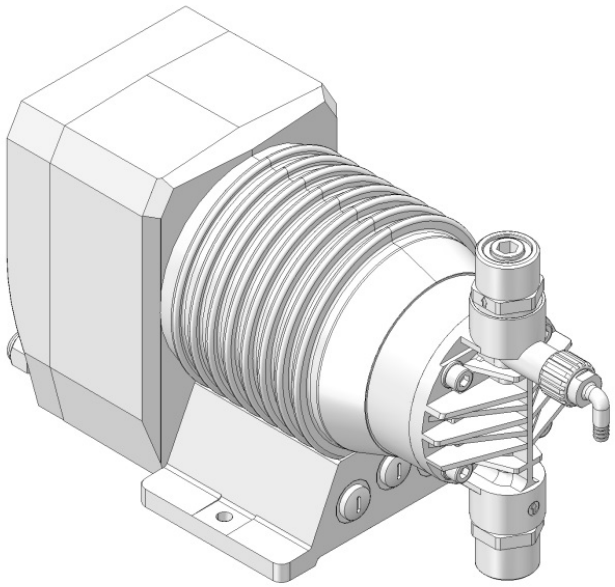
Product: **Controllable solenoid diaphragm pump**

Type:
C 204.1 – 1,2 e
C 204.1 – 2,4 e
C 204.1 – 7,0 e
C 204.1 – 10 e
C 204.1 – 35 e



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:

sera GmbH
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 !

Carefully read and understand all precautions before installing or servicing any metering pump.

Translation of the original operating instructions!

Table of contents:

1 General

Before commissioning and during operation of the **sera** solenoid diaphragm pump the respective regulations valid at the place of installation are to be observed.

The **sera** solenoid diaphragm pump is delivered ready for installation. Carefully read these instructions and especially the safety instructions herein contained before installation and initial start-up of the pump.

Please review this manual carefully. Pay particular attention to warning and precautions. Allways follow good safety procedures, including the use of proper dothing, eye and face protection.

2 Types

2.1 Type code

Example:

Solenoid diaphragm pump type **C 204.1-10e**

C	204.1	10	e

Pump control

C controllable

C	**204.1**	10	e

Indication of model range/stroke mechanism

C	204.1	**10**	e

Indication of nominal delivery rate

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

C	204.1	10	**e**

Indication of the pump design

e single solenoid diaphragm pump

2.2 Type plate

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

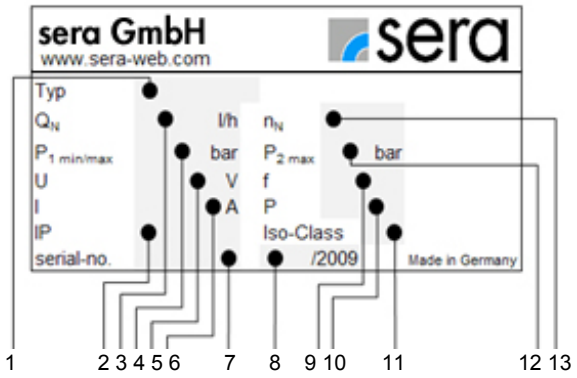


Fig. 01 Type plate

Explanation of the indications on the type plate		
1	Type	**Pump type**
2	IP	**Protection category / Protection class**
3	Q_N l/h	**Nominal delivery rate** Delivery rate which the pump was ordered for, based on the nominal rotation speed n_N, the nominal delivery height $p_2$max. and the delivery medium stated in the supply contract.
4	P_1min/max [bar]	**Minimum/maximum permissible pressure in the pump inlet** Minimum/maximum permissible pressure in the inlet cross section which the pump can be used for. Please consider that pressure depends on rotation speed, delivery rate, temperature and static pressure at the inlet.
5	U [V]	**Operating voltage range**
6	I [A]	**max. charging rate**
7	No.	**Serial number of the pump**
8	Date	**Date of manufacture**
9	f	**Supply frequency**
10	P	**Average power input**
11	Iso-Class	**Isolation class of drive**
12	P_2max [bar]	**Maximum permissible pressure in the pump outlet** Maximum permissible pressure in the outlet cross section which the pump can be used for. Please consider that pressure depends on rotation speed, delivery rate, temperature and static pressure at the outlet.
13	n_N 1/min	**Nominal stroke frequency**

Table 01 Explanation of type plate

2.3 Materials

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

2.4 Viscosity, pumped medium

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

2.5 Dosing range

The flow capacity of the solenoid diaphragm pump can be controlled manually via the stroke length adjustment and/or stroke frequency adjustment (0... 100 %).

The linear dosing range depends on the pump type and is between 20%...100% or 30%...100%.

2.6 Noise measurement

Compliance with ISO 3746 or ISO 9614-1 , Instruments (type 1) according to IEC 60651 or IEC 60804 (in UL 61010-1).

3 Safety instructions

3.1 Note on quality

Observance of these operating instructions and, in particular, the safety instructions, helps to
avoid dangers to persons, machines, and environment
increase the reliability and service life of the pump and the entire system
reduce repair cost and downtime.

The **sera** quality management and quality assurance system for pumps, systems, fittings, and compressors is certified according to DIN EN ISO 9001:2015.
The **sera** solenoid diaphragm pump complies with the valid safety requiremens and accident prevention regulations.

CAUTION !

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

CAUTION !

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

3.2 Marking of notes

3.2.1 Marking of notes in these operating instructions

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

(safety symbol in compliance with ANSI Z 535.4 or ISO 3864-2)

3.2.2 Marking of notes on the product

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

3.3 Personnel qualification and training

The personnel who operate, maintain, inspect and install the solenoid diaphragm pump must be suitably qualified. Range of responsibility, and supervision of the personnel are to be clearly defined by the owner. If the personnel do not have the knowledge required it is to be trained and instructed accordingly. If required such a traning can be carried out by the manufacturer /supplier upon order of the owner. The owner must also ensure that the personnel have understood the operating instructions.

3.4 Dangers in case of inobservance of the safety instructions

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

Inobservance can result in:

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

3.5 Safety conscious working

The safety instructions specified in these operating instructions, the national regulations concerning accident prevention as well as internal working-, operating-, and
safety instructions of the owner are to be observed.

3.6 Safety instructions for the owner / operator

Leaking pumped media must be disposed off in such a way that any danger to persons and hazards to the environment are excluded. The legal regulations are to be observed.

Dangers through electrical energy are to be precluded.

3.7 Safety instructions for maintenance-, inspection and installation work

The owner must ensure that all maintenance-, inspection- and installation work are exclusively carried out by trained people / engineer who have read the operating instructions carefully.

The spare parts used must comply with the requirements of the respective operating instructions.

All screwed connections and connections may only be removed when the system is not under pressure.

3.8 Arbitrary modification and spare parts production

Modification to and changement of the pump is only permitted after previous agreement of the manufacturer. Original spare parts and accessories approved by the manufacturer increase safety.

NOTE !

If non-approved parts are used or if the pump is modified arbitrarily the manufacturer refuses any liability claims.

3.9 Improper operations

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

3.10 Intended use

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

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

CAUTION !

- **Acceptable for indoor use only!**
- **Non submersible pump!**

CAUTION !

- **Pump not authorized for operation in Ex-Areas!**
- **Only for temperatures of medium +2…+40°C!**
- **Standard design not suitable for drinking water!**

Criteria for the proper use of the solenoid diaphragm pump are:

Observe characteristics of the pumped medium (please see safety- and product data sheet of the pumped medium used – the safety data sheet is to be provided by the supplier / owner of the pumped medium)

Resistance of the materials which come into contact with the pumped medium

Operating conditions at the place of installation

Pressure and temperature of the pumped medium

Voltage supply

Using of the pump in non hazardous area

3.11 Personal protection for maintenance and service

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

In case of an incident pay attention to the following leaking media:

fluids

vapours

noise emissions (sound level)

Emissions are to be monitored by corresponding monitoring systems.

WARNING !

Wear protective clothing, gloves, and a face protecting and breathing mask.
Danger of breach / Danger of poisoning

NOTE !

Personal protective equipment must be provided by the owner!

3.12 Pre-Installation and maintenance instructions

The following precautions should be taken when working with **sera** dosing pumps. Please read this section carefully prior to installation.

CAUTION !
Protective Clothing

ALWAYS wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on the solution being pumped. Refer to MSDS precautions from your solution supplier.

CAUTION !
Water Pre-Prime

All sera pumps are pre-primed with water when shipped from the factory. If your solution is not compatible with water, disassemble the pump head assembly. Thorought dry the pump head, valves, seal rings, balls and Liquifram™ (diaphragm). Reassemble head assembly tightening screws in a crisscross pattern. Refill the pump head with the solution to be pumped before priming the pump. (This will aid in priming.)

CAUTION !
Solution Compatibility

Determine if the materials of construction included in the liquid handling portion of your pump are adequate for the solution (chemical) to be pumped. Always refer to the solution supplier for compatibility of your specific sera dosing pump. Contract your local sera distributor for further information.

4 Transport and intermediate storage

4.1 General

Before shipment **sera** products are checked for proper condition and functioning.
The customer has to check the product for transport damage immediately aftr receipt. Any damage detected is to be reported immediately to the carrier and the supplier.

4.2 Storage

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

Proper storage increases the service life of the solenoid diaphragm pump and comprises prevention of negative influences such as heat, humidity, dust, chemicals etc.

The following storage instructions are to be observed:

Storage place: cool, dry, dust-free and slightly ventilated

Storage temperatures between +2°C and +40°C

Relative air humidity not more than 50%.

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

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

5 Components of the solenoid diaphragm pump

The solenoid diaphragm pump may be composed of the following (main) components:

Motor housing
with stroke magnet
Electronics with operating panel
Assembly pump
Pump body
Valves

Optional accessories:

Diaphragm rupture electrode

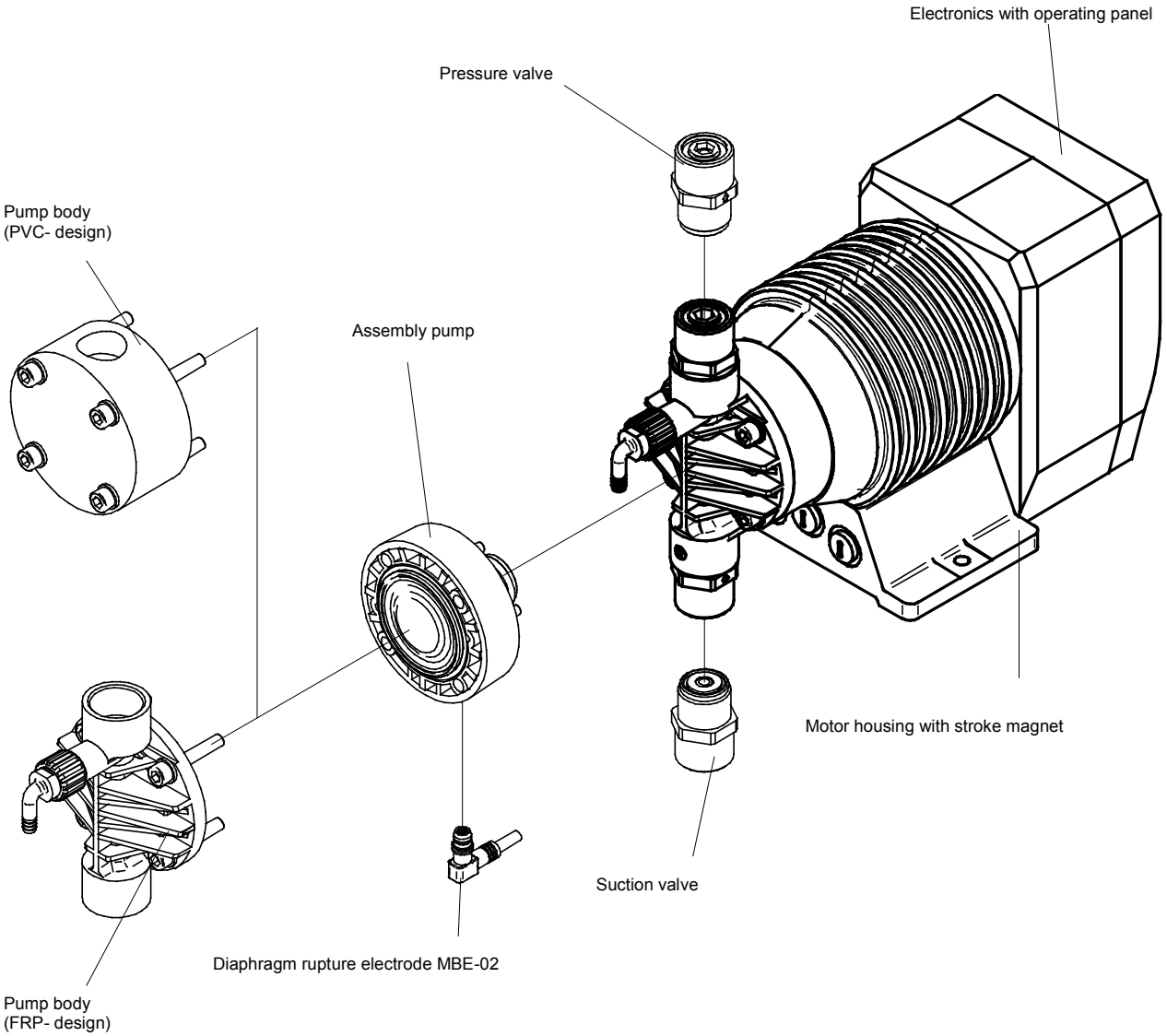


Fig. 02 Overview of the components

6 Technical specifications

6.1 Dimensions

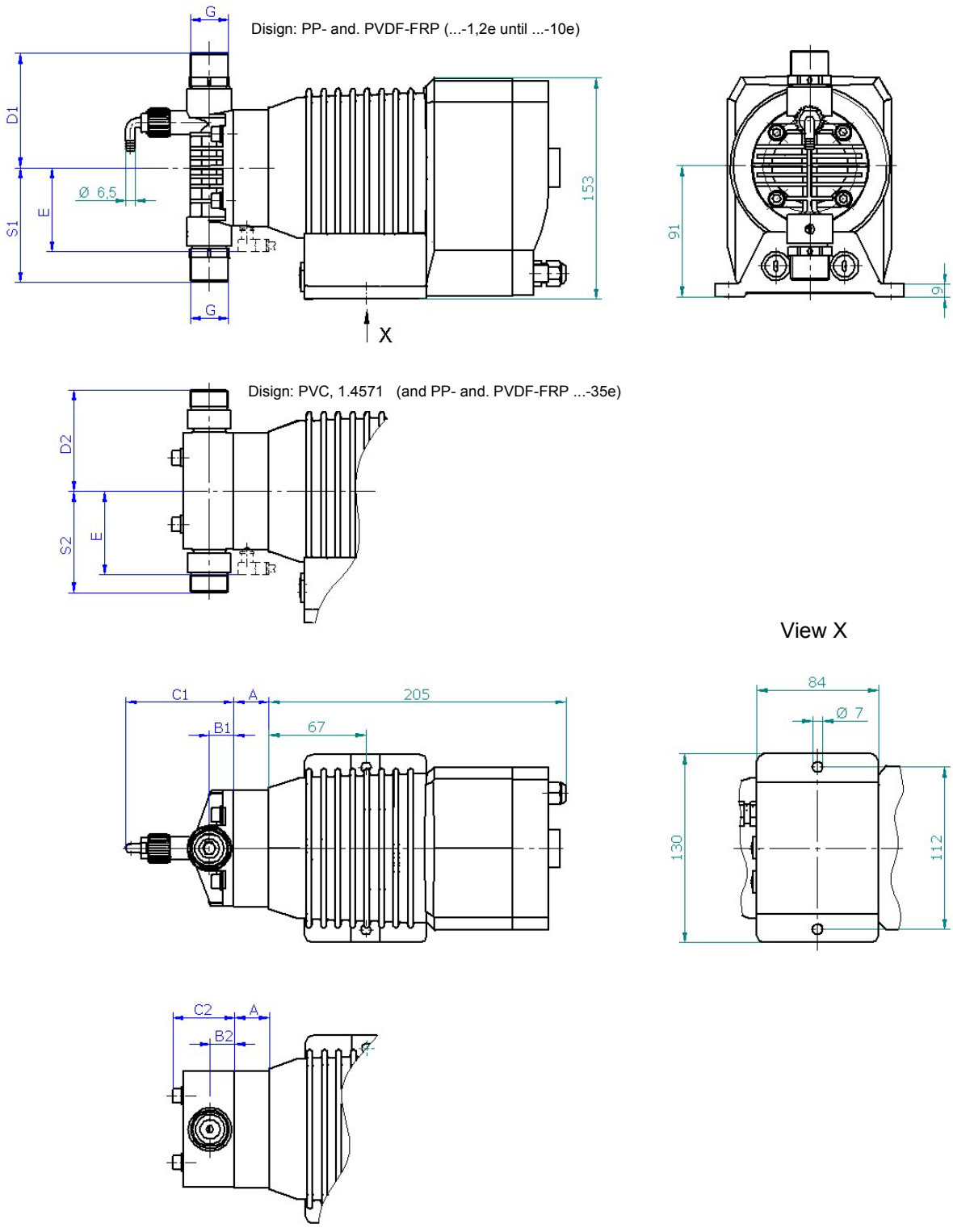


Fig. 04 Dimensions

Table 02
Dimensions

All dimensions in mm!

