SmartControlEVO
Operating Manual

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Translation

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Disclaimer

Observing the operating and maintenance instructions is a prerequisite for the safe operation of our products and for obtaining the specified product properties and performance features. Tiefenbach Control Systems GmbH will not accept any liability for any personal injury, property damage or financial damage resulting from a failure to observe these instructions. Any liability for material defects is excluded in these cases.

The contents of this document will be checked and updated on an ongoing basis. Due to the technical development, however, no warranty can be accepted for up-to-dateness, correctness, and completeness. Claims for damages against Tiefenbach Control Systems GmbH which refer to damage of a material or immaterial kind caused by the use or non-use of the information presented or by the use of faulty or incomplete information are generally excluded.

The respective up-to-date version can be obtained via the service department of Tiefenbach Control Systems GmbH.

Subject to technical alterations.

Table of contents

1 General

2 Use of the documentation

This documentation is an important part of the product purchased by you. This documentation is intended to familiarize you with the safe and effective operation of your product.

Please read this manual carefully before using your product for the first time.

If you implement the instructions and notes described in the following in a responsible manner the hazards which might occur e.g. due to improper installation/disassembly, commissioning, or faulty operation will be minimized.

The information given in this documentation reflects the state of the art and are updated regularly.

With this documentation we endeavor to make available to our customers the best possible information about our product. Should you nonetheless have any cause for criticism please do not hesitate to let us know your suggestions for improvement. Please use the form provided in the chapter “Service” () for that purpose.

2.1 Contents and structure

This operating manual is built up on the basis of the life cycle principle, i.e. all chapters are arranged in the sequence of operations required when handling newly supplied equipment.

- Delivery and transport
- Installation
- Commissioning
- Operation
- Trouble shooting
- Maintenance & repair
- Elimination of malfunctions
- Disassembly
- Storage/preservation
- Disposal

When delivered into countries where German is not an official language the operating manual will be translated into the respective language of the user country.

Should any discrepancies occur in the translated text the original operating manual (German) shall be consulted or the manufacturer contacted.

2.2 List of abbreviations

CNC	Computerized Numerical Control
CPU	Computer Prozessor Unit
CSV	Comma-separated values
GSM	Global System for Mobile Communications
HMI	Human Machine Interface
KCl	Potassium chloride
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light-emitting diode
KSS	Cooling lubricant
PC	Personal Computer
pH	Potentia Hydrogenii
SPS	Programmable logic controller
USB	Universal Serial Bus
SW	Wrench size

2.3 Supporting documents

See product documentation

- Lubricant manufacturer

2.4 Guarantee and warranty

The components of the SmartControlEVO are covered by a warranty period of 18 months after the last delivery or 12 months from the date of operation of the SmartControlEVO, whichever occurs sooner.

The warranty only covers free repair or replacement of defective parts. The same warranty applies to the replaced part as to a new part and the warranty period for the part in question begins on the day of its use and does not lead to an extension of the warranty period for the entire machine.

2.5 Exclusion of guarantee and warranty

Warranty coverage does not apply to damage or defects resulting from improper use, improper handling or transport, repairs by unauthorized persons or conversions and modifications.

If the instructions in these operating manual, particularly those in the “Maintenance and repair” chapter or the “Troubleshooting” chapter, are not followed, the warranty will also be void.

3 Liability and warranty

3.1 Legal notes

In the event of any damage caused by a failure to observe this operating manual the warranty claim will become invalid.

Tiefenbach Control Systems GmbH does not accept any liability for any consequential damage.

The “General Terms and Conditions“ apply.

Warranty and liability claims for personal injuries and property damage shall be excluded if resulting from one or several of the following causes:

- Non-intended use of the equipment/device
- Improper installation, commissioning, operation and/or maintenance of the equipment/device
- Operating the equipment/device with defective safety installations
- Unauthorized constructional changes of the equipment/device
- Improperly conducted repairs or use of spare parts or accessories not approved by the manufacturer
- Disaster situations due to foreign body impact and force majeure

3.2 Intended use

The product is exclusively approved for use under the conditions described in the chapter “Description/Overview” (). Any use beyond that stated is not permissible.

The manufacturer shall not be liable for any damage resulting therefrom but the user shall bear the risk alone.

3.3 Residual risk

Even after all risk hazards have been identified and all possible precautions have been taken to reduce the likelihood of occurrence and the consequences of risks, we can never entirely exclude the possibility of risks.

With respect to the hazards stated in DIN EN 12100, the device will be designed such as to avoid or reduce as many hazards as possible by a suitable selection of design features.

The product has been built according to the state of the art and tested and is thus safe to operate. All products supplied by Tiefenbach Control Systems GmbH are function and leakage tested before delivery and leave the factory only after having passed the tests successfully.

There may be dangers present in this product if used improperly or used for other than the intended purpose by personnel not adequately trained. The residual risks can be minimized if you read this operating manual carefully and follow the instructions in a responsible manner.

4 Safety

The safety information in this document has been prepared on the basis of the hazards identified by means of the risk assessment performed for the equipment and has to be observed.

The equipment has been built according to the latest state of the art and is safe to operate. Nonetheless, residual hazards may emanate from the product under the following circumstances:

- Non-intended use of the product
- Operation by unqualified personnel
- Improper maintenance or repair
- Failure to observe the specified inspection and maintenance intervals
- Unauthorized changes or modifications of the equipment
- Failure to observe the safety information and instructions given in this document

Every person assigned to conduct any work on the product must have read and understood this documentation. Any method of working that adversely affects the safety of the product shall not be allowed.

The following rules and regulations must be observed additionally:

- Accident prevention regulations
- Occupational medicine regulations
- Generally recognized safety rules
- National/regional laws and regulations
- Documentations of external manufacturers
- Manufacturer’s data (safety data sheets) for operating media
- In-plant regulations
- In-house regulations

This document pertains to the equipment.
Keep this document over the entire life of the product. Take care to ensure that any amendment/addition received is included into the document, if required, and that every user will be granted access to this document.

4.1 Safety information in this documentation

Explanation of signal words and symbols:

⚠ DANGER

Danger of death!

Indicates an immediate hazardous situation which, if not avoided, will result in death or serious irreversible injuries.

⚠ WARNING

Risk of serious injuries!

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious irreversible injuries.

⚠ CAUTION

Risk of moderate to minor injuries!

Indicates a hazardous situation which, if not avoided, may result in minor to moderate reversible injuries.

ATTENTION

Property damage

Indicates a situation which may result in property damage.

Here you will find application notices and useful information

4.2 Obligations

The operating company and the operating personnel have different responsibilities in the life cycle of the product. These are explained in the two following sections.

4.2.1 Obligations of the operator

The operator:

- Is responsible for ensuring that the above-mentioned equipment will only be used for the respective intended purpose.
- Is committed to only letting qualified personnel (see subchapter *"Definition Qualified Personnel"* -) work on and with the equipment.
- Is committed to checking the safety awareness of the personnel at work at regular intervals.
- Has read and understood the safety regulations and warnings in this documentation.
- Has to take care to ensure that the personnel knows and observes the safety regulations and warnings in this documentation.
- Is responsible for ensuring that this documentation is available to the personnel working on and with the equipment at all times.
- Is committed to supplying the documentation when selling the device on.
- Is committed, for reasons of warranty, to keeping a maintenance manual (see chapter *"Maintenance and repair"* -).

We recommend that the operator should prepare work instructions which precisely describe the product-specific work steps.

4.2.2 Personnel obligations

A good level of training of the operating and maintenance team is a prerequisite for safe handling of the device.

Only qualified personnel are allowed to work on this device.

These individuals must:

- have been authorised by the operator.
- be familiar with all relevant safety and accident prevention regulations.
- have read and understood this operating manual.

The following personal protective equipment must be worn:

- Protective goggles
- Protective gloves
- Safety shoes

The personal protective equipment must comply with the applicable health and safety regulations.

Clearly define responsibilities for all activities on the device.
A lack of clarity regarding responsibilities can compromise safety.

The user must ensure that only personnel who have been trained in handling the machine work on it.

⚠ WARNING

Operating errors due to insufficient concentration

Persons who are under the influence of intoxicating substances may experience a decline in concentration. This could result in hazards due to operating errors.

Never work on the device under the influence of

- drugs
- alcohol
- medicaments

The operator is committed to operate the equipment in perfect condition. Any damage, conversions, modifications, and leakages have to be reported to the responsible body immediately.

4.2.3 Electrical hazards

The product operates with an AC voltage of 94V zo 264V. Live parts (power supply including power adapter) pose the usual dangers during operation. The system must not be opened when live.

The product works with a direct voltage of 24V. Due to the low current, the live parts do not pose any electrical hazards such as electric shock or arcing during operation.

4.2.4 Mechanical hazards

The device has sharp edges where people may get hurt when bumping or knocking against them during operation. Different hazards occur during the individual life cycles of the device (transport, installation etc.). For details on these hazards, please refer to the individual chapters.

4.2.5 Thermal hazards

In normal operation, there are no thermal hazards in connection with the product.

4.2.6 Noise hazard

The noise emission level coming from this equipment is below 70 dB. A noise hazard does not exist.

4.2.7 Dangers when handling cooling lubricants

- Report any pending work on the product to the responsible body and/or supervisory personnel.
- Route and install hoses correctly and check they are correctly fitted.
- Do not subject hoses to twisting or mechanical friction.
- Check all pipes regularly for damage and leaks. Replace damaged pipes immediately.

⚠ WARNING

Health hazard posed by cooling lubricants!

The oils, greases and additives contained in the cooling lubricant can cause skin irritation and eye damage on contact.

- For the safe handling of cooling lubricants, the producer's instructions and safety data sheets, as well as the following points, must be observed.

- Only persons with specialised knowledge and experience with cooling lubricants may work on the cooling lubricant system.
- The operator must instruct the operating personnel about the potential dangers involved in handling cooling lubricants.
- Avoid any contact with cooling lubricants. Wear protective goggles and protective gloves.
- In the event of eye or skin contact, rinse the affected area immediately with plenty of water. Rinse eyes with eyewash and seek medical attention immediately.

⚠ CAUTION

Leaking cooling lubricant!

A floor contaminated with cooling lubricant is slippery. Risk of injury due to slipping.

- Do not spill any cooling lubricant.
- If necessary, absorb spilt cooling lubricant with liquid-binding material (e.g. a universal binding agent) and dispose of it in accordance with waste and environmental regulations.

ATTENTION

Damage to the product due to contaminated cooling lubricant.

Contamination in hoses and connections can lead to total damage to the product.

- Only remove the protective caps from the product immediately before installation.
- Check the hoses are clean before installation and clean the insides if necessary.

ATTENTION

Environmental damage caused by cooling lubricant!

Leaking cooling lubricant or its improper disposal pollutes the environment.

- Collect leaking cooling lubricant in suitable containers and do not allow it to enter the soil or groundwater.
- Only use approved containers for storage.
- Dispose of cooling lubricant properly in accordance with national and local regulations.
- Dispose of cooling lubricant in accordance with the applicable regulations for preventing environmental hazards.

4.2.8 Hazards occurring when handling electrical components

ATTENTION

Defective product due to excess voltage!

Operating the product at a higher voltage than the permissible maximum voltage can damage the product.

- Operate the product only up to the specified maximum voltage

ATTENTION

Defective product due to reverse polarity!

Reversing the polarity specified for the product can damage the product.

- Operate the product only with polarized connectors

5 Description and overview

5.1 General description

The Smart Control EVO measuring device monitors the concentration, temperature, flow rate and pH value of cooling lubricant emulsions on CNC machines fully automatically.

The focus here is on machines that predominantly produce chips of a visible size, e.g. by milling, drilling, turning, reaming, thread cutting, broaching or suchlike, and whose chips are absorbed by the system's own filtration. In metal machining, such metals might be steel alloys, aluminium alloys, yellow metals and possibly titanium.

The measurement takes place at parameterisable time intervals. The measurement results obtained are transmitted to the display of the user terminal, where they are shown graphically and numerically.

The Smart Control EVO measuring device is equipped with a visual status display. The operating status of the device can be identified from this colour display.

The Smart Control EVO measuring device can be operated with an input voltage of 90 V AC to 264 V AC.

A LAN and WLAN interface is available for any necessary data communication. Communication can optionally be extended to GSM via a USB port.

The following communication options are available:

- Remote- / Screen-mirroring
- SQL interface
- OPC UA (unsecured data transmission)
- MQTT (secured data transmission)

Fig. 1: Smart Control EVO

5.2 Function description

The Smart Control EVO measuring device monitors the concentration, temperature, flow rate and pH value of cooling lubricant emulsions on CNC machines. The measurement takes place at parameterisable time intervals.

The built-in pump draws the coolant from the tank of the CNC machine via an ø8 mm hose. The fluid passes through the measuring cell of the concentration sensor and determines the concentration and temperature of the fluid. Furthermore, the pH value of the fluid is measured using a pH value probe.

All measurement results are transmitted to the display of the user terminal, where they are shown graphically and numerically. The measurements are taken at fixed time intervals. This measuring interval can be changed via the integrated user terminal.

The Smart Control EVO measuring device is equipped with a visual status display. The operating status of the device can be identified from this colour display:

- Green: Everything OK
- Yellow: Warning
- Red: Fault

The Smart Control EVO measuring device works on 24 V DC. A universal power supply unit reduces the 90 V AC to 264 V AC input voltage to the required operating voltage.

The Smart Control EVO measuring device is equipped with a LAN connection and a Wi-Fi interface for any necessary data communication.

If required, a USB stick can be used for GSM. The GSM stick can be easily plugged into the USB socket and enables mobile communication in the telecommunications network.

After the measurement, the cooling lubricant emulsion flows back into the tank of the CNC machine in a depressurised manner.

The pH probe can be recalibrated via a 3-point calibration if required. The calibration menu of the user terminal supports the user in this process.

5.3 Circuit diagram

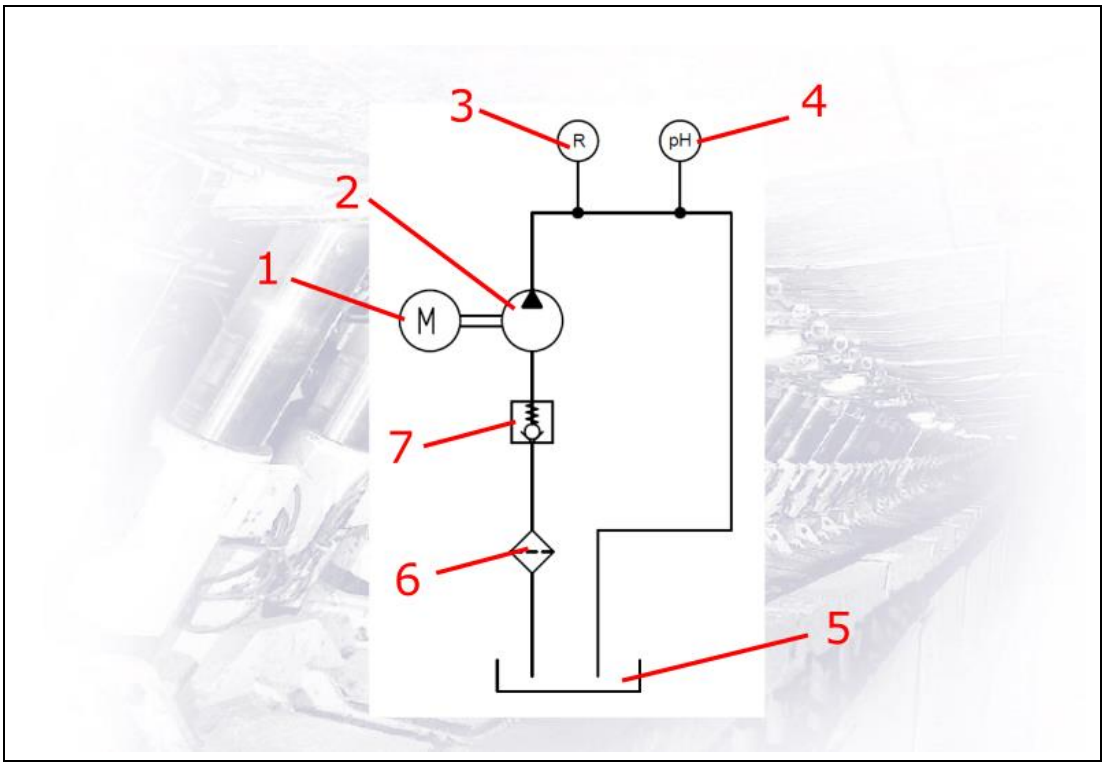

Fig. 2: Smart Control EVO circuit diagram

Item number	Item
1	Pump motor
2	Pump
3	Concentration sensor
4	pH sensor
5	Tank
6	Filter element
7	Check valve

5.4 Structure

All the necessary components of the Smart Control EVO are housed compactly in a plastic housing.

