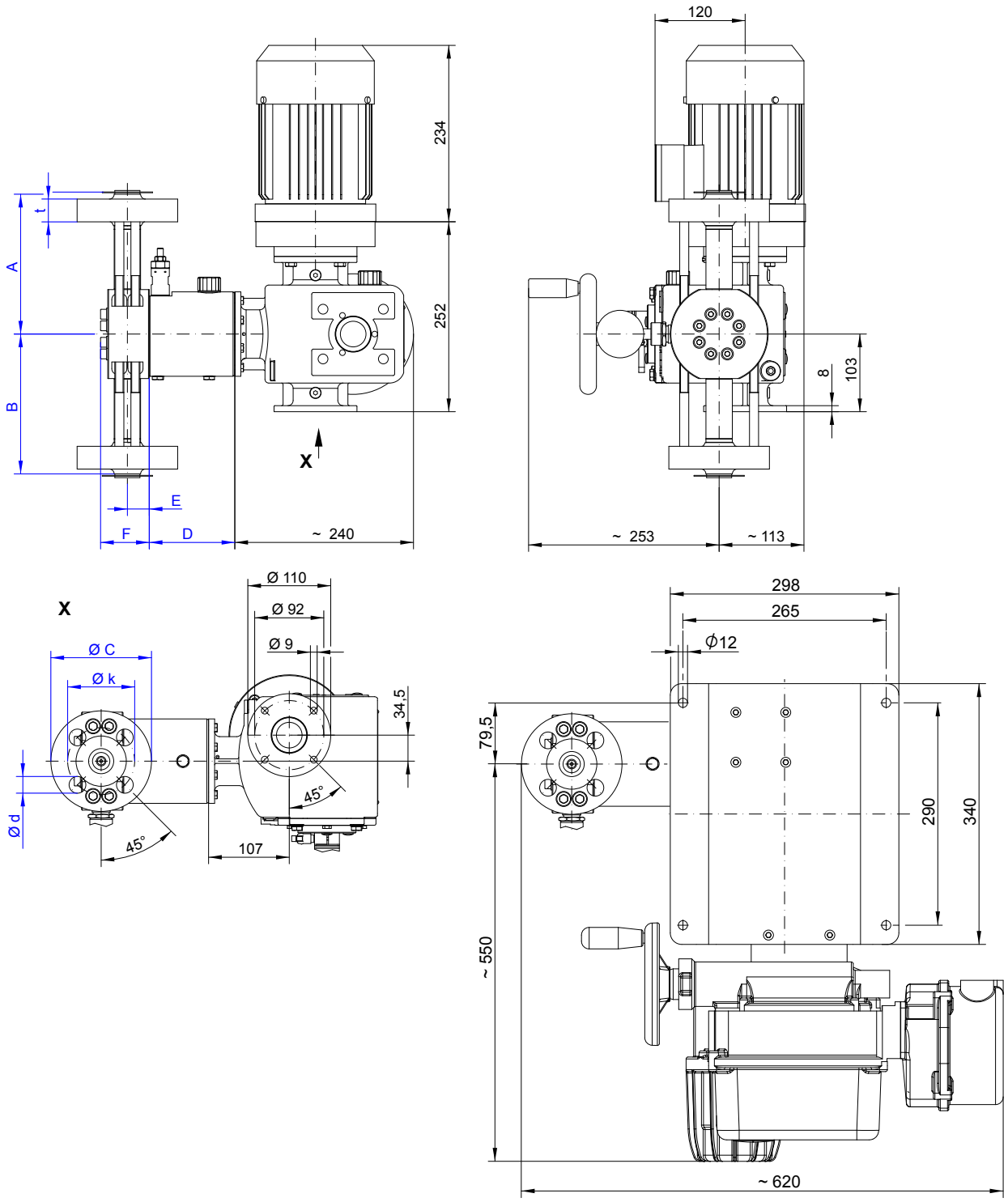


Electrical actuator (option)

Dimensions in mm!

			...509.1 - 6,5 KM	...509.1 - 18 KM	...509.1 - 28 KM	...509.1 - 74 KM
Ventile	**DN**	Nominal diameter	4	4	8	8
	G1	Screw-in thread male Suction-/pressure valve	G1/2	G1/2	G1/2	G1/2
	A1	Single valves 1.4571	---	---	132	132
		Double valves 1.4571	114	114	---	---
	B1	Single valves 1.4571	---	---	132	132
		Double valves 1.4571	114	114	---	---
	G2	Screw-in thread female Suction-/pressure valve	1/2“ NPT	1/2“ NPT	1/2“ NPT	1/2“ NPT
	A2	Single valves 1.4571	---	---	114	114
		Double valves 1.4571	95	95	---	---
	B2	Single valves 1.4571	---	---	114	114
		Double valves 1.4571	95	95	---	---
EP	**D**	Assembly pump	114	114	161	161
Pump body	**E**	Centre screw-in thread of valves	30	30	30	30
	F	Pump body, stainless steel	59	59	61	61
Stroke mechanism		Amongst others dimensions for fastening the pump	see dimensional drawing			

5.5 Dimensions (Process connection: Flange)



Electrical actuator (option)

Dimensions in mm!

				...509.1 - 6,5 KM	...509.1 - 18 KM	...509.1 - 28 KM	...509.1 - 74 KM
Valves and process connection	**DN**		Nominal diameter	4	4	8	8
	Flange acc. to DIN		Flange (size)	DN10 PN400	DN10 PN400	DN10 PN160	DN10 PN160
		A	Single valves 1.4571	---	---	118	118
			Double valves 1.4571	172	172		
		B	Single valves 1.4571	---	---	118	118
			Double valves 1.4571	172	172		
		C	Flange diameter	125	125	125	125
		k	Bolt circle diameter	85	85	85	85
		d	Bolt circle diameter	18	18	18	18
		t	Flange thickness	24	24	24	24
			Screw size	M16	M16	M16	M16
	Flange acc. to API (ANSI)		Flange (size)	1/2“ 2500 lbs Class	1/2“ 2500 lbs Class	1/2“ 1500 lbs Class	1/2“ 1500 lbs Class
		A	Single valves 1.4571	---	---	123	123
			Double valves 1.4571	180	180	---	---
		B	Single valves 1.4571	---	---	123	123
			Double valves 1.4571	180	180	---	---
		C	Flange diameter	133,4	133,4	133,4	120,6
		k	Bolt circle diameter	88,9	88,9	88,9	82,5
		d	Bolt circle diameter	22,4	22,4	22,4	22,4
		t	Flange thickness	36,6	36,6	36,6	36,6
			Screw size	3/4“	3/4“	3/4“	3/4“
EP	D		Assembly pump	114	114	161	161
Pump body	E		Center screw thread	21,5	21,5	21,5	21,5
	F		Pump body	59	59	61	61
Stroke mechansim			Amongst others dimensions for fastening the pump	see dimensional drawing			

6. Installation instructions

- Retighten the flange valves with the specified tightening torques (see. Chap. „Overview of the tightening torques“).
- 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!

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.

- 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.

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

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

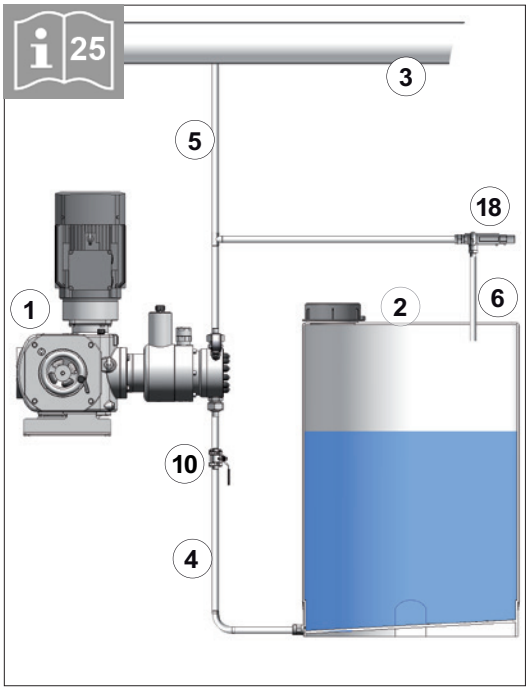
6.1 Provide for an overpressure protection

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 safety valve(s).

When using a safety valve applies to the return line:

- lead the overflow line with descending gradient in the store tank which is under atmospheric pressure or in an open drain gutter.
- The hydraulic discharge valve installed in the pump protects the pump from overload.
  Under certain circumstances an external discharge- or safety valve mounted on the pump pressure side is not required.
- In general, however, an external overpressure protection should be provided.



