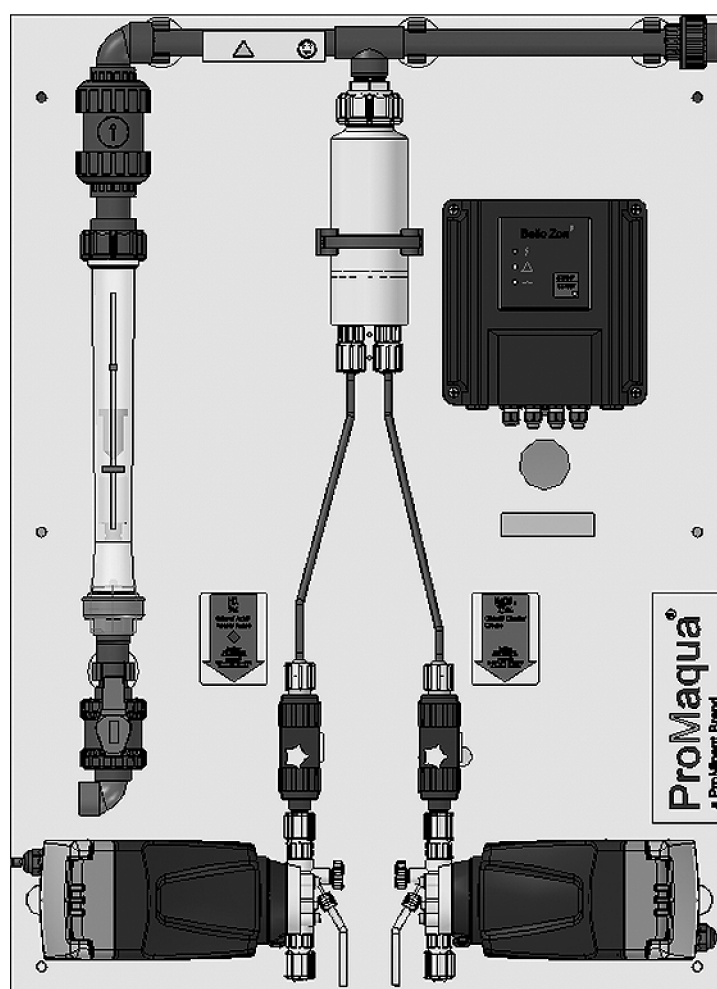


Operating instructions

Chlorine Dioxide Systems

Bello Zon® Type CDEb

EN



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.
The latest version of the operating instructions are available on our homepage.

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 IdentificationCDEb...

| Type | Max. ClO ₂ capacity | Order No. |
|-------------|--------------------------------|-----------|
| CDEb... 30 | 30 g/h | 1079438 |
| CDEb... 75 | 75 g/h | 1079439 |
| CDEb... 200 | 200 g/h | 1079440 |

2 About this system

Connection-ready complete Bello Zon® CDEb... chlorine dioxide systems are used in the continuous production and metering of 5 to 200 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[®] CDEb... 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® CDEb... 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.



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 CDEb...
- Operating instructions for the solenoid metering pump gamma/X
- 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, rawlplugs, washers and nuts (mounting kit = plastic bag with fixings and threaded cable connectors...).

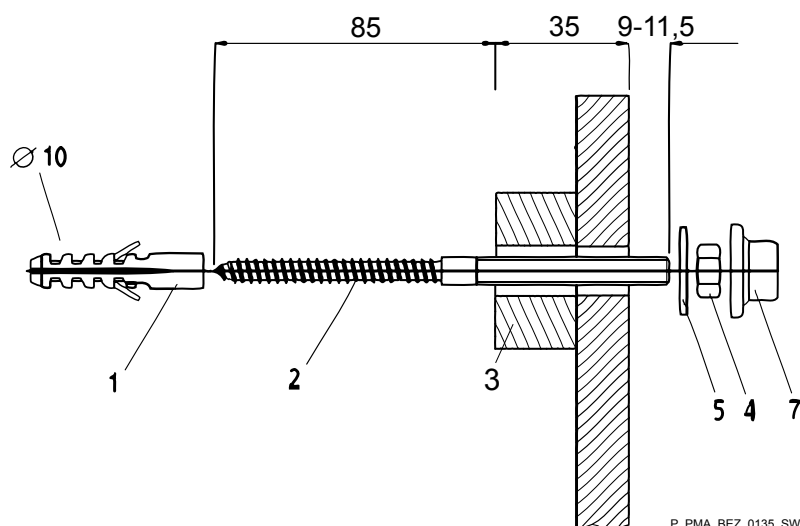
6 spacers are also supplied with the system.

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).



P_PMA_BEZ_0135_SW

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


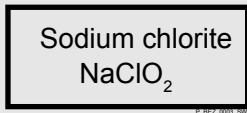
Observe the regulations that apply where the device is installed.

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

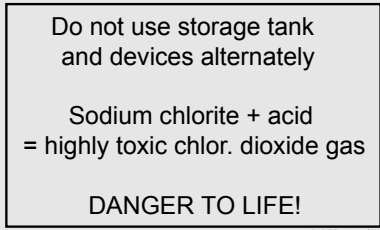
a) Attach both these signs together at the entrances to rooms in which Bello Zon® chlorine dioxide systems are set up:

| Warning sign * | Warning label * | Included text |
|---|---|--|
|  | <div style="border: 1px solid black; padding: 5px; width: fit-content;">Chlor. dioxide equipment Access only for trained personnel <small>P_BEZ_0004_SW</small></div> | 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!"

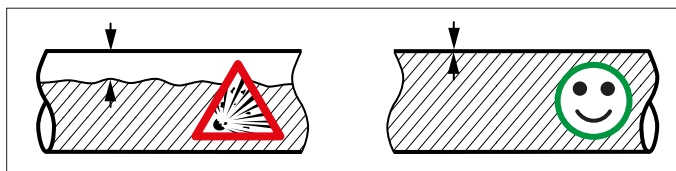


Fig. 3

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 information



DANGER!

Warning of hazardous chlorine dioxide vapours

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

- Only use PVC or PVDF pipes for the bypass line. Chlorine dioxide seriously corrodes other materials.
- 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, there can be uncontrolled siphoning of chemicals if the bypass line of the Bello Zon[®] system is subject to negative pressure. Consequently, chlorine dioxide can gas out if a high vacuum pressure occurs at the same time as a gas/water mixed phase is formed. Under unfavourable circumstances, the critical gas concentration of 300 g/m³ is exceeded and the reactor can explode.

- Take appropriate measures to ensure that the bypass line of the Bello Zon[®] system is not subject to vacuum pressure (for example, by installing 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 de-energises the system if the bypass line is not completely full.

