### Controllable Multi layer diaphragm pump

Series C 409.2 ML



#### **Operating instructions**

Product: Multi-layer diaphragm pump

Type: C 409.2 - 11 ML

C 409.2 - 17 ML C 409.2 - 30 ML C 409.2 - 45 ML C 409.2 - 72 ML C 409.2 - 110 ML C 409.2 - 150 ML C 409.2 - 220 ML



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!

### Controllable Multi layer diaphragm pump Series C 409.2 ML



#### **Operating instructions**

#### Table of contents:

1		Quickstart	4	5		Transportation and intermediate storage	.10
	1.1	Electric supply	4		5.1	General	.10
		Operating elements			5.2	Storage	
	1.2			_	5.2	-	
	1.3	LED operation indicators	4	6		Assembly groups of multi-layer diaphragm pump	.11
	1.4	Key operation	5	7		Technical data	.12
	1.5	Factory settings	5		7.1	Dimensions	.12
	1.6	Control inputs and outputs	5		7.2	Technical data	.14
	1.6.1 1.6.2				7.2.1 7.2.2	Output data	
		Control via an analog signal  cting the operating mode		8	7.2.2	Functional discription	
	00.00					·	
2		General	6		8.1	General	.15
3		Types	6		8.2	Assembly groups of the multi-layer diaphragm pumps	.15
	3.1	Model key	6		8.2.1	Stroke mechanism	
			_		8.2.2 8.2.3		
	3.2	Type plate	6		8.2.4	Pump body	
			_		8.2.5	Suction-/Pressure valve	
	3.3	Materials	/		8.2.6	Diaphragm rupture monitoring	
	3.4	Viscosity, dosing medium	7		8.3 8.3.1	Drive motor	
					8.3.2		
	3.5	Dosing range	7		8.3.3	Maintenance of the drive motor	19
	3.6	Noise test	7	_	8.3.4	Restart	
	0.0			9		Installation	.20
4		Safety instructions	7		9.1	Installation instructions	.20
	4.1	Quality instructions	7		9.1.1 9.1.2	Provide for an overpressure protection  How to prevent a backflow of the dosing medium	
					9.1.3	,	
	4.2	Marking of instructions	7		9.1.4	How to ensure an airless suction	
	4.2.1	Marking of instructions (operating manual)	7		9.1.5 9.1.6	Installing the empty-tank alarm  How to avoid an emptying of the suction line	
	4.2.2				9.1.7	Line strainer	
	12	Qualification and training of paragonal	0		9.1.8	Suction via a siphon pipe	25
	4.3	Qualification and training of personnel	0		9.1.9	In case of slightly degassing dosing media	
		December in the effect of the effet.			9.1.1	Damping of the pulsation	25
	4.4	Dangers in case of inobservance of the safety instructions	8	10		Electrical connections	.27
	4.5	Safety-conscious working	8		10.1	Electric supply	.27
	4.6	Safety instructions for the operator	8		10.2	Electrical interfaces	.27
		,			10.2.		
	4.7	Safety instructions for maintenance, inspection and			10.2.		
		installation	8		10.2.		
	4.8	Arbitrary modification and spare parts production	R	11		Operation	.29
	4.0	Albitrary modification and spare parts production	O		11.1	Operating elements	.29
	4.9	Improper use	8				
	4.10	Proper use	9		11.2	LED operation indicators	.29
		·			11.3	Key operation	.30
	4.11	Personal protection for service and maintenance	9		11 /	Parameter table	21
	4.40	Litilities	0		11.4	i arameter table	ا د.

## Controllable Multi layer diaphragm pump

Series C 409.2 ML



#### **Operating instructions**

	11.5	Me	nu	32
	11.5.	1	Screen "Operating messages"	22
	11.5.		Fault and warning messages	
	11.5.		Screen "Main menu"	
	11.5.			
			Value entry	
	11.5.		Menu guide	
	11.6	Se	lecting the operation mode	38
	11.7	Ad	ditional settings for the operation mode	38
	11.7.	1	Additional settings for the ANALOG operation mode	
	11.7.	2	Additional settings for the PULSE mode	40
	11.7.3	3	Additional settings for the BATCH mode	41
	11.7.	4	Settings for the EXTERNAL operation mode	42
	11.8	Co	nfiguring the inputs and outputs	42
	11.8.		Digital input 01	43
	11.8.		Digital/analog inputs 02 and 03	
	11.8.	3	Outputs 01 and 02	43
	11.9	Flo	ow rate indicator	44
	11.10	) Ca	libration	45
	11 11	151	stem	46
		. Cy	0.011	-10
	44 40	т.	talizer	17
	11.12	210	talizei	47
	11.13	3 Pa	ssword	47
	11.14	1 Inf	0	47
	11.15	5Ex	tras	47
	11.15	: 1	Slow-Mode	17
	11.15		Dosing monitoring	
	11.15		Diaphragm rupture detection (OPTION)	
	11.15		Level monitoring	
	11.10	). <del>4</del>	Level monitoring	43
12		Ma	intenance	50
	12.1	VVe	earing parts	50
		_		
	12.2	Sp	are parts	50
	12.3	Sp	are- and wearing parts	51
	12.4	Re	placing the diaphragm	53
	12.4.	1	General	53
	12.4.		Diaphragm change	
	40.5	0.1	. 5	
	12.5	OII	change	55
10		1	brigant	EF
13		Lu	bricant	၁၁
	13.1	Lu	bricant in stroke mechanism	55
14		Fa	ult analysis and corrective action	55
				-
	14.1	۸n	alysis of the plain text error messages	56
	17.1	ΛH	arysis of the plant text end thessages	50
	440		about a faith an faulta	
	14.2	Αn	alysis of other faults	၁ၓ

15		Foreseeable misuse59
	15.1	Transport59
	15.2	Assembly and installation59
	15.3	Start-up59
	15.4	Operation59
	15.5	Maintenance/Repair59
	15.6	Cleaning60
	15.7	Shut-down60
	15.8	Disassembly60
	15.9	Disposal60
16		Decommissioning61
17		Disposal61
	17.1	Dismounting and transport61
	17.2	Complete disposal61
18	Tech	nical documentation of diaphragm rupture monitoring62
	18.1	Pressure switch

## serd

#### **Operating instructions**

#### 1 Quickstart

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

#### **CAUTION!**



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

#### 1.1 Electric supply

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

#### **CAUTION!**



The specifications on the type plate must absolutely be adhered to!

The C 409.2 is available in two versions:

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

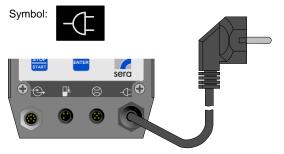


Fig. 01 (Electric supply)

#### **CAUTION!**



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

#### **CAUTION!**



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

#### 1.2 Operating elements

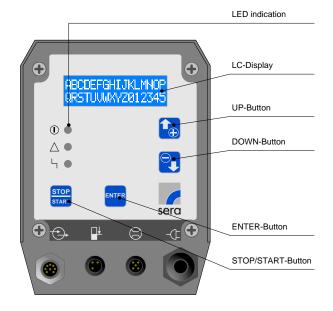


Fig. 02 (Electronics control panel)

#### 1.3 LED operation indicators

Three light-emitting diodes (LED) indicate the status of the pump.

Green: Operation and stroke indicator





When switching on the pump, the green LED lights steadily. The operation indicator works in combination with a stroke indicator; during pump operation, the LED flashes in accordance with the current stroke frequency.

Yellow: Warning indicator





The yellow LED indicates all occurring warning messages (see Tab. 06). The warning is not only indicated by the LED but also as plain text in the LCD display.

Red: Fault indicator





The red LED indicates all occurring faults (see Tab. 06). The fault is not only indicated by the LED but also as plain text in the LCD display.

### Controllable Multi layer diaphragm pump

Series C 409.2 ML



#### **Operating instructions**

#### 1.4 Key operation

Operation of the pump is performed with 4 keys:



#### STOP/START key

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



#### **ENTER key**

You can use the ENTER key to open and confirm value input fields and to select menu items.





UP / DOWN key

Using the UP/DOWN key, you can scroll the different menu items / menu levels and select the display of various operating messages.

During parameter adjustment, the UP key is used to increase the parameter value and the DOWN key is used to decrease the parameter value.

#### 1.5 Factory settings

The factory setting of the pump electronics is specified in Chapter 11.4.

#### 1.6 Control inputs and outputs

#### 1.6.1 Control via a contact signal

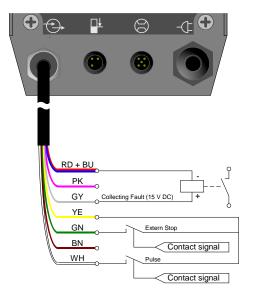


Fig. 03 (Control of digital inputs via a potential-free contact signal and control of a relay via an output of the dosing pump)

#### 1.6.2 Control via an analog signal

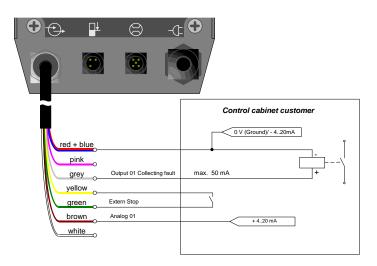
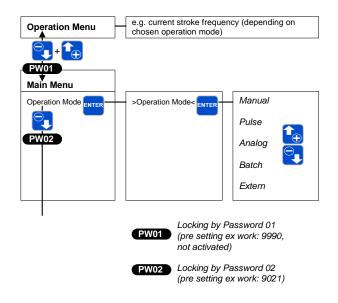


Fig. 04 (Control of analog/digital inputs via an analog signal, potential-free contact signal and control of a relay via an output of the dosing pump)

#### Selecting the operating mode

Proceed as follows to select the operating mode:

- Input the password PW01 (factory setting 9990) to release the programming levels.
- 2. Change the operating mode.



#### **Operating instructions**

#### 2 General

Before commissioning and during operation of the **sera** - Multi-layer diaphragm pump it is necessary to follow the relevant local instructions.

The **sera** - multi-layer diaphragm pump is delivered ready for connection. Carefully read these instructions and especially the safety instructions herein contained before putting the diaphragm pump into service.

#### 3 Types

#### 3.1 Model key

Example:

Multi-layer diaphragm pump Type C 409.2-17 ML

С	409.2	17	ML

Pump control

C controllable

С	409.2	17	ML
---	-------	----	----

Indication of model range/stroke mechanism

С	409.2	17	ML

Indication of nominal delivery rate

This number states the nominal delivery rate in litres/hour.

(standard version referring to water)

С	409.2	17	ML

Indication of the execution of the plug-in pump

ML Execution Multi-layer diaphragm

#### 3.2 Type plate

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

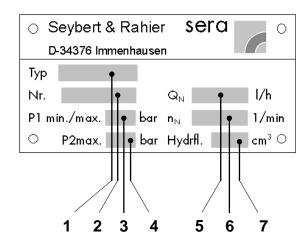


Fig. 05 Type plate

	Explanation of the indications on the type plate										
1	Тур	Pump type									
2	Nr.	Serial-No. (Pump)									
3	P₁min/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	P₂max [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 <sub>N</sub> I/h	Nominal delivery rate Delivery rate which the pump was ordered for, based on the nominal rotation speed n <sub>N</sub> , the nominal delivery height p₂max. and the dosing medium stated in the supply contract.									
6	n <sub>N</sub> 1/min	Nominal stroke frequency for									
7	Hydrfl. [cm³]	Buffer fluid Quantity of buffer fluid in the diaphragm ring (in the case of double diaphragm pumps)									

Tab. 01 Designation type plate

#### **Operating instructions**

#### 3.3 Materials

The materials used are indicated in the order confirmation.

#### 3.4 Viscosity, dosing medium

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

#### 3.5 Dosing range

The flow capacity of the multi-layer diaphragm pump can be controlled manually via the stroke length adjustment (0...100%) The linear dosing range is between 20...100%

#### 3.6 Noise test

The measured sound pressure level acc. to DIN 45635 for the diaphragms pumps is between 50 and 60 dB (A).

#### 4 Safety instructions

#### 4.1 Quality instructions

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

- Avoid danger to staff, machines, and environment.
- Increase the reliability and service life of the equipment and the entire installation.
- Reduce expenses for repairs and downtimes.

The **sera** quality management and quality assurance system for pumps, installations, fittings and compressors is certified according to DIN EN ISO 9001:2000.

The **sera** - multi-layer diaphragm pump is compliant with the valid safety requirements and accident prevention regulations

#### **CAUTION!**



Always keep these operating instructions within reach at the workplace!

#### **CAUTION!**



Pay attention to the safety data sheet of the medium conveyed! Take appropriate accident prevention measures to avoid that operators are endangered by the used conveying media!

#### 4.2 Marking of instructions

### 4.2.1 Marking of instructions (operating manual)

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



(safety symbol according to 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.



### 4.2.2 Marking of instructions (Product)

Information signs which are directly attached to the pump, such as arrows indicating the direction of rotation or signs for fluid connections must be adhered to and kept in a legible condition.

This especially applies to the type plate of the pump.

#### 4.3 Qualification and training of personnel

The personnel who operate, maintain, carry out inspections or install the machine must be suitably qualified for their tasks. The operator has to define clearly the responsibility, and the supervision of the personnel. If the personnel do not have the knowledge required, then the operator has to carry out corresponding training and instructions. Such a training can be realized - if required - upon order of the operator of the machine by the manufacturer / supplier. The operator has to ensure furthermore that the personnel have understood the contents of the operating instructions completely.

### 4.4 Dangers in case of inobservance of the safety instructions

The inobservance of the safety instructions may result in personal injuries, hazards to the environment and damages to the pump.

The inobservance of the safety instructions may have the following consequences:

- Failure of important functions of the pump
- Failure of prescribed methods for maintenance and upkeep
- Danger to persons by electrical, mechanical and chemical influences
- Danger to the environment due to leakage of hazardous media

#### 4.5 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.

#### 4.6 Safety instructions for the operator

Leakage of dangerous conveying media and materials must be drained off so that a risk to persons and the environment can be excluded. The legal regulations are to be adhered to.

Dangers caused by electrical energy are to be prevented.

### 4.7 Safety instructions for maintenance, inspection and installation

The operator has to ensure that all maintenance, inspection and installation tasks are carried out by authorized and sufficiently qualified personnel, who have carefully read and understood the operating instructions.

Only those spare parts and materials are to be used that satisfy the requirements of the relevant operating conditions.

Loosen screws and connections only when the system is not under pressure.

### 4.8 Arbitrary modification and spare parts production

Modifications of or changements to the machine are only allowed after previous agreement of the manufacturer. Original spare parts and accessories that are authorized by the manufacturer are essential for safety reasons.

