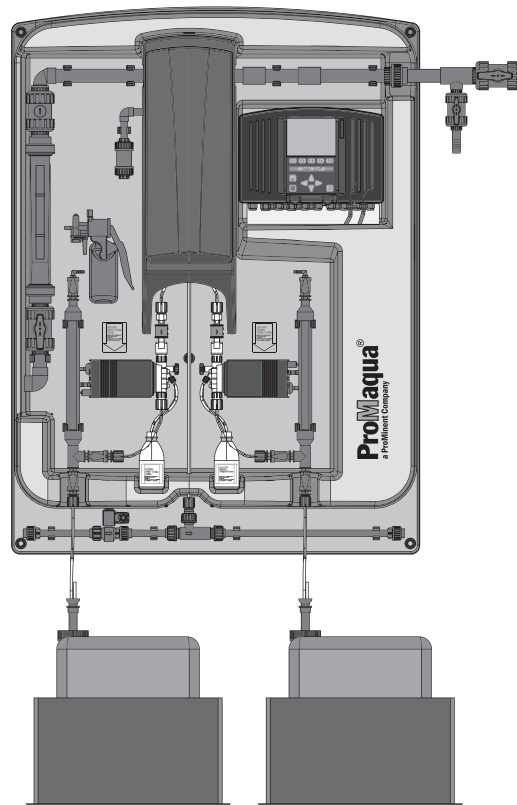


# Operating Instructions

## Chlorine dioxide systems

### Bello Zon® Type CDVc

#### Part 1



CDVc

Please enter the Identcode of your system

**For a safe and proper operation of the Bello Zon® system, Part 1 and Part 2 of the operating instructions are required.**

**Both are only valid in connection with each other.**

**Part 1 is only intended for ProMaqua service technician or qualified staff authorised by ProMaqua.**

**Please completely read through operating instructions! Do not discard!**

**The operator shall be liable for any damage caused by installation or operating errors!**

**Corporate information:**

Operating Instructions Chlorine Dioxide Systems Bello Zon® Type CDVc Part 1  
© ProMinent ProMaqua GmbH, 2008

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**Technical changes reserved.**

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1 Storage and Transport

The chlorine dioxide system Bello Zon® CDVc is supplied in a wooden outer packaging. The chlorine dioxide system must be emptied and flushed free of chemical residues before storing or transporting.

Environmental conditions for storage and transport:  
Temperature: -10 °C to +40 °C  
Humidity: < 92 % relative humidity, non-condensing  
Other: protect against direct sunlight

The scope of delivery includes in addition to the Identcode options:

- A flushing device (see Chap. 5.1.7)
- The mounting kit (mounting material and cable screw fittings)
- Labels for suction lances / suction fittings
- Danger signs (see Chap. 4-

Shipping weight (in kg, without packaging)

CDVc	20	45	120	240	600	2000
	26	27	27	45	75	120

2 Safety Chapter

Identification of the notes on safety:

The following terms are used in the present operating instructions to indicate the various severity levels of the danger:

DANGER

*Characterizes a hazardous situation. There is a danger of death or serious injuries if these notes are disregarded.*

WARNING

*Characterizes a possibly hazardous situation. Your life is in danger and there is a danger of serious injury if these notes are disregarded!*

CAUTION

*Characterizes a possibly hazardous situation. There is a danger of slight or minor injury or damage to property if these notes are disregarded!*

The following warning signs are used in the present operating instructions to indicate different types of danger:



Warning of danger area



Warning of hazardous electrical voltage



Warning of toxic substances



Warning of explosion risk



Warning of caustic substances

Please always first observe the following three basic rules:

1. The two components Bello Zon® acid (diluted HCl) and Bello Zon® chlorite (diluted NaClO<sub>2</sub>) must never get into contact beyond the reactor!  
Otherwise, toxic ClO<sub>2</sub> gas may be generated very suddenly which might explosively decompose!
2. The chlorine dioxide system Bello Zon® CDVc must never be operated with undiluted acid or undiluted sodium chlorite!  
Otherwise, toxic ClO<sub>2</sub> gas may be generated very suddenly which might explosively decompose in the reactor!
3. The bypass water may never be subjected to vacuum!  
Otherwise, the ClO<sub>2</sub> solution in the reactor may be subjected to vacuum, ClO<sub>2</sub> gasses out, accumulates, and may explosively decompose!

#### Proper use:

- The Bello Zon® system is exclusively designed to generate a ClO<sub>2</sub>-containing disinfection solution from diluted hydrochloric acid (9 %) and sodium chlorite solution (7.5 %) and to feed it into a bypass line with water.
- All other uses or modifications are prohibited!
- The Bello Zon® system is not designed to treat liquids (with the exception of water) or gaseous media as well as solids with ClO<sub>2</sub>!
- The system may not be operated beyond the scope of the conditions described in the Technical Data!
- The Bello Zon® system must only be operated by instructed persons! All other activities may only be performed by specially trained and authorised personnel (see table below)!
- You are obliged to observe the information in the operating instructions on the various life phases of the system!
- Please observe the relevant local regulations in all life phases of the system!

Activity	Training
Mounting / installation	Trained qualified employees
Initial commissioning	Customer service authorised by ProMinent ProMaqua
Commissioning	Technical experts
Operation / replacement of can	Instructed persons
Maintenance / repair	Customer service authorised by ProMinent ProMaqua
Decommissioning / disposal	Technical experts
Troubleshooting	Instructed persons

Table 1: Qualification of the personnel for the operation of the system



#### WARNING

**According to accident statistics, replacements during holiday represent a safety risk!**

**Replacements during holiday, too, must possess the above mentioned qualifications and must be trained!**

### Explanations for the table:

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

#### Note:

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

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

#### Note:

A technical training of equal qualification can also have been acquired by an activity of several years in the relevant field of work.

An **instructed person** is a person having been informed about the tasks assigned to this person and the possible hazards in case of improper behaviour and having been trained, if required, as well as having been informed about the required protective equipment and protective measures.

The **customer service** means service technicians which have been provably trained and authorised by ProMinent ProMaqua for work in the CDVc systems.

### Personal protective equipment:

- Face protection
- Rubber or plastic boots
- Protective gloves (ClO<sub>2</sub>-resistant!)
- Protective apron
- Respiratory equipment as full mask
- 1 replacement filter for each respiratory equipment



#### WARNING

- ***The operating personnel must be instructed by a ProMaqua service technician! (is done during commissioning)***
- ***The operating instructions must be kept at the system!***
- ***Danger signs must be affixed at the installation location of the CDV and the storage rooms for the chemicals! (see Part 1 of the operating instructions)***
- ***Observe national regulations!***



#### WARNING

***Danger because of toxic and explosive ClO<sub>2</sub> gas!***

***In rare cases of failure, dangerous ClO<sub>2</sub> solution might leak!***

***A safe operation is possible for all ClO<sub>2</sub> systems using a gas detector which switches off and triggers an alarm in case of a ClO<sub>2</sub> leak!***

***Install a gas detector which switches off the system in case of a ClO<sub>2</sub> leak and triggers an alarm which is noticeable from a distance!***

**Conduct For Entering an Installation Room for Chlorine Dioxide Systems:**

- Access only for instructed persons.
- If there is a smell of chlorine dioxide (pungent, chlorine-like odour), access is only permitted wearing the prescribed personal protective equipment.
- If there is a smell of chlorine dioxide, switch off the system immediately from a position where there is no danger (e.g. emergency switch which is installed at a distance from the system).

**Notes to the system operator**

Keywords for the search for the required regulations:

- Chlorine dioxide systems
- Chlorine dioxide (possibly also chlorination)
- Drinking water
- Foodstuff
- Hydrochloric acid
- Sodium chlorite
- Storage
- Dangerous substances
- Personal protective equipment:

**Information for emergencies**

- If you got into contact with acid: see EU safety data sheet acid, of the supplier!
- If you got into contact with chlorite: see EU safety data sheet chlorite, of the supplier!
- If you got into contact with  $\text{ClO}_2$  solution or  $\text{ClO}_2$  gas: see leaflet "Hazardous Materials Data Sheet Chlorine Dioxide: Properties of chlorine dioxide and notes on handling aqueous solutions" in the annex of Part 2 of the operating instructions!
- An orange-yellow coloured  $\text{ClO}_2$  gas was released: immediately vacate the room and interrupt the power supply (e.g. emergency switch)! Don the complete protective equipment and condense the gas with spray! See also leaflet "Hazardous Materials Data Sheet Chlorine Dioxide: Properties of chlorine dioxide and notes on handling aqueous solutions" in the annex of Part 2 of the operating instructions!
- An orange-yellow coloured  $\text{ClO}_2$  solution was released: immediately vacate the room and interrupt the power supply (e.g. emergency switch)! Don the complete protective equipment, pour sodium thiosulphate solution over the  $\text{ClO}_2$  solution, then dilute with a lot of water, and flush into the drain. See also leaflet "Hazardous Materials Data Sheet Chlorine Dioxide: Properties of chlorine dioxide and notes on handling aqueous solutions" in the annex of Part 2 of the operating instructions!
- The Bello Zon® system was supplied with concentrated chemicals and the metering pumps have already pumped some of it to the reactor: immediately vacate the room and interrupt the power supply (e.g. emergency switch)! Contact the fire brigade and inform about the explosion hazard caused by concentrated  $\text{ClO}_2$  gas! ( $\text{ClO}_2$  gas may explode even after several hours!) See also leaflet "Hazardous Materials Data Sheet Chlorine Dioxide: Properties of chlorine dioxide and notes on handling aqueous solutions" in the annex of Part 2 of the operating instructions!
- The Bello Zon® system was supplied with concentrated chemicals and the metering pumps have not yet started to pump: immediately set the Bello Zon® system to "Metering OFF" (Start / Stop key)! Place the suction lances in a bucket of water each and get a chemicals container with diluted chemicals. Have the concentrated chemicals disposed of by a specialist. See also leaflet "Hazardous Materials Data Sheet Chlorine Dioxide: Properties of chlorine dioxide and notes on handling aqueous solutions" in the annex of Part 2 of the operating instructions!

### 3 Requirements on the Installation Location



#### **WARNING**

***Observe the valid national and local regulations!***

***The operator of the system is responsible for the observance of these regulations!***

Requirements on the installation location:

- The chlorine dioxide system may not be installed in the open!
- It must be possible to protect the chlorine dioxide system against unauthorized access!
- The location of the chlorine dioxide system must be protected against exposure to the sun and freezing and must be well-vented.
- Below a room temperature of 10 °C (15 °C for CDVc 600 and 2000), pre-heating jackets may have to be used for the suction lines of the metering pumps.
- It must be possible to transport the component tanks to the system without any obstructions.
- An escape route must exist.
- For mounting the Bello Zon<sup>®</sup> system, a flat, vertical wall must exist.
- A water tap must exist.
- A floor drain must exist.
- A mains connection with emergency switch beyond the installation room is required.

