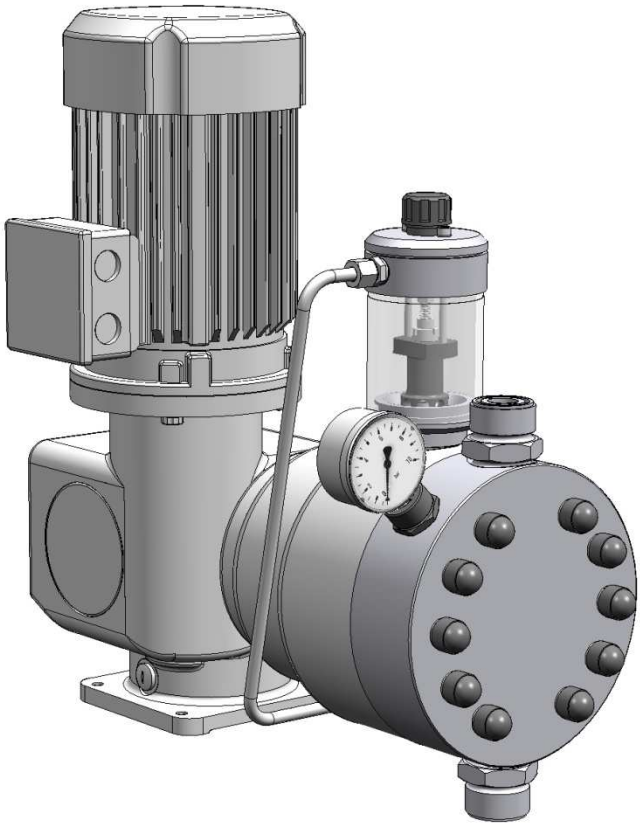
Operating instructions

Product: **Piston diaphragm pump**

Type: **M… R… RF…**

...410.2 – 30 KM
...410.2 – 38 KM
...410.2 – 60 KM
...410.2 – 76 KM
...410.2 – 120 KM
...410.2 – 150 KM
...410.2 – 250 KM
...410.2 – 310 KM
...410.2 – 400 KM
...410.2 – 510 KM
...410.2 – 700 KM
...410.2 – 850 KM



Please state here the exact type and serial number of your pump. (can be read off the type plate on the pump)
Type:
Serial-No.:
These data are important in case of queries or for ordering spare and wearing parts and must absolutely be stated.

Manufacturer:

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

CAUTION !

Keep the operating instructions for future application!

TA 445-02 en / 14.12.10 / ak
Subject to technical modifications!

Operating instructions

Table of contents:

Operating instructions

1 General

Before commissioning and during operation of the **sera** piston diaphragm pumps the respective regulations valid at the place of installation are to be adhered to.

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

2 Types

2.1 Type designation

Example:

Piston diaphragm pump, type **R 410.2 - 30 KM**

R	410.2	30	KM

Information for adjustment

M not controllable
R manually controllable (stroke length adjustment)
F with three phase AC motor, suitable for frequency converter operation

(**RF** combination possible!)

R	**410.2**	30	KM

Indication of model range/stroke mechanism

R	410.2	30	KM

Indication of nominal delivery rate

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

R	410.2	30	KM

Indication of the execution of the pump

KM Designed as piston diaphragm pump

2.2 Type plate

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

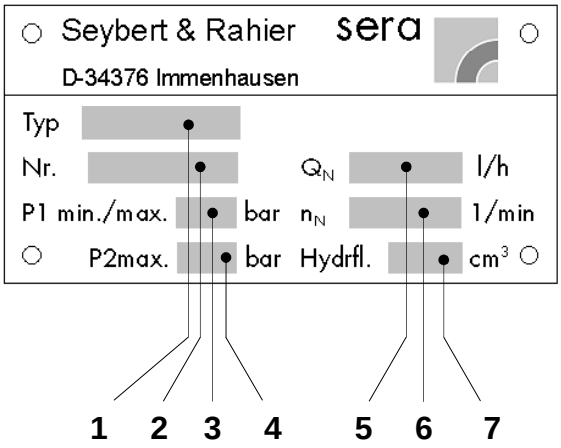


Fig. 01 Type plate

Explanation of the indications on the type plate		
1	Type	**Pump type**
2	No.	**Serial number of the pump**
3	P_1min/max [bar]	**Minimum/maximum permissible pressure in the pump inlet** Minimum/maximum permissible pressure in the inlet cross section which the pump is applicable for. Please consider that the pressure depends on rotation speed, delivery rate, temperature and static pressure at inlet.
4	P_2max [bar]	**Maximum permissible pressure in the pump outlet** Maximum permissible pressure in the outlet cross section which the pump is applicable for. Please consider that the pressure depends on rotation speed, delivery rate, temperature and static pressure at outlet.
5	Q_N l/h	**Nominal delivery rate** Delivery rate which the pump was ordered for, based on the nominal rotation speed n_N, the nominal delivery height $p_2$max. and the pumped medium stated in the supply contract.
6	n_N 1/min	**Nominal stroke frequency** Stroke frequency which the pump has been designed for
7	Hydrfl. [cm³]	**Hydraulic fluid** Quantity of Hydraulic fluid

Table 01 Designation type plate

2.3 Materials

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

2.4 Viscosity, pumped medium

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

2.5 Dosing range

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

2.6 Noise measurement

The sound pressure level measured according to DIN 45635 of the piston diaphragm pumps is between 50 and 60 dB (A).

3 Safety instructions

CAUTION !

If the pump is operated in explosion-hazardous areas the instructions given in chapter 9 are to be observed!

3.1 Quality instructions

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

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

The **sera** quality management and quality assurance system for pumps, systems, valves and fittings and compressors is certified according to ISO 9001:2008.
The **sera** piston diaphragm pump meets the valid safety and accident prevention regulations.

CAUTION !

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

CAUTION !

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

3.2 Marking of notes

3.2.1 Marking of notes in these operating instructions

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

(safety symbol in compliance with DIN 4844 – W9)

The safety sign appears in the following cases:

- If improper observance or non-observance of the operating manual, work instructions, specified operating procedures and similar can lead to personal injury or accidents.
- If improper observance or non-observance of the operating manual, work instructions, specified operating procedures and similar can lead to damage to property.
- Due to danger of causticization personnel must wear protective clothing (safety goggles, safety gloves and safety apron) for maintenance and repair work on parts which come into contact with hazardous products or for changing the containers.

3.2.2 Marking of notes on the product

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

3.3 Personnel qualification and training

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

3.4 Dangers in case of inobservance of the safety instructions

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

Inobservance of the safety instructions may lead to:

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

3.5 Safety conscious working

The safety instructions specified in this operating manual, the national regulations for accident prevention, the safety regulations for the pumped medium valid at the place of installation as well as internal working-, operating-, and safety instructions of the owner are to be observed.

3.6 Safety instructions for owner / operator

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

Danger caused by electrical energy is to be avoided.

3.7 Safety instructions for maintenance, servicing and installation work

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

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

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

3.8 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 authorization of the manufacturer or spare parts are used which are not approved, any warranty claim becomes null and void.

3.9 Improper operations

Operating safety of the supplied piston diaphgram pump is only guaranteed if the product is used as intended, according to the descriptions in Chapter 3.10 of these operating instructions.

3.10 Intended use

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

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

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

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

3.11 Personal protection for maintenance and service

In order to avoid risks to health, the provisions of the German Ordinance on Hazardous Substances (GefStoffV) (§14 Safety Data 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.

CAUTION !

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

CAUTION !

Personal protective equipment must be provided by the owner!

3.12 Utilities

If not agreed otherwise in the contract conditions, the **sera** - piston diaphragm pump will always be supplied with the necessary utilities.
(For type and quantitiy of utilities/lubricants, see Chapter 11)

4 Transport and intermediate storage

4.1 General

sera – products are checked for perfect condition and function previous to shipment.
Check for transport damage immediately after arrival of goods. If damage is found, this is to be reported immediately to the responsible carrier and the manufacturer.

CAUTION !

The packaging material must be disposed of appropriately!

4.2 Transport

Select a hoist which is adapted to the weight of the pump and attach it to the motor flange of the pump (see Fig. 02).

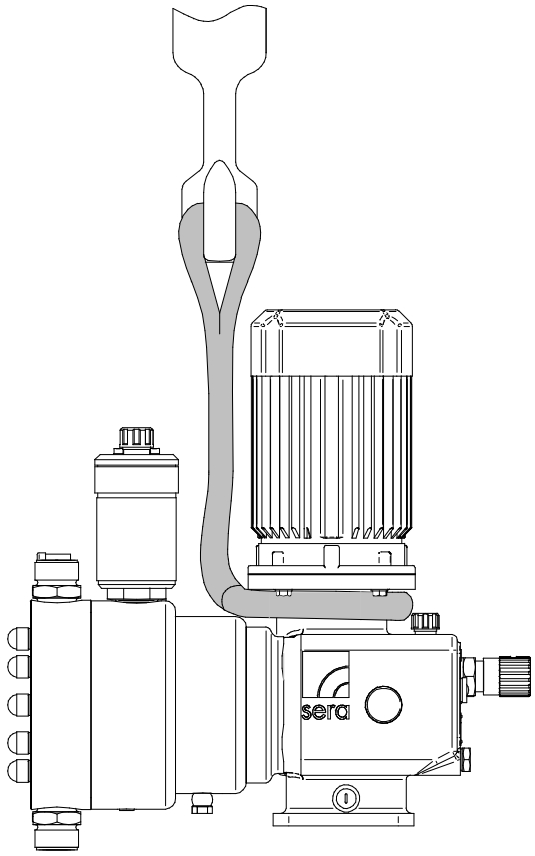


Fig. 02 Transport/Handling

4.3 Storage

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

Proper storage increases the service life of the piston disphragm pump 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 +2℃ and +40℃
- 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.

5 Assembly groups of the piston diaphragm pump

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

- Stroke mechanism with drive
- Stroke length adjustment
- Assembly pump
- Pump body
- Valves

Optional accessories:

- Stroke frequency transmitter
- Actuator

nicht dargestellt:

- Actuator for explosion-hazardous area
- EExeIIT4 - motor
- Drive motor with frequency converter

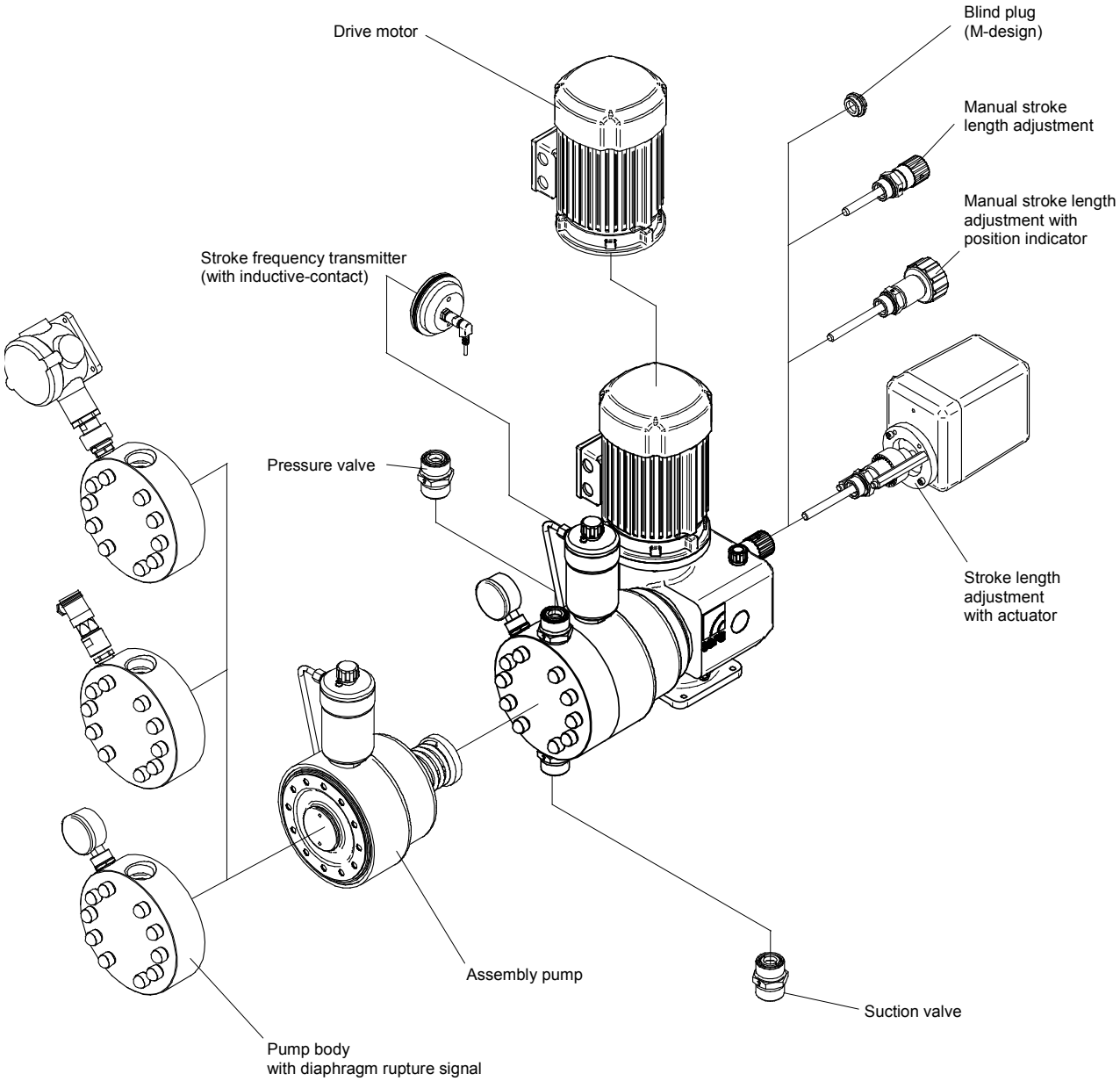


Fig. 03 Overview of assemblies

6 Technical Data

6.1 Dimensions

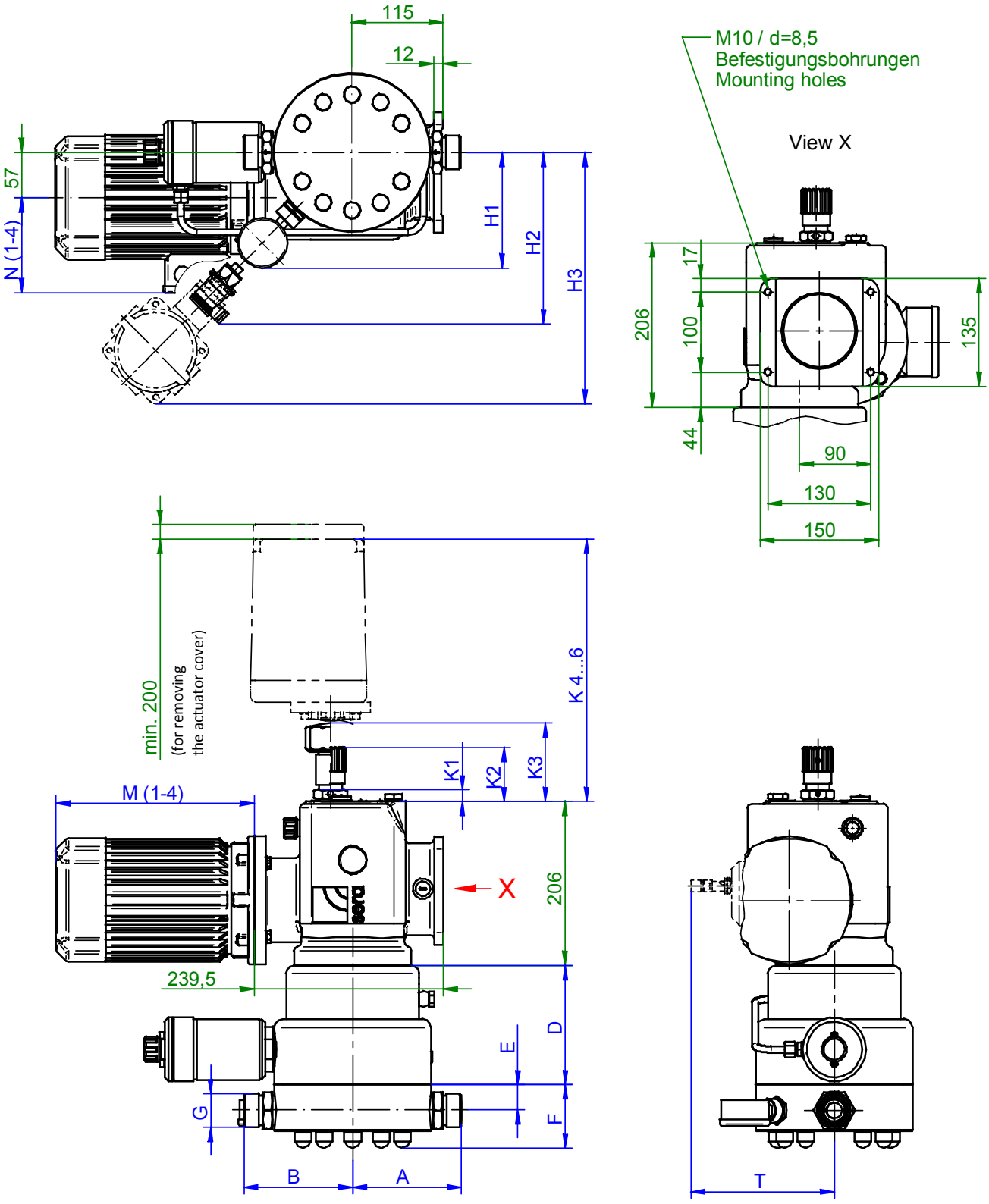


Fig. 04 Dimensions

Operating instructions

Tab. 02
Dimensions

All dimensions in mm!