			Solenoid diaphragm pump				
			C 204.1 – 1,2 e	**C 204.1 – 2,4 e**	**C 204.1 – 7,0 e**	**C 204.1 – 10 e**	**C 204.1 – 35 e**
Valves	**S1**	Double valve PP-FRP, PVDF-FRP	80	80	80	80	---
	S2	Double valve PP-FRP, PVDF-FRP	---	---	---	---	75
		Single valve PVC	---	---	---	---	78
		Chamber valve PVC, 1.4571	70	70	70	70	---
		Double valve 1.4571/1.4581	---	---	---	---	76
		Double valve PP, PVC, PVDF	---	---	---	---	---
	D1	Double valve PP-FRP, PVDF-FRP	80	80	80	80	---
	D2	Double valve PP-FRP, PVDF-FRP	---	---	---	---	75
		Single valve PVC	---	---	---	---	85
		Chamber valve PVC, 1.4571	70	70	70	70	---
		Double valve 1.4571/1.4581	---	---	---	---	76
		Double valve PP, PVC, PVDF	---	---	---	---	---
	G	Connection thread Suction/pressure valve	G ¾	G ¾	G ¾	G ¾	G ¾
Assembly pump	**A**	Assembly pump	24	24	24	24	26
Pump body (PB)	**B1**	Centre of valve thread (FRP-design)	17	17	17	17	15
	B2	Centre of valve thread	17	17	17	17	18
	C1	PB (FRP-design)	75	75	75	75	---
	C2	PB (FRP-design)	---	---	---	---	33
		Pump body	43	43	43	43	41
Option	**E**	Diaphragm rupture signal-ling MBE-02	58	58	58	58	68
Stroke mechanism		a.o. Dimensions for fas-tening of the pump	see Fig. 04				

6.2 Technical data

Type	Pump data								
	Diaphragm diameter	Nominal delivery rate adjustable by stroke length adjustment and stroke frequency adjustment		Maximum permissible pressure in the pump outlet	Minimum / maximum permissible pressure in the pump inlet	Maximum suction height [1]	recommended nominal diameter of the connecting pipes	Nominal stroke frequency	Maximum stroke length
		Q_N l/h	Q_N ml/stroke	p_2 max.	p_1 min. / max.	WS	DN	min $^{-1}$	h100
	mm	60 Hz		bar	bar	m	mm	60 Hz	mm
C 204.1-1,2 e	26	0-1,2 [2]	0-0,13	10	-0,3/0	3	5	150	1,5
C 204.1-2,4 e	30	0-2,4 [2]	0-0,27	10	-0,3/0	3	5	150	1,5
C 204.1-7,0 e	42	0-7,0 [3]	0-0,78	10	-0,3/0	3	5	150	1,5
C 204.1-10 e	52	0-10 [3]	0-1,11	6	-0,3/0	3	5	150	1,5
C 204.1-35 e	74	0-35 [3]	0-3,89	1,5	-0,3/0	3	10	150	1,5

Table 04 Technical data / Pump data

[1] Achievable height with media similar to water
[2] Linear dosing range at a stroke length between 30% and 100%
[3] Linear dosing range at a stroke length between 20% and 100%

Type	Drive				
	Solenoid diameter	Middle power draw	Nominal voltage	Frequency	Weight [1]
	mm	W	V	Hz	approx. kg
C 204.1-1,2 e	65	20	100-120	60	2,7
C 204.1-2,4 e	75	26	100-120	60	3,7
C 204.1-7,0 e	90	33	100-120	60	4,4
C 204.1-10 e	90	33	100-120	60	4,4
C 204.1-35 e	90	33	100-120	60	4,7

Table. 06 Technical data / drive

[1] standard-design

Additional data for electronics

Type	Electronics data							
	Inlet voltage / Control input	Current consumption during stroke	Recommended Fuse	Min. contact signal time Min. distance betrween pusles	Analogue input resistance	Digital Output	Protection category	Thermal class
C 204.1-...	5…30 V DC	max. 2,0 A	C2A Circuit breaker	55 ms	100 Ω	PNP, internal supply max. 15V DC, 50 mA external supply max. 30V DC, 350 mA	IP 55	F

Table. 08 Electronics data

7 Functional description

7.1 General

sera solenoid diaphragm pumps C 204.1 are self-priming and run-dry safe oscillating displacement pumps that are characterised by high tightness of the dosing head.

The flow capacity of the solenoid diaphragm pump C 204.1 can be controlled manually via the stroke length adjustment 0...100% and/or stroke frequency adjustment 0...100%.

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

Motor housing with stroke magnet

Electronics with connection / operating panel

Assembly pump

Pump body

Manual vent valve
(only by C 204.1 - 1,2e... - 10e in FRP-design)

Suction and pressure valve

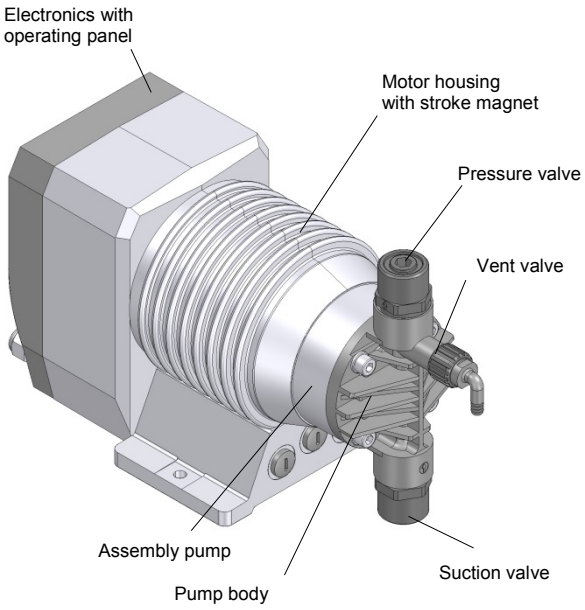


Fig. 09 (Components of solenoid diaphragm pump)

7.2 Components of the solenoid diaphragm pump C 204.1

7.2.1 Assembly pump / Motor housing

Function

The liquid is conveyed by a deformable drive diaphragm. This drive diaphragm is connected to the drive magnet via a connecting rod which results in a deflection of the suction and pressure stroke (see Fig. 10).

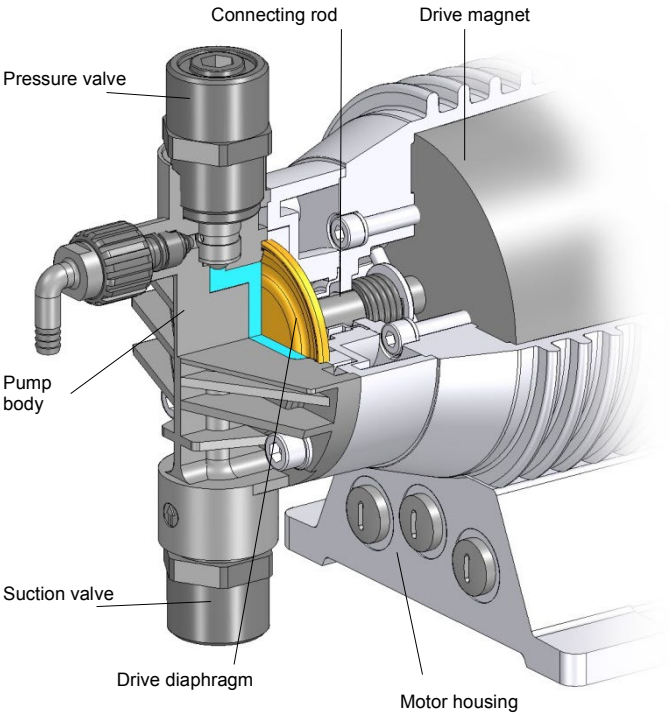


Fig.10. Functional principle

7.2.2 Pump body

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

7.2.3 Manual vent valve (only FRP-execution C 204.1-1,2e - ...-10e)

Function

The vent valve is used to release the manual pressure in the pump body during commissioning. Open vent valve when pump primes first time.
When vent valve is opened gas including medium escapes into the feedback line. The vent valve must be closed again as soon as only medium without gas constituent escapes. The pump now feeds the medium into the pressure line.
Open again for another ventilation. The vent valve consists of a vent screw with integrated hose nozzle, which must be fitted with a hose (inside diameter 6 mm) as feedback line (see Fig. 11). The leaking medium incl. the gas admixtures must be disposed off properly.

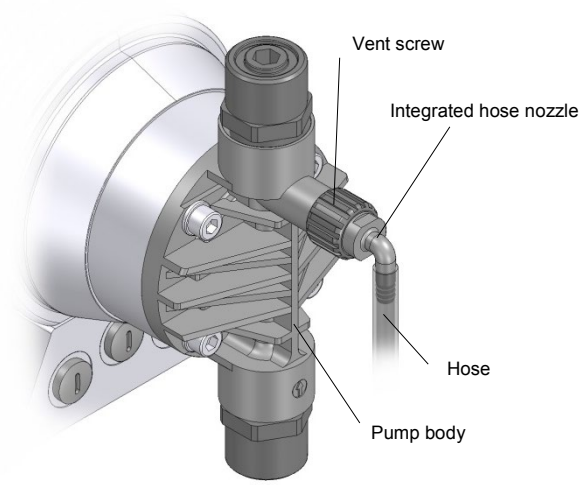


Fig. 11 Vent valve

The vent screw is inserted during normal operation.

NOTE!

Open vent screw with great caution and perform max. 1 turn. Take care that the tightness of the thread is still guaranteed.
Danger in case of leaking medium!

CAUTION !

The vent screw must always be closed during the driving process.

7.2.4 Electronics (operating panel)

The electronics permit proportional volumetric dosing via analogue signals 0/4 ... 20 mA or contact signals with the option of dividing or duplicating the pulse.
An integrated LCD display and three LED's for warning and fault display indicate the current status of the dosing pump (see Fig. 12).
A connection for flow monitoring or flow measurement as well as an empty signal with pre-alarm and dry operation alarm are installed as standard (see Chapter 9).

Fig. 12 Electronics

7.2.5 Suction / pressure valve

The pump valves are always ball valves which can only function properly when they are installed in a vertical position. The condition of the valves is decisive for the operational behaviour of the pump. The valves should only be exchanged completely. Pay attention to the flow direction when installing the valves (see Fig. 13).

NOTE !

Pressure valve above, suction valve below!

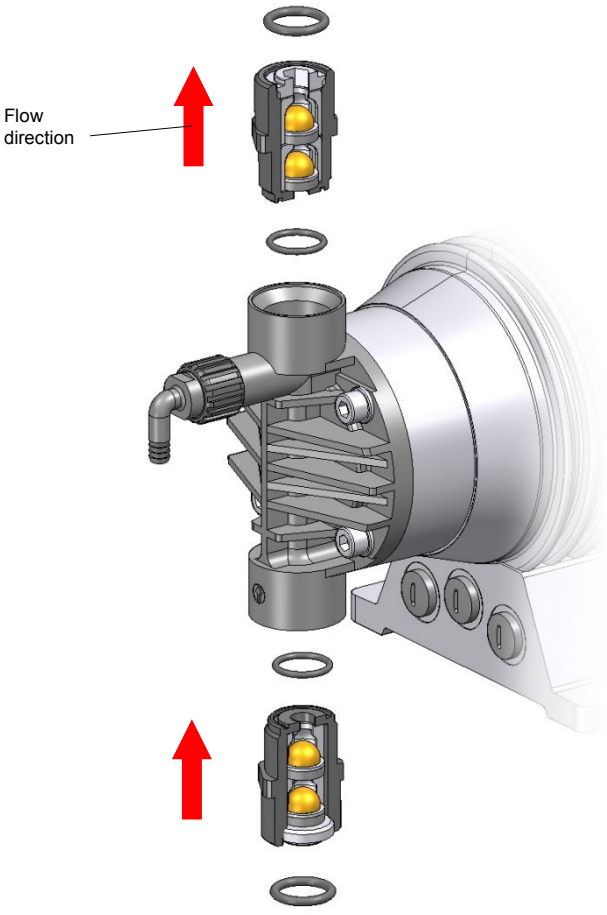


Fig. 13 Double valves, for evample. PVDF-FRP

7.2.6 Diaphragm rupture monitoring device (option)

sera Solenoid diaphragm pumps of the C 204.1 series can be equipped with a conductive diaphragm rupture monitoring device as option.

NOTE !

The sensitivity of the diaphragm rupture electrode can be adapted to the conductivity of the medium via the electronics (see Chapter 10.15.2).
Preset ex works to 50% approx. 10 µS/cm.

The diaphragm rupture electrode is fitted at the base of the base ring (see Fig. 02/03) and is connected to the drive housing.

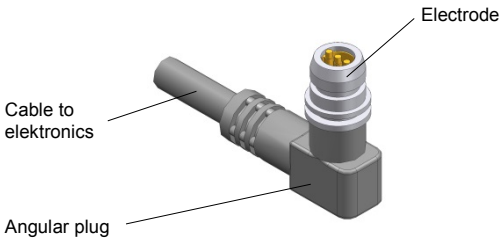


Fig. 15 MBE-02

NOTE !

