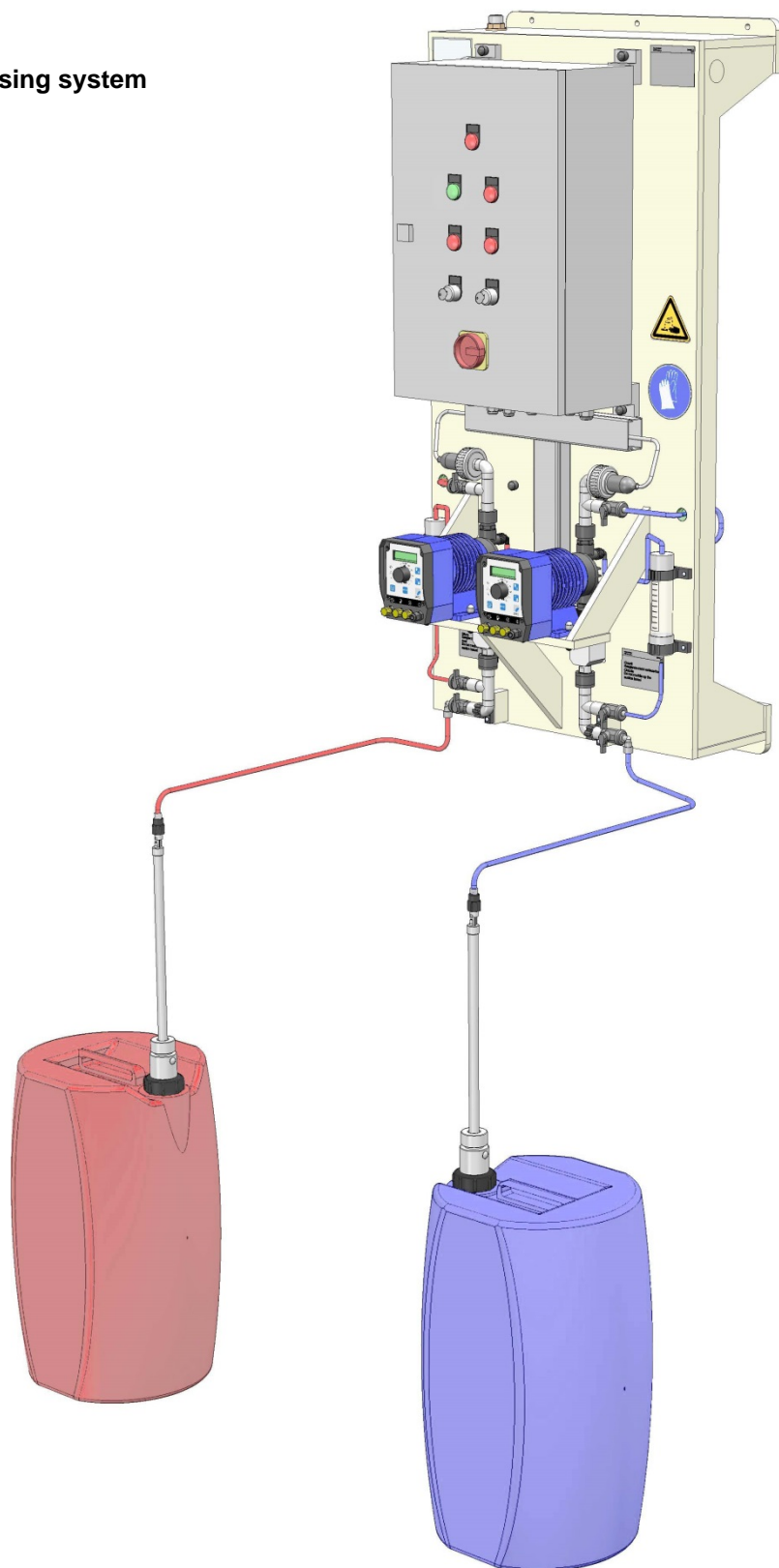


Product: Chlorine dioxide
production- and dosing system

Type: CDG



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Translation of the original operating instructions!

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Operating Instructions

1 General

Pay attention to the general local instructions which apply for commissioning and operating **sera** products.

sera products are delivered ready for operation. Carefully read these instructions and especially the safety instructions herein contained before putting the system into operation.

When mounting the system the owner is responsible that the requirements according to the regulations on pressure vessels 2014/68/EU as well as the valid regulations for prevention of accidents are observed.

1.1 Health hazards

A chlorine dioxide gas concentration of more than 45 mg ClO₂ / m³ leads to difficulties in breathing, irritation of the mucous membranes and headache. Chlorine dioxide in general is strongly irritating to the mucous membranes of the eyes and the respiratory tract. Depending on the concentration and duration of exposure chlorine dioxide can lead to suffocation, coughing fits, occasionally vomiting, conjunctivitis and severe headache, in some cases to pulmonary oedema with shortness of breath, anaemia and circulatory failure. Short-term exposure of very high concentrations can lead to acute spasmodic laryngitis or reflexive respiratory arrest or cardiac arrest (e.g. gaze palsy).

CAUTION !



Chlorine dioxide can be recognized by the yellow colour of the solution. Gaseous chlorine dioxide is orange-yellow, heavier than air and explosive from a concentration of 300 g/m³. From a concentration of 15 mg/m³ it is odor perceptible and from concentrations above 45 mg/m³ it leads to difficulties in breathing, headache and is irritating to the mucous membranes.

You will find all information required for the understanding of the different chlorine dioxide systems in the DVWG worksheets W 224 and W 624.

1.2 First Aid

Remove any clothing which was contaminated with chlorine dioxide or its watery solution immediately and wash skin thoroughly with plenty of water and soap.

If the liquid has splashed in the eyes, wash the eyes by running water while holding eyelids apart. When chlorine dioxide was inhaled, take person to the fresh air, keep quiet, keep in a horizontal position, and keep warm. Seek immediate medical attention, even if symptoms do not occur instantly. Take person carefully and quickly to a hospital, if necessary.

2 Safety instructions

2.1 Note on quality

Read these operating instructions attentively before starting up or maintaining the system. Observance of these operating instructions and, in particular, safety instructions, helps to

- Avoid danger to staff, machines, and environment.
- Increase the operational reliability and life of the system.
- Reduce expenses for repairs and downtimes.

The **sera** quality management and quality assurance system for pumps, systems, and fittings is certified according to ISO 9001:2008.

sera products comply with the valid safety requirements and accident prevention regulations.

CAUTION !



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

CAUTION !



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

2.2 Purpose of these operating instructions

These operating instructions contain basic notes which must be observed during installation, operation and maintenance work. Therefore, these operating instructions are to be read by the responsible fitter and the qualified personnel / operator before the system is installed and must be kept within reach at the place of installation of the system.

The general safety instructions stated in this main section "Safety" and the special safety instructions given in the other sections must be observed.

CAUTION !



Detailed information about the individual components of the system (e.g. the dosing pumps) is given in the supplementary operating instructions of the total documentation.

2.3 Personnel qualification and training

The personnel who operate, maintain, inspect and install the system must be suitably qualified. Range of responsibility, and supervision of the personnel are to be clearly defined by the owner. The personnel must be trained and instructed correspondingly if they do not have the required knowledge. If required such a training 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.

2.4 Marking of notes

2.4.1 Marking of notes in these operating instructions

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



(safety symbol in compliance with
DIN 4844 – W9)

2.4.2 Marking of notes on the product

Symbols which are directly attached to the system, e.g. warning notes or symbols for fluid connections are to be observed and kept in a legible condition.

2.5 Preventive safety measures

- Carry out inspection of the locality together with the responsible fire-brigade. Inform the fire-brigade about: the area, the access roads and escape routes, the water connections and the measures for cordoning off.
- Provide an external water connection (hose connection) which can prevent the leaking of chlorine gases outside the chlorine rooms, e.g. in the event of a leaky container, by means of a water jet.

2.6 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 machine. If these safety instructions are not observed any claim for damages may become void.

Inobservance can result in:

- Failure of important functions of the system
- Failure of prescribed methods regarding maintenance and service
- Danger to persons through chemical influences
- Hazards to the environment through leaking dangerous media

2.7 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.

2.8 Safety instructions for the owner / operator

Hot or cold machine parts must be secured by the customer against contact if these may lead to hazards.

Protective devices against accidental contact of moving parts (e.g. coupling) must not be removed during operation.

Leaging dangerous pumped media (e.g. explosive, toxic, hot) must be carried off in such a way that there is no danger to persons and the environment. The legal regulations are to be observed.

Dangers through electric energy are to be ruled out.

When handling chemicals, operating and servicing the system the protective measures according to the Safety Data Sheets for sodium chlorite and hydrochloric acid must be observed.

2.9 Measures after spilling and draining off of chlorine dioxide solutions, gas leaks and for disposal

Suppress leaking gas with water spray jet. Pour sodium sulphate solution over the flown out solution, dilute with plenty of water and discharge into drain.

2.10 Fire fighting measures

Chlorine dioxide itself is not combustible, but has an oxidizing effect. Exlosion-like decomposition at temperatures from 100°C. Cool down containers with water and suppress leaking chlorine dioxide gas with water spray jet.

2.11 Proper use

sera products are exclusively to be deployed according to the intended use stated in the corresponding order confirmation and the acceptance test certificate.

sera does not assume any responsibility for damage resulting from an operation which does not conform with the intended use.