			Pump type (KM, Piston Diaphragm pump)																	
			R 410.2 - 30 KM	R 410.2 - 38 KM	R 410.2 - 60 KM	R 410.2 - 76 KM	R 410.2 - 120 KM		R 410.2 - 150 KM		R 410.2 - 250 KM		R 410.2 - 310 KM		R 410.2 - 400 KM		R 410.2 - 510 KM		R 410.2 - 700 KM	R 410.2 - 850 KM
Valves	**G**	Screw-in thread Suction-/pressure valve	G¾	G¾	G¾	G¾	G1¼	G1	G1¼	G1	G1¼	G1	G1¼	G1	G1¼	G1	G1¼	G1	G1¼	G1¼
	DN	Nominal diameter	8	8	8	8	20	15	20	15	20	15	20	15	20	15	20	15	20	20
	A	Single valves PVC-U	97	97	97	97	---	132	---	132	---	132	---	132	---	132	---	132	172	172
		Single valves 1.4571/1.4581	---	---	---	---	138	---	138	---	138	---	138	---	138	---	138	---	162	162
		Double valves 1.4571/1.4581	95	95	95	95	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Single valves PP- FRP, PVDF- FRP	---	---	94	94	138	---	138	---	138	---	138	---	138	---	138	---	162	162
		Double valves PP- FRP, PVDF- FRP	94	94	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	B	Single valves PVC	104	104	104	104	---	151	---	151	---	151	---	151	---	151	---	151	192	192
		Single valves 1.4571/1.4581	---	---	---	---	138	---	138	---	138	---	138	---	138	---	138	---	162	162
		Double valves 1.4571/1.4581	95	95	95	95	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Single valves PP- FRP, PVDF- FRP	---	---	94	94	138	---	138	---	138	---	138	---	138	---	138	---	162	162
		Double valves PP- FRP, PVDF- FRP	94	94	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	D	Built-in pump	143	143	143	143	149		149		149		149		149		149		157	157
Pump body (PK)	**E**	Centre screw-in thread of valves	27	27	27	27	44		44		44		44		44		44		49	49
	F	PK special steel (without front plate)	58	58	58	58	80		80		80		80		80		80		96	96
		PK plastic (with front plate)	67	67	67	67	99		99		99		99		99		99		117	117
	H_1	MBE Manometer	141	141	141	141	163		163		163		163		163		163		179	179
	H_2	MBE Pressure switch	92	92	92	92	112		112		112		112		112		112		138	138
	H_3	MBE Pressure switch (Ex)	155	155	155	155	172		172		172		172		172		172		200	200
Stroke length adjustment (HLV)	**K_1**	Blind flange for execution without HLV	14	14	14	14	14		14		14		14		14		14		14	14
	K_2	Manual stroke length adjustment (max.)	79	79	79	79	79		79		79		79		79		79		100	100
	K_3	Manual HLV with position indicator	110	110	110	110	110		110		110		110		110		110		115	115
	K_4	Electric servo motor	260	260	260	260	260		260		260		260		260		260		260	260
	K_5	Electric servo motor with PMR3	340	340	340	340	340		340		340		340		340		340		340	340
	K_6	Electric servo motor, explosion-hazardous des.	430	430	430	430	430		430		430		430		430		430		430	430
Drive motor	**M_1**	Standard motor	255	255	255	255	295		295		295		295		295		295		295	295
	N_1		135	135	135	135	145		145		145		145		145		145		145	145
	M_2	Motor for frequency converter operation	255	255	295	295	295		295		295		295		295		295		295	295
	N_2		135	135	145	145	145		145		145		145		145		145		145	145
	M_3	AC motor	257	257	257	257	341		341		341		341		341		341		341	341
	N_3		120	120	120	120	127		127		127		127		127		127		127	127
	M_4	EExeIIT4 - motor	209	209	247	247	247		247		247		247		247		247		247	247
	N_4		142	142	142	142	142		142		142		142		142		142		142	142
Option	**T**	Stroke frequency transmitter	181	181	181	181	181		181		181		181		181		181		181	181
Stroke mechanism		Amongst others dimensions for fastening the pump	See Fig. 04																	

6.1.1 Output data

Type	Nominal capacity (2) adjustable by changing lift of strokes		Maximum permissible pressure in the pump outlet	Min./max. permissible pressure in the pump inlet	Max. suction height	Inlet / outlet nominal width	Nominal stroke frequency	
	Q_N l/h		p_2 max.	p_1 min. / max.	WC	DN	min $^{-1}$	
	50 Hz	60 Hz	bar	bar	m	mm	50 Hz	60 Hz
...410.2 – 30 KM	0-30	0-36	10 (3) 80	-0,2/0	2	8	76	92
...410.2 – 38 KM	0-38	0-45	10 (3) 80	-0,2/0	2	8	97	116
...410.2 – 60 KM	0-60	0-72	10 (3) 70	-0,2/0	2	8	76	92
...410.2 – 76 KM	0-76	0-90	10 (3) 70	-0,2/0	2	15	97	116
...410.2 – 120 KM	0-120	0-144	10 (3) 40	-0,3/0	3	15	76	92
...410.2 – 150 KM	0-150	0-180	10 (3) 40	-0,3/0	3	15	97	116
...410.2 – 250 KM	0-250	0-300	10 (3) 20	-0,3/0	3	15	76	92
...410.2 – 310 KM	0-310	0-372	10 (3) 20	-0,3/0	3	15	97	116
...410.2 – 400 KM	0-400	0-480	10 (3) 14	-0,3/0	3	15	76	92
...410.2 – 510 KM	0-510	---	10 (3) 14	-0,3/0	3	15	97	116
...410.2 – 700 KM	0-700	---	10 (3) 11	-0,3/0	3	20	97	116
...410.2 – 850 KM	0-850	0-1020	8	-0,3/0	3	20	76	92

Tab. 03 Output data

(1) Achievable height with media similar to water and filled suction line
(2) Linear dosing range between 20 and 100% stroke length
(3) Maximum pressure for pump bodies made of plastics

6.2 Motor data

6.2.1 Motor data size 80

Motor type	Motor data								
	Power	Motor speed		Mains frequency	Voltage range	Rated current	Protection rating	Thermal class	ATEX design
	[kW]	[min^{-1}]		[Hz]	[Volt]	[A]	[IP]		
		50 Hz	60 Hz		50 Hz / 60 Hz	50 Hz / 60 Hz			
Standard motor	0,75	~1400	~1700	50/60	**PAY ATTENTION TO THE TYPE PLATE !** The data can be read off the type plate on the drive motor of the respective diaphragm pump !		55	F	---
Motor for FU-operation	0,75	~1400	~1700	50/60			55	F	---
AC motor	0,75	~1500	---	50			55	F	---
EExeIIT4- motor	0,55	~1400	---	50			55	F	II2G EExe IIT4
EExdeIIT4-motor (flameproof enclosure)	0,75	~1400	---	50			55	F	II2G EExde IIT4

Tab. 04 Motor data (R410.2-30KM until R410.2-76KM, size 80)

6.2.2 Motor data size 90

Motor type	Motor data								
	Power	Motor speed		Mains frequency	Voltage range	Rated current	Protection rating	Thermal class	ATEX design
	[kW]	[min^{-1}]		[Hz]	[Volt]	[A]	[IP]		
		50 Hz	60 Hz		50 Hz / 60 Hz	50 Hz / 60 Hz			
Standard motor	1,5	~1400	~1700	50/60	**PAY ATTENTION TO THE TYPE PLATE !** The data can be read off the type plate on the drive motor of the respective diaphragm pump !		55	F	---
Motor for FU-operation	1,1	~1400	~1700	50/60			55	F	---
AC motor	0,75	~1500	---	50			55	F	---
EExeIIT4- motor	1,1	~1400	---	50			55	F	II2G EExe IIT4
EExdeIIT4-motor (flameproof enclosure)	1,1	~1400	---	50			55	F	II2G EExde IIT4

Tab. 05 Motor data (R410.2-120KM until R410.2-850KM. size 90)

7 Functional description

7.1 General

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

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

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

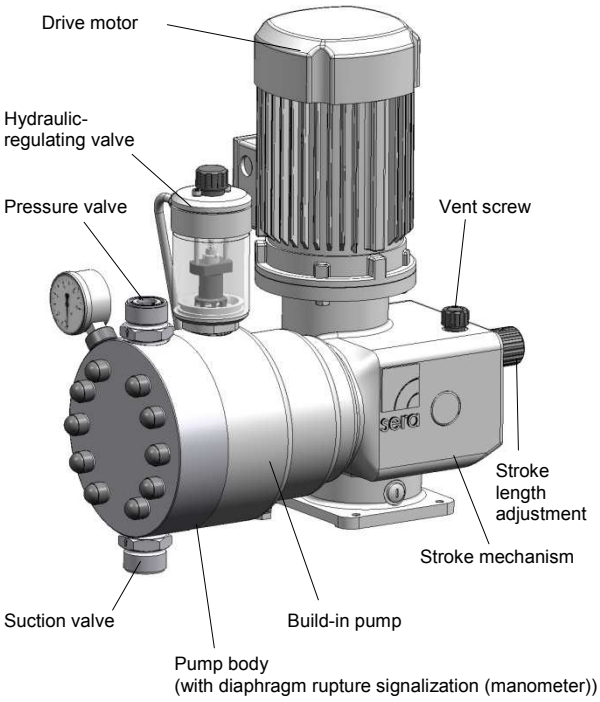


Fig. 05 Assembly groups

7.2 Assembly groups of the piston diaphragm pumps

7.2.1 Stroke mechanism

Function

Piston diaphragm pumps of this type series use a rotary cam drive to transmit the rotation of the drive motor to the displacement body.
In case of the rotary cam drive, the eccentric provides the pressure stroke while the suction stroke is performed by a pressure spring (return spring).
The effective stroke length can be changed by means of an adjustable scale knob which prevents the connecting rod from following the rotary cam up to the rear dead centre during suction stroke (see stroke length adjustment).

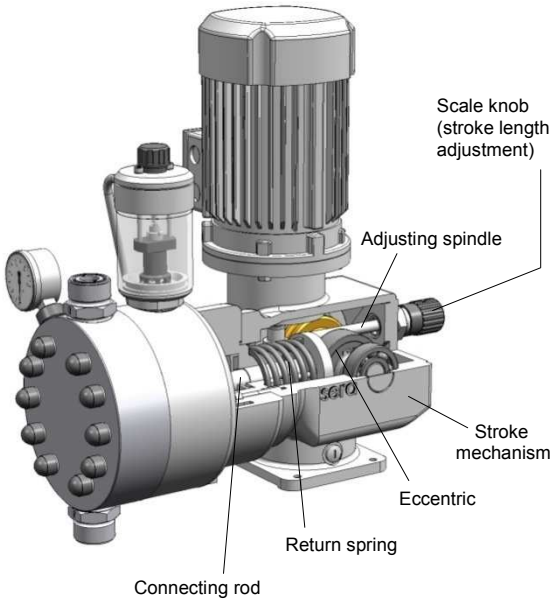


Fig. 06 Stroke mechanism

7.2.2 Stroke length adjustment

General

The delivery rate of the pump is set by changing the stroke length. The stroke length is infinitely variable between 20% and 100%.
A linear dosing behaviour is achieved with stroke length adjustments between 20% and 100%.

7.2.2.1 Manual stroke length adjustment (standard)

The effective stroke length of the connecting rod is changed by turning the scale knob.
The stroke length can be adjusted both during operation and standstill of the pump (depressurized condition).
The set stroke length can be read off a scale, e.g. 75% (see Fig. 07).
With the 20-steps adjustment on the scale knob, the stroke length can be set individually with a tolerance of 0.5%.

Turning counter-clockwise (see Figb. 07) ➔ the effective stroke length increases, the delivery rate increases.

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

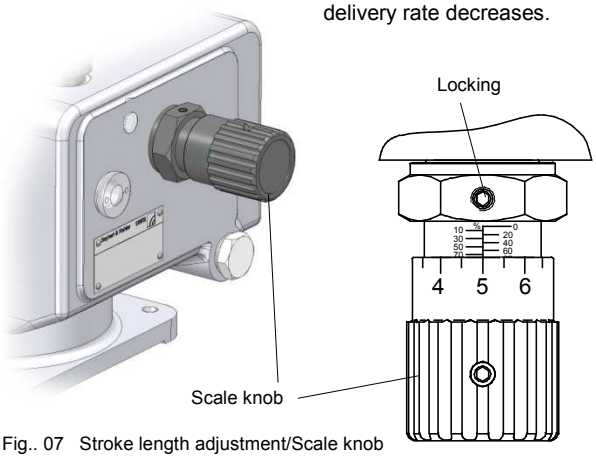


Fig.. 07 Stroke length adjustment/Scale knob

CAUTION !

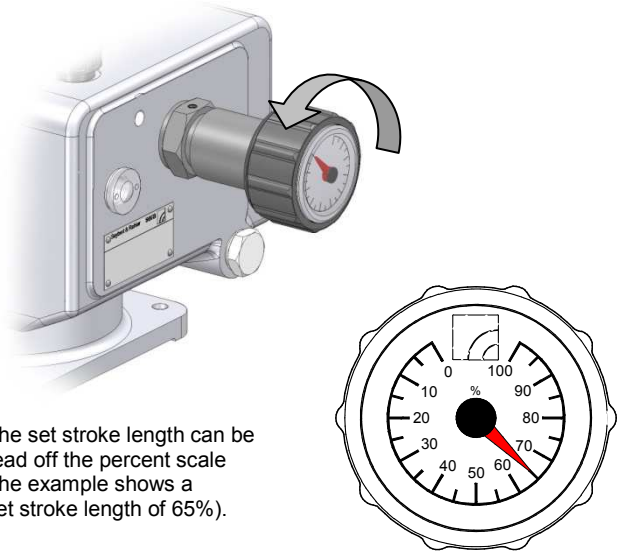
**The locking (see Fig. 07 and 09) is to be released (using a spanner SW3) before the stroke length is changed.
Then the locking must be tightened again. This ensures that the set stroke length does not change during operation.**

7.2.2.2 Manual stroke length adjustment by a dial scale with indication of percent

The stroke length is adjusted by turning the hand wheel. The stroke length can be adjusted both during operation and standstill (in unpressurized condition) of the pump.

Turning counter-clockwise (see Fig. 08) ➔ the effective stroke length increases, the delivery rate increases.

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



The set stroke length can be read off the percent scale (the example shows a set stroke length of 65%).

Fig. 08 Stroke length adjustment with position indicator

In delivery state, the stroke length adjustment is factory set to 50%.

CAUTION !

**The dial scale with indication of percent may become misadjusted during transport.
If the indicator does not match the 50% setting, then the percent scale must be re-adjusted during operation (!) of the pump!**

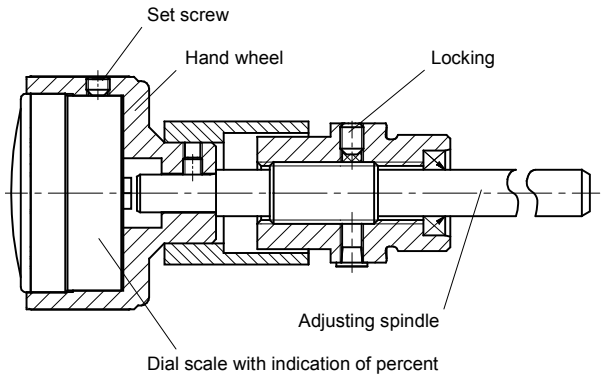


Fig. 09 Stroke length adjustment with position indicator

Adjusting the percent scale:

- Switch on the piston diaphragm pump
- Loosen setscrew
- Remove percent scale from the hand wheel
- Manually turn the percent scale to 0% setting
- Loosen the locking
- Use the hand wheel to set the stroke length to 0%. Turn hand wheel clockwise until there is no further stroke movement (connecting rod does no longer hit the adjusting spindle)
- Insert percent scale again
- Use the setscrew to secure the percent scale to the hand wheel
- Adjust desired stroke length
- Tighten the locking

7.2.2.3 Automatic stroke length adjustment by means of an electrical actuator

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

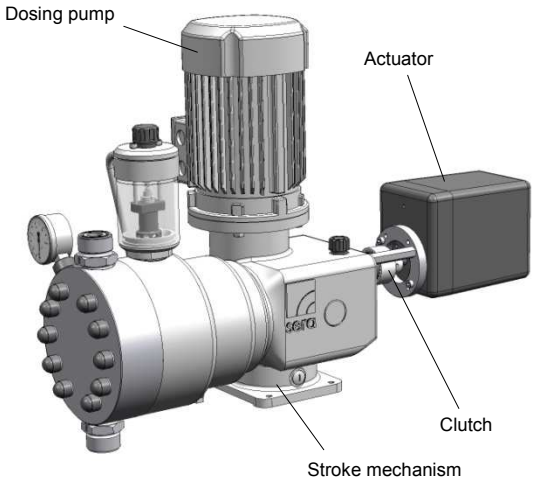


Fig. 10 Stroke length adjustment by electrical actuator

In case of dosing pumps with electrical actuator, a manual adjustment of the stroke length on the pump is no longer possible.
(Exception: actuator with hand wheel)

The actuator is equipped with two integrated limit switches as well as a position potentiometer for position feedback as standard.
Both limit switches are factory set so that the drive will switch off at a stroke length of 0% and 100%, even if a control voltage is applied.
This guarantees that adjustments can only be made within the permissible range. The position potentiometer is driven by a safety clutch which prevents damage caused by incorrectly adjusted limit switches.
Activation is performed by appropriate control units
(see **sera** - accessories)
The set stroke length can be read off on the pump (percent scale).
Information on the electrical connection is given inside the cover of the actuator.

CAUTION !

The adjustment is only possible when the pump is running.

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

same as Chapter 7.2.2.3, additionally:

- PMR3 positioner

This PMR3 positioner which is integrated in the actuator allows an actuator setting from 0…100% that is proportional to the connected input signal.
As an option, the actuator can also be provided with a collective fault signal.
Information on the electrical connection is given inside the cover of the actuator.

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

Pay attention to the documents attached to the actuator.

7.2.3 Assembly pump

Function

The stroke movement of the mechanically linked piston is transferred hydromechanically to the intermediate diaphragm and thus to the pumped medium.
The multi-layer diaphragm touches the spherical cap (pump body or diaphragm ring) when the pressure stroke finishes in the front dead centre.
The compensating valve ensures an optimum quantity of hydraulic fluid between diaphragm and piston.
The so-called blow valve and the hydraulic discharge valve are the most important components of the compensating valve. Both valves are spring-loaded and can be adjusted according to the operating conditions (see Chapter 10.4.4.).
Minimum quantities of fluid may leak on the piston which are compensated for by the adjustable blow valve at each suction stroke.
The leaking fluids are returned to the store tank via a return pipe (see Fig. 12).

CAUTION !