#### **Notes to the system operator**

In the following, some regulations are listed which apply in Germany:

the accident prevention regulations (UVV) "Chlorination of Water", GUV-V D5 (formerly GUV 8.15), April 1979

"Metering systems for chlorine dioxide", DVGW leaflet W 624, DVGW e.V., Eschborn, 10/1996

"Chlorine dioxide in water treatment", DVGW Working leaflet W 224, DVGW e.V., Eschborn, 04/1986, ISSN 0176-3504

the guidelines on the protection of groundwater (§19 German Water Resources Act - WHG, as amended on September 23, 1986)

the hazardous goods regulations (GefStoffV) - in particular §17 (General Protection Duty) and §20 (Operating Instructions; see also UVV § 9).

These regulations apply in Germany.

Observe national regulations!

## 4 Mounting



### WARNING

**Danger because of unexpectedly leaking toxic chlorine dioxide solution!**

**The gaskets in contact with the chlorine dioxide solutions will leak eventually if not replaced in time!**

**The system must be installed such that it is easily accessible for maintenance work!**

The mounting kit supplied includes the required hanger screws, plugs, washers as well as nuts (mounting kit = bag with mounting material and cable screw fittings ...).

- The Bello Zon® system is to be positioned at a suitable, flat and vertical wall as close as possible to the metering station (dimension drawing see annex).
- The mounting height should be selected such that:
  - the LCD panel of the control is well readable
  - the component tanks can still be positioned below the bracket
  - the liquid level of the full component tank is below the metering pumps
  - the maximum suction height of the metering pumps is not exceeded.

Maximum suction height of metering pumps in m WC:

CDVc	20	45	120	240	600	2000
	1,8	2,0	3	3	3	1 ... 2

- after mounting, coat the metallic mounting elements with Vaseline for corrosion protection

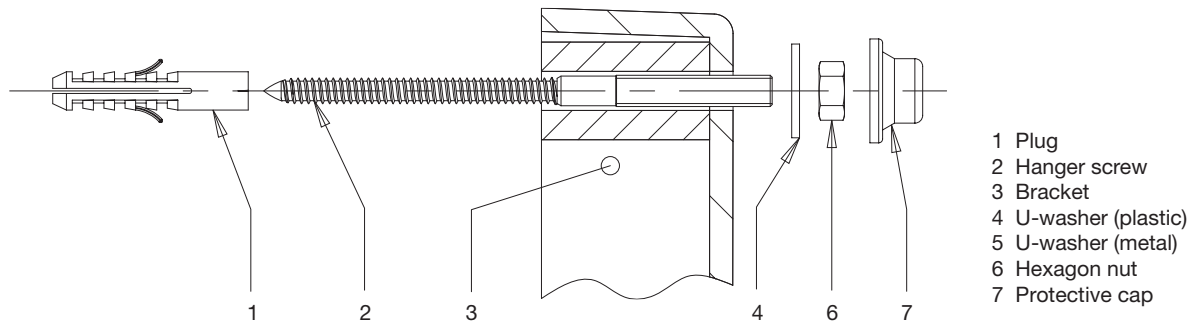


Fig. 1: Bracket mounting CDVc 20-120

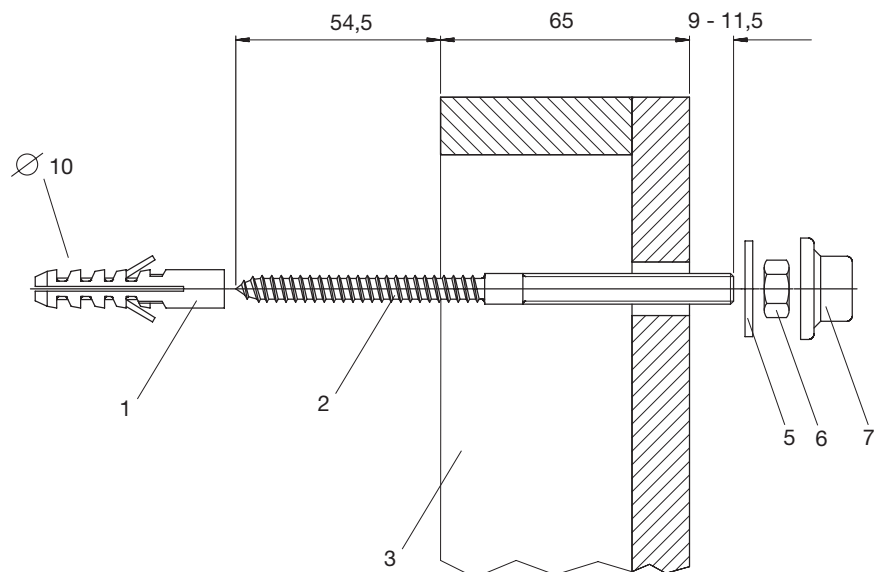


Fig. 2: Bracket mounting CDV 240-2000

- Affix the danger signs depending on national regulations well-visibly at the access to the chlorine dioxide system and the chemicals storage or other places (danger signs according to German regulations included):

- a) Affix these two signs together at the accesses to rooms where the Bello Zon® chlorine dioxide systems are installed:



**Chlorine Dioxide Systems**  
**Access only for trained personnel**

- b) Affix these two signs together at the accesses to rooms where the component Bello Zon® chlorite is stored or used:



**Sodium chlorite**  
**NaClO<sub>2</sub>**

- c) Affix this sign **in rooms** where sodium chlorite (Bello Zon® chlorite) is handled:

**Do not alternately use tanks and devices**  
**Sodium chlorite + acid = highly toxic chlorine dioxide gas**  
**DANGER TO LIFE**

These are the storage and transfer rooms as well as the room, where the chemical tank is installed, which are connected to the Bello Zon® system.

### Mounting location for gas detector (accessory)

Install the gas detector at a height of approx. 1m close to the generation system and above the storage tanks to ensure a reliable warning!

## 5 Installation



### CAUTION

*Observe the valid national and local regulations!*

### 5.1 Installation, Hydraulical



### DANGER

- *Toxic chlorine dioxide vapours may leak from broken bypass lines!*  
*Only use pipes made of PVC or PVDF for the bypass line!*  
*Chlorine dioxide heavily attacks other materials!*
- *Toxic chlorine dioxide vapours may leak from broken bypass lines!*  
*Only use PVC pipes of the pressure class PN 16 for the bypass line in order to consider in the long term the calcification of the PVC.*



### WARNING

- *The reactor may explode!*  
*An uncontrolled siphoning of the chemicals may occur if the bypass line of the Bello Zon® system is subjected to negative pressure!*  
*As a consequence, chlorine dioxide may outgas given excessive vacuum and simultaneous generation of gas/water mixed phases. Under unfavourable circumstances, the critical gas concentration of 300 g/m<sup>3</sup> can be exceeded and the reactor may explode!*  
*Take suitable measures to prevent that the bypass line of the Bello Zon® system is subjected to vacuum!*

Mainly, the following component parts are to be installed hydraulically:

- Bypass line
- Flow generator for bypass line
- Metering station
- Flushing device
- Suction lances / suction fittings
- Water supply suctioning device (option)

### Installation example A

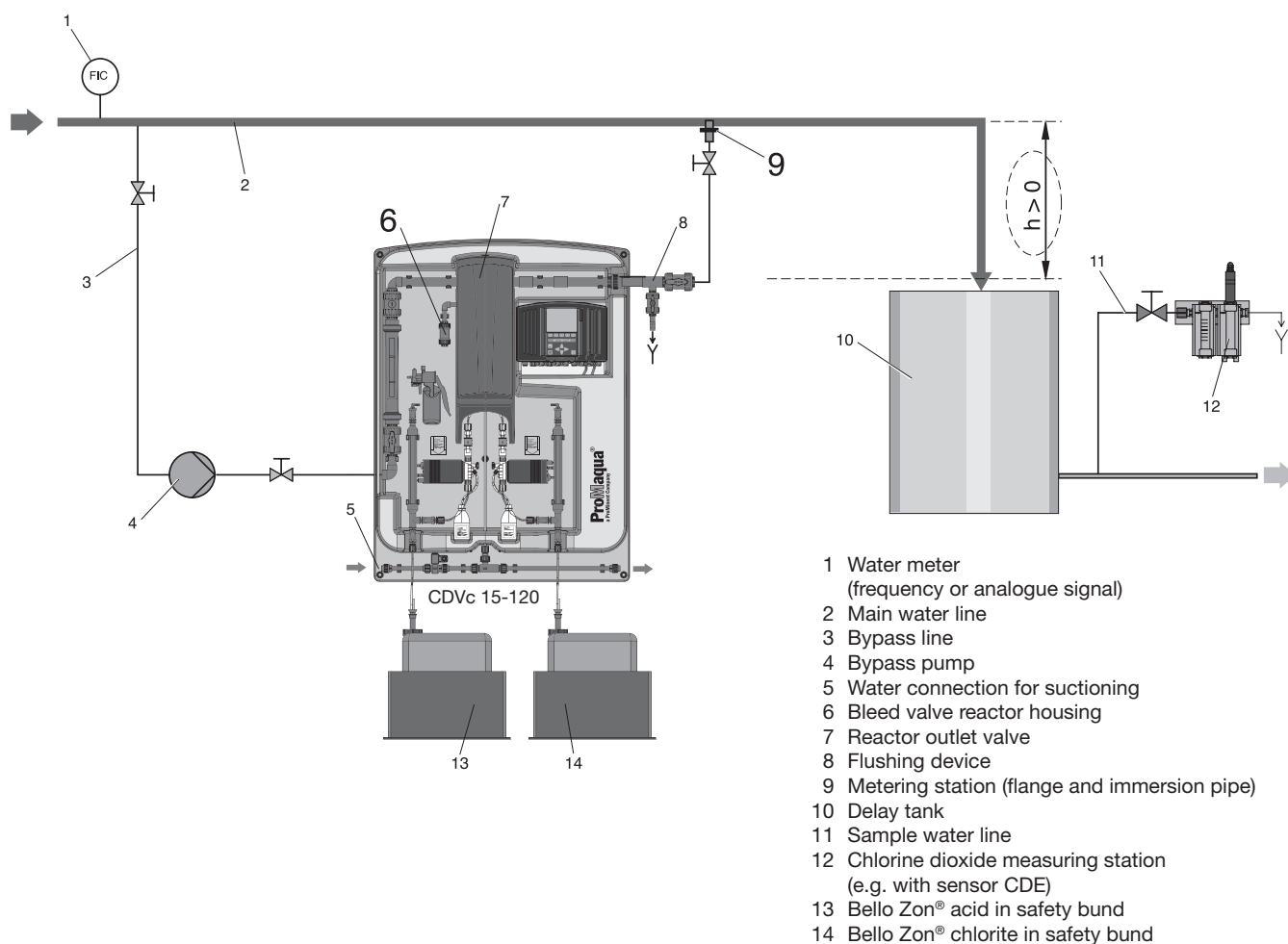


Fig. 3: Installation example A: the reactor outlet valve (7) of the Bello Zon® system is located below the metering station (9).