Maintenance of the diaphragm rupture electrode (MBE) is limited to cleaning when the diaphragm is exchanged. The MBE must only be replaced if it was destroyed by the pumped medium.

8 Assembly / Installation

8.1 Installation instructions

CAUTION !

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 and at permitted humidity until approx. 90%.

- Protect the pump against any sources of heat and against the direct irradiation of sun and ultraviolet light
- for dimensions of the pump connections and fixing holes, see Fig. 04/05, Table. 02/03

IMPORTANT NOTE !

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

- Install the pump in such a way that there is no vibration and no tension and that it is aligned precisely.
- Install the pump at the optimum possible operating height. Mount the pump in such a way that the valves are vertical.
- Ensure that there is sufficient space around the pump body and the suction and pressure valve so that these parts may be easily dismantled, if required.
- Mount the pump in such a way that electronics, operating panel and electric connections are easy accessible.
- Design the nominal diameters of the downstream pipes and of the connections built into the system to be the same size or larger than the nominal inlet and outlet diameters of the pump.
- To check the pressure ratios in the pipe system, we recommend to provide for connections for pressure gauges (e.g. manometers) near the suction and pressure sockets.
- Drain cocks are to be provided.
- Prior to connecting the pipes, remove the plastic caps on the suction and pressure sockets of the pump. (see Fig.16).
- Check that the fixing screws for the pump body are tightly fitted and, if necessary, retighten.
- Fixing of pump with 2 Fixing screws M6 (without thread using in pump feed). Non-fixing with plastic screws!

Tightening torques of the fixing screws	
C 204.1-1,2 e	5,0 Nm
C 204.1-2,4 e	
C 204.1-7,0 e	
C 204.1-10 e	
C 204.1-35 e	6,0 Nm

Table 09 Tightening torques

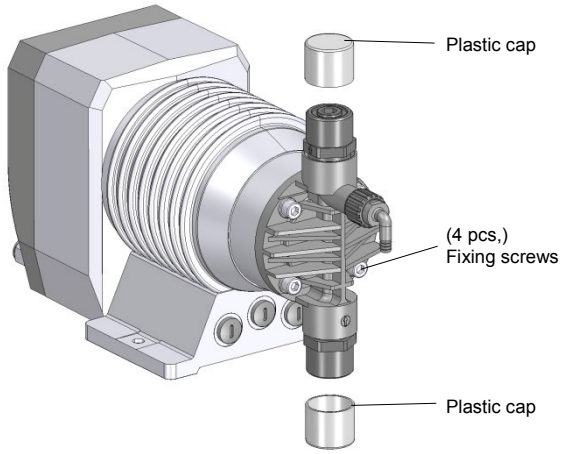


Fig. 16 Solenoid diaphragm pump with plastic caps

- 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.

WARNING !

If toxic, crystallizing or corrosive liquids are conveyed the pipe system is to be equipped with facilities for emptying, cleaning and rinsing with an appropriate medium, if necessary.
Danger of breach / Danger of poisoning

CAUTION !

Mount the solenoid diaphragm pump in such a way that leaking medium cannot cause any damage.

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 provide for appropriate protective measures (collecting basin, diaphragm rupture electrode) in the supply pipe so that the container does not drain off in case of a diaphragm rupture.

8.1.1 Provide 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 overflow valve (Fig. 17)
When using an overflow valve, please note for the return line:

lead the overflow line with descending gradient in the storage tank which is under atmospheric pressure or in an open drain gutter
or connect the overflow line directly to the pump suction line, but only if there is no check valve inside the suction line (e.g. foot valve of a suction lance) (please see Fig. 18).

WARNING !

Shut-off valves must <u>not</u> be closed when the pump is running!
Danger of breach / Danger of poisoning by leaking medium in case of diaphragm- or pipe break.

WARNING !

Provide an overpressure protection (e.g. overflow valve) if the permissible operating pressure may be exceeded.

WARNING !

If the permissible operating pressure is exceeded and the pump is not equipped with an overpressure protection the pump and the piping may be damaged.

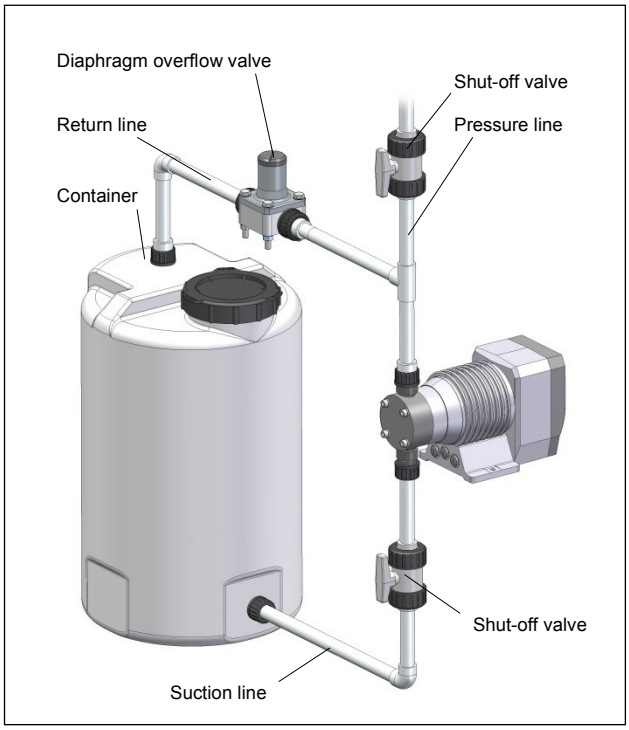


Fig. 17 System with (external) overflow valve

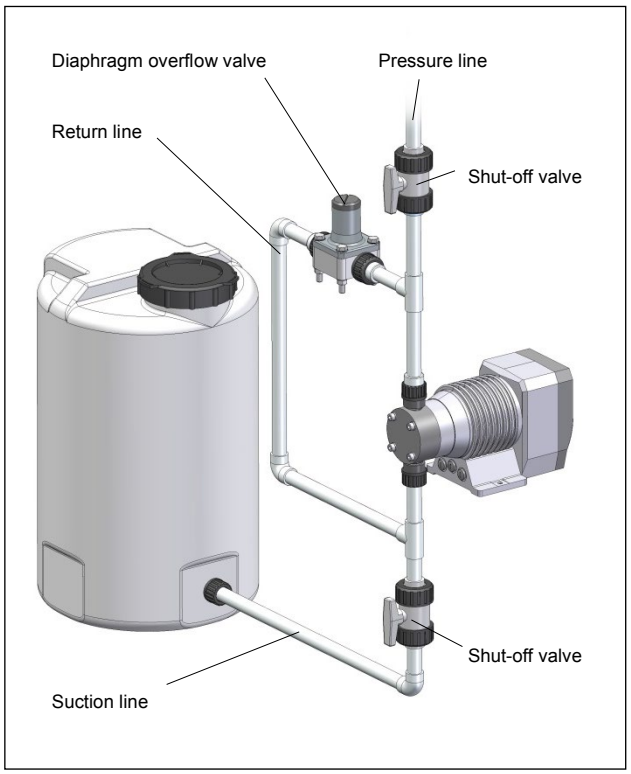


Fig. 18 System with (external) overflow valve

8.1.2 Prevent a backflow of the pumped medium

if the dosing line is linked with a main line:

install an injection fitting (dosing valve).

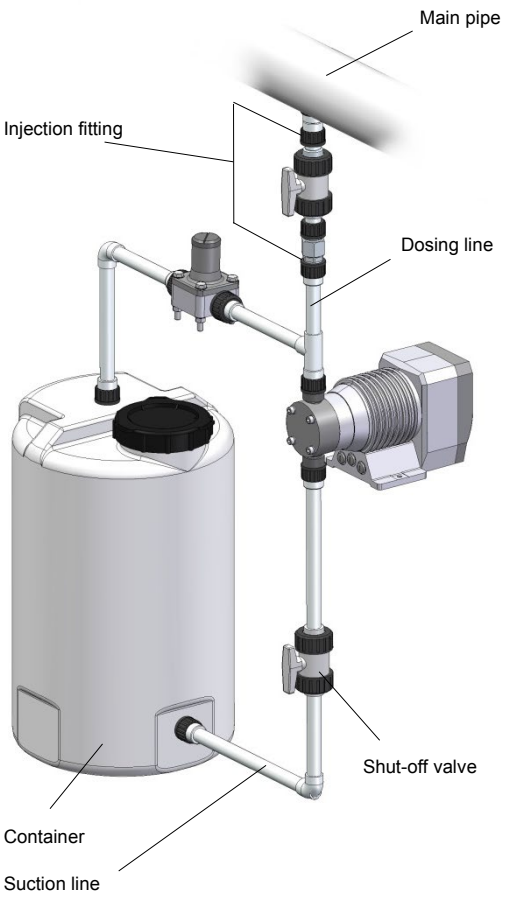


Fig. 19 Installing an injection fitting

CAUTION !

The contents in the dosing line is mixed unintentionally if a backflow from the main pipe is not prevented.

WARNING !

Note / avoid chemical reactions during a backflow.

8.1.3 Eliminate undesired siphoning

when dosing into a main line with negative pressure:

install a pressure keeping valve in the dosing line.

CAUTION !

When installating the pump it is to be ensured that an excess supply (due to a positive pressure difference (≥ 1 bar) between pressure and suction side) is avoided.
Danger in case of incorrect dosing

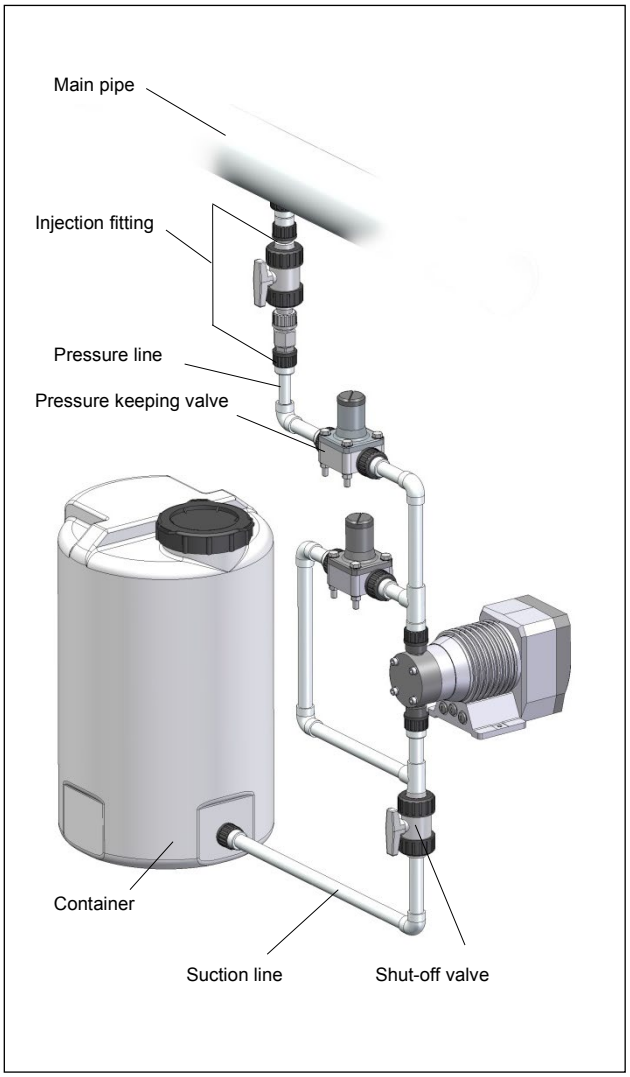


Fig. 20 Installing a pressure keeping valve

8.1.4 Install the empty-tank alarm

so that the tank is refilled before air is drawn in

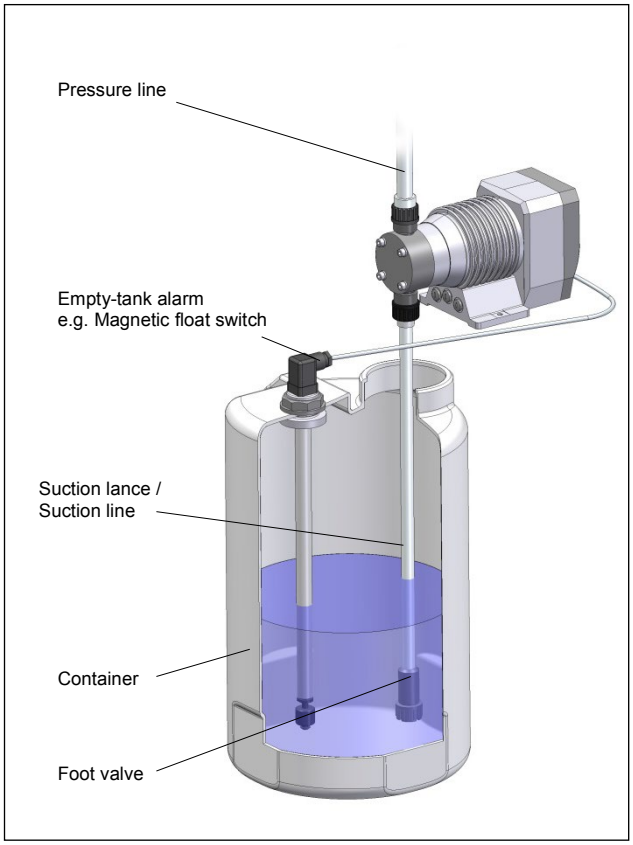


Fig. 22 Installing an empty-tank alarm

NOTE !

The delivery flow may be interrupted if air enters the suction line!

8.1.5 How to avoid an emptying of the suction line

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

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

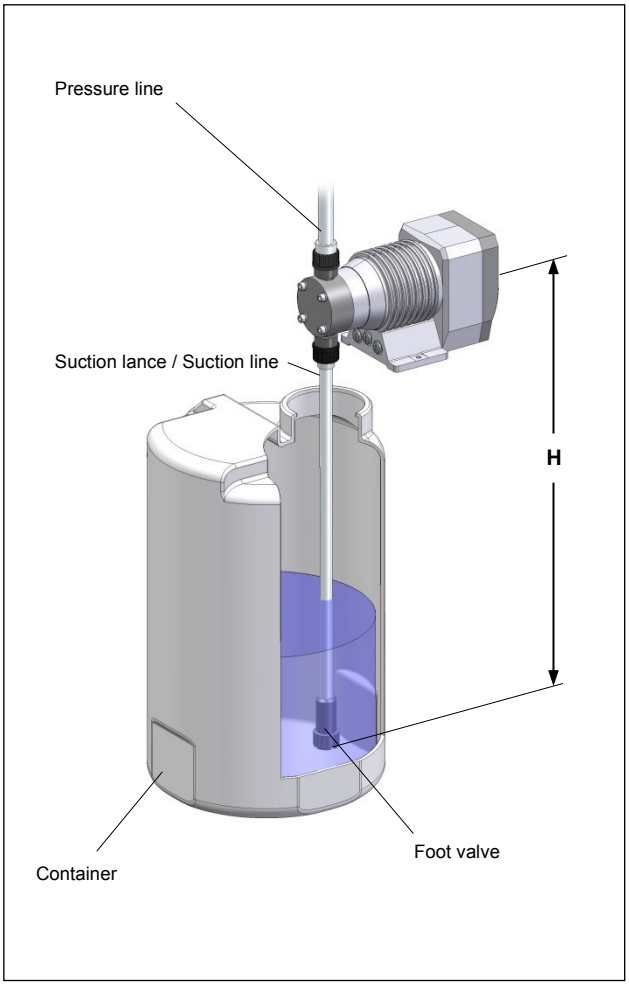


Fig. 23 Avoiding an emptying of the suction line

8.1.6 Line strainer

Connect the suction line slightly above the bottom of the tank and install a line strainer (≤ 0,1mm – aperture size – depending on nominal width of the valve).