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

Thus, the system is closed and no more hydraulic fluid may leak out; during normal operation there is no need to replenish hydraulic fluid.
The blow valve always sucks in a greater quantity of hydraulic fluid than is leaking out at the piston during each suction stroke.
The excess quantity is returned into the store tank via the hydraulic discharge valve at the end of a pressure stroke when the diaphragm touches the calotte.

If a stop valve is closed in the pressure pipe during operation of the pump, the complete stroke volume of hydraulic fluid is returned into the store tank to protect the pump from overload.
If the pressure in the pressure pipe falls below the set pressure of the hydraulic discharge valve, the blow valve sucks in hydraulic fluid until the optimum volume has been reached.
This process can take up to several minutes, depending on the operating conditions.

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

CAUTION !

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

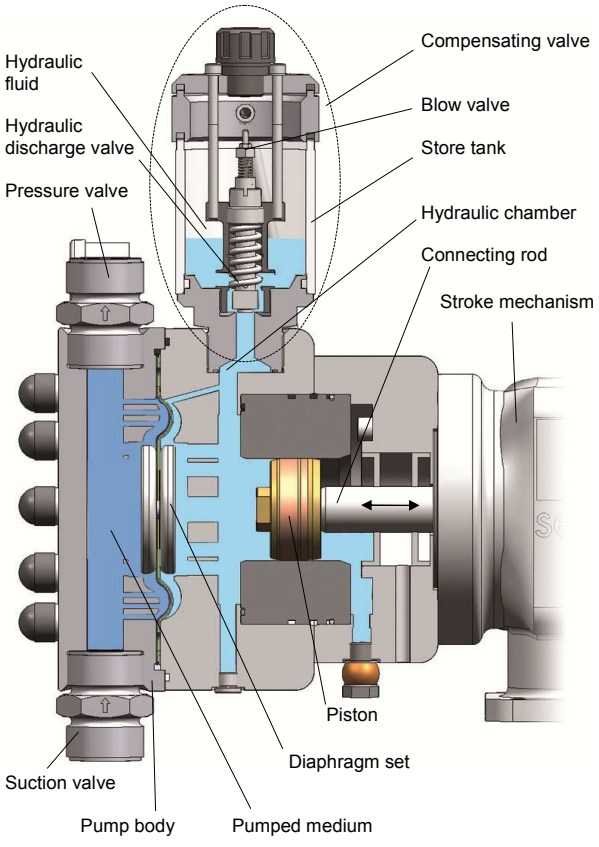


Fig. 11 Functional principle of the piston diaphragm pump

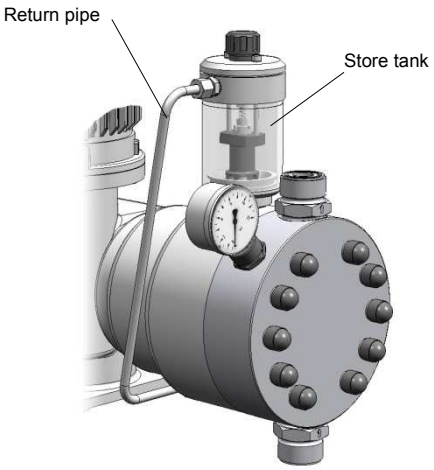


Fig.12 Return pipe

7.2.3.1 Multi-layer Diaphragm

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

- Working diaphragm
- Signal diaphragm
- Protection diaphragm

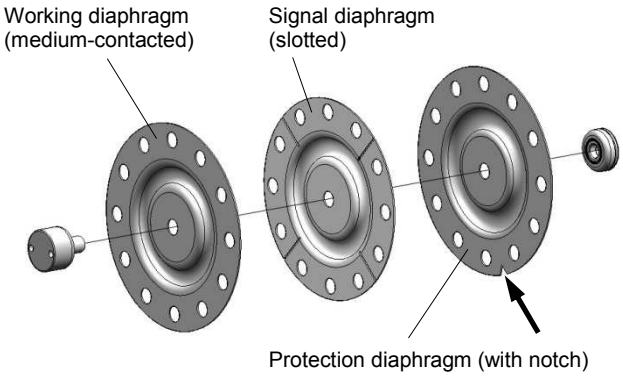


Fig. 13 Assembly of multi-layer diaphragm

The notch of the protection diaphragm indicates the correct mounting position changing the diaphragm set (see Chapter. 10.4)

7.2.4 Pump body

Depending on the applied counterpressure, movements of the plastic pump body in elastic materials are possible.

This does not affect the pumps's durability or operating safety

7.2.5 Suction-/Pressure valve

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

When replacing the valves it is important to check the flow direction (see Fig. 14).

CAUTION!

Pressure valve above; Suction valve below !

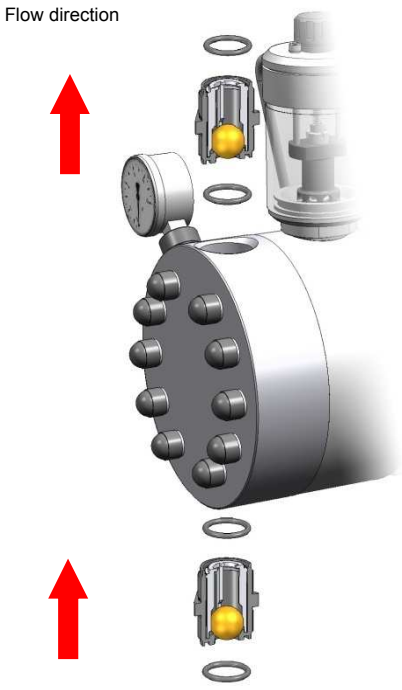


Fig. 14 Mounting position of valves, flow direction

7.2.6 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) is added to the pump and reports each single pump stroke to the evaluation unit (e.g. preselection counter, SPC-control unit, etc.)

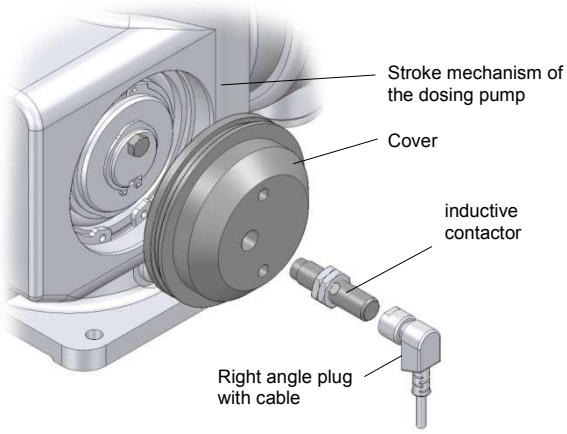
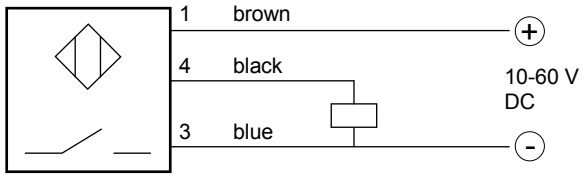


Fig. 15 Stroke frequency transmitter

Technical data

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

Wiring diagram



CAUTION !

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

CAUTION !

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

7.2.7 Diaphragm rupture monitoring

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

CAUTION!

For more detailed information about the indicators of the diaphragm rupture monitoring, please see Kap. 15!

7.2.7.1 Visual diaphragm rupture monitoring by manometer (only local signalling)

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

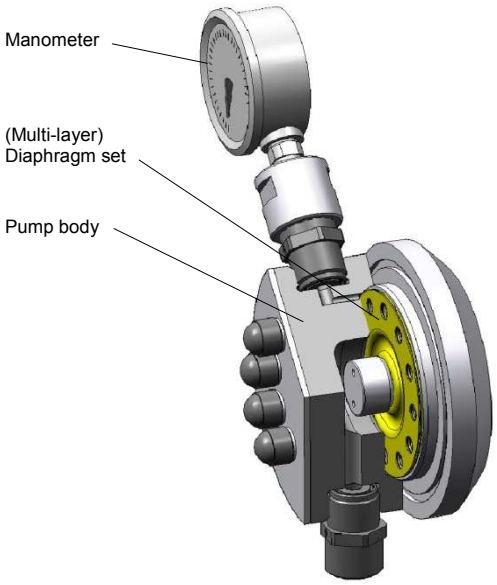


Fig.16 Diaphragm rupture monitoring by manometer

CAUTION!

If the pump is operated with a backpressure that is only slightly higher than the permissible minimum pressure of p_2=1bar, then the deflection of the pointer on the manometer will also be slight!

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

7.2.7.2 Diaphragm rupture monitoring by Pressure switch

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

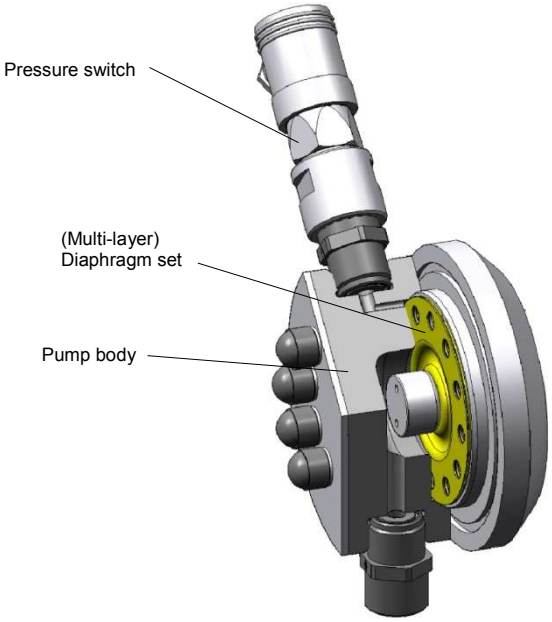


Fig. 17 Diaphragm rupture monitoring by pressure switch

7.2.7.3 Diaphragm rupture monitoring by Pressure switch (Ex-Area)

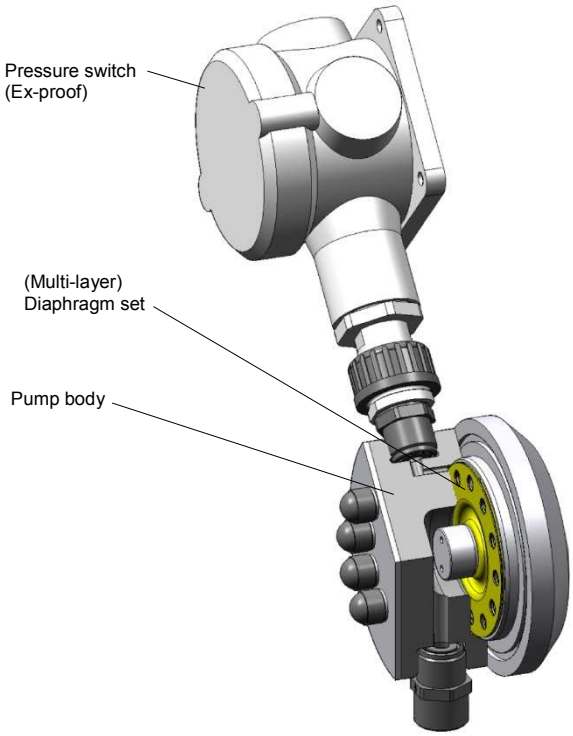


Fig.18 Diaphragm rupture monitoring by pressure switch (Ex)

CAUTION!

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!

7.3 Driving motor

sera - piston diaphragm pumps are driven either by a three-phase motor or an AC motor.

7.3.1 Motor connection (standard)

In case of a three-phase motor

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

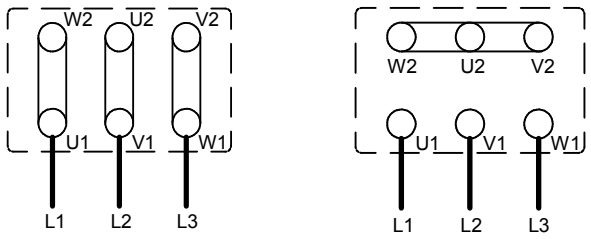


Fig. 19 Circuit diagram(s) three-phase motor

Example:

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

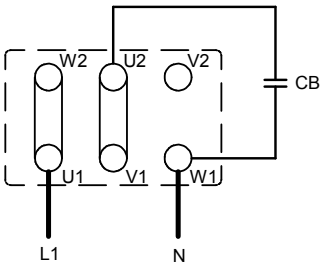


Fig. 20 Circuit diagram AC-motor

7.3.2 Direction of rotation

The direction of rotation of the drive motor is arbitrary.

7.3.3 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.

7.3.4 Start-up

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℃ 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.

CAUTION !

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

7.3.5 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!

7.3.6 Maintenance of the 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.

7.3.7 Restart

Restart the system as described in Chapter 7.3.4 after maintenance work of after longer periods of standstill.

8 Installation

CAUTION!

In case of operation in explosion-hazardous areas, the instructions in Chapter 9 must also be followed!

8.1 Installation instructions

- The standard model of the pump is only approved for installation in dry rooms in a non-aggressive atmosphere, at temperatures between +2℃ and +40℃ and at permi t-ted humidity until approx. 90%. (For operation in explosion-harzardous areas, see Chapter 9).
- For dimensions of the pump connections and fixing holes, see Fig. 04, Table 02.
- 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, indicator scale and visual diaphragm rupture signalling must be easily accessible and readable.
- Design the nominal diameters of the downstream pipes and of the connections built into the system to be the same size or larger than the inlet / outlet nominal widths of the pump valves.
- To check the pressure ratios in the pipe system, we recommend to provide for connections for pressure gauges (e.g. manometers) near the suction and pressure attachments.
- Provide evacuation fittings
- Prior to connecting the pipes, remove the plastic caps on the suction and pressure attachments of the pump.
- Check that the fixing screws for the pump body are tightly fitted and, if necessary, retighten.

Torque for tightening the fixing screws	
Pump type	**Torque** (Nm)
...410.2 – 30 KM	15
...410.2 – 38 KM	15
...410.2 – 60 KM	15
...410.2 – 76 KM	15
...410.2 – 120 KM	15
...410.2 – 150 KM	15
...410.2 – 250 KM	15
...410.2 – 310 KM	15
...410.2 – 400 KM	15
...410.2 – 510 KM	15
...410.2 – 700 KM	25
...410.2 – 850 KM	25

Tab.06 Torque for tightening

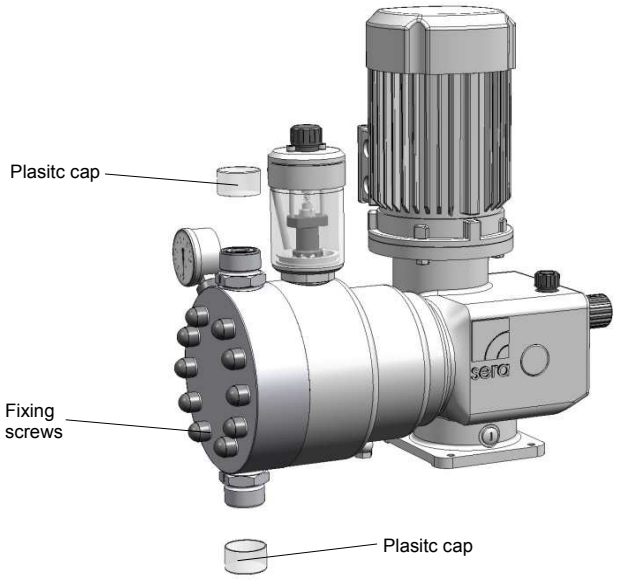


Fig. 21 Piston diaphragm pump with plastic caps

- For models with a built-on actuator, ensure sufficient space for removal of the cover (see Chapter 6.1 “Dimensions“)
- Connect pipes to the pump in such a way that there are no forces acting on the pump, such as e.g. misalignment, weight or stress of the pipe.
- Keep the suction lines as short as possible.
- Use pressure- and medium-resistant hoses / pipes.
- All pipes and containers connected to the pump must comply with the regulations and must be cleaned, tension-free and intact.
- Exchange the plug in the compensating valve for the vent screw in the bag.
- Keep the adjusting key (included in the delivery scope) in close proximity to the pump.

CAUTION !

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

CAUTION !

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

CAUTION !

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

In order to avoid cavitation, overloading and excessive delivery, the following points should be noted:

- avoid high suction heights
- keep pipes as short as possible
- choose sufficiently large nominal diameters
- avoid unnecessary choke points
- install a pulsation damper
- install a pressure relief
- install a pressure keeping valve, if necessary
- in the case of degassing media, provide for a supply

CAUTION !

The operator must take suitable precautions on the supply side (collecting tray) to ensure that the container does not run dry in the event of a diaphragm rupture.

8.1.1 Provide for an overpressure protection

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

- install the overflow valve

When using an external relief valve the following is valid for the feed back pipe:

- lead the overflow line with descending gradient in the store tank which is under atmospheric pressure or in an open drain gutter (see Fig. 22)
- or connect the overflow line directly to the pump suction line, but only if there is no check valve inside the suction line (e.g. foot valve of a suction lance) (see Fig. 23).

The hydraulic discharge valve installed in the pump protects the pump from overload. Under certain circumstances an external discharge- or safety valve mounted on the pump pressure side is not required.
In general, however, an external overpressure protection should be provided.

CAUTION !

<u>Do not</u> connect shut-off valves when the pump is operating.

CAUTION !

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

CAUTION !