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

Operating Instructions

Criteria for proper use:

- 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 of the chemical)
- Stability 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

sera does not assume any responsibility if these criteria are not or only partly observed by the owner / operator.

sera pumps are positive displacement pumps which, in theory, can build up an infinitely high pressure.

If the pressure pipe is closed, e.g. due to clogging of the pipes or a closed valve, the pressure generated by the pump can reach a multiple of the permissible system pressure. This may lead to damage to the pipes with dangerous consequences, especially if aggressive or toxic media are conveyed. Therefore, the corresponding protective devices must be installed.

CAUTION !



Do not carry out any constructional changes on the system!

2.12 Approved maintenance, service and operating personnel

The system operator may only approve persons to operate or maintain the unit, who are at least eighteen years old and suitably qualified, and of a physical and mental state to perform the tasks entrusted to them. These persons must be properly instructed and act responsibly, properly and reliably. The operating personnel must be familiar with all applicable accident prevention and safety instructions and regulations.

2.13 Safety instructions for maintenance-, inspection- and installation work

When mounting and installing the system the valid accident prevention regulations, especially the DVGW W 224, DVGW W 624, GUV-V D5, §19 WHG (applicable to Germany) must be observed.

All personnel who install, operate or maintain the chlorine dioxide production system must have been correspondingly instructed in the relevant safety measures.

The owner must ensure that all maintenance-, inspection- and installation work are exclusively carried out by authorized and qualified personnel who have read the operating instructions carefully.

The spare parts and utilities used must comply with the requirements of the corresponding operating conditions.

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

Pumps, systems or units which are used for conveying hazardous media must be decontaminated.

All safety- and protective devices must be reinstalled or made operative immediately after the work is finished.

The instructions in the section "Commissioning" are to be observed before the system is restarted.

2.14 Personal protection for maintenance and repair

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

In case of an incident pay attention to possibly leaking media.

Emissions are to be monitored by corresponding monitoring devices.

CAUTION !



Use protective clothing, gloves and a suitable face screen!

CAUTION !



Personal protective equipment must be provided by the owner of the system at all times!

2.15 Arbitrary modification and spare parts production

Modification to and change of the system are only permitted after previous agreement of the manufacturer. Original spare parts and accessories approved by the manufacturer increase safety.

Any guarantee claims against the manufacturer / supplier are nullified if non-authorized parts are used or if the system or its components are modified arbitrarily.

2.16 Improper operation

Operational reliability of the supplied system is only guaranteed if the product is used as intended, according to the descriptions in Chapter 2.11 of these operating instructions.

3 System description

3.1 Production of chlorine dioxide

Due to its physical-chemical properties chlorine dioxide must be produced directly at its place of use.

This (these) system(s) was (were) designed for the production and dosing of chlorine dioxide solutions.

The system(s) operate(s) according to the chlorite acid process on the basis of prediluted basic chemicals (**hydrochloric acid 9% and sodium chlorite solution 7.5%**). By dosing the chemicals in the ratio 1:1 a ClO_2 -solution with a concentration of 20 g/l is produced.

Chlorine dioxide is produced by reaction of the two combined basic chemicals in the reactor. The chlorine dioxide produced is immediately transported to the mixing station.

The chlorine dioxide reactor is on the back of the wall pallet and can be accessed from the right side (see Fig. 01). The basic chemicals are transported electronically controlled and monitored by two single diaphragm pumps of the **sera** C-series directly into the reactor and to the dosing unit.

Every stroke of the dosing pumps is monitored by a flow meter. If the flow is reduced a corresponding signal will be transmitted to the pumps. The system switches off and a fault is reported.

Two float switches in the suction lances prevent the dosing pumps from dry running and thus air from entering into the system. When the level reaches the first limiting value, a pre-alarm is triggered. The system switches off and a fault is reported when the second limiting value is reached.

The system is equipped with two calibration pots for calibrating the dosing pumps. A mechanic pressure switch in the pressure pipe protects the pumps from overpressure. In case of an overpressure the system is switched off immediately.

CAUTION !



ClO_2 solutions with a concentration greater than 30 g/l can explode without any outside influence!

CAUTION !



Only use chemicals with the following concentrations: 9% HCl (hydrochloric acid) and 7.5% NaClO_2 (sodium chlorite)!

3.2 ClO_2 production proportional to quantity

Chlorine dioxide solution is produced proportional to the flow in a water pipe and dependent on the ClO_2 concentration measured by a regulator.

The controller generates impulses dependent on the signals of the regulator or of a flow meter (magnetic-inductive flow meter or contact water meter). The dosing pumps carry out strokes in the ratio 1:1 dependent on the pulse frequency.

3.3 Basic substances / added quantities

3.3.1 Hydrochloric acid (HCl)

MAK value: 7.0 mg/m³ or 5 ml/m³

Hydrochloric acid is a colourless to yellowish, toxic liquid with a pungent odour which can cause severe burns to the skin and eyes after contact.

The hydrochloric acid is transported and delivered without pressure in a tank lorry, plastic, glass or stoneware containers. The technical conditions of supply for hydrochloric acid as a chemically pure substance for water treatment are specified in the DIN 19610 standard.

3.3.2 Sodium chlorite (NaClO_2)

MAK value: not defined

Sodium chlorite (NaClO_2) is a strong oxidizing agent in ionic form which is preferably used as a solution. Sodium chlorite is a colourless to yellow-greenish liquid without noticeable odour, which reacts alkaline (pH 12-13) and can be stored without any loss of activity at room temperature.

Sodium chlorite is transported and delivered in tank lorries or plastic containers which must be protected against intense heat exposure, direct sunlight and frost.

It can cause burns after skin- and eye contact. Sodium chlorite must not come into contact with acids, acid salts, greases, oils and oxidizing substances or stored together with these substances in order to avoid dangerous reactions if the substances are not stored in fracture-proof containers (UVV VBG 65 - for Germany).

Dried in sodium chlorite solution can ignite combustible material such as wood, paper, rubber, greases, oils etc. after contact and explode if ignited. For this reason objects which were wetted with sodium chlorite solution must be cleaned with plenty of water.

The technical conditions of supply for sodium chlorite solutions are specified in the DIN 19617 standard.

3.4 Function

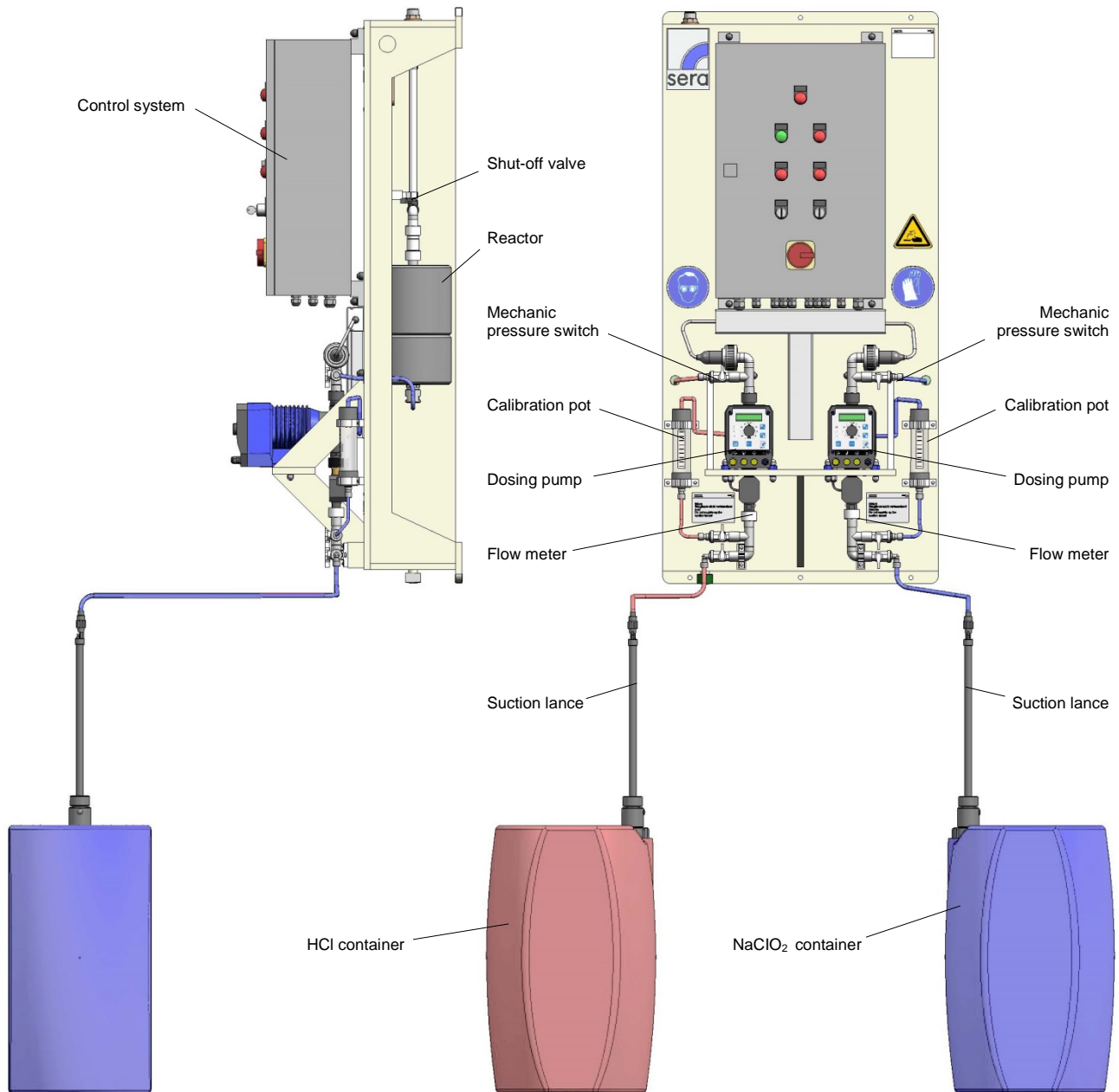


Fig. 01 System design

4 Transport and intermediate storage

4.1 General

Before shipment **sera** products are checked for proper condition and functioning. The products are packed according to the transport conditions.