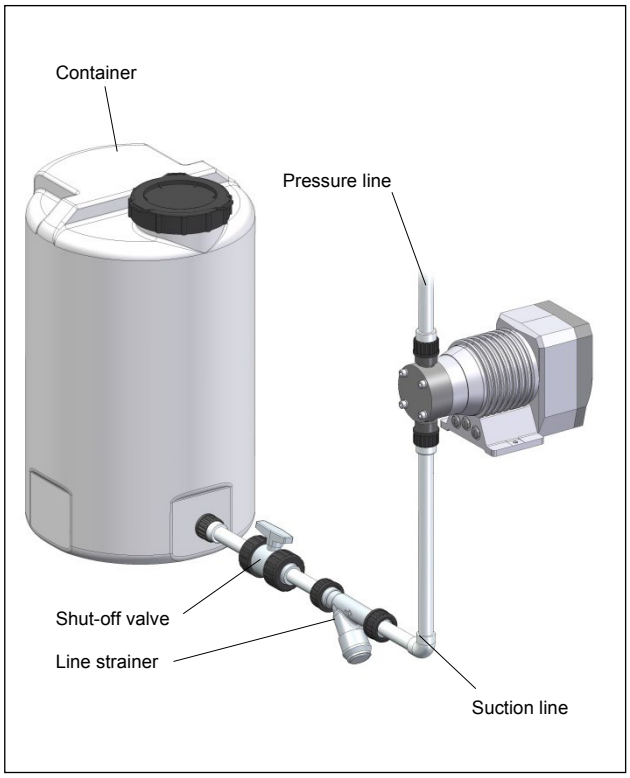


Fig. 24 Installing a line strainer

NOTE !

If contaminations are not removed this may result in malfunctions of the pump and the system.

8.1.7 Suction via a siphon pipe

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

Install a siphon tank.

Pay attention to acceleration pressures which may be generated in a long suction line.

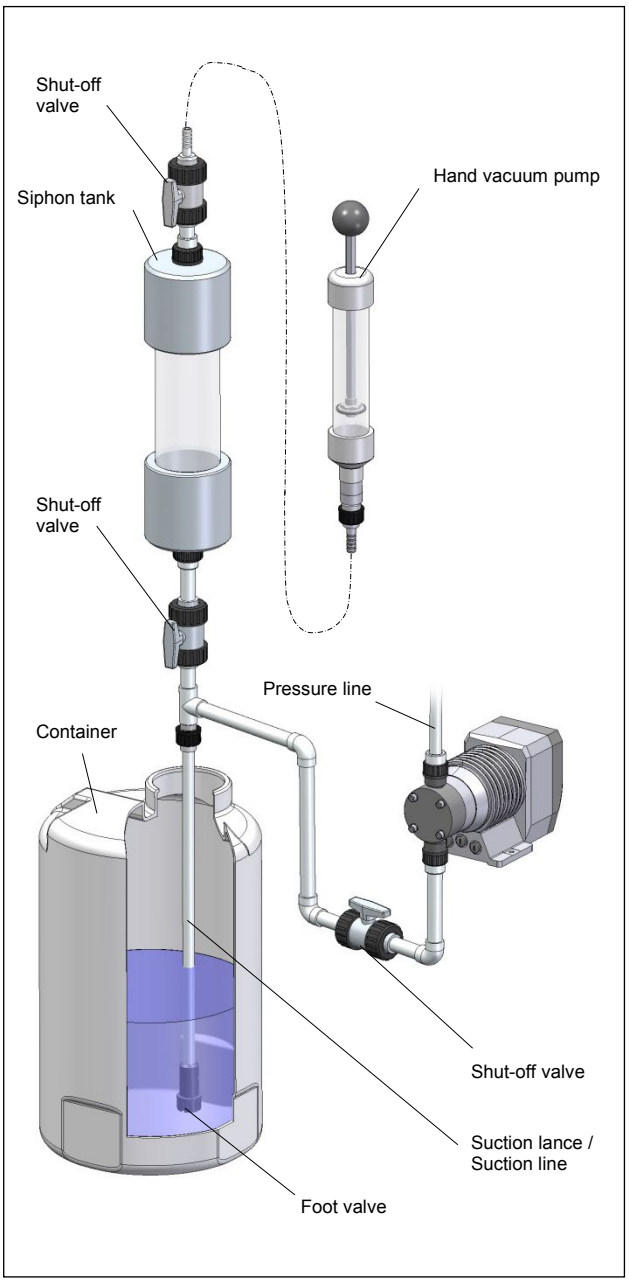


Fig. 25 Installing a siphon tank (**sera** fitting)

8.1.8 In case of slightly degassing dosing media

Install the pump in such a way that it can be operated with a supply line.

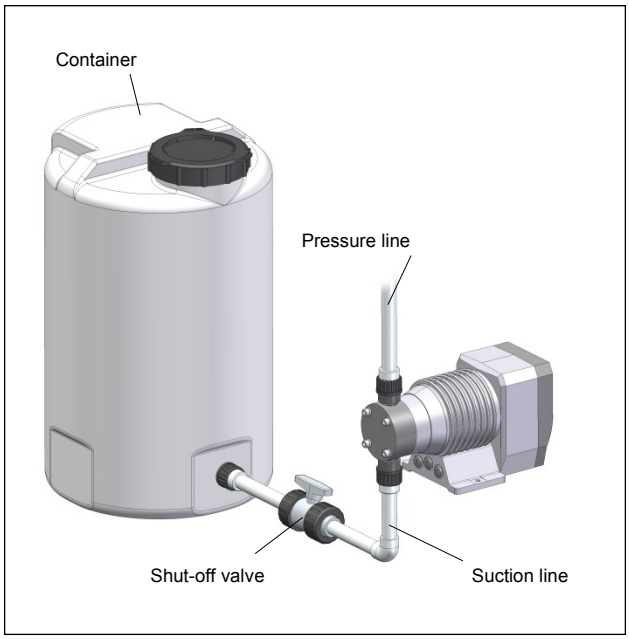


Fig. 26 Installation with supply line

8.1.9 Damping of the pulsation

by installing pulsation dampers if:

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

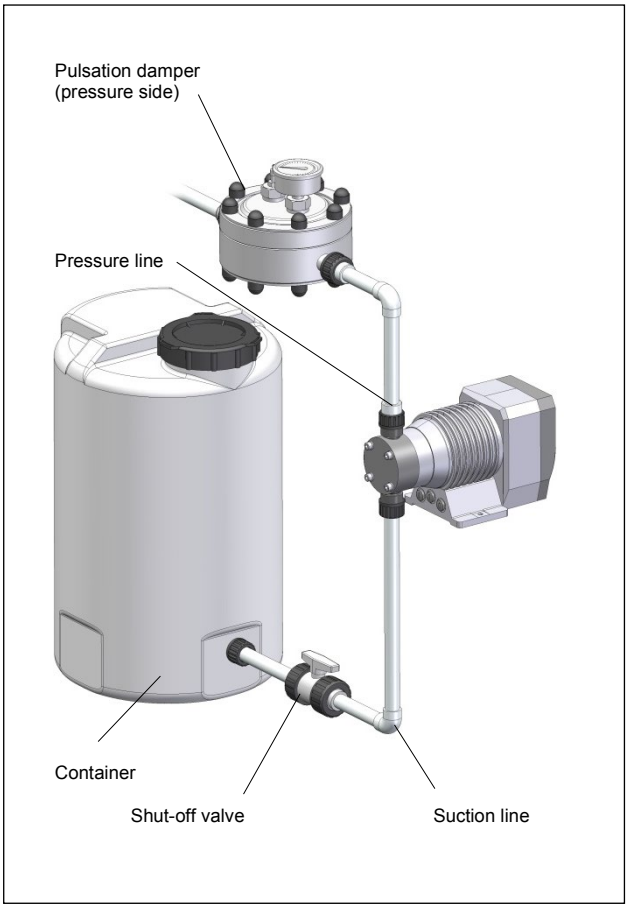


Fig. 28 Installing a pulsation damper (I)

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

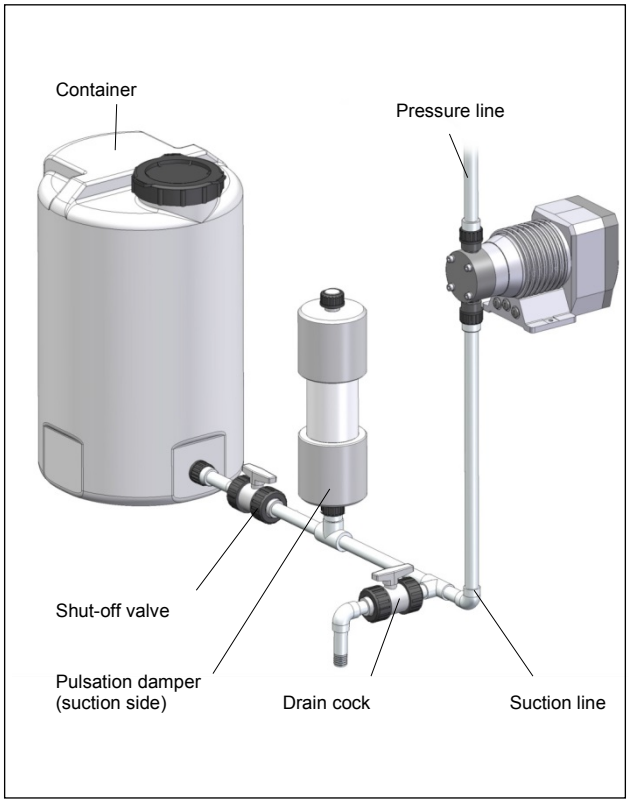


Fig. 29 Installing a pulsation damper (II)

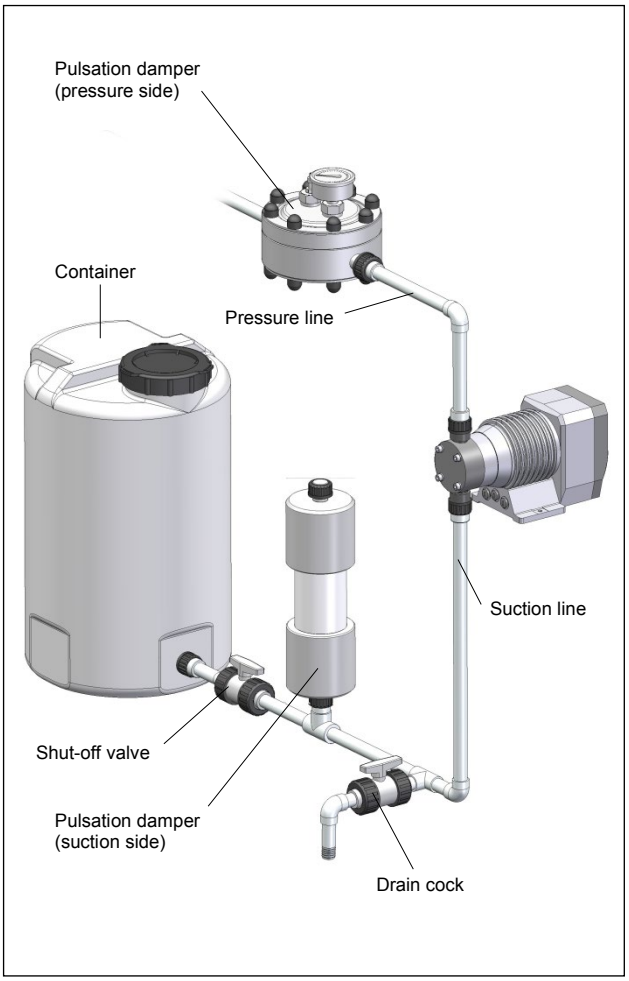


Fig. 30 Installing a pulsation damper (III)

CAUTION !

Undamped acceleration forces may lead to the following faults / damage:

delivery rate fluctuations
dosing errors
pressure serges
valve wobbles
increased wear on the suction- and pressure side of the pump;

mechanical damage of the pump
leakage and valve wobbles if the permissible maximum pressure on the pump pressure side is exceeded.

Danger of breath / Danger of poisoning in case of leaking medium

Installation of suction and/or pressure pulsation damper 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. 31 Installing a pulsation damper and a pressure keeping valve

9 Electrical connections

9.1 Electric supply

The **sera** solenoid diaphragm pump is delivered ready for installation. Standard delivery includes a 2m power cable with plug. The **standard version C 204.1** is designed for an operating voltage range of 100 – 120V, 60Hz.

NOTE !

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

CAUTION !

The pump must only be connected to the power supply with the mains plug
The mains plug should always be accessible.
For safety reasons the pump must be disconnected from the power supply by pulling the mains plug (e.g. for maintenance work)

Symbol:

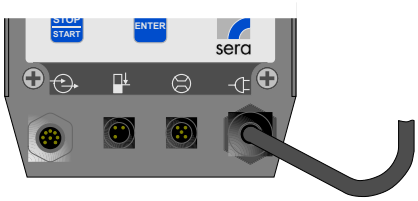


Fig. 32 (Electric supply)

If connected to a circuit protected by Fuse, use type C 2 A Fuses as supplementary protector acc. to UL 1077, CSA 22.2 No. 235.

9.2 Electrical interfaces

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

9.2.1 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 10.8.2). When leaving the factory, the inputs and outputs are preset as described in Tab. 10.

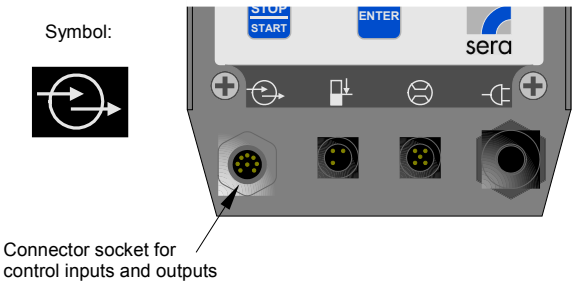


Fig. 33 (Connection of control inputs and outputs)

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. 10 shows the identification of the individual leads of the control cable.

Lead colour	Pin	Function (ex works setting)
WH (white)	1	Input 01 (pulse)
BN (brown)	2	Input 02 (analog 01)
GN (green)	3	Input 03 (external ON)
YE (yellow)	4	Output + / signal + / 15V DC
GY (grey)	5	Output 01 (collective fault)
PK (pink)	6	Output 02 (stroke signal)
RD (red)	7	Earth
BU (blue)	8	Earth

Tab. 10 (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) (see Fig. 34).
This enables, for example, the direct connection of a programmable logic controller to the dosing pump.