Main components

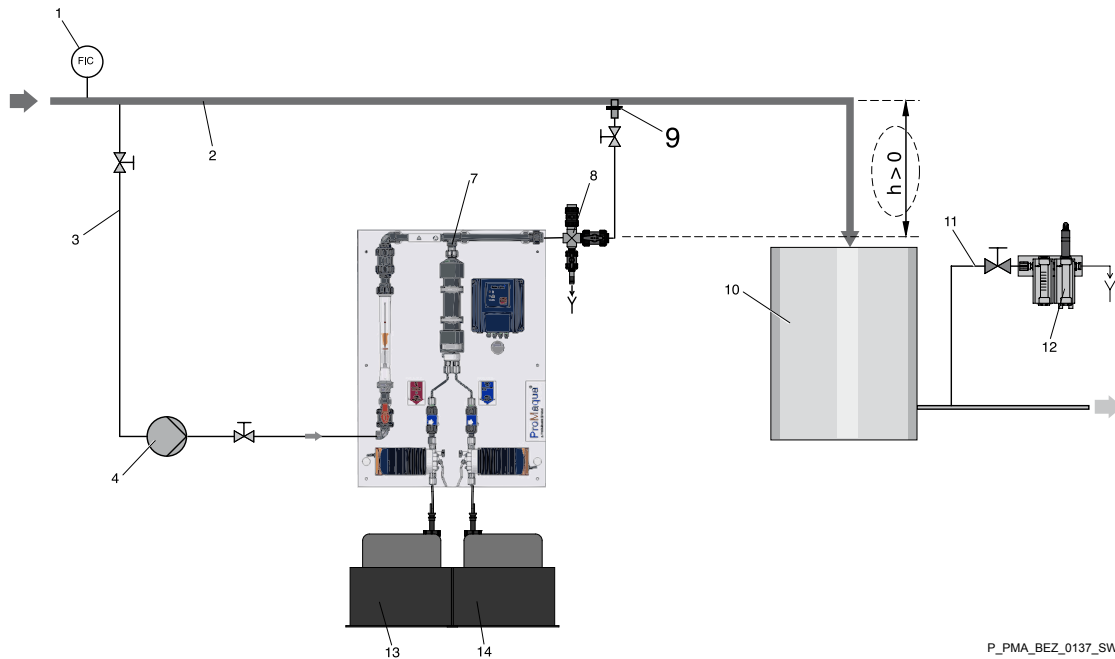
The following components must be hydraulically installed:

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

- Point of injection
- Flushing assembly 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 line | 11 Sample water line |
| 3 Bypass line | 12 Chlorine dioxide measuring point (for example with CDE sensor) (accessories) |
| 4 Bypass pump (accessories) | 13 Acid in safety tank (accessories) |
| 7 Reactor outlet valve | 14 Chlorite in safety tank (accessories) |
| 8 Flushing assembly with vacuum relief valve (accessories) | 16 Back pressure valve (accessories) |
| 9 Point of injection (flange and immersion pipe) (accessories) | |

Installation example B

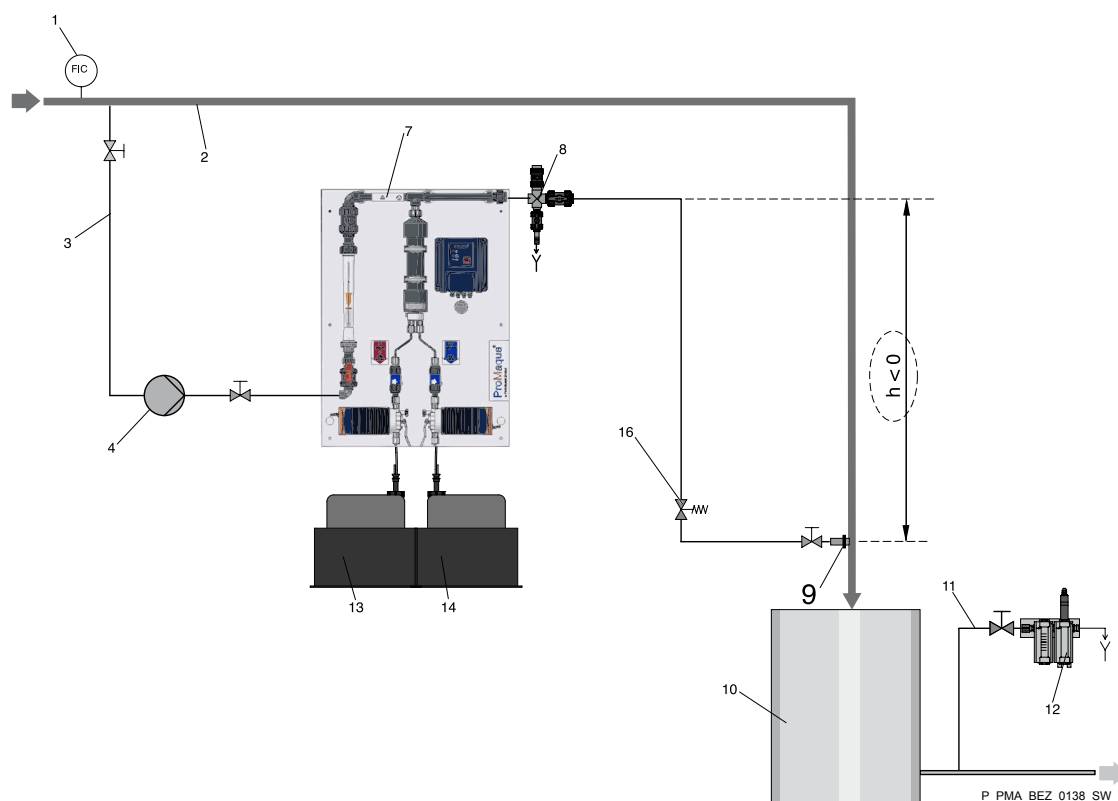


Fig. 5: Installation example B: the reactor outlet valve (7) of the Bello Zor® system is located above the point of injection (9): Back pressure valve (16) and vent valve (8) required in the bypass line.

7.1.1 Bypass line

**DANGER!****Warning of hazardous chlorine dioxide vapours**

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

- Only use PVC or PVDF pipes for the bypass line. Chlorine dioxide seriously corrodes other materials.
- 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!

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 could then lead to an unacceptably high concentration of chlorine dioxide in the bypass line. If the bypass line is not completely filled with water, a critical gas phase could form, resulting in an explosion in the bypass line.

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



Protect transparent pipes carrying water containing ClO_2 against light radiation (direct sunlight, fluorescent tubes, ...). Otherwise the photochemical breakdown of the ClO_2 in the pipes will cause the ClO_2 concentration to fall unexpectedly at the place of consumption.

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 subjected to a vacuum.

- Therefore, install the bypass line so that a vacuum can never form nor can the line be filled incompletely, not even if the system is idle or there is a fault or malfunction.

**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.

- Ensure on site that the bypass line is always filled with water.
- Incorporate the chlorine dioxide system in the installation environment so that, even in the event of unplanned chlorine dioxide production, a concentration of greater than 3 g/l cannot be produced.
- 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 increased 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 CDEb... 30

| Data | Value | Unit |
|-------------------------|--------------|------|
| Nominal width | DN20 | |
| Diameter | 25 | mm |
| Min. operating pressure | 1.5 | bar |
| Max. operating pressure | 8 | bar |
| Pressure stage* | PN16 | |
| Flow | 100 ... 1000 | l/h |

* with PVC lines

Bypass line specifications for CDEb... 75

| Data | Value | Unit |
|-------------------------|--------------|------|
| Nominal width | DN20 | |
| Diameter | 25 | mm |
| Min. operating pressure | 1.5 | bar |
| Max. operating pressure | 8 | bar |
| Pressure stage* | PN16 | |
| Flow | 200 ... 1000 | l/h |

* with PVC lines

Bypass line specifications for CDEb... 200

| Data | Value | Unit |
|-------------------------|--------------|------|
| Nominal width | DN20 | |
| Diameter | 25 | mm |
| Min. operating pressure | 1.5 | bar |
| Max. operating pressure | 8 | bar |
| Pressure stage* | PN16 | |
| Flow | 350 ... 1000 | l/h |

* with PVC lines

There is a particular risk of a vacuum, especially if the water is stationary, where:

- 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 line runs beneath the Bello Zon® system's reactor outlet valve
- 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 20, 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.