ATTENTION!

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

CAUTION!

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

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:

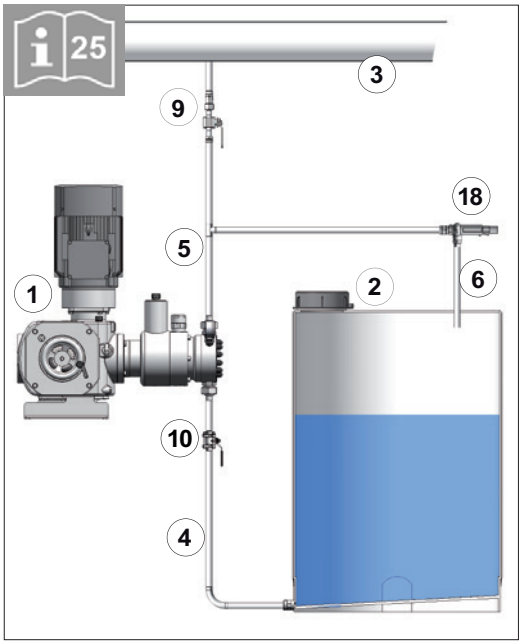
- Install an injection fitting (**9**).

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.



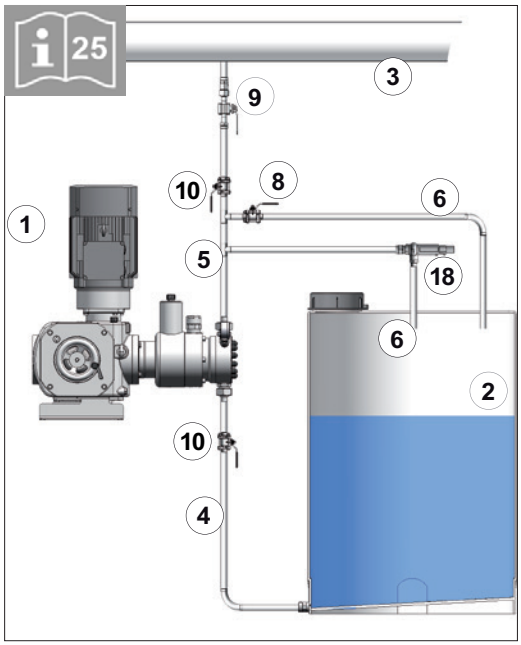
6.3 How to ensure suction free from air

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!

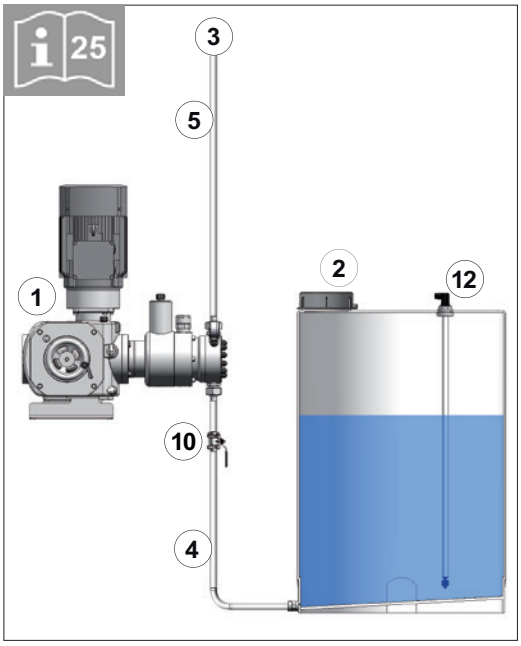


6.4 Install the empty-tank alarm

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

NOTE!

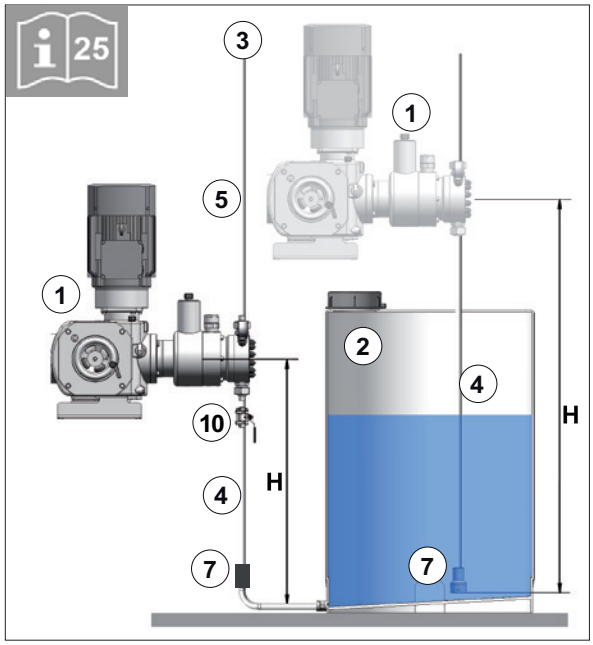
The delivery may be interrupted if air enter in the suction line!



6.5 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.



6.6 Line strainer

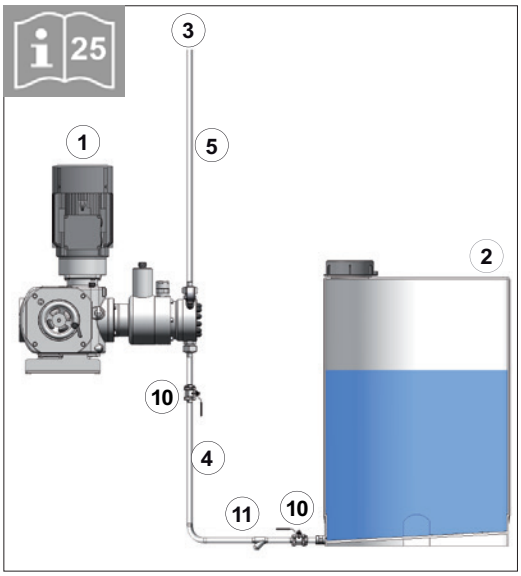
- Connect the suction line slightly above the bottom of the tank and install a line strainer (0.1 – 0.5mm aperture size – depending on nominal width of the valve).

ATTENTION!

Pump and system may not function properly if contami-nates are not collected.

WARNING!

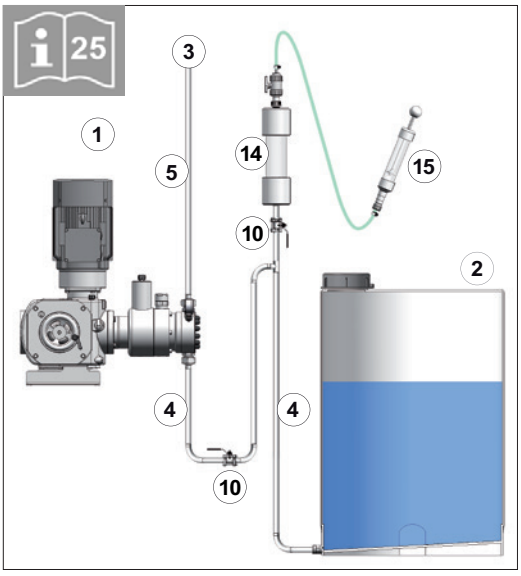
The ball valve (item 10) should be designed to match the nominal pressure of the pump.



6.7 Suction via a siphon vessel

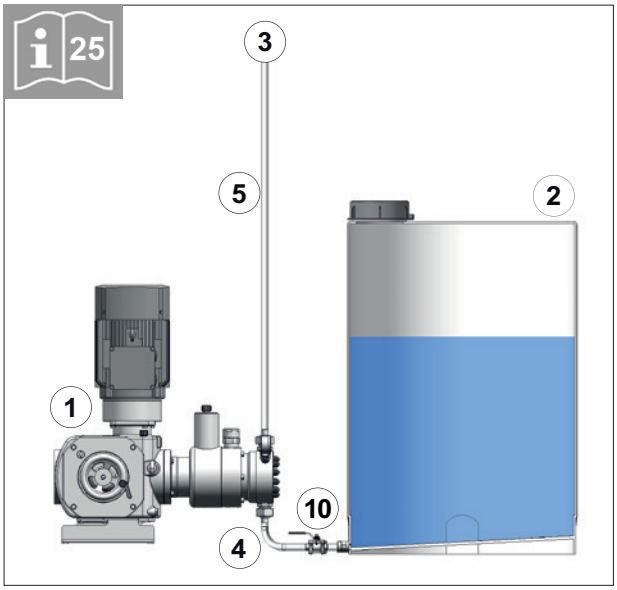
For use with high tanks without connection on the tank bottom:

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



6.8 In case of easily degassing pumped media

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



6.9 Damping of the pulsation

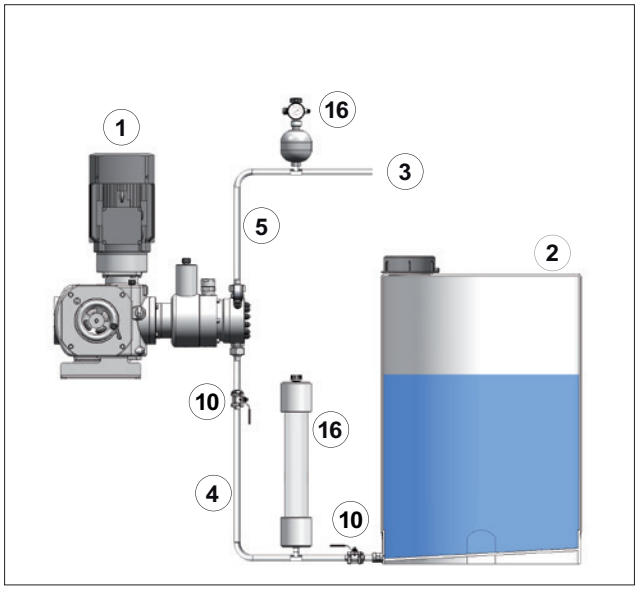
WARNING!

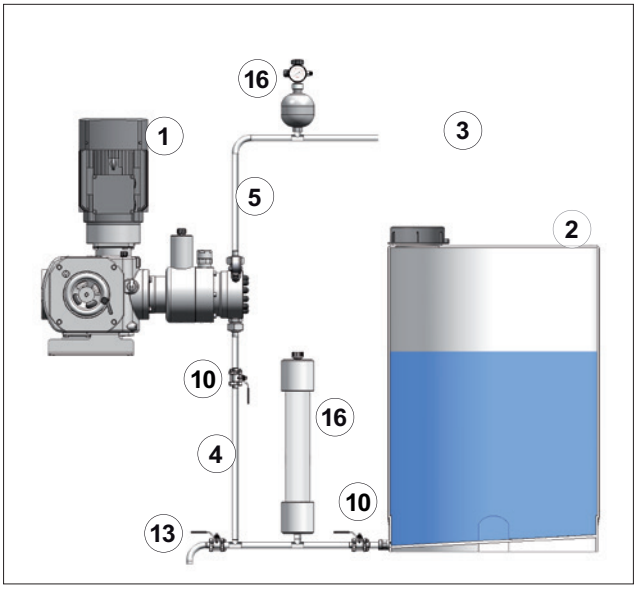
Undamped accelerating forces can cause the following malfunctions / damage:

- **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 ex-ceeded.**
- **Damage to the pipe and in the pipe installed fittings.**

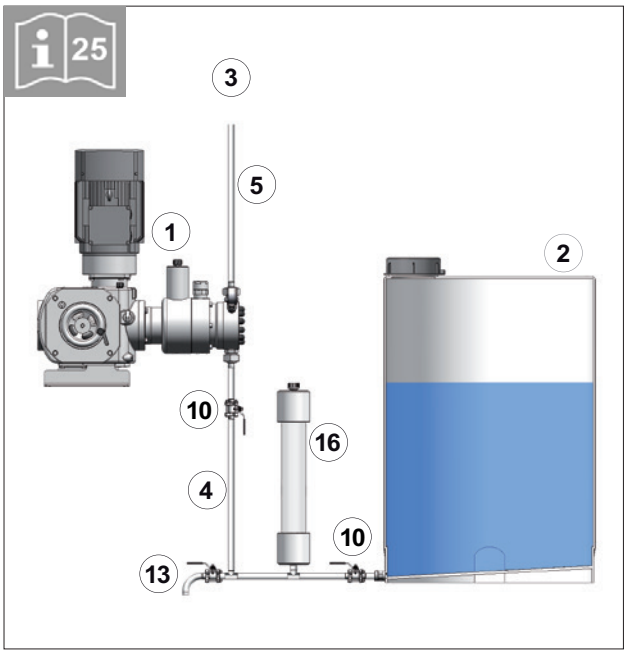
Damping of the pulsation by installing pulsation dampers if:

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





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



6.10 Dosing of suspensions

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

- intermittent rinsing

or

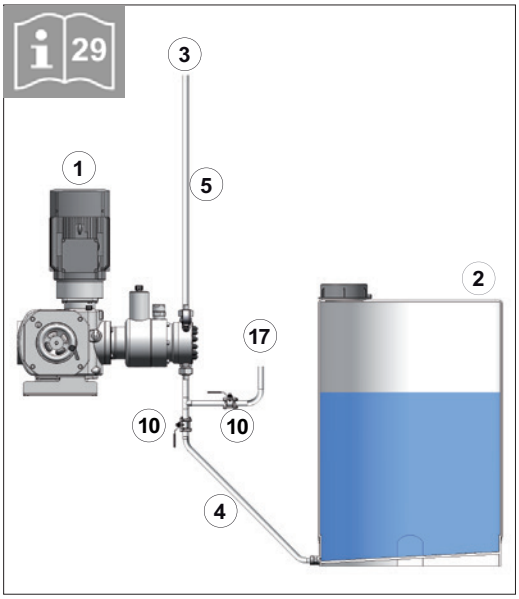
- rinsing when pump was switched off.

ATTENTION!

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

NOTE!

The rinsing process should be automated.



7. Electrical connection / Interfaces

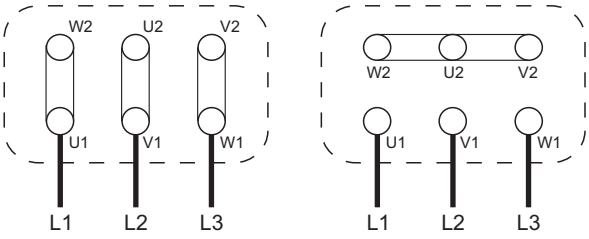
sera diaphragm pumps are driven either by a three-phase motor or an AC motor.
Standard: three-phase motor (with PTC thermistor; suitable for operation with frequency converter)

7.1 Motor connection (standard)

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)

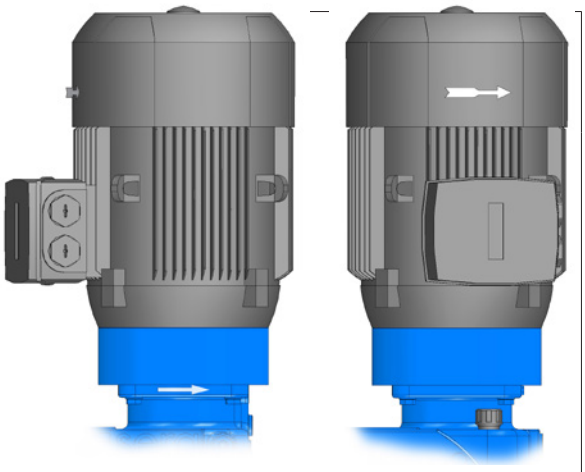


Δ *Delta connection* Y *Star connection*

7.2 Direction of rotation

NOTE!

Note the direction of rotation of the drive motor / arrows of direction of rotation on tte pump !



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.

CAUTION!

Fuses do not protect the motor!

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.

8.3 Potential equalization

After mounting the pump the proper connection to the site potential equalization is to be ensured.
The max. bleed resistor (1MΩ) 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°C ≤ Ta ≤ +40°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!

9. Start-Up

NOTE!

Before initiation the operator has to fit a pressure-sided manometer for checking the operating and set pressure.

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.

NOTE!

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

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.
- Adjusting the compensating valve see Chap. 11.3.3.

9.3 Dosing pump in explosion-hazardous areas

The maintenance notes listed are generally applicable.

ATTENTION!

After the pump is connected liquid must be primed immediately, i.e. the pump has to be initiated right after the appropriate tank has been installed and filled.

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 prefect 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“.

Operating instructions

Perform after 8000 operating hours or at least once a year the following work:

- Hydraulic fluid changes[1)]
- Replace of diaphragm and valves [1)]
- Lubricant changes

[1)] Recommendation for optimal operation

NOTE!

Change the lubricant 2500 operating hours after the initial start!

11.1 Working materials

	Pump type	Lubricant			Hydraulic fluid	
		Specification	sera use	Quantity	Type	Quantity
WORKING MATERIAL	...509.1 - 6,5 KM	DIN 51517 CLP680	Renolin PG680	2,5 Liter	Castrol Aircol SR68	0,4 l
	...509.1 - 18 KM					
	...509.1 - 28 KM					0,6 l
	...509.1 - 74 KM					

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 contaminates 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.

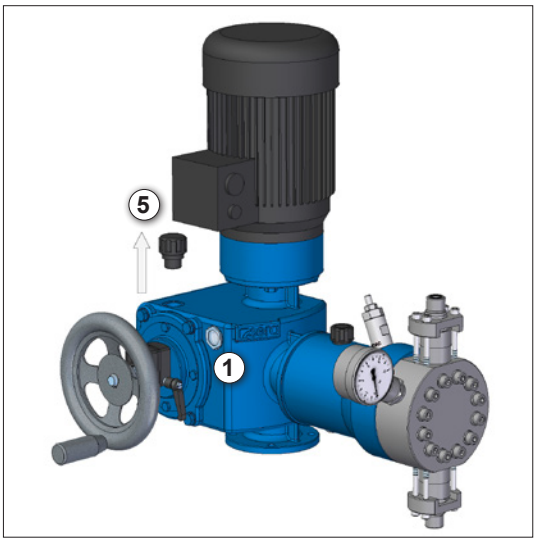
11.2.2 Oil change

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

Perform an oil change once a year.

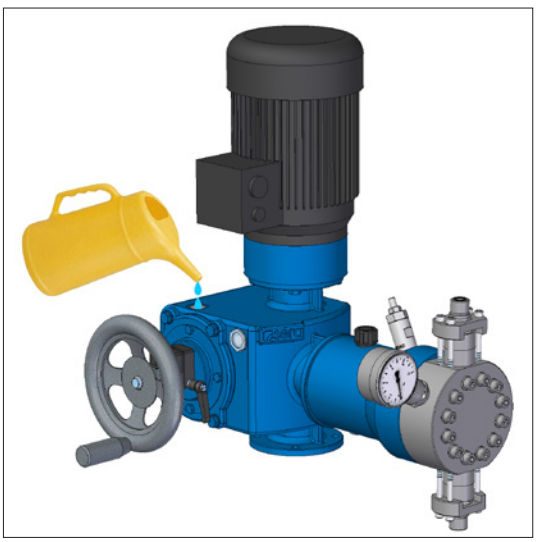
To do so, proceed as follows:

- 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**)!).

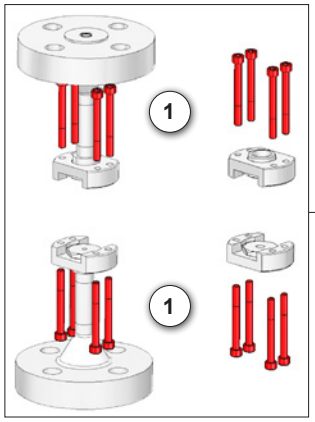
- Fill oil in threaded hole of the venting screw.
- For type and quantitiy of the gear oil, please see Chapter “Working materials“.
- Screw in venting screw (**5**).

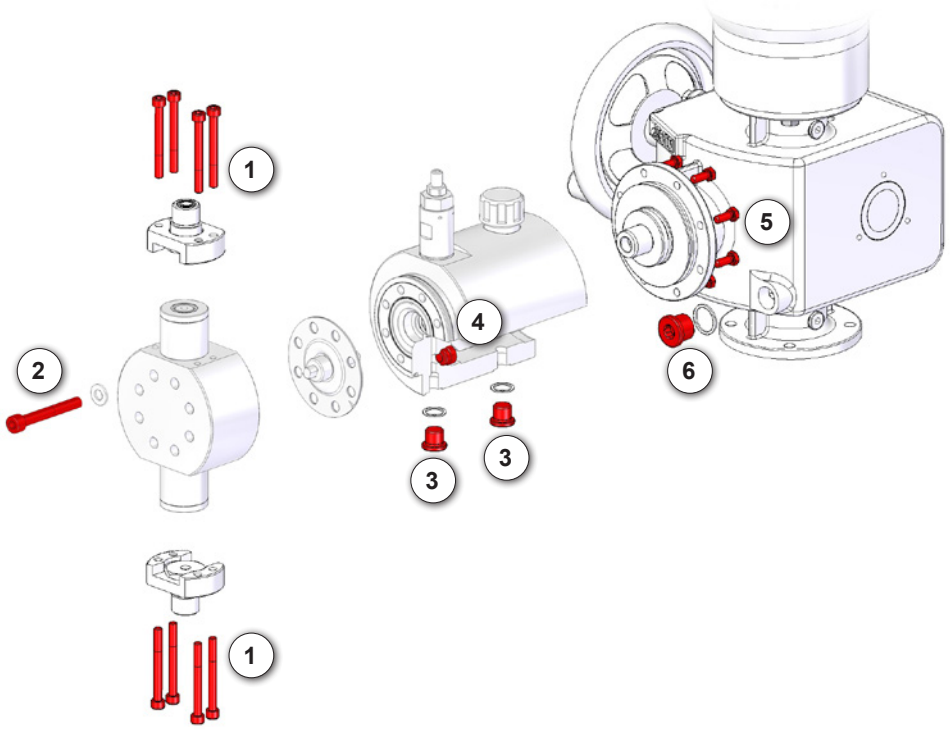


11.3 Dosing unit

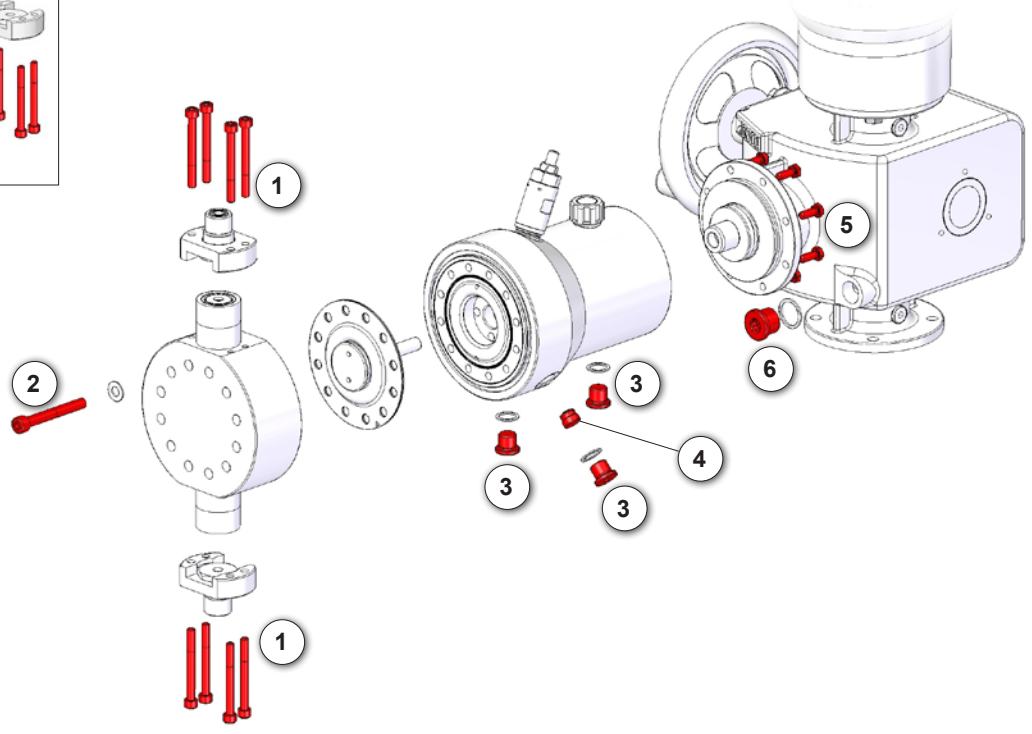
11.3.1 Overview of the tightening torques

...509.1 - 6,5 KM
...509.1 - 20 KM





...509.1 - 37 KM
...509.1 - 81 KM



	Pos.	1	2	3	4	5	6
	Qty. of screws	*4*	*8 [1] 12 [2]*	*2 [1] 3 [2]*	*1*	*8*	*1*
Pump type	...509.1 - 6,5 KM [1]	8 Nm	25 Nm	12 Nm	15 Nm	12 Nm	30 Nm
	...509.1 - 18 KM [1]						
	...509.1 - 28 KM [2]						
	...509.1 - 74 KM [2]						

11.3.2 Diaphragm replacement

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.

