Operating instructions
Chlorine dioxide systems
Bello Zon® Type CDVc

These operating instructions are only valid in conjunction with the "Operating instructions Chlorine dioxide systems Bello Zon® Type CDVc, Part 1

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

Read the following supplementary information in its entirety! Should you already know this information, you have an even greater need of the Operating Instructions.

The following are highlighted separately in the document:

- Enumerated lists
- refer to references

Instructions

Results

„User interface text“

[Keys]

Information

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

Safety information

Safety information is 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 operators from their responsibility as an operator and is intended only to remind them or make them 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.

Version number of the hardware and software

The version number of the hardware and software can be found here: In the display press „Equipment OFF“ [F2 SETTING], change to the menu „CAN overview“ and press the [ENTER] key. In case of complaints, or if expanding the scope of use of the device, specify the version number in addition to the identity code.
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# Identity code

## CDV product range, version c

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<th>Type</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>CDV 20</td>
<td>20 g/h</td>
</tr>
<tr>
<td>04</td>
<td>CDV 45</td>
<td>45 g/h</td>
</tr>
<tr>
<td>06</td>
<td>CDV 120</td>
<td>120 g/h</td>
</tr>
<tr>
<td>08</td>
<td>CDV 240</td>
<td>240 g/h</td>
</tr>
<tr>
<td>10</td>
<td>CDV 600</td>
<td>600 g/h</td>
</tr>
<tr>
<td>14</td>
<td>CDV 2000</td>
<td>2000 g/h</td>
</tr>
</tbody>
</table>

## Version

- **P**: ProMaqua
- **S**: Special version

### Operating voltage:

- **U**: 100-230 V + 10 %, 50/60 Hz (for versions without suction)
- **A**: 230 V + 10 %, 50/60 Hz (for versions with "bypass" 04)
- **B**: 100-115 V + 10 %, 50/60 Hz (not available for versions with "bypass" 04 or 06)

## Bypass version, bypass monitoring

- 00: Without bypass
- 02: Bypass PVC-U with float flow meter and pump
- 04: Bypass PVC-U with float flow meter and bypass pump (not CDVc 2000)
- 06: Bypass PVC-U for storage module with water supply 230 V (only CDVc 45-600)
- 07: Bypass PVC-U for storage module with water supply 24 V (only CDVc 45-600)

## Ventilation unit

- 0: Without reactor housing with ventilation, without calibration device, but with measurement cylinder
- 1: Without reactor housing with ventilation, with calibration device
- 2: With reactor housing with ventilation, without calibration device, with measuring cylinder (only in operating voltage A or B designs).
- 3: With reactor housing with ventilation, with calibration device

## Suction lance, suction fitting for chemicals

- 0: None
- 1: Suction lance for 5..60 l-tank (only CDVc 20-600)
- 2: Suction lance for 200 l-tank (only CDVc 20-600)
- 3: Flexible suction assembly up to 5 m with two-stage level switch (only CDVc 20-600)
- 4: Suction lance for 25 l-tank with 2 40 l collecting pans without leakage probe (only CDVc 20-600)

## Mechanical design

- 0: Standard
<table>
<thead>
<tr>
<th>CDV product range, version c</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M</strong> Modified</td>
</tr>
<tr>
<td><strong>Preset language</strong></td>
</tr>
<tr>
<td>DE German</td>
</tr>
<tr>
<td>EN English</td>
</tr>
<tr>
<td>FR French</td>
</tr>
<tr>
<td>IT Italian</td>
</tr>
<tr>
<td>ES Spanish</td>
</tr>
<tr>
<td><strong>Control</strong></td>
</tr>
<tr>
<td>0 Base version</td>
</tr>
<tr>
<td>1 With measurement and control features (only for &quot;extended inputs and outputs&quot; = 1 or 3)</td>
</tr>
<tr>
<td>2 With measurement and control features, data logger and screen writer (only for &quot;extended inputs and outputs&quot; = 1 or 3)</td>
</tr>
<tr>
<td><strong>Extended inputs and outputs</strong></td>
</tr>
<tr>
<td>0 none</td>
</tr>
<tr>
<td>1 2 analog inputs, freely configurable for control variables (only for control with measurement and control properties) and flow</td>
</tr>
<tr>
<td>2 1 analog output, freely configurable</td>
</tr>
<tr>
<td>3 2 analog inputs, freely configurable for control variables (only for control with measurement and control properties) and flow and 1 analog output, freely configurable</td>
</tr>
<tr>
<td><strong>Communication interfaces</strong></td>
</tr>
<tr>
<td>0 None</td>
</tr>
<tr>
<td><strong>Certification</strong></td>
</tr>
<tr>
<td>01 CE mark</td>
</tr>
<tr>
<td><strong>Temperature monitoring</strong></td>
</tr>
<tr>
<td>0 No temperature monitoring</td>
</tr>
<tr>
<td><strong>Hardware</strong></td>
</tr>
<tr>
<td>0 Standard</td>
</tr>
<tr>
<td><strong>Software</strong></td>
</tr>
<tr>
<td>0 Standard</td>
</tr>
</tbody>
</table>
2 About this system

The Bello Zon® chlorine dioxide generation and dosing system uses the chlorite/acid process. In these systems ClO₂ solution is generated by the chemical reaction of sodium chlorite solution with hydrochloric acid.

ClO₂ is an exceptionally reactive gas, which is not stored due to its instability, rather must only be manufactured according to requirements at its location of use in special systems.

In contrast to chlorine, which is mainly used in drinking and industrial process water treatment systems, ClO₂ has a series of advantages. Thus for instance, the disinfection effect does not reduce with increasing pH-value as is the case with chlorine, rather remains constant across the entire pH-range normally encountered during water treatment.

ClO₂ remains stable in piping systems over long periods and provides from many hours up to days of microbiological water protection.

Ammonia or ammonium, which cause considerable chlorine loss, are not attacked by ClO₂ so that the dosed ClO₂ remains fully available for disinfection purposes. Chlorophenols, strongly smelling compounds, which result from the chlorination of water etc., are not formed with ClO₂. Trihalogenmethanes (THMs), a substance class, which, like their main representative, chloroform, are suspected of being carcinogens, result from the reaction of chlorine with dissolved matter naturally found in water (humic acids, fulvic acids, etc.). Where ClO₂ is used as an alternative, these substances do not arise.

In most applications, dosing is quantity-proportional, i.e. flow-dependent on the signal from an inductive flow meter or a contact water meter or parallel to a feed pump.

For circulation systems such as bottle rinsing machines, cooling circuits, etc., in which a ClO₂ loss need solely be made-up, the addition can also be controlled in a quantity-dependent manner using a chlorine dioxide or ORP potential measurement.

Decades of experience with the Bello Zon® chlorine dioxide systems has shown that using the selected process parameters, an excellent yield of 90-95 % (relative to the stoichiometric ratio) can be achieved. When correctly adjusted, no chlorite is metered as a side-product.

Bello Zon® CDV systems work with diluted chemicals, i.e. using Bello Zon® acid (9 % hydrochloric acid) and using Bello Zon® chlorite (sodium chlorite 7.5 %). When a litre of each of the two solutions is used in the system, approx. 40 g of ClO₂ results.

As with every disinfection technology, the interfering dissolved matter in the water and the overall treatment must also be taken into account with ClO₂. ProMinent benefits from its experience from globally executed chlorine dioxide installations in may different application fields and will willingly provide assistance during system design.

Applications:

- Public drinking water supply
- Cooling water treatment
- Paper industry within slime control and process water treatment
- Waste water treatment
- Drinking and process water in the beverage and food industry
- Bottle cleaning
- CIP system as disinfectant
- Pasteurizer and rinser
- Cold-sterile bottling
- Water vapour treatment (condensation) in the milk industry
- Water treatment for processing of fruit, vegetables, seafood, fish and poultry.
- Irrigation water disinfection in market gardening
- Combating legionella
3 Safety chapter

Explanation of the safety information

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

<table>
<thead>
<tr>
<th>Signal word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING!</td>
<td>This combination of symbol and signal word indicates a possible dangerous situation that can result in death or serious injury if it is not avoided.</td>
</tr>
<tr>
<td>CAUTION!</td>
<td>This combination of symbol and signal word indicates a possible dangerous situation that can result in minor injury if it is not avoided.</td>
</tr>
<tr>
<td>NOTICE!</td>
<td>This combination of symbol and signal word indicates a possible dangerous situation that can result in material and environmental damage if it is not avoided.</td>
</tr>
</tbody>
</table>

Warning signs denoting different types of danger

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

<table>
<thead>
<tr>
<th>Warning signs</th>
<th>Type of danger</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Warning – corrosive substances." /></td>
<td>Warning – corrosive substances.</td>
</tr>
<tr>
<td><img src="image" alt="Warning – high-voltage." /></td>
<td>Warning – high-voltage.</td>
</tr>
<tr>
<td><img src="image" alt="Warning – explosive substances." /></td>
<td>Warning – explosive substances.</td>
</tr>
<tr>
<td><img src="image" alt="Warning – toxic substances." /></td>
<td>Warning – toxic substances.</td>
</tr>
<tr>
<td><img src="image" alt="Warning – danger zone." /></td>
<td>Warning – danger zone.</td>
</tr>
</tbody>
</table>

The three basic rules

1. The two components Bello Zon® acid (dilute HCl) and Bello Zon® chlorite (dilute NaClO₂) must never be brought into contact except in the reactor! Otherwise poisonous ClO₂ gas forms abruptly and can then decompose explosively!

2. Never operate the chlorine dioxide Bello Zon® CDV with undiluted acid or undiluted sodium chlorite! Otherwise poisonous ClO₂ gas forms abruptly and then decomposes explosively within the reactor!

3. The bypass water must never be exposed to a 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!
Correct and proper use

- The Bello Zon® CDV system is intended solely for producing a ClO₂-containing disinfectant solution from diluted hydrochloric acid (9 %) and sodium chlorite solution (7.5 %) and for dosing 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!
- The system must not be operated under conditions other than those described in the technical data!
- Do not allow untrained personnel to operate the Bello Zon® system! All other activities 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 system's service life!

Qualification of personnel

**WARNING!**
According to accident statistics, holiday replacements are a safety risk.
- Holiday replacements must also hold the named qualifications and have been instructed accordingly.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Qualification level</th>
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<tbody>
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<td>Installation, installation of hydraulic system</td>
<td>Technical personnel</td>
</tr>
<tr>
<td>Electrical installation</td>
<td>Electrician</td>
</tr>
<tr>
<td>Initial commissioning</td>
<td>Customer service - authorised by ProMaqua</td>
</tr>
<tr>
<td>Start up</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Operation, canister replacement</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Maintenance, repair</td>
<td>Customer service - authorised by ProMaqua</td>
</tr>
<tr>
<td>Decommissioning, disposal</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>Customer service - authorised by ProMaqua, technical experts, instructed personnel (fault-dependent)</td>
</tr>
</tbody>
</table>

Explanation of the terms:

**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.

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

**Instructed personnel**
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.
Customer Service department

Customer service refers to service technicians who have received certificated training and have been authorised by ProMaqua® to work on the system.

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

Safety Equipment

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

Safety information

**WARNING!**

Danger from incorrect operation

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

- The operating personnel must be instructed by a ProMinnent service technician. (Undertaken during initial commissioning.)
- The operating instructions must be available by the system.

**WARNING!**

Danger due to toxic and explosive ClO₂ gas

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

- To overcome this, for example, install a gas detector which switches off the system if ClO₂ gas escapes and triggers an alarm that is readily apparent from a distance. This ensure that save operation is possible with every ClO₂ system.

**NOTICE!**

Warning of illegal operation

Observe the regulations that apply where the device is installed.

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.

Note for the system operator

Keywords when searching for the necessary regulations:

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

Information in the event of an emergency

- You have already come into contact with acid: See the “EC acid safety data sheet” provided by the supplier!
- You have already come into contact with chlorite: See the “EC chlorite safety data sheet” provided by the supplier!
- You have come into contact with ClO\(_2\) solution or ClO\(_2\) gas: See data sheet “Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions” in the operating instructions, part 2, appendix!
- An orange-yellow ClO\(_2\) 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! See also the data sheet “Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions” in the operating instructions, part 2, appendix!
- An orange-yellow ClO\(_2\) 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 ClO\(_2\) solution, then dilute with lots of water and wash away into the drain. See also the data sheet “Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions” in the operating instructions, part 2, appendix!
- The Bello Zon® system was supplied with concentrated chemicals and the dosing 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 brigade, explaining about the risk of an explosion due to concentrated ClO\(_2\) gas! ClO\(_2\) gas can still explode after several hours! See also the data sheet “Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions” in the operating instructions, part 2, appendix!
- The Bello Zon® system was supplied with concentrated chemicals and the dosing pumps have not yet started to pump: immediately switch the Bello Zon® system to “dosing OFF” ([Start/Stop])! Place the suction lances in separate individual buckets of water and procure drums of chemicals with dilute chemicals. Arrange for the concentrated chemicals to be properly disposed off. See also the data sheet “Chlorine dioxide hazardous substance data sheet: Properties of chlorine dioxide and instructions for handling aqueous solutions” in the operating instructions, part 2, appendix!

Sound Pressure Level

The sound pressure level is < 70 dB (A) at a maximum stroke length, maximum stroke rate, maximum counter pressure (water) according to:

DIN EN 12639 (Noise testing on liquid pumps).
4 System overview

Fig. 2: Device parts for the acid metering line of the ClO₂ production system

1 Reactor outlet valve
2 Reactor
3 Reactor input valve acid
4 Stroke sensor acid
5 Bleed valve acid
6 Acid dosing pump
7 Acid calibration device
8 Acid vent bottle
9 Acid suction lance with foot valve and level switch
10 Bello Zon acid in chemical canister (accessories)

For the sake of clarity, only device parts of the acid metering line are identified.

The corresponding device parts for the chlorite metering line are always located in a mirror image fashion to the right of the corresponding acid device part.
Fig. 3: Device parts of the CDVc without the device parts of the preceding figure

11  Bypass line stopcock
12  Non-return valve
13  Mixer
14  Flushing equipment
15  Control
16  Panel
not shown  Danger signs
not shown  CDV fitting kit
5 Functional description

5.1 Chemical principle behind the systems

Operate the chlorine dioxide Bello Zon® system according to the hydrochloric acid-chlorite process:

\[ \text{Hydrochloric acid + sodium chlorite} = \text{chlorine dioxide + sodium chloride + water} \]

\[ (4\text{HCl} + 5\text{NaClO}_2 = 4\text{ClO}_2 + 5\text{NaCl} + 2\text{H}_2\text{O}) \]

The Bello Zon®CDV systems produce a 2 % chlorine dioxide solution (20 g/l ClO₂) at temperatures of at least 10 °C (15 °C for CDVc 600 and 2000) through the combination of dilute hydrochloric acid and dilute sodium chlorite solution.

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

5.2 System operating principle

Two metering pumps dose the components Bello Zon® acid and Bello Zon® chlorite into the reactor. Here the components react to produce ClO₂ solution. The metering pumps are simultaneously used to transport solution from mixing via the reactor outlet valve into the bypass. A mixer is connected downstream of the reactor outlet valve which mixes the ClO₂ solution homogeneously with the bypass water. At the point of injection, the diluted ClO₂ reaches the main water flow and dilutes itself further to the final effective concentration which applies to the process.

In the "bypass version" - "bypass PVC-U for storage module", the "Water supply" module (comprising shut-off valve, filter, pressure reducer, solenoid valve, water meter and needle valve) supplies the bypass line with fresh water. Instead of entering the main water flow, the ClO₂ solution enters a storage tank ("storage module"), from which several injection points can be supplied.

The control calculates the stroke rates for the metering pumps from the transported ClO₂ output and, where necessary, from a current stroke rate. Moreover, it interprets the sensor signals from the safety equipment and if necessary switches the metering off.

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

- Manually (using the control alone)
- Proportionally to the flow (via a water meter)
- In proportion to the quantity (via ClO₂ sensor)
- Control variable dependent (via external control variable, e.g. from the control room)

Definitions

- "System" comprises the totality of the control for the Bello Zon® system and everything located on its panel.
- The "control" refers to the control in the housing on the panel of the Bello Zon® system.
Fig. 4: Hydraulic drawing CDVc in bypass operation

1 Water to be prepared
2 Bypass
3 Ventilation (option)
4 Reactor outlet valve
5 Reactor housing (option)
6 Reactor
7 Mixer
8 Flushing equipment with vacuum relief valve
9 Water to be treated
10 Metering pumps

11 Bello Zon® Acid
12 Bello Zon® Chlorite
13 Safety bund, recommended (option)
14 Drinking water, 1…6 bar
15 Extraction reactor housing (option)
16 Waste water
17 Bypass pump (option)
18 Bypass monitoring
19 Stroke sensor dosing pumps
Functional description

Fig. 5: Hydraulic diagram CDVc for the storage module version

1 Water to be prepared
2 “Water supply” module
3 Ventilation (option)
4 Reactor outlet valve
5 Reactor housing (option)
6 Reactor
7 Mixer
8 Flushing equipment
9 Storage tank
10 Metering pumps
11 Bello Zon® Acid
12 Bello Zon® Chlorite
13 Safety bund, recommended (option)
14 Drinking water, 1 ... 6 bar
15 Extraction reactor housing (option)
16 Waste water
17 Bypass pump (option)
18 Bypass monitoring
19 Stroke sensor dosing pumps

5.3 Safety Equipment

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

18
5.4 Control elements and buttons

Fig. 6: The keys
1 Function keys, variably assigned
2 [Arrow keys]
3 Key[ESC]
4 Key[START/STOP]
5 Key[ENTER]

Fig. 7: The displays
6 LCD display
7 Devices LED
8 CAN 1-LED
5.5 Functions of the buttons

5.5.1 System control

START/STOP key

- The [START/STOP] key is used to:
  - Start the entire system. Key [START/STOP] press for 3 s: „Production off“ - „System on“

5.5.2 Navigation within the operating menu

[ENTER] key

- The [ENTER] key is used to:
  - Navigate from menu item to menu item in the operating menu - into deeper tiers of the operating menu.
  - To make a selection of a menu item and confirm a change.

[ESC] key

- The [ESC] key is used to:
  - Navigate from menu item to menu item in the operating menu - upwards into higher tiers of the operating menu.
  - To return from any menu item of the operating menu back to the continuous display, either press [F1] HOME or repeatedly press the [ESC] key until the continuous display appears.
  - It is also possible to wait until the control independently jumps back to the continuous display.

Arrow keys [UP], [DOWN], [LEFT], [RIGHT]

- The arrow keys [UP], [DOWN], [LEFT], [RIGHT] are used to:
  - Move between selections under a menu item.
  - Under a selection, the arrow keys [UP], [DOWN] are used to change the displayed numerical value or the displayed variable. The arrow keys [LEFT], [RIGHT] can be used to select the decimal place of a numerical value which is to be changed.

Function keys [F1] to [F5]

- The function keys, [F1] to [F5] to which varying allocations can be made, are used to select menus or functions, which are displayed as keys in the display (e.g. menus „SET“ (to set), „CALIB“ (rate) or the function „SAVE“ (accept)).

**CAUTION!**

Warning of faulty operation

If settings are not saved due to a momentary lack of concentration, the system may not react as expected.

- Only the function „SAVE“ can be used to save the menu settings.
- Individual numerical values such as in „TIME“ or „DATE“ are saved using the key [ENTER].
Functional description

Fig. 9: Example assignment of the function keys
6 Setting, Diagram, Access codes and INFO-level

The chapters “Setting, Diagram, Access codes and INFO-level” describe the operating menu, its functions and its setting options.

The following chapters then describe application in association with a concrete objective, such as “Start up”, “Operate”, ... .

6.1 Operating menu, schematic

![Operating menu, schematic](image)

Fig. 10: Operating menu, schematic

The display „System OFF“ is the linchpin of the operating menu! Numerous menus can be branched to from here. Therefore it makes sense to become familiar with its layout.

6.2 Access codes

The menus are protected using access codes with the following levels:
<table>
<thead>
<tr>
<th>Name</th>
<th>Enables ...</th>
<th>Access code</th>
</tr>
</thead>
<tbody>
<tr>
<td>User code</td>
<td>Enables functions which trained personnel must use in their day-to-day work.</td>
<td>Factory setting: 5005, can be changed in &quot;Settings&quot; - &quot;System info&quot;.</td>
</tr>
<tr>
<td>Expert code</td>
<td>Enables additional functions which technical experts must use in their day-to-day work.</td>
<td>Is only provided during technical expert training courses.</td>
</tr>
<tr>
<td>Service code</td>
<td>For basic settings during commissioning and maintenance.</td>
<td>Only known by suitably trained personnel such as customer service employees.</td>
</tr>
</tbody>
</table>

### 6.3 INFO-level

The INFO-level is reached from the "Display OFF" display by pressing the key [START/STOP]. It comprises the:

- "Continuous Display 1" ("Production 1")
- "Continuous Display 2" ("Production 2")
- Display "Logbook"

#### Continuous display 1 (Production 1)

![Production display](image)

For example the "Continuous display 1" (Production 1) indicates:

- the instantaneous ClO₂ output
- The stroke length of the pumps
- The activity of the metering pumps
- The activity of the bypass pumps
- The time remaining up until maintenance
- Remaining suction time
- Error messages

The following can also be carried out via the function keys:

- Switching on or off of ClO₂ production
- Change the setpoint
- Calibrate the sensors
- View the log book (option)
- Extract escaped gases out of the reactor housing (if the function exists)
- Acknowledge the beeper
"Continuous display 2" (Production 2)

For example the "Continuous display 2" (Production 2) also indicates:
- The instantaneous flow in the bypass
- ClO₂ production setpoint
- ClO₂ concentration measured value (if function available)
- Chlorite concentration measured value (if function available) instead of the instantaneous ClO₂ output and the activity of the pumps
- ORP voltage measured value (if function available)
- Measured pH value (if function available)

"Logbook"

The "logbook" display indicates:
- The recorded events
- The operator actions at the control
- Listed values
- Graphic values for the listed values

Log book settings can be made under „Settings ➔ Configuration ➔ Logbook“.

Events
The menu „Events“ lists the date, time and the respective event with the source. For example this may be:
- Warning set - Water pump not ready
- Alarm acknowledge - Error sample water

Operator actions
The menu „Operator actions“ lists the date, time and the respective operator action. For example this may be:
- Power on
- Equipment on
- Production off
Listed values
The menu „Listed values“ lists the date, time and the measured values - independent of the system settings. For example this may be:
- ClO2 output
- ClO2 concentration
- Flow value

Graphic values
The menu „Graphic values“ displays the time-dependent graphic values - independent of the system settings. For example this may be:
- ClO2 output

In the following chapters those menu items are omitted for which the setting options are fixed!
7 Setting, Service

This menu contains the submenus:

1 - Commissioning: During start up, this menu must be run through - see Chapter 7.1 “Commissioning” on page 26

2 - Expert jobs: Contains functions for working on the pumps - see Chapter 7.2 “Expert jobs” on page 29

3 - Parameter reset: only for customer service - see Chapter 7.3 “Parameter Reset” on page 31

7.1 Commissioning

During start up, this menu must be run through.

For the detailed, binding description of system start up see the chapter “Start up”.

A green tick ✔ is placed after the “Commissioning” menus in question which have been successfully run through.
7.1.1 Bypass activ. manual

From here a possibly existing bypass pump can be manually switched off during Start up.
Outside this menu, the setting has no effect.

7.1.2 Bleeding pumps

This menu is used for bleeding the dosing pumps.
For more information see the "Start up" chapter.

7.1.3 Fill reactor

This menu is used for filling the reactor tank.
For more information see the "Start up" chapter.
7.1.4 Stroke sensor adjust

This menu is used to adjust the stroke sensors. For more information see the "Start up" chapter.

7.1.5 Calibrate pumps

The dosing pumps must be calibrated via this menu. For more information see the "Start up" chapter.

7.1.6 Service interval

Confirmation of the annual service must be carried out via this menu using the [ENTER] key, so that the system is re-enabled and the day countdown of the annual service interval is restarted.
WARNING!
If the [ENTER] key is wrongfully pressed, the result is serious danger as a result of an exceeded service interval.

The [ENTER] key must not be pressed as a consequence of work other than the annual service being carried out.

For more information see the "Start up" chapter.

7.2 Expert jobs

This menu supports the following activities during operation, as they are carried out in the correct sequence:

1 - Bleeding pumps - see Chapter 7.2.1 „Bleeding pumps“ on page 29
2 - Set stroke length - see Chapter 7.2.2 „Set stroke length“ on page 30
3 - Adjust stroke sensors - see Chapter 7.2.3 „Adjust stroke sensors“ on page 30

For the detailed, binding description of Expert jobs, see the "Operation" chapter.

7.2.1 Bleeding pumps

This menu is used for bleeding the dosing pumps.

For more information see the "Start up" chapter.
7.2.2 Set stroke length

This menu must be used to adjust the stroke lengths, so that the set data are transferred to the control.

- When using calibrated pumps and only the stroke length requires adjustment, via the menu „Set stroke length“, a recalibration is not required.
- The Bello Zon® control can match the number of preset strokes to the adjusted stroke length, provided the pumps inform the control via the menu „Set stroke length“ of their actual stroke lengths.

For more information see the "Operation" chapter.

7.2.3 Adjust stroke sensors

This menu is used to adjust the stroke sensors.

For more information see the "Start up" chapter.
7.3 Parameter Reset

This menu is used for resets which have a different effect range.

All values, which can be changed in the operating menu using the allocated access code, are reset to the factory settings upon selecting Reset in the menu.
Setting, settings

The "Settings" menu branches into the following parameter sets:
1 - "Equipment" Chapter 8.1 "Equipment" on page 32
2 - "Control" Chapter 8.2 "Control" on page 37

The current parameter set in which the control is currently located, is always shown by the display at the top left, e.g. see the display below.

To branch to other parameter sets from the menu "Settings" use the arrow keys [LEFT] and [RIGHT].

8.1 Equipment

This menu branch of the "Settings" menu contains the "Equipment" parameter set, comprising:
- "Enable code" Chapter 8.1.1 "Enable code" on page 32
- "Identity code" Chapter 8.1.2 "Identity code" on page 33
- "CAN overview" Chapter 8.1.3 "CAN overview" on page 33
- Saving Data Chapter 8.1.4 "Saving Data" on page 34
- "Language" Chapter 8.1.5 "Language" on page 34
- "Date and time" Chapter 8.1.6 "Date and time" on page 35
- "Configuration" Chapter 8.1.7 "Configuration" on page 35
- "Service interval" Chapter 8.1.8 "Service interval" on page 36

8.1.1 Enable code

From this menu, it is possible to enable an additional, chargeable identity code characteristic for the equipment using an Enable code.
8.1.2 Identity code

This menu shows the identity code of the equipment and the explanation of the identity code options. The identity code can also be modified here. Chargeable identity code options can only be enabled using an enable code - see the previous chapter. To do this order the required identity code from ProMinent; quote the system serial number when doing so.

8.1.3 CAN overview

This menu shows the recognized CAN modules of the system/equipment as well as their:
- Software version
- Hardware version
- Serial number
- Node ID

The serial number of the control is also the serial number of the system.

This menu is also used to change the User code.

1. In the menu „CAN overview“ press key [P].
   ⇒ The sub-menu „Control“ appears.

2. Change to menu item „User code“ and press key [P].

3. If necessary, change the access code using the [arrow keys] and press key [P].

4. Accept the new User code using [F5 Save].
   ⇒ Confirm the request „Save changes? Yes = ENTER“ by pressing the [ENTER] key.
8.1.4 Saving Data

From here it is possible to save parts of the system configuration, such as the identity code, on an SD card.

This menu is also used to update the software.

8.1.5 Language

The user interface language can be changed here.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>German</td>
<td></td>
<td>Depending on identity code</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td></td>
<td>English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>French</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Italian</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spanish</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Czech</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.1.6 Date and time

This menu is used to set the date and time for the control.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date*</td>
<td>31.12.9999</td>
<td>01.01.0001</td>
<td>-</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Time**</td>
<td>23:59:59</td>
<td>00:00:00</td>
<td>-</td>
<td>none</td>
<td></td>
</tr>
</tbody>
</table>

* Format: dd.mm.yyyy, ** Format: hh:mm:ss

**Summer time**

Where necessary, the time must be manually adjusted between summer time and normal time.

8.1.7 Configuration

This function is used to configure:
- Display
- Logbook
- Switch off beeper
- Delay access authentication

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brightness</td>
<td>9999</td>
<td>0</td>
<td>7999</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>9999</td>
<td>0</td>
<td>5000</td>
<td>Factory code</td>
<td></td>
</tr>
</tbody>
</table>
### Setting, settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dim time</td>
<td>99 min</td>
<td>0 min</td>
<td>5 min</td>
<td>none</td>
<td>To extend the service life of the display</td>
</tr>
<tr>
<td>Logbook</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interval</td>
<td>999 s</td>
<td>0 s / off</td>
<td>60 s</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Archive storing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Archive storing</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Storage time gap</td>
<td>7 d</td>
<td>1 d</td>
<td>1 d</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Switch off beeper</td>
<td>ON</td>
<td>OFF</td>
<td></td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Delay access authentication</td>
<td>30 min</td>
<td>0 min</td>
<td>10 min</td>
<td>Expert code</td>
<td></td>
</tr>
</tbody>
</table>

#### 8.1.8 Service interval

![Service interval](image)

The following points can be adjusted here:
- Service interval
- Warning time
- Reaction signal
- Reaction system

The following points are for information only:
- Last service
- Time until service

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service interval</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service interval</td>
<td>999 d</td>
<td>0 d</td>
<td>365 d</td>
<td>Service code</td>
<td>Warning signal before the next service interval</td>
</tr>
<tr>
<td>Warning time</td>
<td>999 d</td>
<td>0 d</td>
<td>28 d</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>max.</td>
<td>min.</td>
<td>Factory setting</td>
<td>Code</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------</td>
<td>-------</td>
<td>-----------------</td>
<td>---------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm</td>
<td></td>
<td>Alarm</td>
<td>Service code</td>
<td>Reaction signal</td>
</tr>
<tr>
<td></td>
<td>Warning</td>
<td>Info</td>
<td>n.exist.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn</td>
<td>shutdown</td>
<td>continue</td>
<td></td>
<td>Service code</td>
</tr>
</tbody>
</table>

* Explanation see "Terminology list" at the end of the operating instructions.

As soon as the "Service interval" has elapsed, the control reacts according to the reaction which is set under "Reaction system".

8.2 Control

This menu branch of the SETTING menu contains the "Control" parameter set, comprising:

1 - "Signal inputs"% Chapter 8.2.1 "Signal inputs" on page 38
2 - "ClO₂ production"% Chapter 8.2.2 "ClO₂ production" on page 45
3 - "Digital inputs"% Chapter 8.2.3 "Digital inputs" on page 53
4 - "Relay outputs"% Chapter 8.2.4 "Relay outputs" on page 55
5 - "Analog output XA1"% Chapter 8.2.5 "Analog output XA1" on page 56

From here the inputs and outputs of the control can be configured and the parameters adjusted for ClO₂ production and ventilation from the reactor enclosure.
8.2.1 Signal inputs

This menu is used to configure the inputs and set the corresponding limits for:

1. "Flow meter" Chapter 8.2.1.1 "Flow meter" on page 38
2. "Setpoint" Chapter 8.2.1.2 "Setpoint" on page 39
3. "Disturbance variable" Chapter 8.2.1.3 "Disturbance variable" on page 40
4. "ClO2 measurement" Chapter 8.2.1.4 "ClO2 measurement" on page 41
5. "Chlorite measurement" Chapter 8.2.1.5 "Chlorite measurement" on page 42
6. "ORP measurement" Chapter 8.2.1.6 "ORP measurement" on page 43
7. "pH measurement" Chapter 8.2.1.7 "pH measurement" on page 44
8. "Current XE1" Chapter 8.2.1.8 "Current XE1 / XE2" on page 45
9. "Current XE2"

8.2.1.1 Flow meter

This menu contains the following flow meter menu items:

- "Input" (input used)
- "Range"
- "Units"
### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td>not available</td>
<td>not available</td>
<td>not available</td>
<td>Service code</td>
<td>- 0.25-20Hz = XK8:3 &amp; 4 10-10 000Hz = XK8:2 &amp; 3 Current XE1 = XE1:2 &amp; 3 Current XE1 = XE1:2 &amp; 3</td>
</tr>
<tr>
<td><strong>Range:</strong></td>
<td>30 000 ... 1 m³/h</td>
<td>1 m³/h</td>
<td>1 m³/h</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td>Liter/pulse</td>
<td>Liter/pulse</td>
<td>Expert code</td>
<td>Valid for both contact inputs</td>
<td></td>
</tr>
<tr>
<td><strong>Value</strong></td>
<td>9999.9</td>
<td>0</td>
<td>1.0</td>
<td>Expert code</td>
<td>Valid for both contact inputs; impulses per litre of the water meter</td>
</tr>
</tbody>
</table>

**Limits**

| Min value(a)      | 30 000 m³/h | 1 m³/h / off | 1 m³/h / off | Expert code |
| Max value(a)      | 30 000 m³/h | 0 m³/h       | 999 m³/h     | Expert code |
| Hysteresis(a)     | 30 000 m³/h | 0 m³/h       | 10 m³/h      | Expert code |
| Min value(w)      | 30 000 m³/h | 1 m³/h / off | 1 m³/h / off | Expert code |
| Max value(w)      | 30 000 m³/h | 0 m³/h       | 999 m³/h     | Expert code |
| Hysteresis(w)     | 30 000 m³/h | 0 m³/h       | 30 m³/h      | Expert code |
| tDelay(alarm)*    | 0 s         |              | Service code  | Delay time |
| Reaction system*  | p.shutdn/shut-down/continue | shutdown | Service code | |

* Explanation see "Terminology list" at the end of the operating instructions

### 8.2.1.2 Setpoint

![Setpoint](image.png)
### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuating variable:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>n.exist.</td>
<td></td>
<td>not available</td>
<td>Service code</td>
<td>Input used</td>
</tr>
<tr>
<td>Current XE1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current XE2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limits:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. value(a)</td>
<td>100 %</td>
<td>1 % / off</td>
<td>1 % / off</td>
<td>Expert code</td>
<td>Min. value alarm</td>
</tr>
<tr>
<td>Max. value(a)</td>
<td>100 %</td>
<td>0 %</td>
<td>100 %</td>
<td>Expert code</td>
<td>Max. value alarm</td>
</tr>
<tr>
<td>Hysteresis(a)</td>
<td>100 %</td>
<td>0 %</td>
<td>2 %</td>
<td>Expert code</td>
<td>for alarm</td>
</tr>
<tr>
<td>tDelay(alarm)*</td>
<td>0 s</td>
<td></td>
<td></td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn/shut-down/continue</td>
<td>shutdown</td>
<td>Service code</td>
<td>Reaction control</td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see "Terminology list" at the end of the operating instructions

### 8.2.1.3 Disturbance variable

![Disturbance variable](image)

This term is explained in the "Terminology list" at the end of the operating instructions.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interference variable:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
<td></td>
<td>None</td>
<td>Service code</td>
<td>Input used</td>
</tr>
<tr>
<td>Current XE1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current XE2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limits:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. value (a)</td>
<td>100 %</td>
<td>1 % / off</td>
<td>1 % / off</td>
<td>Expert code</td>
<td>for signal checking</td>
</tr>
<tr>
<td>Max. value (a)</td>
<td>100 %</td>
<td>0 %</td>
<td>100 %</td>
<td>Expert code</td>
<td>for signal checking</td>
</tr>
<tr>
<td>Hysteresis(a)</td>
<td>100 %</td>
<td>0 %</td>
<td>2 %</td>
<td>Expert code</td>
<td></td>
</tr>
</tbody>
</table>
### 8.2.1.4 ClO2 measurement

A suitably equipped Bello Zon® system can measure and also control ClO2.

This menu contains these menu items for ClO2 measurement:

- "Input"
- "Range" (of the sensor)
- "Limits"

#### Parameter table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Service code</td>
<td>Input used</td>
</tr>
<tr>
<td></td>
<td>Current XE1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current XE2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0.50 ppm</td>
<td>2.00 ppm</td>
<td>2.00 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.00 ppm</td>
<td>10.00 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.00 ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limits</td>
<td>Min value(a)</td>
<td>Range</td>
<td>0.00 ppm / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max value(a)</td>
<td>Range</td>
<td>0.00 ppm / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hysteresis(a)</td>
<td>Range</td>
<td>0.00 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min value(w)</td>
<td>Range</td>
<td>0.00 ppm / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max value(w)</td>
<td>Range</td>
<td>0.00 ppm / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hysteresis(w)</td>
<td>Range</td>
<td>0.00 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tDelay(alarm)*</td>
<td>999 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
</tbody>
</table>
### Parameter Settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>tDelay (warning)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn/shut-down/continue</td>
<td>shutdown</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see “Terminology list” at the end of the operating instructions

### 8.2.1.5 Chlorite measurement

A suitably equipped Bello Zon® system can measure chlorite.

This menu contains these menu items for chlorite measurement:
- "Input"
- "Range" (of the sensor)
- "Limits"

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current XE1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current XE2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0.50 ppm</td>
<td>2.00 ppm</td>
<td>2.00 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Limits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min value(a)</td>
<td>Range</td>
<td>0.00 ppm / off</td>
<td>0.00 ppm / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Max value(a)</td>
<td>Range</td>
<td>0.00 ppm</td>
<td>2.00 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Hysteresis(a)</td>
<td>Range</td>
<td>0.00 ppm</td>
<td>0.04 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Min value(w)</td>
<td>Range</td>
<td>0.00 ppm / off</td>
<td>0.00 ppm / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Max value(w)</td>
<td>Range</td>
<td>0.00 ppm</td>
<td>2.00 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Hysteresis(w)</td>
<td>Range</td>
<td>0.00 ppm</td>
<td>0.04 ppm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>tDelay(alarm)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>tDelay (warning)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn/shut-down/continue</td>
<td>shutdown</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see “Terminology list” at the end of the operating instructions.
## 8.2.1.6 ORP measurement

A suitably equipped Bello Zon® system can measure the ORP voltage.

This menu contains these menu items for ORP measurement:
- "ORP measurement" (input used)
- "Range" (of the sensor)
- "Limits"

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORP measurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Service code</td>
<td>Input used</td>
</tr>
<tr>
<td>Range</td>
<td>2000 mV</td>
<td>0 mV</td>
<td>1000 mV</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Limits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min value(a)</td>
<td>2000 mV</td>
<td>0 mV / off</td>
<td>0 mV / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Max value(a)</td>
<td>2000 mV</td>
<td>0 mV</td>
<td>1000 mV</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Hysteresis(a)</td>
<td>2000 mV</td>
<td>0 mV</td>
<td>10 mV</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Min value(w)</td>
<td>2000 mV</td>
<td>0 mV / off</td>
<td>0 mV / off</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Max value(w)</td>
<td>2000 mV</td>
<td>0 mV</td>
<td>1000 mV</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Hysteresis(w)</td>
<td>2000 mV</td>
<td>0 mV</td>
<td>10 mV</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>tDelay(alarm)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>tDelay (warning)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn/shut‐down/continue</td>
<td>shutdown</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see "Terminology list" at the end of the operating instructions
A suitably equipped Bello Zon® system can measure pH.

This menu contains these menu items for pH measurement:
- "Input"
- "Limits"

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
<td></td>
<td>None</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current XE1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current XE2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Limits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min value(a)</td>
<td>pH 16</td>
<td>pH -2</td>
<td>pH 2</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Max value(a)</td>
<td>pH 16</td>
<td>pH -2</td>
<td>pH 12</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Hysteresis(a)</td>
<td>pH 16</td>
<td>pH -2</td>
<td>pH 0.2</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Min value(w)</td>
<td>pH 16</td>
<td>pH -2</td>
<td>pH 2</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Max value(w)</td>
<td>pH 16</td>
<td>pH 0</td>
<td>pH 12</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Hysteresis(w)</td>
<td>pH 16</td>
<td>pH 0</td>
<td>pH 0.2</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>tDelay(alarm)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>tDelay (warning)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn/shut-down/continue</td>
<td>shutdown</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see "Terminology list" at the end of the operating instructions.
8.2.1.8 Current XE1 / XE2

This menu is used to check the mA signal at the current input XE1 (XE2 analog).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current XE1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0..20 mA / 4..20 mA</td>
<td>4..20 mA</td>
<td>Expert code</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Limits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min value(a)</td>
<td>25 mA</td>
<td>0 mA</td>
<td>3 mA</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Max value(a)</td>
<td>25 mA</td>
<td>0 mA</td>
<td>23 mA</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Hysteresis(a)</td>
<td>25 mA</td>
<td>0 mA</td>
<td>0 mA</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>tDelay(alarm)*</td>
<td></td>
<td></td>
<td>0 s</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn/shut-down/continue</td>
<td>shutdown</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see “Terminology list” at the end of the operating instructions

8.2.2 ClO₂ production

This menu is used to set or check the necessary parameters for ClO₂ production:
- „Control“ ClO₂ quantity via (flow meter, ClO₂ measurement...) see Chapter 8.2.2.1 „Control ClO₂ via“ on page 46
- „Control“ (ClO₂ production) see Chapter 8.2.2.2 „Control“ on page 47
8.2.2.1 Control ClO₂ via

This menu is used to set which signal should be used to control the ClO₂ production quantity:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control ClO₂ via</td>
<td>Manual</td>
<td>Manual</td>
<td>Expert code</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Setpoint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flow value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ClO₂ measurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORP measurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Manual: No input signal; constant quantity
Setpoint: Via external setpoint, e.g., from the control room; setpoint dependent
Flow value: Via water meter; flow-proportional
ClO₂ measurement: Via ClO₂ sensor; measurement-proportional
ORP measurement: Via ORP sensor
8.2.2.2 Control

Main control 09.10.2009 14:23:10

Control

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setpt. ClO₂ production</td>
<td></td>
<td>0 g/h</td>
<td>0 g/h</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Setpt. ClO₂ concentrat.</td>
<td>0 g/h</td>
<td>0.00 ppm</td>
<td>0.00 ppm</td>
<td>User code</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 11
This menu is used to set all control parameters and the corresponding alarms.

A. Setpt. ClO₂ production (manual control)
Here constant Setpt. ClO₂ production can be preselected for "Control ClO₂ via":

- "Manual"

This value can be set during operation in the continuous display „Production“ under [F2] SETPOINT, as soon as the control has been started using the [START/STOP] key.

B. Setpt. ClO₂ production (measurement-proportional control)
Here Setpt. ClO₂ production can be preselected for "Control ClO₂ via":

- "Flow value"
- "ClO₂ measurement"

This value can be easily set during operation in the continuous display „Production“ menu under [F2] SETPOINT, as soon as the control has been started using the [START/STOP] key.

C. Setpoint ClO₂ high concentration
Here Setpt. ClO₂ production can be preselected for "Dosing input"-"high level d.".

C. Man. ClO₂ production
Here Setpt. ClO₂ production can be preselected for "Dosing input"-"man. dosing".

D. Control parameters
Here the control parameters can be set for "Control ClO₂ via":

- "ClO₂ measurement"
<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setpt. ClO₂ production for manual dosing</td>
<td>Max. production volume (config)</td>
<td>0 g/h</td>
<td>0 g/h</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Setpt. ClO₂ high concentration</td>
<td>Measuring range of the ClO₂ sensor</td>
<td>0.00 ppm</td>
<td>0.00 ppm</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Setpt. ClO₂ concentration during flow measurement</td>
<td>2000 ppm</td>
<td>0.00 ppm</td>
<td>0.00 ppm</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Setpoint ORP potential</td>
<td>Measuring range of the ORP sensor</td>
<td>0 mV</td>
<td>0.00 ppm</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Setpoint ORP high concentration</td>
<td>Measuring range of the ORP sensor</td>
<td>0 mV</td>
<td>0.00 ppm</td>
<td>User code</td>
<td></td>
</tr>
<tr>
<td>Control mode</td>
<td>PID control</td>
<td>P control</td>
<td>PID control</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Control parameters for the P control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P factor</td>
<td>500 % of the measuring range</td>
<td>1% of the measuring range</td>
<td>0.20 ppm</td>
<td>Expert code</td>
<td>For ClO₂</td>
</tr>
<tr>
<td>P factor</td>
<td>500% of the measuring range</td>
<td>10 mV</td>
<td>100 mV</td>
<td>Expert code</td>
<td>For ORP</td>
</tr>
<tr>
<td>Basic load</td>
<td>100.0 %</td>
<td>0.0 %</td>
<td>0.0 %</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Feedforward control</td>
<td>n.exist. additive multiplicative</td>
<td>n.exist.</td>
<td>n.exist.</td>
<td>Expert code</td>
<td>Feedforward control</td>
</tr>
<tr>
<td>Disturb. variable factor</td>
<td>100 %</td>
<td>0 %</td>
<td>0 %</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Control parameters for the PID control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P factor</td>
<td>500 % of the measuring range</td>
<td>1% of the measuring range</td>
<td>0.20 ppm</td>
<td>Expert code</td>
<td>For ClO₂</td>
</tr>
<tr>
<td>P factor</td>
<td>500% of the measuring range</td>
<td>10 mV</td>
<td>100 mV</td>
<td>Expert code</td>
<td>For ORP</td>
</tr>
<tr>
<td>I factor</td>
<td>9999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>D factor</td>
<td>2500 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Basic load</td>
<td>100.0 %</td>
<td>0.0 %</td>
<td>0.0 %</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Feedforward control</td>
<td>n.exist. additive multiplicative</td>
<td>n.exist.</td>
<td>n.exist.</td>
<td>Expert code</td>
<td>Feedforward control</td>
</tr>
<tr>
<td>Disturb. variable factor</td>
<td>100 %</td>
<td>0 %</td>
<td>0 %</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Control parameters for the 2 point control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Setting, settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band for 2 point control</td>
<td>100.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Lower limit ctrl output</td>
<td>100.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Upper limit ctrl output</td>
<td>100.00%</td>
<td>0.00%</td>
<td>100.00%</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>On time min</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Expert code</td>
<td>Minimum switch on time for 2 point control</td>
</tr>
<tr>
<td>Off time min</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Expert code</td>
<td>Minimum switch on time for 2 point control</td>
</tr>
</tbody>
</table>

For an explanation of the parameters see "Terminology list" at the end of the operating instructions.

### E. Control alarm

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>tDelay(alarm)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm</td>
<td>Warning</td>
<td>Alarm</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Message</td>
<td>none</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn</td>
<td>shutdown</td>
<td>shutdown</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>continue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see "Terminology list" at the end of the operating instructions.

Here the control parameters can be set for the reaction to a „Control alarm.“

### F. Alarm overload

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>tDelay(alarm)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm</td>
<td>Warning</td>
<td>none</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Message</td>
<td>none</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn</td>
<td>shutdown</td>
<td>continue</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>continue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see "Terminology list" at the end of the operating instructions.

Here the control parameters can be set for the „Alarm overload“. This occurs as soon as the current process requires more ClO₂ solution that the system can supply.

---

E. Control alarm

F. Alarm overload
G. Alarm parameter error

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>tDelay(alarm)*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Service code</td>
<td>Delay time</td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm Warning Message none</td>
<td>Warning</td>
<td>Expert code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn shutdown continue</td>
<td>continue</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see “Terminology list” at the end of the operating instructions.

Here the control parameters can be set for the „Alarm parameter error“. This occurs as soon as parameters are input into the control and confirmed which could lead to an inconsistency in a parameter set.

8.2.2.3 Level acid

Service technicians can read-off information about the following functions from this menu:

- Level alarms

These items can also be set:

- Empty switch
- Low switch

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty switch</td>
<td>N/O / NC (open)</td>
<td>N/O</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low switch</td>
<td>N/O / NC (open)</td>
<td>N/O</td>
<td>Service code</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.2.2.4 Level chlorite

8.2.2.5 Pumps
### Setting, settings

- "Tol. stroke length diff"
- "Pls gap"

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosing acid/chlorite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration volume/Actual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not adjustable here</td>
</tr>
<tr>
<td>Stroke volume/setp.</td>
<td></td>
<td></td>
<td>Type dependent</td>
<td></td>
<td>Not adjustable at medium back pressure</td>
</tr>
<tr>
<td>Stroke volume/Actual</td>
<td>3000 ml</td>
<td>1 ml</td>
<td></td>
<td></td>
<td>Input upon calibration</td>
</tr>
<tr>
<td>Alarm capacity limit pumps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm</td>
<td></td>
<td>none</td>
<td></td>
<td>Service code</td>
</tr>
<tr>
<td></td>
<td>Warning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction system</td>
<td>p.shutdn</td>
<td>shutdown</td>
<td>continue</td>
<td></td>
<td>Service code</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pls gap</td>
<td>100 ms</td>
<td>0 ms</td>
<td>Type dependent</td>
<td></td>
<td>Factory code</td>
</tr>
</tbody>
</table>

#### 8.2.2.6 Bypass control

![Bypass control interface](image)

This function is used to set or read-off from:
- "Startup time"
- "Runout time"
- "Bypass pump (type contact)"
- "Bypass supervision alarm"
- "Flow Bypass XK5:1/2" (Type contact)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startup time *</td>
<td>999 s</td>
<td>0 s</td>
<td>12 s</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Runout time *</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Expert code</td>
<td></td>
</tr>
</tbody>
</table>
### 8.2.3 Digital inputs

This menu is used to set or read-off parameters relating to:

- **Input sample water XK3:1/2**
- **Input leakage XK4:3/4** (safety bund)
- **Input error XK5:3/4**
<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input sample water XK3:1/2</td>
<td></td>
<td></td>
<td>Open</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>Type contact</td>
<td>N/O / NC (open)</td>
<td>Open</td>
<td></td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>tDelay*</td>
<td>999 s</td>
<td>0 s</td>
<td>5 s</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm</td>
<td></td>
<td>Alarm</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn</td>
<td>shutdown continue</td>
<td>p.shutdn</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>Input leakage XK4:3/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type contact</td>
<td>N/O / NC (open)</td>
<td>Open</td>
<td></td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>tDelay*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm</td>
<td></td>
<td>Alarm</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn</td>
<td>shutdown continue</td>
<td>p.shutdn</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Input error XK5:3/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type contact</td>
<td>N/O / NC (open)</td>
<td>Open</td>
<td></td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>tDelay*</td>
<td>999 s</td>
<td>0 s</td>
<td>0 s</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Reaction signal</td>
<td>Alarm</td>
<td></td>
<td>Alarm</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Reaction system*</td>
<td>p.shutdn</td>
<td>shutdown continue</td>
<td>p.shutdn</td>
<td>Factory code</td>
<td></td>
</tr>
<tr>
<td>Input pause XK6:1/2</td>
<td></td>
<td></td>
<td></td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td>Input dosing XK6:3/4**</td>
<td></td>
<td></td>
<td></td>
<td>Service code</td>
<td></td>
</tr>
</tbody>
</table>
8.2.4 Relay outputs

Service technicians can read-off information about the relay from this menu for:
- „Alarm XR1“
- „Warning XR2:1“
- „Operation XR2:2“
The control can output these signals via the analog output XA1, provided they are present or measured:

- "Flow value"
- "Setpoint"
- "ClO2"
- "Chlorite"
- "Production volume"
- "ORP"

### Parameter Table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>max.</th>
<th>min.</th>
<th>Factory setting</th>
<th>Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>0..20 mA</td>
<td>4..20 mA</td>
<td>4..20 mA</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td><strong>Output signal</strong></td>
<td>none</td>
<td>Flow value</td>
<td>off</td>
<td>Service code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Setpoint</td>
<td>ClO₂</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chlorite</td>
<td>Production volume</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORP</td>
<td>pH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current failure</strong></td>
<td>off</td>
<td>0.0 mA</td>
<td>off</td>
<td>Expert code</td>
<td>E.g. signals to a PLC a system fault (when an error exists)</td>
</tr>
<tr>
<td></td>
<td>3.7 mA</td>
<td>22.0 mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23.0 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Production volume</strong>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Factory setting = Measuring range-factory setting</td>
</tr>
<tr>
<td>20 mA</td>
<td>Dependent on system size</td>
<td>0 g/h</td>
<td>45 g/h</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>0/4 mA</td>
<td>Dependent on system size</td>
<td>0 g/h</td>
<td>0 g/h</td>
<td>Expert code</td>
<td>20 mA-value≥ 0/4 mA-value + 1 g/h</td>
</tr>
<tr>
<td><strong>Flow value</strong>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 mA</td>
<td>30000 m³/h</td>
<td>0 m³/h</td>
<td>1 m³/h</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>max.</td>
<td>min.</td>
<td>Factory setting</td>
<td>Code</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>-----------</td>
<td>-----------------</td>
<td>--------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>0/4 mA</td>
<td>30000 m³/h</td>
<td>0 m³/h</td>
<td>0 m³/h</td>
<td>Expert code</td>
<td>20 mA-value ≥ 0/4 mA-value + 1 m³/h</td>
</tr>
<tr>
<td></td>
<td>30000 l/h</td>
<td>0 l/h</td>
<td>1 l/h</td>
<td>Expert code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30000 l/h</td>
<td>0 l/h</td>
<td>0 l/h</td>
<td>Expert code</td>
<td>20 mA-value ≥ 0/4 mA-value + 1 l/h</td>
</tr>
</tbody>
</table>

**ClO₂:**

| 20 mA        | Measuring range dependent | 0 ppm | 2.00 ppm        | Expert code  | Factory setting = Measuring range-factory setting |
| 0/4 mA       | Measuring range dependent | 0 ppm | 0 ppm           | Expert code  | 20 mA-value ≥ 0/4 mA-value + 0.1 ppm           |

**Chlorite:**

| 20 mA        | Measuring range dependent | 0 ppm | 2.00 ppm        | Expert code  | Factory setting = Measuring range-factory setting |
| 0/4 mA       | Measuring range dependent | 0 ppm | 0 ppm           | Expert code  | 20 mA-value ≥ 0/4 mA-value + 0.1 ppm           |

**ORP:**

| 20 mA        | 2000 mV    | 0 mV     | 1000 mV         | Expert code  | Factory setting = Measuring range-factory setting |
| 0/4 mA       | 2000 mV    | 0 mV     | 0 mV            | Expert code  | 20 mA-value ≥ 0/4 mA-value + 1 mV              |

**Actuating variable:**

| 20 mA        | 100 %      | 0 %      | 100 %           | Expert code  | 20 mA-value ≥ 0/4 mA-value + 5 %              |
| 0/4 mA       | 100 %      | 0 %      | 0 %             | Expert code  |                                              |


9 Setting, Calibration

From here it is possible to calibrate:
- Chlorine dioxide (sensors) % Chapter 9.1 „ClO₂“ on page 58
- Chlorite (sensors) % Chapter 9.2 „Chlorite“ on page 61
- ORP (sensors) % Chapter 9.3 „ORP“ on page 65
- pH (sensors) % Chapter 9.4 „pH value“ on page 67

Only for factory settings:
- Calibration system level % Chapter 9.5 „Calibr. System level“ on page 70

9.1 ClO₂

CAUTION!
Danger from incorrect dosing
Incorrect operation of the sensors can result in incorrect dosing.
- Please also observe the operating instructions for the sensor and in-line probe housing.
- The sensor must have been run-in.
- Following the replacement of a membrane cap or electrolyte, a slope calibration must be carried out.
- The slope has to be re-calibrated at regular intervals to ensure perfect operation of the sensor.
- Avoid air bubbles in the sample water, as they can adhere to the sensor membrane.
- Please note the pertinent national guidelines for calibration intervals.
CAUTION!
Warning prior to interrupting monitoring of the limits and signals
When changing to the calibration menu, the control interrupts monitoring of limit values and signals.
- Bear in mind when changing to the calibration menu, that the control interrupts monitoring of limit values and signals.

If you wish to reset the zero point and slope values to the factory settings, press [F4] STANDARD.

Requirements, general
- The sensor has been run-in
- Constant flow at the in-line probe housing - minimum 40 l/h
- Constant temperature of the sample water
- Identical temperature of sample water and sensor (wait approx. 15 minutes).

9.1.1 Zero point

9.10.2010 14:23:10
Confirm value with F2 or F3
Change the value manually
Take over values with F5
Test value 0.00 ppm
Future sensor data
Zero pt. 4.00 mA  Slope 6.00 mA/ppm
Message: No alarm

CAUTION!
Warning of incorrect metering
If an unnecessary zero point calibration is carried out, the existing calibration can be worsened.
- Only perform a zero point calibration if you are using the sensor at the lower threshold of the measuring range.

Prerequisites:
The control is set to "Production on".

1. Remove the sensor. Sample water shut-off?
2. Dip the CDE sensor in a bucket of clean, chlorine dioxide free tap water (or in still mineral water or distilled water. Check the tap water for chlorine dioxide using a suitable sampling instrument). The chlorine dioxide free water must be at the same temperature as the bypass water.
3. Stir using the sensor until the measured value in the continuous display 2 ("Production 2", arrow key [LEFT]) remains stable and close to zero for 5 minutes.
4. Stop the system with the [START/STOP] key.
5. Press [F3] CALIBR to change to the calibration menu.
6. Select the submenu „Chlorine dioxide“ (arrow keys) and press the [ENTER] key.
7. Confirm the displayed measured value under „Test value“ by pressing [F3] ZEROP.
8. Accept the zero point using [F5].
9. Replace the sensor in the in-line probe housing.

**CAUTION!**
Warning of incorrect metering
If a slope calibration is not also carried out following a zero point calibration, incorrect metering may occur.
– Now calibrate the slope without fail.

### 9.1.2 Slope

![Main control interface]

**CAUTION!**
Warning of incorrect metering
The measuring system cannot be calibrated, if chlorine dioxide is not present in the sample water for the entire period.
– Ensure that chlorine dioxide is present in the sample water for the entire period.

1. Press [F3] CALIBR to change to the calibration menu.
2. Select the sub-menu „Chlorine dioxide“ (arrow keys) and press the [ENTER] key.
3. Immediately afterwards, take a water sample at the in-line probe housing.
4. Immediately afterwards, determine the chlorine dioxide content of the sample water with a photometer and a suitable sampling instrument (e.g. DPD 1 for chlorine dioxide (CDE sensor)).
5. Confirm the displayed measured value under „Test value“ by pressing [F2] SLOPE or press the [ENTER] key, to change the displayed measured value with the arrow keys and save by pressing the [ENTER] key, and then confirm with [F2] SLOPE.
6. To conclude the calibration and save the values, press [F5] SAVE.
8. If you do not want to carry out any further calibrations, press the [ESC] key to jump back to the menu item “Equipment off”.

9. Re-open the stopcocks for the sample water, first discharge then feed.

**CAUTION!**

Warning of incorrect metering
It may be that the sensor infeed phase is not yet completed and consequently incorrect metering can occur.

– The calibration must be repeated without fail after a day.

### Clearing faults during calibration

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>After the sensor run in period (for CDE approximately 2 ... 6 h), the measured value is clearly too low.</td>
<td>The sensor is not yet run-in.</td>
<td>Double the run in period or extend until the following morning.</td>
</tr>
<tr>
<td>After the run in period (for CDE approximately 2 ... 6 h) the sensor will not calibrate.</td>
<td>The sensor is not yet run-in.</td>
<td>Double the run in period or extend until the following morning.</td>
</tr>
<tr>
<td>After the extended run in period, the sensor will still not calibrate.</td>
<td>-</td>
<td>Call ProMinent customer service (phone numbers, see under <a href="http://www.prominent.com">www.prominent.com</a> at the top under „Contact”).*</td>
</tr>
</tbody>
</table>

* Please have the following data ready:
  - DPD value (chlorine dioxide)
  - pH value
  - Sensor type with measuring range

<table>
<thead>
<tr>
<th>Fault message</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>„Zero point too low“</td>
<td>&lt; 3 mA</td>
</tr>
<tr>
<td>„Zero point too high“</td>
<td>&gt; 5 mA</td>
</tr>
<tr>
<td>„Slope too low“</td>
<td>Slope &lt; 1/4 standard slope</td>
</tr>
<tr>
<td>„Slope too high“</td>
<td>Slope &gt; 3 x standard slope</td>
</tr>
<tr>
<td>„Check value too low“</td>
<td>&lt; 2 % of measuring range</td>
</tr>
</tbody>
</table>

### 9.2 Chlorite

![Chlorite calibration](image)
CAUTION!
Danger from incorrect measurements
Incorrect operation of the sensors can result in incorrect measurements.

- Please also observe the operating instructions for the sensor and in-line probe housing.
- The sensor must have been run-in.
- Following the replacement of a membrane cap or electrolyte, a slope calibration must be carried out.
- The slope has to be re-calibrated at regular intervals to ensure perfect operation of the sensor.
- Avoid air bubbles in the sample water, as they can adhere to the sensor membrane.
- Please note the pertinent national guidelines for calibration intervals.

CAUTION!
Warning prior to interrupting monitoring of the limits and signals
When changing to the calibration menu, the control interrupts monitoring of limit values and signals.

- Bear in mind when changing to the calibration menu, that the control interrupts monitoring of limit values and signals.

Requirements, general

- The sensor has been run-in
- Constant flow at the in-line probe housing - see “Technical data” in the sensor operating instructions
- Constant temperature of the sample water
- Identical temperature of sample water and sensor (wait approx. 15 minutes).
- There is a constant pH value in the permitted pH range of pH 6.5 .. pH 9.5

9.2.1 Zero point

If you want to return to the factory settings for zero point and slope, press [F4] STANDARD.

Future sensor data
Zero pt. 4.00 mA  Slope 6.00 mA/ppm
Message: No alarm

Main control  09.10.2010  14:23:10
Prerequisites:
The control is set to „Production on“.

1. ▶ Remove the sensor. Sample water shut-off?
2. ▶ Immerse the CLT sensor in a bucket with clean tap water which is free from chlorine and reducing agents (Fe$^{2+}$, Mn$^{2+}$, nitrite, ...) (or in still mineral water or distilled water. Check the tap water for chlorite using a suitable sampling instrument). The water must be the same temperature as the bypass water.
3. ▶ Stir using the sensor until the measured value in the continuous display 2 („Production 2“, arrow key [LEFT]) remains stable and close to zero for 5 minutes.
4. ▶ Stop the system with the [START/STOP] key.
5. ▶ Press [F3] CALIBR to change to the calibration menu.
6. ▶ Select the submenu „Chlorite“ ([arrow keys]) and press the [ENTER] key.
7. ▶ Confirm the displayed measured value under „Test value“ using [F3] ZEROP.
8. ▶ Accept the zero point using [F5] SAVE.
9. ▶ Replace the sensor in the in-line probe housing.

CAUTION!
Warning of incorrect measurements
If an unnecessary zero point calibration is carried out, the existing calibration can be worsened.
– Only perform a zero point calibration if you are using the sensor at the lower threshold of the measuring range.

CAUTION!
Warning of incorrect measurements
If a slope calibration is not also carried out following a zero point calibration, incorrect measurements may occur.
– Now calibrate the slope without fail.

9.2.2 Slope
CAUTION!
Warning of incorrect measurements
The measuring system cannot be calibrated, if chlorite is not present in the sample water for the entire period.
- Ensure that chlorite is present in the sample water for the entire period.

1. Press [F3] CALIBR to change to the calibration menu.
2. Select the submenu „Chlorite“ ([arrow keys]) and press the [ENTER] key.
3. Immediately afterwards, take a water sample at the in-line probe housing.
4. Then immediately determine the chlorite content of the sample water with a photometer and a suitable sampling instrument (e.g. DPD for chlorite (CLT sensor)).
5. Confirm the displayed measured value under „Test value“ using [F2] SLOPE or
6. press the [ENTER] key, to change the displayed measured value with the arrow keys and save by pressing the [ENTER] key, and then confirm with [F2] SLOPE.
7. To conclude the calibration and save the values, press [F5] SAVE.
8. If you do not want to carry out any further calibrations, press the [ESC] key to jump back to the menu item „Equipment off“.
9. Re-open the stopcocks for the sample water, first discharge then feed.

CAUTION!
Warning of incorrect measurements
It may be that the sensor infeed phase is not yet completed and consequently incorrect measurements can occur.
- The calibration must be repeated without fail after a day.

Clearing faults during calibration

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>After the sensor run in period (for CLT approximately 2 ... 12 h), the measured value is clearly too low.</td>
<td>The sensor is not yet run-in.</td>
<td>Double the run in period or extend until the following morning.</td>
</tr>
<tr>
<td>After the run in period (for CLT approximately 2 ... 12 h) the sensor will not calibrate.</td>
<td>The sensor is not yet run-in.</td>
<td>Double the run in period or extend until the following morning.</td>
</tr>
<tr>
<td>After the extended run in period, the sensor will still not calibrate.</td>
<td>-</td>
<td>Call ProMinent customer service (phone numbers, see under <a href="http://www.prominent.com">www.prominent.com</a> at the top under „Contact“).*</td>
</tr>
</tbody>
</table>

* Please have the following data ready:
- DPD value (chlorite)
- pH value
- Sensor type with measuring range
### Fault message

<table>
<thead>
<tr>
<th>Fault message</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>„Zero point too low“</td>
<td>&lt; 3 mA</td>
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<td>„Slope too high“</td>
<td>Slope &gt; 3 x standard slope</td>
</tr>
<tr>
<td>„Check value too low“</td>
<td>&lt; 2 % of measuring range</td>
</tr>
</tbody>
</table>

---

### 9.3 ORP

#### Main control

**Check Redox sensor**

Change Buffer value manually then confirm using F5

Buffer val **465 mV**

Message: No alarm

---

#### Safety information

**CAUTION!**

**Danger from incorrect metering**

Incorrect operation of the sensors can result in incorrect dosing.

- Please also observe the operating instructions for the sensor and in-line probe housing.
- For perfect operation of the sensor, the check must be repeated at regular intervals.
- Please note the pertinent national guidelines for calibration intervals.

**CAUTION!**

**Warning prior to interrupting monitoring of the limits and signals**

When changing to the calibration menu, the control interrupts monitoring of limit values and signals.

- Bear in mind when changing to the calibration menu, that the control interrupts monitoring of limit values and signals.

---

*In the event that the displayed value deviates by more than ± 40 mV from the measured value of the buffer solution, then check and replace the buffer solution and ORP sensor as necessary.*
Discard used buffer solution.

If you wish to reset the zero point and slope values to the factory settings, press [F4] STANDARD.

To exit the „Calibration“ menu without terminating the calibration, press the [ESC] key.

Requirements, general
- Constant temperature of the sample water
- Identical temperature of sample water and sensor (wait approx. 5 minutes).

Prerequisites:
- The sample water is shut-off - if necessary acknowledge any alarms which occur by pressing the [ENTER] key.
- The system is now in the state „Equipment off“.

1. Shut-off the sample water - if necessary acknowledge any alarms which occur by pressing the [ENTER] key.
2. Unscrew the coaxial cable from the ORP sensor.
3. Remove the ORP sensor - sample water shut-off?
4. Rinse the ORP sensor with distilled water.
5. Carefully dab the ORP sensor dry with a cloth (grease-free, lint-free).
6. Press [F3 Calibr] to change to the menu „Calibration“.
7. If necessary use the key [DOWN] „to select ORP“.
8. Using the key [ENTER] switch to the menu „ORP checking“.
9. To specify the value from the buffer bottle (e.g. 465 mV) press the [ENTER] key and use the [arrow keys] to correct it.
10. Confirm the correction using the [ENTER] key.
11. Immerse the ORP sensor in the buffer solution.

If an equipotential bonding pin was used for measuring, then also dip this in the buffer solution.

12. As soon as the displayed value is stable, press [F2 check] to start the test.
13. Accept the value using [F5 Save] :
   ⇒ The control changes to the higher-level menu and simultaneously displays an error message.
14. Unscrew the coaxial cable from the ORP sensor.
15. Replace the ORP sensor in the in-line probe housing.
16. Screw the coaxial cable back onto the ORP sensor
17. Re-install the equipotential bonding pin.
18. Open the stopcocks for the sample water, first discharge then feed.

19. Press [F1 Home] to jump back to the central menu item „Equipment off“.

20. Using the key [Start/Stop] start the system.

<table>
<thead>
<tr>
<th>Fault message</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>„Test value too low“</td>
<td>&lt; -40 mV</td>
</tr>
<tr>
<td>„Test value too high“</td>
<td>&gt; +40 mV</td>
</tr>
</tbody>
</table>

9.4 pH value

![Main control](image)

**Main control**

**pH calibration**

Dip sensor in buffer solution 1

Buffer 1  7.03 pH

if Value stable, confirm using F2

Message: No alarm

**Safety information**

**CAUTION!**

**Danger from incorrect measurements**

Incorrect operation of the sensors can result in incorrect measurements.

- Please also observe the operating instructions for the sensor and in-line probe housing.
- The slope has to be re-calibrated at regular intervals to ensure perfect operation of the sensor.
- Avoid air bubbles in the sample water, as they can adhere to the sensor membrane.
- Please note the pertinent national guidelines for calibration intervals.

**CAUTION!**

**Warning prior to interrupting monitoring of the limits and signals**

When changing to the calibration menu, the control interrupts monitoring of limit values and signals.

- Bear in mind when changing to the calibration menu, that the control interrupts monitoring of limit values and signals.

**Discard used buffer solution.**
If you wish to reset the zero point and slope values to the factory settings, press [F4] STANDARD.

To exit the „Calibration“ menu without terminating the calibration, press the [ESC].

### Requirements, general

- Constant temperature of the sample water
- Identical temperature of sample water and sensor (wait approx. 5 minutes).

### Instruction

The pH sensor calibration is a 2-point calibration.

**Prerequisites:**
- The sample water is shut-off - if necessary acknowledge any alarms which occur by pressing the [ENTER] key.
- The system is now in the state „Equipment off“.

1. Unscrew the coaxial cable from the pH sensor.
2. Remove the pH sensor.
3. Rinse the pH sensor with distilled water.
4. Carefully dab the pH sensor dry with a cloth (grease-free, lint-free).
5. Screw the coaxial cable back onto the pH sensor.
6. Press [F3 Calibr] to switch to the menu „Calibration“.
7. If necessary use the key [DOWN] „to select pH“.
8. Using the key [ENTER] switch to the menu „pH calibration“.

9. Immerse the pH sensor in the first quality buffer (e.g. pH 7) and stir slightly using the sensor.

If an equipotential bonding pin was used for measuring, then also dip this in the quality buffer.

10. As soon as the measured value „Buffer 1“ is stable, press [F2 Buffer 1] to confirm.
11. To specify the value from the buffer bottle press the [ENTER] key and use the [arrow keys].
12. Confirm the entry using the [ENTER] key.
13. Accept the value using [F5 Save].
14. Rinse the pH sensor with distilled water.
15. Carefully dab the pH sensor dry with a cloth (grease-free, lint-free).

<table>
<thead>
<tr>
<th>Main control</th>
<th>18.10.2010 15:23:10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH calibration</strong></td>
<td></td>
</tr>
<tr>
<td>Dip sensor in buffer solution 1</td>
<td></td>
</tr>
<tr>
<td>Buffer 2</td>
<td>4.07 pH</td>
</tr>
<tr>
<td>if Value stable, confirm using F2</td>
<td></td>
</tr>
<tr>
<td>Message: No alarm</td>
<td></td>
</tr>
</tbody>
</table>

16. Immerse the pH sensor in the second quality buffer (e.g. pH 4 or pH 10) and stir slightly using the sensor.

- **i** If an equipotential bonding pin was used for measuring, then also dip this in the quality buffer.

17. As soon as the measured value „Buffer 2“ is stable, press [F2 Buffer 2] to confirm.
18. To specify the value from the buffer bottle press the [ENTER] key and use the [arrow keys].
19. Confirm the entry using the [ENTER] key.
20. Accept the value using [F5 Save].
   - The menu item „Future sensor data“ and, where applicable, an error message appear.
21. If the displayed sensor data do not appear plausible, press [F4 Standard] to load the standard data and repeat the calibration.
22. If the displayed sensor data appear plausible, press [F5 Save] to accept.
   - The query “Save changes?” appears
23. Confirm the query using the [ENTER] key.
   - The menu item „pH calibration“ appears from the start.
24. Unscrew the coaxial cable from the pH sensor.
25. Replace the pH sensor in the in-line probe housing - manually tighten, but ensure it is water-tight.
26. Screw the coaxial cable back onto the pH sensor
27. Re-install the equipotential bonding pin.
28. Open the stopcocks for the sample water, first discharge then feed.
29. Press [F1 Home] to jump back to the central menu item „Equipment off“.
30. Using the key [Start/Stop] start the system.

<table>
<thead>
<tr>
<th>Fault message</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>„Zero point too low“</td>
<td>&lt; -60 mV</td>
</tr>
<tr>
<td>„Zero point too high“</td>
<td>&gt; +60 mV</td>
</tr>
</tbody>
</table>
9.5 Calibr. System level

This menu has no meaning to the user.
Only for factory settings:
- Calibration system level

9.6 Calibrate pumps

The dosing pumps can be calibrated by customer service via the "SERVICE" menu - see chapter Chapter 10.3.5 “Calibrate pumps” on page 83.
10 Start up

Safety information

**WARNING!**
- Prior to Start up carefully read through this entire chapter.
- Initial commissioning (Start up) may only be carried out by ProMaqua authorised customer service.
- The ProMaqua authorised customer service must instruct the operating and maintenance personnel during the Start up.
- Such a commissioning may only be carried out by an expert.

**WARNING!**
**The reactor can explode**
If the empty reactor is started up directly with chemicals, an explosive ClO₂ gas phase can form inside the reactor.
- The chemical canister must only be connected after the reactor has been completely filled with water.

**WARNING!**
**Warning of the possible escape of corrosive liquid**
If the system leaks, corrosive liquid can escape.
- Under no operating status must the system maximum permissible operating pressure be exceeded.
- The entire installation must remain leak-tight when operated at the maximum operating pressure.
- Prior to Start up carefully open all the shut-off devices in the bypass.
- Check the hydraulic connectors.

**Note for the system operator**
During Start up, also adhere to the instructions of the following regulations without fail:

a) - Accident prevention regulations (in Germany: GUV 8.15 or VGB 65): Chlorinating systems must only be started up after they have been checked by a technical expert to ensure they are in a correct and proper state and have been subject to leak testing. Chlorinating systems must be checked for safety prior to each re-commissioning by a technical expert. Only personnel must be appointed to operate and maintain chlorinating systems and handle chemicals, who have been instructed in such matters and who can be expected to reliably fulfil their duties.

b) - The ordinance relating to dangerous substances (in Germany: Arb-StoffV according to the edition of 11 February 1982 BGBl. I page 145)

c) - Requirements relating to output chemicals - see chapter ☞ „Safety information“ on page 90

d) - All other local regulations for such installations outside Germany
Start up

Overview
1. Check the implementation of the hydraulic connectors.
2. Check the implementation of the electrical connections.
3. Connect the Bello Zon® system to the mains (cable with 3 x 1 mm² conductors).

10.1 Installation - last steps

1. Check the implementation of the hydraulic connectors.
2. Check the implementation of the electrical connections.
3. Connect the Bello Zon® system to the mains (cable with 3 x 1 mm² conductors).

10.2 Configuring the system and control

1. Check that the system is off (if necessary press the [START/STOP] key).
2. In principle now sequentially run through the individual tabs in the „SETTING“ menu ([F2] „SETTING“).

- Tab „Equipment“
- Tab „Control“

Change from tab to tab using the [LEFT] key and the [RIGHT] key; the names of the tabs appear at the top left.

"Equipment“ tab

1. Press [F2] „SETTING“ to change to the „SETTING“ menu, tab „Equipment“.
2. Under „Identity code“ check whether the identity code is suitable for the desired operating mode (flow meter, analog inputs, control properties ...) and if necessary adjust.
3. Under „CAN overview“ check, whether all CAN modules have been recognized by the control.
4. Under „Language“ change the language of the operating menu as necessary.
5. Under „Date and time“ change the date and time as necessary.
6. Under „Configuration“ configure the inputs, display, log book and the dosing module which are found here.

"Control“ tab

1. Change to the "Control" tab using the [LEFT] or [RIGHT] key.
2. Set the parameters in the menus according to the desired control mode:
10.2.1 "Manual" control

The Bello Zon® system should operate continuously with a preset, constant ClO₂ output.

1. Press [F2] "SETTING" to change to the "SETTING" menu, tab "Equipment".
2. Change to the tab "Control" using the [RIGHT] key.
3. If necessary configure a current input under "Signal inputs". "ClO₂ production" selection (keys [UP] or [DOWN]) and press the [ENTER] key.
4. Set "Control ClO₂ via" to "Manual" (key [ENTER], keys [UP] or [DOWN], key [ENTER]).
5. "Control" selection (keys [UP] or [DOWN]) and press the [ENTER] key.
6. Set the required ClO₂ output using "Setpt. ClO₂ production" (key [ENTER], [arrow keys], key [ENTER]).
   ⇨ The continuous display 1 ("Production 1") and the continuous display 2 ("Production 2", [LEFT]) henceforth show both the set ClO₂ outputs.
7. Accept the settings using the key [F5] "SAVE" and the [ENTER] key.
8. If necessary, set limits and alarms in other menus.
9. If necessary change the suction interval and suction duration under "Ventilation".
10. If necessary, match the digital inputs and the analog output to the requirements (Pause, leakage sensor...).
11. Accept the settings using the key [F5] "SAVE" and the [ENTER] key.

10.2.2 Proportional control "Flow"

The ClO₂ output of the chlorine dioxide system should change in proportion to the quantity using the flow meter signal (contact water meter, inductive flow meter,...).

1. Press [F2] "SETTING" to change to the "SETTING" menu, tab "Equipment".
2. Change to the tab "Control" using the [RIGHT] key.

Configuring the water meter

For the water meter under "Signal inputs" configure the input "Flow meter":

3. Under "Input" set the input for the flow meter (key [ENTER], [arrow keys], key [ENTER]).
4. Under "flow as" set the required units for the flow (key [ENTER], [arrow keys], key [ENTER]).
5. Under „Range“ set the required flow meter range (key [ENTER], [arrow keys], key [ENTER]).

6. Under „Units“ set the units „liter/pulse“ (key [ENTER], keys [UP] or [DOWN], key [ENTER]).

7. Under „value“ set the number per litre per pulse of the flow meter (key [ENTER], [arrow keys], key [ENTER]).

8. Under „Limits“ set the correct values. In this respect, observe the following instructions!


**WARNING!**

Danger of explosion

ClO\(_2\) can form a rich enough mixture to become explosive, if the Bello Zon\(®\) system is dosed with insufficient diluting water.

– For analog flow meters (0/4 - 20mA) set a value greater than “0” under „Lower lim.<A>“ without exception.

As small as possible a pulse interval for the water meter ensures uniform mixing of ClO\(_2\) solution in the water, which is to be treated.

**Selection of a suitable flow meter**

The Bello Zon\(®\) control should calculate the actual, instantaneous flow from the set pulse interval of a flow meter and its signals. Accordingly, the pulse interval of the water meter must be preselected to match the oscillations which are expected for the flow.

Background:

The control requires accurate values for the flow, because it must be able to calculate the appropriate, current system output from them and the set ClO\(_2\) concentration; only if this is successful, can the desired ClO\(_2\) concentration in the water flow really be maintained at a constant level.

In this respect two cases can be considered:

1. - If it is expected that the flow rate will oscillate only slowly or remain constant, then use a water meter with a long pulse interval (e.g. contact water meter with reed switch or NAMUR output); this can easily "replicate" these slow oscillations for the control. For the Bello Zon\(®\) control, the contact water meter must deliver 0.25 ... 20 pulses per second.

2. - If it is expected that the flow rate will oscillate often and quickly, then use a water meter with a short pulse interval (e.g. IDM with frequency output (inductive flow meter)), so that it can "replicate" these fast oscillations for the control. If the pulse interval was larger in this case, the system and the system output could only react too slowly and with a very "square response" to changes in the actual flow. For the Bello Zon\(®\) control, the IDM must deliver 10 ... 10 000 pulses per second.

The maximum, worthwhile pulse interval therefore depends on the requirements of the respective process version, as it defines the delay period with which the control reacts to oscillations in the flow.

– For most water meters, the pulse interval can be set.

– The control cannot process pulse rates that are too low. This leads to irregular or too low dosing.
Further settings

1. „ClO2 production“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.

2. Set „Control ClO2 via“ to „Flow value“ (key [ENTER], keys [UP] or [DOWN], key [ENTER]).

3. „Control“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.

4. Set the required ClO2 concentration using „Setpt. ClO2 concentrat.“ (key [ENTER], [arrow keys], key [ENTER]).

   ➞ The continuous display 1 („Production 1“) and the continuous display 2 („Production 2“, key [LEFT]) show both the set ClO2 outputs.


6. If necessary, set limits and alarms in other menus.

7. If necessary change the suction interval and suction duration under „Ventilation“.

8. If necessary, match the digital inputs and the analog output to the requirements (Pause, leakage sensor...).


   ➞ Continuous display 1 and continuous display 2 now show the instantaneous ClO2 output as well as additionally the flow and the set setpoint.

   If the flow exceeds the maximum value, the ClO2 output remains constant at its maximum value and the ClO2 concentration falls (error message „Warning: Prod. overload“).

   If the flow falls below its minimum value, the control stops the dosing.

10.2.3 Operating mode "Setpoint-proportional control"

The ClO2 output of the Bello Zon® system should change with the mA signal of an external device, e.g. with the signal from a control room.

1. Press [F2] „PARAMETER“ to change to the „SETTING“ menu, tab „Equipment“.

2. Change to the tab „Control“ using the [RIGHT] key.

3. „Signal inputs“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.

4. „Setpoint“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.

5. Under „Setpoint“ e.g. set the „Current XE2“ (key [ENTER], [arrow keys], key [ENTER]).

6. If necessary, match under e.g. „Current XE2“ the current input to the requirements (key [ENTER], [arrow keys], key [ENTER]).

7. Using the key [ESC] jump back to the menu „Settings“.

8. „ClO2 production“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.

9. Set „Control ClO2 via“ to „Setpoint“ (key [ENTER], keys [UP] or [DOWN], key [ENTER]).


11. If necessary, set limits and alarms in other menus.

12. If necessary change the suction interval and suction duration under „Ventilation“.
Start up

13. If necessary, match the digital inputs and the analog output to the requirements (Pause, leakage sensor...).

Output adjustment range ClO$_2$ production for the individual system types

<table>
<thead>
<tr>
<th>System type</th>
<th>Min. stroke length</th>
<th>Output adjustment range ClO$_2$ (g/h), Min. stroke length, approx.</th>
<th>Max. stroke length, approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDV 20</td>
<td>70</td>
<td>0 ... 14</td>
<td>0 ... 20</td>
</tr>
<tr>
<td>CDV 45</td>
<td>60</td>
<td>0 ... 27</td>
<td>0 ... 45</td>
</tr>
<tr>
<td>CDV 120</td>
<td>50</td>
<td>0 ... 60</td>
<td>0 ... 120</td>
</tr>
<tr>
<td>CDV 240</td>
<td>40</td>
<td>0 ... 96</td>
<td>0 ... 240</td>
</tr>
<tr>
<td>CDV 600</td>
<td>40</td>
<td>0 ... 240</td>
<td>0 ... 600</td>
</tr>
<tr>
<td>CDV 2000</td>
<td>30</td>
<td>0 ... 600</td>
<td>0 ... 2000</td>
</tr>
</tbody>
</table>

10.2.4 Proportional ClO$_2$ measurement control

The ClO$_2$ output of the Bello Zon® changes according to the measurement-dependent mA signal of a ClO$_2$ sensor connected directly to the control.

1. Press [F2] „SETTING“ to change to the „SETTING“ menu, tab „Equipment“.
2. Change to the tab „Control“ using the [RIGHT] key.
3. „Signal inputs“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.
4. „ClO$_2$ measurement“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.
5. Under „ClO$_2$ measurement“ e.g. set the „Current XE1“ (key [ENTER], [arrow keys], key [ENTER]).
6. If necessary, match under e.g. „Range“ the current input to the requirements (key [ENTER], [arrow keys], key [ENTER]).
7. „ClO$_2$ production“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.
8. Set „Control ClO$_2$ via“ to „ClO$_2$ measurement“ (key [ENTER], [arrow keys], key [ENTER]).
9. „Control“ selection (keys [UP] or [DOWN]) and press the [ENTER] key.
10. Set the required ClO$_2$ concentration using „Setpt. ClO$_2$ concentr.“ (key [ENTER], [arrow keys], key [ENTER]). The continuous display 1 („Production 1“) now shows the instantaneous ClO$_2$ output and the continuous display 2 („Production 2“, key [LEFT]) additionally shows the set setpoint ClO$_2$ concentration.
11. Select “Control” (keys [UP] or [DOWN]) and press the [ENTER] key.
12. Match the control parameters to the process and press the [ENTER] key.
14. If necessary, set limits and alarms in other menus.
15. If necessary change the suction interval and suction duration under „Ventilation“.
16. If necessary, match the digital inputs and the analog output to the requirements (Pause, leakage sensor...).


10.3 Starting the system

2. Press key [ENTER] to change to the „Commissioning“ menu. For the following steps, see the next chapter.

10.3.1 Bleeding pumps

CAUTION!
Corrosive chemicals may escape
After several sequential bleed processes, the bleed bottles may overflow.
– If carrying out several sequential bleed processes, monitor the bleed bottles.

Without calibration device

Prerequisites:
The stroke lengths of the pumps are set to 100%.

1. Place each suction lance in its own bucket full with clean water.
2. Slightly open the pump bleed valves (in the anticlockwise direction).
4. Start bleeding with \[F3\] „START“ - wait until the suction lines and liquid ends are free from bubbles.

CAUTION!
In an emergency, the pumps can be stopped with the \[F3\] „STOP“ key.

5. If the suction lines and liquid ends are not yet bubble-free after the dosing pumps have stopped, repeat bleeding with the \[F3\] „START“ key.

6. Press \[F5\] „NEXT“ to switch to the menu „Fill reactor tank“ - see the following chapter.

7. Close the bleed valves on the pumps, by turning in a clockwise direction.

With a calibration device

Prerequisites:
The stroke lengths of the pumps are set to 100%.

1. Remove the vacuum pump from the system panel.

2. Place the vacuum pump on the left (acid) calibration device and suck feed chemical manually up to the top to the “0” marking, but no further! Is the top stopcock on the calibration device open?

3. Close the bottom stopcock to the suction lance.

4. Place the vacuum pump on the right (chlorite) calibration device and suck feed chemical manually up to the top to the “0” marking, but no further! Is the top stopcock on the calibration device open?
Fig. 13: Stopcock positions during calibration, shown here for CDK

5. Close the bottom stopcock to the suction lance.

6. Using the key [DOWN] to „Bleeding pumps“ and press the [ENTER] key.

7. Start bleeding with [F3] „START“ - wait until the suction lines and liquid ends are free from bubbles.

CAUTION!
In an emergency, the pumps can be stopped with the [F3] „STOP“ key.

8. If the suction lines and liquid ends are not yet bubble-free after the dosing pumps have stopped, repeat bleeding with the [F3] „START“ key.

9. Press [F5] „NEXT“ to switch to the menu „Fill reactor tank“ - see the following chapter.

10. Open the bottom stopcock to the acid suction lance.

11. Place the vacuum pump on the left calibration device and suck feed chemical manually up to the top to the “0” marking, but no further!

12. Close the top stopcock on the left calibration device.

13. Open the bottom stopcock to the chlorite suction lance.

14. Place the vacuum pump on the right calibration device and suck feed chemical manually up to the top to the ”0“ marking, but no further!
Clear fault arising during bleeding pumps

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Error message, the strokes are not counted down and the overlying bar goes red. | The stroke sensor is not correctly adjusted. | - Turn the knurled screw beneath the stroke sensor by one turn downwards.  
- Acknowledge the error message.                            |

10.3.2 Fill reactor

**WARNING!**
**System parts can burst**
If the rinse valve is not open when filling the reactor, the pressure of the dosing pumps can cause the reactor to burst.
- Before filling the reactor, open the rinse valve.
– When using calibrated pumps and only the stroke length requires adjustment, via the menu „Set stroke length“, a recalibration is not required.

– The Bello Zon® control can match the number of preset strokes to the adjusted stroke length, provided the pumps inform the control via the menu „Set stroke length“ of their actual stroke lengths.

1. Open the rinse valve.

2. Start filling with [ F3] „START“.

CAUTION!
In an emergency, the pumps can be stopped with the [ F3] „STOP“ key.

⇒ The control counts down the preset number of strokes.

3. Wait until the preset number of strokes is processed.

4. If the reactor is not yet full, i.e. no liquid has yet escaped from the rinse valve, start filling again using the [ F3] „START“ key.

5. Do not change to the next menu using [F5] „NEXT“; rather check the system for leaks - see the next chapter.

10.3.3 Checking for leaks

WARNING!
Warning of toxic ClO₂ solution
Toxic ClO₂ solution can escape through leaks.
⇒ Immediately seal any leaks using appropriate measures.

1. If the dosing pumps are not yet running, start them via the menu „Fill reactor“ using the [ F3] „START“ key.

2. Check the system parts for leak-tightness with the dosing pumps running at maximum operating pressure.

3. Immediately seal any leaks which may occur using appropriate measures.

4. If checking is still not complete, start the dosing pumps again using the [ F3] „START“ key.

5. If the dosing pumps are still running, stop them after the test using the [ F3] „STOP“ key.

6. Press [ F5] „NEXT“ to switch to the menu „Adjust stroke sensors“ (= „Adjust stroke sensors“) - see the following chapter.
10.3.4 Adjust stroke sensors

**WARNING!**
Warning of incorrect ClO₂ metering quantity
If the stroke sensors are not operating, the expected ClO₂ metering quantity can be incorrect.
- Never set the ring initiators too low.
- Reliably counter a fall in the back pressure.
- Observe the minimum values for the stroke lengths.

**WARNING!**
Warning of toxic chlorite gas
If the stroke sensors are not operating, the permissible chlorite concentration can be exceeded.
- Never set the ring initiators too low.
- Reliably counter a fall in the back pressure.
- Observe the minimum values for the stroke lengths.

---

**Fig. 15: Stroke sensor overview**

1. Top adjusting washer
2. Ring initiator
3. Bottom adjusting washer

Prerequisites:
The dosing pumps are bled.

1. Turn the top adjustment washer (1) of the stroke sensors fully upwards.
2. Reposition the ring initiators (2) and the bottom adjustment washers (3) respectively.
3. Start the metering pumps with the [F3], "START" key.

**CAUTION!**
In an emergency, the pumps can be stopped with the [F3], "STOP" key.

4. Slowly lower each ring initiator (2), until the number beneath the corresponding green bar remains permanently on 0 to 1 strokes (e.g. for the left ring initiator (HCl): left bar).

5. Then lower the bottom adjusting washer (3) by 1 turn.

6. Lower the respective top adjusting washers (1) to the ring initiators (2).

7. Press [F5], "NEXT" to change to the menu, "Calibrate pumps" see the next chapter.

### 10.3.5 Calibrate pumps

![Calibrate pumps interface](image)

**CAUTION!**
**Warning of toxic substances in the water**
If the dosing pumps are not calibrated at the operating pressure, which will subsequently apply during operation, the chemicals will possibly not be mixed in the correct ratio within the reactor.

- Only calibrate the pumps at that operating pressure which will subsequently apply during operation.

- When using calibrated pumps and only the stroke length requires adjustment, via the menu „Set stroke length“, a recalibration is not required.

- The Bello Zon® control can match the number of preset strokes to the adjusted stroke length, provided the pumps inform the control via the menu „Set stroke length“ of their actual stroke lengths.
With a calibration device

1. Remove the vacuum pump from the system panel.

2. Place the vacuum pump on the left (acid) calibration device and suck feed chemical manually up to the top to the "0" marking, but no further! Is the top stopcock on the calibration device open?

3. Close the bottom stopcock to the suction lance.

4. Place the vacuum pump on the right (chlorite) calibration device and suck feed chemical manually up to the top to the "0" marking, but no further! Is the top stopcock on the calibration device open?

5. Close the bottom stopcock to the suction lance.

6. Fill the measuring cylinder up to the top marking with water.

7. Slowly raise the water suction lance, hold perpendicular and carefully position in its measuring cylinder. There must be no air in the suction lances which would falsify the calibration.

**CAUTION!**
In an emergency, the pumps can be stopped with the [F3] „STOP“ key.

If the calibration devices become empty too soon, stop the pumps using the [F3] „STOP“ key.

9. As soon as the displayed strokes are processed, the pumps stop, the menu option „Set calibration“ appears.

10. [F2] „ACID“ press, then press the key [ENTER] and enter and record the used quantity of feed chemical from the left calibration device using the arrow keys.

11. Confirm the value using the key [ENTER] and accept using the [F5] „SAVE“ key.

12. Determine the difference value between the first value and the new value (in ml) for water.

13. [F2] „Water“ press, then press the key [ENTER] and enter this difference value using the [arrow keys].

14. Confirm the value using the [ENTER] key.

15. Accept the value using [F5] „SAVE“!

16. [F3] „CHLORITE“ press, then press the key [ENTER] and enter and record the used quantity of feed chemical from the right calibration device using the arrow keys.

17. Confirm the value using the key [ENTER] and accept using the [F5] „SAVE“ key.

18. Enter the values for acid and chlorite in the commissioning report or the system log book.

19. Enter the value for water in the commissioning report or the system log book.


21. Open the bottom stopcock to the acid suction lance.

22. Place the vacuum pump on the left calibration device and suck feed chemical manually up to the top to the "0" marking, but no further!

23. Close the top stopcock on the left calibration device.

24. Open the bottom stopcock to the chlorite suction lance.

25. Place the vacuum pump on the right calibration device and suck feed chemical manually up to the top to the "0" marking, but no further!
**Fig. 18: Stopcock positions in operation, shown here for CDK**

26. Close the top stopcock on the right calibration device.

27. Slowly raise the water suction lance, hold perpendicular and carefully position in its canister.

### Without calibration device

1. Not during initial commissioning: Place each suction lance in its own bucket full with clean water (this prevents the suction lances from running dry and ensures the chemical residues are rinsed away to the exterior).

   **WARNING!**
   **Warning of toxic ClO₂ gas**
   Some toxic ClO₂ gas is formed as soon as both suction lances are placed in the same vessel.
   - Never place both suction lances in the same vessel.

2. Place the measuring cylinders on a horizontal, level support to optimise reading off, this should ensure that the liquid level can be read-off properly.

3. Fill the measuring cylinder up to the top marking with water.

4. Slowly raise each suction lance, hold perpendicular and carefully position in its measuring cylinder: There must be no air in the suction lances which would falsify the calibration!


   **CAUTION!**
   In an emergency, the pumps can be stopped with the [F3] „STOP“ key.

   *If the calibration devices become empty too soon, stop the pumps using the [F3] „STOP“ key.*

6. As soon as the displayed strokes are processed, the pumps stop, the menu option „Set calibration“ appears.
7. Slowly raise the suction lances, hold perpendicular, remove from their measuring cylinders and place each in its bucket.

8. Place the measuring cylinders on a horizontal, level support to optimise reading off, this should ensure that the liquid level can be read-off properly.

9. Read off the new values from the measuring cylinders and record.

10. Determine the difference value between the first value and the new value (in ml) for acid.

11. [F2] „ACID“ press, then press the key [ENTER] and enter this difference value using the [arrow keys].

12. Confirm the value using the [ENTER] key.

13. Accept the value using [F5] „SAVE“!

14. Determine the difference value between the first value and the new value (in ml) for chlorite.

15. [F3] „CHLORITE“ press, then press the key [ENTER] and enter this difference value using the [arrow keys].

16. Confirm the value using the [ENTER] key.

17. Accept the value using [F5] „SAVE“!


19. Enter the values for acid and chlorite in the commissioning report or the system log book.

20. Enter the value for water in the commissioning report or the system log book.

21. Not during initial commissioning: Carefully immerse the acid suction lance in the "acid" vessel and secure.

22. Not during initial commissioning: Carefully immerse the chlorite suction lance in the "chlorite" vessel and secure.

23. Not during initial commissioning: Thoroughly rinse the measuring cylinder and the water bucket.

A green tick is placed after each of the "Commissioning" menus which have been successfully run through.

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

10.4 Testing the safety equipment

Safety bund (accessories)
Remove the intact tank out of the dry safety bund. Fill the safety bund with water up to the edge and inspect for leaks.

If the safety bund is one provided with leakage monitoring, the control must switch off the metering. Press key [Press F1] „QUIT“.

Acid and chlorite level switches
Slowly withdraw the suction lance from the filled storage tank. The control must switch off production, the equipment LED flashes red, the bleep bleeps and the alarm relay switches.

Press key [F5] „BEEP OFF“ and then press the key [Press F1] „QUIT“. 
Start up

Stroke sensors
More the upper adjusting washer and the ring initiator of a stroke sensor upwards, the control must switch off dosing after 6 defective strokes. Simultaneously, the LCD screen display a message, the device LED flashes red, the bleeper bleeps and the alarm relay switches.
Press key [F5] „BEEP OFF“ , then move the ring initiator and the top adjusting washer back to the initial position and press the key [Press F1] „QUIT“. If the bottom adjusting washer was displaced, reset the stroke sensor.
Now check the other stroke sensors.

Reactor housing (option)
Keep the bleed valve, left, or the bleed line closed and press the key [F5] „VENTILATE“ . Listen for noises which could originate from a leak (without the roar of the water jet pump). If necessary, press the key several times, to switch the suction on and off several times.
Release the bleed valve, left, or the bleed line on the reactor housing again.

Reactor cover
Check that the reactor cover is correctly fitted.

Level switch in the reactor housing (option)
Raise the circular float of the level switch - the control must immediately stop ClO<sub>2</sub> production.
Press key [F1] „QUIT“.
Function explanation: The level switch on the bottom of the reactor housing reports significant leaks from there to the control, which immediately stops ClO<sub>2</sub> production.

Ventilation reactor housing (option)
To start ventilation manually, press the key [F5] „VENTILATE“ . The water jet pump must start to roar. If necessary, press the key several times, to switch the suction on and off several times.

Bypass survey
Slowly close the stopcock prior to the float flow meter. The control must switch off production, the device LED flashes red, the bleeper bleeps and the alarm relay switches.
Press key [F5] „BEEP OFF“ , open the stopcocks and then press key [F1] „QUIT“.

Gas detector (option)
Test the gas detector and its sensor according to its operating instructions.

10.5 Chemical canister installation

1. Switch off production in the continuous display using [F1] „PROD OFF“ - “Production off" appears.
2. Position the chemical canisters beneath the system - acid left (HCl, red), chlorite right (NaClO<sub>2</sub>, blue), water middle (H<sub>2</sub>O, green) – viewed from the front!
3. Immerse the left suction lance in the acid chemical canister. Does the foot valve float just above the bottom 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 bottom of the chemical canister?
6. Tighten the screw lid.
10.6 Checking ClO2 production

1. Switch on production in the continuous display using [F1] „PROD ON” - „Production on” appears.

2. After a suitable time period, prepare a sample from the main water supply line (after a reaction tank, if fitted, or at an in-line probe housing) - the ClO2 solution must have reached this point.

3. Place the sample in a clean vessel and immediately mix it with the DPD 1 reagent - see the operating instructions for your colorimeter; ClO2 tends to outgas, especially at water temperatures > 25 °C!

4. Immediately measure the ClO2 content of the sample using a colorimeter, e.g. using the photometer DT 1.

5. As necessary change the control parameters or supply quantity in the „SETTING” menu, allow the system to run and repeat the measurement after a sufficiently long interval.

---

**CAUTION!**

Warning against illegal operation
- Observe national and local regulations in respect of ClO2 concentrations.

---

If the stroke length must be changed, then:
- carry this out via the menu “Set stroke length”.
- Observe the minimum stroke lengths.

---

- 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! - - -
11 Operation

WARNING! Risk of explosion due to ClO₂ gas
Together the two components, hydrochloric acid (HCl) and sodium chlorite (NaClO₂) almost instantaneously form large quantities of toxic ClO₂ gas, which can also decompose in an explosive manner.
- Together the two components, hydrochloric acid (HCl) and sodium chlorite (NaClO₂) must never be brought into contact except in the reactor.

WARNING! Warning of toxic ClO₂ gas
When pouring chemicals back into chemical canisters mix-ups often occur. Then lots of toxic ClO₂ gas can be generated.
- Never pour chemicals from chemical canisters back into the canisters or pour them together.

WARNING! Warning of toxic ClO₂ solution.
If system leaks occur, toxic ClO₂ solution can escape.
- Under no operating status must the system maximum permissible operating pressure be exceeded.
- The entire installation must remain leak-tight when operated at the maximum operating pressure.

11.1 Chemical canister replacement

Safety information

WARNING! Risk of explosion due to incorrect concentrations
If the chlorine dioxide system Bello Zon® CDV is operated with too highly concentrated chemicals, highly concentrated ClO₂ can form, which can then explosively decompose in the reactor.
- Only operate the chlorine dioxide Bello Zon® CDV with Bello Zon® chlorite or diluted sodium chlorite: NaClO₂, 7.5 % by wght.
  Only use Bello Zon® acid or dilute hydrochloric acid: HCl 9 % by wght.
WARNING!
Warning of toxic ClO₂ gas
Large quantities of toxic ClO₂ gas can arise, if the chemical canisters are not handled correctly.
- Only trained personnel may change the chemical canisters.
- Observe the colour code:
  Red stands for acid (HCl, left),
  Blue for chlorite (NaClO₂, right).
- Never place both suction lances in the same vessel or interchange them.

WARNING!
Warning of toxic ClO₂ solution.
If leaks occur due to corrosion on the system, toxic ClO₂ solution can escape.
- Only use Bello Zon® acid or dilute hydrochloric acid: HCl 9 % by wght.
- The hydrochloric acid must conform to DIN EN 939.
- The chlorite must conform to DIN EN 938.

### Purity requirements

<table>
<thead>
<tr>
<th>For sodium chlorite 7.5 %</th>
<th>Upper limits according to DIN EN 938</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium chlorate</td>
<td>3 g/l</td>
</tr>
<tr>
<td>Sodium nitrate</td>
<td>0.08 g/l</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For sodium chlorite 9 %</th>
<th>Upper limits according to DIN EN 939</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>16 mg/l</td>
</tr>
<tr>
<td>Halogenated organic compounds</td>
<td>1.6 mg/l</td>
</tr>
</tbody>
</table>

### Minimum temperatures, liquids

<table>
<thead>
<tr>
<th>For chemicals and water</th>
<th>Temperature, at least</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDVc 20 ... 240</td>
<td>10 °C</td>
</tr>
<tr>
<td>CDVc 600 ... 2000</td>
<td>15 °C</td>
</tr>
</tbody>
</table>

### Instructions

1. **Switch off ClO₂ production in the continuous display using [F1] „PROD OFF“.
   ⇒ „Production off“ appears.

2. **Carefully remove each suction lance out of its chemical canister.**
   Raise slowly, maintain perpendicular!

3. **Place each of the suction lances in its own bucket full with clean water.**
   This prevents the suction lances from running dry and ClO₂ being created.

4. **Close the empty chemical canisters and ensure they are disposed of properly.**
5. Place the new chemical canisters beneath the system:
   Red stands for acid (HCl, left), blue chlorite (right)!

6. Slowly raise each suction lance, hold perpendicular and carefully
   insert in the corresponding chemical canister.
   Red stands for acid, blue for chlorite!

7. Check the suction lines for air bubbles, bleed as necessary (in
   accordance with the next chapter).

8. Switch on ClO₂ production in the continuous display using [F1] „PROD ON“.
   ⇒ „Production on“ appears.

### 11.2 Bleeding pumps

<table>
<thead>
<tr>
<th>Main control</th>
</tr>
</thead>
<tbody>
<tr>
<td>09.10.2009 14:23:10</td>
</tr>
</tbody>
</table>

#### Bleeding pumps

<table>
<thead>
<tr>
<th>% HCl 100 %</th>
<th>NaClO₂ 100 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 strok</td>
<td>0 strok</td>
</tr>
</tbody>
</table>

Message: No alarm

Prerequisites:
The stroke lengths of the pumps are set equal to each other and according
to the minimum values from the table on page 76.

1. Press [F1] „SERVICE“ to change to the „SERVICE“ menu.
2. Press key [DOWN] change to the „Expert jobs“ menu and press the
   [ENTER] key.
3. Using the [arrow keys] select „Bleeding pumps“ menu.
4. Press key [ENTER] to change to the „Bleeding pumps“ menu.
5. Place each suction lance in its own bucket full with clean water.
6. Slightly open the coarse/fine bleed valves on the pumps (clockwise
   direction).
7. Start bleeding with [F3] „START“ - wait until the suction lines and
   liquid ends are free from bubbles.

CAUTION!
In an emergency, the pumps can be stopped with the
[F3] „STOP“ key.

8. If the suction lines and liquid ends are not yet bubble-free after the
   dosing pumps have stopped, repeat bleeding with the [F3] „START“
   key.
9. If the suction lines and liquid ends are bubble-free earlier than
   expected, stop bleeding with the [F3] „STOP“ key.
10. Press [F1] „HOME“ to change to the display „Equipment off“.
11. Close the coarse/fine bleed valves on the pumps (anticlockwise
direction).
WARNING!
Warning of toxic ClO\textsubscript{2} gas
When pouring chemicals together lots of toxic ClO\textsubscript{2} gas can be generated.
- Never pour the contents of the bleed bottles together.
- Never pour the contents of the bleed bottles back into the chemical canisters. The risk of a mix-up is too high.
- Pour the contents of the bleed bottles individually into the drainage and flush away each of chemical contents with lots of water.

CAUTION!
Corrosive chemicals may escape
After several sequential bleed processes, the bleed bottles may overflow.
- If carrying out several sequential bleed processes, monitor the bleed bottles.

Clear fault arising during bleeding pumps

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Error message, the strokes are not counted down and the overlying bar goes red.  | The stroke sensor is not correctly adjusted.| ▪ Turn the knurled screw beneath the stroke sensor by one turn downwards.  
▪ Acknowledge the error message.                                                  |

11.3 Set stroke length

If the stroke length must be changed, then:
- carry this out via the menu "Set stroke length".
- Observe the minimum values from the table on page 76.

- For safe operation, set the stroke length as long as possible; this prevents outgassing of the chemicals in the suction lines.
- To ensure efficient mixing, set the stroke length as short as possible, because this results in a higher stroke rate.
1. Press [F1] „SERVICE“ to change to the „SERVICE“ menu.
2. Press key [ENTER] switch to the menu „Expert jobs“.
3. Use the arrow keys to select the menu „Set stroke length“.
4. Using the key [ENTER] switch to the menu „Set stroke length“.
5. Set the new stroke lengths at the dosing pumps.
6. Accept the new values for the stroke lengths with the [F5] „SAVE“ key.
   ⇒ The menu „Adjust stroke sensors“ appears.
7. Now adjust the stroke sensors without fail - see the following chapter.

### Output adjustment range ClO₂ production for the individual system types

<table>
<thead>
<tr>
<th>System type</th>
<th>Min. stroke length</th>
<th>Output adjustment range ClO₂ (g/h), For min. / max. stroke rate and ...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min. stroke length, approx.</td>
</tr>
<tr>
<td>CDV 20</td>
<td>70</td>
<td>0 ... 14</td>
</tr>
<tr>
<td>CDV 45</td>
<td>60</td>
<td>0 ... 27</td>
</tr>
<tr>
<td>CDV 120</td>
<td>50</td>
<td>0 ... 60</td>
</tr>
<tr>
<td>CDV 240</td>
<td>40</td>
<td>0 ... 96</td>
</tr>
<tr>
<td>CDV 600</td>
<td>40</td>
<td>0 ... 240</td>
</tr>
<tr>
<td>CDV 2000</td>
<td>30</td>
<td>0 ... 600</td>
</tr>
</tbody>
</table>

### 11.4 Adjust stroke sensors

**WARNING!**

Warning of incorrect ClO₂ metering quantity
If the stroke sensors are not operating, the expected ClO₂ metering quantity can be incorrect.
- Never set the ring initiators too low.
- Reliably counter a fall in the back pressure.
- Observe the minimum values for the stroke lengths.
WARNING!

Warning of toxic chlorite gas
If the stroke sensors are not operating, the permissible
chlorite concentration can be exceeded.
– Never set the ring initiators too low.
– Reliably counter a fall in the back pressure.
– Observe the minimum values for the stroke lengths.

Fig. 19: Stroke sensor overview
1 Top adjusting washer
2 Ring initiator
3 Bottom adjusting washer

Prerequisites:
The dosing pumps are bled.
1. Turn each top adjustment washer (1) of the stroke sensors - see
figure Fig. 19 - fully upwards.
2. Reposition the ring initiators (2) and the bottom adjustment washers
(3) respectively.
3. Start the metering pumps with the [F3] „START“ key.

CAUTION!
In an emergency, the pumps can be stopped with the
[F3] „STOP“ key.

4. Slowly lower each ring initiator (2), until the number beneath the
corresponding green bar remains permanently on 0 to 1 strokes
(e.g. for the left ring initiator (HCl): left bar).
5. Then lower the bottom adjusting washer (3) by 1 turn.
6. Lower the respective top adjusting washers (1) to the ring initiators
(2).
8. Press [F1] „HOME“ to change to the display „Equipment off“.

11.5 Check sensors

In the event of measured valued dependent dosing, the sensors must be
regularly checked. The interval is dependent upon national regulations or
process conditions - see the sensor operating instructions.

ClO₂ sensor

Check the display value of the sensor at the control using a suitable
chlorine-dioxide measuring instrument (e.g. DPD) - see sensor operating
instructions.

If necessary, recalibrate the sensor, see chapter "Setting, Calibration" and
the sensor operating instructions.
Check the display value of the sensor at the control using a suitable chlorine-dioxide measuring instrument (e.g. DPD) - see sensor operating instructions.

If necessary, recalibrate the sensor, see chapter "Setting, Calibration" and the sensor operating instructions.

Check the display value of the sensor at the control using a suitable quality buffer solution (e.g. for 465 mV) - see sensor operating instructions.

If the stable display value deviates by more than ±40 mV from the buffer value, replace the sensor - see sensor and in-line probe housing operating instructions.

Check the display value of the sensor at the control using a suitable quality buffer solution (e.g. for pH 7) - see sensor operating instructions.

If necessary, recalibrate the sensor, see chapter "Setting, Calibration" and the sensor operating instructions.

### 11.6 Further processing of data

#### General

The Bello Zon® control only saves the events, operator actions and listed values on the SD card under the transparent interface cover of the control - see Fig. 7. This is the only place it saves them permanently; if the control is disconnected from the mains voltage, it no longer displays the old values. Also the old values can no longer be imported from the SD card into the control. However, they can be transferred from the SD card to a PC, where they can be displayed or further processed.

The capacity of the supplied SD card is 512 MB. In general, this is sufficient capacity for 1/2 to 1 year.

However, the control can also use SD cards of up to 2 GB capacity.

The SD card formatting must be FAT 16.

#### SD card insertion

1. To insert the SD card, open the bottom transparent interface cover on the control.

2. Push the SD card into the card slit until it engages. If it is not engaged, the error message "SD card not initialized".

3. Close the interface cover and screw in place to ensure that it is moisture-proof.

#### Evaluation of the SD card files

1. Remove the SD card - logically reversed as under "SD card insertion" on page 96.

2. Copy the files contained in the SD card to a PC via a card reader - they are contained in the "Logbook" directory.

3. Plug the SD card back in, as under "SD card insertion" on page 96.
Now open the TXT files using a spreadsheet program such as EXCEL.

If you have changed the clock of the Bello Zon® control from or to summer time, bear this in mind during data evaluation.
What happens in the event of incorrect operation?

12 What happens in the event of incorrect operation?

a) Chemical canisters

<table>
<thead>
<tr>
<th>Incorrect operation</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical canisters are interchanged.</td>
<td>Toxic ClO₂ gas is formed in the chemical canisters.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incorrect operation</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect chemicals or chemicals in the incorrect concentration or purity are used and the Bello Zon® system / pumps started</td>
<td>Uncontrolled, dangerous reactions can take place. Explosions may occur, toxic ClO₂ gas can escape.</td>
</tr>
</tbody>
</table>

b) Stroke sensors

<table>
<thead>
<tr>
<th>Incorrect operation</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring initiator set too low.</td>
<td>It is possible that the stroke sensor does not identify a reduction of the flow volume of &gt; 30 % and the dosing continues running. Excess acid or chlorite is requested.</td>
</tr>
<tr>
<td></td>
<td>– The processed ClO₂ dosing quantity which the control displays, is no longer correct.</td>
</tr>
<tr>
<td></td>
<td>– If too little chlorite is present, the still present excess amount of acid is reinforced and the ClO₂ solution diluted.</td>
</tr>
<tr>
<td></td>
<td>– With too little acid:</td>
</tr>
<tr>
<td></td>
<td>– The yield of ClO₂ falls and the displayed ClO₂ quantity is no longer correct.</td>
</tr>
<tr>
<td></td>
<td>– The result is possible health hazards due to exceeding of the permissible chlorite concentration!</td>
</tr>
</tbody>
</table>

c) Bypass

<table>
<thead>
<tr>
<th>Incorrect operation</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The limit contact of the flow meter in the bypass is set too low.</td>
<td>The ClO₂ concentration in the bypass becomes too high and environmental damage or health hazards result. If a gas phase can form, an explosion may occur.</td>
</tr>
</tbody>
</table>

d) Control

<table>
<thead>
<tr>
<th>Incorrect operation</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect calibration values set for the dosing pumps.</td>
<td>Excess acid or chlorite is requested.</td>
</tr>
<tr>
<td></td>
<td>– The processed ClO₂ dosing quantity which the control displays, is no longer correct.</td>
</tr>
<tr>
<td></td>
<td>– If too little chlorite is present, the still present excess amount of acid is reinforced and the ClO₂ solution diluted.</td>
</tr>
<tr>
<td></td>
<td>– With too little acid:</td>
</tr>
<tr>
<td></td>
<td>– The yield of ClO₂ falls and the displayed ClO₂ quantity is no longer correct.</td>
</tr>
<tr>
<td></td>
<td>– The result is possible health hazards due to exceeding of the permissible chlorite concentration!</td>
</tr>
</tbody>
</table>
13 Maintenance

Safety information

**WARNING!**
**Toxic ClO\textsubscript{2} solution can escape**
If maintenance is forgone or neglected, the worst case scenario would result in the escaping of ClO\textsubscript{2} solution through a pipe leak.
- Customer service must service the Bello Zon\textsuperscript{®} system at least annually.

**WARNING!**
**Toxic chemicals may escape**
Toxic chemicals in the hydraulic components of the system.
- Prior to any maintenance work (e.g. replacement of parts, etc.) rinse the Bello Zon\textsuperscript{®} system with water until the piping and especially the reactor no longer contain any chemicals.

**WARNING!**
**Danger of an electric shock**
Danger due to incorrectly replaced electrical cabling.
- Control cabling or mains leads must only be replaced by customer service.
- Only the appropriate special cabling must be used.

Relating only to the reactor housing:

**WARNING!**
**Toxic chemicals in the reactor housing**
The interior of the reactor housing may contain toxic ClO\textsubscript{2} gas or ClO\textsubscript{2} solution.

Relating only to the reactor housing:

**WARNING!**
**The reactor housing can explode**
If ClO\textsubscript{2} can become enriched in the reactor housing, it may explode.
- Never operate the reactor housing ventilation with a de-energized solenoid valve.
- Never operate the reactor housing ventilation with a blocked water supply line.

**NOTE for the system operator**
Chlorine dioxide systems must be regularly checked for safety, but in any event at least annually and before any recommissioning, by a technical expert - for example also according to German accident prevention regulations [GUV 8.15 or VGB 65 § 19 (2)].
Customer service can carry out this check as part of a service. We therefore recommend the taking out of a service contract.

13.1 Inspection work by the operator

<table>
<thead>
<tr>
<th>Interval</th>
<th>Maintenance work</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily to weekly, depending on the operating conditions</td>
<td>System inspection - see below.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>Dosing pumps inspection - see below.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>Cleaning of the housing - see below.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>Acid vapour separator inspection - see below.</td>
<td>Instructed personnel</td>
</tr>
</tbody>
</table>

**System inspection**

1. Check the ClO₂ concentration in the treated water; observe national regulations.
2. Check the levels in the chemical canisters and compare, note possible warning „Low level“ in the display, as necessary have Bello Zon® acid and Bello Zon® chlorite ready for use.
3. Record the consumption of Bello Zon® acid and Bello Zon® chlorite (system log book).
4. Check the flow in the bypass.
5. In older systems, check the pipe walls of the bypass line for lime-scale.
6. Check the system for leak-tightness.

**Cleaning the housing**

1. Check the housing using a cloth dampened with soapy water.

   **CAUTION!**
   
   Solvent can attack the surfaces.
   
   – Do not use solvents under any circumstances.

2. Rub the housing dry.

**Dosing pumps inspection**

1. Check the dosing head screws for correct seating.
2. Check the dosing lines on both the discharge and suction sides for correct seating.
3. Check the dosing lines on both the discharge and suction valves for correct seating.
4. Check for moisture in the leakage hole of the end disc. If moisture is present, a membrane rupture has probably occurred.

Check both acid vapour separators for dark discolouring of the packing. If necessary, replace them.

**Acid vapour separator inspection**

1. Check both acid vapour separators for dark discolouring of the binding agent.
2. If the packing is coloured blue-violet, replace the binding agent.

**Acid vapour separator for acid canisters** To bind the HCl vapours which may arise during filing and drainage processes, an acid vapour separator is fitted to both the acid canister and the corresponding calibration device. Their padding is replaceable.
### Accessories

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1034692</td>
<td>Acid vapour separator, 130 ml</td>
</tr>
<tr>
<td>1035854</td>
<td>Binding agent type 1, 150 ml</td>
</tr>
</tbody>
</table>

### 13.2 Service work by customer service

<table>
<thead>
<tr>
<th>Interval</th>
<th>Maintenance work</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 10 years</td>
<td>If not previously replaced, the reactor and all bypass piping must be replaced now</td>
<td>Customer Service department</td>
</tr>
<tr>
<td></td>
<td>Replace the batteries of the control on a preventative basis - refer to the &quot;Disposal&quot; chapter.</td>
<td>Customer Service department</td>
</tr>
<tr>
<td>After 6 months, at least annually</td>
<td>Replace all wear parts - ProMaqua service set!</td>
<td>Customer Service department</td>
</tr>
<tr>
<td></td>
<td>Check the system for safety</td>
<td>Customer Service department</td>
</tr>
</tbody>
</table>

#### Concluding servicing

- In the „Service“ menu under „Commissioning“ - „Service interval“ conclude the service using the [Enter] key.
- The daily countdown of the next annual service interval is restarted.

#### Maintenance sets for CDVc systems

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

<table>
<thead>
<tr>
<th>Maintenance set, complete for</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDVc 20</td>
<td>1034758</td>
</tr>
<tr>
<td>CDVc 45</td>
<td>1034759</td>
</tr>
<tr>
<td>CDVc 120</td>
<td>1034760</td>
</tr>
<tr>
<td>CDVc 240</td>
<td>1034761</td>
</tr>
<tr>
<td>CDVc 600</td>
<td>1034762</td>
</tr>
<tr>
<td>CDVc 2000</td>
<td>1034763</td>
</tr>
</tbody>
</table>
14 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.
## 15 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 dosing is "OFF", then the control does not actuate the pumps and ignores nearly all input signals (with the exception of "Ventilate", "External error", "Leakage" ...).
- If you wish to contact ProMinent because of a fault, then you must have the following information to hand:
  - The identity code (press [F2] SETTING, using key [DOWN] "Identity code" select and press key [ENTER]).
  - The version number for hardware and software ([F2] SETTING, using key [DOWN] "select CAN overview" and press key [ENTER] . "SW-Vers" and "HW-Vers" enter the desired information under "Control".),
  - the colour of the left LED of the Bello Zon ® control and its behaviour
  - the precise error text - in the event that the control is displaying an error message.

### 15.1 Faults without error messages

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid is escaping from the end disc of a dosing pump.</td>
<td>The liquid end leaks at the metering diaphragm.</td>
<td>Retighten the Allen screws at the dosing head. If this is unsuccessful, inform the Customer Service department.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>The dosing pump has been working for a long time, but suddenly is no longer transporting.</td>
<td>Air in the metering line or the chemical canister is empty.</td>
<td>Bleed the metering line, check the level in the chemical canister, if no success: Pump diaphragm probably defective.</td>
<td>Instructed personnel Customer Service department</td>
</tr>
<tr>
<td>Dosing pump does not dose, a green bar is not flashing - see &quot;continuous display 1&quot; Fig. 10.</td>
<td>CAN cables connection problem.</td>
<td>Check the CAN cable connection.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Problem with pump mains voltage.</td>
<td></td>
<td>Check the applied mains voltage.</td>
<td>Electrician</td>
</tr>
<tr>
<td>The pump fuse is defective.</td>
<td></td>
<td>Check the fuse and replace as necessary - see end of chapter.</td>
<td>Customer Service department</td>
</tr>
<tr>
<td>Chemical consumption oscillates unusually.</td>
<td>The dosing pumps are overstrained due to too low operating pressure.</td>
<td>Increase the operating pressure over 1.5 bar.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>The processed ClO₂ concentration in the water varies unusually.</td>
<td>The dosing pumps are overstrained due to too low operating pressure.</td>
<td>Increase the operating pressure over 1.5 bar.</td>
<td>Technical experts</td>
</tr>
</tbody>
</table>
15.2 Faults with error messages

The error messages which occur during calibration, are listed in the chapter entitled “Setting”-“Calibration”.

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Cause</th>
<th>Remedy</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating time expired</td>
<td>The system must be serviced.</td>
<td>Service system.</td>
<td>Customer Service department</td>
</tr>
<tr>
<td>Operating time nearly expired</td>
<td>The system must be serviced.</td>
<td>Book customer service.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Bypass survey - as warning message</td>
<td>operating status.</td>
<td>No remedy necessary.</td>
<td></td>
</tr>
<tr>
<td>CANBus failure</td>
<td>CANBus failure.</td>
<td>Briefly interrupt the mains voltage to the Bello Zon® control and all CAN modules.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Chlorite CANOpen - nodes not found</td>
<td>No CAN bus connection to the chlorite pump available.</td>
<td>Check the cable connections to the chlorite pump.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Chlorite concentration high</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Chlorite pump not ready</td>
<td>see &quot;Detailed troubleshooting&quot;, below</td>
<td>see &quot;Detailed troubleshooting&quot;, below</td>
<td></td>
</tr>
<tr>
<td>Chlorite conc. low</td>
<td>Entire application problem.</td>
<td>Book customer service.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Chlorite conc. too low</td>
<td>Entire application problem.</td>
<td>Book customer service.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Chlorite signal (cable break)</td>
<td>Cable break</td>
<td>Check the cable connection to the CLT sensor</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Faulty Chlorite calibration</td>
<td>Zero point or slope lies outside the tolerance range.</td>
<td>Improve the CLT sensor calibration once more.</td>
<td></td>
</tr>
<tr>
<td>ClO2 concentration low</td>
<td>Problem with ClO2 dosing.</td>
<td>ClO2 dosing.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>ClO2 concentration too high</td>
<td>Problem with ClO2 dosing.</td>
<td>ClO2 dosing.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>ClO2 signal (cable break)</td>
<td>Cable break</td>
<td>Check the cable connection to the CDE or CDP sensor</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Faulty ClO2 calibration</td>
<td>Zero point or slope lie outside the tolerance range.</td>
<td>Improve the CDE or CDP sensor calibration once more.</td>
<td></td>
</tr>
<tr>
<td>Dosing error chlorite</td>
<td>see “Detailed troubleshooting”, below</td>
<td><strong>[F1] press QUIT, next - see “Detailed troubleshooting”, below</strong></td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Dosing error acid</td>
<td>see “Detailed troubleshooting”, below</td>
<td><strong>[F1] press QUIT, next - see “Detailed troubleshooting”, below</strong></td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Flow Bypass</td>
<td>see “Detailed troubleshooting”, below</td>
<td>see “Detailed troubleshooting”, below</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Fault description</td>
<td>Cause</td>
<td>Remedy</td>
<td>Personnel</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Flow signal (cable break)</td>
<td>Cable break of the mA wire for the flow meter of the main water supply line.</td>
<td>Check cable connection.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Flow high</td>
<td>The flow in the main water supply line is very high.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Flow low</td>
<td>The flow in the main water supply line is very low.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Flow too high</td>
<td>The flow in the main water supply line is too high.</td>
<td>[F1] „QUIT“, check system, [press F1] „ON“.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Flow too low</td>
<td>The flow in the main water supply line is too low.</td>
<td>[F1] „QUIT“, check system, [press F1] „ON“.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Flow signal too high</td>
<td>The flow signal in the main water supply line is too high.</td>
<td>Check the signal generator.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Leakage input</td>
<td>Leak at the safety bund or the reactor in the reactor housing.</td>
<td>Check for leaks at the safety bund or reactor in the reactor housing.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Error input</td>
<td>An input is faulty.</td>
<td>[Press F1] „QUIT“, check system, [press F1] „ON“.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Incorrect control parameters</td>
<td>The control parameters are not accepted by the controller.</td>
<td>Enter the correct control parameters.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Stroke length error Chlorite</td>
<td>Incorrect stroke length at the chlorite dosing pump.</td>
<td>[Press F1] „QUIT“, check stroke length or set the same value for all pumps, [press F1] „ON“.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Stroke length error Acid</td>
<td>Incorrect stroke length at the acid dosing pump.</td>
<td>[Press F1] „QUIT“, check stroke length or set the same value for all pumps, [press F1] „ON“</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>IO CANopen - node not found</td>
<td>Fault at the cable connection in the control.</td>
<td>Check the cable connection in the control.</td>
<td>Customer Service department</td>
</tr>
<tr>
<td>No alarm</td>
<td>Normal condition</td>
<td>No remedy necessary</td>
<td></td>
</tr>
<tr>
<td>Error sample water</td>
<td>Error sample water</td>
<td>[Press F1] „QUIT“, check system, [press F1] „ON“.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>pH high</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>pH low</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>pH too high</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>pH too low</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>pH signal (cable break)</td>
<td>Cable break</td>
<td>Check the cable connection to the pH sensor</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Faulty pH calibration</td>
<td>Zero point or slope lie outside the tolerance range.</td>
<td>Repeat calibration, if necessary replace the pH sensor.</td>
<td></td>
</tr>
<tr>
<td>ORP high</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>ORP low</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>ORP too high</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>Fault description</td>
<td>Cause</td>
<td>Remedy</td>
<td>Personnel</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>ORP too low</td>
<td>Entire application problem.</td>
<td>Check system.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>ORP signal (cable break)</td>
<td>Cable break</td>
<td>Check the cable connection to the ORP sensor</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Faulty ORP check</td>
<td>The test value lies outside the tolerance range.</td>
<td>Repeat the test, if necessary replace the ORP sensor.</td>
<td></td>
</tr>
<tr>
<td>Acid CANopen - node not found</td>
<td>No CAN bus connection to the acid pump available.</td>
<td>Check the cable connections to the acid pump.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Acid pump not ready</td>
<td>- see &quot;Detailed troubleshooting&quot;, below</td>
<td>- see &quot;Detailed troubleshooting&quot;, below</td>
<td></td>
</tr>
<tr>
<td>SD card not initialized</td>
<td>The small slider on the SD card is set to &quot;LOCK.&quot;</td>
<td>Slide the small slider towards the contacts of the SD card.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No SD card inserted.</td>
<td>Insert an SD card.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The SD card is full.</td>
<td>Replace the SD card with an empty card.</td>
<td></td>
</tr>
<tr>
<td>Setpoint signal (cable break)</td>
<td>mA cable connection to the signal generator interrupted.</td>
<td>Check the mA cable connection to the signal generator.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Setpoint high</td>
<td>Error at the setpoint signal generator.</td>
<td>Check the signal generator.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Setpoint low</td>
<td>Error at the setpoint signal generator.</td>
<td>Check the signal generator.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Setpoint too high</td>
<td>Error at the setpoint signal generator.</td>
<td>[Press F1] &quot;QUIT&quot;, check signal generator, [press F1] &quot;ON&quot;.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Setpoint too low</td>
<td>Error at the setpoint signal generator.</td>
<td>[Press F1] &quot;QUIT&quot;, check signal generator, [press F1] &quot;ON&quot;.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Disturbance variable signal (cable break)</td>
<td>mA cable connection to the signal generator interrupted.</td>
<td>Check the mA cable connection to the signal generator.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Dist. variable high</td>
<td>Error at the disturbance variable signal generator.</td>
<td>Check the signal generator.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Dist. variable low</td>
<td>Error at the disturbance variable signal generator.</td>
<td>Check the signal generator.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Dist. variable too high</td>
<td>Error at the disturbance variable signal generator.</td>
<td>[Press F1] &quot;QUIT&quot;, check signal generator, [press F1] &quot;ON&quot;.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Dist. variable too low</td>
<td>Error at the disturbance variable signal generator.</td>
<td>[Press F1] &quot;QUIT&quot;, check signal generator, [press F1] &quot;ON&quot;.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Dist. variable too high</td>
<td>Error at the disturbance variable signal generator.</td>
<td>[Press F1] &quot;QUIT&quot;, check signal generator, [press F1] &quot;ON&quot;.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td>Supply Chlorite empty</td>
<td>The chlorite storage tank is empty.</td>
<td>[F1] &quot;QUIT&quot;, press, next - see &quot;Detailed troubleshooting&quot;, below.</td>
<td></td>
</tr>
<tr>
<td>Supply Chlorite low</td>
<td>The level in the chlorite storage tank is low.</td>
<td>Change both chemical canisters - see chapter 11.1, &quot;Chemical canister replacement&quot; on page 90. WARNING!</td>
<td></td>
</tr>
<tr>
<td>Supply Acid empty</td>
<td>The chlorite storage tank is empty.</td>
<td>[F1] &quot;QUIT&quot;, press, next - see &quot;Detailed troubleshooting&quot;, below.</td>
<td></td>
</tr>
<tr>
<td>Supply Acid low</td>
<td>The level in the acid storage tank is low.</td>
<td>Change both chemical canisters - see chapter 11.1, &quot;Chemical canister replacement&quot; on page 90. WARNING!</td>
<td></td>
</tr>
<tr>
<td>Fault description</td>
<td>Cause</td>
<td>Remedy</td>
<td>Personnel</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td>„Dosing error acid” or „Dosing error chlorite”</td>
<td>A stroke sensor is misadjusted.</td>
<td>Adjust the stroke sensor - see chapter % Chapter 11.4 „Adjust stroke sensors” on page 94. [Press F1] „ON”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The back pressure has risen.</td>
<td>If there is a high pressure increase, rectify the cause, if there is a low pressure increase readjust the stroke sensor - see Chapter % Chapter 11.4 „Adjust stroke sensors” on page 94. [Press F1] „ON”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air is contained in the line from the vessel to the stroke sensor, the vessel is empty.</td>
<td>See chapter % Chapter 11.1 „Chemical canister replacement” on page 90. [Press F1] „ON”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leak in the line from the vessel to the stroke sensor.</td>
<td>Rectify the leak.</td>
<td>Customer Service department</td>
</tr>
<tr>
<td>„Acid pump not ready” or „Chlorite pump not ready”</td>
<td>The dosing pump has not yet been bled or calibrated within the scope of commissioning.</td>
<td>- see chapter % Chapter 11.2 „Bleeding pumps” on page 92.</td>
<td>Technical experts</td>
</tr>
<tr>
<td></td>
<td>The stroke length is set to too small a value.</td>
<td>Increase the stroke length with the adjustment knob - see chapter % Chapter 11.3 „Set stroke length” on page 93.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>„Water pump not ready”</td>
<td>The dosing pump has not yet been bled or calibrated within the scope of commissioning.</td>
<td>- see chapter % Chapter 11.2 „Bleeding pumps” on page 92.</td>
<td>Technical experts</td>
</tr>
<tr>
<td></td>
<td>The stroke length is set to too small a value.</td>
<td>Increase the stroke length with the adjustment knob - see chapter % Chapter 11.3 „Set stroke length” on page 93.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>„Supply Acid empty” or „Supply Chlorite empty”</td>
<td>Chemical canister empty.</td>
<td>Change both chemical canisters - see chapter % Chapter 11.1 „Chemical canister replacement” on page 90. Bleed dosing pumps - see chapter % Chapter 11.2 „Bleeding pumps” on page 92. [Press F1] „ON”.</td>
<td>Technical experts</td>
</tr>
<tr>
<td>„Flow Bypass”</td>
<td>The ball valve in the bypass is not open.</td>
<td>Open the ball valve in the bypass.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>The cable connection from the bypass survey to the control is defective.</td>
<td>Rectify this cable connection.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>If available: The bypass pump is not transporting.</td>
<td>Check he bypass pump.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>The float in the flow meter is blocked.</td>
<td>Clear the blockage and clean the flow meter.</td>
<td>Instructed personnel</td>
</tr>
<tr>
<td></td>
<td>The limit contact is defective.</td>
<td>Check the limit contact and replace if necessary.</td>
<td>Instructed personnel</td>
</tr>
</tbody>
</table>

**Change the mains fuse of the control**

**WARNING!**

Danger of electric shock

Within the control, individual parts can carry a mains voltage.
- 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, a mains voltage still exists in the terminal blocks XR1 and XR2.
- Switch the corresponding power supply to a zero-volts state and secure to prevent switching on again.

WARNING!
Warning of risk of fire and malfunctions
Fire risks and malfunctions can result from using incorrect fuses.
- Only use the approved original fuses from ProMinent, see . Only in rare cases will any other fuse, with the values given below, have the same properties.

Personnel: Electrician

1. Undo the four countersunk screws.
2. Remove the front part. For further information - see Part 1 of the Operating Instructions, chapter "Installation, electrical".
3. Open the bayonet coupling of the corresponding fuse holder. For the fuse layout - see Part 1 of the Operating Instructions, appendix.
4. Replace the defective fuse with a new one.
5. Ensure the bayonet coupling engages.
6. Tightly re-close the housing.

Permitted fuses for the Bello Zon® control (230 V AC or 115 V AC)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Type</th>
<th>Supplied ...</th>
<th>Terminals</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>0.4 ATT</td>
<td>Control</td>
<td>XP</td>
<td>712060</td>
</tr>
<tr>
<td>F2</td>
<td>10 AT</td>
<td>Bypass pump</td>
<td>X12:1, 5, 9</td>
<td>712073</td>
</tr>
<tr>
<td>F3</td>
<td>1.0 AT</td>
<td>Solenoid valves</td>
<td>X12:2, 6, 10; X12:3, 7, 11</td>
<td>732409</td>
</tr>
<tr>
<td>F4</td>
<td>10 AT</td>
<td>Metering pumps</td>
<td>X11:1 ... 12</td>
<td>712073</td>
</tr>
</tbody>
</table>

Micro fuse 5 x 20 mm:
The fuses are each contained in a fuse holder with a bayonet coupling. They are located in the terminal box of the control, on the right above the mains voltage terminals. For the layout, see figure below.

Fig. 20: Fuse layout in the control
16 Decommissioning

16.1 For a short period
Taking the Bello Zon® system out of service for only short periods:

Press key [START/STOP].

⇒ „Dosing STOP“ appears.

The power supply to the control of the Bello Zon® system must not be interrupted during this period.

CAUTION!
Warning of incorrect metering
Nevertheless, if the power supply to a possibly fitted chlorine dioxide or chlorite sensor is interrupted, for a period longer than 2 hours, it may subsequently deliver incorrect measurements.

– Do not interrupt 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 to its operating instructions.

16.2 For a longer period
Taking the Bello Zon® system out of service for longer periods:

Chlorine dioxide in an unstable compound, which decomposes over time. If the Bello Zon® system is to be taken out of service for several days, then the reactor should be rinsed through with water. To do this using the flushing equipment in the bypass line - see Part 1, chapter "Installation, hydraulic"
**WARNING!**
**Warning of explosive ClO₂ gas**
It takes just a short period for ClO₂ solution to form an explosive ClO₂ gaseous phase.
- Never leave the contents of the reactor without detoxifying them first.

**WARNING!**
**Warning of toxic ClO₂ gas, ClO₂ solution and sodium chlorite**
The inside of the system contains toxic substances.
- Take appropriate protective measures, wear safety glasses, rubber gloves, gas mask, rubber apron, see 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 of corrosive hydrochloric acid and sodium chlorite**
The inside of the system contains corrosive substances.
- Take appropriate protective measures, wear safety glasses, rubber gloves, gas mask, rubber apron, see 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.
Personnel:
- Technical experts

Protective equipment:
- Safety glasses
- Chemically resistant safety gloves
- Chemically resistant protective apron
- Protective respirator, ambient air dependent

Special tool:
- Approx: 3 m of hose with textile, d 19/27 mm, soft PVC #37041
- pH measurement instrument Provisionally pH indicator paper, however it is bleached by ClO₂!
- Neutralising container - see table, "Liquid volume, total": It must exceed this volume.
- Drinking water - see table for quantities
- Sodium hydroxide solution NaOH 50 % (C, caustic) - see table for quantities
- Hydrogen peroxide H₂O₂ 30 % (Xi, irritating) - see table for quantities
- Sodium perborate NaBO₃ * 4 H₂O - see table for quantities

1. Stop the system with the [Start/Stop] key.
   ⇨ The message "Equipment OFF" appears.

2. Close the bypass shut-off valves upstream and downstream of the system.

3. Carefully place each of the suction lances upright its own container full with drinking water.

4. Make a tank available that contains the appropriate "dilution volume" for the reactor, taken from the table below.

5. Fill the tank with the amount of water corresponding to the "To be provided water quantity".

6. In it, dissolve the specified quantities of sodium hydroxide solution NaOH and hydrogen peroxide H₂O₂ or sodium perborate NaBO₃ * 4 H₂O.

7. Connect the PVC hose to the rinse valve and lead in into the tank below the liquid level.

8. Open the rinse valve.

9. Follow the path „Service ➔ Commissioning“.

10. „Bypass activ. manual“ change to „OFF“.
    ⇨ The dosing pumps can also operate with out bypass control via the „Commissioning“ menu.

11. Advance further in the menu „Commissioning“ to „Fill reactor“ - see chapter „Setting, Service“ - „Commissioning.“
    ⇨ The dosing pumps begin to pump.

12. If the PVC hose continues to still contain yellow solution, press the key [F3] as soon as the dosing pumps have stopped, so that further rinsing can be carried out.

13. As soon as rinsing is finished, open the shut-off valves in the bypass line.
14. Close the rinse valve and secure against unauthorised opening (padlock or cable ties ...).

<table>
<thead>
<tr>
<th>Type</th>
<th>Reactor volume</th>
<th>ClO₂ quantity</th>
<th>Dilution volume</th>
<th>Water quantity to be provided</th>
<th>NaOH 50 %</th>
<th>H₂O₂ 30 %</th>
<th>NaBO₃ * 4 H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDVc 20</td>
<td>0.2</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>14</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>CDVc 45</td>
<td>0.4</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>28</td>
<td>6</td>
<td>52</td>
</tr>
<tr>
<td>CDVc 120</td>
<td>1.1</td>
<td>22</td>
<td>5</td>
<td>3</td>
<td>77</td>
<td>17</td>
<td>143</td>
</tr>
<tr>
<td>CDVc 240</td>
<td>2.1</td>
<td>42</td>
<td>7</td>
<td>4</td>
<td>147</td>
<td>32</td>
<td>273</td>
</tr>
<tr>
<td>CDVc 600</td>
<td>3.6</td>
<td>72</td>
<td>12</td>
<td>8</td>
<td>252</td>
<td>54</td>
<td>468</td>
</tr>
<tr>
<td>CDVc 2000</td>
<td>12.1</td>
<td>242</td>
<td>40</td>
<td>25</td>
<td>847</td>
<td>182</td>
<td>1573</td>
</tr>
</tbody>
</table>

1 table spoon of sodium perborate = 10 ... 15 ml = 15 ... 25 g
17 Disposal

WARNING!
Danger due to toxic and corrosive chemicals
The Bello Zon® system could still contain hydrochloric acid (HCl), sodium chlorite (NaClO₂) and chlorine dioxide (ClO₂).
– The entire Bello Zon® system must be thoroughly rinsed through with water - see chapter 12 “Decommissioning”. If necessary, also rinse the empty chemical canisters.

WARNING!
Danger to persons and the environment
Pay special attention to chemicals, control unit electronic waste and the lithium batteries upon disposal.
– Observe the conditions which apply to your site.

WARNING!
Danger due to lithium battery.
If the lithium battery is mistreated or handled violently (heating, short-circuiting, crushing), it may be give off substances harmful to health and can heat up or explode!
– The battery must be removed from the control. It is clamped in a holder on the rear side of the housing upper section - see below.
– It must be disposed of separately from the device.

Removing the battery

1. Unscrew the four securing screws at the front on the housing upper section and take the housing upper section off from the housing lower section.

2. To remove the battery from the bracket, press on the flap of the holder - see figure.

Fig. 21: Removing the battery
18  Glossary of technical terms

pH value  pH-value is a measure of the concentration (activity) of hydrogen ions or, put simply, is a measure of the acidity or alkalinity of water.

The pH value influences the corrosiveness: The corrosiveness of the water increases as the pH value decreases. Metallic materials can be attacked.

Calibration (sensor comparison)  All sensors differ from the theoretical values. Therefore a calibration must be carried out on the measuring transducer.

The slope of the sensor can change as a result of ageing and soiling.

Zero point  This refers to, for example, the current or voltage that a sensor emits in very pure water. The zero point of the sensor can change as a result of ageing and soiling.

Slope / sensitivity  This value is, for example, given in mA/ppm at 25 °C.

Control variable (measured value, actual value)  The control variable is the variable which is to be measured or recorded (e.g. ClO₂ concentration).

Setpoint  Set point refers to a value which is to be maintained at a constant level in the process by the controller (e.g. concentration ClO₂ = 0.30 ppm).

Disturbance variable  The control can, for example, process the signal of a flow measurement as a disturbance variable.

This disturbance value influences the production volume calculated by the controller dependent on this external signal.

Depending on the nature of the effect on the production volume, it is referred to either as a

- multiplicative disturbance variable (flow-proportional effect) or an
- additive disturbance variable (disturbance variable-related effect)

The disturbance variable signal exists as a 0/4 ... 20 mA signal.

When "commissioning", the zero point signal of the flow gauge has to be checked without flow (must be ≥ 0).

Multiplicative disturbance variable

**CAUTION!**

The multiplicative disturbance variable is not intended to permanently switch off the production volume.

- In this case you should realise deactivation via the pause function.

This type of disturbance variable processing is used, for example, with flow neutralisation.

The "Calculated Production volume" initially determined by the controller is influenced by the ratio "Actual Disturbance variable" to "Disturb. variable factor". The "Final Production volume" can at most equal 100 %:

\[
\text{Final production volume [g/h]} = \text{Calculated Production volume [g/h]} \times \frac{\text{Actual Disturbance variable [%]}}{\text{Disturb. variable factor [%]}}
\]
### Examples

<table>
<thead>
<tr>
<th>Designation</th>
<th>Units</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated Production volume</td>
<td>g/h</td>
<td>0</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Actual disturbance variable</td>
<td>%</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Disturb. variable factor</td>
<td>%</td>
<td>100</td>
<td>50</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Final Production volume</td>
<td>g/h</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

Legend:
The "Calculated Production volume" is the Production volume which is issued by the controller without a disturbance variable.

If the ratio "Actual Disturbance variable" to "Disturb. variable factor" > 1, then the final Production volume can even be greater than the "Calculated Production volume"!

---

### Additive Disturbance variable

The additive disturbance variable switch is suitable for metering tasks, in which the production volume is dependent in the first place on the disturbance variable (e.g. flow) and requires only minimal re-correction. This type of disturbance variable processing is used, for example, in the chlorination of water with approximately constant ClO$_2$ uptake.

A disturbance variable related base load metering value will be added to the first "calculated Production volume" determined by the controller. The Final Production volume can at most equal 100 %:

$\text{Production volume [g/h]} = \text{Calculated Production volume [g/h]} + \text{Max. Production volume [g/h]} \times \frac{\text{Actual Disturbance variable [%]}}{\text{Disturb. variable factor [%]}}$

- If there is no current interference variable (flow = 0), but a calculated Production volume of the PID control, then the final Production volume corresponds to the "calculated Production volume" of the PID control.
- If there is a current disturbance variable (flow > 0) and the "calculated Production volume" of the PID control equals "0", then the final Production volume corresponds to the 2nd term from the above formula.
### Glossary of technical terms

#### Examples

<table>
<thead>
<tr>
<th>Designation</th>
<th>Units</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated Production volume</td>
<td>g/h</td>
<td>40</td>
<td>90</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Actual disturbance variable</td>
<td>%</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>10</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Disturb. variable factor</td>
<td>%</td>
<td>100</td>
<td>50</td>
<td>100</td>
<td>50</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Final Production volume</td>
<td>g/h</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Max. Production volume</td>
<td>g/h</td>
<td>46</td>
<td>102</td>
<td>52.4</td>
<td>74</td>
<td>74</td>
<td>60</td>
</tr>
</tbody>
</table>

**Legend:**

The "Calculated Production volume" is the Production volume which is issued by the controller without a disturbance variable.

If the ratio "Actual Disturbance variable" to "Disturb. variable factor" > 1, then the Disturbance variable fraction of the Production volume can be greater than the "Max. Production volume"!

If there is no actual disturbance variable (flow = 0), but a calculated Production volume of the PID control, then the final Production volume corresponds to the calculated Production volume of the PID control.

If there is an actual disturbance variable (flow > 0) and the calculated Production volume of the PID control equals "0", then the final Production volume corresponds to the 2nd term from the above formula:

\[
\text{Max. production volume [g/h] } \times \text{Actual Disturbance variable [%]} / \text{Disturb. variable factor [%]}
\]

**Control variable**

The variable (e.g. mA signal), which originates from an external system, is designated as the control variable so that the system output can be set using it.

**Delay period tDelay (alarm, general)**

In the event that a limit value is violated, the control will trigger an error message only after the delay set here. This means that brief limit value violations will not trigger an error message.

**Delay period tDelay (Bypass control)**

If the flow exceeds the limit during production, a warning is generated without delay and the delay period starts to elapse. However, if the flow remains below the limit throughout the delay period and beyond, the control enters the condition "Production error".

**Control**

The control can be used as a P-, PI-, PD-, PID or 2 point control. This depends on the settings of the control parameters.

The control function (output of control variable) can be switched off by means of the "Pause control input".

Control variable calculation is resumed as soon as Pause is ceased.

There are the following types of controller:

- **P controller:**
  The setpoint is directly proportional to the deviation of the actual value from the set point.

- **PI controller:**
In systems with continuous attrition a pure controller will never lead to the set point being achieved, as shortly before this point the setpoint is only just sufficient to compensate for the attrition, but to reach the set point. The I-part of the PI controller ensures that the setpoint is increased above that calculated by the P controller, should the set point not be reached within the reset time Tn.

The I-function is inactive with Tn=0.

**PD controller:**

The PD controller compensates the inertia that occurs in reaction to rapidly varying ratios. To do this, the controller determines the current speed of variation of the reading, and from this calculates the value that would result upon expiry of the derivative time Tv. The PD controller immediately sets the setpoint that the P controller would calculate from this future value.

The D-function is inactive with Tv=0.

**PID controller:**

The PID controller combines all three functions.

**2 point control:**

If the setpoint is exceeded by the "Switch diff.", the controller issues a control variable of 100 % for a reset process. As soon as the setpoint is exceed by the "Switch diff.", the controller sets the control variable back to 0 %.

**Neutral zone**

With neutral zone control (dead zone control) two set points must be specified. If the measured value is located within the neutral zone, then no control variable is issued. Set point 2 must be greater than set point 1!

**Additive basic load**

A basic load is added to the current actuating variable. The additive basic load means that, for example, constant attrition can be compensated for.

\[ Y_{\text{Ges}} = Y_p + 15\% \]

Legend: additive basic load = 15 %

**Limits**

"Lower lim" means that the limit criterion has been transgressed by dropping below the lower limit.

"Upper lim" means that the limit criterion has been transgressed by exceeding the upper limit.
If an alarm occurs, the system can react in different ways:

- **continue** - The system does not switch off, but continues to work normally.
- **shutdown** - The system switches off (error), if the condition clears, the system then continues working as it was working prior to the error.
- **p.shutdn** - The system switches off permanently, i.e. it remains in the state "error", until the alarm is acknowledged. These alarms remain displayed until they are acknowledged.

When the Pause contact is closed, the control sets the control outputs to "0" provided the pause contact is closed. While the Pause contact is closed, the control determines the P factor; the I and the D factor are inactive.

If the installation requires a high dosing of ClO\(_2\) solution from time-to-time, then reconfigure "Input dosing" to "High. dosing" in "Settings"-"Configuration". If a contact between the terminals of the "Input dosing" is closed (with "N/O" presetting), the control increases the ClO\(_2\) concentration to that value, which was entered under "Settings"-"Control"-"ClO2 production"-"Controller". Simultaneously, the message "High dosage" appears in the continuous display. Moreover, the system must also be able to supply this concentration.

Upon opening of the contacts, the supplied concentration returns to the normal value.

If the installation requires a certain constant dosing of ClO\(_2\) solution from time-to-time, then reconfigure "Input dosing" to "Man. dosing" in "Settings"-"Configuration". If a contact between the terminals of the "Input dosing" is closed (with "N/O" presetting), the control sets the ClO\(_2\) concentration to that value, which was entered under "Settings"-"Control"-"ClO2 production"-"Manual". Simultaneously, the message "Man. dosing" appears in the continuous display. Moreover, the system must also be able to supply this concentration.

Upon opening of the contacts, the supplied concentration returns to the current value.
19 Chlorine dioxide hazardous substance data sheet

(The text is taken from the hazardous substances data sheet of the Bundesvereinigung der Firmen im Gas- und Wasserfach e.V. FIGWA, 50968 Cologne, of 16.4.1998.)

Properties of chlorine dioxide and instructions for handling aqueous solutions

The chlorine dioxide stock solutions used for water treatment have a concentration of 2 g/L ClO₂. At a temperature of up to 25 degrees C, this results in a chlorine dioxide concentration in the gas compartment of less than 100 g/m³. Consequently provided preparation is carried out correctly, explosive decomposition in both the gas compartment and the stock solution are excluded.

19.1 Physical and chemical properties

19.1.1 Chemical characterisation

Aqueous solution of chlorine dioxide (ClO₂) approx. 2 g ClO₂/L physically dissolved chlorine dioxide gas

19.1.2 Properties of gaseous chlorine dioxide

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<th>Value</th>
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<td>Colour</td>
<td>Orange-yellow</td>
</tr>
<tr>
<td>Odour</td>
<td>Pungent</td>
</tr>
<tr>
<td>Melting point</td>
<td>-59 °C</td>
</tr>
<tr>
<td>Boiling point</td>
<td>11 °C</td>
</tr>
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</table>

Stability: Gaseous chlorine dioxide explosively decomposes at concentrations above 300 g/m³ (=10 Vol %) into chlorine and oxygen.

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

For example, with a critical chlorine dioxide concentration in the gas compartment above an aqueous chlorine dioxide solution, a concentration of more than 8 g/L chlorine dioxide (at a temperature of 20 degrees C) must be reckoned with.

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

19.1.3 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.
19.2 Handling aqueous chlorine dioxide solutions

19.2.1 Labelling and characters

The labelling of the workplace and area is carried out using characters conforming to the (German) Accident Prevention Regulation "Chlorination of Water" (GUV 8.15, appendix 3).

19.2.2 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 ready for immediate use.

19.2.3 Measures for spillage, escaping, gas escapes

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

19.2.4 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 containers with water, precipitate any escaped chlorine dioxide gas out with a water spray. There are no limitations for fire extinguishing agents in the event of encroaching fires.

19.2.5 Disposal

See point 1.2.3

19.3 Health protection

19.3.1 MAC-value and odour threshold

MAC-value: 0.1 ppm (mL/m$^3$) or 0.3 mg/m$^3$

Odour threshold: The odour of chlorine dioxide gas is perceptible from a concentration of around 15 mg/m$^3$ of air.

19.3.2 Personal protective equipment

Respiratory protection: Gas mask, filter B/grey

Eye protection: Safety glasses, face visor
19.3.3 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 concentration and the duration of the influence, the results 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 the very brief influence of very high concentrations, there is a risk of laryngospasm or reflexive apnoea or cardiac arrest. Harmful to the nervous system (e.g. eye muscle paralysis).

19.3.4 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 out splashes into the eyes for several minutes using 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.

19.4 More information

DVGW-Arbeitsblatt (worksheet) W 224 "Chlorine dioxide in water treatment" [in German]

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

Ullmann Volume 5, Page 551

Kühn-Birett, Sheet C 20

Note:

A European standard for chlorine dioxide is currently under preparation as well as the DVGW-Data Sheet W 624 "Chlorine dioxide dosing systems", Edition 10/96.

Note:

The information is based on the latest state of our knowledge. It should contribute to the safe handling of aqueous chlorine dioxide solution and as such does not have the purpose of safeguarding particular properties. Automatic correction upon revision is not guaranteed, also legally non-binding.
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