Supplement the chlorine dioxide system with safety-relevant accessories, depending on the application and the particular conditions of the installation site.

7.1.3 Flushing assembly with vacuum relief valve (accessories)

Install a flushing assembly complete with vacuum relief valve in the bypass line downstream of the Bello Zon® system, see ↗ „*Installation examples*“ on page 20, 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 be subjected to 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 the ClO₂ solution out-gassing if the bypass line is under vacuum.

- Provide the vacuum relief valve with a protective cover if dirt can enter 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 (accessories)

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 the design with no back pressure to ensure that this 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 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 then be locked by the Bello Zon® system's control.

When installing a bypass pump, we recommend fitting an inclined seat valve to regulate the flow at the inlet to the Bello Zon® system.

7.1.6 Point of Injection (Accessories)

Install an "immersion pipe", for example, 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 delivery 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 (Accessories)

Connect a protective filter upstream if there are solid particles in the bypass water.

7.1.8 Chlorine Dioxide Detection Kit (Accessories)

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

7.1.9 Acid and Chlorite Suction Lances / Suction Assemblies (Accessories)

Safety information



WARNING!

Warning of hazardous chlorine dioxide gas

Hazardous chlorine dioxide can be produced outside the reactor.

- Assign 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 insert the suction lances into the component storage tanks yet!

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



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

3. ➤ Shorten the suction hoses so that they subsequently 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 the hose end over the nozzle (2) as far as the stop (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) onto the nozzle (3) and tighten the union nut (4).
8. ➤ Pull briefly on the suction hose (5) and tighten the union nut (4).
9. ➤ The bleed hose from the corresponding pump can be inserted into the head of the suction lance with ProMinent suction lances. This cleanly returns the feed chemical when the pump is bled.

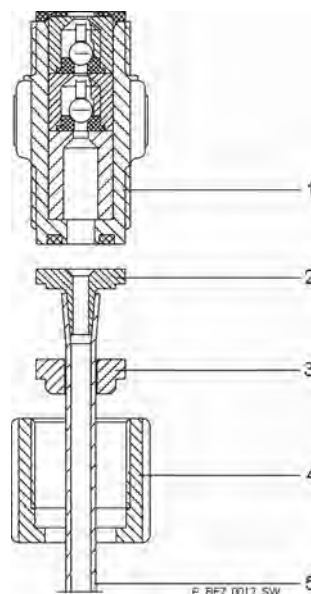


Fig. 6: Installing the hose

- 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.

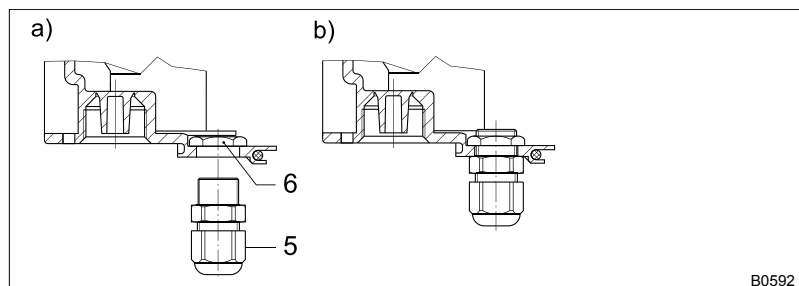


Fig. 7: Threaded connectors for signal cable (M12 x 1.5)

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

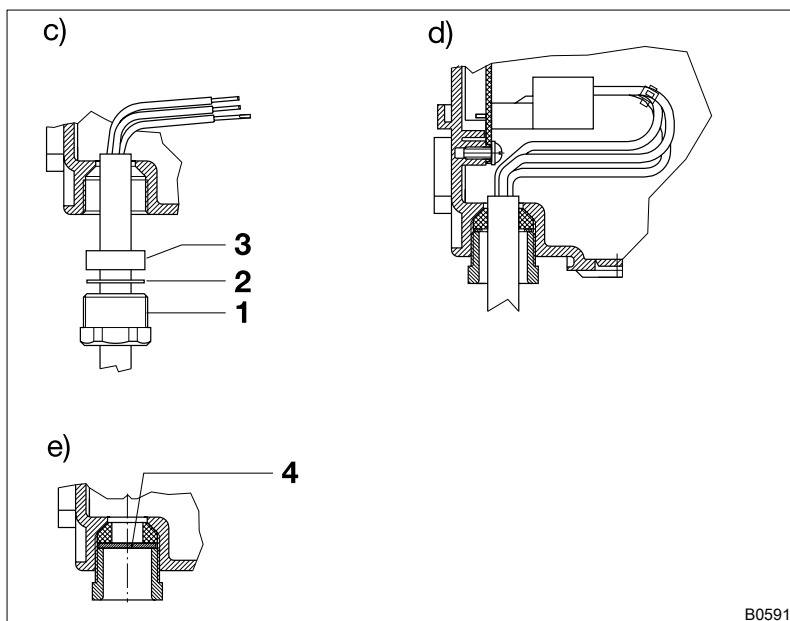



Fig. 8: Threaded connector for mains cable (M20 x 1.5)

- 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  *Further information on page 29* 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.

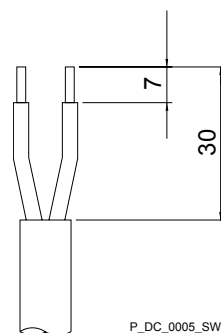


Fig. 9: Removing the cable insulation

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 tea 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

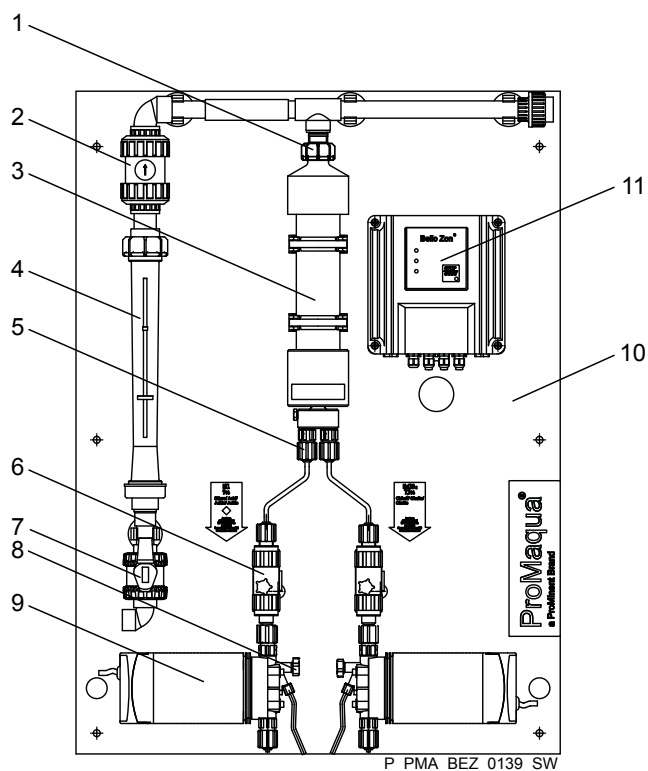


Fig. 10: CDEb...

