s::can
A Badger Meter® Brand

Manual

pH::lyser

redo::lyser

January 2024 Release

Table of Contents

1 General

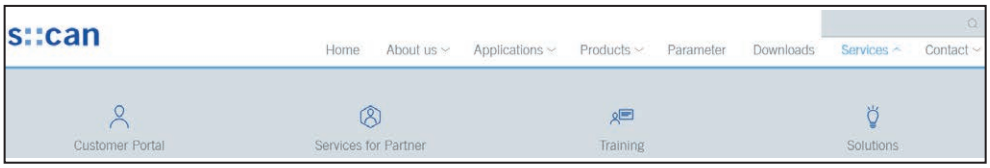
This manual contains, firstly, general information (chapter 1) and safety guidelines (chapter 2). The next chapter (chapter 3) provides a technical description of the s::can product itself as well as information regarding transport and storage of the product. In further chapters the installation (chapter 4) and the initial startup (chapter 5) are explained. Furthermore information regarding calibration of the device (chapter 6), data management (chapter 7), how to perform a function check (chapter 8) and maintenance (chapter 9) can be found in this manual. Information regarding troubleshooting (chapter 10), the available accessories (chapter 11) and the technical specifications (chapter 12) complete the document.

Each term in this document that is marked *italic and underlined*, can be found on the display of your controller for operation or as lettering on your s::can product.

In spite of careful elaboration this manual may contain errors or incompletion. s::can does not assume liability for errors or loss of data due to such faults in the manual. The original manual is published in English and German by s::can. This original manual serves as the reference in case discrepancies occur in versions of the manual after translation into third languages.

This manual, at the time of its publication (see release date printed on the top of this document), concerns the s::can products listed in chapter 3. Information and technical specifications regarding these items in s::can manuals from earlier release dates are herewith replaced by this manual.

The electronic version (pdf-document) of this manual (https://www.s-can.at/en/manuals/) is available on the s::can Customer Portal (Services for Customer) of the s::can website (www.s-can.at).



2 Safety Guidelines

Installation, electrical connection, initial startup, operation and maintenance of any s::can product as well as complete s::can measuring systems must only be performed by qualified personnel. This qualified personnel has to be trained and authorised by the plant operator or by s::can for these activities. The qualified personnel must have read and understood this manual and must follow the instructions contained in this manual.

For proper initial startup of complete s::can measuring systems, the manuals for the controller and software used for operation (con::lyte, con::cube, con::line, moni::tool, lo::Tool), the connected probes and sensors as well as the used additional devices (e.g. compressor) have to be consulted.

The operator has to obtain the local operating permits and has to comply with the joint constraints associated with these. Additionally, the local legal requirements have to be observed (e.g. regarding safety of personnel and means of labour, disposal of products and materials, cleaning, environmental constraints). Before putting the measuring device into operation, the operator has to ensure that during mounting and initial startup – in case they are executed by the operator himself – the local legislation and requirements (e.g. regarding electrical connection) are observed.

All s::can products are leaving our factory in immaculate technical and safety conditions. Inappropriate or not intended use of the product, however, can cause danger! The manufacturer is not responsible for damage caused by incorrect or unauthorised use. Any kind of manipulation of the instrument is strictly prohibited - except for the activities described in this document. Conversions and changes to the device must not be made, otherwise all certifications and guarantee / warranty become invalid. For details regarding guarantee and warranty please refer to our general conditions of business.

2.1 Declaration of Conformity

This s::can product has been developed, tested and manufactured for electromagnetic compatibility (EMC) and according to applicable European standards, as defined in the declaration of conformity.

A CE-mark is applied on the device. The declaration of conformity related to this marking can be requested from s::can or your local s::can sales partner or can be downloaded from the s::can Customer Portal (https://www.s-can.at/en/certificates/).

For further details about certifications related to this product please refer to the technical specifications located at the end of this manual.

2.2 Special Hazard Warning

Because the s::can measuring systems are frequently installed in industrial and municipal waste water applications, one has to take care during mounting and demounting of the system, as parts of the device can be contaminated with dangerous chemicals or pathogenic germs. All necessary precautions should be taken to prevent endangering of one’s health during work with the measuring device.

3 Technical Description

3.1 Intended Use

The pH::lyser is an ion-selective measuring device designed for continuous monitoring of the logarithmic concentration of dissolved hydrogen ions (H^+). The instrument also continuously measures the temperature of the medium and corrects the measured concentration accordingly.

The redo::lyser measures the oxidation-reduction potential of an aqueous solution.

Both sensors are equipped with an extremely durable and stable solid state reference electrode, suitable for difficult and extreme process applications. The pH bulb of the pH::lyser is a conventional pH bulb.

Both sensors provide the measured temperature as an additional parameter.

In all types of applications, the respective acceptable limits, which are provided in the technical specifications in the respective s::can manuals, have to be observed. All applications falling outside of these limits, and which are not authorised by s::can GmbH in written form, do not fall under the manufacturer's liability.

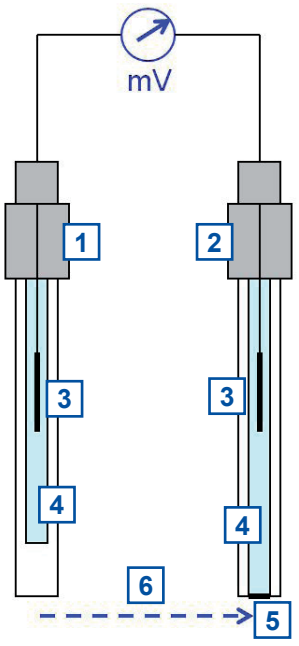
⚠ The device must only be used for the purpose described in this manual. Use in applications not described in this manual, or modification of the device without written agreement from s::can, is not allowed. s::can is not liable for claims following from such unauthorised use. In such a case, the risks are the sole responsibility of the operator.

3.2 Functional Principle

The determination of the pH value (logarithmic activity of H^+ ions in an aqueous solution) is performed by measuring the potential difference between a reference electrode and the measuring electrode. The principal schema of such a potentiometric measurement is displayed on the right hand side below.

The potential measured between the reference electrode and the measurement electrode is simply the sum of all potential differences which occur on all liquid-liquid and liquid-solid interfaces. For the measurements to be accurate all such potential differences should be constant with the exception of the potential difference between the internal electrolyte of the measurement electrode and the solution. This potential difference U correlates with the concentration c of the H^+ ions and can be described by the Nernst equation:

$U = U_0 + S * \log(c)$ S ..... temperature dependent slope of the electrode
$pH = (U_0 - U) / S$ U_0 ..... a constant voltage



1 Reference electrode
2 Measuring electrode
3 Internal lead
4 Internal electrolyte
5 Membrane
6 Potential difference U

The oxidation reduction potential (ORP), or also called redox potential, is a quantity for the tendency of the measuring medium to hold or lose electrons. ORP is measured in mV and the readings are not corrected by temperature. If the ORP value is positive the medium has the tendency to gain electrons (e.g. chlorinated water) and it will oxidise new species that are dissolved in it. If the ORP value is negative, the medium has the tendency to lose electrons (e.g. hydrogen sulfide) and thus reduce new species solved in it.

The basic setup of the redo::lyser is similar to the one for the pH::lyser, but instead of the pH electrode a platinum electrode is used. When the ORP electrode is immersed into aqueous solution, the platinum electrode will gain or lose electrons until it has developed a potential which is equal to the ORP of the solution. The reference electrode is constructed in the same way like for the pH measurement.

The reference electrode has to provide a stable reference potential independent of temperature and media over a long period of time. The most widely used reference electrodes are Ag/AgCl ones filled with a KCl electrolyte (“single junction electrode”). A porous diaphragm on one end allows contact between the solution and the electrolyte.

For pH::lyser / redo::lyser a “double junction electrode” (solid state body) is used. In this case the inner cell (the reference) is inserted in an outer tube containing a different electrolyte which is then in contact with the solution. The potential difference over the reference layer is minimized and constant by ensuring a constant and equal exchange of ions through the interface. The used solid state reference electrode does not contain any porous diaphragma and therefore provides long term stability, is maintenance free and avoids problems like electrolyte leaking and contamination.

3.3 Product

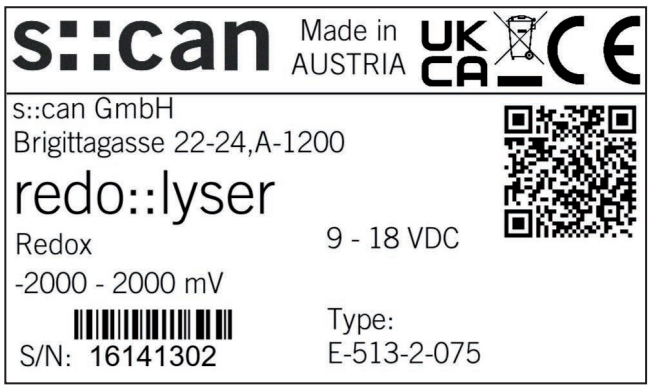
The following device variants and accessory parts of the pH::lyser / redo::lyser are available. Regarding detailed information of the device variants please refer to the technical specifications located at the end of this manual. Regarding detailed information of the accessory parts please refer to section 10 (accessories).

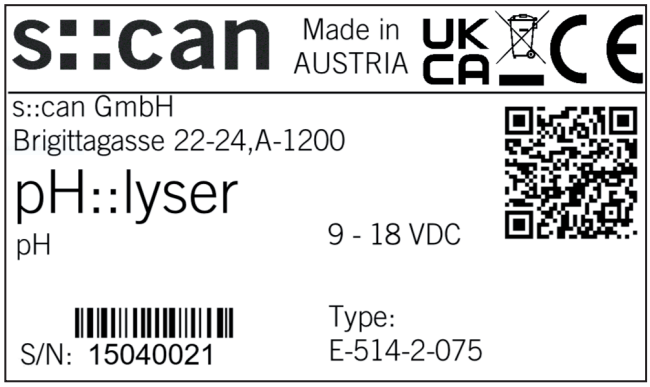
Part-no.	Type / specification
E-513-2-000	redo::lyser eco for redox potential (ORP) with plug connection
E-513-2-000-DW	redo::lyser eco for redox potential (ORP) with plug connection and drinking water certificate; for operation in pipe::scan
E-513-2-075	redo::lyser eco for redox potential (ORP) with 7.5 m fixed cable
E-513-3-000	redo::lyser pro for redox potential (ORP) with plug connection
E-513-3-075	redo::lyser pro for redox potential (ORP) with 7.5 m fixed cable
E-514-2-000	pH::lyser eco for pH (pH) with plug connection
E-514-2-000-DW	pH::lyser eco for pH (pH) with plug connection and drinking water certificate; for operation in pipe::scan
E-514-2-075	pH::lyser eco for pH (pH) with 7.5 m fixed cable
E-514-3-000	pH::lyser pro for pH (pH) with plug connection
E-514-3-075	pH::lyser pro for pH (pH) with 7.5 m fixed cable
E-514-4-075	pH::lyser pro for pH (pH) with 7.5 m fixed cable, PVC version
E-513-ORP	Spare electrode ORP & reference for redo::lyser
E-514-PH	Spare electrode pH & reference for pH::lyser
E-510-GUARD	Protective electrode cage for submersed installation
E-532-TOOL	Tool for electrode replacement

Regarding detailed information of the measured parameters please refer to section 5.4.

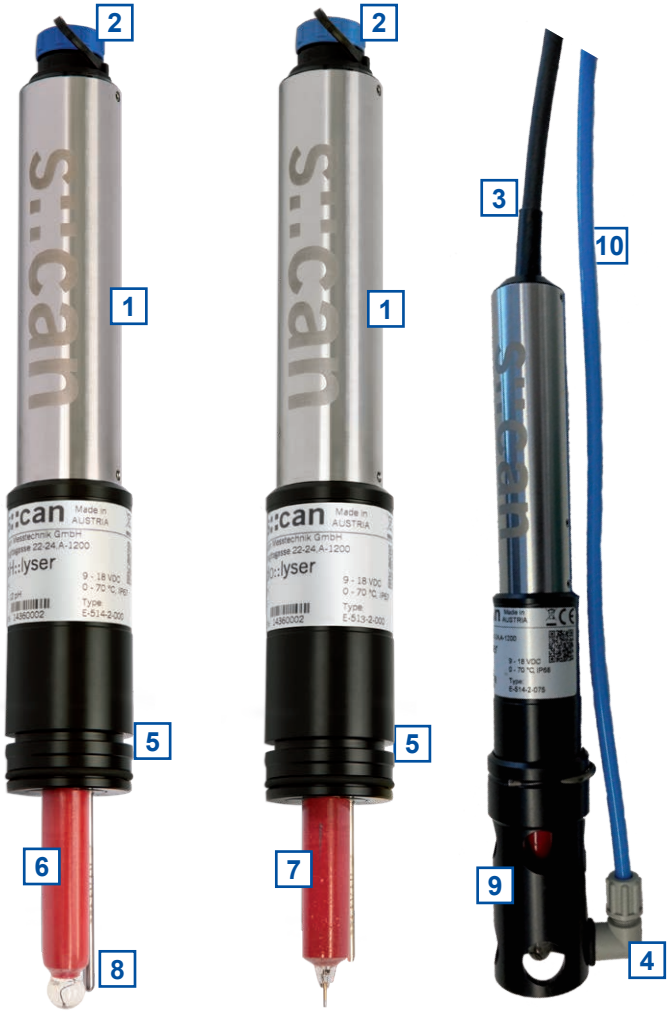
The device is typified by a type label, as shown on the right, that contains the following information:

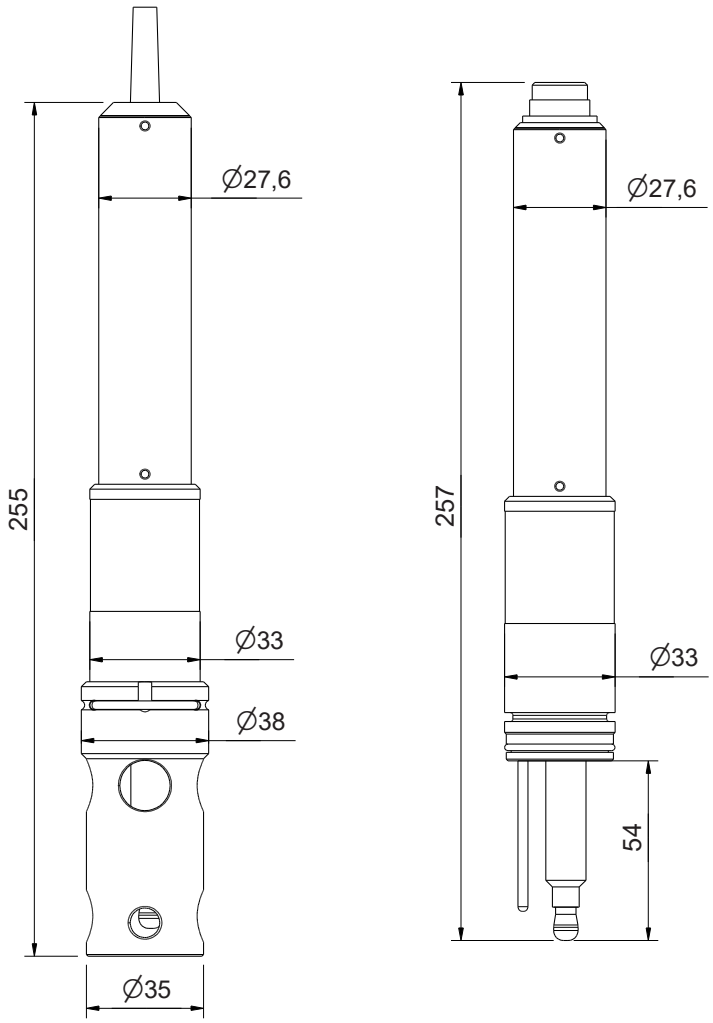
- Manufacturer‘s name and country of origin
- Several certification marks
- Device name
- QR code to s::can Support
- Part number (Type)
- Bar code
- Device serial number (S/N)
- Information on power supply





1	Sensor housing
2	Sensor plug
3	Sensor cable
4	Connection for automatic compressed air cleaning
5	Fastening groove for metal clamp for fixing in flow cell
6	pH electrode
7	ORP electrode
8	Temperature sensor
9	Protective cage for electrode
10	Tube for compressed air cleaning





Dimensions of redo::lyser / pH::loyser cable version (left) and plug version (right)

3.4 Storage and Transport

The limiting values for device operation, storage and transport, which are described in the section technical specifications, must be observed at all times. The device shall not be exposed to strong impacts, mechanical loads or vibrations. The device should be kept free of corrosive or organic solvent vapours, nuclear radiation as well as electromagnetic radiation.

The electrode has to be stored with the provided protective cap. The protective cap needs to be filled with KCl (approx. 2 molar). Vertical storage (electrode connector on top) is recommended. For short term storage (up to 1 week) tap water can be used to fill the protective cap (don't use distilled water). Drying out of the electrode will reduce measuring quality and life time of the electrode significantly. If the electrode is stored on air for longer time (> 48 hours) it will be destroyed and therefore has to be replaced (see section 8.4 for function check also).

Damage to the device caused by wrong storage will not be covered by guarantee / warranty.

Transport should be done in a packaging that protects the device (original packaging or protective covering if possible).

This product is marked with the WEEE symbol to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EC. The symbol indicates that this product should not be treated as household waste. It must be disposed and recycled as electronic waste. Please assist to keep our environment clean.

3.5 Scope of Delivery

Immediately upon receipt, please check the received consignment for completeness on the basis of the delivery note and check for any possible damage incurred during shipping. Please inform the delivering dispatcher and s::can immediately in case of any damages in transit.

The following parts should be included in the delivery:

- scan ORP or pH sensor (part-no. according to section 3.3)
- Connection cable (part-no. C-1-010-SENSOR) in case of plug version (-000)
- Connection set for automatic cleaning (part-no. B-41-SENSOR) in case of cable version (-075)
- Tool for electrode replacement (part-no. E-532-TOOL)
- s::can manual pH::lyser / redo::lyser (part-no. S-294-M)

The following parts could be included in the delivery if ordered as an option:

- Extension cable (part-no. C-210-SENSOR, C-220-SENSOR or C-230-SENSOR)
- Probe carrier (part-no. F-12-SENSOR for submersed installation)
- Fixing adapter for railing (part-no. F-15)
- Flow cell waste water (part-no. F-48-SENSOR)
- Flow cell clean water (part-no. F-45-SENSOR)
- Flow cell clean water for 4 sensors (part-no. F-45-FOUR)
- Flow cell clean water for i::scan and 3 sensors (part-no. F-46-FOUR-ISCAN)
- Cleaning valve (part-no. B-44 or B-44-2)
- s::can compressor (item-no. B-32-230, B-32-110 or B-32-012)

In case of incompleteness please contact your s::can sales partner immediately!

3.6 Product Updates, Other

The manufacturer reserves the rights to implement, without prior notice, technical developments and modifications in the light of continuous product care.

4 Installation

4.1 Environment

The correct installation of measuring instruments is an important prerequisite for satisfactory operation. Therefore the following checklist for the installation can be used to ensure that all sources for potential operational problems can be ruled out to the greatest possible extent during the installation, allowing the monitoring system to operate properly.

For information on environmental limitations (e.g. temperature), also refer to the Technical Specifications at the end of the manual.