4.2 Checking the packaging after delivery

On delivery, immediately check the packaging for damage. Report any external damage without delay to the transport company, and fill out a damage report. After recording the damage caused, open the package and check the contents for damage.

4.3 Transport

The unit should only be transported using suitable lifting gears.

Example:

Lifting by means of a tie-bar (not included in the scope of supply).

Lead the carrying belts through the transport holes and lift.

CAUTION !

Be careful when lifting the system.
Pay attention to the center of gravity!

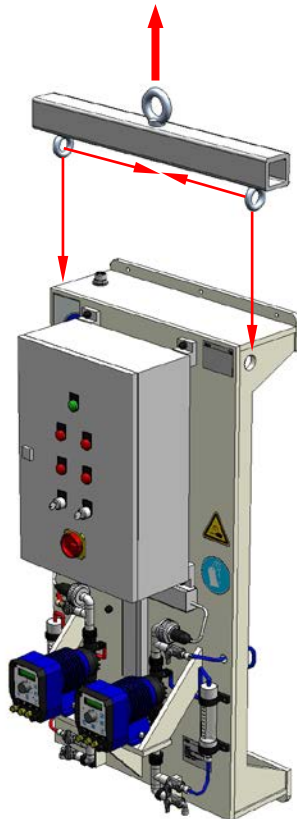


Fig. 02 Transport

4.4 Storage

An undamaged packaging protects the unit during subsequent storage and should only be opened before the system is installed.

Proper storage increases the service life of the unit and comprises protection from 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 -10°C and +30°C
- Relative air humidity not more than 50%.

If these values are exceeded, metal products should be air-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.

Operating Instructions

5 Technical specifications

Medium: max. 2% ClO₂ solution
 Basic substances: 9% HCl and 7.5% NaClO₂ solutions
 Viscosity: max. 10mPas
 Working temperature: +5°C to +35°C
 Solid matters: none
 Water quality: similar to drinking water, i.e. chemically neutral
 free from solid and suspended matters as well as disturbing ion concentrations
 Place of installation: inside, frost-protected

Technical specifications						
Type	Nominal capacity*	Minimum capacity**	Chemical consumption		Max. allowable backpressure [bar]	Weight [approx. kg]
	ClO ₂	ClO ₂	HCl (9%)	NaClO ₂ (7,5%)		
	[g/h]	[g/h]	[l/h]	[l/h]		
CDG - 125.1	125	20	3,2	3,2	10	64
CDG - 220.1	220	35	5,5	5,5	10	64
CDG - 500.1	500	80	12,6	12,6	10	70
CDG - 1000.1	1000	140	25,2	25,2	10	75

Tab. 01 Technical specifications

* other capacities on request

** for factory-adjusted stroke length

Electrical data, switch cabinet					
Type	Supply voltage [V (50 Hz/N/PE)]	Control voltage [V DC]	Frequency [Hz]	Power consumption [approx. kW]	Protection class (switch cabinet)
CDG - 125.1	230	24	50 / 60	1,0	IP 65
CDG - 220.1	230	24	50 / 60	1,0	IP 65
CDG - 500.1	230	24	50 / 60	1,5	IP 65
CDG - 1000.1	230	24	50 / 60	1,5	IP 65

Tab. 02 Electrical data, switch cabinet

Electrical data, control technology		
Inputs	4 potential-free inputs 1 analog input (potential-free)	Pulse input (minimum pulse length 100ms), Automatic externally ON, fault external regulator, external bypass flow 4...20mA (input impedance < 500 Ohm)
Outputs	3 potential-free outputs 1 voltage outlet	Pre-alarm container, release from external regulator, collective fault 230V / 50Hz / 2A (e.g. for external regulator)

Tab. 03 Electrical data, control technology

5.1 Dimensions

5.2 CDG - 125.1 and CDG - 220.1

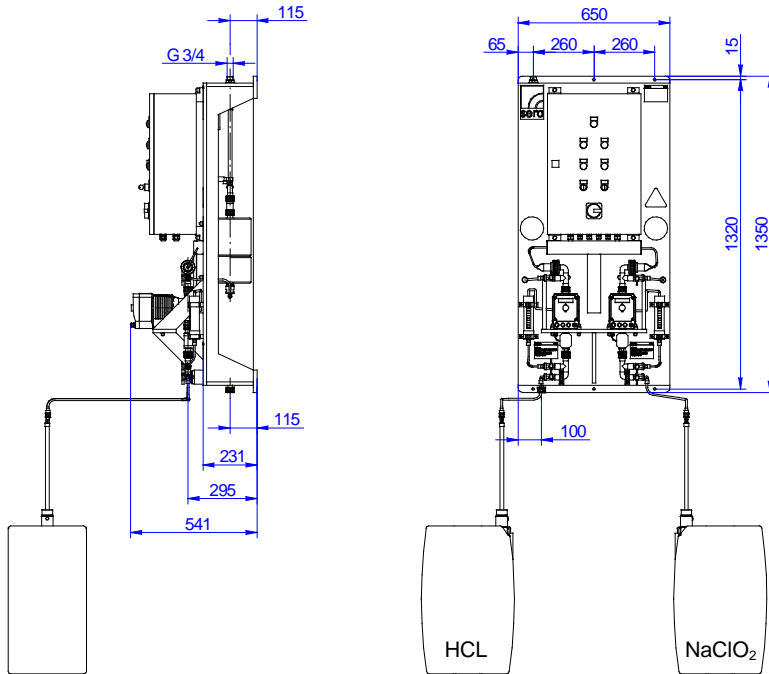


Fig. 03 Dimensions of the CDG – 125.1 and CDG – 220.1

5.3 CDG - 500.1 and CDG - 1000.1

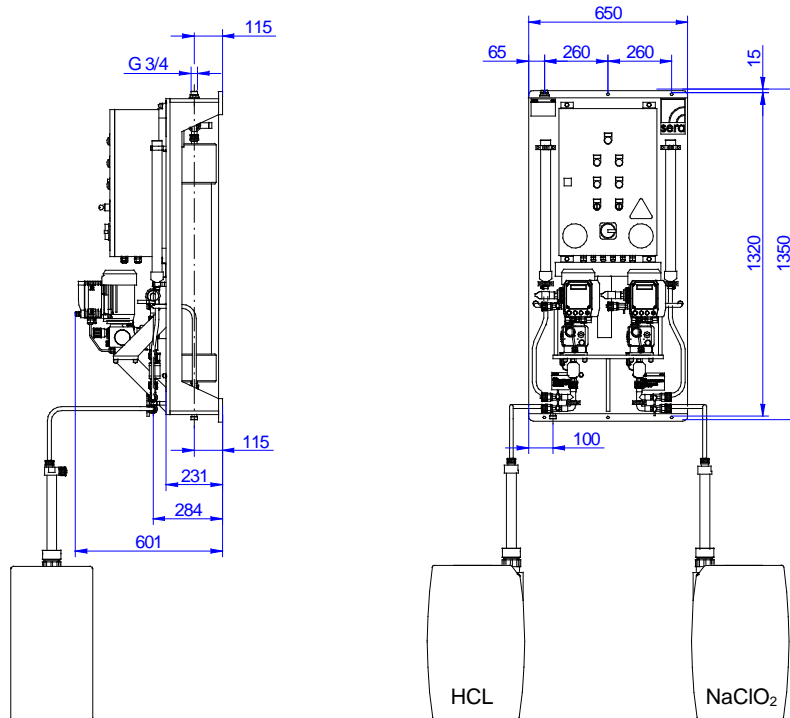


Fig. 04 Dimensions of the CDG – 500.1 and CDG – 1000.1

6 Operation

6.1 Control system (switch cabinet)

6.1.1 Operation in general

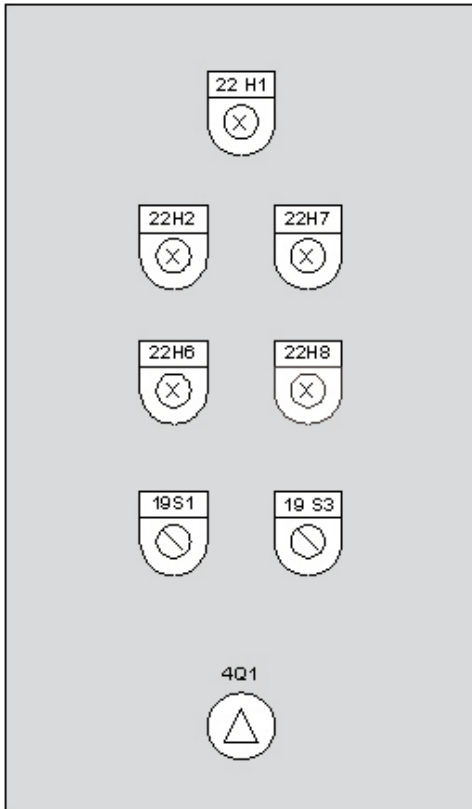


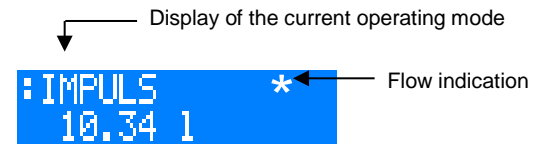
Fig. 05 View of the switch cabinet

4Q1	Main switch
19S1	0/1; 0/Start-up
19S3	1/0/2; Automatic/0/Calibration
22H1	Collective fault (red)
22H2	Operation (green) Dosing impulse (flashing green)
22H6	Fault external regulator (red) No flow in the bypass (flashing red)
22H7	Overpressure of HCl dosing pump (red)
22H8	Overpressure of NaClO ₂ dosing pump (red)

6.1.2 "Start-up" operating mode

In the "Start-up" operating mode the air inclusions are removed out of the reactor. At the same time the operator can check whether the flow meter function properly.