- | | |
|-----------|----------------------------------|
| 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[®] CDEb... 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)

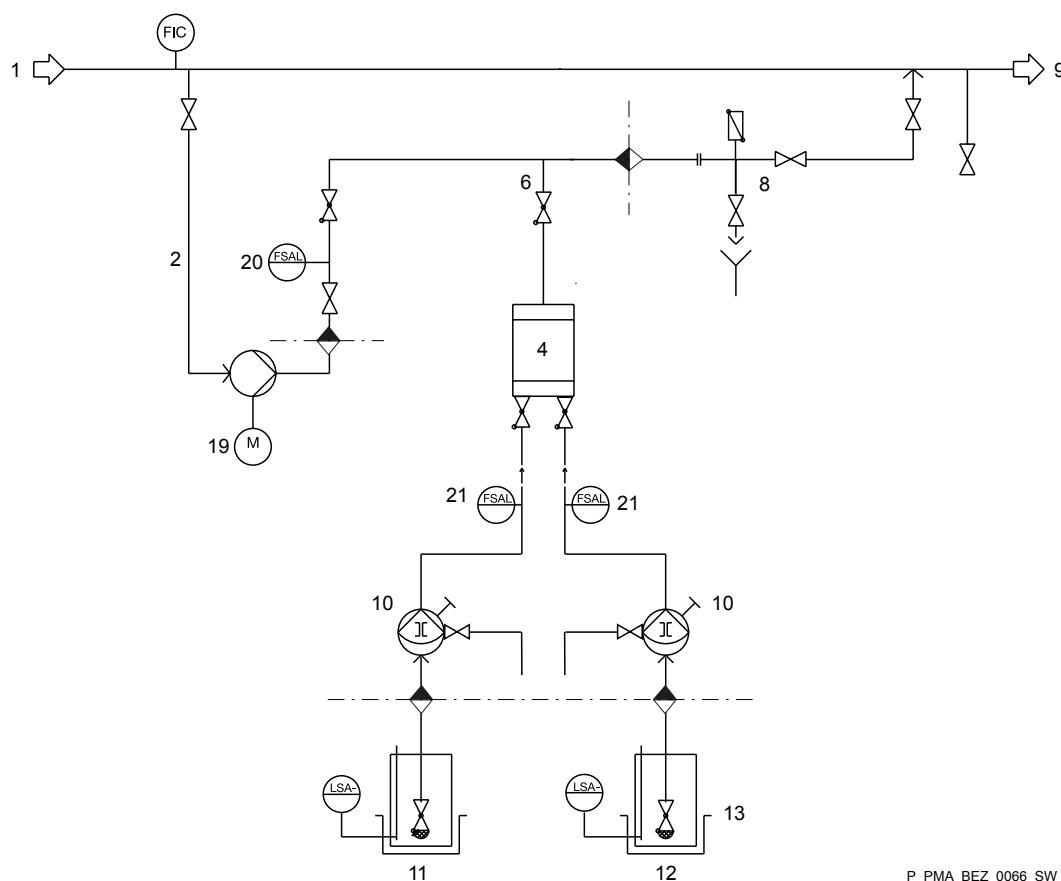


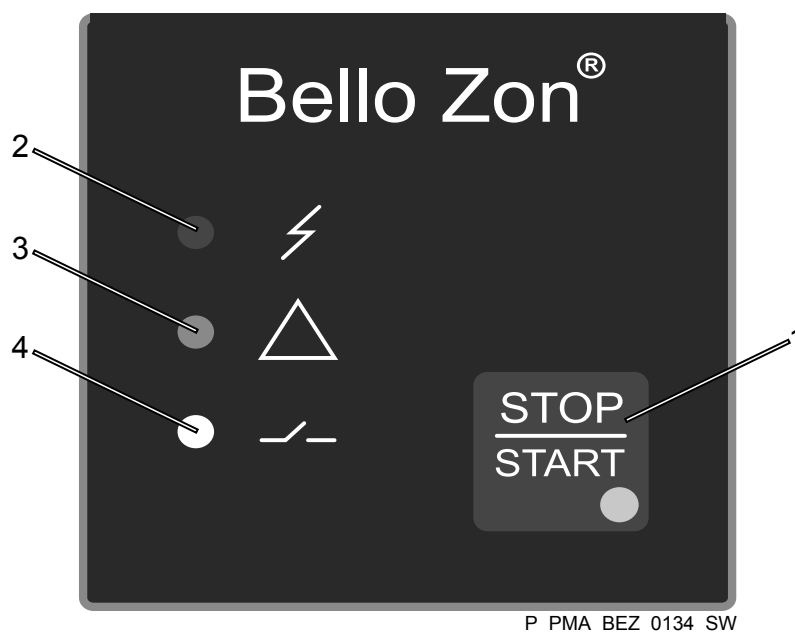
Fig. 11: Hydraulic drawing CDEb... in bypass operation

- | | |
|--|--|
| 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



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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 Setting

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/ X".

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 identical on BOTH metering pumps.
- The setting values, shown in the following set-up overview, may not be changed on the pumps.

Setup overview of mandatory settings for GMXa

| 1st level | 2nd | 3rd | 4th | 5th | 6th |
|-----------|----------------|------------------|------------------|----------------------|-------|
| Settings | Metering | Discharge stroke | fast | | |
| | | Pressure stage | 10 bar | | |
| | Inputs/outputs | Relay 1 | Relay1 type | Warning | |
| | | | Relay 1 polarity | normally-closed (NC) | |
| | | Relay 2 | Relay 2 type | Fault | |
| | | | Relay 2 polarity | normally-closed (NC) | |
| | | Flow control | Flow Control | Tolerance / strokes | 008 |
| | | | | Activation | Fault |