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

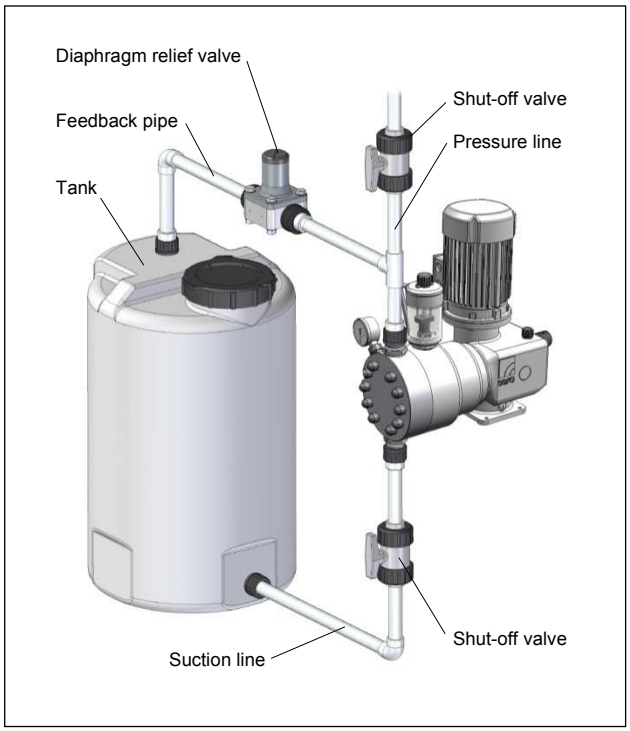


Fig. 22 Installation with (external) relief valve

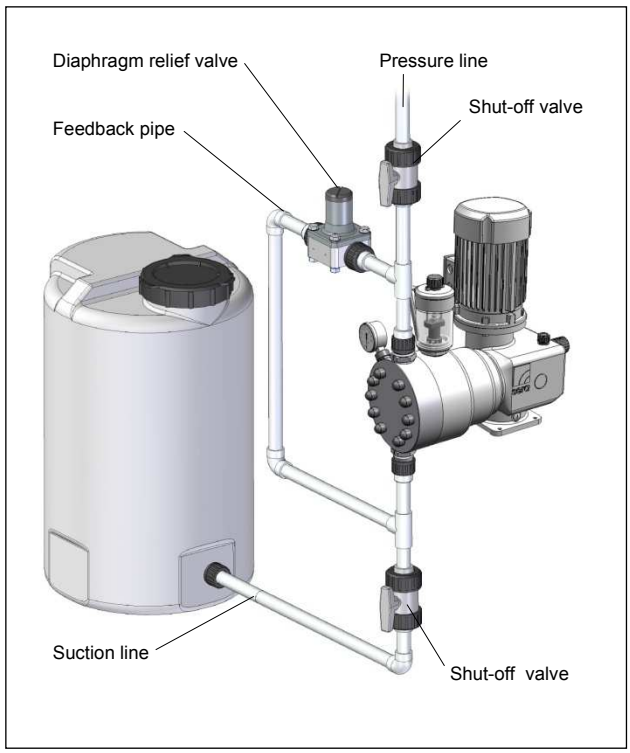


Fig. 23 Installation with (external) relief valve

8.1.2 Preventing a backflow of the pumped medium

If the dosing line is linked with a main line:

- install an injection fitting (dosing valve).

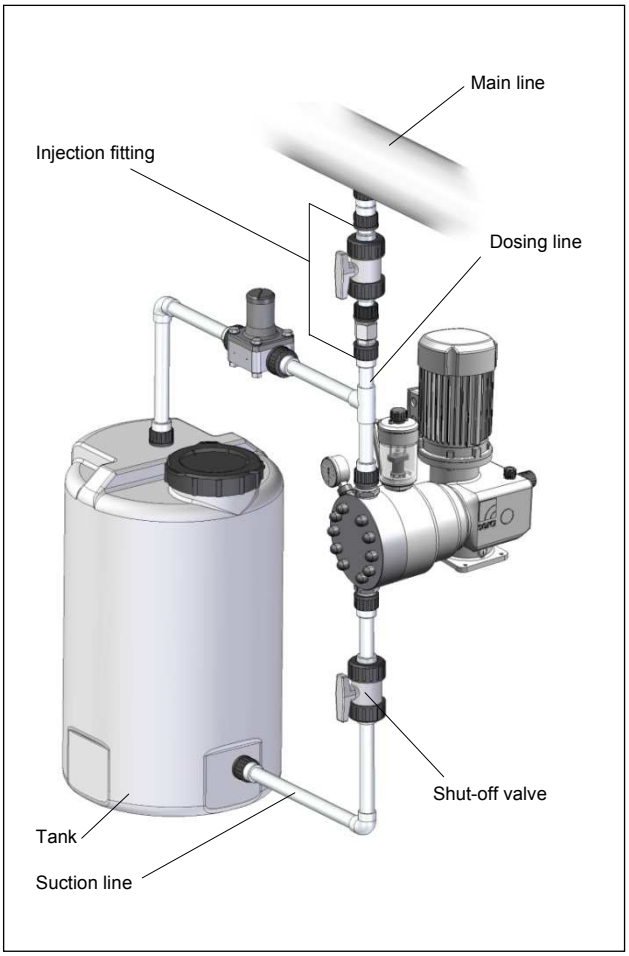


Fig. 24 Installation of an injection fitting

CAUTION !

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

CAUTION !

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

8.1.3 Eliminating undesired siphoning

When dosing into a main line with negative pressure:

- install a pressure keeping valve into the dosing line.

CAUTION !

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

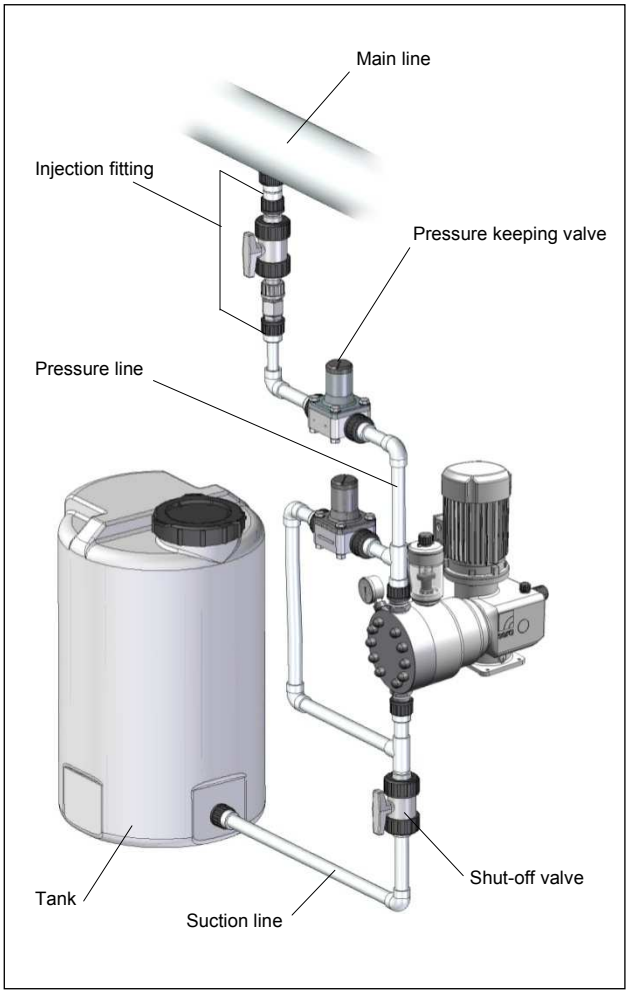


Fig. 25 Installation of a pressure keeping valve

8.1.4 How to ensure suction free from air

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

- install a vent valve into the pressure line.

CAUTION !

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

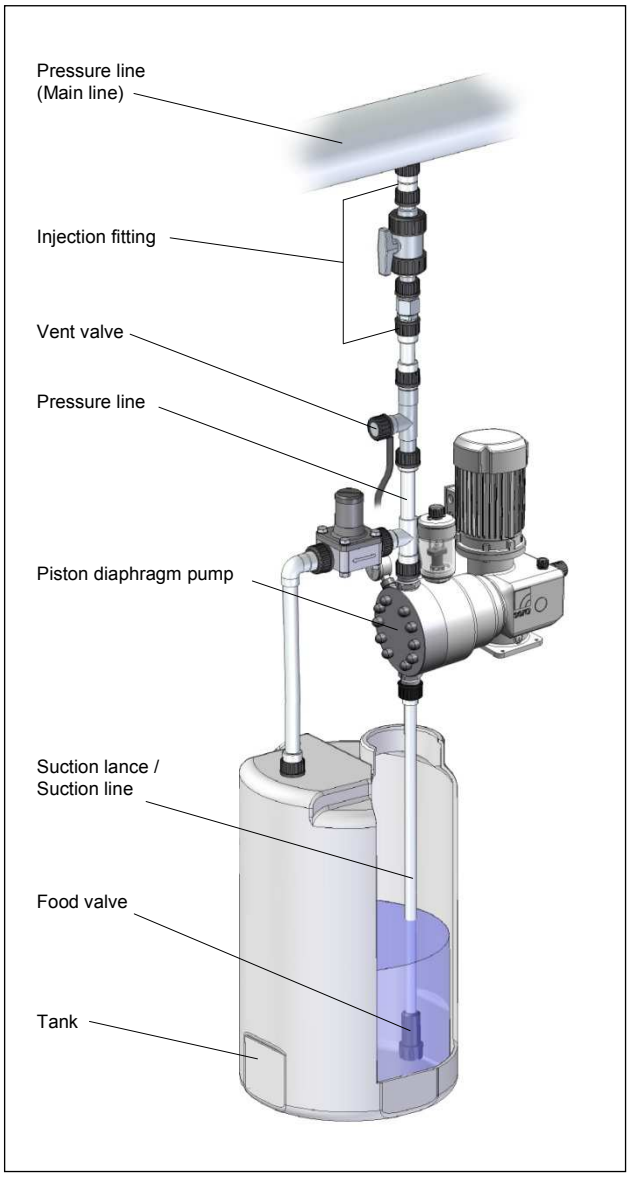


Fig. 26 Installation of a vent valve

8.1.5 Install the empty-tank alarm

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

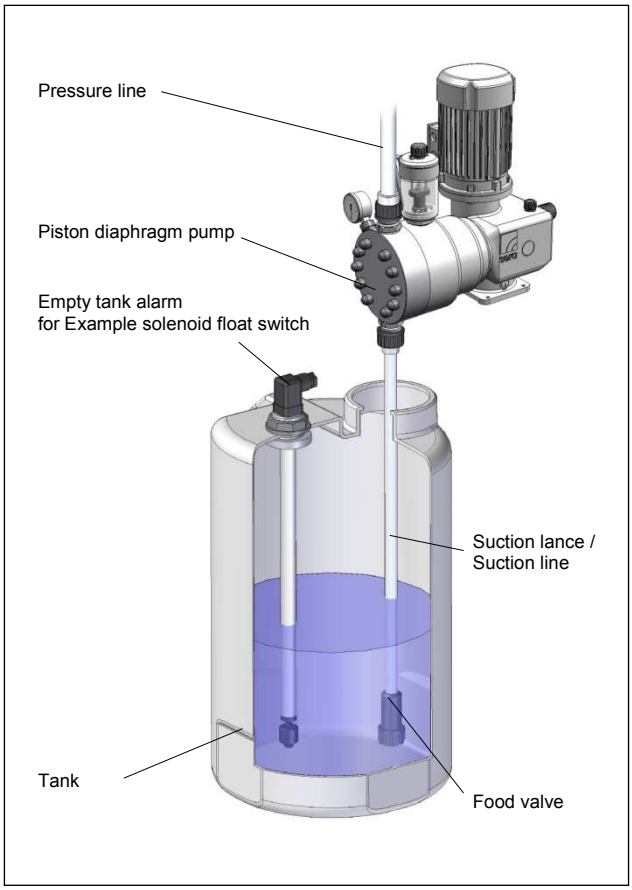


Fig. 27 Installation of the empty-tank alarm

CAUTION !

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

8.1.6 How to avoid an emptying of the suction line

- Install a foot valve at the end of the suction line

Based on calculations, the dimension '**H**' may not exceed the number that is equal to the specified maximum suction height of the pump divided by the density of the pumped medium and in consideration of mass acceleration and viscosity of the medium.

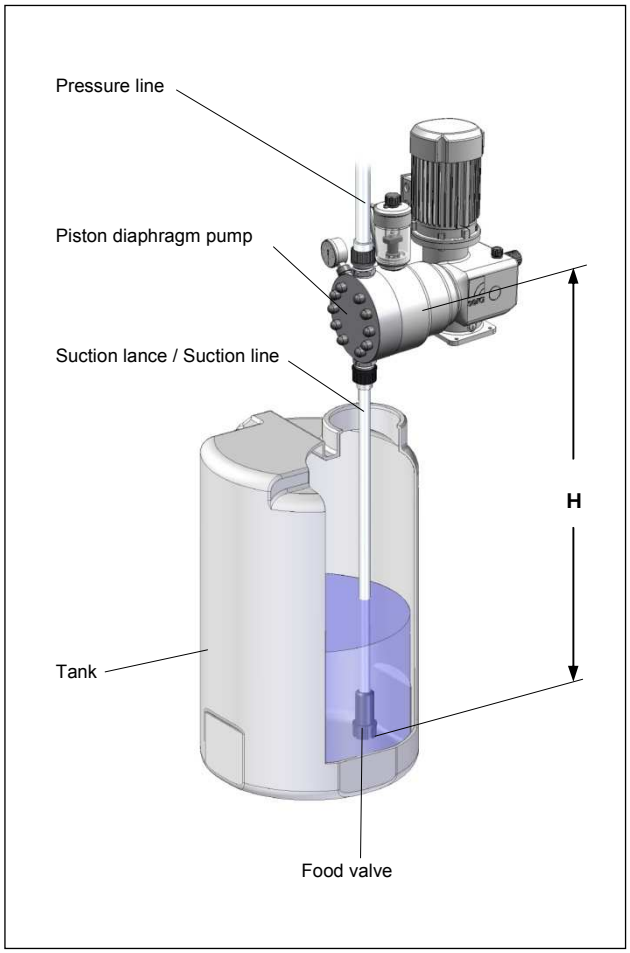


Fig. 28 How to avoid emptying of the suction line

8.1.7 Line strainer

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

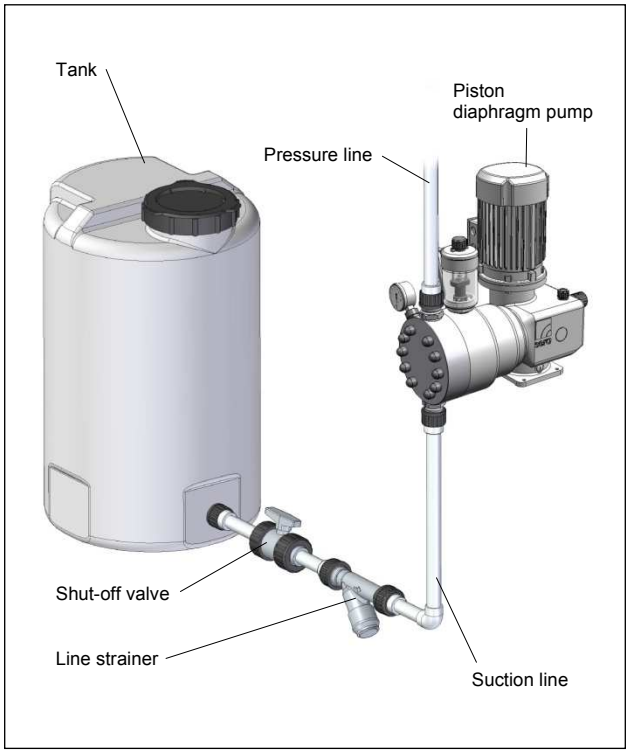


Fig. 29 Installation of a line strainer

CAUTION !

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

8.1.8 Suction via a siphon vessel

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

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

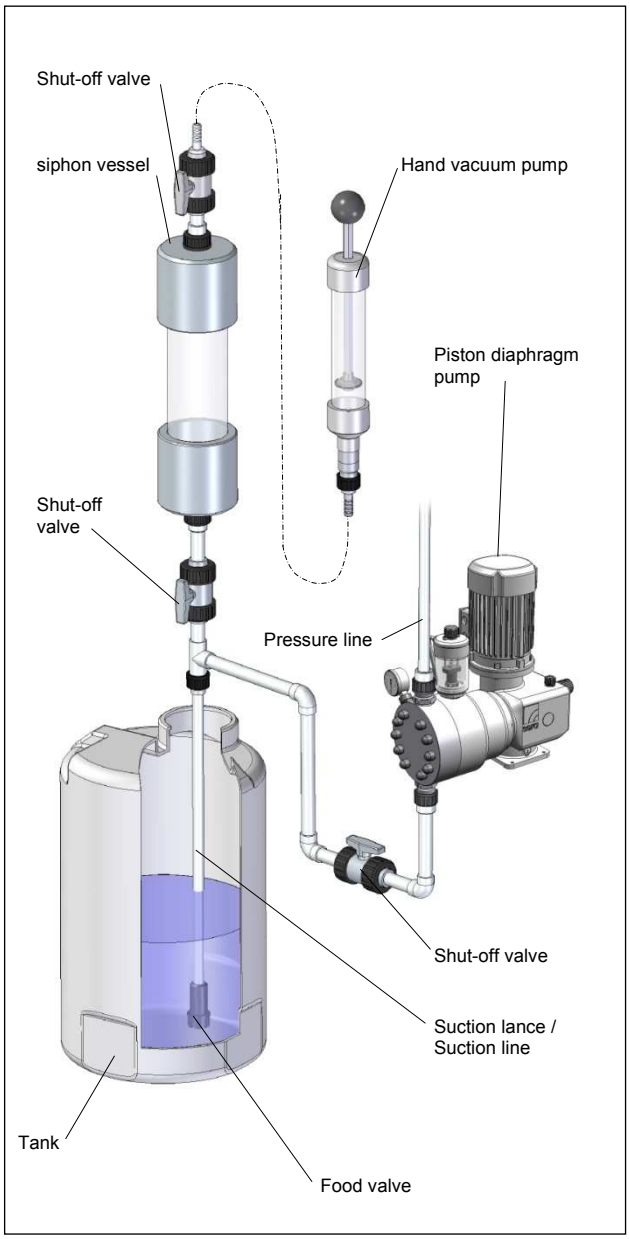


Fig. 30 Installation siphon vessel (**sera** - fitting)

8.1.9 In case of easily degassing pumped media

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

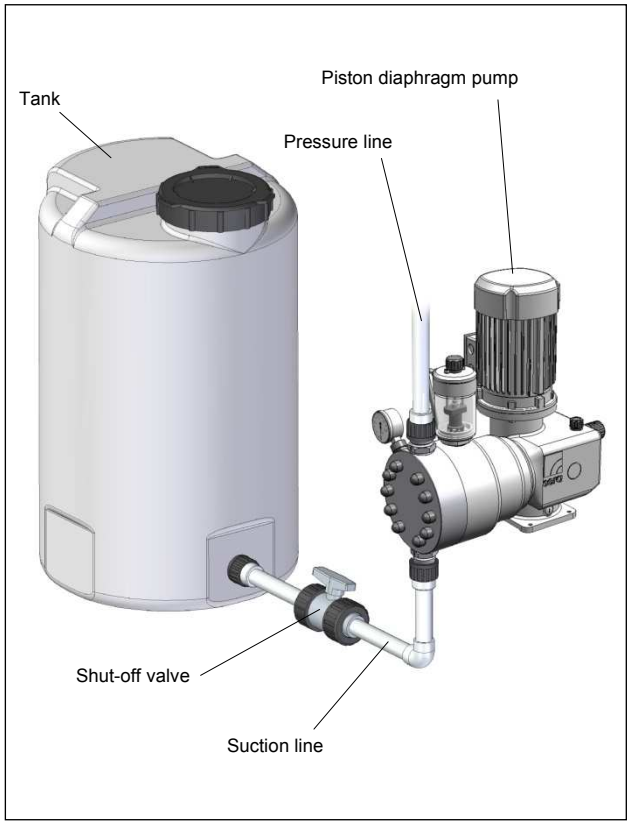


Fig. 31 Installation under afflux

8.1.10 Dosing of suspensions

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

- intermittent rinsing

or

- rinsing when pump was switched off

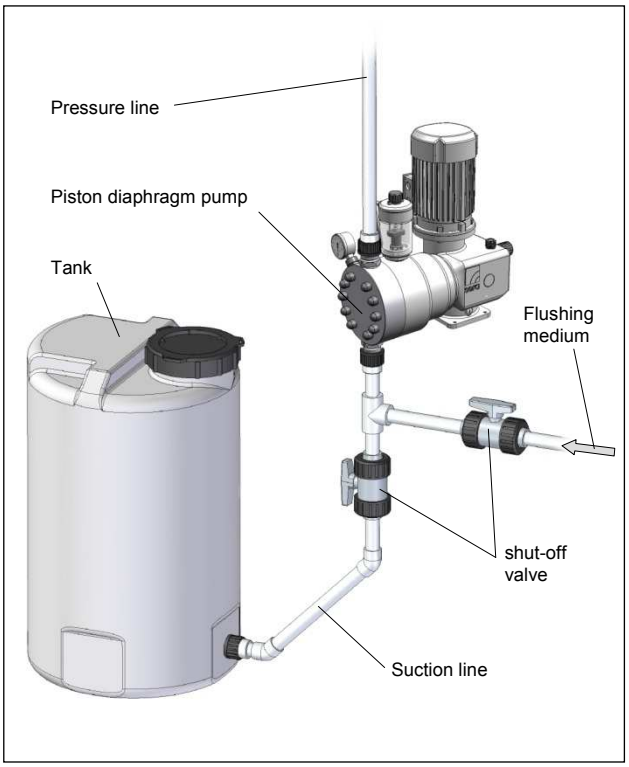


Fig. 32 Dosing of suspenions

CAUTION !