IMPORTANT NOTE !

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.

Fig. 34 shows exemplarily the control of the digital inputs 01 and 03 via a potential-free contact signal.

IMPORTANT NOTE !
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. 34).
Possible damage of electric

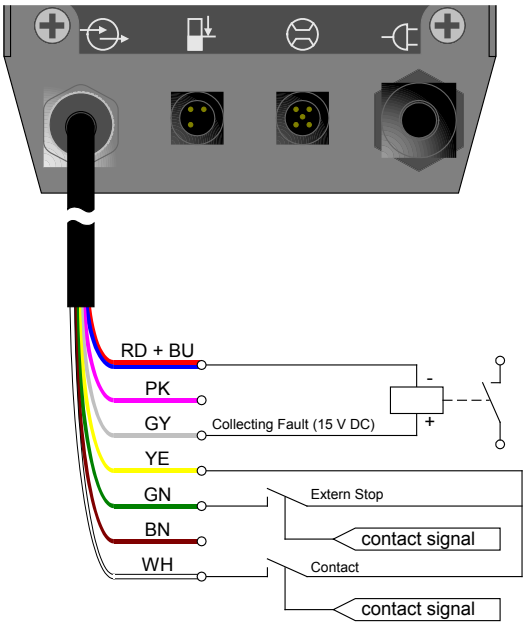


Fig. 34 (Control of digital inputs via a potential-free contact signal)

NOTE !

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)

NOTE !

The output + / signal + connection pin (lead colour: yellow) is not 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. 35 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.

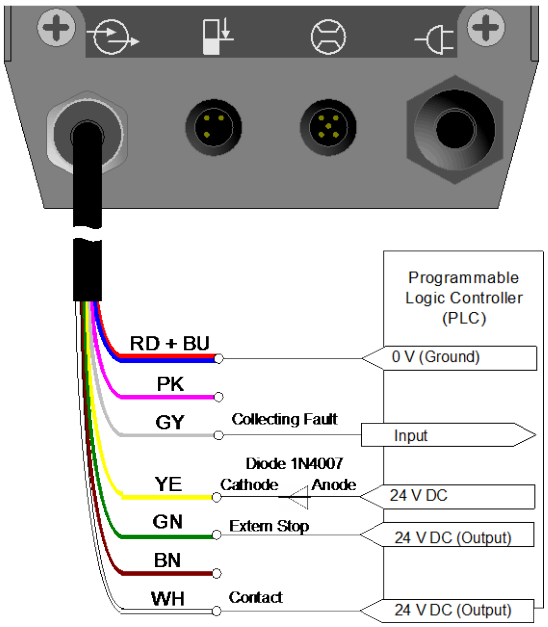


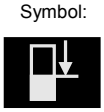
Fig. 35 (Direct activation of digital inputs via a control voltage signal of a programmable logic controller)

9.2.2 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 10.15.3).

Symbol:



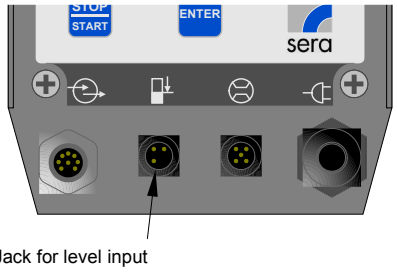


Fig. 36 (Connection for leader contact / main contact)

9.2.3 Input for flow control and flow meter

NOTE !

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.

Symbol:

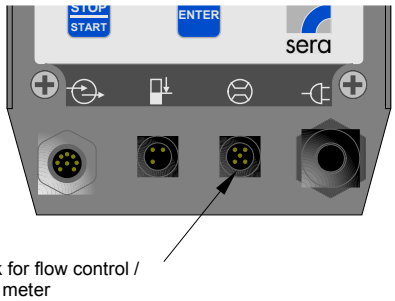


Fig. 37 (Connection for flow control / flow meter)

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

10 Operation

10.1 Operating elements

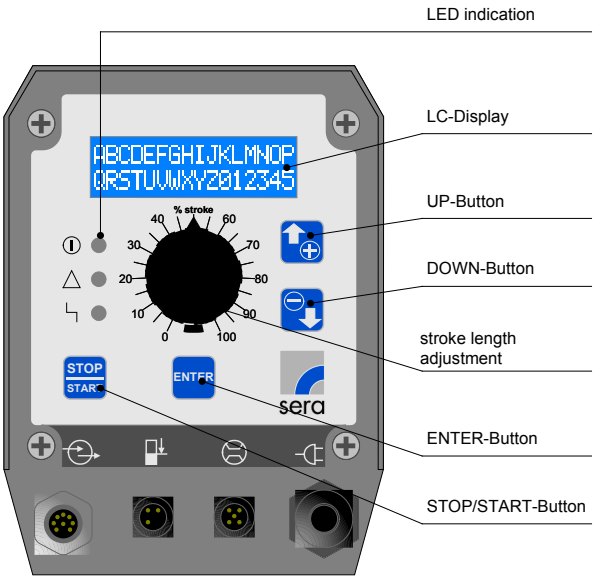


Fig. 38 (Electronics control panel)

10.2 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. 11). 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. 11). 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 too low / too high		On	
No mains			
Level monitoring:			
Level pre-alarm		Flushes	
Dry run			Flushes
Dosing control (flow controller or flow meter)**:**			
No flow - with warning message		On	
No flow - with shut-off			On
Flow too low - with warning message		On	
Flow too low - with shut-off			On
Optional diaphragm rupture monitoring:			
Diaphragm rupture			On
Analog mode:			
mA signal < 3.5mA			On
mA signal > 20.5mA			On

Tab. 11 (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.

10.3 Key operation

Operation of the pump is performed with 4 keys:

STOP/START key

After connection to the power supply, the pump is switched 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.

10.4 Parameter table

Tab. 12 shows the factory settings of the controllable magnetic 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 10.6) and, in case of external control, to connect the respective input (see Chapter 9.2.1).
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
Pulse operation:					
Pulse mode	1/1	10.7.2			
Pulse factor	1	10.7.2			
Pulse memory	ON	10.7.2			
Analog mode:					
Analog signal	4-20mA	10.7.1			
Adjustment: Analog I1	4mA	10.7.1			
Adjustment: Frequency f1	0%	10.7.1			
Adjustment: Analog I2	20mA	10.7.1			
Adjustment: Frequency f2	100%	10.7.1			
Batch mode:					
Batch control	Manual	10.7.3			
Batch quantity	0 strokes	10.7.3			
Batch start	00:00 h	10.7.3			
External mode:					
Stroke freq.	100%	10.7.4			
Input 01:					
Function I1	Pulse	10.8.1			
Contact I1	NO	10.8.1			
Input 02:					
Function I2	Analog 01	10.8.2			
Contact I2	NO	10.8.2			
Input 03:					
Function I3	External ON	10.8.2			
Contact I3	NO	10.8.2			
Output 01:					
Function O1	Collective fault	10.8.3			
Contact O1	NC	10.8.3			
Output 02:					
Function O2	Stroke signal	10.8.3			
Contact O2	NO	10.8.3			
Dosing monitor.:					
Sensor	OFF	10.15.1			
Function	Message	10.15.1			
Fault stroke	10	10.15.1			
Alarm limit	80%	10.15.1			
Level:					
Pre-alarm	NO	10.15.3			
Dry run	NO	10.15.3			
System:					
Language	German	10.11			
Calibration	OFF	10.11			
Password:					
PW01 mode	OFF	10.13			
Password 01	9990	10.13			
Password 02	9021	10.13			
Diaphragm rupt. (1):					
Input signal	NO	10.15.2			
Sensitivity	50%	10.15.2			

(1) only with MBE option

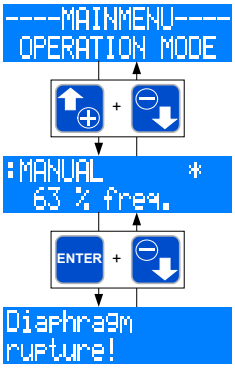
Tab. 12 (Overview of preset parameters)

10.5 Menu

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.



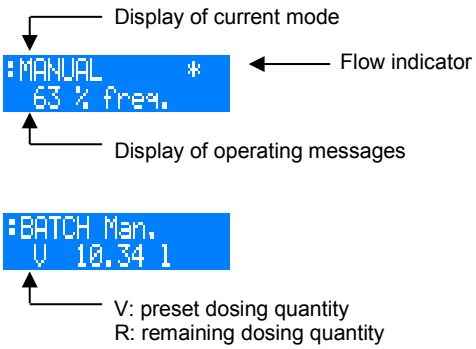
A change between the screens “Operating messages” and “Main menu” is done by simultaneously pressing the UP and DOWN keys.

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.

10.5.1 Screen “Operating messages”



Display of the **current operation mode**

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

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).

NOTE !

The flow indicator (*) is only active when a flow control / flow meter is connected and the dosing monitoring is activated (see Chapter 10.15).

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. 13). 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. 13). The value input is described in Chapter 10.5.4.

Operating messages	**Operation mode**				
	Manual	Analog	Pulse	Batch	External
Current stroke frequency	○(1)	●	●	●	●
Current dosing performance (2)	○	●			
Total strokes	○	○	○	○	○
Total dosing quantity (2	○	○	○	○	○
Current control current		●			
Pulse factor			●		
Memory			●	●	
Dosing quantity / strokes				●	
Remaining dosing quantity / remaining strokes				●	
Manual start				●	

● = Indication
○ = Indication and setting option
(1) = not with a calibrated pump
(2) = only with a calibrated pump

Tab. 13 (Operating messages in dependence on the selected operation mode)

10.5.2 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.

10.5.3 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 “---“ (see examples in Fig. 39). 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.

Fig. 39 (Example for the display of superordinate menu items)

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 (see examples in Fig. 40).

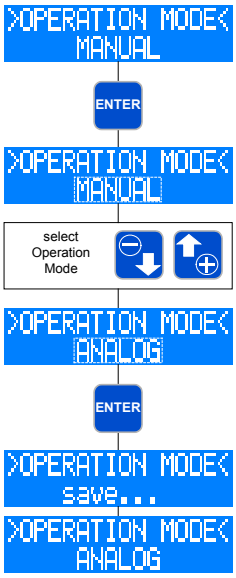
Fig. 40 (Example for the display of parameters)

10.5.4 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 mode).

Value entry is enabled after pressing the ENTER key.

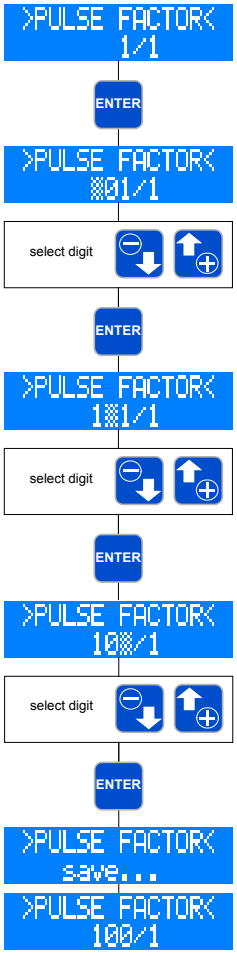
Then, the operation mode indicator flashes and a setting can be selected (in this example: operation modes) using the UP and DOWN keys.

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.

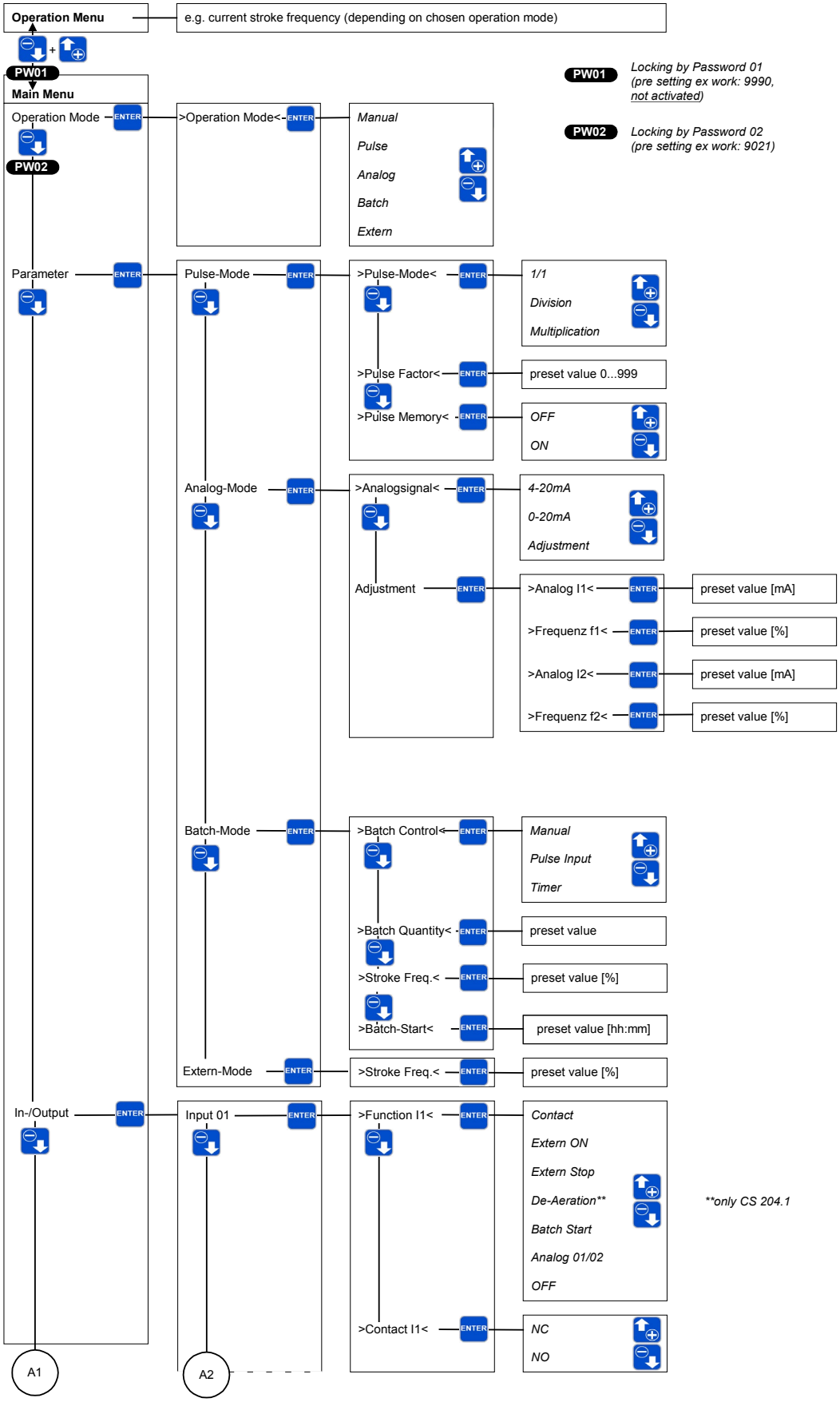
Display of current value (in this example: pulse factor 100/1