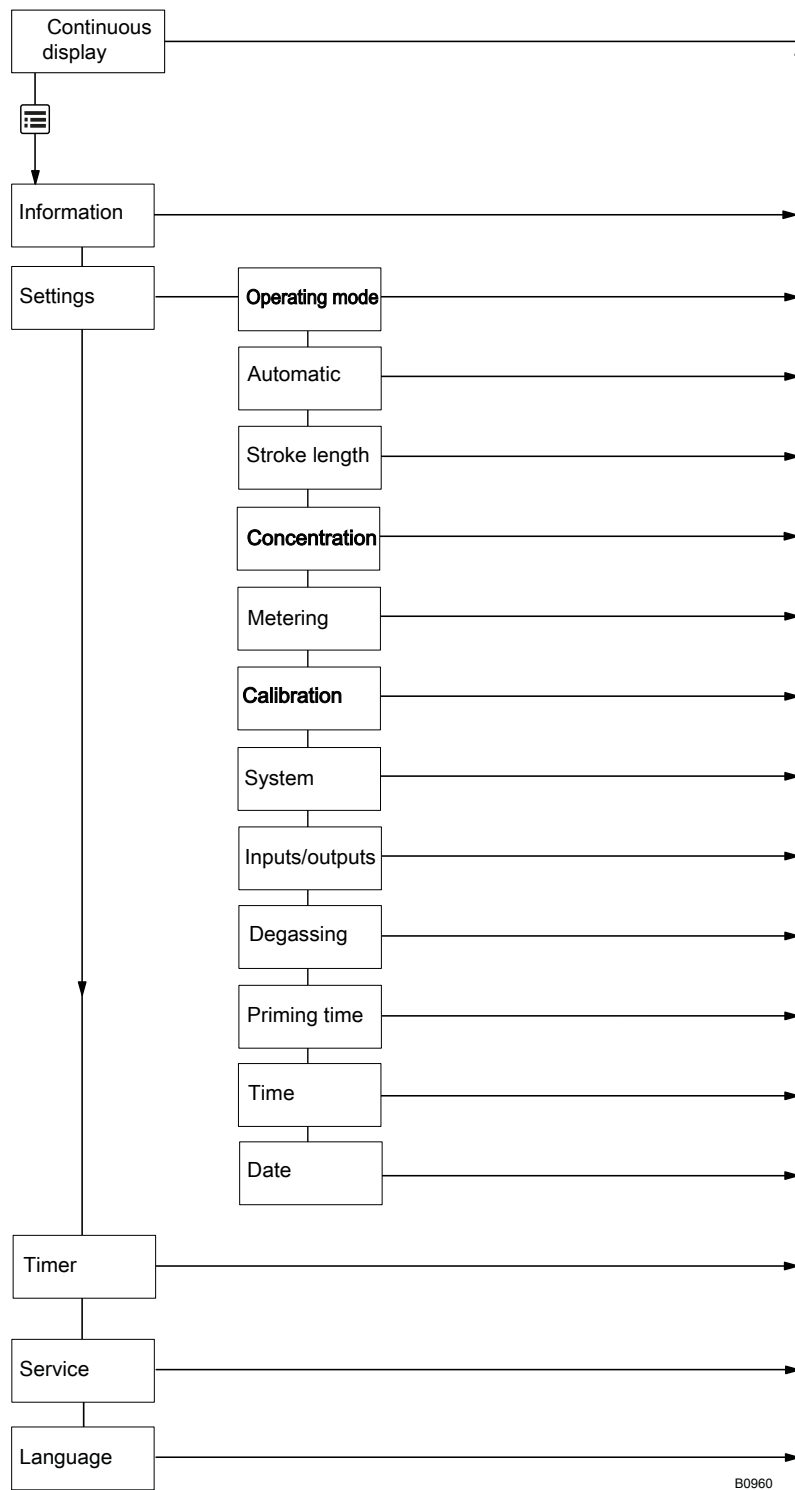


Fig. 13: Extract of gamma/ X menu overview

10.1 „Settings“ „Operating mode“ „Manual“

☰ → „Menu / Information“ → Settings → Operating mode
→ Manual → ...“

For „Operating mode“ „Manual“ (control via Pause contact).





Ex-works both pumps are set to „Operating mode“ „Manual“.

As soon as the Pause signal is cancelled, the metering pumps should meter at this capacity:

| System, type | Capacity* [l/h] | max. ClO ₂ metering* [g/h] |
|--------------|-----------------|---------------------------------------|
| CDEb 30 | 0.75 | 30 |
| CDEb 75 | 1.875 | 75 |
| CDEb 200 | 5.00 | 200 |

* at 20°C and 5 bar.

(0.025 l/h \equiv 1 g/h ClO₂)

1.  Check in the "l/h" continuous displays whether both pumps have the same capacity: Turn the [Clickwheel] to go to the "l/h" continuous display.
If the capacities differ: Press the [Clickwheel] until the figures are highlighted and use the [Clickwheel] to set the capacity so that it is identical on both pumps.
2.  Check whether the metering pumps respond as expected to these inputs.

Example: calculating ClO₂ metering


For the CDEb 200 (max. ClO₂ metering = 200 g/h).
Required = 120 g/h.

The required capacity for the pumps is:



$$X = 120 / 200 * 5.00 \text{ l/h} = 3.00 \text{ l/h}$$

If other settings are needed, set up both pumps in accordance with the "Operating Instructions for Solenoid Metering Pumps gamma/X" supplied – specifically the chapters "Selecting Operating Mode" and "Settings for „Operating modeManual“".

10.2 „Settings“ „Operating mode“ „Contact“ - „Concentration“

 \rightarrow „Menu / Information“ \rightarrow Settings \rightarrow Operating mode
 \rightarrow Contact \rightarrow ...“

Adjust this here:

1.  „Storage tank“ to „off“.
2.  Adapt „Metering volume“ to contact water meter.

10.2.1 Calibration

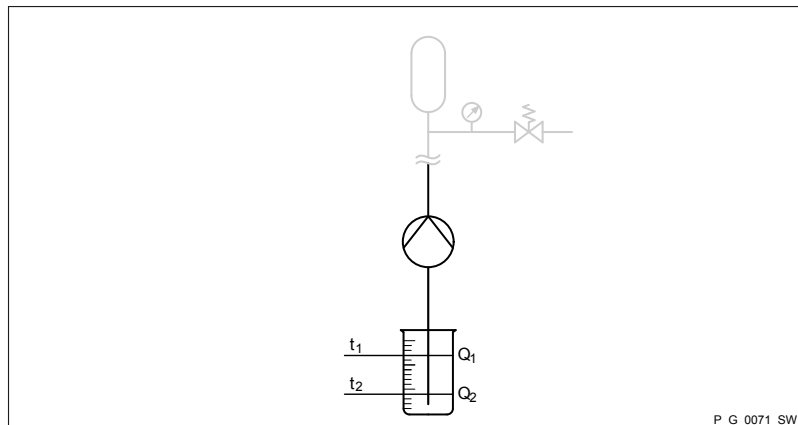
☰ → „Menu / Information → Settings → Calibration → ...“

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



WARNING!

Take appropriate safety precautions when performing the following calibration instructions. Adhere to the material safety data sheets for the feed chemical!



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Preparation

1. Use the [Clickwheel] to scroll through the continuous display to check whether litres or gallons have been selected.
2. If the incorrect volume unit is selected, correct it in the „Menu / Information → Settings → System → Volume unit“.
3. Check whether the capacity in the continuous display is not too low for calibration.
4. Lead the suction hose into a measuring cylinder filled with water.
5. Prime the water (press ►) [Prime], should the suction hose be empty.
6. Flush the system with water - refer to the "Decommissioning" chapter.
7. Allow water to flow through the bypass.
8. Set the capacities of the metering pumps to 80%.

Calibration process


1. Record the level in the measuring cylinder.
2. Select the „Menu / Information → Settings → Calibrate“, menu and press the [Clickwheel].
 - ⇒ The „Start calibration (PUSH)“ appears.
3. To start calibration, press the [Clickwheel].
 - ⇒ The „Calibrate ...“ menu item appears, the pump starts to pump and indicates the number of strokes.
4. After a reasonable number of strokes (a minimum of 200 strokes), use the [Clickwheel] to stop the pump.
 - ⇒ The „Calibration ended“ menu point appears. It demands the calibration volume to be entered.

5. ➤ Determine the required metering volume (difference between initial volume - remaining volume in the measuring cylinder).
6. ➤ Use the *[Clickwheel]* to enter this volume in the „*Calibration ended*“ menu items and close.
 - ⇒ The pumps switches to the „*Calibration result*“ menu item - the pump is calibrated.
7. ➤ Press the *[Clickwheel]*.
 - ⇒ The pump returns to the „*Menu / Information* ➔ *Settings*“ menu.
8. ➤ Calibrate the other pump.


