![evoqua WATER TECHNOLOGIES]

BLU-SENTINEL SE MEASURING, CONTROL AND DOSING SYSTEM
Version 2.00 and later

INSTRUCTION MANUAL

2

Please note

Original instruction manual!

Contents

1. Introduction

1.1   Documentation

1.1.1   Target groups

This instruction manual provides the information required by installation, operating and maintenance personnel for operation and maintenance of the Blu-Sentinel SE.

All persons working with the Blu-Sentinel SE must have read and understood the instruction manual, in particular, the safety instructions it contains.

1.1.2   Structure of the documentation

This instruction manual contains important information for the safe, trouble-free and economical use of the Blu-Sentinel SE. Observing these instructions will help prevent risks, reduce repair costs and downtimes, and increases the reliability and service life of the Blu-Sentinel SE.

The Chapters Installation and Maintenance are intended only for trained and authorized service personnel. These chapters contain important information on the installation, configuration, commissioning, maintenance and repair of the Blu-Sentinel SE, which are essentially carried out by this target group.

Please consult the table of contents and the index to quickly find the information you require.

1.2   Conventions

NOTICE

This instruction manual contains a number of notes with different priorities that are marked with symbols.

Pictogram	Safety Panel	Safety note
	⚠ **DANGER**	Immediate danger to life and limb! If the situation is not handled properly, death or serious injury is the result.
	⚠ **WARNING**	Danger to life and limb! If the situation is not handled properly, death or serious injury may be the result.
	⚠ **CAUTION**	If this warning is not observed, there is a medium or slight risk that injury or damage to the equipment may be the result.
⚡	⚠ **WARNING**	Electrical hazard.
	⚠ **WARNING**	**Never override sample flow switch!** Uncontrolled feeding of chemicals can result in injury or death. Sample flow switch is a critical safety device which prevents uncontrolled chemical feed. Follow instructions carefully!
	⚠ **WARNING**	**Test flow switch function!** Uncontrolled feeding of chemicals can result in injury or death. Assure flow switch prevents chemical feed in any circulation NO-FLOW or backwash condition. Follow instructions carefully!
	⚠ **WARNING**	**Always use anti-siphon devices!** Uncontrolled feeding of chemicals can result in injury or death. Anti-siphon devices must be installed to prevent uncontrolled chemical feed. Follow instructions carefully.

Pictogram	Safety Panel	Safety note
	⚠ **WARNING**	**Never connect feeder directly to power source!** Uncontrolled feeding of chemicals can result in injury or death. Chemical metering pumps must be connected to the controller to enable safety controls. Follow instructions carefully.
	⚠ **WARNING**	**Always install interlock!** Chemical feed without water circulation can result in injury or death. Circulation pump interlock with chemical feeders is a critical safety device which prevents unsafe chemical feed. Recirculation pump must be interlocked to prevent chemical feed whenever pump power is removed. Follow instructions carefully.
	⚠ **WARNING**	**Electrical surges can damage your controller!** A damaged controller could feed chemicals in an uncontrolled manor. Uncontrolled feeding of chemicals can result in injury or death. If you suspect your controller is not operating properly, disconnect it from control of chemical feed
	NOTICE	These notes assist in the operation of the system.

2. Safety

2.1   Intended use

The Blu-Sentinel SE intended exclusively for measurement and control tasks during the treatment of water in swimming pools and baths and saline pools.

The operational safety of the Blu-Sentinel SE is only guaranteed if it is used in accordance with its intended application. The system may only be used for the purpose defined in the order and under the installation, operating and ambient conditions specified in this instruction manual.

All inspection and maintenance work must be carried out at the specified intervals.

Compliance with the intended use also includes reading this instruction manual and observing all the instructions therein.

The owner/operator of the installation bears sole responsibility for consequences of any use that does not conform with the installation's intended use.

⚠ DANGER

Risk of injury or death!

The unit must not be operated with flammable liquids.

2.2   General safety instructions

The manufacturer attaches great importance to ensuring that work on its device is always perfectly safe. This is taken into account, starting with the design of the installation, by the integration of safety features.

Safety regulations   The safety instructions in this documentation must be observed at all times. Additional industry-wide or in-house safety regulations also continue to apply.

Safety instructions on the unit	All safety instructions attached to the unit itself must be observed. These instructions must always be clearly legible and complete.
State-of-the-art technology	The unit has been constructed in accordance with state-of-the-art technology and the accepted rules of safety engineering. However, if the unit is used by persons who have not been adequately instructed, danger to the life and limb of such persons or third parties and damage to the unit itself or to other property cannot be ruled out. Work not described in this instruction manual must be performed only by authorized personnel.
Personnel	The operator of the overall system must ensure that only authorized and qualified specialist personnel are permitted to work with and on the unit within their defined scope of authority. "Authorized specialist personnel" are trained, skilled personnel employed by the owner/operator, the manufacturer or, if applicable, the service partner. Work on electrical components must be carried out by qualified electricians.
Spare parts / components	Trouble-free operation of the unit is only guaranteed if original spare parts and components are used in precisely the combination described in this instruction manual. Failure to observe this instruction may lead to malfunctions or damage to the unit.
Extensions and conversions	Never attempt to perform any modifications, extensions or conversions on the unit that could have an adverse affect on safety without the written approval of the manufacturer.
Electrical power	Only qualified electricians or trained personnel supervised by a qualified electrician are permitted to perform any work on electrical components and must do so in accordance with valid electro-technical regulations.

During normal operation, the controller must remain closed. Connect power cables in accordance with the wiring diagram.

⚠ **DANGER**

Risk of injury or death!

External voltages may still be connected even if the operating voltage is switched off. In the event of a fault in the electrical power supply, switch the Blu-Sentinel SE off immediately.

Hazardous material   All users of this equipment should be made aware of the problems associated with handling hazardous materials in either liquid, gaseous or solid form and of the effects of exposure to their fumes. Reference should be made to the literature and safety data sheets available from the suppliers of these chemicals, particular attention being paid to the information and advice on protective clothing.

When dealing with hazardous material, it is the responsibility of the equipment user to obtain and follow all safety precautions recommended by the material manufacturer.

Do not discard this instruction book upon completion of installation. information provided is essential to proper and safe operation and maintenance.

IT security   The manufacturer offers IT security mechanisms for its products to support secure system operation. We recommend checking on a regular basis to see what information is available regarding IT security developments for your products. Information on this can be found on the Internet.

Moreover, for the safe operation of an installation, it is also necessary to integrate the automation components into a holistic IT security concept which comprises the entire system and is in accordance with the state of the art in IT technology. Integrated products from other manufacturers should also be taken into account.

During commissioning of the Blu-Sentinel SE, the factory-configured passwords and user names should be replaced with individual ones and the user administration activated.

Disposal   Ensure safe and environment-friendly disposal of agents and replacement parts.

Environmental hazard!

Dispose of the electronic waste in accordance with local and national applicable regulations.

2.3   Unit-specific notes

2.3.1   Sample water monitoring

⚠ DANGER

Risk of injury or death

If there is a shortage of sample water or the flow rate is too low, there is a risk of uncontrolled dosing of chemicals. To ensure safe operation and prevent injury, the sample water monitoring must never be disabled.

The sample water monitoring must be checked regularly. Without automatic detection of a shortage of sample water or an excessively low flow rate, there is a risk of uncontrolled dosing of chemicals. Never disable the sample water monitoring - even temporarily, e.g. by bridging the signal input. The sample water monitoring deactivates dosing if there is a shortage of sample water and prevents the uncontrolled dosing of chemicals.

2.3.2   Circulation monitoring

⚠ DANGER

Risk of injury or death

Chemical dosing must switch off if the circulation is switched off or the circulation rate is too low. To ensure safe operation and prevent injury, it is essential to install circulation monitoring.

The circulation monitoring must be checked regularly. A circulation monitoring device must be installed in the unit and connected to the Blu-Sentinel SE. The input used must be configured as "Controller Stop." The dosing of chemicals must switch off if the circulation is deactivated or the circulation output is too low, e.g. dosing switches off with digital input 2 used as "Controller Stop."

2.4   Specific safety operating

Normal operation   Never employ any working methods which could affect safety!

The unit must not be operated with flammable liquids.

The Blu-Sentinel SE may only be operated with the housing closed!

Inspect the Blu-Sentinel SE at least once daily for externally visible damage and faults! Inform the responsible person/authority immediately of any detected changes (including any changes in the operating performance)!

In the event of malfunctions, always switch the electronics module off immediately! Have malfunctions remedied immediately!

Installation and   During installation and maintenance work, secure the Blu-Sentinel
maintenance work   SE against being switched back on!

If stipulated, disconnect all parts of the electronics module from the power supply before performing any inspection, maintenance or repair work. Then first test the disconnected components to ensure they do not carry any voltage.

Never use corrosive cleaning agents (e.g. spirit, scouring agents)! We recommend that you use a moist cloth with a neutral household cleaning agent.

2.5   Warning notifications

2.5.1   Never override sample flow switch

⚠ WARNING

Never override sample flow switch!

Uncontrolled feeding of chemicals can result in injury or death. Sample flow switch is a critical safety device which prevents uncontrolled chemical feed.
Follow instructions carefully!

Flow switches are provided with all Blu-Sentinel™ controllers and are an integral safety device to prevent the uncontrolled feed of chemicals, which could cause personal injury or death. The flow switch should NEVER be bypassed, even temporarily, as this critical safety device will not be available to protect the swimmers.

2.5.2   Test flow switch function

⚠ WARNING

Test flow switch function!

Uncontrolled feeding of chemicals can result in injury or death.
Assure flow switch prevents chemical feed in any circulation NO-FLOW or backwash condition.
Follow instructions carefully!

If flow switch does not stop and remain stopped during backwash, no-flow, or very low flow conditions, the controller cannot prevent the uncontrolled feed of chemicals, which could cause personal injury or death.

Testing of the flow switch installation is essential to assure the flow switch stops, remains stopped, and controller shows "NO-FLOW ALARM" within 20 seconds, whenever filter is in backwash or circulation flow stops. If the flow switch does not stop completely, plumbing corrections or the installation of additional safeguards will be necessary to avoid uncontrolled chemical feed.

2.5.3   Never connect feeder directly to power source

⚠ WARNING

Never connect feeder directly to power source!

Uncontrolled feeding of chemicals can result in injury or death.
Chemical metering pumps must be connected to the controller to enable safety controls.
Follow instructions carefully.

If the chemical feeders are connected to a wall outlet, the safety devices integral to your Blu-Sentinel™ controller, and to the safe feeding of chemicals, will be bypassed. It is very important that the chemical feeders are connected to the controller and never to a wall outlet. Potentially hazardous concentrations of chemicals can be fed into pool or spa if the chemical feeders are connected to a wall outlet. The chemicals will feed continuously, ignoring the following situations the flow of water to the pool stops due to filter backwash, the circulation pump losing prime or other causes, potentially hazardous concentrations of chemicals can be fed into pool or spa.

2.5.4   Always use anti-siphon devices

⚠ WARNING

Always use anti-siphon devices!

Uncontrolled feeding of chemicals can result in injury or death.
Anti-siphon devices must be installed to prevent uncontrolled chemical feed.
Follow instructions carefully.

If a vacuum is created in the water circulation line and no anti-siphon device is installed on the chemical feeders, potentially hazardous concentrations of chemicals can be drawn into pool or spa. Always use injection check valves and anti-siphon valves in the chemical feed lines to prevent this situation from occurring.

2.5.5   Electrical surges can damage your controller

⚠ WARNING

Electrical surges can damage your controller!

A damaged controller could feed chemicals in an uncontrolled manor.
Uncontrolled feeding of chemicals can result in injury or death.
If you suspect your controller is not operating properly, disconnect it from control of chemical feed.

Blu-Sentinel™ controllers, like all modern electronic devices can be damaged by severe electrical spikes and surges (think 'lightning'). Every effort has been made to protect your Blu-Sentinel™ controller against such surges, but no precautions are 100% effective. Additional surge protection can be installed at time of installation, but even that is not a guarantee that surge damage will not occur. If surge damage occurs, chemicals could be fed to your pool or spa, continuously with no safety controls. If you inspect your Blu-Sentinel™ controller after a possibly damaging power surge (thunderstorm or power outage) and suspect the controller is not operating properly, disconnect the chemical feeders at once, and contact your Blu-Sentinel™ dealer for service.

2.5.6 Hazardous voltage enclosed

⚠ WARNING

Hazardous voltage enclosed!

Voltage or current hazard sufficient to cause shock, burn, or death. Disconnect and lockout power before servicing.

Line voltage (125 VAC) can be present inside the Blu-Sentinel™ controller and caution should be used to prevent electrical shock, burns or electrocution. Be sure electric power is disconnected before opening the cover of any Blu-Sentinel™ controller. Follow all local safety policies, procedures and electrical codes, to prevent injury from electrical hazards, before opening the cover of this controller. If you are not trained and comfortable performing work on electrical equipment, contact a licensed electrician to perform the work.

2.5.7 Always install circulation pump interlock

⚠ WARNING

Always install interlock!

Chemical feed without water circulation can result in injury or death.
Circulation pump interlock with chemical feeders is a critical safety device which prevents unsafe chemical feed.
Recirculation pump must be interlocked to prevent chemical feed whenever pump power is removed.
Follow instructions carefully.

If concentrated Chlorine and Acid are combined, chlorine gas is released. Chlorine gas causes severe irritation to lungs and can be toxic in certain situations.

If water is not flowing in the return line to the pool, and both these concentrated chemicals are allowed to combine in still water, a chlorine gas bubble will be created. When the flow eventually resumes to the pool, the chlorine bubble would then be flushed into the pool and released into the air around the pool, beginning at the water surface. To help prevent this situation, a chemical pump interlock must be installed. An interlock removes power from the chemical feed pumps whenever the power to the recirculation pump power is switched off.

2.5.8   Warning regarding connecting ph & chlorine or bromine feeders

⚠ **WARNING**

Only connect a pH feeder to this outlet!

Connecting a Chlorine/Bromine feeder to this outlet can cause chemical interactions that may cause personal injury or death.
Caution must be used to insure feeders are connected properly to avoid hazardous chemical feed conditions.
Never connect Chlorine/Bromine feeder or any other device to this connector.
Blu-Sentinel™ pH Sensors are color coded as YELLOW.

⚠ **WARNING**

Only connect a Chlorine or Bromine feeder to this outlet!

Connecting a pH feeder to this outlet can cause chemical interactions that may cause personal injury or death.
Caution must be used to insure feeders are connected properly to avoid hazardous chemical feed conditions.
Never connect pH feeder or any other device to this connector.
Blu-Sentinel™ Chlorine/Bromine Sensors are color coded as BLUE.

Oxidizers (Chlorine or Bromine), acids (Muriatic or Carbon Dioxide) and caustics (Sodium Hydroxide, Caustic Soda, or Soda Ash) are common chemicals used to automatically maintain safe and healthy pool and spa water chemistry. The automatic feeding of these chemicals is performed using sensors, which continuously monitor the water circulating through the filter(s). Each of the sensors is associated with a chemical it is monitoring and feeding. These sensors, their connectors, and the feeder power cords, if present, are color coded. The YELLOW sensor is associated with the pH control channel which feeds an Acid or a Base (sometimes called caustic or alkaline) chemical. The BLUE sensor is associated with the feed of Chlorine or Bromine (sometimes called an oxidant or oxidizer). If these sensors or chemical feed pumps are not plugged into to the proper connections, or are connected to opposite devices, the uncontrolled feeding of one or both chemicals can occur. Uncontrolled or improper feeding of these two chemicals can cause serious injury or death to swimmers in the pool area from the formation of chlorine gas. Use extreme caution when connecting chemical feeders and sensors.

2.6 Warranty conditions

The following must be observed for compliance with warranty conditions:

- Installation and commissioning by the manufacturer or trained and authorized specialist personnel, e.g. from contracted companies
- Intended use
- Observation of the operational parameters and settings
- The unit may only be operated by trained personnel
- An operating log book must be kept (only in the public sector)
- Only approved calibration chemicals may be used
- The unit must not be exposed to frost.
- The prescribed maintenance work must be carried out
- Use of original spare parts

If any of the above conditions are not met, the warranty is void.

2.7 Warranty

Evoqua Water Technology warrants equipment of its manufacture and bearing its trademark to be free of defects in materials and workmanship and to materially conform to any applicable specifications and drawings approved in writing by Evoqua Water Technologies.

If the customer gives Evoqua Water Technologies prompt written notice of breach of this warranty within twelve months from the date of start-up for the controller in accordance with the below conditions (the "Warranty Period"), Evoqua Water Technologies will, at its sole option and as the customer's exclusive remedy, either repair or replace free of charge, or refund the purchase price paid with respect to, any material found to be defective during the warranty period.

No repair or replacement of defective products shall extend the warranty period, but any such repaired or replaced product shall be covered for the balance of the original warranty period. If Evoqua Water Technologies determines that any claimed breach is not, in fact, covered by this warranty, the customer shall pay Evoqua Water Technologies 's then customary charges for any repair or replacement.

The "Warranty Period" for Blu-Sentinel controller components shall be as follows: a) the controller electronics shall be five (5) years from the date of manufacture b) the Strantrol sensors shall be two (2) years from the date of shipment c) the Wallace & Tiernan sensors (if used) and flow cell shall be one (1) year from the date of shipment.

The foregoing warranty is subject to the following conditions: (i) initial start-up of the equipment shall be completed by a factory authorized representative within the first twelve months after shipment of the equipment, with such installation and start-up to be documented in a duly completed start-up and field test report to be returned to Evoqua Water Technologies by the customer within thirty (30) days of start-up.; (ii) the customer shall have operated and maintained the equipment in accordance with all instructions provided by Evoqua Water Technologies; (iii) the customer shall not have made any unauthorized repairs or alterations; (iv) the customer shall not be in default of any payment obligation to Evoqua Water Technologies; (v) if requested, the customer will deliver the equipment to Evoqua Water Technologies authorized service center the customer shall pay all inbound and outbound freight costs; (vi) the customer must provide a complete and detailed description of the problem including, without limitation the Evoqua Water Technologies job number, date of delivery, date of installation, date of start-up and the operating conditions of the unit (s); and (vii) for equipment which is destined for extended storage, such equipment must have been stored in the accordance with the storage requirements detailed in the operation and maintenance manual (storage of equipment does not extend the warranty period).

The foregoing warranty does not extend to, and Evoqua Water Technologies assumes no responsibility for, (i) the installation quality or any services defects resulting there from unless a Evoqua Water Technologies representative or designee supervised the installation; (ii) in the event that the unit size and location are predetermined by someone other than by Evoqua Water Technologies or our local representative, the serviceability and/or performance of the unit for the specified design and/or actual operating conditions (this exclusion shall not apply if all necessary design information is submitted to and approved in writing by Evoqua Water Technologies); (iii) any auxiliary equipment or accessories supplied by Evoqua Water Technologies but manufactured by others (the original manufacturer's warranty, if any, shall apply to such products); (iv) damage to the equipment or products resulting from normal wear, abuse, neglect or operation in a manner inconsistent with Evoqua Water Technologies' recommendations; and (v) damage to the equipment or products that have been modified, tampered with or altered without written consent from Evoqua Water Technologies.

In addition to the foregoing conditions and limitations, the following product-specific limitations and conditions must be satisfied for the foregoing warranty to apply:

• This warranty does not cover damage caused by chemical action or abrasive material, damage caused by handling or during transportation, or damage arising from misuse, installation or any other cause beyond Evoqua Water Technologies' control.

• Standard units not in outdoor configurations are not warranted in outdoor applications.

The warranties set forth above are Evoqua Water Technologies' sole and exclusive warranties. Evoqua Water Technologies makes no other warranties of any kind, express or implied, including without limitation, any warranty of merchantability or of fitness for a particular purpose, all warranties arising from course and dealing and usage of trade and all such express or implied warranties are hereby disclaimed. The remedies provided above are the customer's sole remedies for Evoqua Water Technologies' failure to comply with obligations. Correction of any nonconformity in the manner and for the period of the time provided above shall constitute complete fulfillment of all the warranty liabilities of Evoqua Water Technologies, whether the claims of the purchaser are based in contract, in tort (including negligence) or otherwise with respect to or arising out of the work performed hereunder.

Limitation of liability: notwithstanding anything else to the contrary, Evoqua Water Technologies and its suppliers and any affiliated companies shall not be liable for any consequential, incidental, special, punitive or other indirect damages, and Evoqua Water Technologies total liability arising at any time from the sales of use of the equipment shall not exceed the purchase price paid for the equipment. These limitations apply whether the liability is based on contract, tort, strict liability or any other theory.

2.8   Disclaimer

We are not liable for any damages incurred during installation or use of these hardware and software components. This applies specifically to trouble-free interaction with the software and hardware components you choose.

We cannot be held liable for damage incurred by the user (in particular, lost profits, lost information and service interruptions) when using the Blu-Sentinel SE or for other damage. You are solely responsible for the installation!

The content of the instruction manual has been checked to make sure that it matches the hardware and software described. Nevertheless, deviations cannot be ruled out, and we therefore assume no liability for full conformity. The details in this instruction manual are checked regularly and any necessary corrections included in subsequent issues.

3. Description

3.1   General

The Blu-Sentinel SE comprises a flow cell (module type D02) and an electronics module (module type E02). The electronics module, together with the flow cell and the installed sensors, measures and controls the auxiliary hygiene parameters free chlorine, pH value, ORP (Redox) voltage, conductivity and temperature (depending on the scope of delivery).

As a rule, the water in swimming pools is disinfected by adding chlorine, sodium hypochlorite or non-organic chlorine compounds. Precise dosing is of vital importance here, as disinfection may not be successful if the concentration is too low, whereas excessively high concentrations can lead to odor contamination, corrosion and damage to pipework.
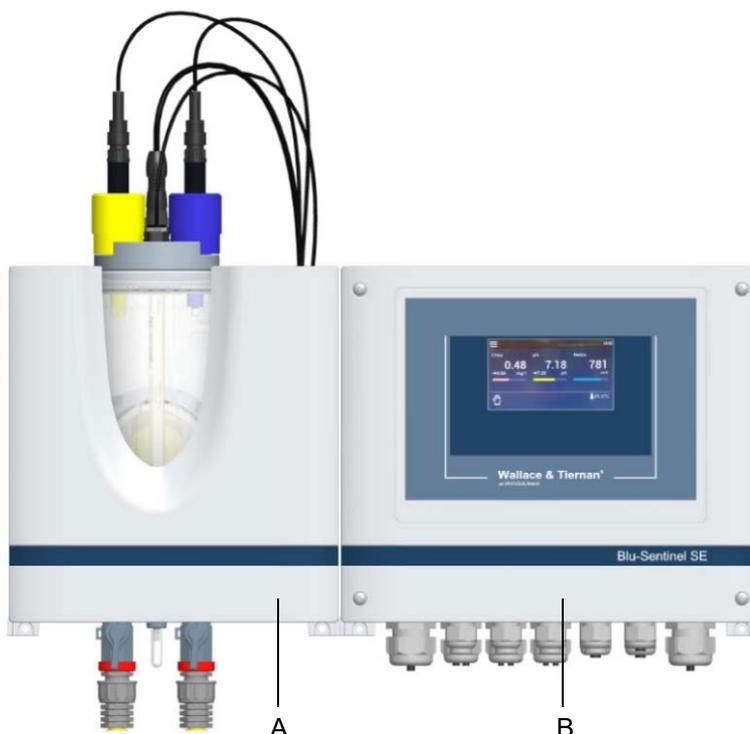
Image 1   Blu-Sentinel SE with sensors

A   Flow cell with sensors
B   Electronics module

NOTICE

The addition and presence of so-called "chlorine stabilizers" (isocyanurates) in the pool water, e.g. in public outdoor swimming pools, disturbs chlorine measurement. Chloroisocyanurates are also sold as "organic chlorine products" in the form of fully soluble granulate or poorly soluble tablets. A dosing system controlled by the measurement of excess chlorine can only be operated with these products if the hydrolysis balance, i.e. the concentration of isocyanuric acid, is taken into consideration. If hydrolysis of these organic chlorination agents is incomplete, only the chlorine released by hydrolysis is detected by the chlorine electrode and not the entire quantity (in accordance with the DPD method).

As a result of the integrated process management, the following functions can be realized:

- Measurement of the hygiene parameters and control
- Dosing of disinfectants
- Correction of the pH value
- Dosing of brine
- Limit value monitoring
- Data transfer to higher-level systems
- Integrated safety functions

3.2   Versions

The Blu-Sentinel SE is available as a complete system in the following version:

Part No.	Description
W3T391858	Blu-Sentinel SE for measurement of pH value, ORP voltage and free chlorine

The Blu-Sentinel SE can be expanded at any time later:

Part No.	Description
W3T391865	4-way mA output card A 4-way mA output card is required for data registration and transfer.
W3T434521	Sensor measuring module conductivity 60 mS/cm comprising: conductivity sensor card, conductivity sensor (LF325), sensor cable, calibration solution 60 mS/cm and terminal strip
W3T434592	Sensor measuring module conductivity 600 µS/cm comprising: conductivity sensor card, conductivity sensor (LF325), sensor cable, calibration solution 600 µS/cm and terminal strip

3.3   Optional accessories

The following optional accessories are available:

* Mounting plate with accessories

  For simple mounting of the flow cell and electronics module, preliminary filter unit and up to four hose dosing pumps.

* Impedance converter

  In cases where the sensor cable is not long enough and an extension is required, one impedance converter must be screwed onto the pH sensor and one onto the ORP sensor. The impedance converter converts the very high-resistance sensor signal into a low-resistance signal. The impedance converter is supplied by a built-in battery with a battery service life of approximately 5 years. At the end of this time, the impedance converter should be returned to Evoqua Water Technologies GmbH Günzburg for replacement of the battery.

* Extension cable for sensors

  If the flow cell and electronics module are mounted in separate locations, the use of sensor extension cables is required.

* Booster pump

  If the admission pressure is below 0.25 bar, a booster pump must be used.

* Pressure reducing valve

  If the admission pressure exceeds 3.0 bar, a pressure reducing valve must be used.

* Hose and hose connection

  PVC or PE version

NOTICE

For order numbers, see Chapter 8. "Spare parts, accessories and retrofit kits".

3.4   Flow cell

3.4.1   Design

The structure of the flow cell (module type D02) is as follows:
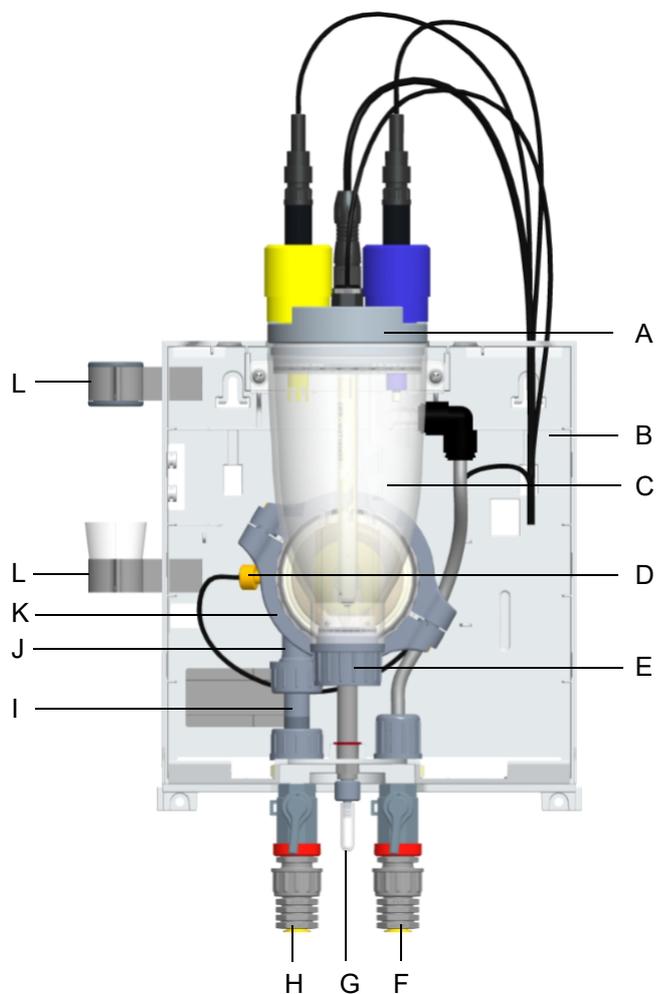
Image 2   Flow cell (without housing cover)

A   Cover to hold the sensors and LED glow stick
B   Plastic housing with removable housing cover
C   Cell body
D   Multi-sensor
E   Flow distributor cap
F   Sample water outlet with ball valve
G   Flow cell drain (drain)
H   Sample water inlet with ball valve
I   Filter unit without fine filter
J   Check valve housing
K   Flow control valve
L   Calibration holding clips

3.4.2   Function

The following section describes the functional principle of the flow cell from the sample water inlet to the sample water outlet (see Image 2 on page25).

Sample water inlet

The sample water is connected on the input side to the shut-off ball valve (A). The input pressure must be around 0.25 to 3.0 bar. To guarantee a constant flow, the minimum input pressure must not be less than 0.25 bar. Otherwise, an optional booster pump must be used. If the admission pressure exceeds 3.0 bar, an optional pressure reducing valve must be used. The differential pressure between the sample water inlet and sample water outlet must always be more than 0.25 bar.

For example:

Back pressure	0.5 bar
Inlet pressure	min. 0.75 bar

Strainer

The sample water flows over the strainer, which prevents dirt particles penetrating into the flow cell module.

Check valve housing

The sample water flows in the flow direction to the check valve housing (C) through the filter unit (B). The check valve housing (C) provides a non-return function and guides the ball for monitoring the flow rate.

Multi-sensor

The multi-sensor (D) monitors the correct flow following the float principle with reed switch and records the temperature with a Pt1000 sensor. Large-area sample water earthing is via the stainless steel sensor housing.

Flow control valve

The flow control valve (K) ensures a flow of the sample water that is not dependent on the operating pressure. The correct sample water flow of 33 l/h is preset, checked and documented at the factory.