#### **CAUTION!**



Use of other parts may result in loss of guarantee for damages arising as a consequence thereof.

#### 4.9 Improper use

The operating safety of the supplied multi-layer diaphgram pump is only guaranteed if the product is used as intended, according to the descriptions in Chapter 4.10 of these operating instructions.

## serd

#### **Operating instructions**

#### 4.10 Proper 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 pump is to be used for other purposes, it is required to consult **sera** beforehand to settle whether the multi-layer diaphragm pump is suitable for the new usage!

The criteria for determining whether the multi-layer -diaphragm pump is appropriately used are:

- Characteristics of the medium conveyed (refer to the safety and product data sheet of the used medium – the safety data sheet is to be provided by the supplier / operator of the conveying medium).
- Stability of the materials which have contact with the medium conveyed
- Operating conditions at the place of installation
- Pressure and temperature of the conveying and cooling medium
- Voltage supply

### 4.11 Personal protection for service and maintenance

In order to avoid risks to health, the provisions of the German Ordinance on Hazardous Substances (GefStoffV) (§14 Safety Data Sheet) and relevant national safety regulations for the dosing medium must strictly be adhered to.

In case of accidents check whether the following substances are emitted:

- Leakage of fluids
- Leakage of fumes
- Noise emissions (sound level)

Emissions must be monitored by monitoring systems of the total installation.

#### **CAUTION!**



Use protective clothing, gloves, breathing mask and suitable goggles for face protection!

#### **CAUTION!**



Personal protective equipment must be provided by the equipment operator at all times!

### Controllable Multi layer diaphragm pump

Series C 409.2 ML



#### **Operating instructions**

#### 4.12 Utilities

If not agreed otherwise in the contract conditions, the **sera** -multi-layer diaphragm pump will always be supplied with the necessary utilities.

(For type and quantitiy of utilities/lubricants, see Chapter 13)

#### 5 Transportation and intermediate storage

#### 5.1 General

Before shipment **sera** - products are tested for proper functioning and quality.

An undamaged packaging protects the device during subsequent storage and should only be opened when the multi-layer diaphragm pump will be installed.

#### **CAUTION!**



The packaging material must be disposed of appropriately!

#### 5.2 Storage

An undamaged packaging protects the device during subsequent storage and should only be opened when the multi-layer diaphragm pump will be installed.

A proper storage will increase the service life of the pump. Proper storage means avoidance of negative influences, such as heat, humidity, dust, chemicals etc.

The following storage conditions must be observed:

- Storage place: cool, dry, dust-free and slightly ventilated.
- Storage temperature between +2°C and + 40°C.
- Humidity not more than 50%.
- The maximum storage time for the standard system is 12 months.

If this value is exceeded, products made from metal should be sealed in foil and protected against condensation water using suitable desiccants.

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

#### **Operating instructions**

#### 6 Assembly groups of multi-layer diaphragm pump

The multi-layer diaphragm pump may be assembled of the following (main) components:

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

#### Options:

Actuator

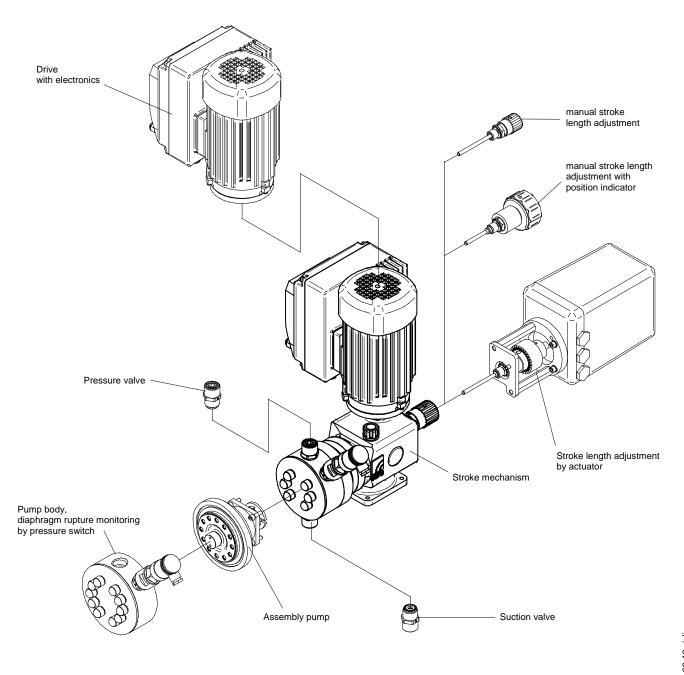
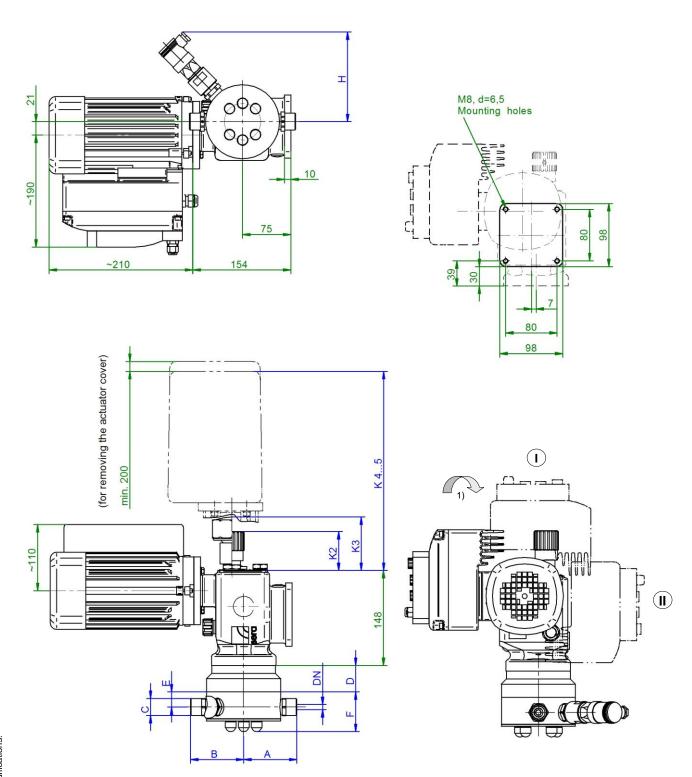


Fig. 06 Assembly - overview

#### **Operating instructions**

#### 7 Technical data

#### 7.1 Dimensions



Drive with electronics can be rotated throughout 90° each and can be put to the positions I and II. (release the motor fastening screws, put the motor carefully to the desired position and fasten with screws again).

Fig. 07 Dimensions

#### **Operating instructions**

All dim	ensior	ns in mm!	Pump type									
			C 409.2-11 ML	C 409.2-17 ML	C 409.2-30 ML	C 409.2-45 ML	C 409.2-72 ML	C 409.2-110 ML	C 400 2 450 MI	C 403.2-130 MIL	C 400 2 220 MI	C 403.2-220 IVIL
		Single valves PVC			93	93	97	97		124		124
		Single valves 1.4571/1.4581							127		127	
		Single valves PP-FRP, PVDF-FRP					94	94	127		127	
	Α	Double valves PP-FRP, PVDF-FRP	83	83	90	90						
		Double valves 1.4571/1.4581	83	83	91	91	95	95				
		Chamber valves PVC, 1.4571	88	88								
,es		Single valves PVC			100	100	104	104		143		143
Valves	В	Single valves 1.4571/1.4581							127		127	
		Single valves PP-FRP, PVDF-FRP					94	94	127		127	
		Double valves PP-FRP, PVDF-FRP	83	83	90	90						
		Double valves 1.4571/1.4581	83	83	91	91	95	95				
		Chamber valves PVC, 1.4571	88	88								
	С	Connection thread suction-/pressure valve	G ¾	G ¾	G ¾	G ¾	G ¾	G ¾	G1¼	G1	G1¼	G1
	DN	Nominal diameter	5	5	8	8	8	8	20	15	20	15
	D	Assembly pump	41	41	36	36	42	42	4	1	4	1
	Е	Centre – screw-in thread for valves (1.4571)	16	16	18	18	21	21	3	3	3	3
(PD)		Centre – screw-in thread for valves (PP, PVC, PVDF)	24	24	24	24	27	27	3	3	3	3
) dpc	F	Pump body, 1.4571 (without front plate)	49	49	51	51	54	54	8	0	8	0
Pump body (PD)	<b>.</b>	Pump Body, PP, PVC, PVDF (with front plate)	62	62	65	65	65	65	8	3	8	3
Pur	н	Pump body with pressure switch (1.4571)	123	123	127	127	131	131	14	45	14	45
		Pump body with pressure switch (PVC, PP, PVDF)	140	140	144	144	148	148	16	162 162		32
tt t	K <sub>2</sub>	Manual stroke length adjustment (max.)	70	70	70	70	70	70	7	0	7	0
Stroke length adjustment (SLA)	K <sub>3</sub>	Manual stroke length adjustment with position indicator	110	110	110	110	110	110	1	10	1′	10
troke adjus (SI	K <sub>4</sub>	Electrical actuator	240	240	240	240	240	240	24	40	24	40
	K <sub>5</sub>	Electrical actuator with PMR3	320	320	320	320	320	320	32	20	32	20
Stroke mecha	nism	Amongst others, dimensions for fastening the pump				see	fig. 07					

Tab. 02 Dimensions



#### 7.2 Technical data

#### 7.2.1 Output data

Туре	Pump data	ump data											
	Nominal capacity (2) adjustable by changing lift of strokes		Nominal capacity (2) adjustable by changing lift of strokes  Maximum permissible pressure at outlet of pump  Minimum- / maximum permissible pressure at inlet of pump  max. suction height (1)  Inlet- / outlet nominal size		Nominal stroke	Nominal stroke frequency		Motor size (standard execution)					
	Q <sub>N</sub> I/h		p <sub>2</sub> max.	p <sub>1</sub> min. / max.	ws	DN	min <sup>-1</sup>		h100	BG			
	50 Hz	60 Hz	bar	bar	m	mm	50 Hz	60 Hz	mm	20			
C 409.2 – 11 ML	0-11	0-13,2	10 <sup>(3)</sup> 20	-0,3/0	3	10	100	120	4	71			
C 409.2 – 17 ML	0-17	0-20	10 <sup>(3)</sup> 20	-0,3/0	3	10	150	180	4	71			
C 409.2 – 30 ML	0-30	0-36	10 <sup>(3)</sup> 16	-0,3/0	3	10	100	120	6	71			
C 409.2 – 45 ML	0-45	0-54	10 <sup>(3)</sup> 16	-0,3/0	3	10	150	180	6	71			
C 409.2 – 72 ML	0-72	0-86	10	-0,3/0	3	15	100	120	8	71			
C 409.2 – 110 ML	0-110	0-132	10	-0,3/0	3	15	150	180	8	71			
C 409.2 – 150 ML	0-150	0-180	4	-0,3/0	3	15	100	120	10	71			
C 409.2 – 220 ML	0-220	0-264	4	-0,3/0	3	15	150	180	10	71			

Tab. 03 Output data

#### 7.2.2 Motor data

Туре	Motor d	ata						
			230V, 5	60/60Hz	115V, 50/60Hz			<u>&gt;</u>
	Power	Mains frequency	Voltage	Nominal current	Voltage	Nominal current	Insulation class	Protection category
	[kW]	[Hz]	[V]	[A]	[V]	[A]	[ISO]	[IP]
C 409.2 ML	0,37	50/60	210-250	3,0	100-125	6,0	F	55

Tab. 04 Motor data

 $<sup>^{\</sup>left( 1\right) }$  Achievable suction height with media similar to water and filled suction line

 $<sup>^{(2)}\,</sup>$  Linear dosing range between 20 and 100% stroke length

 $<sup>^{\</sup>left( 3\right) }$  Maximum pressure for pump bodies made of plastics

## serd

#### **Operating instructions**

#### 8 Functional discription

#### 8.1 General

Sera - multi-layer diaphragm pumps are run-dry safe oscillating displacement pumps that are characterised by high tightness of the dosing head. The liquid is conveyed by a deformable multi-layer diaphragm.

Multi-layer diaphragm pumps consist of the following (main) components:

- Driving motor
- Stroke mechanism
- Stroke length adjustment
- Assembly pump
- Pump body (with MBE)
- Suction- and pressure valve

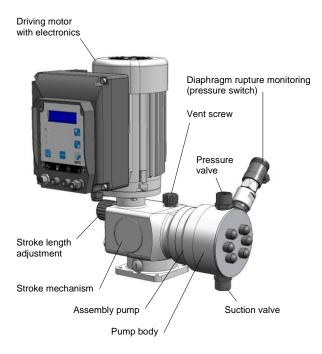


Fig. 08 Assembly groups

### 8.2 Assembly groups of the multi-layer diaphragm pumps

#### 8.2.1 Stroke mechanism

#### **Function:**

Multi-layer 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).

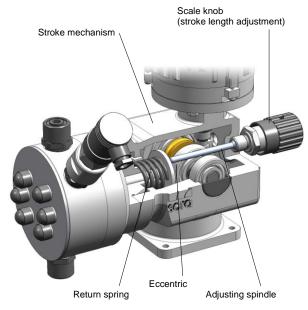


Fig. 09 Stroke mechanism

#### 8.2.2 Stroke length adjustment

#### General

The delivery rate of the pump is regulated 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%.

### 8.2.2.1 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 (in unpressurized condition) of the pump.

The set stroke length can be read off a scale, e.g. 75% (see Fig. 10)

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 Fig. 10)

→ the effective stroke length increases, the delivery rate increases.

Turning clockwise

→ the effective stroke length decreases, the delivery rate decreases.

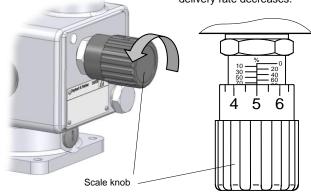


Fig. 10 Stroke length adjustment/Scale knob

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

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

Turning counter-clockwise → (see Fig. 11)

the effective stroke length increases, the delivery rate increases.

Turning clockwise

the effective stroke length decreases, the delivery rate decreases.

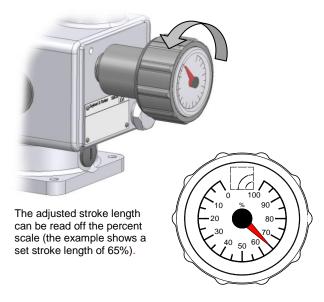


Fig. 11 Stroke length adjustment with position indicator

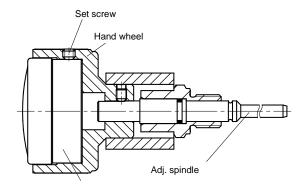
In delivery state, the stroke length adjustment is factory set to 50%.