### Installation example B

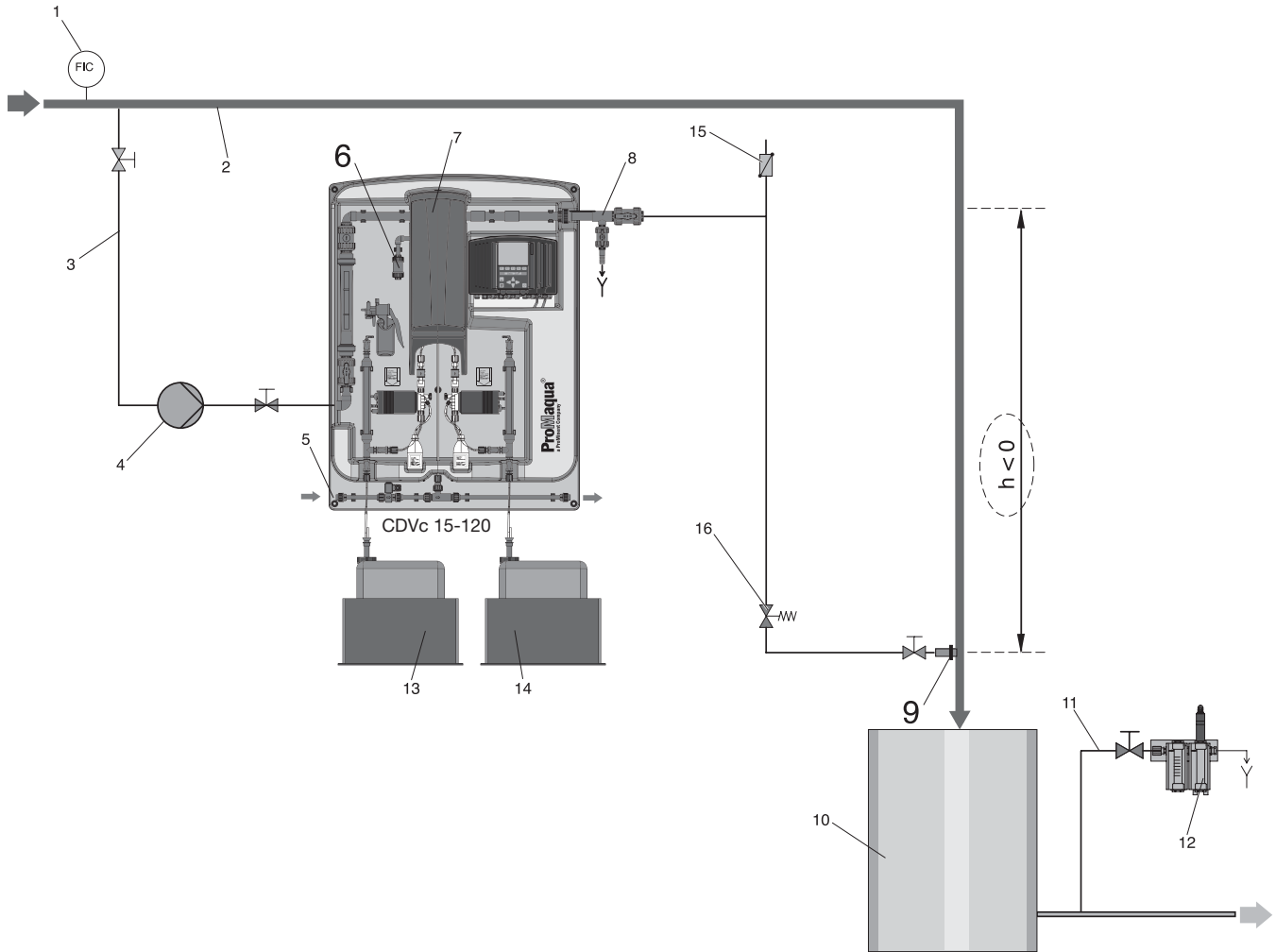


Fig. 4: Installation example B: the reactor outlet valve (7) of the Bello Zon® system is located above the metering station (9): pressure-retaining valve (16) and bleed valve (15) are required in the bypass line.

#### 5.1.1 Bypass Line

The bypass line is supplied either by the main water line or separately.

The purpose of the bypass line is to dilute the chlorine dioxide concentration of the chlorine dioxide solution from the reactor from approx. 20 g/l (=20,000 ppm) to approx. 0.1 – 1 g/l (= 100 – 1,000 ppm) and to transport this solution to the metering station.



##### **DANGER**

- **Toxic chlorine dioxide vapours may leak from broken bypass lines!**  
**Only use pipes made of PVC or PVDF for the bypass line!**  
**Chlorine dioxide heavily attacks other materials!**
- **Toxic chlorine dioxide vapours may leak from broken bypass lines!**  
**Only use PVC pipes PN 16 for the bypass line in order to consider in the long term the calcification of the PVC.**
- **Toxic chlorine dioxide vapours may leak from broken bypass lines!**  
**The maximum permissible system operating pressure may not be exceeded (see “Specifications Bypass Line PVC” in Section 5.1.2)! There may be no surges!**



##### **WARNING**

- **Toxic chlorine dioxide vapours may escape from leaking bypass lines!**  
**Some screw fittings are loosened at the factory for transport purposes.**  
**Check that all screw fittings of the bypass line at the bracket are properly screwed on!**

**WARNING**

- **Danger of explosion in the bypass line!**  
No particles may be present in the bypass water! They could block a flow meter. As a result, impermissibly high concentrations of chlorine dioxide might occur in the bypass line. If the bypass line is not completely filled with water, a critical gas phase may form and an explosion in the bypass line may occur!  
If required, install a dirt filter in the bypass line!

**NOTE**

Protect transparent pipes for  $\text{ClO}_2$ -containing water against exposure to light (direct sun light, fluorescent lamps, ...). Otherwise, the  $\text{ClO}_2$  concentration at the site of consumption may be less than expected because of the photochemical degradation of the  $\text{ClO}_2$  in the pipes.

### 5.1.2 Safety Devices Bypass Line

**DANGER**

- **If the chlorine dioxide solution in the reactor is subjected to vacuum, the reactor may explode!**  
The bypass line is thus to be installed such that vacuum can never be created – even not if the system is stopped or in case of failure!
- **Risk of explosion in the bypass line!**  
The flow of the bypass line must be monitored to be able to switch off metering as soon as the water stops to flow!  
Otherwise, impermissibly high concentrations of chlorine dioxide might occur in the bypass line. If the bypass line is not completely filled with water, a critical gas phase may form and an explosion in the bypass line may occur!  
Typically, the bypass flow is monitored by the flow meter, the correctly adjusted minimum contact and the control of the Bello Zon® system.
- **Risk of explosion in the bypass line!**  
For CDVc systems without bypass monitoring, the operator has to ensure that a sufficient flow through the bypass is guaranteed any time during the metering of chlorine dioxide! Otherwise, impermissibly high concentrations of chlorine dioxide might occur in the bypass line. If the bypass line is not completely filled with water, a critical gas phase may form and an explosion in the bypass line may occur!  
E.g. use a flow meter with minimum contact.

Specifications of the bypass line:

Type	Nominal width	Diameter (mm)	max. operating pressure (bar)	Pressure class for PVC pipes
CDVc 20 - 600	DN25	32	8	PN16
CDVc 2000	DN40	50	5	PN16

There exists risk of vacuum in particular, above all if no water flows, if:

- the flow direction in the main water line (with large diameter) is reversed (non-return valves are never 100 % leakproof!)
- the main water line is installed below the reactor outlet valve of the Bello Zon® system
- the bypass line is very long, above all if it runs to the bottom, i.e. the reactor outlet valve (7) of the Bello Zon® system is located above the metering station (9) (h smaller than "0", see Installation example B" in Fig. 6). Then install a bleed valve (15) at the highest point of the bypass line as shown in Fig. 6 (see also Chap. 5.1.3, b). This ensures, that at least atmospheric pressure is always present in the bypass line.

Depending on the application and the given circumstances of the installation location, the chlorine dioxide system is to be supplemented by the appropriate safety-technical accessories.