If the flow is shown on the display of the dosing pump a proper functioning can be assumed.



The operating mode selector switch **19S3** must be in Position "0".

The "Start-up" operating mode is started with the **19S1** switch. The "Start-up" operating mode is indicated by the flashing **22H2**. The signal lamp "Operation" flashes at each stroke. The process is finished automatically after 10 minutes. It can be finished manually by switching the **19S1** switch in the "0" position. If the "Start-up" operating mode is ended prematurely and then restarted, the start-up time starts again with 10 minutes.

The following monitoring modes are active:

- Collective fault of the dosing pumps (no flow, dry running of the product container and malfunction of the dosing pump).
- Pressure of the HCl or NaClO₂ dosing pump too high
- Fuse of dosing pumps triggered

6.1.3 “Calibration” operating mode

The “Calibration” operating mode is started with the **19S3** switch. In this operating mode the 1:1 ratio of the dosing volume is checked and adjusted by means of the stroke length, if necessary. Both dosing pumps carry out 100 strokes at the stroke frequency set for the operation. When the process is interrupted and restarted the counter starts again with 0. The process is also indicated by the flashing indicator lamp **22H2**.

The following monitoring modes are active:

- Collective fault of the dosing pumps (no flow, dry running of the product container and malfunction of the dosing pump).
- Pressure of the HCl or NaClO₂ dosing pump too high
- Fuse of dosing pumps triggered

6.2 “Automatic” operating mode

The process-dependent chlorine dioxide production and dosing in automatic operation is started with the **19S3** switch in the ‘Automatic’ position. In addition the process must be released externally. The control system generates pulses depending on an external signal transmitter. The dosing pumps carry out strokes according to the pulse frequency. The “Automatic” operating mode is indicated by the **22H2** indicator lamp which lights permanently. The indicator lamp flashes at each dosing pulse. The “Automatic” operating mode is finished by switching the **19S3** switch in the “0” position or when a malfunction is present.

Drive in the “Automatic” operating mode is carried out via a contact signal or an analog signal 4-20 mA.

The following monitoring modes are active:

- Collective fault of the dosing pumps (no flow, dry running of the product container and malfunction of the dosing pump).
- Pressure of the HCl or NaClO₂ dosing pump too high
- Fuse of dosing pumps triggered
- Fault of an external regulator (option)

The system will be stopped if one of these alarm messages is present. After the fault was rectified the system can be restarted by switching the **19S3** key switch in the -0- position and then in the “Automatic” position.

When a bypass is installed, it must be checked for proper flow. If there is no flow for more than 20 seconds, the system will be switched in the “Pause” state.

6.2.1 Setting the ClO₂ dosing volume

In the “Automatic” operating mode chlorine dioxide is produced and dosed proportional to the input signal.

System	Nominal capacity ClO ₂	Nominal capacity per dosing stroke	Max. number of pulses per hour
CDG-125.1	125 g/h	ca. 13,8 mg	9000
CDG-220.1	220 g/h	ca. 24,44 mg	9000
CDG-500.1	500 g/h	ca. 83,33 mg	6000
CDG-1000.1	1000 g/h	ca. 166,7 mg	6000

Tab. 04

Example for the CDG-125.1:

Approximately 13.8 mg of ClO₂ are produced and dosed at each input pulse. The dosing volume can be adjusted by setting a transmission/reduction at the dosing pumps. If a required quantity of 42 mg per input pulse is added the dosing pumps must be set for transmission with the factor 3 (3 x 13.8mg = 41.4)

6.2.1.1 Settings for the PULSE mode

You can select from three different pulse modes at the dosing pump:

- 1/1
- REDUCTION
- TRANSMISSION

```
>PULSE MODE<
  1/1
```

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

```
>PULSE MODE<
  DIVISION
```

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

```
>PULSE MODE<
  MULTIPLICATION
```

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

Selecting the PULSE FACTOR

Depending on the selected pulse mode, the pulse factor corresponds either to the reduction factor or the transmission factor.

```
>PULSE FACTOR<
  50/1
```

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

```
>PULSE FACTOR<
  1/ 50
```

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

Switching the PULSE MEMORY ON/OFF

The pump is equipped with a pulse memory, which can optionally be switched ON and OFF. 999 strokes maximum 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
→ performance of 5 x 50 strokes = 250 strokes.

6.3 Setting of the dosing pumps

6.3.1 Operating elements

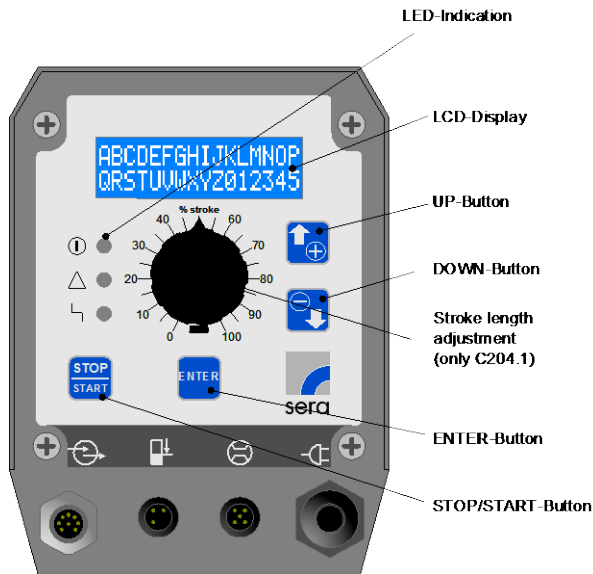


Fig. 06 (Control panel of the electronics)

6.3.2 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 permanently. The operation indicator works in combination with a stroke indicator; during pump operation, the LED flashes depending on the current stroke frequency.

Yellow: Warning indicator



The yellow LED indicates all warning messages that are present. The warning is not only indicated by the LED but also as plain text on the LCD display.

Red: Fault indicator



All faults which are present are indicated by the red LED. The fault is not only indicated by the LED but also as plain text on the LCD display.

	Green LED	Yellow LED	Red LED
Ready	On		
Confirmation of stroke	Flashing		
Internal error			On
Mains voltage too low / too high		On	
No mains			
Level monitoring:			
Pre-alarm level		On	
Dry run			On
Dosing monitoring (flow monitor or flow meter):			
No flow - with shut-down			On
Flow too low - with shut-down			On
Diaphragm rupture monitoring:			
Diaphragm rupture			On

Tab 05

CAUTION !



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 flashes.

6.3.3 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 setting, the UP key is used to increase the parameter value and the DOWN key is used to decrease the parameter value.



ENTER / DOWN key

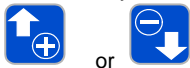
Switches between the operating and the alarm messages.

6.3.4 Display of operating messages

Operating message: Pulse mode



Press the keys



to scroll the individual operating messages.

Operating message: Dosing volume



Pressing the  key resets the value.

Operating message: Stroke number



Pressing the  key resets the value.

Flow indicator

An asterisk (*) in the first line on the right-hand side serves as flow indicator. The asterisk indicates the acknowledgement of the connected dosing monitoring device. A constant flow is indicated by a flashing asterisk.

Display of the current operating mode



External Stop



Remote stop of the dosing pump.

6.3.5 Parameters

The parameters of the dosing pumps were set at the factory. The following settings were changed from the default setting.