#### **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!



Dial scale with indication of percent

Fig. 12 Stroke length adjustment with position indicator

#### Adjusting the percent scale:

- · switch the multi-layer diaphragm pump on
- loosen the set screw
- remove the percent scale from the hand wheel
- manually turn the percent scale to 0% setting
- use the hand wheel to set the stroke length to 0%. Turn hand wheel clockwise until there is no further stroke movement (push rod does no longer hit the adjusting spindle)
- · insert percent scale again
- use the set screw to secure the percent scale to the hand wheel
- · adjust desired stroke length

### 8.2.2.3 Automatic stroke length adjustment by 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 driveshaft to the adjusting spindle. The axial displacement is compensated in the clutch.

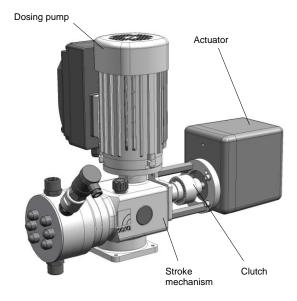


Fig. 13 Stroke length adjustment by actuator

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 standardly equipped with two integrated limit switches and a position potentiometer for position feedback. 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).

## serd

#### **Operating instructions**

The set stroke length can be read off on the pump (percent scale).

Information about the electrical connection is given inside the cover of the actuator.

#### **CAUTION!**



The adjustment is only possible when the pump is running.

## 8.2.2.4 Automatic stroke length adjustment by an electrical actuator with integrated positioner (PMR3)

same as Chapter 8.2.2.3, additionally:

#### PMR3 positioner

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

As an option, the actuator can also be provided with a collective interference signal.

Information about the electrical connection is given inside the cover of the actuator.

#### 8.2.3 Assembly pump

#### General

#### **Function**

The diaphragm consists of three layers and is linked with the connecting rod. Only the front layer, the so-called working diaphragm, comes into direct contact with the dosing medium. The middle layer functions as a signalling diaphragm. In case of a rupture of the working diaphragm, the medium is fed to the diaphragm rupture signalling in a controlled manner. The diaphragm rupture can be analysed either electrically or visually (local). The third membrane functions as protection diaphragm and ensures that no dosing medium will leak out, even not if the working diaphragm has ruptured.

A diaphragm rupture is indicated either by a manometer (visual) or, optionally, by a pressure switch (electrical).

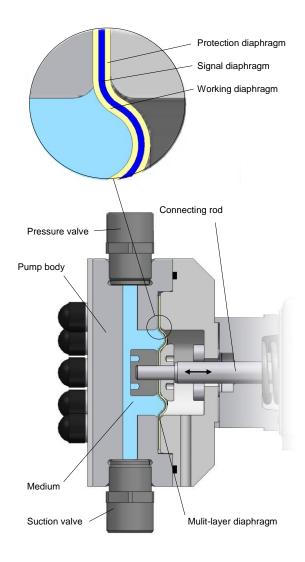


Fig. 14 Function principle of multi-layer diaphragm pump

#### **Operating instructions**

#### 8.2.3.1 Multi-layer Diaphragm

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

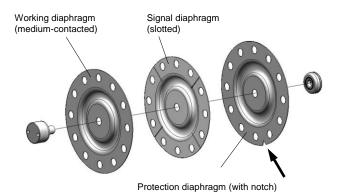


Fig. 15 Assembly of multi-layer diaphragm

The notch of the protection diaphragm indicates the correct mounting position changing the diaphragm set (see Chapter. 11.4).

#### 8.2.4 Pump body

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

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

#### 8.2.5 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. 16).

#### **CAUTION!**



Pressure valve above; Suction valve below!



Fig. 16 Double valves, FRP-Execution

#### **Operating instructions**

#### 8.2.6 Diaphragm rupture monitoring

**sera** - multi-layer diaphragm pumps are equipped with a diaphragm rupture monitoring.

#### **CAUTION!**



For more detailed information about the indicators of the diaphragm rupture monitoring, please see enclosed Documentation!

### 8.2.6.1 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.

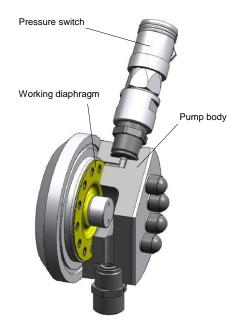


Fig. 18 Diaphragm rupture monitoring by pressure switch

#### 8.3 Drive motor

A **sera** – diaphragm pump of series C 409.2 is driven by a threephase-motor controlled by the electronics.

#### 8.3.1 Start-up

Preconditions:

Make sure that voltage and frequency correspond with the specifications on the type plate of electrics.

The nominal motor power on the type plate of the motor refers to an ambient temperature of 40°C and an installation site below 1000m above sea level. Motor output will be reduced if these values are exceeded (see VDE 0530).

Adapted for "moderate" group 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!

#### 8.3.2 Motor protection

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

#### 8.3.3 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.

#### 8.3.4 Restart

Restart the system as described in Chapter 8.3.1 after maintenance work of after longer periods of standstill.



#### 9 Installation

#### 9.1 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°C and +40°C, permitted humidity until approx. 90%, altitude 1000 m above sea level
- For dimensions of the pump connections and fixing holes, see Fig. 08, Table 02.
- Install the pump in such a way that there is no vibration and no tension and that it is aligned precisely.

#### **CAUTION!**



When the C 409.2 is installed next to a pump of series 204.1 and C 410.2 a minimum distance of 100 mm between the pumps (motor housings) has to be kept!

- 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.

#### **CAUTION!**



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

Torque for tightening the fixing screws							
Pump body without mounting plate	15 Nm						
Pump body with mounting plate	15 Nm						

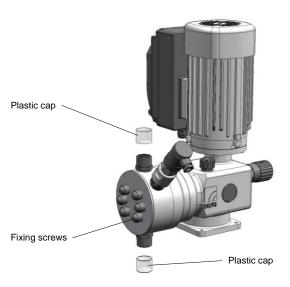


Fig. 19 Multi-layer diaphragm pump with plastic caps

- For models with a built-on actuator, ensure sufficient space for removal of the cover (see Chapter 7.1 "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.

#### **CAUTION!**



Where toxic, crystal-forming or corrosive liquids are being delivered, the pipe system must have equipment to enable it to be emptied, cleaned and, if necessary, rinsed with a suitable medium.

#### **CAUTION!**



The multi-layer diaphragm pump must be installed in such a way that no damage can be caused if the medium leaks out.

### Controllable Multi layer diaphragm pump

Series C 409.2 ML

#### **Operating instructions**

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

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

#### **CAUTION!**



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

#### 9.1.1 Provide for an overpressure protection

if the permissible pressure in the pump head 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 storage tank which is under atmospheric pressure or lead it in an open drain gutter (see Fig.20).
- 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. 21).

#### **CAUTION!**



Shut-off valves must  $\underline{not}$  be closed when the pump is operating!

#### **CAUTION!**



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

#### **CAUTION!**



In the case that the pump is not equipped with an overpressure protection, it may get damaged if the permissible operating pressure is exceeded.

#### CAUTION!



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

serd

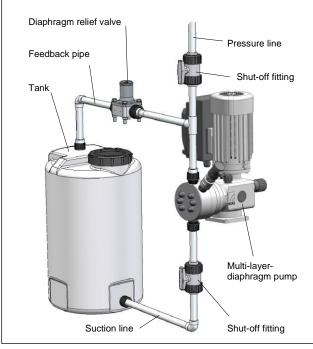


Fig. 20 Installation with diaphragm relief valve (into tank)

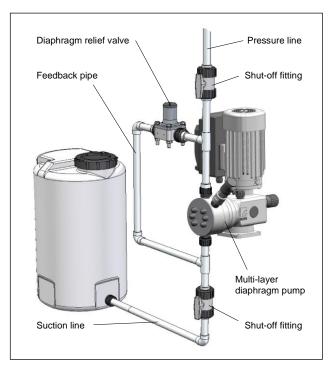


Fig. 21 Installation with diaphragm relief valve (into suction line)

#### **Operating instructions**

### 9.1.2 How to prevent a backflow of the dosing medium

When the dosing line is linked with a main line:

install an injection fitting (dosing valve).

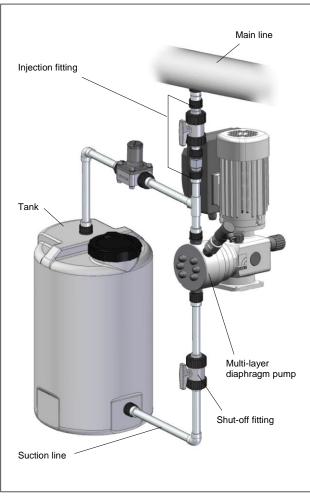


Fig. 22 Installation of injection fitting

#### **CAUTION!**



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

#### **CAUTION!**



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

#### 9.1.3 How to eliminate 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 avoided (by a positive pressure difference (≥ 1bar) between pressure and suction side).

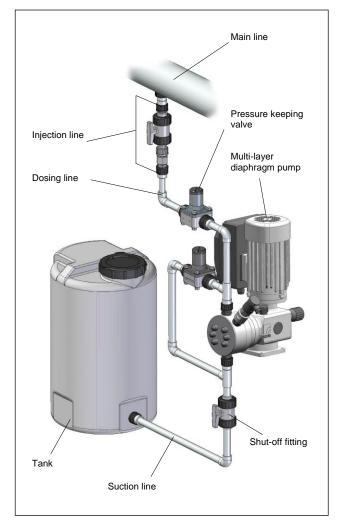


Fig. 23 Installation of pressure keeping valve

#### **Operating instructions**

#### 9.1.4 How to ensure an airless suction

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 ventilation valve into the pressure line.

#### **CAUTION!**



The delivery may get interrupted if air remains in the suction line!

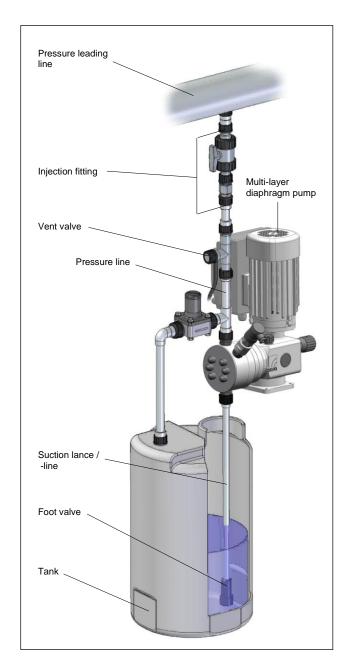


Fig. 24 Installation of ventilation valve

#### 9.1.5 Installing the empty-tank alarm

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

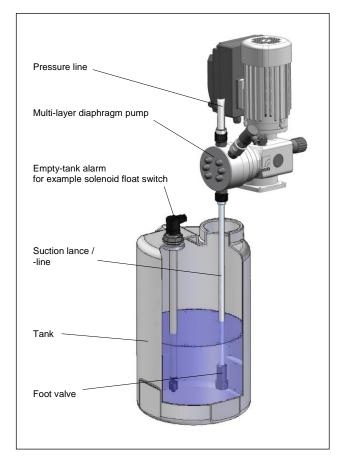


Fig. 25 Installation empty-tank-alarm

#### **CAUTION!**



The delivery may get interrupted if air remains in the suction line!

#### **Operating instructions**

### 9.1.6 How to avoid an emptying of the suction line

 Install a foot valve at the end of the suction line if the pump is installed at a higher level than the maximum fluid level in the tank.

Based on calculations, the dimension ' $\mathbf{H}$ ' may not exceed the number that is equal to the specified maximum suction height of the pump divided by the density of the dosing medium and under consideration of mass acceleration and viscosity of the medium.

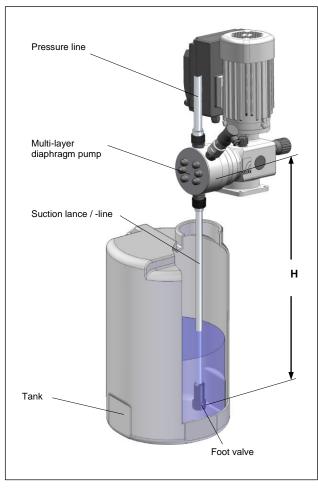


Fig. 26 How to avoid an emptying of the suction line

#### 9.1.7 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).

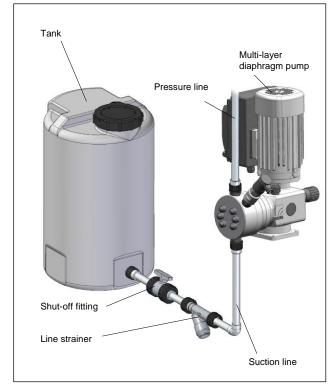


Fig. 27 Installation of a line strainer

#### **CAUTION!**



Pump and system may malfunction if contaminates are not collected.

#### **Operating instructions**

#### 9.1.8 Suction via a siphon pipe

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

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

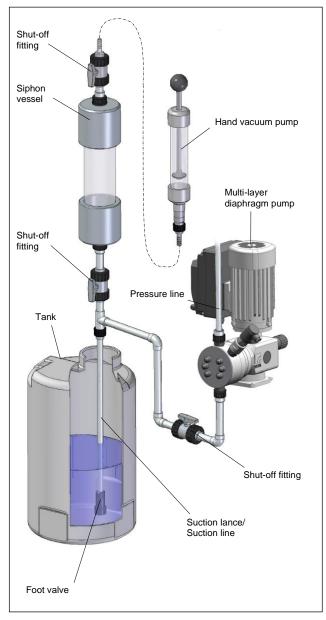


Fig. 28 Installation of siphon vessel (sera -fitting)

### 9.1.9 In case of slightly degassing dosing media

• Install the pump so that it can be operated with afflux

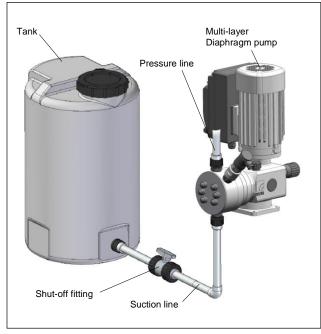


Fig. 29 Installation under afflux

#### 9.1.10 Damping of the pulsation

By installing pulsation dampers if:

a pulsation-poor dosing flow is desired for procedural reasons

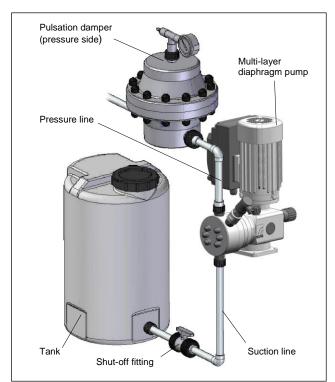


Fig. 30 Installation of pulsation damper (I)

#### **Operating instructions**

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

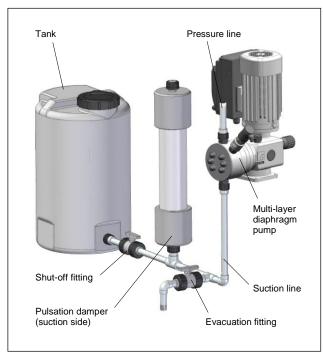


Fig. 31 Installation of pulsation damper (II)

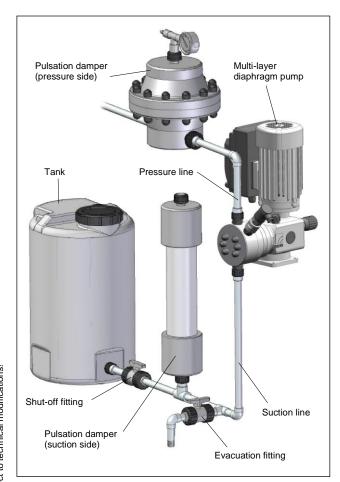


Fig. 32 Installation of pulsation damper (III)

#### **CAUTION!**



Undampened acceleration forces can cause the following problems/damage:

Fluctuations in the delivery rate Dosing errors Pressure thrusts Valve wobbles

Increased wear on the suction and pressure side of the

Mechanical breakdown of the pump Leakages 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.