The rinsing process should be automated.

8.1.11 Damping of the pulsation

By installing pulsation dampers if:

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

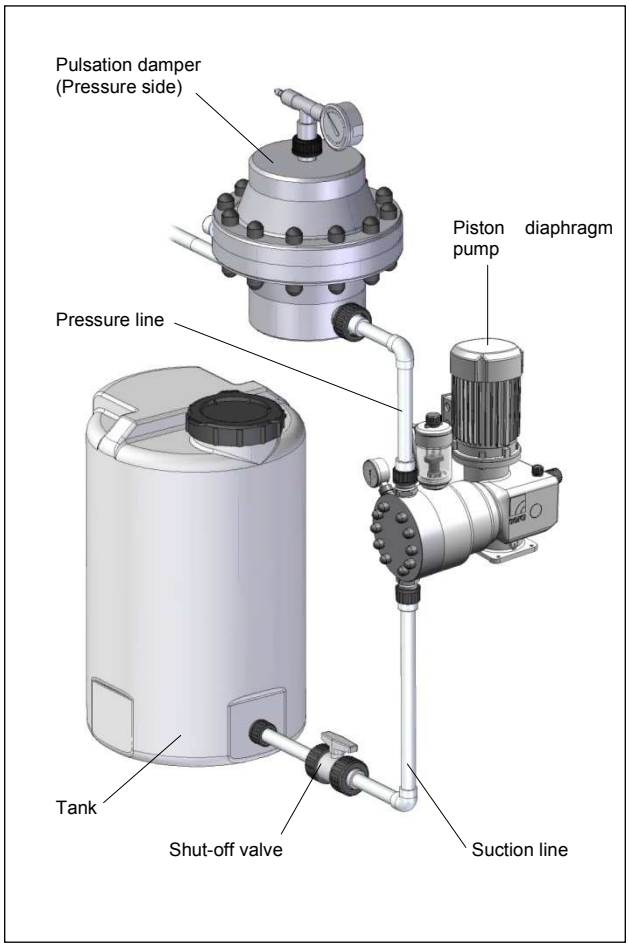


Fig. 33 Installation of a pulsation damper (I)

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

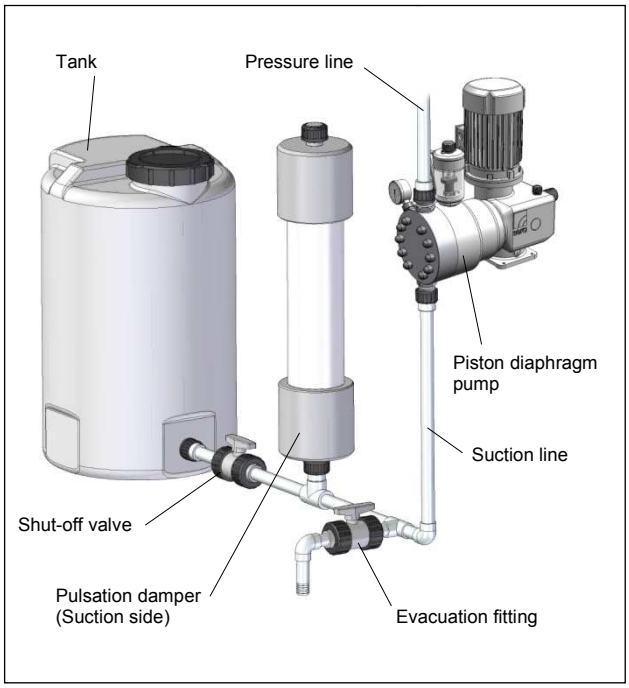


Fig. 34 Installation of a pulsation damper (II)

CAUTION !

Undamped accelerating forces can cause the following malfunctions / damage:

Fluctuations of the delivery rate,
dosing errors,
pressure thrusts,
valve wobbles,
increased wear on the suction- and pressure side of the pump;

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

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

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

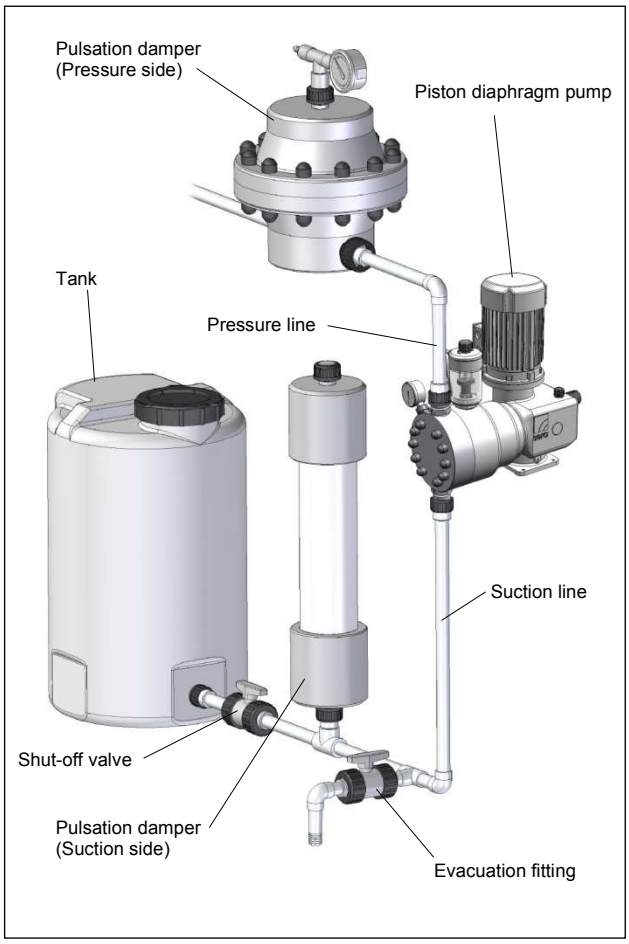


Fig. 35 Installation of a pulsation damper (III)

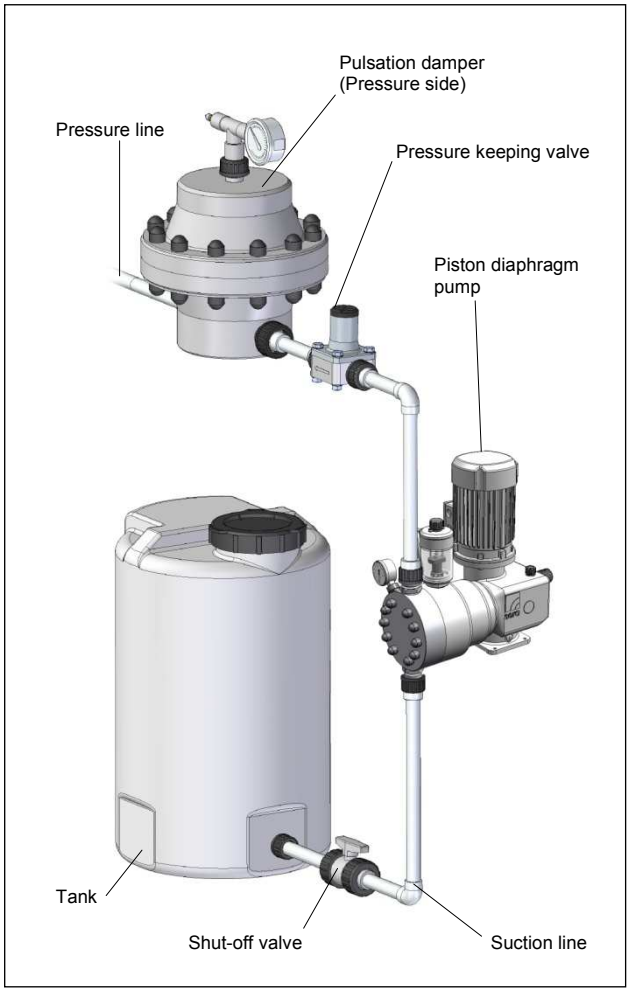


Fig. 36 Installation of pulsation damper and pressure keeping valve

9 Operation in explosion-hazardous areas

9.1 General

CAUTION !

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 94/9/EC if it is correspondingly marked. This guarantees safe operation in explosion-hazardous areas.

CAUTION !

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.

9.2 Identification

The pump has a label stating the zone/device category /explosion group/temperature class in compliance with directive 94/9/EC.

- Ex II2G c IIBT4 or
- EX II2G c IICT4

(note special specifications in the confirmation of order).

9.3 Installation

9.3.1 General

The intended operating conditions in explosion-hazardous areas according to directive 94/9/EG 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.

9.3.2 Working in explosion-hazardous areas

CAUTION !

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.

9.4 Potential equalization

After fixation, make sure that the pump is properly connected to the potential equalization system on site.

9.5 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.

9.6 Operation

9.6.1 General

The intended operating conditions in explosion-hazardous areas according to directive 94/9/EG 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.

9.6.2 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.

CAUTION !

Formation of an explosive gas mixture must be prevented.

9.6.3 Temperature indications

Permissible ambient temperature

0℃ ≤ Ta ≤ +40℃

9.7 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!

10 Maintenance

CAUTION !

Before starting maintenance make sure that the wearing parts and the spare parts required are available.
Deposit the parts so that they will not get damaged.

CAUTION !

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

Check the following at regular intervals:

- tight fit of piping
- tight fit of pressure and suction valve
- proper condition of the electrical connections
- tight fit of the screws for fastening the pump body (check this at least every three months)
  For the tightening torques of the mounting screws, please see Chapter 8.1/Table 07 “Installation”.

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

10.1 Wearing parts

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

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

In case of a premature diaphragm rupture caused by difficult operating conditions, switch off the piston diaphragm pump and replace the diaphragms (see Chapter 10.4).

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

- intermediate diaphragms
- suction valve
- pressure valve

10.2 Spare parts

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

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

10.3 List of spare and wearing parts

10.3.1 Piston diaphragm pump ...410.2-...KM

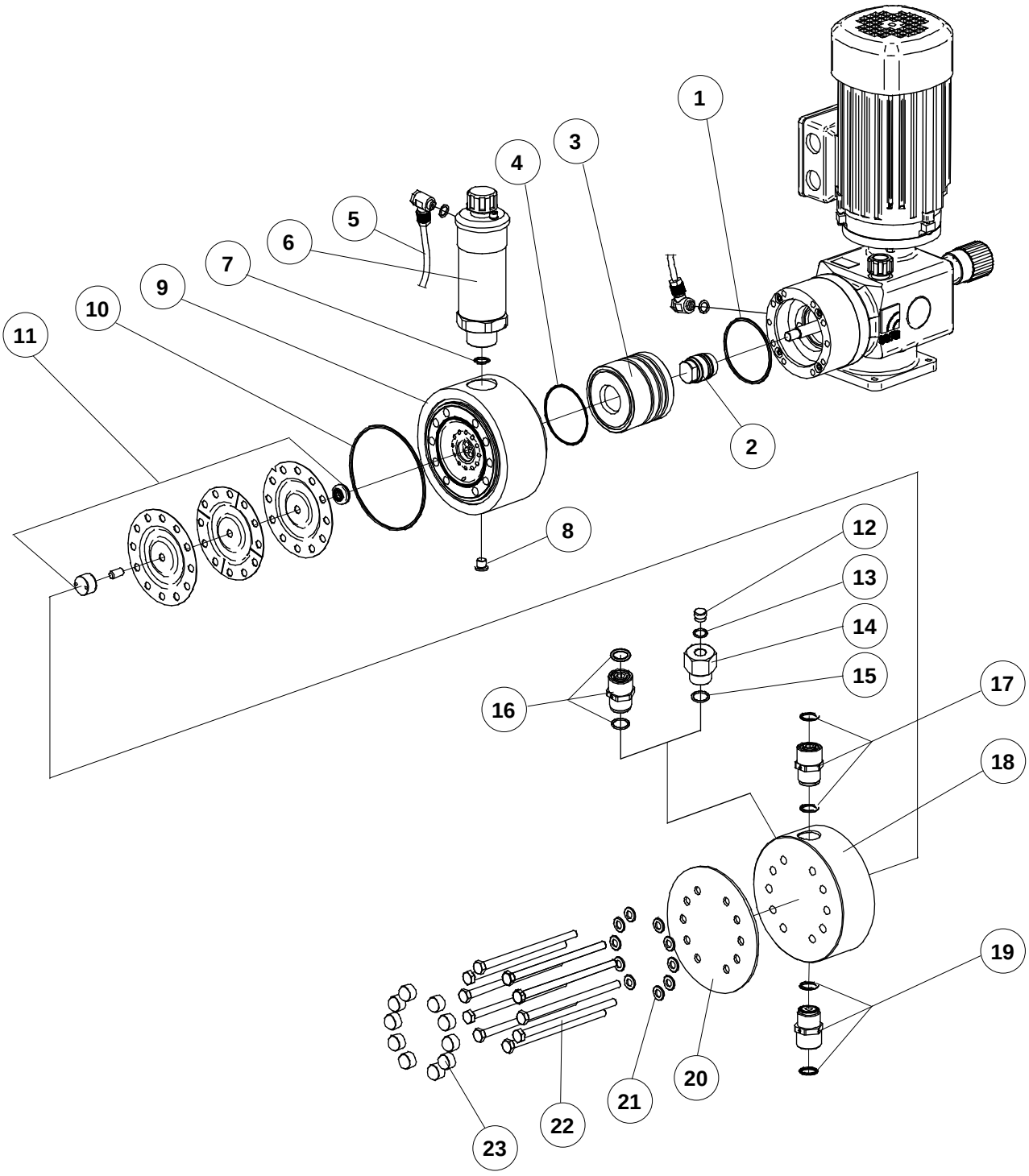


Fig. 37 List of spare and wearing parts

Operating instructions

Overview of spare and wearing part kits

Piston diaphragm pump ...410.2- ... KM

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

Piston-Set	
Item	*Designation*
2	Piston, complete

Cylinder kit	
Item	*Designation*
9	Cylinder
8	Screw plug

Cylinder bushing kit	
Item	*Designation*
3	Cylinder bushing
1	O-ring
4	O-ring

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

Pressure valve (kit)	
Item	*Designation*
17	Pressure valve (incl. o-rings)

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

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

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

Tab. 07 Spare and wearing parts

10.4 Replacing the diaphragm

10.4.1 General

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

CAUTION !

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

CAUTION !

For replacing the diaphragm, the system must be depresssurised!