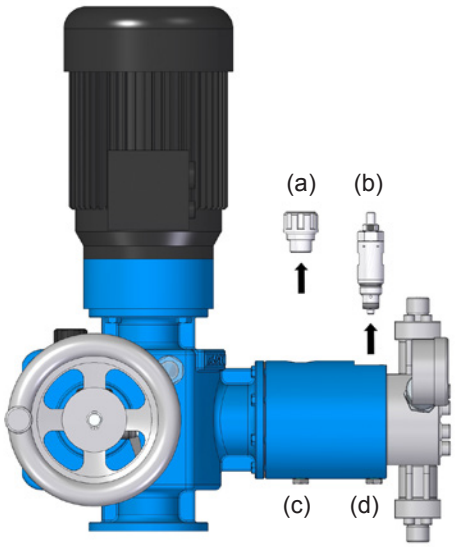
Man, machine and environment are endangered if the safety instructions are not observed.

WARNING!

For replacing the diaphragm, the system must be depressurised!

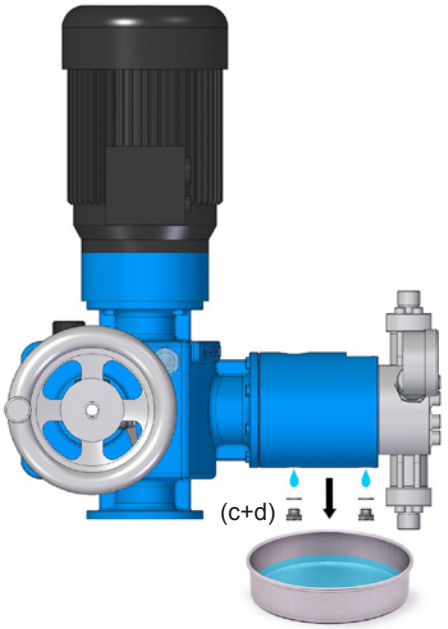
Step 1

- Drain hydraulic fluid from the hydraulic chamber and basin.
- Unscrew vent screw (a) and compensating valve (b).



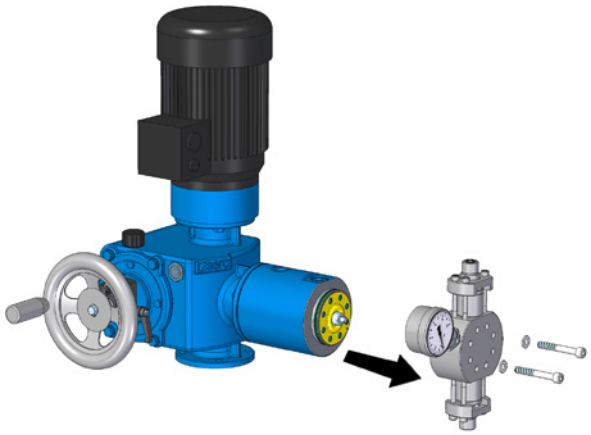
Step 2

- **Have the collection container ready.**
- Remove screw plugs (c/d) and drain hydraulic fluid.
- Fit screw plugs (c/d) after the hydraulic fluid was drained.



Step 3

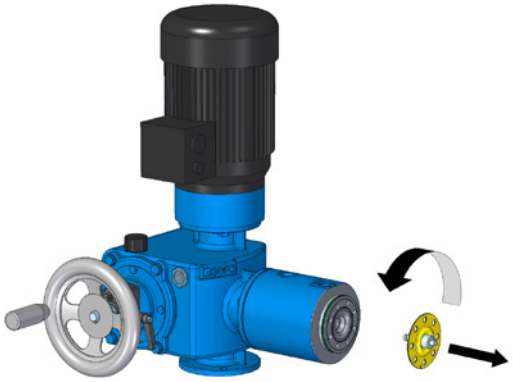
- Dismount the fixing screws.
- Remove the pump body
- Remove o-ring.



Step 4

- Remove membrane package.

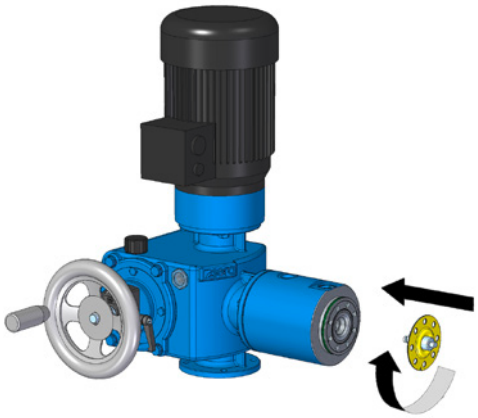
(Removing with circlip pliers)



Step 5

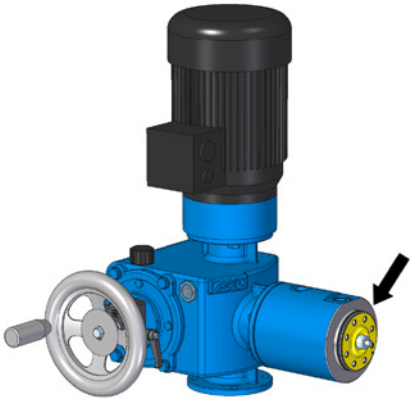
- Mount new diaphragm package.

(Mounting with circlip pliers)



Step 6

- Check o-ring for damage(s).
- Put o-ring into the groove of the perforated plate. (if necessary use new O-ring (see O-ring set in chapter „Spare- and wearing parts“)).

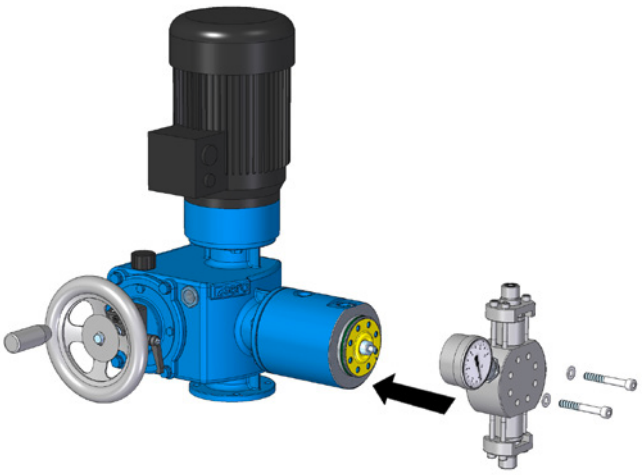


Operating instructions

Step 7

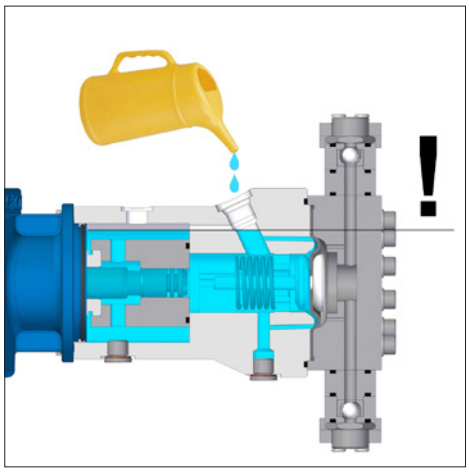
- Mount pump body.
  (**Caution**: suction valve below, pressure valve above!)

- (Tightening torques see table in Chapter „Overview of the tightening torques“)
- Mounting with suitable torque wrench
- Tighten screws crosswise.



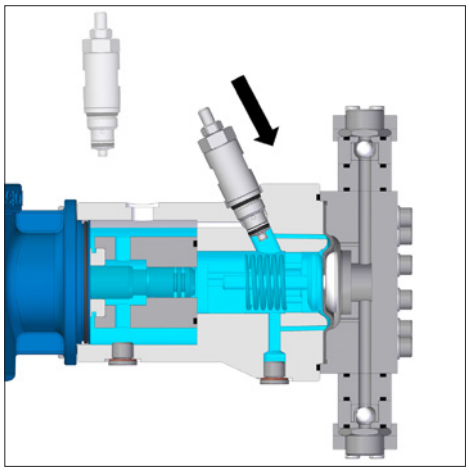
Step 8

- Fill in hydraulic fluid (observe the filling level „ ! “).
  Type andquantity see table in Chapter „Working materials“



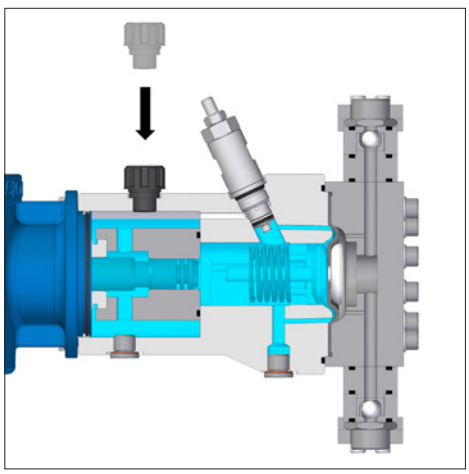
Step 9

- Screw in the compensating valve (with o-ring).