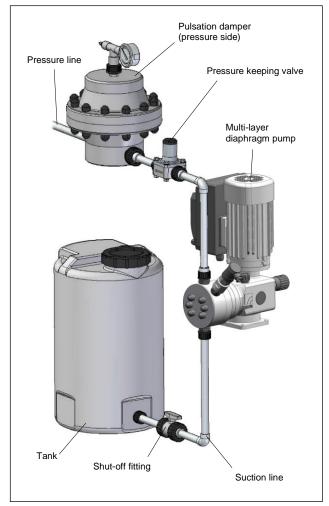


Fig. 33 Installation of pulsation damper and pressure keeping valve

#### **Operating instructions**

#### 10 Electrical connections

#### 10.1 Electric supply

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

#### **CAUTION!**



The specifications on the type plate must absolutely be adhered to!

The C 409.2 is available in two versions:

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

#### **CAUTION!**



Temporary activate and deactivate of supply voltage is to be avoided!

#### **CAUTION!**



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

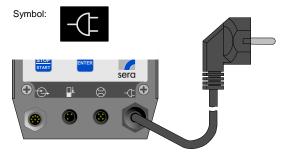


Fig. 34 (Electric supply)

#### **CAUTION!**

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

#### 10.2 Electrical interfaces

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

#### 10.2.1 Control inputs and outputs

The pump is equipped with three control inputs and two control outputs. They can be programmed with different functions. All three inputs can be used as digital inputs, whereas two of them can optionally be configured as analog inputs (inputs 02 and 03, see Chapter 11.8.2). When leaving the factory, the inputs and outputs are preset as described in Tab.05.





Connector socket for control inputs and outputs

Fig. 35 (Connection of control inputs and outputs)

Standard delivery of the dosing pump includes a 5m control cable, which is to be connected to the 8-pin socket of the control inputs and outputs. Tab. 05 shows the identification of the individual leads of the control cable.

Lead colour	Pin	Function (ex works setting)			
WH (white)	1	Eingang 01 (Impuls)			
BN (brown)	2	Eingang 02 (Analog 01)			
GN (green	3	Eingang 03 (Extern EIN)			
YE (yellow)	4	Ausgang + / Signal + / 15 V DC			
GY (grey)	5	Ausgang 01 (Sammelstörung)			
PK (pink)	6	Ausgang 02 (Hubsignal)			
RD (red)	7	Masse			
BU (blue)	8	Masse			

Tab. 05 (Identification of the leads of the control cable)

The digital inputs can not only be switched by a potential-free contact signal but also **directly via a control voltage signal** (e.g. 24V DC).

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

#### **CAUTION!**



When an external supply (for example, 24 V DC) is connected to the pin output + (colour of cable lead: yellow) the following has to be considered:

A protective diode is necessary in the feeding pipe of the external supply in order to exclude a feeding back of the pump (see fig. 37).

Connect the anode with 24V DC.

Connect the cathode with the yellow lead of a cable. Use the diode type 1N4007 or the like.

### Controllable Multi layer diaphragm pump

Series C 409.2 ML

#### **Operating instructions**

Fig. 36 shows exemplarily the control of the digital inputs 01 and 03 via a potential-free contact signal.

#### **CAUTION!**



The outputs 01 and 02 are not potential-free! In order to enable a potential-free switching via the outputs, the use of a relay is necessary (see example in fig. 36).

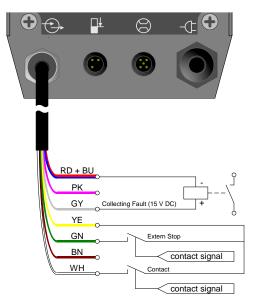


Fig. 36 (Control of digital inputs via a potential-free contact signal)

#### CAUTION!

The maximum voltage/maximum current withstand capability of the control inputs and outputs is as follows:

Inputs: 30V DC / 50mA

Outputs: 15V DC / 50mA (internal supply) 30V DC / 350mA (external supply)

#### **CAUTION!**



The output + / signal + connection pin (lead colour: yellow) is <u>not</u> short-circuit proof! In case of a short-circuit, the control electronics may get damaged!

Therefore, please make absolutely sure that the signal + connection pin is not directly connected with the earth connections (lead colour: red and blue)!

Fig. 37 shows exemplarily the direct activation of the digital inputs 01 and 03 via a control voltage signal (in this example: 24V DC) of a programmable logic controller.

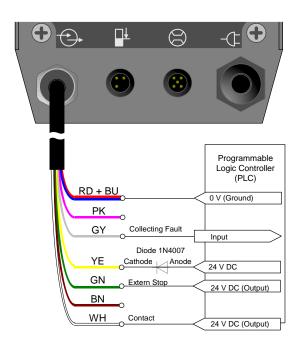


Fig. 37 (Direct activation of digital inputs via a control voltage signal of a programmable logic controller)

#### **Operating instructions**

#### 10.2.2 Level input with pre-alarm and dry run

#### NOTE!



Pre-alarm and dry run are connected to the same jack. When leaving the factory, both inputs are preset to "closing when floating down".

However, if necessary, they can be freely configured (see Chapter. 11.15.4).

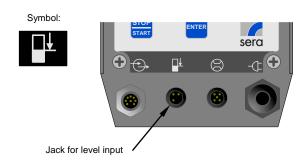


Fig. 38 (Connection for leader contact / main contact)

Suction lances that are compatible with types R/C 203 or C 408.1/409.1 can be connected to the pump using an adapter plug M8/M12, 3-pin (Item No. 90025005).

#### 10.2.3 Input for flow control and flow meter

#### **CAUTION!**



Only flow controllers and flow meters made by Sera may be connected to the dosing pump.

If you use other than sera products, the electronics might get damaged.

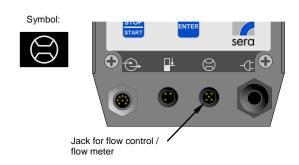


Fig. 39 (Connection for flow control / flow meter)

**sera** flow controllers and flow meters are delivered completely with cable and plug. Electrical connection is made directly to the 5-pin socket.

**sera** flow controllers that are compatible with types R/C 203 or C 408.1/409.1 can be connected to the pump using an adapter plug M8/M12, 4-pin (Item No. 90025006).

#### 11 Operation

#### 11.1 Operating elements

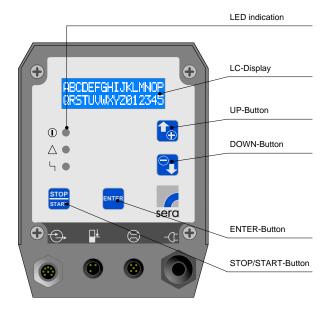


Fig. 40 (Electronics control panel)

#### 11.2 LED operation indicators

Three light-emitting diodes (LED) indicate the status of the pump.

Green: Operation and stroke indicator





When switching on the pump, the green LED lights steadily. The operation indicator works in combination with a stroke indicator; during pump operation, the LED flashes in accordance with the current stroke frequency.

Yellow: Warning indicator





The yellow LED indicates all occurring warning messages (see Tab. 06). The warning is not only indicated by the LED but also as plain text in the LCD display.

Red: Fault indicator



The red LED indicates all occurring faults (see Tab. 06). The fault is not only indicated by the LED but also as plain text in the LCD display.



	Green LED	Yellow LED	Red LED					
Ready	On							
Stroke confirmation	Flashes							
Internal error			On					
Supply voltage		On						
too low / too high		Oli						
No mains								
Level monitoring:								
Level pre-alarm		Flashes						
Dry run			Flashes					
Dosing control (flow co	ntroller or flow n	neter):						
No flow		On						
<ul> <li>with warning message</li> </ul>		On						
No flow			On					
- with shut-off			011					
Flow too low		On						
- with warning message		0						
Flow too low			On					
- with shut-off								
Optional diaphragm r	upture monit	toring:	_					
Diaphragm rupture			On					
Vent valve (CS 409.2)		r	_					
Venting	Flashes		On					
Analog mode:								
mA signal < 3.5mA			On					
mA signal > 20.5mA			On					

Table. 06 (Overview of LED indicators)

#### NOTE!



The "dry run" fault message suppresses the "pre-alarm" warning. This means that if the pump runs dry while the 2-stage level monitoring is activated, then only the red LED will flash.

#### 11.3 Key operation

Operation of the pump is performed with 4 keys:



#### STOP/START key

After connection to the power supply, the pump is switched  $\mbox{ON/OFF}$  using the  $\mbox{STOP/START}$  key.



#### **ENTER key**

You can use the ENTER key to open and confirm value input fields and to select menu items.





#### UP / DOWN key

Using the UP/DOWN key, you can scroll the different menu items / menu levels and select the display of various operating messages.

During parameter adjustment, the UP key is used to increase the parameter value and the DOWN key is used to decrease the parameter value.



#### 11.4 Parameter table

Tab. 07 shows the factory settings of the controllable diaphragm pump. With these defaults, the user can start standard applications such as manual operation, analog operation with 4-20mA, 1/1 pulse operation and external operation with External ON, without having to make further adjustments. It is only necessary to select the operation mode from the respective menu (see Chapter 11.6) and, in case of external control, to connect the respective input (see Chapter 10.2.1).

The references to the respective chapters facilitate the adjustment of the settings to special applications and dosing tasks.

In addition, the parameter table offers the possibility to document the changes that have been made in the settings. Thus, the current settings of the pump can be viewed quickly at any time.

Factory settings	Chapter	Modification 1	Modification 2	Modification 3
	-			
1/1	11.7.2			
1	11.7.2			
ON	11.7.2			
			1	
Auto	11.7.1			
4 mA				
0 %				
	1			
Manual	11.7.3			
00.00 11	1		1	
100 %	1174			
100 /0	1 11.7.7		1	
Pulse	1181			
110	11.0.1		1	
Analog 01	11 8 2			
INO	11.0.2			
External ON	11 0 0		T	
			+	
INO	11.0.2			
Collective fault	11 0 2		T	
INC	11.0.3			
Ctroko ojanal	1400		1	
NO	11.6.3			
	14440		T	
80%	11.12		1	
NO	144454			
NO	11.15.4			
	1 44 1		1	
UFF	11.11			
	1 4 4 1		1	
80 %	11.15.1			
	T		1	
9021	11.13			
NC 70%	11.15.3 11.15.3			
· · · · · · · · · · · · · · · · · · ·	1/1 1 ON Auto 4-20mA	1/1	1/1	1/1 11.7.2

Tab. 07 (Overview of preset parameters)

#### Controllable Multi layer diaphragm pump

Series C 409.2 ML

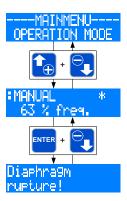
#### **Operating instructions**



You can switch between the following three screens:

- Operating messages
- Main menu
- Fault and warning messages

A change to the screen "Fault and warning messages" is only possible when a fault or warning is present.



A change between the screens "Operating messages" and "Main menu" is done by simultaneously pressing the UP and DOWN keys.

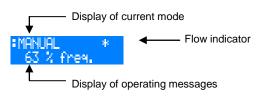
A change between the screens "Operating messages" and "Fault and warning messages" is done by simultaneously pressing the ENTER and DOWN keys.

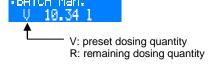
#### NOTE!



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

#### 11.5.1 Screen "Operating messages"





#### Display of the current operation mode

The first line in the screen "Operating messages" shows the currently set operation mode.

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#### Flow indicator

A star-symbol (\*) in the first line on the right-hand side is used as flow indicator. The star symbol indicates the response of a connected dose monitoring instrument (flow control or flow meter).

#### **HINWEIS!**



The flow indicator (\*) is only active when a flow control / flow meter is connected and the dosing monitoring is activated (see Chapter 11.15.1).

#### Display of operating messages

The second line of the display shows, dependent on the set operation mode, a variety of operating messages (e.g. the current stroke frequency, total strokes – see Tab. 08). The operating messages can be scrolled using the UP and DOWN keys.

You can use the ENTER key to open the value input fields of the editable operating messages (see Tab. 08). The value input is described in Chapter 11.5.4.

Operating messages	Operation mode				
	Manual	Analog	Pulse	Batch	External
Current stroke frequency	O <sup>(1)</sup>	•	•	•	•
Current dosing performance (2)	0	•			
Total strokes	0	0	0	0	0
Total dosing quantity (2	0	0	0	0	0
Venting ON/OFF (3)		•			
Current control current			•		
Pulse factor			•	•	
Memory				•	
Dosing quantity / strokes				•	
Remaining dosing quantity / remaining strokes				•	
= Indication					

= Indication and setting option

(1) = not with a calibrated pump

(2) = only with a calibrated pump

Tab. 08 (Operating messages in dependence on the selected operation mode)

#### 11.5.2 Fault and warning messages

When a fault or warning has occurred, the dosing pump shows a message in plain text format on the LCD display.

#### NOTE!



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

#### Operating instructions

#### 11.5.3 Screen "Main menu"

The upper line shows the superordinate menu items or editable parameters. The lower line shows the subordinate menu items or selectable values and settings.

Superordinate menu items are marked with "---". Superordinate means that no values or settings can be assigned to this item. It is, for example, possible to select a variety of subordinate menu items (e. g. ANALOG MODE) in the ---PARAMETER--menu but these items cannot be assigned to the superordinate menu as a fixed value.