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

10.4.2 Piston diaphragm pump

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

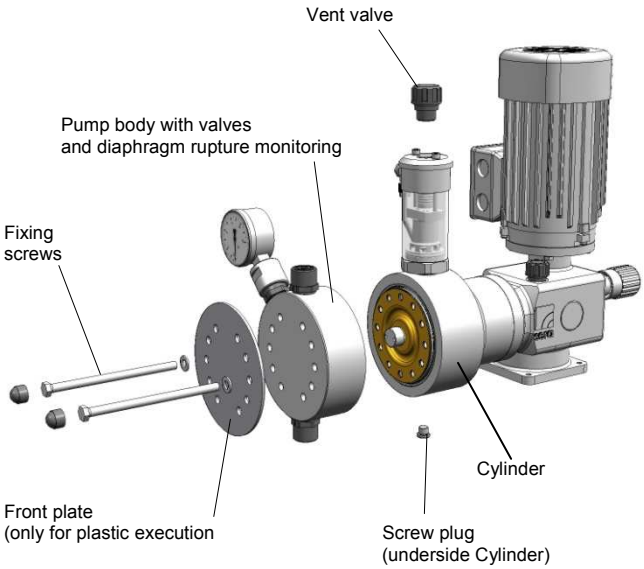


Fig. 38

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

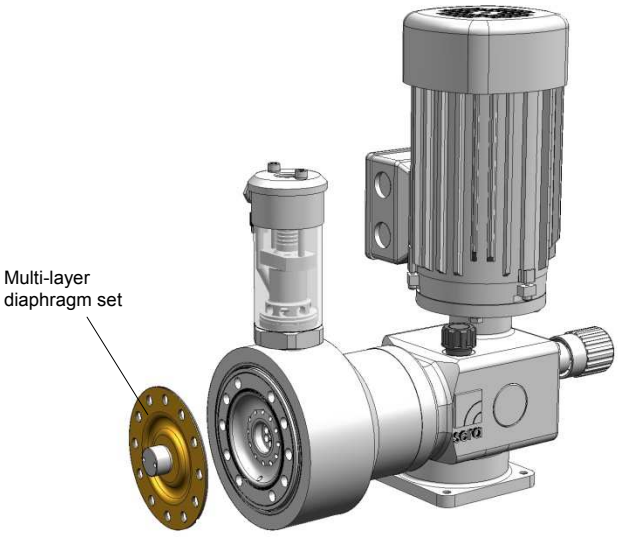


Fig. 39

Assemble the pump in reverse order

- Insert the multi-layer diaphragm set to the cylinder.
- When assembling the pump body, please note: suction valve below, pressure valve above!
- Pay attention to tightening torques (see Chapter 8.1, Table 07). Secure the nut crosswise.
- Fill hydraulic fluid in store tank (type and quantity are indicated in Chapter 11.2)
- Set maximum stroke length.
- Fill hydraulic fluid in store tank and make sure not to overfill in first stage.
- Start pump and press on blow valve with a screwdriver at each stroke of the pump. Hydraulic fluid is sucked in.
- Fill remaining hydraulic fluid in store tank.
- Press again on the blow valve with a screwdriver and repeat process until no bigger air bubbles escape from the hydraulic chamber.
- Switch pump off again.
- Screw in vent valve

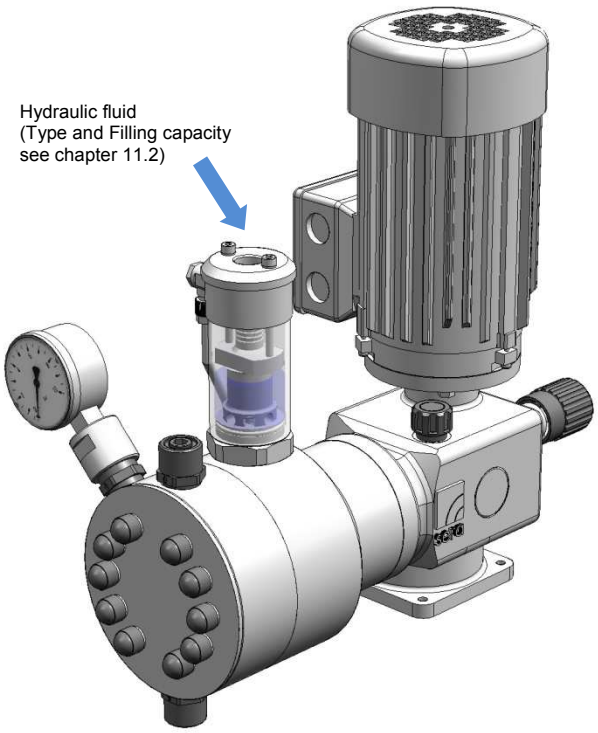


Fig. 40 Filling of the hydraulic fluid

- Reset stroke length to the initial value.
- Connect suction- and pressure line
- The diaphragm pump is ready for operation

CAUTION !

Fill in new hydraulic fluid after every diaphragm change.

10.4.3 Ventilation after diaphragm replacement

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

a) diaphragm rupture signalization by manometer or pressure switch:

- Screw out the signal device
- Apply delivery pressure and have the pump run for a short period (30s)
- Switch off the pump
- Screw in the signal device (see Fig. 41).

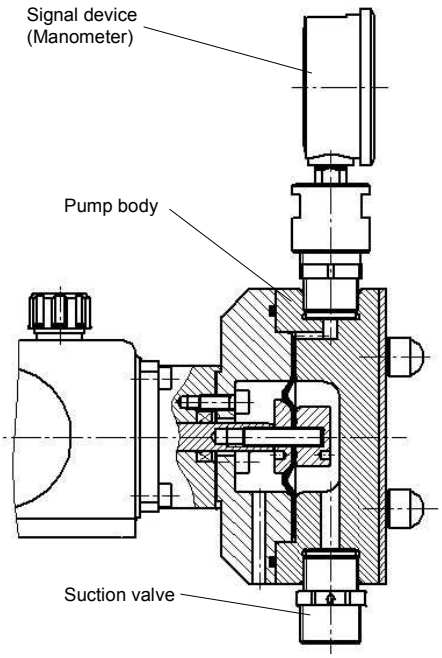


Fig. 41

b) diaphragm rupture signalization by pressure switch ex-design

- Release union nut and remove the signal device (see Fig. 42/43).
- Apply delivery pressure and have the pump run for a short period (30s)
- Switch off the pump
- Screw on the signal device:

  Pressure switch is for pump body made of plastic
  - Adjust the pressure switch to the desired position
  - Tighten union nut by hand and hold the insert socket by means of an open-end wrench

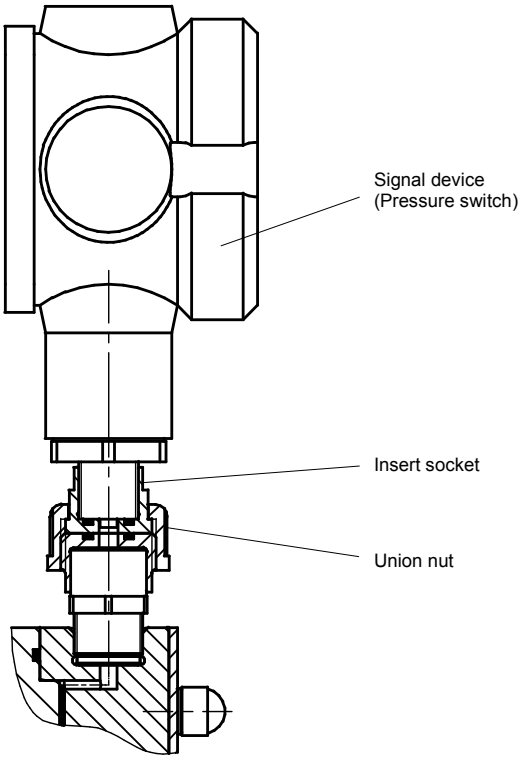


Fig. 42

Pressure switch is for pump body made of stainless steel

- Screw the pressure switch with union nut on the external thread of the socket
- Tighten the union nut with an open-end wrench and while doing so, press against with an open-end wrench at the insert socket. Adjust the pressure switch to the desired position.

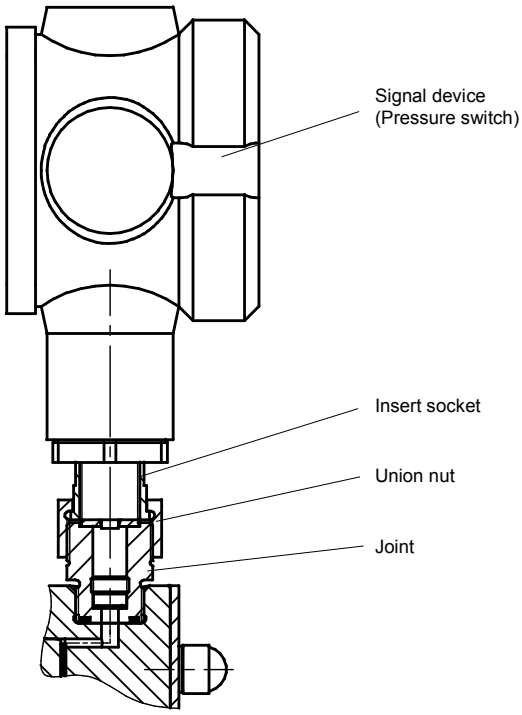


Fig. 43

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

10.4.4 Setting the compensating valve

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

10.4.4.1 Blow valve

Set the spring tension of the blow valve with the rifle nut so that a stroke movement of appr. 0,5 to 1 mm is achieved at every suction stroke.
Proceed as follows when the pump is switched off:

- Put socket spanner on rifle nut and hold in place.
- Put smaller socket spanner through bigger socket spanner, loosen lock nut and remove socket spanner (see Fig 44).

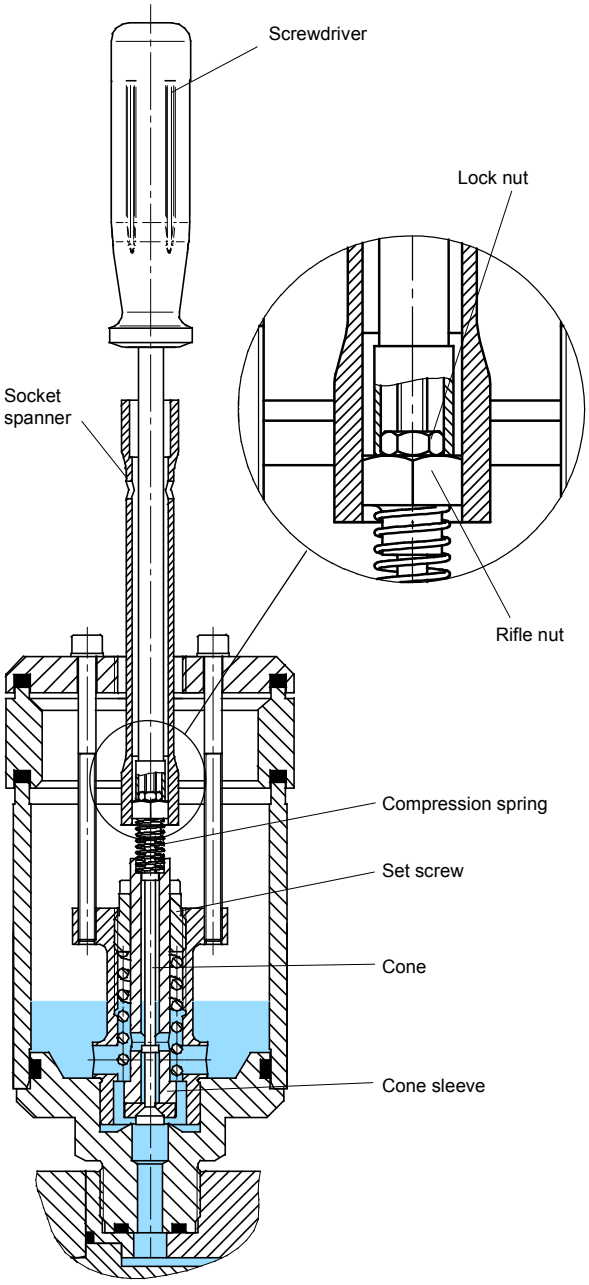


Fig. 44

- Secure cone of blow valve with a screwdriver against distortion and turn rifle nut using the socket spanner (see Fig. 45).

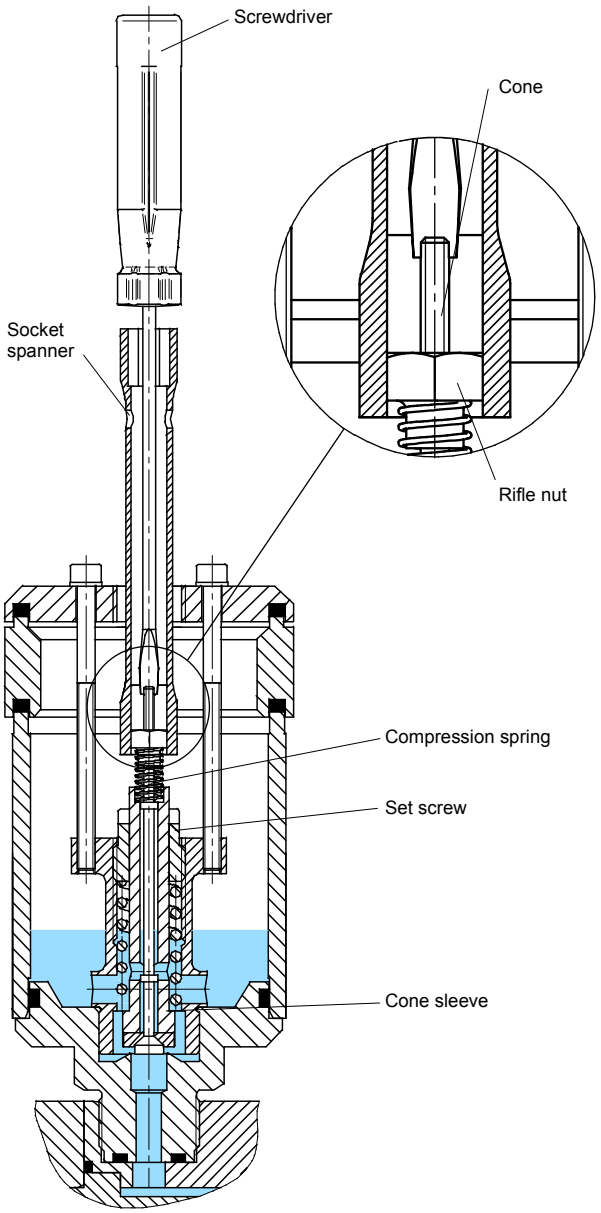


Fig. 45

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

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

- Remove socket spanner and screwdriver and switch pump on

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

10.4.4.2 Hydraulic compensating valve

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

CAUTION !

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

Proceed as follows when the pump is switched on:

a) factory-set pressure too high:

- Turn slowly the adjusting screw anti-clockwise by means of a adjusting spanner with the pump running (see Fig. 46) until the fluid level in the store tank rises suddenly - > hydraulic discharge valve opens

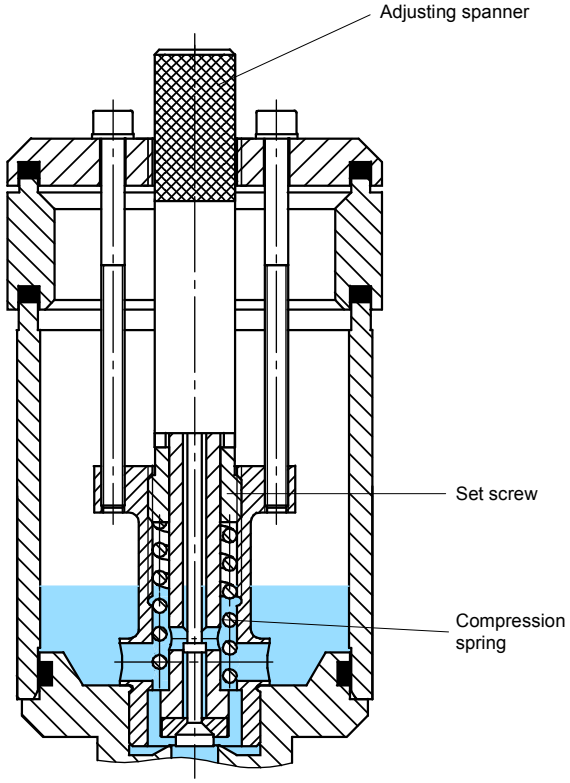


Fig. 46

CAUTION !

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

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

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

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

CAUTION !

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

CAUTION !

The set pressure must not exceed the maximum counterpressure of the pump (see Chapter 6.2, Tab. 04).

CAUTION !

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

10.5 Oil change

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

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

- Unscrew vent screw (see Fig. 05).
- Prepare an appropriate container. Open screw plug and drain off oil.

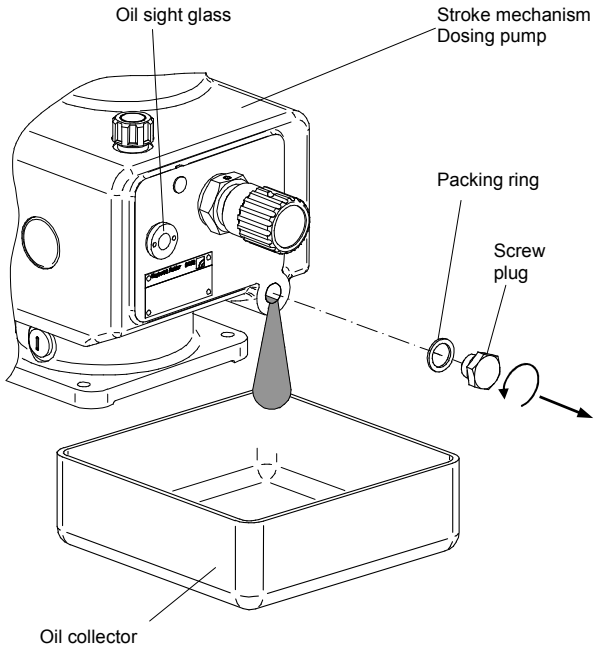


Fig. 47 . (Drain off oil)

- Close bore hole with screw plug (pay attention to packing ring).
- Fill oil in threaded hole of the vent screw.
- Oil type and quantity are specified in Chapter 11.1
- Screw in vent screw..

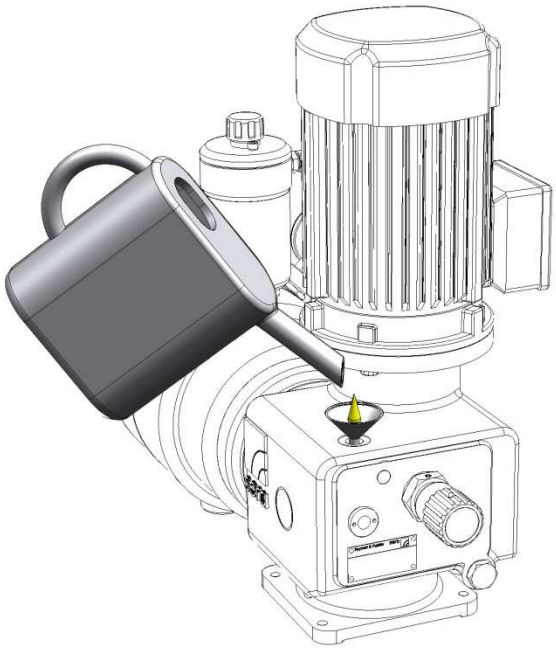


Fig. 48 . (Refilling oil)

11 Lubricants

11.1 Lubricant in stroke mechanism

Pump type	Lubricant	Quantity
...410.2 – 30 KM	Gear oil SAE 90 DIN 51512	1,25 Litres
...410.2 – 38 KM		
...410.2 – 60 KM		
...410.2 – 76 KM		
...410.2 – 120 KM		
...410.2 – 150 KM		
...410.2 – 250 KM		
...410.2 – 310 KM		
...410.2 – 400 KM		
...410.2 – 510 KM/		
...410.2 – 700 KM		
...410.2 – 850 KM		

Tab. 08 Lubricant in stroke mechanism

11.2 Hydraulic fluid

Pump type	Hydraulic fluid	Quantity
...410.2 – 30 KM	Silicone oil AK100 or Paraffin oil P180	120 ml
...410.2 – 38 KM		120 ml
...410.2 – 60 KM		120 ml
...410.2 – 76 KM		120 ml
...410.2 – 120 KM		350 ml
...410.2 – 150 KM		350 ml
...410.2 – 250 KM		350 ml
...410.2 – 310 KM		350 ml
...410.2 – 400 KM		350 ml
...410.2 – 510 KM/		350 ml
...410.2 – 700 KM		1.300 ml
...410.2 – 850 KM		1.300 ml

Tab. 09 Hydraulic fluid

12 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 table 10.