Cell body

The clear cell body (C), which can be illuminated, holds the sensors and due to its design, offers good cleaning and service options. The sensors are installed in the mount hole in the cell body cover (A) with standardized threaded connections or in special sensor holders. The LED glow stick is installed in the cell body cover to visually monitor the sensors, sand cleaning and to signal messages and errors in color.

The flow distributor cap screwed into the cell body from the bottom allows continuous hydro-mechanical cleaning of the electrode of the chlorine sensor using special cleaning sand and thereby effectively prevents the natural contamination of the electrode surfaces. Clean electrode surfaces and a constant flow of sample water are decisive criteria for high-quality chlorine measurement and quick responsiveness.

Sample water outlet

The sample water supply is connected on the output side via the G1/2" connection to ball valve (F). At this point, a maximum back pressure of 1.5 bar is permitted.

Flow cell drain (drain)

A flow cell drain (G) is provided for calibration. It is used to draw sample water from the cell body through the low-pressure side of the flow control valve or to drain the cell body for servicing purposes.

Calibration holding clips

Two calibration holding clips (L) are attached in the cover of the flow cell. For "hands-free" calibration of the sensors with buffer solution or calibration solution (bag or beaker), the two calibration holding clips are pushed into the side of the basic housing at the back.

⚠ CAUTION

Do not overtighten the sample valve assembly as damage to this component may be the result.

3.5   Sensors

The sensors are screwed into the cover of the flow cell and connected to the electronics module.

3.5.1   Chlorine sensor

The chlorine sensor consists of a amperometric 3-electrode systems with potentiostatic connection. The free chlorine reacts at the working electrode (cathode) and a current proportional to the chlorine concentration is measured.

The chlorine sensor consists of the measurement or working electrode, the counter electrode and a reference electrode.
The potentiostatic connection maintains the potential between working electrode and reference electrode at the level necessary for the reaction. The current flows via the counter electrode. This measurement method ensures a precise and reproducible reading and a stable zero point.

The reference electrode is a silver/silver chloride electrode (Ag/AgCl) that remains de-energized. The electrolyte is a saturated potassium chloride solution. A membrane permeable for the electrolyte provides the electrical connection to the measuring solution.

Direct contact with the sample water to be examined can lead to inactivation of the electrode surfaces as a result of dirt deposits or electrochemical side reactions. The flow of sample water in the flow cell ensures continuous cleaning of the electrodes with a special cleaning sand. Turbulence ensures constant contact of the cleaning particles with the surfaces of the electrodes and keeps them free of contamination.

In as-delivered status, the chlorine sensor is equipped with a watering cap over the electrodes and the membrane. It contains diluted potassium chlorine solution which keeps the membrane moistened, ensuring that the chlorine sensor is ready for immediate use. When the chlorine sensor is not in use, for example during the winter, we recommend fitting the watering cap, filled with diluted potassium chloride solution.
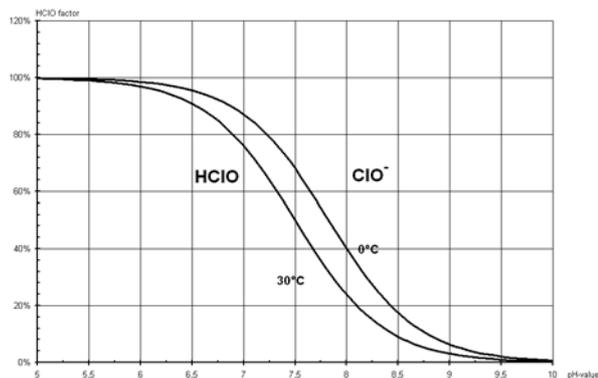
Image 3   Graph shows relationship between pH value and chlorine measurement

3.5.2   pH sensor (yellow)

The pH sensor consists of a pH combination electrode and covers almost the entire pH spectrum.

The pH-sensitive element is the membrane made of special glass, a rounded tip at the lower end of the pH sensor. The reference electrode together with the pH electrode forms the measuring chain. The reference electrode is the stable electrical reference point for voltage measurement.

The electrolyte is a concentrated solution. As the concentration of the electrolyte remains almost constant, the potential of the reference electrode is also constant. An additional depot further increase the service life of the pH sensor.

A membrane permeable for the electrolyte provides the electrical connection to the measuring solution. This ceramic membrane is particularly suitable for the treatment of water in swimming pools and baths, as the electrolyte can only flow slowly through the pores of the membrane, thus ensuring very long service life for the entire measuring chain.

The pH sensor is installed in an electrolyte container with diluted electrolyte which protects the sensitive membrane, keeps the membrane moist and thus ensures that the measuring cell is ready for immediate use. When the pH sensor is not in use, for example during the winter, we recommend storing it in the transport container in diluted electrolyte.

3.5.3   ORP sensor (blue)

The ORP sensor consists of a ORP combination electrode. The ORP sensor consists of a glass shaft with a platinum or gold tip fused into its lower end.

Together with a reference electrode, it forms a measuring chain. The task of the reference electrode is to provide a constant potential during potentiometric measurements. This potential is measured against the potential of the metal electrode.

The electrolyte is a concentrated solution. An additional salt depot further increase the service life of the ORP sensor.

A membrane permeable for the electrolyte provides the electrical connection to the measuring solution. This membrane is particularly suitable for the treatment of water in swimming pools and baths, as the electrolyte can only flow slowly through the pores of the membrane, thus ensuring very long service life for the entire measuring chain.

The ORP sensor is installed in an electrolyte container with diluted electrolyte which protects the sensitive membrane, keeps the membrane moist and thus ensures that the measuring cell is ready for immediate use. When the ORP sensor is not in use, for example during the winter, we recommend storing it in the transport container in diluted electrolyte.

3.5.4   Conductivity sensor

The conductivity sensor comprises a 4-electrode system with integrated temperature sensor. The shaft of the measuring cell is made of epoxy, ensuring high durability. The electrodes are made of graphite. The conductivity of the medium is determined by means of voltage and current measurement. The sensor is ready for use. In preparation for winter, the sensor must be flushed (e.g. with distilled water) and can be stored dry. It is installed either loose in a non-pressurized flow cell module or with a clamp connection in a pressurized flow cell module.

3.6 Electronics module

3.6.1 Design

The electronics module (module type E02) essentially consists of:

- Plastic housing with removable housing cover
- Motherboard with power supply, terminal strips, electronic components and relays
- Touchscreen
- Cable terminal screws

Image 4   Electronics module

A   Plastic housing
B   Touchscreen/display
C   Cable terminal screws

3.6.2   Functions

The Blu-Sentinel SE is used for measurement and control of auxiliary hygiene parameters in swimming pool and swimming baths applications.

Examples of typical applications are:

- Measurement and control of chlorine, pH and ORP (Redox) and conductivity in the swimming pool
- Actuation of dosing pumps or chlorine gas metering systems
- Monitoring and raising of alarm if limit values exceeded
- Data visualization
- Data transfer to higher-level systems

Potential process measurements include:

- Free chlorine
- pH value
- ORP voltage
- Conductivity
- Temperature

The color touchscreen shows the following:

- Measured values
- Operation mode and switching states
- Display of limit values
- Setpoint and measurement range
- Customer-specific measuring point designation
- Messages and errors
- Date/Time

The menus are used by means of direct entry on the display or by touching the display.

There are 4 mA outputs (optional), an RS485 interface and an Ethernet interface available for connection to visualization systems.

3.6.3   Controller outputs

The Blu-Sentinel SE is equipped with an integrated controller for the chlorine value and a controller for the pH value and the conductivity. The chlorine value is held constant at the setpoint using PI single feedback closed-loop control. The pH value is held constant at the setpoint using proportional control. The following controller outputs are supported:

Controller for	Type	Parameter designation	Action
Positioner without feedback	3-point	Positioner wo. Ym	Dosing Cl_2 pH correction ↑
Dosing pump with mA-input	2-point	Analog output mA 2P	Dosing Cl_2 pH correction ↓ or pH↑ Conductivity correction ↑
2 dosing pump with mA-input	3-point	Analog output mA 3P	pH correction ↓ or pH↑
Motor dosing pump (pulse-duration controller)	2-point	Dosing pump 2P	Dosing Cl_2 pH correction ↓ or pH↑ Conductivity correction ↑
2 motor dosing pumps (pulse-duration controllers)	3-point	Dosing pump 3P	pH correction ↓ and pH↑
Solenoid pump (pulse-frequency controller)	2-point	Solenoid pump 2P	Dosing Cl_2 pH correction ↓ or pH↑ Conductivity correction ↑
2 solenoid pumps (pulse-frequency controllers)	3-point	Solenoid pump 3P	pH correction ↓ and pH ↑
Dosing contact	2-point	Dosing contact	Dosing Cl_2 pH correction ↓ or pH↑ Conductivity correction ↑

Positioner without feedback

With the selection of the integrated controller for "positioner", for example, it is possible to use chlorine overfeed control in connection with a positioner as an actuator of a chlorine gas dosing system.

2-point pulse-duration controller for dosing pumps

The dosing pump is switched on for the calculated time within an adjustable cycle period Tp (relay contact).
The cycle period is mainly determined by the reaction time of the connected system and entered as the cycle period Tp.

Example:
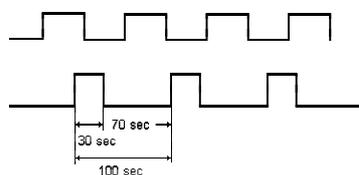
Cycle period Tp	=	100 s
Output value Yout	=	30 %
=> Duty cycle		30 s
Off-duty cycle		70 s

2-point pulse-frequency controller for solenoid pumps

Solenoid pumps are controlled with 0 to 100/120/140/160/180 pulses per minute, depending on the specification of the connected pump. The duty cycle during each dosing is 0.3 s. The pause time is calculated to be between 0.2 s and 60 s, depending on the dosing rate.

Example of a solenoid pump at 120 pulses/min:

Yout in %	100...	84...	72...	56	50...	33...	25...	10...	5...	1	0
Pulses/min	120...	96...	85...	75	60...	40...	30...	12...	6...	1	0

3-point pulse-duration controller for dosing pump and 3-point pulse-frequency controller for solenoid pump
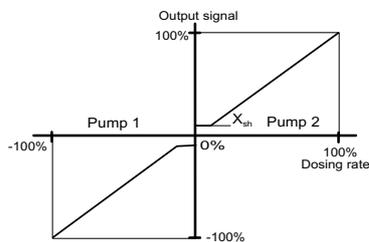
Pump 1 decreases the control value,
Pump 2 increases the control value.

The control range is between –100 % (Pump 1) and +100 % (Pump 2); this range can also be set in manual mode.

If the setpoint = actual value, no pump is activated (neutral zone Xsh).

Output signals as for 2 point pulse-duration controller and 2-point pulse-frequency controller.

Analog output controller 2-point

With a control output of 0%, the output current is 0 or 4 mA; with a higher control output, the output current reaches up to 20 mA. Pumps with current input, thyristor control units with DC or AC pumps, or analog control valves can be used as actuators.

Analog output controller 3-point
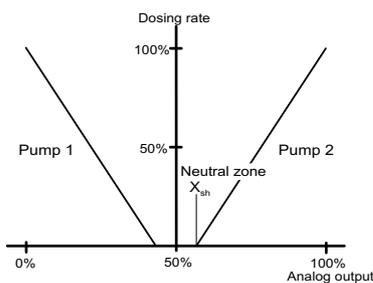
Pump 1 decreases the control value,
Pump 2 increases the control value.

Output behaviour is similar to "Analog output controller (2-point)", but with 50 % offset. This means that with a control deviation of 0 % (setpoint = actual value) a current of 10 mA or 12 mA is output (pump is idle).

Setting	Signal	Pump	Signal	Pump
0 to 20 mA	0 to 10 mA	Pump 1	10 to 20 mA	Pump 2
4 to 20 mA	4 to 12 mA	Pump 1	12 to 20 mA	Pump 2

Therefore, two suitable pumps can be actuated with one mA current loop.

Dosing contact

A dosing contact, for example, can be used to actuate electrolysis systems for chlorine dosing. A special controller is required to drive these systems in order to prevent frequent switching on or off (reason: start-up time of electrolysis systems).
The contact is enabled or disabled within the set control parameters.
If the entered setpoint minus hysteresis (e.g. 0.20 mg/l) is not reached, the controller output switches on for at least the minimum duty cycle. The controller output remains switched on as long as the setpoint is not reached.
If the setpoint is exceeded, the controller output switches off immediately (provided that the minimum duty cycle has elapsed). Renewed activation if the value is below the setpoint hysteresis is only possible when the minimum off-duty cycle has elapsed.

NOTICE

In manual mode, the minimum duty cycle and the minimum off-duty cycle are ignored!

Controller STOP function

When the controller Stop function is active, all controller outputs are switched off (positioner closed, dosing pump off, solenoid pumps off, dosing contact off).
Controller Stop is triggered by the digital inputs, e.g. by sample water Stop, circulation off, external Stop.

Standby function

When the Standby function is active, all controller outputs are switched off (positioner closed, dosing pump off, solenoid pumps off, dosing contact off). The function is triggered by the digital input function Standby, which is used when circulation is switched off and no sample water is flowing through the flow cell over an extended period. The measured value display is hidden during Standby.

3.6.4   Control parameters

Control parameters are setting values used to determine the control response of a controller. Different parameters apply depending on the type of controller. Depending on the selection, the different settings menus are displayed.

NOTICE

The control parameters are listed alphabetically.

Control disinfection

Control disinfection	
Description	Defines which measurement is used for chlorine control.
Setting range	ORP = The chlorine dosing is based on the ORP measurement and an ORP setpoint. Chlorine = The chlorine dosing is based on the chlorine measurement and a chlorine setpoint.

Max. pulses/min

Maximum number of pulses	
Description	The max. pulses/min parameter only applies to solenoid pumps. This parameter is used to set the maximum number of pulses per minute in accordance with the pump used.
Setting range	The parameter Max. pulses/min can be set to 100/120/140/160/180.

Setpoint

Setpoint	
Description	Specified value at which the control value (ORP, chlorine, pH, conductivity) can be maintained by the controller.
Setting range	The setting range corresponds to the respective measuring range.

Tn

Integral action time (I-element) of the PI controller	
Unit	Minutes (min)
Description	On the basis of the integral action time Tn, the dosing rate changes constantly until the setpoint is reached. The higher the value of Tn, the longer it takes until the controller increases the dosing rate. Tn higher: Control response is slower Tn lower: Control response is faster
Setting range	The parameter Tn can be set from 0 to 100 min (Tn = 0 means that the "I-element" is deactivated, i.e. a pure P-control response applies). It may not be possible to reach the setpoint value.

Tp

Cycle period	
Unit	Seconds (s)
Description	The parameter Tp only applies to dosing pumps. The cycle period Tp defines a switching period, which must be coordinated with the respective pump type.
Setting range	The parameter Tp can be set between 10 and 180 s.

Example:
Fast dosing pumps can be actuated by a low Tp, slow dosing pumps can be actuated by a high Tp.

The control parameter Tp must always be adjusted to suit the dosing pump used:

Dosing pump	up to 20 strokes/min	20 to 40 strokes/min	40 to 80 strokes/min	80 to 125 strokes/min	125 to 200 strokes/min
Tp value	120	100	60	30	15

Ts

Loop rise time	
Unit	Minutes (min)
Description	Time required to reach the end value of the measuring range with 100 % dosing rate. This time is defined automatically by the system for automatic tuning, but it can also be entered manually.
Setting range	The parameter Ts can be set between 1.0 and 480.0 min.

Tu

Loop dead time	
Unit	Minutes (min)
Description	Time required between start of dosing and clear recognition of an increase in the measured value. This time is defined automatically by the system for automatic tuning, but it can also be entered manually.
Setting range	The parameter Tu can be set between 1.0 and 60 min.

NOTICE

If the Tu and Ts values are modified manually, the control parameters Xp and Tn are re-calculated.

Ty

Running time of the positioner	
Unit	Seconds (s)
Description	The parameter Ty only applies to positioners. Ty is the time the positioner requires to adjust from 0 % to 100 %.
Setting range	The parameter Ty can be set between 10 and 180 s.

Control direc.

Control direction	
Unit	Acid / Alkali for pH control
Description	Defines which medium is used to perform the correction. Only for 2-point control for pH

Example:

pH	for control direction "Acid"	Lower pH value when adding acid

Xp

Proportional factor of the PI controller	
Unit	Percentage (%) with factor
Description	The control amplification is determined by means of the proportional factor. The lower the proportional factor Xp is selected in %, the greater the deviation from the setpoint is amplified, and the more quickly the controller attempts to control the deviation from the setpoint. The control amplification factor is calculated using the following equation: Factor = (1/Xp) x 100 %
Setting range	The parameter Xp can be set from 1 % (factor 100) to 1000 % (factor 0.1).

Xsh

Neutral zone	
Unit	Percentage (%)
Description	The parameter Xsh only applies to 3-point controllers. There is no control output within the neutral zone.
Setting range	The parameter Xsh can be set from 1 to 5 % (based on the measuring range).

3.6.5   Alarms

The Blu-Sentinel SE supports up to eight freely configurable alarms. The alarms are output optionally via relay contacts and the color display. At the same time, a message is displayed in the message window. The number of available relays depends on the configuration. A minimum of two alarm relays and a maximum of six alarm relays are possible, depending on the dosing outputs used. The alarm relays can be used, for example, for Cl_2 feed lock-out activated of dosing when specific values are exceeded or not reached. Each alarm can be assigned the following functions:

Limit value Min 1 Limit value Min 2	=>	all measuring values can be selected individually
Limit value Max 1 Limit value Max 2	=>	all measuring values can be selected individually
Digital inputs	=>	1 to 5 can be selected individually
Error		

Acknowledgment "none"

- The alarm symbol and the message symbol light up in the event of an alarm and go out automatically when the condition is eliminated.
- Unlatched alarms are displayed in yellow as messages.
- The relay is active when the alarm symbol is displayed and the alarm is active.
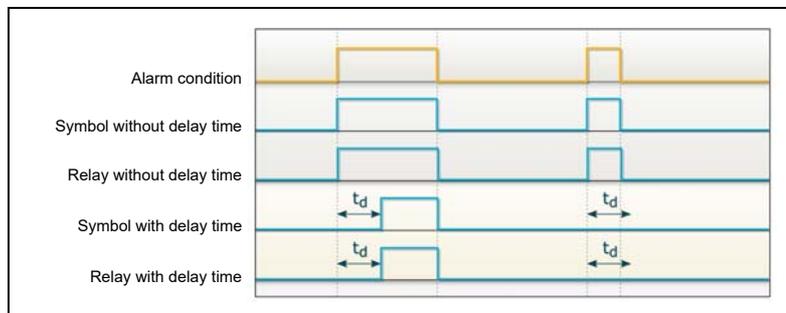
Image 5   Acknowledgment "none"

Acknowledgment "ACK with reset"

- In the event of an alarm, the alarm symbol and the message symbol flash and the relay is active until acknowledged.
- The alarm symbol and the message also go out even if the conditions still apply when the alarm is acknowledged.
- Latched alarms are displayed in red as messages.
- The relay becomes inactive after acknowledgment if the condition is still pending.
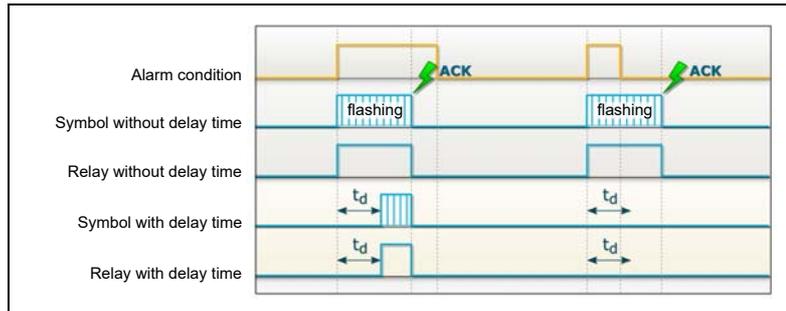
Image 6   Acknowledgment "ACK with reset"

Acknowledgment "simple ACK"

- The relay becomes active as soon as the alarm is active.
- In the event of an alarm, the alarm symbol and the message symbol flash until the alarm is acknowledged.
- If the condition is no longer present when the alarm is acknowledged, the alarm symbol goes out and the message disappears.
- If the condition is still present when the alarm is acknowledged, the alarm symbol and the message are reset from flashing to a permanent state. The alarm symbol and the message light up until the condition is eliminated (auto-reset).
- Latched alarms are displayed in red as messages.
- The relay is only deactivated when the condition has been eliminated and acknowledged.
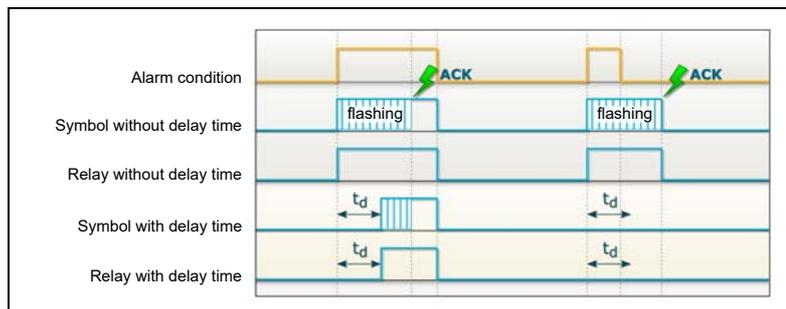
Image 7   Acknowledgment "simple ACK"

3.6.6   Auto tune (only applies to disinfection control = chlorine)

The Blu-Sentinel SE is equipped with an Auto tune function to facilitate commissioning and optimize operation. The Auto tune program automatically determines the path times Tu and Ts and calculated from the control parameters Xp and Tn for free chlorine control.
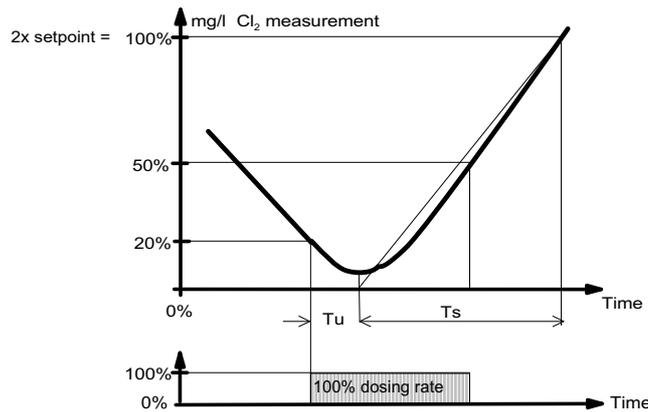
NOTICE

The control parameters Xp and Tn determined by the Auto tune program must be considered as a recommendation for first commissioning! The control parameters Xp and Tn can be optimized manually to ensure maximum control quality.

Requirements   The following requirements must be met:

- pH value stably controlled and at the setpoint.
- Positioner set to automatic (manual wheel engaged)
- Dosing pump set to automatic
- Calibrated chlorine measurement (zero point and DPD value)
- Loop dead time < 60 min
- Loop rise time < 480 min (8 h) for 0 to 100 %
  Measurement range
- Decomposition time < 480 min (8 h) of the current measuring value to 20 % of the 2x setpoint
- Correct menu setting of the end value, actuator (e.g. positioner), positioner running time (Ty)

Auto tune must not be started:

- if a large volume of fresh water is being added
- if the measuring cell has not been run in
- during cleaning work
- during filter backwashing
- while the circulation changes

Starting Auto tune   Proceed as follows:

Main menu
    Measurement menu field "Chlorine"
        Symbol „Settings menu"
            AUTO TUNE

1 Switch to the main view.

2 Press the measurement menu field "Chlorine."

3 Press the ⊙ symbol.

4 Press "Auto tune." The loop parameters Tu and Ts are displayed.

5 Press the "Start" button. The current phase (13 in total) of Auto tune is displayed.

6 Confirm successful Auto tune with "Auto tune OK."

7 Press the Home key to return to the main view.

Error message during Auto tune   If Auto tune is not successful, the error message "AUTO TUNE?" is displayed. The reason for this may be problems with the dosing system or loop times. Errors must be rectified in order to carry out the Auto tune function. See also "Completing Auto tune with errors" on page 43.

Auto tune sequence   Each Auto tune phase is now displayed with a status message:

Display text	Explanation
1: Initialization	Start
2: Control signal Ym = 0 %	Chlorinator to 0 % or dosing pump off
3: Wait for act. value X = 20 %	Delay until act. value < 0.2 x 2xsetpoint
4: Set control signal 100 %	Chlorinator to 100 % or dosing pump on
5: Wait for control signal 100 %	Wait until chlorinator reaches 100 %
6: Init. dead time measurement Tu	Start dead time measurement
7: Dead time measurement Tu	Measurement of the loop dead time Tu
8: Check dead time Tu	Plausibility enquiry dead time
9: Calculate initial values Ts	Start of rise time measurement
10: Measure rise time Ts	Measurement of the loop rise time Ts
11: Calculate parameter	Calculate control parameters
12: Set control signal Y = 0 %	Chlorinator to 0 % or dosing pump off
13: Wait for control signal 0 %	Wait until chlorinator reaches 0 %

Various status messages can be read off, depending on the selection of the actuator. Different status messages also have different execution times. Some status messages may only be displayed briefly or not at all if the execution time is very short.

⚠ CAUTION

Auto tune can take up to 13 hours, depending on the control loop. During this time no errors should occur on the control loop (e.g. filter backwashing, changes in the circulation speed or widely fluctuating number of visitors to the pool).

NOTICE

The Auto tune procedure can be terminated at any time with "STOP" The previously set parameters remain unchanged.

Completing Auto tune without errors

When the loop times (dead time Tu and rise time Ts) have been completed without error, calculation of the control parameters Xp and Tn commences. This is shown by "AUTO TUNE OK:"
The calculated parameters are entered in the menus. When Auto tune has been completed, the measuring amplifier adjusts with the newly calculated control parameters and continues in the selected operating mode (e.g. automatic).
To monitor the determined loop times, they are entered in the "Tu" and "Ts" menus.
If any errors in the control loop do occur during Auto tune (e.g. filter backwash or changes in the circulation speed), this may lead to incorrect loop times, resulting in the determination of incorrect control parameters.

⚠ CAUTION

The remaining control parameters are not influenced when Auto tune is performed.

Completing Auto tune with errors

If errors occur in the control loop during Auto tune (e.g. filter backwashing, changes in the circulation speed or widely fluctuating number of visitors to the pool) or if the reaction times of the control loop are too long, Auto tune is interrupted.

NOTICE

If any of the error conditions described below occur, Auto tune is interrupted. The measuring amplifier displays a fault message. The original parameters Xp, Tn, Tu and Ts are not changed. The message must be acknowledged, the controller continues to operate with the previous settings.

Possible error conditions:

- Initial value not reached (display: "T = > 8h")

  When Auto tune has started and the dosing system has closed or the dosing pump has switched off, the measuring amplifier waits until the actual value has dropped below the initial value (0.2 x the measurement range value). This delay is indicated by "2: X = 20 %" on the display and must not exceed 8 hours.

- Loop dead time too long (display: "Tu = > 1h")

  The value determined by the time measurement between start-up of the dosing system, switch-on of the dosing pump and the rise of the actual value must not exceed 1 hour. This measured time is displayed by "6: Tu!" on the display.

- Loop rise time too long (display: "Ts = > 8h")

  The time required by the control loop to increase the actual value to 50 % of the measuring range at a 100 % dosing rate of the dosing system or the dosing pump. This measurement is indicated with "9: Ts!" on the display and must not take more than 4 hours.

Determination of the control parameters with known Tu and Ts times

If the loop times Tu and Ts are already known or if these cannot be determined automatically due to specific system conditions, the loop times can be entered in the "Tu" and "Ts" menus. When Tu or Ts are saved, the control parameters Xp and Tn are also calculated and entered in the menus.

3.6.7 Safety functions

The Blu-Sentinel SE is equipped with various integrated safety functions to ensure system safety and minimize the risk of accidents. The following safety functions are integrated:

- Cl_2 feed lockout activated if the circulation fails and/or if the dosing tank signals that it is empty and also if the sample water supply fails (depending on the configuration of the digital inputs)
- Maximum dosing time monitoring and the feed time delay (configurable)
- Alarms freely configurable
- External STOP for all controllers (depending on the configuration of the digital inputs)
- "Positioner closed" function in the event of a power failure (only if actuator has external power supply)
- If the pH value deviates too greatly from the pH setpoint, Cl_2 feed lockout switches chlorine dosing off
- Password protection with three levels
- Safety MAN. mode
  stops dosing with sample water stop or external stop

3.6.8   Digital inputs

There are five integrated digital inputs on the CPU-board of the electronics module. They are provided for connection of voltage-free contacts (< 100 Ohm) and are supplied internally with 24 V.

⚠ WARNING

Do not apply voltages at the digital input terminals!

The functions of the digital inputs can be configured for the specific customer application in the "Input/Output" menu. Digital input 1 is used for sample water monitoring and cannot be changed.

Digital input DI 1

With the help of the voltage-free contact of the flow rate monitor on the flow fitting, the controllers can be influenced:

- Before expiry of the sample water monitoring delay time (0 to max. 10 min.):

  The chlorine dosing pump and the dosing pump for pH correction continue dosing at the same rate.

  The positioner remains unaffected.

  The 🚫 symbol on the display flashes.

  Display: 🚫

- After expiry of the sample water monitoring delay time:

  The chlorine dosing pump and the dosing pump for pH correction are switched off.

  The positioner moves to 0 %.

  Display: 🚫

- Controller switch-off is only effective in "Safety MAN. mode".

Digital input DI 2 to DI 5

Various functions can be assigned to the digital inputs. With the help of a voltage-free enabling contact, e.g. circulation off, the controllers can be stopped immediately:

- The chlorine dosing pump and the dosing pump for pH correction are switched off.

  The positioner moves to 0 %.

  Display: DI☐2 (example)

- Controller switch-off is only effective in "Safety MAN. mode".

- Empty signal contact of the chemical tank(s).

  The chlorine dosing pump and the dosing pump for pH correction are switched off.

  The positioner moves to 0 %.

  Display: DI☐3 (example)

- Cl$_2$/pH tank monitoring

  If the Cl$_2$/pH tank monitoring is activated, DI 3 to DI 5 are used for connection of the chlorine and pH suction lances. At minimum fill level, a message is generated for each tank, and if one of the two tanks is empty, chlorine and pH dosing switches off.

- Standby function

  When the Standby function is activated, all controllers are switched off and dosing is deactivated. The alarms are disabled. Measured value displays are hidden. This function is used to switch off the circulation to prevent incorrect measured values and incorrect controller outputs.

NOTICE

When the contact closes, restart of the controller may be delayed due to the dosing delay time. In as-delivered status, the digital inputs are disabled. To activate the function, connect an external contact and configure the digital input in the menu. It is also possible to assign the digital inputs for alarms.

3.6.9   Relay outputs

The electronics module has a maximum of six relays, each with a changeover contact. These switches are assigned various switching tasks depending on the respective application. The corresponding diagrams are defined in chapter 9. "Wiring diagrams". The connection and switching of non-permissible loads / loads destroys the relay contacts. The device works uncontrollably as a result!
In order to switch inductive loads or larger capacitive loads, which exceed the technical characteristics of the relay contact, an additional switching element must be installed. For example a contactor or load relay with suitable specification. Relay contact details see chapter 3.7 "Technical Data" - Relay outputs. To protect radio interference suppression, the relay contacts are protected internally by suppressor diodes. Relay outputs are protected by fuses. They act as overcurrent limiters protecting the terminal and relay connections. The fuses are replaceable. Spare fuses see chapter 8.
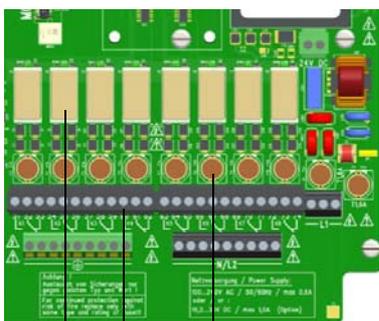
Image 8   Detail of PCB - relay outputs

A   Relay
B   Terminal strips
C   Fuses

NOTICE

When using internal power (L1 and N/L2) for power supply of dosing machines or external devices the power consumption must not be higher than 6 A in total.

3.6.10   Interfaces

The following interfaces are available:

- USB interface
- RS485 interface
- Ethernet interface
- Modbus TCP interface

NOTICE

The interfaces are described in detail in Chapter 4. "Interfaces".

3.7   Technical data

3.7.1   Flow cell (module type D02)

Housing

Dimensions (WxHxD)	253 x 375 x 163 mm
Weight	approx. 2.5 kg

Connections

Pressurized version	Inlet and outlet: G 1/2" A thread connection

Flow control valve

Sample water flow	33 l/h, controlled, preset at the factory
Flow control range	0.25 to 3.0 bar
Back pressure	pressurized version: max. 1.5 bar

Multi-sensor

Switching point	21 l/h ±3 l/h
Switching hysteresis	2 l/h
Temperature sensor	Pt1000

Operating conditions

Water quality	Brine and pool water acc. to standard
Storage temperature	–20 to +70 °C

3.7.2 Electronics module (module type E02)

Housing

Dimensions (WxHxD)	320 x 311 x 153 mm
Weight	approx. 3.5 kg
Protection rating	IP66
Mains connection	100 to 240 V AC ± 10 % 50 to 60 Hz, 15 W

Display

4.3" graphic color display with LED backlighting and capacitive touchscreen behind shatterproof glass panel, resolution 480 x 272 pixels

Insulation

Overvoltage category	2
Contamination level	2
Protection category	1

Operating conditions

Ambient temperature	0 to 50 °C
Humidity	< 80 %, non-condensing
Environment	No direct sunlight
Atmospheric pressure	75 to 106 kPa
Max. working height (altitude)	2000 m
Storage temperature	–20 to +70 °C
Noise emission	<45 dB

Digital inputs of the electronics module

5x for voltage-free contact (internal 5 V power supply)	
Freely selectable function in menu	
When input open	DI active
When input closed	DI inactive

Measurement inputs

- Free chlorine for 3-electrode sensor (measuring range 0 ... max. 10 mg/l, end value can be set)
- pH value (measuring range pH 0 ... pH14, initial and end value can be set)
- ORP voltage (measuring range 0 ... max. 1000 mV, initial and end value can be set)
- Conductivity (measuring range 0 ... max. 300 mS/cm) end value can be set
- Temperature (measuring range 0...50 °C/32...122 °F)

Relay outputs

Type	6x changeover contact with integrated fuse, replaceable, type TR5 3,15 A T
High nominal breaking	5A 250V AC, 1250VA max. (resistive load) 1A 250V AC, 250VA max. (cos φ = 0,4) 5A 30V DC, 150W max. (resistive load)
Switching voltage max.	250V AC / 125V DC
Switching current max.	5A AC / DC
UL/CSA-rating	5A, 125/250V AC (general use) 1/6HP 125, 250V AC 5A 30V DC (resistive) 30W max., 1A, 30V DC – 0.24A, 125V DC (inductive) B300

NOTICE

When connecting inductive or capacitive loads (e.g. pump with integrated switching power supply), an additional power relay with suitable specification must be provided. Each relay output has an integrated 3.15 A fuse as overcurrent protection.
Typical use of relays: enable contact for dosing device, control of motors or dosing pumps.

Analog outputs

4-way mA output card 0/4 to 20 mA (optional)
Freely configurable signal assignment
Load max. 500 ohm, accuracy < 0.5 % FS
Galv. isolated up to 50 V relative to earth

Interfaces

RS485 interface with Wallace & Tiernan protocol for connection to ChemWeb server, OPC server, Process Monitoring System or control system for data visualization
Ethernet interface (HTTP protocol/Modbus TCP protocol)
USB interface for firmware update

3.7.3 Sensors

Chlorine sensor (free chlorine)
(W3T160652)

Version	Amperometric 3-electrode sensor with platinum electrodes, salt reserve, zirconium dioxide diaphragm, polymerized solid electrolyte, Ag/AgCl reference electrode
Measurement range	0 to 50 mg/l Cl_2
Working temperature range	-5 to +80°C (23 to 176°F)
Operating pressure	0 to 6 bar
Minimum conductivity of the sample water	50 µS/cm
Installation length	165 mm (6.5 inch)
Screw-in thread	PG 13.5
Storage temperature	-5 to +30°C (23 to 86°F)

pH sensor (W2T817978)
(yellow)

Working temperature range	-0 to +50°C (23 to 122°F)
Temperature drift	0.2 %/10 K max.
Calibration	Pre-calibrated
Measuring range	0 to 14 pH (can be freely scaled in 1 pH value steps)
Input resistance	5×10^{11} Ohm
Storage temperature	-5 to +30°C (23 to 86°F)

ORP sensor (W2T817979)
(blue)

Working temperature range	-0 to +50°C (23 to 122°F)
Temperature drift	0.2 %/10 K max.
Calibration	Pre-calibrated
Measuring range	0 to 1000 mV (can be freely scaled in 100 mV steps)
Input resistance	5×10^{11} Ohm
Storage temperature	-5 to +30°C (23 to 86°F)

Conductivity sensor
(W3T172052)

Version	4-electrode measurement, integrated temperature sensor, graphite electrodes, epoxy shaf
Measurement range	1 µS/cm to 2 S/cm
Cell constant	$0{,}475$ cm $^{-1}$ µ1,5%
Working temperature range	-5 to +100°C (23 to 212°F)
Operating pressure	0 to 10 bar (1×10^{6} Pa)
Installation length	120 mm
Insert	Loose or pressurized with clamp connection
Enclosure	IP 67 (in plugged in state)
Storage temperature	0 to +50°C (32 bis 122°F), store in the fresh air

4. Interfaces

> **⚠ DANGER**
>
> **Risk of injury or death!**
>
> External voltages may still be connected even if the operating voltage is switched off.

4.1   USB interface
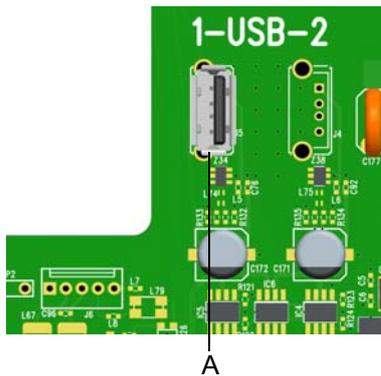
The electronics module is equipped internally with a USB interface. It is used to update the firmware via USB stick (see Chapter 6.5 "Firmware update") or for use as a data logger via USB stick. If a memory stick (W2T866279) is permanently installed in the USB port, monthly archive files are saved in CSV format. All measurements, controller outputs and states of the digital inputs are saved every two minutes.
Proceed as follows to create data backup:

1   De-energize the electronics module.

2   Remove the housing cover.

3   Remove the USB stick.

4   Copy the archive files.

5   Reinsert the USB stick.

6   Fit the housing cover again.

7   Switch the electronics module on again.

Image 1   Detail of PCB - USB interface

A   USB interface

4.2   RS485 interface
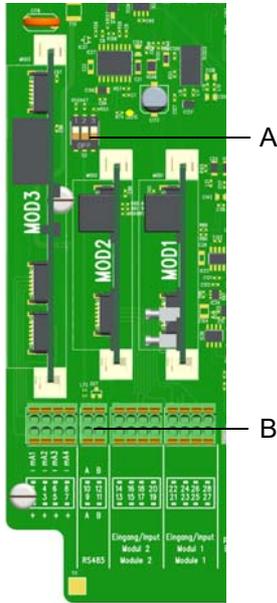
The RS485 interface is used for data transfer to higher-level control systems such as the Process Monitoring system or an other system that support the Wallace & Tiernan RS485 protocol. For more detailed information, please refer to the instruction manual "RS485 interface." You can request this instruction manual or download it from our homepage, www.evoqua.com.

The RS485 interface is electrically isolated. It has four integrated terminals, a terminating resistor R_t and balancing resistors R_u and R_d for incorporation into a Wallace & Tiernan bus system.

Image 2   Detail of PCB - RS385 interface

A   DIP switch for activating the resistors:
    DIP switch 1 (left): balancing resistor R_u
    DIP switch 2 (middle): terminating resistor R_t
    DIP switch 3 (right): balancing resistor R_d
B   Terminals, RS485 interface

4.3   Ethernet interface
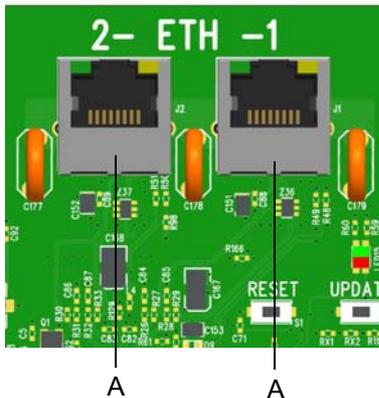
The Blu-Sentinel SE has two integrated Ethernet interfaces (ETH 1 and ETH 2). They are connected internally via an Ethernet switch. The MAC address is displayed in the menu "Information". The installed LAN interface allows data visualization via Internet-capable devices and HTTP protocol or standard browser. The LAN interface also supports data communication via the Modbus TCP protocol, see Chapter 4.4 "Modbus TCP interface".

Image 3   Detail of PCB - Ethernet interface

A   Ethernet connections

Visualization and operation are effected via the web pages integrated in the Blu-Sentinel SE. Wireless access via mobile devices such as tablet computers or smartphones is possible by installing a wireless router on-site and connecting it to the Blu-Sentinel SE. The Ethernet- interface supports a transmission rate of 10 or 100 Mbit/s. There are two integrated Ethernet connections. The integrated 2-port switch replaces additional external switch assemblies. To avoid long process times, we recommend that you do not daisy-chain more than three devices via the internal switch. An additional external switch assembly must be provided if several devices are used.

Connection is via a standard Ethernet connection cable.
Two special M25 cable connections with slit rubber seals and
larger grommets are installed to allow the use of pre-terminated
Ethernet cables with connectors. The Ethernet connectors can be
inserted through these fittings. For Ethernet connection, see
"Configuring direct network connection" on page 57.

NOTICE

This instruction manual does not cover installation and
commissioning in combination with routers or wireless routers.
Responsibility for this lies with the operator.

NOTICE

For security reasons, access to the device should only be granted
to authorized personnel. Permanent, unsafe connections via the
Internet or WLAN are not permitted. Safe connections can, for
example, be set up via a VPN-secured communication channel or
an encoded WLAN connection. The Blu-Sentinel SE only supports
the unencrypted communication protocol "http" and is designed for
operation within an Intranet (closed network). Please observe
Chapter 2.2 "General safety instructions", section "IT safety."

LED
(green)

LED
(yellow)
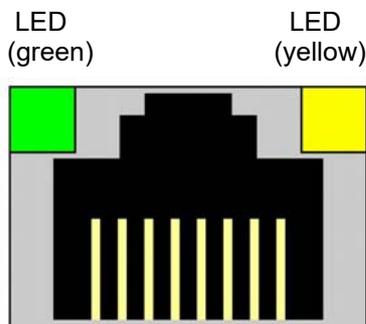
The Ethernet connection is designed in accordance with IEEE 802.3.
There are two I8P8C sockets (often referred to as RJ45 sockets)
installed. Connection to the HUB or switch can be realized with a
1:1-wire and screened patch cable. Direct connection to a PC
network card is possible using a patch cable (1:1) or a crossover
cable (crossed network cable). The LEDs are fitted in the 8P8C
socket. They display the interface statuses. The meaning of the
LEDS is as follows:

Green: lights up	Ethernet connection established
Green: flashes	Data being transferred
Yellow: off	10 Base-T
Yellow: lights up	100 Base-T

The connection runs in Auto negotiation mode. The data transfer
rate and full or half duplex are defined automatically with the
connected switch/HUB. The adjacent drawing shows the RJ45
terminal assignment.

4.3.1 Configuring the Ethernet connection for installation in a network

The Blu-Sentinel SE is delivered with a fixed IP address. Alternatively, the Blu-Sentinel SE can be configured with DHCP.
The Ethernet settings of the electronics module can be configured via the menu "Settings" – "Network". The MAC address is also displayed in the Network menu.

A network connection is set up between a PC or laptop computer with Ethernet interface (10/100 MB/sec) and the Blu-Sentinel SE. In order to operate the Blu-Sentinel SE in a network, the network configuration must be adapted to the existing network. If required, you can obtain the necessary information (IP address, subnet mask) from your local network administrator. You can configure the IP address and subnet mask assigned to you in the menu "Settings" - "Network".

Example:

	Blu-Sentinel SE
IP address	192.168.200.11 (factory setting)
Subnet mask	255.255.255.0 (factory setting)
Gateway	0.0.0.0 (factory setting)

Proceed as follows to visualize the web view of the Blu-Sentinel SE in the browser:

1 Start the browser, e.g. Firefox or Internet Explorer.

2 Enter the IP address "http://192.168.200.11/" (factory setting). After successful connection, the start screen of the Blu-Sentinel SE appears. Depending on the resolution of the operating device, the measurement windows are displayed side by side or one below the other. The current value, range, setpoint and limit values as arrows are displayed for each measurement. The operation mode and dosing output for the available controllers are also displayed.

Image 4   Example, web view, Blu-Sentinel SE

NOTICE

A network connection or connection via WLAN router is required in order to access the web views of the Blu-Sentinel SE.

4.3.2   Configuring direct network connection

If the Blu-Sentinel SE is not integrated in a network, a direct network connection can be established between a PC or laptop computer with Ethernet interface (10/100 MB/sec) and the Blu-Sentinel SE using a network cable.

Proceed as follows:

1 Using a network cable, connect the electronics module to a PC or laptop computer.

2 Assign a fixed IP address and subnet mask to the PC or laptop (see chapter "Network setting under Windows 10" on page 58).

3 Start the browser, e. g. Firefox or Internet Explorer, and enter the IP address of the Blu-Sentinel SE "http://192.168.200.11" (factory setting) in the address input field. After successful connection, the start screen of the Blu-Sentinel SE appears.

NOTICE

The Blu-Sentinel SE and the PC or laptop computer must always have the same subnet mask and an IP address in the same IP address range. The IP address must not be identical.

Example:

	Blu-Sentinel SE	**Laptop or PC**
IP address	192.168.200.11 (factory setting)	192.168.200.1
Subnet mask	255.255.255.0 (factory setting)	255.255.255.0
Gateway	0.0.0.0 (factory setting)	

4.3.3 Network setting under Windows 10

Windows 10 automatically establishes a network connection as soon as a network card is detected in the PC or laptop computer. All you need to do is assign a fixed IP address and a subnet mask.

Windows 10 allows you to define two different configurations, e.g. if a laptop is used in different network environments:

- Windows 10 with static (fixed) IP address
- Windows 10 with an alternative configuration if a DHCP server is available

The network connection can be configured on the PC or laptop under "Settings" – "Network and Internet" – "Ethernet" – "Network and Sharing Center" – "Ethernet." All network connections can be checked and adjusted in the lower window.
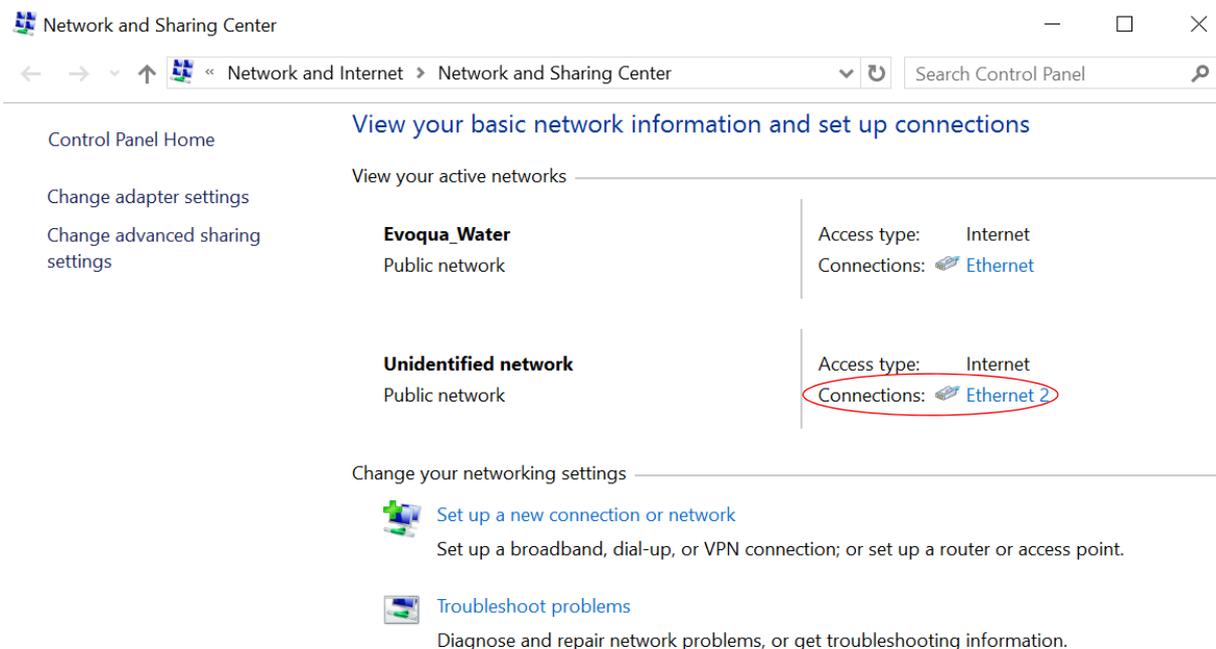
Image 5   Network and Sharing Center

NOTICE

If the PC or laptop is connected to a network, further elements that must not be deleted or changed may be present! In this case, consult your network administrator!

Windows 10 with static (fixed) IP address

Windows 10 with static (fixed) IP address

With the setting, a fixed IP address is always assigned to the PC or laptop computer.

Proceed as follows:
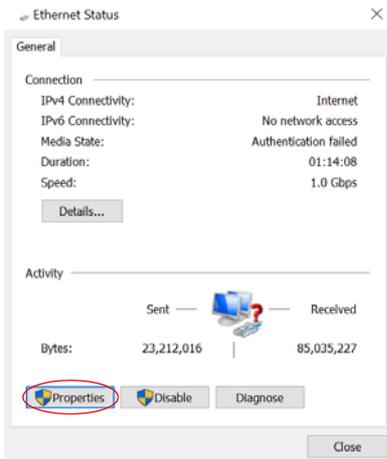
1 Under "Connections," click "Ethernet" (see red marking in the illustration). A further menu, "Ethernet status," opens.

2 Click the "Properties" button.
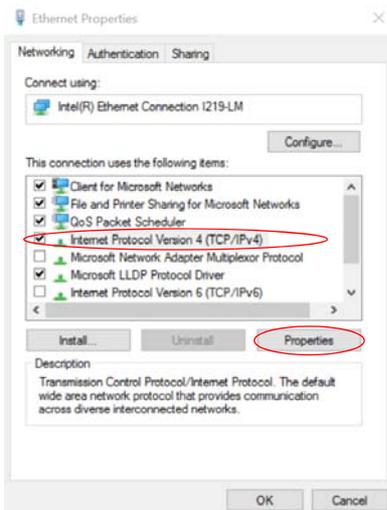
3 Under the menu "Ethernet properties," select the element "Internet protocol Version 4 (TCP/Pv4)." Only the element "Internet protocol Version 4 (TCP/IPv4)" is required; all other elements are not necessary for operation of the Blu-Sentinel SE.

4 Click the "Properties" button to configure the element "Internet protocol Version 4 (TCP/Pv4)."
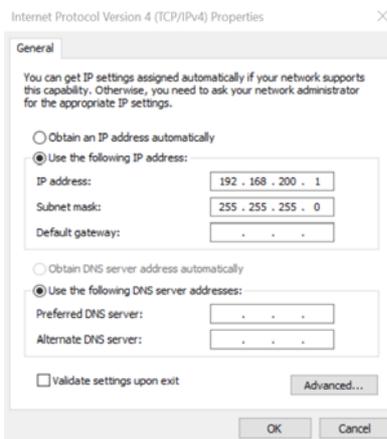
5 Activate the selection "Use following IP address."

6 Assign a fixed IP address and subnet mask. Do not change any other settings.

7 Tap the "OK" button twice to confirm and save the entry. In some Windows configurations, it may be necessary to reboot Windows.
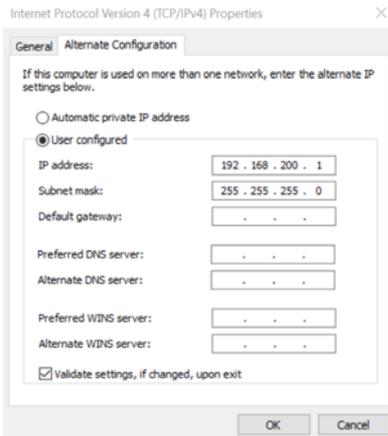
Windows 10 with an alternative configuration

With Windows 10, it is also possible to set an alternative configuration.

Proceed as follows:

1 Carry out steps 1 to 4 as described under "Windows 10 with static (fixed) IP address" on page 59.

2 Now click the "Alternative configuration" button.

3 Activate the selection "User-defined."

4 Assign a fixed IP address and subnet mask. Do not change any other settings.

5 Tap the "OK" button twice to confirm and save the entry. In some Windows configurations, it may be necessary to reboot Windows.

The settings of the Blu-Sentinel SE for the TCP/IP connection can be made in the menu Settings - Connections - Network:

IP address (factory setting)	192.168.200.11
Subnet mask	255.255.255.0

4.4   Modbus TCP interface

The Ethernet interface integrated in the electronics module supports data communication via Modbus TCP protocol. Various data points are available for data exchange, see Chapter 4.4.1 "Data formats".

Transmission technology	Ethernet in accordance with IEEE802.3
Connection	RJ45 socket, internal
Communication	Supported commands: FC03: Read Multiple Registers FC16: Write Multiple Registers FC06: Write Single Register

The Blu-Sentinel SE works as a Modbus TCP slave (server). The data packages are transferred as TCP/IP data packages via the Ethernet interface. Access is via the Modbus register. The port used for the communication protocol Modbus TCP is 502.

4.4.1   Data formats

The table below contains the data format used for transmission of the process data:

Data type	Size (bit)	Typical names	Value range min.	Value range max.
INT8	8	yes	-128	127
UINT8	8	no	0	255
INT16	16	yes	-32.768	32,767
UINT16	16	no	0	65,535
INT32	32	yes	-2,147,483,648	2,147,483,647
UINT32	32	no	0	4,294,967,295
FLOAT	32 (8/23)[*1]	yes	$3,4*10^{-38}$ $(-3,4*10^{-38})$	$3,4*10^{38}$ $(-3,4*10^{38})$
ASCII	n * 8	no	– –	– –

[*1] Exponent / mantissa

For the byte sequence in which the various data types are saved in the memory or transferred, see the following figures.

Data type INT8 / UINT8

Example using the figure 50 (32 hex):

Register X	
Byte 1	Byte 2
00 H	32 H
0 0 0 0 0 0 0 0	0 0 1 1 0 0 1 0
15	0
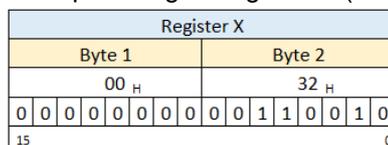
Data type INT16 / UINT16

Example using the figure 12589 (312D hex):

Register X	
Byte 1	Byte 2
31 H	2D H
0 0 1 1 0 0 0 1	0 0 1 0 1 1 0 1
15	0
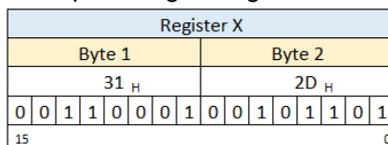
Data type INT32 / UINT32

Example using the figure 1212117675 (483F72AB hex):

Register X		Register X+1	
Byte 1	Byte 2	Byte 1	Byte 2
72 H	AB H	48 H	3F H
0 1 1 1 0 0 1 0	1 0 1 0 1 0 1 1	0 1 0 0 1 0 0 0	0 0 1 1 1 1 1 1
15	0	31	16
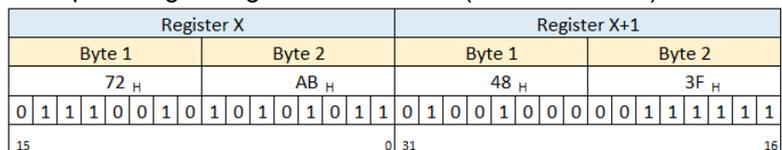
Data type FLOAT   The Float or Real values are transferred in accordance with the IEEE754 Standard Format for 32-bit values. Example using the figure 1.25.

Hexadecimal:	3F A0 00 00	(0: + ; 1: -)
Signed (S):	0	
Exponent (E):	0111 1111	
Mantissa (M):	010 0000 0000 0000 0000 0000	

Sign

Register X		Register X+1	
Byte 1	Byte 2	Byte 1	Byte 2
Mantissa		Exponent :	Mantissa
M M M M M M M M M M M M M M M M		S E E E E E E E E M M M M M M M	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0 0 1 1 1 1 1 1 1 0 1 0 0 0 0 0	
15	0	31	16
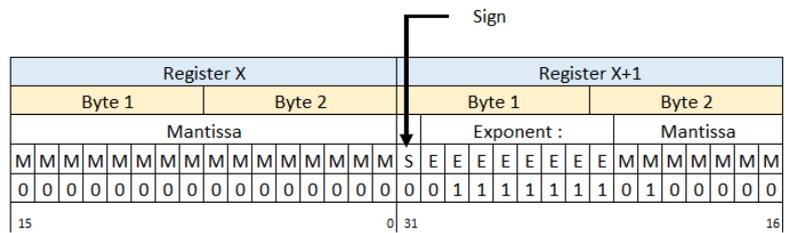
Data type ASCII   The characters are transmitted in accordance with ASCII Codepage 437. Example "mg/l"

Register X		Register X+1	
Byte 1	Byte 2	Byte 1	Byte 2
67 $_H$	6D $_H$	6C $_H$	2F $_H$
'g'	'm'	'l'	'/'
15	0	31	16

4.4.2   Reference list

The following reference list contains all available data points and values that can be read and written via Modbus TCP. It must be noted that write commands should not be set to variables or the Modbus register cyclically or repeatedly set to the same values. Permanent writing of values can cause damage to the device (memory).

Modbus register Blu-Sentinel SE
IP address: IP address of the device, e.g. 192.168.200.11   Port: 502

Modbus Register	Bit	Type	No. Byte	Access	Designation	Description
System information						
400001		ASCII	20	R	System name	e.g. "Blu-Sentinel SE"
400011		ASCII	10	R	Software Version	e.g. "V:1.00"
400016		ASCII	10	R	act. date	e.g. "21.02.17"
400021		ASCII	6	R	act. time	e.g. "13:16"
400024		ASCII	16	R	Serial number	
(Ch.1) Chlorine - Measurement						
400100		FLOAT	4	R	Measured value	
400102		ASCII	10	R	Measured unit	"mg/l"
400107		FLOAT	4	R	Lower range	
400109		FLOAT	4	R	Upper range	
400111		FLOAT	4	R	Current setpoint	in the measuring range
400113		FLOAT	4	R	Current measuring range/control value Yout	0.0 - 100.0%
(Ch.2) pH - Measurement						
400115		FLOAT	4	R	Measured value	
400117		ASCII	10	R	Measured unit	"pH / mg/l"
400122		FLOAT	4	R	Lower range	
400124		FLOAT	4	R	Upper range	
400126		FLOAT	4	R	Current setpoint	in the measuring range
400128		FLOAT	4	R	Current measuring range/control value Yout	0.0 - 100.0%
(Ch.3) ORP (Redox) - Measurement						
400130		FLOAT	4	R	Measured value	
400132		ASCII	10	R	Measured unit	"mV"
400137		FLOAT	4	R	Lower range	
400139		FLOAT	4	R	Upper range	
400141			4	R	-	
400143			4	R	-	
(Ch.4) Conductivity - Measurement						
400145		FLOAT	4	R	Measured value	
400147		ASCII	10	R	Measured unit	"µS/cm"; "mS/cm"
400152		FLOAT	4	R	Lower range	
400154		FLOAT	4	R	Upper range	
400156		FLOAT	4	R	Current setpoint	in the measuring range
400158		FLOAT	4	R	Current measuring range/control value Yout	0.0 - 100.0%

Modbus Register	Bit	Type	No. Byte	Access	Designation	Description
(Ch.5) Temperature - Measurement						
400160		FLOAT	4	R	Measured value	
400162		ASCII	10	R	Measured unit	"°C"; "°F"
400167		FLOAT	4	R	Lower range	0.0°C; 32.0°F
400169		FLOAT	4	R	Upper range	50.0°C; 122.0°F
400171			4	R	--	
400173			4	R	--	
Status messages						
400300		UINT16	2	R	Alarm stats	
	0				Alarm 1	1 = Alarm pending
	1				Alarm 2	1 = Alarm pending
	2				Alarm 3	1 = Alarm pending
	3				Alarm 4	1 = Alarm pending
	4				Alarm 5	1 = Alarm pending
	5				Alarm 6	1 = Alarm pending
	6				Alarm 7	1 = Alarm pending
	7				Alarm 8	1 = Alarm pending
400301		UINT16	2	R	Digital inputs	
	0				Sample water STOP - DI1	1 = DI active (open)
	1				DI 2	1 = DI active (open)
	2				DI 3	1 = DI active (open)
	3				DI 4	1 = DI active (open)
	4				DI 5	1 = DI active (open)
400302		UINT16	2	R	Relay outputs	
	0				Relay K1	1 = Relais aktiv
	1				Relay K2	2 = Relais aktiv
	2				Relay K3	3 = Relais aktiv
	3				Relay K4	4 = Relais aktiv
	4				Relay K5	5 = Relais aktiv
	5				Relay K6	6 = Relais aktiv
400303		UINT16	2	R	---	
400304		UINT16	2	R	Operation mode controller 1 (chlorine)	
	0				MAN.	
	1				Auto	
	2				Controller Aus	
	3				Adaption running	
	4				--	
	5				Controller stop (Yout=0%)	
	6				Controller freeze (Yout=Yout)	
	7				Controller Yout=100%	
	8				--	
	9				--	
	10				--	
	11				Eco Mode switching	
	12				Controller standby	

Modbus Register	Bit	Type	No. Byte	Access	Designation	Description
400305		UINT16	2	R	Operation mode controller 2 (pH)	Coding see Reg. 400304
400306						
400307		UINT16	2	R	Operation mode controller 4 (Cond.)	Coding see Reg. 400304
400308						
400310		UINT32	4	R	Error code chlorine (Ch.1)	
	0				Zero point calibration	1 = error active
	1				DPD calibration	1 = error active
	2				pH7 calibration	1 = error active
	3				pHX calibration	1 = error active
	4				Error calibration e.g. ORP (Redox)	1 = error active
	5				Offset calibration	1 = error active
	6				--	
	7				Cell error	1 = error active
	8				Factory calibration error	1 = error active
	9				--	
	10				--	
	11				Setpoint error	1 = error active
	12				Limit error	1 = error active
	13				HOCL error (Cl2++)	1 = error active
	14				--	
	15				Overfeed (max. dosing time)	1 = error active
	16				Auto tune error	1 = error active
400314		UINT32	4	R	Error code pH/Fluoride (Ch.2)	Coding see Reg. 400310
400318		UINT32	4	R	Error code ORP (Redox) (Ch.3)	Coding see Reg. 400310
400326		UINT32	4	R	Error code temperature (Ch.5)	Coding see Reg. 400310
(Ch.1) Chlorine - Controller parameter						
401000		FLOAT	4	RW	Setpoint (W)	in the measuring range
401002		FLOAT	4	RW	P-element(Xp)	0 - 1000%
401004		FLOAT	4	RW	I-element (Tn)	0.0 - 100.0 min 0 = Tn inactive
(Ch.2) pH - Controller parameter						
401006		FLOAT	4	RW	Setpoint (W)	in the measuring range
401008		FLOAT	4	RW	P-element (Xp)	0 - 1000%
401010			4		--	
(Ch.3) Reserved						
401012						
401014						
401016						
(Ch.4) Conductivity - Controller parameter						
401018		FLOAT	4	RW	Setpoint (W)	in the measuring range
401020		FLOAT	4	RW	P-element(Xp)	0 - 1000%
401022		FLOAT	4	RW	I-element (Tn)	0.0 - 100.0 min 0 = Tn inactive

Modbus Register	Bit	Type	No. Byte	Access	Designation	Description
(Ch.1) Chlorine - Limits						
401050		FLOAT	4	RW	Min. value 1	Lower range - Max 1
401052		FLOAT	4	RW	Max. value 1	Min 1 - Upper range
401054		FLOAT	4	RW	Hysteresis value 1	1 - 25 Digit
401056		FLOAT	4	RW	Min. value 2	Lower range - Max 2
401058		FLOAT	4	RW	Max. value 2	Min 2 - Upper range
401060		FLOAT	4	RW	Hysteresis value 2	1 - 25 Digit
(Ch.2) pH - Limits						
401062		FLOAT	4	RW	Min. value 1	Lower range - Max 1
401064		FLOAT	4	RW	Max. value 1	Min 1 - Upper range
401066		FLOAT	4	RW	Hysteresis value 1	1 - 25 Digit
401068		FLOAT	4	RW	Min. value 2	Lower range - Max 2
401070		FLOAT	4	RW	Max. value 2	Min 2 - Upper range
401072		FLOAT	4	RW	Hysteresis value 2	1 - 25 Digit
(Ch.3) OPR (Redox) - Limits						
401074		FLOAT	4	RW	Min. value 1	Lower range - Max 1
401076		FLOAT	4	RW	Max. value 1	Min 1 - Upper range
401078		FLOAT	4	RW	Hysteresis value 1	1 - 25 Digit
401080		FLOAT	4	RW	Min. value 2	Lower range - Max 2
401082		FLOAT	4	RW	Max. value 2	Min 2 - Upper range
401084		FLOAT	4	RW	Hysteresis value 2	1 - 25 Digit
(Ch.4) Reserved						
401086		FLOAT	4	RW	Min. value 1	Lower range - Max 1
401088		FLOAT	4	RW	Max. value 1	Min 1 - Upper range
401090		FLOAT	4	RW	Hysteresis value 1	1 - 25 Digit
401092		FLOAT	4	RW	Min. value 2	Lower range - Max 2
401094		FLOAT	4	RW	Max. value 2	Min 2 - Upper range
401096		FLOAT	4	RW	Hysteresis value 2	1 - 25 Digit
(Ch.5) Temperature - Limits						
401098		FLOAT	4	RW	Min. value 1	Lower range - Max 1
401100		FLOAT	4	RW	Max. value 1	Min 1 - Upper range
401102		FLOAT	4	RW	Hysteresis value 1	1 - 25 Digit
401104		FLOAT	4	RW	Min. value 2	Lower range - Max 2
401106		FLOAT	4	RW	Max. value 2	Min 2 - Upper range
401108		FLOAT	4	RW	Hysteresis value 2	1 - 25 Digit

5. Installation

5.1   Scope of delivery

The scope of delivery includes the following, depending on the version selected (see Chapter 3.2 "Versions"):

- Flow cell, pressurized (module type D02)
- Electronics module (module type E02), sensor cable pre-wired
- LED glow stick (pre-wired)
- Sensors:
    - Chlorine sensor (free chlorine)
    - pH sensor
    - ORP sensor
- Multi-sensor
- Strainer
- Top-hat rail
- Assembly accessories
- Power cord with marking label for Chlorine/Bromine feeder (blue)
- Power cord with marking label for pH feeder (yellow)
- Instruction manual

Optional:

- 4-way mA output card
- Sensor measuring module conductivity

5.2 Transport and storage

Transport The Blu-Sentinel SE is shipped in standard packaging. During transport, the packaged system must be handled carefully and should not be exposed to wet weather or moisture.

Check that the transport packaging is undamaged. In the event of damage, please inform the transport company immediately, as your rights to compensation will otherwise be lost.

If a component is damaged, please contact your affiliate immediately.

Keep the packaging until the system has been commissioned and put into operation.

Storage Flow cell, electronics module and sensors must be stored in dry condition without any residual water in a dry place that is not exposed to the elements. For storage temperature, see Chapter 3.7 "Technical data".

Shut-down The Blu-Sentinel SE must only be shut-down by trained and authorized technicians.

5.3 Requirements for the environment

NOTICE

Correct and safe operation can only be guaranteed if the requirements for the ambient conditions are met. All applicable national and local regulations must be observed!

Installation location

The following points must be observed when installing the Blu-Sentinel SE:

- The Blu-Sentinel SE must be protected against moisture, rain, frost, heat and direct sunlight and may therefore not be installed outdoors.
- Do not use the Blu-Sentinel SE Do not use the Pool Management system in environments where there are flammable gases, fumes or dust or conductive dust.
- Do not subject the system to strong shocks or vibrations.
- The air in the room must be non-condensing.

5.4   Mechanical installation

The following installation variations are available for the mechanical installation of the Blu-Sentinel SE:

• with top-hat rail
• without top-hat rail

⚠ WARNING

Risk of injury or damage to the installation!

Only authorized and qualified personnel are permitted to the Blu-Sentinel SE. All electrical work on the Blu-Sentinel SE must be carried out by authorized and qualified electricians. Modifications to the device other than those described in this instruction manual are not permissible.

NOTICE

The Blu-Sentinel SE comprises a flow cell and an electronics module. We recommend that you install the flow cell to the left of the electronics module. Leave a clearance of at least 250 mm above the flow cell for working with the sensors.

NOTICE

The electronics module is not suitable for electrical connection with permanently installed cable conduits. If the cable glands do not meet local installation rules and regulations, these glands must be replaced with suitable ones.

NOTICE

If the flow cell and electronics module are mounted in separate locations, the use of sensor extension cables (optional) is required. A length of 50 m must not be exceeded. An impedance converter (optional) is required with pH and ORP sensors.

5.4.1   Procedure for mechanical installation

Mechanical installation is performed in accordance with the following checklist.

Ser. No.	Work step	Chapter	Done
1	Installation of the modules • with top-hat rail or • without top-hat rail	5.4.2 5.4.3	
2	Remove the housing cover of the flow cell	5.4.5	
3	Fitting the strainer	5.4.7	
4	Connect the sample water inlet • with hose connection or • with rigid pipework	5.4.6	
5	Connect the sample water outlet	5.4.8	
6	Insert electrode cleaning sand	5.4.10	
7	Install LED glow stick, sensors and multi-sensor	5.4.11	
8	Install calibration aids	5.5	
9	Fit housing cover	5.4.5	

5.4.2   Mechanical installation with top-hat rail

Proceed as follows, see 5.4.4 "Dimensional drawings":

1 Secure the top-hat rail to a solid wall using the dowels and screws supplied. (Screws and dowels for fixing to a solid wall are included in the scope of delivery.)

> **NOTICE**
>
> If the device is to be installed on a suitable lightweight wall, use the corresponding mounting fixtures (not included in the scope of delivery).

2 We recommend that you hook the flow cell on the top-hat rail to the left of the electronics module.

3 Fasten the flow cell to the solid wall at the bottom by the holders using dowels and screws.

4 Hook the electronics module onto the top-hat rail so that it is flush at the right.

5 Fasten the electronics module to the solid wall at the bottom by the holders using dowels and screws.

5.4.3   Mechanical installation without top-hat rail

Instead of hooking the Blu-Sentinel SE onto the top-hat rail, it can also be hooked onto the top holding clips with suitable tallow-drop screws.

NOTICE

The dimensions for the drilling pattern can be found on the back of the plastic housing.

Proceed as follows:

1   Attach the tallow-drop screws and dowels provided to the solid wall (tallow-drop screws and dowels for fixing to a solid wall are included in the scope of delivery.)

NOTICE

If the device is to be installed on a suitable lightweight wall, use the relevant mounting fixtures (not included in the scope of delivery).

---

2   Hook the flow cell onto the tallow-drop screws.

3   Fasten the flow cell to the solid wall at the bottom by the holders using dowels and screws.

4   Hook the electronics module onto the tallow-drop screws.

5   Fasten the electronics module to the solid wall at the bottom by the holders using dowels and screws.

NOTICE

If the flow cell and electronics module are mounted in separate locations, the use of sensor extension cables (optional) is required. A length of 50 m must not be exceeded. An impedance converter (optional) is required with pH and ORP sensors.

5.4.4   Dimensional drawings

> **NOTICE**
>
> Measurement are shown in millimeters. To convert to inch measurement, divide by 25.4 (1 inch = 25.4 mm).

5.4.5   Removing and fitting the housing cover of the flow cell
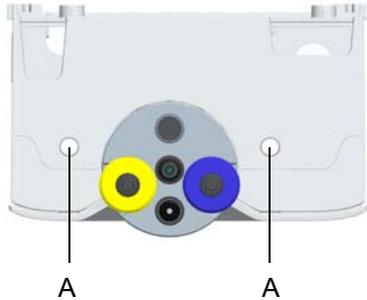
1 Remove the housing cover of the flow cell. To do this, press both unlocking buttons on the top of the housing and carefully remove the cover toward the front.

2 Fit and engage the housing cover of the flow cell. To do this, position the housing cover at the bottom and carefully press it upward until the housing cover engages on the unlocking buttons.

Image 1   View of top of housing cover

A   Unlocking buttons

5.4.6   Connecting the sample water inlet

> **NOTICE**
>
> No water pipes made of copper may be fitted in the installation. These would distort the measurement.

When connecting the sample water inlet, note the following:

• The sample water inlet must be installed upstream of the flocculant dosing station. Otherwise, it could influence the measurements.

• The sample water inlet must be installed according to the local regulations in the pool return or as a pool extraction.

• The sample water inlet must be chosen to ensure that the water sample is representative with a constant, bubble-free flow and a constant pH value (range from 6 to 8).

• A distinction must be made between a sample water inlet with hose connection and one with rigid pipes.

• The sample water inlet should be designed with PVC hose ø 6x3 or PVC tube DN 6 and be as short as possible in order to avoid long measuring dead times. Long measuring dead times mean poorer control quality!

- To prevent long loop dead times, ensure that the lines in the sample water inlet are as short as possible and do not have a large line cross-section.The pressure in the sample water inlet must always be within a range of min. 0.25 to max. 3.0 bar. At the same time, the pressure in the sample water inlet must generally be 0.25 bar higher than in the sample water outlet.

- If the admission pressure is below 0.25 bar, a booster pump must be used. See Chapter 4.4.5 "Example for sample water extraction using a booster pump".

- If the admission pressure exceeds 3.0 bar, an optional pressure reducing valve must be used. See Chapter 4.4.5 "Example for sample water extraction".

- An optional strainer with a mesh width of 0.5 mm is provided for the sample water inlet. See Chapter 5.4.7 "Installing strainer".

Image 2   Flow cell (without housing cover)

A   Sample water inlet with ball valve
B   Flow cell drain (drain at the drain screw)
C   Sample water outlet with ball valve

Sample water inlet with hose connection

> **NOTICE**

The water-tightness of the hose screw connection is only guaranteed if the following installation instructions are followed!

Proceed as follows:

1 Release union nut (C) on the hose screw connection.

2 Insert the tubing (D) until it meets the hose bushing (A).

3 Push the locking ring (B) out until the union nut (C) engages the connecting threads.
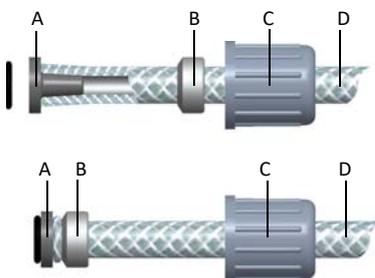
Image 3   Detail of hose screw connection

A   Hose bushing
B   Locking ring
C   Union nut
D   Tuning

Sample water inlet with rigid pipes

Proceed as follows:

1 Connect the sample water pipework to the connection thread (G 1/2" A thread connection) of the ball valve.

2 Ensure that the sample water pipes are installed free of mechanical stress.

5.4.7   Installing strainer

Proceed as follows to install the strainer in the sample water inlet:

1 Release the screw joint on the sample water inlet with ball valve (A) (G 1/2" connection).

2 Connect strainer with pipe clamp (B).

3 Connect sample water inlet (C).
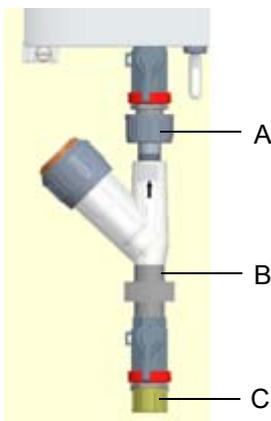
Image 4   Section, installation of strainer, straight

A   Screw joint on sample water inlet with ball valve
B   Strainer with pipe clamp
C   Sample water inlet

5.4.8   Connecting the sample water outlet

> **NOTICE**
>
> No water pipes made of copper may be fitted in the installation. These would distort the measurement.

Proceed as follows:

1 On the pressurized version, a maximum back-pressure of 1.5 bar is permitted on the sample water outlet.

2 Ensure that the drain screw (flow cell drain) is always closed.

Image 5   Flow cell (without housing cover)

A   Sample water inlet with ball valve
B   Flow cell drain (drain at the drain screw)
C   Sample water outlet with ball valve

5.4.9   Sample water extraction options

Example for sample water extraction using a booster pump
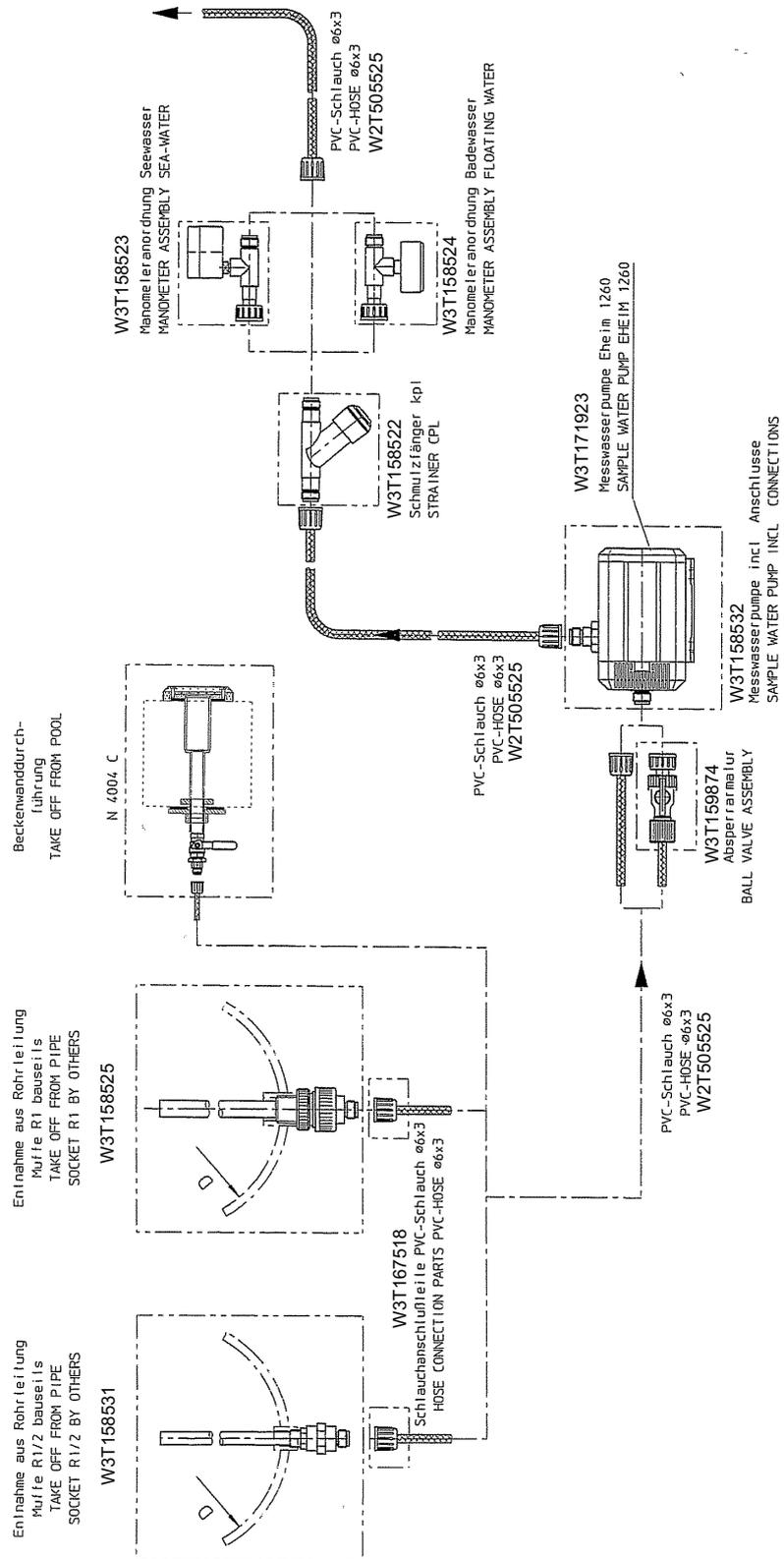
Only operate with sample water inlet!

Example for sample water extraction

See "Parts list" on page 78.

PVC-Schlauch ⌀6x3
PVC-HOSE ⌀6x3 **W2T505525**

6
39
17,14
7
20,26
43
DN20
4
3
36
35
42
X
2
40,41
DN15
DN20
27
X
1:2
28
Bypass
BYPASS
9
W3T171924
Messwasserpumpe
SAMPLE WATER PUMP
Entnahme aus Rohrleitung
TAKE OFF FROM PIPE
Muffe R1 bauseils
SOCKET R1 BY OTHERS
11
24
23,25
DN20
DN20
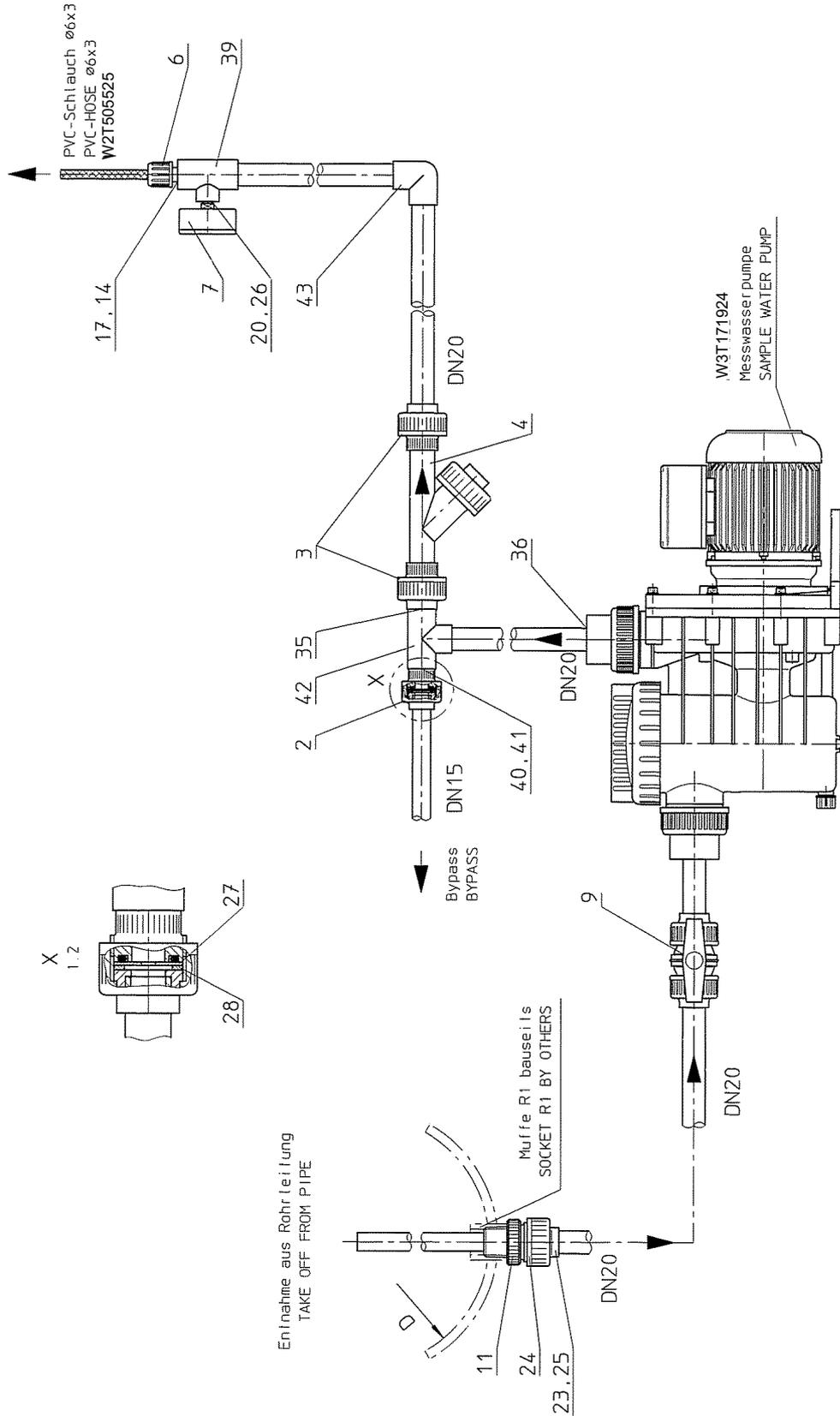
Only operate with sample water inlet!

Parts list

Sample water extraction for fresh water (part no. W3T158528)
Sample water extraction for salt water (part no. W3T158529)

Item	Qty.	Part No.	Description
2	1	W2T505181	Screw joint
3	2	W2T505182	Screw joint
4	1	W3T171416	Strainer complete
6	1	W3T167518	Hose connection parts
7	1	W3T173160 W3T173198	Pressure gage (fresh water) Pressure gage (salt water)
9	1	W2T505945	Ball valve
11	1	W3T163670	Sample pipe
14	1	W3T172948	Threaded part
17	1	W2T505600	Reduction
20	1	W3T163500	Reduction nipple
23	1	W2T507288	Insert
24	1	W2T506934	Union nut
25	1	W3T172720	O-ring
26	1	W3T161254	Flat gasket
27	1	W3T171146	Nozzle washer
28	1	W3T172727	Flat gasket
35	1	W3T166090	Pipe segment
36	2	W2T506782	Reducing junction, short
39	1	W2T506527	T-piece
40	1	W3T166089	Pipe segment
41	1	W2T506778	Reducing junction, short
42	1	W2T507525	T-piece
43	1	W2T507535	Elbow bend

5.4.10   Inserting Cl$_2$-electrode cleaning sand

The electrode cleaning sand (part no. W3T171317) is supplied in a plastic bottle, the cap serves as a measure.

Proceed as follows:
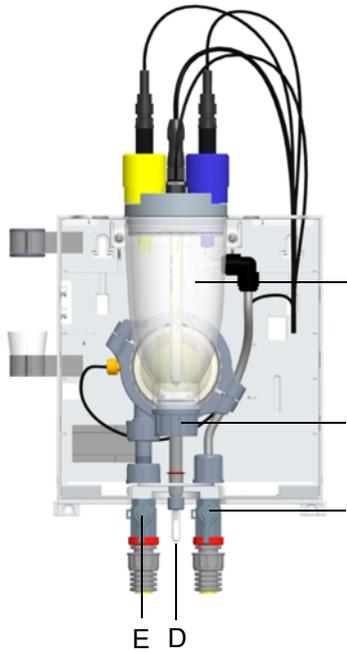
1 Close the ball valve on the sample water inlet (E) and outlet (C).

2 Open the drain screw on the flow cell drain (D) and empty the cell body. To do so, temporarily loosen a plug or sensor to allow air to flow in.

3 When the cell body (A) is empty, close the drain screw once more.

4 Remove the housing cover of the flow cell.

5 Unscrew the flow distributor cap (B). Hold a container underneath, as the remaining water will drip out.

6 Fill the cap of the cleaning sand bottle until it is one-third full and then pour it into the middle of the flow distributor cap (F). The inner indentation of the flow distributor cap is filled roughly half-way with electrode cleaning sand.

7 Screw the flow distributor cap (B) back on.

8 Open the ball valve on the sample water inlet (E) and outlet (C).

9 The cell body (A) fills with sample water again.

10 Replace and engage the housing cover of the flow cell.

11 After 2 to 3 hours running-in time, perform a chlorine calibration. If necessary, repeat the chlorine calibration after 24 hours. See Chapter 6.6 "Calibration".

NOTICE

An initial rotating air bubble at the bottom of the cell body does not affect the measurement.

Image 6   Flow cell (without housing cover)

Image 7   Flow distributor cap

A   Cell body
B   Flow distributor cap
C   Ball valve on the sample water outlet
D   Flow cell drain (drain)
E   Ball valve on the sample water inlet
F   Middle of the flow distributor cap

5.4.11   Installing and connecting sensors

> **NOTICE**
>
> The sensors must be prepared accordingly. Keep the watering cap of the chlorine sensor and the transport container of the pH and ORP sensors in a safe place for later use. Please follow the relevant operating instructions for the sensors!

Proceed as follows:

1 Remove the plug from the mount hole on the cover of the cell body.

2 Remove the watering cap from the chlorine sensor and screw the sensor into the mount hole (A) in the cell body cover.

3 Remove the pH and ORP sensors from the KCI tank with stand and screw them into the mount holes (C and E) in the cell body cover.

4 Install the conductivity sensor (optional) into the mount hole (B) and fix with clamp connection.

5 Connect the sensors to the electronics module with the pre-fitted cables. To do this, feed the cables through the lower hole (F) into the housing of the flow cell and connect to the sensors as described below:

- Feed the LED glow stick through the opening (F) and out of the housing and screw it into the mount hole (D) in the cell body cover.

- Feed the multi-sensor (H) through toward the left behind the cell body and plug it into the flow control valve (remove blind plug first).

- Route sensor cables upward and out of the housing through opening (F), and connect the 'free chlorine" sensor cable with the chlorine sensor and the pH and ORP sensor cable connectors with the pH and ORP sensors.
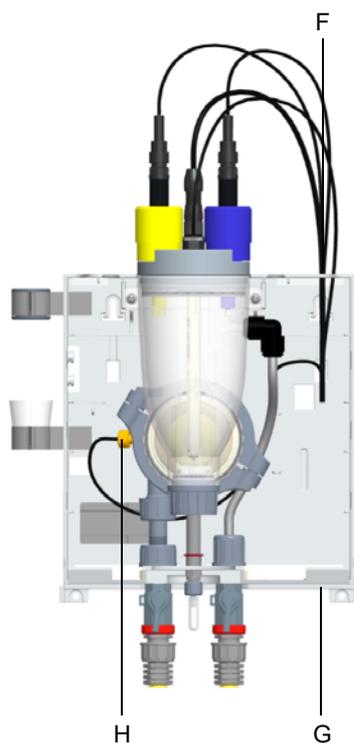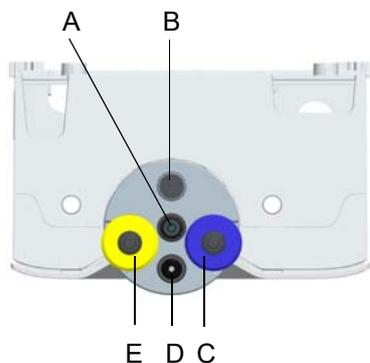
Image 8   View of top of housing cover

Image 9   Flow cell (without housing cover)

A   Chlorine sensor (free chlorine)
B   Conductivity sensor
C   ORP sensor
D   LED glow stick
E   pH sensor
F   Housing opening for sensor cables (upper bore hole)
G   Housing opening for sensor cables (lower bore hole)
H   Multi-sensor

5.5   Electrical installation

⚠ DANGER

Risk of injury or death!

External voltages may still be connected even if the operating voltage is switched off. Disconnect all power sources before opening the electronics module.

⚠ CAUTION

Controller power and pump power must be separated. This setup reduces noise inside the controller and eliminates controller damage due to transient spikes from the pumps. It also allows pump power to be interrupted without interrupting controller power.

⚠ WARNING

Risk of injury or damage to the device!

Only authorized and qualified electricians are permitted to install the Blu-Sentinel SE and open the housing. The electronics module may only be put into operation when the housing is closed, and must be connected to protective earth. Modifications to the device other than those described in this instruction manual are not permissible.
The Blu-Sentinel SE may only be wired in de-energized state.
Connect the electronics module in accordance with the wiring diagrams and applicable national and local regulations.

⚠ WARNING

Risk of injury or damage to the device!

The Blu-Sentinel SE is not equipped with a mains switch and is in operation as soon as the supply voltage is applied. For this reason, an external switch or circuit breaker with a clearly identifiable "Off" switch position is necessary.
Line cross-section for the mains input side at least 0.75 mm² (AWG 18), on-site mains fuse 6 A with 100 to 240 V AC supply.
When connecting system components (e.g. devices, motors, pumps) as well as when entering operating data, the system components must be switched off in order to prevent uncontrolled activation or incorrect operation.
Installations with internal supplied loads (e.g. dosing machines) must not have a current consumption higher than 6 A.

NOTICE

The electronics module is not suitable for electrical connection with permanently installed cable conduits. If the cable glands do not meet local installation rules and regulations, these glands must be replaced with suitable ones.

⚠ WARNING

Electrical hazard!

Risk of electrical shock.

Line voltage (120/240VAC) can be present inside the electronics module and caution should be used to pre-vent electrical shock, burns or electrocution. Be sure electric power is disconnected be-fore opening the cover of any electronics module. Follow all local safety policies, procedu-res and electrical codes, to prevent injury from electrical hazards, before opening the cover of this controller. If you are not trained and comfortable performing work on electri-cal equipment, contact a licensed electrician to perform the work.

⚠ WARNING

Risk of injury or damage to the device!

High temperatures at the terminals of the relay and the power sup-ply!

The terminals may become very hot with high ambient tempera-tures and the connected cables must be designed to withstand these temperatures.

Ambient temperature <30°C: cable temperature resistant up to at least 60°C

Ambient temperature <40°C: cable temperature resistant up to at least 70°C

Ambient temperature >40°C: cable temperature resistant up to at least 80°C

⚠ CAUTION

Risk of electrical shock!

To ensure safe and correct commissioning, knowledge of the operation, connected electrical load, measurement signals, cable assignment and fuse protection of the connected devices and machines and the relevant safety regulations is required.

Start-up of the Blu-Sentinel SE electronics module may there-fore only be performed by qualified and authorized electricians.

Incorrectly connected systems can be damaged, possibly irreparably, or cause faults in other equipment when they are switched on or in operation. Ensure that the measuring and control cables are not confused or make contact with one another. Never connect or disconnect any cables to which voltage is applied.

⚠ WARNING

Risk of injury or damage to the device!

Only wire the Blu-Sentinel SE electronics module when it is disconnected from the mains.

NOTICE

The electronics module is equipped with a flexible voltage supply input and accepts AC voltages from 100 to 240 volts. Take the power consumption into account when dimensioning. See Chapter 3.7 "Technical data".

⚠ WARNING

Electrical surges can damage your controller!

A damaged controller could feed chemicals in an uncontrolled manor.
Uncontrolled feeding of chemicals can result in injury or death.
If you suspect your controller is not operating properly, disconnect it from control of chemical feed.

The electronics module, like all modern electronic devices can be damaged by severe electrical spikes and surges (think 'lightning'). Every effort has been made to protect your electronics module against such surges, but no precautions are 100% effective. Additional surge protection can be installed at time of installation, but even that is not a guarantee that surge damage will not occur. If surge damage occurs, chemi-cals could be fed to your pool or spa, continuously with no safety controls. If you inspect your Blu-Sentinel SE after a possibly damaging power surge (thunderstorm or power outage) and sus-pect the controller is not operating properly, disconnect the chemi-cal feeders at once, and contact your Blu-Sentinel SE dealer for service.

⚠ WARNING

Always use anti-siphon devices!

Uncontrolled feeding of chemicals can result in injury or death. Anti-siphon devices must be installed to prevent uncontrolled chemicalfeed. Follow instructions carefully.

If a vacuum is created in the water circulation line and no antisiphon device is installed on the chemical feeders, potentially hazardous concentrations of chemicals can be drawn into pool or spa. Always use injection check valves and anti-siphon valves in the chemical feed lines to prevent this situation from occurring.

⚠ WARNING

Test flow switch function!

Uncontrolled feeding of chemicals can result in injury or death. Assure flow switch prevents chemical feed in any circulation NO-FLOW or backwash condition. Follow instructions carefully.

If flow switch does not stop and remain stopped during backflow, no-flow, or very low flow conditions, the controller cannot prevent the uncontrolled feed of chemicals, which could cause personal injury or death.

Testing of the flow switch installation is essential to assure the flow switch stops, remains stopped, and controller shows "NO-FLOW ALARM" within 20 seconds, whenever pool circulation flow stops. If the flow switch does not stop completely, plumbing corrections or the installation of additional safeguards will be necessary to avoid uncontrolled chemical feed.

⚠ WARNING

Never connect feeder directly to power source!

Uncontrolled feeding of chemicals can result in injury or death. Chemical metering pumps must be interconnected to the controller to enable safety controls. Follow instructions carefully.

If the chemical feeders are directly connected to a wall outlet, the safety devices integral to your Blu-Sentinel SE electronics module, and to the safe feeding of chemicals, will be bypassed. It is very important that the chemical feeders are connected to the controller and never to a wall outlet. If the chemical feeders are connected to a wall outlet and feeding continuously, when the flow of water to the pool stops due to filter backwash, the circulation pump losing prime or other causes, potentially hazardous concentrations of chemicals can be fed into pool or spa.

⚠ WARNING

Always install a recirculation pump interlock!

Chemical feed without water circulation can result in injury or death.
Circulation pump interlock with chemical feeders is a critical safety device which prevents unsafe chemical feed.
Recirculation pump must be interlocked to prevent chemical feed whenever pump power is removed. Follow instructions carefully.

If concentrated Chlorine and Acid are combined, chlorine gas is released. Chlorine gas causes severe irritation to lungs and can be toxic in certain situations.

If water is not flowing in the return line piping to the pool, and both these concentrated chemicals are allowed to combine in the piping, a chlorine gas bubble will be created. When the flow eventually resumes to the pool, the chlorine bubble would then be flushed into the pool and released into the air around the pool, beginning at the water surface. To help prevent this situation, a chemical pump interlock must be installed. An interlock removes power from the chemical feed pumps whenever the power to the recirculation pump power is switched off.

NOTICE

The maximum allowable external load to the relays is 3.15 AMPS @ 120 VAC.

5.5.1   Electrical installation pH feeder

The Blu-Sentinel SE is supplied with additional connection cables for dosing pumps. The cable for the pH feeder is marked with a yellow label.
Decide which dosing device is used (refer to chapter 9.) and note also the technical data of the relay output (see chapter 3.7.2). The additional power relay may have to be used.
If a dosing pump is used, wire the connection cable with the yellow sign referring to the connection diagrams in chapter 9.

⚠ WARNING

Only connect a pH feeder to this outlet!

Connecting a Chlorine/Bromine feeder to this outlet can cause chemical interactions that may cause personal injury or death.
Caution must be used to insure feeders are connected properly to avoid hazardous chemical feed conditions.
Never connect Chlorine/Bromine feeder or any other device to this connector.
Blu-Sentinel SE pH Sensors are color coded as YELLOW as well as the pH feeder connector is marked with a yellow label.
Oxidizers (Chlorine or Bromine), acids (Muriatic or Carbon Dioxide) and caustics (Sodium Hydroxide, Caustic Soda, or Soda Ash) are com- mon chemicals used to automatically maintain safe and healthy pool and spa water chemistry. The automatic feeding of these chemicals is performed using sensors, which continuously monitor the water circulating through the filter(s).
Each of the sensors is associated with a chemical it is monitoring and feeding. These sensors, their connectors, and the feeder power cords, if present, are color coded. The YELLOW sensor is associated with the pH control channel which feeds an Acid or a Base (sometimes called caustic or alkaline) chemical. If these sensors or chemical feed pumps are not plugged into to the proper connections, or are connected to opposite devices, the uncontrolled feeding of one or both chemicals can occur. Uncontrolled or improper feeding of these two chemicals can cause serious injury or death to swimmers in the pool area from the formation of chlorine gas.
Use extreme caution when connecting chemical feeders and sensors.

5.5.2 Electrical installation Chlorine/Bromine feeder

The Blu-Sentinel SE is supplied with additional connection cables for dosing pumps. The cable for the Chorine / Bromine feeder is marked with a blue label.
Decide which dosing device is used (refer to chapter 9.) and note also the technical data of the relay output (see chapter 3.7.2). The additional power relay may have to be used.
If a dosing pump is used, wire the connection cable with the blue sign referring to the connection diagrams in chapter 9.

⚠ WARNING

Only connect a Chlorine or Bromine feeder to this outlet!

Connecting a pH feeder to this outlet can cause chemical interactions that may cause personal injury or death.
Caution must be used to insure feeders are connected properly to avoid hazardous chemical feed conditions.
Never connect pH feeder or any other device to this connector. Blu-Sentinel SE Chlorine/Bromine Sensors are color coded as BLUE as well as the Chlorine/Bromine feeder is marked with a blue label.

Oxidizers (Chlorine or Bromine), acids (Muriatic or Carbon Dioxide) and caustics (Sodium Hydroxide, Caustic Soda or Soda Ash) are common chemicals used to automatically maintain safe and healthy pool and spa water chemistry. The automatic feeding of these chemicals is performed using sensors, which continuously monitor the water circulating through the filter(s).
Each of the sensors is associated with a chemical it is monitoring and feeding. These sensors, their connectors, and the feeder power cords, if present, are color coded. The BLUE sensor is associated with the feed of Chlorine or Bromine (sometimes called an oxidant or oxidizer). If these sensors or chemical feed pumps are not plugged into to the proper connections, or are connected to opposite devices, the uncontrolled feeding of one or both chemicals can occur. Uncontrolled or improper feeding of these two chemicals can cause serious injury or death to swimmers in the pool area from the formation of chlorine gas. Use extreme caution when connecting chemical feeders and sensors.

5.5.3   Electrical installation electronics module
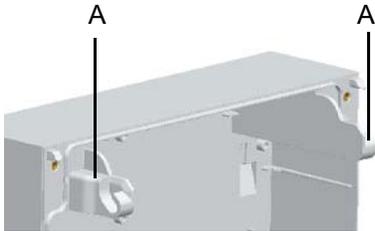
Proceed as follows:

1 Open the housing cover of the electronics module. To do so, unscrew the housing cover and hook into the holders (A) on the basic housing.

2 Connect the power supply in accordance with the wiring diagram (see Chapter 9. "Wiring diagrams").

NOTICE

Note the correct polarity of the voltage connections and the correct dimensioning of the wire cross-sections (see „Chapter 3.7 "Technical data" - Power consumption).

---

3 Installing a retrofit kit (optional) for mA outputs or conductivity, see Chapter 5.7 "Retrofit kits".

4 Wire the CPU-board in accordance with wiring diagram Chapter 9. "Wiring diagrams".

5 Make sure that all cable glands are installed correctly.

6 Fit the housing cover of the electronics module again. Tighten the housing screws to a maximum torque of 0.7 Nm (± 0.15 Nm).

7 Then put the Blu-Sentinel SE into operation. See Chapter 5.6 "Startup".

5.6   Startup

⚠ CAUTION

Risk of injury or damage to the device!

To ensure safe and correct commissioning, knowledge of the operation, connected electrical load, measurement signals, cable assignment and fuse protection of the connected devices and machines and the relevant safety regulations is required.

Startup of the Blu-Sentinel SE may therefore only be performed by qualified and authorized electricians.

Incorrectly connected devices can be damaged, possibly irreparably, or cause faults in other equipment when they are switched on or in operation. Ensure that the measuring and control cables are not confused or make contact with one another. Never connect or disconnect any cables to which voltage is applied.

⚠ WARNING

Risk of injury or damage to the device!

When connecting the Blu-Sentinel SE to the power supply, a 6A back-up fuse must be used in the mains supply line.

After completing mechanical and electrical installation of the Blu-Sentinel SE, commissioning can be performed following the individual steps in the order shown in the table below. Please check that the following conditions are met:

- The electronics module is wired in accordance with the wiring diagram (circuit diagram).
- The housing cover of the electronics module is fitted.
- The flow cell is installed.
- Sample water inlet and outlet are connected.
- Sensors are installed in the flow cell.
- The sensors are connected to the electronics module.
- Ensure that all transport protection was removed.
- Check all connections for leakage.

Ser. No.	Procedure	Done
1	Switch on power supply.	

2	Perform initial configuration:
	
	   • Set "MANUAL" mode
	   • Select the language
	   • Set the date and time
	   • Enter the system name	

3	Check parameter „Disinfection" and set to „Chlorine measured" if chlorine measurement is available otherwise set to „off" or „Chlorine derived".	
4	Check parameter „Disinfection Controller" and set to Cl_2 or ORP based control.	
4	Check parameter measurement „Cl2" and adjust as necessary.	
5	Check parameter measurement „pH" and adjust as necessary.	
6	Check parameter measurement „ORP" and adjust as necessary.	
7	Check parameter „Control pH" and set to ON or Off as desired.	
	Chlorine measurement (if available)	
8	Set the dosing output for Cl_2, if necessary set positioner running time "Ty," "Tp" or "Max. pulses/min."	
9	Check setpoint for Cl_2 control, change if necessary (only for Cl_2 closed-loop control).	
10	Adapt values for "Xp" and "Tn" to control loop. *Please note* These values may be optimized later by Auto tune or manually.	
11	Check the limit values 1 and 2 for Cl_2 ("Min" and "Max"), adjust if necessary.	
12	Check the measurement range for Cl_2, adjust if necessary.	
	pH measurement	
13	Set the dosing output for pH, if necessary set positioner running time "Ty," "Xsh," "Tp" or "Max. pulses/min."	
14	Set the control direction (for pumps 2P).	
15	Check the setpoint for pH control, adjust if necessary	
16	Adapt the value for "Xp" to the control loop, if necessary optimize in small steps.	
17	Check the limit values 1 and 2 for pH ("Min" and "Max"), adjust if necessary.	

Ser. No.	Procedure	Done
	ORP measurement (if available)	
18	Set dosing output for ORP, if necessary set Tp or max. pulses/min (only if disinfection control = ORP).	
19	Check setpoint for ORP control, change if necessary (only if disinfection control = ORP).	
20	Adjust value for Xp (only if disinfection control = ORP).	
21	Check the limit values 1 and 2 for ORP ("Min" and "Max"), adjust if necessary.	
22	Check the measurement range for ORP, adjust if necessary.	
	Conductivity measurement (if available)	
23	Check the limit values 1 and 2 for conductivity ("Min" and "Max"), adjust if necessary.	
24	Check the measurement range for conductivity, adjust if necessary.	
25	Activate controller for conductivity, if necessary.	
26	Set control outputs for conductivity, if necessary.	
27	Set the setpoint for conductivity, if necessary.	
28	Adapt the values for "Xp" and "Tn" to the control loop, if necessary	
29	Configure alarms as required.	
30	Configure analog outputs as required.	
31	Define function DI 2, DI 3, DI 4 and DI 5.	
32	Parametrize interfaces.	
33	In Manual mode, check all connected dosing devices for correct functioning.	
34	Test Cl_2 feed lockout activated functions such as circulation monitoring and Sample water Stop	
35	Carry out initial calibration of the sensors after a running time of approx. one hour (see Chapter 6.6 "Calibration").	
36	Switch to Automatic mode and monitor system for correct functioning.	
37	Repeat calibration after a running-in time of approx. 24 hours.	

5.7   Retrofit kits

5.7.1   Installing 4-way mA output card (optional)

The 4-way mA output card is available as an optional retrofit kit. Proceed as follows to install it:

1   Disconnect the electronics module from the power supply.

2   Remove the housing cover of the electronics module. To do this, unscrew the housing cover and remove carefully. Hook into holder on the basic housing.

3   Install mA output card at position A and make sure that the holders engage. Note the correct installation direction.

4   Plug in terminal block at position B.

5   Wire in accordance with the wiring diagram (see Chapter 9. "Wiring diagrams").

6   Fit the housing cover of the electronics module again. Tighten the housing screws to a maximum torque of 0.7 Nm (± 0.15 Nm).

7   Connect the electronics module to the power supply again.

8   The electronics module automatically detects the installed modules and enables the corresponding settings menus.

9   Configure mA outputs as required.

10 Check all menu settings and configure if necessary. After changes the electronic module resets all parameter to factory settings.

Image 10   View, installation of the 4-way mA output card

5.7.2   Installing the conductivity sensor measuring module (optional)

The conductivity sensor measuring module can be retrofitted at any time. Proceed as follows to install the conductivity sensor measuring module:

1 Disconnect the electronic module from the power supply.

2 Remove the housing cover of the electronic module. Unscrew the housing cover and remove it carefully. Hook the housing cover into the holders on the basic housing.

3 Feed the conductivity sensor cable through the cable gland together with the glow stick cable in double sealing insert.

4 Plug the terminal block (B) into the motherboard input Module 2.

5 Connect sensor cables in accordance with the wiring diagram.

6 Insert sensor card (A) into Mod2 slot. Ensure that the holders engage.

7 Remove the cover of the flow cell module. To do this, press both unlocking buttons on the top of the housing and carefully remove the cover toward the front.

8 Install conductivity sensor in the flow cell module. Please remove the blind plug first (note position!).

9 Feed the sensor cable through the hole at the bottom into the housing of the flow cell module and route upward to the sensor.

10 Connect sensor cable to the conductivity sensor.

11 Fit the housing cover of the electronic module again. Tighten the housing screws to a maximum torque of 0.7 Nm (± 0.15 Nm).

12 Fit the housing cover of the flow cell module again. To do this, position the housing cover at the bottom and carefully press it upward until the housing cover engages on the unlocking buttons.

13 Switch the device on.

14 The sensor card is automatically detected and the conductivity measurement is displayed.

15 Calibrate the conductivity measurement.

16 Set the limit values and perform conductivity and control settings.

A   B

Image 11   Detail of conductivity sensor measuring module

5.8   Shut-down

> **⚠ DANGER**
>
> **Risk of injury or death!**
>
> External voltages may still be connected even if the operating voltage is switched off.

To shut down, proceed as follows:

1 Disconnect the electronics module from the power supply.

2 Drain the sample water supply line and drainage line.

3 Remove the housing cover of the flow cell.

4 Drain the cell body via the flow cell drain.

5 Flush out the cleaning sand.

6 Dismantle the filter unit and the check valve housing. See Chapter 5.7, "Cleaning the flow rate monitor and non-return ball valve."

7 When the remaining water has drained from the flow control valve, refit the filter housing and the check valve housing.

8 Remove the sensors from the mount hole in the cover of the cell body and disconnect from the electronics module.

9 Shut down the sensors. See relevant operating instructions for the sensors.

   For the chlorine sensor and pH or ORP sensors, proceed as follows:
   - Fit watering cap to the chlorine sensor.
   - Install pH or ORP sensor in the KCl tank and stand with KCl solution.
   - Cleaning the conductivity sensor or wash the sensor in distilled water. Store the conductivity sensor in a dry place.
   - Store the sensors in a frost-free place.

10 Replace and engage the housing cover of the flow cell.

5.9   Renewed start up

See Chapter 5.6 "Startup".

6. Operation

6.1   Display and control elements

6.1.1   General

The colored graphic display with capacitive touchscreen is the display and control element. It is used by means of direct entry on the display, i.e. by touching using your finger or a pen (PDA pen) for capacitive touchscreens. As soon as you touch an area on the display, the display reacts and switches to subordinate views or operating menus. Swipe functions for switching between screens or moving parameter lists upward or downward are also supported.

NOTICE

Damage to the touchscreen!

Touching the touchscreen with pointed or sharp objects or striking the touchscreen with hard objects will damage the glass surface. Only touch the touchscreen with your finger or a pen (PDA pen).

6.1.2   Main display (Home view)
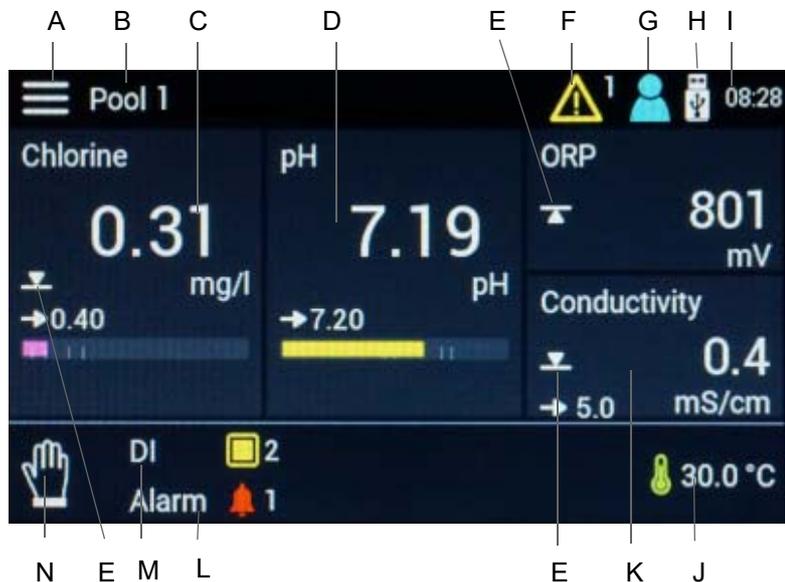
Image 1   Main menu showing (example)

A   System menu
B   Device name
C   Menu field Measurement with current measured value for chlorine,
*   setpoint display and bar graph*
D   Menu field Measurement with current measured value for pH, setpoint
*   display and bar graph*
E   Limit value is exceeded
F   Error message
G   Logout/Login-Level
H   Data logger symbol USB memory stick
I   Current time
J   Current temperature
K   Menu field Measurement with current measured value for ORP
*   (Redox), setpoint display and bar graph*
L   Display range for alarm
M   Display range for digital input
N   Operation mode

NOTICE

Depending on the selected disinfection control the order of the
display measurements changes. The parameter which is selected
for control of disinfection is displayed on the left. If the Blu-Sentinel
SE is only equipped with two sensors (ORP and pH), the menu
fields Measurement with the current measured value are shown
wider on the screen.

Menu fields   The menu fields are used to carry out functions and to switch
                 between the menu fields, menus and screens.

Buttons   The buttons are used to perform functions.

Symbols   The symbols display functions. Functions can also be carried out or changed by pressing certain symbols.

The following symbols are used:

Symbols	Meaning
1 2 3	Numeric keypad
↵	Enter key - save entry
⇧	Upper-case character keypad
⌫	Delete previous keypad entry
▼	Limit value Min. 1/2 not reached
▲	Limit value Max. 1/2 exceeded
ⓘ	Menu Information
🌡	Temperature display
→	Setpoint controller
△	Dosing on (raise/positioner open)
▽	Dosing on (reduce/positioner closed)
⋀	Raise value
⋁	Reduce value
⌂	Change main menu
↩	Switch to previous screen
👤	Logout and Login levels Level 1 = white symbol Level 2 = green symbol Level 3 = blue symbol
⚠	Message/error active Press the symbol to open the message window. Yellow symbol = alarm that cannot be acknowledged is active Red symbol = alarm that can be acknowledged is active or error message is active
🔌	Data logger symbol USB memory stick
⚙	Menu Alarms

Symbols	Meaning
	Digital input active
	Sample water Stop
	Alarm active (1 to 8)
	Change calibration menu
	Change settings menu
	Acknowledgment button
	Selection disabled
	Selection enabled
	Controller Stop
	Controller manual mode
	Controller constant
	Controller automatic mode
	System menu
	Menu/Measurements display
	Confirmation prompt
	Information
	Note
	Abort/Close
	Automatic adaption active

6.2   Menus

6.2.1   Menu structure

The following menus are available in the main menu:

- Chlorine (free chlorine)
- pH
- ORP
- Messages
- Operation mode
- System menu
- Logout and Login levels screen

From the main menu, you can call up the system settings, the measured values menus and the controller menus. Tap the measurement menu fields or tap the ▤ symbol to access the corresponding menus. The layout of the measurement and control menus for Free chlorine, pH and ORP (Redox) is the same. If all sensors are connected, the following main menu appears on the electronics module.

Main menu
    Menu field Measurement (chlorine, pH or ORP)
        CHLORINE (EXAMPLE)

▤ Pool 1	↩ 🏠 ⚠¹ 👤 🔌 08:28
Chlorine	CAL ⚙

0.31 mg/l

+2.07 µA

Dosing average
0.0 % / Hour

Limit value I
Max   0.60
Min   0.30
Limit value II
Max   0.80
Min   0.10

The preceding screens are listed in the margin to show the user how to access the current screen. Screenshots of the various menu screens are shown, with the name immediately above the screenshot.

6.2.2   Menu "Measurement"

The menu "Measurement" shows the current measured value and the sensor signal. The menu "Measurement" contains all settings relating to measured values and also the calibration of the corresponding sensor. All settings relating to measured values, such as measuring range, limit values and controller setting, must be performed via this menu.

Main menu
   Menu field Measurement (chlorine, pH or ORP)
CHLORINE (EXAMPLE)

To access the menu "Measurement," proceed as follows:

1 Switch to the main display.

2 Press the desired measurement (chlorine, pH or ORP). The menu "Measurement" opens.

3 Press the ⚙ symbol. The settings menu for the selected measurement opens.

4 To switch to other menus, press the desired symbol. The following menus are available:

Display	Meaning
☰	System menu
↰	Back to previous menu level
🏠	Main display (Home view)
CAL	Sensor calibration level (see Chapter 6.6 "Calibration")
⚙	Settings menu

6.2.3   Menu "Settings"

Main menu
Menu field Measurement (chlorine, pH or ORP)
CHLORINE (EXAMPLE)

To access the "Settings" menu for a specific measurement, proceed as follows:

1 Switch to the main display.

2 Press the desired measurement (chlorine, pH or ORP). The menu "Measurement" opens.

Symbol „System menu"
SETTINGS
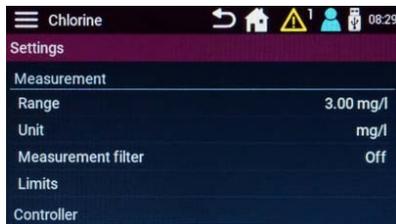
3 Press the ⬡ symbol. The settings menu for the selected measurement opens.

Depending on the measurement selected, different setting parameters are displayed. Swipe upward on the touchscreen to access further setting parameters which are further down the list and not currently visible on the screen. You can scroll upward and downward to the top and bottom of the parameter list (length of list depends on the measured value) at any time. The settings menus are subdivided into various areas such as Measurement, Controller and Dosing. To change values, press the corresponding parameter.

NOTICE

Depending on the user administration configuration and the currently registered users, the changes that can be made are limited. In order to change parameters, login on the corresponding user level is required (see Chapter 6.3.8 "Menu "User administration"").

Chlorine measurement

The following parameter settings are possible for chlorine measurement:

Measurement	
Range	1, 2, 3, 5 and 10 mg/l
Unit	mg/l, ppm
Measurement filter	off/low/middle/strong
Limits	
Limit values I	
Max	Within range
Min	Within range
Hysteresis	0.01...0.25
Limit values II	
Max	Within range
Min	Within range
Hysteresis	0.01...0.25
Controller (only if control disinfection = Chlorine)	
Setpoint	Within range
Proportional factor Xp	1...1000
Integral action time Tn	0...100.0 min
Auto tune	Start
Dead time Tu	1...480 min
Rise time Ts	1...60 min
Dosing (only if control disinfection = Chlorine)	
Actuator	Dosing pump 2P, solenoid pump, positioner wo. Ym, analog output mA, dosing contact
Cycle period Tp	10...180 s
Max. Pulse	100/120/140/160/180
Running time Ty	10...180 s
Hysteresis	0.01...0.50
min. duty cycle	00:00...10:00 h
max. off-duty cycle	00:00...10:00 h
Reset dosing average	
Sampling time Ta	

pH measurement   The following parameter settings are possible for pH measurement:

Measurement	
Upper range	pH 8...14
Lower range	pH 0...6
Measurement filter	off/low/middle/strong
Limits	
Limit values I	
Max	Within range
Min	Within range
Hysteresis	0.01...0.25
Limit values II	
Max	Within range
Min	Within range
Hysteresis	0.01...0.25
Controller (only if control pH = ON)	
Setpoint	Within range
Proportional factor Xp	
Integral action time Tn (only for positioner)	
Dosing (only if control pH = ON)	
Actuator	Dosing pump 2P, dosing pump 3P, solenoid pump 2P, solenoid pump 3P, positioner wo. Ym, analog output 2P, analog output 3P, dosing contact
Direction	Acid/Alkali
Cycle period Tp	10...180 s
Max. Pulse	100/120/140/160/180
Running time Ty	10...180 s
Hysteresis	0.01...0.50
min. duty cycle	00:00...10:00 h
max. off-duty cycle	00:00...10:00 h
Reset dosing average	
Sampling time Ta	

ORP measurement   The following parameter settings are possible for ORP measurement:

Measurement	
Upper range	600/700/800/900/1000
Lower range	0/100/200/300/400
Measurement filter	off/low/middle/strong
Limits	
Limit values I	
Max	Within range
Min	Within range
Hysteresis	1...25
Limit values II	
Max	Within range
Min	Within range
Hysteresis	1...25
Controller (only if control disinfection = ORP)	
Setpoint	Within range
Proportional factor Xp	1...1000
Dosing (only if control disinfection = ORP)	
Actuator	Dosing pump 2P, solenoid pump, positioner wo. Ym, analog output mA, dosing contact
Cycle period Tp	10...180 s
Max. Pulse	100/120/140/160/180
Running time Ty	10...180 s
Hysteresis	2...25
min. On	00:00...10:00 h
max. Off	00:00...10:00 h

Conductivity measurement

The following parameter settings are possible for conductivity measurement:

Measurement	
Upper range	5.00/10.0/20.0/50.0/100.0/200.0/ 300.0 mS/cm 500/1000/2500 µS/cm
Lower range	mS/cm, µS/cm
Measurement filter	off/low/middle/strong
Additional display	off/NaCl [g/l]/TDS
TDS Factor	0.40...1.00
Reference temperature	20°C/25°C
Limits	
Limit values I	
Max	Within range
Min	Within range
Hysteresis	0.01...0.25
Limit values II	
Max	Within range
Min	Within range
Hysteresis	0.01...0.25
Controller	
Setpoint	Within range
Proportional factor Xp	1...1000
Integral action time Tn	0.0...100.0 min
Dosing	
Actuator	Dosing pump 2P, solenoid pump 2P, analog output 2P, dosing contact
Cycle period Tp	10...180 s
Max. Pulse	100/120/140/160/180
Hysteresis	0.01...0.50
min. duty cycle	00:00...10:00 h
max. off-duty cycle	00:00...10:00 h
Reset dosing average	

Temperature measurement   The following parameter settings are possible for temperature measurement:

Measurement	
Measurement filter	
Limits	
Limit values I	
Max	0...50 °C
Min	0...50 °C
Hysteresis	0.1...2.5 °C
Limit values II	
Max	0...50 °C
Min	0...50 °C
Hysteresis	0.1...2.5 °C

6.3   System menu

Access to the operating and configuration level of the electronics module is possible via the System menu. All setting parameters not relating to measured values, for example, Alarms, I/O inputs and outputs, interface parameters etc., are parametrized via the System menu.

Main menu
    Symbol „System menu"

S YSTEM MENU
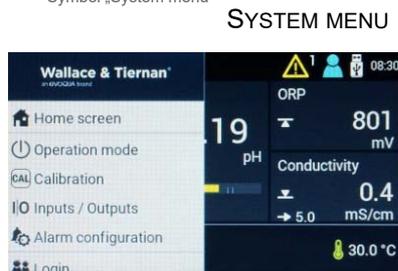
Proceed as follows:

1   Switch to the main display.

2   Press the ▤ symbol.

3   Press the desired menu. The following menus are available:

Symbol/Menu	Meaning
Home menu	Home screen
Operation mode	"Operation mode" menu
Calibration	"Calibration" menu
Inputs/Outpus	Configuration of inputs and outputs
Alarm configura-tion	Configuration alarms
Login	Login screen for entry of the pass-word or unlock code
Settings	Settings menu
Information	Info display

NOTICE

The individual menus are described in the following chapters.

6.3.1   Menu "Operation mode"

The device offers two options for changing the operation mode.

Proceed as follows:

1 Switch to the main display.

2 Press symbol 🔄 or ✋ .

or

Press the ☰ symbol and then press the menu ⏻ Operation mode.

3 To switch to "Manual mode," press the "Change" button. An additional prompt appears, i.e. in order to change the operation mode, you need to confirm the prompt with "Yes" or "No".

4 In "Manual mode," it is possible to set a manual dosing rate for the controller outputs. The following settings are possible:

Manual dosing rate chlorine	0...100 %/open/closed
Manual dosing rate pH	−100...+100 %/open/closed
Manual dosing rate conductivity	0...100 %

Furthermore, a runtime limitation can be set for manual dosing (not with positioner). Dosing is switched off after expiry of this time. If the running time is set to 00:00, it is inactive and manual dosing is in continuous mode.

Running time chlorine	00:00...11:59 PM h
Running time pH	00:00...11:59 PM h
Running time conductivity	00:00...11:59 PM h

5 In "Automatic mode" it is possible to switch to the settings level by pressing the ⚙ symbol.

6.3.2   Menu "Calibration"

In the "Calibration" menu, the measurements are compared in compliance with the prescribed maintenance intervals using calibration solution or buffer solution or via comparative measurements, see Chapter 6.6 "Calibration". The date of the last calibration and the calibration value entered are displayed. The calibration datas (the last five calibrations) are being recorded in the calibraton history. Press "Date of last calibration" to open the calibration history. Depending on the desired measurement, the corresponding calibration menus can be selected.

The "Calibration" menu can be opened in two ways:

- via the System menu
- via the menu field Measurement

System menu

Main menu
   Symbol „Settings menu"
SYSTEM MENU

To perform calibration via the System menu, proceed as follows:

1 Switch to main display.

2 Press the ▤ symbol.

Menü „Calibration"
   Menu field Measurement (chlorine, pH or ORP)
CALIBRATION (EXAMPLE CHLORINE)

3 Press the menu [CAL] Calibration.

4 Press the desired measurement (chlorine, pH, ORP, conductivity or temperature). The menu "Measurement" opens; the example here shows Chlorine.

5 Press calibration selection, see "Calibration selection" on page 112.

6 Carry out sensor calibration as described in Chapter 6.6 "Calibration". See also "Example "Chlorine calibration"" on page 113.

7 Resetting calibration using the button "Execute".

Menu field Measurement

To perform calibration via the menu field Measurement, proceed as follows:

Main menu
Menu field Measurement (chlorine, pH or ORP)
CHLORINE (EXAMPLE)

≡ Pool 1	08:28
Chlorine	CAL ⚙
0.31 mg/l +2.07μA	Limit value I Max 0.60 Min 0.30 Limit value II Max 0.80 Min 0.10
Dosing average 0.0 % / Hour	

Symbol „Calibration"
CALIBRATION (EXAMPLE CHLORINE")

≡ Calibration	08:32
Chlorine	
0.31 mg/l Cell signal	+2.07μA
Date of last calibration	-----
Zero point	0.00 μA
DPD	5.00 μA / mg/l
Reset calibration data	**Execute**

1 Switch to the main display.

2 Press the desired measurement (chlorine, pH or ORP).
The menu "Measurement" opens.

3 Press the ![CAL] symbol. The corresponding menu opens;
the example here shows Chlorine.

4 Press calibration selection, see "Calibration selection" on page 112.

5 Carry out sensor calibration as described in Chapter 6.6 "Calibration". See also "Example "Chlorine calibration"" on page 113.

6 Resetting calibration using the button "Execute".

Calibration selection   The following calibration selections are available, depending on the selected measurement:

Chlorine	
Date of last calibration	Date and time Calibration history (press „Date of last calibration")
Zero point	Calibration of the zero point current of the chlorine measurement cell
DPD	DPD calibration of the chlorine measurement cell

pH	
Date of last calibration	Date and time Calibration history (press „Date of last calibration")
pH7	pH7 calibration with buffer solution
pHX	Span calibration of the pH sensor with buffer solution
Offset	Offset calibration of the pH sensor

ORP	
Date of last calibration	Date and time Calibration history (press „Date of last calibration")
Cal. value	ORP calibration with buffer solution

Conductivity	
Date of last calibration	Date and time Calibration history (press „Date of last calibration")

Conductivity	
Calibration	60 mS/cm or 600 µS/cm Calibration with the calibration solution or or comparative measurements
Temp. Offset	Temperature calibration of the integrated temperature sensor in the conductivity sensors

Temperature	
Date of last calibration	Date and time Calibration history (press „Date of last calibration")
Cal. value	Temperature calibration for entry after comparative measurement

Example "Chlorine calibration"

Main menu
Symbol „Settings menu" or Menu field Measurement
CHLORINE CALIBRATION

To perform the desired calibrations, proceed as follows:

1 Press the menu **CAL** Calibration in the System menu or the **CAL** symbol in the menu Measurement. The menu "Calibration" opens.

Calibration selection (example „Zero point")
ZERO POINT

2 Press the desired calibration selection. The example here shows chlorine zero point calibration. A further screen opens with information describing the calibration process.
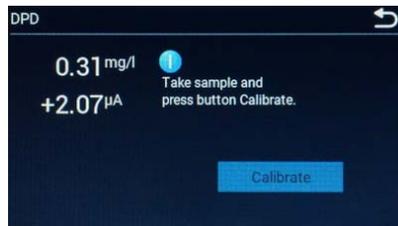
NOTICE

Other calibration selections are performed in a similar way and are not described individually.

Button „Calibrate"
INPUT FIELD

3 Press the "Calibrate" button to open the input menu.

4 Enter the desired values in the input field and save with the Enter key.

5 Make any further entries (e.g. DPD).

NOTICE

NSF 50 Compliance Notice

To be within NSF 50 certification compliance, the following calibration instructions must be adhered to: After initial start-up of the Blu-Sentinel SE controller, the free chlorine sensor must be calibrated when the chlorine grab sample measurement result is within plus or minus 0.20 mg/l of the desired free chlorine control setpoint to be within NSF/ANSI 50 compliance. The free chlorine sensor must be recalibrated thereafter if the grab sample measurement result used for the previous calibration differs by more than plus or minus 1.5 mg/l from the free chlorine measurement displayed on the controller.

6.3.3   Menu "Inputs and outputs"

The digital inputs and the mA outputs are configured in the "Inputs and outputs" menu.

Main menu
    Symbol „System menu"
        Menu „Inputs / Outputs"
            INPUTS / OUTPUTS

☰ Inputs / Outputs	↩ 🏠 ⚠¹ 👤 🗓 08:35
Settings	
Digital inputs	
Cl2/pH tank monitoring	Off
DI 1	Sample water STOP
DI 2	Enabled
DI 3	Disabled
DI 4	Disabled

Proceed as follows:

1 Switch to the main display.

2 Press the ☰ symbol.

3 Press the menu ▊O Inputs / Outputs.

4 Press the desired menu "Digital inputs" or "mA outputs". The following settings can be realized:

Digital inputs	Settings
Cl$_2$/pH tank monitoring	On/Off This parameter is used to switch the min. and empty fill level monitoring for the chlorine and pH tank (acid or alkali). With this function, digital inputs 3 and 4 are used for recording of the tank minimum fill level. Digital input 5 is used as an empty signal input (see Chapter 9. "Wiring diagrams" - Digital inputs). If this function is not used, digital inputs 3 to 5 are freely assignable. When the minimum fill level is reached, an error message appears in the message window. When the empty level is reached, dosing switches off and an error message appears in the message window.
DI 1	Measurement Stop (cannot be changed)
DI 2	Disabled, Enabled, Controller Stop, Standby
DI 3	Disabled, Enabled, Controller Stop, Standby
DI 4	Disabled, Enabled, Controller Stop, Standby
DI 5	Disabled, Enabled, Controller Stop, Standby

Explanation of digital input settings	
Disabled	Changes at the digital input have no effect.
Enabled	Changes at the digital input have an effect if they are used in the alarm configuration. Active = contact open at digital input
Controller Stop	The controllers switch to Stop (Dosing off) if the digital input is opened (e.g. Circulation off).
Standby	All controllers switch to Dosing off if the digital input is opened. The measured value display is hidden. Standby is used when circulation is switched off and no sample water is flowing through the flow cell.

mA outputs 1 / 2 / 3 / 4	Settings
mA output	off, 0 ... 20 mA, 4...20 mA
Measurement	Chlorine, pH, ORP, Temperature
Signal	Measured value, Yout

Example:
To transfer a measurement signal, e.g. Chlorine, via the mA output, the following setting is required:

mA output	Settings
mA output	0/40 ... 20 mA
Measurement	Chlorine
Signal	Measured value

NOTICE

The settings menus for the mA outputs are only displayed with an installed mA output card.

6.3.4   Menu "Alarm configuration"

Alarms 1 to 8 are configured in the "Alarm Configuration" menu. The Blu-Sentinel SE allows you to set various alarm configurations. It is not necessary to assign a relay switching function to every alarm. An alarm can also be used as an alarm message without a relay. The number of available relays that can be used as alarm relays depends on the dosing output. The use of relays for dosing output takes priority. For example, if analog mA is used as dosing output for chlorine, relays K1 and K2 can be used as alarm relays. If dosing pump 2 is used for chlorine dosing, relay K1 can be used as an alarm relay. The pH dosing output also influences the assignment of alarm relays. K3 and K4 can be used as alarm relays if they are not used for dosing output.

When the alarms become active, they are displayed in color via the message symbol ⚠ and shown in the display area for alarms as an alarm symbol. Pressing the message symbol ⚠ opens the message window. Here, the alarm is displayed with time-stamp and description. Alarms that can be acknowledged can be confirmed by pressing the green Acknowledge button ACK in the message window.

Main menu
  Symbol „Settings menu"
    Menu „Alarm configuration"
      ALARM CONFIGURATION

Proceed as follows:

1 Switch to the main display.

2 Press the ☰ symbol.

3 Press the menu "Alarm configuration". See also Chapter 3.6.5 "Alarms".

4 Enter the desired setting. The following alarm events can be realized:

Alarm 1/2/3/4	Setting
Name	A customer-specific alarm name can be defined. This name is displayed in the message window (main menu) when the alarm becomes active.
Assignment	Assignment of the alarm cause. All min. or max. limit values, digital inputs, errors (general) can be assigned as alarm causes. Multiple assignment is possible.
Acknowledge	Input specifies whether an alarm is defined as an alarm without acknowledgment, an alarm with simple acknowledgment or acknowledgment with Reset.
Delay time	Switch-on delay time.
Relay	Disabled 1/2/3/4/5/6
Relay function	Normally Open / N.O Normally Closed / N.C

6.3.5   Menu "Login"

Log in on the desired user level in the "Login" menu.

Main menu
    Symbol „Settings menu"
        Menu „Login"
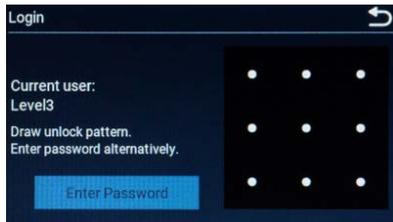
LOGIN

To access the Login menu, proceed as follows:

1   Switch to the main display.

2   Press the ▤ symbol.

3   Press the menu ◫ Login. The "Login" menu opens.

4   Enter locking code or password.

NOTICE

Depending on the user administration configuration
(see Chapter 6.3.8 "Menu "User administration""), three user
levels with different rights are available. You can enter either a
locking code or a password. The currently logged in user is also
displayed in this screen. If the locking code entry is corrected,
the pattern is displayed in green. If an incorrect locking code is
entered, the pattern is displayed in red. If the user data can no
longer be found, please contact your service partner.

6.3.6   Menu "Settings"

The device settings not relating to measured values are configured
in the "Settings" menu.

Main menu
    Symbol „Settings menu"
        Menu „Settings"

SETTINGS

Proceed as follows:

1   Switch to the main display.

2   Press the ▤ symbol.

3   Press the menu "Settings".

4   Enter desired settings. The following settings must be entered:

   •   System
   •   Connections
   •   Backup and Reset

System	
Setup	
Control	
pH control	On/Off Disabled or enabled the pH control function
Conductivity control	On/Off Disabled or enabled the conductivity control function
Disinfection controller	Defines which measurement should be used for control of Chlorine. This paremeter is used to select the type of chlorine control (ORP or chlorine). ORP: The chlorine dosing is based on the ORP measurement and an ORP setpoint. Chlorine: The chlorine dosing is based on the chlorine measurement and a chlorine setpoint.
pH controller	On/Off Selection to enable/disable pH control.
Measurement	
Disinfection	Off, Chlorine measured, Chlorine derived Defines if the displayed chlorine value is measured (only if Cl_2 probe is installed) or calculated based on the ORP measurement. Off means no chlorine value is displayes.
pH	Off/On Enables or disables the pH measurement.
ORP	Off/On Enables or disables the ORP measurement.
Conductivity	On/Off Disabled or enabled the conductivity measurement function (only by installed sensor measuring module conductivity)
General	
System name	Freely definable
Language	German/English/French/Italian/Croatian/Dutch/Japanese/Czech

Hold function	On/Off The hold function is used to either buffer all measured values or keep them constant during calibration. This prevents the output of invalid control signals by the sensor during the calibration process and also the output of erratic values from measurements via mA-signal and communication interfaces. The function is enabled when the calibration menu is opened and disabled when the menu is closed.
Display	
Brightness	0...100 %
Screensaver	Off, 30 sec, 1/5/15/30 min, 1 h
Color scheme	Design 1...5
Main display	Standard/narrow Selection of the measurement arrangement in the main display when using the conductivity measurement
Calibrate LED	This setting can be used for white balance of the LED glow stick color if color deviations occur. Red: 50...100 % Green: 50...100 % Blue: 50...100 %
Date/Time	
Date	
Time	00:00 ... 24:00 / 00:00 ... 12:00
24h Format	On/Off
Safety	
Sample water delay time	00:00 ... 10:00 min The sample water delay time determines the time after which dosing is deactivated, e.g. in the event of sample water Stop. While the delay time is running, "Const." is displayed in the Automatic symbol.
Feed delay time	00:00 ... 120:00 min The feed delay time delays the start of dosing when the device is switched on, after switch-on, when the operating mode has been changed, after Controller Stop or Standby. The rundown of the selected time can be interrupted by selecting the "Start now!" button.

Max. dosing time	00:00 ... 10:00 h The maximum dosing time determines the length of time in which all control outputs must reach their setpoint in the range of the adjusted parameter „Monitoring hyseresis". The controller outputs are switched off after this time. When the setting is "00:00:00," this function is switched off.

NOTICE

Disabling the overfeed timer by setting the maximum dosing time to 00:00 will void the NSF certification.

Monitoring hysteresis	2 ... 50 % This parameter defines a range around the setpoint for the max. dosing time observation.
Safety MAN. mode	Stops dosing with sample water stop or external stop.
Cl_2 feed lockout	On/Off If this function is switched on, chlorine dosing switches off automatically if the pH value deviates too far from the pH setpoint. The switch-off limits are defined by the pH setpoint and the parameter "Switch-off range." Example: Setpoint = 7.20 pH Switch-off range = 0.40 pH Chlorine dosing switches off at: pH value > 7.20 + 0.40 = 7.60 pH or pH value > 7.20 - 0.40 = 6.80 pH
Lockout span +/-	0.2 ... 1.5 Defines the permissible deviation from the pH setpoint for Cl_2 feed lockout.

User administration	
Access control	This parameter is used to switch the user administration on and off. Disabled = no user administration, all parameters can be changed without entering a password Enabled = user administration enabled, password protection or Level 1, 2 and 3 can be configured
Level 3	If access control is enabled, as least Level 3 must be used or configured. Level 3 comprises read and write access to all setting parameters of the device.
Unlock pattern	Menu for entry/definition of a Level 3 unlock pattern. The entry must be repeated as confirmation.
Password	Menu for entry/definition of a Level 3 password. The entry must be repeated as confirmation.
Level 2	If access control is enabled, Level 2 can be enabled or disabled. Level 2 allows access to setting parameters such as limit values, setpoint, date, time and calibration. If Level 2 is enabled, an unlocking pattern and/or a password must be defined.
Unlock pattern	Menu for entry of a Level 2 unlock pattern. The entry must be repeated as confirmation.
Password	Menu for entry of a Level 2 password. The entry must be repeated as confirmation.
Level 1	If access control is enabled, Level 1 can be enabled or disabled. Level 1 allows access to calibration. If Level 2 is not enabled, access to limit values and setpoints is also possible on Level 1. If Level 1 is enabled, an unlocking pattern and/or a password must be defined.
Unlock pattern	Menu for entry/definition of a Level 1 unlock pattern. The entry must be repeated as confirmation.
Password	Menu for entry/definition of a Level 1 password. The entry must be repeated as confirmation.

NOTICE

For a detailed description of the user administration, see "Menu
"User administration"" on page 124.

Connections	
Network	
IP address	Enter a fixed IP address (if necessary, contact network administrator)
Subnet mask	Enter the subnet mask (if necessary, contact network administrator)
Gateway	Gateway setting
DHCP	On/Off If the „DHCP" is set to „On", the network configuration determines a DHCP-server automatically. It is not possible to configure manually. Network configurations are displayed. If the „DHCP" is set to „Off", the network configuration must be configured manually.
Status	☐ Http ☐ Modbus ☐ UPD
RS485 Interface	
Function	Select the RS485 interface function. The RS485 interface supports the bus communication with the Process Monitoring System or other superordinate systems that support the RS485-WT protocol. Various operating modes are integrated to be compatible with old devices. RS485-WT protocol (new address reference list). RS485 PCS plus (1) (address reference list is compatible with the PCS plus 1-address operation) RS485 PCS (3) (address reference list is compatible with the PCS 3-address operation)
Bus address	Bus address setting at the RS485 Interface (RS485 WT) 00...31
Bus address 1 Bus address 2 Bus address 3	Bus address setting at the RS485 Interface PCS (3) operating mode for Cl_2 (1), pH (2) and ORP (3) 00 ... 31
Status	☐ RxD ☐ TxD ☐ Active ☐ Error

Backup and Reset	
Reset to factory settings	Under Reset to factory settings, the device can be reset to the factory settings. When the factory settings have been restored, the reset settings have to be entered again. You can select which settings are to be reset.
Reset measurement & control parameters	☑ ☐
Reset system settings	☑ ☐
Reset user administration	☑ ☐
Reset dosing average	☑ ☐

NOTICE

To reset the selected setting to the factory setting, press the "Execute" button.

6.3.7 Menu "Information"

Various device features, e.g. the installed software version, are described in the "Information" menu.

6.3.8 Menu "User administration"

The device offers the option of using up to three user levels. Different rights are assigned to each user level. The colored user symbol (A) in the main menu shows on what level the user is logged in.

Image 2   Main display (example Chlorine)

A   User administration display

NOTICE

The user administration of the web visualization via Internet browser differs from the user administration on the display or on the device itself (see Chapter 6.4 "Web visualization").

The following user levels are possible in the main menu:

Symbol	Explanation
No symbol	User logged out, read rights for all settings and change of operation mode No symbols are displayed also with disabled access control; in this case, write access to all settings is possible.
User symbol white = Level 1	User logged in on Level 1, read rights for all settings, sensor calibration and change of user
User symbol yellow = Level 2	User logged in on Level 2, read rights for all settings, sensor calibration, change of operation mode, change limit values and setpoints and change date and time
User symbol blue = Level 3	User logged in on Level 3, read rights for and write access to all device settings

NOTICE

In as-delivered status, access control and user administration are switched off. We recommend that you enable access control after commissioning and create the desired users.

Login

Proceed as follows to log in:

Main menu
    Symbol „Settings menu"
       Menü „Login"
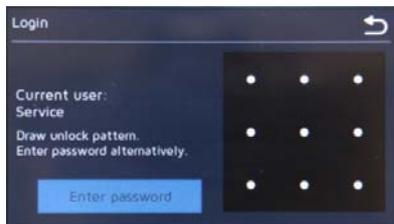
LOGIN

1 Switch to the main display.

2 Press the ☰ symbol.

3 Press the "Login" menu.

4 Enter locking code or password. See Chapter 6.3.5 "Menu "Login"".

Symbol „Settings menu"
    Symbol „Logut" and Menu „Login-Level"

Logout

Proceed as follows to log out:

1 Press the ▣ user symbol. The user is logged out and the user symbol is no longer displayed.

Create users

In order to create or change the users, log in on Level 3 is required and access control must be enabled. Proceed as follows:

1 Switch to the main display.

2 Press the ☰ symbol.

3 Press the ⬢ menu "Settings".

4 Press the "User administration" parameter.

5 Set the parameter "Access control" to "On".

6 To define or change a password or locking code, the password "3000" (factory setting for Level 3) must be entered.

As an alternative, Level 1 and Level 2 can be enabled. However, this is not mandatory. If Level 1 or Level 2 are not enabled, the device must be operated via the next highest user level.

NOTICE

When access control is disabled, all passwords and locking codes entered are deleted. "3000" is therefore again enabled as the Level 3 password.

---
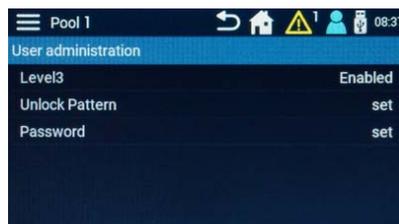
7 Press the desired parameter Level 1/Level 2 or Level 3 to enable or change the desired Level, 1, 2 or 3. The screen changes to the settings menu for the corresponding level (Example: Level 1).

The parameter Level 1/Level 2 or Level 3 is used to enable or disable user level 1,2 and 3. Enter the setting "enabled" to use the Level. After enabling, an unlock pattern and/or password for login must be defined (at least one of these two login options must be set).

To enter an unlock pattern, proceed as follows:

1 Press the "Unlock pattern" parameter.

2 Define unlock pattern using the 9 points displayed.

3 Press the "Retry" button to correct your entry.

4 Press the "Next" button to confirm the entry a second time.

5 Enter the same pattern again and save with the "OK" button. The unlock pattern is now set and valid.

To enter a password, proceed as follows:

1 Press the parameter "Password".

2 Enter the desired password via the input keypad.

3 Confirm with the Enter key.

4 Enter the same password again.

5 Confirm with the Enter key.

6 Press the "OK" button to save the changes. The password is now set and valid.

6.4   Web visualization

The web views integrated in the Blu-Sentinel SEBlu-Sentinel SE allow you to visualize the measurements and setting parameters via a standard browser and Internet-capable devices.
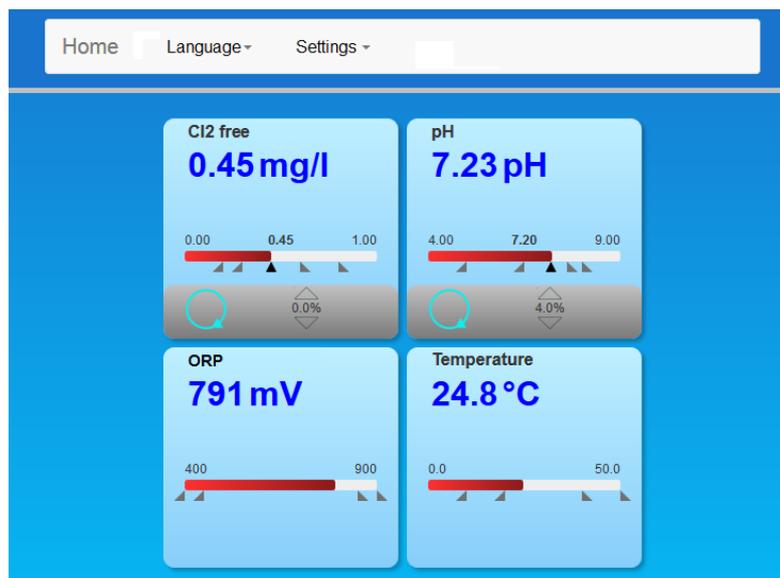
Image 3   Blu-Sentinel SE web visualization view

NOTICE

When alarms or errors are activated, a yellow or red message symbol is displayed in the menu bar. The activated alarms or erros are displayed by touching the message symbol.

The menu bar is divided into two main menus:

- Language
- Settings

6.4.1   User administration via web visualization

User administration via web visualization comprises two levels. At the factory, these two user levels are disabled and preset to "0". For security reasons, the user levels must be enabled during commissioning. The padlock symbol in the menu bar shows whether the user is logged in. Depending on the specific user, the various menus are shown or hidden.

Image 4   Web visualization view in Login Level 2

Symbol	Explanation
Padlock symbol red, closed 🔒	User logged out, read rights only
Padlock symbol black, open 🔓	User logged in on Level 1 or 2
No padlock symbol	User administration not enabled

Login   Proceed as follows to log in:

1 Press the red padlock symbol. Login window for password entry opens.

2 Enter password.

3 Confirm with the "Save" button.

Logout   Proceed as follows to log out:

1 Press the black padlock symbol. User is logged out.

Enable user levels   To enable the user levels, proceed as follows:

1 Open menu "Settings" - "Configure user administration".

2 To change/enable the password on Level 1, click the value for the Level 1 password. The input menu opens.

3 Enter a combination of numbers and letters with a maximum of ten characters.

4 Confirm with the "Save" button.

5 To change/enable the password on Level 2, click the value for the Level 2 password. The input menu opens.

6 Enter a combination of numbers and letters with a maximum of ten characters.

7 Confirm with the "Save" button.

> **NOTICE**
>
> To define or change the passwords at a later time, Login on Level 2 is required. To disable the passwords, define the password as "0".

The following settings can be configured from the „Settings":

Parameter Cl2 free	
Setpoint	within measurement range
Xp	1...1000
Tn	0...100.0 min
Limit Max 1	within measurement range
Limit Min 1	within measurement range
Limit Max 2	within measurement range
Limit Min 2	within measurement range
Parameter pH	
Setpoint	within measurement range
Xp	1...1000
Tn	0...100.0 min
Limit Max 1	within measurement range
Limit Min 1	within measurement range
Limit Max 2	within measurement range
Limit Min 2	within measurement range
Parameter ORP	
Setpoint	within measurement range
Xp	1...1000
Tn	0...100.0 min
Limit Max 1	within measurement range
Limit Min 1	within measurement range
Limit Max 2	within measurement range
Limit Min 2	within measurement range

Parameter Conductivity	
Setpoint	within measurement range
Xp	1...1000
Tn	0...100.0 min
Limit Max 1	within measurement range
Limit Min 1	within measurement range
Limit Max 2	within measurement range
Limit Min 2	within measurement range
Parameter Temperature	
Setpoint	within measurement range
Xp	1...1000
Tn	0...100.0 min
Limit Max 1	within measurement range
Limit Min 1	within measurement range
Limit Max 2	within measurement range
Limit Min 2	within measurement range
System	
System name	Customizable, customer-specific device name
Date	Date setting
Time	00:00...24:00
Software version	Display software version
Software number	Display software number
Serial number	Display device serial number
IP configuration	
IP	Enter a fixed IP address (if necessary, contact the network administrator)
Subnet mask	Enter the subnet mask (if necessary, contact the network administrator)
Gateway	Gateway setting
Mac	Display the device Mac address
IP password	124 In order to change the IP address of the device via the web visualization, the IP password must first be set to "124."

IP link 1...3	Enter the IP address for up to three devices with the integrated web visualization. These devices can then be called directly from the selection menu ▮ (top left of the web view) via the name Link 1...3.
Name link 1...3	Freely configurable menu name for the devices of the IP link 1...3. A maximum of three IP links is possible. This name is displayed in the menu. See example:
Menu IP link ⋮	
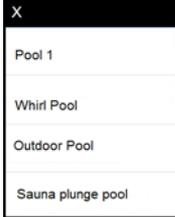
NOTICE

If several Blu-Sentinel SE devices are connected via IP link, enter the IP address followed by „/main.shtml".
Example: 192.168.200.12/main.shtml

6.5   Firmware update

The firmware for the device is updated using a commercially available USB stick. The memory size should be at least as large as the firmware file itself. For a firmware update, the firmware file "*.SREC" and the file "Bootload.ini" must be copied to the USB stick. Do not use subdirectories.

NOTICE

A firmware update can be downloaded free of charge from the homepage of Evoqua Water Technologies GmbH.

Risk of injury or damage to the device!

Only authorized and qualified electricians are permitted to connect the Blu-Sentinel SE electrically and to open the housing.

⚠ DANGER

Risk of injury or death!

External voltages may still be connected even if the operating voltage is switched off.

Proceed as follows:

1 Disconnect the electronics module from the power supply.

2 Remove the housing cover of the electronics module. To do this, release the four screws on the housing cover and remove the cover carefully. Hook into the housing cover into the holders on the basic housing.

3 Insert the USB stick into the USB port (A).

4 Switch on mains voltage.

5 Using an insulated screwdriver or similar tool, briefly press the Update button (B) on the motherboard.

6 The update takes approximately 1 to 2 minutes. The LED flashes green while the update is in progress.

7 The update is complete when the green LED no longer flashes.

8 The USB stick must now be removed.

9 Close the housing cover of the electronics module again. To do this, place the housing cover carefully on the basic housing. Tighten the four housing screws to a maximum torque of 0.7 Nm (± 0.15 Nm).

10 Switch the device on.

11 All settings must now be entered again. See Chapter 5.6 "Startup".

12 If necessary, calibrate the sensors.
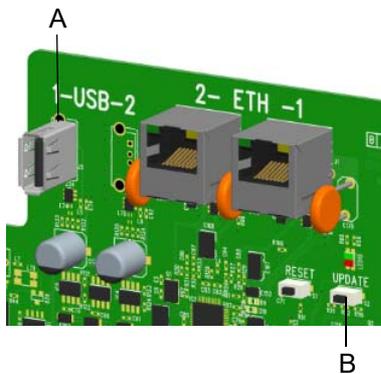
6.5.1   LED glow stick color signaling

The color of the LED glow stick switches between white, yellow
and red depending on the operating state.

The different colors have the following meanings:

White	• All OK. • The device is working trouble-free. • No active errors or currently no message in the message system.
Yellow	• Alarm that is configured as "unlatched" has been activated. As soon as the cause was rectified and the alarm is inactive, the yellow color signal changes again. • Fault message became active (only with activated container monitoring and if the Min message from the Cl_2 or pH container is present).
Red	• Error message present. • Alarm that is configured with acknowledgment has been activated.

NOTICE

The white color of the LED glow stick is possible to calibrate in
case of color deviations, see Chapter 6.3.6 "Menu "Settings"".

6.6   Calibration

When calibrating the measurements, variations in the calibration
solutions, buffer solutions or comparative measurements are
adjusted. Calibration is performed for new devices (first commis-
sioning) and to recalibrate existing measuring instruments in
accordance with maintenance regulations. See also Chapter 6.3.2
"Menu "Calibration"" and Chapter 5.5 "Electrical installation".

NOTICE

Calibration must be carried out on first commissioning.
The calibration intervals are defined depending on the area of
application and water quality. Please observe the prescribed
maintenance intervals.
Calibration history (Chapter 6.3.2)

NOTICE

Before calibration of the pH or redox value, the ball valves on the sample water inlet and sample water outlet must be closed and the pressure released. Open the ball valves again after calibration.

⚠ CAUTION

Damage to sensor!
Electrodes are highly sensitive! Do not soil or damage!
Comply with the safety data sheets for the buffer solutions or calibration solutions.

6.6.1   Chlorine calibration

Free chlorine (Cl2) calibration

During calibration for free chlorine, a zero point calibration and a measured value calibration (DPD1) must be carried out.

NOTICE

To prevent non-permissible control signals being output during calibration, the "Hold function" in the system menu should be set to "On". mA-outputs and controller outputs then remain constant as long as a calibration menu is open.

Zero point calibration

System menu
  Calibration
    CHLORINE MEASUREMENT MENU

Proceed as follows:

1 Press the ▤ symbol.

2 Press the menu 🔲 Calibration.

3 Tap the measurement "Chlorine".

4 Press the parameter "Zero point".

5 Close the ball valve on the sample water inlet.

NOTICE

Make sure that the chlorine sensor is firmly screwed in. Otherwise the measurement accuracy will be affected by inhomogeneous flow and inadequate sand cleaning.
When the sample water supply has been stopped, the display first drops rapidly, and after approximately one minute slowly approaches zero. During first commissioning, it is essential to wait for 5 minutes, even if the display shows "0.00" or flashes after a few seconds.

6 Wait until the displayed chlorine value no longer changes.

7 Press the "Calibration" button. An input field opens.

8 Press "Enter" to save the zero point.

9 Open the ball valve on the sample water inlet.

Measuring value calibration (DPD)

10 After zero point calibration, wait at least 2 minutes.

11 Open the flow cell drain (drain) by approximately 1 turn and extract a specimen of the sample water.

12 Determine the content of free chlorine in the sample using a photometer.

13 Press the parameter "DPD".

14 Press the "Calibration" button. An input field opens.

15 Use the input keys to enter the determined value.

16 Press "Enter" to save the entry.

This concludes the calibration for free chlorine.

6.6.2   pH calibration

> **NOTICE**
>
> During pH calibration, the buffer solution and the sample water should have the same temperature. If there is a temperature difference of > 8 °C, first bring the buffer solution to the same temperature as the pool water.

System menu
Calibration
PH MEASUREMENT MENU

Proceed as follows:

1 Press the ▤ symbol.

2 Press the menu **CAL** Calibration.

3 Tap the measurement "pH".

pH 7 calibration

4 Press the parameter "pH 7".

5 Close the sample water inlet and sample water outlet and briefly open the flow cell drain (drain) to release the pressure. Close the flow cell drain (drain) again.

6 Place the beaker into the bottom clip and fill with buffer solution "pH 7.00" or clamp the bag with buffer solution "pH 7.00" into the bottom clip.

7 Unscrew the pH sensor from the flow cell.

8 Dip the pH sensor through the top clip at least 2 cm deep into the buffer solution and move slightly until the indicated pH value remains constant.

9 Press the "Calibration" button. An input field opens.

10 Use the input field to enter the value to be calibrated for the buffer solution.

11 Press "Enter" to save the entry.

pH X-span calibration   **12** Remove the buffer solution "pH 7.00" from the bottom clip.

13 Wash the sensor in distilled water to prevent carryover of buffer solution.

14 Press the parameter "pH X".

15 Place the beaker into the bottom clip and fill it with buffer solution "pH 4.65" or clamp a bag with buffer solution "pH 4.65" into the bottom clip.

NOTICE

If buffer solutions other than those stated are used, the pH value of the buffer solution must be lower than pH 6 or higher than pH 8.

16 Dip the pH sensor at least 2 cm deep into the buffer solution and move gently until the indicated pH value remains constant.

17 Press the "Calibration" button. An input field opens.

18 Use the keypad to enter the value to be calibrated.

19 Press "Enter" to save the entry.

20 Remove the pH sensor from the top clip.

21 Screw the pH sensor into the cover of the cell body of the flow cell.

22 Open the sample water inlet and outlet again.

The pH measurement has now been calibrated.

Offset compensation   If external influences result in a constant difference between the displayed pH value and a pH value measured manually, this difference can be compensated and the comparative value entered in the Offset menu.

System menu
   Calibration
      pH measurement menu

OFFSET   Proceed as follows:

1 Press the ▤ symbol.

2 Press the menu CAL Calibration.

3 Tap the measurement "pH".

4 Press the parameter "Offset".

5 Use the keypad to enter the value from the comparative measurement.

6 Press "Enter" to save the entry.

    This concludes the pH offset.

NOTICE

The offset entry is deleted each time a new pH 7 calibration or span calibration is performed.

6.6.3   ORP calibration (Redox)

> **NOTICE**
>
> ORP sensors have long running-in times. This means that after calibration with calibration solution, it can take several hours for the measured value to stabilize.

System menu
  Calibration
    ORP (REDOX) MEASUREMENT
                       MENU

Proceed as follows:

1 Press the ▤ symbol.

2 Press the menu **CAL** Calibration.

3 Select the "ORP" measurement menu.

4 Press the parameter "Cal. value".

5 Place the beaker into the bottom clip and fill it with calibration solution "478 mV" or clamp a bag with calibration solution "478 mV" into the bottom clip.

6 Close the sample water inlet and sample water outlet and briefly open the flow cell drain (drain) to release the pressure. Close the flow cell drain (drain) again.

7 Screw the ORP sensor into the cover of the cell body of the flow cell.

8 Dip the ORP sensor through the top clip at least 2 cm deep into the calibration solution and move it slightly until the indicated pH value remains constant.

9 Press the "Calibration" button. An input field opens.

10 Use the keypad to enter the value to be calibrated.

11 Press "Enter" to save the entry.

12 Remove the ORP sensor from the top clip.

13 Screw the ORP sensor into the cover of the cell body of the flow cell.

14 Open the sample water inlet and outlet again.

This concludes the ORP calibration.

6.6.4   Conductivity calibration

NOTICE

Conductivity sensors have no running-in time. When calibrating with calibration solution, it must be noted that it takes several minutes for the temperature measurement of the conductivity sensor to become stable.

Depending on the area of application, use appropriate calibration solution:
Calibration solution 600 µS/cm => conductivity measurement in µS/cm
Calibration solution 60 mS/cm   => conductivity measurement in mS/cm

Furthermore, a measuring range must be set before calibration, which is suitable for calibration solution used:

Calibration solution 600 µS/cm: select measuring range 1000 µS/cm or 2500 µS/cm.
Calibration solution60 mS/cm: select measuring range 100 mS/cm or higher.

Alter calibration, the orignal measuring range can be adjusted again.

System menu
    Calibration
      CONDUCTIVITY MEASUREMENT
                    MENU

Proceed as follows:

1 Press the ▤ symbol.

2 Tap the 🄲🄰🄻 Calibration menu.

3 Select the "Conductivity" measurement menu.

4 Tap the parameter "Calibration."

5 Place the beaker into the bottom clip and fill it with calibration solution. The corresponding calibration solution must be used, depending on whether the conductivity is measured in µS/cm or mS/cm (for µS/cm => 600 µS/cm or for mS/cm => 60 mS/cm).

6 Close the sample water inlet and sample water outlet and briefly open the sample extraction unit (drain) to release the pressure. Close the sample extraction unit (drain) again.

7 Release the clamp connection of the conductivity sensor and remove the conductivity sensor from the cover of the cell body of the flow cell module.

8 Dip the conductivity sensor into the calibration solution through the top clip and move it slightly until the indicated pH value remains constant.

9 Press the "Calibration" button. An input field opens.

10 Use the keypad to enter the value to be calibrated.

11 Press "Enter" to save the entry.

12 Remove the conductivity sensor from the top clip.

13 Screw the conductivity sensor into the cover of the cell body of the flow cell module and tighten the clamp connection.

14 Open the sample water inlet and outlet again.

15 The conductivity electrode has its own integrated temperature sensor. Variations in the conductivity temperature measurement can be adjusted via the menu Tem.Offset.

This concludes the conductivity calibration.

6.6.5 **Temperature calibration**

System menu
  Calibration
    TEMPERATURE MEASUREMENT
                          MENU

Proceed as follows:

1 Press the ☰ symbol.

2 Press the menu CAL Calibration.

3 Tap the measurement "Temperature".

4 Press the parameter "Cal. value".

5 Perform comparative temperature measurement.

6 Use the keypad to enter the value to be calibrated.

7 Press "Enter" to save the entry.

This concludes the temperature calibration.

6.7   Faults and remedies

6.7.1   Messages, alarms and errors

Messages, alarms and errors are displayed on the electronics module with the colored message symbol ⚠ . Error messages can occur that can be acknowledged or that can not be acknowledged. If several messages occur at the same time, the number of messages appears next to the symbol. Press the message symbol ⚠ to display the message window. Configured alarms, messages that can be acknowledged and errors are displayed as clear text. A time-stamp shows when the message was activated.

Acknowledgeable messages

They are acknowledged via the message window and the green ACK button. It is also possible to acknowledge the fault messages (green ACK button) via website. To do this, a password must be assigned for "Password 2" in the user administration of the website and the user must be logged in.

Error message	Cause	Remedy
Maximum dosing time?	The maximum dosing time set for a control output has been exceeded.	Determine the cause, e. g. chemical tank empty. Check the dosing pump.
Auto tune error	Auto tune terminated with error.	See Chapter 3.6.6 "Auto tune (only applies to disinfection control = chlorine)".

Non-acknowledgeable messages and errors

Error messages can only be rectified by eliminating the cause.

Error message	Cause	Remedy
Measured value display flashes	Measured value is outside the measurement range.	Check measurement range and change, if necessary. Check dosing or controller settings.
DI 1 flashes	Sample water flow rate recently insufficient (delay time running).	Check the sample water flow rate (approx. 33 l/h).
DI 1	Sample water flow rate insufficient for some time (delay time elapsed).	Clean or replace strainer. Multi-sensor incorrectly connected or defective.
DI 2 DI 3 DI 4 DI 5	Digital input 2 active Digital input 3 active Digital input 4 active Digital input 5 active	Check the cause depending on the use of digital input 2 and 5, e.g. circulation off, remedy fault in the circulation, chemical tank empty, change tank.
Zero point calibration ?	Chlorine Sensor: Zero current of sensor > +5 µA or < −5 µA	Upot potential voltage set incorrectly; change if necessary. Electrodes of chlorine sensor are dirty, if necessary clean / service. Sample water is not turned off or check valve leaks; turn off sample water if necessary.
DPD calibration ?	Slope error The current difference required for span calibration over the entire measurement range was less than the minimum value. Range: Minimum current difference	Check chlorine sensor. Clean electrodes. Check the pH value of the water (< pH 8).
	Organic chlorine compound (e.g. chlorine stabilizer chloroisocyanurate) in the water.	Do not add any chlorine stabilizers to the water.
	Chlorine sensor: Slope error - the sensor current based on 1 mg/l has fallen below the required minimum.	Clean chlorine sensor, replace cleaning sand.
Conductivity Temperature error ?	Temperature sensor conductivity sensor defective, not connected or incorrectly connected.	Check sensor, wiring or connector.

Error message	Cause	Remedy
Module Communication ?	Card of Redox or conductivity sensor is defective.	Check sensor card, if the card is correctly installed.
pH7 calibration ? pHX calibration ? Calibration ? Offset calibration ?	pH: In pH 7 calibration, the sensor signal is outside the range -100 to +100 mV or the sensor issues a signal outside the range 46 to 70 mV per pH increment, the calibration point distance is smaller than 1 pH increment.	Check the electrode. Check buffer solutions, replace if necessary.
	mV: The mV sensor correction offset is outside the range –50 to +50 mV.	Check the electrode. Check calibration solutions, replace if necessary.
	Conductivity: Slope > 1.4 or < 0.6	Offset error in case of a temperature calibration.
Factory calibration ?	Hardware or electronic error	Contact Service.
Setpoint ?	Due to modification of the measurement range, the controller setpoint is outside the range.	Reset the controller setpoint or adjust the measurement range.
Limit value ?	Due to modification of the measurement range, the limit value is outside the range.	Reset the limit value or adjust the measurement range.
Temperature error ?	Interruption in the temperature sensor or cable of the multi-sensor.	Check multi-sensor and cable.
mA Output 1 ? mA Output 2 ? mA Output 3 ? mA Output 4 ?	Load error The mA output cannot drive its mA output current through the connected current loop (500 ohm at 20 mA max.).	Check whether the mA signal is required at all (e.g. for plotter). If not, switch off the output signal in the "INPUTS/OUTPUTS" menu, "Analog output". Check mA signal cable for interruption.
Hardware ?	Hardware or electronic error	Contact Service.
Data storage ?	Hardware or electronic error	Contact Service.

Error message	Cause	Remedy
Cell ?	Chlorine sensor: Chlorine sensor not screwed in. No sand cleaning. Sensor, sensor cable or sensor measuring module defective. Sensor measuring module µA measuring range exceeded. pH, F⁻ and mV modules: Sensor, sensor cable or sensor measuring module defective. Conductivity sensor: Sensor, sensor cable or Sensor-measuring module defective, conductivity to high or too low.	Screw in sensor correctly. Check sand cleaning. Check the sensor, sensor cable or sensor measuring module, replace if necessary. Select higher µA measurement range. Check the sensor, sensor cable and sensor measuring module, replace if necessary. Check the sensor, sensor cable and sensor measuring module, replace if necessary.
Cl2 feed lockout activated	Deviation of measured pH value from setpoint greater than the set switch-off range (Cl_2 feed lockout activated). pH tank may be empty pH measurement may be faulty	Check pH dosing Check/replace pH tank Check pH measurement
Auto tune error	See chapter Chapter 3.6.6.	
Maximum dosing time has been exceeded	The maximum dosing time set for a control output has been exceeded	Check measuring water, calibration, dosing pump, chemical storage sensor, sensor cable, measurement.

6.7.2   Messages

Message	Cause	Remedy
pH tank level min. reached!	Suction lance pH min. fill level reached	Replace pH tank
Cl2 tank level min. reached!	Suction lance Cl2 min. fill level reached	Replace Cl_2 tank
Cl2 tank level empty!	Suction lance Cl2 empty fill level reached	Replace Cl_2 tank
pH tank level empty!	Suction lance pH empty fill level reached	Replace pH tank
Sample water	Sample water flow rate too low, dirt filter soiled, sample water inlet or sample water outlet ball valve closed, dirt in inlet, flow control valve or check valve housing.	Open ball valves, clean dirt filter, remove dirt

6.7.3   Faults

The table below shows and explains possible faults. If it is not possible to remedy the fault or error yourself, please contact your affiliate.

Error	Cause	Remedy
No indication on device	No power supply.	Turn external switch or fuse on.
	Device fuse defective.	Check the power supply and replace fuse if necessary (electrician).
Device not showing a measurement.	Sensor measuring module has been changed or added.	Start device again.
Displayed/output value incorrect.	Change on sensor or in the sample water.	Calibrate
Low control quality (controller oscillates, setpoint not reached)	Incorrect controller parameters for Xp or Tn.	Check, adjust controller parameters; perform automatic adaption on single feedback closed-loop control.
	Dosing chemical tank empty.	Fill, replace.
	Incorrect actuator selected.	Check, correct actuator.
	Positioner or pump defective.	Check, replace positioner/pump.
Measured value display not available, although the appropriate sensor measuring module is installed	Sensor measuring module defective or not installed correctly.	Check, replace sensor measuring module (electrician).
Positioner/pump does not work	Positioner in manual mode.	Engage manual knob.
	Dosing device selected incorrectly.	Select correct dosing device.
	Positioner/pump incorrectly connected.	Connect positioner/pump correctly (electrician).
	Relay defective.	Check (electrician).
	Fuse at relay output defective.	Check (electrician), if necessary, replace fuse and eliminate cause.
Positioner runs in wrong direction	Positioner incorrectly connected.	Correct connections (electrician).
Digital inputs without function	Digital inputs not enabled.	Enable digital inputs, assign function.
Relay switches, but no output.	Relay defective. Fuse on relay defective.	Check (electrician), if necessary, replace fuse.

7. Maintenance

Please note

Liability for defects can only be accepted if maintenance work is performed as specified. Only authorized and trained technicians must perform the maintenance. Only qualified electricians must perform work on electrical components. Adhere to the applicable standards and national and regional regulations.

Danger!

Risk of injury or death!

External voltages may be connected even with the operating voltage switched off. Disconnect all power sources before opening the Blu-Sentinel SE.

Line voltage (120/240VAC) can be present inside the electronics module and caution should be used to prevent electrical shock, burns or electrocution. Be sure electric power is disconnected before opening the cover. Follow all local safety policies, procedures and electrical codes, to prevent injury from electrical hazards, before opening the cover of this electronics module. If you are not trained and comfortable performing work on electrical equipment, contact a licensed electrician to perform the work.

7.1   Maintenance intervals

Activity	Period/Interval	Chapter
Cleaning the sensors	regular intervals	See separate instruction manual „Sensors"
Sample water monitoring	regular intervals	7.2
Circulation monitoring	regular intervals	7.3
Check the flow cell, including all screw connections, for leakage	daily	7.4
Comparative measurement of chlorine and pH, if necessary calibration	In acc. with standard or local standards	7.10
Check the electrode cleaning sand	weekly	7.5
Replace the electrode cleaning sand	every six months	7.5
Check ORP in calibration solution	every 4 to 6 weeks or local standards	See separate instruction manual „Sensors"
Check conductivity measurement with comparative measurement and/or calibration solution	every 4 to 6 weeks or local standards	See instructions on sensors
Clean or replace the strainer	as required	7.8
Replace battery of the electronics module	Replace the battery after 5 years	7.11

Please note

The parts required for servicing of the flow cell are included in the maintenance parts kits. Here, we distinguish between maintenance parts kits for wear parts for 1 year and for 4 years. For details, see Chapter 8. "Spare parts, accessories and retrofit kits".

7.2   Sample water monitoring

Danger!

Risk of injury or death

If there is a shortage of sample water or the flow rate is too low, there is a risk of uncontrolled dosing of chemicals. To ensure safe operation and prevent injury, the sample water monitoring must never be disabled.

The sample water monitoring must be checked regularly. Without automatic detection of a shortage of sample water or an excessively low flow rate, there is a risk of uncontrolled dosing of chemicals. Never disable the sample water monitoring - even temporarily, e.g. by bridging the signal input. The sample water monitoring deactivates dosing if there is a shortage of sample water and prevents the uncontrolled dosing of chemicals.

7.3   Circulation monitoring

Danger!

Risk of injury or death

Chemical dosing must switch off if the circulation is switched off or the circulation rate is too low. To ensure safe operation and prevent injury, it is essential to install circulation monitoring.

The circulation monitoring must be checked regularly. A circulation monitoring device must be installed in the unit and connected to the Blu-Sentinel SE. The input used must be configured as "Controller Stop." The dosing of chemicals must switch off if the circulation is deactivated or the circulation output is too low, e.g. dosing switches off with digital input 2 used as "Controller Stop."

7.4   Checking for leakage

Check the entire flow cell every day, including all screw connections, for leakage. Repair any leaks immediately.

Please note

Ascending air bubbles in the cell body influence the measuring accuracy. The cause must be determined and remedied.

7.5   Checking the electrode cleaning sand

At weekly intervals, check that there is enough electrode cleaning sand in the cell body. The cleaning sand must be swirled around in the bottom part of the cell body. The electrode cleaning sand is necessary for cleaning the electrode of the chlorine sensor and must be replenished or replaced if necessary.

7.6   Replacing the electrode cleaning sand

The electrode cleaning sand used for constant cleaning of the chlorine sensor grinds itself down with time. The cleaning sand must be replaced regularly. For details of the procedure, see Chapter 5.4.10 "Inserting Cl2-electrode cleaning sand".

Please note

After adding fresh electrode cleaning sand or replacing it, the electrode current can increase slightly for approximately 2 to 3 hours. Calibration is needed after this. See Chapter 6.6 "Calibration".

7.7 Cleaning the flow rate monitor and check valve

Proceed as follows:

1 Switch off the power supply.

2 Drain the sample water supply line and drainage line.

3 Remove the housing cover of the flow cell.

4 Remove the filter unit. To do this, release both knurled nuts.

5 Carefully pull the complete check valve housing (A) down and out.

6 Turn the check valve housing upside down and catch the flow ball (B) or if the ball is jammed, release it with a slight knock.

7 Now use a suitable blunt tool to push out the ball seat (D) and glass ball (C) against the direction of flow.

8 Clean the empty check valve housing, flow ball, ball seat and glass ball with clear water.

9 During reassembly, make sure that the ball seat and ball are correctly positioned.

10 To help push the assembled check valve housing back into the control valve, we recommend slightly lubricating the gaskets with the Unisilikon grease provided.

11 Check that the check valve housing is correctly positioned by the guide lugs on the housing.

12 Fit the filter unit again. To do this, tighten the knurled nuts.

13 Fit and engage the housing cover of the flow cell.

14 Connect the sample water supply line and drainage line again.

15 Reconnect the power supply.
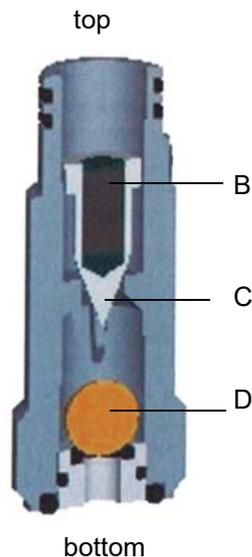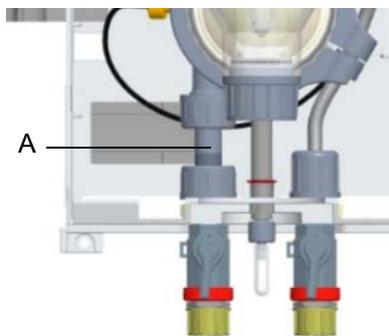
Image 1   Section, installation position of the check valve housing

Image 2   Cross-section of the check valve housing

A   Check valve housing (overall view)
B   Flow ball
C   Ball seat
D   Glass ball

A

top

B

C

D

bottom

7.8   Clean or replace the strainer

The strainer must be cleaned or replaced regularly to avoid con-
tamination or blockages. The frequency of cleaning or replace-
ment depends on the degree of contamination caused by the
sample water.

Proceed as follows:

1   Close the ball valve on the sample water supply and drainage
line. The unit must be unpressurized and drained.

2   Unscrew the strainer and rinse it with water. Catch any water
that emerges in the tank.

3   Remove the strainer screen and rinse it under running water or
replace it.

4   Fit the strainer screen again and reinstall the strainer.

5   Open the ball valve on the sample water supply and drainage
line again.

7.9   Cleaning

Never use corrosive cleaning agents (e.g. spirit, scouring agents)!
We recommend that you use a moist cloth with a neutral
household cleaning agent.

7.10   Changing the fuses on the CPU-board

Warning!

Only authorized and qualified electricians are permitted to open the housing. The electronics module is not equipped with a mains switch.

The mains input and all relays are protected by fuses of type TR5. 3.15 A (slow-blow) fuses are used for the relays and 1.6 A (slow-blow) fuses for the mains input. Spare fuses are included with the accessories.

Danger!

Risk of injury or death!

External voltages may still be connected even if the operating voltage is switched off.

Proceed as follows:

1 Disconnect the electronics module from the power supply and check that it is de-energized.

2 Remove the housing cover of the electronics module. To do this, unscrew the housing cover and remove carefully. Hook into holder on the basic housing.

3 Pull the defective fuse (A) out of the fuse holder and insert new fuse, making sure that the rated data match!

4 Fit the housing cover of the electronics module again. Tighten the housing screws to a maximum torque of 0.7 Nm (± 0.15 Nm).
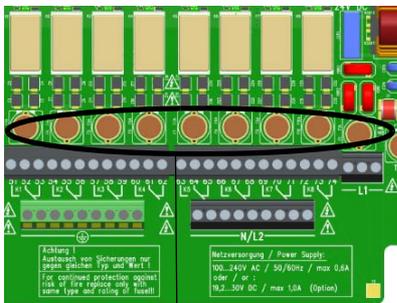
Image 3   Section, electronics module - fuses

A

7.11   Replacing the battery

Warning!