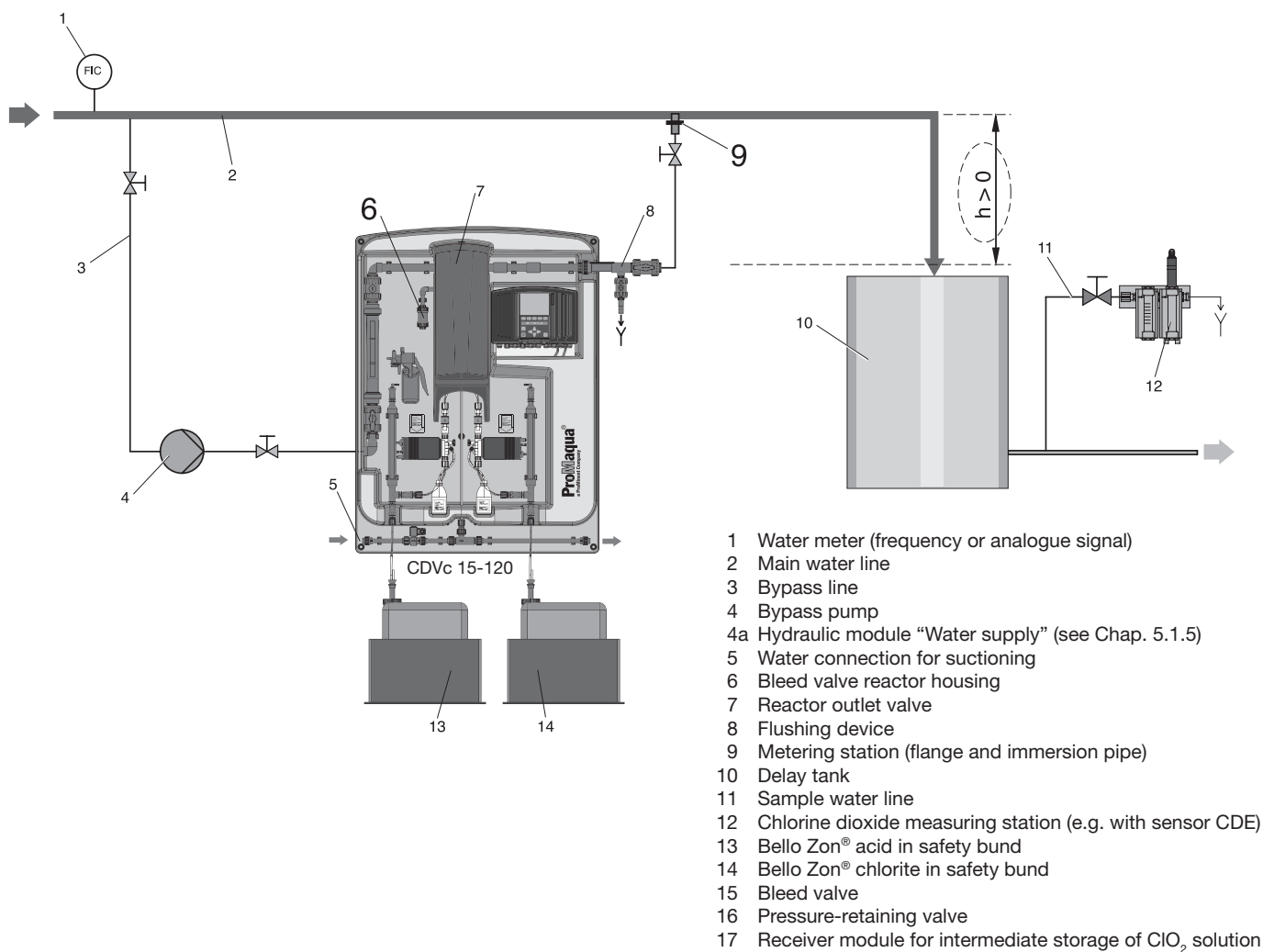


Fig. 5: Installation example A: the reactor outlet valve (7) of the Bello Zon® system is located **below** the metering station (9)

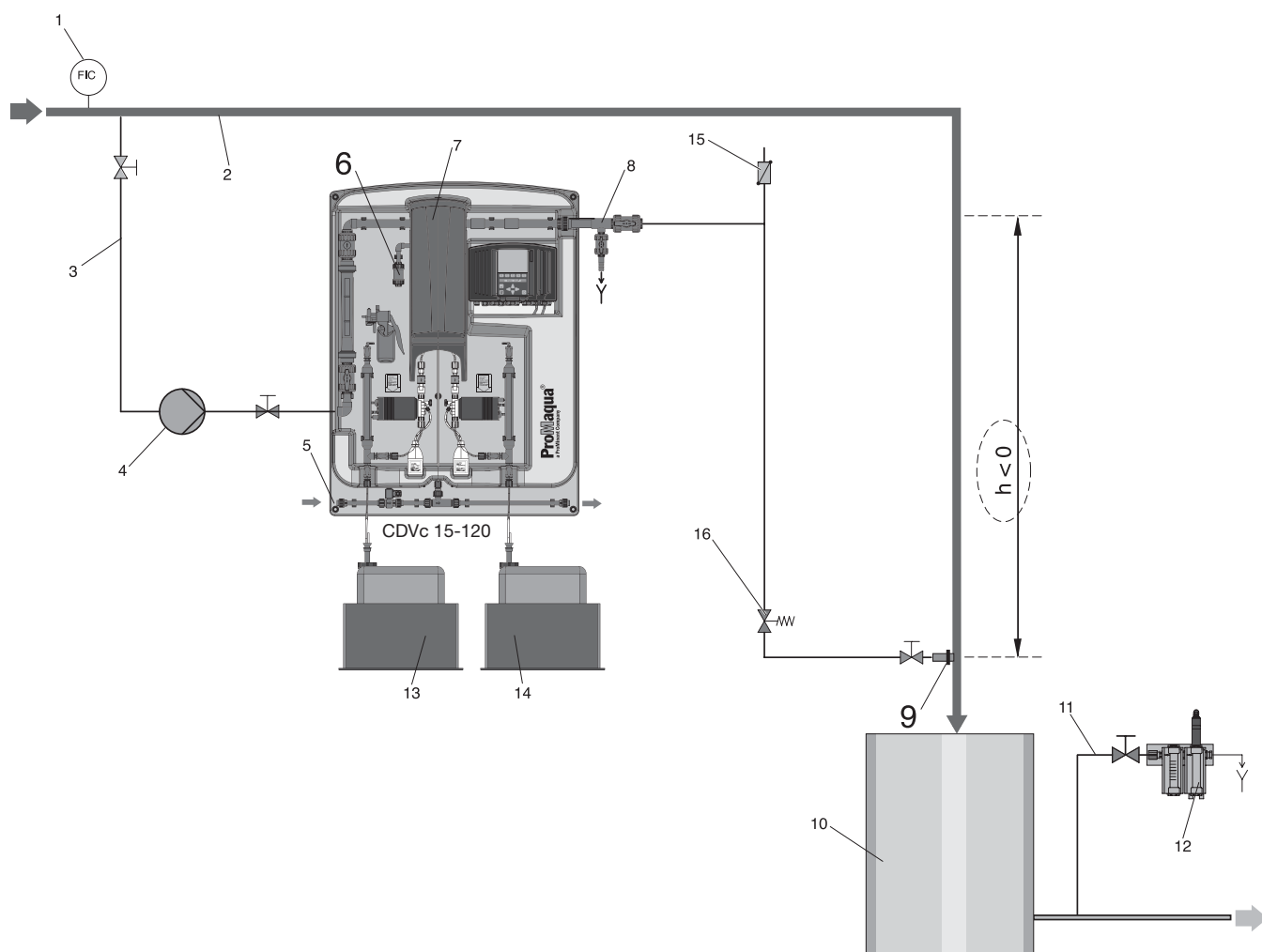


Fig. 6: Installation example B: the reactor outlet valve (7) of the Bello Zon® system is located **above** the metering station (9); pressure-retaining valve and bleed valve are required in the bypass line.

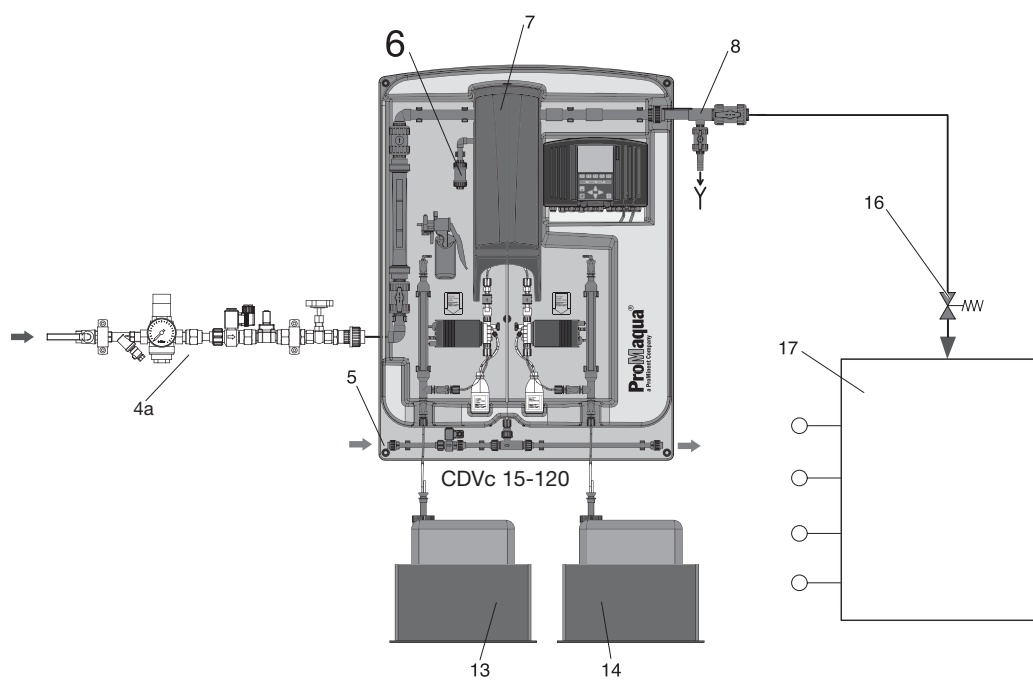


Fig. 7: Installation example C: Bello Zon® system with “bypass version for receiver module”

### 5.1.3 Additional Safety Fittings

In case of doubt, install the following in the bypass line:

- a) a bleed valve at the highest point of the bypass line (see Fig. 6, No. 15, accessory order no.: 1001260).



Fig. 8: Bleed valve for bypass line

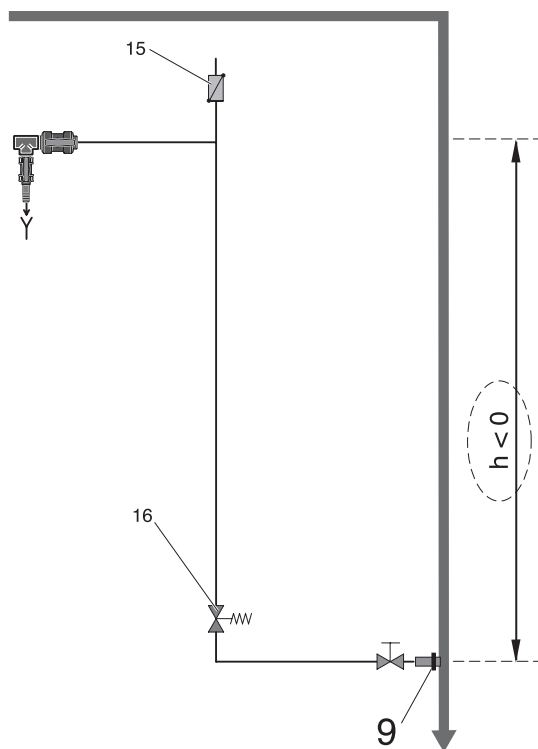


Fig. 9: Hydraulic environment of the bleed valve (detail from Fig. 6)

b) a pressure-retaining valve at the end of the bypass line, shortly upstream of the metering station (opening pressure > 1.5 bar) (see Fig. 6, No. 16)! Use a version without backpressure effect such that the function is maintained even given increased backpressure!