Fault analysis and corrective action

Type of fault													Possible cause	Corrective action
Pump does not suck	Pump does not deliver	Delivery rate is not reached	Delivery height is not reached	Delivery rate varies	Delivery rate exceeds permissible value	Drive motor does not start	Tube oscillates heavily	High noise emission	Service life of drive diaphragm too short	Drive overloaded	Stroke mechanism/drive damaged	Pump head leaking		
●	●	●											Suction height too great	Reduce suction height or suction resistance
●	●	●		●									Suction pipe leaky	Check seals, tighten tube connections
●	●					●						●	Shut-off valves in tube closed	Open shut-off valves or check whether they are open – check pump for damage
●	●	●											Store tank empty	Fill store tank
●	●	●	●	●									Pump valves leaky	Remove and clean pump valves
●	●		●	●									Pump valves (ball seats) damaged	Remove and clean valves, check for proper function; fit new valves if required
●	●												Pump valves not correctly mounted or valve balls missing	Check installation and completeness, replace missing parts or install correctly
●	●												Filter in suction pipe clogged	Clean filter
						●				●			Electric data of motor do not correspond with mains data	Check order details. Check electrical installation. Adjust motor to actual mains conditions.
		●	●	●		●	●	●	●	●		●	Counterpressure too high	Measure pressure with manometer directly above pressure valve and compare with permissible counterpressure
●	●	●	●	●									Foreign particles in pump valves	Remove and clean pump valves
				●	●								Pressure on suction side higher than at the end of the pressure pipe	Check geodetic conditions, fit float valve or pressure keeping valve, if necessary
		●	●	●	●	●	●	●	●	●	●	●	Acceleration too high due to pipe geometry	Check acceleration on pressure- and suction side with manometer and compare with layout data. Install pulsation damper, if necessary
									●			●	Material which come in contact with medium are not suitable for the pumped medium	Check whether pumped medium corresponds with layout specifications; choose other material if required
●		●	●	●									Too high viscosity of pumped medium	Check viscosity of pumped medium and compare with layout data; reduce concentration or increase temperature if required.
	●	●		●									Pumped medium outgasses in suction pipe	Check geodetic conditions and compare with data of pumped medium. Operate pump with suction-side supply, reduce temperature of pumped medium
●													Air in suction pipe while pressure is applied on pressure valve ball	Vent pressure side
●	●	●	●	●								●	Pipe connections leaky	Tighten connections according to material type. Be careful with plastic – danger of breakage
●	●	●										●	Temperature too low	Check flow characteristics of pumped medium. Temperature of pumped medium must not fall below -10℃.
●	●					●					●	●	Pumped medium in pipe frozen	Remove pump and check for damage – increase temperature of pumped medium
●	●	●	●	●					●			●	Diaphragm rupture	Replace diaphragm according to Chapter 10.4
●	●	●	●										Compensating valve not adjusted to operating conditions	Set compensating valve according to operating conditions

Tab. 10 (Fault analysis and corrective action)

13 Foreseeable misuse

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

CAUTION !

Misuse can result in danger to the operating personnel!

13.1 Transport

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

13.2 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).

13.3 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

13.4 Operation

- Fault message ignored → faulty dosing / process error.
- Setting of the hydraulic compensating valve misadjusted.
- Pipes hit, pulsation damper not used → damage to the pipes, medium is leaking.
- Pumped medium contains particles or is contaminated.
- External fuse bridged → no cut off in case of an error.
- Ground wire removed → no cut off by fuse in case of an error, supply voltage directly at the housing.
- Insufficient lighting of the working place.
- Suction height too high, pump capacity too low → process error.

13.5 Maintenance/Repair

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

13.6 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.

13.7 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.

13.8 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.

13.9 Disposal

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

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

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

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!

CAUTION !

The consignor is responsible for leaking lubricants or fluids!

Mechanical Pressure Measurement

Bourdon Tube Pressure Gauges Stainless Steel, Safety Pattern Version Model 232.30/233.30, without/with Liquid Filling

WIKA Data Sheet PM 02.04

Ⓢ

Applications

- Increased safety requirements
- With liquid filled case for applications with high dynamic pressure pulsations or vibrations
- Suitable for corrosive environments and gaseous or liquid media that will not obstruct the pressure system
- Process industries: chemical/petro-chemical, power stations, mining, on- and offshore, environmental technology, mechanical engineering and plant construction

Special Features

- Safety pressure gauge with solid baffle wall designed in compliance with operational safety requirements of EN 837-1, BS 1780 and ASME B 40.1
- Excellent load-cycle stability and shock resistance
- All stainless steel construction
- Scale ranges up to 0 ... 1600 bar

Bourdon Tube Pressure Gauge Model 232.30

Description

Design
EN 837-1

Nominal size
63, 100 and 160 mm

Accuracy class
63 mm: 1.6
100, 160 mm: 1.0

Scale ranges
63 mm: 0 ... 1 to 0 ... 1000 bar
100 mm: 0 ... 0.6 to 0 ... 1000 bar
160 mm: 0 ... 0.6 to 0 ... 1600 bar
or other equivalent units of pressure or vacuum

Working pressure

63 mm:	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.1 x full scale value
100, 160 mm:	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.3 x full scale value

Operating Temperature
Ambient: -40 ... +60 °C without liquid filling
-20 ... +60 °C gauges with glycerine filling
Medium: +200 °C maximum without liquid filling
+100 °C maximum with liquid filling

Temperature effect
When temperature of the pressure element deviates from reference temperature (+20 °C):
max. ±0.4 %/10 K of true scale value

Ingress protection
IP 65 per EN 60 529 / IEC 529

Stainless steel series *model 232.50* *see data sheet PM 02.02*
High pressure series *model 222.30* *see data sheet PM 02.09*
For UHP applications, safety pressure gauges *model 232.35* *see data sheet PM 02.11*

Standard features

Pressure connection
Material: stainless steel 316L
Lower mount (LM) or lower back mount (LBM) [1]
63 mm: G ¼ B (male), 14 mm flats
100, 160 mm: G ½ B (male), 22 mm flats (160 mm only lower mount)

Pressure element
Material: stainless steel 316L
< 100 bar: C-type
≥ 100 bar: helical type

Movement
Stainless steel

Dial
White aluminium with black lettering,
63 mm with pointer stop pin

Pointer
Black aluminium

Case
Natural finish stainless steel, case with solid baffle wall and blow-out back

Window
Laminated safety glass

Bezel ring
Cam ring (bayonet type), natural finish stainless steel

Liquid filling (for model 233.30)
Glycerine 99.7 %

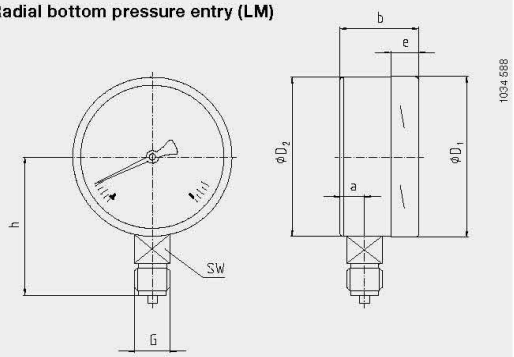
1) Connector position back mount only for gauges NS 63 and 100 without liquid filling

Optional extras

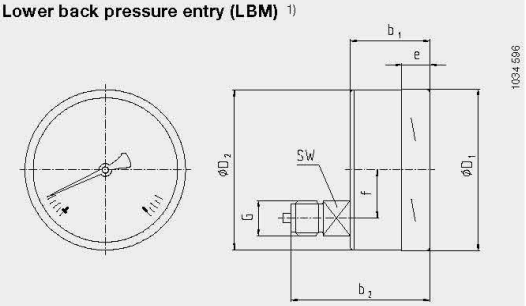
- Other pressure connections
- Monel pressure system (model 262.30)
- Pressure system stainless steel 1.4571
- 3-hole panel mounting flange, stainless steel or stainless steel, polished
- Surface mounting lugs on case, stainless steel
- Ambient temperature -40 °C: silicon oil filling
- Ingress protection IP 66 / IP 67
- Alarm contacts (see data sheet AC 08.01)
- Transmitter (model 89X.34, see data sheet AE 08.02)

Standard version

Radial bottom pressure entry (LM)



Lower back pressure entry (LBM) [1]



Dimensions in mm

NS	Dimensions in mm											Weight in kg	
	a	b	b_1	b_2	D_1	D_2	e	f	G	h ± 1	SW	Mod. 232.30	Mod. 233.30
63	17.5	42	42	61	63	63	14.5	18.5	G ¼ B	54	14	0.20	0.26
100	25	59.5	59.5	93	101	100	17	30	G ½ B	87	22	0.65	1.08
160	27 [1]	65 [2]	-	-	161	159	17.5	-	G ½ B	118	22	1.30	2.34

Standard pressure entry with parallel thread and sealing to EN 837-1 / 7.3
1) 41.5 mm with pressure ranges ≥ 100 bar
2) 79 mm with pressure ranges ≥ 100 bar

Ordering information
Pressure gauge model / Nominal size / Scale range / Size and location of connection / Optional extras required

9019766 10/2005 GB

WIKA Alexander Wiegand GmbH & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Phone (+49) 93 72/132-0
Fax (+49) 93 72/132-406
E-Mail info@wika.de
www.wika.de

Diaphragm rupture monitoring:

- **Pressure switch (Type 0186)**

Operating instructions

Bedienungsanleitung

Für künftige Verwendung aufbewahren

Membran-/ Kolbendruckschalter Baureihe 0180 / 0181 Baureihe 0186 / 0187

D

Einbau und Inbetriebnahme sind nach dieser Bedienungsanleitung und nur von autorisiertem Fachpersonal vorzunehmen

Robert-Scheuffele GmbH & Co. KG
Keplerstraße 12-14
D-74321 Bietigheim-Bissingen
Telefon (07142) 597-0
Telefax (07142) 597-19
www.suco.de
E-Mail: info@suco.de

Funktion und Anwendung

Die Baureihe 0180 / 0181 und 0186 / 0187 öffnet oder schließt einen elektrischen Stromkreis beim Erreichen eines einstellbaren Druckwerts. Durch das Ansteigen des Drucks wird eine Membrane bzw. ein Kolben bewegt. Die Auslenkung Membrane bzw. der Hub des Kolbens hängt von der Druckkraft und der einstellbaren Federvorspannung ab. Bei einer definierten Auslenkung der Membrane bzw. einem definierten Hub des Kolbens wird ein Mikroschalter betätigt, der die elektrischen Kontakte öffnet bzw. schließt (Wechsler).

Der Druckschalter überwacht einen eingestellten Druckwert.

Vorraussetzungen für den Produkteinsatz

Allgemeine, stets zu beachtende Hinweise für den ordnungsgemäßen und sicheren Einsatz des Druckschalters:

- Halten Sie die angegebenen Grenzwerte wie z.B. Drücke, Kräfte, Momente und Temperaturen ein.
- Berücksichtigen Sie die vorherrschenden Umgebungsbedingungen (Temperatur, Luftfeuchte, Luftdruck etc.).
- Beachten Sie die Vorschriften der Berufsgenossenschaften, des Technischen Überwachungsvereins (TÜV) oder die entsprechenden nationalen Bestimmungen.
- Beachten Sie unbedingt die Warnungen und Hinweise in der Bedienungsanleitung.
- Setzen Sie den Druckschalter niemals starken Stößen oder Vibrationen aus.
- Verwenden Sie das Produkt nur im Originalzustand. Nehmen Sie keine eigenmächtige Veränderungen vor.
- Entfernen Sie die alle Transportvorkehrungen wie Schutzfolien, Kappen oder Kartonagen.
- Die Entsorgung der einzelnen Werkstoffe in Recycling-Sammelbehältern ist möglich.

Operating instructions

Please keep carefully for future use

Diaphragm-/ Piston Pressure Switch Series 0180 / 0181 Series 0186 / 0187

GB

Installation and commissioning must be carried out in accordance with these operating Instructions and by authorized, qualified personnel only.

Robert-Scheuffele GmbH & Co. KG
Keplerstraße 12-14
D-74321 Bietigheim-Bissingen
Telephone (07142) 597-0
Telecopy (07142) 597-19
www.suco.de
e-mail: info@suco.de

Operating and use

The series 0180 / 0181 and 0186 / 0187 switch opens or closes an electrical circuit when a certain (adjustable) pressure is reached. A diaphragm or piston is moved by the increase in pressure. The amount of the diaphragm deflection or piston travel depends on the force of the pressure applied and the (adjustable) spring tension. At a predetermined deflection of the diaphragm or movement of the piston, a micro switch is actuated which opens or closes the electrical contacts (changeover).

The pressure switch monitors a preset pressure.

Conditions governing the use of the product

The following general instructions are to be observed at all times to ensure the correct, safe use of the pressure switch:

- Do not exceed the specified limits for e.g. pressures, forces, moments or temperatures under any circumstances.
- Give due consideration to the prevailing ambient conditions (temperatures, atmospheric humidity, atmospheric pressure, etc.).
- Observe the applicable safety regulations laid down by the regulatory bodies in the country of use.
- Observe without fail the warning notices and other instructions laid down in the operating instructions.
- Never subject pressure switch to intense blows or high vibrations.
- Never expose the pressure switch to severe side impacts or vibrations.
- Use the product only in its original condition. Do not carry out any unauthorized modifications.
- Remove all items providing protection in transit such as foils, caps or cartons.
- Disposal of the above-named materials in recycling containers is permitted.

Betriebsbedingungen

Bei Medientemperaturen außerhalb der Raumtemperatur (20°C):

Extreme Temperatureinflüsse (abweichend von der Raumtemperatur) können zu einer starken Schaltpunktabweichung oder zum Ausfall des Druckschalters führen

Schutzart IP65:

Die Typenprüfung ist nicht uneingeschränkt auf alle Umweltbedingungen übertragbar.

Die Überprüfung, ob die Steckverbindung anderen als den angegebenen Bestimmungen und Vorschriften entspricht bzw. ob diese in speziellen, von uns nicht vorgesehenen Anwendungen eingesetzt werden kann, obliegt dem Anwender.

Sauerstoffeinsatz:

Membrandruckschalter:
Beim Einsatz von Sauerstoff sind die einschlägigen Unfallverhütungsvorschriften zu beachten. Außerdem empfehlen wir, einen maximalen Betriebsdruck von 10 bar nicht zu überschreiten.

Kolbendruckschalter:
Kolbendruckschalter sind für gasförmige Medien, insbesondere für Sauerstoff nicht geeignet.

Überdrucksicherheit:

In den Technischen Daten ist die statische Überdrucksicherheit angegeben. Sie bezieht sich auf den hydraulischen bzw. pneumatischen Teil des Druckschalters. Der dynamische Wert ist 30 bis 50 % niedriger.

Operating conditions

Media temperatures other than room temperature (20°C):

The effects of extreme temperatures (relative to the room temperature) can lead to pronounced variations in the switching point or failure of the pressure switch.

Type of protection IP65:

Type testing does not apply to all ambient conditions without limitations. The user is responsible for verifying that the plug-and-socket connection complies with the specified rules and regulations of CE, or whether it may be used for specialized purposes other than those intended by us.

Use with oxygen:

Diaphragm pressure switch:

If oxygen is used, the applicable accident prevention regulations must be observed. In addition, we recommend a maximum operating pressure of 10 bars, which should not be exceeded.

Piston pressure switch:

Piston pressure switches are not suitable for gaseous media, particularly oxygen.

Protection against overpressure:

The static overpressure safety is included in the technical data. The overpressure safety corresponds to the hydraulic, pneumatic part of the pressure switch. The dynamic rating of the overpressure safety is smaller than 30 to 50%.