	Factory setting
Pulse operation:	
Pulse mode	1/1
Pulse factor	1
Pulse memory	ON
Input 01:	
Function E1	Pulse
Contact E1	Make contact
Input 02:	
Function E2	External Stop
Contact E2	Break contact
Output 01:	
Function A1	Pre-alarm
Contact A1	Make contact
Output 02:	
Function A2	Ready to run
Contact A2	Break contact
Dosing monitoring:	
Sensor	***
Function	Stop of dosing pump
Faulty strokes	1
Alarm limit	80 %
Level:	
Pre-alarm	Make contact
Dry run	Make contact
System:	
Language	German
Calibration	ON
Password:	
PW01 mode	ON
Password 01	9990
Password 02	9021
Diaphragm rupture:	
Input signal	Make contact
Sensitivity	50 %

Tab. 06

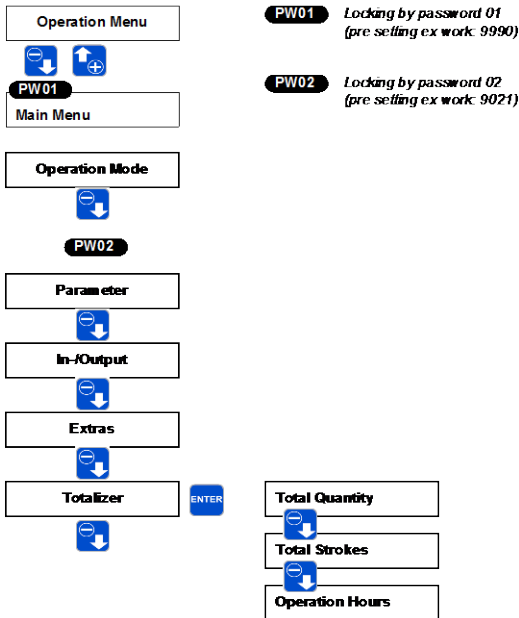
CDG 125.1 and 220.1 type 8010.1
CDG 500.1 type 8012.1
CDG 1000.1 type 8013.1

Operating Instructions

6.3.6 Totalizer

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

Menu sequence



6.3.7 Password

Two passwords are provided to increase the operational safety of the pump.

Password 01 (PW01) is used to protect the setting of the operating mode. This password can be activated and deactivated (when leaving the factory, it is activated).

Password 02 (PW02) protects all further setting options of the main menu. This password protection cannot be deactivated.

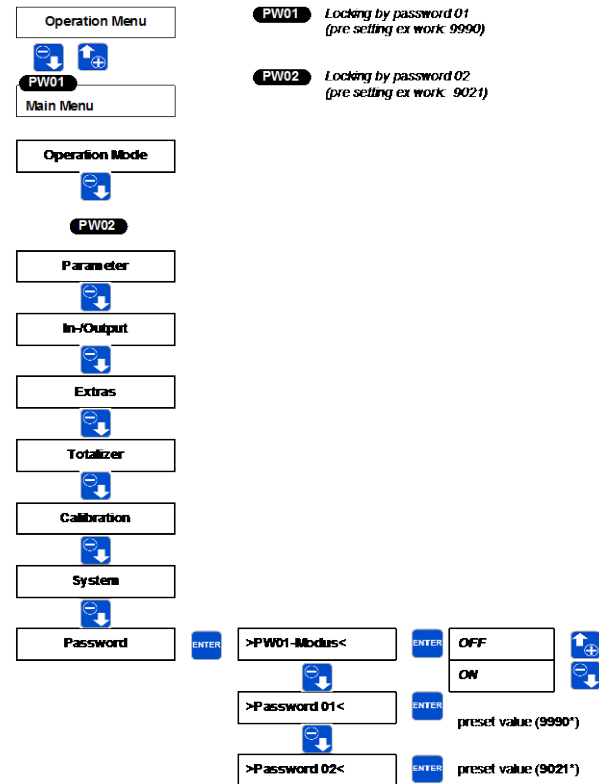
CAUTION !



The passwords are factory set as follows:

- Password 01: 9990
- Password 02: 9021 (cannot be deactivated!)

Menu sequence



(* pre setting ex work)

6.4 Fault messages

Fault messages are indicated by an indicator lamp at the front panel of the switch cabinet and as plain text on the display of the dosing pumps (if necessary).

By turning both key switches in the -0- position the messages at the front panel of the switch cabinet can be deleted.

6.5 Fault messages at the switch cabinet

Message	Cause
Pressure of the HCl dosing pump too high	Shut-off valve in the pressure pipe closed
Pressure of the NaClO ₂ dosing pump too high	Shut-off valve in the pressure pipe closed
Fault of external regulator	External regulator defective or fault of limit value, cable break
No flow in the bypass (indicator flashing red)	No flow in the bypass for 20 seconds, system switched in the Pause state
Collective fault	Please see also collective fault at the dosing pump

Tab. 09

6.6 Messages at the dosing pumps

Message	Cause
No flow	No flow in the corresponding dosing leg. Air inclusion in the suction pipe.
Dry run of dosing pump	Barrel empty.
Flow too low	The recorded flow volume in the corresponding dosing leg is too low. Air inclusion in the suction pipe.
Diaphragm rupture	Diaphragm rupture at the dosing pump.
Out of calibration range	Stroke length changed by more than +/- 10 scale graduations from the working point during calibration I.

Tab. 10



ENTER / DOWN key

Switches between the operating and the alarm messages.

6.6.1 Analysis of the plain text error messages

CDG-125.1 and CDG-220.1:

Please see operating instructions TA 418, Chapter 12.1 "Analysis of the plain text error messages".

CDG-500.1 and CDG-1000.1:

Please see operating instructions TA 414, Chapter 13.1 "Analysis of the plain text error messages".

7 Installation and assembly

The following points must be noted and performed during installation:

- Check the complete dosing system for transport and storage damage.
- Build in the dosing system and attach it with appropriate material.
- Connect the transfer pipes of the barrels to the pump suction pipes.
- Connect the electrical control system to the mains supply. See Chapter "Electrical connection".
- Integrate the external regulator (option) or contact water meter into the system.
- Integrate the optional bypass flow monitoring device into the circuit.
- Connect the electrical interfaces to the process measuring and control equipment.
- Connect all pipes and make sure that they are tension- and vibration-free. An offset of the pipes within the area of the screwed and flanged connections must be avoided.
- The electrical connections are to be made in accordance with the VDE (Association of German Electrotechnical Engineers) or the local electrical regulations applicable.

7.1 Place of installation

- The place of installation must be frost resisting and ventilated.
- Leaking chemicals must be disposed off in a safe manner by provision of a water connection and a floor drainage.
- The place of installation should be in close proximity to the place of usage of the chlorine dioxide solutions. A bypass should be used if this is not possible.

7.2 Wall mounting

Attach the system to the wall at a suitable height. The mounting height (approx. 1.90m upper edge of the wall pallet) must be selected in such a way that the chemical containers can be placed below the system and that the control system can be operated comfortably.

The position of the threaded holes is shown in figures 03 / 04 "Dimensions".

CAUTION !



The system must be accessible from the right-hand side for maintenance work (approx. 80 cm of free space)!

7.3 Hydraulic connection

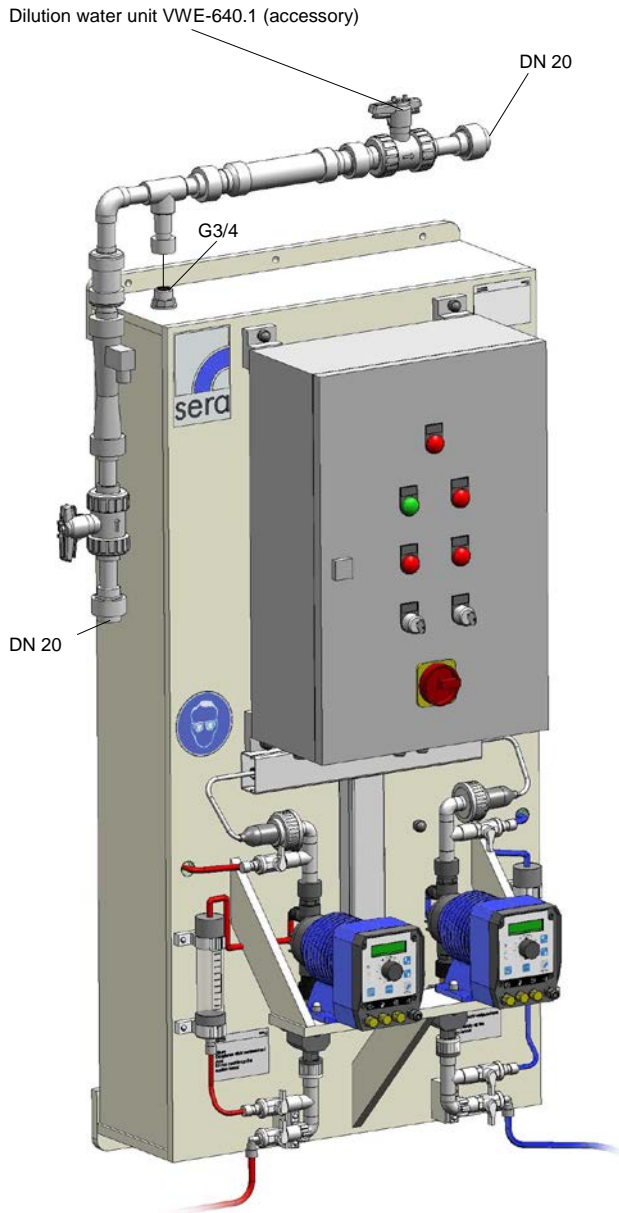


Fig. 07 Hydraulic connection

7.4 Electrical connection

CAUTION !