Parameters which can be assigned different values or settings are marked with ">" and "<". Such parameters are, for example, the operation mode, the analog signal or the pulse mode. Each parameter should be assigned a definitive value or setting. The >OPERATION MODE< can, for example, be assigned the ANALOG setting.



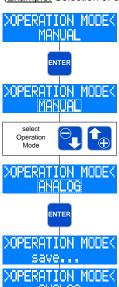
)ANALOGSIGNAL

#### 11.5.4 Value entry

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

#### Assignment of settings

(Example: Selection of operation mode)



Display of the current setting (in this example: MANUAL operation

Value entry is enabled after pressing the ENTER key.

Then, the operation mode indicator flashes and a setting can be selected (in this example: operation modes) using the UP and DOWN keys.

After a setting has been selected (in this example: ANALOG mode), pressing the ENTER key will confirm and save the choice.

Display of the current setting (in this example: ANALOG mode)

#### Assignment of values

(Example: Selection of the pulse factor in case of division)



Display of the current value (in this example: pulse factor 1/1)

Value entry is enabled after pressing the ENTER key.

Then, the first digit of the pulse factor flashes.

The desired figure can be set using the UP and DOWN keys (in this example: 1).

After having selected the desired figure, pressing the ENTER key will confirm the choice.

Then, the second digit of the pulse factor starts to flash.

The desired figure can be set using the UP and DOWN keys (in this example: 0).

After having selected the desired figure, pressing the ENTER key will confirm the choice.

Then, the third digit of the pulse factor starts to flash.

The desired figure can be set using the UP and DOWN keys (in this example: 0).

After having selected the desired figure, pressing the ENTER key will confirm the choice.

Afterwards, the entered value will be saved

Display of current value (in this example: pulse factor 100/1

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

#### NOTE!

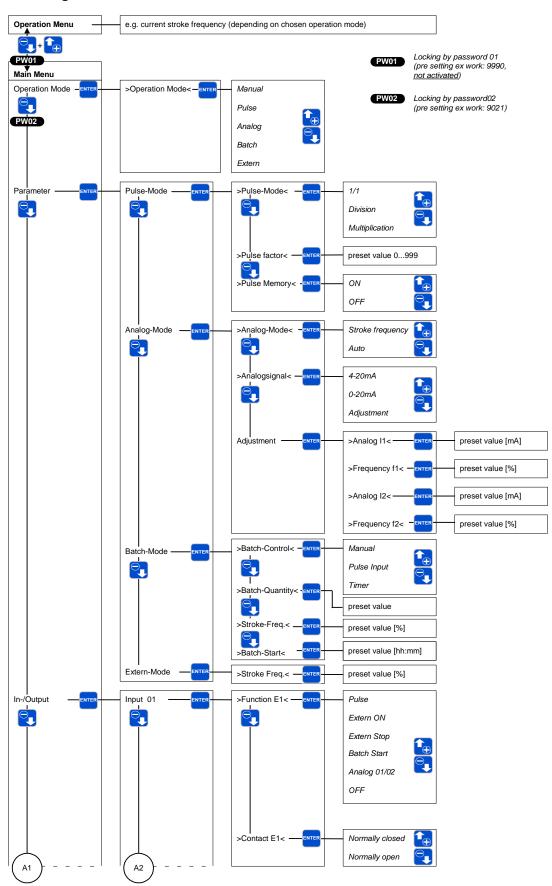


If, during the value entry (flashing indication), no key has been pressed for 30 sec. the entry mode is exited automatically and the previous value / previous setting is maintained.

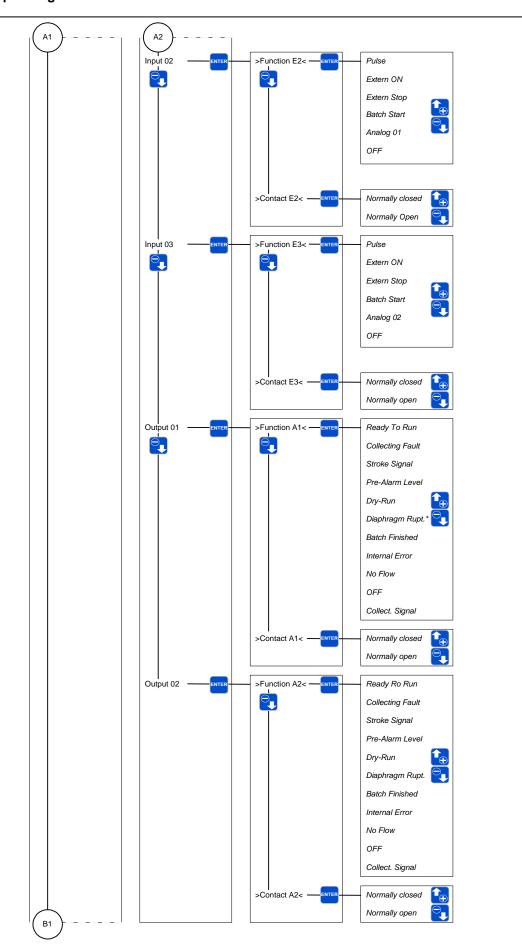
TA 432-04 en / 01.06.12 / li Subject to technical modifications!



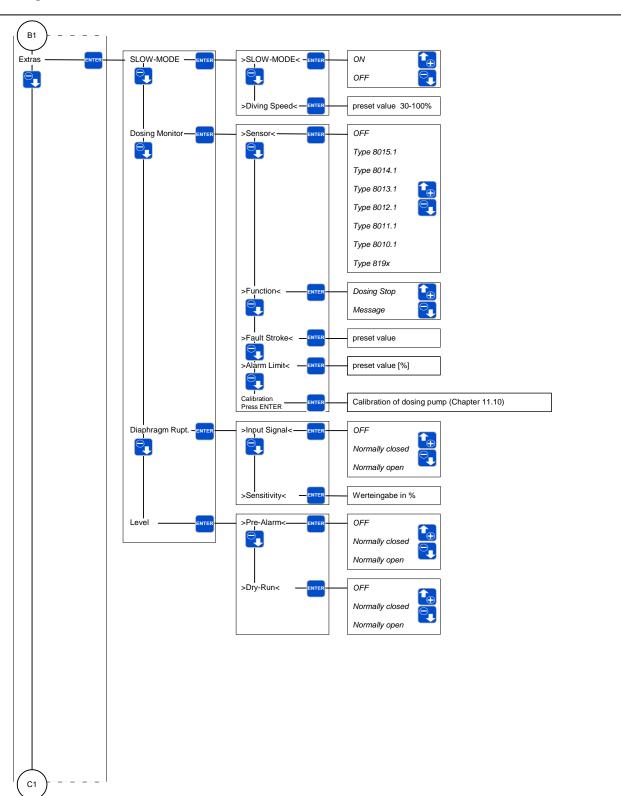
#### 11.5.5 Menu guide





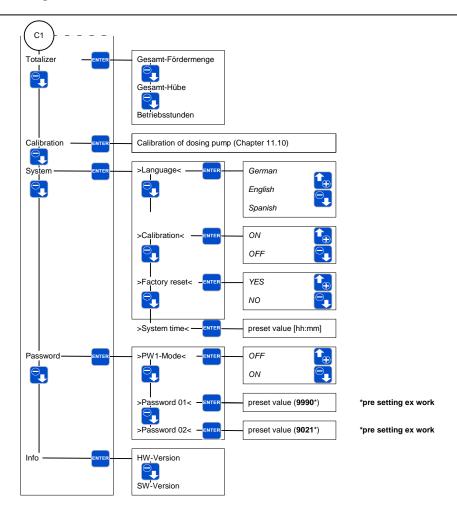








#### **Operating instructions**



#### Controllable Multi layer diaphragm pump

Series C 409.2 ML

#### Operating instructions



#### 11.6 Selecting the operation mode

You can select among five different operation modes:

- MANUAL
- **PULSE**
- **ANALOG**
- **BATCH**
- **EXTERNAL**

### XOPERETION MODE

On-site operation and on-site control of the pump without external control. The flow rate can be set via the manual stroke length adjustment (10.6) and/or by presetting a stroke frequency. With a calibrated pump, the delivery rate is set in I/h instead of via the stroke frequency.

#### OPERATION MODE EXTERN

The pump is released or blocked via an external switch. If the pump is released, it will run at the preselected stroke frequency (see Chapter 11.7.4).

### >OPERATION MODE(

Batch dosing that can either be started manually, via an external pulse signal or by time control. The batch quantity can be entered in strokes or in liters (only with a calibrated pump) (see Chapter. 11.7.3).

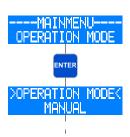
The stroke frequency of the pump is controlled via the received analog signal. The pump can optionally be controlled with a control current of either 0...20mA or 4...20mA.

In addition, there is the possibility to adjust the receiving analog signal according to needs (see Chapter 11.7.1).

### >OPERATION MODE(

Three pulse modes are offered. The pump can either be operated in the 1/1 mode or with multiplication or division of the input pulses (see Chapter 11.7.2).

#### Setting diagram:



Go to the ---MAIN MENU--- and select the menu item OPERATION MODE (if necessary, use the UP / DOWN keys).

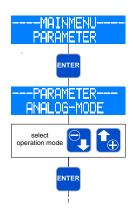
Pressing the ENTER key will open the >OPERATION MODE< submenu.

Here, the currently set operation mode is indicated (in this example: MANUAL).

The adjustment of an operation mode is done in accordance with the description in Chapter 11.5.4.

### 11.7 Additional settings for the operation

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



Go to the ---MAIN MENU--- and select the menu item PARAMETER (if necessary, use the UP / DOWN keys).

Pressing the ENTER key will open the --- PARAMETER --- submenu.

Here, the currently set operation mode is indicated (in this example: ANALOG MODE).

The DOWN key is used to move to the respectively next operation mode. The UP key is used to move to the previous operation mode. When in the PULSE MODE, the UP key is used to back move to the ---MAIN MENU---.

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

#### NOTE!



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

#### 11.7.1 Additional settings for the ANALOG operation mode

#### NOTE!



In order to be able to use the ANALOG operation mode, at least one input must be assigned the ANALOG 01 or ANALOG 02 function (see Chapter 11.8.2).

Input 02 (see Chapter 10.2.1) is factory preset to analog input (ANALOG 01).

#### Choose the ANALOG MODE

Two different analog modes can be chosen:

- Auto
- Stroke frequency



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



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

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#### **Operating instructions**

#### Selecting the ANALOG SIGNAL

You can select among three different analog signals:

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

#### >ANALOGSIGNALK 4-20mA

A signal with a control current of 4mA corresponds to 0% stroke frequency; a signal with 20mA corresponds to 100% stroke frequency. In this range, the stroke frequency behaves proportionally to the control current (Fig. 41).

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

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

#### >ANALOGSIGNALK 0-20mA

A signal with a control current of 0mA corresponds to 0% stroke frequency; a signal with 20mA corresponds to 100% stroke frequency. In this range, the stroke frequency behaves proportionally to the control current (Fig. 41).

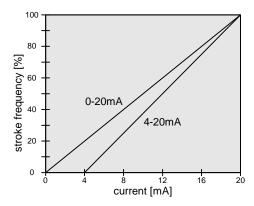


Fig. 41 (Stroke frequency in dependency on the control current at 4-20mA / 0-20mA)

#### >ANALOGSIGNAL< ADJUSTMENT

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

Two points are given that reflect a proportional relation between control current and stroke frequency of the pump. In addition, these two points restrict the stroke frequency range of the pump as shown in Fig 42.

Example: Point 1: 15% stroke frequency at 5mA Point 2: 80% stroke frequency at 15mA

If the control current is < 5mA, then the stroke frequency of the pump is 0%.

If the control current is > 15mA, then the stroke frequency of the pump is 80%.

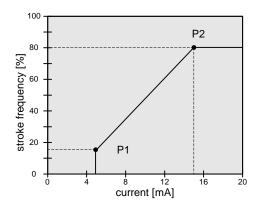


Fig. 42 (Exemplary adjustment of the analog signal)

#### **CAUTION!**



If the input signal is greater than 25 mA, the pump stops and a fault indicator "analog signal > 25 mA" is emitted. Additionally in this case, the appropriate input will be switched off as protective measure. The input is reactivated after the dosing pumps is switched off and started again via the button STOP/START.

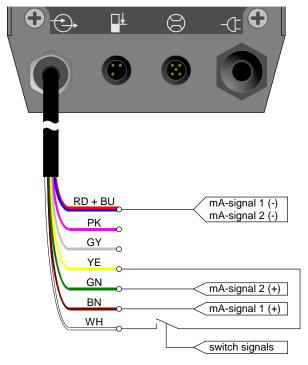


Fig. 43 (Connection of two analog signals with switch-over)

#### **Operating instructions**

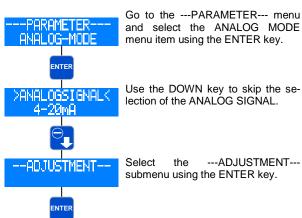
#### **ADJUSTMENT** of the analog signal

The adjustment of the analog signal is done under consideration of two default points. These two points are two value pairs which assign control currents to stroke frequencies:

Point 1 (I1, f1) Point 2 (I2, f2)

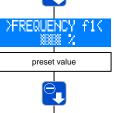
The following diagram shows the procedure to determine the points.

#### Setting diagram:





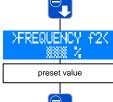
Einstellen der Stromstärke I1. Werteingabe gemäß Kap. 10.5.4.



Enter the value for current I1, To do so, proceed as described in Chapter 11.5.4.



Enter the value for stroke frequency f1 which is assigned to current I1. To to so, proceed as described in Chapter 11.5.4.



Enter the value for current I2. To do so, proceed as described in Chapter 11.5.4.



The adjustment is then completed.

### 11.7.2 Additional settings for the PULSE mode

#### NOTE!



In order to be able to use the PULSE operation mode, at least one input must be assigned the PULSE function (see Chapter 11.8).

Input 01 (see Chapter 10.2.1) is factory preset to pulse input (ANALOG 01).

#### Selecting the PULSE MODE

You can select among three different pulse modes:

- 1/1
- DIVISION
- MULTIPLICATION

#### >PULSE MODEK 1/1

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

#### >PULSE MODEK DIVISION

In this mode, a division of the received pulses is performed. This means that a stroke will only be performed after an adjustable number of pulses (division factor) has been received.

### >PULSE MODEK MULTIPLICATOIN

In this mode, a multiplication of the received pulses is performed. This means that the pump will perform an adjustable number of strokes (multiplication factor) after every received pulse.