Fig. 3: Complete overview of the outside of the Smart Control EVO

Item number	Item
1	Green pH sensor cover
2	Housing
3	White LED display cover
4	User terminal display
5	Supply voltage input connection
6	LAN connection
7	USB connection
8	Maintenance opening cover
9	Fluid drain connection
10	Fluid supply line connection

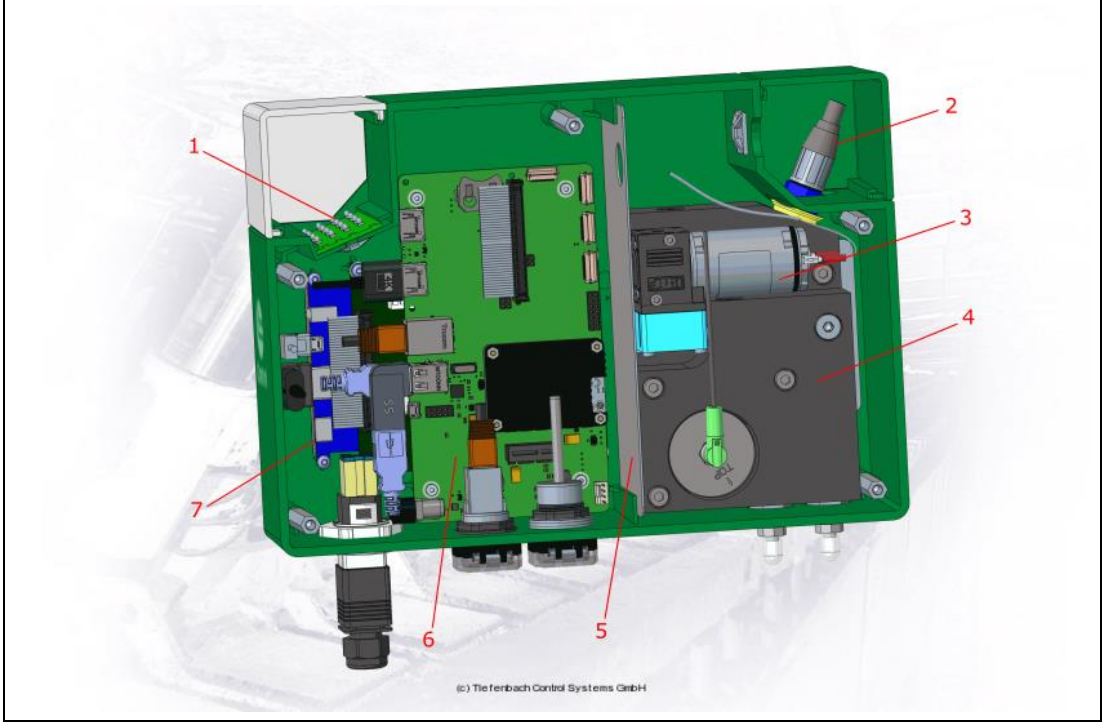

Fig. 4: Complete overview of the inside of the Smart Control EVO

Item number	Item
1	LED board
2	pH sensor
3	Pump
4	Fluid housing
5	Partition plate
6	Boards
7	Display

5.5 Nameplate

The Smart Control EVO is fitted with a nameplate. The nameplate is located under the white cover cap of the LED display.

Abb. 5: Nameplate location on the Smart Control EVO

Item number	Item
1	Housing
2	White LED display cover

The nameplate contains the following information:

- Model name
- Article number
- Year of manufacture
- Serial number
- Maximum permissible voltage
- Maximum permissible current

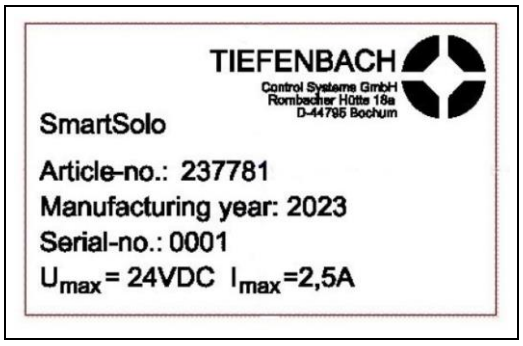

Fig. 6: Nameplate

6 Technical data

General information	
Name	Smart Control EVO
Supply voltage	90 V AC to 264 V AC
Operating voltage Rated current	24 V DC Max. 2.5 A
Electrical connections:	
Mains connection 90 V AC – 264 V AC	2-pin EU mains connector Optional: 2-pin European adapter to 2-pin USA, Japan
Mains connection 24 V DC LAN USB	5-pole plug connector RJ45, cat. 6 USB 2.0
WLAN: Frequency band Standard	 2.4 / 5.0 GHz IEEE 8.211b/g/n/ac
Display	5" LCD touch 800x400 pixels
Relative ambient humidity	Max. 85%, no condensation
Ambient air temperature	Min. 15°C Max. 50°C
Weight	Approx. 3.5 kg
Dimensions (LxWxH)	291 x 217 x 51 (mm)
Fastening	By the customer
Housing:	
Material Colour	BIO-FED M·VERA®GP1015 RAL 6024 traffic green
Operating system	Linux 11 (Bullseye)

Hydraulic connections:	
Supply line Return line Material	Hose connector for hose ø8 mm x ø6 mm Hose connector for hose ø8 mm x ø6 mm Stainless steel 1.4571
Pump:	
Operating pressure Flow rate Suction head, H_20 Type	Max. 1 bar 0.3 l/min Max. 6 m Self-priming

Permitted medium temperature	+5°C to +40°C
Filtration:	
Type	Suction filter
Fineness	125 µm
Connection	1/2" hose connector thread
Check valve:	
Opening pressure	0.025 bar
Material	Nickel-plated brass
Connection	1/2" internal thread
Hose:	
Material	Food-safe PVC
External diameter	Ø8 mm
Internal diameter	Ø6 mm
Colour	Transparent
Concentration sensor:	
Measurement range	0.0% to 55.0% cooling lubricant
Resolution	0.1% cooling lubricant
Accuracy	0.5%wt cooling lubricant
pH sensor:	
Measurement range	0 to 14
Process temperature	Maximum 135°C
Process pressure	Maximum 16 bar

7 Operating media

7.1 Recommended operating materials for installation, cleaning and maintenance

Operating materials	
Techniclean 90 XBC, universal cleaner	
– Producer	Castrol
– Viscosity at 20°C (concentrate)	1.03 g/cm³
– Colour (concentrate)	Clear, colourless
– pH-value 5%	9.8
– Solubility in water	Completely soluble
Isopropanol 99.9%	
– Producer	Paintsystems GmbH
– Components	2-propanol isopropyl alcohol 99.9%
pH calibration fluid	
– Type	pH 4.00 (red) pH 7.00 (green) pH 10.00 (blue)
Distilled water	
– Type	Demineralised as per VDE0510 and DIN43530
– Properties	Clear, colourless, odourless, tasteless

If you plan to use products not recommended by us, please refer to our customer service department prior to use. We are happy to advise you!

8 Delivery and transport

8.1 Delivery and transport

- Observe the national and international regulations and import rules as well as the national and regional accident prevention and safety regulations when transporting the product.
- Always transport the products one by one.
- Pack the product such that it cannot get damaged.
- Secure the product to prevent it shifting or falling down.
- Protect the product aganst the ingress of dirt or foreign particles. Close the openings of the product.

⚠ CAUTION

Damage due to cooling lubricant!

Residues of cooling lubricant and operating materials can cause serious injuries if they come into contact with the skin or eyes.

- Wear protective gloves and protective goggles.
- Avoid skin contact.
- In the event of skin or eye contact, rinse thoroughly with water and seek medical attention.

8.2 Delivery

Check, directly upon receipt of the goods, the completeness of the shipment on the basis of the shipping and freight documents. Pay particular attention to the completeness and possible transport damage. Each product has its own serial number. Check this number against the number on the freight documents.

Notify the Tiefenbach Control Systems GmbH service department of any missing items or any damage within one month after receipt of the shipment. After the elapse of one month no complaints will be accepted any longer.

For the operative handling of your complaint we recommend that you document the damage by means of photos. Please quote the serial number in all correspondence or in purchase orders for accessories or spare parts.

8.3 Packaging material

The protective function of the packaging material involves the following tasks:

- Protecting the goods from mechanical influences during transport.
- Protecting the goods from environmental influences during storage.
- Protecting the contents from loss.

Do not remove the packaging material until shortly before installation.

Dispose of the packaging material in compliance with the applicable regulations in an environmentally acceptable manner and have it recycled.

1.1 Transport below freezing point

The Smart Control EVO is equipped with a pH probe that contains liquid.

ATTENTION

Burst of the pH sensor

The pH sensor contains a buffer fluid and electrolyte fluid. These liquids can freeze and the sensor will burst.

- Only operate the pH sensor above -15°C
- Store the pH sensor above -15°C
- Use frost-proofed packaging for further transport

9 Installation

9.1 Safety

⚠ CAUTION

Crushing hazard!

When handling the product its weight can cause injuries in the respective life cycles.

- Wear the gloves and safety shoes of your personal protective equipment.
- Additionally wear a safety helmet when conducting work in areas or positions where you might hurt or injure your head.

⚠ CAUTION

Damage due to wrong tools!

The use of unsuitable tools for the product can result in light injuries and damage to the product.

- Only use proper and suitable tools.

9.2 Protecting plug dismantling

The Smart Control EVO has been fitted with protecting plugs to prevent fluid from escaping during transport.

These protecting plugs must be removed prior to installation and start-up.

Store away the protecting plugs for later use (e.g. when returning the device).

9.2.1 Protecting plug fluid connections

Tools required

- None

Procedure

1. Release union nut (1) from R connection and pull off protecting plug (2).
2. Release union nut (3) from P connection and pull off protecting plug (4).
3. Keep union nuts for connecting the hoses.

Fig. 7: Smart Control EVO protecting plug fluid connections

Item number	Item
1	Fluid (R) drain connection
2	Protecting plug
3	Fluid (P) inflow connection
4	Protecting plug

9.2.2 pH sensor protecting plug

Tools required

- None

Procedure

1. Pull green cover cap off the housing (1).
2. Pull protecting plug (2) out of the housing (1).
   – Make sure no dirt particles enter the opening.

Fig. 8: Smart Control EVO pH sensor protecting plug

Item number	Item
1	Smart Control EVO housing
2	pH sensor protecting plug

9.3 pH sensor installation

Tools required

- Screwing tool

The pH sensor is predominantly made of glass.
Handle the pH sensor with care.

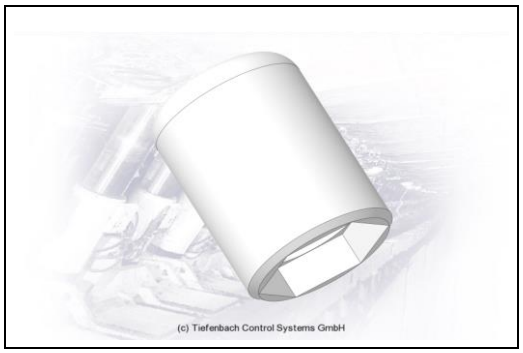

Fig. 9: pH sensor screwing tool

Procedure

1. Pull the cover cap (4) off the housing (3).
2. Take pH sensor cable (2) out of the housing.
3. Insert pH sensor (1) into the block opening, and carefully screw it in with the screwing tool.
   – Tightening torque 3 Nm
4. Screw pH sensor cable (2) onto the pH sensor (1).
5. Push cover cap (4) onto the housing (3).

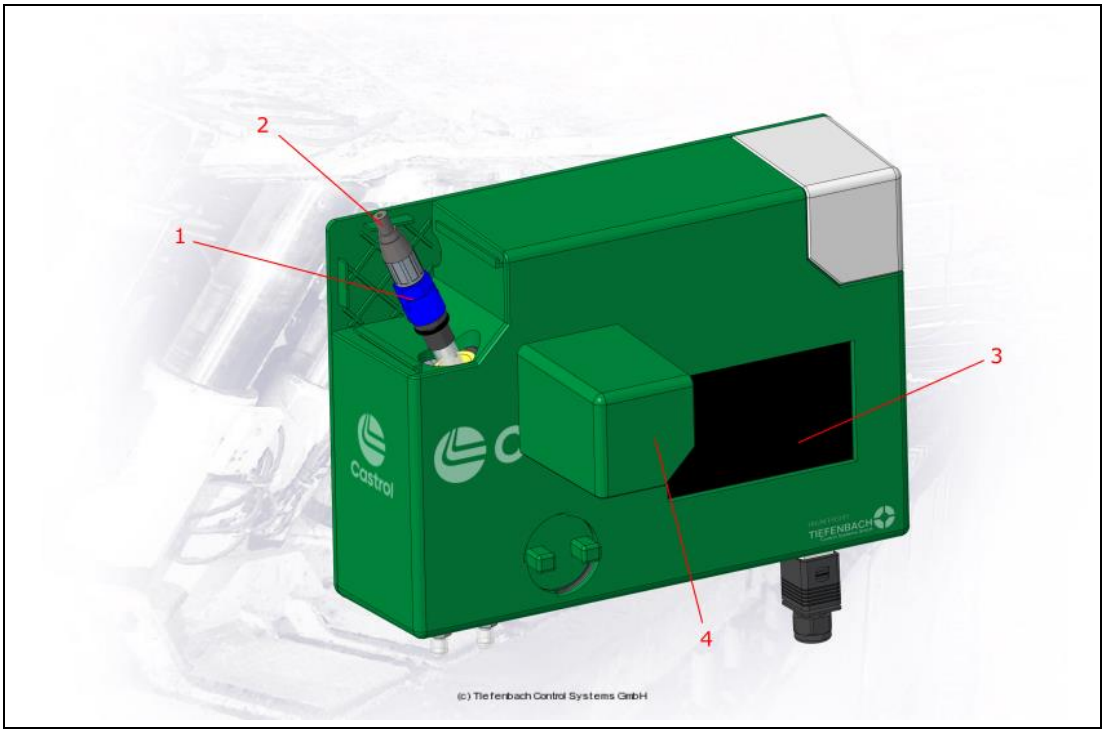

Fig. 10: pH sensor installation

Item number	Item
1	pH sensor
2	pH sensor cable
3	Housing
4	Cover cap

After installation, the pH sensor must be calibrated. See chapter Maintenance and repair.

The pH sensor in the SmartControlEVO must be used, which was calibrated with this device. Exchanging pH sensor between different devices is not permitted, otherwise the measured values determined will differ.

9.4 Connections

Abb. 11: Underside of the Smart Control EVO

Item number	Item
1	Power connection
2	LAN connection
3	USB connection
4	Fluid outlet
5	Fluid inlet

9.5 Hose installation

The measurement fluid for the Smart Control EVO measuring device must be pre-filtered to ensure fault-free operation of the system. For this purpose, the system must be equipped with a filter system and devices for removing chips.

The supplied filter with a filter mesh of 125 µm merely serves as a "last resort filter".

Tools required

- None

Procedure

1. Push the union nut with thread to the end of the hose for the P connection.
2. Push the ø8-mm hose for the supply line on the P connection hose nipple.
3. Tighten the union nut.
4. Push the union nut with thread to the end of the hose for the R connection.
5. Push the ø8-mm hose for the return line on the R connection hose nipple.
6. Tighten the union nut.
7. If necessary, slide a protecting hose onto a hose as kink protection for the tank inlet.
8. Push the union nut with thread to the end of the hose for the filter connection.
9. Push the ø8-mm hose for the filter connection on the hose nipple.
10. Tighten the union nut.
11. Screw filter element on the check valve.
12. Check hoses and filter elements for firm fitting

Fig. 12: Smart Control EVO fluid connections

Item number	Item
1	Fluid (R) drain connection
2	Fluid (P) inflow connection

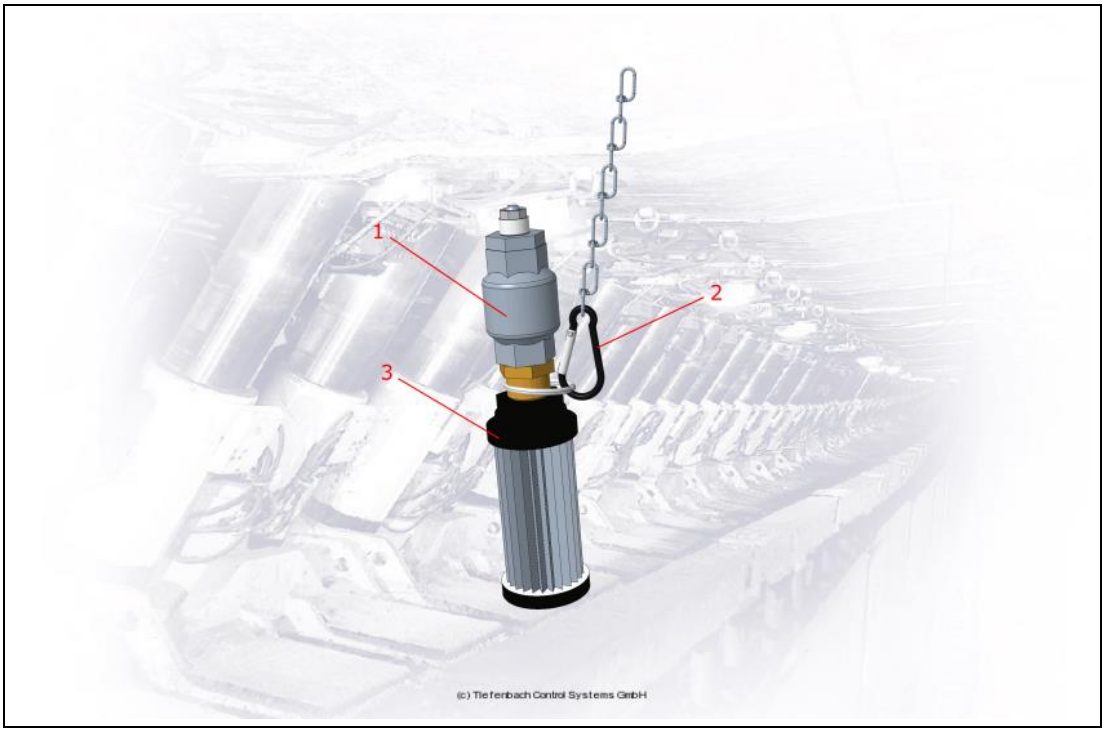

Fig. 13: Filter with check valve

Item number	Item
1	Check valve
2	Filter element

13. Attach hoses in the tank. Fix the hose with filter to 50% of the tank height.

ATTENTION

Failure or total failure of the device

If the filter is hung too low in the tank and dirt is sucked in, this can cause the device to fail, or to total failure.

- Fix the filter to 50% of the tank level.
- Avoid hanging the filter in dirt.
- Clean the tank regularly to remove dirt.

9.5.1 Installation of hose lines

When laying the hose lines, the following specifications must be adhered to:

- Observe the maximum permissible bending radius of 20mm
- Avoid torsion
- Avoid abrasion, chafing and kinking
- Avoid tensile loads and compression loads

9.6 Installing electrical connections

Tools required

- None

Procedure

1. Insert the power supply plug (2) into the power supply connection (1) on the Smart Control EVO.

If necessary:

2. Insert USB stick into the USB socket (3) on the Smart Control EVO.
3. Insert LAN connector into the LAN socket (4) on the Smart Control EVO.

Fig. 14: Electrical connections

Item number	Item
1	Voltage supply connection
2	Voltage supply connector
3	LAN connection
4	USB connection

9.7 Fastening

The Smart Control EVO is installed on site according to the customer's requirements.

Alternatively, the Smart Control EVO can be fastened using a mounting bracket made of high-alloy steel. The mounting bracket is equipped with three magnets for easy installation. If the mounting bracket is to be fixed permanently, the magnets can be removed and the holes can be used for a screw connection. Adhesive pads attached to the lower rear ensure straight attachment.

Fig. 15: Smart Control EVO with bracket holder, front

Fig. 16: Smart Control EVO with bracket holder, rear

9.8 Network connection

The Smart Control EVO can be connected to the system by different methods.

Use the settings for the Linux 11 operating system for

- WLAN
- Remote- / Screen-mirroring
- SQL interface
- OPC UA (unsecured data transmission)
- MQTT (secured data transmission)

10 Start-up

10.1 Safety

ATTENTION

Defective product due to excess voltage!

Operating the product at a higher voltage than the permissible maximum voltage can damage the product.

- Operate the product only up to the specified maximum voltage

ATTENTION

Defective product due to reverse polarity!

Reversing the polarity specified for the product can damage the product.

- Operate the product only with polarized connectors

10.2 Commissioning

Requirements

Check the following requirements prior to start-up:

- Both hose connections are connected
- The filter / check valve is in the tank
- An input voltage of 90VAC to 264VAC is being supplied
- The fluid parameters are within normal values:
  - Particle quantity in the sizes 3µm, 5µm, 12µm <400ppm
  - Particle quantity size 45µm <100ppm
  - Total particle quantity <1000ppm

ATTENTION

Device failure due to contamination

If fluid systems with a high level of dirt particle formation are connected to the Smart Control EVO measuring device during the initial start-up phase, the device may fail.

The following systems should be excluded from the initial start-up phase:

- Systems in which the fluid is used for all operations with cast iron (due to the formation of graphite particles).
- Systems in which the fluid is used for grinding or honing metals.

The Smart Control EVO measuring device does not have its own mechanism for switching on/off.

The Smart Control EVO is operational when the mains plug is plugged in.

If an on/off switch is desired, this must be provided by the customer.

Initial start-up procedure

1. Connect the VAC mains plug to the power source
   – Depending on the conditions specific to your country, also use the adapter plug.
   – Once the device has voltage, the Smart Control EVO is in operation.

The Smart Control EVO is now running with the set start parameters. Change the values according to your system criteria in the "Parameters" menu

11 Operation

The Smart Control EVO runs completely autonomously and requires no direct operation apart from maintenance and inspection.

After activation, the Smart Control EVO automatically starts measuring operations with the saved default parameters.

11.1 Restart the Smart Control EVO visualization

If the visualization does not start automatically or if the visualization needs to be restarted, then the visualization can be switched on manually.

- Menu „Administration“
- Menu „F“
- Linux Application menu

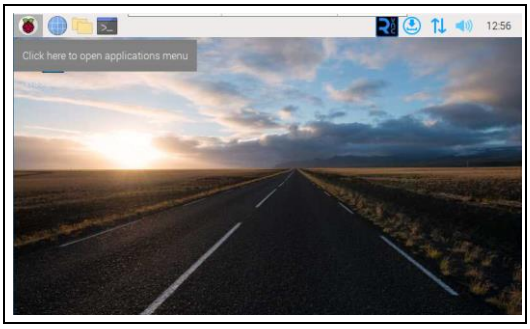

Abb. 17: Applications menu Linux

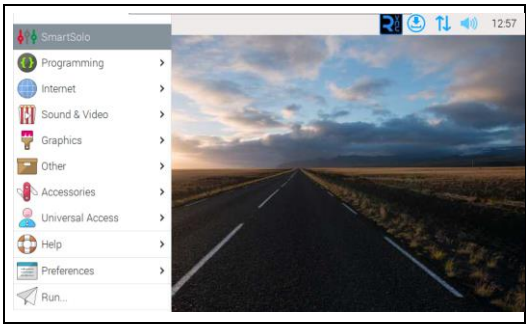

Abb. 18: Starting visualization

11.2 Default parameters

The Smart Control EVO starts measuring operation automatically with the following stored standard parameters.

Parameter	Value
Measuring interval	58 minutes
Pumping time	2 minutes

The following limits are set for measuring operation:

Parameter	Green Area	Yellow Area	Red Area
Temperature	10°C - 40°C	< 10°C / > 42°C	< 5°C / > 45°C
pH	9.1 - 12	9 / >12	< 8.7 / > 13
Concentration	-	0.1% - 15%	< 0.1% / > 15%

No starting parameter were stored for the green area of the refractometer. The indicator therefore lights up yellow.
Please set a suitable value for your application in the “Parameters” menu.

12 Software operation

The software stored inside the Smart Control EVO is operated via the built-in HMI (touchscreen). A USB mouse/keyboard combo can be connected to the Smart Control EVO for more convenient operation.

Alternatively, set-up can be performed via remote access (remote desktop).

Once the system has booted up, the operating and display software is displayed in the foreground of the computer screen. The current measurement values can be seen in the overview.

All the other pages can be conveniently accessed via the buttons at the side of the window.

The Smart Control EVO measuring device is configured so that the measuring mode can be restored automatically after a drop in voltage.

12.1 Start screen menu

The Smart Control EVO starts with the start screen. The current measurement values are listed there under the configurable system names.

- Concentration in %
- pH value
- Temperature in °C
- Status color
- Warning messages

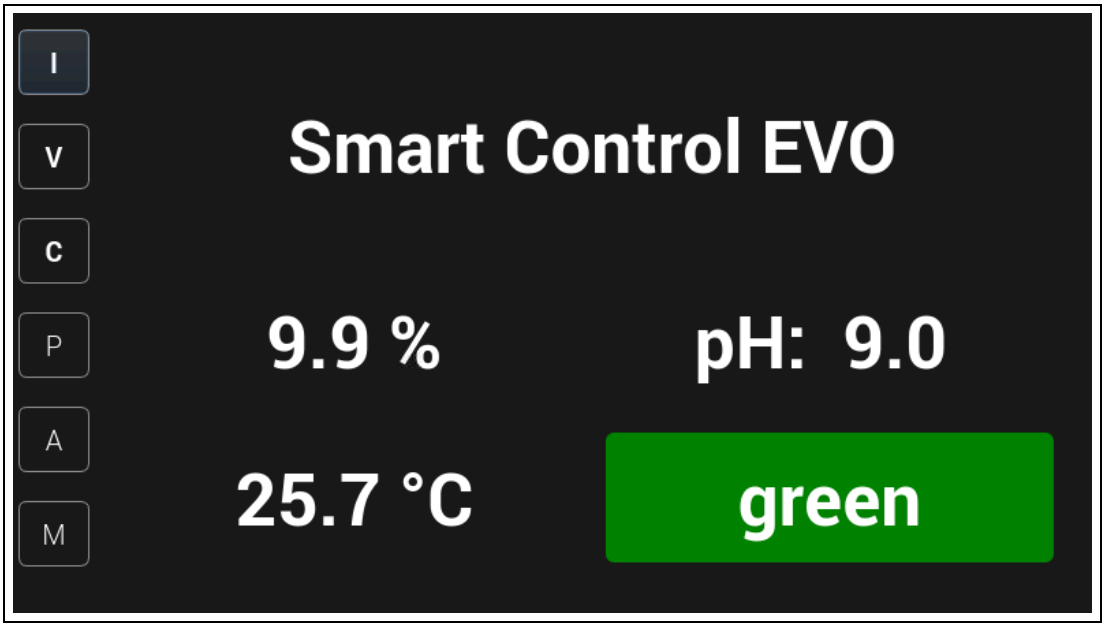

Fig. 19: Smart Control EVO start screen

The value for the concentration is given in brackets because it is the value from the last measurement; i.e. it is not current.
The pH and temperature values are checked continuously.

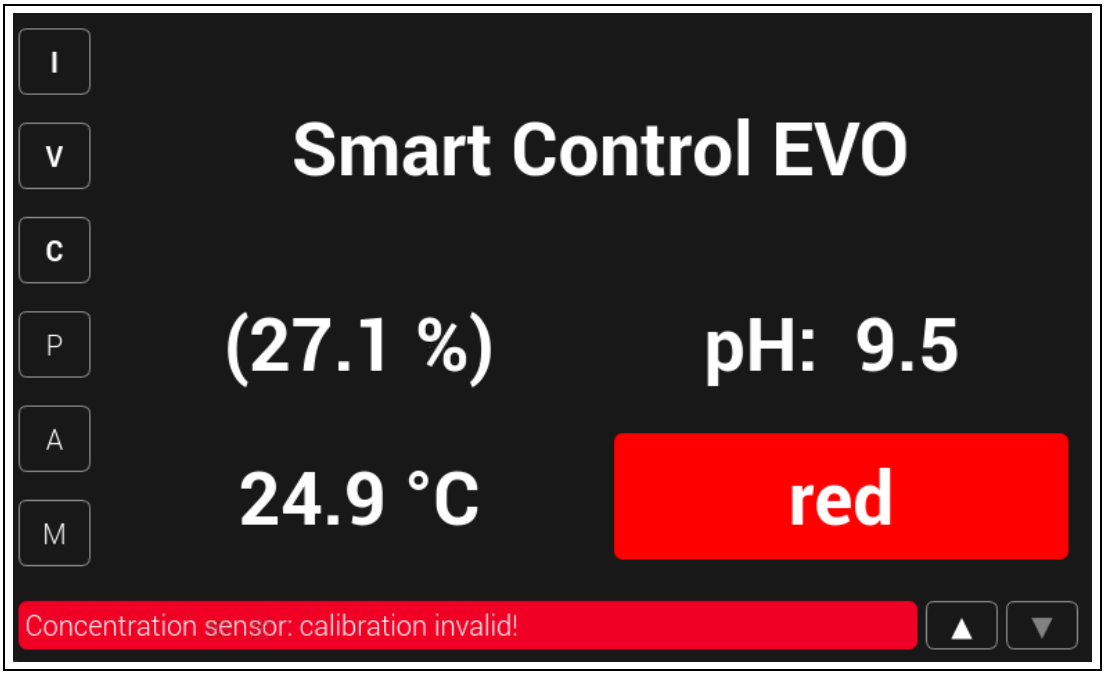

Fig. 20: Smart Control EVO start screen with warning message

The touch buttons on the left-hand side of the screen make it easy to navigate through the menus.

The following menus are available:

- I - Information
- V - Values
- C - Curve trend
- P - Parameters
- A - Administration
- M - Message archive

12.2 Measurement values menu

The "Measurement values" window shows the date and time of the last measurement, the time until the next measurement and a complete overview of the recorded measurement parameters.

Each measurement value is shown digitally as a figure and in a bar chart.

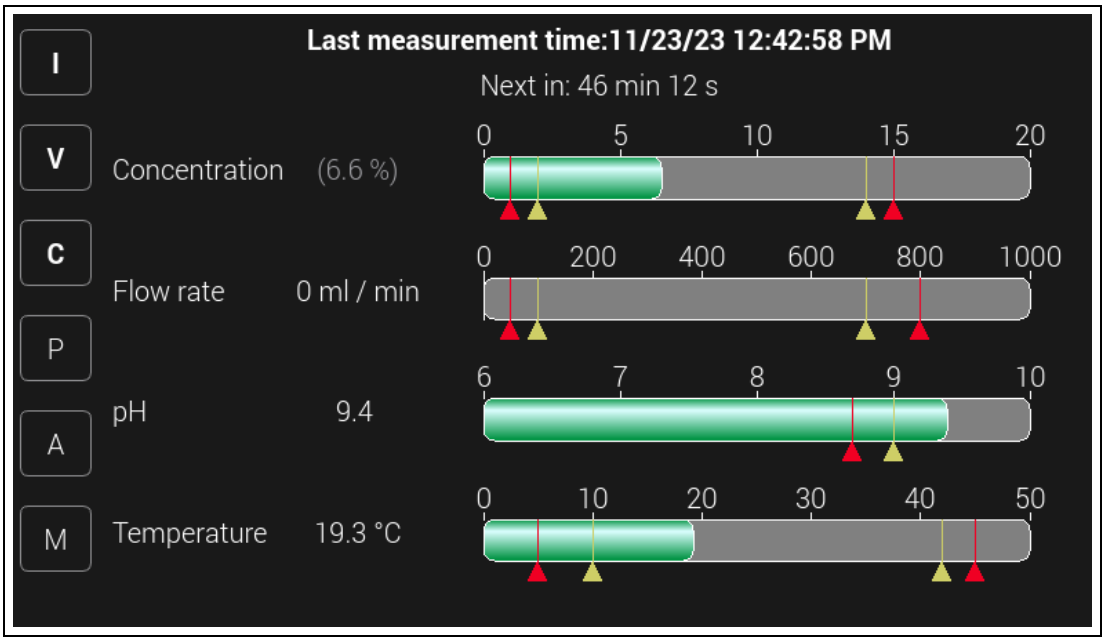

Fig. 21: Window with the current measurement values and the set limit values

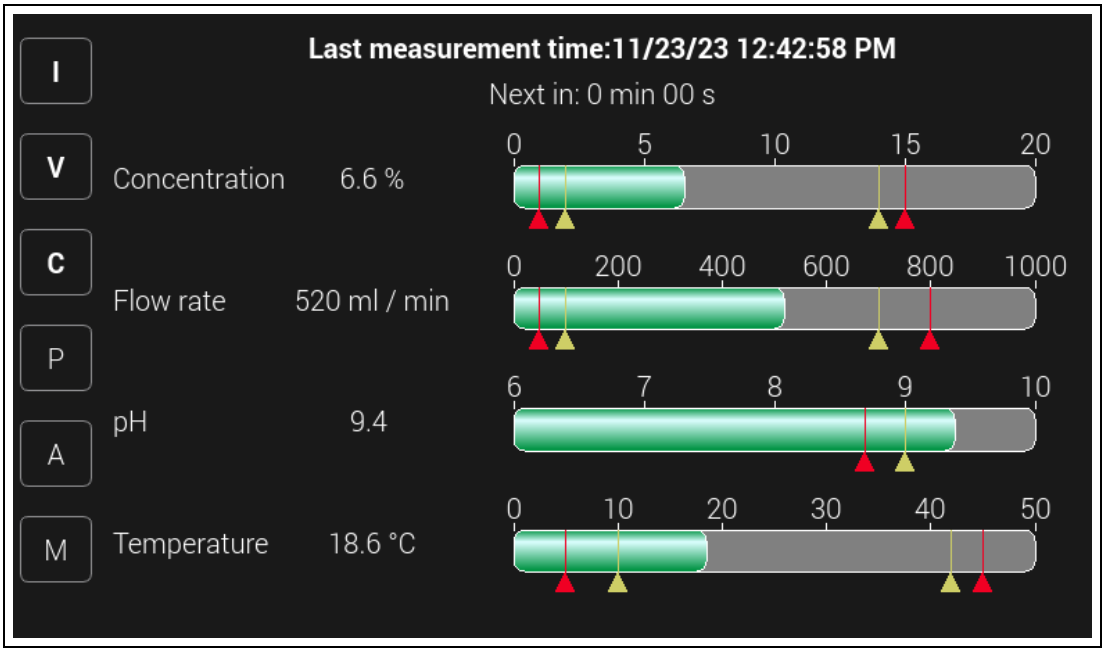

Fig. 22: Window with the current measurement values and the set limit values during the measurement

The colour of the bar indicates whether the current measured value is within the set tolerance (green) or outside the set tolerance (red).

The coloured triangles below the scales show the preset tolerance values.

Yellow warning level

If the value reaches the preset "Limit High" or "Limit Low" parameter

- the Smart Control EVO LED display lights up yellow
- a message is displayed on the screen
- the measurement bar becomes yellow

Red warning level

If the value reaches the preset "Alarm High" or "Alarm Low" parameter

- the Smart Control EVO LED display lights up red
- a message is displayed on the screen
- the measurement bar becomes red

12.3 Menu curve trend

The measured values are continuously saved on the integrated PC. The documentation is accessed via the “Curve trend” menu. The saved measured values can be selected and displayed here.

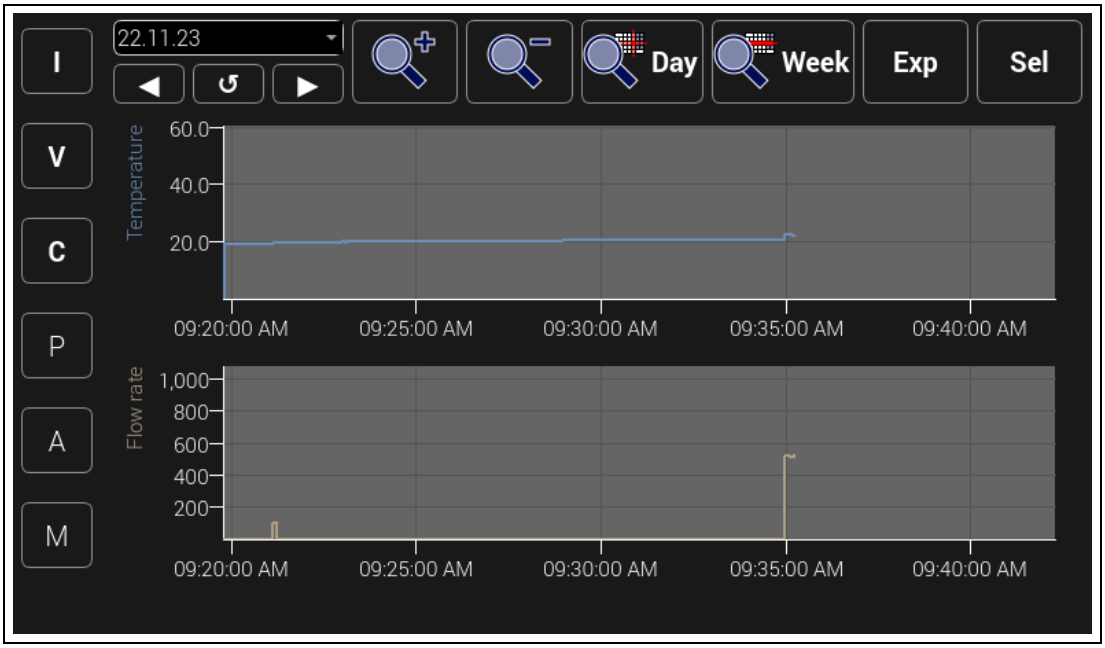

Abb. 23: Display of the measured values as a curve

When you exit the menu, the selected display setting is saved so that you can call up the menu again.

Menu item	Meaning
Date	Set the start of the measurement curve display
Left arrow	Go back a day
Round arrow	Refresh screen
Right arrow	Skip forward a day
Magnifying glass +	Zoom in → reduce measurement range
Magnifying glass -	Zoom out → increase measurement range
Magnifying glass Day	Show measured values for the day selected in the date field
Magnifying glass Week	Show measured values for the selected week. The start of the measured values is the date selected in the date field
Exp	Data export
Sel	Select measurements

12.3.1 Select measurements

The values that should be displayed can be set using the menu item “Sel” (select measured variables). Up to five measured values can be selected, which are then displayed as a curve trend in the selected order.

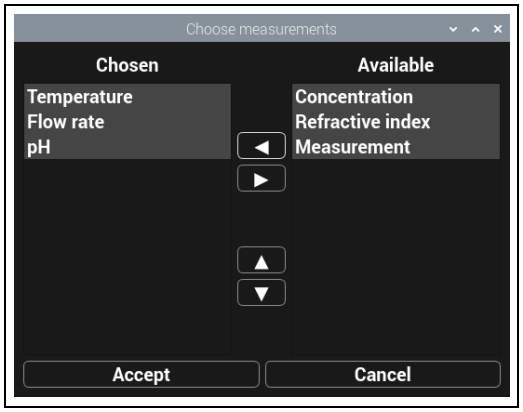

Abb. 24: Selection menu of the measured variables to be displayed

The following measurements are available:

- Temperature
- Concentration
- Flow
- pH
- Refractive index

12.3.2 Data export

The selected measured values can be exported using the menu item “Exp” (data export). The measured values are saved in a CSV file. The storage location can be freely chosen.

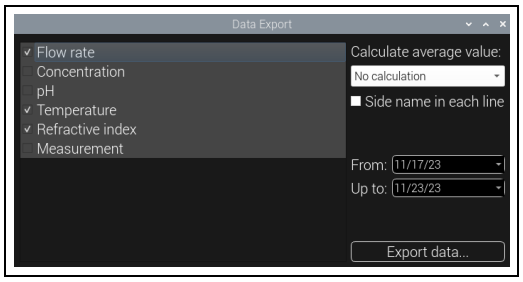

Abb. 25: Data export selection menu

Menu item	Meaning
Calculate average value	Creates an average of all set values. The average is formed from the period set in the menu. Available values 5 minutes to 24 hours.
Side name on each line	At the beginning of the CSV export file, the system name is written in each line

12.4 Parameters menu

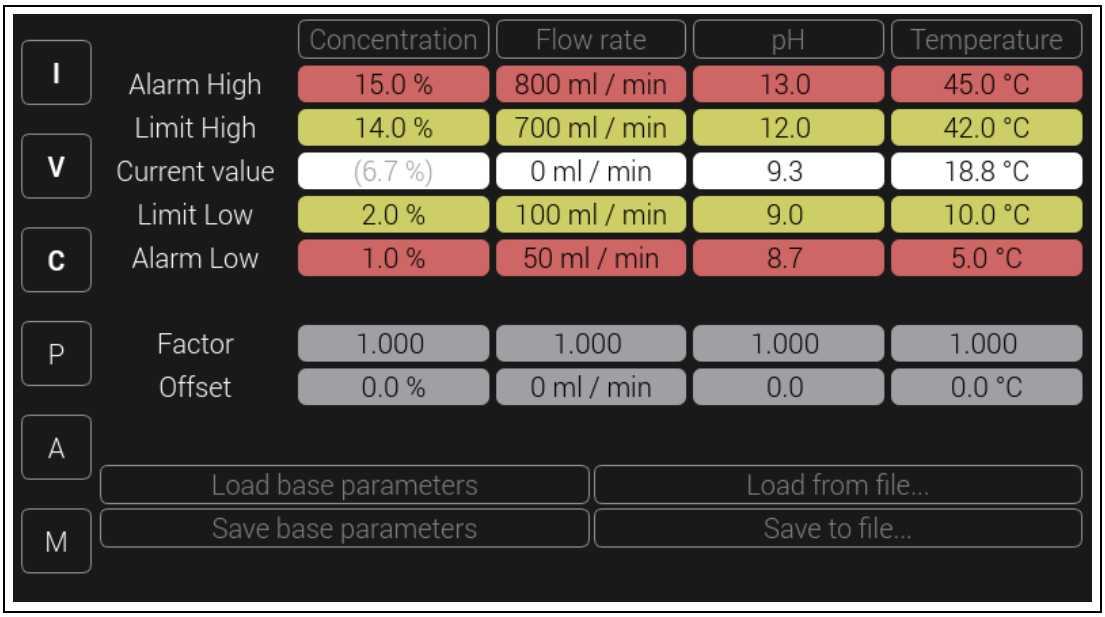

Fig. 26: Input screen for parameters, warning values and alarm values

The limit values and alarm values for the individual measurement values, such as concentration, etc., are entered in the "Parameters" display screen. The parameterisation of the individual tolerance ranges is also possible here.

The parameters can only be entered or changed by authorised persons (administrators).

Before authorisation to change settings is approved, the user must log in with their password in the "Administration – Password entry" menu.

The authorisation remains active for a period of 5 minutes. After this time, a new registration is required.

12.4.1.1 Loading basic settings

The parameters are loaded from the default storage location on the computer's data carrier.

As when starting the program, files with the extension ".base" are accessed here if the files from which the program normally reads are faulty.

12.4.1.2 Saving basic settings

The parameters are saved to the default storage location on the computer's data carrier.

The parameters are saved automatically after each change. This command allows you to additionally save the parameters in files with the extension ".base" that are used when starting the program and when loading the basic settings if the files in which they are normally saved are faulty.

12.4.1.3 Loading from a file

Load saved parameter file from a data carrier (*.para).

12.4.1.4 Saving to a file

Save parameters as a file to a data carrier (*.para).

12.4.2 Changing parameters

To set the parameters, click on the corresponding column heading; e.g. "Concentration". The input window then opens.

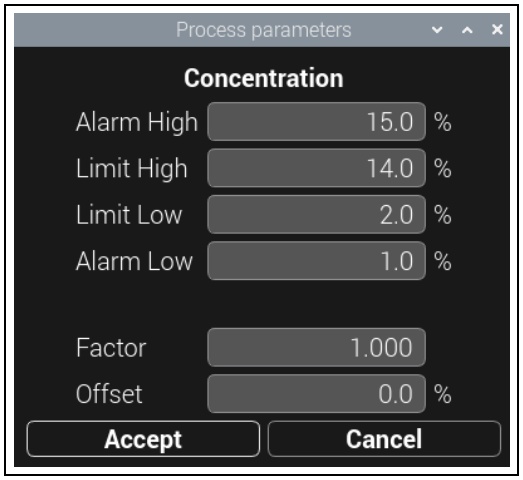

Fig. 27: Process parameters input field

12.4.2.1 Alarm High:

Specifies the upper limit above which the "red" warning level is signalled.

12.4.2.2 Limit High:

Specifies the upper limit above which the yellow warning level is signalled.

12.4.2.3 Limit Low:

Specifies the lower limit from which the yellow warning level is signalled.

12.4.2.4 Alarm Low:

Specifies the lower limit from which the red warning level is signalled.

12.4.2.5 Factor

A correction factor that is multiplied by the sensor value to obtain a valid measurement value for the medium. The correction factor must be determined together with the supplier of the medium.

12.4.2.6 Offset

An offset value that is added to the sensor value to obtain a valid measurement value for the medium. The offset value must be determined together with the supplier of the medium.

12.5 Administration menu

Settings for individual functions can be adjusted in the “Administration” menu.

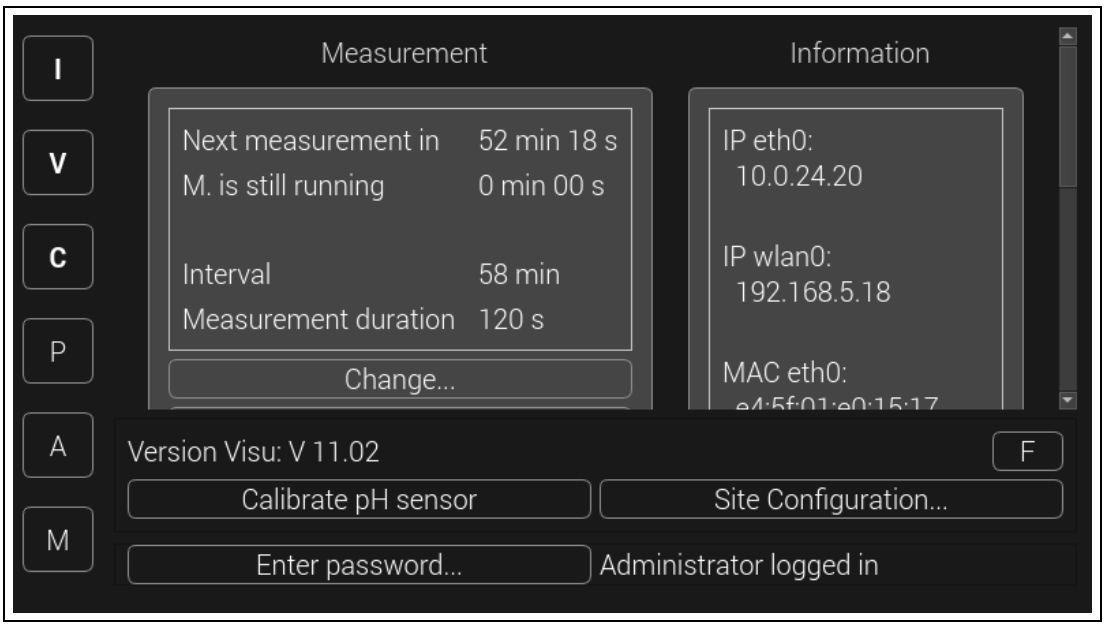

Abb. 28: Menu Administration

Entering or changing the settings can only be carried out by authorized persons (administrator).

Before permission to change settings is granted, the user must log in with their password under “Password entry”.

The authorization remains active for a period of 5 minutes. After this time, a new registration is required.

12.5.1 Measurement menu

The time period between automatic measurements can be selected in the “Measurement” menu. The usual interval is 1 hour.

A measurement is also carried out every time the Smart Control EVO is switched on.

To change the settings, the window must be pushed up.

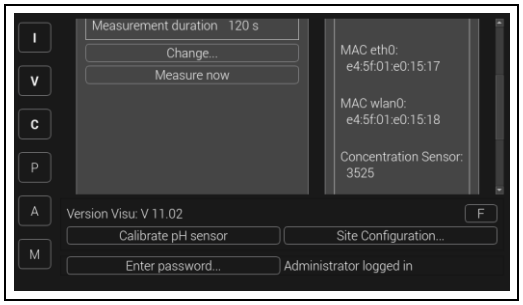

Abb. 29: Image position to change settings

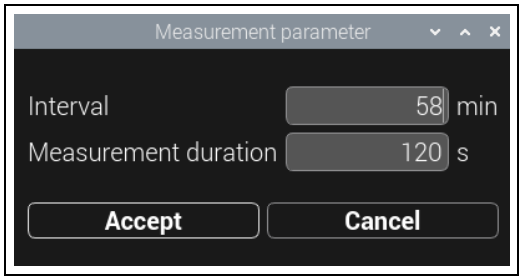

Abb. 30: Measuring parameters window

12.5.1.1 Intervall

Specifies the intervals at which checks are carried out. An interval of 1 hour is usual. Possible input values: 5 minutes to a maximum of 1440 minutes.

12.5.1.2 Measurement duration

Specifies how long the pump pumps fresh cooling lubricant into the measuring cell.

Possible input values: 1 second to a maximum of 1000 seconds.

12.5.2 Menu Information

The following information is listed in the Information menu:

Display	Meaning
IP eth0	IP address of the device in the Ethernet
IP wlan0	IP address of the device in the WLAN
MAC eth0	MAC address of the device in the Ethernet
MAC wlan0	MAC address of the device in the WLAN
Concentration Sensor	Concentrate sensor serial number

12.5.3 Notification version Visu

The version of the currently installed software can be read here.

12.5.4 Menü F

Using the “F” button, the visualization window can be reduced in size so that the operating system functions can be operated in the upper windows area.

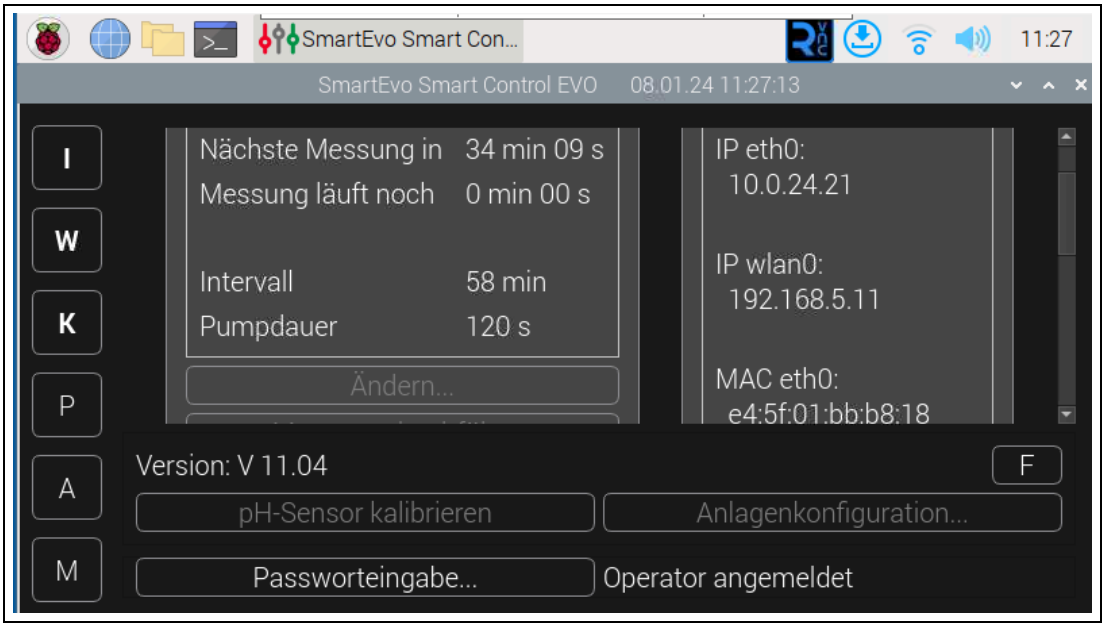

Abb. 31: Reduced view with access to operating system

12.5.5 Menu Calibrate pH-Sensor

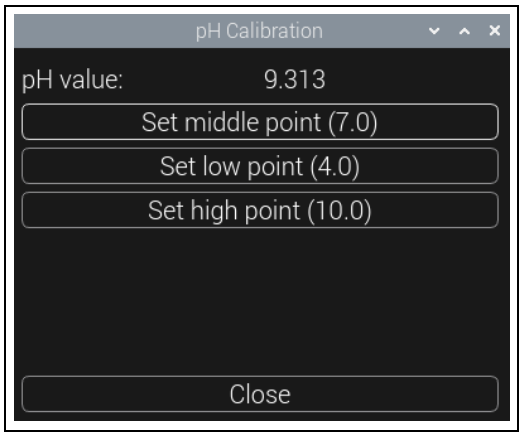

Abb. 32: pH calibration window

12.5.5.1 pH value

The current pH value is displayed

12.5.5.2 Set middle point

This function sets the middle point required for calibrating the pH sensor at pH7.

12.5.5.3 Set low point

This function sets the middle point required for calibrating the pH sensor at pH4.

12.5.5.4 Set high point

This function sets the middle point required for calibrating the pH sensor at pH10.

12.5.6 Menu Site Configuration

The “System configuration” menu allows you to create and change the system name, select the language and select additional functions.

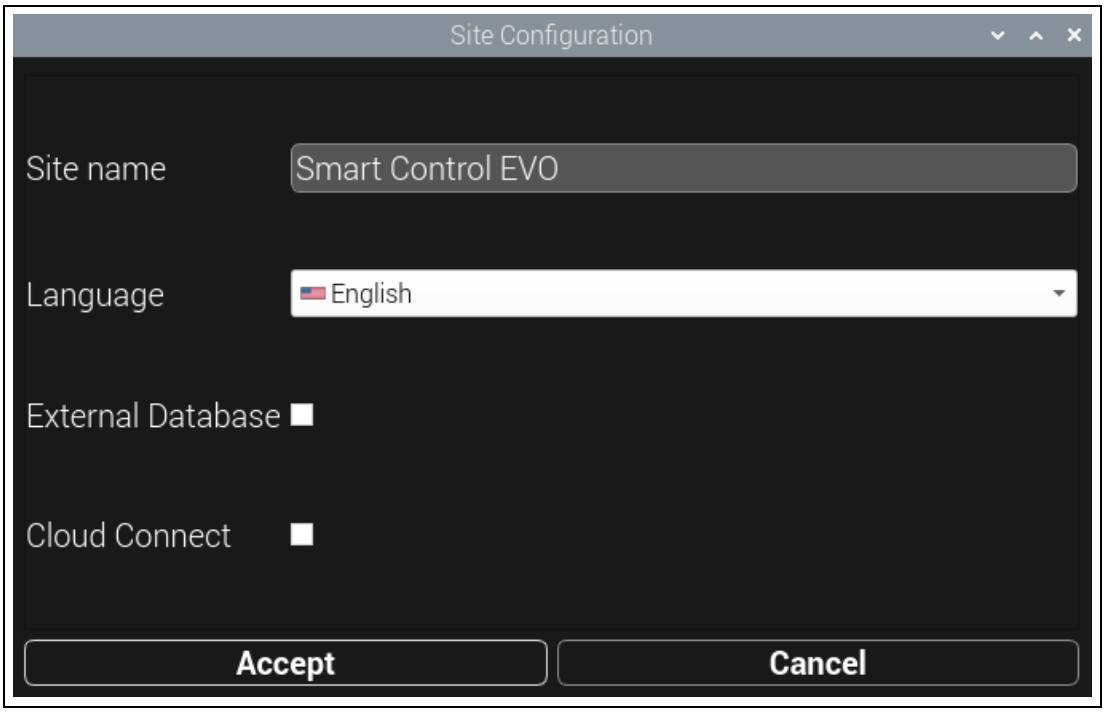

Abb. 33: Site configuration window

12.5.6.1 Site name

A system name can be assigned here. It is displayed at the top of the title bar to make it easier for the operating personnel to assign the measuring device to the medium.

12.5.6.2 Language

The display language can be set in this menu. In order for the display of the message texts to be switched, the visualization must be restarted.

The following languages are available:

- German
- English
- Svenska

12.5.6.3 Externe Datenbank (Option)

When this module is active, the measured values and error messages are stored in an external MySQL database. A new option will appear in the Administration menu.

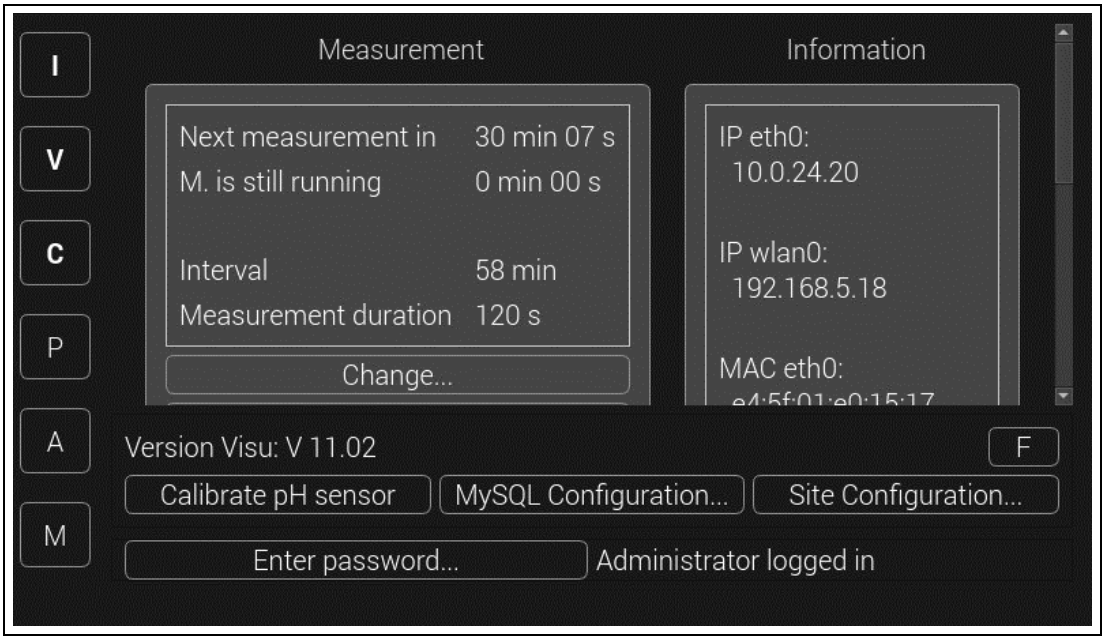

Abb. 34: Administration window with MySQL Configuration

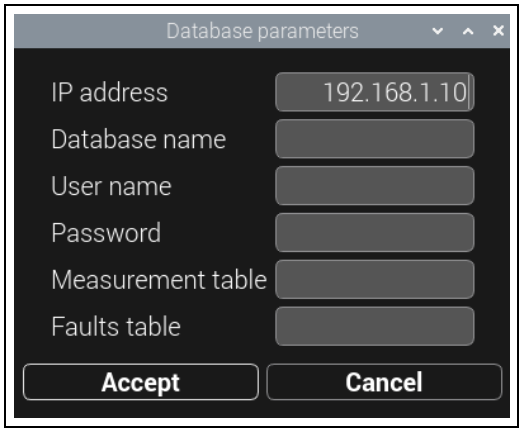

Abb. 35: Database parameters

12.5.6.3.1 IP adress

IP address of the external database

12.5.6.3.2 Database name

Name of the database

12.5.6.3.3 Benutzername

Database user name

12.5.6.3.4 Password

Database user access password

12.5.6.3.5 Measurement table

Name of the table in which the measured values are to be entered.

12.5.6.3.6 Faults table

Name of the table in which the error messages are to be entered.

12.5.6.4 Cloud Connect

When this module is activated, the measured values and error messages are stored in a cloud and the “Cloud configuration” option is displayed in the administrator menu.

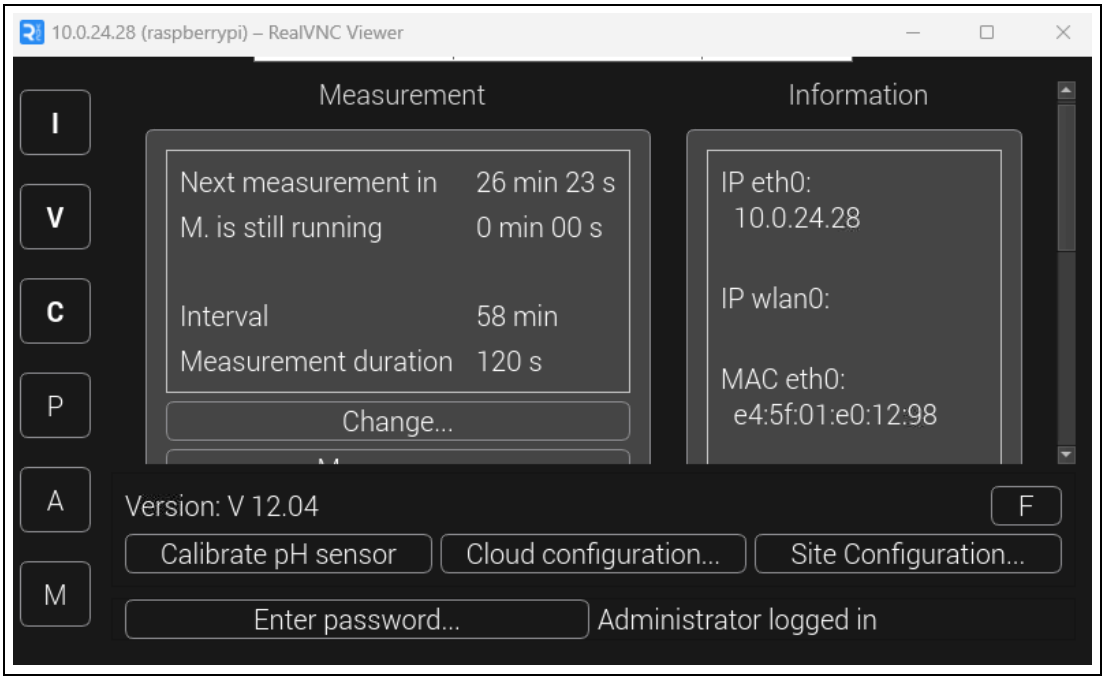

Abb. 36: Administration with Cloud Configuration

12.5.6.4.1 Cloud configuration

In order to send data to the cloud, some settings must first be made.

To gain access to the cloud, certificates are required, which are available from the cloud provider. These are usually provided in a zip file.

All certificates should be saved in the “Certificates” directory in the “Tiefenbach” folder. If the directory does not exist, it must be created.

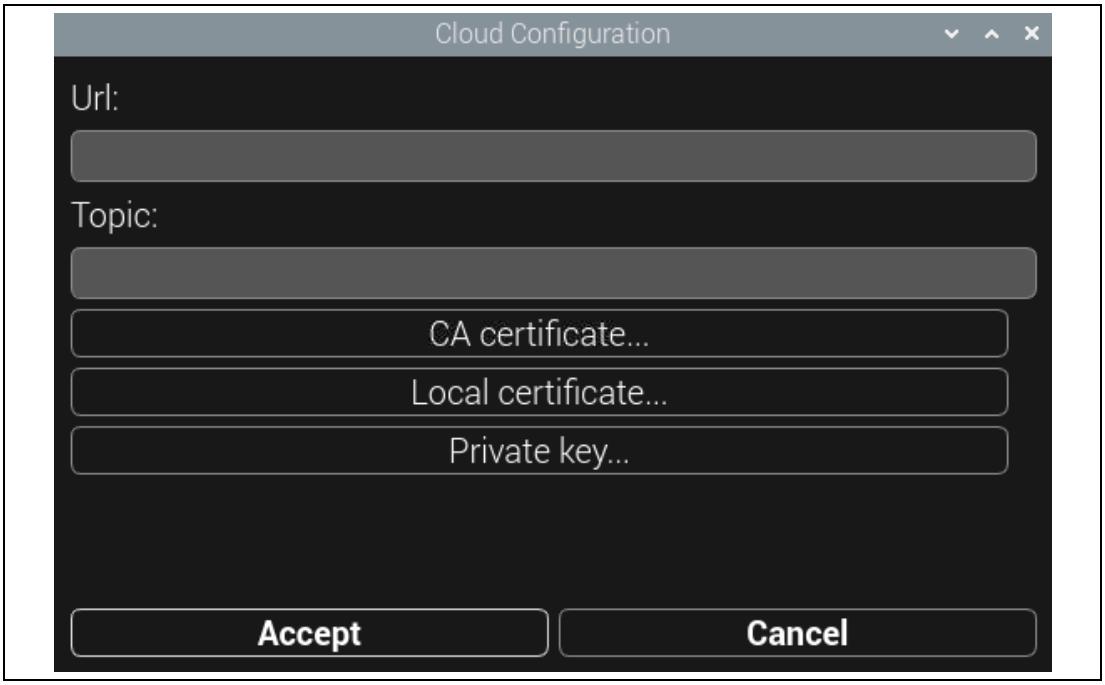

Abb. 37: Cloud Configuration

12.5.6.4.2 URL

Field for entering the web address. The text to enter in the URL: field is typically provided in a text file named endpoint.txt.

12.5.6.4.3 Topic

The text to enter in the Topic field is typically provided in a text file called Topic.txt.

12.5.6.4.4 CA certificate…

Button for selecting the CA certificate.

12.5.6.4.5 Lokal certificate…

Button for selecting the local certificate.

12.5.6.4.6 Privat key…

Button for selecting the private key.

12.5.7 Menu Enter password…

In order to use the administrator functions, the password must be entered here. The password can be obtained from Castrol Service.

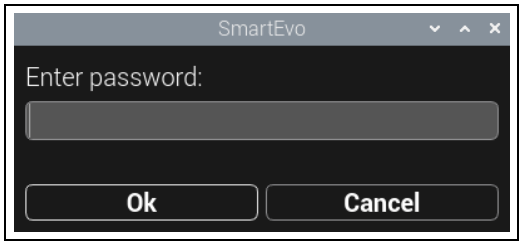

Abb. 38: Password entry window

12.5.8 Display logged in users

The logged in user is displayed in the Administration menu. A distinction is made between

- Operator
- Administrator

When you log in as an operator, the basic functions are available. By logging in as an administrator, parameters can be set and settings changed.

12.6 Message archive menu

The "Message archive" menu is used to store all alarm messages and warning messages with the associated date and time. This data is retained until it is deleted manually.

Fig. 39: Message archive window

12.7 Date

To display the messages for a specific period, the date can be selected using the date fields. The date entry must be confirmed with "OK".

12.8 Messages

The fault messages are listed in the message archive window, sorted by date and time. The side scroll bar can be used to move the window when many messages are displayed.

12.9 Export function

You have the option to export saved measurement data. In this process, the selected data is exported in a .txt file and can subsequently be further processed in a text editor.

The data is saved sorted row by row and contains the date, time and the message.

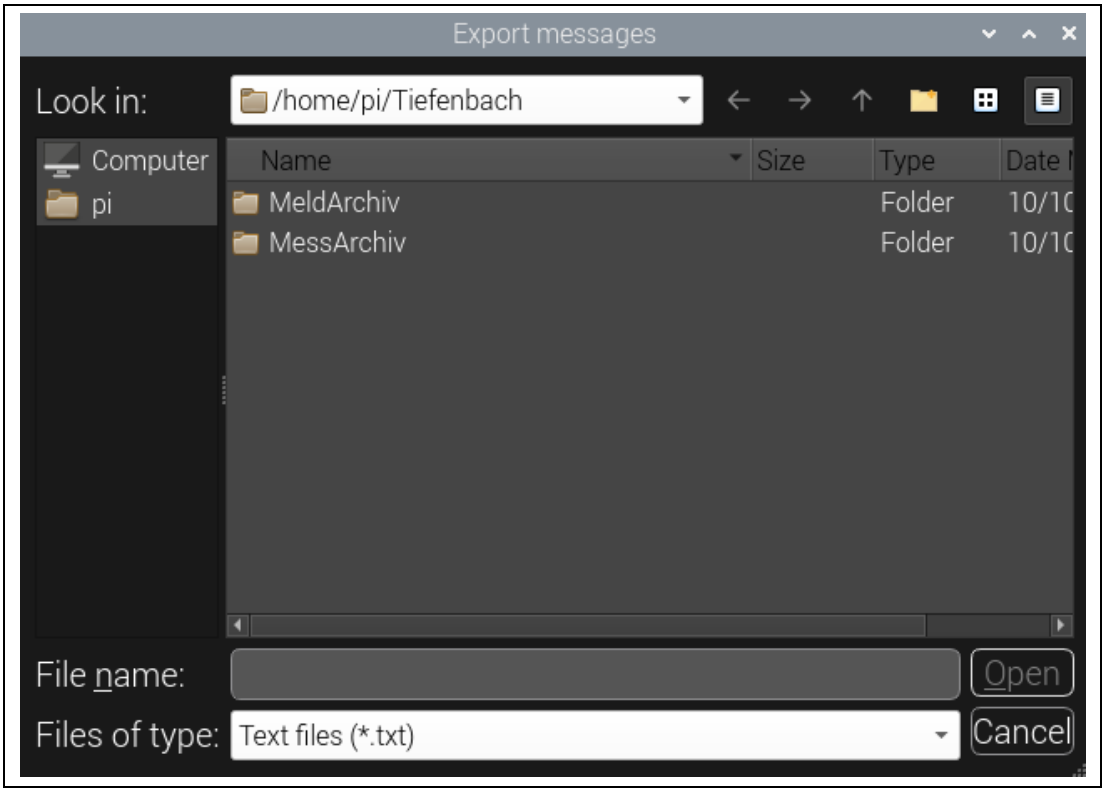

Fig. 40: Export messages window

12.10 Warning messages and advisory messages

The Smart Control EVO outputs the following messages:

Message
Flow: Alarm High exceeded
Flow: Alarm Low fallen below
Flow too low for measurement
Flow: Limit High exceeded
Flow: Limit Low fallen below
No connection: ext. Database
Concentration Alarm High exceeded
Concentration Alarm Low fallen below
Concentration: Limit High exceeded
Concentration: Limit Low fallen below
Concentrate sensor: Calibration invalid!
pH- value: Alarm High exceeded
pH- value: Alarm Low fallen below
pH value: Limit High exceeded
pH- value: Limit Low fallen below
Sensor is dirty: PLEASE CLEAN!
Sensor error: concentration
Sensor error: flow
Sensor error: pH
Sensor error: temperature
Temperature: Alarm High exceeded
Temperature: Alarm Low fallen below
Temperature: Limit High exceeded
Temperature: Limit Low fallen below
Visualization is running

12.11 Setting the date and time

When connected to the network via the LAN connection, the SmartControlEVO receives the current date and time.

Setting the date and time manually overwrites the network settings.
The manually entered values are deactivated after a restart.

If the date and time are to be set manually, the following steps must be followed:

1. Select the “Administration” menu
2. Activate button “F”.
3. Activate the “Terminal” button
4. In the terminal, enter “sudo date” in syntax [MMDDhhmm[[CC]YY][.ss]].
   - MM: Month
   - DD: Day
   - hh: Hour
   - mm: Minute
   - CC: Century
   - YY: Year
   - ss: Sekond
5. Press “Enter”
6. After about 40 seconds the date and time will be shown.

Example for 23.11.2024 03:57:55 => sudo date 112303572024.55

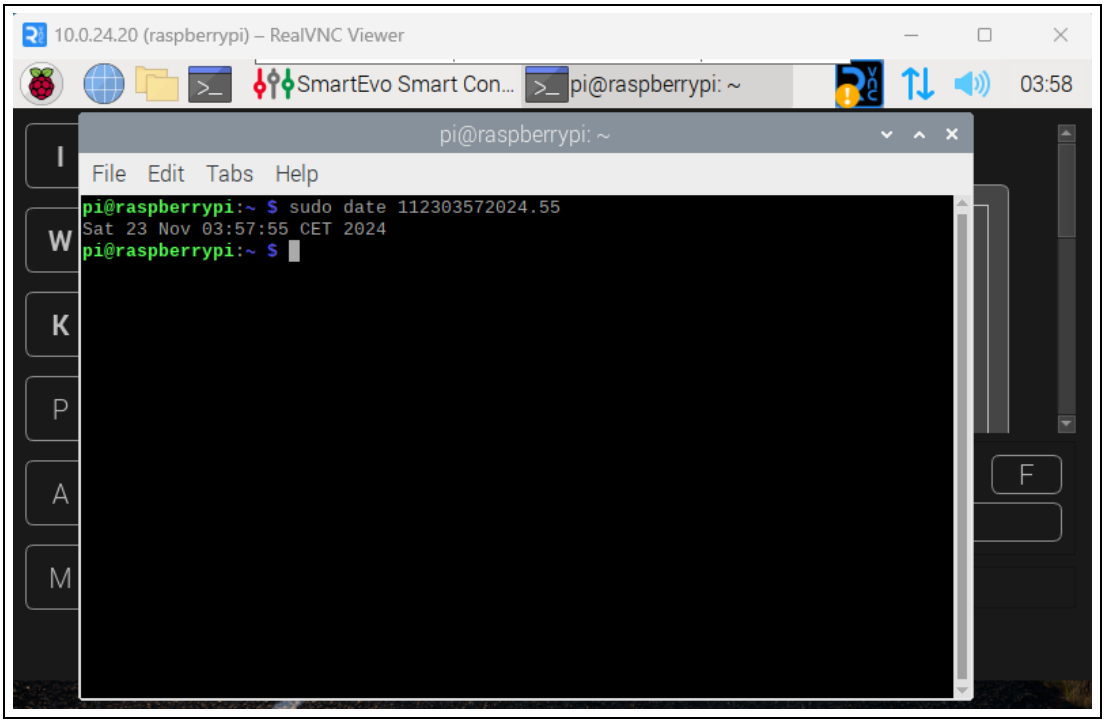

Abb. 41: System window Terminal

13 Maintenance and repair

13.1 Safety

⚠ WARNING

Unforeseeable risks!

A product not maintained in a proper condition prevents safety of operation. Malfunctions of the product and unexpected risks may result which cause severe injuries or even death.

- Maintain the product in a proper condition.
- Only operate the product when it is in a proper condition.

⚠ CAUTION

Damage due to wrong tools!

The use of unsuitable tools for the product can result in light injuries and damage to the product.

- Only use proper and suitable tools.

⚠ CAUTION

Danger posed by liquids spraying out

The liquid in the system is pressurised. This liquid can spray out and cause injuries when working on the system.

- Depressurise the product prior to working on the system.

ATTENTION

Failure of the device!

The use of non-original spare parts may result in a failure of the device.

- Only use original spare parts

ATTENTION

Non-conforming products

Damaged or non-conforming products can cause personal injury and property damage.

- Observe maintenance intervals
- Replace non-conforming products immediately

ATTENTION

Natural ageing

Seals, hoselines, and other components made of rubber materials or plastics are subject to natural ageing.

Be sure to observe all storage instructions and information and do not store these components for more than 2 years.

13.2 Inspection and maintenance schedule

The following applies for the maintenance activities specified below:

- Perform maintenance work at the specified intervals.
- Log every maintenance activity in the maintenance logbook.

Interval	Component	Maintenance activity	By
Daily	Smart Control EVO	Visual inspection for damage	User
		Check the connections and valves are tight	User
		Check the electrical connections (power plug; LAN; USB)	User
		Clean screen	User
Monthly	Filter	Check filter condition. The measurement volume flow should be > 300 ml/min (with a new filter). Replace the filter if measurement volume flow < 100 ml/min.	User
	Concentration sensor	Clean concentration sensor measurement window	User
Every 6 months	Filter element	Replace filter element	User
	pH sensor	Check pH sensor and recalibrate if necessary	User
	Concentration sensor	Check concentration sensor and recalibrate if necessary	User
Every 12 months	Hoses	Replace hoses	User
Every 24 months	pH sensor	Replace the pH sensor	User

13.3 Wear parts and spare parts

Wear part	Article number	Required
pH sensor	238080	1x
O-ring, 39.5x1.2 for sealing measuring cell	240261	1x
Filter element	238127	1x
Check valve, complete	238126	1x
Hose, 2,5 metres	240227	2x

Accessories	Article number	Required
Magnet	240164	3x
Mounting bracket	240165	1x
Adhesive pads	240242	2x
Screwing tool	240172	1x
Protecting hose	240262	2x
Bracket for filter element and check valve	240301	1x

13.4 Filter element replacement

All steps for replacing the filter element are listed below.

Tools required

- Wrench, AF24
- Wrench, AF30
- Sealing tape

Procedure

1. Unplug mains connector.
2. Unscrew filter element (5) from the adapter (4) using an AF30 wrench (filter element) and an AF24 wrench (adapter).
3. Clean/replace filter element.
4. Place sealing tape around the thread of the adapter (4).
5. Screw new filter element (5) onto the adapter (4) using an AF30 wrench (filter) and an AF24 wrench (adapter).
6. Plug in the mains connector.

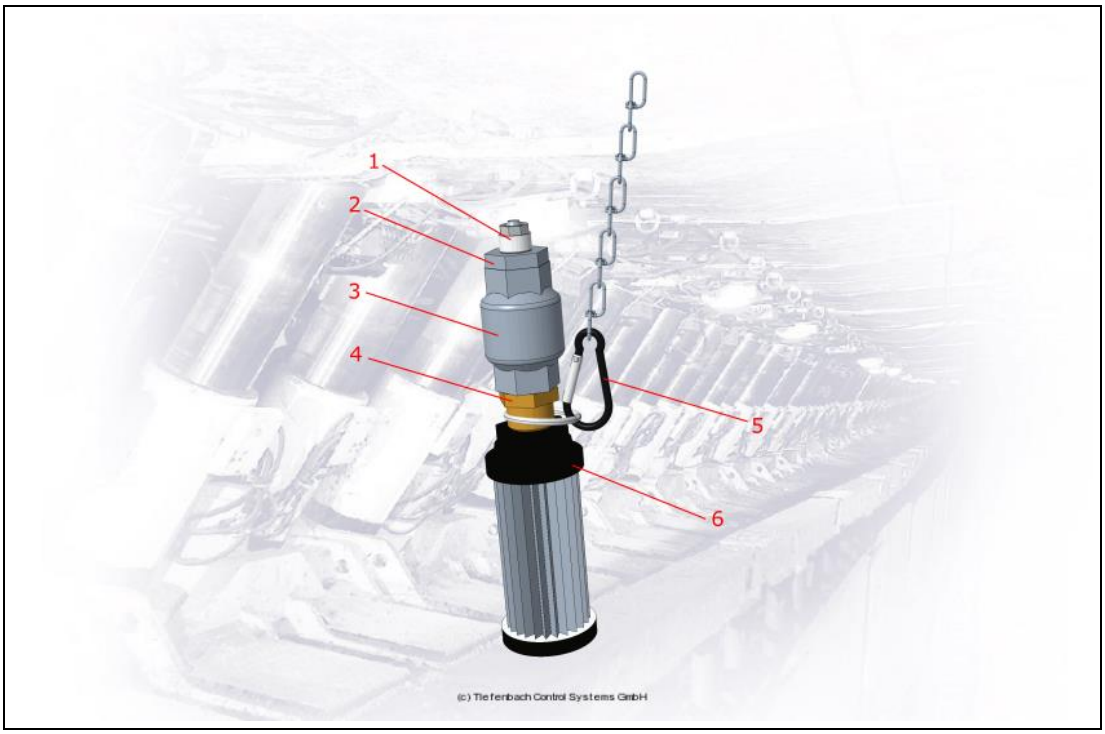

Fig. 42: Filter element with add-on parts

Item number	Item
1	Union nut
2	Hose screw fitting
3	Check valve
4	Adapter
5	Bracket
6	Filter element

13.5 pH sensor cleaning

All steps for cleaning the pH sensor are listed below.

Tools required

- Screwing tool
- Lint-free cloth
- Isopropyl alcohol
- Absorbent cloth

The pH sensor is predominantly made of glass.
Handle the pH sensor with care.