- DN25 Order no. 1000050
- DN40 Order no. 1000052

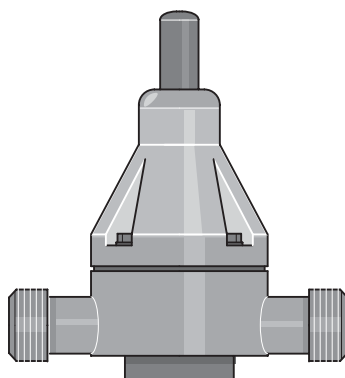


Fig. 10: Pressure-retaining valve without backpressure effect

### 5.1.4 Flow Generator Bypass Line

In order to generate a flow in the bypass line, install either:

- a throttle fitting in the main water line (e.g. valve, 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 to be interlocked via the control of the Bello Zon® system).

When installing a bypass pump, it is recommended to install an Y-valve (order no. 1001877) at the inlet of the Bello Zon® system to regulate the flow.

### 5.1.5 Hydraulic Module “Water Supply”

If chlorine dioxide solution is to be produced on stock with systems of "bypass version for receiver module", the hydraulic module "Water supply" is to be installed at the inlet of the bypass line.

The hydraulic module “Water supply” consists of:

- Ball valve, brass, 1/2" internal thread
- Strainer
- Pressure reducer
- Manometer
- Solenoid valve
- Flow meter
- Needle valve
- Screw fitting PVC, DN 15

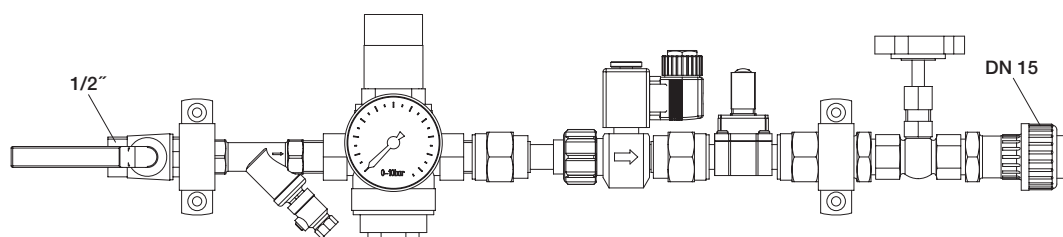


Fig. 11: Hydraulic Module “Water supply”

### 5.1.6 Metering station

Install an “immersion pipe” at the metering station in the main water line (for better mixing of  $\text{ClO}_2$  into the main water flow):

- up to nominal width DN 80 of the main water line, with ball valve, order no. 1018754
  - from nominal width DN 100 of the main water line, with ball valve, order no. 1018753
- Cut the immersion pipes to the required length. For this purpose, the scope of delivery includes Tangit cleaning agent and Tangit adhesive as well as a ball valve DN 25 as shut-off valve.
- Install the immersion pipe using a DIN flange DN50 to be provided by the customer.



Immersion pipe

### 5.1.7 Flushing Device

The included flushing device must be installed in the bypass line downstream of the Bello Zon® system to be able to fill the reactor at zero pressure and safely during commissioning and to be able to safely fill and drain the reactor for servicing (see Figs. 5, 6, and 7).

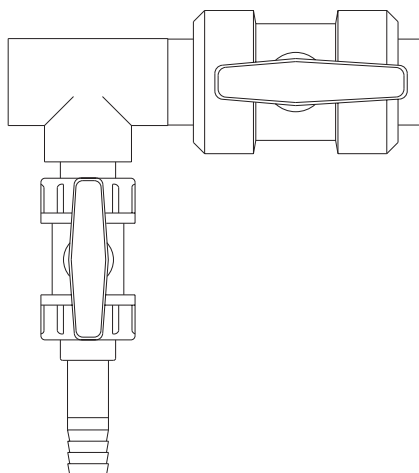


Fig. 13: Flushing device bypass line

### 5.1.8 Suction Lances / Suction Fittings



#### WARNING

- *Toxic  $\text{ClO}_2$  gas may be generated beyond the reactor!  
Correctly assign the parts for the acid end and the parts for the chlorite end!*



#### CAUTION

- *Caustic acid or toxic chlorite may leak at the connections!  
Only use appropriate hoses and connecting kits!*

#### NOTE

*Only use suction lances or suction fittings with two-phase level switch and round plug.  
Other suction lances do not fit.*

Do not insert the suction lances in the component tank in this step!

- ▶ Adjust the length of each suction lance (the foot valve must later float shortly above the bottom in the drum)
- ▶ Affix the labels “acid” and “chlorite” (included) well-visibly on the suction lance ends or suction hoses (“acid”, red is left - “chlorite”, blue is right)
- ▶ Cut the suction hoses such that they are continuously rising and tensile stress-free later
- ▶ Slip the union nut and the locking ring over the suction hose (see Fig. 12)
- ▶ Push the hose end up to the stop of the grommet (if necessary, extend the hose end a bit)
- ▶ Place the grommet at the suction valve of the pump.
- ▶ Press the suction hose onto the grommet and tighten the union nut
- ▶ Pull shortly at the suction hose and re-tighten the union grommet.

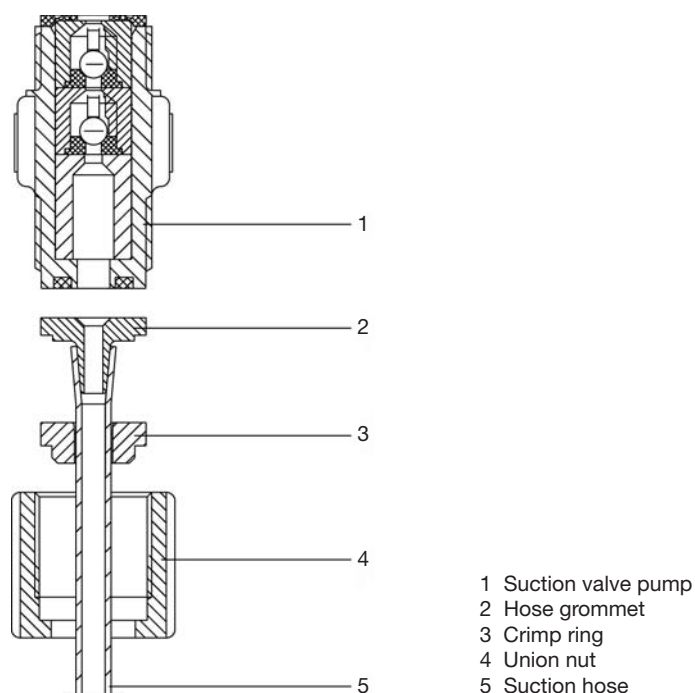


Fig. 14: Installation of hose

### 5.1.9 Water Supply Suctioning Device (Option)

For safety reasons, the air in the reaction housing is regularly suctioned off via a suctioning device (consisting of injector and solenoid valve).



#### WARNING

- **Toxic chlorine dioxide gas, which may have escaped in the reactor cabinet during a failure, cannot be suctioned off from the cabinet via the suctioning device! Water must always flow through the water line to the injector when the solenoid valve is open - even when the system is stopped! The bypass line may thus not be used for this purpose!**
  - **The injector requires a separate water supply (water pressure 1 – 6 bar, water quality: drinking water, no chlorine dioxide, no particles). Route a PVC piping DN 10 from the water line to the system. Route a PVC piping DN 10 from the system to the drain (constantly downcoming, with free outlet).**
- ▶ Route a PVC piping DN 10 from the water line to the system.
  - ▶ Route a PVC piping DN 10 from the system to the drain (constantly downcoming, with free outlet).

### 5.1.10 Installation of Flow Meter

For CDVc systems without integrated bypass monitoring, the operator has to ensure that a sufficient flow through the bypass is guaranteed any time during the metering of chlorine dioxide! Otherwise, impermissibly high concentrations of chlorine dioxide might occur in the bypass line. If the bypass line is not completely filled with water, a critical gas phase may form and an explosion in the bypass line may occur!

E.g. use a flow meter with minimum contact.

- Install a flow meter with minimum contact.

### 5.1.11 Notes on Chemical Supply

#### 5.1.11.1 Chemical Tanks Directly Connected to the Bello Zon® System



##### WARNING

- **The reactor may explode!**  
*The chemicals may siphon in an uncontrolled way! As a consequence, chlorine dioxide may outgas given excessive vacuum and simultaneous generation of gas/water mixed phases. Under unfavourable circumstances, the critical gas concentration of 300 g/m<sub>3</sub> can be exceeded and the reactor may explode!*  
*The filling levels of the chemical tanks may not be above the lower edge of the reactor!*



##### CAUTION

- **Caustic acid or toxic chlorite may be spilled in case of a leakage at the suction end of a metering pump!**  
*The filling levels of the chemical tanks may not be above the lower edge of the metering pumps!*

##### Notes to the system operator

Chemical tanks directly connected to Bello Zon® system should not be larger than 1,000 l! If larger chemical quantities are needed, a tank farm with hydraulic separation by intermediate tanks is required (see next section).

#### 5.1.11.2 Tank Farm

For high chemical consumption, a tank farm may be required.



##### DANGER

- **Large amounts of caustic acid or toxic chlorite may siphon in an uncontrolled way and form chlorine dioxide!**  
*The tank farm must be separated hydraulically from the Bello Zon® system via an intermediate tank.*  
*A shut-off valve is no substitute for this!*



##### WARNING

- **An explosive chloride dioxide phase can form in the concerned tank if acid and chlorine are confused during filling!**  
*When filling the tank farms, ensure that this cannot happen!*  
*The tank farms must be clearly identified (acid = red, chlorite = blue)!*
  - *The most simple way is to identify the chemicals using litmus paper: acid changes its colour to red, chlorite changes its colour to blue - corresponding to the chemicals identification at the Bello Zon® system!*
  - *Different connecting systems (adapter) at the acid or chlorite tanks alone offer no complete protection against confusing the chemicals!*
  - *An automatic pH value monitor in the filling lines of the tank farms helps to protect against inadvertent wrong filling.*

##### Notes to the system operator

Please observe the local regulations with regard to tank farms (in Germany e.g. the WHG (German Water Resources Act))!

## 5.2 Installation, Electrical

### Notes to the system operator

The local regulations for electrical installations must be observed!

#### NOTE

*To differentiate between two cables used for identical purposes (e.g. power supply for the metering pump for acid and for the metering pump for chlorite), the cables are identified by different identification rings. ("S" for acid, "C" for chlorite).*

### 5.2.1 Connection of the Level Switch of the Suction Lances

Connect the round plug of the suction lance (level switch) for acid at the left pump at the input "level".

Connect the round plug of the suction lance (level switch) for chlorite at the right pump at the input "level".

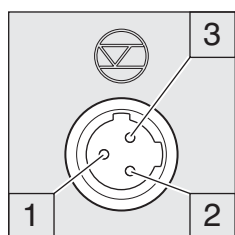


Fig. 15: "Level" input of a pump

### 5.2.2 Installation of Minimum Contact Flow Meter

For CDVc systems without integrated bypass monitoring, the operator has to ensure that a sufficient flow through the bypass is guaranteed any time during the metering of chlorine dioxide! Otherwise, impermissibly high concentrations of chlorine dioxide might occur in the bypass line. If the bypass line is not completely filled with water, a critical gas phase may form and an explosion in the bypass line may occur!

E.g. use a flow meter with minimum contact.

- ▶ Electrically install the minimum contact of the flow meter.

### 5.2.3 Wiring of the Control

#### NOTE

*Only CDVc 20 to 120: To be able to route the cables more easily into the housing of the control, remove the housing from the bracket (see Chap. 5.2.4 "Removal of the Housing from the Bracket").*

- ▶ Loosen the 4 housing screws and place the front part in park position.
- ▶ Insert the cables into the screw fittings.  
If multiple gaskets are used (Fig. 16,2), ensure that the permitted cable cross-section is observed (see table at the terminal diagram in the annex).
- ▶ For further steps, please see 5.2.5 "Connection of Terminals".  
Please continue with the following steps:
- ▶ Tighten the union nuts (Fig. 16, 4) of the screw fittings such that the fitting is tightly sealed.
- ▶ Position the front part onto the rear part.



### **WARNING**

***Risk of electric shock!***

***No humidity may penetrate the control!***

***Check again that the gasket is correctly seated such that the IP rating IP 65 is achieved!***

- ▶ Check the seating of the gasket again.
- ▶ Tighten the housing screws finger-tight.

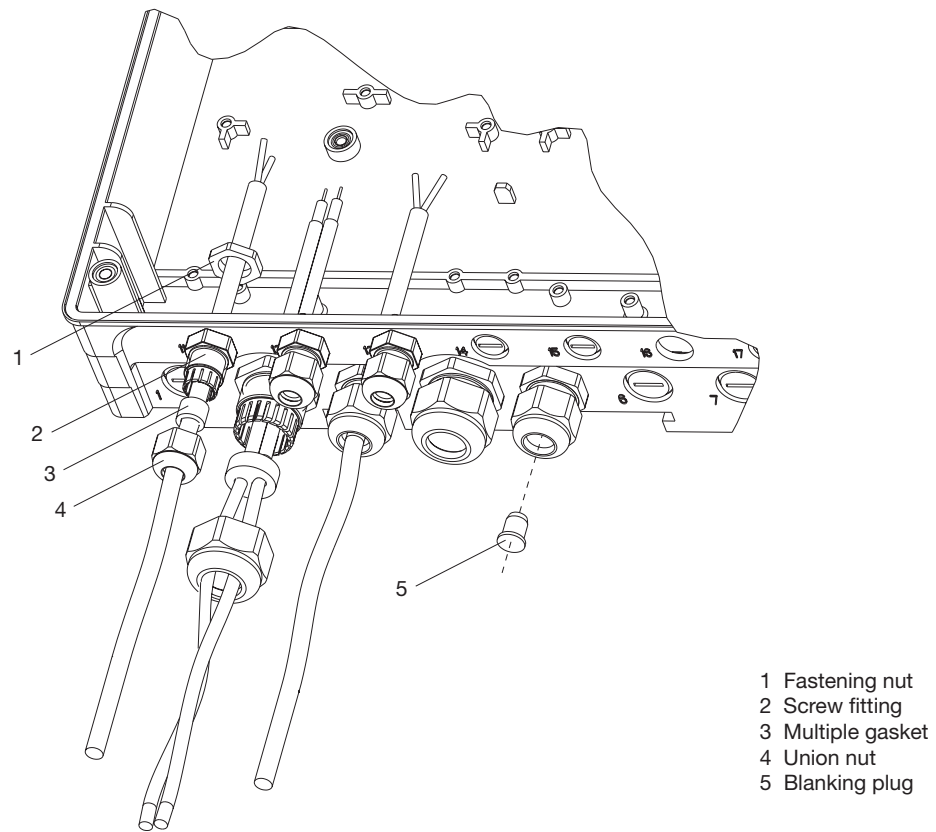


Fig. 16: Screw fitting, mounting

### 5.2.4 Removal of the Housing from the Bracket

*Removal of the housing* Pull both snap-on hooks at the bottom of the housing away from the housing – the housing is lifted a bit to the top.  
Press the housing to the top and fold it away from the bracket at the top.

*Mounting of the housing* Place the housing in the bottom of the wall bracket (Fig. 17, 1) and press it slightly at the top against the wall bracket (Fig. 17, 1). Then check that it is securely hinged at the top and press to the bottom until an audible click is heard (Fig. 17, 3).

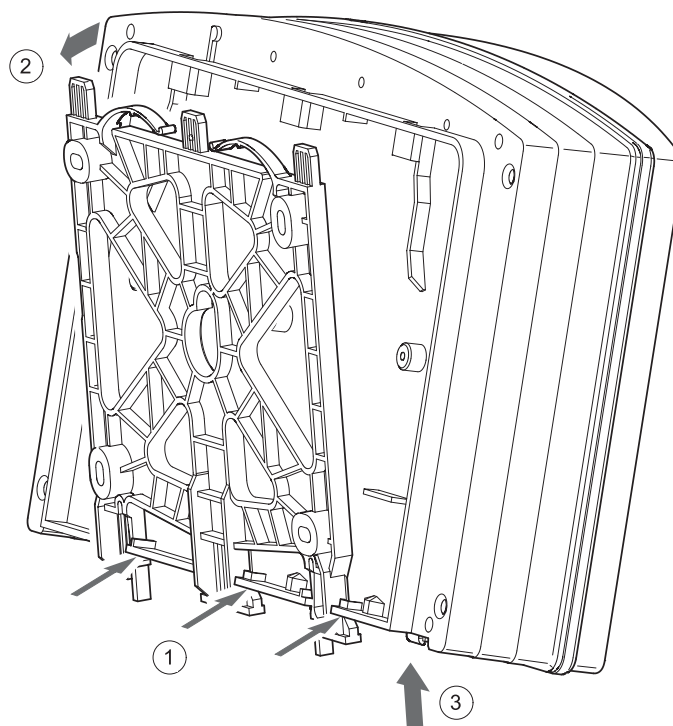


Fig. 17: Mounting of the housing

### 5.2.5 Connection of Terminals

- ▶ Strip the cable ends as shown in Fig. 18 and press on appropriate wire end ferrules.
- ▶ Connect the cables as shown in the terminal diagram.
- ▶ Check the entire wiring based on the terminal diagram.
- ▶ Tighten the clamping screws of the screw fittings such that the fitting is tightly sealed.

#### NOTE

- **For installation, simply insert the litz wires for the terminals XE1 through XA1 into the terminals.**  
**To loosen the litz wires for the terminals XK1 to X2 again, simply press onto the white button of the desired terminal with a ball-pen tip and remove the litz wire.**
- **The terminal diagram is shown in the annex.**

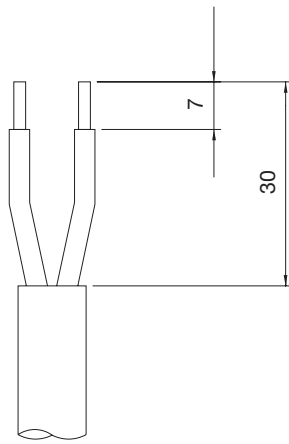


Fig. 18: Removal of cable insulation

### 5.2.6 Installation of the Bypass Pump

#### NOTE

- *If a bypass pump is used, the control can supply it with mains voltage up to a certain power (see below). The bypass pump is thus locked together with chlorine dioxide generation.*
- *Use an auxiliary contactor for circulation pumps with electrical capacities of:*
  - *above 1.1 VA at 230 V AC*
  - *above 0.55 VA at 115 V AC*

### 5.2.7 Preparation of the Mains Connection



#### CAUTION

- *Only connect the CDVc system to the power supply during commissioning!  
If the system is operated inadvertently, toxic chlorine dioxide might e.g. be generated!*
- *Observe the local regulations applicable to the feeder!*

### 5.2.8 Installation of the Emergency Switch



#### WARNING

*After certain maloperations or failures, it might be dangerous coming close to the system!  
In these cases, it must be possible to switch off the system via an emergency switch which is installed at a safe distance!*

*Install an emergency switch in the feeder.*

- Install an emergency switch in the feeder.

The emergency switch must be installed at an easily accessible, invulnerable point close to the door of the chlorine dioxide system room and must be marked as such.

The emergency switch must de-energise the electrical supply unit connected to the system.

**The Bello Zon® system is now sufficiently prepared to be commissioned by a ProMinent ProMaqua service technician (see Part 2 of the operating instructions)!**

## EC Declaration of Conformity

We,

**ProMaqua GmbH**  
**Maaßstraße 32/1**  
**D - 69123 Heidelberg**

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.

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

Product description :

***Chlorine dioxide generator***

Product type:

***CDVc...***

Serial number:

***see type identification plate on device***

Relevant EC regulations :

***EC - machine directive (98/37/EC)***  
***EC - low voltage directive (2006/95/EC)***  
***EC - EMC - directive (2004/108/EC)***  
***EC - directive for pressure equipment (97/23/EC)***

Harmonised standards used,  
in particular

***EN ISO 12100-1, EN ISO 12100-2, EN 809,***  
***EN 60204-1, EN 60529, EN 610000-6-1/2/3/4***

other technical specifications  
used, in particular :

***DVGW-compilation of rules, job-sheet W224 and W624***

Date/manufacturer's signature :

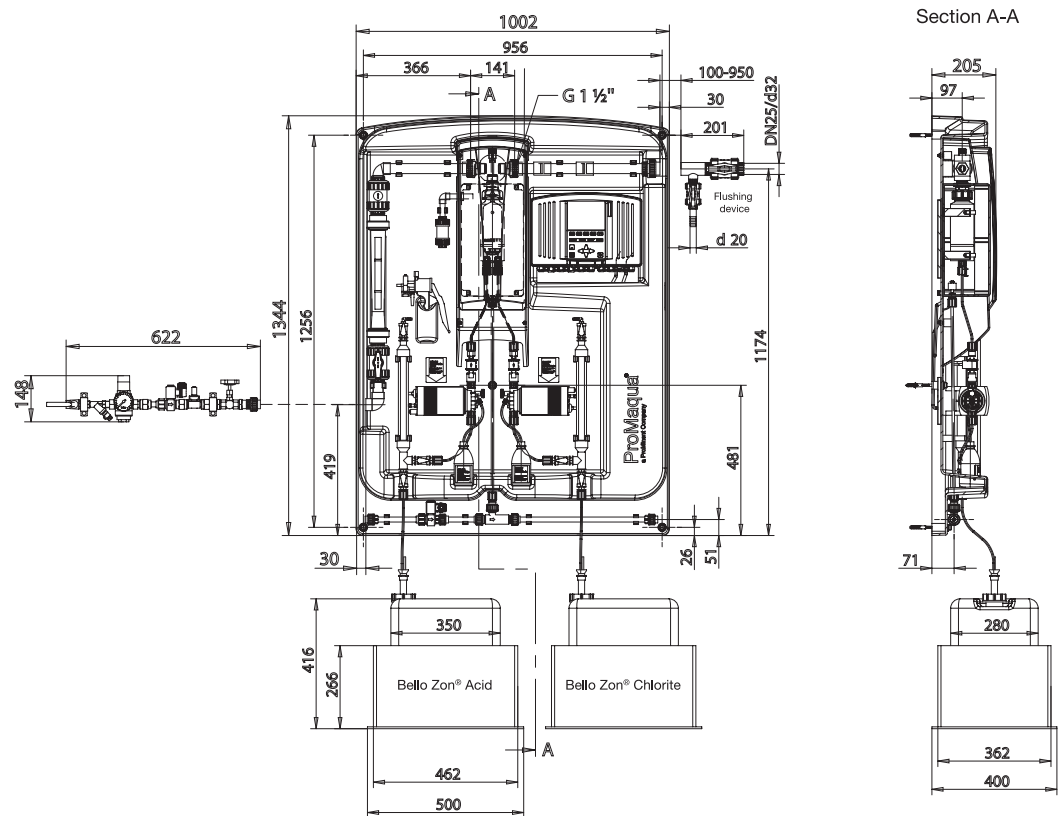
***08.01.2009***



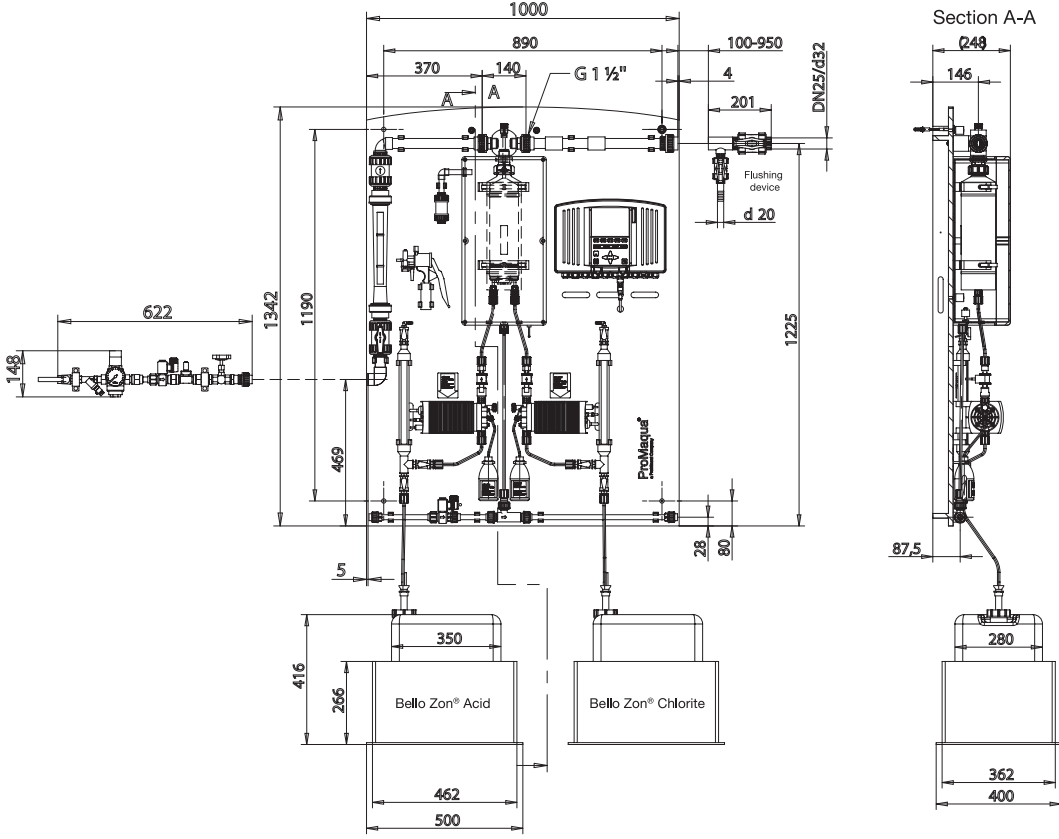
The undersigned :

***Dr. Andreas Wolf, Executive Vice President***

Dimension drawing CDVc 20 - 120  
(dimensions in mm)

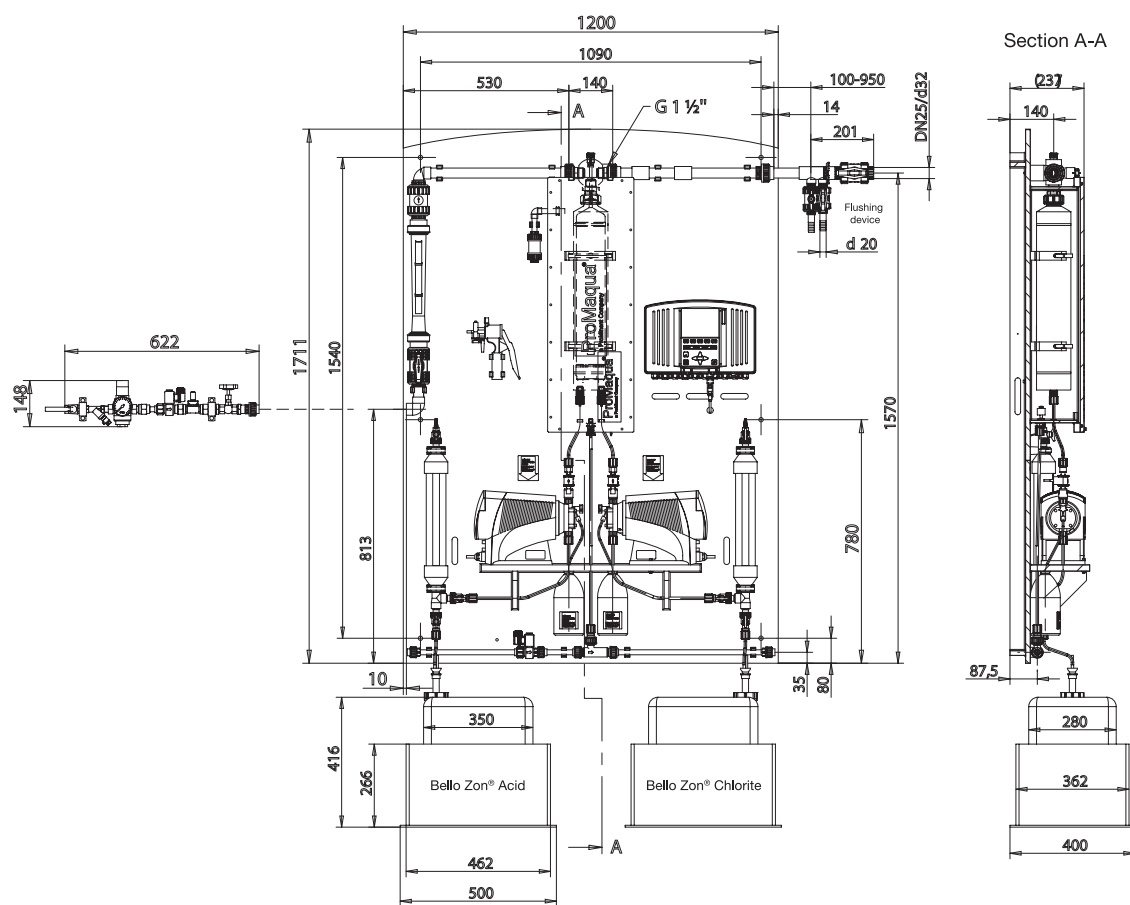


Dimension drawing CDVc 240  
(dimensions in mm)



## Dimension drawing CDVc 600

(dimensions in mm)



## Technical data

Type	Metering output Chlorine dioxide*		Operating pressure max.	Operating temperature	Max. suction Height metering pumps**	Dimensions*** HxWxD	Weight***	Current consumption (max.)****	
	Min.-max./ Hour	Min/day						230 V	115 V
	g/h	g/d	bar	°C	mWS	mm	kg	A	A
CDVc 20	1-20	6.4	8	10-40	1.8	1344x1002x200	26	2.7	0.9
CDVc 45	2-45	16	8	10-40	2.0	1344x1002x200	27	2.7	0.9
CDVc 120	6-120	40	8	10-40	3.0	1344x1002x200	28	2.7	0.9
CDVc 240	12-240	80	8	10-40	3.0	1342x1000x248	45	2.7	1.2
CDVc 600	30-600	140	8	15-40	3.5	1711x1200x273	75	2.8	1.4
CDVc 2000	100-2000	468	5	15-40	1.0 ... 2.0 #	1900x1400x370	120	4.1	3.2

\* The metering figures refer to 5 bar backpressure and an ambient temperature of 20° C. The minimum capacity/hour is based on the fact that when the plant is operating at below 5 % of the nominal capacity, continuous metering is no longer possible because of the then low pumping frequency of the metering pumps. When systems are not operating continuously, the reactor content must be changed at least twice a day. The stated minimum capacity/day should thus not be undershot.

\*\* Suction height at 100 % stroke length.

\*\*\* Without bypass pump, flushing device and module "water supply".

\*\*\*\* 230 V values with bypass pump, 115 V values without bypass pump.

# For water, with wetted valves, without backpressure.

## Control

## Voltage supply

Nominal voltage: 100-230 V AC, 50/60 Hz, depending on version

Fuses: miniature fuse 5 x 20 mm:

Designation	Type	Supplies ...	Terminals	Order no.
F1	0.4 ATT	Control	XP	712060
F2	10 AT	Bypass pump	X12:1, 5, 9	712073
F3	1.0 AT	Solenoid valves	X12:2, 6, 10; X12:3, 7, 11	732409
F4	10 AT	Metering pumps	X11:1 ... 12	712073

## NOTE

*The fuses are located in a fuse holder with bayonet lock each, on the right side in the terminal chamber of the control above the terminals for power supply. For layout see the figure below.*

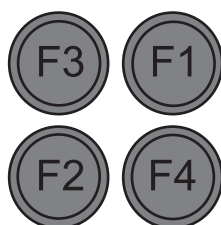
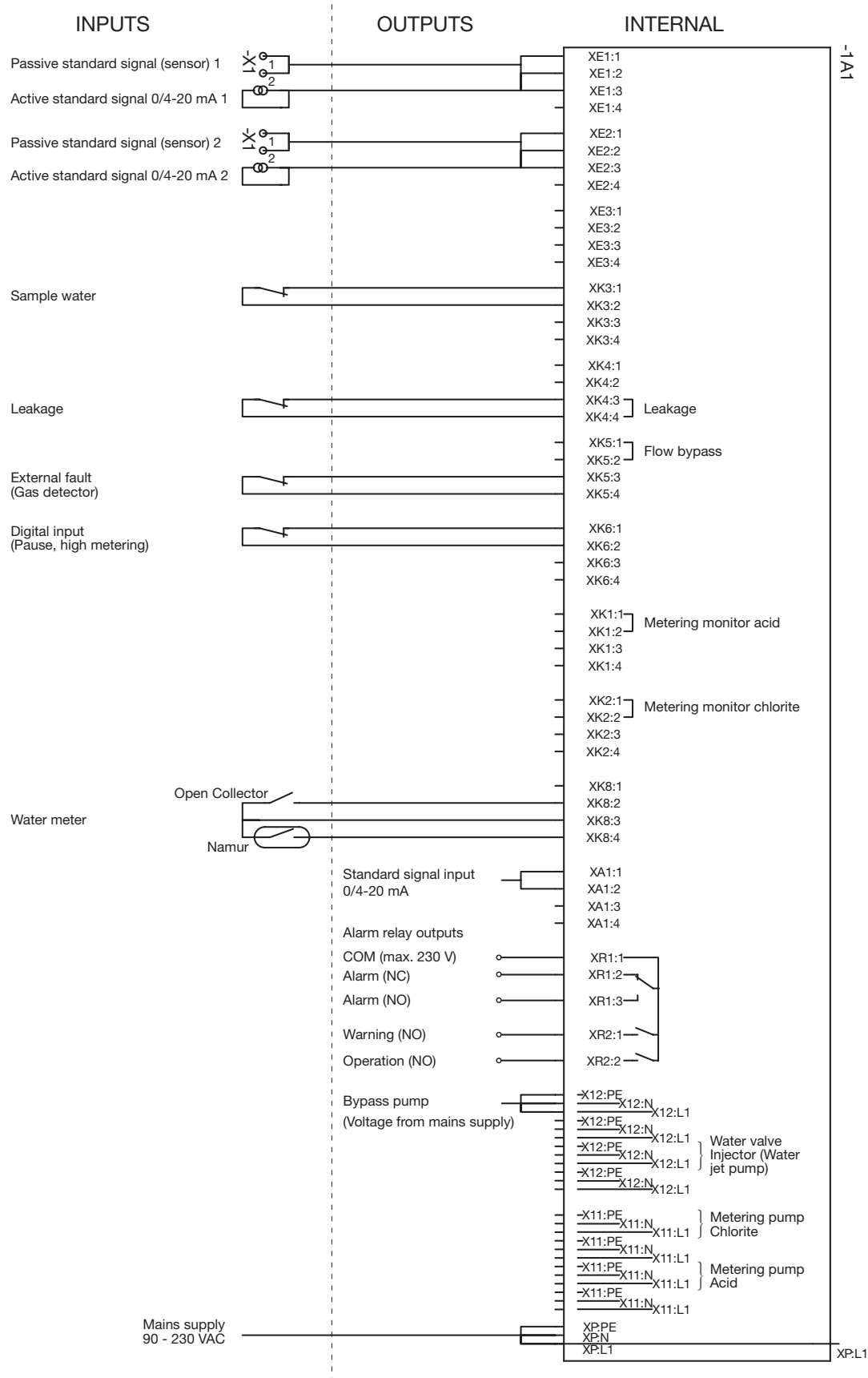


Fig. 19: Layout of the fuses in the control

- Inputs* Digital input water meter Namur (XK8:3 and XK8:4)  
 Inputs: derived from DIN 19 234 (Namur)  
 Supplied off-load voltage: 8.2 V  
 Switching point: 4 kOhm
- Contact input (XK8:2 and XK8:3)  
 For contact water meter with: Reed contact or Hall sensor  
 (integrated supply voltage +11 V, 2 mA), contact spacing 0.1 - 10 L/impulse  
 or IDM (Open Collector) with: frequency output up to 10 kHz (pulse width > 20 µsec)
- Contact inputs (XK3 – XK6):  
 For contacts or switching transistors:  
 Off-load voltage: 12 V ± 1 V  
 Short-circuit current: 5 mA  
 Contact: open, R > 100 kOhm  
           closed, R > 1 kOhm
- Standard signal inputs (mA) (XE1 and XE2):  
 0/4 ... 20 mA, electrically isolated  
 Insulation voltage: 500 V  
 Input resistance: 50 Ω  
 Load rating: 30 mA  
 Inputs with 2-wire  
 Connection (loop supply): supply voltage 22.0 V - 25.0 V  
 Measuring accuracy: ± 1 % of the measuring range (at 25 °C)
- Outputs* Switched mains outputs:  
 X12:1, 5, 9: "bypass pump" max. 6 A continuous current
- Relay alarm (XR1.2 and XR1.1):  
 Contact type: changeover contact  
 Load rating: 250 V AC / 3 A / 100 VA
- Relay Warning (XR1.2 and XR1.1):  
 Contact type: make contact  
 Load rating: 250 V AC / 3 A / 100 VA
- Relay status display (XR2.2 and XR1.1):  
 Contact type: make contact  
 Load rating: 250 V AC / 3 A / 100 VA
- Standard signal outputs (mA) (XA1):  
 0/4...20 mA, potential-free  
 Maximum load: 600 Ohm

Terminal diagram



## Table terminal areas

Cable feedthrough	Terminal	Cable use	Screw fitting	Number Cable	Litz per cable	Cable ø min.-max.
Bottom/rear row						
1	XE1/1,2,3 XE2/1,2,3	Flow, controller output, disturbance, ClO <sub>2</sub> or chlorite Flow, controller output, disturbance, ClO <sub>2</sub> or chlorite	M 16	1	2	2xø4
				1	2	
2	XK3/3,4 XK4/1,2 XK5/1,2	Not assigned Not assigned Flow bypass	M 20			3xø4
				1	2	
3	XK4/3,4	Leakage, chemical stock ClO <sub>2</sub> Leakage, chemical stock chlorite	M 16	1	2	2xø4
				1	2	
4	XK1/1,2 XK1/3,4 XK2/1,2	Metering monitor acid Not assigned Metering monitor chlorite	M 20	1	2	3xø4
				1	2	
5	XK8/2,3 XK8/4	Water meter (Open Collector) (0 - 10 kHz) Water meter (Namur) (0 - 10 kHz)	M 16	1	2	ø4.5-ø10
6	XR1/1 XR1/2,3 XR2/1 XR2/2	Relay: root Relay: alarm Relay: warning Relay: operation	M 16	1	5	ø4.5-ø10
7	X11	Power supply metering pump acid	M 16	1	3	ø4.5-ø10
8	X11	Not assigned				
9	X11	Power supply metering pump chlorite	M 16	1	3	ø4.5-ø10
10	X11	Power supply control	M 16	1	3	ø4.5-ø10

## Top/front row

11	XK4/3,4	Level switch, reactor housing	M12	1	2	ø3.5-ø6.5
12	XK3/1,2	Sample water	M 12	1	2	ø3.5-ø6.5
13	XK5/3,4	External fault	M 12	1	2	ø3.5-ø6.5
14	XK6/1,2	Pause (remote control)	M 12	1	2	ø3.5-ø6.5
15	XA1/1,2	Recorder (flow, controller output or chlorine dioxide)	M 12	1	2	ø3.5-ø6.5
16		CAN	M 12	1	5	-
17	X12/1,5,9	Bypass pump	M 12	1	3	ø3.5-ø6.5
18	X12/2,6,10	Not assigned				
19	X12/3,7,11	Valve Motive water Injector	M 12	1	3	ø3.5-ø6.5

## Replacement parts and Accessories

### Pressure-retaining valve

If long bypass lines are installed, above all if these run to the bottom and the metering station is located below the Bello Zon® system, as well as in case of installation with varying backpressure, a pressure-retaining valve without backpressure effect is to be installed.

Type	Nominal width	Connection	Material	Order no.
DHV-RM	DN 25	G 1½"	PVC (PC1)	1000050
DHV-RM	DN 32	G 2"	PVC (PC1)	1000051
DHV-RM	DN 40	G 2¼"	PVC (PC1)	1000052
DHV-RM	DN 50	–	–	On request

### Bleed valve

PVC-U bleed valve for bypass line as a vacuum breaker to prevent uncontrolled siphoning of the chemicals when the bypass line is under vacuum. Opening pressure approx. -0.5 bar.

<b>Bleed valve B 895 d32 DN 25</b>	1001260
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### Chlorine dioxide metering stations made of PVC-U

For a homogeneous distribution of the bypass water enriched with chlorine dioxide into the main water line, an immersion pipe is to be used which helps to optimise the mixing and distribution of the chlorine dioxide. The immersion pipes must be cut to the desired length at site.

For this purpose, the scope of delivery includes Tangit cleaning agent and adhesive as well as a ball valve DN 25 as shut-off valve.

The immersion pipe is installed using a DIN flange DN50 to be provided by the customer.

<b>Immersion pipe for pipe diameters up to DN 80</b>	1018754
<b>Immersion pipe for pipe diameters from DN 100</b>	1018753

### Gas detector GMA 36 chlorine dioxide

The gas detector type GMA 36 chlorine dioxide is designed as compact measuring and switching unit to monitor the ambient air for hazardous concentrations of chlorine dioxide.

<b>Gas detector GMA 36 chlorine dioxide</b>	1023156
<b>Replacement sensor</b> for chlorine, chlorine dioxide, ozone	1023314

### Safety bunds for chemical tanks

Net volume l	Type	Order no.
40	Without leakage monitor	791726
70	Without leakage monitor	740309
140	Without leakage monitor	740723

### Leakage monitor for CDVc systems

Consisting of 1 level switch which is to be installed in the safety bunds 40, 70 or 140 l and to be connected to the control of the Bello Zon® CDVc.

<b>Level switch with litz wire 5 m</b>	1003191
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### Replacement part kits for CDVc systems

The replacement part kits contain all wear parts which are to be replaced in the course of the regular servicing of the system.

<b>Replacement part kit compl. CDVc 20</b>	1034758
<b>Replacement part kit compl. CDVc 45</b>	1034759
<b>Replacement part kit compl. CDVc 120</b>	1034760
<b>Replacement part kit compl. CDVc 240</b>	1034761
<b>Replacement part kit compl. CDVc 600</b>	1034762
<b>Replacement part kit compl. CDVc 2000</b>	1034763







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