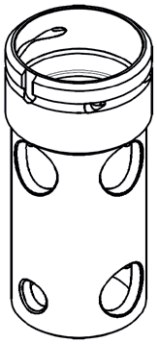
- Favourable flow conditions (little turbulence, acceptable flow rate, etc.)
- Unadulterated, representative measuring medium
- Measuring medium is in equilibrium state (no gas release, no precipitation, etc.)
- No external interferences (no electric and electro-magnetic interferences by leakage current, earth fault of pumps, electric motors, electric power lines, etc.)
- Easy accessibility (mounting, sampling, function check, demounting)
- Availability of sufficient space (probe / sensor, installation fitting, controller, etc.)

- Power supply for controller (operational reliability, voltage, power, peak free)
- GPRS connection for data transfer and remote control
- Oil- and particle free compressed-air supply (optional for automatic probe / sensor cleaning)
- Best possible weather and splash water proof conditions of the controller for operation
- Shortest possible distances between system components (probe / sensor – controller for operation – compressed-air supply – energy supply)
- Correct dimensioning, mounting and protection of all cables and lines (non-buckling, no risk of stumbling, no damage etc.)

4.2 Sensor Preparation for Installation

Before installation of the pH::lyser or redo::lyser the protective cap has to be removed carefully and should be stored for later storage or transport.

For submersed installation the place the protective electrode cage (E-510-GUARD) on the sensor head and fix it with the metal bracket uncluded in delivery.

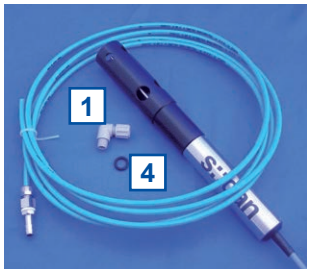


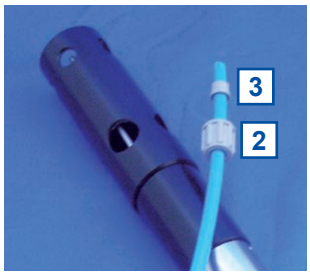
4.3 Connection of automatic Cleaning

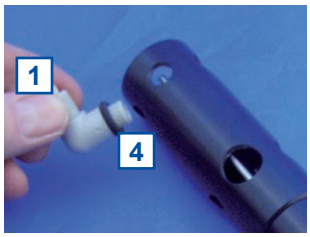
The compressed air cleaning can be used for pH::lyser / redo::lyser with a protective electrode cage (E-510-GUARD) or when installed in the flow cell for waste water (F-48-SENSOR) only. Information on the configuration of the cleaning settings (frequency, duration, waiting time) is given in the Technical Specifications at the end of the manual.

The correct configuration of the automatic cleaning is an important prerequisite for satisfactory operation. Therefore the following checklist can be used to ensure that all sources for potential cleaning problems can be ruled out to the greatest possible extent, allowing the monitoring system to operate properly.

- The cleaning valve should never be connected to the compressed air coupling of your compressor directly, i.e. without a pressure hose in between.
- The total length of hoses (especially between cleaning valve and sensor) should be as short as possible to avoid unnecessary pressure loss.
- Any foreign matter in the compressed air supply may impair the hydraulic-pneumatic cleaning process. If you have any doubts about the purity of the air used (contamination by particles, oil, etc.), please install an appropriate filter upstream from the solenoid valve.
- In areas with extremely low outside air temperature, s::can recommends laying the compressed air hoses such that they remain frost-free to prevent freezing of condensed water in the compressed air hose.
- Please note that depending on the s::can probe and sensor type you are using, different maximum allowed pressures may be specified. In case a central pressurised air supply is used in such a case the lowest maximum allowed pressure amongst those specified for the individual instruments is to be used to supply all instruments or the use of pressure reducing valves to supply each instrument with the correct pressure is necessary.
- In order to ensure proper operation of automatic cleaning, s::can highly recommends to use s::can compressor optimized for compressed air supply of all probes and sensors.

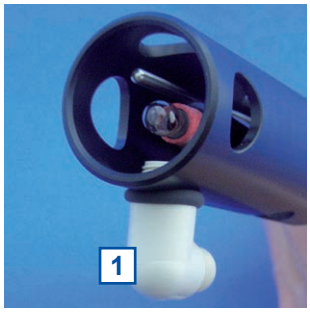


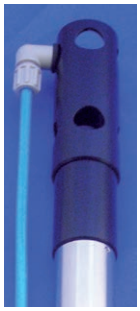




The pressure connection set (B-41) supplied with the system contains components necessary to connect the sensor to the cleaning valve. The connection to the sensor is performed by the following steps (see pictures on the right hand side also):

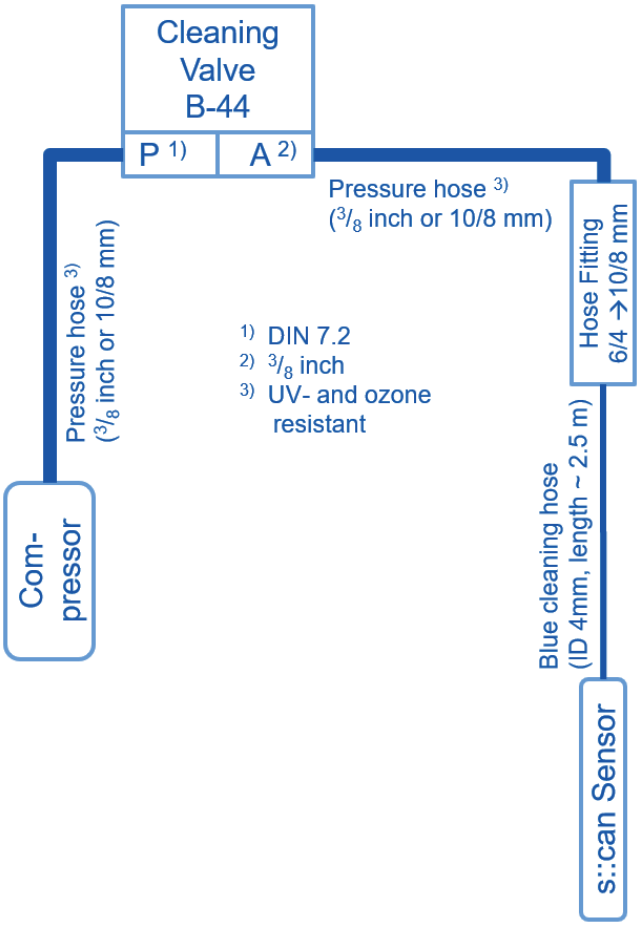
- Disassemble the 90° fitting [1] into individual parts.
- Put the connecting nut [2] and the conical part [3] over the blue cleaning hose. Ensure the correct orientation of the conical part [3].
- Screw the 90° fitting [1] with O-ring sealing [4] into the thread hole on the lower end of the electrode protective cage.
- Turn the electrode protective cage in that way the opening of the fitting is pointing towards the electrode.
- Push the cleaning hose over the 90° fitting (warm up cleaning hose in hot water if necessary).
- Fasten connecting nut [2] by hand.





The connection of the compressed air hose to the cleaning valve depends on the used type of the valve (B-44 or B-44-2).

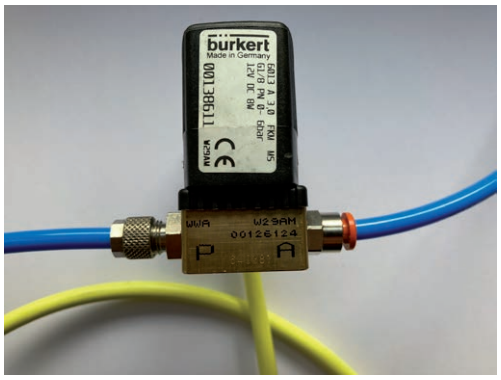
- Cleaning valve B-44

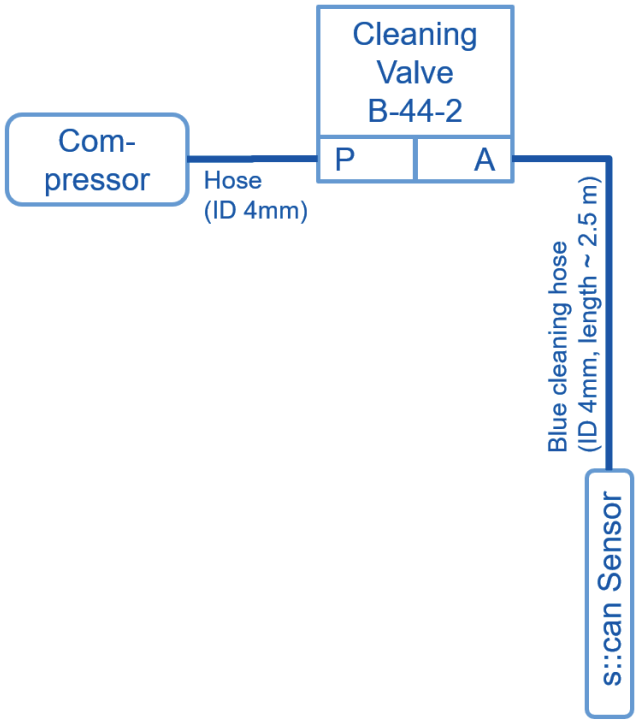


A compressed air hose (to be provided by customer, ID 8 to 9 mm) must be used to connect the adapter fitting of the pressure connection set (B-41) to the output side of the cleaning valve (marked with A). Fasten the air hose with hose clamps.

Another compressed air hose with DIN 7.2 compressed air coupling (to be provided by customer) are required to hook up the compressed air supply to the input side of the cleaning valve (marked with P).

- Cleaning valve B-44-2





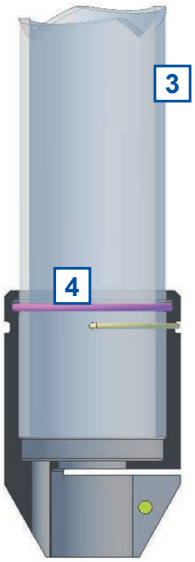
The adapter fitting of the pressure connection set (B-41) can be removed to connect the blue tube directly to the push-pull fitting of the cleaning valve. The same type of tube can be used to connect the cleaning valve to the s::can compressor.

4.4 Mounting with Sensor Carrier for submersed Installation (F-12-SENSOR)

The submersed installation of a pH::lyser / redo::lyser using the specific probe carrier (part-no. F-12-SENSOR) is performed by the following steps (see figures below also):

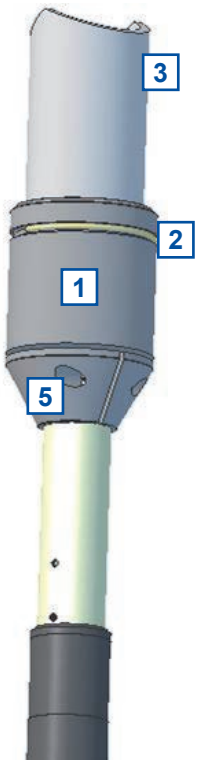
- Remove the retaining clip [2] from the sensor carrier [1].

- Put the extension pipe OD 50 mm or $1^1/_2$ inch [3] - to be provided by the customer - into the sensor carrier [1].



- Drill two holes into the correctly positioned extension pipe [3]. Use the two existing holes [6] for the retaining clip [2] in the sensor carrier [1] as guiding help.

- Snap the retaining clip [2] into both holes [6]. Doing this the sensor carrier [1] will be fixed onto the extension pipe [3].



⚠ Depending on the extension pipe's OD use one of the two O-rings [4], included in delivery to stabilize the position of the pipe. O-ring 50 x 2.5 mm can be used for OD 50 mm and O-ring 50 x 3.5 mm can be used for OD 2 inch.

- Lead the sensor cable and the air hose for automatic sensor cleaning through the sensor carrier (see figure on the right).

- Push the sensor into the sensor carrier as far as it will go (see figure on the right).

- Tight the screw [5] on the sensor carrier using a slotted screw driver (5.5 mm) until the sensor is firmly fixed (see figure below).

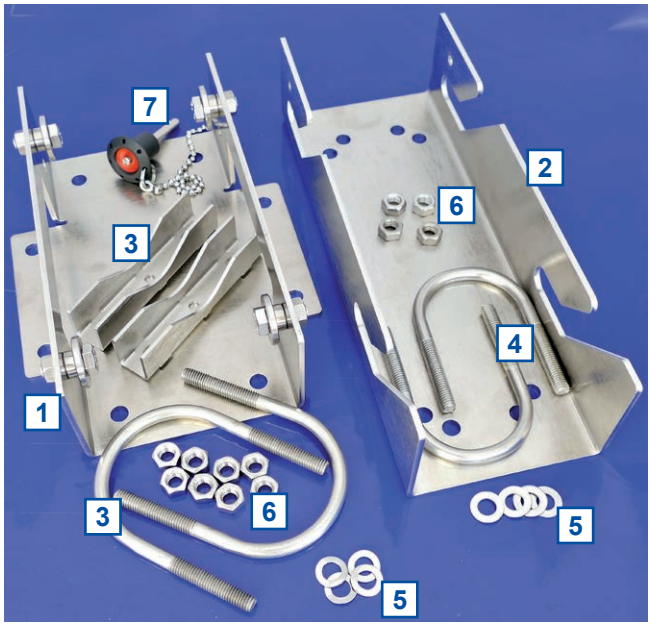
When necessary the probe carrier can be supplied with a tube extension that can simply be fixed to a railing by means of the fixing adapter (part-no. F-15). The probe cable and the compressed air hose must be protected at the upper end of the mounting tube against damage by kinking, abrasion, etc. by suitable measures.

4.5 Mounting of Railing Bracket / Fixing Adapter (F-15)

This section explains the mounting of the railing bracket (fixing adapter) with the extension pipe on the railing in case of a submersed installation.

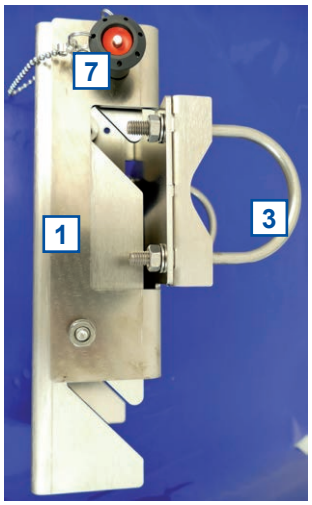
The following parts are included in the delivery of the railing bracket F-15:

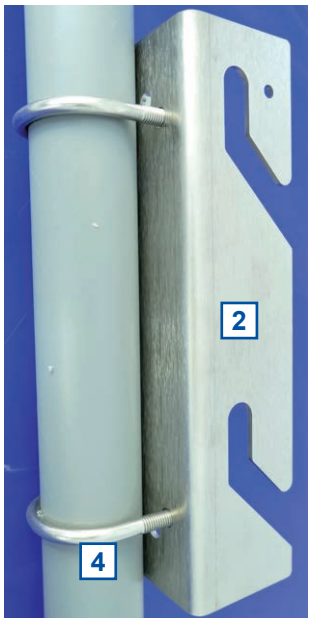
1. Fixing adapter for railing
2. Fixing adapter for extension pipe of sensor carrier
3. 2 pcs. fixing clamps for railing (OD $2^1/_2$ inch)
4. 2 pcs. fixing clamps for extension pipe of sensor carrier (50 mm)
5. 8 pcs. washers for fixing clamp
6. 12 pcs. screw nuts for fixing clamp
7. Safety pin for railing bracket



Once the sensor is installed in the sensor carrier with the extension pipe (see section 4.4) the mounting of the railing bracket is performed by the following steps:

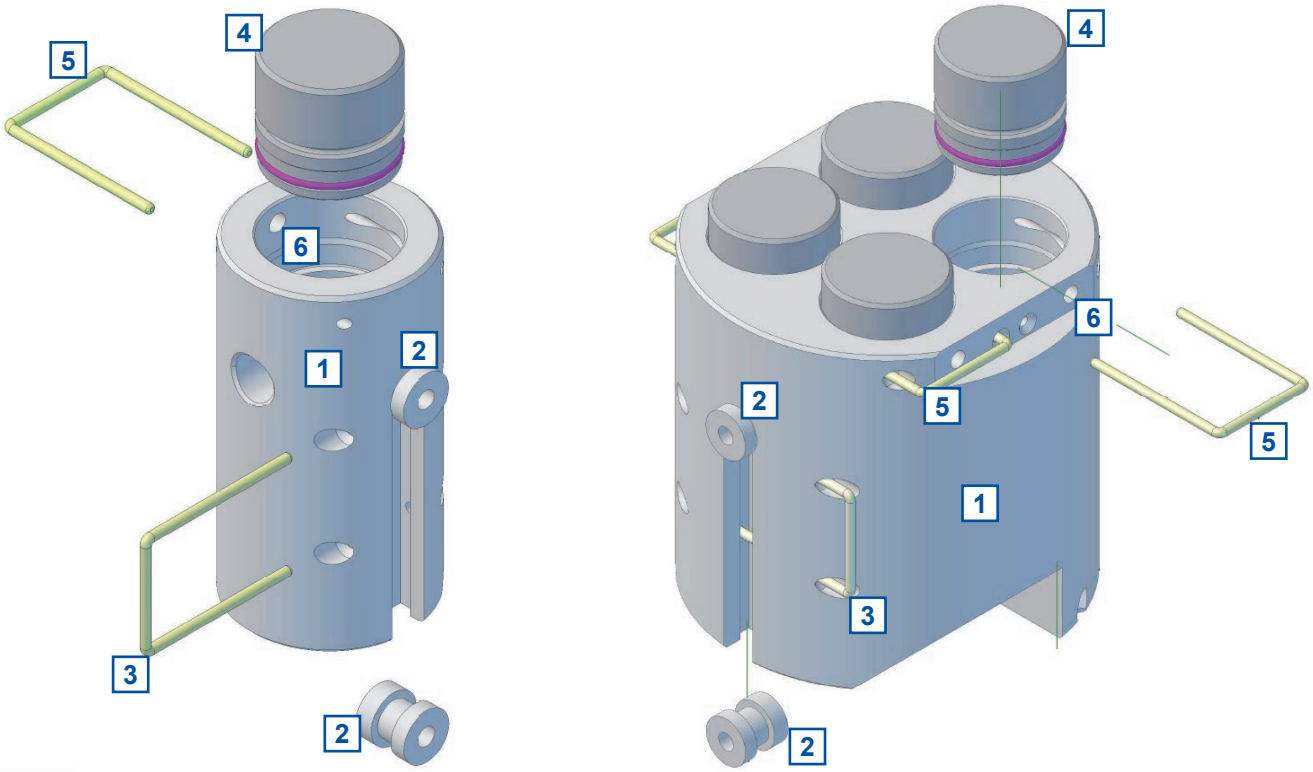
- Fasten the fixing adapter for the railing [1] with the fixing clamp [3], the screw nuts and the washers, included in delivery, onto the railing.
- Fasten the other part of the fixing adapter [2] with the fixing clamp [4], the screw nuts and the washers, included in delivery, onto the extension pipe of the sensor carrier.
- Now insert the sensor with the extension pipe into the railing bracket from top.
- Secure the railing bracket with the locking pin [7] to prevent it from being pulled out unintenionally.
- If necessary, adjust the inclination of the extension pipe and the immersion depth of the sensor. To do this, loosen the corresponding screw nuts of the fixing clamps.





4.6 Mounting in Flow Cell for Clean Water (F-45-SENSOR or F-45-FOUR)

This section explains how the pH::lyser / redo::lyser can be installed in the flow cell for clean water. There are two types of flow cells available, a single sensor flow cell (F-45-SENSOR) and a flow cell for up to four s::can sensors (F-45-FOUR, F-46-FOUR-ISCAN, F-446-FOUR-ISCAN).