Technische Daten

Bemessungsbetriebsspannung U_e	Bemessungsbetriebsstrom I_e	Gebrauchs-kategorie
250 Volt AC 50/60 Hz	4 Ampere	AC12
250 Volt AC 50/60 Hz	1 Ampere	AC14
30 Volt DC	4 / 4 Ampere	DC12 / DC13
50 Volt DC	2 / 1 Ampere	DC12 / DC13
75 Volt DC	1 / 0,5 Ampere	DC12 / DC13
125 Volt DC	0,3 / 0,2 Ampere	DC12 / DC13
250 Volt DC	0,25 / 0,2 Ampere	DC12 / DC13
Bemessungsisolationsspannung U_i:		300 Volt
Bemessungsstoßspannungsfestigkeit U_{imp}:		2,5 kV
konventioneller thermischer Strom I_{the}:		5 Ampere
Schaltüberspannung:		< 2,5 kV
Bemessungsfrequenz:		DC und 50 / 60 Hz
Nennstrom der Kurzschlusseinrichtung:		bis 5 Ampere
Bedingter Kurzschlussstrom:		< 350 Ampere
IP-Schutzart nach EN 60 529:1991:		IP65 mit Stecker
Anzugsdrehmoment der Anschlussschrauben:		< 0,35 Nm
Anschlussquerschnitt:		0,5 bis 1,5 mm²
Schalthäufigkeit:		< 200 min^{-1}
Schalthysterese:		10-30%, im Werk einstellbar
mechanische Lebensdauer:		
Membranausführung:	10^6 Schaltspiele (bei Schaltdrücken bis 40 bar)	
Kolbenausführung:	10^6 Schaltspiele	
Gehäusewerkstoff:	verzinkter Stahl (Fe/Zn12cC)	
Temperaturbeständigkeit:	NBR -30°C bis +100°C EPDM -30°C bis +120°C FKM -5°C bis +120°C	
Überdrucksicherheit:		
Membrandruckschalter:	100 bar (0,3...1,5 bar, 1...10 bar) 300 bar (1...10 bar m. Endnummer 040, 041, 042, 340, 341, 342 und restliche Druckbereiche)	
Kolbendruckschalter:	600 bar	

Technical data

Rated operating voltage U_e	Rated operating current I_e	Utilization category
250 Volt AC 50/60 Hz	4 Amps	AC12
250 Volt AC 50/60 Hz	1 Amp	AC14
30 Volt DC	4 / 4 Amps	DC12 / DC13
50 Volt DC	2 / 1 Amp	DC12 / DC13
75 Volt DC	1 / 0,5 Amp	DC12 / DC13
125 Volt DC	0,3 / 0,2 Amp	DC12 / DC13
250 Volt DC	0,25 / 0,2 Amp	DC12 / DC13
Rated insulation voltage U_i:		300 volts
Rated surge capacity U_{imp}:		2,5 kV
Rated thermal current I_{the}:		5 Amps
Switching over voltage:		< 2,5 kV
Rated frequency:		DC and 50 / 60 Hz
Rated current of short-circuit protective device:		Up to 5 Amps
Rated short-circuit current:		< 350 Amps
IP protection to EN 60 529:1991:		IP65 with plug
Tightening torque for terminal screws:		< 0,35 Nm
Connection size:		0,5 to 1,5 mm²
Operating frequency:		< 200 per min^{-1}
Switching hysteresis:		10-30% adjustable by the factory
mechanical life:		
Diaphragm type	10^6 operation cycles (at trip pressure up to 40 bars)	
Piston type	10^6 operation cycles	
Body material:	Zic plated steel (Fe/Zn12cC)	
Temperature range:	NBR -30°C to +100°C EPDM -30°C to +120°C FKM -5°C to +120°C	
Over pressure safety:		
Diaphragm pressure switch:	100 bars (0,3 to 1,5 bar, 1 to 10 bar) 300 bars (1 to 10 with end number 040, 041, 042, 340, 341, 342 and residual pressure range)	
Piston pressure switch:	600 bars	

Diaphragm rupture monitoring:

- **Pressure switch (Type 0186)**

Operating instructions

Bedienteile und Anschlüsse

Bild 1

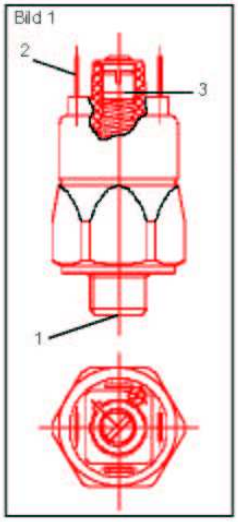
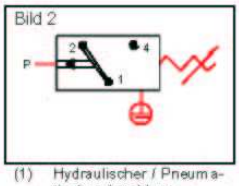


Bild 2



(1) Hydraulischer / Pneumatischer Anschluss
(2) Elektrischer Anschluss (AMP 6,3x0,8)
(3) Einstellschraube für den Schaltpunkt

Operating controls and connections

Fig. 1

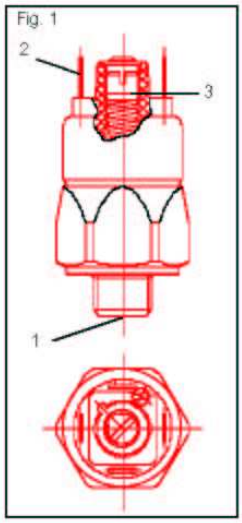
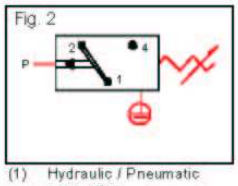


Fig. 2



(1) Hydraulic / Pneumatic connection
(2) Electrical connection (AMP 6,3x0,8)
(3) Switching point adjusting screw

Einbau

Mechanisch, pneumatisch, hydraulisch:

Drehen Sie den Druckschalter an dem sechskantförmigen Ansatz mit einem Maulschlüssel der Schlüsselweite 27 (nach DIN 894 o.ä.) in den vorgesehenen Druckanschluss (Anzugsdrehmomente siehe nachfolgende Tabelle).

Zum Abdichten des Systems verwenden Sie einen Standard-Kupferdichtring mit den entsprechenden Abmessungen.

Anschlussgewinde	Drehmoment
M10x1keg. und NPT1/8"	Einschrauben bis System abgedichtet ist
M10x1zyl.	35 Nm
Restliche	50 Nm

Elektrisch:

Verkabeln Sie den Druckschalter gemäß dem Schaltbild (Bild 2).

Verwenden Sie die Gerätesteckdose 1-1-80-652-002 (nicht im Lieferumfang enthalten!).

Installation

Mechanical / pneumatic / hydraulic:

With a size 27 open-ended wrench (to DIN 894 or similar), install the pressure switch, by means of the hexagon connector, in the corresponding pressure socket (tightening torque G1/4": 50 Nm).

For sealing the system use a standard copper gasket of the appropriate dimensions.

Connecting thread	Torque
M10x1keg. and NPT1/8"	Tighten until system is hermetically sealed
M10x1 straight	35 Nm
Others	50 Nm

Electrical:

Connect up the pressure switch in accordance with the circuit diagram (Fig. 2).

Use a connector type 1-1-80-652-002 (not include in the delivery specification).

Diaphragm rupture monitoring:

- **Pressure switch (Type 0186)**

Operating instructions

Inbetriebnahme

1. Verkabeln Sie die elektrischen Anschlüsse 1 und 4 mit einem Durchgangsprüfer (Bild 2).

Bei Verwendung einer Prüflampe als Durchgangsprüfer: Achten Sie auf die max. zulässige Schaltleistung (siehe technische Daten).

2. Drehen Sie die Einstellschraube (3) zunächst ganz ein. Verwenden Sie zum Einstellen des Druckschalters einen Schraubendreher mit 6,3 mm Klingenbreite.

Beachten Sie bitte, dass die Einstellschraube (3) nur beim Eindrehen einen Anschlag besitzt.

3. Beaufschlagen Sie den Druckschalter mit dem gewünschten Schaltdruck (Kontrollmanometer erforderlich).
4. Drehen Sie die Einstellschraube (3) so weit heraus, bis der Druckschalter umschaltet (Durchgangsprüfer reagiert).
5. Korrigieren Sie gegebenenfalls den Schaltdruck durch Verdrehen der Einstellschraube (3).

Bei der Inbetriebnahme des Druckschalters beachten Sie bitte die entsprechenden Sicherheitsvorschriften der Berufsgenossenschaften oder die entsprechenden nationalen Bestimmungen.

Die Einstellung der Hysterese ist nur werkseitig durchführbar. Bei unsachgemäßer Vorgehensweise kann der Druckschalter beschädigt werden.

Entry into service

1. Using a continuity tester, wire up the electrical connections 1 and 4 (Fig. 2).

If using a testing lamp as a continuity tester, observe the maximum permissible switching capacity (see technical data).

2. First, screw in the adjusting screw (3) as far as it will go. To adjust the pressure switch use a screwdriver with a 6,3 mm wide blade.

Take care to ensure that the adjusting screw (3) dose not seize at any point other than when it is fully tightened down.

3. Adjust the pressure switch to the desired actuating pressure (a test pressure gauge is required).
4. Ease off the adjusting screw (3) to a sufficient extent to cause the pressure switch to trip (continuity tester reacts).
5. If necessary, adjust the trip pressure setting by turning the adjusting screw (3).

When putting the pressure switch into service, please observe the applicable safety regulations laid down by the governing bodies in the country of use.

The adjustment of Hysteresis can only carried out in the factory. If this is inexpertly undertaken, damage may be caused to the pressure switch.

Ausbau

Beachten Sie folgende wichtige Punkte beim Ausbau des Druckschalters:

- Das Drucksystem, aus dem der Druckschalter ausgebaut werden soll, muss sich in drucklosem Zustand befinden.
- Es müssen alle relevanten Sicherheitsbestimmungen beachtet werden.
- Drehen Sie den Druckschalter mit einem Maulschlüssel der Schlüsselweite 27 (nach DIN 894 o.ä.) aus dem Druckanschluss.

Removing the pressure switch

When removing the pressure switch, observe the following important instructions:

- The pressurized system from which the pressure switch is intended to be removed must be entirely of pressure.
- All the relevant safety regulations must be observed.
- Use a size 27 open-ended wrench (to DIN 894 or similar), to remove the pressure switch.

Zeichenerklärung

Achtung — Hinweis, Bemerkung — Recycling — Gefahr

Key to drawings:

Caution — Note — Recycling — Danger

Art.-Nr.: 1-1-80-628-014_2 06 / 02

Art.-No.: 1-1-80-628-014_2 06 / 02

RP2E Pressure switches explosion proof

All industrial environments

Reduced overall dimensions

Good vibration resistance

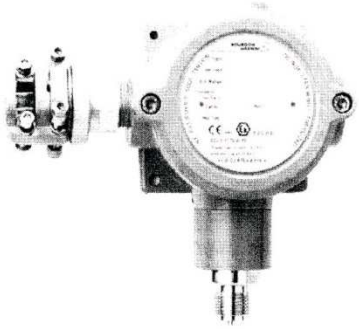
Resistant to short duration overpressure

LCIE 02 ATEX 6219X

CE 0081

Ex II 2 G and D
EEx d IIC T6 or T5

Hazardous area : Area 1, 2, 21, 22



These pressure switches maintain a constant pressure around a chosen set value: regulator action. They trigger an alarm or safety system, when the pressure reaches a critical pre-set value : "safety action".

Normal operation must be between 10% and 90% of the selected scale.

The deadband values in the table overleaf are defined under these conditions.

Any pulsating circuit must be fitted with pulsation dampeners.

Technical Data (20°C)

Fluids	All fluids compatible with the measuring element from -40...+150°C
Operating ambient temperature	From -30...+70°C
Storage temperature	From -50...+70°C
Reproducibility	±2% of F.S.
Minimum deadband	Depending on the type of microswitch used (see table overleaf)
Conform to CE	EN 50018, explosion-proof "d" Low voltage Directive N° 73/23/EEC modified by 93/68/CEE Directive 94/9/CE (EN50014, EN50018, EN50281-1-1)
Degree of protection	IP 65, NF EN 60529
Weight	1.800 kg

Manufacturing

Explosion-proof housing	Epoxy painted aluminium housing
Wall mounting	2 CHC M6 x 16 screws
Earth connection	Via internal or external terminal block
Electrical connection	Via internal terminal block with P.G. certified ATEX for cable 7 to 12 mm dia
Graduated scale	Internal calibrated scale
Pressure connection	G 1/2
Measuring element	1.4404 s.s. (316 L) diaphragm

BOURDON HAENNI
made to measure

www.bourdon-haenni.com
Design and specifications subject to change without notice

Data sheet A32.02
Page 1

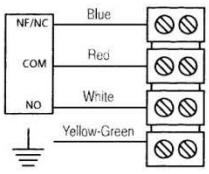
Adjustable ranges

Scale			Code	Max.P		MAXI FIXED DEADBAND						MINI-MAXI ADJUSTABLE DEADBAND	
				Permanent	Accidental	Standard (1xSPDT)		Standard (2xSPDT)		Gold contact	Hermetically sealed	Adjustable	
						L		U		M	P	R	
						At 10 % of scale	At 90 % of scale	At 10 % of scale	At 90 % of scale	At 10 % of scale	At 90 % of scale	At 10 % of scale	At 90 % of scale
bar				bar		mbar		mbar		mbar		mbar	
0	-	1	41	10	50	30	60	150	300	120	330	*	*
0	-	1.6	42			35	70	175	350	150	390	100 .. 200	200 .. 550
0	-	2.5	43			40	80	200	400	180	480	125 .. 230	250 .. 700
0	-	4	44			45	90	225	450	210	540	150 .. 290	320 .. 900
0	-	6	45			50	100	250	500	240	630	190 .. 350	420 .. 1200
0	-	10	46			55	110	275	550	300	750	260 .. 500	600 .. 1800
0	-	4	51	40	100	110	200	550	1000	800	1320	500 .. 1000	1250 .. 2000
0	-	6	52			110	235	550	1175	750	1620	550 .. 1100	1350 .. 2200
0	-	10	53			120	270	600	1350	840	2010	650 .. 1300	1500 .. 2600
0	-	16	54			130	305	650	1525	960	2370	800 .. 1600	1700 .. 3100
0	-	25	55			140	340	700	1700	1050	2730	1000 .. 2000	2000 .. 3800
0	-	40	56			150	380	750	1900	1140	3150	1400 .. 2800	2600 .. 5200
0	-	10	61	100	200	200	500	1000	2500	1500	3600	1000 .. 2000	3000 .. 6000
0	-	16	62			280	700	1400	3500	2100	3960	1150 .. 2300	3500 .. 7000
0	-	25	63			360	900	1800	4500	2700	5550	1350 .. 2700	4200 .. 8400
0	-	40	64			440	1100	2200	5500	3300	7350	1700 .. 3400	5350 .. 10700
0	-	60	65			520	1300	2600	6500	3900	9600	2100 .. 4200	6900 .. 13800
0	-	100	66			600	1500	3000	7500	4500	13200	3000 .. 6000	10000 .. 20000

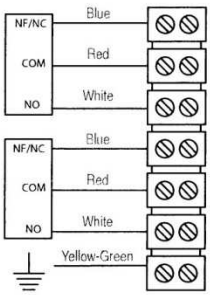
Cable identification, current rating

Cable identification

1 switch



2 switches



Current rating

Microswitch type SPDT

L	Standard Fixed deadband	0.4 A min.; 10 A max. 250 Vac max.
P	Hermetically sealed Fixed deadband	0.4 A min.; 2 A max. 30 Vdc max.
R	Adjustable deadband	0.4 A min.; 10 A max. 250 Vac max. 220 Vdc max.
U	2 contacts Fixed deadband	0.4 A min.; 10 A max. 250 Vac max. 220 Vdc max.
M	Gold contact Fixed deadband	10 mA min.: 50 mA max. 250 Vac max. 220 Vdc max.

Regulation

Pressure of regulator type RP2E

LCIE 02 ATEX 6219X

CE 0081

II 2 G and D
EEx d IIC T6 or T5

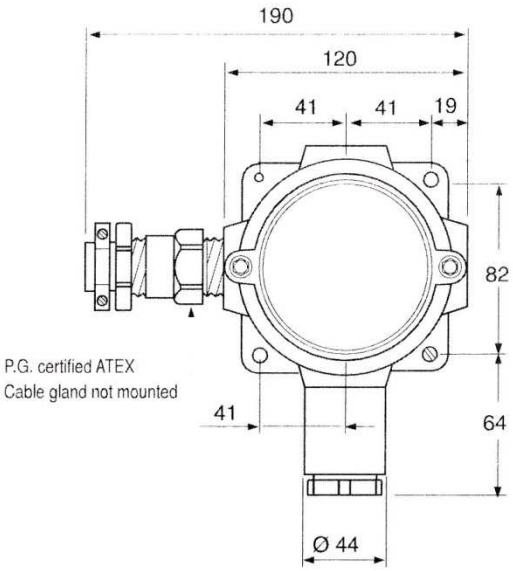
DO NOT OPEN - LIVE VOLTAGE

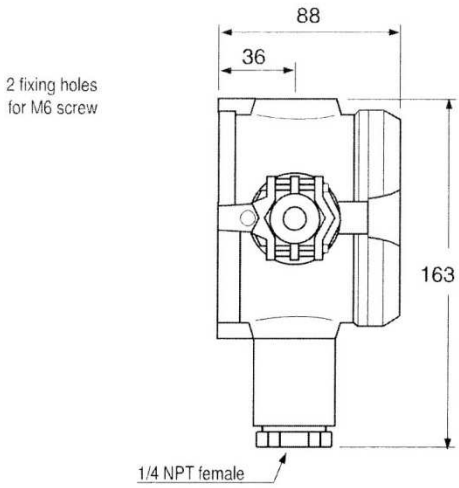
-30°C ≤ Ta ≤ +70°C	Dust IP65	Gases
	T° surface	Class
Ta = +60°C	+80°C	T6
Ta = +70°C	+95°C	T5

The maximum dissipated power in the unit must not exceed 5W.

All necessary measures must be taken by the user, to avoid the calorific transfer from the fluid to the apparatus head increasing the head's temperature to such that it reaches the self-ignition temperature of the gas in which it is used.

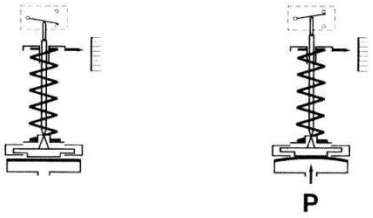
Dimensions (mm)





Operating principle

A flexible diaphragm actuates a microswitch by means of a piston. The set point is adjusted by means of a compressible spring installed in opposition.



Options

Uncoded options (have to be listed after the code number)

Stainless steel label
Cleanliness for oxygen service
Adjustment of the set point
Connection on pipe 2" dia.
Input conduit fitting ATEX (groupe II) : 1/2 NPT female, M20 x 1,5 female, 3/4 NPT female

Coded options

Hydraulic connection
1/2 NPT male
1/2 NPT female
1/4 NPT female

Ordering Details - RP2

		RP2x x0x xx
Model	**1´ digit**	
Pressure switch		R
Type	**2´...3´ digit**	
P2		P2
Type of protection	**4´ digit**	
Explosion-proof		E
Type of microswitch	**5´ digit**	
Fixed deadband, standard (1 x SPDT)		L
Fixed deadband 2 x SPDT		U
Fixed deadband, gold contact		M
Fixed deadband, hermetically sealed ultra sensitive		P
Adjustable deadband		R
Hydraulic connection	**6´...7´ digit**	
G 1/2 male (standard version)		03
1/2 NPT male		06
1/4 NPT female		08
1/2 NPT female		0N
Pressure range	**8´...9´ digit**	
See codes in table		xx

code	range in bar		
41	0	+	1
42	0	+	1.6
43	0	+	2.5
44	0	+	4
45	0	+	6
46	0	+	10
51	0	+	4
52	0	+	6
53	0	+	10
54	0	+	16
55	0	+	25
56	0	+	40
61	0	+	10
62	0	+	16
63	0	+	25
64	0	+	40
65	0	+	60
66	0	+	100

Notes:

Notes: