TECHNICAL MANUAL

DIAPHRAGM PUMP 409.2...e / 410.2...e

TRANSLATION OF THE ORIGINAL TECHNICAL MANUAL! EN

PUMP TYPES

RF/R/MF/M 409.2 - 1,6e	C 409.2 - 1,6e Pro/Pro+	RF/R/MF/M 410.2 - 200e	C 410.2 - 200e Pro/Pro+
RF/R/MF/M 409.2 - 2,4e	C 409.2 - 2,4e Pro/Pro+	RF/R/MF/M 410.2 - 280e	C 410.2 - 280e Pro/Pro+
RF/R/MF/M 409.2 - 7,0e	C 409.2 - 7,0e Pro/Pro+	RF/R/MF/M 410.2 - 450e	C 410.2 - 450e Pro/Pro+
RF/R/MF/M 409.2 - 12e	C 409.2 - 12e Pro/Pro+	RF/R/MF/M 410.2 - 570e	C 410.2 - 570e Pro/Pro+
RF/R/MF/M 409.2 - 18e	C 409.2 - 18e Pro/Pro+	RF/R/MF/M 410.2 - 700e	C 410.2 - 700e Pro/Pro+
RF/R/MF/M 409.2 - 25e	C 409.2 - 25e Pro/Pro+	RF/R/MF/M 410.2 - 900e	C 410.2 - 900e Pro/Pro+
RF/R/MF/M 409.2 - 50e	C 409.2 - 50e Pro/Pro+	RF/R/MF/M 410.2 - 1100e	C 410.2 - 1100e Pro/Pro+
RF/R/MF/M 409.2 - 75e	C 409.2 - 75e Pro/Pro+	RF/R/MF/M 410.2 - 1450e	C 410.2 - 1450e Pro/Pro+
RF/R/MF/M 409.2 - 90e	C 409.2 - 90e Pro/Pro+		
RF/R/MF/M 409.2 - 115e	C 409.2 - 115e Pro/Pro+		
RF/R/MF/M 409.2 - 140e	C 409.2 - 140e Pro/Pro+		
RF/R/MF/M 409.2 - 180e	C 409.2 - 180e Pro/Pro+		
RF/R/MF/M 409.2 - 250e	C 409.2 - 250e Pro/Pro+		
RF/R/MF/M 409.2 - 350e	C 409.2 - 350e Pro/Pro+		

NOTE

Record the exact type and serial number here ► can be read off the type plate on the pump.
These data are important in the case of queries or for ordering spare and/or wear parts and must always be stated.

TYPE:

SERIAL NO:

NOTE

Keep the operating manual for future use!

ATTENTION

Subject to technical modifications!

Quality notes

The **sera** quality management and quality assurance system is certified in accordance with DIN EN ISO 9001:2015.
The **sera** product complies with the applicable safety requirements and accident prevention regulations.

About this instructions

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

NOTE

Notes or instructions that faciliate work and ensure a safe operation.

ATTENTION

The non-observance of these safety instructions can result in malfunctions or material damages.

WARNING

The non-observance of these safety instructions can lead to material damages and personal injuries.

Note on the additional instructions „SAFETY INSTRUCTIONS“.

These technical manual is divided into the following main parts:

TRANSPORT & STORAGE	page 6
PRODUCT DESCRIPTION	page 7
TECHNICAL DATA	page 24
ASSEMBLY / INSTALLATION	page 44
OPERATION / EXPLOSION-HAZARDOUS AREAS	page 51
START-UP	page 53
ELECTRICAL CONNECTION	page 54
MAINTENANCE	page 55
FAULT ANALYSIS / CORRECTIVE ACTION	page 65
SHUT-DOWN / DISPOSAL	page 67
CLEARANCE CERTIFICATE	page 68

Depending on the pump type (see order confirmation) the following additional instructions are included:

Control PRO	TM15
Control PRO+	TM04
INTERFACE MODULE PROFIBUS Pro+	TM05
INTERFACE MODULE PROFINET Pro+	TM07
Motor ATEX	supplier documentation
AC motor	supplier documentation
Electrical actuator	supplier documentation
Electrical actuator ATEX	supplier documentation
Pneumatic actuator	supplier documentation
Frequency converter	supplier documentation
Special construction	**sera** drawing

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TRANSPORT & STORAGE

WARNING

Observe and follow the safety instructions by all means.
See the additional instructions „SAFETY INSTRUCTIONS".
Man, machine and environment are endangered if the safety instructions are not observed.

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.

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 and relative air humidity see Chapter „TECHNICAL DATA".
- The maximum storage time for the standard packaging 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.

Type key

1 Type of drive (combinations possible)

- C controllable
- M not mechanically adjustable
- R mechanically adjustable
- F Motor suitable for frequency converter operation
- i Frequency converter, mounted on the 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

2 Series

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

3 Revision index

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

5 Displacer (type of construction)

- e Single diap hragm
- ML Multy-layer diaphragm
- KM Piston daphragm
- K Piston

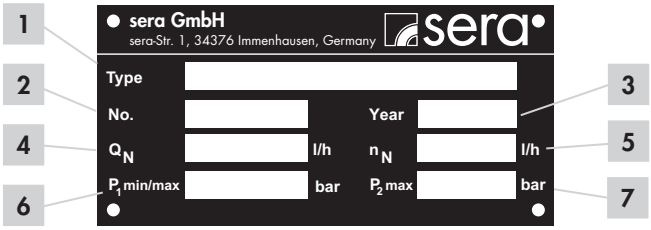
6 Type of control

- Pro/Pro+

1	2		3		4	5	6	
C	409	.	2	-	50	e	Pro+	*(example)*

Type plate

Each **sera** 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	Year of construction
4	Nominal delivery rate Delivery rate which the pump was ordered for, based on the nominal rotation speed nN, the nominal delivery height p2max. and the delivery medium stated in the supply contract.
5	Nominal stroke frequency
6	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.
7	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.

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.

Materials

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

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.

Components ...409.2

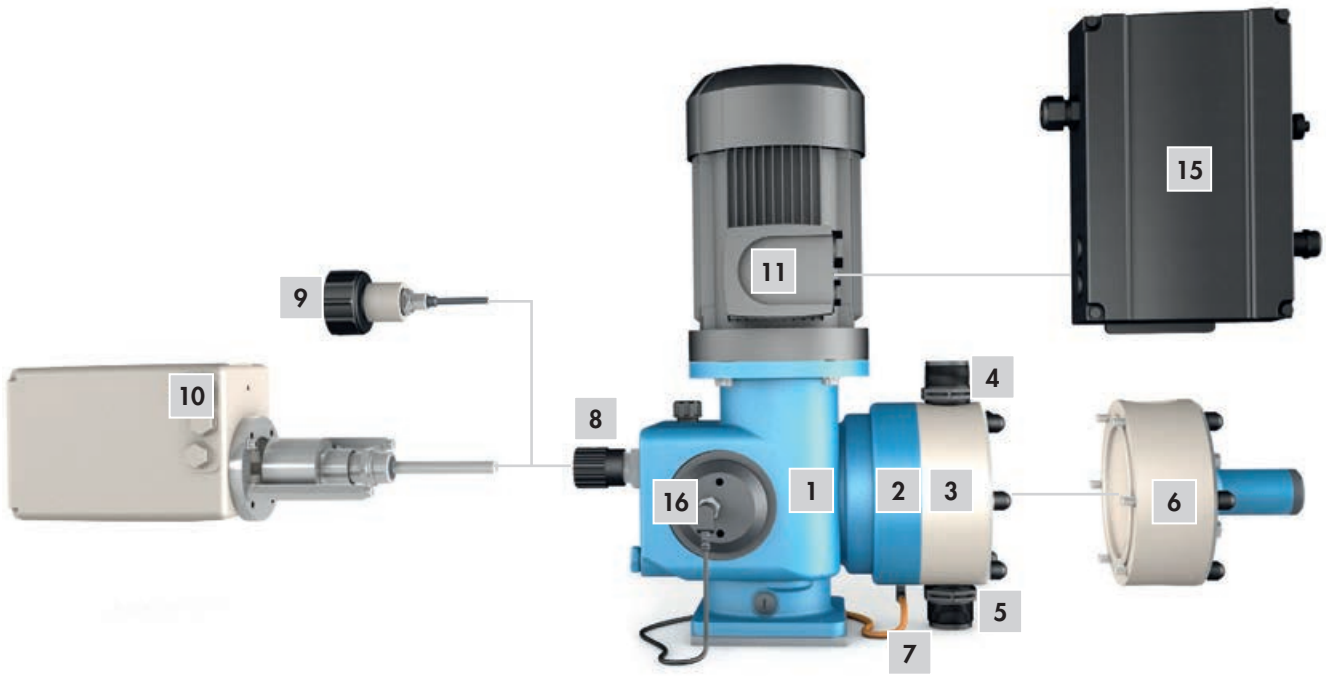
No.	Designation	Remark
1	Stroke mechanism	
2	Assembly pump	
3	Pump body	
4	Pressure valve	
5	Suction valve	
6	Pump body with integrated overflow valve	
7	Diaphragm rupture monitoring device	option
8	Manual stroke length adjustment	
9	Manual stroke length adjustment with position indicator	option
10	Stroke length adjustment with actuator	option
11	Motor	
14	Pump body with manual vent valve	...409.2-1,6e; -2,4e
15	Frequency converter *	option
16	Stroke frequency transmitter	option
not illustrated	Blind plug	option (M-design)
not illustrated	Motor for Ex-area *	option (R-design)
not illustrated	Actuator for Ex-area *	option
not illustrated	Pneumatic actuator *	option

* see enclosed documentation

Components of C409.2

No.	Designation	Remark
1	Stroke mechanism	
2	Assembly pump	
3	Pump body	
4	Pressure valve	
5	Suction valve	
6	Pump body with integrated overflow valve	
7	Diaphragm rupture monitoring device	
8	Manual stroke length adjustment	
9	Manual stroke length adjustment with position indicator	option
10	Stroke length adjustment with actuator	option
11	Motor	
12	Control Pro+ with removable control element	
13	INTERFACE MODULE	accessories
14	Pump body with manual vent valve	...409.2-1,6, -2,4e
not illustrated	Suction lances connection	accessories

Components ...410.2



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2	Assembly pump	
3	Pump body	
4	Pressure valve	
5	Suction valve	
6	Pump body with integrated overflow valve	
7	Diaphragm rupture monitoring device	option
8	Manual stroke length adjustment	
9	Manual stroke length adjustment with position indicator	option
10	Stroke length adjustment with actuator	option
11	Motor	
15	Frequency converter *	option
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not illustrated	Blind plug	option (M-design)
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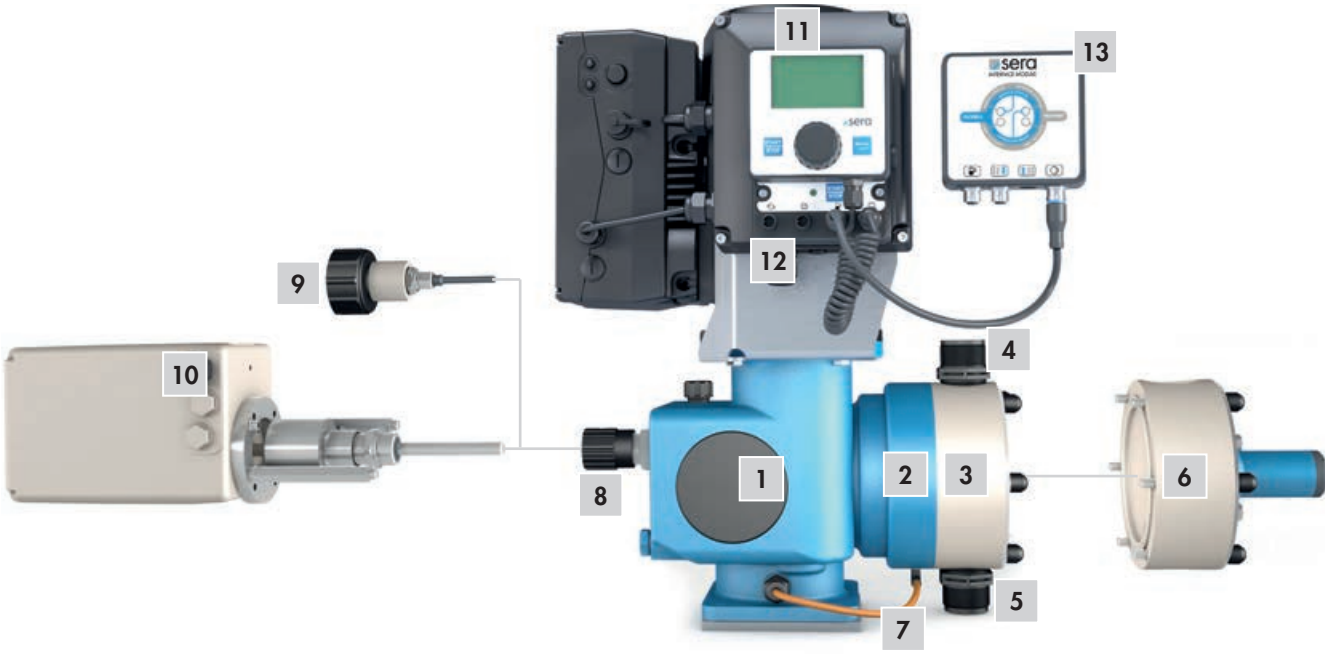
not illustrated	Actuator for Ex-area *	option
not illustrated	Pneumatic actuator *	option

* see enclosed documentation

Components of C410.2



No.	Designation	Remark
1	Stroke mechanism	
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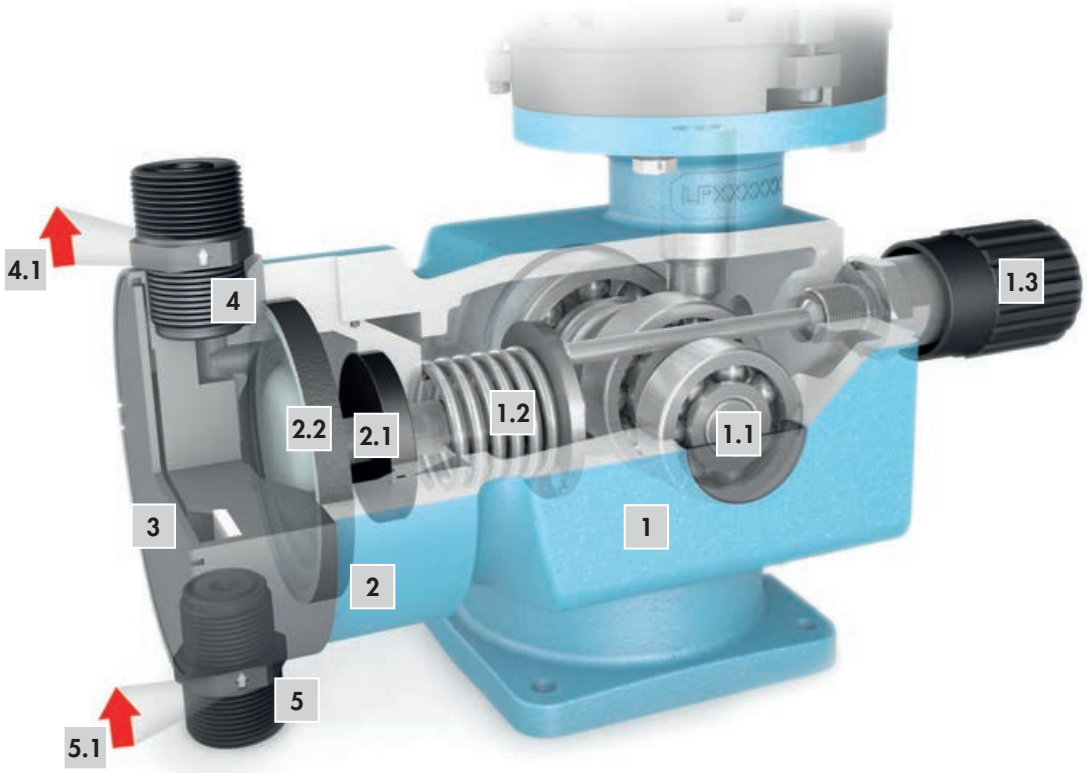
7	Diaphragm rupture monitoring device	
8	Manual stroke length adjustment	
9	Manual stroke length adjustment with position indicator	option
10	Stroke length adjustment with actuator	option
11	Motor	
12	Control C410.2	
13	INTERFACE MODULE	accessories
not illustrated	Suction lances connection	accessories



Stroke mechanism (1)

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 (**1.1**) provides the pressure stroke while the suction stroke is performed by a pressure spring (return spring) (**1.2**).
The effective stroke length can be changed by means of an adjustable scale knob (**1.3**) which prevents the connecting rod from following the rotary cam up to the rear dead centre during suction stroke (see stroke length adjustment).

Assembly pump (2)

The drive diaphragm (**2.2**) connected to the drive via the connecting rod (**2.1**) transmits the stroke movement directly to the pumped medium.

Pump body (3)

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.

Pressure valve / Suction valve (4/5)

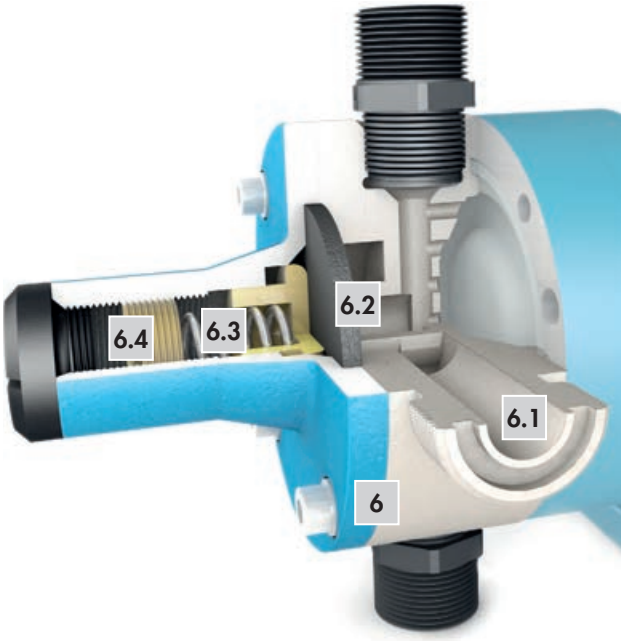
The pump valves are ball valves that only work properly in a vertical position. The condition of the valves has a deciding effect on the operating capability of the pump. Valves must be exchanged as complete units. When replacing the valves it is important to check the flow direction (**4.1/5.1**) .

ATTENTION

Pressure valve above, suction valve below!

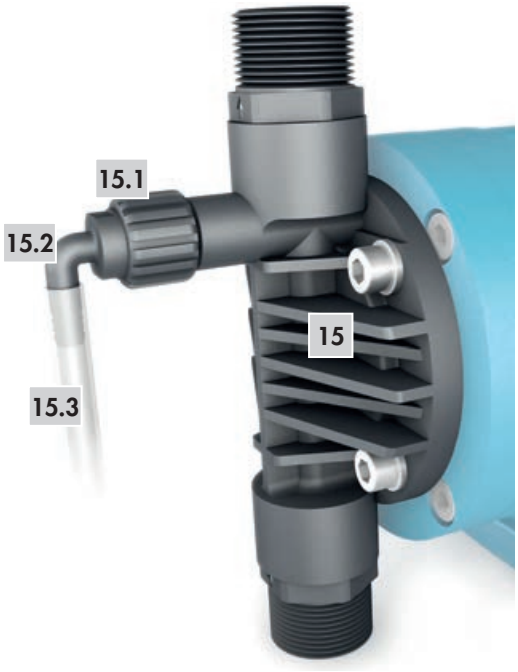
Pump body with integrated overflow valve (6)

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 (**6.1**) through which the pumped medium is drained in case of an unacceptable overpressure.
The relief channel is closed by the mechanically prestressed diaphragm (**6.2**) of the overflow valve.
The mechanical prestress which is executed by a pressure spring (**6.3**) can be adjusted with a set screw (**6.4**). 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.



Pump body with manual vent valve (14) (409.2-1,6e; -2,4e)

The vent valve is used to release the manual pressure in the pump body (**15**) 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 (**15.1**) with integrated hose nozzle Ø 6,5 (**15.2**), which must be fitted with a hose (**15.3**) (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.

Diaphragm rupture monitoring device (7)

C409.2 /C410.2 (standard)

sera - pumps of the C409.2 series are equipped with a conductive diaphragm rupture monitoring device.

ATTENTION

The sensitivity of the diaphragm rupture electrode can be adapted to the conductivity of the medium via the electronics (see the technical manual of the control). Preset ex works to 50% approx. 45 µS/cm.

...409.2 / ...410.2 (option)

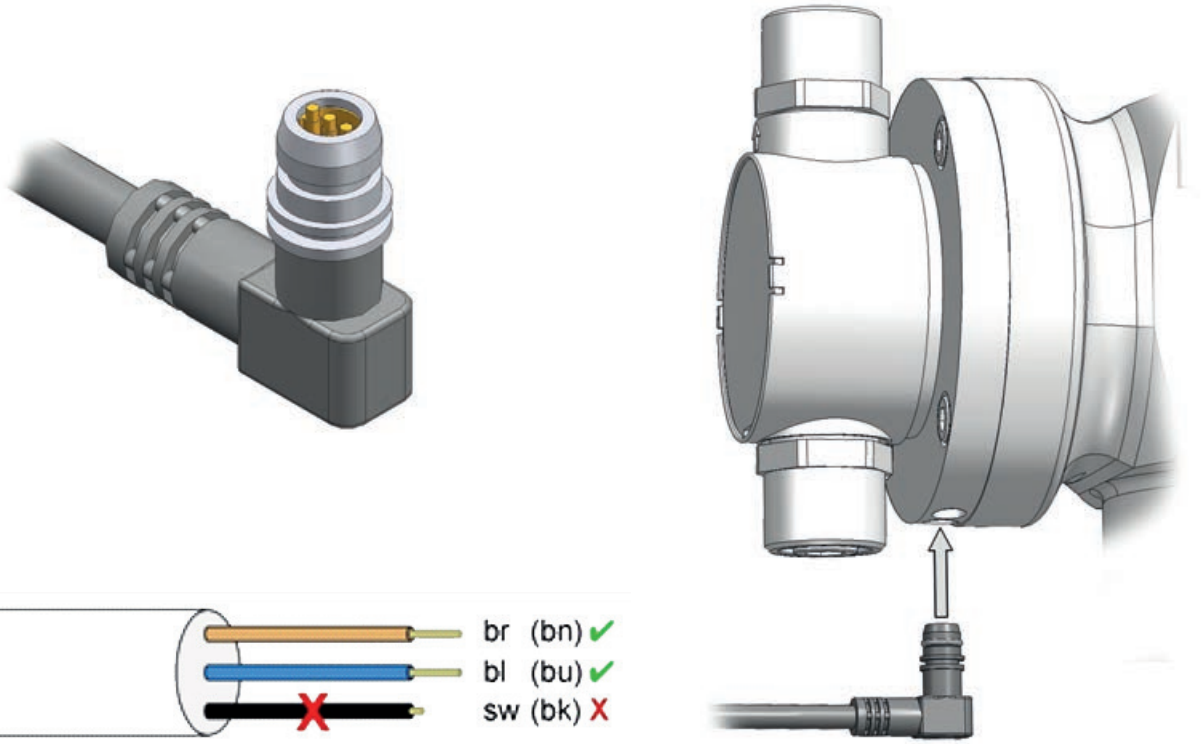
sera pumps of the R(F)/M(F)409.2 /R(F)/M(F)410.2 series can be equipped with a conductive diaphragm rupture monitoring device as option.

ATTENTION

The pumped medium must have a minimum conductivity of at least 5 µS/cm!

An electrode together with an approprate evaluation unit (option, e.g. **sera** diaphragm rupture relay, type ER-104 (or XR-410 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.
The diaphragm rupture electrode type MBE-02 is not mounted by sera due to transport. We put the MBE-02 electrode onto the cable and fix it to the pump in a separate bag.

Put the diaphragm rupture electrode is in the base ring of the pump from below (see fig.).



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%..

NOTE

A linear dosing behaviour is achieved with stroke length adjustments between 20% and 100%.
Below 20% stroke length, electronic stroke length detection is no longer ensured for pumps of the C409.2/C410.2 series.
In this case, the warning „Out off range calibrate“ appears, followed by the error message „No stroke recognition!“.

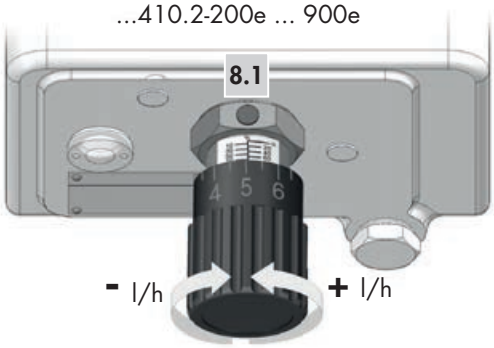
Manual stroke length adjustment (standard) (8)

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

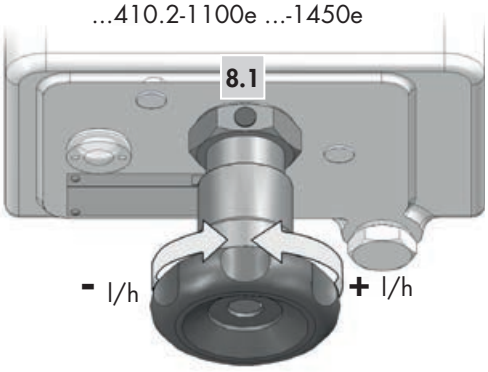
A protecting cap can be provided for the protection of the stroke length adjustment against unintentional adjustment.

...409.2

...410.2-200e ... 900e



...410.2-1100e ...-1450e



ATTENTION

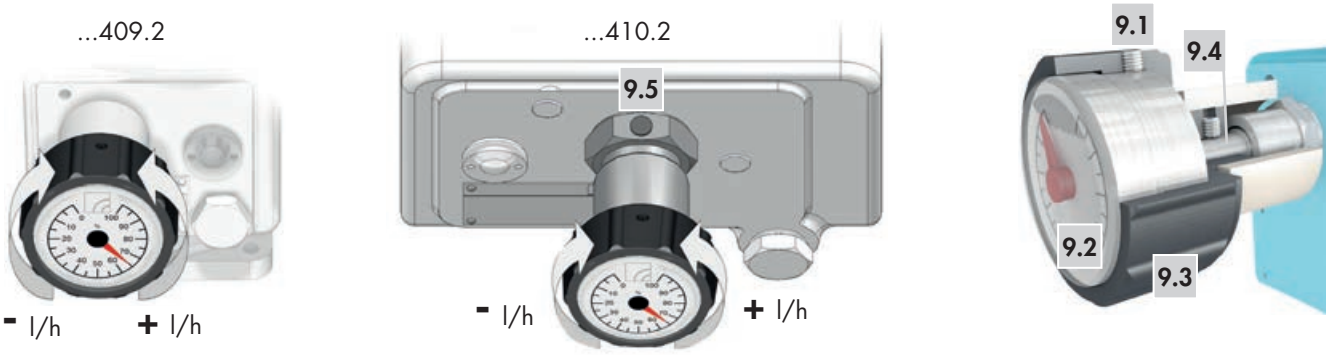
The locking (**8.1**) is to be released (us-ing a spanner SW3) before the stroke length is changed. Then the locking must be tightened again. This ensures that the set stroke length does not change during opera-tion.

Manual stroke length adjustment by a dial scale with indication of percent (option) (9)

The stroke length is adjusted by turning the hand wheel.
The stroke length shuold 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 pump.
Loosen setscrew (**9.1**).
Remove percent scale (**9.2**) from the hand wheel (**9.3**).
Manually turn the percent scale to 0% setting.
Loosen the locking (**9.5**) ► bei ...410.2.
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 (**9.4**)).
Insert percent scale again.
Use the setscrew to secure the percent scale to the hand wheel.
Adjust desired stroke length.
Tighten the locking (**9.5**) ► bei ...410.2.

Automatic stroke length adjustment by means of an electrical actuator (10)

The electrical actuator is directly mounted to the stroke mechanism (**1**) of the pump. A clutch transmits the rotary motion of the actuator drive shaft to the adjusting spindle. The axial displacement is compensated in the clutch.
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!

Automatic stroke length adjustment by means of an electrical actuator with integrated positioner

same as Chapter „Automatic stroke length adjustment by means of an electrical actuator (10)", additionally:

This 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.

Drive motor C409.2 / C410.2

A **sera** motor pump of series C409.2 is driven by a threephase-motor controlled by the electronics.

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

Drive motor ...409.2 / ...410.2

sera motor pumps R(F)/M(F)409.2 /R(F)/M(F)410.2 are driven either by a three-phase motor.
Standard: three-phase motor (with PTC thermistor; suitable for operation with frequency converter).

Motor connection

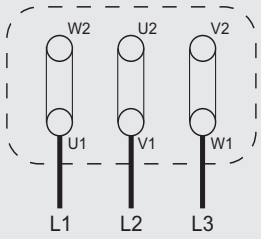
In case of a three-phase motor

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

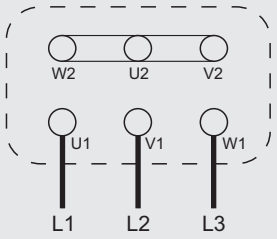
Example:

Indication on the type plate:	Δ 230V/ Y400V 50Hz
Three-phase power system on sit:	Y400V 50 Hz
Correct motor connection:	Star connection (Y)

Δ Delta connection

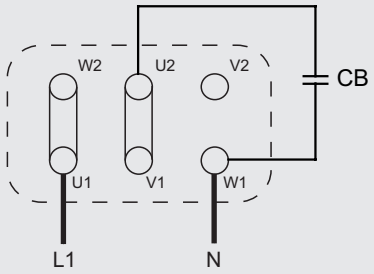


Y Star connection



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.



Direction of rotation

The direction of rotation of the drive motor is arbitrary.

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.

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.

ATTENTION

Fuses do not protect the motor!

Conrol (12) C409.2/C410.2 Pro/Pro+

Among other things, the control enable the proportional dosing via analogue signals 4 … 20 mA or contact signals with the possibility of pulse division or pulse multiplication.
The graphical display shows information about the current status of the pump.
A connection for flow monitoring or flow rate measurement (only Pro+) and an „empty" signal with pre-alarm and dry run alarm are available as standard.

INTERFACE MODULE (13) (accessories C409.2/C410.2 Pro+)

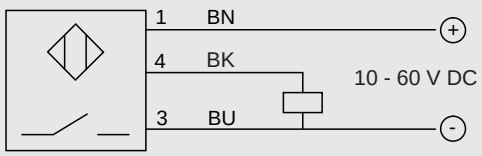
The INTERFACE MODULE provides level input, PROFIBUS connectivity (see TM05) and PROFINET connectivity (see TM07).

Stroke frequency transmitter (16) (option ...409.2 /...410.2)

sera pumps R(F)/M(F)409.2 /R(F)/M(F)410.2 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) 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.).

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!

ATTENTION

When the pump is deployed in exlosion-hazardous areas a NAMUR type stoke frequency transmitter (II2G Ex ia IICT6, acc.to. ATEX95) is to be provided!

TECHNICAL DATA

PUMP DATA (* 8mWS = performance losses of nominal capacity QN of 20-25%)			RF 409.2-... 1,6e	2,4e	7,0e	12e	18e	25e
Permissible pressure $p_{2max.}$ at the pump outlet	bar		10	10	10	10	10	10
Nominal capacity QN at $p_{2max.}$	l/h	50 Hz	0-1,6	0-2,4	0-7,0	0-12	0-18	0-25
		60 Hz	0-1,9	0-2,9	0-8,4	0-14,4	0-21,5	0-30
Quantity per stroke	ml/stroke (100%)		0,27	0,27	0,78	2,0	3,0	2,8
Max. suction height	mWC		3					3 (8*)
Min./max. permissible pressure at the pump inlet	bar	$p_{1min/max}$	-0,3/0					-0,3/0 (-0,8/0*)
Recomm. nominal diameter DN of the connecting pipes	mm		5	5	5	10	10	10
Nominal stroke frequency	1/min	50 Hz	100	150	150	100	100	150
		60 Hz	120	180	180	120	120	180
Weight approx.	kg	plastic	9	9	9	9	9	9
		stainless steel	10	10	10	10	10	10

PUMP DATA (* 8mWS = performance losses of nominal capacity QN of 20-25%)			RF 409.2-... 50e	75e	90e	115e	140e	180e	250e	350e
Permissible pressure $p_{2max.}$ at the pump outlet	bar		10	10	8	4	8	4	3	3
Nominal capacity QN at $p_{2max.}$	l/h	50 Hz	0-50	0-75	0-90	0-115	0-140	0-180	0-250	0-350
		60 Hz	0-60	0-90	0-108	0-138	0-168	0-216	0-300	-
Quantity per stroke	ml/stroke (100%)		8,3	8,3	15,0	19,2	15,6	20,0	41,7	38,9
Max. suction height	mWC		3 (8 *)						3	
Min./max. permissible pressure at the pump inlet	bar	$p_{1min/max}$	-0,3/0 (-0,8/0)						-0,3/0	
Recomm. nominal diameter DN of the connecting pipes	mm		10	15	15	15	15	15	15	15
Nominal stroke frequency	1/min	50 Hz	100	150	100	100	150	150	100	150
		60 Hz	120	180	120	120	180	180	120	–
Weight approx.	kg	plastic	9	9	11	10	11	10	13	13
		stainless steel	10	10	13	13	13	13	21	21

Linear dosing range at a stroke length between 20% and 100%.
Linear dosing range at a stroke length between 30% and 100% ► RF409.2-1,6, -2,4e (50Hz), RF409.2-7,0e, -12e (60Hz).
The nominal data refer to water, 20°C and nominal pressure. With lower counterpressure it can come to be soaked off achievements.

PUMP DATA			C 409.2-... Pro/Pro+					
			1,6e	2,4e	7,0e	12e	18e	25e
Permissible pressure $p_{2max.}$ at the pump outlet	bar		10	10	10	10	10	10
Nominal capacity QN at $p_{2max.}$	l/h	50/60 H	0-1,6	0-2,4	0-7	0-12	0-18	0-25
Quantity per stroke	ml/stroke	(100%)	0,27	0,27	0,78	2,0	3,0	3,0
Max. suction height	mWC		3					
Min./max. permissible pressure at the pump inlet	bar	$p_{1min/max}$	-0,3/0					
Recomm. nominal diameter DN of the connecting pipes	mm		10	10	10	10	10	10
Nominal stroke frequency	1/min	50/60 Hz	100	150	150	100	100	150
Weight approx.	kg	plastic	11	11	11	11	11	12,5
		stainless st.	13,5	13,5	13	13	13	13

PUMP DATA (* 8mWS = performance losses of nominal capacity QN of 20-25%)			C 409.2-... Pro/Pro+							
			50e	75e	90e	115e	140e	180e	250e	350e
Permissible pressure $p_{2max.}$ at the pump outlet	bar		10	10	8	4	8	4	3	3
Nominal capacity QN at $p_{2max.}$	l/h	50/60 Hz	0-50	0-75	0-90	0-115	0-140	0-180	0-250	0-350
Quantity per stroke	ml/stroke	(100%)	8,3	8,3	15,0	19,2	15,6	20,0	41,7	38,9
Max. suction height	mWC		3 (8*)						3	
Min./max. permissible pressure at the pump inlet	bar	$p_{1min/max}$	-0,3/0 (-0,8/0*)						-0,3/0	
Recomm. nominal diameter DN of the connecting pipes	mm		15	15	15	15	15	15	15	15
Nominal stroke frequency	1/min	50/60 H	150	150	100	100	150	150	100	150
Weight approx.	kg	plastic	8,5	8,5	10,5	9,0	10,5	9,0	13,0	13,0
		stainless st.	14	16	16	16	16	16	24	24

Linear dosing range at a stroke length between 20% and 100% and at a stroke frequency between 5 and 100%.
The nominal data refer to water, 20°C and nominal pressure. With lower counterpressure it can come to be soaked off achievements.

TECHNICAL DATA

PUMP DATA			RF 410.2-...							
			200e	280e	450e	570e	700e	900e	1100e	1450e
Permissible pressure at the pump outlet	bar	$p_{2max.}$	8	8	6	6	5	5	5	5 *
Nominal capacity QN at $p_{2max.}$	l/h	50 Hz	0-200	0-280	0-450	0-570	0-700	0-900	0-1.100	0-1.450
		60 Hz	0-240	0-336	0-540	0-684	0-840	0-1.080	0-1.320	0-1.740
Quantity per stroke	ml	(100%)	46	46	98	98	155	155	245	245
Max. suction height	mWC		5	5	5	5	3	3	3	3
Min./max. permissible pressure at the pump inlet	bar	$p_{1min/max}$	-0,5/0	-0,5/0	-0,5/0	-0,5/0	-0,3/0	-0,3/0	-0,3/0	-0,3/0
Recommended nominal diameter DN of the connecting pipes	mm		15	15	15	15	20	20	25	25
Nominal stroke frequency	1/min	50 Hz	76	97	76	97	76	97	76	97
		60 Hz	92	116	92	116	92	116	92	116
Weight approx.	kg	plastic	35	35	35	35	37	37	41	41
		stainless steel	42	42	42	42	52	52	59	59

PUMP DATA			C 410.2-...							
			200e	280e	450e	570e	700e	900e	1100e	1450e
Permissible pressure at the pump outlet	bar	$p_{2max.}$	8	8	6	6	5	5	5	5
Nominal capacity QN at $p_{2max.}$	l/h	50/60 Hz	0-200	0-280	0-450	0-570	0-700	0-900	0-1.100	0-1.450
Quantity per stroke	ml/stroke	(100%)	46	46	98	98	155	155	245	245
Max. suction height	mWC		5	5	5	5	3	3	3	3
Min./max. permissible pressure at the pump inlet	bar	$p_{1min/max}$	-0,5/0	-0,5/0	-0,5/0	-0,5/0	-0,3/0	-0,3/0	-0,3/0	-0,3/0
Recommended nominal diameter DN of the connecting pipes	mm		15	15	15	15	20	20	25	25
Nominal stroke frequency	1/min	50 Hz	76	97	76	97	76	97	76	97
Weight approx.	kg	plastic	38	38	38	38	49	49	49	49
		stainless steel	45	45	45	45	64	64	64	64

* at 60 Hz is the permissible pressure 3,5 bar

Linear dosing range at a stroke length between 20% and 100%.
The nominal data refer to water, 20°C and nominal pressure. With lower counterpressure it can come to be soaked off achievements.

ELECTRICAL DATA		RF409.2-1,6e ... RF409.2-25e
Motor power	kW	0,18
Voltage	V	230/400V 50Hz, 460V 60Hz
Frequency	Hz	50/60
Insulation class	ISO	F
Enclosure	IP	55

ELECTRICAL DATA		RF409.2-50e ... RF409.2-350e
Motor power	kW	0,37
Voltage	V	230/400V 50Hz, 460V 60Hz
Frequency	Hz	50/60
Insulation class	ISO	F
Enclosure	IP	55

ELECTRICAL DATA		C 409.2-1,6e Pro/Pro+ ... C 409.2-25e Pro/Pro+	
		230 V, 50/60 Hz	115 V, 50/60 Hz
Power consumption	kW	0,18	
Voltage	V	210 - 250	100 - 125
Frequency	Hz	50/60	
Inlet voltage, control input	V DC	5...30	
Minimum contact signal time	ms	55	
Analogue input resistance	Ω	39	
Digital output internal/external supply		20V DC, 30mA /... 30V DC, 30mA	
Recommended fuse	(circuit breaker)	C6A	C10A
Insulation class	ISO	F	
Enclosure	IP	55	

ELECTRICAL DATA		C 409.2-50e Pro/Pro+ ... C 409.2-350e Pro/Pro+	
		230 V, 50/60 Hz	115 V, 50/60 Hz
Power consumption	kW	(...-50e = 0,18 kW)	0,37
Voltage	V	210 - 250	100 - 125
Frequency	Hz	50/60	
Inlet voltage, control input	V DC	5...30	
Minimum contact signal time	ms	55	
Analogue input resistance	Ω	39	
Digital output internal/external supply		20V DC, 30mA /... 30V DC, 30mA	
Recommended fuse	(circuit breaker)	C6A	C10A
Insulation class	ISO	F	
Enclosure	IP	55	

TECHNICAL DATA

ELECTRICAL DATA		RF 410.2-...			
		200e/280e	450e/570e	700e/900e	1100e/1450e
Motor power	kW	0,75	0,75	1,1	1,5
Voltage	V	230/400V 50Hz, 460V 60Hz			
Frequency	Hz	50/60			
Insulation class	ISO	F			
Enclosure	IP	55			

ELECTRICAL DATA		C 410.2-... Pro/Pro+	
		200e ... 570e	700e ... 1450e
Power consumption	kW	0,75	1,1
Voltage	V	380-420	
Frequency	Hz	50/60	
Inlet voltage, control input	V DC	5...30	
Minimum contact signal time	ms	55	
Analogue input resistance	Ω	39	
Digital output internal/external supply		20V DC, 30mA /... 30V DC, 30mA	
Recommended fuse	(circuit breaker)	C10A	
Insulation class	ISO	F	
Enclosure	IP	65	

NOTE

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

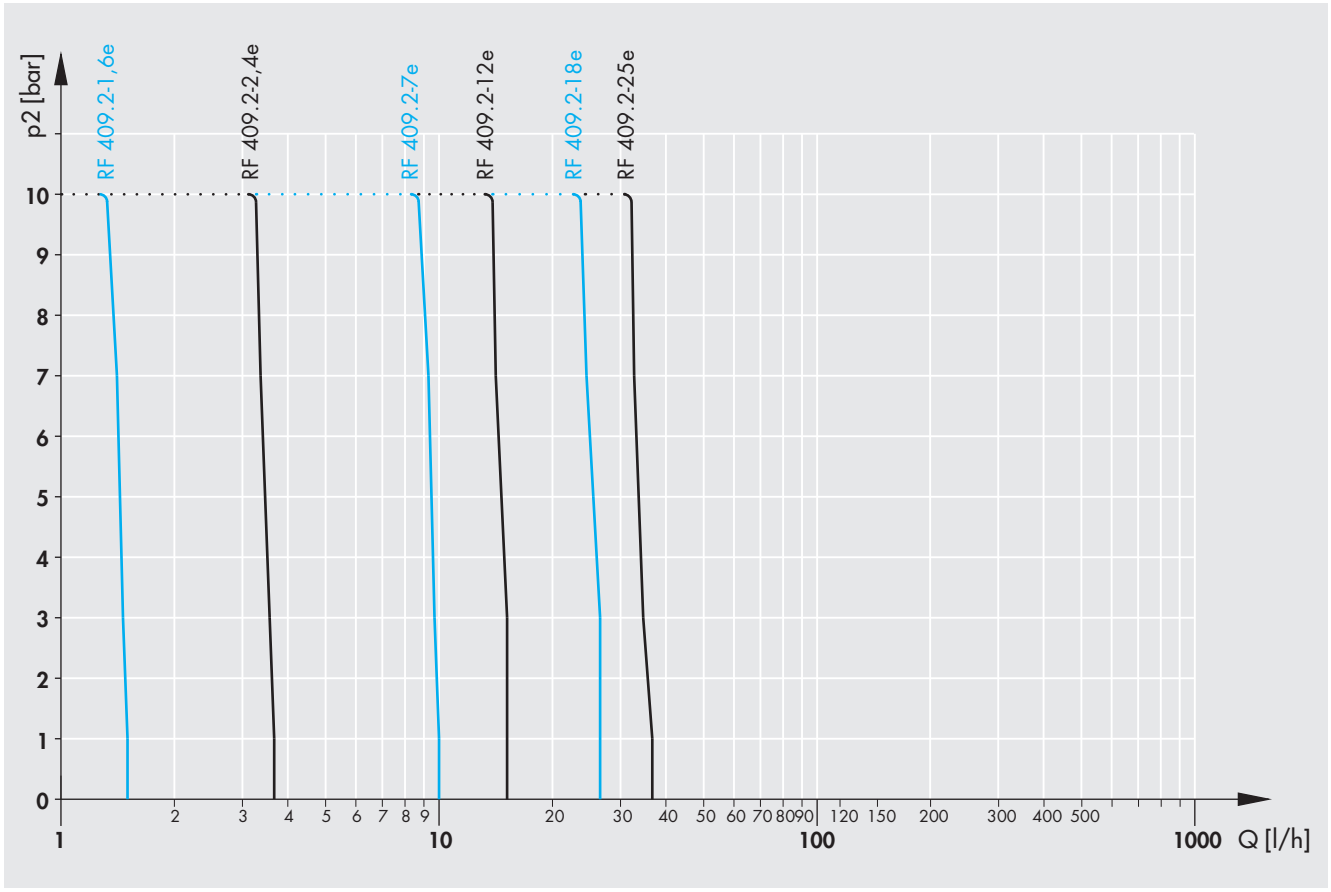
NOISE MEASUREMENT	
Max. sound pressure at max. burden	50 - 65 dB(A)

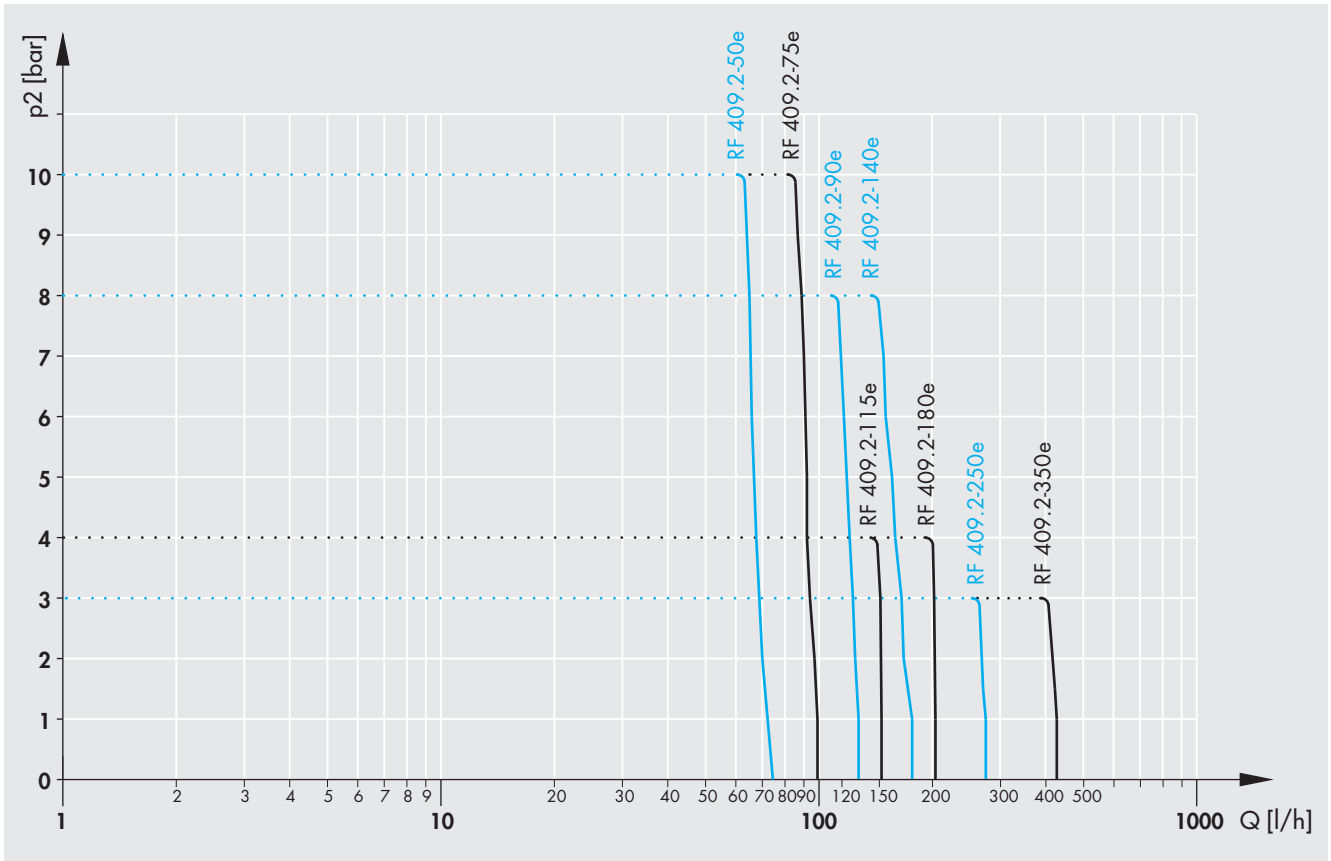
VISCOSITY, PUMPED MEDIUM	
Max. viscosity with non-spring-loaded valves	100 mPas (=cP)

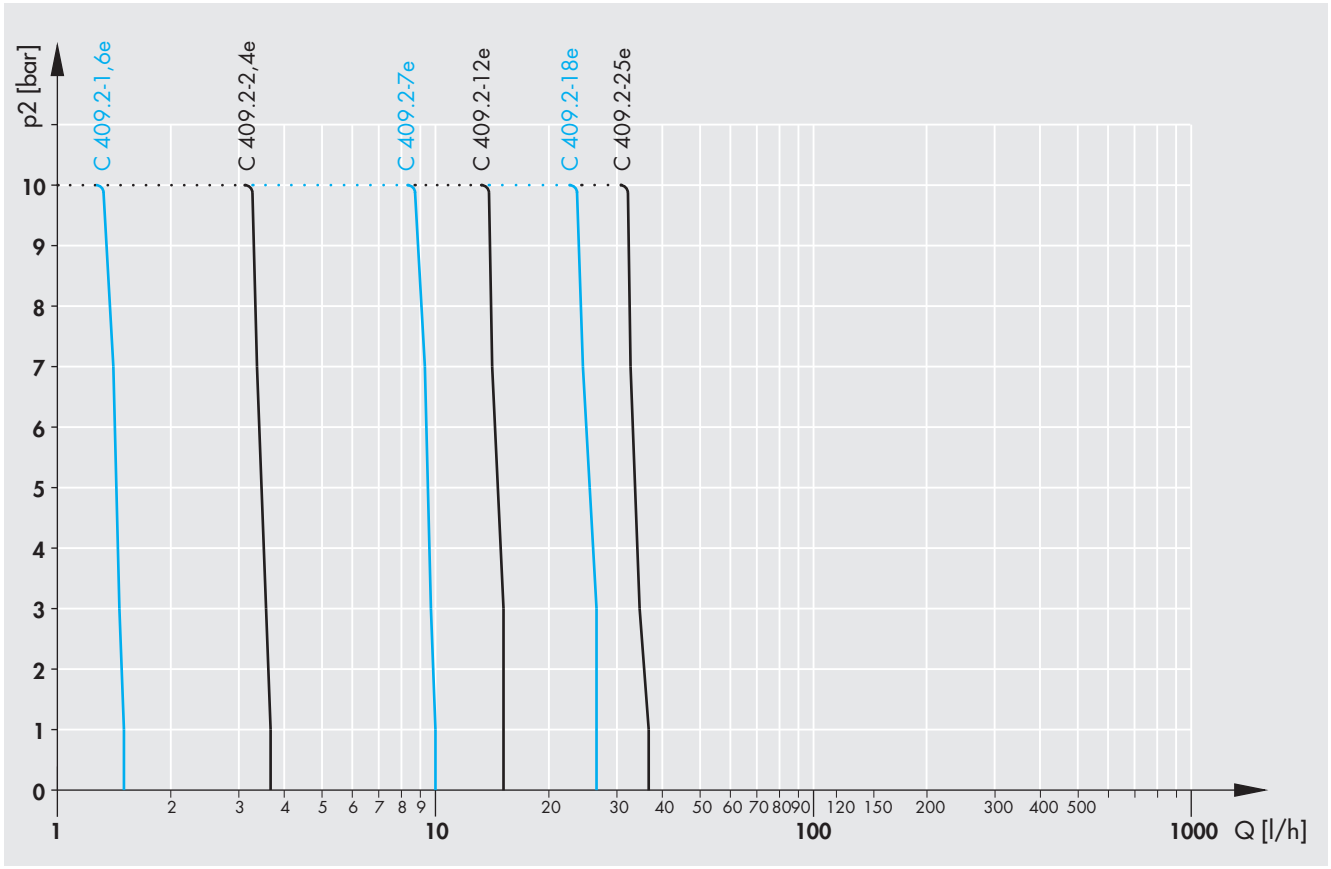
TEMPERATURE DATA	
Max. liquid temperature	60 °C
Min. liquid temperature	10 °C
Max. operating temperature	40 °C
Min. operating temperature	0 °C
Max. storage temperature	40 °C
Min. storage temperature	0 °C

AMBIENT CONDITIONS	
Max. installation altitude above sea level	1000 m
Max. relative air humidity	< 90%

Characteristics



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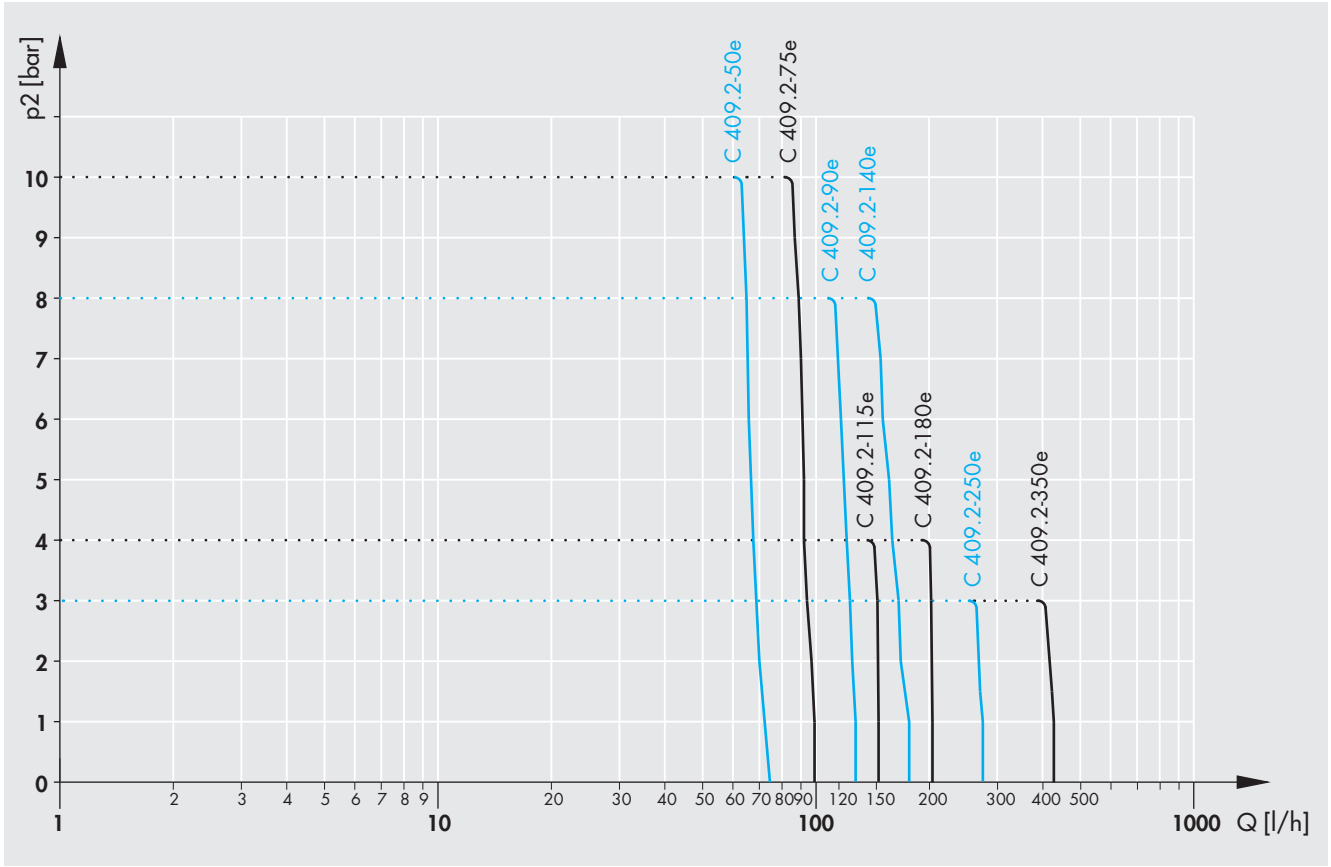
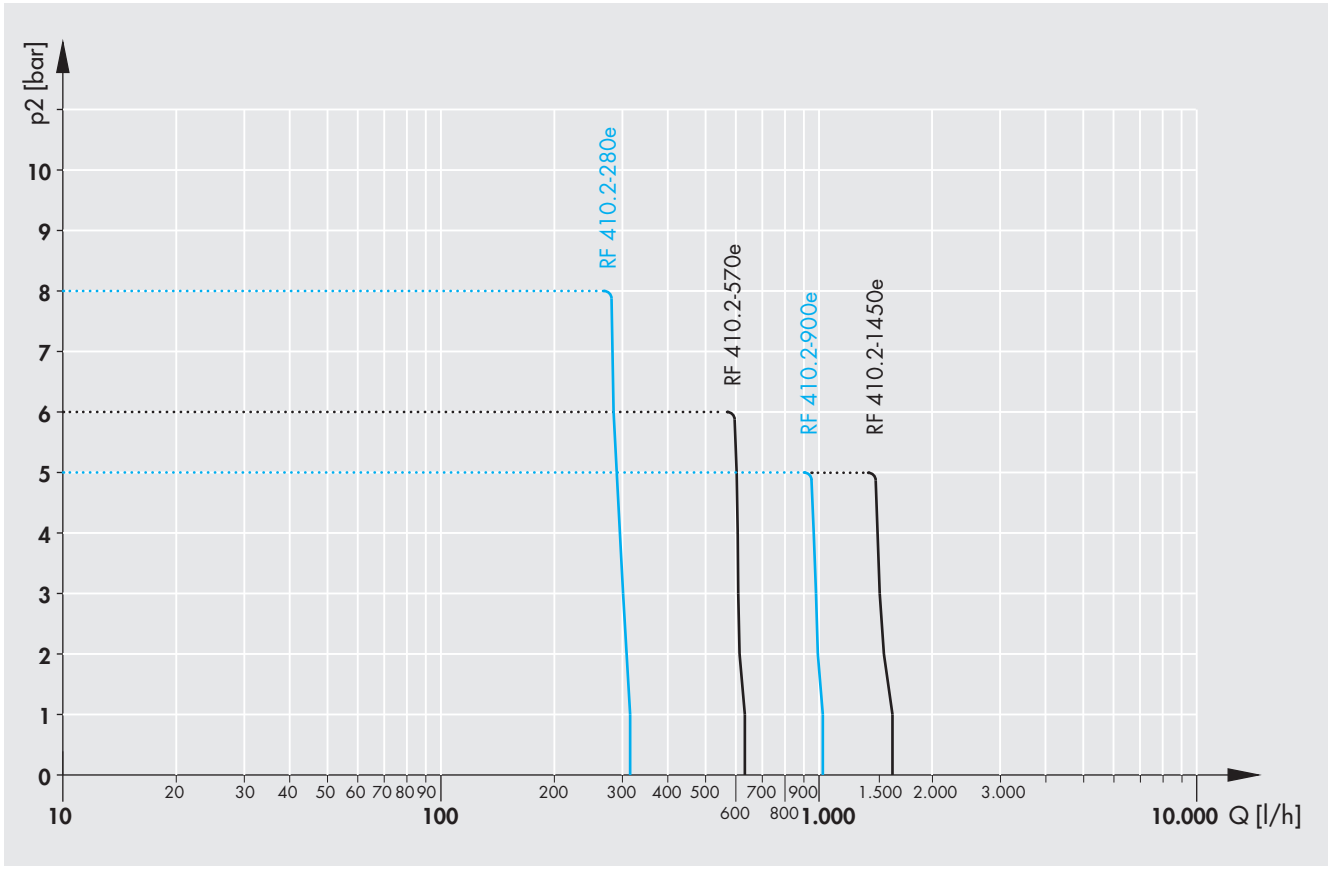
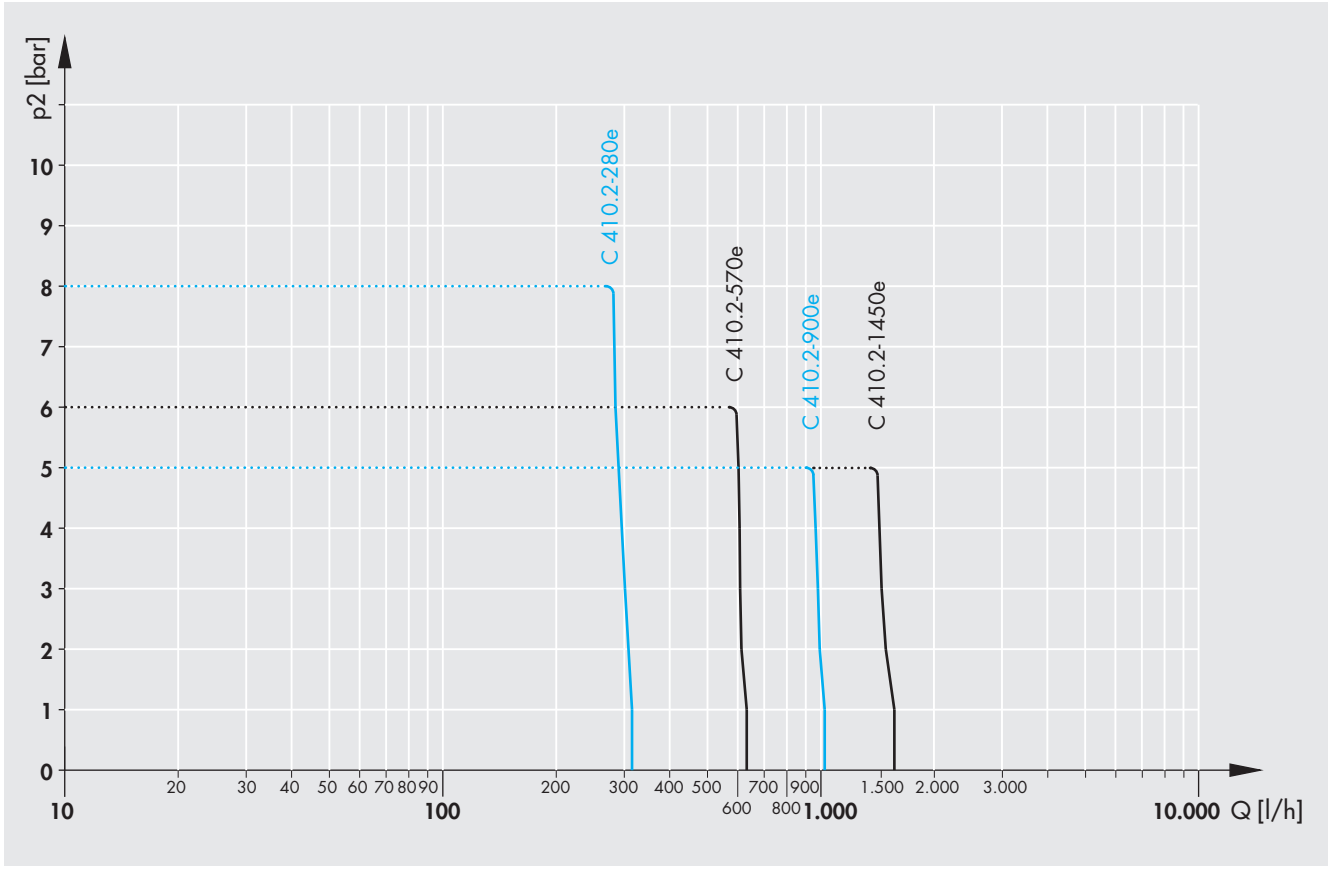
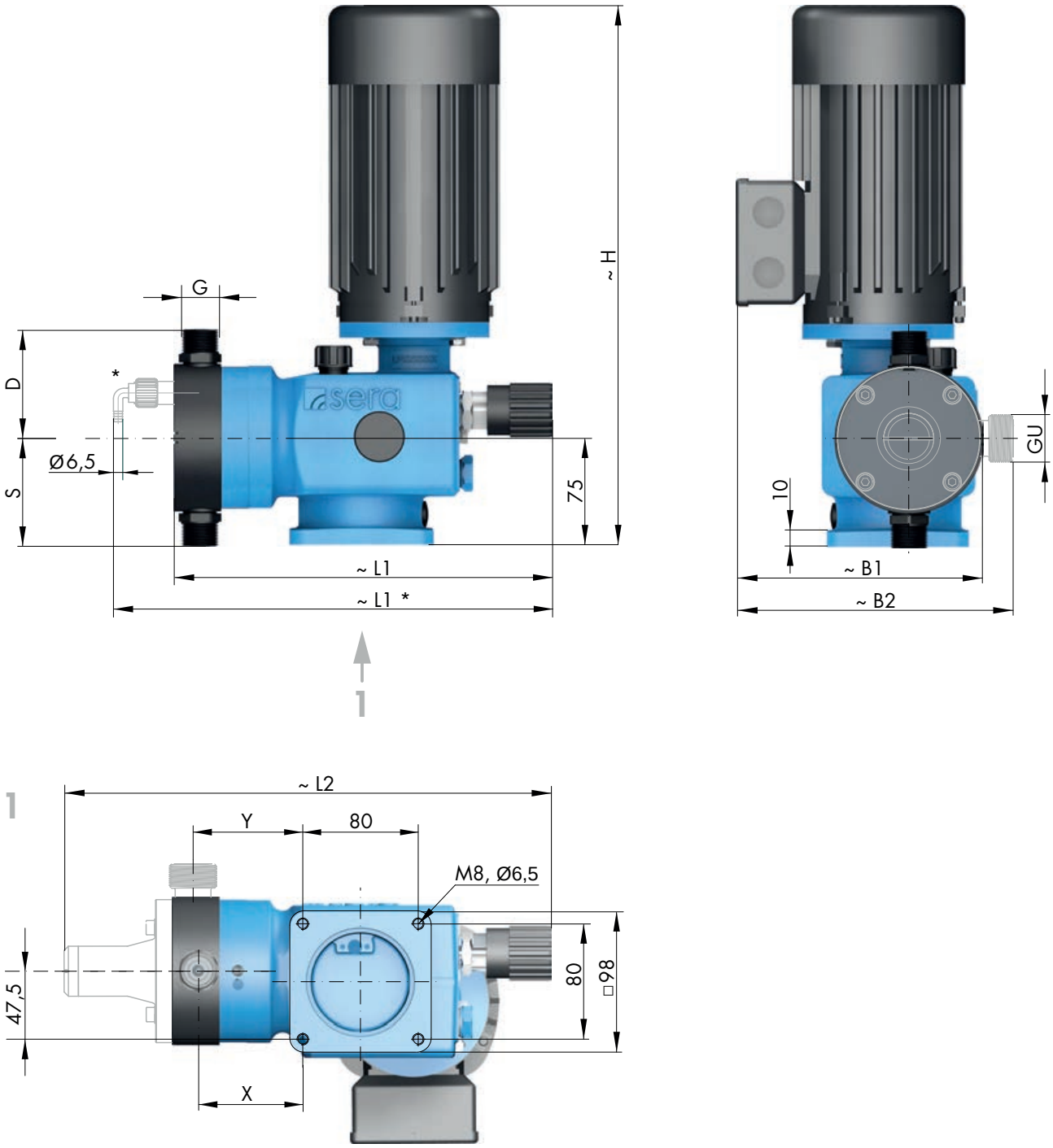
C 409.2-1,6e
C 409.2-2,4e
C 409.2-7e
C 409.2-12e
C 409.2-18e
C 409.2-25e
0 1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10 20 30 40 50 60 70 80 90 100 120 150 200 300 400 500 1000
Q [l/h]


p2 [bar]
C 409.2-50e
C 409.2-75e
C 409.2-90e
C 409.2-140e
C 409.2-115e
C 409.2-180e
C 409.2-250e
C 409.2-350e
0 1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10 20 30 40 50 60 70 80 90 100 120 150 200 300 400 500 1000
Q [l/h]


p2 [bar]
10
9
8
7
6
5
4
3
2
1
0
RF 410.2-280e
RF 410.2-570e
RF 410.2-900e
RF 410.2-1450e
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1.000
1.500
2.000
3.000
10.000
Q [l/h]


p2 [bar]
10
9
8
7
6
5
4
3
2
1
0
C 410.2-280e
C 410.2-570e
C 410.2-900e
C 410.2-1450e
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1.000
1.500
2.000
3.000
10.000
Q [l/h]

Dimensions RF409.2 standard



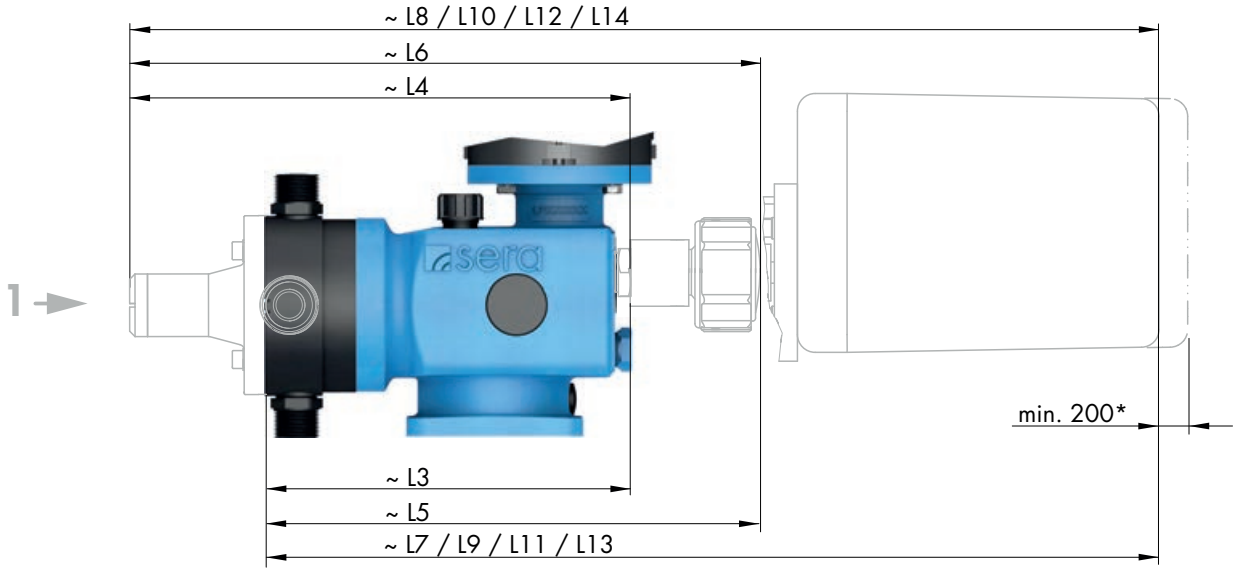
* Pump body with manual vent valve ...409.2-1,6e, -2,4e PP-FRP, PVDF-FRP

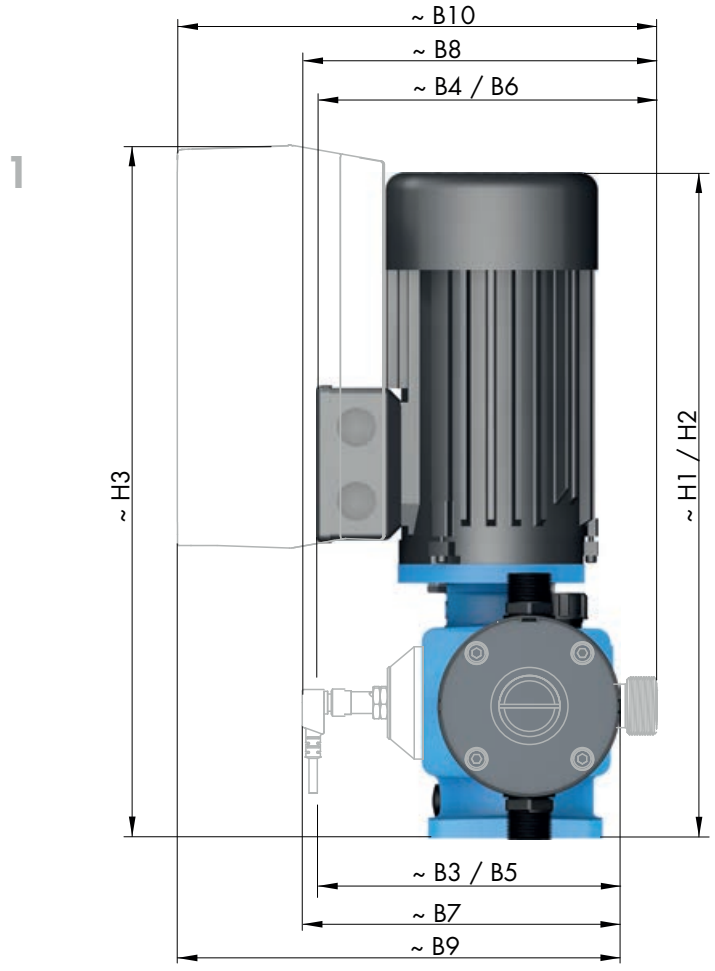
		RF 409.2-...							
SUCTION VALVES		**1,6e 2,4e**	**7,0e**	**12e**	**18e 25e**	**50e 75e**	**90e 115e**	**140e 180e**	**250e 350e**
DN	Nominal width	5	5	5	8	8	8	8	20[1]
G	Connection thread	G¾	G¾	G¾	G¾	G¾	G¾	G¾	G1¼[1]
S	PP-FRP / PVDF-FRP	80	56	56	56	69	76	76	122
S	PP-FRP / PVDF-FRP [2]	–	57	60	60	67	76	76	122
S	PVC-U	70	62	65	63	70	78	78	119
S	PVC-U [2]	–	52	52	63	70	78	78	119
S	1.4571	70	57	61	61	68	76	76	122
S	1.4571 [2]	–	57	61	61	68	76	76	122
PRESSURE VALVES									
DN	Nominal width	5	5	5	8	8	8	8	20[1]
G	Connection thread	G¾	G¾	G¾	G¾	G¾	G¾	G¾	G1¼[1]
D	PP-FRP / PVDF-FRP	80	64	64	64	69	76	76	122
D	PP-FRP / PVDF-FRP [2]	–	57	60	60	67	76	76	122
D	PVC-U	70	62	65	70	77	85	85	138
D	PVC-U [2]	–	65	65	70	77	85	85	138
D	1.4571	70	57	61	61	68	76	76	122
D	1.4571 [2]	–	57	61	61	68	76	76	122
MAX. TOTAL HEIGHT									
H		355	355	355	355	365	365	365	365
MAX. TOTAL WIDTH									
B1		170	170	170	170	185	185	185	220
B2	(with relief valve)	–	170	170	170	190	205	205	230
MAX. TOTAL LENGTH									
L1		310	285	285	285	295	300	300	355
L2	(with relief valve)	–	345	345	345	360	370	370	435
RELIEF VALVE CONNECTION									
GU		–	G¾	G¾	G¾	G¾	G1	G1	G1¼[1]
CONNECTION DIMENSIONS									
X		72	66	67	67	69	73	73	101
Y		–	71	69	69	69	78	78	101

(Measurements in mm)

[1] DN15 / G1 at valves of PVC-U
[2] Pump body with relief valve

Dimensions ...409.2 options



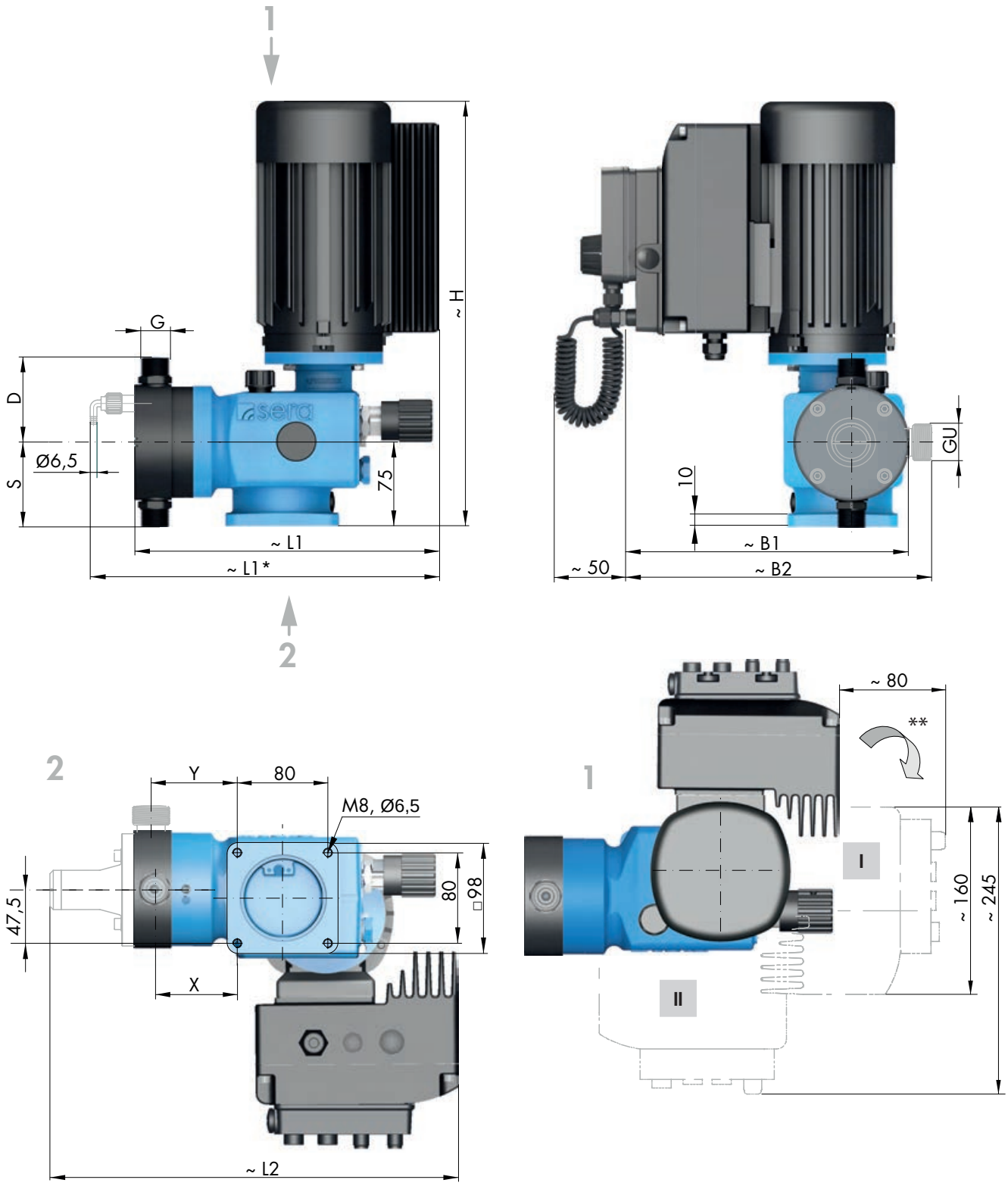


* for removing the actuar cover

OPTIONS		... 409.2-...							
MAX. TOTAL HEIGHT		1,6e 2,4e	7,0e	12e	18e 25e	50e 75e	90e 115e	140e 180e	250e 350e
H1	with AC motor	335	335	335	335	370	375	375	375
H2	with motor ATEX	385	385	385	385	420	420	420	420
H3	with frequency converter	410	410	410	410	425	425	425	425
MAX. TOTAL WIDTH									
B3	with AC motor	180	180	180	180	190	190	190	190
B4	with AC motor	–	180	180	180	195	210	210	245
B5	with motor ATEX	220	220	220	220	230	230	230	255
B6	with motor ATEX	–	220	220	220	235	250	250	270
B7	with stroke freq. transmitter	180	180	180	180	180	180	180	215
B8	with stroke freq. transmitter	–	180	180	180	190	205	205	230
B9	with frequency converter	255	255	255	255	260	260	260	295
B10	with frequency converter	–	255	255	255	270	285	285	310
MAX. TOTAL LENGTH									
L3	mit blind plug (M(F)...)	250	215	210	190	190	190	190	220
L4	mit blind plug (M(F)...)	–	270	270	270	270	285	285	350
L5	HLV with position indicator	450	315	310	290	290	295	295	320
L6	HLV with position indicator	–	375	370	370	375	390	390	450
L7	HLV with actuator	480	445	440	420	420	425	425	450
L8	HLV with actuator	–	505	500	500	505	520	520	580
L9	HLV with actuator with integrated positioner	560	525	520	500	500	505	505	530
L10	HLV with actuator with integrated positioner	–	585	580	580	585	600	600	660
L11	HLV with actuator ATEX	655	620	615	595	595	595	595	625
L12	HLV with actuator ATEX	–	675	675	675	680	690	690	755
L13	HLV with pneumatic actuator	–	590	590	590	600	605	605	660
L14	HLV with pneumatic actuator	–	650	650	650	665	675	675	740

HLV ► Manual stroke length adjustment
(Measurements in mm)

Dimensions C409.2 standard



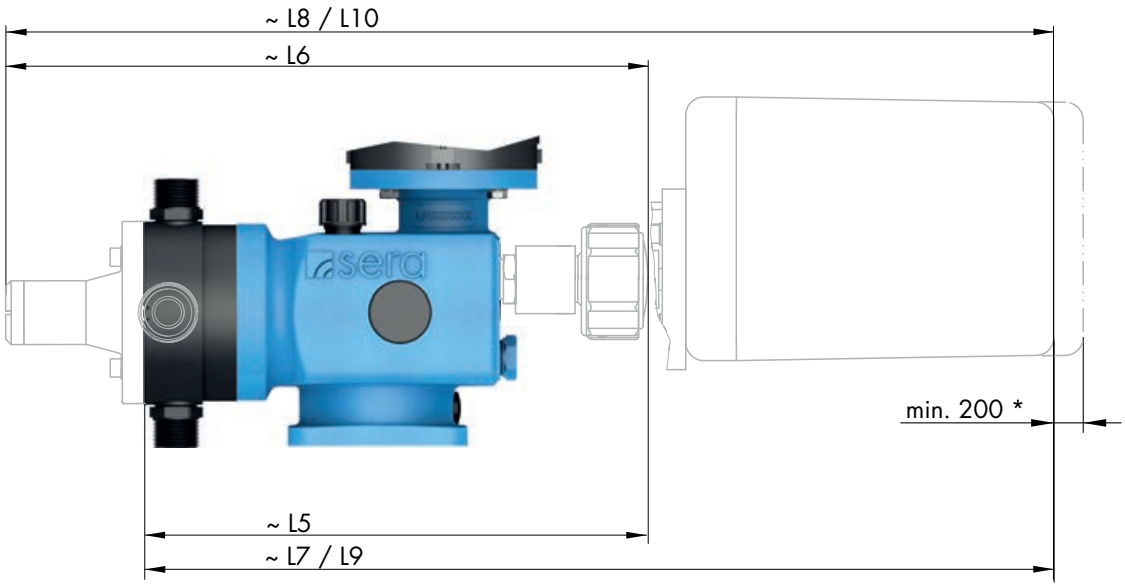
* Pump body with manual vent valve ...409.2-1,6e, -2,4e PP-FRP, PVDF-FRP
** Drive with electronics can be rotated throughout 90° each and can be put to the positions I and II.
(release the motor fastening screws, put the motor carefully to the desired position and fasten with screws again).

STANDARD		C 409.2-...							
SUCTION VALVES		1,6e 2,4e	7,0e	12e	18e 25e	50e 75e	90e 115e	140e 180e	250e 350e
DN	Nominal width	5	5	5	8	8	8	8	20[1]
G	Connection thread	G¾	G¾	G¾	G¾	G¾	G¾	G¾	G1¼[1]
S	PP-FRP / PVDF-FRP	80	56	56	56	69	76	76	122
S	PP-FRP / PVDF-FRP [2]	–	57	60	60	67	76	76	122
S	PVC-U	70	62	65	63	70	78	78	119
S	PVC-U [2]	–	52	52	63	70	78	78	119
S	1.4571	70	57	61	61	68	76	76	122
S	1.4571 [2]	–	57	61	61	68	76	76	122
PRESSURE VALVES									
DN	Nominal width	5	5	5	8	8	8	8	20[1]
G	Connection thread	G¾	G¾	G¾	G¾	G¾	G¾	G¾	G1¼[1]
D	PP-FRP / PVDF-FRP	80	64	64	64	69	76	76	122
D	PP-FRP / PVDF-FRP [2]	–	57	60	60	67	76	76	122
D	PVC-U	70	62	65	70	77	85	85	138
D	PVC-U [2]	–	65	65	70	77	85	85	138
D	1.4571	70	57	61	61	68	76	76	122
D	1.4571 [2]	–	57	61	61	68	76	76	122
MAX. TOTAL HEIGHT									
H		355	355	355	355	355	365	365	365
MAX. TOTAL WIDTH									
B1		250	250	170	250	250	260	260	295
B2	(with relief valve)	–	250	170	250	250	285	285	310
MAX. TOTAL LENGTH									
L1		310	285	285	285	295	300	300	355
L2	(with relief valve)	–	345	345	345	360	370	370	435
RELIEF VALVE CONNECTION									
GU		–	G¾	G¾	G¾	G¾	G1	G1	G1¼[1]
CONNECTION DIMENSIONS									
X		72	66	67	67	69	73	73	101
Y		–	71	69	69	69	78	78	101

(Measurements in mm)

[1] DN15 / G1 at valves of PVC-U
[2] Pump body with relief valve

Dimensions C409.2 options

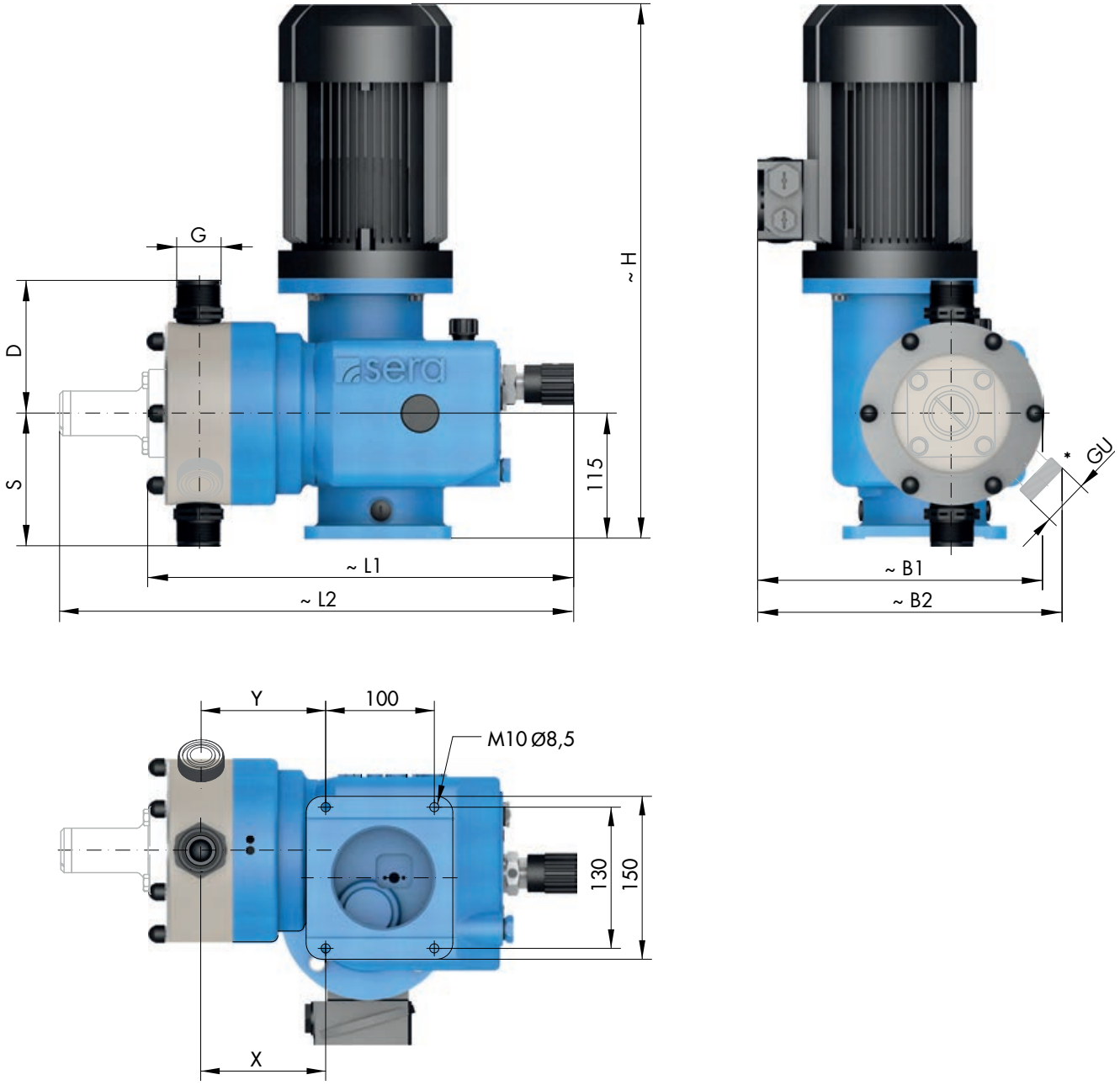


* for removing the actuar cover

OPTIONS		C 409.2-...							
MAX. TOTAL LENGTH		1,6e 2,4e	7,0e	12e	18e 25e	50e 75e	90e 115e	140e 180e	250e 350e
L5	HLV with position indicator	450	315	310	290	290	295	295	320
L6	HLV with position indicator	–	375	370	370	375	390	390	450
L7	HLV with actuator	480	445	440	420	420	425	425	450
L8	HLV with actuator	–	505	500	500	505	520	520	580
L9	HLV with actuator with integrated positioner	560	525	520	500	500	505	505	530
L10	HLV with actuator with integrated positioner	–	585	580	580	585	600	600	660

HLV ► Manual stroke length adjustment
(Measurements in mm)

Dimensions RF410.2 standard



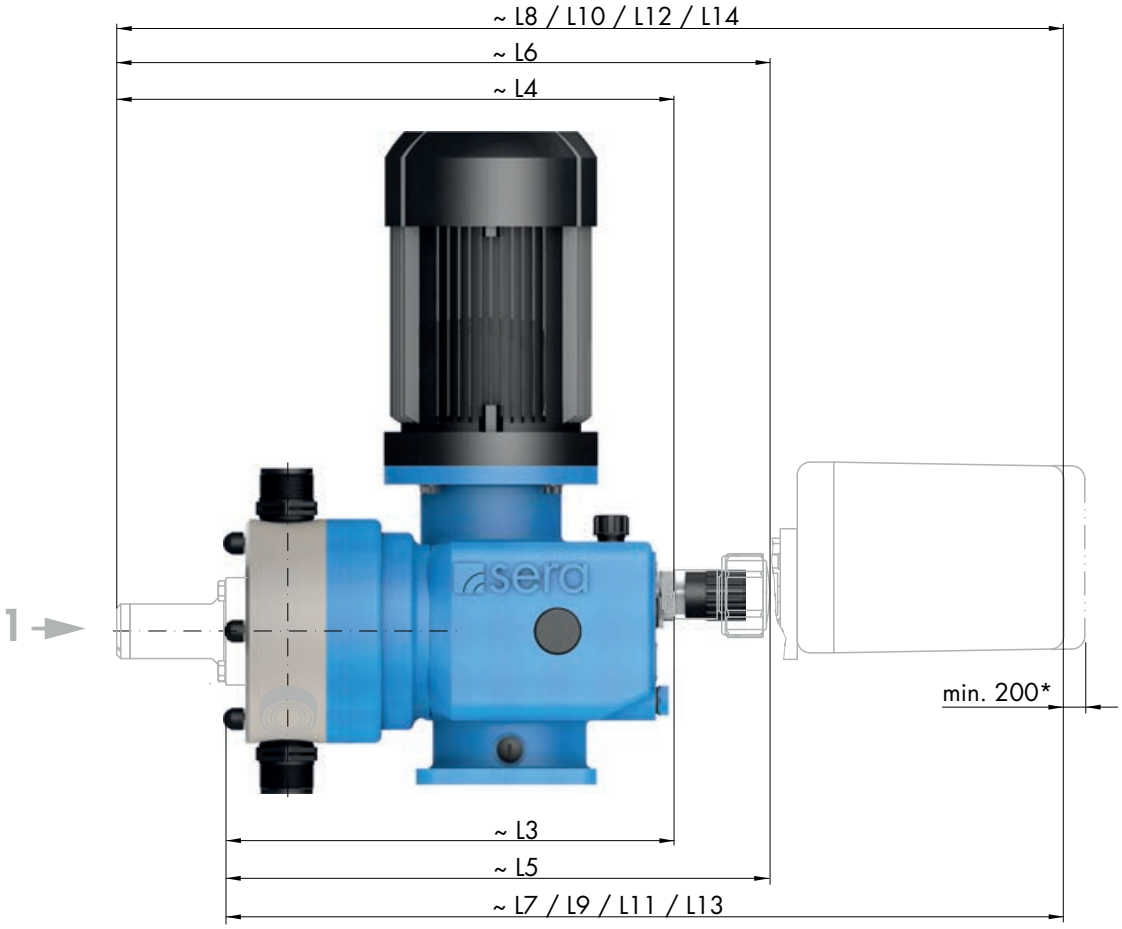
* Angle 45° - socket overflow valve

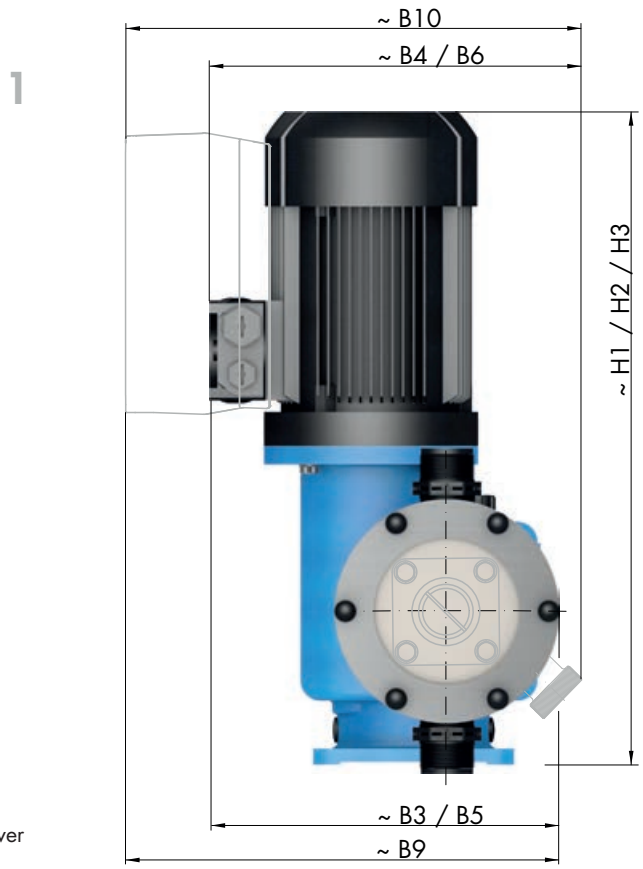
		RF 410.2-...			
SUCTION VALVES		**200e/280e**	**450e/570e**	**700e/900e**	**1100e/1450e**
DN	Nominal width	20 [1]	20 [1]	20	20
G	Connection thread	G1¼ [1]	G1¼ [1]	G1¼	G1¼
S	PP-FRP / PVDF-FRP	122	122	148	148
S	PVC-U	119	119	150	150
S	1.4571	122	122	148	148
PRESSURE VALVES					
DN	Nominal width	20 [1]	20 [1]	20	20
G	Connection thread	G1¼ [1]	G1¼ [1]	G1¼	G1¼
D	PP-FRP / PVDF-FRP	122	122	148	148
D	PVC-U	138	138	170	170
D	1.4571	122	122	148	148
MAX. TOTAL HEIGHT					
H		530	530	540	580
MAX. TOTAL WIDTH					
B1		265	265	295	295
B2	(with relief valve)	280	280	–	–
MAX. TOTAL LENGTH					
L1		430	430	460	460
L2	(with relief valve)	535	535	–	–
RELIEF VALVE CONNECTION					
GU		G1¼ [1]	G1¼ [1]	–	–
CONNECTION DIMENSIONS					
X		115	115	138	138
Y		115	115	–	–

(Measurements in mm)

[1] DN15 / G1 at valves of PVC-U

Dimensions ...410.2 options



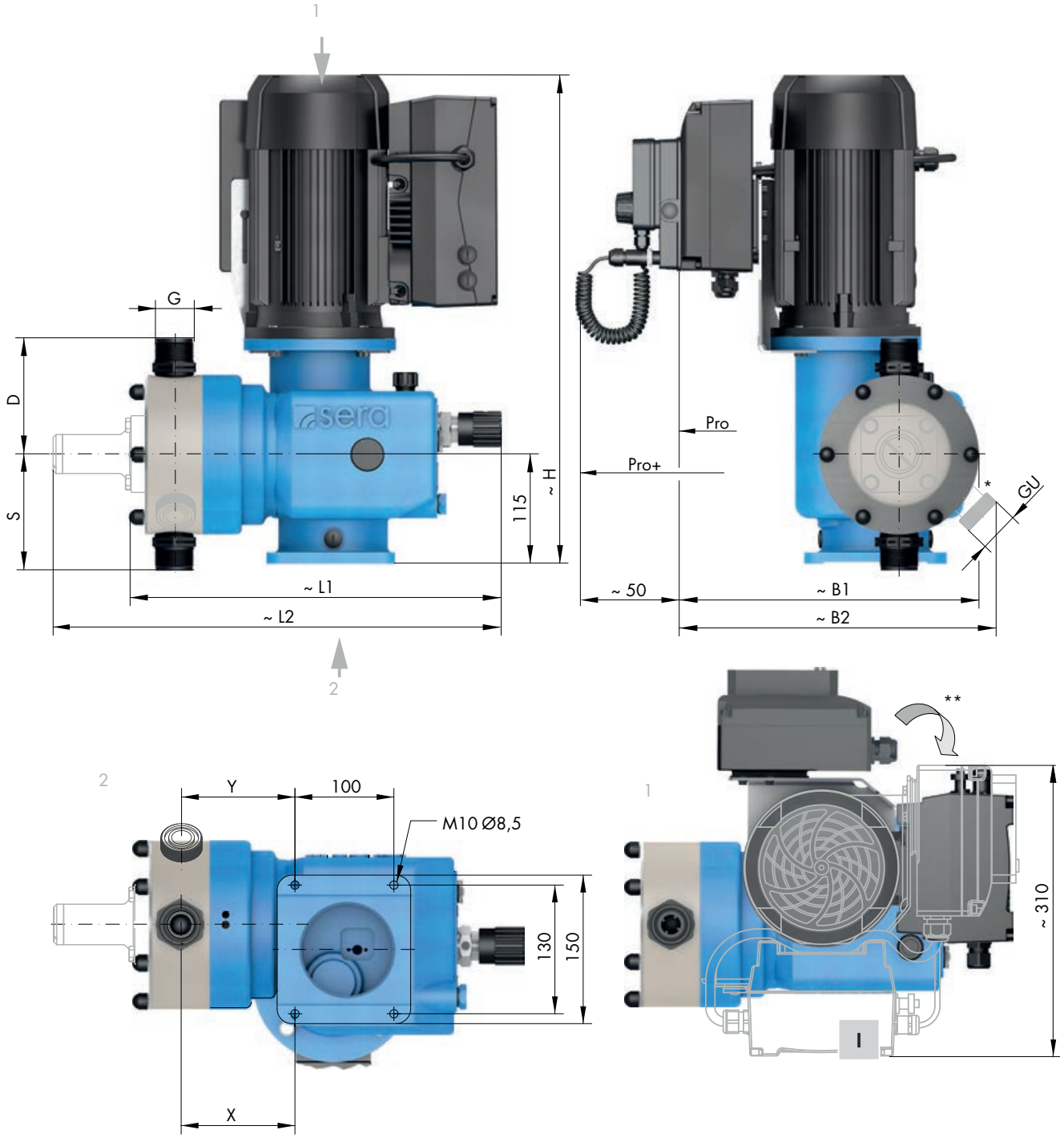


* for removing the actuar cover

OPTIONS		...410.2-....			
MAX. TOTAL HEIGHT		200e/280e	450e/570e	700e/900e	1100e/1450e
H1	with AC motor	500	500	500	585
H2	with motor ATEX	570	570	625	625
H3	with frequency converter	530	530	540	580
MAX. TOTAL WIDTH					
B3	with AC motor	265	265	290	295
B4	with AC motor	290	290	–	–
B5	with motor ATEX	315	315	350	350
B6	with motor ATEX	330	330	–	–
B9	with frequency converter	340	340	370	370
B10	with frequency converter	350	350	–	–
MAX. TOTAL LENGTH					
L3	mit blind plug (M(F)...)	365	365	395	395
L4	mit blind plug (M(F)...)	470	470	–	–
L5	HLV with position indicator	465	465	495	495
L6	HLV with position indicator	570	570	–	–
L7	HLV with actuator	615	615	645	645
L8	HLV with actuator	715	715	–	–
L9	HLV with actuator with integrated positioner	690	690	720	720
L10	HLV with actuator with integrated positioner	795	795	–	–
L11	HLV with actuator ATEX	780	780	810	810
L12	HLV with actuator ATEX	885	885	–	–
L13	HLV with pneumatic actuator	790	790	820	820
L14	HLV with pneumatic actuator	895	895	–	–

HLV ► Manual stroke length adjustment
(Measurements in mm)

Dimensions C410.2 standard



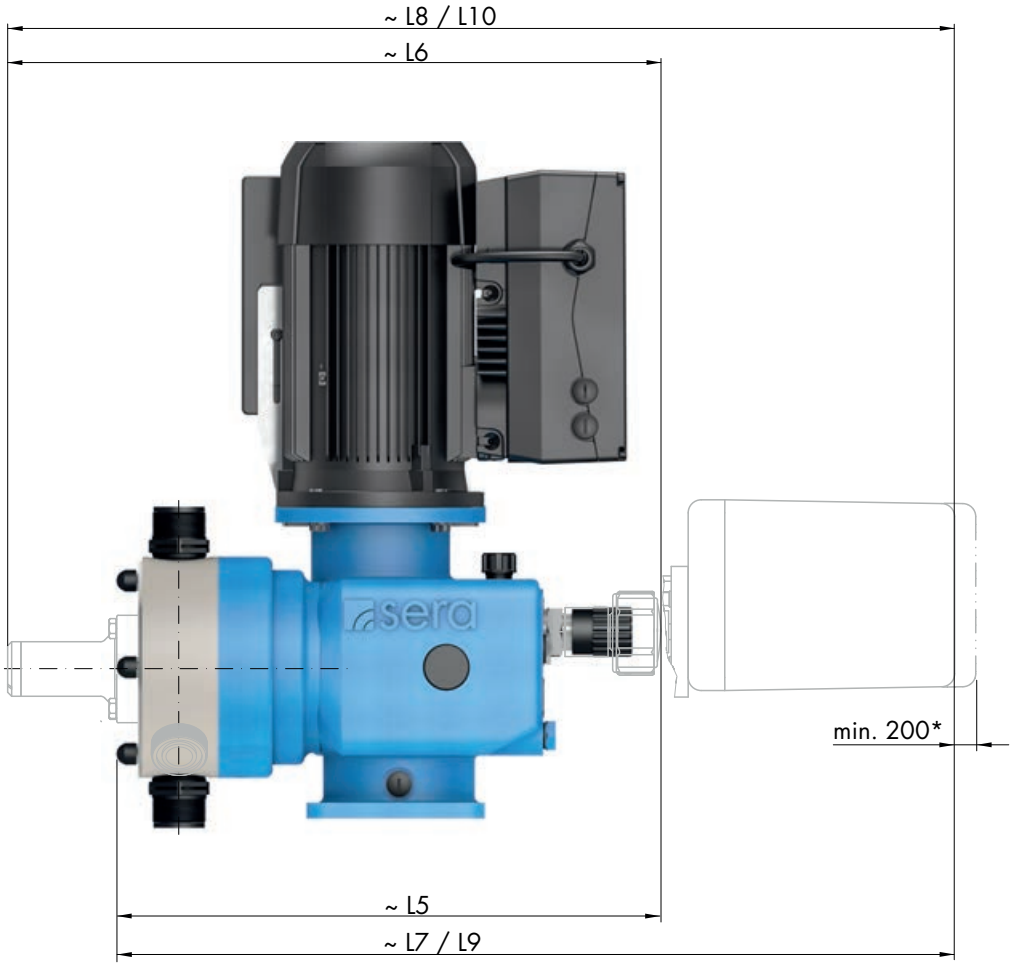
* Angle 45° - socket overflow valve
** Drive with electronics can be rotated throughout 90° each and can be put to the positions I.
(release the motor fastening screws, put the motor carefully to the desired position and fasten with screws again).

		C 410.2-...			
SUCTION VALVES		**200e/280e**	**450e/570e**	**700e/900e**	**1100e/1450e**
DN	Nominal width	20 [1]	20 [1]	20	20
G	Connection thread	G1¼ [1]	G1¼ [1]	G1¼	G1¼
S	PP-FRP / PVDF-FRP	122	122	148	148
S	PVC-U	119	119	150	150
S	1.4571	122	122	148	148
PRESSURE VALVES					
DN	Nominal width	20 [1]	20 [1]	20	20
G	Connection thread	G1¼ [1]	G1¼ [1]	G1¼	G1¼
D	PP-FRP / PVDF-FRP	122	122	148	148
D	PVC-U	138	138	170	170
D	1.4571	122	122	148	148
MAX. TOTAL HEIGHT					
H		530	530	580	580
MAX. TOTAL WIDTH					
B1		355	355	380	380
B2	(with relief valve)	365	365	–	–
MAX. TOTAL LENGTH					
L1		430	430	460	460
L2	(with relief valve)	535	535	–	–
RELIEF VALVE CONNECTION					
GU		G1¼ [1]	G1¼ [1]	–	–
CONNECTION DIMENSIONS					
X		115	115	138	138
Y		115	115	–	–

(Measurements in mm)

[1] DN15 / G1 at valves of PVC-U

Dimensions C410.2 options



* for removing the actuar cover

OPTIONS		C 410.2-....			
MAX. TOTAL LENGTH		200e/280e	450e/570e	700e/900e	1100e/1450e
L5	HLV with position indicator	465	465	495	495
L6	HLV with position indicator	570	570	–	–
L7	HLV with actuator	615	615	645	645
L8	HLV with actuator	715	715	–	–
L9	HLV with actuator with integrated positioner	690	690	720	720
L10	HLV with actuator with integrated positioner	795	795	–	–

HLV ► Manual stroke length adjustment
(Measurements in mm)

WARNING

Observe and follow the safety instructions by all means.
See the additional instructions „SAFETY INSTRUCTIONS".
Man, machine and environment are endangered if the safety instructions are not observed.

NOTE

Pump design data for dosing and its temperature can be found in the order confirmation.

NOTE

Operating conditions:
Ambient temperature, relative air humidity and max. installation altitude ► see chapter „Technical data".

The standard model of the pump is only approved for installation in dry areas in a non-aggressive atmosphere.
Protect the pump from heat sources, direct sunlight and UV light.
See "Dimensions" chapter for dimensions of the pump connections and fixing holes.
Fixing the pump with at least four bolts above the pump base is required for safe operation.
Install the pump so 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 so 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 can be easily dismantled if required.
Design the nominal diameters of the downstream piping and the valves installed in 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 piping system, it is recommended to provide connections for pressure measurement fittings (e.g. manometers) near the suction and pressure ports.
Drain valves must be provided.
Before connecting the pipes, remove the plastic caps on the suction and pressure ports of the pump.
Check the fastening bolts for the pump body for tightness and tighten if necessary, see chapter "Overview of the tightening torques".
Connect pipes to the pump so that there are no forces acting on the pump, such as e.g. misalignment, weight or strain of the pipe.
Keep the suction pipes 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.
Display devices must be easily accessible and readable.

In order to avoid cavitation, overload or excessive delivery, the following points should be noted:

Avoid high suction heights.
Keep pipes as short as possible.
Select sufficiently large nominal diameters.
Avoid unnecessary choke points.
Install a pulsation damper.
Install overpressure protection.
Install a pressure-sustaining valve, if necessary
Provide feed line for outgassing media.

WARNING

The pump with a control is only designed for operation outside Ex-zonest!

SUCTION SIDE (1)

The following fittings can be used on the suction side:

1.1 Line strainer

1.2 Suction aid
Siphon vessel

1.3 Suction lance

1.4 Multifunction device

1.5 Foot valve

1.6 Shut-off valve

PRESSURE SIDE (2)

The following fittings can be used on the pressure side:

2.1 Vent valve

2.2 Injection fitting

2.3 Dosing valve

2.4 Pulsation damper

2.5 Diaphragm pressure keeping valve

2.6 Diaphragm relief valve

2.7 Multifunction valve

2.8 Flow meter [1]

2.9 Flow monitor [1]

2.10 Shut-off valve

[1] only for diaphragm pumps with a control

SUCTION SIDE (1)

Line strainer (1.1)

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

ATTENTION

If impurities are not removed, this results in malfunctions of the pump and the system.

Suction aid / siphon vessel (1.2)

For high tanks without connection on the bottom of the tank ► install suction aid / siphon vessel.
Thereby, pay attention to accelerating pressures which may be generated in a long suction pipe.

Suction lance (1.3)

Install a suction lance for removal of chemicals from tanks and barrels.
The integrated foot valve prevents the backflow of the suctioned medium.
The suction lances are equipped with a level switch for „empty“ signal.

Multifunction device (1.4)

The multifunction device is installed in the suction side piping of the pump and is used for determination of the delivery rate of pumps under real operating conditions.
The device can be filled either using a pending tank volume (communicating container) or using a hand vacuum pump.

Foot valve (1.5)

To prevent running dry of the suction line ► install foot valve (check valve) at the end of the suction line.

PRESSURE SIDE (2)

Vent valve (2.1)

If air can be drawn in due to falling liquid level in the suction tank and at the same time delivered to a pressurised line or against a pressure-sustaining valve ► install vent valve in the pressure line.

NOTE

The delivery flow can be interrupted if there is air in the suction line!

Injection fitting (2.2)

Install an injection fitting that routes into a main line to prevent the backflow of the pumped medium in the dosing line.

WARNING

Unwanted mixing in the dosing line occurs if any possible backflow from the main line is not prevented.

Dosing valve (2.3)

Installation of the dosing valve prevents the liquid from the system to be treated being able to penetrate into the dosing line.

Pulsation damper (2.4)

Damping of the pulsation by installation of pulsation dampers if:

a low-pulsation delivery flow is desired for process reasons,
acceleration forces caused by the piping geometry must be removed.

Install pulsation damper as close as possible to the pump head.
If both pulsation damper and pressure-sustaining valve should be integrated, install the pressure-sustaining valve between pump and pulsation damper.

WARNING

Undamped acceleration forces can result in the following faults / damage:

flow rate fluctuations
dosing errors
pressure surges
valve shocks
increased wear on the suction and pressure sides of the pump
mechanical destruction of the pump
leaks and valve shocks if the permissible maximum pressure on the pump pressure side is exceeded
damage to the piping and its installed fittings

Diaphragm pressure-keeping valve (2.5)

If dosing into a main line with negative pressure ► install pressure-keeping valve in the dosing line.

ATTENTION

It must be ensured during the installation that excess delivery (due to positive pressure difference (≥ > 1 bar) between pressure and suction sides) is avoided.

Diaphragm relief valve (2.6)

If the permissible pressure in the system can be exceeded by closing any shut-off valve or by clogging of the line ► install diaphragm relief valve.

When using an external overflow valve, the following is applicable for the return line:

Route the return line sloping downward into the storage tank which is under atmospheric pressure or into an open drainage channel.
Or connect directly to the pump suction line, but only if there is no check valve in the suction line (e.g. foot valve of a suction lance).

ATTENTION

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

WARNING

An overpressure protection device (e.g. relief valve) must generally be provided if the permissible operating pressure can be exceeded.

ATTENTION

If the permissible operating pressure is exceeded and the pump is not equipped with overpressure protection, the pump will be damaged.

WARNING

The pumped medium can spray out if the pump is damaged.

Multifunction valve (2.7)

The multifunction valve provides the following functions:

pressure-keeping valve function,
overflow valve function,
pressure relief function,
venting.

The multifunction valve is mounted directly on the pump pressure port.

Flow meter (2.8)

For measurement and monitoring of the flow rate ► install flow meter.
The application range is restricted to media that are similar to water.
The flow meter is screwed upright on the pressure port of the pump and connected to the pump electronics via the input for flow monitoring.

Flow monitor (2.9)

To record the flow rate of the pump ► install flow monitor.
The application range is restricted to media that are similar to water.
The flow monitor is screwed upright on the suction port of the pump and connected to the pump electronics via the input for flow monitoring.

Operation in Ex-zone C409.2 / C410.2

WARNING

The pump with a control is only designed for operation outside Ex-zonest!

Operation in Ex-zone R/M 409.2 / R/M 410.2

WARNING

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.

WARNING

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.

WARNING

Avoid build up electrostatic conditions!

WARNING

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

Identification

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

II2G Ex h IIB T4 resp.
II2G Ex h IIC T4
(note special specifications in the confirmation of order.)

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.

WARNING

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.

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.

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.

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.

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.

WARNING

Formation of an explosive gas mixture must be prevented.

Temperature indications

Permissible ambient temperature: -10°C ≤ Ta ≤ +40°C

Maintenance

The maintenance notes listed in Chapter 10 are generally applicable. **Exception:**

ATTENTION

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

WARNING

Observe and follow the safety instructions by all means.
See the additional instructions „SAFETY INSTRUCTIONS“.
Man, machine and environment are endangered if the safety instructions are not observed.

Adequate fastening at the pump foot and compliance with the operating parameters specified in the technical data are required for the operation of the pump.

Checks before every start-up:

Check all connections for tightness.
Tighten fixing bolts of the pump body with the specified tightening torques (see „Overview of the tightening torques“ chapter).
Check of the electrical connections.
Check of the mains voltage on the rating plate with the local conditions.

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 and an installation site ► see chapter „TECHNICAL DATA“ .
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.

ELECTRICAL CONNECTIONS

NOTE

Operating voltage range see chapter „TECHNICAL DATA“.

NOTE

Pump without control:
Motor connection see chapter „Drive motor“ in the PRODUCT DESCRIPTION.

NOTE

Pump with a control:
Electrical iterfaces see the additional operation instructions for the CONTROL.

ATTENTION

Pump with a control:
The pump restarts in the selected operating mode with the specified parameters after switching on again or after restoration of the power supply following a power failure.

WARNING

Observe and follow the safety instructions by all means.
See the additional instructions „SAFETY INSTRUCTIONS“.
Man, machine and environment are endangered if the safety instructions are not observed.

Check the following at regular intervals:

Tight fit of piping.
Tight fit of pressure and suction valve.
Proper condition of the electrical connections.
Tight fit of the screws for fastening the pump body (check this at least every three months).
For the tightening torques of the mounting screws, please see Chapter „Overview of the tightening torques“.
Additionally with motor pumps: Check oil level regularly (oil eye).

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.

Oil change

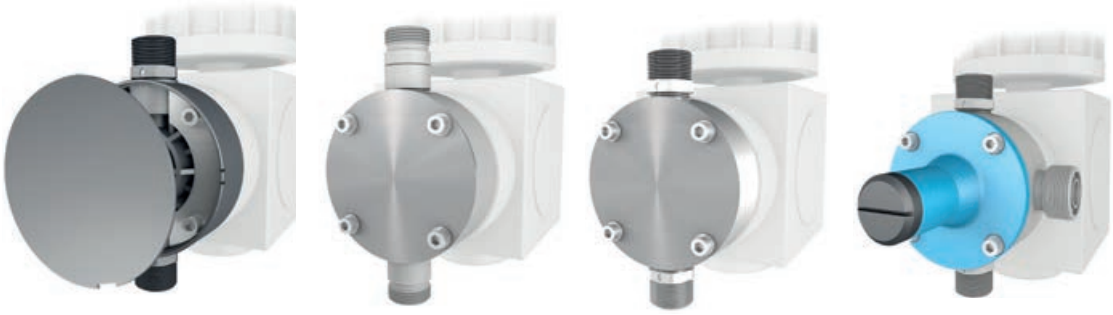
Check oil level at regular intervals (oil sight glass (**1**))

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.
Screw in venting screw (**5**).

Gear oil			
Pump type	Specification	sera use	Quantity (litres)
...409.2	CLP VG220 DIN51517-3	Castrol Alpha EP 220	0,3
...410.2	CLP VG220 DIN51517-3	Castrol Alpha EP 220	1,25

Overview of the tightening torques



	Pump body PP-FRP, PVDF-FRP	Pump body PVC	Pump body 1.4571	Pump body with integrated overflow valve
		Nm		
...409.2-1,6e	5,0	4,5	5,0	–
...409.2-2,4e	5,0	4,5	5,0	–
...409.2-7,0e	4,0	4,0	4,0	4,5
...409.2-12e	4,0	4,0	4,0	4,5
...409.2-18e	4,0	4,0	4,0	4,5
...409.2-25e	4,0	4,0	4,0	4,5
...409.2-50e	7,0	8,0	7,0	8,0
...409.2-75e	7,0	8,0	7,0	8,0
...409.2-90e	7,0	8,0	7,0	8,0
...409.2-115e	7,0	8,0	7,0	8,0
...409.2-140e	7,0	8,0	7,0	8,0
...409.2-180e	7,0	8,0	7,0	8,0
...409.2-250e *	15,0	15,0	15,0	15,0
...409.2-350e *	15,0	15,0	15,0	15,0

* Pump body PP/PVDF

	Pump body PP, PVDF	Pump body PVC	Pump body 1.4571	Pump body with integrated overflow valve
		Nm		
...410.2-200e	15,0	15,0	15,0	15,0
...410.2-280e	15,0	15,0	15,0	15,0
...410.2-450e	15,0	15,0	15,0	15,0
...410.2-570e	15,0	15,0	15,0	15,0
...410.2-700e	15,0	15,0	15,0	–
...410.2-900e	15,0	15,0	15,0	–
...410.2-1100e	15,0	15,0	15,0	–
...410.2-1450e	15,0	15,0	15,0	–

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.

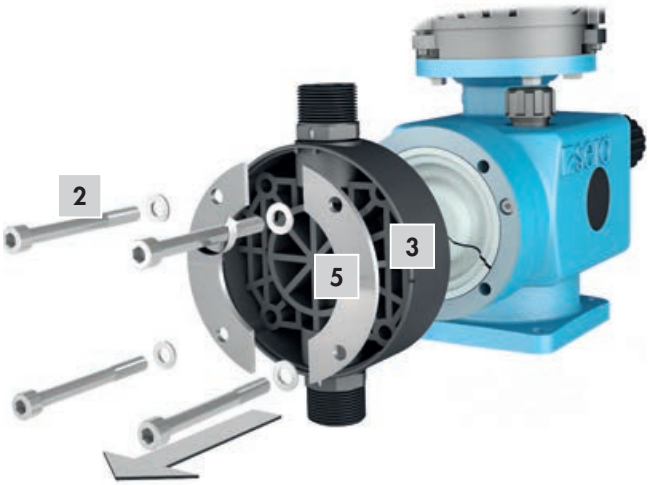
After 3000 operating hours or at the latest after one year, a service message requiring diaphragm replacement is shown on the graphical display of the pump with a control (see additional instructions of the control). An earlier diaphragm replacement can be necessary depending on the medium and the application area.

WARNING

Pump with a control:
Observe the instructions on the graphical display for the replacement of wear parts!

Set the stroke length adjustment to a stroke length of 0% (front position).
Remove cover plate (**1**) of the pump body (FRP design, ...409.2).

Loosen fixing bolts (**2**) on the pump body.
Remove pump body (3), front plate (**4**) (PVC design) or insertion plates (**5**) (FRP design, ...409.2) to the front.



Unscrew defective drive diaphragm (**6**) from the push rod (**7**).
Unscrew pressure plate (**8**) from the set screw of the dia-phragm (with EPDM, FPM drive diaphragm).

Clean pressure plate and screw plate on the new diaphragm.

Assemble the pump in reversed order:

Screw on new diaphragm hand-tight – the diaphragm must be in the middle position.
Set the stroke length to 50%.
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.
Observe tightening torques of the fixing bolts (**2**); see chapter „Overview of the tightening torques".
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.

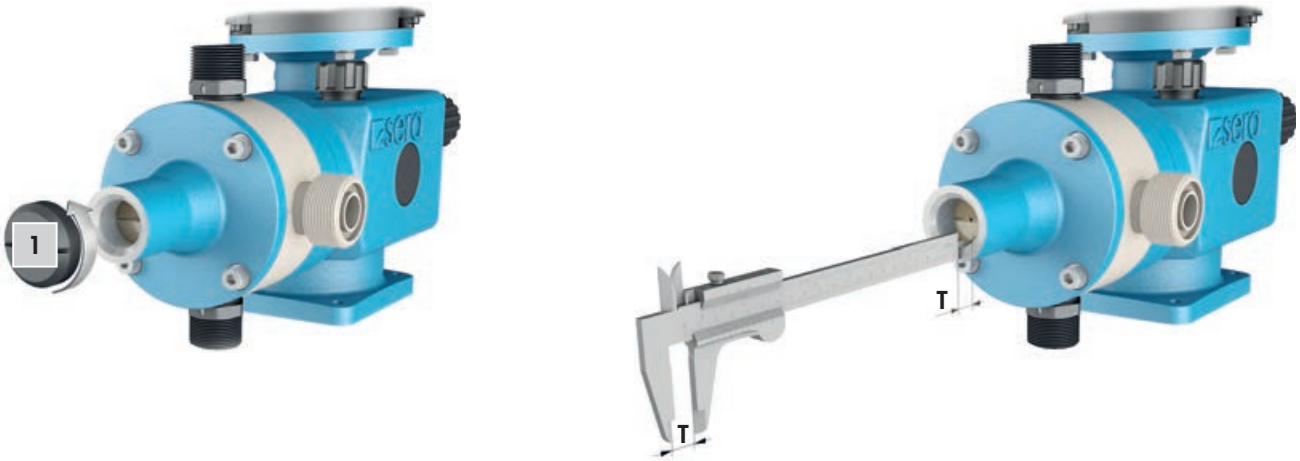
Overflow valve

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

NOTE

All diaphragms should be replaced completely.

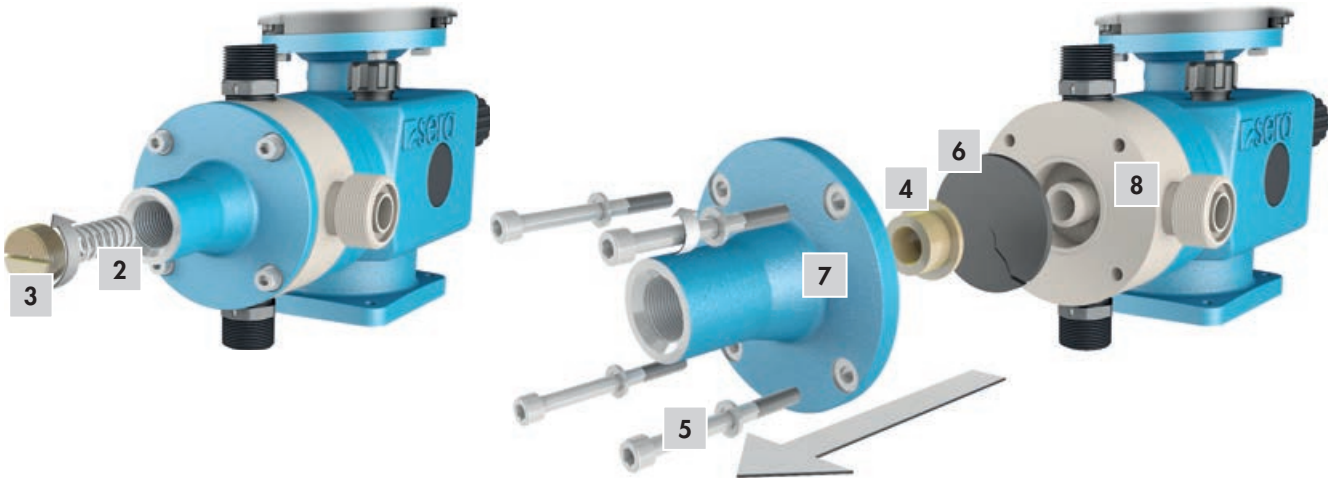
Loosen and unscrew the lid (**1**) of the overflow valve.



NOTE

Before the set screw is unscrewed the dimension **T** (dis-tance 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 NOTE! 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 NOTE! 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!

Spare and wearing parts

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

Drive diaphragm (diaphragm kit)
Diaphragm (diaphragm kit) ► diaphragm of the integrated overflow valve
Diaphragm rupture electrode
Valve kit (including O-ring kit)
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 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").

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

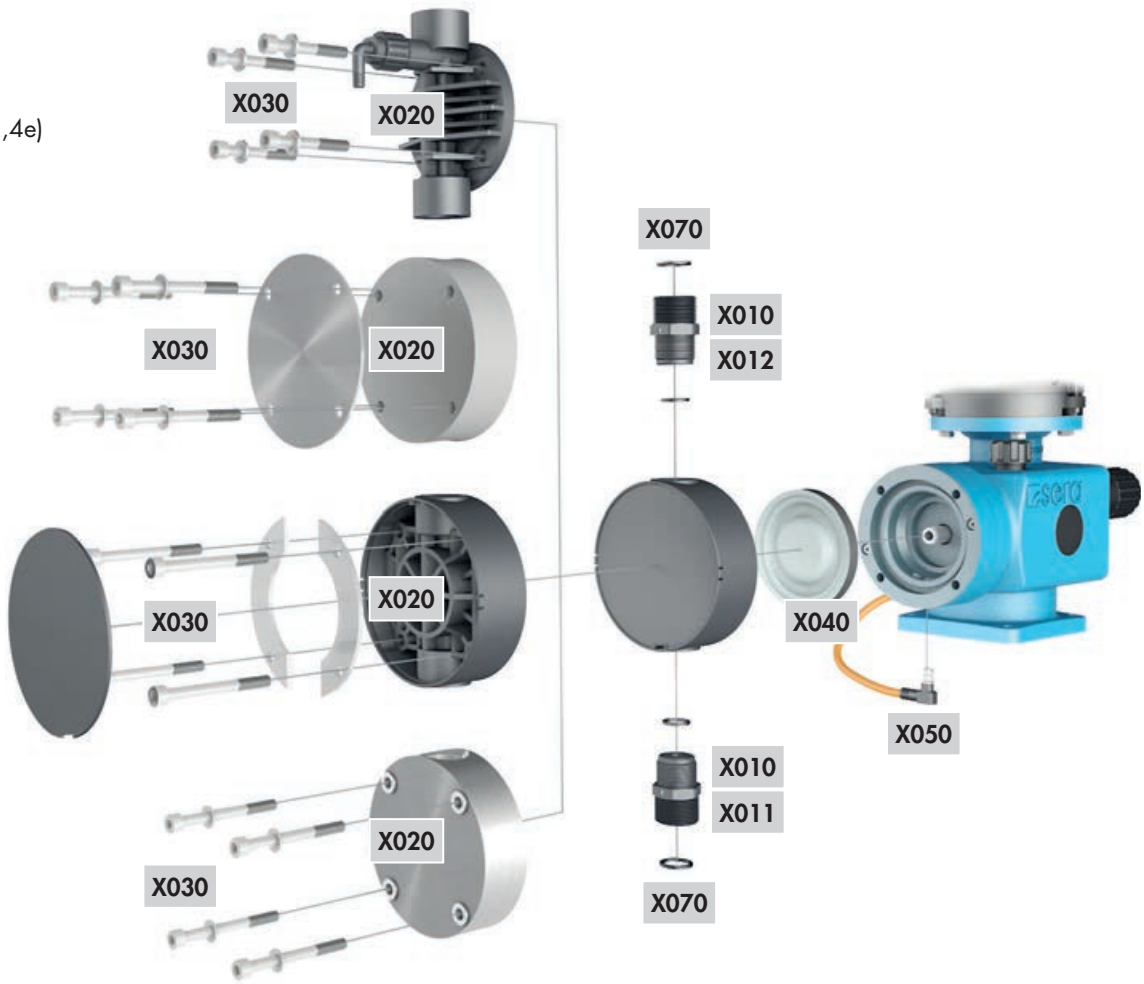
Pump body kit (including mounting kit)
Mounting kit
Cover kit ► pump with integrated overflow valve
Setting kit ► pump with integrated overflow valve

PP-, PVDF-GFK
(...409.2-1,6e, -2,4e)

PVC-U, PP, PVDF

PP-, PVDF-GFK

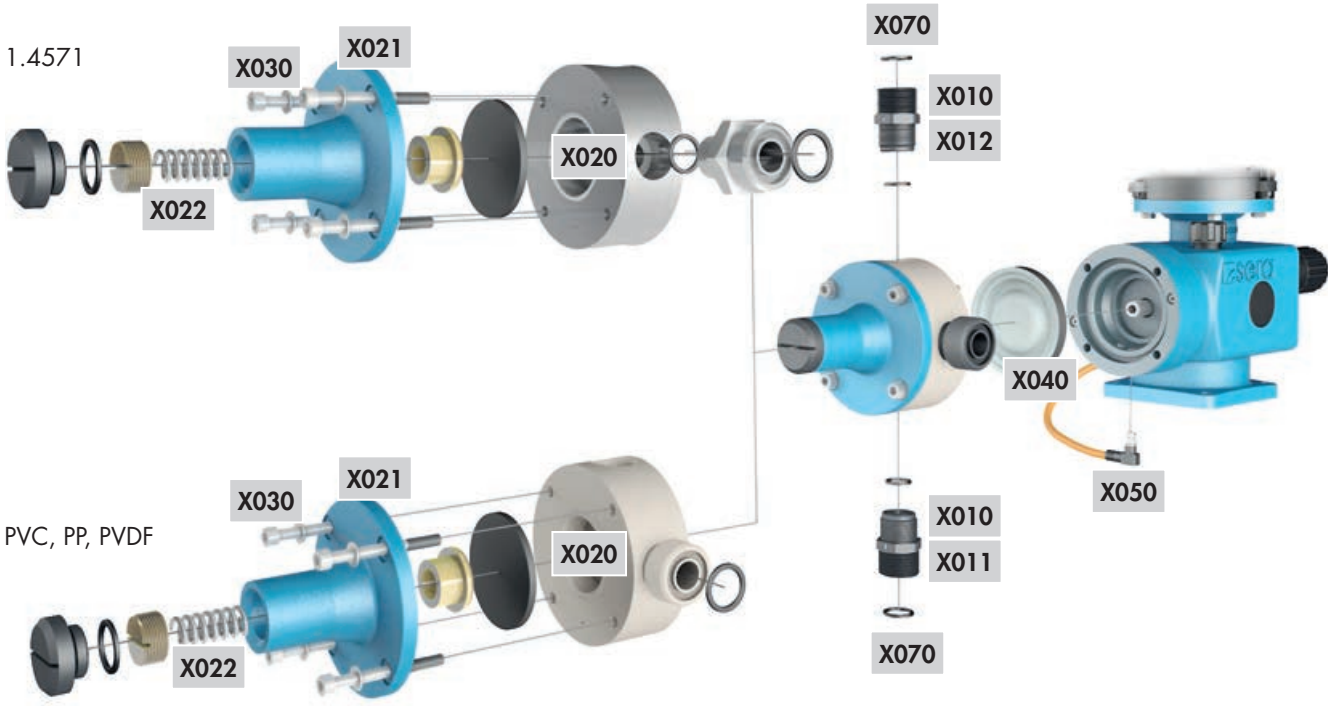
1.4571



Pos.	Kit	Materials	consisting of
X010	Valves	PVC-U PP-FRP PVDF-FRP	Suction valve Pressure valve O-ring kit
X011	Suction valve	1.4571	Suction valve O-ring kit
X012	Pressure valve	1.4571	Pressure valve O-ring kit
X020	Pump body	PVC-U PP PVDF	Pump body Front plate Mounting kit
X020	Pump body	PP-FRP PVDF-FRP	Pump body Cover plate * Insertion plates * Mounting kit
X020	Pump body	1.4571	Pump body Mounting kit
X030	Mounting		Screws, complete
X040	Diaphragm		Drive diaphragm Pressure plate (FPM-, EPDM-diaphragm)
X050	Diaphragm rupture electrode		Diaphragm rupture electrode
X070	O-rings		

* not at ... 409.2-1.6e; -2,4e

MAINTENANCE



Pos.	Kit	Materials	consisting of
X010	Valves	PVC-U PP-FRP PVDF-FRP	Suction valve Pressure valve O-ring kit
X011	Suction valve	1.4571	Suction valve O-ring kit
X012	Pressure valve	1.4571	Pressure valve O-ring kit
X020	Pump body	PVC PP PVDF	Pump body Mounting kit O-ring
X020	Pump body	1.4571	Pump body Mounting kit Socket O-rings
X021	Cover		Cover Lid O-ring
X022	Setting kit		Set screw Pressure spring Pressure disk
X030	Mounting		Screws, complete
X040	Diaphragm		Drive diaphragm Pressure plate (FPM-, EPDM-diaphragm) Diaphragm
X050	Diaphragm rupture electrode		Diaphragm rupture electrode
X070	O-rings		

sera products are sophisticated technical products which are only shipped after having been thoroughly tested and checked at our factory.
Should there be any faults, these can be detected and rectified easily and quickly based the instructions in the tables.

NOTE

Analysis of the error messages in the display for the pumps with a control ► see the operation instructions of the control!

Fault type															Possible cause	Corrective action
Corrective action!	Display, LED not lit! ▲ Pump with control	Motor does not start! ▲ diaphragm pump	Damage to stroke mechanism / drive!	Pump does not draw in!	Pump does not deliver!	Flow rate is not reached!	Delivery head is not reached!	Flow rate fluctuates!	Maximum permissible flow rate exceeded!	Pipe oscillates heavily!	Too high noise development!	Service life of the drive diaphragm too low!	Drive is overloaded (periodically occurring noises)!	Leakage on pump head!		
				■	■	■									Suction height too high.	Reduce suction height or suction resistance.
				■	■	■		■							Suction pipe leaking.	Check seals, tighten pipe connections.
				■	■							■	■	■	Shut-off valves in piping closed.	Open shut-off valves or check opening state ► check pump for possible damage.
				■	■	■									No pumped medium in storage tank.	Fill storage tank.
				■	■	■	■	■							Pump valves leaking.	Remove and clean valves.
				■	■		■	■							Pump valves (ball seats) damaged.	Remove and clean valves, check function; replace valves if necessary.
				■	■										Pump valves incorrectly mounted or valve balls missing.	Check installation position and completeness ► replace missing parts or install correctly.
				■	■	■		■							Filter in suction line clogged.	Clean filter.
				■	■	■	■	■					■		Electrical data of the pump do not match mains data.	Check order data. Check electrical installation. Adjust motor to the network on site (for diaphragm pumps).
					■	■	■	■		■		■	■	■	Backpressure too high.	Measure pressure with manometer directly above pressure valve if possible and compare with permissible backpressure.
				■	■	■	■	■							Foreign matter in the pump valves.	Remove and clean valves.
								■	■						Pressure on suction side higher than at the end of the pressure pipe.	Check geodetic conditions, install float valve or pressure keeping valve if necessary.
						■	■	■		■	■	■	■	■	Acceleration height too high due to pipe geometry.	Check acceleration height on suction and pressure sides with manometer and compare with design data ► install a pulsation damper if necessary.
												■		■	Materials coming into contact with the medium not suitable for the pumped medium.	Check whether the pumped medium matches the design data and select other materials if necessary.

FAULT ANALYSIS / CORRECTIVE ACTION

Fault type															Possible cause	Corrective action
Corrective action!	Display, LED not lit! ▲ Pump with control	Motor does not start! ▲ diaphragm pump	Damage to stroke mechanism / drive!	Pump does not draw in!	Pump does not deliver!	Flow rate is not reached!	Delivery head is not reached!	Flow rate fluctuates!	Maximum permissible flow rate exceeded!	Pipe oscillates heavily!	Too high noise development!	Service life of the drive diaphragm too low!	Drive is overloaded (periodically occurring noises)!	Leakage on pump head!		
				■		■	■	■							Viscosity of the pumped medium too high.	Check viscosity of the pumped medium and compare with design data ► reduce concentration or increase temperature if necessary.
					■	■		■							Pumped medium is outgassing in the suction pipe and/or the pump body.	Check geodetic conditions and compare with data of the pumped medium. Operate pump with suction side supply, reduce temperature of the pumped medium.
				■											Air in suction line while pressure is present on the pressure side.	Vent pressure side.
	■														Power supply failed / switched off.	Restore power supply.
				■	■	■	■	■							Pipe connections leaking.	Tighten connections according to type of material. Be careful with plastic ► risk of fracture!!
				■	■										Pumped medium frozen in pipe.	PRemove pump and check for possible damage - increase temperature of the pumped medium.
■	■				■										No mains power connection.	Connect mains power supply.
				■											Pump valves dry.	Moisten pump body and valves. Open vent valve.
				■	■	■								■	Temperature too low.	Check flowability of the dosing medium. Temperature of the medium see „Technical data“.
				■	■	■	■	■				■		■	Diaphragm rupture.	Replace the diaphragm according to the descriptions in Chapter „Replacing the diaphragm“.
■															Reversible thermal fuse of the pump has tripped.	Let temperature of the pump cool down. Check ambient temperature.
	■														Fuse in electronics blown. ► Pump with control	Return pump for repair.
				■	■	■	■								Compensating valve not adjusted to operating conditions. ► diaphragm pump KM	Set compensating valve according to operating conditions. ► diaphragm pump KM

WARNING

Observe and follow the safety instructions by all means.
See the additional instructions „SAFETY INSTRUCTIONS“.
Man, machine and environment are endangered if the safety instructions are not observed.

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.

Disposal

Shut-down system. Please see “Shut-down“.

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

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!

CLEARANCE CERTIFICATE

NOTE

Inspection / repair of machines and machine parts is only carried out after the 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.

DOWNLOAD

Clearance certificate form

Or directly scan
the QR code opposite:

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