Avoid drying out the pH sensor. Permanent incorrect measurements may result.
The pH sensor is fitted with a protective cap. The protective cap contains a special fluid that prevents the pH sensor from drying out.

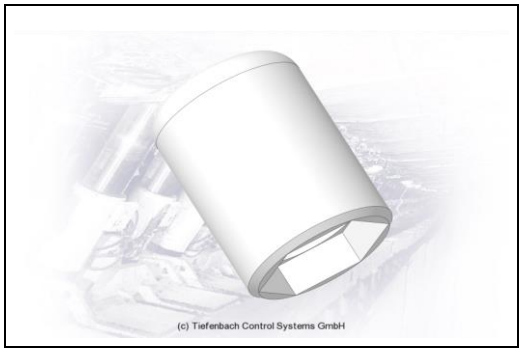

Fig. 43: pH sensor screwing tool

Procedure

1. Unplug mains connector.
2. Pull the cover cap (3) off the housing (2).
3. Unscrew pH sensor (1) from the block using the screwing tool and pull it out carefully.
4. Carefully clean pH sensor (1) with a soft, lint-free cloth an isopropyl alcohol.
5. Insert pH sensor (1) into the block; carefully screw in with the screwing tool.
6. Attach cover cap (3) to the housing (2).
7. Plug in the mains connector.

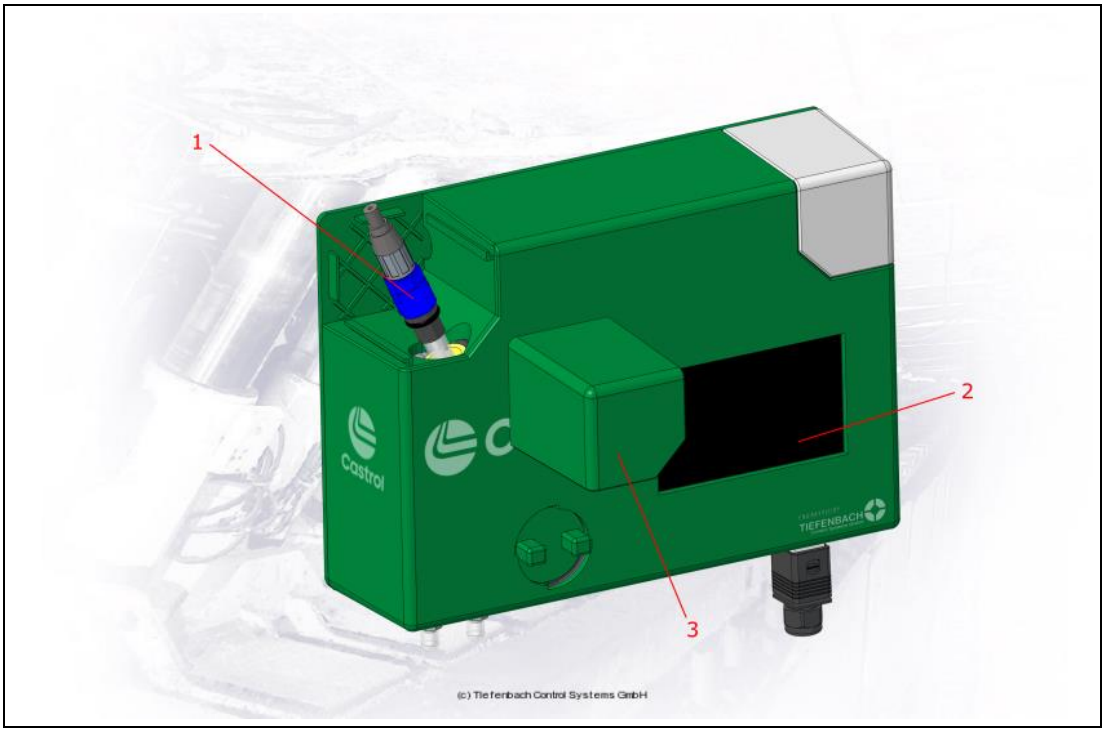

Fig. 44: Housing with pH sensor

Item number	Item
1	pH sensor
2	Housing
3	Green cover cap

13.6 Concentration sensor cleaning

All steps for cleaning the concentration sensor are listed below.

Tools required

- Lint-free cloth
- Isopropyl alcohol
- Absorbent cloth
- Screwing tool

Procedure

1. Unplug mains connector.
2. Turn the sealing cover (2) until the latch is open.
3. Pull the sealing cover (2) out of the housing (1).
   – Attention: fluid discharging from the housing!
   – Capture leaking fluid with an absorbent cloth.

Abb. 45: Smart Control EVO with opened inspection hatch

Item number	Item
1	Housing
2	Sealing cover
3	pH probe
4	Concentration sensor

4. Pull green cover cap (5) forwards and off the housing (1).
5. Release pH probe (3) using a screwing tool and pull out of the hydraulic block slightly.

6. Clean prism of the concentration sensor (4) with cleaning alcohol and a lint-free cloth.
7. Screw pH probe (3) into the hydraulic block using the screwing tool.
8. Place green cover cap (5) onto the housing (1).
9. Insert sealing cover (2) into the housing (1) and shut.
10. Plug in the mains connector.

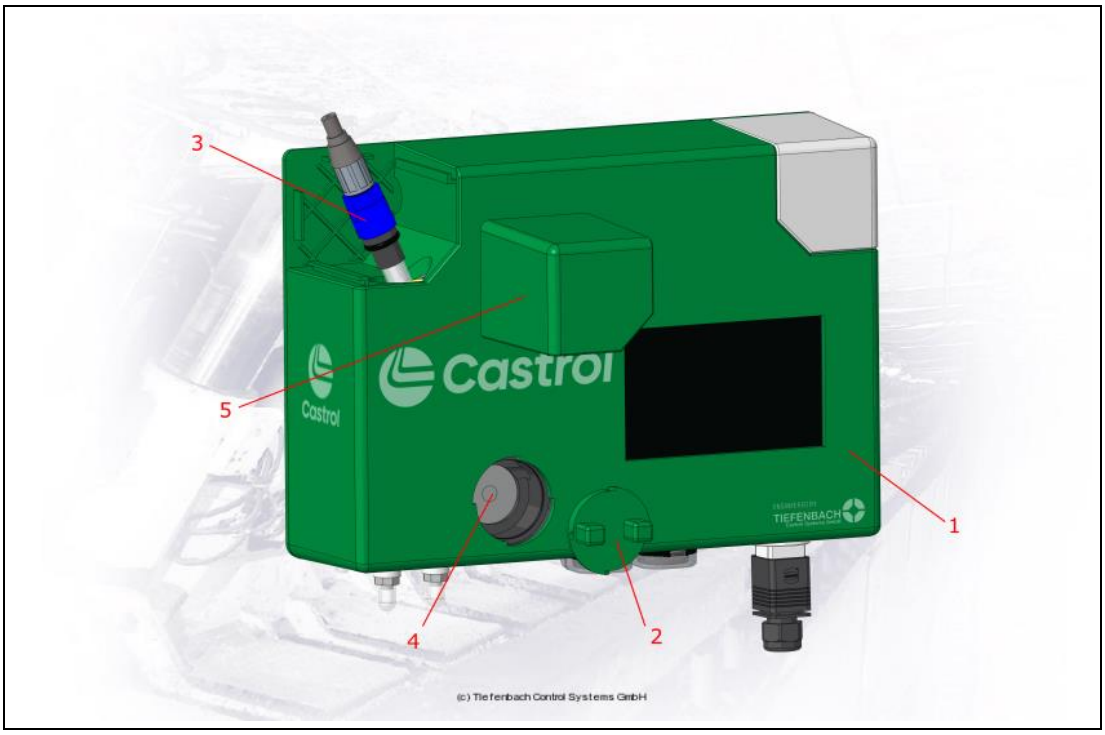

Abb. 46: Smart Control EVO with opened inspection hatch

Item number	Item
1	Housing
2	Sealing cover
3	pH probe
4	Concentration sensor
5	Cover cap

13.7 pH sensor calibration

All steps for calibrating the pH sensor are listed below.

Calibrations or inspections of the pH sensor depend on the usage conditions, such as contamination and chemical load.

The pH sensor must be removed to be calibrated.
For more on this, see section "pH sensor replacement".

Avoid drying out the pH sensor. Permanent incorrect measurements may result.
The pH sensor is fitted with a protective cap. The protective cap contains a special fluid that prevents the pH sensor from drying out.
Alternatively, store the pH sensor in a KCI solution (3 mol/l).

Soak pH sensors stored in a dry place for at least 24 hours before use. Otherwise there will be strong drift phenomena.

The pH sensor is predominantly made of glass.
Handle the pH sensor with care.

ATTENTION

Fluid discharge

The pH sensor must be removed to calibrate it. If the pump starts during the calibration process, fluid will be discharged.

- Only carry out the calibration with an appropriate interval to the next measurement or the next pump run.

Tools required

- pH4 calibration solution
- pH7 calibration solution
- pH10 calibration solution
- Distilled water or isopropyl alcohol
- Lint-free cloth

Procedure

1. Start the "Calibrate pH sensor" menu in the "Administration" menu.
2. Dismantle the pH sensor from the Smart Control EVO.
   – See the subsection "pH sensor replacement" in the section "Rectifying malfunctions".
3. Rinse the pH sensor with distilled water or isopropyl alcohol. Do not allow it to dry!
4. Immerse the pH sensor in a defined, pH7 buffer solution.
5. Activate the button "Set middle point (7.0)" in the "pH calibration" menu.
   – The pH value indicator changes to 7.
6. Rinse the pH with distilled water or isopropyl alcohol. Do not allow it to dry!
7. Immerse the pH sensor in a defined, pH4 buffer solution.
8. Activate the button "Set lower point (4.0)" in the "pH calibration" menu.
   – The pH value indicator changes to 4.
9. Rinse the pH sensor with distilled water or isopropyl alcohol. Do not allow it to dry!
10. Immerse the pH sensor in a defined, pH10 buffer solution.
11. Activate the button "Set upper point (10.0)" in the "pH calibration" menu.
    – The pH value indicator changes to 10.
12. Rinse the pH sensor with distilled water or isopropyl alcohol. Do not allow it to dry!
13. Install the pH sensor in the Smart Control EVO.
    – See the subsection "pH sensor replacement" in the section "Rectifying malfunctions".

13.8 Housing and Display cleaning

All steps for cleaning the housing and display are listed below.

ATTENTION

Damage to the housing or the housing surface

Using cleaning products that contain strong chemicals may damage the surface of the housing or the housing itself.

- Use standard cleaning products such as mild soapy water
- Do not use strong chemicals such as acetone, ethyl acetate, tetrahydrofuran and caustic soda
- Do not use cleaning agents containing chlorine or aggressive cleaning agents

ATTENTION

Scratching the surface of the housing or the display

When using abrasive materials such as steel wool or scouring pads, the surface of the housing or display can be damaged.

- Use soft, lint-free cloths

Required tools

- Soft, lint-free cloth
- Mild soapy water

Proceed

1. Clean dust from the housing and display with a soft cloth
2. Lightly moisten a soft cloth with mild soapy water
3. Rub the housing and display with mild soapy water

14 Elimination of operating problems

14.1 Safety

⚠ WARNING

Health hazard posed by cooling lubricants!

The oils, greases and additives contained in the cooling lubricant can cause skin irritation and eye damage on contact.

- For the safe handling of cooling lubricants, the producer's instructions and safety data sheets, as well as the following points, must be observed.

- Only persons with specialised knowledge and experience with cooling lubricants may work on the cooling lubricant system.
- The operator must instruct the operating personnel about the potential dangers involved in handling cooling lubricants.
- Avoid any contact with cooling lubricants. Wear protective goggles and protective gloves.
- In the event of eye or skin contact, rinse the affected area immediately with plenty of water. Rinse eyes with eyewash and seek medical attention immediately.

⚠ CAUTION

Product falling down!

During assembly, maintenance and disassembly works on the product, the product can fall down. This may lead to injuries.

- Wear the personal protective equipment.
- Don’t go underneath the product during when works are performed on it.

⚠ CAUTION

Damage due to wrong tools!

The use of unsuitable tools for the product can result in light injuries and damage to the product.

- Only use proper and suitable tools.

⚠ CAUTION

Risk of falling due to leaking cooling lubricant!

Leaking cooling lubricants can make the floor slippery. This can cause the user to fall.

- Collect leaking cooling lubricants in suitable containers and clean the floor with suitable equipment.

ATTENTION

Environmental damage caused by cooling lubricant!

Leaking cooling lubricant or its improper disposal pollutes the environment.

- Collect leaking cooling lubricant in suitable containers and do not allow it to enter the soil or groundwater.
- Only use approved containers for storage.
- Dispose of cooling lubricant properly in accordance with national and local regulations.
- Dispose of cooling lubricant in accordance with the applicable regulations for preventing environmental hazards.

14.2 Troubleshooting table

The troubleshooting table shown below clearly summarises the most frequent faults and remedies. In the event of malfunctions, this table will help you identify the specific cause and its remedy.

Smart Control EVO not working

Cause	Remedy	By
No voltage present	Check power supply unit connection	User
	Check voltage source	User
	Check cable	User
Power supply unit failure	Replace power supply unit	User
Smart Control EVO failure	Replace Smart Control EVO	User

User terminal HMI not working

Cause	Remedy	By
Terminal failure	Replace terminal	Producer

Date and time is not updated

Cause	Remedy	By
Battery for date and time memory discharged	Replace battery	Producer

Visual display not lighting up

Cause	Remedy	By
LED failure	Replace LED board	Producer
Connecting cable disconnected	Insert connecting cable	Producer

Visual warnings not displayed

Cause	Remedy	By
Limit values not correctly set	Check set limit values	User
Limit values are not reached	Compare measurement values with limit values	User

Measurement data is not transferred

Cause	Remedy	By
LAN connector not correctly inserted	Check connector/socket connection	User
LAN not set up	Set up LAN	User
LAN cable failure	Check/replace connecting line	User
WLAN not set up	Set up WLAN	User

Leakage at valves and connections

Cause	Remedy	By
Hose screw fitting disconnected from the housing	Tighten hose screw fitting	User
Hose connections are leaking	Tighten union nut on the hose connection	User

Correct concentrate measurement value not determined

Cause	Remedy	By
Concentration sensor dirty	Clean concentration sensor	User
Concentration value outside of measurement range	Set concentration to 2.5% to 12%	User
Concentration sensor failure	Replace concentration sensor	Producer

Temperature measurement value not determined

Cause	Remedy	By
Temperature sensor failure	Replace temperature sensor (concentration sensor)	User

pH measurement value not determined

Cause	Remedy	By
pH sensor dirty	Clean pH sensor	User
pH sensor failure	Replace pH sensor	User
pH sensor misaligned	Recalibrate pH sensor	User
Connecting cable disconnected	Attach connecting cable to the pH sensor	User

Flow measurement value not reached

Cause	Remedy	By
Flow < 100 ml/min	Check filter for blockage	User
Pump dirty	Clean system	User
Fluid level in the suction tank is too low.	Fill up suction tank	User
Hoses kinked	Check hoses and remove kink	User
Pump failure	Replace pump	Producer

14.3 Check valve replacement

All steps for replacing the check valve are listed below.

Tools required

- Wrench, AF24
- Wrench, AF25
- Sealing tape

Procedure

1. Unplug mains connector.
2. Unscrew check valve (3) from the hose screw fitting (2) using an AF25 wrench (check valve) and an AF24 wrench (hose screw fitting).
3. Unscrew check valve (3) from the adapter (4) using an AF25 wrench (check valve) and an AF24 wrench (adapter).
4. Clean/replace check valve.
5. Place sealing tape around the thread of the hose screw fitting (2).
6. Screw new check valve (3) onto the hose screw fitting (2) using an AF25 wrench (check valve) and an AF24 wrench (hose screw fitting).
7. Place sealing tape around the thread of the adapter (4).
8. Screw new check valve (3) onto the adapter (4) using an AF25 wrench (check valve) and an AF24 wrench (adapter).
9. Plug in the mains connector.

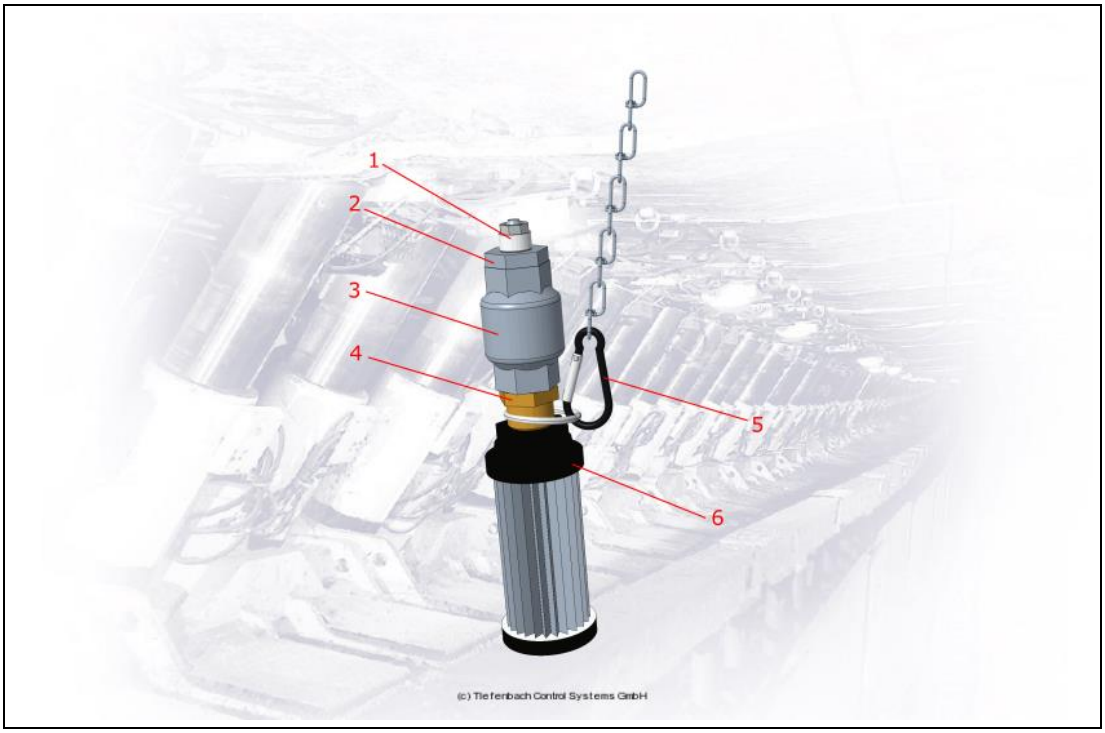

Fig. 47: Check valve with add-on parts

Item number	Item
1	Union nut
2	Hose screw fitting

3	Check valve
4	Adapter
5	Bracket
6	Filter element

14.4 pH sensor replacement

All steps for cleaning the pH sensor are listed below.

Tools required

- Screwing tool
- Lint-free cloth
- Isopropyl alcohol
- Absorbent cloth

The pH sensor is predominantly made of glass.
Handle the pH sensor with care.

Avoid drying out the pH sensor. Permanent incorrect measurements may result.

The pH sensor is fitted with a protective cap. The protective cap contains a special fluid that prevents the pH sensor from drying out.

Alternatively, store the pH sensor in a KCl solution (3 mol/l).

After the replacement, the newly installed pH sensor must be calibrated!

ATTENTION

pH sensor breakage

The pH sensor can break when installing it with a wrench.

- Use the screwing tool for screwing and unscrewing.

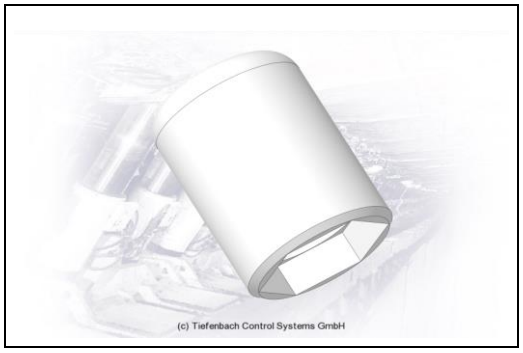

Fig. 48: pH sensor screwing tool

Procedure

1. Unplug mains connector.
2. Pull the cover cap (3) off the housing (2).
3. Unscrew pH sensor (1) from the block using the installation tool and pull it out carefully.
4. Insert the new pH sensor (1) into the block and screw it hand-tight using the installation tool.
   – Tightening torque approx. 3 Nm
5. Attach cover cap (3) to the housing (2).
6. Plug in the mains connector.
7. Calibrate pH sensor

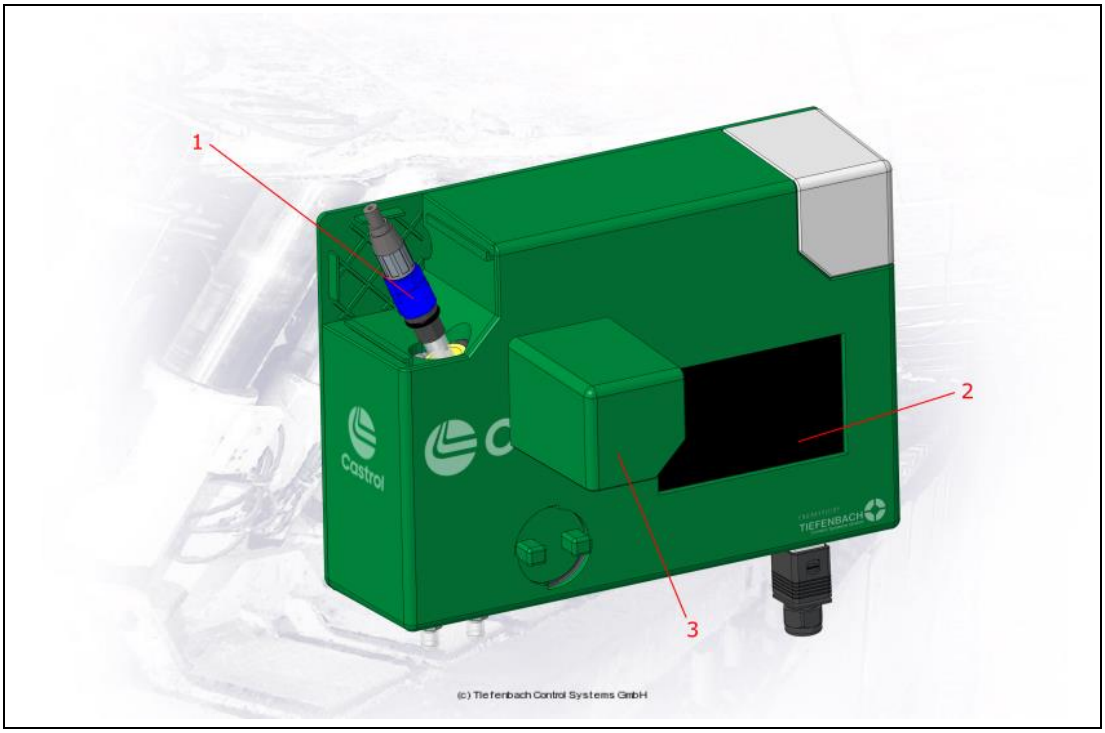

Fig. 49: Housing with pH sensor

Item number	Item
1	pH sensor
2	Housing
3	Green cover cap

15 Disassembly

15.1 Safety

⚠ WARNING

Incorrectly conducted disassembly!

An incorrectly conducted disassembly can cause damage to the product and its components.

- Put the overall installation out of service as described in the general operating manual for the equipment
- Isolate the device and all connected components from the electrical supply.

⚠ CAUTION

Leaking cooling lubricant!

A floor contaminated with cooling lubricant is slippery. Risk of injury due to slipping.

- Do not spill any cooling lubricant.
- If necessary, absorb spilt cooling lubricant with liquid-binding material (e.g. a universal binding agent) and dispose of it in accordance with waste and environmental regulations.

⚠ CAUTION

Risk of falling due to leaking cooling lubricant!

Leaking cooling lubricants can make the floor slippery. This can cause the user to fall.

- Collect leaking cooling lubricants in suitable containers and clean the floor with suitable equipment.

15.2 Dismantling

Tools

- As required
- Cloth or collection container

Procedure

The following points must be observed when dismantling the Smart Control EVO:

1. Disconnect the mains plug from the socket.
2. Pull the plug out of the "Power" connection.
3. Pull the plug out of the "LAN" connection.
4. Release hose connections and pull out hoses.
   – Use a cloth or a container for collecting the fluid.
5. Remove the Smart Control EVO from the system.

16 Storage

16.1 Storage

The Smart Control EVO was tested with cooling lubricant before delivery and then rinsed with tap water.

Please note the following points for storage:

- Store the Smart Control EVO in an appropriate storage room.
  - The storage room should be cool and dry, clean, moderately ventilated and not exposed to direct sunlight. The temperature should not exceed +40 °C and not fall below -10 °C. The relative humidity should be around 65%.
  - If the Smart Control EVO cannot be stored in storage rooms but only outdoors, the Smart Control EVO must be protected against direct sunlight, precipitation and dirt using protective tarpaulins or similar.
- Seals, hose lines and other components made of rubber or plastic are subject to natural aging. Store such components in a dark place and for no longer than 2 years.
- Store the Smart Control EVO in such a way that all connections and openings of the Smart Control EVO are protected against the ingress of even the smallest dirt particles. Seal all connections with protective plugs.

16.1.1 Storage pH sensor

The Smart Control EVO is equipped with a pH probe that contains liquid.

ATTENTION

Burst of the pH sensor

The pH sensor contains a buffer fluid and electrolyte fluid. These liquids can freeze and the sensor can burst.

- Store the pH sensor above -15°C
- Use frost-proofed packaging for further transport

17 Disposal

17.1 Notes

Our products are almost exclusively made of recyclable materials so that they can be recovered and used again for making new products.

Dispose of the product in an environmentally acceptable manner:

- Do not dispose of the product in the regular household refuse.
- Separate the iron metals from the non-iron metals.
- Separate the electronic components.
- Collect the operating fluids drained.
- The waste materials such as packaging material etc. must be separated according to their reusable waste category and disposed of in an environmentally sound manner.
- If required, you should contact a waste collection and disposal company certified in accordance with the applicable national regulations.

18 Wear and spare parts

18.1 Wear and spare parts

The customer parts list includes a list of the wear and spare parts. The respective position of the individual spare parts can be allocated by referring to the customer drawing.

Spare parts will be provided via the service department of Tiefenbach Control Systems GmbH.

The respective item numbers are given in the customer parts list.

To allow locating the wear and sealing parts more easily and quickly these parts are marked in the customer parts list:

- Wear parts with the letter „V“.
- Sealing parts with the letter „D“.

• Replace wear parts if and when they show any traces of wear.

19 Service

19.1 Contact addresses

If you have any questions about this or other products from our company, please do not hesitate to contact us.

Germany

Tiefenbach Control Systems GmbH
Rombacher Hütte 18a
D-44795 Bochum

Tel.: +49 234 777 66 0
Fax.: +49 234 777 66 999
Email: info@tibacon.com
Web: www.tibacon.com

19.2 Suggestions for improvement

Your opinion is important to us!

As we are in a continual optimization process we rely on the participation of our customers. Your suggestions and complaints are welcome and will help us to continue complying with your wishes and meeting your requirements. You may, for example, use this page to submit your suggestions.

Tiefenbach Control Systems GmbH
Rombacher Hütte 18a
D-44795 Bochum

Fax: +49 234 777 66 999

Sender:

Name: _____
Company: _____
Department: _____
Address: _____
Phone: _____
Fax: _____
E-mail: _____

Suggestions / corrections

19.3 Non-conforming products

Faults are opportunities for optimization!

If, despite our high safety standards and test standards, a non-conforming item is supplied to you please let us know immediately so we can agree on a course of action.

Tiefenbach Control Systems GmbH
Rombacher Hütte 18a
D-44795 Bochum

Fax: +49 234 777 66 999

Sender

Name: _____
Company: _____
Department: _____
Address: _____
Phone: _____
Fax: _____
E-mail: _____

Non-conformances

_____
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20 Annex

20.1 Wear parts and spare parts

Wear part	Article number	Required
pH sensor	238080	1x
O-ring, 39.5x1.2 for sealing measuring cell	240261	1x
Filter element	238127	1x
Check valve, complete	238126	1x
Hose, 2,5 metres	240227	2x

Accessories	Article number	Required
Magnet	240164	3x
Mounting bracket	240165	1x
Adhesive pads	240242	2x
Screwing tool	240172	1x
Protecting hose	240262	2x
Bracket for filter element and check valve	240301	1x

20.2 Maintenance and repair

We recommend to use the following tools and auxiliary equipment for a workmanlike installation, disassembly and repair:

- Open-end wrench SW17 for loosening and tightening screw fittings
- Open-ended spanner SW24 for loosening and tightening screw fittings
- A/F 25 wrench for loosening and tightening screw joints
- Screwing tool for installation and extension pH-sensor / Hose connections
- Universal scissors 10mm blade for cutting hose lines
- Isopropylalcohol for cleaning components
- Distilled water for cleaning components
- Soft lint free cloth for the removal of impurities
- Collecting cloth to catch escaping liquids
- Cable tie for the fixation of hoses and hose cables

20.3 FAQ

Below you will find answers to the most frequently asked questions when using the SmartControlEVO.

20.3.1 How do I change the language?

Use the “Administration” menu to set the language appropriately. Once you have entered your password, the “Site configuration” menu is available to you. There you can adjust the language using the drop-down menu.

20.3.2 How do I change the time zone?

The time zone is set in the operating system. Please read the instructions for the Linux 11 operating system version “Bullsexe”.

- Applications menu
- Preferences
- Raspberry Pi Configuration
- Location
- Set Timezone

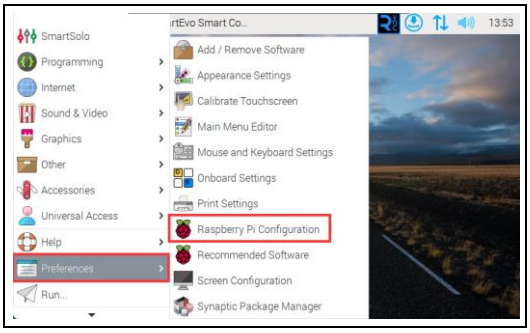

Abb. 50: Applications menu

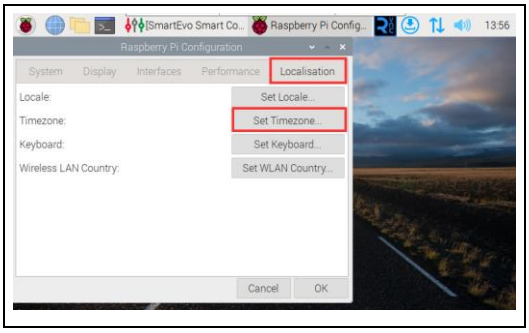

Abb. 51: Menu Set Timezone

20.4 Factors concentration sensor

The following are factors for the optimal setting of the concentration sensor for various cooling lubricants:

Cooling lubricant	c
Almaredge 11 FF	2.7
Almaredge 23	0.9
Almaredge 51 FF	1.0
Almaredge 52	1.0
Almaredge 230 K	1.0
Almaredge CB	0.95
Almaredge VT 7 B	
Alusol ABF 10	1.0
Alusol ABF 47	1.0
Alusol XT FF	1.0
Alusol M-FX	1.1
Alusol SL 41 XBB / Product LD 0192 SC	1,0
Alusol SL 51 XBB	1.0
Alusol SL 61 XBB	1.0
Hysol 30 FF	1.3
Hysol 31 BF	1.2
Hysol ABF 12	1.0
Hysol CGX 100	1.0
Hysol LXE	
Hysol RD	1.1
Hysol SL 20 XBB	1.6
Hysol SL 30 XBB	1.3
Hysol SL 35 XBB	1.2
Hysol SL 36 XBB	1.16
Hysol SL 37 XBB	1.1
Hysol SL 45 XBB	1.0
Hysol SL 50 XBB	1.0
Hysol MB 50	1.0
Hysol T 15	1.5
Hysol XB	1.0
Hysol XF	1.1
Syntilo 75 EF	2.0
Syntilo 81 BF	1.5
Syntilo 81 E	1.5

Syntilo MR 81 BF	1.5
Product FP 0099 SC	1.9