10.2.2 Settings for the function „*Concentration*“ - „*Operating mode*“ „*Contact*“

 ➔ „*Menu / Information* ➔ *Settings* ➔ *Concentration* ➔ ...“





Requirements:

- „*Operating mode*“ - „*Contact*“ has been run through
 - Metering pump is calibrated
 - Metering pump is set to metering mode „*Automatic*“ - „*on*“
1. ➤ Select „*Concentration*“ in the „*Set up*“ menu.
 2. ➤ Actively set „*active*“ in the „*Concentration control*“ menu item and press the *[Clickwheel]*.
 3. ➤ Adjust the „*Contact interval*“ as per the contact water meter and press the *[Clickwheel]*.
 4. ➤ Set the „*Concentration of feed chemical*“ to “004.00” and press the *[Clickwheel]*.
 5. ➤ Set the „*Density dosing medium*“ to “1.05” and press the *[Clickwheel]*.
 - ⇒ The „*Concentration*“ menu appears.
 6. ➤ Press *[Menu]* .
 - ⇒ A continuous display appears.
 7. ➤ Set the other metering pump in the same way.
 8. ➤ Check whether the metering pumps respond as expected to these inputs.
 9. ➤ Turn the *[Clickwheel]* to change to the “Concentration” continuous display, press the *[Clickwheel]* until the figures are highlighted and use the *[Clickwheel]* to set the concentration so that it is identical on both pumps.
 - To save, press the *[Clickwheel]*.

10.3 „*Analogue*“ (Option)

 ➔ „*Menu / Information* ➔ *Settings* ➔ *Operating mode* ➔ *Analogue* ➔ ...“

Make the following entries to control using the analogue input on both pumps:


1.  → „Menu / Information → Settings → Operating mode → Analogue → 4 - 20 mA“.
2.  → „Menu / Information → Settings → Inputs/outputs → Flow monitor → Flow Control → Activation → Active“.
⇒ Both pumps should now:
 - Be in Stop status at 0 mA.
 - Output the capacity below at 20 mA.
3.  Check whether the metering pumps respond as expected to these inputs.
4.  Check in the “l/h” continuous displays whether both pumps have the same capacity: Turn the *[Clickwheel]* to go to the “l/h” continuous display.

If the capacities differ: Press the *[Clickwheel]* until the figures are highlighted and use the *[Clickwheel]* to set the capacity so that it is identical on both pumps.

| System, type | Capacity* [l/h] | max. ClO ₂ metering* [g/h] |
|--------------|-----------------|---------------------------------------|
| CDEb 30 | 0.75 | 30 |
| CDEb 75 | 1.875 | 75 |
| CDEb 200 | 5.00 | 200 |

* at 20°C and 5 bar.

(0.025 l/h \cong 1 g/h ClO₂)

-  The “Signal current” secondary display shows the incoming current (press the *[Clickwheel]* until a small chain of circles appears. Turn the *[Clickwheel]* until the “Signal current” secondary display appears and then press the *[Clickwheel]*.)

Example: calculating ClO₂ metering

For the CDEb 200 (max. ClO₂ metering = 200 g/h).
Required = 120 g/h.

The required capacity for the pumps is:

$$X = 120 / 200 * 5.00 \text{ l/h} = 3.00 \text{ l/h}$$

If other settings are needed, set up both pumps in accordance with the “Operating Instructions for Solenoid Metering Pumps gamma/X” supplied – specifically the chapters “Selecting Operating Mode” and “Settings for „Operating mode“ „Manual“”.

11 Start up

Safety information



WARNING!

- Carefully read through this entire chapter prior to start up.
- Only service personnel, authorised by ProMinent, should carry out initial commissioning.
- The Service personnel 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 canisters after 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.

- The maximum permissible operating pressure for the system may not be exceeded at any operating status.
- The entire installation should remain leak-tight when operated at maximum operating pressure.
- Carefully open all shut-off devices in the bypass prior to start-up.
- Check the design of the hydraulic connectors.

Note for the system operator

During start up, adhere to the instructions specified in the following regulations, among others:

- a) - Accident prevention regulations (in Germany: GUV 8.15 and/or VGB 65): Only start up chlorination systems after they have been checked by a technical expert to ensure they are in a correct and proper state and have undergone leak testing. Ensure that chlorination systems are checked for safety by a technical expert prior to each re-commissioning. Only appoint personnel to operate and maintain chlorination systems and handle chemicals, who have been instructed in these matters and who can be expected to reliably fulfil their duties.
- b) - The Ordinance on Hazardous Substances The German Ordinance on Hazardous Substances (GefStoffV)
- c) - Requirements relating to starting chemicals - see chapter
- d) - All other local regulations governing these installations outside Germany

11.1 Installation - final steps

- 1.** ➤ First connect the water canisters instead of the chemical storage tanks.
- 2.** ➤ Check the design of the hydraulic connectors.
- 3.** ➤ Check the design of the electrical connectors.
- 4.** ➤ Connect the Bello Zon® system to the mains/power supply (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 whether all settings are correct on the metering pumps - refer to the "Setting" chapter.

11.2.2 "Contact"- "Concentration" Control Mode (via a Water Meter)

Enter these settings at the metering pumps - refer also to the "Settings" chapter of the "Operating Instructions for Solenoid Metering Pumps gamma/ X, GMXa":

1.  → „Menu / Information → Settings → Operating mode → Contact → Storage tank → Off“ and adjust the „Metering volume“ at the water meter.
2.  → „Menu / Information → Settings → Concentration → Control of conc. → Active“ and adjust the „Contact interval“ at the water meter.

Enter the „Conc. of feed chemical“: 004.00 %.

Enter the „Density dosing medium“: 1.05 kg/l.



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

11.2.3 "Analogue" Control Mode (via 0/4-20 mA Signal)



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

11.3 Starting the System

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

1.  Place each suction lance in its own bucket full of clean water.
2.  Connect a proprietary drainage method to each bleed valve for each individual chemical.

3. ➤ Slightly open the bleed valve on the acid pump (in an anti-clockwise direction).
4. ➤ Press both *[arrow keys]* on the acid pump then wait until the suction line and liquid end are free from bubbles.
5. ➤ Close the bleed valve, by turning in a clockwise direction.
6. ➤ Repeat these steps on the chlorite pump.

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 "Manual" operating mode to operate at 180 strokes/min and 80% stroke length until water escapes from the bypass (at a downstream valve, e.g. 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 metering monitors Flow Control:

1. ➤ Remove the metering monitor cable from the metering pump (to temporarily disable the metering monitor).
2. ➤ Turn the rotary dial fully to the left ("-").
3. ➤ Enter the required operating pressure on the discharge line.
4. ➤ Re-insert the metering 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 pan (accessories) | Remove the intact storage tank from dry safety collecting pan. Fill the safety collecting pan with water up to the edge and inspect for leaks. |
| Acid and chlorite level switches (accessories) | <p>Slowly withdraw the acid suction lance from the filled storage tank. The warning LED should light up red and the alarm relay should switch.</p> <p>Repeat the entire process with the chlorite suction lance.</p> |
| Metering monitors Flow Control | <p>Turn the setting dial on a metering monitor to the right - the corresponding pump should stop after 8 defective strokes. Simultaneously, the LCD screen displays "Error" and "FLOW", the fault indicator lights up red and the alarm relay switches.</p> <p>Turn back the setting dial of the metering monitor and press <i>[P]</i> on the pump.</p> <p>Now check the other metering monitors.</p> |
| Bypass monitor | <p>Slowly close the stopcock upstream of the flow meter float. The white "Pause" LED lights up and the CDEb... stops.</p> <p>Open then stopcock and the CDEb... starts running again.</p> |
| Gas detector (accessories) | Test the gas detector and its sensor in line with the operating instructions. |
| Interruption of chemical supply (on site) | Set up the chemical supply with the metering pumps in such a way that it can be reliably interrupted as soon as there is insufficient water in the bypass. |



CAUTION!