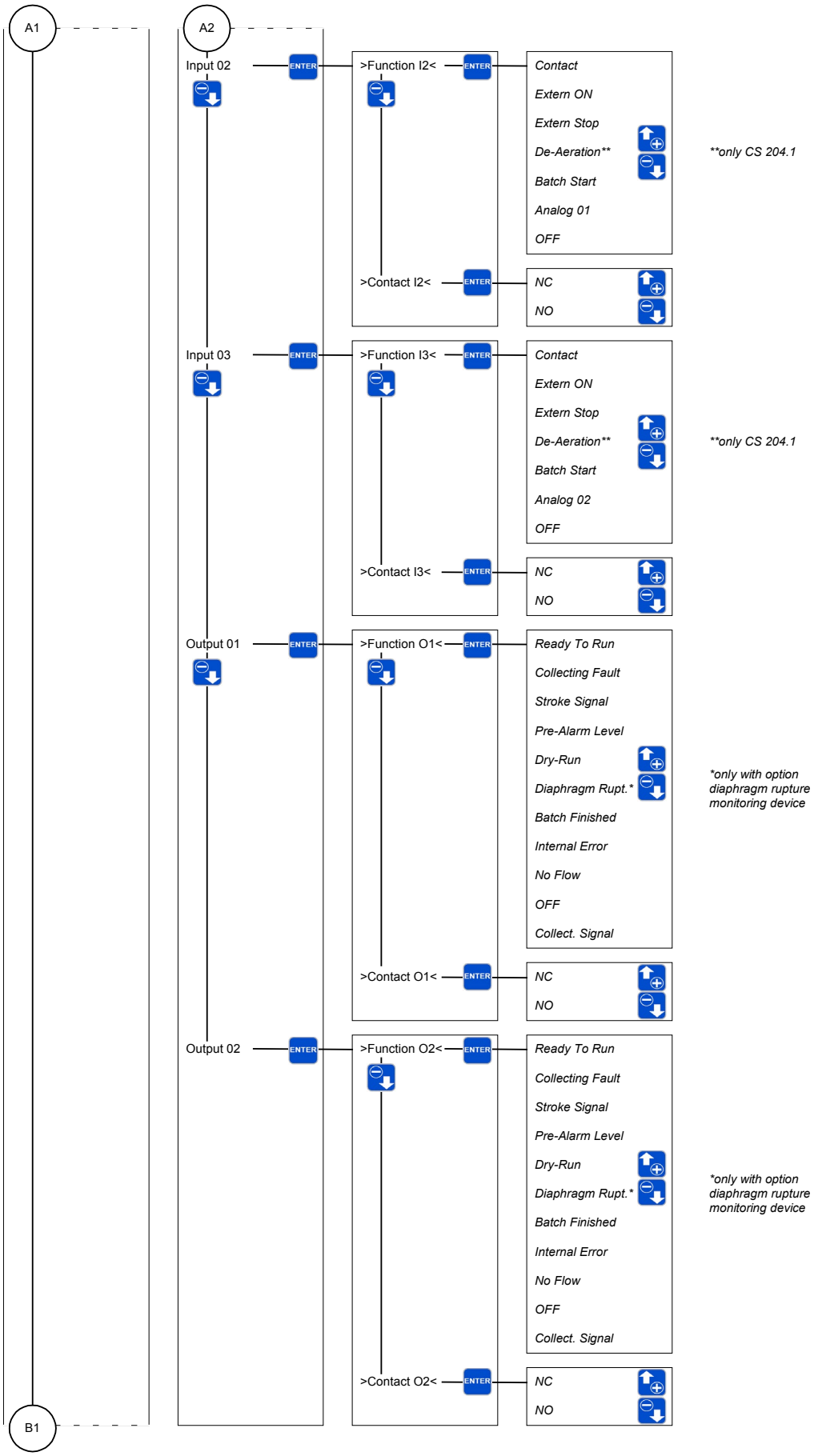
The value entry (flashing indication) can be exited by simultaneously pressing the UP and DOWN keys. In this case, the previous value / previous setting will be maintained.

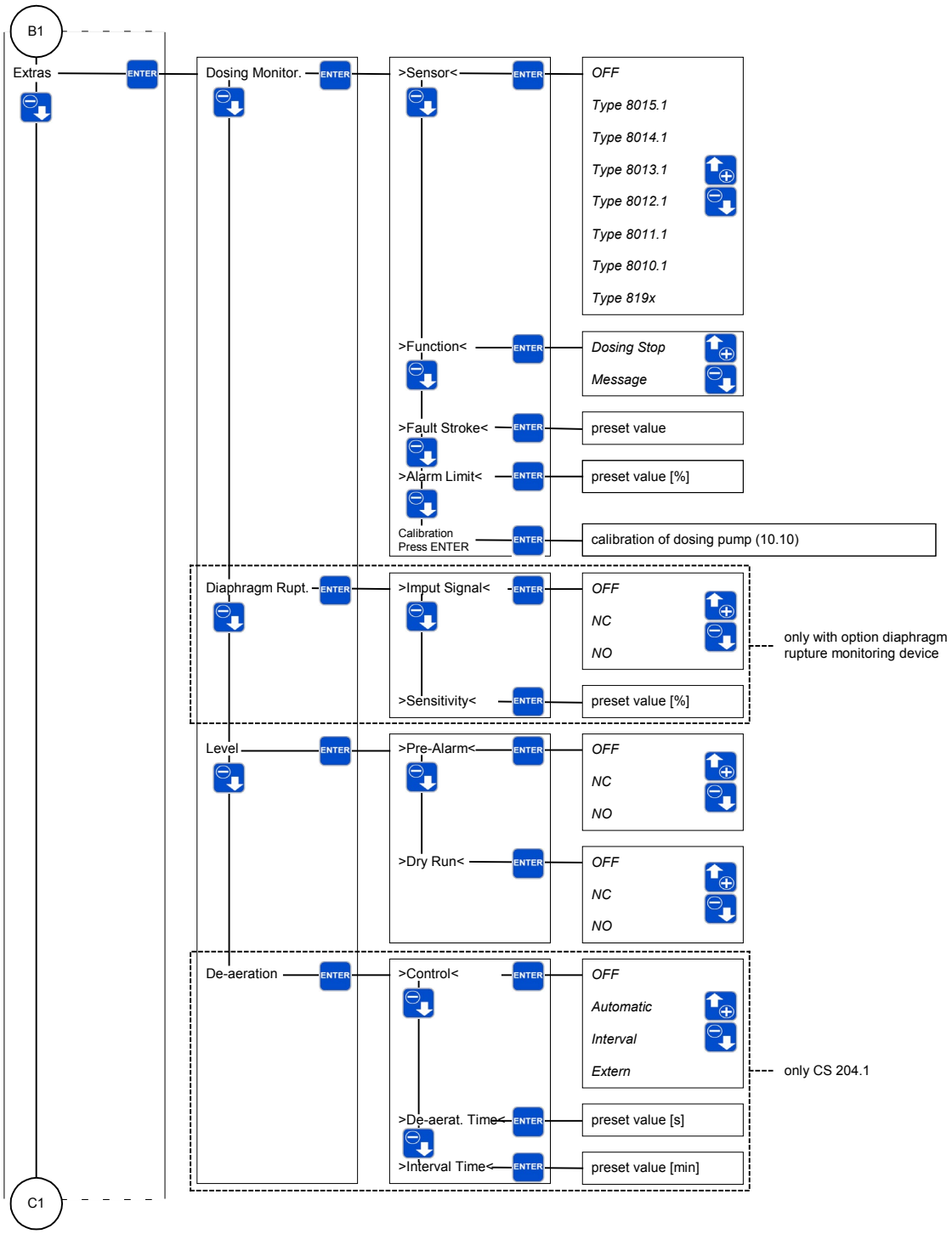
NOTE !

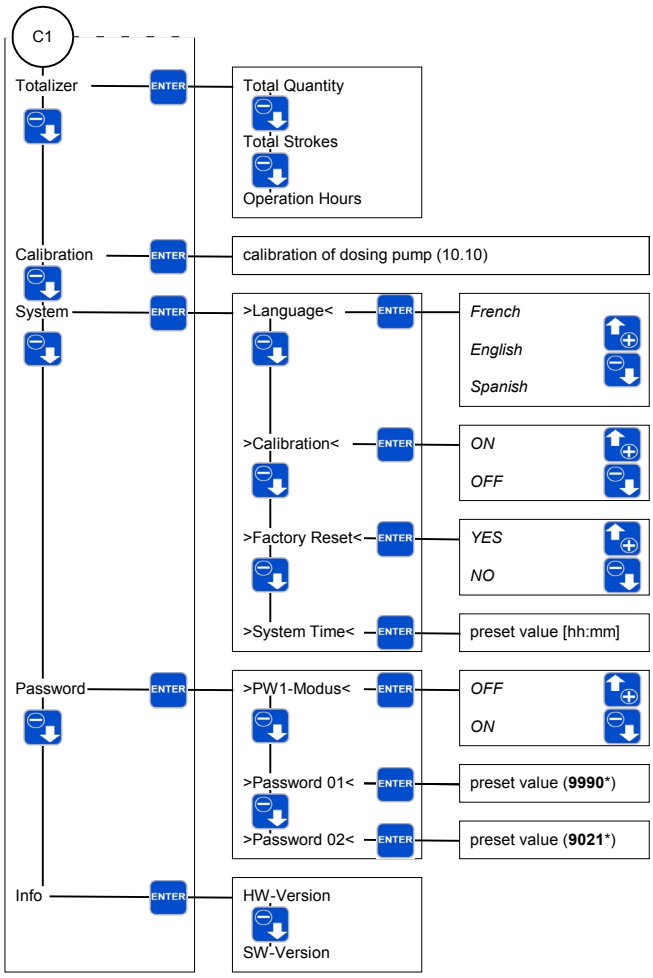
If, during the value entry (flashing indication), no key has been pressed for 30 sec. the entry mode is exited automatically and the previous value / previous setting is maintained.

10.5.5 Menu guide




A1
A2
Input 02
ENTER
>Function I2<
Contact
Extern ON
Extern Stop
De-Aeration**
Batch Start
Analog 01
OFF
>Contact I2<
NC
NO
**only CS 204.1
Input 03
>Function I3<
Contact
Extern ON
Extern Stop
De-Aeration**
Batch Start
Analog 02
OFF
>Contact I3<
NC
NO
**only CS 204.1
Output 01
>Function O1<
Ready To Run
Collecting Fault
Stroke Signal
Pre-Alarm Level
Dry-Run
Diaphragm Rupt.*
Batch Finished
Internal Error
No Flow
OFF
Collect. Signal
>Contact O1<
NC
NO
*only with option diaphragm rupture monitoring device
Output 02
>Function O2<
Ready To Run
Collecting Fault
Stroke Signal
Pre-Alarm Level
Dry-Run
Diaphragm Rupt.*
Batch Finished
Internal Error
No Flow
OFF
Collect. Signal
>Contact O2<
NC
NO
*only with option diaphragm rupture monitoring device
B1


B1
Extras
ENTER
Dosing Monitor.
>Sensor<
OFF
Type 8015.1
Type 8014.1
Type 8013.1
Type 8012.1
Type 8011.1
Type 8010.1
Type 819x
>Function<
Dosing Stop
Message
>Fault Stroke<
preset value
>Alarm Limit<
preset value [%]
Calibration
Press ENTER
calibration of dosing pump (10.10)
Diaphragm Rupt.
>Imput Signal<
OFF
NC
NO
only with option diaphragm rupture monitoring device
>Sensitivity<
preset value [%]
Level
>Pre-Alarm<
OFF
NC
NO
>Dry Run<
OFF
NC
NO
De-aeration
>Control<
OFF
Automatic
Interval
Extern
only CS 204.1
>De-aerat. Time<
preset value [s]
>Interval Time<
preset value [min]
C1



***pre setting ex work**

***pre setting ex work**

10.6 Selecting the operation mode

You can select among five different operation modes:

MANUAL
PULSE
ANALOG
BATCH
EXTERNAL

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 (Chapter 10.16) and/or by presetting a stroke frequency. With a calibrated pump, the delivery rate is set in l/h instead of via the stroke frequency.

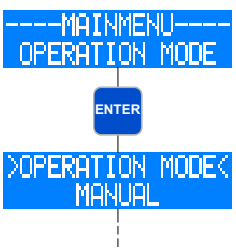
The pump is released or blocked via an external switch. If the pump is released, it will run at the preselected stroke frequency (see Chapter 10.7.4).

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. 10.7.3).

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. 10.7.1).

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. 10.7.2).

Setting diagram:



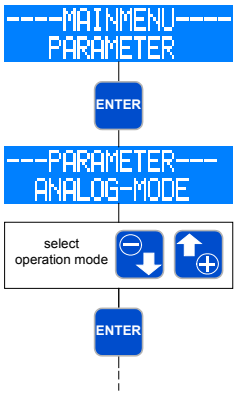
Go to the ---MAIN MENU--- and select the menu item OPERATION MODE (if necessary, use the UP / DOWN keys).
Pressing the ENTER key will open the >OPERATION MODE< submenu.

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 10.5.4.

10.7 Additional settings for the operation mode

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 move back 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.

10.7.1 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 10.8.2).
Input 02 (see Chapter 9.2.1) is factory preset to analog input (ANALOG 01).

Selecting the **ANALOG SIGNAL**

You can select among three different analog signals:

4-20mA
0-20mA
ADJUSTMENT

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 “mA-Signal < 4mA“. Thus, a wire breakage (control current = 0mA) can be detected.
If the input signal is > 20.5mA, then the pump stops and the error message “mA-Signal > 20 mA“ is emitted.

>ANALOGSIGNAL<
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).

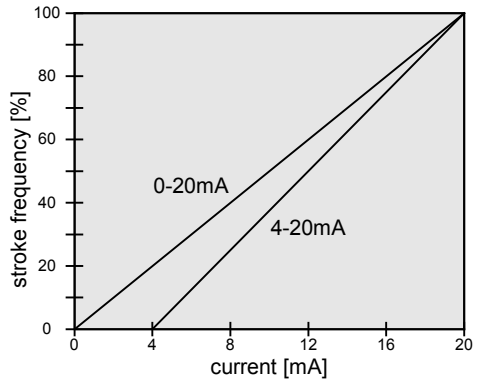


Fig. 41 (Stroke frequency in dependency on the control current at 4-20mA / 0-20mA)

>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%.

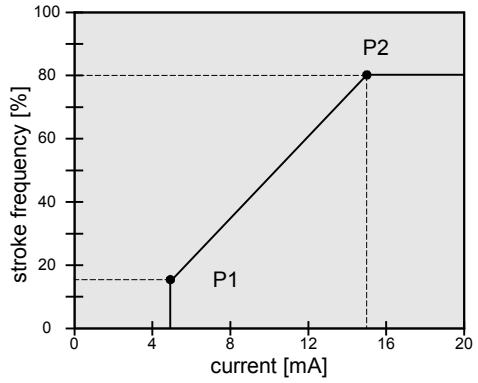


Fig. 42 (Exemplary adjustment of the analog signal)

NOTE !

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.

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:

---PARAMETER---
ANALOG-MODE

Go to the ---PARAMETER--- menu and select the ANALOG MODE menu item using the ENTER key.