#### Selecting the PULSE FACTOR

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

#### >PULSE\_FACTOR( 50/1

The **division** factor can be selected between 1 and 999. If, for example, the division factor is 50, then the pump will perform a stroke only with every 50<sup>th</sup> received pulse.

#### >PULSE FACTORK 1/ 50

The **multiplication** factor can be selected between 1 and 999. If, for example, the multiplication factor is 50, then the pump will perform 50 strokes with every received pulse.

For setting the pulse factor, please see the description in Chapter 11.4.3 (Assignment of values).

#### **Operating instructions**

#### Switching ON/OFF the PULSE MEMORY

The pump is equipped with a pulse memory, which can optionally be switched ON and OFF. 999 strokes max can be saved. If the number of received pulses exceeds the number that can be handled by the pump, then the pulses will be buffered and the strokes will be performed later.

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

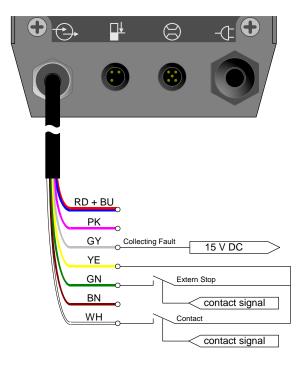


Fig. 44 (Connection of a pulse signal with External stop and response of the stroke signal)

#### 11.7.3 Additional settings for the BATCH mode

#### Selecting the type of CONTROL

You can select among three different types of control:

- **MANUAL**
- TIMER
- **PULSE INPUT**

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

### CONTROLK

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

#### **CAUTION!**



The pump starts the batch when the preset time matches the system time of the pump. When the supply voltage is switched off, then the system time will be reset to 0:00.

#### **CAUTION!**



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

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

#### NOTE!



In order to be able to use the PULSE INPUT control, at least one input must be assigned to the START BATCH function (see Chapter 11.8).

#### Determining the BATCH QUANTITY

The type of entry for the batch quantity depends on the calibration (see Chapter 11.10):

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

#### **Operating instructions**

#### Adjusting the STROKE FREQUENCY

The stroke frequency at which the pump works during batch dosing can be adjusted.

The value input is described in Chapter 11.5.4.

#### Determining the **BATCH START**

#### >BATCH-STARTK 16:30 h

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

The value input is described in Chapter 11.5.5.

#### NOTE!



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

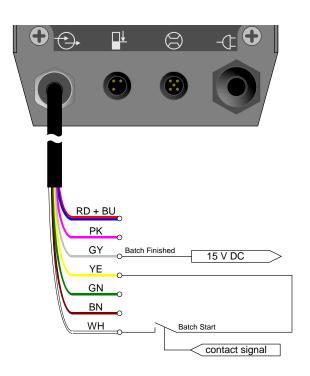


Fig. 45 (Possible connector pin assignment in batch mode)

### 11.7.4 Settings for the EXTERNAL operation mode

#### NOTE!



In order to be able to use the EXTERNAL operation mode, at least one input must be assigned the EXTERNAL ON function (see Chapter 11.8).

Input 03 (see Chapter 10.2.1) is factory preset to External ON.

### >STROKE FREQ.K

In the EXTERNAL operation mode, only one stroke frequency (e.g. 63%) can be set. As soon as an external ON signal is received, the pump will start running at this stroke frequency.

The value input is described in Chapter. 11.5.5.

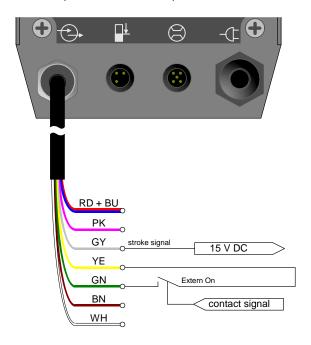


Fig. 46 (Possible connector pin assignment in External operation mode)

#### 11.8 Configuring the inputs and outputs

The pump is equipped with three inputs and two outputs, which can be configured via a menu and thus be adapted to the given operating conditions.

It is possible to assign the same functions to all three inputs.

#### NOTE!

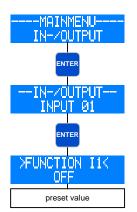


If several inputs are configured identically, then the input signals will be evaluated via OR-operation. This means that the function will be performed as soon as one of the inputs fulfils the condition.

Exception: Pulse input  $\underline{\text{with}}$  pulse memory. If the pulse memory is switched on, then the received pulses will be summed up.

#### **Operating instructions**

#### Setting diagram:



Go to the ---MAIN MENU--- and select the menu item IN-/OUTPUT (if necessary, use the UP / DOWN keys).

Pressing the ENTER key opens the ---IN-/OUTPUT--- submenu.

Here, you can select among the individual inputs and outputs.

Pressing the ENTER key opens the menu level for setting the individual inputs and outputs.

#### 11.8.1 Digital input 01

Input 01 can be assigned one of six different functions. Optionally, it can also be switched off.

- Pulse
- External On
- External Stop
- Venting (only with the "venting" option!)
- Batch Start
- Analog 01/02
- OFF

In addition, it is possible to configure the contact signal of the input as NC or NO.



Configuration of the respective input as pulse input.

#### >FUNCTION I1K EXTERN ON

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

### >FUNCTION I1<

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

#### NOTE!



If the dosing pump is switched off via External Stop, then an "S" will be indicated in the 1. line of the display on the right-hand side.



#### >FUNCTION I1< DE-AERATION

Function for the external control of the charge via the respective input.

#### >FUNCTION 11K ANALOG 01/02

This function is used to switch over between the two analog inputs Analog 01 and Analog 02 (input 02 and 03) via input 01. Selection of the analog input is done in accordance with the following Tab. 09.

Configuration Contact E1	Applied signal	Selected analog input
NC	High	Analog 01 (input 02)
NC	Low	Analog 02 (input 03)
NO	High	Analog 02 (input 03)
NO	Low	Analog 01 (input 02)

Tab. 09 (Analog input switchover)

## >FUNCTION I1<

The respective input is not assigned a function.

#### 11.8.2 Digital/analog inputs 02 and 03

Basically, input 02 and input 03 have the same functions as input 01 (see Chapter 11.8.1). In addition, they can also be used as analog inputs. However, the function "Analog 01/02", which is used to switch over between the analog inputs is not available.

In addition, it is possible to configure the contact signals of the inputs as NC or NO.



>FUNCTION ANALOG (

Respective input is configured as analog input.

#### 11.8.3 Outputs 01 and 02

Each of the outputs 01 and 02 can be assigned one of ten different functions. Optionally, they can also be switched off.

- · Ready to run
- Collective fault
- Collect. signal
- Stroke signal
- Pre-alarm level
- Dry run
- Diaphragm rupture
- Batch finished
- Internal error
- No flow

• OFF

### Controllable Multi layer diaphragm pump

Series C 409.2 ML

#### **Operating instructions**

In addition, it is possible to configure the contact signals of the outputs as NC or NO.

#### >FUNCTION 01< READY TO RUN

Message from the respective output indicating the readiness of the dosing pump.

#### >FUNCTION 01< COLLECTING FAULT

Message if one of the following faults occurs:

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

#### >FUNCTION 01< COLLECT. SIGNAL

Message indicating that one of the following faults has occurred:

- All faults of the collective faults
- Pre-alarm level
- No flow (with MESSAGE function)

#### >FUNCTION 01< STROKE SIGNAL

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

#### >FUNCTION 01< PRE-ALARM LEVEL

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

## >FUNCTION 01<

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

## >FUNCTION 01<

(only with MBE option!)

With activated diaphragm rupture monitoring, message from the respective output indicating a diaphragm rupture.

#### >FUNCTION O1K BATCH FINISHED

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

#### >FUNCTION 01< INTERNAL ERROR

Signal when one of the following listed faults occurs (fault analysis/- causes see chapter 14.1):

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



#### >FUNCTION 01< NO FLOW

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

#### 11.9 Flow rate indicator

#### NOTE!



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

The flow rate indicator is activated via the calibration of the pump (see Chapter 11.10). The display depends on the operation mode.

#### MANUAL operation mode

:MANUAL 7.2 1/h \*MANUAL 10.34 1

After calibration of the dosing pump, the flow rate is entered directly as target value in I/h instead of via the stroke frequency adjustment. In the screen "operating messages" (see Chapter 11.5.1), the stroke frequency indicator is replaced by the flow rate indicator. In addition, the total dosing quantity is indicated in litres.

#### ANALOG operation mode

ANALOG 7.2 1/h \*ANALOG 10.34 1

The calibration of the pump activates the flow rate indicator and the stroke frequency remains also visible. In addition, the total dosing quantity is indicated in litres.

#### **BATCH** operation mode

\*BATCH Man. V 10.34 1 BATCH Man. R 10.34 l

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

#### PULSE operation mode

:PULSE 10.34 1

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

#### Operating instructions

#### Standard flow rate indicator

With the standard flow rate indicator, the entered target value is converted into the corresponding stroke frequency.

The maximum adjustable target value is limited by the internally determined stroke length.

Example: The calibration at 50% stroke length results in a flow rate of 10l/h (at 100% stroke frequency). If a target value of 8l/h is entered, then the stroke frequency is

accordingly reduced to 80%.

The maximum target value in this case is 10l/h. It can be changed via the stroke length adjustment (+/-10%).

Internal calculation:

100% stroke frequency → Measure in litres: 10l/h Target value: 8l/h → 80% stroke frequency

#### Flow rate indicator with flow meter

The flow meter records the actual value, and if the flow rate deviates from the entered target value, the dosing pump will readjust it.

#### **CAUTION!**



If the pump already works with 100% stroke frequency, there is no possibility of an additional capacity adjustment upwards. If the set value is fallen below, the warning signal "flow too low" appears.

The maximum adjustable target value is limited by the internally determined stroke length.

Example: The calibration at 50% stroke length results in a delivery rate of 10l/h (at 100% stroke frequency). If a target value of 8l/h is entered, then the stroke frequency is at first accordingly reduced to 80%. The flow meter measures a delivery rate of 7.9l/h. The internal control increases the stroke frequency to 81% in order to achieve 8l/h.

The maximum target value in this case is 10l/h. It can be changed via the stroke length adjustment (+/- 10%).

Internal control:

100% stroke frequency → Measure in litres: 10l/h Target value: 8l/h → 80% stroke frequency → Actual value: 7.9l/h 80% stroke frequency 8l/h → 81% stroke frequency

#### **CAUTION!**



In order to enable an effective capacity adjustment, pay attention that the given set value is attained when having a stroke frequency of < 100 %. A max. nominal stroke frequency of approx. 80 % is recommended in order to enable an adjustment of the capacity when the set value is fallen below.

#### NOTE!



The set value in I/h can be preset manually (operating mode MANUAL) or by analog signal (ANALOG) as soon as the dosing pump is calibrated.

#### 11.10 Calibration

The calibration is used to activate the flow rate indicator. Calibration is always done in the same way, no matter whether a flow meter is connected or not.

#### **CAUTION!**



Calibration is performed with a fixed stroke length. The calibration remains valid even if the stroke length is changed by up to +/- 10%. If this calibration range is exceeded, then the warning message "Out of range" will be displayed.

#### Sequence of calibration:

#### CAUTION!



Prior to the calibration of the flow rate indicator with connected flow meter, the sensor type (>SENSOR<) must be set (see Chapter 11.15.1).

If no sensor type is set (OFF), then the calibration will only activate the standard flow rate indicator.

#### **CAUTION!**



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

#### **Operating instructions**

- Lead the suction line into a calibration pot filled with the dosing medium – the pressure line must be installed in final position, i.e. the operating conditions (backpressure, etc.) must be fulfilled.
- When the suction line is empty the dosing medium must be drawn in (MANUAL operation mode, keep the pump running).
- Set the stroke length with which the pump should be calibrated (can also be done via the manual stroke length adiustment)
- 4. Note the filling level in the calibration pot (= base quantity)
- Go to the main menu and select the --CALIBRATION-menu:



- Press the ENTER key to access the field for entering the number of calibration strokes.
- At first, enter the desired stroke number (at least 200!)
   → the higher the stroke number the more accurate the calibration!
- 8. To start the calibration, press the ENTER key.
- The dosing pump performs the preset number of strokes.
- Determination of the pumped quantity (= difference between base quantity and remaining quantity in the calibration pot).
- Entry of the determined quantity.

Calibration of the dosing pump is then completed!

#### NOTE!



After the dosing pump has been calibrated, calibration (see Chapter 11.11) will automatically be set to ON.

#### **CAUTION!**



If the operating conditions are changed (supply line, backpressure, etc.), then the dosing pump must be newly calibrated. Otherwise, the flow rate indicator might be inaccurate!

#### 11.11 System

The system settings do not depend on the operation mode. These include:

- Language
- Calibration
- Factory reset
- System time

#### >LANGUAGE<

You can select between GERMAN; ENGLISH and SPANISH menu texts.

#### >CALIBRATION<

The calibration of the pump (see Chapter 11.10) can be switched ON and OFF. If the calibration is set to ON and the dosing pump has been calibrated, then the flow rate indicator is activated.

If the calibration is set to OFF and/or the pump has not been calibrated, then the flow rate indicator is not activated.

#### >FACTORY RESET<

The factory settings (see Tab. 07, Chapter 11.4) can be restored. To do so, adjust YES.

#### **CAUTION!**



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

#### >SYSTEM TIME<

The system time must be adjusted manually.

#### **CAUTION!**



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

#### **Operating instructions**

#### 11.12 Totalizer

The totalizer indicates the total quantity conveyed, the total strokes and the pump's operating hours. These values are for information purposes and cannot be reset.

#### 11.13 Password

Two password levels are provided to increase the operating safety of the pump. The passwords for these levels consist of a four-digit number code and are individually selectable. Password 01 (PW01) is used to protect the setting of the operation mode (Level 01). This password can be activated and deactivated (when leaving the factory, it is deactivated). Password 02 (PW02) protects all further setting options of the main menu (Level 02, see "Menu guide"). This password protection cannot be deactivated.

#### NOTE!



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

#### **CAUTION!**

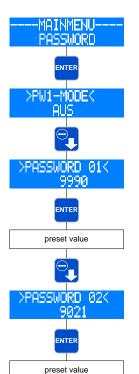


The passwords are factory set as follows:

Password 01: 9990 (deactivated)

Password 02: 9021 (cannot be deactivated!)

#### Setting diagram:



Go to the ---MAIN MENU--- and select the menu item PASSWORD.

Pressing the ENTER key opens the setting menu for the PW01 mode.

Press the DOWN key to access the setting for Password 01.

Value entry for Password 01 is enabled after pressing the ENTER key.