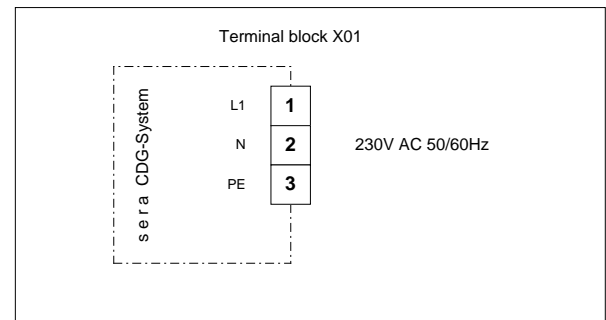
The electrical connection must only be done by qualified personnel! The local safety regulations must be observed!

CAUTION !

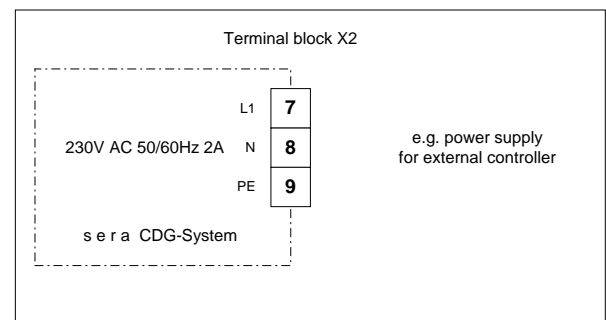


Danger to life! Switch off the mains voltage and secure against being switched on again before connecting the voltage supply!

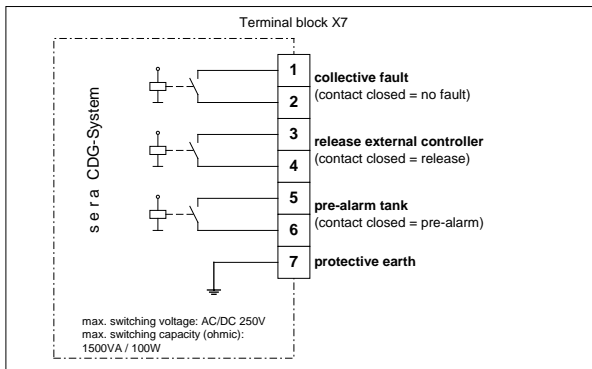
Voltage supply:



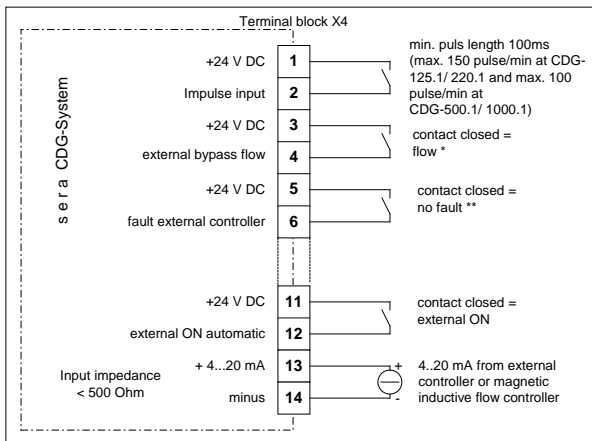
Voltage outlet:



Potential-free signal output:



Potential-free signal input:



* The terminals X4/3 and X4/4 must be bridged if there is no bypass.

** The terminals X4/5 and X4/6 must be bridged if an external regulator is not used.

8 Commissioning

According to the valid regulations for prevention of accidents chlorine dioxide systems may only be put into operation after they were checked for proper condition by an expert. The chlorine dioxide systems must be checked by an expert before each restart. According to the regulations this check is to be repeated every 6 to 12 months.

Only persons who have been correspondingly instructed may be entrusted with the operation and maintenance of chlorine dioxide systems and the handling of chemicals. It must be presupposed that the personnel fulfil their task reliably. Please see the regulation for prevention of accidents GUV-V D5 "Water chlorination".

Therefore, the system may only be commissioned by trained and qualified personnel on the basis of corresponding instructions.

CAUTION !



It is the owner's task to ensure that the local regulations for prevention of accidents are observed!

The following steps must be executed before commissioning the system:

- Check all hose and pipe connections, screwed and flanged connections etc. for proper fit and retighten, if necessary.
- Connect the dosing station to the water supply!
- Check the following: Check the electrical connections and the terminal assignment. Check whether the local supply voltage and frequency correspond with the indications on the type plates.

CAUTION !



In principle the system is started-up with water. Dip the two suction pipes into a container filled with water.

Operating Instructions

8.1 Venting the dosing pumps with water

1. Fill the containers the dosing pumps are conveying from with water until no air can be taken in by the pumps.
2. Switch on the main switch.
3. Switch the ball valves in the pump suction pipe to 'Container suction' (see Fig. 11).

Procedure for the C204.1

4. Open the vent valves at the pump head of the dosing pumps and the shut-off valves in the pressure pipe (see Fig. 08).

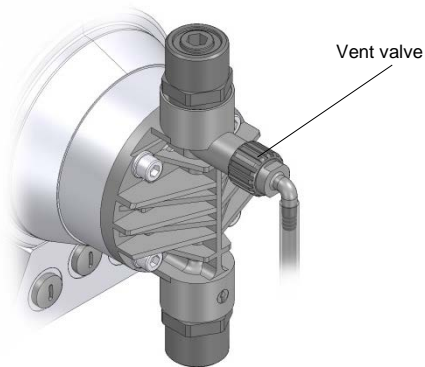


Fig. 08

Procedure for the C409.2

4. Open the air relief cock at the back of the dosing system behind the reactor and the shut-off valves in the pressure pipe (see Fig. 09).

Air relief cock

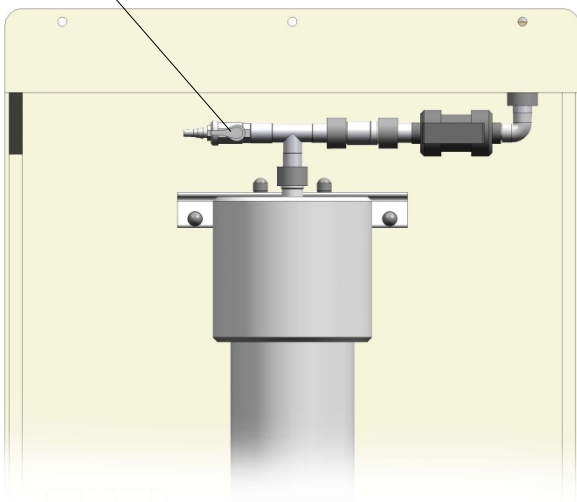


Fig. 09

5. Insert the vent hose in the collecting bottle.
6. Switch both key switches in the -0- position.
7. Set the dosing pump to "Offline" (the green LED is off).
8. Have the dosing pump deliver until the suction pipe and the dosing heads are filled with water without air bubbles. Repeat the process several times, if necessary.

Keep the

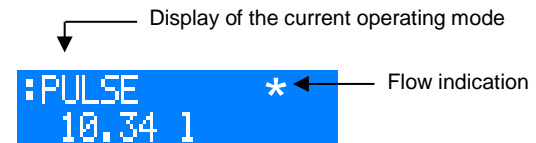


STOP/START key

pressed at the dosing pump (alarm messages are ignored). The dosing pump delivers as long as the key is pressed.

Flow indication

An asterisk (*) in the first line on the right-hand side serves as flow indicator. The asterisk indicates the acknowledgement of the connected dosing monitoring device.



9. Close the vent valves.

8.2 Calibration I of the flow meter

As diluted chemicals are used for this system, the consumption data can be compared 1:1 with water!

The flow meters are factory-calibrated. A recalibration is only necessary when the preset stroke length changes by more than +/- scale graduations (the message "Out of range" will be displayed).

1. Switch the ball valves in the suction pipes towards the calibration pots (see Fig. 10).

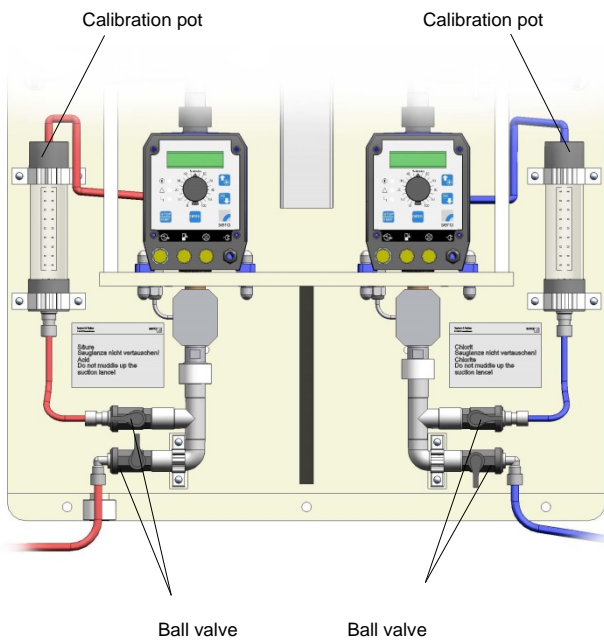


Fig. 10

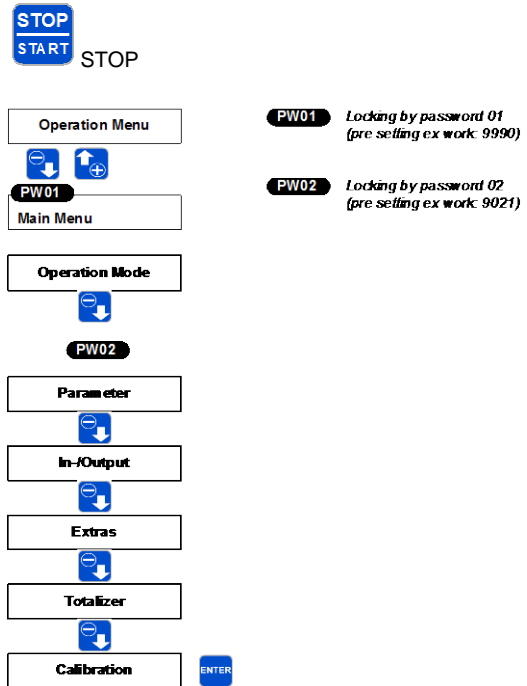
2. When the suction pipe is empty the dosing medium must be drawn in (see Venting of the dosing pumps, Chapter 8.1).
3. Set the stroke length with which the pump should be calibrated (can also be done via the manual stroke length adjustment).
4. Note the filling level in the calibration pot (= base quantity).
5. Go to the main menu and select the --CALIBRATION-- menu:

CAUTION !

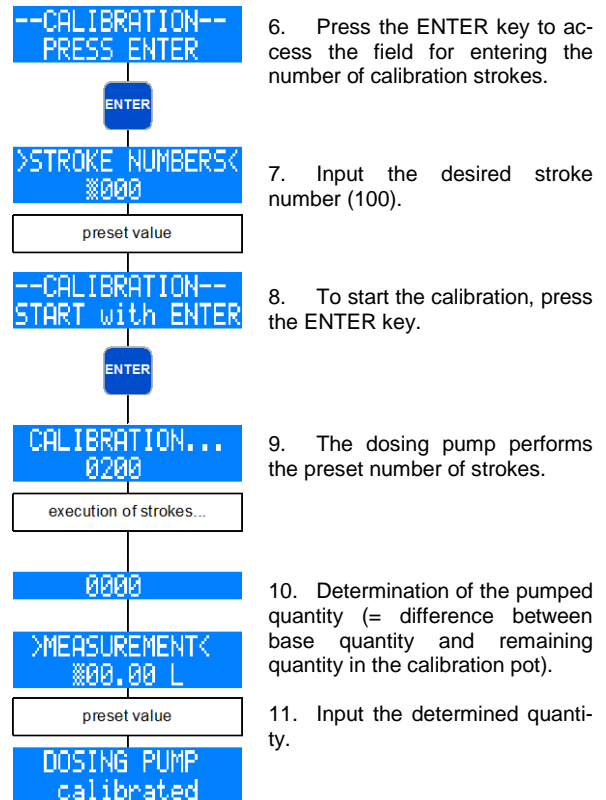


The "Calibration I" process must be carried out after the flow meter was replaced!

Calling the "Calibration" menu



"Calibration" menu



6. Press the ENTER key to access the field for entering the number of calibration strokes.

7. Input the desired stroke number (100).

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. Input the determined quantity.

Calibration of the dosing pump is then completed!

Operating Instructions

8.3 Calibration II of the dosing pumps

The system is factory-set to its nominal data. The stroke length should only be changed by max. +/- scale graduations.

Set both dosing pumps in the PULSE operating mode and switch the pumps online by pressing the



STOP/START key

before starting the calibration II. The green LED is on.

1. Switch the ball valves in the suction pipes towards the calibration pots (see Fig. 10).
2. Switch the **19S3** key switch in the "Calibration" position.
3. Exactly 100 dosing strokes are triggered. The dosed volume must then be read off at the measuring cylinders. Correct the stroke length adjustment in the event of deviations and repeat the volumetric measurement until both dosing pumps deliver exactly the same quantity.

If several volumetric measurements are performed make sure that the suction pipes are not filled with air and vent the pump again, if necessary.

CAUTION !



The stroke length of the dosing pumps may only be changed when the pumps are operating.

NOTE !



The set stroke lengths of the pumps should be approximately the same and must not be changed after the „Calibration II“ process was carried out.

8.4 "Start-up" operating mode with water

Set both dosing pumps in the PULSE operating mode and switch the pumps online by pressing the



STOP/START key

before starting the "Start-up" operating mode. The green LED is on.

1. Switch the ball valves towards 'Container suction' (see Fig. 11).

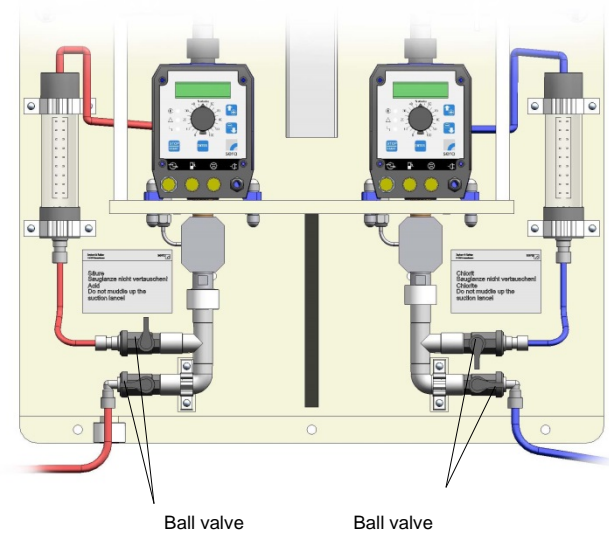


Fig. 11

2. Switch the **19S1** key switch in the "Start-up" position to activate dosing of the dosing pumps until the chlorine dioxide reactor is completely filled with water and the system is under operating pressure.
3. Check for tightness and tighten the screwed connections, if necessary.
4. Check the level switches in the barrels.
5. Repeat the "Start-up" procedure.

Number of "Start-up" procedures for filling the reactor with water (factory-set stroke length):

CDG-125.1	3x
CDG-220.1	2x
CDG-500.1	3x
CDG-1000.1	2x

CAUTION !



Observe the safety and warning notes on the system!

CAUTION !



The stroke length must not be set lower than 40%.

Operating Instructions

8.5 “Automatic” operating mode

In this operating mode the system operates proportional to the analog or pulse input. The system is controlled via an external release signal.

Set both dosing pumps in the PULSE operating mode and switch the pumps online by pressing the



STOP/START key

before starting the “Automatic” operating mode. The green LED is on.

CAUTION !



Before starting the system, both dosing pumps must be switched on (online) and the operating mode must be set to “Pulse” (factory setting)!

Switch the 19S2 key switch in the “AUTOMATIC” position. The dosing pumps are now operating proportional to the external pulse input or the 4...20mA signal.

Check function of the external regulator (option) or the contact signal of the water meter.

8.6 Operating the dosing system with chemicals

- After having started the system successfully with water, it can now be operated with chemicals. Mount the suction lances in the corresponding barrels (see Fig. 01 / page 8).
- Fill the reactor completely with chemicals using the “Start-up” operating mode, or repeat the procedure.

Number of “Start-up” procedures for filling with chemicals (factory-set stroke length):

CDG-125.1	2x
CDG-220.1	1x
CDG-500.1	2x
CDG-1000.1	1x

- Switch the system in the “Automatic” operating mode. Control the system via the external signal.

Take a sample out of the water pipe 10 to 15 minutes after the chemical has reacted in the reactor and check the excess of ClO_2 .

CAUTION !



Only use chemicals with the following concentrations: 9% HCl (hydrochloric acid) and 7.5% NaClO_2 (sodium chlorite)!

CAUTION



The system must be restarted after a longer period of standstill!

9 Maintenance

All technical devices must be serviced in order to guarantee proper function of the system.

Note:

According to the regulations for prevention of accidents GUV 8.15 and VBG 65 § 19(2) chlorine dioxide production systems are to be checked for safety by an expert at regular intervals or at least once a year as well as before each restart.

CAUTION !



All maintenance work is to be documented carefully!

We recommend to conclude a maintenance contract on a yearly basis which comprises the safety check and the replacement of wearing parts.

9.1 Daily checks of the system

Production system

- Check the complete system for tightness.
- Check the level in the chemical container.
- Check the safe connection of the suction lances.
- Check the optional chemical collecting basins for leakage.

CAUTION !



Do not confuse the suction lances when filling or replacing the barrels!

Checking the dosing ratio

- The consumption of the basic chemicals must be nearly the same. Call the operating message "Pumped quantity" of the dosing pumps and note down the value.
- Delete the value on the display afterwards.

Checking the chlorine dioxide concentration

The desired chlorine dioxide concentration must be measured at regular intervals. The limit values for the excess of ClO_2 must not be exceeded. Switch off the system immediately if these values are exceeded.

The analysis device must be provided by the customer or can be ordered from the system manufacturer.

9.2 Wearing parts

Maintenance should be carried out twice per year in order to ensure a safe production of chlorine dioxide.

CAUTION !



Rinse the system with clear water in order to flush any chemicals before replacing the wearing parts!

The yearly maintenance work comprises replacement of all gaskets, diaphragms (yearly or after 3,000 operating hours), suction and pressure valves of the dosing pumps which come into contact with the chemicals, the inlet valves at the reactor and its gaskets as well as the dosing valve.

Maintenance work which is carried out every six months comprises the checking of the complete chlorine dioxide system.

- Check the overall function.
- Check the complete system for tightness.
- Check the chemical consumption.
- Measure the excess of chlorine dioxide.
- Functional check of the level switch
- Functional check of the optional regulator
- Functional check of the optional flow monitoring device in the bypass
- Check the wires and electrical components for visual damage at regular intervals (loose connections, damaged cables, damaged devices etc.).
- Check the oil filling level of the dosing pumps (only CDG-500.1 and CDG-1000.1).

9.3 Pressure switch

The pressure switches must be replaced every year or returned to sera for testing.

CAUTION !



Rinse the system with clear water in order to flush any chemicals before replacing the pressure switches!

9.4 Flow meter

The flow meters must be calibrated once a year (see Chapter "Calibration I"). They should be tested by sera every 3 years.

CAUTION !



Rinse the system with clear water in order to flush any chemicals before dismantling the flow meters!

9.5 Checking the chemical consumption

Call the totalizers of the dosing pumps (see Chapter “Totalizer”) and note down the value. Calculate the chemicals consumed on the basis of the documented product containers. Afterwards the deviation must be determined. In case of a deviation the flow meters must be recalibrated and the stroke lengths adjusted. The ratio between chlorine dioxide and the water flow should be calculated as well and the maximum added quantity should be checked.

9.6 Changing the container

The **sera** chlorine dioxide production systems are exclusively operated with suction lances with two level switching points. The first level switching point indicates that the chemical barrel will soon be empty (depending on the operating mode after a few hours or days). Thus there is sufficient time for the operating personnel to provide a spare barrel. When the second level switching point is reached the system is stopped and a collective fault is triggered.

If a chemical barrel is exchanged before the second level switching point is reached, the chlorine dioxide production system must be switched off. The system is set to -0- using the key switches. Remove the suction lance out of the empty barrel, replace the chemical barrel with the spare barrel and put the suction lance back into the new barrel.

The replacement of the chemical barrel must be documented.

CAUTION !



Never confuse the chemicals when exchanging the barrels! Highly toxic chlorine dioxide gas may form if the chemicals are reverse-connected (acid on the sodium chlorite side or vice versa).

CAUTION !



Always install the acid component on the left-hand side and the sodium chlorite component on the right-hand side of the chlorine dioxide production system.

9.7 Rinsing the system

The system must be rinsed by all means before replacing parts which come into contact with the medium or longer times of standstill or before shutting-down the system. Dip the two suction pipes into a container filled with water.

Required quantity of rinsing water (factory-set stroke length):

CDG-125.1	ca. 2l per suction lance
CDG-220.1	ca. 2l per suction lance
CDG-500.1	ca. 7l per suction lance
CDG-1000.1	ca. 7l per suction lance

1. Switch on the dosing pumps

Set both dosing pumps in the PULSE operating mode and switch the pumps online by pressing the



STOP/START key

before starting the rinsing process. The green LED is on.

2. Switch the ball valves towards ‘Container suction’ (see Fig. 11).
3. Have the dosing pumps deliver by switching the 19S1 key switch in the “Start-up” position.

Recommended number of start-up procedures for rinsing the complete system with the preset stroke length of the dosing pumps:

CDG-125.1	3x
CDG-220.1	2x
CDG-500.1	3x
CDG-1000.1	2x

9.8 Disassembly of the dosing pumps

Proceed as follows to disassemble the dosing pumps:

- Rinse the dosing pumps with water.
- Close the shut-off devices connected to the dosing pumps.
- Switch off the 4Q1 main switch of the control system and secure against being switched on again.
- The dosing pumps can now be removed.

CAUTION



First restart the system according to Chapter 8 before installing the dosing pumps.

9.9 Changing the diaphragm

CDG-125.1 and CDG-220.1:

Please see operating instructions TA 418, Chapter 11.4 “Changing the drive diaphragm”.

CDG-500.1 and CDG-1000.1:

Please see operating instructions TA 414, Chapter 11.4 “Changing the diaphragm”

9.10 Oil change for the CDG-500.1 and 1000.1

Please see operating instructions TA 414, Chapter “Oil change”

Operating Instructions

9.11 Spare- and wearing parts kit

CDG-125.1 and CDG-220.1:

Please see operating instructions TA 418, Chapter 11.4 "Spare- and wearing parts kits".

CDG-500.1 and CDG-1000.1:

Please see operating instructions TA 414, Chapter 11.3 "Spare- and wearing parts kits".

9.12 Venting the dosing pumps C204.1 with chemicals

1. Switch the ball valves in the pump suction pipe to 'Container suction' (see Fig. 11).
2. Open the vent valve and the shut-off valves in the pressure pipe (see Fig. 08).
3. Insert the vent hose in the collecting bottle.
4. Switch both key switches in the -0- position.
5. Set the dosing pump to "Offline" (the green LED is off).
6. Have the dosing pump deliver until the suction pipe and the dosing heads are filled with medium without air bubbles. Repeat the process several times, if necessary.

Keep the



STOP/START key

pressed at the dosing pump (alarm messages are ignored). The dosing pump delivers as long as the key is pressed.

7. Close the vent valve.
8. The chemicals collected in the collecting bottles can be discharged into the drains one after the other. Rinse the collecting bottle with plenty of water (approximately the triple or quadruple of the chemical quantity).

CAUTION !



Do not mix the two basic chemicals when rinsing the bottles as high toxic chlorine dioxide gas may form! After having disposed the first chemical rinse with sufficient water before disposing the second chemical.

9.13 Venting the dosing pumps C409.2 with chemicals

1. Switch the ball valves in the pump suction pipe to 'Container suction' (see Fig. 11).
2. Open the air relief cock at the back of the dosing system behind the reactor and the shut-off valves in the pressure pipe (see Fig. 09).
3. Insert the vent hose in the collecting bottle.
4. Switch both key switches in the -0- position.
5. Set the dosing pump to "Offline" (the green LED is off).
6. Have the dosing pump deliver until the suction pipe and the dosing heads are filled with medium without air bubbles. Repeat the process several times, if necessary.

Keep the



STOP/START key

pressed at the dosing pump (alarm messages are ignored). The dosing pump delivers as long as the key is pressed.

7. Close the vent valve.
8. The chemicals collected in the collecting bottles can be discharged into the drains. Rinse the collecting bottle with plenty of water (approximately ten times of the chemical quantity).

CAUTION !



Use protective clothing, gloves and a suitable face screen!

10 Decommissioning

The following points must be observed when you decommission the system:

- Rinse the system with sufficient water and then empty the system.
- Set the stroke length of the dosing pumps to 50 % to remove load from the diaphragms.
- Disconnect all electrical operating equipment from the voltage supply.

11 Disposal

Shut-down the system. Please see "Decommissioning".

11.1 Disassembly and transport

- Remove all fluid residues, clean thoroughly, neutralize and decontaminate.
- Package the dosing system appropriately and ship.
- If the system is shipped for repair the gearing must be filled with oil.

11.2 Complete disposal

- Remove all fluid residues from the unit.
- Drain lubricants and hydraulic fluids and dispose off according to the regulations!
- Dismount materials according to type and send them to a suitable waste disposal company!

CAUTION !



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

12 Clearance Certificate

NOTE!



Inspection / repair of machines and machine parts is only carried out after the opposite clearance certificate was filled in correctly and completely by authorized and qualified personnel.

NOTE!



Acceptance will be refused if parts are returned to the manufacturer without a proper clearance certificate.

All industrial companies are obligated by the legal provisions for occupational health, e.g. the workplaces ordinances, the Ordinance on Hazardous Substances, the regulations for prevention of accidents and the environmental protection regulations such as the Waste Management Act and the German Household Water Act to protect their employees or man and the environment from detrimental effects when handling hazardous substances.

Should special safety precautions be necessary despite careful draining and cleaning of the product the necessary information are to be provided.

Machines which are operated with radioactive media shall only be inspected and/or repaired in the safety area of the owner by a sera specialized fitter.

The clearance certificate is part of the inspection-/repair order. sera reserves the right to refuse acceptance of the order for other reasons.

NOTE!



Please make a copy and leave the original with the operating instructions!
(can also be downloaded from: www.sera-web.com)

Clearance Certificate

Product

Type Serial-No.


the product was carefully emptied before shipping / delivery, and cleaned inside and outside. YES

Conveying medium











Designation Concentration %

Properties

Please tick!

Harmless 

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

<input type="checkbox"/>  Toxic	<input type="checkbox"/>  Corrosive	<input type="checkbox"/>  Flammable	<input type="checkbox"/>  Oxidising	<input type="checkbox"/>  Unhealthy
<input type="checkbox"/>  Explosive	<input type="checkbox"/>  Dangerous for the environment	<input type="checkbox"/>  Irritant	<input type="checkbox"/>  Bio-hazardous	<input type="checkbox"/>  Radioactive

The product was used with health or water-polluting substances and came up with labeling requirements and pollution prone media in contact. YES
 NO

Special security arrangements with respect to health or water-hazardous media are in the further handling not required
 required

The following safety precautions regarding rinsing, residual liquids and waste disposal are required:

Process data

The product was used with the following operating conditions described conveying medium:

Temperature °C Pressure bar

Sender

Company: Telephone:

Contact person: FAX:

Address: E-mail:

Zip code, City: Your order No:

We confirm that we have the information in this safety certificate (Clearance Certificate) have been correctly and completely and that the returned parts were carefully cleaned.

The parts are sent free of residues of dangerous amount.

Place, Date

Department

Signature
(and company stamp)

Notes