Step 10

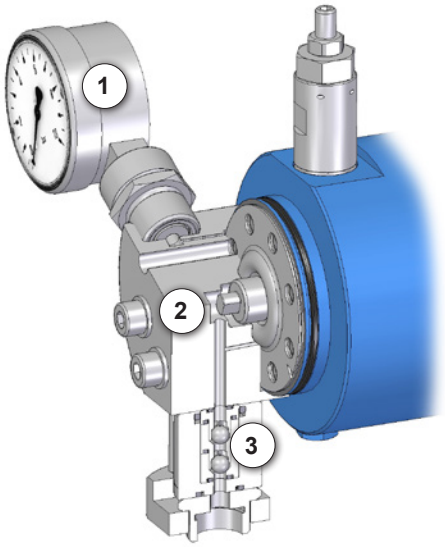
- Fill the remaining quantity of hydraulic fluid into the basin.
- Close with vent screw.
- Replacement of the diaphragm is now finished.



11.3.2.1 Bleeding after diaphragm replacement

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

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

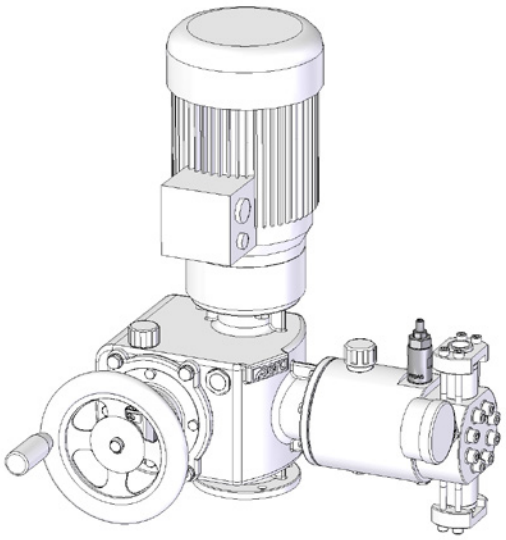


1	Signal device (Manometer)
2	Pump body
3	Suction valve

11.3.3 Adjusting the hydraulic compensating valve

The hydraulic compensating valve is factory set to the back-pressure specified in our order confirmation.

If the on-site operating data differ from these values, the hydraulic compensating valve must be set/adjusted to the respective operating conditions (while keeping the maximum permissible pressure).



WARNING!

The set pressure of the hydraulic compensating valve must not exceed the permissible backpressure of the pump (see type plate of the pump).

The spring tension of the snifter valve (check valve) is mechanically set at the factory and needs not to be adapted to the operating conditions.

NOTE!

When the hydraulic compensating valve is adjusted the operating pressure must be applied to the pressure side of the dosing pump and the delivery rate must be measured.

11.3.3.1 Set pressure too high

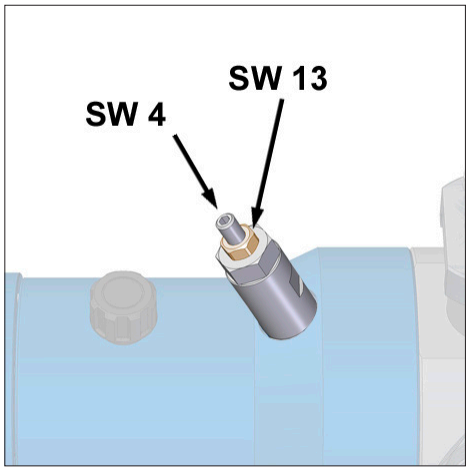
Preparation:

- Identify the hydraulic compensating valve.

- Prepare the tools.

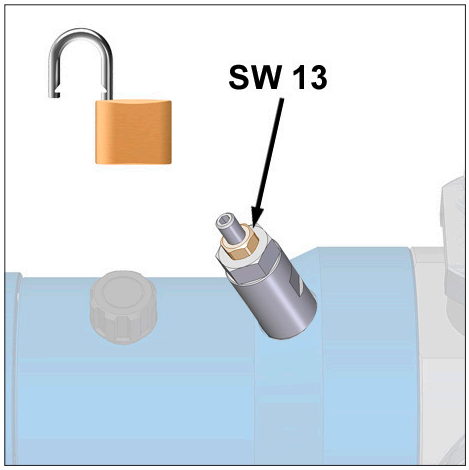
SW 13

SW 4



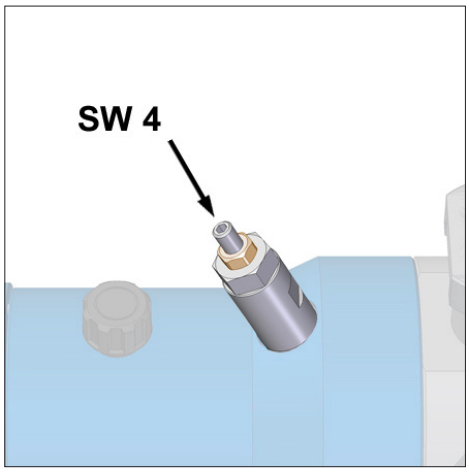
Step 1

- Loose the counter nut the hydraulic compensating valve.



Step 2

- The position of the set screw of the compensating valve can be changed using a suitable hexagonal wrench.

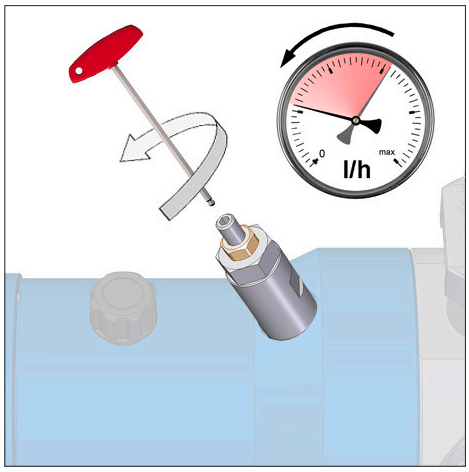


NOTE!

The delivery rate on the pressure side of the dosing pump must be indicated for the following steps.

Step 3

- **Lowering the set pressure (and thus the delivery rate):**
  Turn set screw slowly (1) counter clockwise until the delivery rate (l/h) drops.



Step 4

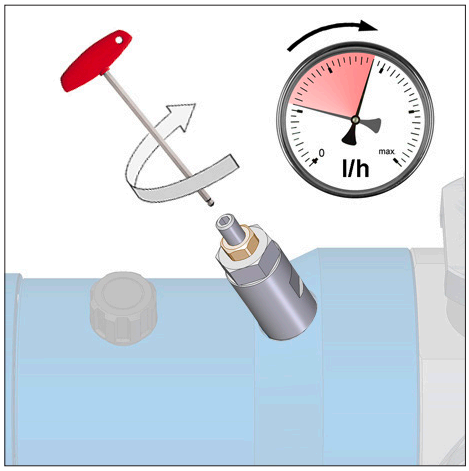
- Turn set screw slowly (!) clockwise until the desired delivery rate is reached.

WARNING!

The set screw of the compensating valve must never be screwed in to a depth so that the pressure spring is compressed to block length.

The compensating valve was now adjusted to the operating
conditions.

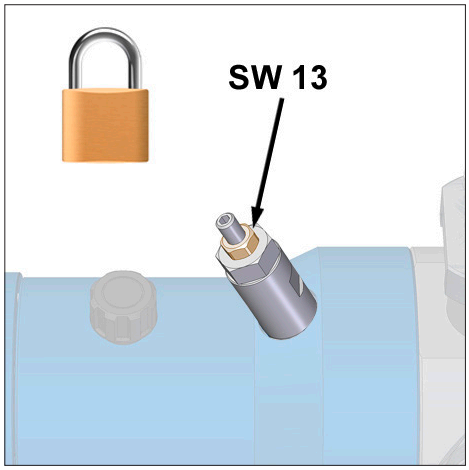
The set pressure can be checked by a manometer installed on
the pressure side.



Step 5

- Tighten locknut of the compensating valve.

SW 13



11.2.3.2 Set pressure too low

If the delivery rate is too low or there is no delivery rate at all the set pressure may be too low.

NOTE!