After having entered Password 01, press the DOWN key to access the setting for Password 02

Value entry for Password 02 is enabled after pressing the ENTER key.

#### **CAUTION!**



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

#### **CAUTION!**



Please write down the passwords and keep them in a safe place. When the passwords are lost the pump cannot be configured on site again.

In this case, the pump must be sent to the manufacturer's works for configuration release.

#### 11.14 Info

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

#### 11.15 Extras

#### 11.15.1 Slow-Mode

#### --EXTRAS--SLOW-MODE

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

Adjustments can be made to the following points:

SLOW-MODE Speed

#### >SLOW-MODE<

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

#### > SPEED <

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

#### NOTE!



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

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

## Controllable Multi layer diaphragm pump

Series C 409.2 ML

#### **Operating instructions**



#### 11.15.2 Dosing monitoring

#### --EXTRAS--DOSING MONITOR.

The connection of a **sera** flow controller to the dosing pump will enable the monitoring of the flow rate.

The connection of a **sera** flow meter to the dosing pump will provide a more detailed flow rate indication with regulation of the flow rate (see Chapter 11.9).

#### **CAUTION!**



Prior to the calibration of the flow rate indicator with connected flow meter, the sensor type (>SENSOR<) must be set.

If no sensor type is set (OFF), then the sensor signal will not be considered during calibration.

It is possible to make adjustments to following items:

- Sensor
- Function
- Fault stroke
- Alarm limit
- Calibration

#### SENSOR<

Selection of the connected **sera** flow controller or **sera** flow meter

#### >FUNCTION<

Selection of the dosing monitoring function. It can be selected whether the dosing monitoring should trigger a warning message (MESSAGE) or a switch-off of the pump (DOSING STOP).

#### >FAULT STROKE<

Number of fault strokes at which a connected **flow controller** triggers the dosing monitoring.

The factory setting is 10 fault strokes. This means that the dosing monitoring will react if the flow controller does not give a stroke confirmation to the pump for the duration of ten consecutive strokes.

#### >ALARM LIMIT<

Alarm limit at which a connected **flow meter** triggers the dosing monitoring. The entered value corresponds to the percental part of the target flow rate.

The factory setting is 80%. This means that the dosing monitoring will react if a connected flow meter measures a flow rate which is lower than 80% of the set target flow rate.

#### ---CALIBRATION---

see Chapter 11.10.

#### 11.15.3 Diaphragm rupture detection (OPTION)



The diaphragm rupture detection (see also Chapter 8.2.7) is an optional feature for the dosing pump. It is used to monitor the diaphragm.

It is possible to make adjustments to following items:

Input signal Sensitivity

#### >INPUT SIGNAL<

Selection between switch-off (OFF) of the diaphragm rupture electrode and a configuration as NO or NC.

#### **CAUTION!**



When leaving the factory, the contact type is preset to "switch normally closed".

This setting must not be changed!

#### >SENSITIVITY<

#### NOTE!



When leaving the factory, the sensitivity is preset to 70%.

This value must not be changed!



#### **Operating instructions**

#### 11.15.4 Level monitoring



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

It is possible to make adjustments to following items:

Pre-alarm Dry run

#### >PRE-ALARM< or >DRY RUN< respectively

Configuration of the two level inputs. It can be selected between either the switch-off (OFF) of the input and a configuration as NC (opening when floating down) or NO (closing when floating down).

When leaving the factory, both level inputs are configured as NO.

Config.	Pre-alarm	Dry run			
1	NO	NO			
2	NO	NC			
3	NC	NC			

Tab. 10 (Configuration of the level input)

#### Config. 1

When leaving the factory, this configuration is preset. A 1- or 2-stage level monitoring with "closing when floating down" contacts (pre-alarm and dry run or dry run only) can be connected.

#### Config. 2

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

#### Config. 3

This configuration must be selected when a 2-stage level monitoring with "opening when floating down" contacts (prealarm and dry run) is connected.

## Controllable Multi layer diaphragm pump

Series C 409.2 ML



#### **Operating instructions**

#### 12 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 9.1 "Installation".

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

#### 12.1 Wearing parts

Depending on their use and period of use, wearing parts must be replaced at regular intervals in order to ensure a safe operation of the multi-layer 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 multi-layer diaphragm pump and replace the multi-layer diaphragm (see Chapter 12.4).

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

- multi-layer diaphragm
- suction valve
- pressure valve

#### 12.2 Spare parts

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

- pump body
- manometer
- pressure
- switch

# sera®

#### **Operating instructions**

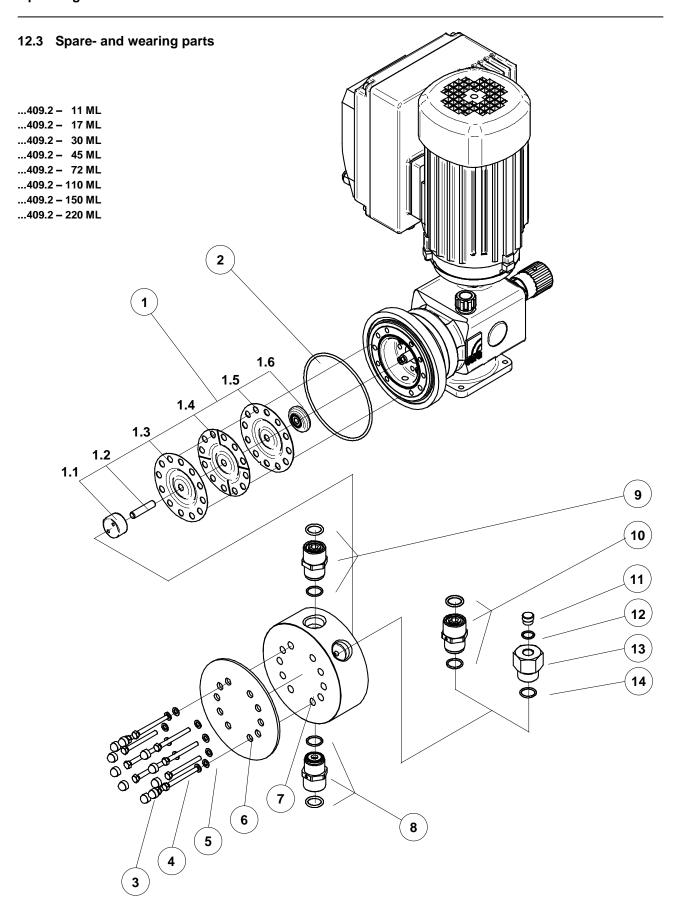


Fig. 47 Spare- and wearing parts



#### **Operating instructions**

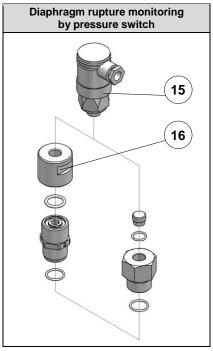


Fig. 48 spare- and wearing parts

#### Overview of the spare and wearing part kits

	Pump body-Set (plastic)							
Pos.	Designation							
3	Protection cap(s)							
4	Hexagon head cap screw(s)							
5	Disk(s)							
6	Front plate							
7	Pump body							
10	Pressure valve (check valve)							
16	Transition piece							

	Pump body-Set (stainless steel)								
Pos.	Designation								
3	Protection cap(s)								
4	Hexagon head cap screw(s)								
5	Disk(s)								
7	Front plate								
11	Check valve								
12	O-ring								
13	Joint								
14	O-ring								

Suction valve (Set)									
Pos.	Designation								
8	8 Suction valve (incl. O-rings)								

Pressure valve (Set)								
Pos.	Designation							
9	Pressure valve (incl. O-rings)							

	Diaphragm set										
Pos.	Designation										
1	Multi-layer diaphragm package										
(1.1)	Pressure plate (front, medium contacted)										
(1.2)	Set screw										
(1.3)	Working diaphragm										
(1.4)	Signal diaphragm										
(1.5)	Protection diaphragm										
(1.6)	Pressure plate (behind)										
2	Multi-layer diaphragm package										

Pressure switch									
Pos.	Designation								
15	Pressure switch								

Tab. 11 Spare- and wearing parts

#### **Operating instructions**

#### 12.4 Replacing the diaphragm

#### 12.4.1 General

In order to ensure a correct function of the multi-layer diaphragm pump and to fulfill the required safety and protective provisions it is absolutely necessary to check and replace the multi-layer 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 the contact with aggressive and/or toxic media!

#### **CAUTION!**



For replacing the diaphragm, the system must be  $\underline{\text{de-pressurised!}}$ 

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

#### 12.4.2 Diaphragm change

The multi-layer diaphragm is to be exchanged as complete pre-assembled diaphragm.

- Set the stroke length adjustment to 0% stroke length (front point)
- Release the fixing screws at the pump body
- Remove the pump body forward as well as the front plate, if necessary.

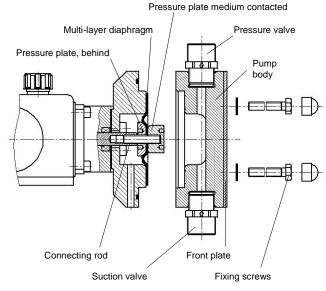


Fig. 49

Screw the multi-layer diaphragm out of the connecting rod

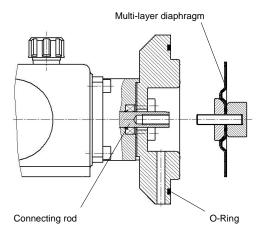


Fig. 50

- O-Ring take out of the base ring
- Check signal device visually for any sign of damage

#### **Operating instructions**

#### Assemble the pump in reversed order

- Insert the new O-Ring into the base ring
- The new multi-layer diaphragm is screwed in the connecting rod until it stops. If the holes in the diaphragm are not congruent with the threaded holes in the base ring, then the diaphragm must again be screwed out until it is congruent with the threaded holes.
- Diaphragm central position should be equal to a stroke length of 50%; this can for example be achieved by turning the motor fan.

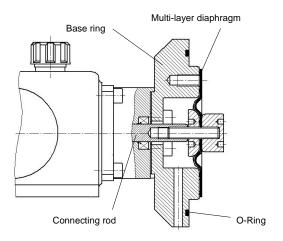


Fig. 51

Screw on the pump body (tightening torques are mentioned in Chapter 9.1)

When assembling the pump body, please note: suction valve below, pressure valve above!

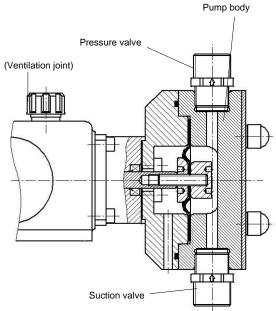


Fig. 52

Connect the signal devices.

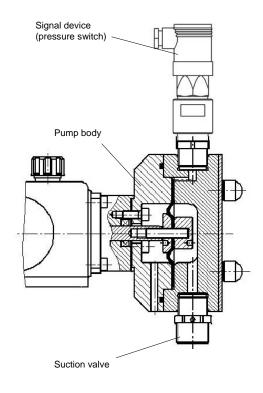


Fig. 53

Before reactivating the pump after a diaphragm replacement, remove the air between the diaphragm layers. Proceed as follows:

- 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. 53).

#### **Operating instructions**

#### 12.5 Oil change

Check oil level in regular intervals (oil sight glass)

Perform an oil change once a year. To do so, proceed as follows:

- Open the vent screw (see Fig. 09).
- Prepare an appropriate container. Open the screw plug and drain off the oil.

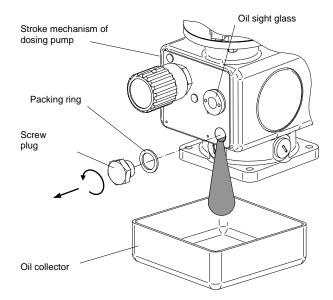
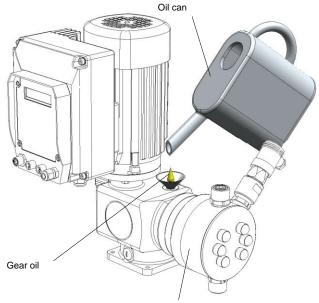


Fig. 54 (Drain off oil)

- Subsequently, close (fingertight fastening) the boring with screw plug (note the packing ring!)
- Fill the oil into the thread boring of the vent nozzle.
- Type and quantity of the gear box oil see chapter 13
- Screw in the vent screw



Dosing pump (multi-layer diaphragm pump)

Fig. 55 (Filling (Oil))

#### 13 Lubricant

#### 13.1 Lubricant in stroke mechanism

Pump type	Lubrication	Quantity
C 409.2 – 11 ML		
C 409.2 – 17 ML		
C 409.2 – 30 ML		
C 409.2 – 45 ML	Gear oil SAE 90	0.21 ites
C 409.2 – 72 ML	DIN 51512	0,3 Litre
C 409.2 – 110 ML		
C 409.2 – 150 ML		
C 409.2 – 220 ML		

Tab. 12 Lubricant in stroke mechanism

#### 14 Fault analysis and corrective action

**sera** – products are proven technical products which are only shipped after an extensive final test in our works. Should any

malfunctions occur, these can be located and corrected easily with the help of the following reference guide (Tab. 13-15).