The flow cell itself [1] can be mounted directly on a solid and flat surface (wall, mounting panel, etc.) with the two fixing holders [2]. The position of the flow cell is secured by the mounting bracket [3] (see figures above).

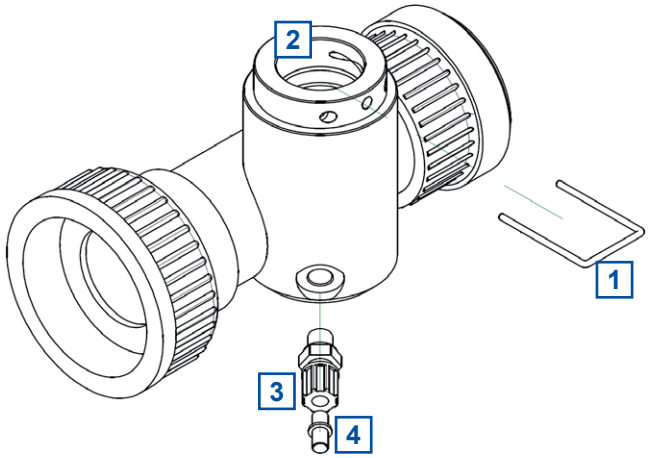
The installation of a pH::lyser / redo::lyser using the flow cell for clean water is performed by the following steps (see figures above also):

- Pull out the U-shaped metal bracket [5] from the flow cell that fixes the blanking plug [4]. A flat screw driver can be used to do this, if needed.
- Remove the blanking plug [4] from the flow cell. To remove the plug insert a flat screw driver or the metal bracket into the small hole [6] on the side of the flow cell and move the plug out by moving the screw driver downwards.
- Insert the sensor in the opening of the flow cell and push sensor down carefully until the O-ring snaps into the correct sensor position. The O-ring can be lightly greased. In the case of applications in drinking water, the drinking water approval of the greases used must be ensured.
- Push the metal bracket [5] back into the flow cell to secure the sensor in place. The metal bracket can only be inserted if the sensor is in the correct position.
- Ensure that all other openings of the flow cell are covered with blanking plugs [4] before putting the monitoring station into operation.

To demount the sensor use a flat screw driver to remove the metal bracket [5] first and pull the sensor out.

4.7 Mounting in Flow Cell for Waste Water (F-48-SENSOR)

The installation of a pH::lyser / redo::lyser using the flow cell setup for waste water (part-no. F-48-SENSOR) is performed by the following steps (see figure on the right also):



- Pull out the U-shaped metal bracket [1] from the flow cell. A flat screw driver can be used to do this, if needed.
- Insert the sensor in the opening of the flow cell [2] and push sensor down carefully until O-ring snaps into the correct sensor position. The O-ring can be lightly greased. In case of applications in drinking water, the drinking water approval of the greases used must be ensured.
- Push the metal bracket [1] back into the flow cell to secure the sensor in place. The metal bracket can only be inserted if the sensor is in the correct position.
- If a compressed air cleaning system is used, it can be connected directly to the fitting of the flow cell. To do this, unscrew the union nut [3] and remove the dummy plug [4] (see section 4.3 also).

5 Initial Startup

Once the mounting and installation of the pH::lyser / redo::lyser have been completed and checked (see chapter 4) the initial startup of the s::can monitoring system will require the following actions, in the order presented below:

- Connect the sensor to the controller used for operation (see section 5.1 and 5.2).
- Connect the cleaning devices to the proper terminal connections in the cable terminal compartment of the used controller (please refer to the manual of the cleaning device and the controller).
- Establish main power supply to the controller (please refer to the manual of the controller) and wait until the operation software has started up.
- Perform initialisation of the sensor. Refer to section 5.3.1 in case of using a con::lyte D-320, refer to section 5.3.2 in case of using con::cube with moni::tool and refer to section 5.3.3 in case of using con::line with Io::Tool.
- Perform parameterisation of the pH::lyser / redo::lyser. Refer to section 5.4.1 in case of using a con::lyte D-320, refer to section 5.4.2 in case of using con::cube with moni::tool and refer to section 5.4.3 in case of using con::line with Io::Tool.
- Configure the measurement and automatic cleaning settings (please refer to the manual of the controller and see section 12 regarding cleaning settings).
- Check the proper functioning of the cleaning system.
- Connection and parameterisation of data transfer when desired (please refer to the manual of the controller for operation).
- Check the plausibility of the readings obtained after sufficient running-in time (at least 15 minutes).
- If necessary calibrate the readings of the pH::lyser / redo::lyser to the local water matrix when the readings are stable (see chapter 6).

5.1 Controller for Operation

For proper operation of the sensor you will need one of the following controller and operating software respectively.

Controller	Type	Software
con::lyte	D-320	V7 or higher
con::cube	D-315	moni::tool V2 or V3
con::cube	D-330	moni::tool V4
con::line	D-500-012	Io::Tool V3

s::can recommends to use the most current version of the operating software on the controller.

5.2 Connection to the Controller for Operation

The sensor will be delivered either with fixed cable or with a plug connection on the sensor itself. In case of plug connection the connection cable C-1-010 must be used to connect the sensor to a compatible socket provided on the controller. Ensure that the sensor plug and the connector are dry and clean. Otherwise communication errors and / or device damage might occur.

In case the controller does not supply enough sockets, the distribution box for sensors C-41-HUB can be used.

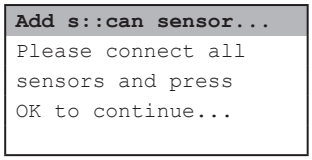
5.3 Probe Initialisation

To enable the operator terminal to operate several probes / sensors simultaneously, it is necessary to assign each probe / sensor its own address. This is done automatically during probe initialization. The connected measuring device is first recognized by the operator terminal via the preset address. If this address is already in use, the operator terminal assigns a new, still free, address for the measuring device and stores this address on the measuring device.

The exact procedure of the probe initialization for the different operator terminals is described in the following sections.

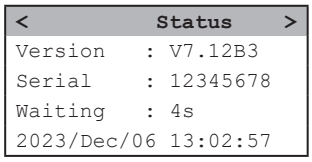
⚠ Sensors of the same type should always be initialized individually and one after the other.

5.3.1 Probe Initialisation using con::lyte

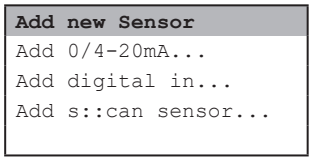


At the initial start-up the con::lyte D-320 provides an automatic probe and sensor initialisation procedure (see screen on the right). After connecting all probes and sensors to the appropriate plugs of the con::lyte (see section 5.2) and pushing the *OK* button, the probe and sensor initialisation starts.

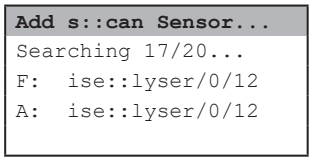
If sensor will be initialized at a later date, the following steps are needed:



- Switch to Status display by using the *Left-* or *Right* button.
- Push *Function* button.
- Select menu *Manage sensors...* and confirm with *OK*.
- Select menu *Add sensor ...* and confirm with *OK*.
- Connect sensor to the D-320 (see section 5.2).
- Select menu *Add s::can sensor ...* and confirm with *OK*.

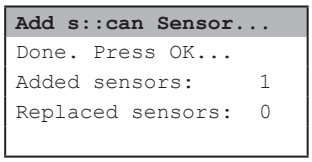


As soon as the sensor search is started by pushing the *OK* button, the con::lyte will automatically search the Modbus port for a new sensor and will add the new sensor to the sensor list.



After a new probe or sensor has been added, the parameters can be added in the parameter screen manually (see section 5.4.1 and menu *Add parameters...*).

In case the installation failed, the message *Error adding!* will be displayed.



5.3.2 Probe Initialisation using con::cube (moni::tool)

1 Click the *Service* tab on the moni::tool screen.

2 Login as *Administrator* with Password *admin1* or your individual username.

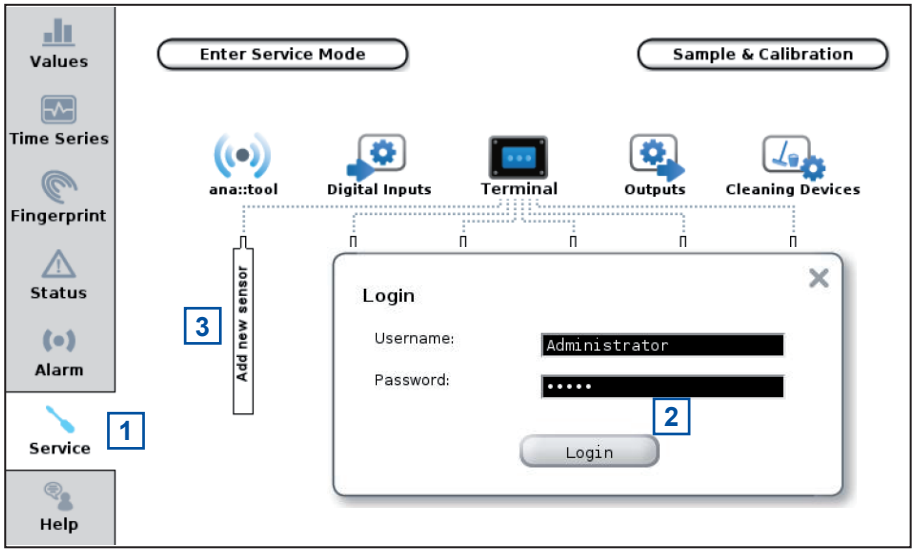
3 Click on an empty sensor icon (*Add new Sensor*) to initiate the initialisation process.

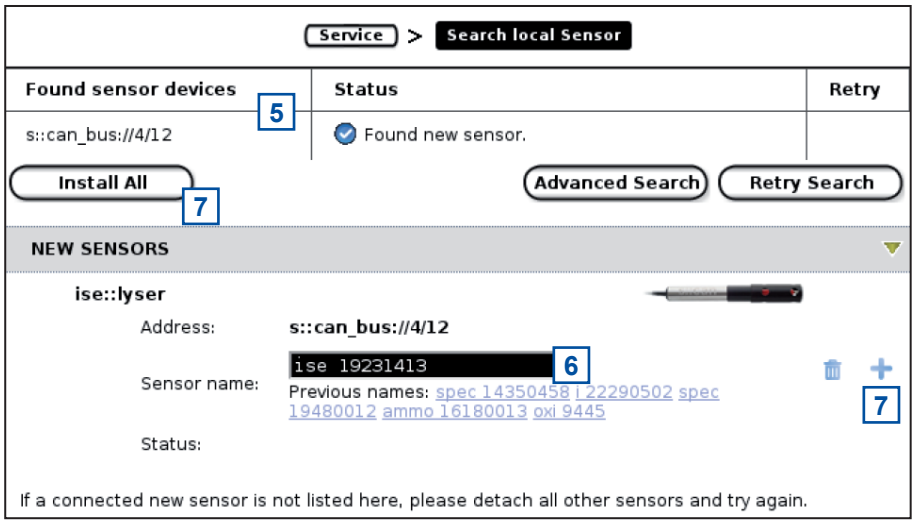
4 An automatic search procedure will start, searching for the connected sensor.

5 When the automatic search prodedure is finished, all connected probes and sensors will be displayed. Those sensors that are connected for the first time and not installed will have the Status *Found new sensor*. These sensors are listed as *New Sensors* below also.

6 If needed the suggested *Sensor name* can be modified. This name will be used in the system overview of the *Status* and *Service* display also.

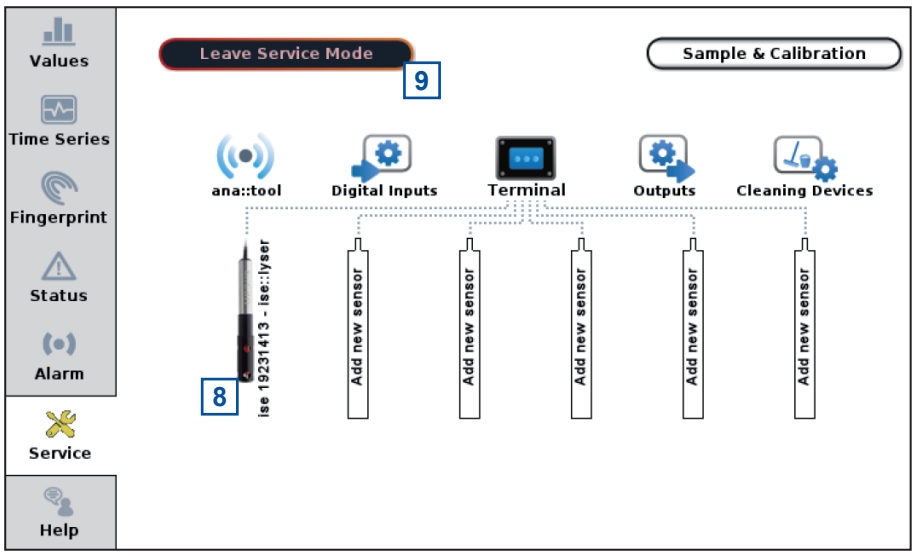
7 To install the new sensor click either on the blue + sign on the right side of the sensor or push the button *Install All*.



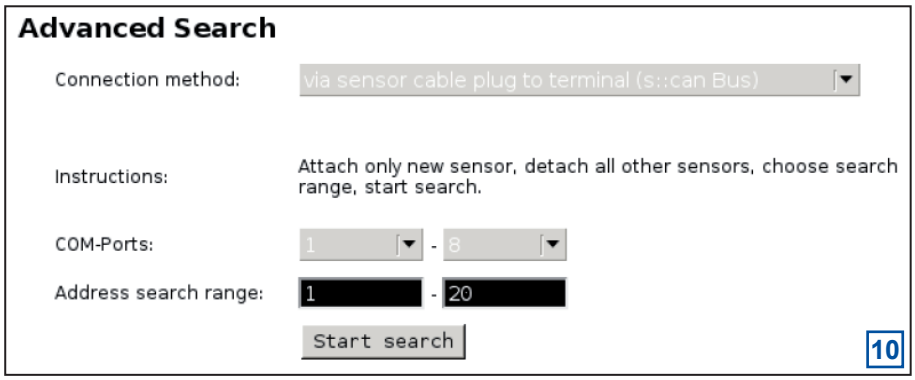


8 moni::tool will install the sensor and switch to the *Service* display. The new sensor is displayed in the system overview.

9 Push the button *Leave Service Mode* located on the upper left side to start the measuring process.



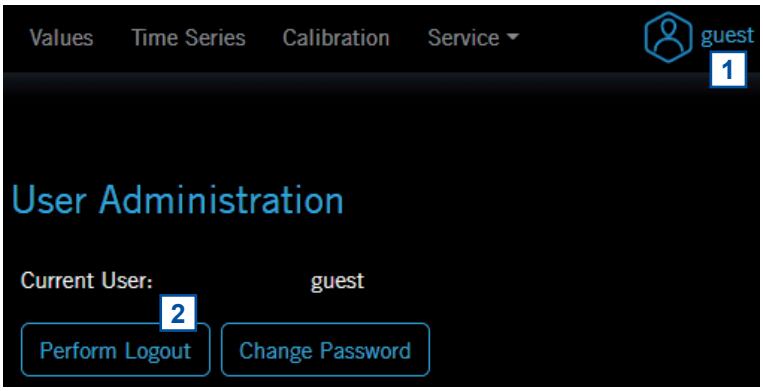
10 When pushing the button *Advanced Search* the method how the sensor is connected (*Connection methode)*, the used *COM-Port* and the *Address* can be defined exactly. This option shall be used by advanced users only.



5.3.3 Probe initialisation using con::line (Io::Tool)

1 Click on the user icon in the upper right corner of Io::Tool.

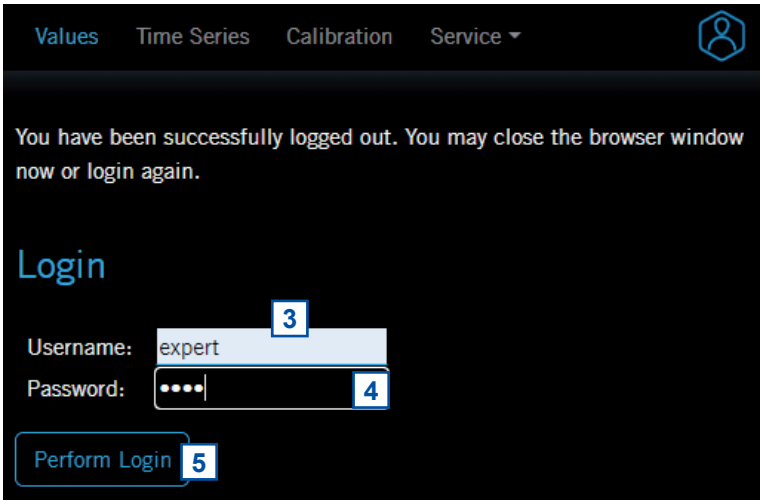
2 Click on the button *Perform Logout* to logout the current user.



3 Enter the new Username (*expert*).

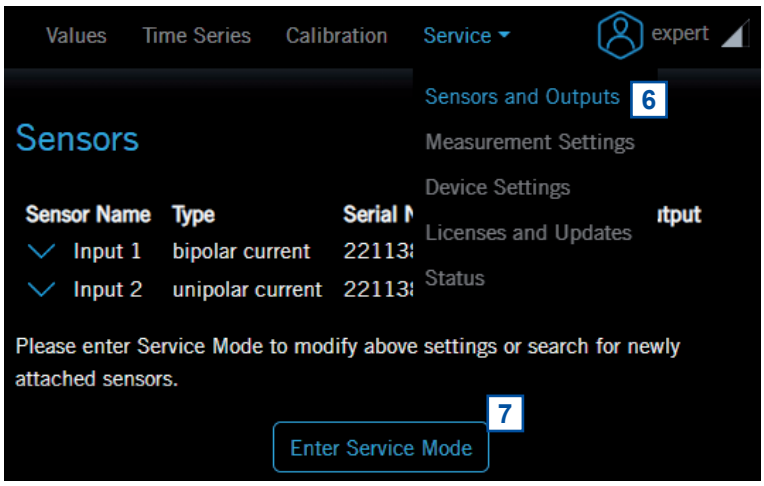
4 Enter the password (*scan*) for the user *expert*.

5 Click on the button *Perform Login* to login the new user.



6 Select the entry *Sensors and Outputs* in the main menu.

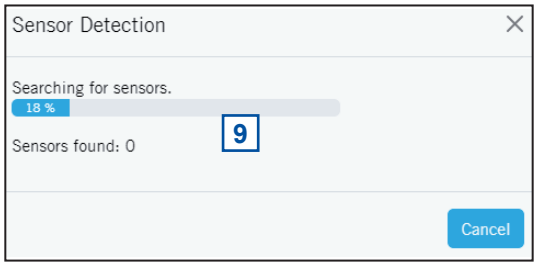
7 Click on the button *Enter Service Mode*, to stop the measuring process.

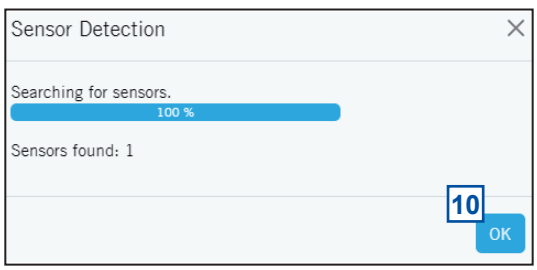


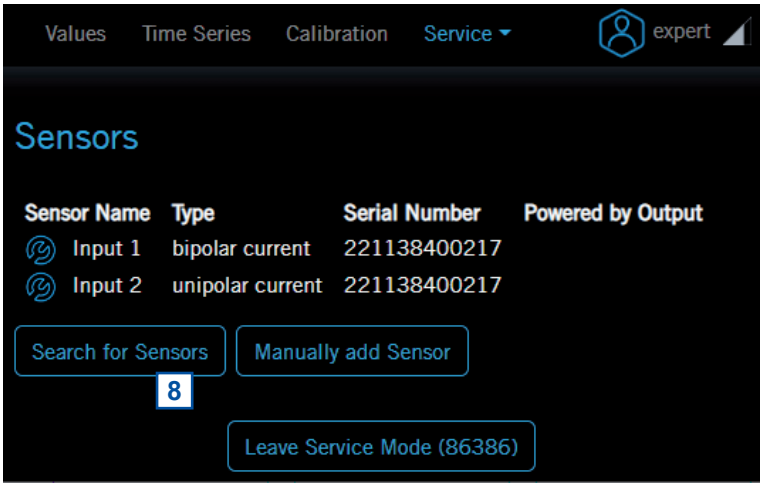
8 Click on the button *Search for Sensors*, to search for the new sensor.

9 The progress of the sensor search will be displayed within a seperate user window.

10 Click on the button *OK* after the sensor search to finalise the sensor initialisation.







11 The name (*Sensor Name*), *Typ*, and the *Serial Number* of the new sensor will be displayed in the overview of the sensors and outputs. In addition the power supply output is displayed that powers the sensor (*Powered by Output*).

12 By pushing the blue tool symbol on the left of the sensor name, the *Sensor Settings* are displayed in a separate window.

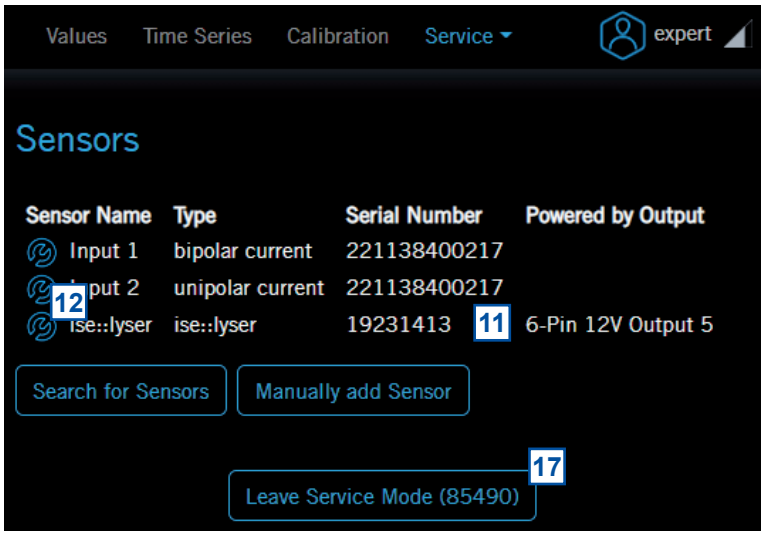
13 The *Name* of the sensor can be changed if necessary.

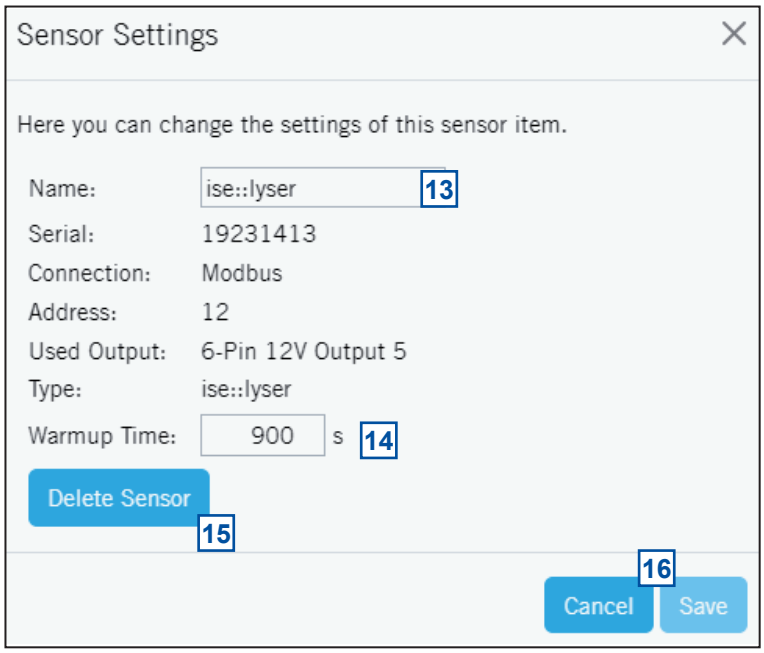
14 The *Warmup Time* defines, how long before the start of the measurement the power supply of the sensor is activated (see section 12). This is important in power-saving operation.

15 Click on the button *Delete Sensor* to remove the sensor permanently.

16 Click on the button *Cancel* to keep the overview of the sensor settings unchanged. Click on the button *Save* to store the modified sensor settings.

17 Click on the button *Leave Service Mode* to stop the service mode and resume normal measuring operation.





5.4 Probe Parameterisation

The following table provides an overview of the parameters that can be measured with these sensors.

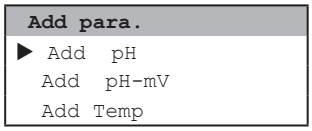
Sensor / Part-no.	Parameter	Unit	Parameter-index	Measuring range	Decimal places
redo::lyser E-513-X	ORP	[mV]	0	-2000 - 2000	0
	ORP - mV	[mV]	1	-2000 - 2000	0
	Temperatur	[°C]	2	-5 - 100	1
pH::lyser E-514-2	pH	[]	0	2 - 12	2
	pH - mV	[mV]	1	-3300 - 3300	1
	Temperatur	[°C]	2	-5 - 100	1
pH::lyser E-514-3	pH	[]	0	0 - 14	2
	pH - mV	[mV]	1	-3300 - 3300	1
	Temperatur	[°C]	2	-5 - 100	1
pH::lyser E-514-4	pH	[]	0	0 - 14	2
	pH - mV	[mV]	1	-3300 - 3300	1
	Temperatur	[°C]	2	-5 - 100	1

5.4.1 Probe Parameterisation using con::lyte

After successful sensor initialisation (see section 5.3.1) the needed measuring parameters of the pH::lyser / redo::lyser must be added to the parameter display. This is performed by the following steps:

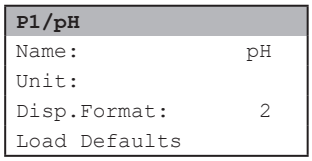
The maximum number of parameters depends on the con::lyte type used or the license installed (see con::lyte menu Status / Settings / License ...).

- Switch to status display with *Left-* or *Right* button.
- Push *Function* button.
- Select menu *Manage sensors...* and confirm with *OK*.
- Select *ise::lyser/0/x* and confirm with *OK*.
- Select menu *Add parameters...* and confirm with *OK*.
- Select needed parameter and confirm with *OK*.



The selected parameter will be displayed now on the next free position of the parameter display. The default display configuration is used. Changing the display format is performed by the following steps:

- Select the parameter in the parameter display using *Up-* or *Down* button.
- Push *Function* button.
- Select menu *Display settings...* and confirm with *OK*.



In the displayed parameter configuration the following settings can be modified.

- *Name* Displays the actual name of the parameter.
- *Unit* Displays the actual unit of the parameter.

A change of the name or unit of the parameter is performed by the following steps:

- Select the entry with *Up-* and *Down* buttons and confirm by pushing the *OK* button.
- Change the name with *Up-*, *Down-*, *Left-* and *Right* buttons.
- Push the *OK* button to confirm the new name.

Please note that change of parameter name or unit will not change the parameter configuration itself (e.g. if you change the parameter name NO_3-N to NO_3 the reading will still be NO_3-N).

- *Disp.Format* Within this line the number of displayed decimal places (between 0 and 5) can be set. Please note that in case of too many digits high values can not be displayed and the parameter reading will switch to plus signs (++.+++++).
- *Load Defaults* Confirming this entry by pushing the *Ok* button will restore the default display settings from the sensor.

All modifications performed by the operator within these settings menu will be documented in the config file of the con::lyte (see manual con::lyte D-320).

5.4.2 Probe Parameterisation using con::cube (moni::tool)

After successful probe initialisation (see section 5.3.2) all parameters available on the sensor will be installed and displayed on the *Values* screen of moni::tool.

⚠ If not all new parameters are displayed, please check the maximum number of parameters of your monit::tool license.

1 If required, the measurement parameters can be configured individually via the menu item *Service / Terminal / Parameters*.

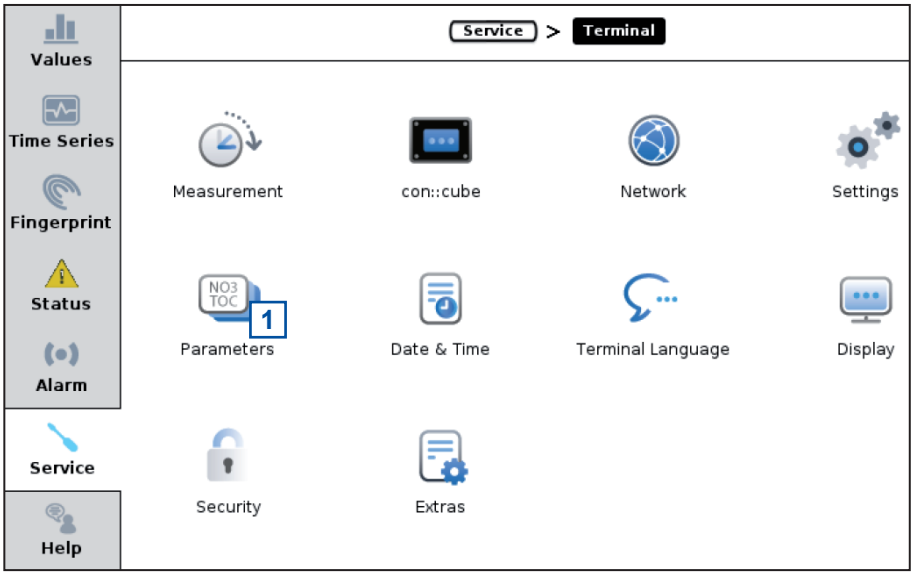
2 After selecting the menu item, a list of all installed parameters is displayed.

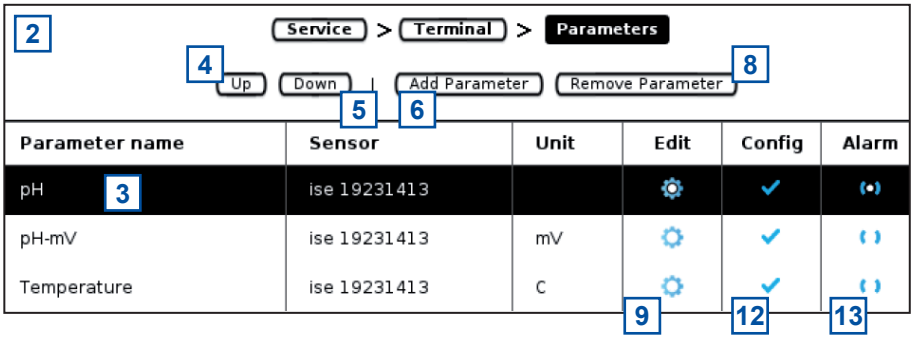
3 To select one or more parameters, simply click on the parameter name (the lines of the selected parameters will be highlighted).

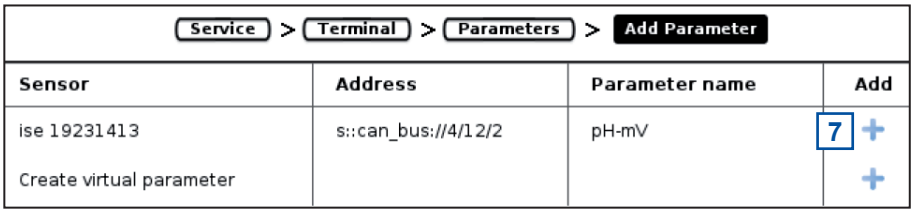
4 A click on the button *Up* moves the selected parameter one position up the the *Value* screen.

5 A click on the button *Down* moves the selected parameter one position down the the *Value* screen.

6 A click on the button *Add Parameter* adds a new parameter to the *Value* screen. A table of all parameters that are available will be displayed.

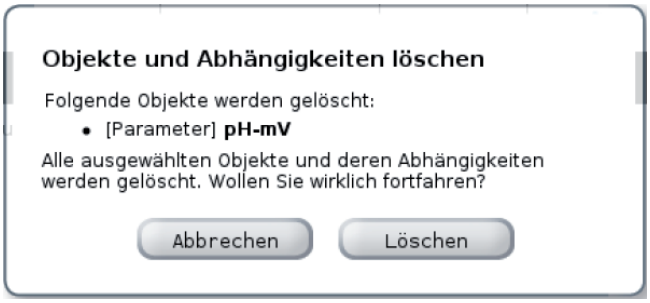






7 Click on the blue plus sign (+) on the right of the parameter you want to add to the *Values* screen.

8 A click on the button *Remove Parameter* removes the selected parameters from the *Value* screen. This action has to be confirmed in a new screen by pushing the button *Delete all* (see figure on the right).



9 A click on the blue gear wheel (*Edit*) on the right of the parameter in the parameter overview displays the actual parameter settings.

10 Depending on the used *Service Level* different settings are displayed. The *Parametername*, the *Unit* and the *Resolution* can be modified in the *Basic* level.

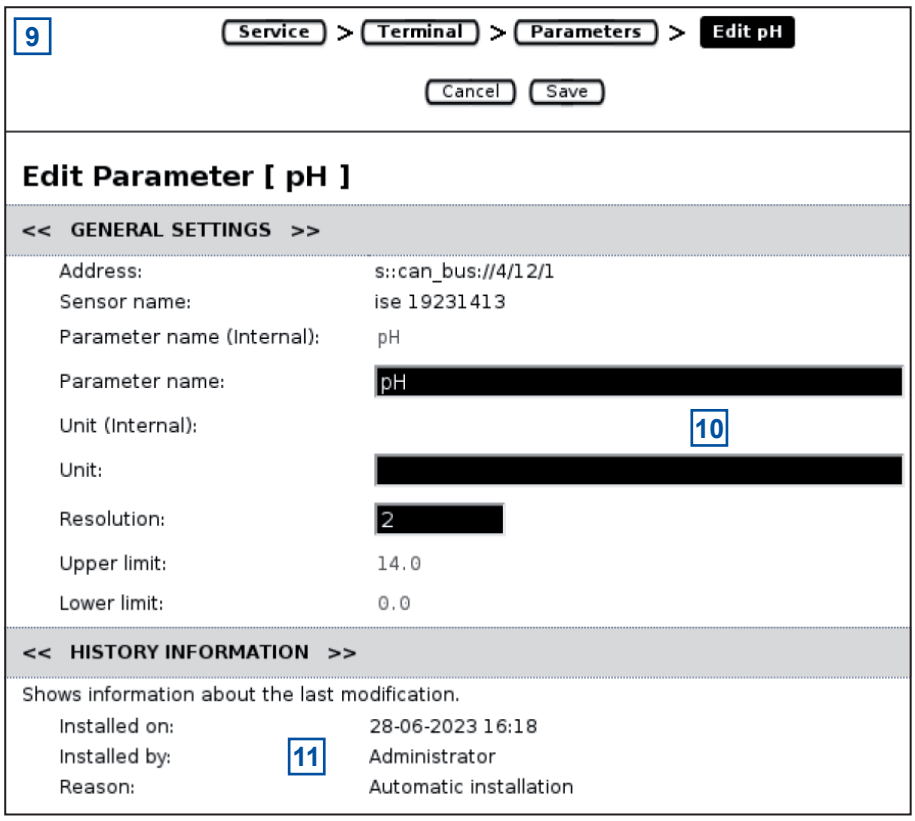
11 On a higher *Service Level* (*Advanced*, *Expert*) the andvanced settings are displayed (*Address*, *Parameter name (Internal)*, *Unit (Intern)*, *History Informationen*).

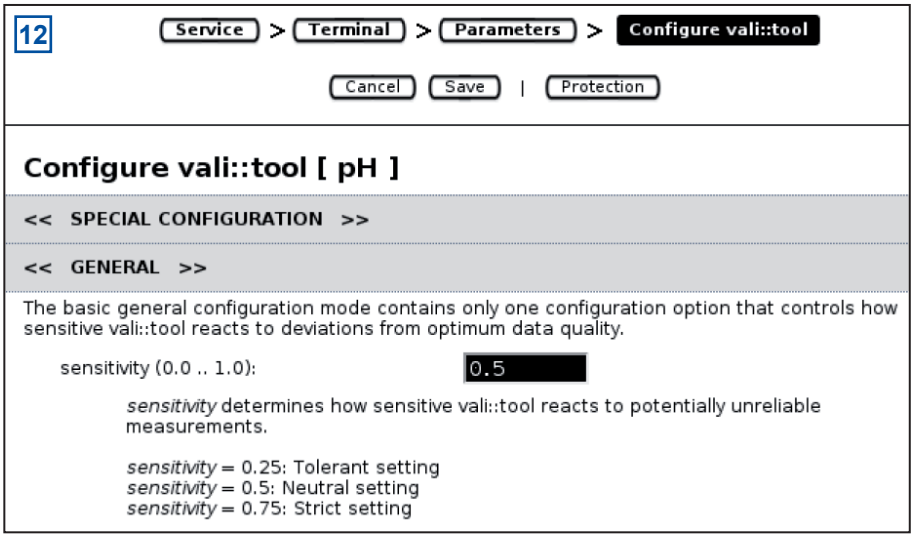
12 A click on the blue check mark (*Config*) on the right of the parameter in the parameter overview displays the actual settings of vali::tool for this parameter. The *Basic* screen is displayed on the right. Please refer to the manual moni::tool for further information.

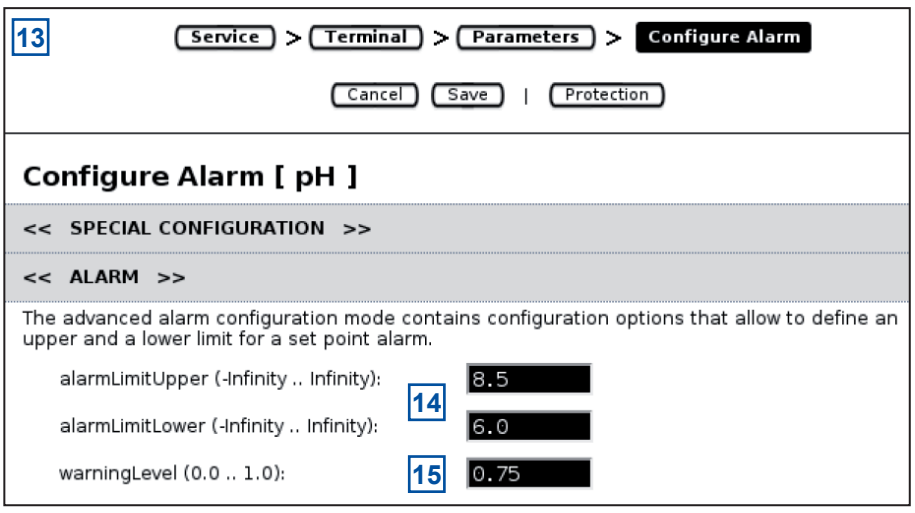
13 A click on the blue icon (*Alarm*) on the right of the parameter in the parameter overview displays the alarm settings for this parameter.

14 The upper (*alarmLimit Upper*) and the lower (*alarmLimitLower*) alarm threshold can be entered here.

15 In addition, a percentage value (*Warning Level*) can be defined, above which a warning is triggered.



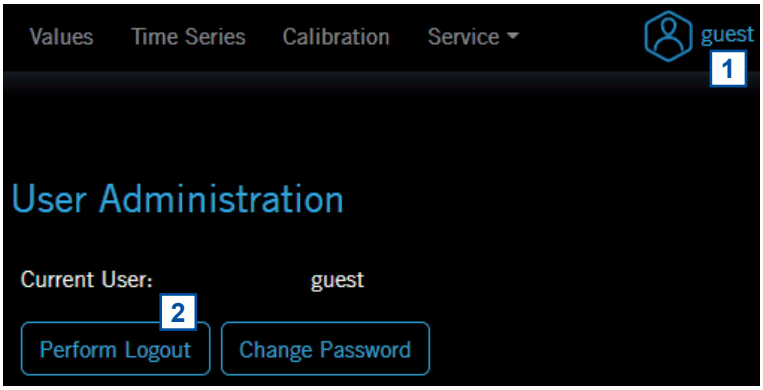




5.4.3 Probe Parameterisation using con::line (Io::Tool)

1 Click on the user icon in the upper right corner of Io::Tool.

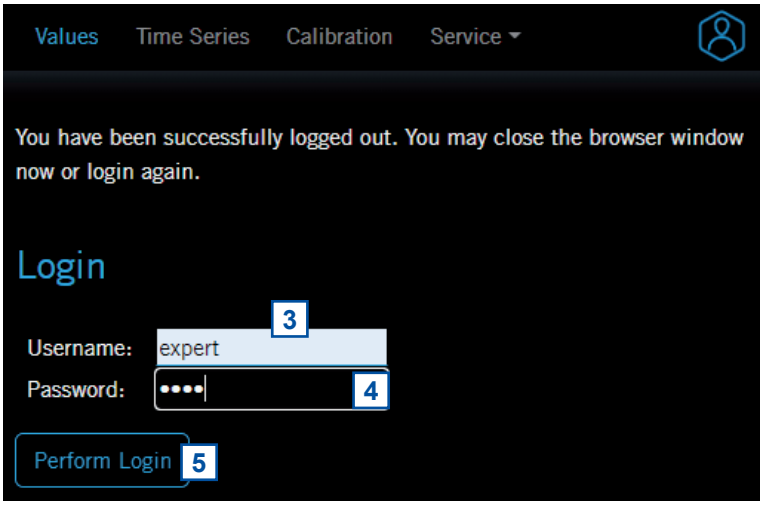
2 Click on the button *Perform Logout* to logout the current user.



3 Enter the new Username (*expert*).

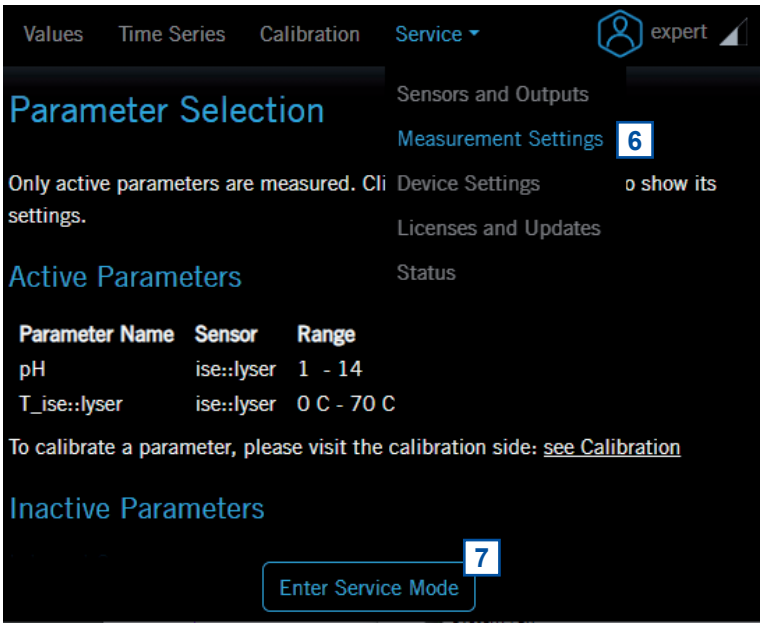
4 Enter the password (*scan*) for the user *expert*.

5 Click on the button *Perform Login* to login the new user.



6 Select the entry *Measurement Settings* in the main menu *Service*.

7 Click on the button *Enter Service Mode*, to stop the measuring process.



8 A click on the blue tool icon on the left of the parameter in the overview of the *Active Parameters* opens a window with the *Parameter Properties*.

9 The parameter name (*Name*), the *Unit* and the number of digits (*Decimals*) are displayed and can be modified if necessary.

10 An individual smoothing (*Averaging*) can be set for the parameter. The number of used readings for averaging is limited to max. 100. A value of 1 (factory setting) deacivates the smoothing.

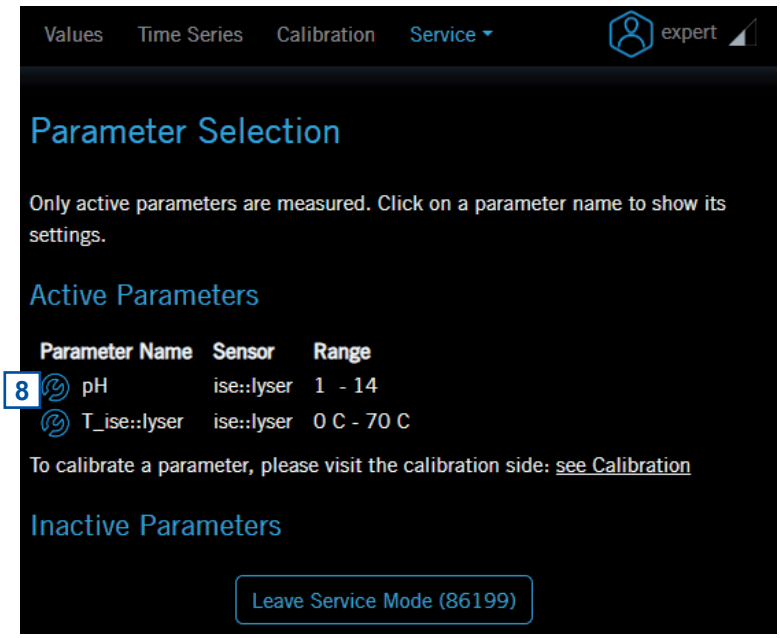
11 The measuring range (*Limits*) and the *Error Limits* are displayed here.

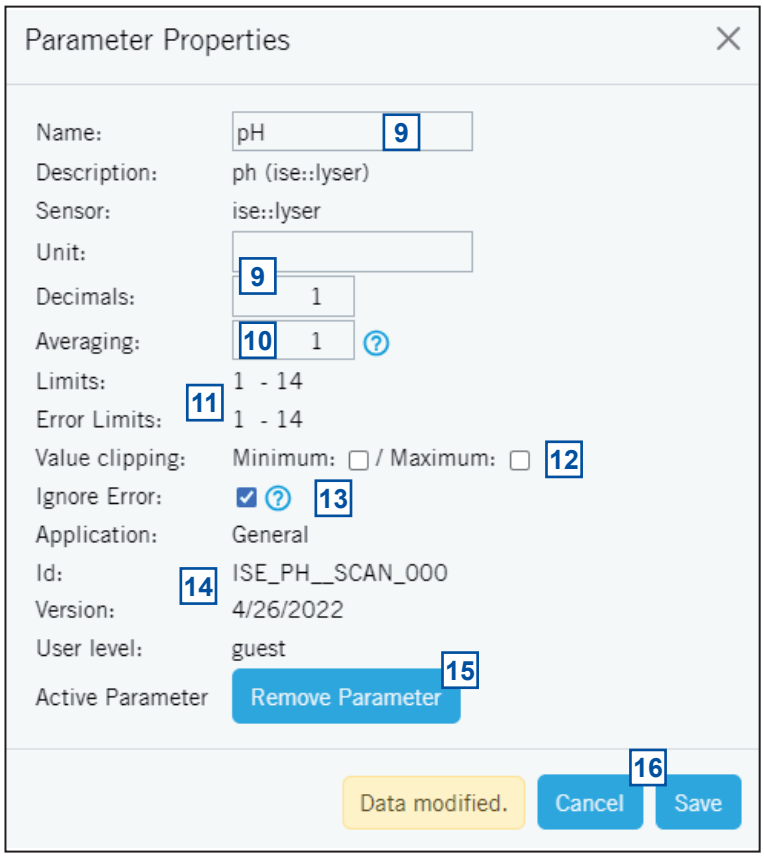
12 These two check boxes (*Value clipping*) are used to limit the display of readings to the measuring range. If the check box is activated, the reading is cut off if the reading falls below (*Minimum*) or exceeds (*Maximum*) the measuring range.

13 These check boxes (*Ignore Error*) can be used to suppress a red status display in the *Value* or *Time Series* display or on the operator terminal in case of an error. It should only be activated in justified exceptional cases.

14 In the lower section special parameter properties are displayed (*Application*, *Id*, *Version* and *User level*).

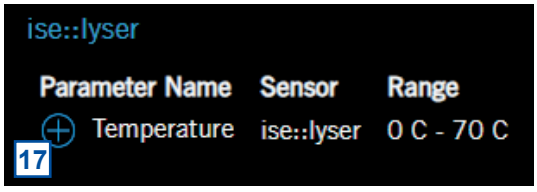
15 Pushing the button *Remove Parameter* will not display readings of this parameter anymore and move the parameter to the inactive parameters.





16 Any changes made must be confirmed by pushing the button *Save*. Pushing the button *Cancel* keeps the parameter settings unchanged.

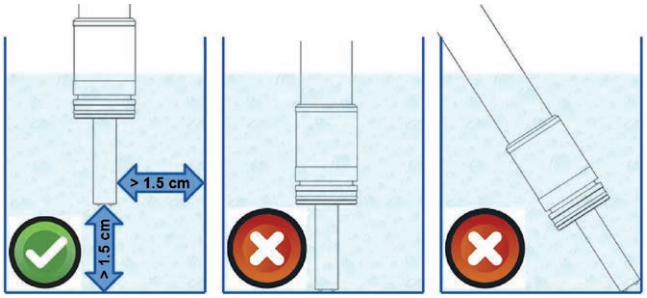
17 A click on the blue + sign on the left of the *Parameter Name* in the overview of the *Inactive Parameters* will add this parameter to the *Values* screen again.



6 Calibration

The pH::lyser and the redo::lyser are precalibrated ex factory and as such can be used immediately. For the offset precalibration of the ORP parameter a 465 mV standard is used and for the linear precalibration of the pH parameter a pH 4 and a pH 9 buffer are used. The temperature sensor is offset calibrated for both sensors.

- Due to high quality manufacturing process including factory calibration, it is not necessary to perform a linear calibration before start-up of a new sensor or after replacing the electrode.
- First check of the slope by using pH standards will typically not be necessary before 6 months in operation.
- After replacement of the electrode, switch back to global calibration and check the accuracy after one day. If necessary, perform an offset calibration.
- One of the advantages of these sensors is the extreme stable electrode slope of the calibration over time. Therefore a new electrode needs several hours of conditioning time in the medium.
- Before performing any kind of calibration ensure correct function and appropriate conditioning time of the sensor. (At least 4 hours after initial operation and at least 5 minutes in a buffer solution).
- The local calibration can be performed either directly in the measured medium without removing the sensor from the installation place (recommended for offset calibration) or outside in a beaker with calibration solution (recommended for linear calibration).
- Ensure that during calibration the complete measuring head (i.e. electrode and temperature sensor) are submersed into the measuring medium and the protective cap is removed.
- When calibration is performed in a small beaker, ensure that the sensor is not in direct contact with the wall or bottom (see figure on the right).
- The temperature sensor can be calibrated on air or in the measuring medium towards a reference thermometer.
- Existing (stored) readings (sample) are overwritten whenever a new sample measurement is triggered.



- The measurement results of the sensor shown during the calibration procedure and stored onto the sensor are the raw signals of the electrodes. Therefore they can be negative numbers.
- On the sensor itself sample readings and corresponding laboratory results of two samples can be stored for each parameter. Furthermore the coefficients of the local calibration (offset and slope) are stored on the sensor.
- If a linear calibration was performed outside the measuring medium successfully and there is still a difference between the real concentration in the measuring medium and the sensor reading after installation, an offset calibration shall be performed directly in the measuring medium additionally.
- If you should observe a deviation from a calibrated and validated reference sensor after installation or during regular check of accuracy, leave the sensor submersed in the medium and perform an offset calibration.

The customer portal on the s::can website provides a support video, showing the complete linear calibration prodedure in pH buffers for a pH::lyser.
(link: https://www.s-can.at/de/customer-portal-support-videos
or https://vimeo.com/646484432/051d01811c).

6.1 Types of Calibration

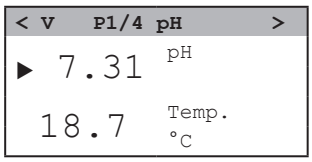
The following table provides an overview of the possible variants for performing a local calibration.

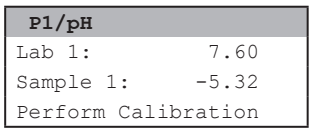
	Offset	Linear	Remark
Samples needed	1 sample	2 samples	Linear calibration shall cover the typical measuring range.
Modified coefficients	Offset	Offset and slope	
Conditioning time	4-24 hours for new sensor or new electrode	5-20 min. in standard solution	New electrode can already be conditioned before installation.
Calibration medium	measured medium ifself or standard solution	Standard solution	Note the temperature dependence of the standard
Reference method	validated hand-held meter or standard solution	Standard solution	Note the temperature dependence of the standard
Time needed for calibration	approx. 10 min. (excl. conditioning)	approx. 50 min.	
Reason for calibration and frequency	1 day after initial start-up or electrode replacement. Every 3 months for validration, if needed	Every 6 months, not during initial start-up	
Calibration can be performed with	all s::can operator terminals	all s::can operator terminals	Calibration remains stored on the sensor when the operator terminal is changed.

6.2 Performing a Calibration

6.2.1 Calibration using con::lyte

This controller for operation provides, beside normal calibration procedure (see further down), the possibility for a quick calibration call directly from the parameter view. This is performed by following steps:

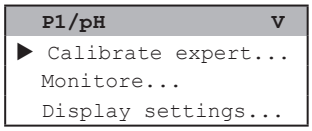




- Select the parameter in the parameter display with *Up-* or *Down* button.
- Push *OK* button, which directly displays the calibration screen.
- Select *Sample 1* and confirm with *OK* to store the global (raw) signal of the actual reading.
- Enter the value of the used standard or the reading of the sensor used for validation into the field *Lab 1*.
- Select entry *Perform Calibration* and confirm with *OK*.
- Leave the calibration screen with *Back* button.

Now the selected parameter is offset calibrated.

The advanced local calibration provides extensive possibilities for local calibration of selected parameter. This is performed by following steps:



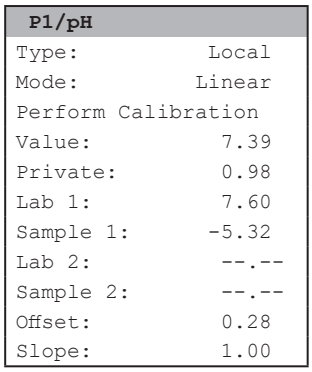
- Select the parameter in the parameter display with *Up-* or *Down* button.
- Push the *Function* button.
- Select the menu *Calibrate expert...* and pushing the *OK* button.

Now the complete calibration screen is displayed and provides the following options:

- *Type* Two different types of calibration are available:
  Local (custom calibration) or *Global* (factory calibration). By default *Local* is selected. This is the normal calibration performed by the operator. As soon as *Global* is selected and confirmed with *OK*, a reset of this parameter to factory calibration (global) is performed and the current reading (*Value*), the default offset (*Offset*) and the default slope (*Slope*) will be displayed.
- *Mode* As available local calibration variants either *Offset* or *Linear* can be selected.

⚠ A local calibration can be performed either starting from type *Global* or *Local*. Depending on this either the global slope or the local slope will be used after perfoming an offset calibration.

- *Perform Calibration* Confirming this entry by pushing the *Ok* button will execute the local calibration, using the *Lab* and *Sample* values displayed on the calibration screen.
- *Value* Displays the measured value of the sensor like on the parameter screen (i.e. using the current calibration).
- *Private* Displays the quality number of this reading. The quality can vary between 0 (bad) and 1 (perfect) and should be > 0.9 when storing the displayed value as a sample.The value will be updated permanently.
- *Lab 1* Within this line the correct value for the measured *Sample 1* (value of standard solution or hand-held meter) must be entered. The unit of the lab value has to be in accordance with the measuring parameter. An entered *Lab* value can be deleted by selecting it and pushing the *Function* button so that it will not be used in the calibration.



- *Sample 1* When confirming this entry by pushing the *Ok* button, a measurement will be performed and stored as sample 1 for the local calibration. The sample for the laboratory should be taken at the same time. Existing readings (*Sample 1* or *Sample 2*) are overwritten whenever a new measurement is performed by pushing *OK*. If no sample measurement was performed or the measurement was invalid, dashes (*---.--*) will be displayed instead of a numerical value.
- *Offset* Displays the used offset of the actual calibration. It is possible to edit this value by pushing the *OK* button. The offset of the global calibration is 0.
- *Slope* Displays the used slope of the actual calibration. It is possible to edit this value by pushing the *OK* button. The slope of the global calibration is 1.

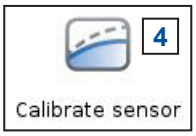
6.2.2 Calibration using con::cube (moni::tool)

1 Click the *Service* tab of the moni::tool screen.

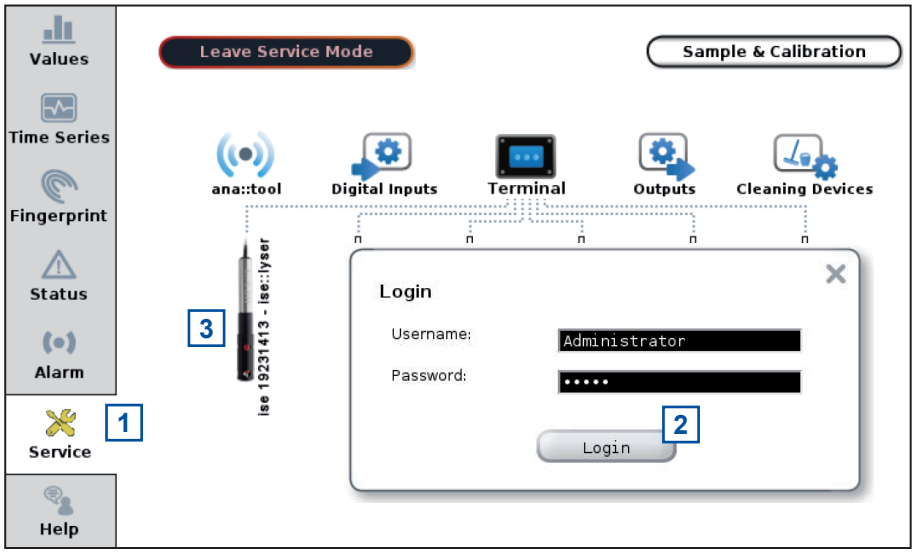
2 Logon as *Administrator* with password *admin1* or your individual username.

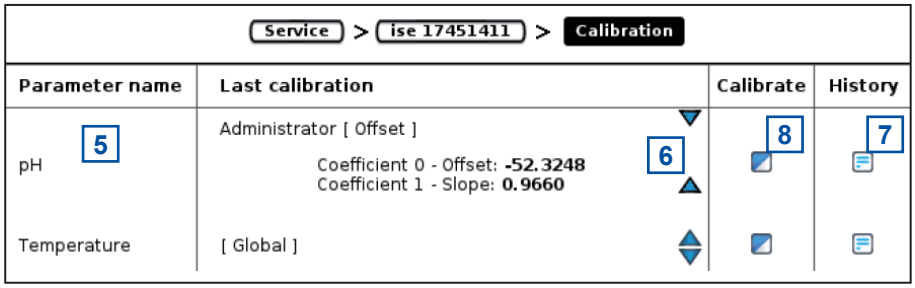
3 Click the icon of the sensor you want to calibrate in the displayed system overview.

4 Click the icon *Calibrate sensor* in the next screen.



5 Now the screen shows a list of all parameters being measured by this sensor (*Parameter name*).

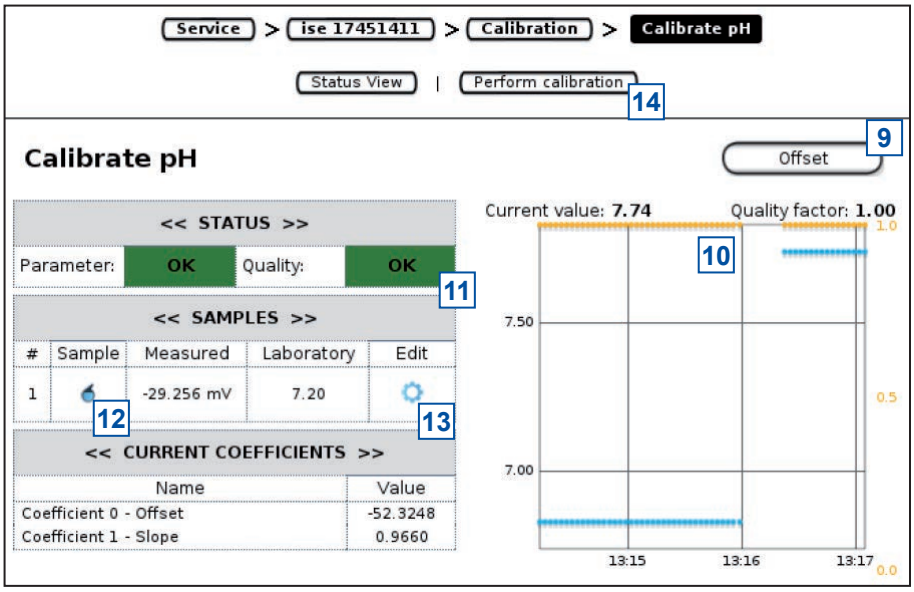




6 Clicking on the blue triangles will display more information about actual used calibration for this parameter. The global calibration uses offset=0 and slope=1.

7 Furthermore a click on the *History* icon rightmost opens a logbook showing all calibration procedures performed with this con::cube up to now.

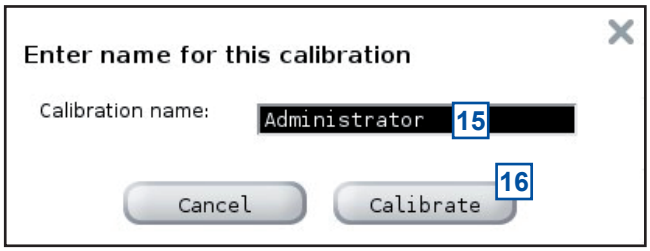
8 Open the calibration screen by clicking on the *Calibrate* icon on the right side of the parameter you want to calibrate.



9 This button displays the actual used calibration (*Global*, *Offset* or *Linear*). Push this button to select the type of calibration you want to perform.

10 The current readings and the quality factor of the parameter will be displayed numerically and graphically. Wait until readings are stable (*Quality OK*).

11 The quality is *OK* as soon as the *quality factor* is > 0.9.



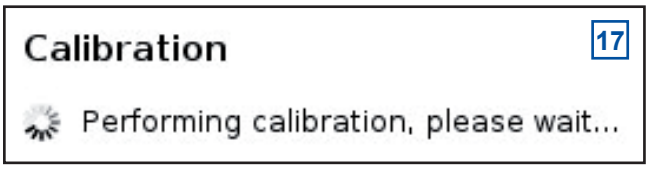
12 Push the *Sample* icon to perform a new measurement and store the reading on the probe. Please note that the value (*Measured*) displayed below *<<SAMPLES>>* is the raw value (mV value). The *Sample #1* will be used for offset and linear calibration.

13 Push the *Edit* icon to enter the result of the laboratory (value of standard solution or hand-held meter) and store it on the probe.

14 Push the button *Perform Calibration* to start the calibration procedure.

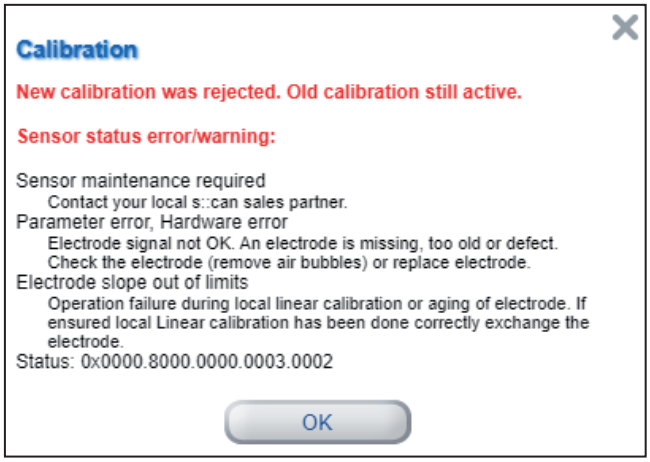
15 In the next window an individual name can be entered to describe the calibration (*Calibration name*).

16 Push the button *Calibrate* to continue the calibration procedure.



17 During the calibration procedure a message is displayed on the screen.

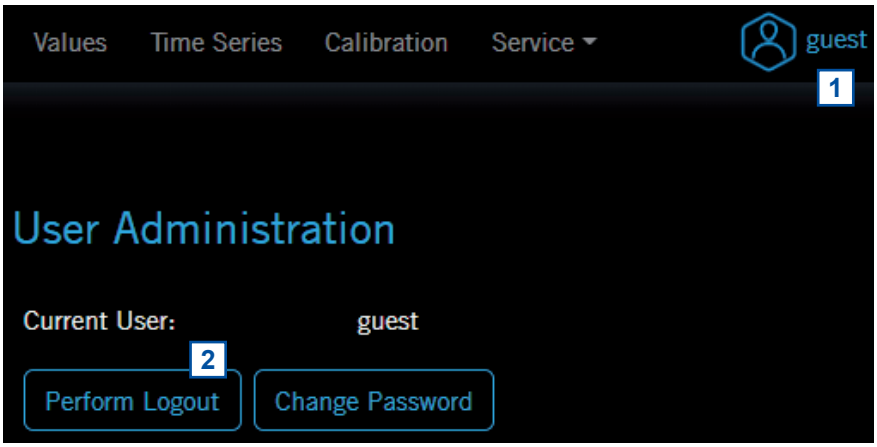
18 After the calibration procedure is finished a user message will inform the operator, if the local calibration was successful or not (see two figures on the right).



6.2.3 Calibration using con::line (lo::Tool)

1 Click on the user icon in the upper right corner of lo::Tool.

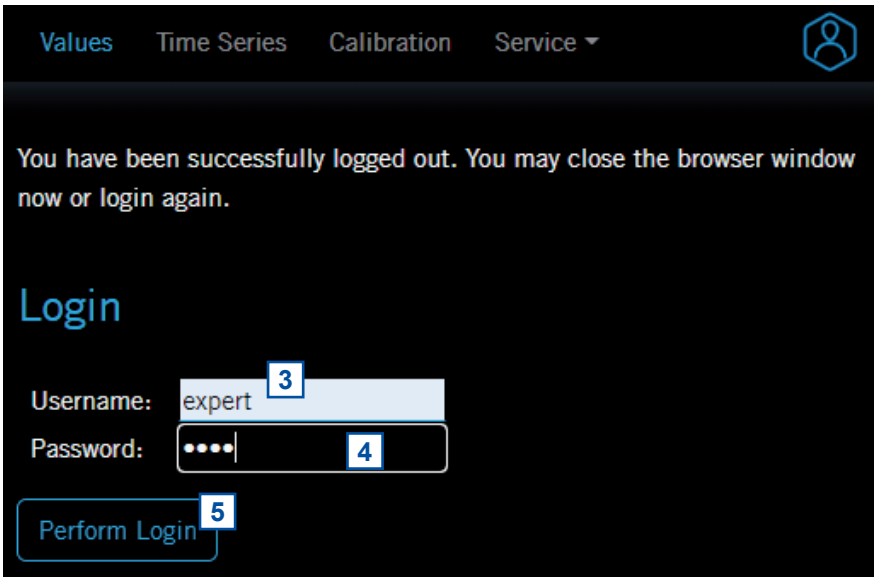
2 Click on the button *Perform Logout* to logout the current user.



3 Enter the new Username (*expert*).

4 Enter the password (*scan*) for the user *expert*.

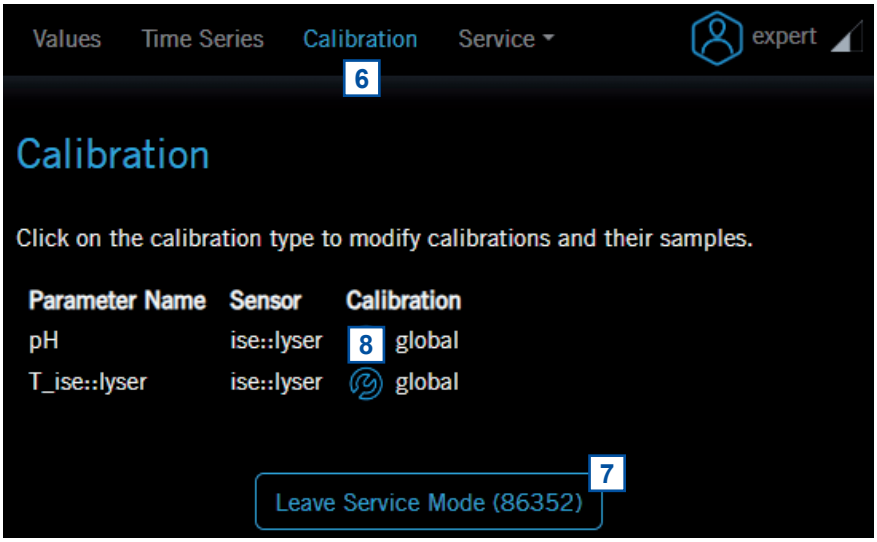
5 Click on the button *Perform Login* to login the new user.



6 Push the *Calibration* entry in the main menu.

7 Click on the button *Enter Service Mode*, to stop the measuring process. The button name will be changed to *Leave Service Mode*.

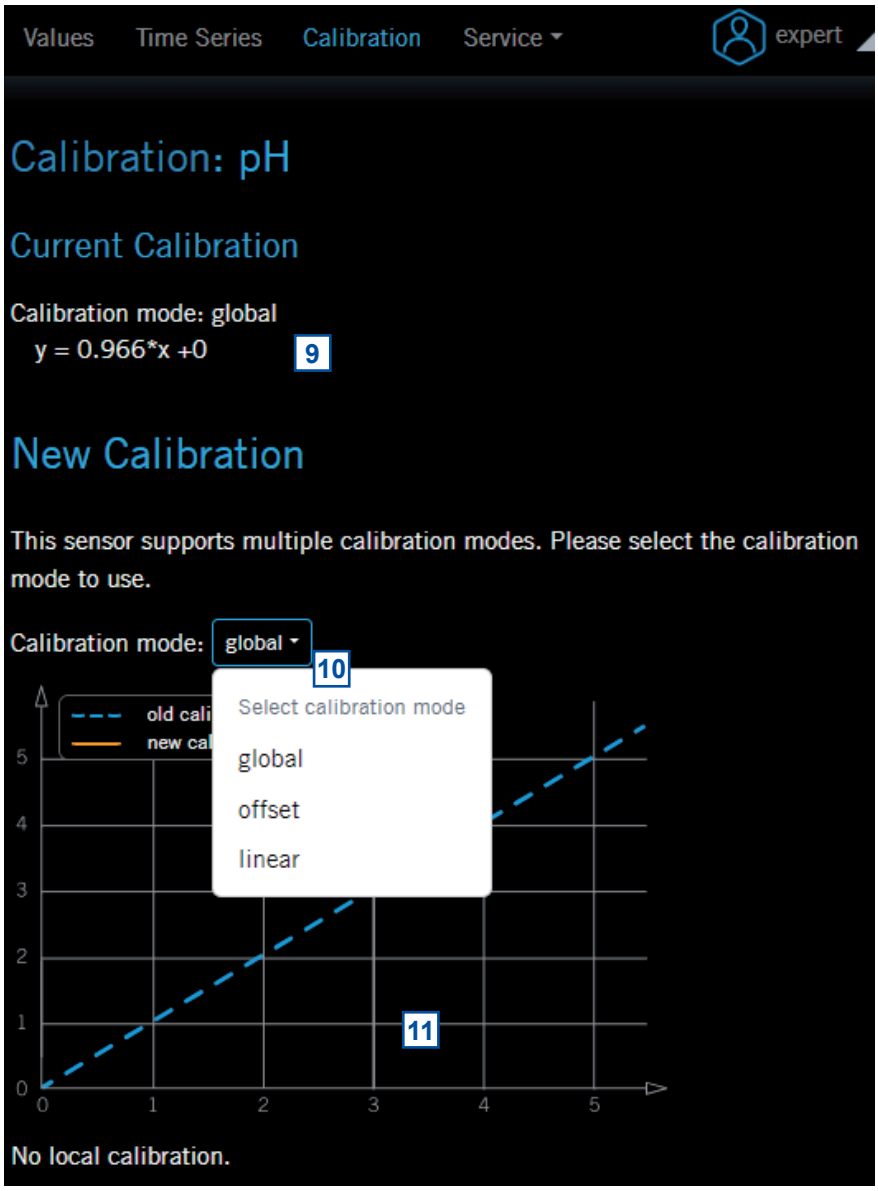
8 A click on the blue tool icon on the left of the parameter in the overview of *Calibration* opens the calibration window.

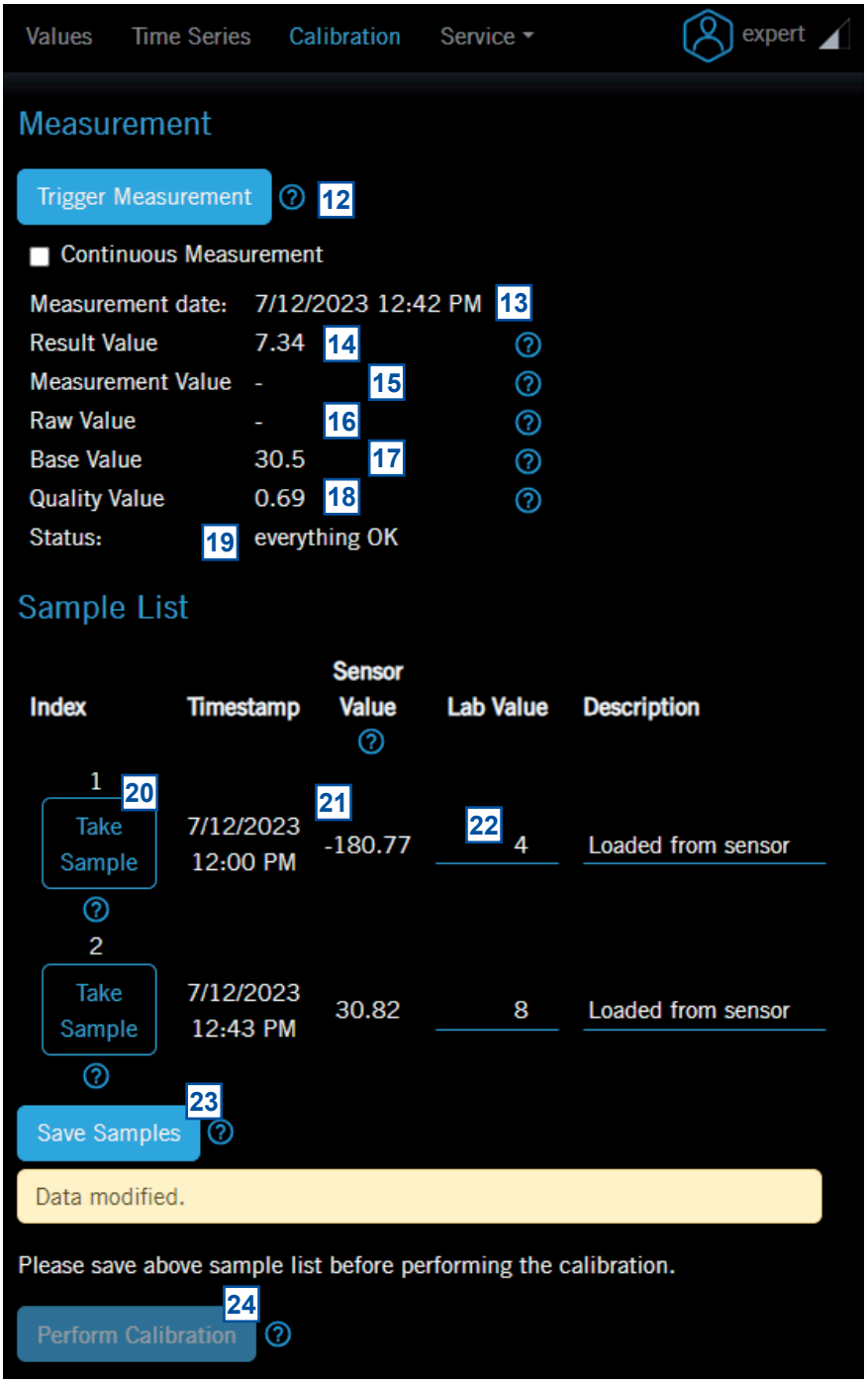


9 The actual used calibration mode with the used offset and slope of this calibration is displayed.

10 Push the button on the right side of *Calibration mode* to select the calibration to be performed (*global*, *offset* or *linear*).

11 The effect of the selected *Calibration mode* is explained here as a diagram and as plain text.





12 Push the button *Trigger Measurement* to start a single measurement. Activate the checkbox *Continuous Measurement* to start a fast automatic measurement mode.

13 The date and time stamp of the last measurement is displayed here (*Measurement date*).

14 The *Result Value* is the same value as displayed in the value screen of your operator terminal.

15 The *Measurement Value* is the final reading without any value clipping or limitation caused by quality check. The *Measurement Value* will be displayed only if it is different to the *Result value*.

16 The *Raw Value* is the sensor reading with the correct unit before performing any local calibration. It is identical to the global sensor reading. The *Raw Value* is only displayed, if it differs from the *Measurement Value*.

17 The *Base Value* is the original physical signal of the sensor. It might have a different unit to the final reading (e.g. mV) and is only displayed, if it differs from the Raw Value.

18 The *Quality Value* is an indicator for the quality of the sensor signal. If the value is > 0.9, the sensor signal is stable (*Ok*) and can be used as a sample for local calibration.

19 The *Status* of the sensor is displayed here as plain text.

20 Push the button *Take Sample* to perform a new measurement and store this measurement on the sensor for a local calibration.

21 The *Timestamp* and the *Sensor Value*, which will be either the *Raw Value* or the *Base Value* of the stored sample is displayed.

22 The value of the used standard or the reading of the handheld can be entered here (*Lab Value*).

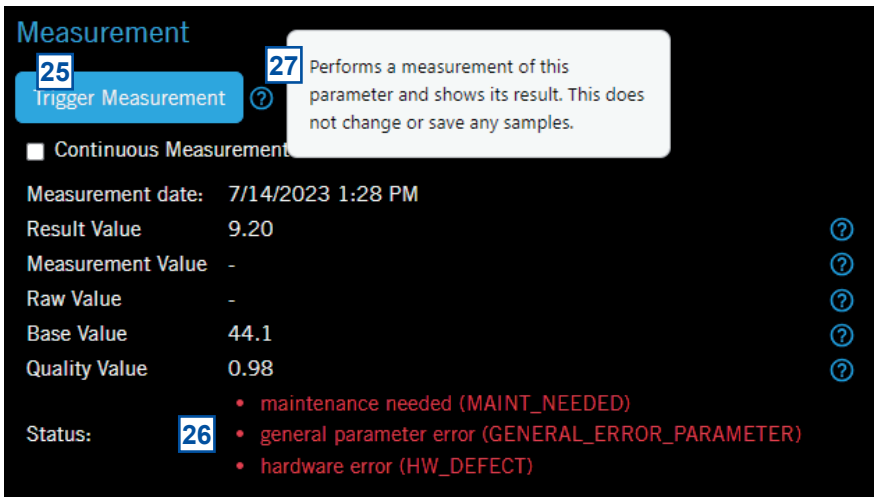
23 Push the button *Save Samples* to save all modified data on the sensor itself.

24 Push the button *Perform Calibration* to execute the local calibration.

25 Push the button *Trigger Measurement* to start one manual measurement and check if the Status is *OK* after the local calibration.

26 If the local calibration is not *OK*, the error reason are explained in plain text in red (*Status*).

27 Click the question mark icon (*?*) to open a window with help text.



7 Data Management

7.1 Data Storage

The following information is stored directly on the sensor:

- Global calibration (default settings) for all installed parameters
- Actual used local calibration for each parameter
- Readings of sample measurements for each parameter
- Laboratory results (comparison value) of samples for each parameter
- Device information (e.g. type, serialnumber, address, please refer to section 10.3)

The sensor readings can be stored on the controller used for operation. There is no possibility to store the readings on the sensor itself.

7.2 Data Transfer

The measurements are performed on the sensor and the readings are transfered to the controller used for operation via the sensor cable using Modbus RS 485.

7.3 Data Visualisation

For visualisation of the sensor readings one of the following s::can controller for operation or s::can tools can be used:

- con::lyte (parameter readings)
- con::cube (parameter readings and time series)
- con::line in combination with Io::Tool (parameter readings and time series)
- visu::tool for offline visualisation of parameter readings and status messages

8 Function Check

A function check might be required for one of the following reasons:

- Initial startup
- Routine function check
- Suspicion of monitoring system malfunction
- Modification of monitoring system (e.g. integration of additional sensor or device)
- Change of measuring point / location

Depending on the application (water composition), the probes and sensors used and the environmental conditions a regular function check (weekly to monthly) is recommended. The following sections provide an overview of all the actions that must be performed to check the monitoring system quickly (see section 8.1), to check the plausibility of the collected readings (see section 8.2) and to check the integrity of a single probe or sensor (see section 8.3).

8.1 Check of System / Monitoring Station

Check if the monitoring system is powered and operational			
con::lyte	con::cube / moni::tool	con::line / Io::Tool	Remark
■ Green LED is on? ■ Readings are visible on the display after touching one key? ■ Displayed system time is current and is updated every second?	■ 4 LEDs on housing cover are on or at least flashing? ■ moni::tool screen is displayed after touching the screen? ■ Click on system clock at the bottom of the screen will shows current time and last measurement. Both are current?	■ 4 LEDs on housing cover are on or at least flashing? ■ Io::Tool can be started on mobile device? ■ Displayed date and time on the bottom of the screen is current?	■ Check power supply of controller. ■ Check battery and solar panel in case of battery usage. ■ Power off controller for 2 minutes and power on again.

Check if the monitoring system is measuring automatically and readings are updated continuously			
con::lyte	con::cube / moni::tool	con::line / Io::Tool	Remark
■ Push button *Left* to enter *Status* view. ■ Check if counter of *Waiting* time is active. ■ Check if Service mode is not active.	■ Check counter in the lower right corner of the moni::tool screen, which displays the remaining time until next measurement. ■ Check time series. ■ Check if Service mode is not active.	■ Check counter in the lower right corner of the moni::tool screen, which displays the remaining time until next measurement. ■ Check time series. ■ Check if Service mode is not active.	■ Check measuring interval. ■ Leave Service mode.

Check if the Status of the monitoring system is OK			
con::lyte	con::cube / moni::tool	con::line / lo::Tool	Remark
■ No error messages or error symbols are displayed in the header line? ■ Check whether an alarm is pending.	■ LED of con::cube is blue and *Status* icon of moni::tool is not blinking yellow? ■ Open *Status* tab and select symbol of affected sensor for more information.	■ LED of con::line is blue? ■ Readings are displayed within a blue circle? ■ Check device status in *Service / Status*	■ Note all displayed error messages. ■ Download logbook. ■ See section 8.2 for check of parameter readings. ■ See section 8.3 for check of sensor integrity.

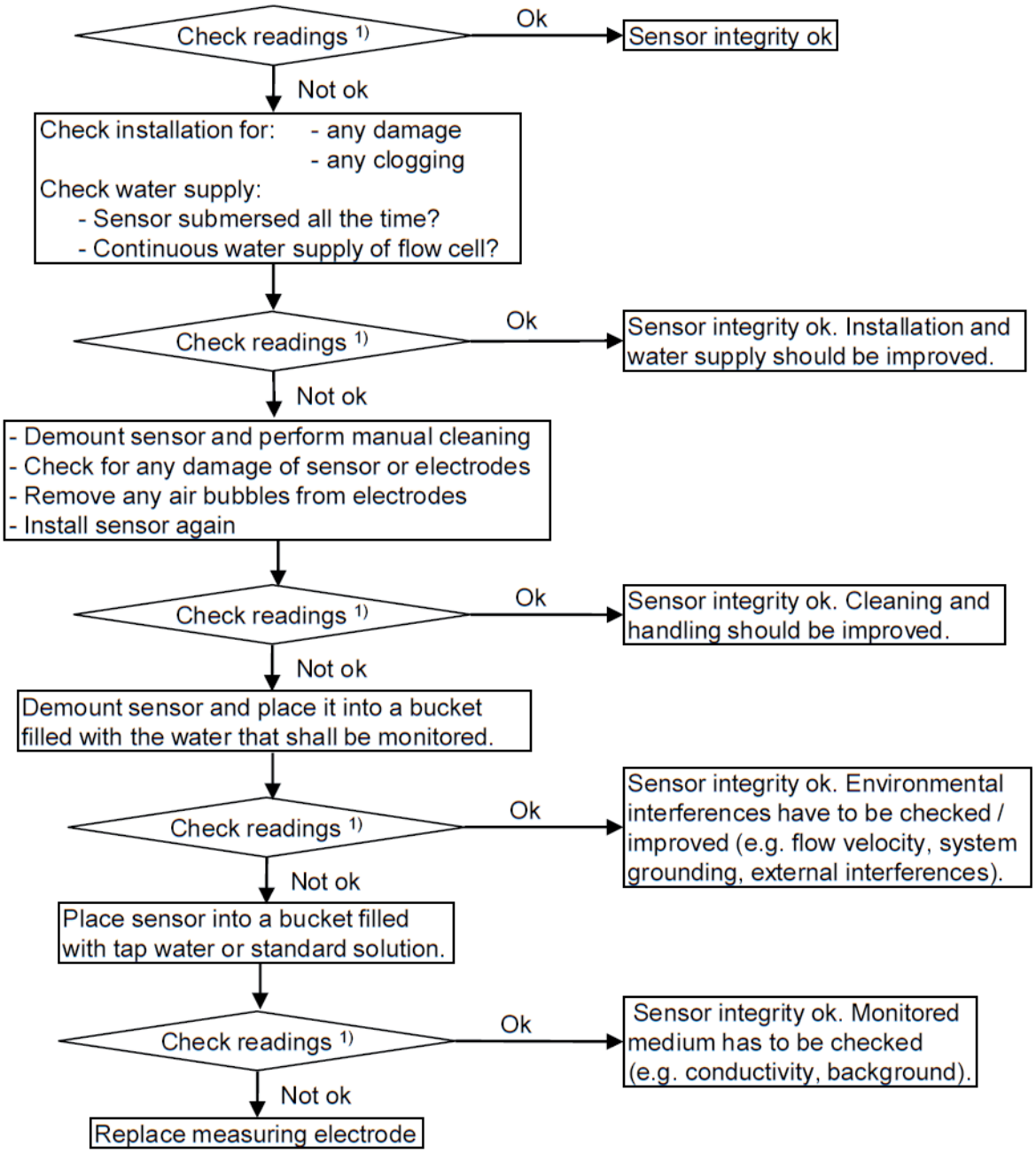
Check of installation and automatic cleaning	
Monitoring system	Remark
■ Monitoring station (by-pass)	■ All tubes and fittings are tight and all probes and sensors are supplied with medium? ■ No air bubbles within the tubes?
■ Submersed Installation (in-situ)	■ Mounting equipment of all devices is ok and all probes and sensors are submersed? ■ Flow conditions are stable (little turbulences, etc.)?
■ Automatic cleaning (operational)	■ Use function *Clean now* or wait for next cleaning cycle. ■ Watch for air bubbles when cleaning is activated or listen / watch if cleaning brush is rotating.
■ Compressed air supply for automatic cleaning	■ All tubes and fittings are tight?
■ Function of compressor and storage tank	■ Drain condensed water from storage tank of compressor (not necessary for s::can compressor B-32). ■ Check function of the compressor (see manual of compressor).

8.2 Check of Readings

Check	Reason	Remark
■ Current readings: Completely displayed. No *NaN* and no dashes (- - - -,- -) or plus signs (++++,++) are displayed.	■ No communication to sensor ■ Parameter error ■ Reading is too long to be displayed ■ vali::tool error	■ Use arrow buttons / scroll bar to scroll through all displayed parameters. ■ Check status and configuration of parameter.
■ Status of displayed readings:	■ Red background or frame for parameter indicates an error or alarm. ■ Grey background or frame indicates reading is not current. ■ Flashing background indicates an error.	■ Check parameter status ■ Check sensor integrity
■ Up-to-date: Readings are updated on regulary base?	■ Measuring interval is too long ■ Automatic measurement has been stopped manually	■ Consider measuring interval and smoothing.
■ Continuity: Check historical readings (timeseries) for interruptions or discontinuities	■ Change of medium ■ Local calibration ■ Maintenance of probe / sensor (cleaning, etc.) ■ Readings out of range ■ System failure (loss of power, communication error, etc.) ■ Unsteady flow through flow cell installation	■ Check only possible if timeseries are available.
■ Plausibility of timeseries: Timeseries reflect daily / seasonal fluctuation or known process changes	■ Drift of readings (can be caused by fouling or aging of electrode) ■ Increasing noise (can be caused by flow conditions or fouling) ■ Fixed readings / no fluctuation	■ Check logbook of plant operator if possible.
■ Measuring range: Readings are within the specified and calibrated measuring range?		■ Quality of results might be reduced outside the specified range.
■ Accuracy: Difference between laboratory (comparison) values and readings of the sensor	■ In case of significant difference during initial operation, a local offset calibration must performed (please refer to section 6). ■ In case of significant difference during normal operation, a function check must be performed.	■ To verify the accuracy of the displayed readings, only a reliable and validated comparison method has to be used.
■ Data transfer		■ Check if displayed readings on local controller are equal with displayed readings on customer display system.

8.3 Check of Probe / Sensor Integrity

If you have any doubts about sensor integrity, please use the following flowchart to check the sensor, installation and environmental conditions.



1) Check if the sensor readings are plausible and stable (no jumps, no scattering, no drift) for at least 5 consecutive measurements.

8.4 Check of Reading Accuracy

For regular checking of the pH::lyser / redo::lyser the sensor can be left submersed in the medium or in the flow cell (by-pass). The displayed reading is compared with a calibrated and validated laboratory pH sensor / ORP sensor.

An offset calibration is recommended for a deviation of:

- > +/- 0,1 pH for pH::lyser
- > +/- 5 % of reading (standard) for redo::lyser

For a 2-point calibration of the pH::lyser, use an acid (pH 4) and a basic (pH 9) buffer. Keep the pH::lyser in each buffer for sufficient time to provide stable values (see section 6).

The customer portal on the s::can website provides a support video, showing the complete linear calibration prodedure in pH buffers for a pH::lyser.
(link: https://www.s-can.at/de/customer-portal-support-videos
or https://vimeo.com/646484432/051d01811c).

- As soon as the electrode slope falls below 80 % (slope < 0.8), this corresponds to 46.5 mV per pH unit at 20 °C, a replacement of the pH electrode is recommended.
- If the pH::lyser is only checked with a pH 7 buffer, the deviation of the raw value (mV signal) should be between - 50 mV and + 50 mV. Otherwise, a more precise check using linear calibration or an electrode exchange is recommended.
- No linear calibration is required for the redo::lyser. When performing a linear calibration, the electrode slope is checked and a status warning is issued if there is a deviation of +/- 5 %.
- For the redo::lyser, a control measurement in a single buffer solution is sufficient to check the accuracy. If there is a deviation of > +/- 10 % from the measured value of the standard, a replacement of the ORP-electrode is recommended.

9 Maintenance

9.1 Cleaning

During routine operation the cleaning of the pH::lyser / redo::lyser, i.e. the electrode, is performed automatically via compressed air. To clean the probe manually the following is recommended:

Before demounting the sensor be sure that automatic air cleaning is deactivated via operating software (e.g. by entering the Service Mode). In addition ensure the air supply line is depressurised. This is to avoid dirt and / or injury by suddenly escaping compressed air.

- Rinse sensor with hand-hot (lukewarm) drinking water to remove course deposits.
- Put the sensor in a bucket of hand-hot (lukewarm) drinking water for several minutes to remove deposits on the sensor and the electrode.
- For cleaning a soft sponge, tissue or a soft brush can be used. Do not use abrasive materials such as scouring sponges or stiff brushes.
- To clean the sensor housing a soft cleaning agent (e.g. dish-washing detergent) can be used.
- To clean the electrode, the electrode protective cage can be removed from the sensor. For this purpose the metal bracket for fixing the guard onto the sensor housing has to be pulled out.
- Deposits / fouling on the electrode can be removed by briefly rinsing with weak acid (2% aqueous solution of hydrochloric acid (HCl) or citric acid) or weak basic cleaning solutions (e.g. s::can cleaning agent or a 2% aqueous solution of sodium hydroxide (NaOH)).
- Finally the electrode itself and the complete sensor must be rinsed with distilled water drinking water and the stainless steel housing should be dried off.

9.2 Replacement of Electrode

Keep the sensor as well as the electrode and the connectors (plug) absolutely dry and clean during the exchange procedure.

The electrode is replaced in the following steps:

- Deactivate automatic cleaning (if applicable) and demount the sensor.
- Clean the sensor and wipe dry thoroughly (see section 9.1).
- Provide all necessaty parts for the exchange (see points 1 to 3 below).

1 pH::lyser or redo::lyser

2 Service tool (E-532-TOOL)

3 Spare electrode (E-514-PH / E-513-ORP)

4 Unscrew the old electrode counterclockwise using the service tool. Do not tilt service tool to avoid electrode breakage.

5 Pull out the old electrode from the sensor housing.

6 Remove black electrode holder from the shaft of the old electrode.

7 Unpack the new electrode and remove the protective cap. The thick black O-ring must be on the electrode shaft.

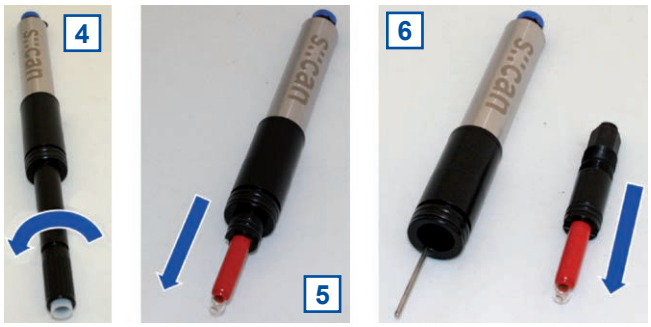
8 Insert the new electrode with the thick black O-ring into the sensor housing, without black electrode holder.

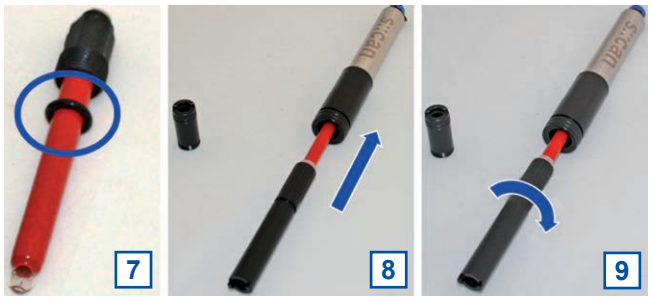
9 Carefully tighten the new electrode using the opposite end of the service tool (equipped with the plastic cap) and turn clockwise.

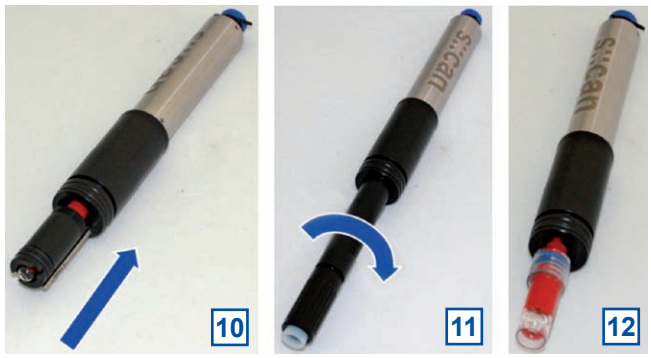
10 Slide the black electrode holder back onto the shaft of the new electrode.

11 Carefully tighten the electrode holder using the service tool (turn clockwise). Once screwed in, the electrode holder has to be even with the sensor housing.

12 Condition the new electrode in the medium according to the technical specification. Put filled protective cap onto the electrode, if sensor installation is postponed.







After replacement of the electrode, switch back to global calibration. After one day the accuracy can be checked and an offset calibration performed, if needed (see section 8.4).

10 Troubleshooting

10.1 Typical Error Pattern

Error	Reason	Removal
Drift of readings	■ Fouling of the electrode	■ Check electrode for cleanliness Perform manual cleaning
	■ Conditioning after start-up or replacement of electrode	■ Check stability again after one day
	■ Electrode aged or defect	■ Perform offset calibration or replace electrode
Periodical deviation of the readings (outliers of readings)	■ No continuous flow	■ Ensure stable flow conditions
	■ Influence of pressurized air cleaning	■ Enlarge waiting time after automatic cleaning
Unstable readings (scattering of readings)	■ No continuous flow	■ Ensure stable flow conditions
	■ External influence	■ Check installation environment
No response to changes in concentration	■ Fouling of the electrode	■ Check electrode for cleanliness Perform manual cleaning
	■ Electrode aged or defect	■ Perform linear calibration or replace electrode
The quality number displayed during calibration does not rise above 0.80 even after 20 minutes.	■ No continuous flow	■ Ensure stable flow conditions
	■ Buffer temperature not constant	■ Wait until the temperature of the buffer is constant
	■ Electrode aged or defect	■ Replace electrode
Reset to global calibration was not accepted	■ On the con::lyte, the menu *Perform calibration* was also selected.	■ After changing the *Type* from *Local* to *Global*, simply confirm with OK

10.2 Error Messages and Status Messages

During execution of a measurement the monitoring system (system status), the measuring device itself (device status) and the result (parameter status) will be checked for possible errors and for plausibility. In case of an error (status bit will be set from 0 to 1) a user message will be displayed to the operator.

