

Operating instructions

Chlorine Dioxide Systems

Bello Zon[®] Type CDEa



**Please carefully read these operating instructions before use! · Do not discard!
The operator shall be liable for any damage caused by installation or operating errors!
Technical changes reserved.**

Supplementary information



Fig. 1: Please read!

Read the following supplementary information in its entirety! Should you already know this information, you will benefit more from referring to the operating instructions.

The following are highlighted separately in the document:

- Enumerated lists
- refer to... References
- Operating guidelines
 - ⇒ Results

'User interface text'

[Keys]

Information



This provides important information relating to the correct operation of the unit or is intended to make your work easier.

Safety notes

Safety notes are identified by pictograms - see Safety Chapter.

Notes for the System Operator

This document includes notes and quotes from German guidelines relating to the system operator's scope of responsibility. This information does not discharge the operator from his responsibility as an operator and is intended only to remind him or make him aware of specific problem areas. This information does not lay claim to being complete, nor applicable to every country and every type of application, nor to being unconditionally up-to-date.

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1 Product identification CDEa

Type	Max. ClO ₂ output	Part no.
CDEa 45	45 g/h	1047456
CDEa 80	80 g/h	1047457
CDEa 140	140 g/h	1047458

2 About this system

Connection-ready complete Bello Zon® CDEa chlorine dioxide systems are used in the continuous production and metering of 5 to 140 g of chlorine dioxide per hour with diluted chemicals. The system is winning over customers, thanks to its simple operation and clearly laid out construction. The metering pump stroke lengths are continuously monitored, thereby avoiding inadmissible operating statuses arising from incorrect pump stroke length adjustment.

The system controller is very easy to operate, consisting of a central Start-Stop key and colour-differentiated LEDs to display all the operating statuses. The system can be controlled via a 0/4-20mA external Pause contact or via a contact water meter. Warning and alarm messages are made available via separate relay outputs.

3 Safety chapter

Labelling of safety notes

The following signal words are used in these operating instructions to denote different levels of danger:




Identification of safety notes

The following signal words are used in these operating instructions to denote different severities of danger:

Signal word	Meaning
DANGER	Denotes a possibly hazardous situation. If this is disregarded, it will result in serious injuries.
WARNING	Denotes a possibly dangerous situation. If this is disregarded, you are in a life-threatening situation and this can result in serious injuries.
CAUTION	Denotes a possibly dangerous situation. If this is disregarded, it could result in slight or minor injuries or material damage.

Warning signs denoting different types of danger

The following warning signs are used in these operating instructions to denote different types of danger:

Warning signs	Type of danger
	Warning – high-voltage.
	Warning – explosive substances.
	Warning – danger zone.

The three basic rules

1. - Ensure that the two components Bello Zon[®] acid (dilute HCl) and Bello Zon[®] chlorite (dilute NaClO₂) are never be brought into contact with each other except in the reactor, otherwise poisonous ClO₂ gas can then form abruptly and decompose explosively!
2. - Never operate the Bello Zon[®] CDEa chlorine dioxide system with undiluted acid or undiluted sodium chlorite, otherwise poisonous ClO₂ gas will form abruptly and decomposes explosively within the reactor!
3. - Ensure that the bypass is never empty as long as the system is connected to the mains voltage and that the bypass water is never placed under vacuum pressure, otherwise the ClO₂ solution in the reactor is placed under a vacuum, the ClO₂ outgasses, forms a richer mixture and can decompose explosively!

Intended use

- The Bello Zon® CDEa system is intended solely for producing a disinfectant solution containing ClO₂ from dilute hydrochloric acid (9 %) and sodium chlorite solution (7.5 %) and for metering it into a bypass line together with water.
- Any other uses or modifications to the system are prohibited!
- Die Bello Zon® system is not designed for treating liquids (other than water) or gaseous media, as well as substances with ClO₂!
- Do not operate the system under conditions other than those described in the technical data!
- The system is not intended for use outdoors.
- Do not allow untrained personnel to operate the Bello Zon® system! All other work should only be carried out by trained and authorised personnel, see the following table!
- You are obliged to observe the information contained in the operating instructions at the different phases of the system's service life!
- Please observe the relevant national regulations and guidelines at every phase of the device's service life!

Qualification of personnel



WARNING!

According to accident statistics, holiday replacements are a safety risk.

- Holiday replacements should also hold the named qualifications and have been instructed accordingly.

Task	Qualification
Installation, installation of hydraulic system	Trained qualified personnel
Electrical installation	Electrical technician
Initial commissioning	Service - authorised by ProMinent
Start up	Technical experts
Operation, canister replacement	Instructed person
Maintenance, repair	Service - authorised by ProMinent
Decommissioning, disposal	Technical experts
Troubleshooting	Service - authorised by ProMinent, technical experts, instructed personnel (depending on fault)

Explanation of the table:

Technical experts

A technical expert is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his/her technical training and experience, as well as knowledge of applicable regulations.

Note:

A technical qualification is typically proved by the required completion of a technical training course, e.g. as an engineer or craftsman. The assessment of a person's technical training can also be based on several years of work in the relevant field.

Qualified employee

A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognise possible dangers based on his/her technical training, knowledge and experience, as well as knowledge of pertinent regulations.

Note:

A qualification of equal validity to a technical qualification can also be gained by several years employment in the relevant work area.

Instructed person

An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him/her and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.

Service

Service refers to service technicians, who have received proven training and have been authorised by ProMinent to work on the system.

Safety equipment

The safety equipment available and how it is tested, is contained in the "Start up" chapter.

Instructions for entering a room in which a chlorine dioxide system is installed

- Access only for trained personnel.
- If there is a smell of chlorine dioxide (pungent, chlorine-like smell) access is only permitted to personnel wearing the specified protective equipment.
- If there is a smell of chlorine dioxide, immediately switch off the system from a safe position, e.g. emergency stop switch, which is installed at a distance from the system.

Safety notes



WARNING!

Danger from incorrect operation

Incorrect operation can result in dangerous conditions for the system and its surroundings.

- The operating personnel should be instructed by a ProMinent service technician (Undertaken during initial commissioning.)
- The operating instructions should be available adjacent to the system.



WARNING!

Danger due to hazardous ClO₂ gas

Under rare fault conditions toxic ClO₂ solution and gas can escape via a leak.

- A gas detector should be installed if no other measure is provided to ensure personnel safety in the event of ClO₂ escaping.
- The gas detector should reliably switch off the system if ClO₂ gas escapes and trigger an alarm that is readily apparent from a distance.



WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.



WARNING!

Danger due to hazardous substances

By operating this system the operator generates hazardous substances.

The operator is responsible for adapting the operating instructions to their system in the event that more recent knowledge about the dangers associated with a hazardous substance and its avoidance become available or national regulations prescribe something else to that stated in the supplied operating instructions.

Note for the system operator

Keywords when searching for the necessary regulations:

- Chlorine dioxide systems
- Chlorine dioxide (possibly chlorination as well)
- Potable water
- Food safe
- Hydrochloric acid
- Sodium chlorite
- Storage
- Hazardous substances
- Personal protective equipment

Personal protective equipment

- Face mask
- Rubber or plastic boots
- Protective gloves (ClO₂-resistant type!)
- Protective apron
- Full-face protective mask
- 1 replacement filter per protective mask

**WARNING!**

The required type and configuration of personal protective equipment may vary from country to country and change over time.

Information in the event of an emergency

- You have already come into contact with acid: Refer to the "Acid safety data sheet" provided by the supplier!
- You have already come into contact with chlorite: Refer to the "Chlorite safety data sheet" provided by the supplier!
- You have come into contact with ClO₂ solution or ClO₂ gas: Refer to the "Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions" in the appendix.
- An orange-yellow ClO₂ gas has escaped: Clear the room immediately and disconnect the power supply, for example using the emergency stop switch! Wear complete personal protective equipment and ensure the gas is precipitated out of the atmosphere using a water spray! Refer also to the "Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions" in the appendix.
- An orange-yellow ClO₂ solution has escaped: Clear the room immediately and disconnect the power supply, for example using the emergency stop switch! Wear complete personal protective equipment and pour sodium thiosulphate solution over the ClO₂ solution, then dilute with lots of water and wash away into the drain. Refer to also "Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions" in the appendix.
- The Bello Zon[®] system was fed with concentrated chemicals and the metering pumps have already pumped them as far as the reactor: Clear the room immediately and disconnect the power supply, for example using the emergency stop switch! Inform the fire service, explaining about the risk of an explosion due to concentrated ClO₂ gas! ClO₂ gas can still explode after several hours! Refer also to "Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions" in the appendix to the operating instructions!
- The Bello Zon[®] system was fed with concentrated chemicals and the metering pumps have not yet started to pump: immediately switch off the Bello Zon[®] system (*/Start/Stop*)! Place each suction lance in a bucket of water and provide chemical drums with diluted chemicals. Arrange for the concentrated chemicals to be properly disposed of. Refer also to "Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions" in the appendix!



WARNING!

The required information for the emergency may vary from country to country and change over time.

Sound pressure level

Sound pressure level $L_{pA} < 70$ dB according to EN ISO 20361
at maximum stroke length, maximum stroke rate, maximum back
pressure (water)

4 Storage and Transport

Safety notes



WARNING!

Only return the device for repair in a cleaned state and with flushed hydraulic components - refer to the "Decommissioning" chapter!

Only send the unit together with a completed Decontamination Declaration. The Decontamination Declaration constitutes an integral part of an inspection / repair order. A unit can only be inspected or repaired when a Decontamination Declaration is submitted that has been completed correctly and in full by an authorised and qualified person on behalf of the operator.

The "Decontamination Declaration" can be found in the Appendix or at www.prominent.com/en/downloads.



WARNING!

Ensure that the system is thoroughly rinsed through before moving or transporting it - see "Decommissioning" chapter.



NOTICE!

Danger of material damage

The device can be damaged by incorrect or improper storage or transportation!

- The device should only be stored or transported in a well packaged state - preferably in its original packaging.
- The packaged unit should also only be stored or transported in accordance with the stipulated storage conditions.
- The packaged unit should be protected from moisture and the ingress of chemicals.

Ambient conditions for the Bello Zon® system

Ambient conditions - refer to "Technical Data" chapter.

Miscellaneous: Protect against sunlight

Scope of supply

Included in the scope of supply:

- Operating instructions for the CDEa
- Operating instructions for the solenoid metering pump gamma/L
- The mounting kit (mounting equipment and threaded cable connectors)
- 6 spacers
- Labels for suction lances / suction assemblies
- Warning signs - refer to "Assembly" chapter

Weight

Weight - refer to "Technical Data" chapter.

5 Requirements relating to the installation location

Safety notes



CAUTION!

Warning against illegal operation

Observe the regulations that apply where the device is installed.

Requirements relating to the chlorine dioxide system installation site

- Do not locate the chlorine dioxide system outdoors.
- Provision should be made for protecting the chlorine dioxide system against unauthorised access.
- Protect the site of the chlorine dioxide system from direct sunlight, other radiation and strong sources of heat and ensure that it is also frost-proof and well ventilated.
- For ambient conditions - refer to "Technical Data" chapter.
- The atmosphere should be non-condensing and non-corrosive.
- Allow sufficient space around the system to adjust it and maintain it.
- It should be possible to transport the component storage tanks to the system without obstruction.
- Provide for emergency escape route.
- Ensure that a flat, vertical and load bearing wall or frame is available when mounting the Bello Zon® system.
- Ensure that a water tap is available.
- Provide for a drain in the floor.
- If a gas detector is necessary, it must be possible to fit it.
- Ensure that mains voltage is available.
- Install an emergency shut-off switch for the mains voltage outside the installation room.

Note for the system operator

Below are some of the regulations which apply within Germany:

- The Accident Prevention Regulation (UVV) "Chlorination of Water", [in German] GUV-V D5 (previously GUV 8.15), April 1979
- The Directives for the Protection of Groundwater Against Pollution [in German] (section 19 of the German Federal Water Act (WHG) Edition 31.07.2009)
- The German Ordinance on Hazardous Substances (GefStoffV) - especially section 17 (General Duty of Protection) and section 20 (Operating Instructions; see also Accident Prevention Regulations section 9) [in German]

6 Assembly

Safety notes



WARNING!

Danger due to the sudden unexpected escape of hazardous chlorine dioxide solution

The seals, which are exposed to chlorine dioxide solution, will start to leak if they are not replaced early enough.

- Set up the system so that it can be accessed easily for maintenance.

Fitting the bracket



The supplied mounting kit contains the necessary hangar bolts, rawplugs, washers and nuts (mounting kit = plastic bag with fixings and threaded cable connectors...).

6 spacers are also supplied with the system.

Select the mounting height of the Bello[®]Zon panel so that:

- The metering pumps' LCD screens can be easily read
- The [START/STOP] key on the control box is easily accessible
- The liquid levels of the full chlorite and acid component storage tanks are below the level of the metering pumps
- The maximum priming lift of the metering pumps is not exceeded, see "Technical data" table in the appendix
- There is still sufficient space for the component storage tanks below the bracket.

Personnel: ■ Technical personnel

1. ➤ Secure the chlorine dioxide system on a suitable, flat and vertical wall, or frame as close as possible to the point of injection. Dimension sheets - see appendix
2. ➤ After fitting, apply Vaseline to the metallic fastenings to prevent corrosion.
3. ➤ Attach the warning signs according to the national regulations at the access to the chlorine dioxide system and the chemical store or any other locations so that they are clearly visible (Warning signs according to German regulations, see ☞ 'Warning labels' on page 17 in the scope of supply).

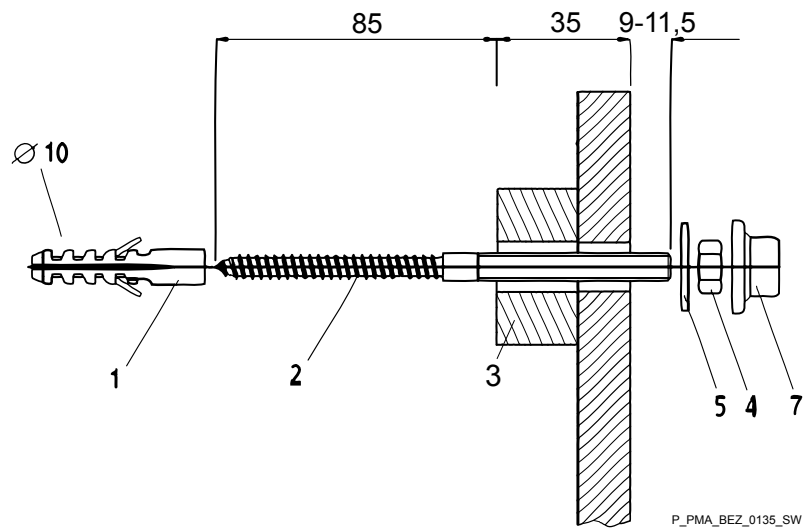


Fig. 2: Fixing plate

- 1 Rawlplug
- 2 Hanger bolt
- 3 Spacer
- 4 Hexagon nut
- 5 Washer (metal)
- 7 Protective cap

Warning labels




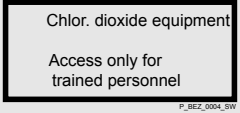
CAUTION!

Warning against illegal operation


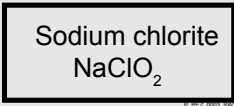
Observe the regulations that apply where the device is installed.

Provided national regulations do not require otherwise, use signs with the shape and type given below.

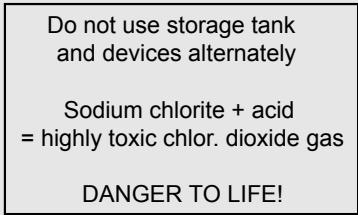
a) Attach both these signs together at the entrances to rooms in which Bello Zon® chlorine dioxide systems are set up:

Warning sign *	Warning label *	Included text
		Chlorine dioxide system. Access only for trained personnel.
* Mandatory in Germany		

b) Attach both these signs together at the entrances to rooms in which sodium chlorite is stored or used:

Warning sign *	Warning label *	Included text
		Sodium chlorite NaClO ₂
* Mandatory in Germany		

c) Attach this sign in rooms in which sodium chlorite is handled:

Warning label *	Included text
	Do not interchange storage tanks and devices. Sodium chlorite + acid = highly toxic chlorine dioxide gas. Danger to life!
* Mandatory in Germany	

This applies to stores and dispensing rooms in which the chemical drums are located, which are then connected to the Bello Zon® systems.

d) Always ensure that this sign is clearly visible on the bypass line. It should remind operators: "Bypass with ClO₂ never without water!"

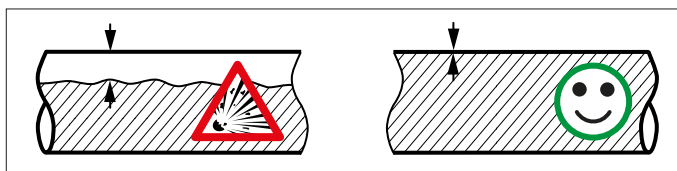


Fig. 3

Installation location of gas detector (accessories)

If a gas detector is necessary, fit it in line with instructions provided by a professional. Select the location of its sensor in line with the installation location and surroundings!

7 Installation



CAUTION!

Warning against illegal operation

Observe the regulations that apply where the device is installed.

7.1 Installation, hydraulic

Safety notes



DANGER!

Warning of hazardous chlorine dioxide vapours

Hazardous chlorine dioxide vapours can escape through to a broken bypass line.

- Only use PVC or PVDF pipes for the bypass line. Chlorine dioxide corrodes other materials too strongly.
- Only use PVC pipes with pressure rating PN 16 for the bypass line to allow for long-term scaling of the PVC.
- Do not exceed the maximum permissible system operating pressure - see "Safety equipment bypass line" - "PVC bypass line specifications"). Do not allow pressure surges to occur.



WARNING!

The reactor can explode

During operation, uncontrolled sucking through of chemicals may occur if the bypass line of the Bello Zon[®] system enters a vacuum pressure state. Consequently, if a high vacuum pressure exists together with the simultaneous formation of gas/water mixed phases, chlorine dioxide can gas out. Under unfavourable circumstances, the critical gas concentration of 300 g/m³ is exceeded and the reactor can explode.

- Take appropriate measures to ensure the bypass line of the Bello Zon[®] system is not placed under vacuum pressure (for example install a ProMinent flushing valve with venting mechanism).
- Take appropriate measures to ensure that the bypass line of the Bello Zon[®] system is always completely full.
- Install equipment that always switches the system to a voltage-free state if the bypass line is not completely full.

Main components

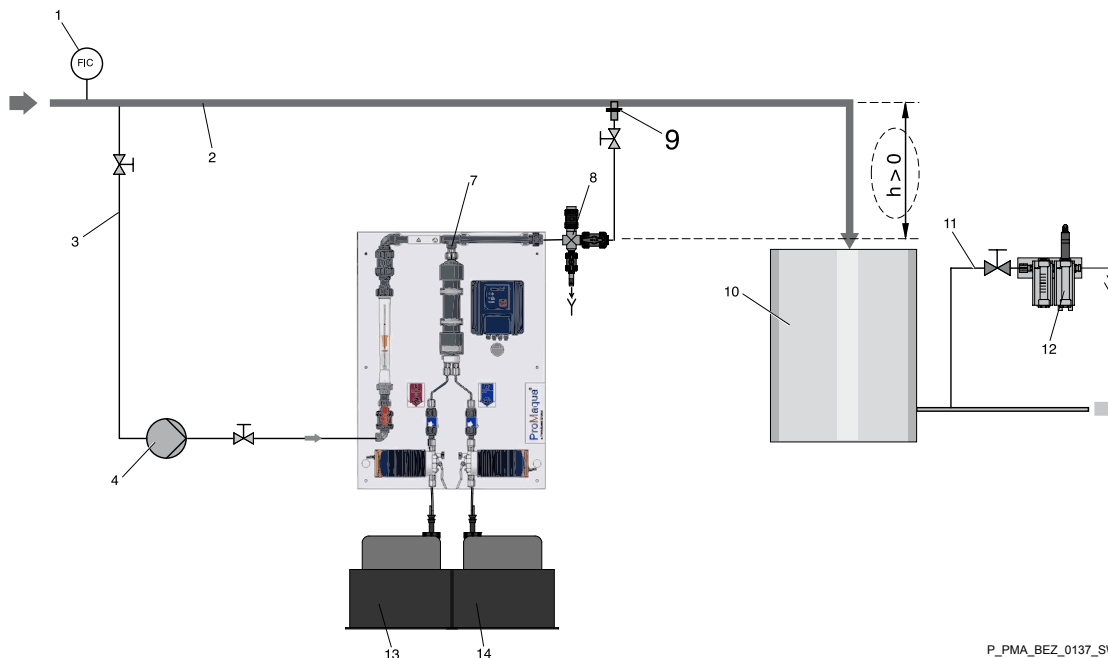
In essence, the following components must be hydraulically installed:

- Bypass line
- Safety equipment bypass line
- Additional safety fittings
- Flow generator bypass line

- Point of injection
- Flushing equipment with vacuum relief valve
- Suction lance and level switch for dilute acid

Installation examples

Installation example A



P_PMA_BEZ_0137_SW

Fig. 4: Installation example A: the reactor outlet valve (7) of the Bello Zor® system is located beneath the point of injection (9)

- | | | | |
|---|--|----|--|
| 1 | Water meter (frequency or analogue signal) | 10 | Delay tank |
| 2 | Main water supply | 11 | Sample water line |
| 3 | Bypass line | 12 | Chlorine dioxide measuring point (for example with CDE sensor) (accessory) |
| 4 | Bypass pump (accessory) | 13 | Acid in safety collecting pan (accessory) |
| 7 | Reactor outlet valve | 14 | Chlorite in safety collecting pan (accessory) |
| 8 | Flushing equipment with vacuum relief valve (accessory) | 16 | Back pressure valve (accessory) |
| 9 | Point of injection (flange and immersion pipe) (accessory) | | |

Installation example B

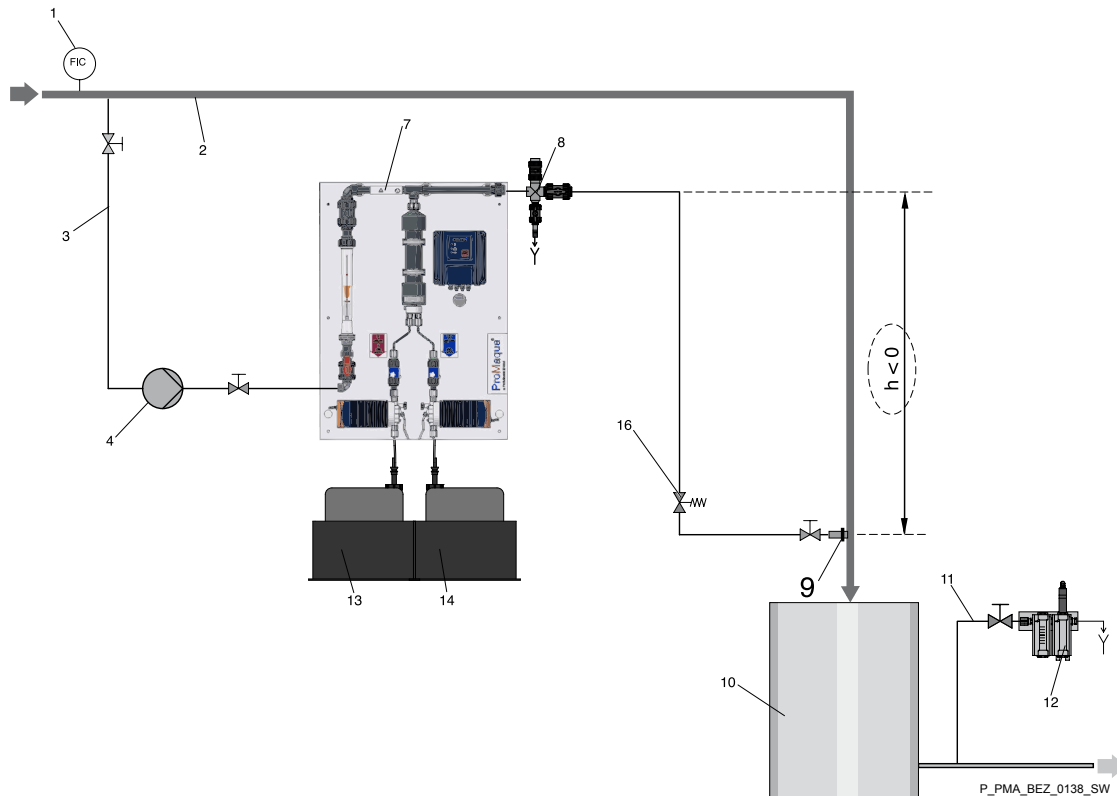


Fig. 5: Installation example B: the reactor outlet valve (7) of the Bello Zor® system is located above the point of injection (9): Back pressure valve (16) and vent valve (8) required in the bypass line.

7.1.1 Bypass line



DANGER!

Warning of hazardous chlorine dioxide vapours

Hazardous chlorine dioxide vapours can escape through to a broken bypass line.

- Only use PVC or PVDF pipes for the bypass line. Chlorine dioxide corrodes other materials too strongly.
- Only use PVC pipes of pressure rating PN 16 for the bypass line to allow for long-term scaling of the PVC.
- Do not exceed the maximum permissible system operating pressure - see "Safety equipment bypass line" - "PVC bypass line specifications"). Do not allow pressure surges to occur.



WARNING!

Warning of hazardous chlorine dioxide vapours

Hazardous chlorine dioxide vapours can escape through a leaking bypass line. Some threaded connectors are loosened in the factory prior to transport.

- Check whether all threaded connectors on the bypass line on the bracket are correctly tightened.

**WARNING!****Danger of an explosion in the bypass line**

Particles in the bypass water could block a flow meter. This can then lead to an unacceptably high concentration of chlorine dioxide in the bypass line. If a bypass line is not completely full with water, a critical gas phase can form, resulting in an explosion in the bypass line.

- If necessary, install a dirt-trap filter in the bypass line.
- The site operator should ensure that the bypass line is always fed with water.



Protect transparent pipes carrying ClO₂ containing water against light radiation (direct sunlight, fluorescent tubes, ...), otherwise the photochemical breakdown of the ClO₂ in the pipes will cause the ClO₂ concentration to drop unexpectedly at the place of use.

The bypass line is either fed from the main water supply or separately. The purpose of the bypass line is to dilute the chlorine dioxide concentration of the chlorine dioxide solution from the reactor from approximately 20 g/l (= 20,000 ppm) to approximately 0.1 - 1 g/l (= 100 - 1000 ppm) and to transport this solution to the point of injection.

7.1.2 Safety equipment bypass line

**WARNING!****The reactor can explode**

The chlorine dioxide solution in the reactor can explode if it is placed under vacuum.

- Therefore install the bypass line in such a way that it is impossible for a vacuum to form or for the pipe to be incompletely filled – even if the system is idle or a malfunction has occurred.

**WARNING!****Risk of explosion in the bypass line**

If the dosing remains switched on when there is no water flow, it can then lead to an unacceptably high concentration of chlorine dioxide in the bypass line. If additionally the bypass line is not completely full with water, a critical gas phase can form, resulting in an explosion in the bypass line.

- Route the lowest part of the bypass line over the reactor output valve.
- If this is not possible then: Install a back pressure valve at the end of the bypass line.



WARNING!

Warning of heightened ClO₂ levels

Too much ClO₂ solution can be metered if the back pressure in the bypass line is lower than 1.5 bar.

- Ensure that the back pressure in the bypass line is always greater than 1.5 bar when in operation.

Bypass line specifications for CDEa 45

Data	Value	Unit
Nominal width	DN20	
Diameter	25	mm
Operating pressure, min.	1.5	bar
Operating pressure, max.	8	bar
Pressure rating*	PN16	
Flow	100 ... 1000	l/h

* with PVC lines

Bypass line specifications for CDEa 80

Data	Value	Unit
Nominal width	DN20	
Diameter	25	mm
Operating pressure, min.	1.5	bar
Operating pressure, max.	8	bar
Pressure rating*	PN16	
Flow	200 ... 1000	l/h

* with PVC lines

Bypass line specifications for CDEa 140

Data	Value	Unit
Nominal width	DN20	
Diameter	25	mm
Operating pressure, min.	1.5	bar
Operating pressure, max.	8	bar
Pressure rating*	PN16	
Flow	350 ... 1000	l/h

* with PVC lines

There is a specific risk of a vacuum being generated especially when the water is stationary if:

- The flow direction reverses in the main water supply pipe (with a large diameter) - non-return valves are never 100 % water-tight!
- The main water supply line runs below the reactor outlet valve of the Bello Zon® system
- The bypass line is very long, especially if it runs downwards, i.e. the reactor outlet valve (7) of the Bello Zon® system lies above the point of injection (9) (h less than "0" ↪ *'Installation examples' on page 19, installation example B*). Then install a vent valve at the highest point on the bypass line, as shown in figure . This ensures that there is always a minimum of atmospheric pressure in the bypass line.

Depending on the application and the particular circumstances of the installation site, appropriate safety-related accessories may need to be added to the chlorine dioxide system.

7.1.3 Flushing equipment with vacuum relief valve (accessory)

Install flushing equipment complete with vacuum relief valve in the bypass line downstream of the Bello Zon® system, see ↪ *'Installation examples' on page 19*, so that during start up the reactor safely fills up at atmospheric pressure, and so that the reactor can be safely rinsed and drained ready for maintenance work.

In addition, the valve acts as a vacuum relief valve should the bypass line enter a state of vacuum.



WARNING!

Gaseous ClO₂ solution can still vaporise in the bypass line

If the vacuum relief valve becomes blocked due to dirt, then it cannot prevent outgassing of the ClO₂ solution if the bypass line is under vacuum.

- Provide the vacuum relief valve with a protective cover to protect it from dirt entering from above.



WARNING!

Hazardous ClO₂ solution can escape

- Prevent the flushing valve from being opened unintentionally, e.g. using a cable connector or a padlock.



WARNING!

Outgassing ClO₂ solution can still vaporize in the bypass line

With Bello Zon® systems that are ordered without a bypass line, a flow control and a rinse valve with a vacuum relief valve must be installed that are technically equivalent to the original parts.

7.1.4 Back pressure valve (accessory)

Install a back pressure valve if it is not possible to ensure in any other way that the back pressure is > 1.5 bar and constant:

Back pressure valve

Install a back pressure valve at the end of the bypass line, just upstream of the point of injection (opening pressure > 1.5 bar) see fig. 5!

Use a design free from the effects of back pressure to ensure that its function is maintained even at high levels of back pressure!

7.1.5 Flow generator bypass line

To create a flow in the bypass line, an alternative is to install:

- A choke valve in the main water supply line, e.g. gate, spring or weight-loaded non-return valve or
- A bypass water pump in the bypass line upstream of the Bello Zon[®] system. The bypass pump can be locked via the control of the Bello Zon[®] system.

When installing a bypass pump, we recommend fitting an inclined seat valve to permit regulation of the flow at the inlet to the Bello Zon[®] system.

7.1.6 Point of injection (accessory)

Install an "immersion pipe" to improve the mixing of the ClO₂ solution in the main water line at the point of injection.

TANGIT cleaner, TANGIT adhesive and a DN25 ball valve as a shut-off valve are provided in the scope of supply should the immersion pipe require shortening.

1. ▶ Shorten the immersion pipe to the required length.
2. ▶ Glue the ball valve to the shortened end.
3. ▶ Fit the immersion pipe using a DN50 DIN flange supplied by others.

7.1.7 Protective filter (accessory)

Fit a protective filter upstream if solid particles are present in the bypass water.

7.1.8 Chlorine dioxide detection kit (accessory)

The DPD method can be used simply and reliably to determine the concentration of chlorine dioxide. An appropriate photometer is available for this purpose.

7.1.9 Acid and chlorite suction lances / suction assemblies (accessory)

Safety notes



WARNING!

Warning of hazardous chlorine dioxide gas

Hazardous chlorine dioxide can be produced outside the reactor.

- Allocate parts correctly to the acid and chlorite sides.



WARNING!

Warning of hazardous acid or toxic chlorite solution

Hazardous acid or hazardous chlorite solution can escape at the connectors.

- Only use suitable hoses and connector kits.



Only use suction lances or suction assemblies with two-stage level switches and round plugs. Other suction lances do not fit.

Installing suction hoses

Do not plug the suction lances into the component storage tanks yet!

1. ➔ Adjust the length of each suction lance - the foot valve should subsequently float in the container just above the base.
2. ➔ Stick the "Acid" and "Chlorite" labels (in the scope of supply) onto the suction lance heads or suction hoses so they are clearly legible.



"Acid", red, is attached on the left - "Chlorite", blue on the right!

3. ➔ Shorten the suction hoses so that subsequently they rise continuously and are free from tension.
4. ➔ Pull the union nut (4) and clamp ring (3) over the suction hose (5) - see figure Fig. 6.
5. ➔ Push in the hose end up to the stop over the nozzle (2) (it may be necessary to slightly widen the hose end).
6. ➔ Fit the nozzle on the pump suction valve (1).
7. ➔ Press the suction hose (5) on to the nozzle (3) and tighten the union nut (4).
8. ➔ Pull briefly on the suction hose (5) and tighten up the union nut (4).
9. ➔ The bleed hose of the corresponding pump can be inserted into the head of the suction lance with ProMinent suction lances, returning the feed chemical cleanly when the pump is bled.

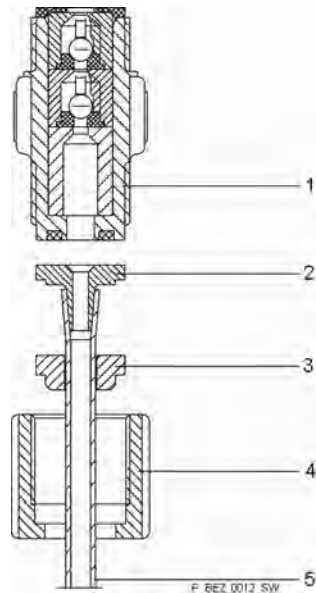


Fig. 6: Installing the hose

- 1 Pump suction valve
- 2 Nozzle
- 3 Clamp ring
- 4 Union nut
- 5 Hose

7.2 Installation, electrical

Note for the system operator

Please observe the local regulations for electrical installation work!

Main components

In essence, electrical installation involves the following work:

- Connecting the level switch
- Wiring the system's control box
- Installing an emergency stop switch (accessory) upstream of the Bello Zon® control
- Preparing the mains connection

7.2.1 Connecting the level switch

1. ➤ Connect the round plug for the acid suction lance (level switch) to the "Level" input on the left pump.
2. ➤ Connect the round plug for the chlorite suction lance (level switch) to the "Level" input on the right pump.

7.2.2 Wiring the system's control box

1. ➤ Loosen the 4 screws on the housing and place the front part in the parked position.
2. ➤ Feed cables into the threaded connectors - see Fig. 8 and Fig. 7

3. ➤ The remaining steps are outlined in [Chapter 7.2.2.1 'Connecting the terminals'](#) on page 29.

Then please continue with the following steps:

4. ➤ Tighten the union nuts on the threaded connectors until they are tight.
5. ➤ Fit the front part onto the rear part.



WARNING!

Danger of electric shock

An electric shock can occur if moisture penetrates into the control.

- Once again check that the seal is sitting correctly to achieve IP 65 degree of protection.

6. ➤ Check that the seal is sitting correctly once again.

7. ➤ Manually tighten the screws on the housing until hand-tight.

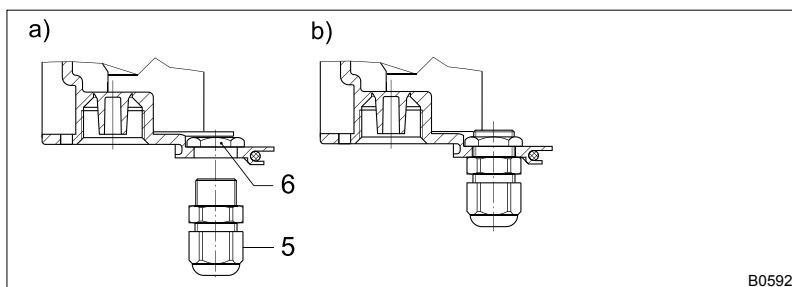


Fig. 7: Threaded connectors for signal cable (M12 x 1.5)

- 5 Threaded connector M12 x 1.5
6 Locking nut M12 x 1.5

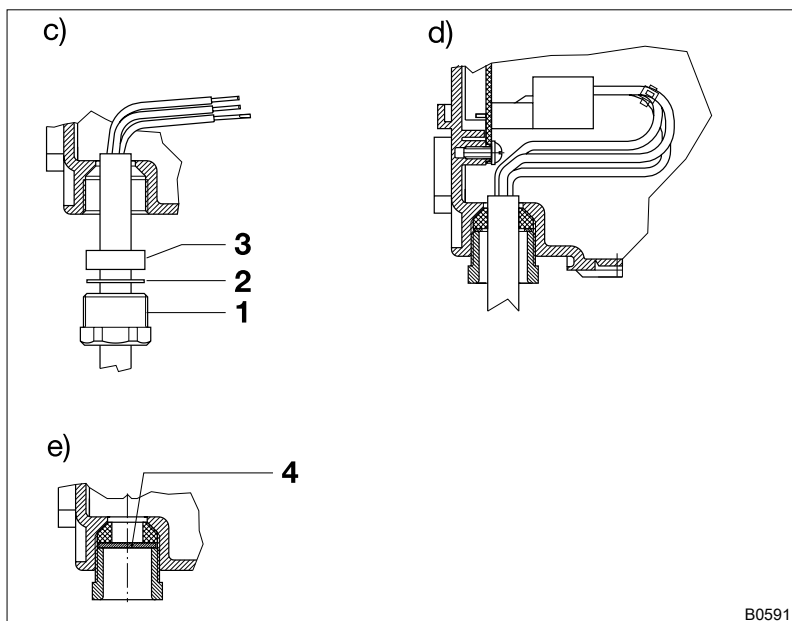



Fig. 8: Threaded connector for mains cable (M20 x 1.5)

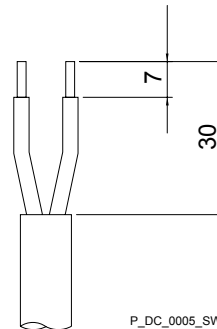
- 1 Threaded connector M20 x 1.5
2 Thrust collar M20
3 Thrust collar M20
4 Dummy washer M20

7.2.2.1 Connecting the terminals

1. ➤ Remove the cable insulation as per  on page 28 and crimp on the corresponding cable end sleeves.
2. ➤ Connect the cables according to the wiring diagram.
3. ➤ Check all the cabling against the wiring diagram.
4. ➤ Tighten the clamping screws of the threaded connectors until they are leak-tight.



– For wiring diagram - see appendix.



P_DC_0005_SW

Fig. 9: Removing the cable insulation

7.2.3 Installing an emergency stop switch



WARNING!

It can be dangerous to approach the system after specific incorrect operations or faults. It is then essential to switch off the system at least by the emergency stop switch, located at a safe distance.

- Install an emergency stop switch in the mains supply cable.
- Install the emergency stop switch in an easily accessible, invulnerable position in the vicinity of the door of the operation room of the chlorine dioxide system and label it as such.
- The emergency stop switch should disconnect the electrical supply equipment connected to the system from the mains.

7.2.4 Preparing the mains connection



WARNING!

Risk of explosion due to chlorine dioxide

If the system is started up and connected to the mains voltage without using qualified personnel, toxic chlorine dioxide can accumulate and explode.

- Only have the system started up by a Service team authorised by ProMinent in accordance with the operating instructions.



CAUTION!

Warning against illegal operation

Observe the regulations that apply where the device is installed.

- - - The chlorine dioxide system is now sufficiently prepared that it can be started up by a ProMinent service technician! - - -

8 System overview

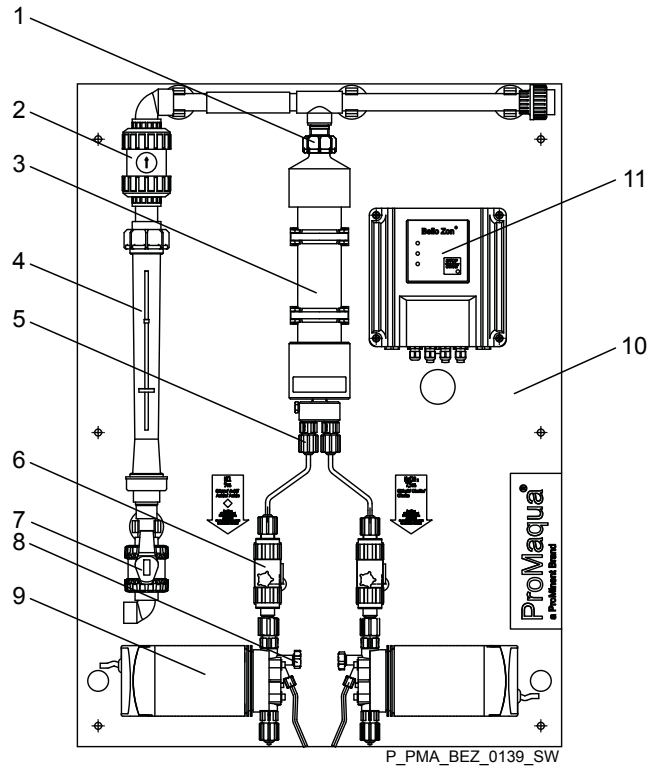


Fig. 10

- 1 Reactor outlet valve
- 2 Non-return valve for bypass line
- 3 Reactor
- 4 Flow meter
- 5 Reactor input valve, acid
- 6 Dosing monitor, acid
- 7 Stopcock, bypass line
- 8 Bleed valve, acid
- 9 Metering pump, acid
- 10 Bracket
- 11 Control box
- not shown Danger signs
- not shown CDV fitting kit



For the sake of clarity, only parts of the acid metering line have been shown.

The corresponding parts for the chlorite metering line are located as a mirror image on parts.

9 Functional description

9.1 Chemical principle of the systems

Bello Zon® chlorine dioxide systems work according to the hydrochloric acid-chlorite process:

Bello Zon®CDEa systems produce a 2 % chlorine dioxide solution (20 g/l ClO₂) by combining dilute hydrochloric acid and dilute sodium chlorite solution.

This solution is immediately diluted after its creation in the bypass line and added to the water to be treated.

9.2 Function principle of the systems

General description

Two metering pumps meter the Bello Zon® acid and Bello Zon® chlorite components into the reactor. There the components react to produce ClO₂ solution. The metering pumps are simultaneously used to transport this solution through the reactor outlet valve into the bypass. The diluted ClO₂ solution reaches the main water flow at the point of injection and dilutes itself to the final effective concentration which applies to the process.

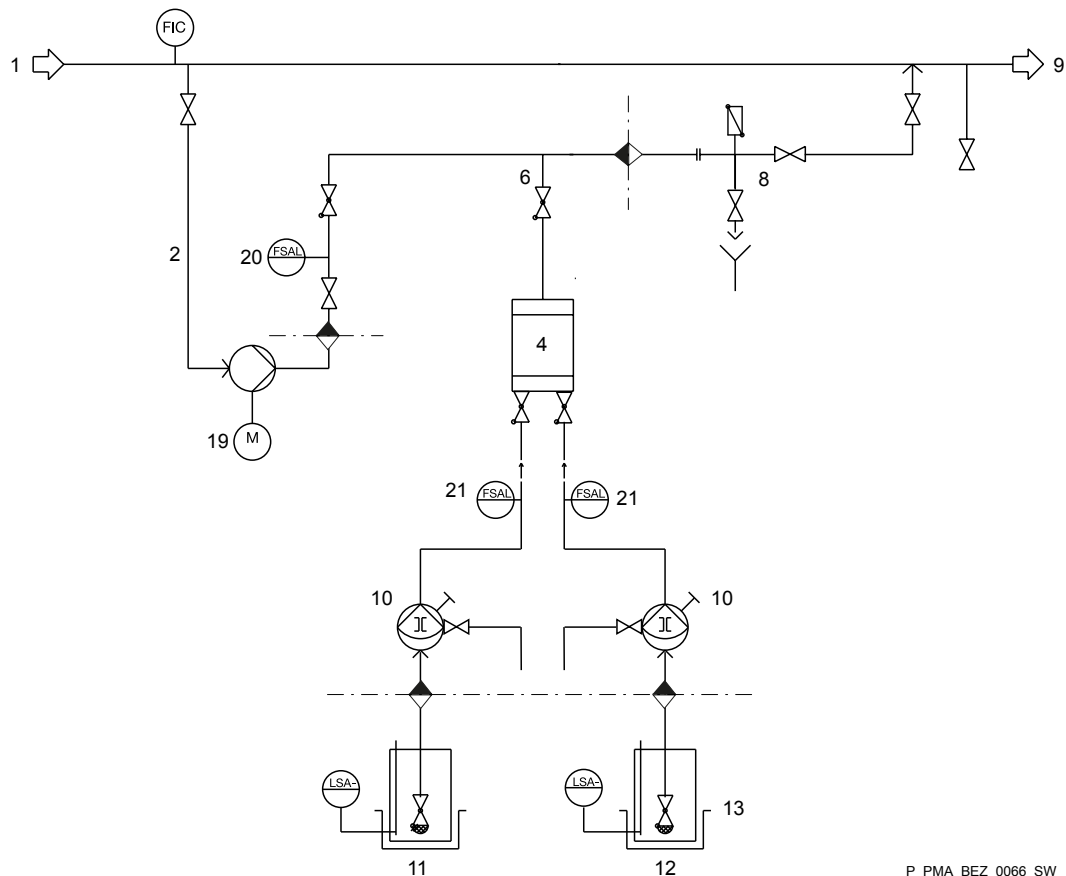
The pump controls calculate the stroke rates for the metering pumps from the pumped ClO₂ capacity. Moreover, they can also interpret the signals of the contact water meter or a control panel.

The control box includes the On/Off switch and LEDs for indicating system statuses. It records the contact signal or analogue signal from the contact water meter or another device. It is also possible to tap a warning or fault alert signal to it.

Control types

The Bello Zon® system (the ClO₂ output) can be controlled in 3 different ways:

- Contact conc (via a water meter)
- Manual (via the Pause contact)
- Analog (via 0/4-20 mA signal)



P_PMA_BEZ_0066_SW

Fig. 11: Hydraulic drawing CDEa in bypass operation

- | | | | |
|----|--|----|---|
| 1 | Water to be treated | 11 | Acid |
| 2 | Bypass | 12 | Chlorite |
| 4 | Reactor | 13 | Safety collecting pans, recommended (accessory) |
| 6 | Reactor outlet valve | 19 | Bypass pump (accessory) |
| 8 | Flushing equipment with vacuum relief valve, recommended (accessory) | 20 | Flow meter |
| 9 | Water to be treated | 21 | Flow Control dosing monitor |
| 10 | Metering pumps | | |

9.3 Safety equipment

The description of the safety equipment is at the end of the chapter "Start up".

9.4 Control elements

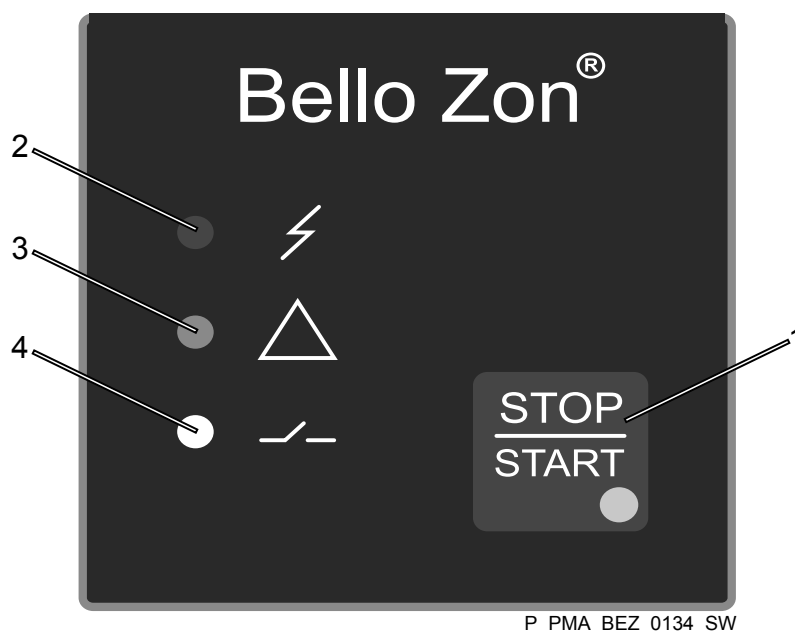


Fig. 12: The control elements

- 1 *[START/STOP]*key with green "Operation" LED
- 2 Alarm LED, red
- 3 Warning LED, yellow
- 4 Pause LED, white

*[START/STOP]*key

The *[START/STOP]*key can be used to start and stop the two metering pumps.

LEDs

Name	Colour	Indicates ...	Consequence
Fault	red	Fault alert from a metering pump, e.g. storage tank empty	Fault output deactivated, The system stops
Warning	yellow	Warning alert from a metering pump, e.g. the storage tank level is low	Warning output deactivated,
Pause	white	No bypass flow or external pause	System is in standby
Ready for operation	green	The <i>[START/STOP]</i> key is used to make the system read for operation.	The system is now capable of producing chlorine dioxide

10 Set up

This chapter describes the parts of the software needed for the two metering pumps. The entire software is described in the enclosed "Operating Instructions for Solenoid Metering Pumps gamma/ L".

The "Start Up" chapter describes the settings relating to start up.

The pumps have to be adjusted accordingly if other settings are needed over and above the factory settings or a replacement pump needs to be used.



CAUTION!

Warning of an unhealthy chemical cocktail

All the software settings have to be made on BOTH metering pumps.

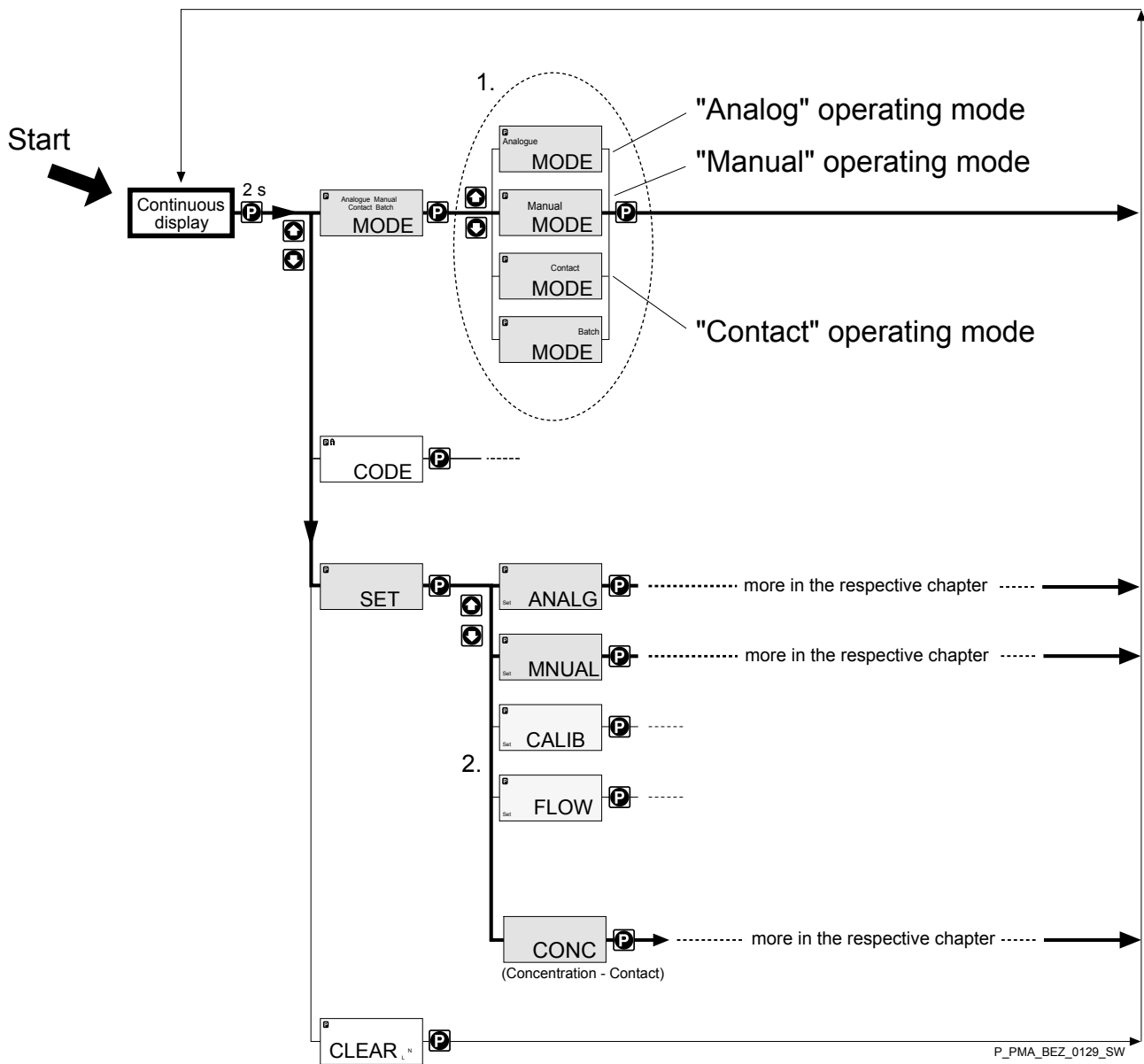


Fig. 13: Extract of the gamma/ L overview menu

10.1 Calibrate pumps (CALIB menu)

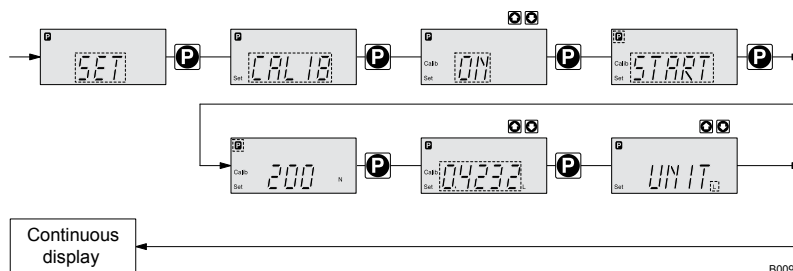


Fig. 14

The two metering pumps have to be calibrated when starting up or following the replacement of a diaphragm.

If the stroke length is changed by more than ± 10 scale divisions, the yellow warning light lights up, the continuous display flashes and the flashing identifier 'Calib' appears.



CAUTION!

- Calibration becomes more accurate, the more strokes the pump makes during calibration. Allow the pump to run for 200 strokes.

Calibration



CAUTION!

Danger with dangerous feed chemicals

Provided the following handling instructions are followed, contact with the feed chemical is possible.

- If the feed chemical is dangerous, take appropriate safety precautions when carrying out the following handling instructions.
- Observe the feed chemical safety data sheet.

1. Flush the system with water - refer to the "Decommissioning" chapter.
2. Allow water to flow through the bypass.
3. The stroke lengths of the metering pumps are set to 80 %.
4. Lead the suction hose into a measuring cylinder filled with water – the discharge hose should be installed in a permanent manner (operating pressure, ...!).
5. Prime using the water (simultaneously press the two *[arrow keys]*), should the suction hose be empty.
6. Record the level in the measuring cylinder and the stroke length.
7. Select the 'CALIB' menu and press *[P]* to move to the first menu option.
8. Use the *[arrow key]* to select 'ON' and press *[P]* to change to the next menu option.
9. Press *[P]* to start calibration. The pump starts to pump and indicates the stroke rate - at certain intervals 'STOP' appears. The pump works at the stroke rate set under 'MANUAL'.

10. ▶ After a reasonable number of strokes (minimum of 200), press *[P]* to stop the pump.
11. ▶ Determine the required metering volume (difference between initial volume - remaining volume).
12. ▶ Enter this amount under the next menu option and then press *[P]* to move to the next menu option.
13. ▶ Under menu option 'UNIT', use the *[arrow key]* to select the unit 'L' and press *[P]*.
 - ⇒ The pump is calibrated.

10.2 "Manual" operating mode

For "Manual" control mode (control via Pause contact) (factory setting).

Both CDEa installed pumps are factory-set to these values:

- Stroke rate 180 strokes/min
- 'mem' to 'OFF'
- 'FLOW' to 'ON'

As soon as the Pause signal is cancelled, the metering pumps meter at 180 strokes/min.

Set 'Manual' operating mode as follows for both pumps if other settings are required:

To do so, refer to the enclosed "Operating Instructions for Solenoid Metering Pump gamma/L" - specifically the "Selecting Operating Mode (MODE Menu" and "Settings for "Manual" (MANUAL) Operating Mode" chapters.



- *For safe operation, set the stroke length as long as possible; this prevents outgassing of the chemicals in the suction lines.*
- *To ensure efficient mixing, set the stroke length as short as possible, because this results in a higher stroke rate.*

1. ▶ Calibrate the metering pump if it is not yet calibrated - refer to "Calibrating Pump ('CALIB' Menu)" chapter).
2. ▶ Set 'Mode' - 'MANUAL' on the metering pump.
3. ▶ Calculate the stroke rate according to the ClO₂ output required: 180 strokes/min \cong Nominal power (in g/l of ClO₂) (at 80 % stroke length).
4. ▶ In turn enter the identical stroke rate on both pumps at which they are to work as soon as they receive the external release (Pause input).

To do so, use the *[i]* key to select the "Stroke rate" continuous display and use the *[arrow keys]* to select the stroke rate.

5. ▶ Check whether the metering pumps respond as expected to these inputs.

6. → To do this, use the $[i]$ to switch to the "Capacity" (l/h) continuous display and use the stroke adjustment dial to set the stroke length so that the capacity is identical on both pumps. ($0.025 \text{ l/h} \cong 1 \text{ g/h ClO}_2$)

10.3 "Contact" operating mode

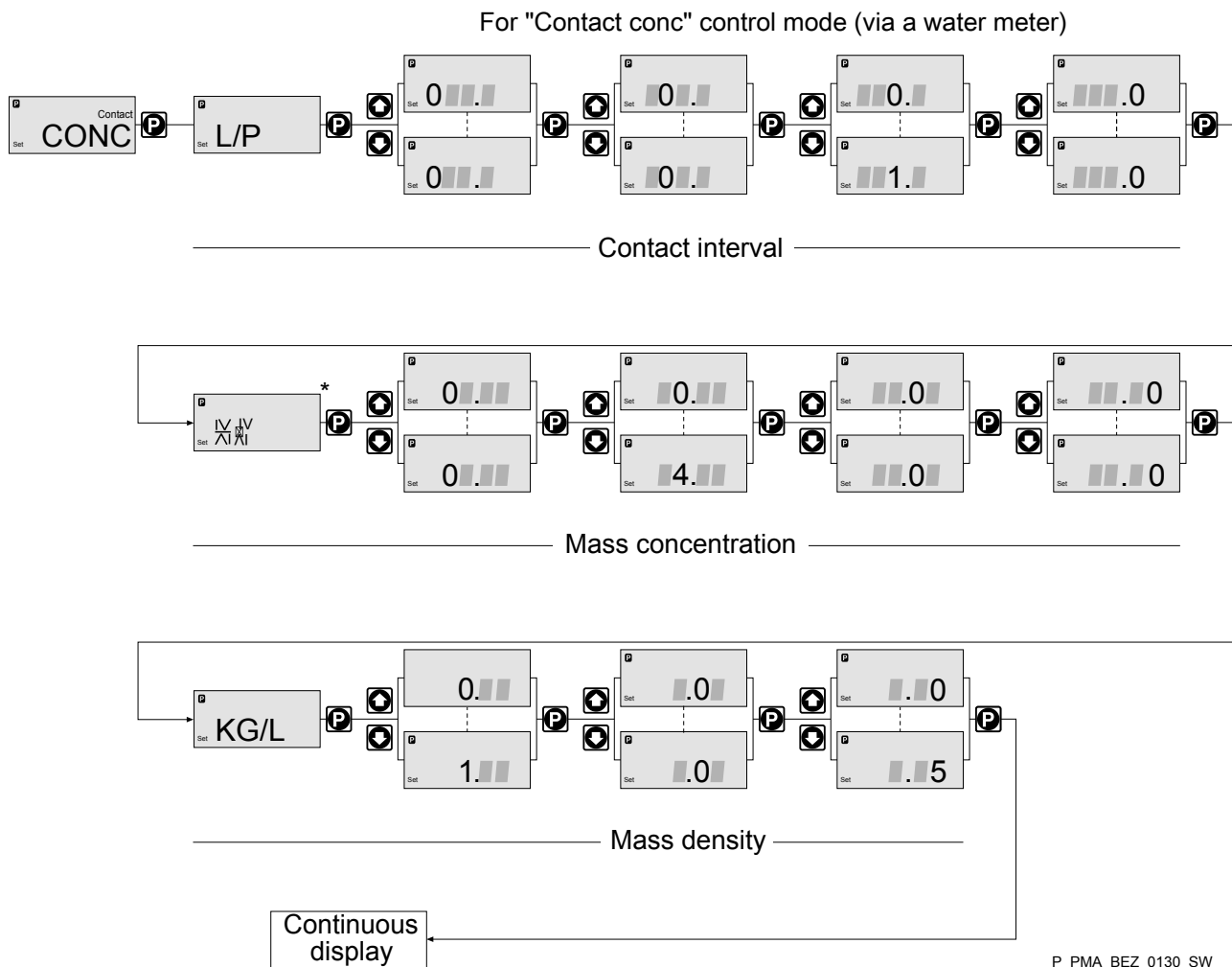


Fig. 15

Both CDEa installed pumps are factory-set to these values:

- "Contact" operating mode
- Contact interval 1 pulse/l
- Mass concentration 4.0 % by weight.
- Mass density 1.05 kg/l
- 'mem' to 'OFF'
- 'FLOW' to 'ON'

Set "Contact" operating mode as follows for both pumps if other settings are required:



CAUTION!

Danger due to ClO_2 concentration being too high
Never set 'mem' to 'ON'.

1. ▶ Calibrate the metering pump if it is not yet calibrated - see chapter "Calibrating Pumps ('CALIB' menu)".
2. ▶ Select 'CNTCT' operating mode (CONTACT).
3. ▶ Select the 'CONC' menu in the 'SET' menu.
4. ▶ The first menu item displays the unit of measure for the contact interval spacing ('L/P'; the unit of measure for the volume was determined during calibration via 'UNIT').
5. ▶ Enter the contact interval for the water meter.
6. ▶ Select the unit ' % by weight' for the mass concentration.
7. ▶ Enter a mass concentration of 4.0 % by weight.
8. ▶ Select the unit 'g/l' for the mass density.
9. ▶ Enter a mass density of 1.05 g/l.
10. ▶ A continuous display will appear once [P] has been pressed.
11. ▶ Use the [i/j] key to move to the continuous display for the concentration.
12. ▶ Set the other metering pump in the same way.
13. ▶ Check whether the metering pumps respond as expected to these inputs.
14. ▶ To do this, use the [i/j] to switch to the "Capacity" (l/h) continuous display and use the stroke adjustment dial to set the stroke length so that the capacity is identical on both pumps. (0.025 l/h \cong 1 g/h ClO₂)

10.4 "Analog" operating mode

For "Analog" control mode (via 0/4-20 mA signal)

Both CDEa installed pumps are factory-set to these values:

- '4 - 20 mA'
- 'mem' to 'OFF'
- 'FLOW' to 'ON'

The pump stops with 4 mA at the mA input, and operates at 180 strokes/min with 20 mA at the mA input

Set 'Analog' operating mode as follows for both pumps if other settings are required:

To do so, refer to the enclosed "Operating Instructions for Solenoid Metering Pump gamma/L, GALa" - specifically the "Selecting Operating Mode (MODE Menu" and "Settings for "Analog" (ANALG) Operating Mode" chapters.

1. ▶ Calibrate the metering pump if it is not yet calibrated - see chapter "Calibrating Pumps ('CALIB' menu)".
2. ▶ Set 'Mode' - 'ANALG' on the metering pump.
3. ▶ Enter in turn on both metering pumps how they are to process the analog signal.
4. ▶ Check whether the metering pumps respond as expected to these inputs.
5. ▶ To do this, use the [i/j] to switch to the "Capacity" (l/h) continuous display and use the stroke adjustment dial to set the stroke length so that the capacity is identical on both pumps. (0.025 l/h \cong 1 g/h ClO₂)

11 Start up

Safety notes

**WARNING!**

- Carefully read through this entire chapter prior to start up.
- Only have initial commissioning performed by a Service team authorised by ProMinent .
- The Service team authorised by ProMinent should instruct the operating and maintenance personnel during start up.
- Only technical experts are authorised to start up the system in any other way.

**WARNING!****Risk of explosion from the reactor and bypass**

An explosive ClO_2 gas phase can form and explode if the empty reactor and the empty bypass are started up directly with chemicals.

- Only connect the chemical canister once the reactor and bypass have been completely filled with water.

**WARNING!****Risk of explosion from the reactor and bypass**

An explosive ClO_2 gas phase can form in the bypass and explode if the reactor has been started up with chemicals and the bypass is empty.

- Ensure that the bypass is always filled with water, whenever the system contains chemicals.

**WARNING!****Warning of the escape of hazardous liquid**

Hazardous liquid can escape if the system leaks.

- At no operating status may the maximum permissible operating pressure for the system be exceeded.
- The entire installation should remain leak-tight when operating at maximum operating pressure.
- Carefully open all shut-off devices in the bypass before starting up.
- Check the hydraulic connectors.

Note for the system operator

During start up, also adhere to the instructions in the following regulations:

- a) - Accident Prevention Regulations (in Germany: GUV 8.15 or VGB 65): Only start up chlorination systems after they have been checked by a technical expert to ensure they are in correct and proper working order and have undergone leak testing. Have chlorination systems checked by a technical expert for safety prior to each re-commissioning. Only appoint personnel who have been instructed in such matters and who can be expected to reliably fulfil their duties to operate and maintain chlorination systems and handle chemicals.
- b) - The ordinance relating to hazardous substances (in Germany: The German Ordinance on Hazardous Substances (Gef-StoffV)
- c) - Requirements relating to starting chemicals - see chapter
- d) - All other local regulations for these installations outside of Germany

11.1 Installation - final steps

1. ➤ First connect the water canisters instead of the chemical storage tanks.
2. ➤ Check that the hydraulic connectors have been fitted correctly.
3. ➤ Check that the electrical connections have been fitted correctly.
4. ➤ Connect the Bello Zon® system to the mains (cable with 3 x 1 mm²).
5. ➤ Push the limit contact on the water meter to a value just below the expected flow in the bypass and fix in place with a retaining screw.

11.2 Adjusting the system

1. ➤ Close the stopcock in the bypass.
 - ⇒ The metering pumps go into "Pause" mode.
2. ➤ Use the [START/STOP] key to switch on the system.
 - ⇒ The green "Operation" LED on the control box lights up.

11.2.1 "Manual" control mode (via the Pause contact)

Check on the metering pumps whether all the settings are correct - refer to the "Operating Instructions for Solenoid Metering Pump gamma/ L GALa" and the "Setting" chapter.

11.2.2 "Contact conc" control mode (via a water meter)

Check on the metering pumps whether all the settings are correct - refer to the "Setting" chapter.



As small as possible a pulse interval for the water meter ensures uniform mixing of the ClO₂ solution in the water to be treated.

11.2.3 "Analog" control mode (via 0/4-20 mA signal)

Check on the metering pumps whether all the settings are correct - refer to the "Operating Instructions for Solenoid Metering Pump gamma/ L GALa" and the "Setting" chapter.

11.3 Starting up the system

11.3.1 Deactivating Flow Control

➔ Turn the rotary dial on the Flow Control fully to the left ("-").

11.3.2 Deactivating the bypass monitor

1. ➔ Close the stopcock in the bypass.
2. ➔ Push the flow meter's limit contact as far down as possible.
 - ⇒ The white "Pause" LED goes out.

11.3.3 Bleeding pumps



CAUTION!

Corrosive chemicals will escape

When bleeding the pumps, remove and appropriately dispose of the escaping liquid from the bleed connectors.

The hose from a bleed connector can be inserted into the head of the corresponding suction lance with ProMinent suction lances.

1. ➔ Remove the cable connector from the hood of the metering pump.
2. ➔ Place each suction lance in its own bucket full of clean water.
3. ➔ Connect a proprietary drainage method to each bleed valve for each individual chemical.
4. ➔ Slightly open the bleed valve on the acid pump (in an anti-clockwise direction).
5. ➔ Press both *[arrow keys]* on the acid pump then wait until the suction line and liquid end are free from bubbles.
6. ➔ Close the bleed valve, by turning in a clockwise direction.
7. ➔ Repeat these steps on the chlorite pump.



CAUTION!

The hood of each pump has to be connected to the housing with a cable connector (plastic o-rings) to ensure that no one tampers with the pump during operation.

11.3.4 Filling the reactor



WARNING!

System components can rupture

If the downstream valves are not open when the reactor is filled, the pressure of the metering pumps can cause the reactor to rupture.

- Open the valves downstream of the reactor or open a flushing valve before filling the reactor.

1. Check whether only pure water is connected instead of chemicals.
2. Open the valves downstream of the reactor or open a flushing valve.
3. Push the water meter's limit contact downwards.
⇒ The white "Pause" LED goes out.
4. Allow both metering pumps in the "Manual" operating mode to operate at 180 strokes/min and 80% stroke length until water escapes from the bypass (at a downstream valve, like a flushing valve).
5. Open the shut-off valve in the bypass and push the limit contact to just below the expected flow value and fix in place with the retaining screw.

11.3.5 Checking for leaks



WARNING!

Warning of toxic ClO₂ solution

Hazardous ClO₂ solution can escape through leaks.

- Take appropriate action to immediately seal any leaks.

1. Check the system components for leaks when the metering pumps are running at maximum operating pressure.
2. Take appropriate action to seal any leaks.

11.3.6 Setting the Flow Control dosing monitors

Use their rotary dials to set the two Flow Control dosing monitors:

1. ➤ Remove the dosing monitor cable from the metering pump (to temporarily disable the dosing monitor).
2. ➤ Turn the rotary dial fully to the left ("-").
3. ➤ Enter the required operating pressure on the discharge line.
4. ➤ Re-insert the dosing monitoring cable.
5. ➤ The '*Flow*' identifier on the LCD screen goes out with each pressure surge.
6. ➤ Slowly turn the rotary dial of the dosing monitor to the right ("+") until the '*Flow*' indicator stops flashing.
7. ➤ Turn the rotary dial back a little until the '*Flow*' indicator starts flashing again.
8. ➤ Now turn back the stroke length of the pump approximately 20 % (scale divisions) (record old value) – the '*Flow*' identifier should stop flashing. If not, slowly turn the rotary dial of the dosing monitor to the right ("+") again until the '*Flow*' indicator stops flashing.



If the pump goes into "Fault" mode at this point, press [P] to acknowledge the fault.

9. ➤ Reset the stroke length to the old value - the '*Flow*' identifier should flash again.
10. ➤ Make sure that the green LEDs on the dosing monitors are flashing.

11.3.7 Calibrating pumps



CAUTION!

Warning of hazardous substances in the water

If the metering pumps are not calibrated at the operating pressure at which they will subsequently operate, the chemicals will possibly not be mixed in the correct ratio within the reactor.

- Only calibrate the pumps at the operating pressure at which they will also operate subsequently.

Procedure - refer to "Setting" chapter.

The system now operates with the required metering volume (during initial commissioning still with water).

11.3.8 Final start up

If an operating mode other than "Manual" is required:

➔ Set the required operating mode on the metering pumps.

The system now operates with the required metering volume.

11.4 Testing the safety equipment

Safety collecting pans (accessories)

Remove the intact storage tank from the dry safety collecting pan. Fill the safety collecting pan with water up to the edge and inspect for leaks.

Acid and chlorite level switches (accessory)

Slowly withdraw the acid suction lance from the filled storage tank. The warning LED should shine red and the alarm relay should switch.

Repeat the entire process with the chlorite suction lance.

Flow Control dosing monitors

Turn the setting dial on a dosing monitor to the right - the corresponding pump should stop after 8 defective strokes. Simultaneously, the LCD screen displays the "Error" and "FLOW" identifiers, the fault indicator lights up red and the alarm relay switches.

Turn back the setting dial of the dosing monitor and press *[P]* on the pump.

Now check the other dosing monitors.

Bypass monitor

Slowly close the stopcock upstream of the prior to the float flow meter. The white "Pause" LED lights up and the CDEa stops.

Open then stopcock and the CDEa starts running again.

Gas detector (accessory)

Test the gas detector and its sensor in line with the operating instructions.

Interruption of chemical supply (on site)

Set up the chemical supply via the metering pumps in such a way that it can be reliably interrupted as soon as there is insufficient water in the bypass.



CAUTION!

With systems which are connected up in a way different to that described here, the operator should carry out a safety review of the overall system.

11.5 Installation of the chemical canisters

1. Use the *[START/STOP]* key to switch off production on the control.
⇒ The green LED goes out.
2. Position the chemical canisters beneath the system - acid on the left (HCl, red), chlorite on the right (NaClO₂, blue) – viewed from the front!
3. Immerse the left suction lance in the acid chemical canister. Does the foot valve float just above the base of the chemical canister?
4. Tighten the screw lid.
5. Immerse the right suction lance in the chlorite chemical canister. Does the foot valve float just above the base of the chemical canister?
6. Tighten the screw lid.
7. The temperature of the chemicals should always remain below 35 °C.

11.6 Checking ClO₂ production

1. Prepare a sample from the main water supply line (downstream of a reaction tank, if fitted, or at an in-line probe housing) – the ClO₂ solution should have reached this point by now.
2. Place the sample in a clean vessel and immediately mix it with the DPD 1 reagent - see the operating instructions for your colorimeter; ClO₂ tends to outgas, especially at water temperatures of > 25 °C!
3. Immediately measure the ClO₂ content of the sample using a colorimeter, e.g. using the photometer DT 1.
4. Use the stroke lengths to adjust the metering volume or change the control parameters or supply quantity in the pumps' menu, allow the system to run and repeat the measurement after a sufficiently long interval.
5. Sign the completed commissioning report.



CAUTION!

Warning against illegal operation

- Observe national and local regulations with regard to ClO₂ concentrations.



If the stroke length has to be changed, then:

- *Without re-calibrating: adjust the stroke lengths by no more than 10 % (yellow LED "Warning alert" lights up on the appropriate metering pump).*
- *Do not set the stroke length below 30 %.*



- *For safe operation, set the stroke length as long as possible; this prevents outgassing of the chemicals in the suction lines.*
- *To ensure efficient mixing, set the stroke length as short as possible, because this results in a higher stroke rate.*

--- The Bello Zon® system is now ready for operation! ---

12 Operation

**WARNING!****Risk of explosion due to ClO₂ gas**

Together the two components, hydrochloric acid (HCl) and sodium chlorite (NaClO₂), almost instantaneously form large quantities of toxic ClO₂ gas, which can also decompose in an explosive manner.

- The two components, hydrochloric acid (HCl) and sodium chlorite (NaClO₂) should never be brought into contact with each other except in the reactor.

**WARNING!****Warning of hazardous ClO₂ gas**

Mix-ups can often occur when pouring chemicals back into chemical canisters. Then large volumes of hazardous ClO₂ gas can be generated.

- Never pour chemicals back into chemical canisters or pour them together.

**WARNING!****Warning of hazardous ClO₂ solution**

If system leaks occur, hazardous ClO₂ solution can escape.

- At no operating status may the maximum permissible operating pressure for the system be exceeded.
- The entire installation should remain leak-tight when operated at maximum operating pressure.

12.1 Replacing chemical canisters

Safety notes

**WARNING!****Risk of explosion due to incorrect concentrations**

If the Bello Zon[®] CDEa chlorine dioxide system is operated with too highly concentrated chemicals, highly concentrated ClO₂ can form, which can then explosively decompose in the reactor.

- Only operate the Bello Zon[®] CDEa chlorine dioxide system with diluted sodium chlorite: NaClO₂, 7.5 % by weight.
Only use diluted hydrochloric acid: HCl 9 % by weight.



WARNING!

Warning of hazardous ClO₂ gas

Large volumes of hazardous ClO₂ gas can be produced, if the chemical canisters are not handled correctly.

- Only allow trained personnel to change the chemical canisters.
- Observe the colour code:
Red stands for acid (HCl, left),
Blue for chlorite (NaClO₂, right).
- Never place both suction lances in the same vessel or interchange them.



WARNING!

Warning of hazardous ClO₂ solution

Hazardous ClO₂ solution can escape if leaks are caused by corrosion of the system.

- Only use diluted hydrochloric acid: HCl 9 % by weight.
- The hydrochloric acid should conform to the purity criteria in line with DIN EN 939.
- The chlorite should conform to the purity criteria in line with DIN EN 938.

Basic purity requirements

for sodium chlorite 7.5 %	Upper limit as per DIN EN 938
Sodium chlorate	3 g/l
Sodium nitrate	0.08 g/l

for hydrochloric acid 9 %	Upper limit as per DIN EN 939
Iron	16 mg/l
Halogenated organic compounds	1.6 mg/l

Other upper limits as per DIN EN 938 and DIN EN 939.

Impurity	Sodium chlorite 7.5%	Hydrochloric acid 9%
Arsenic (As)	0.09 mg/l	0.3 mg/l
Cadmium (Cd)	0.12 mg/l	0.1 mg/l
Chromium (Cr)	0.09 mg/l	0.3 mg/l
Mercury (Hg)	0.09 mg/l	0.05 mg/l
Nickel (Ni)	0.09 mg/l	0.3 mg/l
Lead (Pb)	0.09 mg/l	0.3 mg/l

Impurity	Sodium chlorite 7.5%	Hydrochloric acid 9%
Antimony (Sb)	0.09 mg/l	0.1 mg/l
Selenium (Se)	0.09 mg/l	0.5 mg/l

Permissible temperatures, liquids

- refer to "Technical Data" chapter.

Operating guidelines

1. Use the *[START/STOP]* key to stop production.
⇒ The green "Operation" LED goes out.
2. Carefully remove each suction lance out of its chemical canister. Raise slowly, maintain perpendicular!
3. Place each of the suction lances in its own bucket full of clean water. This prevents the suction lances from running dry and ClO₂ being created.
4. Close the empty chemical canisters and ensure they are disposed of properly.
5. Place the new chemical canisters beneath the system:
Red stands for acid (HCl, left), blue chlorite (right)!
6. Slowly raise each suction lance, hold perpendicular and carefully insert into the corresponding chemical canister.
Red stands for acid, blue for chlorite!
7. Check the suction lines for air bubbles, bleed as necessary (in accordance with the next chapter).
8. Use the *[START/STOP]* key to start production.
⇒ The green "Operation" LED lights up.

12.2 Bleeding pumps



CAUTION!

Corrosive chemicals will escape

When bleeding the pumps, remove and appropriately dispose of the escaping liquid from the bleed connectors.

The bleed hose from a bleed connector can be inserted into the head of the corresponding suction lance with ProMinent suction lances.

1. Note the stroke lengths of the pumps.
2. Set the stroke lengths of the pumps 100%.
3. Place each suction lance in its own bucket full of clean water.
4. Connect a proprietary drainage method to each bleed valve for each individual chemical.
5. Slightly open the bleed valve on the acid pump (in an anti-clockwise direction).

6. ➤ Press both *[arrow keys]* on the acid pump then wait until the suction line and liquid end are free from bubbles.
7. ➤ Close the bleed valve, by turning in a clockwise direction.
8. ➤ Repeat these steps on the chlorite pump.
9. ➤ Set the recorded stroke lengths on the pumps.



CAUTION!

The hood of each pump has to be connected to the housing with a cable connector (plastic o-rings) to ensure that no one tampers with the pump during operation.

12.3 Setting the Flow Control dosing monitors

Use their rotary dials to set the two Flow Control dosing monitors:

1. ➤ Remove the dosing monitor cable (to temporarily disable the dosing monitor).
2. ➤ Turn the rotary dial fully to the left ("-").
3. ➤ Enter the required operating pressure on the discharge line.
4. ➤ Set the require capacity on the operating pump (using the stroke; frequency also possible with analogue).
5. ➤ Re-insert the dosing monitoring cable.
6. ➤ The 'Flow' identifier on the LCD screen goes out with each pressure surge.
7. ➤ Slowly turn the rotary dial of the dosing monitor to the right ("+") until the 'Flow' indicator stops flashing.
8. ➤ Turn the rotary dial back a little until the 'Flow' indicator starts flashing again.
9. ➤ Now turn back the stroke length of the pump approximately 20 % (scale divisions) (record old value) – the 'Flow' identifier should stop flashing. If not, slowly turn the rotary dial of the dosing monitor to the right ("+") again until the 'Flow' indicator stops flashing.



If the pump goes into "Fault" mode at this point, press [P] to acknowledge the fault.

10. ➤ Reset the stroke length to the old value - the 'Flow' identifier should flash again.
11. ➤ Make sure that the green LEDs on the dosing monitors are flashing.

12.4 Checking sensors

Regularly check with sensors with metering dependent on measured values. The interval depends on national regulations or process conditions - refer to the operating instructions for the sensors.

13 What happens in the event of incorrect operation?

a) Chemical canisters

Incorrect operation:	Chemical canisters have been swapped.
Consequence:	Toxic ClO ₂ gas is formed in the chemical lines and chemical canisters.
Incorrect operation:	Incorrect chemicals or the incorrect concentration or purity of chemical have been used and the Bello Zon® system / pumps have started up.
Consequence:	Uncontrolled, dangerous reactions can take place. Explosions may occur, toxic ClO ₂ gas can escape.

b) Flow Control dosing monitors

Incorrect operation:	Dosing monitors set incorrectly.
Consequence:	<p>It is possible that the stroke sensor does not identify a reduction of the flow volume of > 30 % and the dosing continues running. Excess acid or chlorite is requested.</p> <ul style="list-style-type: none"> ■ With too little chlorite, the present excess amount of acid is strengthened and the ClO₂ solution diluted. ■ With too little acid: <ul style="list-style-type: none"> – The output of ClO₂ falls. – This can lead to a hazard to health by exceeding the permissible chlorite concentration.

c) Bypass

Incorrect operation:	The limit contact of the flow meter in the bypass is set too low.
Consequence:	The ClO ₂ concentration in the bypass becomes too high and can result in environmental damage or a hazard to health. If a gas phase forms, an explosion may occur.
Incorrect operation:	The limit contact of the flow meter in the bypass is set too high.
Consequence:	The CDEa goes into Pause mode although ClO ₂ is demanded by the process.

d) Pump control

Incorrect operation:	<p>Incorrect or poor calibration values set for the metering pumps.</p> <p>The metering pumps indicate different capacities (in l/h).</p> <p>A single metering pump was stopped by its [START/STOP]key.</p>
Consequence:	<p>Excess acid or chlorite is requested.</p> <ul style="list-style-type: none"> ■ With too little chlorite, the present excess amount of acid is strengthened and the ClO₂ solution diluted. ■ With too little acid: <ul style="list-style-type: none"> – The output of ClO₂ falls. – This can lead to a hazard to health by exceeding the permissible chlorite concentration.

14 Maintenance

Safety notes



WARNING!
Hazardous ClO₂ can escape

If maintenance is forgone or neglected, in the worst case ClO₂ solution could escape through a pipe leak.

- Service should service the Bello Zon® system at least annually.



WARNING!
Chemicals can escape

Hazardous chemicals in the system's hydraulic components.

- Rinse the Bello Zon® system with water until the piping and especially the reactor no longer contain any chemicals.



WARNING!
Danger of electric shock

Danger due to incorrectly replaced electrical cabling.

- Control cabling or mains leads should only be replaced by Service.
- Only use appropriate special cabling.

NOTE for the system operator

Chlorine dioxide systems have to be regularly checked for safety, but in any event at least annually and before any recommissioning, by a technical expert - for example also in line with the German Accident Prevention regulations GUV 8.15 or VGB 65 § 19 (2).

Service can carry out this check as part of maintenance work. We therefore recommend taking out a service contract.

14.1 Inspection work by the operator

Interval	Maintenance work	Personnel
Daily to weekly, depending on the operating conditions	Inspecting the system - see below.	Instructed personnel
	Inspecting the metering pumps - see below.	Instructed personnel
	Cleaning the housing - see below.	Instructed personnel

Inspecting the system

1. ➤ Check the ClO₂ concentration in the treated water; observe national regulations.
2. ➤ Check and compare the liquid levels in the chemical canisters, look out for a possible warning alert (yellow LED on the pumps), keep acid and chlorite ready for use.
3. ➤ Document the consumption of acid and chlorite (System Log-book)
4. ➤ Check the flow in the bypass.
5. ➤ Check the system for leak-tightness.

Inspect metering pumps

1. ➤ Check the dosing head screws for correct seating.
2. ➤ Check the metering lines on both the discharge and suction sides are seated correctly.
3. ➤ Check the dosing lines on both the discharge and suction valves are seated correctly.
4. ➤ Check for moisture in the leakage hole of the backplate. If moisture is present, there is probably a diaphragm rupture.
5. ➤ Check whether the pump hoods are sealed with a cable connector.

Cleaning the housing

1. ➤ Clean the housing with a cloth moistened with soapy water.



CAUTION!

Solvent can attack the surfaces.

- Under no circumstances use solvents .

2. ➤ Wipe the housing dry.

14.2 Service work by the Service team

Interval	Maintenance work	Personnel
After 6 months, at least annually	Replace all wear parts - ProMinent service kit! With older systems, check the pipe walls of the bypass line for limescale.	Customer Service department
	Check the system for safety	Customer Service department
After 3 years	Replace the reactor	Customer Service department
After 10 years	Replace the bypass pipework not if not previously.	Customer Service department

Concluding servicing

1. ➤ Seal the hoods of the pumps with a cable connector.
2. ➤ Sign the completed maintenance report.

Maintenance kits for CDEa systems

The maintenance kits contain all wear parts, which are to be exchanged within the scope of regular system maintenance.

Order numbers for maintenance kits

Complete maintenance kit for	1-yearly	3-yearly
CDEa 45	1047804	1047807
CDEa 80	1047805	1047808
CDEa 140	1047806	1047809

15 Repairs

**WARNING!****The reactor can explode**

If unauthorised repair work is carried out, the worst case scenario is a reactor explosion.

- Only Customer Service may repair the Bello Zon® system.

16 Troubleshooting



WARNING!

The reactor can explode

If unqualified repair work is carried out, the worst case scenario is a reactor explosion.

- Only personnel with the stipulated qualifications may carry out troubleshooting.



CAUTION!

The hood of each pump has to be connected to the housing with a cable connector (plastic o-rings) to ensure that no one tampers with the pump during operation.



- *If the green "Operation" LED is Off, then the control does not actuate the pumps and ignores all input signals.*
- *If you wish to contact ProMinent because of a fault, then previously e-mail the following details:*
 - *Order number*
 - *Serial number*
 - *Plan of the hydraulic and electrical environment of the pump*

16.1 Faults without error messages

Fault description	Cause	Remedy	Personnel
Liquid is escaping from the backplate of a metering pump.	The liquid end leaks at the metering diaphragm.	Re-tighten the Allen screws on the dosing head. If this is unsuccessful, inform the Service department.	Instructed personnel
The metering pump has been working for a long time, but suddenly is no longer pumping.	Air in the metering line or the chemical canister is empty.	Bleed the metering line, check the liquid level in the chemical canister, if unsuccessful:	Instructed personnel
	Pump diaphragm probably defective.	Replace diaphragm.	Customer Service department
Chemical consumption oscillates unusually.	The metering pumps are overstrained due to too low operating pressure.	Increase the operating pressure over 1.5 bar.	Technical experts
The ClO ₂ concentration in the water fluctuates unusually.	The metering pumps are overstrained due to too low operating pressure.	Increase the operating pressure over 1.5 bar.	Technical experts

16.2 Functional faults with LED signals on control box

Fault description	Cause	Remedy	Personnel
Red "Fault" LED lights up	A chemical canister is empty.	Replace both chemical canisters - refer to the "Operation" chapter.	Instructed personnel
	Problem with a metering pump.	Read the error message on the metering pump's LCD screen and consult your operating instructions.	Technical experts
Yellow "Warning" LED lights up	A chemical canister is almost empty.	Have new chemical canisters ready.	Instructed personnel
	Problem with a metering pump.	Read the warning alert on the metering pump's LCD screen and consult your operating instructions.	Technical experts
White "Pause" LED lights up	An external device has set the system to Pause.	none	Instructed personnel
	The volumetric flow in the bypass is too low.	Check the volumetric flow in the bypass and check the flow meter setting.	

16.3 Functional faults with LED signals on pumps

For an explanation of the functional faults with LED signals on the two metering pumps - refer to the "Operating Instructions for Sole-noid Metering Pump gamma/ L".

16.4 Replacing the mains fuse box



WARNING!

Danger of electric shock

Individual components can carry mains voltage within the control.

- Disconnect the control from the mains power supply and secure it to prevent it from being switched on again.



WARNING!

Danger of electric shock

Even when the mains power supply is disconnected, there is still mains voltage at terminal blocks XR1 and XR2.

- Disconnect the power supply and prevent it from being switched on again.



WARNING!

Warning of risk of fire and malfunctions

Fire risks and malfunctions can result from using incorrect fuses.

- Only use the approved original fuses from ProMinent, see [Chapter 16.4 'Replacing the mains fuse box' on page 57](#). Only in rare cases will any other fuse, with the values given below, have exactly the same properties.

Permitted fuse for the Bello Zon®
CDEa (100 230 V AC) control box

Description	Type	Supplied ...	Terminals	Part no.
F1	T 800 mA	Control	XP	734100
Micro fuse 5 x 20 mm				

17 Decommissioning



WARNING!

Risk of explosion due to ClO₂ gas

The two components, hydrochloric acid (HCl) and sodium chlorite (NaClO₂) almost instantaneously form large quantities of hazardous ClO₂ gas, which can also decompose in an explosive manner.

- Never pour the contents of the chemical canisters together.
- Never place both suction lances together or one after the other in the same bucket.



WARNING!

Warning of the escape of corrosive liquid

The liquid ends of the metering pumps contain hazardous liquids.

- Do not open the bleed valves on the liquid ends of the metering pumps.

17.1 For a short period

Only remove the Bello Zon® system from service for a few hours up to 1 day;

- ➔ Press the [START/STOP] key.
 - ⇒ The green "Operation" LED goes out.



Do not disconnect the power supply to the Bello Zon® system control during this period.



CAUTION!

Warning of incorrect metering

Nevertheless, if the power supply is disconnected for longer than 2 hours to a chlorine dioxide or chlorite sensor possibly fitted, it may subsequently deliver incorrect measurements.

- Do not disconnect the power supply to a chlorine dioxide or chlorite sensor for longer than 2 hours. In the event that this occurs, run the sensor in according with its operating instructions.



CAUTION!

Warning of incorrect metering

The ClO_2 in the reactor decomposes within a few hours (due to its high concentration). Therefore, after switching back on, the system temporarily meters less ClO_2 .

- Bear this in mind when switching back on.
- As far as possible operate the system continuously.

17.2 Over longer periods

Taking the Bello Zon[®] system out of service for longer periods of time:

Chlorine dioxide is an unstable compound that decomposes over time. Thoroughly rinse the reactor through with water if the Bello Zon[®] system is to be taken out of service for more than 1 day. Use the flushing equipment in the bypass line for this purpose, if this equipment has been fitted.

Safety notes



WARNING!

Warning of explosive ClO_2 gas

It takes a very short time for ClO_2 solution to form an explosive ClO_2 gaseous phase.

- Rinse and detoxify the reactor content.



WARNING!

Warning of hazardous ClO_2 gas, ClO_2 solution, hydrochloric acid and sodium chlorite

The inside of the system contains hazardous substances.

- Take appropriate protective measures - wear safety glasses, rubber gloves, gas mask, rubber apron - refer to the safety data sheets.
- If contact occurs with these chemicals, immediately rinse with plenty of cold water, then proceed further in accordance with the safety data sheets.



WARNING!

Warning against illegal operation

Observe national and local regulations.

- Special tool:
- Approx: 3 m of hose with webbing, d 19/27 mm, soft PVC #37041
 - pH measuring instrument pH indicator paper, although it is bleached by ClO₂!
 - Neutralising storage tank - see "Dilution volume" table: It should exceed this volume.
 - Potable water - see table for quantities
 - Sodium hydroxide solution NaOH 50 % (C, caustic) - see table for quantities
 - Hydrogen peroxide H₂O₂ 30 % (Xi, irritating) - see table for quantities
 - Sodium perborate NaBO₃ * 4 H₂O - see table for quantities

Protective equipment as per the safety data sheets for the ClO₂ solution.

1. ➤ Use the *[Start/Stop]* key to stop the system.
 - ⇒ The green "Operation" LED goes out.
2. ➤ Close the bypass shut-off valves upstream and downstream of the system.
3. ➤ Carefully place each of the suction lances upright its own storage tank full of potable water.
4. ➤ Provide a storage tank that contains the appropriate "dilution volume" for the reactor, taken from the table below.
5. ➤ Fill the storage tank with the "volume of potable water stipulated".
6. ➤ In it, dissolve the specified quantities of sodium hydroxide NaOH and hydrogen peroxide H₂O₂ or sodium perborate NaBO₃ * 4 H₂O.
7. ➤ Connect the PVC hose to the rinse valve and lead in into the storage tank below the fluid level.
8. ➤ Open the flushing valve.
9. ➤ Proceed as described in the "Start Up" chapter - "Filling the reactor."
10. ➤ If there should not be any more yellow solution in the PVC hose, press the *[START/STOP]* button on the control box.
11. ➤ Close the flushing valve and prevent it from unauthorised opening (padlock or cable connectors ...).

Neutralising volumes

Type	Reactor volume	ClO ₂ volume	Dilution volume	Stipulated water volume	NaOH 50 %	H ₂ O ₂ 30 %	NaBO ₃ * 4 H ₂ O	
	l	s	l	l	ml	ml	s	ml
CDEa 45	0.2	4	5	3	14	3	26	15
CDEa 80	0.4	8	5	3	28	6	52	30
CDEa 140	0.7	13	5	3	49	11	91	53

1 tablespoon of sodium perborate = 10 ... 15 ml = 15 ... 25 g

18 Disposal

**WARNING!**

Only return the device for repair in a cleaned state and with flushed hydraulic components - refer to the "Decommissioning" chapter!

Only send the unit together with a completed Decontamination Declaration. The Decontamination Declaration constitutes an integral part of an inspection / repair order. A unit can only be inspected or repaired when a Decontamination Declaration is submitted that has been completed correctly and in full by an authorised and qualified person on behalf of the operator.

The "Decontamination Declaration" can be found in the Appendix or at www.prominent.com/en/downloads.

**WARNING!****Danger from hazardous chemicals**

The Bello Zon[®] system could still contain hydrochloric acid (HCl), sodium chlorite (NaClO₂) and chlorine dioxide (ClO₂).

- Thoroughly rinse the entire Bello Zon[®] system with water - refer to the "Decommissioning" chapter. If necessary, also rinse the empty chemical canisters.

**WARNING!****Danger to persons and the environment**

Pay special attention when disposing of chemicals and metering pump electronic waste.

- Observe the regulations that apply to your site.

19 Technical data

System

Type	Chlorine dioxide capacity*		Max. operating pressure	Max. priming lift of metering pumps**	Dimensions #
	min.-max./hour	min./day			
	g/h	g/d	bar	mWS	mm
CDEa 45	5 ... 45	16	7 / 8**	2.0	958x700x195
CDEa 80	8 ... 80	30	7 / 8**	2.5	958x700x195
CDEa 140	14 ... 140	50	7 / 8**	3.0	1177x700x195

* The metering data relates to 5 bar back pressure, 80% stroke length and an ambient temperature of 20 °C. The minimum capacity/per hour is based on the fact that when the system is operating at below 5 % of the nominal capacity, continuous metering is no longer possible, due to the metering pumps' low pumping rate. Change the reactor content at least 2 x daily when systems are not operating continuously. Therefore do not operate the system below the stated minimum capacity / day.

** 7 bar at 40°C ambient temperature and chemical temperature / 8 bar at 35°C ambient temperature and chemical temperature

*** Suction length at 100% stroke length.

without bypass pumps and flushing equipment

Weight

Weight in kg, without packaging:

CDEa	45	80	140
Weight	21	22	24

Ambient conditions

Variable	Value	Comment
Storage temperature:	-10 ... +40 °C	
Temperature during operation:	15 ... 35 °C	at 8 bar operating pressure
	15 ... 40 °C	at 7 bar operating pressure
Temperature of bypass water:	15 ... 35 °C	
Temperature of water to be treated:	5 ... 60 °C	depending on the material of the point of injection and its pressure - refer to documentation on the point of injection
Max. relative humidity:	95 %,	non-condensing

Variable	Value	Comment
Degree of protection:	IP 54	Minimum protection for components. Only applies to the control if the seal is correctly fitted.
Miscellaneous:		Protect against: <ul style="list-style-type: none"> ■ Direct sunlight ■ IR radiation (also strong heat sources) ■ UV radiation ■ Ionising radiation

Control box

Power supply (XP1)

Data	Value	Unit
Nominal voltage, ± 10 %	100 ... 230	V
Mains supply frequency	50 / 60	Hz

Data	Value	Unit
Max. power consumption	0.7	A

Permitted fuse for the Bello Zon® CDEa (100 230 V AC) control box

Description	Type	Supplied ...	Terminals	Part no.
F1	T 800 mA	Control	XP	734100

Micro fuse 5 x 20 mm

Outputs

Warning contact output (XR1):

Type of contact: NC

Load capacity: 230 V AC / 10 A / 2300 VA

Fault contact output (XR2):

Type of contact: NC

Load capacity: 230 V AC / 10 A / 2300 VA

Inputs

Contact water meter (XK1):

Specification	Value	Unit
Voltage with open contacts	5	V
Input resistance	10.2	kΩ
Max. pulse frequency	25	pulse/s
Minimum pulse duration	20	ms

Control via:

- potential-free contact (load: 0.49 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

Technical data

Active standard signal 0/4...20 mA (XE2):

Specification	Value	Unit
Input apparent ohmic resistance, approx.	240	Ω

The metering pumps make their first metering stroke at approx. 0.4 mA (4.4 mA) and enter into continuous operation at approx. 19.6 mA.

External pause (XE1):

Specification	Value	Unit
Voltage with open contacts	5	V
Input resistance	10.2	k Ω
Max. pulse frequency	25	pulse/s
Minimum pulse duration	20	ms

Control via:

- potential-free contact (load: 0.49 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

Sound pressure level

Sound pressure level L_{pA} < 70 dB according to EN ISO 20361 at maximum stroke length, maximum stroke rate, maximum back pressure (water)

20 Dimension sheet

Dimension sheet for CDEa

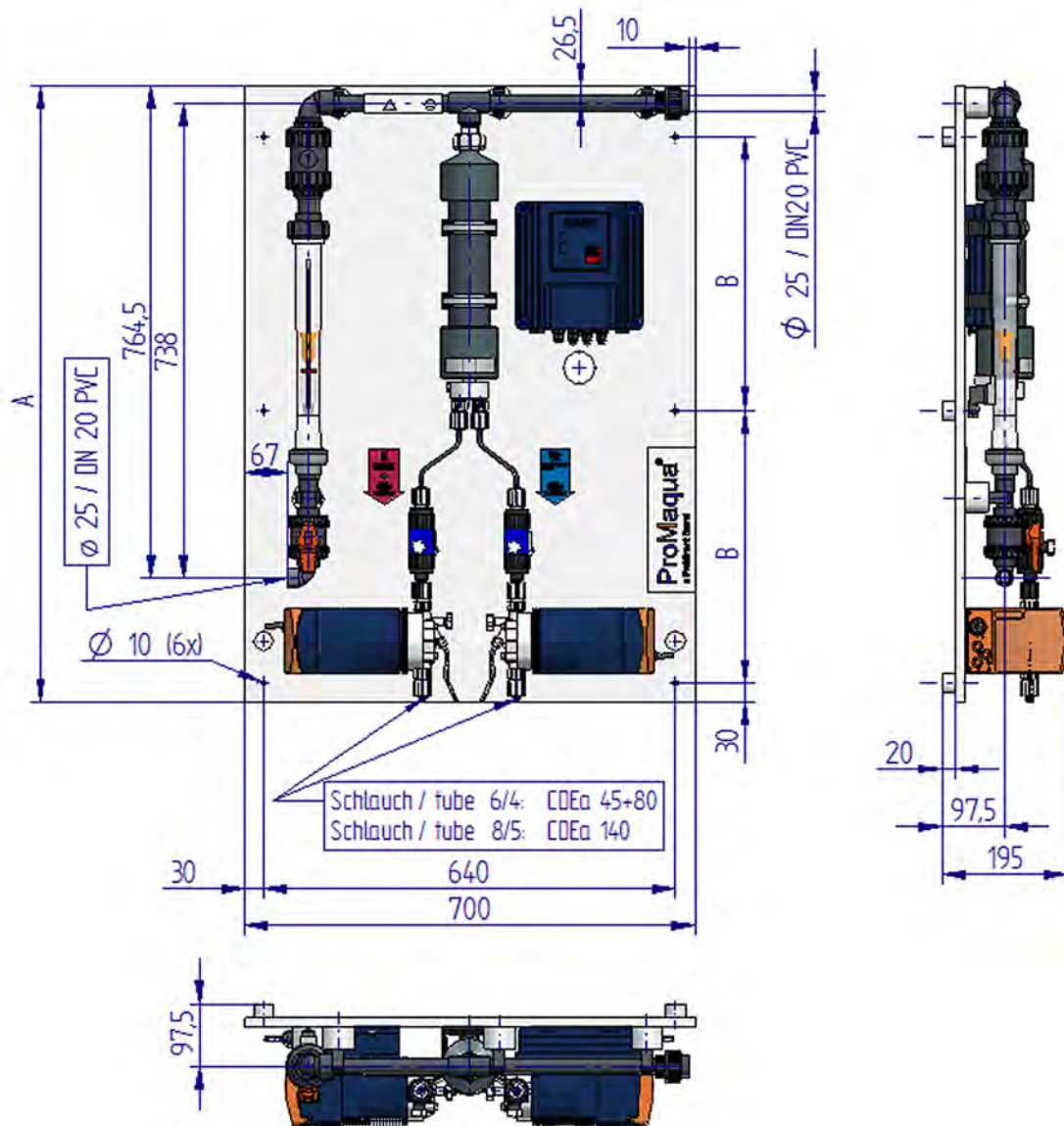


Fig. 16: Dimensions in mm

	CDEa 45	CDEa 80	CDEa 140
A	958	958	1177
B	424	424	533.5

21 Ordering Information

Suction lances

Accessories	suitable for system types	Part no.
Suction lance for connection to disposable storage tanks 5 ... 60 litre with 2 m long suction hose 6/4 mm	CDEa 45 ... 80	802077
Suction lance for connection to disposable storage tanks 5 ... 60 litre with 2 m long suction hose 8/5 mm	CDEa 140	802078
Suction lance for connection to 200 litre drums with 3 m long suction hose 6/4 mm	CDEa 45 ... 80	802079
Suction lance for connection to 200 litre drums with 3 m long suction hose 8/5 mm	CDEa 140	802080
Flexible suction assembly with D55 screw cap and 5 m long suction hose 6/4 mm	CDEa 45 ... 80	1034602
Flexible suction assembly with D55 screw cap and 5 m long suction hose 8/5 mm	CDEa 140	1034644

Measuring cylinder

Accessories	Part no.
Measuring cylinder, 500 ml	790661

Back pressure valve

Fit a back pressure valve free from the effects of back pressure in installations with long bypass lines, especially when these are routed downwards and the point of injection lies below the Bello Zon® system, as well as with installations with fluctuating back pressure.



Fig. 17: Back pressure valve DHV-U, free from the effects of back pressure

Type	Nominal width	Connector	Material	Part no.
DHV-U	DN20	G 1 1/4"	PCB	1037775

Flushing equipment with vacuum relief valve

Flushing equipment complete with vacuum relief valve installed in the bypass line downstream of the Bello Zon® system helps to keep the reactor at atmospheric pressure and enable it to be filled safely when starting up and enable it to be safely rinsed and emptied ready for maintenance work.

In addition, the valve acts as a vacuum relief valve should the bypass line enter a state of vacuum.

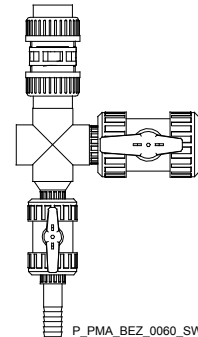


Fig. 18: Flushing equipment with vacuum relief valve

Accessories	Part no.
Flushing equipment d25/20 CDEa_PVC-U	1047718

PVC-U chlorine dioxide points of injection

Install an "immersion pipe" to improve the mixing of the ClO₂ solution in the main water line at the point of injection.

TANGIT cleaner, TANGIT adhesive and a DN25 ball valve as a shut-off valve are provided in the scope of supply should the immersion pipe require shortening.

1. Shorten the immersion pipe to the required length.
2. Glue the ball valve to the shortened end.
3. Fit the immersion pipe using a DN50 DIN flange supplied by others.



Fig. 19: Immersion pipe

Accessories	Part no.
Point of injection up to nominal width DN80*, with ball valve	1018754
Point of injection from nominal width DN100*, with ball valve	1018753
* Main water supply	

Ordering Information

Protective filter (accessory)

Fit a protective filter upstream if solid particles are present in the bypass water.

Accessories	Part no.
DULCOFILT® protective filter G1", mesh size 100 µm	791547

Emergency stop switch

Accessories	Part no.
Emergency stop switch	700560

Gas detector GMA 36 for chlorine dioxide

The GMA 36 chlorine dioxide gas detector is designed as a compact measuring and switching unit for monitoring the ambient air for dangerous concentrations of chlorine dioxide.

Accessories	Part no.
Gas detector GMA 36 for chlorine dioxide	1023156
Replacement sensor for chlorine, chlorine dioxide, ozone	1023314

Chlorine dioxide detection kit (accessory)

The DPD method can be used simply and reliably to determine the concentration of chlorine dioxide. The appropriate photometer is available for this purpose.

Accessories	Part no.
DULCOTEST® DT1 photometer	1003473
DULCOTEST® DT4 photometer	1022736

Safety collecting pans for chemical tanks

Useful capacity	Design	Part no.
40 l	without leakage monitoring	791726
70 l	without leakage monitoring	740309
140 l	without leakage monitoring	740723

Bypass pump

Stainless steel booster pumps for operation in the bypass line. Electrical design 220 ... 230 V, 50 Hz with integral overload protection.

Type	Material	Suction / discharge side connector thread	Pump capacity at 2 bar	Nominal power	Nominal current	Part no.
-	-	-	m³/h	W	A	-
ZHM 3	SS	RP 1 1/4" / 1"	1.2	500	2.3	1038925

Consider the bypass flow required when selecting a suitable bypass pump. The following flow data is recommended for the different systems:

System types	Bypass line	Diameter	Flow
		mm	m ³ /h
CDEa 45 - 140	DN 25	25	0.1 ... 1.0

Use PVC as the material for the bypass. The thickness should at least correspond to the pressure range PN 10, or even better PN 16 (bar).

Accessories

Accessories	Part no.
Bypass pump bracket	791474
Inclined seat valve PVC DN 25 for throttling the bypass pump	1001877

Maintenance kits for CDEa systems

The maintenance kits contain all wear parts, which are to be exchanged within the scope of regular system maintenance.

Order numbers for maintenance kits

Complete maintenance kit for	1-yearly	3-yearly
CDEa 45	1047804	1047807
CDEa 80	1047805	1047808
CDEa 140	1047806	1047809

22 Wiring diagram

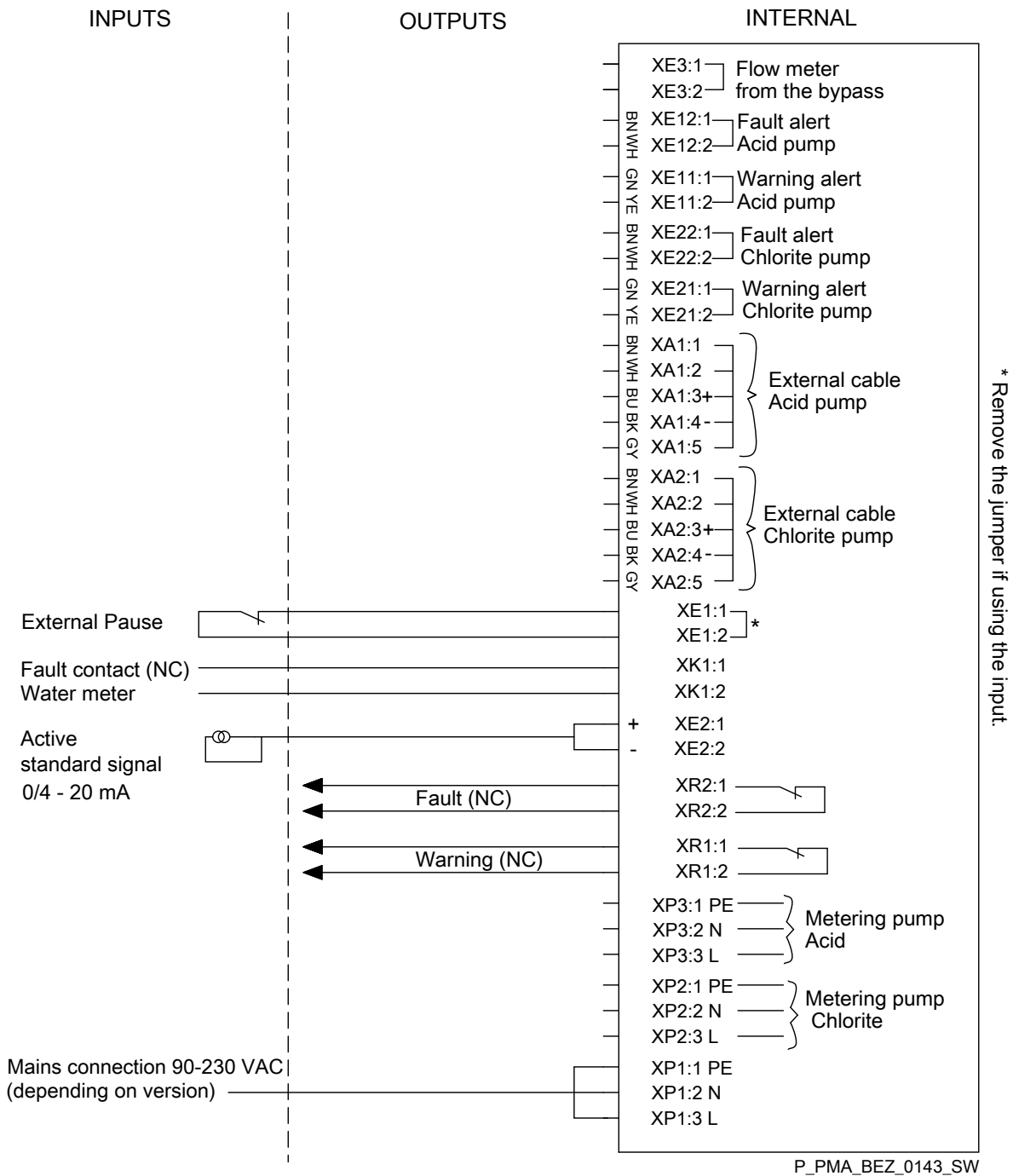


Fig. 20

Assignment of threaded connectors

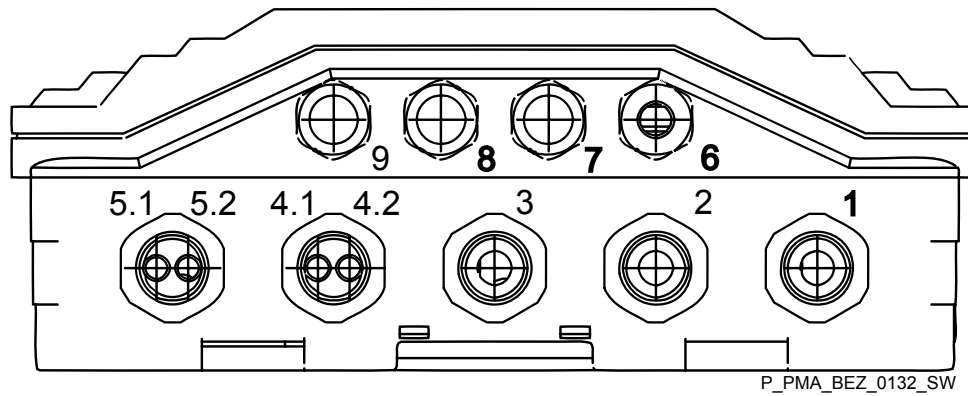


Fig. 21: Assignment of threaded connectors for customers

Cable feed-through	Terminal	Cable use	Threaded connector	Number of cables	Leads per cable	Ø cable min. - max.
1	XP1	Mains voltage input	M20	1	3	4.5 ... 10
6	XR1 / XR2	Warning contact output and Fault contact output	M12	1	4	3.5 ... 6.5
7	XK1 / XE2	Water meter (contact) or water meter 0/4...20 mA	M12	1	2	3.5 ... 6.5
8	XE1	External pause	M12	1	2	3.5 ... 6.5

23 EC Declaration of Conformity for Machinery

In accordance with DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Appendix I, BASIC HEALTH AND SAFETY REQUIREMENTS, section 1.7.4.2. C.

We,

- ProMinent GmbH
- Im Schuhmachergewann 5 - 11
- D - 69123 Heidelberg,

hereby declare that the product specified in the following, complies with the relevant basic health and safety requirements of the EC Directive, on the basis of its functional concept and design and in the version distributed by us. This declaration loses its validity in the event of a modification to the product not agreed with us.

Extract from the EC Declaration of Conformity

Designation of the product:	Bello Zon® chlorine dioxide generation system
Product type:	CDEa...
Serial number:	refer to nameplate on the device
Relevant EC directives:	EC Machinery Directive (2006/42/EC) EC EMC Directive (2004/108/EC) EC Pressurised Equipment Directive (97/23/EC) Compliance with the protection targets of the Low Voltage Directive (2006/95/EC) according to Appendix I, No. 1.5.1 of the Machinery Directive 2006/42/EC
Harmonised standards applied, in particular:	EN ISO 12100:2010 EN 809 EN 60204-1 EN 61529 EN 61000-6-2/4
Date:	27.02.2014

You can download the EC Declaration of Conformity at www.prominent.com/en/downloads

24 Chlorine dioxide hazardous substance data sheet

(The text is based on the hazardous substances data sheet issued by the Bundesvereinigung der Firmen im Gas- und Wasserfach e.V. FIGWA, 50968 Cologne, dated 16.4.1998.)

Properties of chlorine dioxide and instructions for handling aqueous solutions

The chlorine dioxide solutions used for water treatment have a concentration of ≤ 2 g/L ClO_2 . At a temperature of up to 25 degrees C, this results in a chlorine dioxide concentration in the gas chamber of less than 100 g/m³. Consequently, if preparation is carried out correctly, this will rule out explosive decomposition in both the gas chamber and in the stock solution.

24.1 Physical and chemical properties

24.1.1 Chemical characterisation

Aqueous solution of chlorine dioxide (ClO_2) ≤ 2 g ClO_2 /L of physically dissolved chlorine dioxide gas

24.1.2 Properties of gaseous chlorine dioxide

Colour: Orange-yellow

Odour: Pungent

Melting point: - 59 °C

Boiling point: 11 °C

Stability:

Gaseous chlorine dioxide explosively decomposes at concentrations above 300 g/m³ (≈ 10 % by volume) into chlorine and oxygen.

Dilution reduces the explosive tendency; there is no longer a risk of explosion at concentrations below 10 % by volume in gases with which chlorine dioxide does not react (e.g. with air, nitrogen, carbon dioxide).

A concentration of more than 8 g/L of chlorine dioxide (at a temperature of 20 degrees C) has to be reckoned with, for instance with a critical chlorine dioxide concentration in the gas chamber above an aqueous chlorine dioxide solution.

A severe to explosive-type reaction likewise occurs with oxidising substances.

24.1.3 Properties of an aqueous solution of chlorine dioxide

The gaseous phase is decisive.

Stability: Without an upper gas compartment, aqueous chlorine dioxide solutions are explosive from a concentration of around 30 g/L, i.e. they can autonomously explosively decompose without any external influences, such as heat, sparks, dirt or rust.

Chlorine dioxide is stable over several days as an aqueous dilute solution, provided the solution is pure and stored in the dark or if the temperature of the solution remains below 25 degrees C and its pH value is less than 7.

24.2 Handling aqueous chlorine dioxide solutions

24.2.1 Labelling and characters

Label the workplace and surrounding area using characters conforming to the (German) Accident Prevention Regulation "Chlorination of Water" (GUV 8.15, appendix 3).

24.2.2 Storage

Chlorine dioxide cannot be stored or transported either as a gas or as concentrated aqueous solution due to its explosive nature. Therefore it is only produced as dilute (see point 1.1.3) aqueous solutions in special systems for immediate use.

24.2.3 Measures in the event of spillage, escape, gas leaks

Precipitate the gas with water spray.

Pour sodium thiosulphate solution over escaped solution, then dilute with lots of water and wash away into the drain system.

24.2.4 Measures in the event of fires

Chlorine dioxide itself is not combustible, however it acts in an oxidising manner. Explosive decomposition at temperatures greater than 100 degrees C. Cool storage tanks with water, precipitate any escaped chlorine dioxide gas with a water spray. **There are no restrictions with regard to fire extinguishing agents in the event of fires in the vicinity.**

24.2.5 Disposal

See point 1.2.3

24.3 Health protection

24.3.1 MAC value and odour threshold

MAC value: 0.1 ppm (mL/m³) or 0.3 mg/m³

Odour threshold: The odour of chlorine dioxide gas is perceptible above a concentration of around 15 mg/m³ of air.

24.3.2 Personal protective equipment

Respiratory protection: Gas mask, filter B/grey

Eye protection: Safety goggles, face visor

Hand protection: Rubber gloves

Other: Protective clothing

24.3.3 Health hazards

A chlorine dioxide gas concentration of over 45 mg ClO₂/m³ causes breathing difficulties and leads to irritation of the mucous membranes and headaches.

In general, chlorine dioxide causes considerable irritation in the areas of the mucous membranes of the eyes and breathing organs. Depending on the concentration and the duration of the effect, the results can include a danger of suffocation, coughing fits, including vomiting, conjunctivitis and severe headaches, in severe cases pulmonary oedemas with breathlessness, oxygen starvation symptoms and circulatory failures. In the event of very brief influence of very high concentrations, there is a risk of laryngospasm or reflective apnoea or cardiac arrest. Harmful to the nervous system (e.g. eye muscle paralysis).

24.3.4 First Aid

First aid

If clothing comes into contact with chlorine dioxide or its aqueous solution, immediately remove the clothing and thoroughly wash the skin with soap and lots of water.

Rinse any splashes into the eyes for several minutes under running water, keeping the eyes opened.

If chlorine dioxide is inhaled, keep the patient in fresh air, keep absolutely still, lie horizontally, keep warm.

Inform a doctor immediately, even if discomfort does not become immediately apparent. If necessary, transport quickly to a hospital using quick, but gentle transport.

24.4 More Information

DVGW Data Sheet W 624 " Chlorine dioxide metering systems",
Edition 02/2012.

DVGW Worksheet W 224 "Chlorine dioxide in water treatment"

Accident prevention regulation "Chlorination of water" (GUV 8.15)

Ullmann Volume 5, Page 551

Kühn-Birett, Sheet C 20

Note:

The information is based on our state of knowledge at the time of these operating instructions going to print. It is intended to contribute to the safe handling of aqueous chlorine dioxide solution and, as such, does not have the purpose of ensuring certain properties. Automatic correction upon revision is not guaranteed, also legally non-binding.

This data should only be regarded as an initial starting point for operators. The operator should also himself obtain the latest information, especially safety information about chlorine dioxide solutions.

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