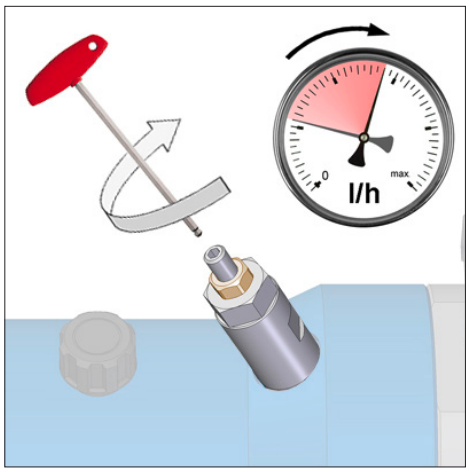
Preparatory measures:
Observe the notes in Chapter 11.3.3
Carry out **steps 1-2** as described in Chapter 11.3.1

Step 3

- Turn set screw slowly (!) clockwise until the desired delivery rate is reached.

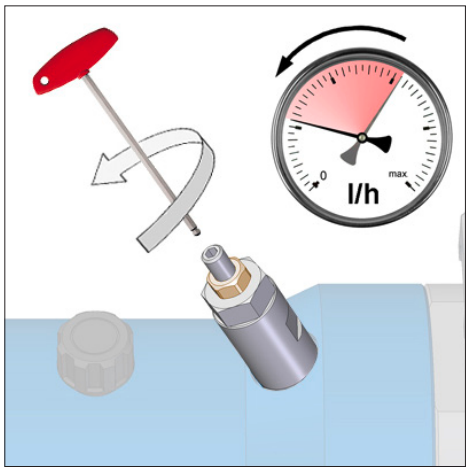
WARNING!

The set screw of the hydraulic compensating valve must never be screwed in to a depth so that the pressure spring is compressed to block length.



Step 4

- **Lowering the set pressure (and thus the delivery rate):**
  Turn set screw slowly (1) counter clockwise, until the delivery rate (l/h) drops.

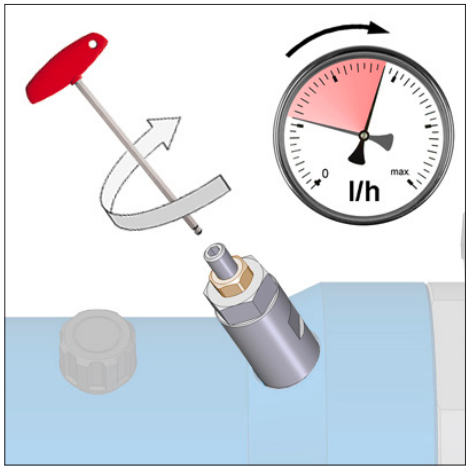


Step 5

- Turn set screw slowly (!) clockwise until the desired delivery rate is reached.

WARNING!

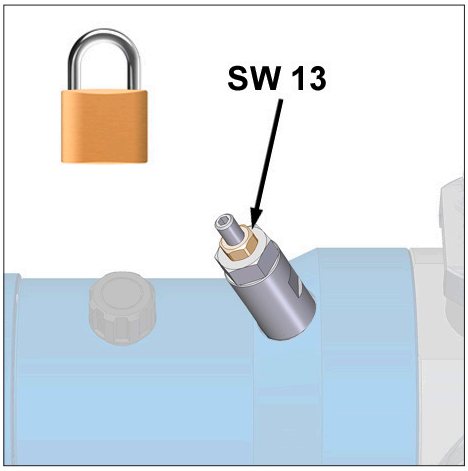
The set screw of the hydraulic compensating valve must never be screwed in to a depth so that the pressure spring is compressed to block length.



Step 6

- Tighten locknut of the compensating valve.

SW 13



WARNING!

The set pressure must not exceed the maximum backpressure of the dosing pump.

ATTENTION!

If an external safety valve is installed on the pump pressure side the set pressure of the hydraulic compensating valve should be by 20% higher than the set pressure of the safety valve.

NOTE!

Optimum adjustment of the hydraulic compensating valve to the operating conditions will ensure a high dosing accuracy and a long service life of the dosing pump.

12. Spare- and wearing parts

12.1 Wearing parts

The following parts are regarded as wearing parts of the dosing pump:

- Diaphragm package
- Suction valve
- Pressure valve
- Valve (diaphragm monitoring)
- O-ring kit

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

sera recommends to replace the intermediate diaphragm after 8000 operating hours or at least once a year.

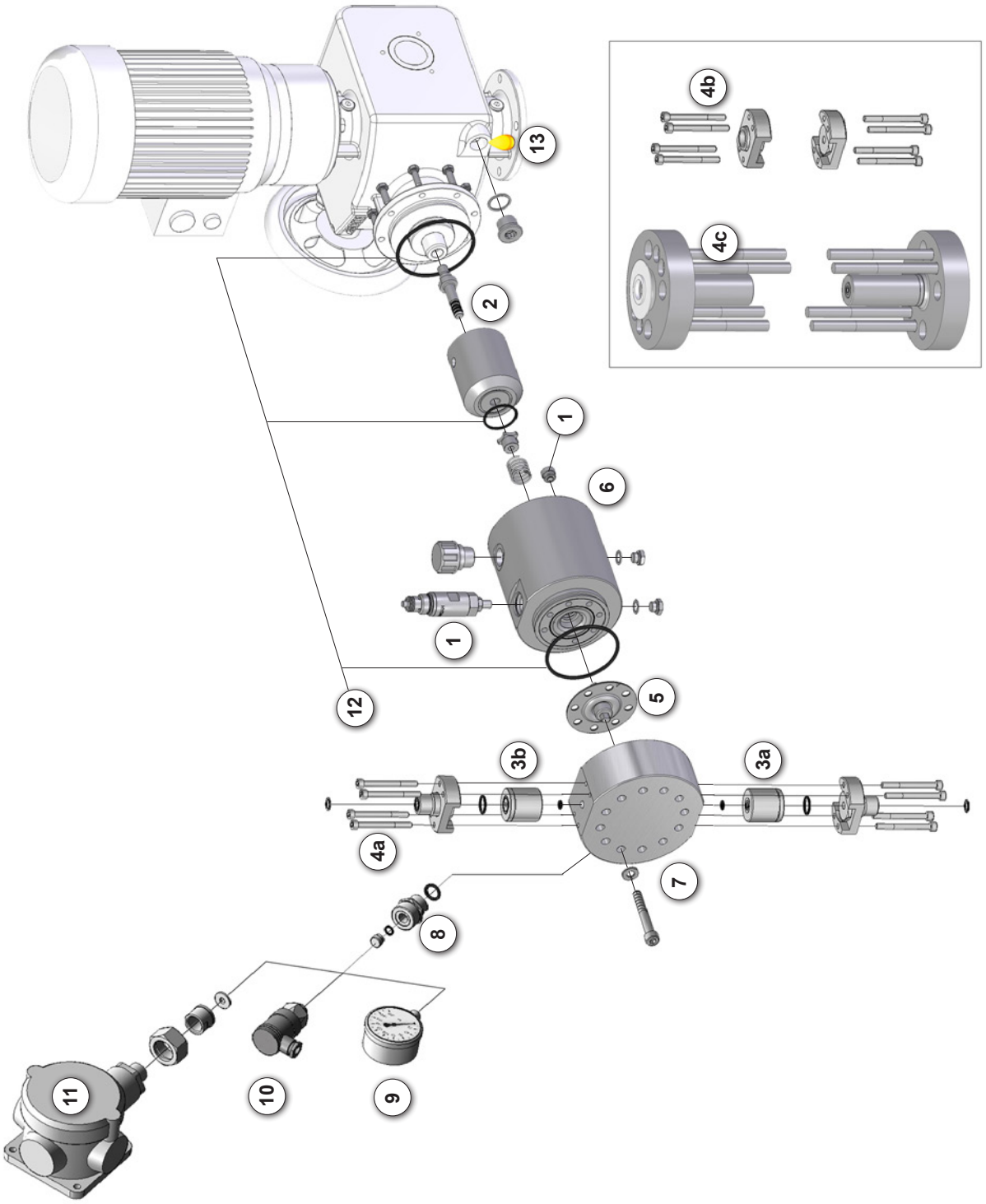
In case of a premature diaphragm rupture caused by difficult operating conditions, switch off the piston diaphragm pump and replace the diaphragms (see Chapter „Diaphragm replacement“).

12.2 Spare parts

The following parts are regarded as spare parts of the dosing pump:

- Pump body
- Compensating valve
- Piston (with piston busching)
- Base ring
- Cylinder
- Diaphragm monitoring (evaluation)
- Attachment (valves)

12.3 Exploded view (R 509.1-6,5 KM, R 509.1-18 KM)



NOTE!

Drain the hydraulic fluid for maintenance work within the dosing unit.
We recommend to have new hydraulic fluid ready when you carry out these works.

We recommend to have new O-rings ready when you carry out maintenance work within the dosing unit (o-ring kit; item 12).