The operator should conduct a safety review of the overall system with systems connected up in a way different to that described here.

11.5 Installation of the chemical canisters

1. ➤ Use *[START/STOP]* to switch off production on the control.
⇒ The green LED goes out.
2. ➤ Position the chemical canisters under 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 Generation

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 colorimetric measuring device; ClO₂ tends to outgas, especially at water temperatures of > 25 °C!
3. ➤ Immediately measure the ClO₂ content of the sample using a colorimetric measuring device, 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 decompose in an explosive manner.

- Never bring the two components, hydrochloric acid (HCl) and sodium chlorite (NaClO₂), 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. This can generate large volumes of hazardous ClO₂ gas.

- 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.

- Never allow the maximum permissible operating pressure for the system to be exceeded at any operating status.
- The entire installation should remain leak-tight when operated at maximum operating pressure.

12.1 Replacing chemical canisters

Safety information

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

If the Bello Zon® CDEb... 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® CDEb... 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, on left),
Blue for chlorite (NaClO₂, right).
- Never place both suction lances in the same vessel or swap 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 the "Technical Data" chapter

Instructions

1. ➤ Use *[START/STOP]* to stop production.
⇒ The green "Operation" LED goes out.
2. ➤ Carefully remove each suction lance out of its chemical canister. Raise slowly, keep vertical!
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 (on left), blue for chlorite (on right)!
6. ➤ Slowly raise each suction lance, hold vertical and insert into the corresponding chemical canister.
Red stands for acid, blue for chlorite!
7. ➤ Check the suction lines for air bubbles, bleed as necessary (as described in the next chapter).
8. ➤ Use *[START/STOP]* 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 to 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.

12.3 Setting the Metering Monitor Flow Control

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

1. ➤ Remove the metering monitor cable (to temporarily disable the metering monitor).
2. ➤ Turn the rotary dial fully to the left ("-").
3. ➤ Enter the required operating pressure on the discharge line.
4. ➤ Set the required capacity on the operating pump (using the stroke; frequency also possible with analogue).
5. ➤ Re-insert the metering 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 the sensors with metering dependent on measured values. The interval depends on national regulations or process conditions - see the sensors' operating instructions.

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 CDEb... 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 information


WARNING!
Hazardous ClO₂ can escape

If maintenance is missed 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 pipes 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/power supply leads should only be replaced by Service.
- Only use the appropriate special cabling.

NOTE for the system operator

Have chlorine dioxide systems regularly checked for safety by a technical expert, but in any event at least annually and before any recommissioning - for example also in compliance with German accident prevention regulations [UV 8.15 or VGB 65 § 19 (2).

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

14.1 Inspection Work by the Operator

| Interval | Maintenance work | Personnel |
|--|---------------------------------------|----------------------|
| Daily to weekly, depending on the operating conditions | System inspection - see below. | Instructed personnel |
| | Metering pump inspection - see below. | Instructed personnel |
| | Cleaning of the housing - see below. | Instructed personnel |

Inspecting the system

1. ➤ Check the ClO_2 concentration in the water treated; 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.

Inspecting the metering pumps

1. ➤ Check the dosing head screws for correct seating.
2. ➤ Check the metering lines on both the discharge and suction sides for correct fit.
3. ➤ Check the discharge valve and suction valves for correct fit.
4. ➤ Check for moisture in the leakage hole of the backplate. There has probably been a diaphragm rupture if moisture is present.

Cleaning the housing

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



CAUTION!

Solvent can attack the surfaces.

- Never 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 maintenance 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 10 years | Replace the reactor. Replace the bypass pipework not if not previously. | Customer Service department |

Concluding maintenance

- Sign the completed maintenance report.

Maintenance kits for CDEb... systems

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

Maintenance kits

| Complete maintenance kit for | Order No. |
|------------------------------|-----------|
| CDEb... 30 | 1079466 |
| CDEb... 75 | 1079466 |
| CDEb... 200 | 1079467 |

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.



- 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 escapes from the back-plate of a metering pump. | The liquid end leaks at the diaphragm. | Re-tighten the Allen screws on the dosing head. If this is unsuccessful, inform Service. | Instructed personnel |
| The metering pump has been working for some 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 |

| Fault description | Cause | Remedy | 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 Solenoid Metering Pump gamma/ X".

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 to prevent switching on again.



WARNING!

Danger of electric shock

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

- Switch the corresponding power supply to a de-energised state and secure to prevent switching on again.



WARNING!

Warning of the risk of fire and malfunction

Fire risks and malfunctions can result from the use of incorrect fuses.

- Only use approved ProMinent original fuses, see [Chapter 16.4 „Replacing the Mains Fuse Box“ on page 58](#). Only in rare cases will any other fuse, with the values given below, have exactly the same properties!

Permitted fuse for the Bello Zon®
CDEb... (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 Over Shorter Periods

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



Press [START/STOP].

⇒ 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 by the control 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 assembly in the bypass line for this purpose, if this equipment has been fitted.

Safety information

**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 device. pH indicator paper, although it is bleached by ClO_2 !
- 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 H_2O_2 30% (Xi, irritating) - see table for quantities
- Sodium perborate $\text{NaBO}_3 \cdot 4 \text{H}_2\text{O}$ - see table for quantities

Protective equipment as per the safety data sheets for the ClO_2 solution.

1. ➤ Use *[Start/Stop]* 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. ➤ Dissolve the specified quantities of sodium hydroxide NaOH and hydrogen peroxide H_2O_2 or sodium perborate $\text{NaBO}_3 \cdot 4 \text{H}_2\text{O}$ in it.
7. ➤ Connect the PVC hose to the flushing valve and immerse it in 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 is no more yellow solution in the PVC hose, press *[START/STOP]* 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_2O_2 30 % | $\text{NaBO}_3 \cdot 4 \text{H}_2\text{O}$ | |
|-------------|----------------|-----------------------|-----------------|-------------------------|----------|-----------------------------|--|----|
| | l | g | l | l | ml | ml | g | ml |
| CDEb... 30 | 0.17 | 3.5 | 5 | 3 | 14 | 3 | 26 | 15 |
| CDEb... 75 | 0.38 | 8 | 5 | 3 | 28 | 6 | 52 | 30 |
| CDEb... 200 | 01.0 | 20 | 5 | 3 | 76 | 17 | 140 | 82 |

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



H₂O₂ can also be used in place of sodium perborate.

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.



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 | | | HxWxD |
| | g/h | g/d | bar | mWS | mm |
| CDEb... 30 | 5 ... 30 | 10 | 7 / 8** | 2.0 | 958x700x250 |
| CDEb... 75 | 10 ... 75 | 20 | 7 / 8** | 2.5 | 958x700x250 |
| CDEb... 200 | 20 ... 200 | 40 | 7 / 8** | 3.0 | 958x700x250 |

* 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

*** Priming lift at 100% stroke length.

without bypass pump and flushing assembly.

Weight

Weight in kg, without packaging

| CDEb... | 30 | 75 | 200 |
|---------|----|----|-----|
| Weight | 23 | 24 | 27 |

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 to be treated: | 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, $\pm 10\%$ | 100 ... 230 | V |
| Mains frequency | 50 / 60 | Hz |
| Data | Value | Unit |
| Max. power consumption | 0.7 | A |

Permitted fuse for the Bello Zon® CDEb... (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 | k Ω |
| Max. pulse frequency | 25 | pulse/s |
| Min. pulse duration | 20 | ms |

Control via:

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

**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 |
| Min. 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 Dimensional drawing

Dimensional drawing CDEb...

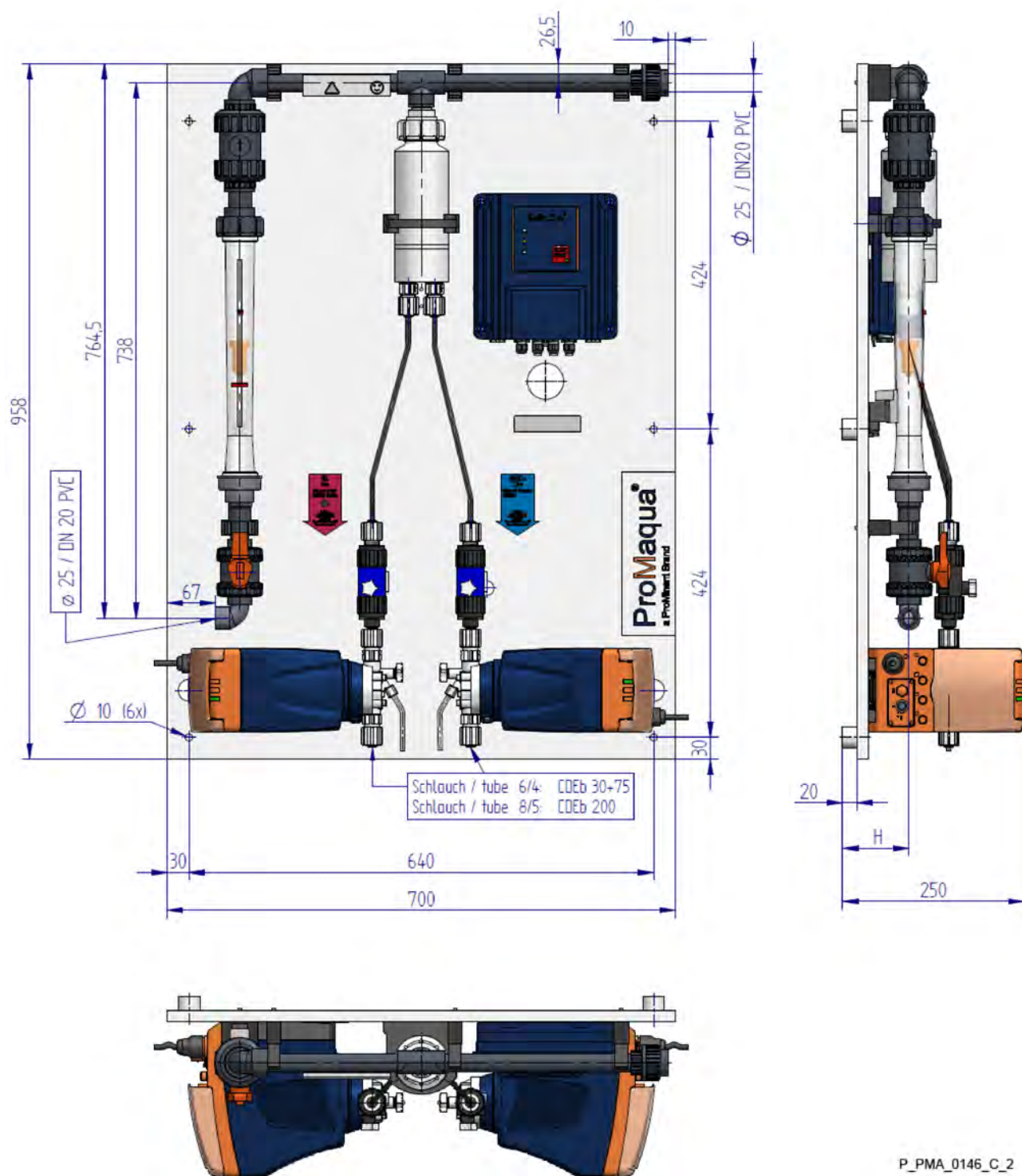


Fig. 14: Measures in mm

| | CDEb... 30 | CDEb... 75 | CDEb... 200 |
|---|------------|------------|-------------|
| H | 99 | 91,5 | 104 |



Assignment of threaded connectors

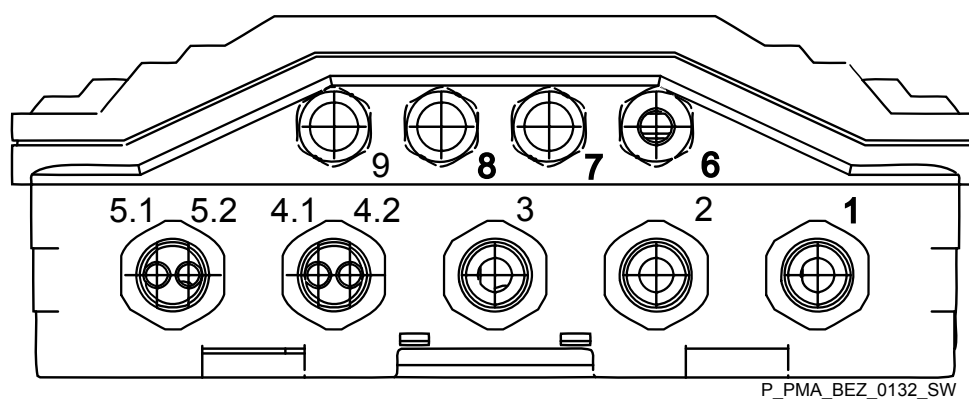


Fig. 16: Assignment of threaded connectors for customers

| 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 |

22 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, Germany,

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. Any modification to the product not approved by us will invalidate this declaration.

Extract from the Declaration of Conformity

| | |
|--|---|
| Designation of the product: | Chlorine dioxide generation system Bello Zon® |
| Product type: | CDEb... |
| Serial number: | see nameplate on the device |
| Relevant EC directives: | EC Machinery Directive (2006/42/EC) EU-EMC Directive (2014/30/EU) EU Pressure Equipment Directive (2014/68/EU) EU RoHS Directive (2011/65/EU) Compliance with the protection targets of the Low Voltage Directive 2014/35/EU 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 60204-1:2006 + AC:2010 EN 61529:1991 + AC:2016 EN 61000-6-2:2005 EN 61000-6-4:2007 + A1:2011 |
| Date: | 06.03.2017 |

You will find the Declaration of Conformity to download on our homepage.

23 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/m^3 . Consequently, if preparation is carried out correctly, this will rule out explosive decomposition in both the gas chamber and in the stock solution.

23.1 Physical and chemical properties

23.1.1 Chemical characterisation

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

23.1.2 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/m^3 ($\approx 10\%$ 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°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.

23.1.3 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.

23.2 Handling aqueous chlorine dioxide solutions

23.2.1 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).

23.2.2 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.

23.2.3 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.

23.2.4 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.**

23.2.5 Disposal

See point 1.2.3

23.3 Health protection

23.3.1 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.

23.3.2 Personal protective equipment

Respiratory protection: Gas mask, filter B/grey

Eye protection: Safety goggles, face visor

Hand protection: Rubber gloves

Other: Protective clothing

23.3.3 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).

23.3.4 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.

23.4 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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