ENTER

>ANALOGSIGNAL<
4-20mA

Use the DOWN key to skip the selection of the ANALOG SIGNAL.

--ADJUSTMENT--

Select the ---ADJUSTMENT--- submenu using the ENTER key.

ENTER

>ANALOG I1<
▒▒.▒ mA

preset value

Enter the value for current I1.
To do so, proceed as described in Chapter 10.5.4.

>FREQUENCY f1<
▒▒▒ %

preset value

Enter the value for stroke frequency f1 which is assigned to current I1. To to so, proceed as described in Chapter 10.5.4.

>ANALOG I2<
▒▒.▒ mA

preset value

Enter the value for current I2. To do so, proceed as described in Chapter 10.5.4.

>FREQUENCY f2<
▒▒▒ %

preset value

Enter the value for stroke frequency f2 which is assigned to current I2. To to so, proceed as described in Chapter 10.5.4.

--ADJUSTMENT--

The adjustment is then completed.

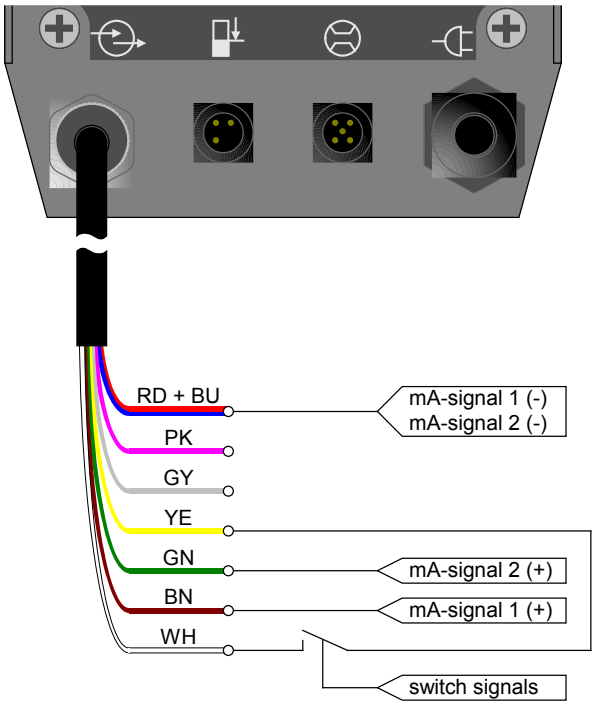


Fig. 43 (Connection of two analog signals with switch-over)

10.7.2 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 10.8).
Input 01 (see Chapter 9.2.1) is factory preset to pulse input (ANALOG 01).

Selecting the **PULSE MODE**

You can select among three different pulse modes:

1/1
DIVISION
MULTIPLICATION

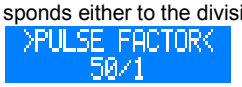
In this mode, the pump performs exactly one stroke for each received pulse.

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.

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.



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 50th received pulse.

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 10.4.3 (Assignment of values).

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 → perform. of 5 x 50 strokes = 250 strokes.

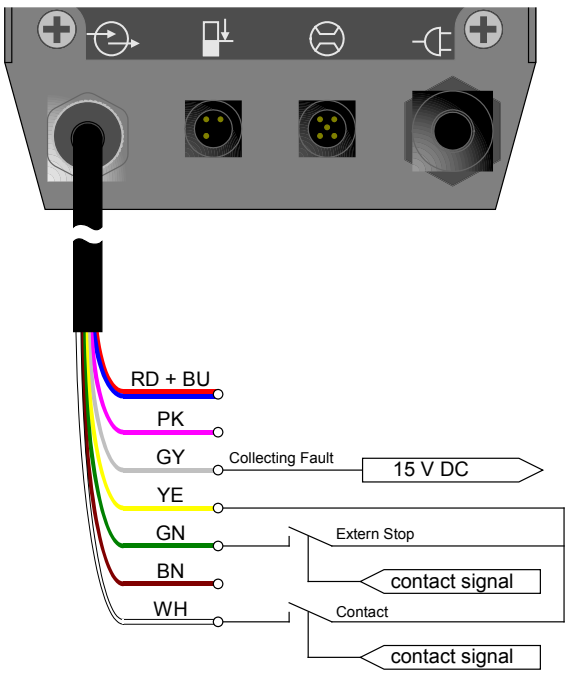


Fig. 44 (Connection of a pulse signal with External stop and response of the stroke signal)

10.7.3 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.

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.

Danger of abrupt pump start.

NOTE !

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 10.8).

Determining the **BATCH QUANTITY**

The type of entry for the batch quantity depends on the calibration (see Chapter 10.10):

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

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 10.5.4.

Determining the **BATCH START**

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 10.5.5.

NOTE !

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

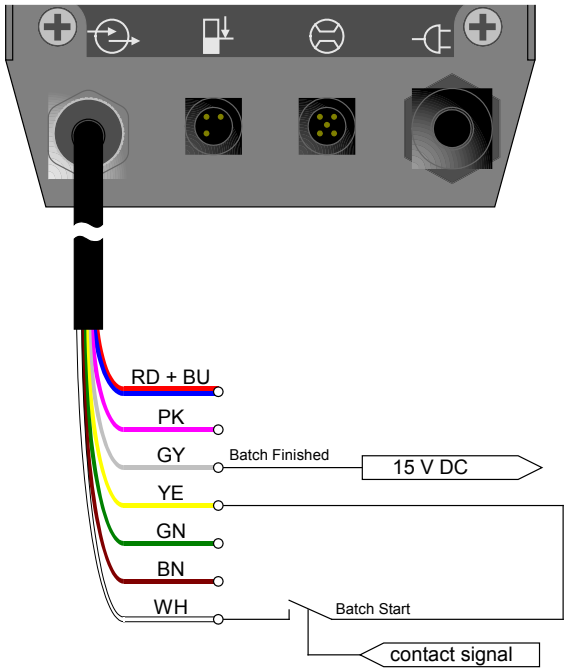


Fig. 45 (Possible connector pin assignment in batch mode)

10.7.4 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 10.8).
Input 03 (see Chapter 9.2.1) is factory preset to External ON.

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. 10.5.5.

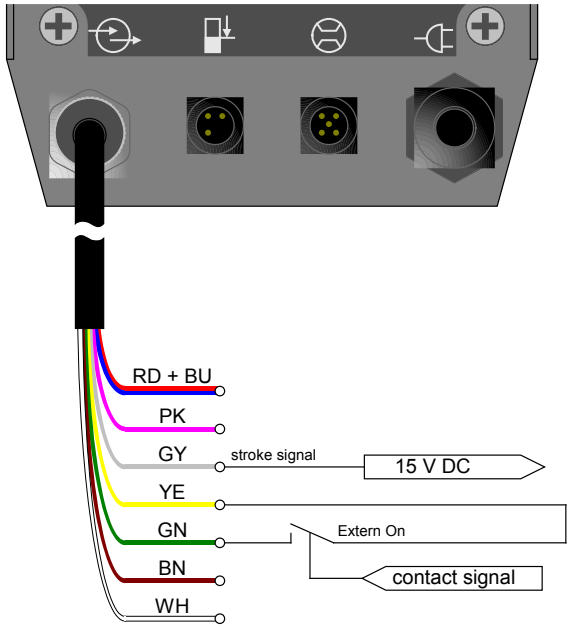


Fig. 46 (Possible connector pin assignment in External operation mode)

10.8 Configuring the inputs and outputs

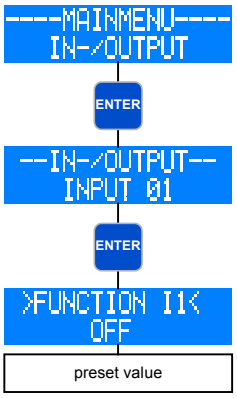
The pump is equipped with three inputs and two outputs, which can be configured via a menu and thus be adapted to the given operating conditions.
It is possible to assign the same functions to all three inputs.

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 <u>with</u> pulse memory. If the pulse memory is switched on, then the received pulses will be summed up.

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.

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

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 for the external control of the venting automatic via the respective input; this automatic is only installed in the self-venting version **CS 204.1**.

Function for externally starting the batch via the respective input.

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. 14.

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. 14 (Analog input switchover)

The respective input is not assigned a function.

10.8.2 Digital/analog inputs 02 and 03

Basically, input 02 and input 03 have the same functions as input 01 (see Chapter 10.8.1). 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.

or.

Respective input is configured as analog input.

10.8.3 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 rupt. (only with option MBE!)
Batch finished
Internal error
No flow
OFF

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

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

Message if one of the following faults occurs:

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

Message indicating that one of the following faults has occurred:

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

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

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

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

(only with MBE option!)

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

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

Signal when one of the following listed faults occurs (fault analysis/- causes see chapter 12.1):

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

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

10.9 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 10.10). The display depends on the operation mode.

MANUAL operation mode

After calibration of the dosing pump, the flow rate is entered directly as target value in l/h instead of via the stroke frequency adjustment. In the screen “operating messages” (see Chapter 10.5.1), the stroke frequency indicator is replaced by the flow rate indicator. In addition, the total dosing quantity is indicated in litres.

ANALOG operation mode

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

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

PULSE operation mode

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

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.

NOTE !

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*
80% stroke frequency → Actual value: 7.9l/h
8l/h → 81% stroke frequency

NOTE !

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

10.10 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.

NOTE !

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:

NOTE !

Prior to the calibration of the flow rate indicator with connected flow meter, the sensor type (>SENSOR<) must be set (see Chapter 10.15).
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!
Danger of breath / Danger of poisoning in case of leaking medium.

1. 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.
2. When the suction line is empty the dosing medium must be drawn in (MANUAL operation mode, keep the pump running).
3. Set the stroke length with which the pump should be calibrated (can also be done via the manual stroke length adjustment)
4. Note the filling level in the calibration pot (= base quantity)
5. Go to the main menu and select the --CALIBRATION-- menu:

6. Press the ENTER key to access the field for entering the number of calibration strokes.
7. 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.
9. The dosing pump performs the preset number of strokes.
10. Determination of the pumped quantity (= difference between base quantity and remaining quantity in the calibration pot).
11. Entry of the determined quantity.

Calibration of the dosing pump is then completed!

NOTE !

After the dosing pump has been calibrated, calibration (see Chapter 10.11) will automatically be set to ON.

NOTE !

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!

10.11 System

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

Language
Calibration
Factory reset
System time

>LANGUAGE<

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

>CALIBRATION<

The calibration of the pump (see Chapter 10.10) 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. 12, Chapter 10.4) can be restored. To do so, adjust YES.

IMPORTANT NOTE !

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

>SYSTEM TIME<

The system time must be adjusted manually.

NOTE !

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

10.12 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.

10.13 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.

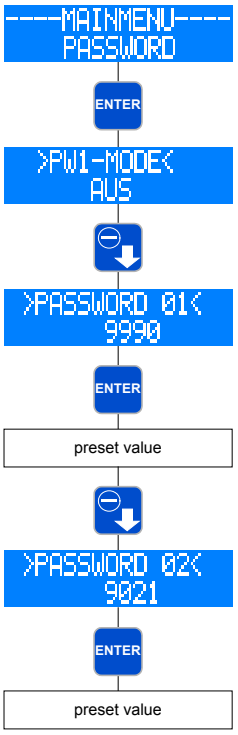
NOTE !

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

NOTE !

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.

NOTE !

If you have lost your password(s), please contact the sera Service Department.

NOTE !

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

IMPORTANT NOTE !

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.

10.14 Info

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

10.15 Extras

10.15.1 Dosing monitoring

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 10.9).

NOTE !

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 10.10.

10.15.2 Diaphragm rupture detection (OPTION)

The diaphragm rupture detection (see also Chapter 7.2.7) is an optional feature for the dosing pump. It is used to monitor the diaphragm during the dosing of conductive fluids.
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.

NOTE !

When leaving the factory, the input signal is configured as NO. The NC configuration is reserved for future options.

>SENSITIVITY<

Entry of the sensitivity of the diaphragm rupture electrode in percent. This enables an adaptation to the conductivity of the pumped medium. In case of poorly conductive media, the sensitivity must be set to a high value (e.g. 100% at approx. 4µS/cm); in case of highly conductive media, the sensitivity must be set to a low value (e.g. 10% at approx. 50µS/cm).

NOTE !

When leaving the factory, the sensitivity is preset to 50%. This corresponds to a minimum conductivity of the dosing medium of approx. 10 µS/cm.
The minimum conductivity at 100% sensitivity is 4µS/cm.

10.15.3 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. 15 (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 (pre-alarm and dry run) is connected.

10.16 Stroke length adjustment

Using the knob for stroke length adjustment, you can mechanically adjust the effective stroke to a value between 0…100%.

NOTE !

Stroke length adjustment may only be performed while the pump is running.

11 Maintenance

WARNING !

Electronics and stroke mechanism shall only be repaired by sera! The pump shall only be opened by sera or after prior arrangement with sera!
Danger of electric shock in case of opening electronic.
Danger of poisoning in case of incorrect decomposition of mechanics.

NOTE !

Before starting maintenance work make sure the the spare and wearing parts as well as the utilities required are available.
Place / deposit components in such a way that any damage is prevented.

NOTE !

Check the wearing parts for proper functioning at regular intervals and replace, if necessary.

The following checks should be carried out at regular intervals:

- tight fit of the the pipework
- 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 fixing screws, please see Chapter 8.1 “Installation”.

NOTE !

Data of internal microfuse:
250 V AC 2A delay-action, 5x20mm
extra disconnect threshold, with UL-/CSA license

CAUTION !

Only use fuses with the same data and properties!
Exchange of fuses only by sera or sera authorized staff.

11.1 Wearing parts

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

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

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

As an option, the solenoid diaphragm pump can be equipped with a diaphragm rupture monitoring device MBE-… (please see Chapter 7.2.7).