Overview of spare and wearing parts (R 509.1-6,5 KM, R 509.1-18 KM)

Compensating valve	
Pos.	*consisting of*
1	Compensating valve (complete; pre-assembled)
	Check valve

Piston	
Pos.	*consisting of*
2	Piston (complete; pre-assembled)
	Piston
	Piston seals
	Piston bushing

Valves	
Pos.	*consisting of*
3a	Suction valve (complete; pre-assembled)
	O-rings
3b	Pressure valve (complete; pre-assembled)
	O-rings

Attachment (male)	
Pos.	*consisting of*
4a	Flange
	Valve joint G1/2
	Fixing screws
	O-Ring

Attachment (female)	
Pos.	*consisting of*
4b	Flange
	Valve joint 1/2“NPT
	Fixing screws

Attachment (Flange)	
Pos.	*consisting of*
4c	Flange
	Valve joint
	Welding flange
	Pipe
	Fixing screws

Diaphragm package	
Pos.	*consisting of*
5	Multi-layer diaphragm (pre-assembled)

Cylinder	
Pos.	*consisting of*
6	Cylinder
	Screw plugs, complete
	Vent screw
	Pressure spring
	Guide plate

Pump body	
Pos.	*consisting of*
7	Pump body
	Washers
	Fixing screws

Diaphragm monitoring (valve in pump body)	
Pos.	*consisting of*
8	Valve joint
	Check valve
	O-rings

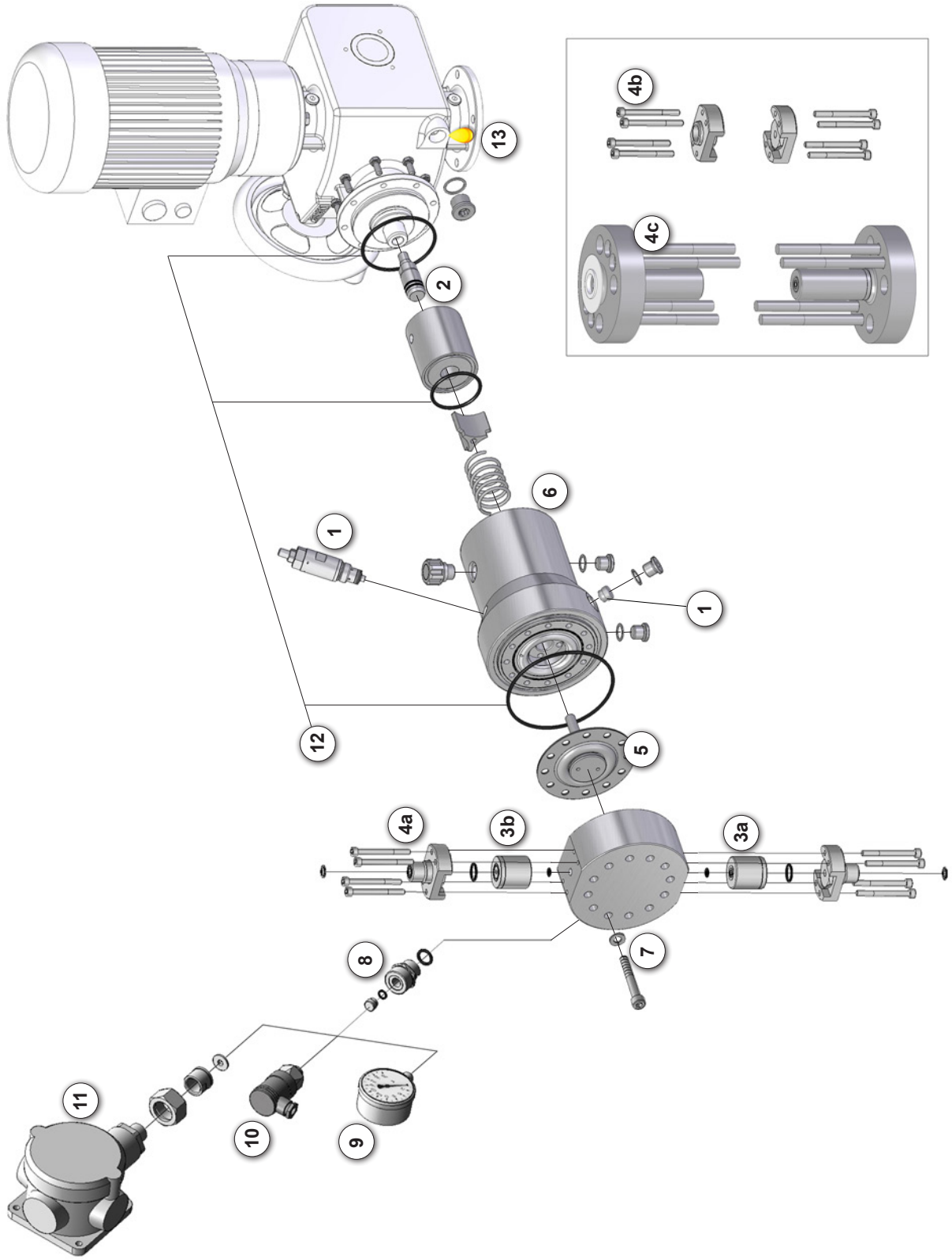
Diaphragm monitoring (evaluation)	
Pos.	*consisting of*
9	Manometer
Pos.	*consisting of*
10	Pressure switch
Pos.	*consisting of*
11	Pressure switch (Ex-Area; complete)
	Pressure switch
	Union nut
	Insert joint
	Gasket

O-ring kit	
Pos.	*consisting of*
12	O-ring kit

Gearbox oil	
Pos.	*consisting of*
13	Gearbox oil + Sealing ring (for lock screw)

Hydraulic fluid	
Pos.	*consisting of*
without	Hydraulic fluid

12.4 Exploded view (R 509.1-28 KM, R 509.1-74 KM)



NOTE!

Drain the hydraulic fluid for maintenance work within the dosing unit.
We recommend to have new hydraulic fluid ready when you carry out these works.

We recommend to have new O-rings ready when you carry out maintenance work within the dosing unit (o-ring kit; item 12).

Overview of spare and wearing parts (R 509.1-28 KM, R 509.1-74 KM)

Compensating valve	
Pos.	*consisting of*
1	Compensating valve (complete; pre-assembled)
	Check valve

Piston	
Pos.	*consisting of*
2	Piston (complete; pre-assembled)
	Piston
	Piston seals
	Piston bushing

Valves	
Pos.	*consisting of*
3a	Suction valve (complete; pre-assembled)
	O-rings
3b	Pressure valve (complete; pre-assembled)
	O-rings

Attachment (male)	
Pos.	*consisting of*
4a	Flange
	Valve joint G1/2
	Fixing screws
	O-Ring

Attachment (female)	
Pos.	*consisting of*
4b	Flange
	Valve joint 1/2“NPT
	Fixing screws

Attachment (Flange)	
Pos.	*consisting of*
4c	Flange
	Valve joint
	Welding flange
	Pipe
	Fixing screws

Diaphragm	
Pos.	*consisting of*
5	Multi-layer diaphragm (pre-assembled)

Cylinder	
Pos.	*consisting of*
6	Cylinder
	Screw plugs, complete
	Vent screw
	Pressure spring
	Guide plate

Pump body	
Pos.	*consisting of*
7	Pump body
	Washers
	Fixing screws

Diaphragm monitoring (valve in pump body)	
Pos.	*consisting of*
8	Valve joint
	Check valve
	O-rings

Diaphragm monitoring (evaluation)	
Pos.	*consisting of*
9	Manometer
Pos.	*consisting of*
10	Pressure switch
Pos.	*consisting of*
11	Pressure switch (Ex-Area; complete)
	Pressure switch
	Union nut
	Insert joint
	Gasket

O-ring kit	
Pos.	*consisting of*
12	O-ring kit

Gearbox oil	
Pos.	*consisting of*
13	Gearbox oil + Sealing ring (for lock screw)

Hydraulic fluid	
Pos.	*consisting of*
without	Hydraulic fluid

13. Fault analysis and corrective action

sera products are sophisticated technical products which are only shipped after a comprehensive test.
Faults which should occure can be easily recognized and corrected with the help of the notes in the table.

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

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!

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

☐ Harmless

☐ Toxic ☐ Corrosive ☐ Flammable ☐ Oxidising ☐ Unhealthy

☐ Explosive ☐ Dangerous for the environment ☐ Irritant ☐ Bio-hazardous ☐ Radioactive

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) _____

QSF 469-01 en / 11.2014 / PM

NOTES

NOTES