#### **Operating instructions**

#### 14.1 Analysis of the plain text error messages

Error message								Possible cause	Corrective action
Analog signal < 4 mA!	Analog signal > 20 mA!	Analog signal > 25 mA!	Flow too low!	Cycle-delay memory full!	Leave the calibration range!	No stroke recognition! (internal fault)	No flow!		
•								Wire break of the analog signal line	Check analog signal line and repair, if necessary
•								The set analog signal (e.g. 4-20mA) does not match the actual analog signal (e.g. 0-20mA).	Check the set analog signal and adapt to the actual analog signal, if necessary.
•	•	•						Fault of the analog signal transmitter (sensor, controller)	Check the analog signal transmitter and eliminate fault of the transmitter if necessary
			•				•	Drive diaphragm defective	Replace drive diaphragm
			•				•	Suction height too high	Reduce suction height or suction resistance.
			•				•	Suction line leaky	Check gaskets, tighten pipe connections
			•				•	Shut-off valves in pipe closed	Open shut-off valves or check opening – check pump for damage
			•				•	Few or no conveying medium in store tank	Fill store tank
			•				•	Pump valves leaky	Remove valves and clean
			•				•	Foreign matter in pump valves or Pump valves (ball seats) damaged	Remove and clean valves, check function; replace valves if necessary.
			•				•	Pump valves incorrectly mounted or valve balls missing	Check installation position and completeness – replace missing parts or install correctly
			•					Filter in suction line clogged	Clean filter
			•				•	No stroke movement of the drive diaphragm	Increase stroke frequency / stroke length; check connecting rod motion.
			•				•	Counter-pressure too high	Measure pressure with manometer directly above pressure valve and compare with permissible counter-pressure
			•				•	Acceleration height too high due to pipe geometry	Check acceleration height on suction- and pressure side and compare with design data – install a pulsation damper if necessary
			•				•	Too high viscosity of the pumped medium	Check viscosity of the pumped medium and compare with the design data – reduce concentration or increase temperature if necessary
			•				•	Pumped medium outgasses in suction line and/or pump body	Check geodetic conditions and compare with the data of the pumped medium. Operate pump with suction side supply, reduce temperature of the pumped medium.
			•				•	sure valve ball	Vent pressure side resp. open vent valve (only FRP-design, see chap. 8.2.7).
			•				•	Pipe connections leaky	Tighten connection according to type of material. Be careful with plastic – risk of fracture
			•				•	Pumped medium frozen in pipe	Remove diaphragm pump and check for damage – increase temperature of the pumped medium
			•				•	Pump valves are dry	Moisten pump body and valves. Open vent valve.
				•				Frequency of the received pulses is (permanently) higher than the maximum stroke frequency of the dosing pump	Check process parameters.
				•				Pulse factor too high	Check process parameters.
					•			After calibration of the dosing pump the stroke length was adjusted by more than +/- 10%	Check the stroke length adjustment, set the set value again, cali brate again, if necessary
					•			stroke length is out of the linear dosing range.	Check the stroke length adjustment, increase the stroke length
								Sensory mechanism of dosing pump is defective	Contact the manufacturer

Table. 13 (Analyze and eliminate faults on the basis of the error messages - part I)



#### **Operating instructions**

Erro	Error message							Possible cause	Corrective action
Diaphragm rupture!	Mains voltage too g too low!	Mains voltage too high!	Pre-alarm level!	Set value not attainable! (Internal fault!!)	Fault drive! (Internal fault!)	Fault stroke sensor!! (Internal fault!!)	Dry running of dosing pump!		
•								Drive diaphragm defective	Replace drive diaphragm
	•	•						Electric data of the dosing pump do not match mains data	Check order data. Check electric installation.
			$\bullet$				•	Few or no conveying medium in store tank	Fill store tank
				•					Check the stroke length and the set value, calibrate the pump again, if necessary.
					•			Integrated excess temperature protection (posistor) of drive motor released.	Let the temperature of the drive motor go down. Check the ambient temperature
						•		No stroke movement of the drive diaphragm	Increase stroke frequency / stroke length; check connecting rod motion.
						•		Shut-off valves in pipe closed	Open shut-off valves or check opening – check pump for damage

Table. 14 (Analyze and eliminate faults on the basis of the error messages - part II)

## Controllable Multi layer diaphragm pump

Series C 409.2 ML



#### **Operating instructions**

#### 14.2 Analysis of other faults

Тур	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
•	•												Pump valves not correctly mounted or	new valves if required  Check installation and completeness, replace missing
•	•												valve balls missing Filter in suction pipe clogged	parts or install correctly  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°C.
•	•					•					•	•	Pumped medium in pipe frozen	Remove pump and check for damage – increase temperature of pumped medium
•	•	•	•	•					•			•	Diaphragm rupture	Replace diaphragm according to Chapter 11.4
•	•	•		•									Air between the diaphragm layers	Remove the air between the diaphragm layers

#### **Operating instructions**

Tab. 15 (Fault analysis and corrective action)

#### 15 Foreseeable misuse

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

#### **CAUTION!**



Misuse can result in danger to the operating personnel!

#### 15.1 Transport

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

#### 15.2 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
- Mains plug cut off (direct connection), safe disconnection impossible. Safe disconnection e.g. by 2-pin main switch
- Wrong connecting cables for supply voltage (crosssection 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).
- Short circuit of the internal power supply (15V DC) at the control cable during installation.
- Admissible current load of the digital outputs exceeded.
- No sera sensors for flow or filling level → damage to the electronics.
- No diode for external control power supply connection → electronics overloaded/destroyed.
- Electronics opened in order to connect the mains cable directly to the power supply → electric shock or damage to the electronics.
- Connection of wrong supply voltage or mains frequency.

#### 15.3 Start-up

- Cover on vent openings (e.g. motor).
- Suction or pressure pipes closed (i.e. foreign matters, particle size, stop valves).
- Sensor cable damaged (electronics <--> stroke mechanism), wrong or no recognition of the stroke length → wrong dosing volume and resulting process error.
- Start-up with damaged system.
- Wrong parameterization of the pump → inadvertent start.
- Distance between dosing pump and other dosing pumps or electrical consumers insufficient → fault by electromagnetic radiation.
- Control cables too long >> 30m → malfunctions due to FMC.
- Control cable and power cable laid in parallel → malfunctions due to EMC.

#### 15.4 Operation

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

#### 15.5 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.

#### **Operating instructions**

Poorly ventilated room.

#### 15.6 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.

#### 15.7 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.

#### 15.8 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.

#### 15.9 Disposal

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

## Controllable Multi layer diaphragm pump

Series C 409.2 ML



#### **Operating instructions**

#### 16 Decommissioning

Switch off multi-layer diaphragm pump.

Remove dosing medium from pump head by means of flushing. The flushing agent must be suitable for dosing medium and pump head material.

#### 17 Disposal

Switch the pump off, please see chapter 'De-commissioning'.

#### 17.1 Dismounting and transport

- Remove all remaining fluid out of the pump, clean neutralize and decontaminate the pump carefully.
- Pack the pump properly and arrange everything for transport.

#### 17.2 Complete disposal

- Drain off all remaining fluid and dispose of them in accordance with the regulations.
- Drain off all lubricants and dispose of them in accordance with the regulations!
- Dismount all materials and send them to a suitable processing company.

#### **CAUTION!**



The consignor is liable for any defects resulting from leaking lubricants or residual fluids!

Diaphragm rupture monitoring:



Operating instructions

Please keep carefully for future use

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

**Piston Pressure Switch** 

Series 0180 / 0181

Series 0186 / 0187

**Operating instructions** 

Pressure switch (Type 0186)

#### Bedienungsanleitung

Für künftige Verwendung aufbewahren

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

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









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## Suco

Operating and use

Diaphragm-/

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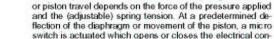


#### **Funktion und Anwendung**

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 Mikroschafter betätigt, der die elektrischen Kontakte öffnet bzw. schließt (Wechsler).



Der Druckschalter überwacht einen eingestellten Druckwert.



The pressure switch monitors a preset pressure.

#### Vorraussetzungen für den Produkteinsatz

Allgemeine, stets zu beachtende Hinweise für den ordnungs gemäßen 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.

#### 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:

The series 0180 / 0181 and 0186 / 0187 switch opens or

closes an electrical circuit when a certain (adjustable) pres-

sure is reached. A diaphragm or piston is moved by the in-

crease in pressure. The amount of the diaphragm deflection



- 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 con-



 Disposal of the above-named materials in recycling containers is permitted.

Bedienungsanleitung\_0180-0181

Seite 1 von 1

Series C 409.2 ML

#### Diaphragm rupture monitoring:



#### Operating instructions

#### Pressure switch (Type 0186)

#### Betriebsbedingungen

Bei Medientemperaturen außerhalb der Raumtemperatur (20°C):

Extreme Temperatureinflüsse (abweichend von der Raumtemperatur) können zu einer starken Schaltpunktabwechung 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 Unfallvehütungsvorschriften 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 plugand-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

Bemessungsbe- triebsspannung U <sub>e</sub>	Bemessungsbe- triebsstrom l <sub>e</sub>	Gebrauchs-kategorie
250 Volt AC 50/60 Hz	4 Атреге	AC12
250 Volt AC 50/60 Hz	1 Атреге	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 Ui:		300 Volt
Bemessungsstoßspanr	nungsfestigkeit U <sub>mp</sub> :	2,5 kV
konventioneller thermis	scher Strom I <sub>the</sub> :	5 Атреге
Schaltüberspannung:		< 2,5 kV
Bemessungsfrequenz:		DC und 50 / 60 Hz
Nennstrom der Kurzschlusseinrichtung:		bis 5 Ampere
Bedingter Kurzschlusss	strom:	< 350 Атреге
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 <sup>-1</sup>
Schalthysterese:		10-30%, im Werk einstellbar
mechanische Lebensda	MEC.	

mechanische Lebensdauer: Membranausführung: Kolbenausführung:	10 <sup>6</sup> Scha (bei Sch 10 <sup>6</sup> Scha	altdrücken bis 40 bar)
Gehäusewerkstoff:	verzinkte	er Stahl (Fe/Zn12cC)
Temperaturbeständigkeit:	NBR EPDM FKM	-30°C bis +100°C -30°C bis +120°C -5°C bis +120°C
Überdrucksicherheit:	0.000 NO.10	
Membrandruckschalter:	300 bar 040, 041	(0,31,5 bar, 110 bar) (110 bar m. Endnummer , 042, 340, 341, 342 und Druck bereiche)

600 bar

#### Technical data

Rated operating voltage U <sub>e</sub>	Rated operating current l <sub>e</sub>	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 voltag	e Uí	300 volts
Rated surge capacity U <sub>imp</sub> :		2,5 kV
Rated thermal current I te:		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 curi	rent:	< 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 <sup>-1</sup>
Switching hysteresis:		10-30% adjustable by the factory
mechanical life:		***

		the factory
mechanical life:	6	
Diaphragm type		ation cycles
		ressure up to 40 bars)
Piston type	10° орег	ation cycles
Body material:	Zic plate	d steel (Fe/Zn12cC)
Temperature range:	NBR	-30°C to +100°C
69 W 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	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
	recidual	pressure range)

600 bars

Piston pressure switch:

Bedienungsanleitung\_0180-0181

Kolbendruckschalter:

Seite 2 von 2

TA 432-04 en / 01.06.12 / li Subject to technical modifications!

#### Diaphragm rupture monitoring:



Pressure switch (Type 0186)

#### **Operating instructions**

### Bedienteile und Anschlüsse Operating controls and connections Bild 2 Hydraulischer / Pneum a-Hydraulic / Pneumatic ischer Anschluss (2) Elektrischer Anschluss (2) Electrical connection (AMP 6,3x0,8) Switching point adjusting AMP 6,3x0,8) (3) Einstellschraube für den Schaltpunkt Einbau Installation

#### 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 abge- dichtet ist
M10x1zyl.	35 Nm
Restliche	50 Nm
Elektrisch:	

#### Elektrisch:

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



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

#### 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 Inread	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).

Bedienungsanleitung\_0180-0181

Seite 3 von 3

Series C 409.2 ML

#### Diaphragm rupture monitoring:



**Operating instructions** 

Pressure switch (Type 0186)

Inbetriebnahme		Entry into service	
	Verkabeln Sie die elektrischen Anschlüsse 1 und 4 mit einem Durchgangsprüfer (Bild 2).	Using a continuity tester, wire up the electrical connections     1 and 4 (Fig. 2).	
Bei Verwendung einer Prüflampe als Durchgangsprüfe Achten Sie auf die max. zulässige Schaltleistung (sieh	If using a testing lamp as a continuity tester, observe the maximum permissible switching capacity (see technical data)		
	<ol> <li>technische Daten).</li> <li>Drehen Sie die Einstellschraube (3) zunächst ganz ein. Verwenden Sie zum Einstellen des Druckschalters einen Schraubendreher mit 6,3 mm Klingenbreite.</li> </ol>	<ol> <li>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.</li> <li>Take care to ensure that the adjusting screw (3) dose not seize</li> </ol>	
3	Beachten Sie bitte, dass die Einstellschraube (3) nur beim Eindrehen einen Anschlag besitzt.	at any point other than when it is fully tightened down.  3. Adjust the pressure switch to the desired actuating pressure.	
	<ol> <li>Beaufschlagen Sie den Druckschalter mit dem gewünschten Schaltdruck (Kontrollmanometer erforderlich).</li> </ol>		
	<ol> <li>Drehen Sie die Einstellschraube (3) so weit heraus, bis der Druckschafter umschaftet (Durchgangsprüfer rea-</li> </ol>	cause the pressure switch to trip (continuity tester reacts)	
	giert).	<ol><li>If necessary, adjust the trip pressure setting by turning the adjusting screw (3).</li></ol>	
	<ol><li>Korrigieren Sie gegebenenfalls den Schaltdruck durch Verdrehen der Einstellschraube (3).</li></ol>	When putting the pressure switch into service, please observe the applicable safety regulations laid down by the governing bodies in the country of use.	
<u>^</u>	Bei der Inbetriebnahme des Druckschalters beachten Sie bitte die entsprechenden Sicherheitsvorschriften der Berufs- genossenschaften oder die entsprechenden nationalen Bestimmungen. Die Einstellung der Hysterese ist nur werkseitig durchführ- bar. Bei unsachgemäßer Vorgehensweise kann der Druck- schalter beschädigt werden.	The adjustment of Hysteresis can only carried out in the factor, If this is inexpertly undertaken, damage may be caused to the pressure switch.	
Ausb	au	Removing the pressure switch	
A	Beachten Sie folgende wichtige Punkte beim Ausbau des Druckschalters:	When removing the pressure switch, observe the following important instructions	
	<ul> <li>Das Drucksystem, aus dem der Druckschalter ausgebaut werden soll, muss sich in drucklosem Zustand befinden.</li> </ul>	<ul> <li>The pressurized system from which the pressure switch is intended to be removed must be entirely of pressure.</li> </ul>	
	<ul> <li>Es müssen alle relevanten Sicherheitsbestimmungen beachtet werden.</li> </ul>	All the relevant safety regulations must be observed.	
		<ul> <li>Use a size 27 open-ended wrench (to DIN 894 or similar), to</li> </ul>	
	<ul> <li>Drehen Sie den Druckschalter mit einem Maulschlüssel der Schlüsselweite 27 (nach DIN 894 o.a.) aus dem Druckanschluss.</li> </ul>	remove the pressure switch.	
Zeich	Drehen Sie den Druckschalter mit einem Maulschlüssel der Schlüsselweite 27 (nach DIN 894 o.a.) aus dem	remove the pressure switch.  Key to drawings:	
Zeich	<ul> <li>Drehen Sie den Druckschalter mit einem Maulschlüssel der Schlüsselweite 27 (nach DIN 894 o.ä.) aus dem Druckanschluss.</li> </ul>	and the state of t	

Bedienungsanleitung\_0180-0181

Seite 4 von 4

TA 432-04 en / 01.06.12 / li Subject to technical modifications!

### Controllable Multi layer diaphragm pump Series C 409.2 ML



**Operating instructions** 

**Notes** 