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

- Drive diaphragm
- Suction valve
- Pressure valve

11.2 Spare parts

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

- Pump body
- Vent valve (only with FRP-design, C 204.1 - 1,2e... - 10e)

11.3 Spare and wearing parts

11.3.1 Solenoid diaphragm pump C 204.1-1,2e ... -10e

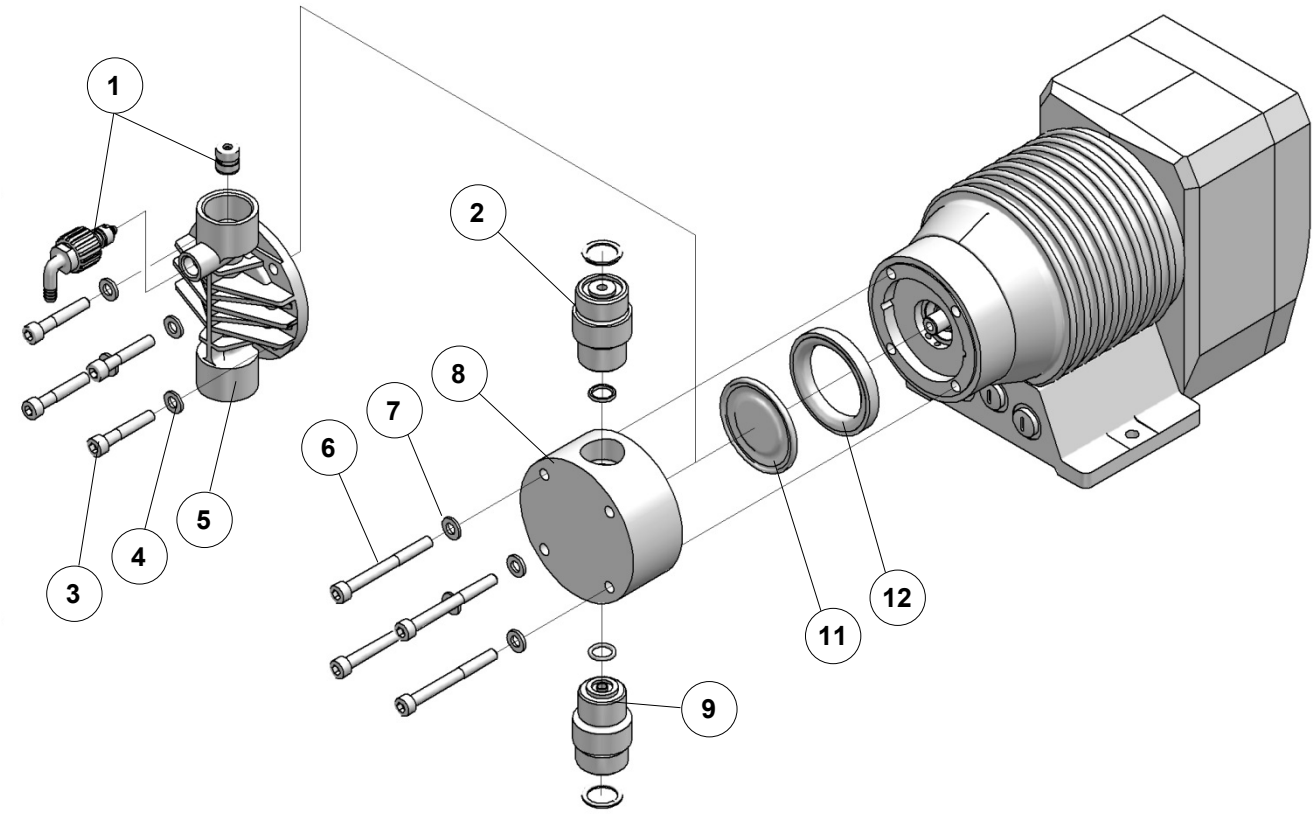


Fig. 48 Spare- and wearing parts C 204.1-1,2e ... -10e

Overview of the spare and wearing part kits

Solenoid diaphragm pump C 204.1-1,2e ... -10e

Suction valve (kit)	
Item	*Designation*
9	Suction valve (incl. o-rings)

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

Diaphragm kit	
Item	*Designation*
11	Drive diaphragm
12	Insert

Pump body kit (FRP-design)	
Item	*Designation*
1	Vent valve
3	Cheese head screw(s)
4	Disk(s)
5	Pump body

Pump body kit (1.4571-, PVC-design)	
Item	*Designation*
6	Cheese head screw(s)
7	Disk(s)
8	Pump body

11.3.2 Solenoid diaphragm pump C 204.1-35e

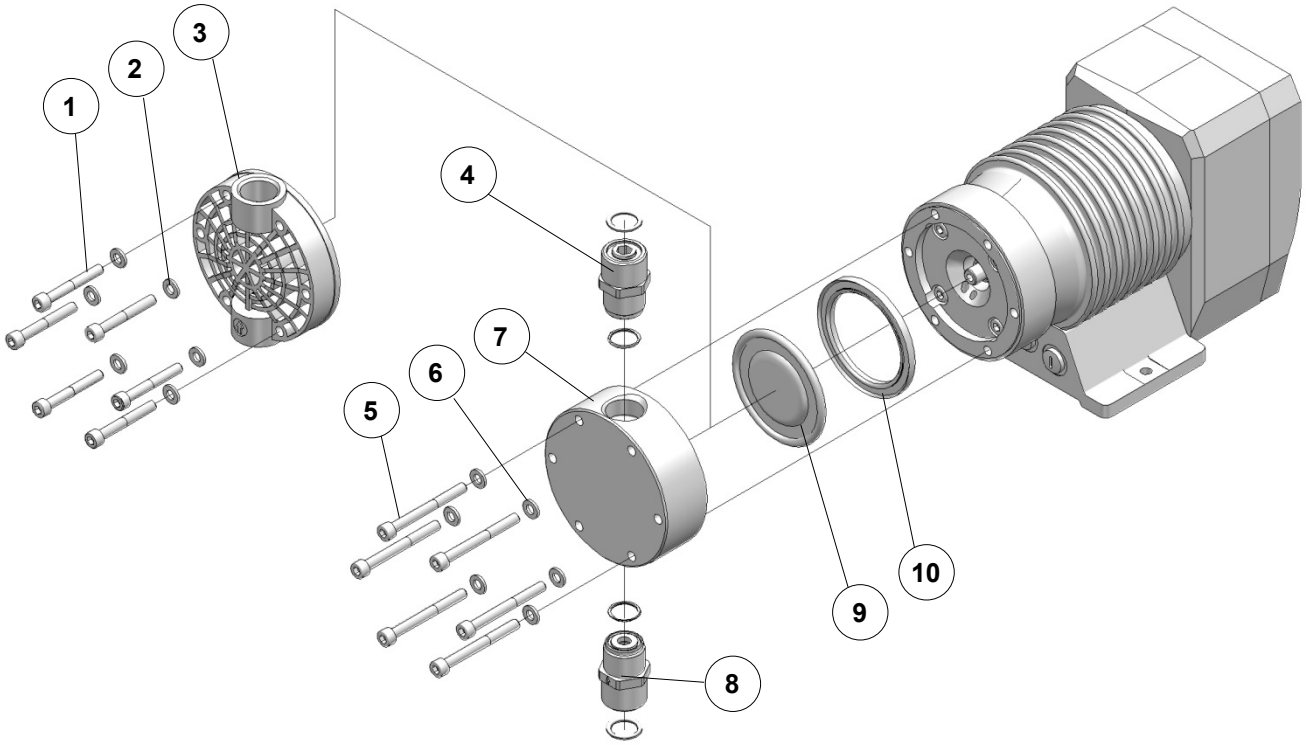


Fig. 49 Spare- and wearing parts C 204.1-35e

Overview of the spare and wearing part kits

Solenoid diaphragm pump C 204.1-35e

Suction valve (kit)	
Item	*Designation*
8	Suction valve (incl. o-rings)

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

Diaphragm kit	
Item	*Designation*
9	Drive diaphragm
10	Insert

Pump body kit (FRP-design)	
Item	*Designation*
1	Cheese head screw(s)
2	Disk(s)
3	Pump body

Pump body kit (1.4571-, PVC-design)	
Item	*Designation*
5	Cheese head screw(s)
6	Disk(s)
7	Pump body

11.4 Changing working diaphragm

General

In order to ensure a correct function of the diaphragm pump and to fulfil the required safety and protective provisions it is absolutely necessary to check and replace the diaphragms at regular intervals.

CAUTION !

For replacing the diaphragm, the system must be depressurised!

CAUTION !

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

Interrupt the power supply during the maintenance / repair of the pump and secure against unintentional or unauthorized starting.

Take appropriate protective measures: wear protective clothing, breathing mask and safety goggles. Prepare a container with appropriate fluid right beside the pump for being able to remove splashes of the pumped medium.

Use an appropriate detergent to rinse the solenoid diaphragm pump until no residues of the pumped medium remain in the pump body. Otherwise, pumped medium may leak when disassembling the pump. Collect the rinsed liquid in a safe way (avoid contact with it) and dispose of it in an environmentally compatible way. This measure is also necessary if the solenoid diaphragm pump should be returned for repair.

Note the set stroke length.

Replacement of the working diaphragm:

Loosen suction and pressure lines of pump

Make a note of the current setting of the stroke length

Set stroke length to 0 %

Screw out fixing screws of pump body (take off with disks)

Remove pump body (with valves) to the front

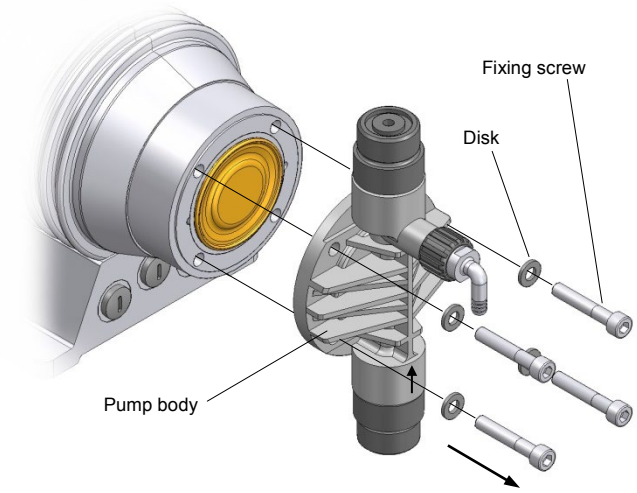


Fig. 52 (Disassembly of pump body)

Unscrew working diaphragm from connecting rod (see Fig. 53)

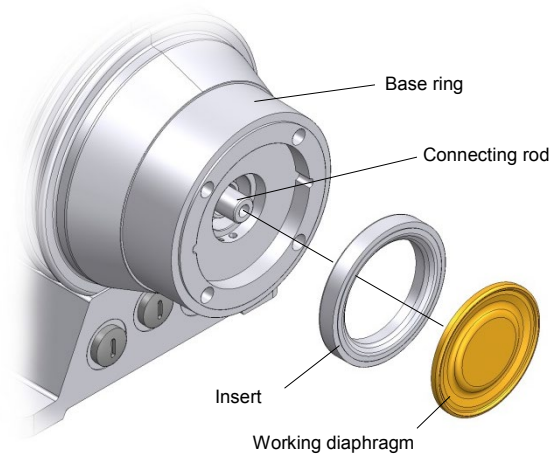


Fig. 53 (Disassembly of working diaphragm)

- Screw working diaphragm onto connecting rod
- Set stroke length to 50 %
- Put pump body onto base ring. Tighten fixing screws crosswise with correct torque (see Chapter. 8.1 / Table.09).

When mounting the pump body please note:

NOTE !

Pressure valve above; suction valve below !

(Consider the direction of the arrows on the valves, described in Chapter 7.2.5)

- Note direction of arrow on pump body
- Fix suction and pressure line
- Reset original stroke length
- Apply voltage

The solenoid diaphragm pump is ready for operation

12 Fault analysis and corrective action

sera products are sophisticated technical products which are only shipped after having been thoroughly tested and checked at our factory.
Should there be any faults, these can be – on account of fault announcement on LCD-display – detected and rectified easily and quickly if the steps in Tables 16 - 18 are carried out.

12.1 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 with an appropriate measuring device 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.
			●				●	Air in suction line while pressure applied to the pressure valve ball	Vent pressure side resp. open vent valve (only FRP-design, see chap. 7.2.7).
			●				●	Pipe connections leaky	Tighten connection according to type of material. Be careful with plastic – risk of fracture
			●				●	Pumped medium frozen in pipe	Remove solenoid diaphragm pump and check for damage – increase temperature of the pumped medium
				●				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, calibrate again, if necessary
					●			Stroke length was set to below 15% approx., the 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. 16 (Analyze and eliminate faults on the basis of the error messages- part I)

Error message									Possible cause	Corrective action
Time lost !	Diaphragm rupture!	Mains voltage too g too low!	Mains voltage too high!	Pre-alarm level!	Set value not attainable! (Internal fault!!)	No stroke vecognition! (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.
				●				●	Few or no conveying medium in store tank	Fill store tank
					●				Only for calibrated pump: Set stroke length is too low to attain the preset set value	Check the stroke length and the set value, calibrate the pump again, if necessary.
						●			Reversible thermal fuse of the solenoid has triggered	Wait until temperature of the solenoid has lowered. Check ambient temperature. Quit with “Stop/Start”-button.
							●		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
●									Breakdown supply voltage by mode of operation „Charge-Timer“	System time adjustment

Table. 17 (Analyze and eliminate faults on the basis of the error messages – part II)

12.2 Analysis of other faults

Fault type													Possible cause	Corrective action
The magnetic diaphragm pump does not run	The operation indicator lamp (LED) does not light up	Solenoid diaphragm pump does not draw in	Solenoid diaphragm pump does not deliver	Delivery rate is not reached	Delivery height is not reached	Delivery rate fluctuates	Maximum delivery rate exceeded	Pipe oscillates heavily	High noise development	Low service life of the drive diaphragm	Drive is overloaded	Leakage on pump head		
		●	●	●									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
		●	●	●									No conveying medium in store tank	Fill store tank
		●	●	●	●	●							Pump valves leaky	Remove valves and clean
		●	●		●	●							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.
			●	●	●	●					●		Electric data of the stroke magnet do not match mains data	Check order data. Check electric installation.
			●	●	●	●		●		●	●	●	Counter-pressure too high	Measure pressure with manometer directly above pressure valve and compare with permissible counter-pressure
		●	●	●	●	●							Foreign matter in pump valves	Remove and clean valves
						●	●						Pressure on suction side higher than at the end of the pressure line	Check geodetic conditions, install float valve or pressure keeping valve if necessary
				●	●	●		●	●	●	●	●	Acceleration height too high due to pipe geometry	Check acceleration height on suction- and pressure side with manometer and compare with design data – install a pulsation damper if necessary
										●		●	Material which is in contact with the medium not suitable for the pumped medium	Check whether the pumped medium corresponds with the design data and select other materials 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.
		●											Air in suction line while pressure applied to the pressure valve ball	Vent pressure side resp. open vent valve (only FRP-design, see chap. 7.2.3).
●													Reversible thermal fuse of the solenoid has triggered	Wait until temperature of the solenoid has lowered. Check ambient temperature.
		●	●	●	●	●						●	Pipe connections leaky	Tighten connection according to type of material. Be careful with plastic – risk of fracture
		●	●										Pumped medium frozen in pipe	Remove solenoid diaphragm pump and check for damage – increase temperature of the pumped medium
	●												Fuse in the electronics blown	Have fuse replaced by qualified personnel, contact the manufacturer if necessary..
	●												The electric power supply has failed/been switched off	Restore the electric power supply.
●	●		●										No mains connection	Supply voltage
				●									Home position misadjusted	Reset stroke length.
		●											Pump valves are dry	Moisten pump body and valves. Open vent valve.

Table. 18 (Analyze and eliminate faults)

13 Shut-down

Switch the solenoid diaphragm pump off.

Rinse pump head to remove the pumped medium and make sure that the detergend is suitable for the pumped medium and the material of the pump head.

14 Disposal

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

14.1 Dismantling and transport

Remove all fluid residues, clean thoroughly, neutralize and decontaminate.

Package unit and ship.

14.2 Complete disposal

Remove all fluid residues from unit.

Drain off lubricants and dispose of according to regulations!

Dismount materials and send them to a suitable waste disposal company!

CAUTION !

The consignor is responsible for damage caused by leaking lubricants and fluids!

Danger of breath / Danger of poisoning in case of leaking medium.

Notes

Notes