Risk of injury!

Only authorized and qualified electricians are permitted to open the housing. The electronics module is not equipped with a mains switch.

Danger!

Risk of injury or death!

External voltages may still be connected even if the operating voltage is switched off.

The battery is required for the real time clock in case of a power failure. If the time is not correct or if time-controlled functions show faulty behavior, the battery must be changed. After five years at the latest.

1   Disconnect the electronics module from the power supply.

2   Remove the housing cover of the electronics module. To do this, unscrew the housing cover and remove carefully. Hook into holder on the basic housing.

3   Remove the battery from the holder and dispose of it in accordance with the regulations.

Attention!

Environmental hazard!

Do not throw away or burn batteries. The batteries must be disposed of in accordance with environmental protection regulations.

4   Insert the new battery, type CR2032.

5   Fit the housing cover of the electronics module again. Tighten the housing screws to a maximum torque of 0.7 Nm (± 0.15 Nm).

6   Switch on mains voltage.

7   Set date and time, no other settings need to be made.

8. Spare parts, accessories and **retrofit kits**

<div style="border:1px solid #000; display:inline-block; padding:4px;">

NOTICE

</div>

For reasons of safety, only use original spare parts. Please contact our customer service if you need any spare parts.

8.1   Spare parts

8.1.1   Electronics module (module type E02)

Part No.	Description
W3T399970	Electronics module for Cl2/pH, spare part
W3T391867	CPU-board (motherboard spare part)
W3T395076	Operating front panel with cover and display
W3T160551	M20x1.5 hex nut
W2T504179	M20x1.5 cable gland
W2T504212	M20 blind plug
W3T160552	M25x1.5 hex nut
W2T542498	M25x1.5 cable gland for assembly of cables with pre-assembled connectors
W2T833447	Cable gland M20 for sensor cable
W3T172625	Lithium coin cell battery CR2032
W2T821593	RJ45 connection cable CPU-board/HMI
W2T839300	Fuse TR5 3,15A T
W2T839299	Fuse TR5 1,6A T
W3T364410	Sensor cable for chlorine sensor
W3T173161	Sensor cable for pH or ORP sensor
W3T172050	Sensor cable for conductivity sensor
W3T391866	LED glow stick
W3T391865	4-way mA output card
W3T391864	Sensor card for ORP sensor
W3T364409	Multi-sensor
W2T505559	RS485 data cable (1 m)
W3T434450	Sensor card for conductivity measurement

8.1.2 Flow cell (module type D02)

Drawing flow cell
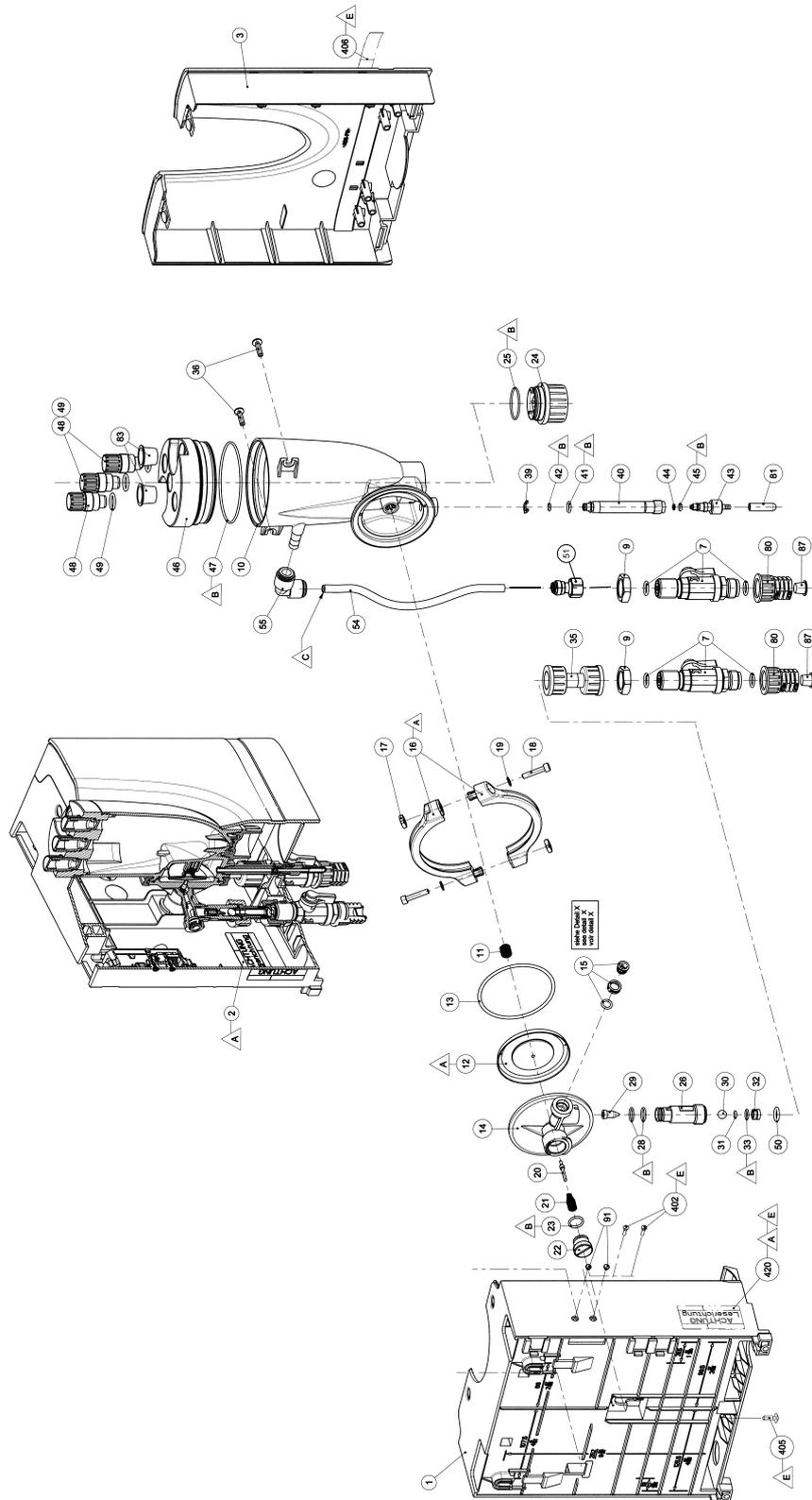
Parts list flow cell

Item	Part No.	Description	Item	Part No.	Description
1	W3T247776	Basic housing	41	W3T172997	O-ring
2	W2T507548	Type plate	42	W3T164597	O-ring
3	W3T247777	Housing cover	43	W3T158575	Drain screw
7	W3T166170	Shut-off valve	44	W3T166160	EPDM flat gasket
9	W2T507615	Flat nut	45	W3T172556	O-ring
10	W3T192471	Cell body	46	W3T320105	Cell body cover
11	W3T164226	Compression spring	47	W3T160657	O-ring
12	W3T158569	Membrane unit	48	W3T161450	Plug
13	W3T160654	O-ring	49	W3T168859	O-ring
14	W3T158595	Control valve body	50	W3T172861	O-ring
15	W2T504209	Plastic cartridge	51	W2T863568	Adapter
16	W3T160649	V profile clamp	54	W3T438413	Hose
17	W3T158567	Square nut	55	W2T505093	Angle-reducing connector
18	W2T504659	Cheese-head screw	80	W3T171786	Adapter
19	W2T506019	Washer	81	W3T168162	Protective cap
20	W3T158572	Valve pin	83	W3T161453	Protection plug
21	W3T172795	Compression spring	87	W3T161275	Protective plug
22	W3T158573	Adjusting screw			
23	W3T160357	O-ring			
24	W3T160650	Flow distributor cap			
25	W3T160655	O-ring			
26	W3T160648	Check valve housing			
28	W3T161396	O-ring			
29	W3T169827	Cone			
30	W3T172946	Ball			
31	W3T172949	O-ring			
32	W3T159707	Insert			
33	W3T172975	O-ring			
35	W3T158602	Filter unit			
36	W2T505463	Pan head screw			
39	W3T172041	Securing ring			
40	W3T158576	Outlet drain pipe			

8.1.3   Cell body, flow cell

Drawing

W3T322441   W3T166171   W3T158603   W3T163739   W3T166194
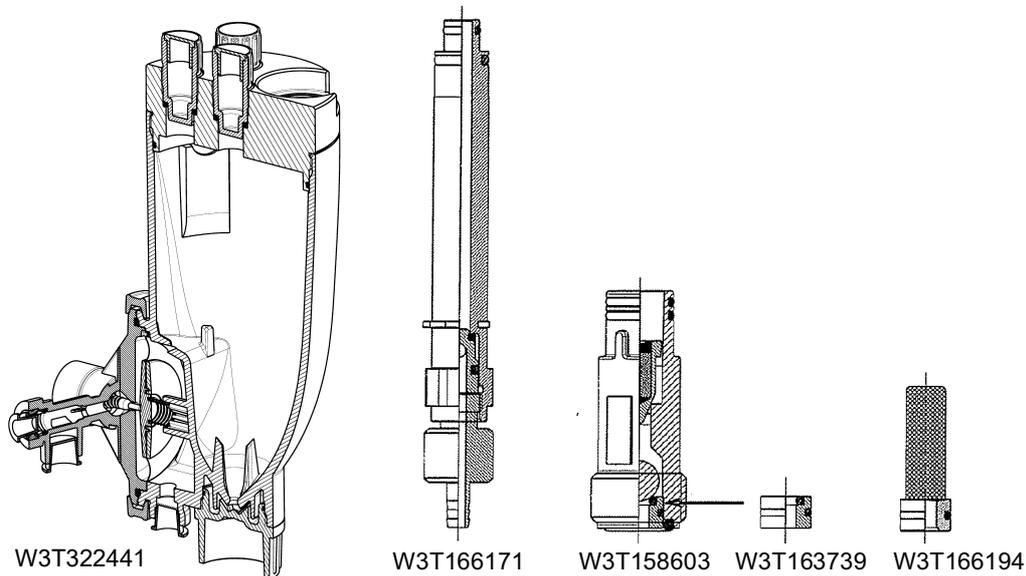
Parts list

Part No.	Description
W3T322441	Cell body, fully pressurized version
W3T166171	Flow cell sample valve assembly
W3T158603	Back pressure unit with float
W3T163739	Spherical set cpl.
W3T166180	Seal set

Maintenance parts kits

Part No.	Description
W3T158874	Maintenance parts kit, annual maintenance
W3T158878	Maintenance parts kit, 4 years
W3T158882	Spare parts set for flow control valve
W3T166180	Seal set
W3T320611	Sealing kit LED pressurized for LED glow stick

8.1.4   Strainer

Part No.	Description
W3T158721	Strainer with ball valve, straight
W3T389201	Set of fittings for strainer

8.2   Sensors

8.2.1   Chlorine sensor (free chlorine)

Part No.	Description
W3T160652	Chlorine sensor (free chlorine in platinum version)
W3T160991*	Chlorine sensor (free chlorine in gold version)
W3T164482	KCl tank with stand and 5 ml KCl solution
W3T160410	Electrolyte solution 3 mol/l KCl, bottle 250 ml
W3T171317	Electrode cleaning sand, white
W3T158600	Measuring beaker (5 pcs)
W3T164515	Extension cable 5 m (with 1 connector)
W3T164516	Extension cable 10 m (with 1 connector)
W3T164547	Extension cable 15 m (with 1 connector)
W3T164548	Extension cable 25 m (with 1 connector)
W3T164549	Extension cable 50 m (with 1 connector)

NOTICE

*Sensor in gold version

When disinfecting with inline electrolysis systems, the gold version of the chlorine sensor must be used.

8.2.2   pH sensor

Part No.	Description
W2T817978	pH sensor (yellow)
W3T165076	Buffer solution pH 7.00, bottle 250 ml
W3T165084	Buffer solution pH 4.65, bottle 250 ml
W3T161181	Buffer solution pH 7.00, bag 12 ml
W3T161189	Buffer solution pH 4.65, bag 12 ml
W3T164482	KCl tank with stand and 5 ml KCl solution
W3T160410	Electrolyte solution 3 mol/l KCl, bottle 250 ml
W3T158600	Measuring beaker (5 pcs)
W3T164517	Extension cable 5 m (with 2 connector)
W3T164518	Extension cable 10 m (with 2 connector)
W3T164544	Extension cable 15 m (with 2 connector)
W3T164545	Extension cable 25 m (with 2 connector)
W3T164546	Extension cable 50 m (with 2 connector)

8.2.3   ORP sensor

Part No.	Description
W2T817979	ORP sensor (blue)
W3T165048	Calibration solution 478 mV, bottle 250 ml
W3T161182	Calibration solution 478 mV, bag 12 ml
W3T164482	KCl tank with stand and 5 ml KCl solution
W3T160410	Electrolyte solution 3 mol/l KCl, bottle 250 ml
W3T158600	Measuring beaker (5 pcs)
W3T164517	Extension cable 5 m (with 2 connector)
W3T164518	Extension cable 10 m (with 2 connector)
W3T164544	Extension cable 15 m (with 2 connector)
W3T164545	Extension cable 25 m (with 2 connector)
W3T164546	Extension cable 50 m (with 2 connector)

8.2.4   Conductivity sensor

Part No.	Description
W3T172052	Conductivity sensor LF325
W3T427608	Calibration solution 60 mS/cm (250 ml)
W3T427609	Calibration solution 600 µS/cm (250 ml)
W3T161187	Calibration solution 60 mS/cm 1 (Liter)
W3T161179	Calibration solution600 µS/cm (1 Litre)
W3T158600	Measuring beaker (5 pcs)
W3T164517	Extension cable 5 m (with 2 connector)
W3T164518	Extension cable 10 m (with 2 connector)
W3T164544	Extension cable 15 m (with 2 connector)
W3T164545	Extension cable 25 m (with 2 connector)
W3T164546	Extension cable 50 m (with 2 connector)

8.3   Accessories

8.3.1   Mounting plate

Part No.	Description
W3T395161	Mounting plate with accessories for simple mounting of the flow cell and electronics module, preliminary filter unit and up to four hose dosing pumps

8.3.2   Impedance converter

Part No.	Description
W3T165563	Impedance converter for pH or ORP sensor

8.3.3 Hose and hose connection
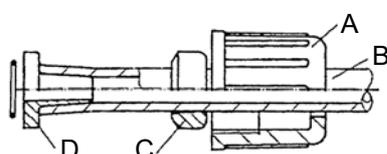
A Union nut
B Hose
C Locking ring
D Hose bushing

PVC hose, fabric-reinforced (internal diameter x wall thickness)	ø 4 x 3	ø 6 x 3	ø 10 x 3
Hose	W2T505524	W2T505525	W2T505334
PVC hose connecting parts comprising:	W3T167626	W3T167518	W3T167590
O-ring	W3T172861	W3T172861	W3T169068
Locking ring	W3T163417	W3T161436	W3T159622
Union nut	W3T161502	W3T161502	W3T167297
Hose bushing	W3T172945	W3T161501	W3T167293

PE hose (internal diameter x wall thickness)	ø 4 x 1	ø 6 x 1	ø 6 x 2	ø 10 x 2
Hose	W2T507155	W2T505784	W2T505676	W2T505734
Hose connecting parts made from PVC comprising:	W3T163752	W3T171453	W3T163796	W3T163825
O-ring	W3T172861	W3T172861	W3T172861	W3T169068
Locking ring	W3T172891	W3T169815	W3T163436	W3T163437
Union nut	W3T161502	W3T161502	W3T161502	W3T167297
Hose bushing	W3T172945	W3T161501	W3T161501	W3T167293

8.4 Retrofit kits

8.4.1 Sensor measuring module conductivity

Part No.	Description
W3T434521	Sensor measuring module conductivity 60 mS/cm comprising: conductivity sensor card, conductivity sensor (LF325), sensor cable, calibration solution 60 mS/cm and terminal strip
W3T434592	Sensor measuring module conductivity 600 µS/cm comprising: conductivity sensor card, conductivity sensor (LF325), sensor cable, calibration solution 600 µS/cm and terminal strip

8.4.2 4-way mA output card

Part No.	Description
W3T391865	4-way mA output card with terminals

9. Wiring diagrams

Digital inputs

DI5 49 50
DI4 47 48
DI3 45 46
DI2 43 44
DI1 41 42

shield multisensor
GN
YE

Control stop / Stand-by
Container min / Container empty

(contact open = DI activ)

Sample water monitoring
flow rate
Multi-sensor

External voltage must not be connected to the digital inputs !

Connection of the digital inputs 3 - 5 with activated tank monitoring Cl2 / pH

DI5 49 50
DI4 47 48
DI3 45 46

Cl2 empty
pH min
Cl2 min
pH empty

Power

L1 N/L2 PE
Power
100..240V AC
50/60 Hz
0,6A max

24V DC
DC
+ −
PE + −
Power
24V DC
1,0A max

AC << alternatively >> DC

With mains supply 100...240V AC
the additional terminals
L1 and N/L2 are for connection
of externals loads (max. 6A)

Interfaces

RS485
display
Ethernet (internal switch)
USB

A B A B
RS485

Ground the shield on one side only!

Mains voltage
Inputs
Interfaces

Evoqua
Water Technologies GmbH

Project
order number

Drawing number
WAE 9686

=A1
+S1

Sheet 1
4 Pa.

Issue	Revision	Date	Name
3	LAE6754	22.06.17	UZ
4	LAE6754	19.07.17	KRO
5	LAE7006	11.09.18	MBE
6	LAE7135.003	13.02.19	rb

Date 19.01.17
Drawn UZ
Checked
Norm

Design Center GER
Prod. / Sales
Date release

Original
Repl. f
Repl. by

Measuring inputs / LED

pH | DES | temperature | RGB-LED

module 3 / Analog outputs

mA Out

mA4 — 0/4...20mA — + − mA4
mA3 — 0/4...20mA — + − mA3

mA Out

mA2 — 0/4...20mA — + − mA2
mA1 — 0/4...20mA — + − mA1

0/4..20mA
Load: max 500 Ohm

Ground the shield on one side only!

module 1
mV measurement module

Redox

Redox

module 2
conductivity measurement module

conductivity ϰ
LF 325

RGB-LED
LED-A / LED-G / LED-B / LED-R
BK / RD / OR / BN

LED glow stick

temperature
PT 100
PT 1000
PT COM

Sample water monitoring
temperature Multi-sensor

shield
multisensor

DES
VCC
GND
CNT
REF
WRK

DIS

pH

pH

Relay-Outputs: alarm contacts

K1 — F3 T3.15A — 51/52/53 — alarm 1 - 8 — Function adjustable
K2 — F4 T3.15A — 54/55/56 — alarm 1 - 8 — Function adjustable
K3 — F5 T3.15A — 57/58/59 — alarm 1 - 8 — Function adjustable
K4 — F6 T3.15A — 60/61/62 — alarm 1 - 8 — Function adjustable
K5 — F7 T3.15A — 63/64/65 — alarm 1 - 8 — Function adjustable
K6 — F8 T3.15A — 66/67/68 — alarm 1 - 8 — Function adjustable

The Relay K1, K2, K3 and K4 are only available as alarm contacts if they are not used as control or dosing outputs!

Relay-Outputs: Dosing Chlorine

Positioner Cl2

Dosing pump Cl2

(Note !)

Dosing contact
e. g. for chlorine electrolyser

(Note)

Capacitive loads (e.g. pumps with
switching power supply)
or inductive loads (e.g. 1-phase motor AC)
reduce the contact life of the relay!
Recommendation: Use metering pumps
with enable input.

To prevent starting delay we recommend
to use pumps with external enable signal
input.
In this case connect the enable signal
input directly to the relay contact.

Please refer to chapter „relay outputs"
when connecting small loads!

**External voltage may
still be connected
even when the main
switch is set to OFF !**

Relay-Outputs: Dosing pH

Positioner pH

Dosing pump pH

(Note !)

Dosing pump pH

Dosing contact

**Relay-Outputs Chlorine
Relay-Outputs pH**

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3	LAE6754	22.06.17	UZ	Date	19.01.17	Design Center	GER
4	LAE6754	19.07.17	KRO	Drawn	UZ	Prod. / Sales	
5	LAE7006	11.09.18	MBE	Date		Date	
6	LAE7135.003	13.02.19	rb	Checked		release	
Issue	Revision	Date	Name	Norm			

Original | Repl. f | Repl. by

Project | =A1
order number | +S1

Drawing number
WAE 9686

Sheet 3
Pa. 4

Relay-Outputs: Dosing conductivity

Note

Capacitive loads (e.g. pumps with
switching power supply)
or inductive loads (e.g. 1-phase motor AC)
reduce the contact life of the relay!
Recommendation: Use metering pumps
with enable input.

To prevent starting delay we recommend
to use pumps with external enable signal
input.
In this case connect the enable signal
input directly to the relay contact.

Please refer to chapter „relay outputs"
when connecting small loads!

**External voltage may
still be connected
even when the main
switch is set to OFF !**

K5   F7   T3,15A   63 64 65

Pulse triggered
dosing pump
conductivity

ext.
release

L1
L2/N

or ...

Dosing pump
conductivity

PE L N

Dosing conductivity

K5   F7   T3,15A   63 64 65

Dosing pump conductivity

L1
L2/N

PE

M 1~

2P

Note !

K5   F7   T3,15A   63 64 65

Dosing contact
conductivity

**Relay-Outputs
conductivity**

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Water Technologies GmbH

			Design Center	GER		
		Date	19.01.17		Prod. / Sales	
		Drawn	UZ		Date	release
					Checked	
					Norm	

3	LAE6754	22.06.17	UZ	KRO
4	LAE6754	19.07.17	UZ	
5	LAE7006	11.09.18	MBE	
6	LAE7135.003	13.02.19	rb	
Issue	Revision	Date	Name	

Original   Repl. f   Repl. by

Project

order number

Drawing number
WAE9686

=A1
+S1

Sheet 4
4   Pa.

Relay-Outputs: Dosing Chlorine

(Use of additional
Power Control Relay e.g. RIB2401B)

Relay-Outputs: Dosing pH

(Use of additional
Power Control Relay e.g. RIB2401B)

Note

Observe permissible
contact load!
Refer to used relay
technical data.

**External voltage may
still be connected
even when the main
switch is set to OFF !**

K1   K2

F3 T3,15A   F4 T3,15A
51 52 53   54 55 56

120VAC
L1
L2/N

Wht/Blk (120VAC)
Wht/Yel (Comm)
RIB2401B

Yel (C)
Blu (N/C)   Org (N/O)
RIB2401B

M 1~

PE

Dosing pump
Cl2

Observe Note !

K4

F6 T3,15A
60 61 62

120VAC
L1
L2/N

Wht/Blk (120VAC)
Wht/Yel (Comm)
RIB2401B

Yel (C)
Blu (N/C)   Org (N/O)
RIB2401B

M 1~

PE

Dosing pump
pH
or

Observe Note !

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Water Technologies GmbH

Relay-Outputs Chlorine
Relay-Outputs pH

Project
.

order number

Drawing number
WBE1534

=A1
+S1

Sheet 1
1   Pa.

Issue	Revision	Date	Name			
1	LAE7446	24.03.20	UZ	Date	24.03.20	Design Center	GER
2	LAE7446.100	15.04.20		Drawn	UZ	Prod. /Sales	
				Checked		Date	release
				Norm			

Original   Repl.f   Repl.f   Repd.by

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10. Declarations and certificates

10.1   Declaration of Conformity

eVOQUA
WATER TECHNOLOGIES

EG-Konformitätserklärung
EC Declaration of Conformity
Déclaration CE de conformité

No. MAE1838

Ausgabe/*issue*/**édition**   01

Hersteller/*Manufacturer*/**Constructeur**:	Evoqua Water Technologies GmbH
Anschrift/*Address*/**Adresse**:	Auf der Weide 10, D-89312 Günzburg
Produktbezeichnung: *Product description:* **Description du produit:**	Mess-, Regel- und Dosiersystem Blu-Sentinel SE bestehend aus: Elektronik-Modul (E02) und Durchfluss-Modul (D02) *Measuring, control and dosing system Blu-Sentinel SE* *comprising: Electronics module (E02) and flow cell (D02)* **Dispositifs de mesure, regulation et de dosage Blu-Sentinel SE** **comprenant : Module électronique (E02) et module de la cellule de** **mesure (D02)**

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender europäischer Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:
Le produit désigné est conforme, dans la version que nous avons mise en circulation, avec les prescriptions des directives européennes suivantes :

2014/30/EU	Richtlinie des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit. *Directive of the European Parliament and of the Council of 26 February 2014 on the approximation of the laws of the Member States relating to electromagnetic compatibility.* **Directive du Parlement européen et du Conseil du 26 février 2014 relative au rapprochement des législations des Etats membres concernant la compatibilité électromagnétique.**
2014/35/EU	Richtlinie des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen. *Directive of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.* **Directive du Parlement européen et du Conseil du 26 février 2014 concernant le rapprochement des législations des Etats membres relatives au matériel électrique destiné à être employé dans certaines limites de tension.** CE-Kennzeichnung / *CE marking* / **Marquage CE**: 2017

Ersteller : SR
Ausgabe : 13.05.2014
Dokument: VD130-1_CE_Konformitätserklärung.doc

Evoqua Water Technologies GmbH   Tel.: +49 (8221) 904-0
Auf der Weide 10   Fax: +49 (8221) 904-203
89312 Günzburg   www.evoqua.com
Deutschland

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Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung der in der Nachweisdokumentation aufgelisteten Normen.
Evidence of conformity to the Directives is assured through the application of the standards listed in the relevant documentation.
La conformité avec les directives est assurée par le respect des normes listés dans la documentation téchnique correspondante.

Benannte Person für technische Unterlagen:
Authorized person for the technical file:
Personne désignée pour la documentation technique:

Name / *name* / **nom:**   Evoqua Water Technologies GmbH

Adresse / *address* / **adresse**: Auf der Weide 10, D-89312 Günzburg

Günzburg, den / *the*   2017-07-12

Evoqua Water Technologies GmbH

Klaus Andre
Technischer Leiter / *Director Engineering*

Unterschrift
signature / **signature**

Helmut Fischer
Leiter QM / *Quality Manager*

Unterschrift
signature / **signature**

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie nach §443 BGB. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the conformity to the specified directives but does not imply any warranty for properties. The safety documentation accompanying the product shall be considered in detail..
La présente déclaration atteste de la concordance avec les directives citées, elle n'offre cependant pas de garantie quant à la nature ou la durabilité selon l'article 443 du code civil allemand. Les consignes de sécurité de la documentation du produit fournie sont à respecter.

Dokument: VD130-1_CE_Konformitätserklärung.doc

Seite 2 von 2

10.2   CSA-Zertifikat

Certificate of Compliance

Certificate:	70027582	**Master Contract:**	226676
Project:	70138021	**Date Issued:**	2017-07-14

Issued to: **Evoqua Water Technologies GmbH**
Auf der Weide 10
Gunzburg, 89312
GERMANY

The products listed below are eligible to bear the CSA Mark shown
with adjacent indicators 'C' and 'US' for Canada and US or with adjacent
indicator 'US' for US only or without either indicator for Canada only.

Issued by: *Jean-Philippe Laplante*
Jean-Philippe Laplante

PRODUCTS
CLASS - C363106 - ELECTRICAL MEASUREMENT AND TEST EQUIPMENT
CLASS - C363186 - ELECTRICAL EQUIPMENT FOR MEASUREMENT USE-Certified to US Standards

Water management system, Models:

Main units: W3Ta E01 b; rated: 100-240Vac, 50/60Hz, 48W or 24Vdc, 30W /
                W3Ta E02; rated: 100-240Vac, 50/60Hz, 24W **or** 24Vdc, 15W;
                all models: 6A max rating including external loads supplied from the mains input circuit of the
                main units via cord outlets or permanently wired

Flow-through units: W3Tc D01 / W3Tc D02, supplied by the main units.

(Where a, b & c are alphanumeric placeholders (different length; including blanks) for non-safety-critical
properties and configurations like user interface design and water analysis functions)

Certificate: 70027582   **Master Contract:** 226676
Project: 70138021   **Date Issued:** 2017-07-14

Notes:
1. The above models are permanently connected or non-detachable cord (model dependent) Equipment Class I, Pollution Degree 2, Overvoltage category II
2. Mode of operation: Continuous
3. Environmental Conditions: Extended: 0 to 50°C, 2000m max, maximum 80% RH non-condensing.

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 61010-1-12   -   Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements

UL Std. No. 61010-1 (3rd Edition)   -   Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements

CONDITIONS OF ACCEPTABILITY

1. The input pressure for the water management system shall be externally limited to 3 bars (300kPa).
2. The equipment shall be installed to the mains supply system using a disconnecting device with the off-position clearly marked and a 6A back-up fuse must be used in the main supply line (for permanently connected only)
3. Relay connections to external devices shall be connected using 5A fuses as overcurrent protection (model E01 only)
4. This product has not been evaluated for rigid conduit installation. The product shall not be installed using conduits.
5. Equipment is only to be installed by authorized qualified electricians.
6. Maintenance of equipment (including fuse and battery replacements) is only to be performed by authorized qualified electricians.
7. Equipment is not to be used with flammable liquids.

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CSA Group

Supplement to Certificate of Compliance

Certificate: 70027582   **Master Contract:** 226676

The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
70138021	2017-07-14	CSA c/us report update for alternate construction (new models E02 & D02) on a Water management system, Models: W3Ta E01 b, W3Ta E02 with flow-through modules: W3Tc D01 / W3Tc D02
70095602	2016-10-19	CSA c/us report update for alternate construction (relay) and model naming changed on a Water management system, Models: W3Txxxxxx-E01 / W3Txxxxxx-D01
70027582	2015-07-09	CSA (c/us) certification of a pool management system for water treatment based on the acceptance of CB test report.

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