Depending on the controller used for operation these messages will be shown on the display (function *Monitor...* in case of con::lyte D-320, *Status* tab in case of moni::tool and *Value details* in case of con::line) and also stored within the result files or logfiles. Additional to the user message (general error reason and recommendations for removal) the detailled status code will be displayed either in binary form (0000, 0001, 0010, 0011, 0100, etc.) or as a hex number (0x0001, 0x0002, 0x0004, 0x0008, 0x0010, etc).

⚠ Up to 16 status bits are used for different errors. If several errors occur at the same time, the con::lyte and moni::tool will add up all the status bits. This detailed information might be important if you request s::can support. Below you will find examples how to translate these combined hex codes:

Hex	Bin	Bits
0x8000	1000 0000 0000 0000	b15
0x8001	1000 0000 0000 0001	b0, b15
0x4011	0100 0000 0001 0001	b0, b4, b14

Within moni::tool the complete status code of a simple parameter has the following format:

0xTTTT.SSSS.PPPP.pppp.VVVV.vvvv.

Code	Status Type	Remark
0xTTTT	System status sensor	visible in the second column of all moni::tool parameter result files (e.g. Error 0x0010 or Ok 0x0000)
0xSSSS	Sensor status general	valid for all sensors
0xssss	Sensor status private	valid for respective sensor
0xPPPP	Parameter status general	valid for all parameters
0xpppp	Parameter status private	valid for respective parameter
0xVVVV	vali::tool status general	valid for all clean values of vali::tool software
0xvvvv	vali::tool status private	valid for respective clean values of vali::tool software

1 Within the moni::tool *Status* tab of the sensor you will see the system status and the sensor status as clear text and as status code (0xTTTT.SSSS.ssss).

2 Within the moni::tool *Status* tab of the parameter you will see the parameter status and in case of activated vali::tool the vali::tool status also (0xPPPP.pppp.VVVV.vvvv).

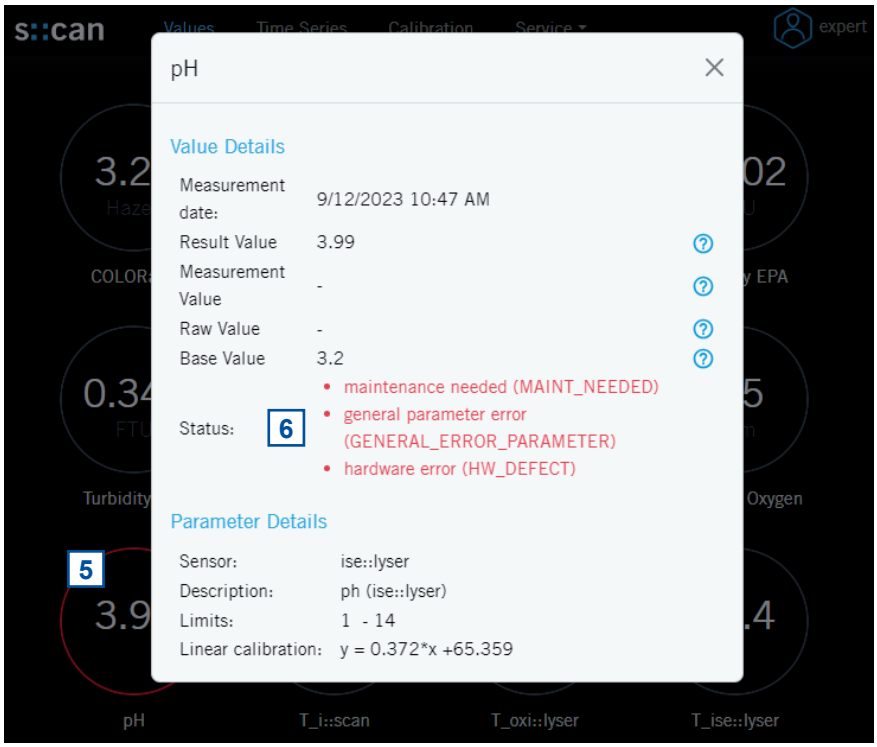
Timestamp	Station 1	ammo::lyser	3 ammo::lyser	ammo::lyser	4 ammo::lyser
Measurement interval	Status	NH4-N - Measured value [ppm]	Status [NH4-N - Measured value]	NH4-N - Clean value [ppm]	Status [NH4-N - Clean value]
31.05.2019 12:32	Ok 0x0000	4.25	Ok 0x0000.0000.0000.0000	3.33	Ok 0x0000.0000
31.05.2019 12:34	Ok 0x0000	4.78	Ok 0x0000.0000.0000.0000	3.43	Ok 0x0000.0000
31.05.2019 12:36	Ok 0x0000	6.05	Ok 0x0000.0000.0000.0000	3.61	Ok 0x0000.0000
31.05.2019 12:38	Ok 0x0000	58.24	Ok 0x0000.0000.0000.0000	3.84	Ok 0x1001.0010
31.05.2019 12:40	Ok 0x0000	123.67	Ok 0x0000.0000.0000.0000	8.64	Ok 0x0000.0000
31.05.2019 12:42	Ok 0x0000	139.51	Ok 0x0000.0000.0000.0000	18.57	Ok 0x0000.0000
31.05.2019 12:44	Ok 0x0000	136.43	Ok 0x0000.0000.0000.0000	28.85	Ok 0x0000.0000

3 Within the moni::tool results file of the sensor parameter the status (0xTTTT.SSSS.PPPP.pppp) will be stored in the column beside the measured value.

4 If vali::tool is active, the result file contains also the vali::tool status (0xVVVV.vvvv) in the column beside the cleaned value.

5 A click on the parameter reading in the *Value* display of Io::Tool will show all parameter details (*Value Details*).

6 If the *Status* is not *OK* one or more error or status messages are displayed in red letters.



10.2.1 System Status

Within this section all error bits / error messages are listed, which are used to describe the status of the monitoring system (TTTT). Besides the error message displayed on the controller used for operation (con::line, con::cube or con::lyte) in the left column, the reason of the error (middle column) and notes for trouble shooting (right column) are displayed. If the error can't be removed although the suggested procedure for removal was executed several times, please contact your s::can sales partner.

TTTT-Error 0x0001 - b0	Reason	Removal

communication error (COMMUNICATION_ERROR)
 	
No communication between sensor and terminal.
 	
`ES007 / COMM!`
`Probe not detected.`
`Check power supply and connection cable.`
	■ No communication between sensor and operation terminal.
	■ Replacement sensor was not installed correctly.
		■ Check sensor cable and connector.
		■ Disconnect and reconnect sensor.

TTTT-Error 0x0002 - b1	Reason	Removal
Invalid sensor 0002	■ Sensor serial number has changed.	■ Connect the previously installed sensor. ■ Perform sensor replacement (moni::tool) or new sensor installation (con::lyte).

10.2.2 Sensor Status

Within this section all error bits / error messages are listed, which are used to describe the status of a sensor in general (SSSS). Besides the error message displayed on the controller used for operation (con::line, con::cube or con::lyte) (see left column), the reason of the error (middle column) and notes for trouble shooting (right column) are displayed. If the error can't be removed although the suggested procedure for removal was executed several times, please contact your s::can sales partner.

SSSS-Error 0x0001 - b0	Reason	Removal
general device error (GENERAL_ERROR_DEVICE) *General sensor error* ES100 / 0001 Probe reports an error. Call service! Param.Status error. Status Code:..	■ Sensor reports error during internal check. ■ At least one internal sensor check failed.	■ For details see additional status message below. ■ In case no further messages are shown, note the error code and contact your s::can sales partner.

SSSS-Error 0x0002 - b1	Reason	Removal
sensor misuse (SENSOR_MISUSE) *SENSOR MISUSE* ES101 / 0002 MISUSE Medium temperature. Take probe out of medium, immediately!	■ Operation outside the specification (e.g. temperature too high). This can damage the device permanently.	■ Take the sensor out of the medium immediately and check environmental conditions.

SSSS-Error 0x8000 - b15	Reason	Removal
maintenance needed (MAINT_NEEDED) *Sensor mainentance required* ES115 / 8000 Device maintenance required Code 8000 0000	■ At least one internal sensor check reports a warning.	■ Perform function check of the sensor according the manual (see section 8 and 8.3).

10.2.3 Parameter Status

Within this section all error bits / error messages are listed, which are used to describe the status of a parameter in general (PPPP) and the individual status of the pH::lyser / redo::lyser (pppp). Besides the error message displayed on the controller used for operation (con::line, con::cube or con::lyte) (see left column), the reason of the error (middle column) and notes for trouble shooting (right column) are displayed. If the error can't be removed although the suggested procedure for removal was executed several times, please contact your s::can sales partner.

PPPP-Error 0x0001 - b0	Reason	Removal

general parameter error (GENERAL_ERROR_PARAMETER)
 	
General parameter error
 	
`EP 100 / 0001`
`Status error.`
`Code: 0001.0000`
`Details in following log messages.`
	■ At least one internal parameter check failed.	■ For details see additional status message below.
		■ In case no further messages are shown, note the error code and contact your s::can sales partner.

PPPP-Error 0x0002 - b1	Reason	Removal

hardware error (HW_DEFECT)
 	
Parameter error, Hardware error
 	
`EP 100 / 0002`
`Parameter failure, hardware failure`
	■ Electrode signal not ok.
	■ An electrode is missing, too old or defective.
		■ Check the electrode (see section 8.3).
		■ Replace the electrode (see section 9.2).

PPPP-Error 0x0004 - b2	Reason	Removal
configuration error (CONFIG_ERROR) *Parameter error, configuration error*	■ Parameter error ■ Configuration error	■ Change the local calibration. ■ Switch back to global calibration.

PPPP-Error 0x0008 - b3	Reason	Removal
no medium detected (NO_MEDIUM) *Parameter error, Wrong medium*	■ Sensor outside of the medium. ■ Sensor in incorrect medium.	■ Check supply of medium. ■ Check medium itself.

PPPP-Error 0x0010 - b4	Reason	Removal

Calibration error (CALIBRATION_ERROR)
 	
Parameter error, Incorrect calibration
 	
`EP 100 / 0010`
`Parameter failure, calibration failure`
	■ Invalid sensor configuration.
	■ At least one calibration coefficient is invalid.
		■ Check readings and lab values.
		■ Restart sensor by un- and replugging.
		■ Set back to factory settings.
		■ Repeat local calibration.

PPPP-Error 0x0020 - b5	Reason	Removal
sensor busy (SENSOR_BUSY) *Parameter not ready* `EP 100 / 0020`	■ Parameter not activated on the sensor. ■ Sensor still warming up.	■ Activate parameter. ■ Wait until sensor is fully operational.

PPPP-Error 0x8000 - b15	Reason	Removal

value out of range (VAL_OUT_OF_RANGE)
 	
Reading out of measuring range
 	
`EP 115 / 8000`
`Out of range`
`Code 8000 0000`
`The parameter is out of measurement range`
	■ Measured parameter is outside the defined measuring range.	■ Check if sensor is in the medium.
		■ Perform function check (see section 8 and 8.3).

pppp-Error 0x0001 - b0	Reason	Removal

hardware error (HW_DEFECT)
 	
Electronics fail
 	
`EP 100 / 0001`
`Status error.`
`Code: 0001.0000`
`Details in following log messages.`
	■ Electronic failure	■ Check sensor head and electrode.
		■ Perform Function check (see section 8 and 8.3).

pppp-Error 0x0002 - b1	Reason	Removal

maintenance needed (MAINT_NEEDED)
 	
Electrode slope out of limits
 	
`EP 100 / 0002`
`Parameter failure, hardware failure`
	■ Electrode slope after linear calibration is too high (> 120 %) or too low (< 80 %).	■ Repeat linear calibration.
		■ Replace electrode if slope is too low (see section 9.2).

pppp-Error 0x0004 - b2	Reason	Removal
maintenance needed (MAINT_NEEDED) *Electrode cleaning necessary*	■ Electrode polluted or defective.	■ Perform manual cleaning. ■ Perform Function check (see section 8 and 8.3).

pppp-Error 0x0008 - b3	Reason	Removal
service needed (SERV_NEEDED) *Missing electrode*	■ No electrode installed. ■ Electrode defective.	■ Install electrode. ■ Perform function check (see section 8 and 8.3).

10.2.4 Status Messages vali::tool

The table below shows all errors regarding clean parameters of the vali::tool software incl. the user message, the reason of the error and notes for trouble shooting. If the error can't be removed although the suggested procedure was executed several times, please contact your s::can sales partner.

Parameter Status Error 0xVVVV	Message moni::tool	Reason	Removal
0x0001 - b0	vali::tool reports an error	At least one internal check reports a warning.	Check further status messages.
0x0800 - b11	Maintenance recommended	Parameter check reports a warning.	Check system and sensor, perform functional check.
0x1000 - b12	Marked as not trustable	Parameter check reports a warning.	Do not use this value for calibration.

10.3 Device Settings

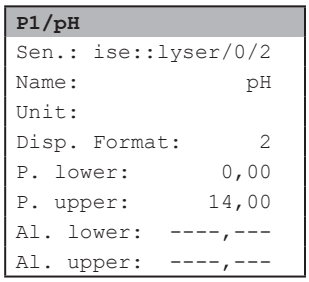
In case detailed sensor information or configuration settings must be checked, the following sections will explain how to find these information when operating the sensor with a s::can operator terminal.

10.3.1 Check of Device Settings using con::lyte

Select the entry *Manage sensors...* in the main menu of the status screen. Select the name *ise::lyser/0/2* in the list of installed sensors and confirm with *OK* button. The second number (*2*) indicates the address assigned to the sensor. After confirming the entry *Configure...* as well as the entry *Probesettings* in the next view, the following information of the sensor will be displayed:

- Internal sensor identifier (*M-Version* and *Model*)
- Sensor name (*ise::lyser*)
- Serialnumber of the sensor (*S/N*)
- Hardware version of the sensor (*H/W-Version*)
- Software version of the sensor (*S/W-Version*)

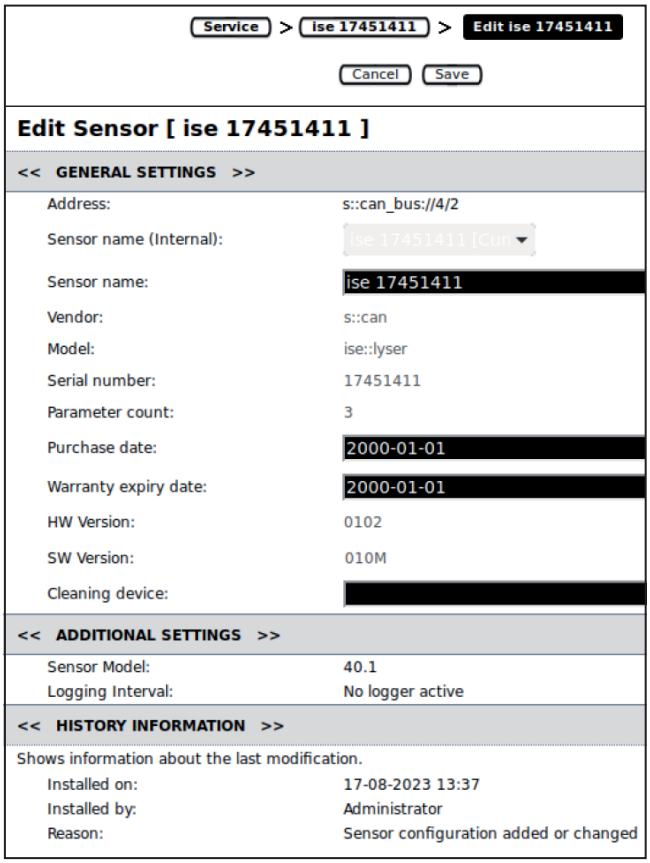
Information of the single measuring parameter can be retrieved via the entry *Parameter info...* from the main menu of the parameter display (see figure on the right). In addition to the parameter name (*Name*), the unit of measurement (*Unit*) the number of decimal places (*Disp. Format*), also the lower and upper limit of the parameter range (*P. lower* / *P. upper*) and the adjusted alarm range (*Al. lower* / *Al. upper*) are displayed.



10.3.2 Check of Device Settings using con::cube (moni::tool)

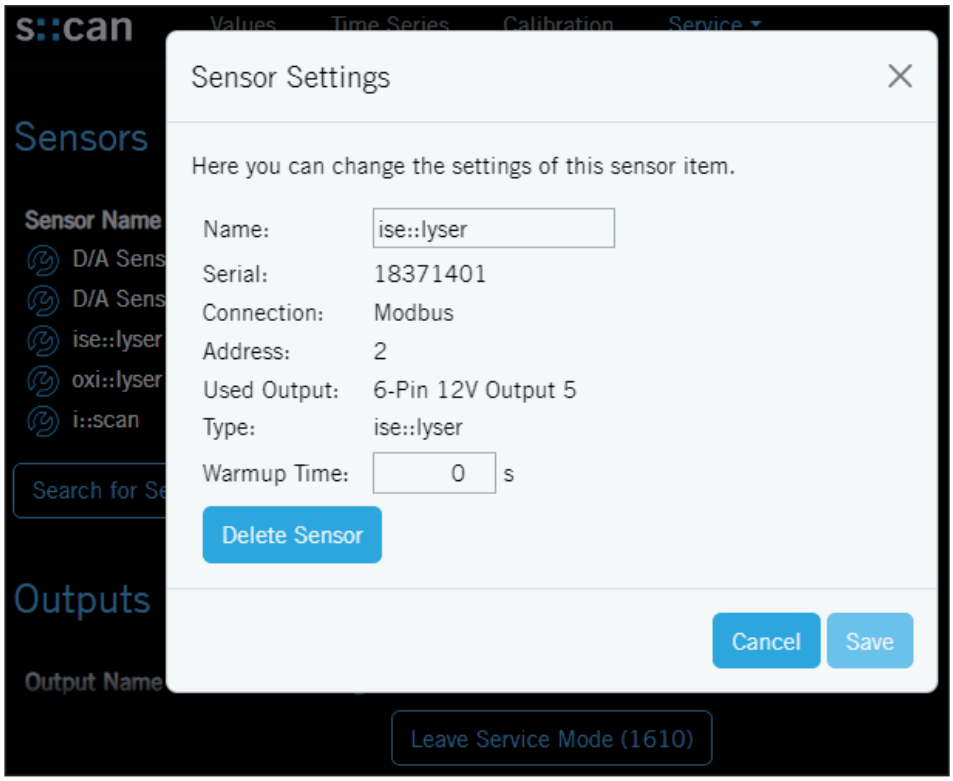
For checking the sensor settings click on the pH::lyser / redo::lyser icon within the system overview of the *Service* tab and select *Sensor Settings*. Depending on the *Service Level* (figure below is *Service Level Expert*) some or all of the following information will be displayed:

- Interface of the sensor (COM-port, *Address*)
- Sensor name used internal (*internal*). Should not be changed by the operator.
- *Sensor Name* for the display, allocated to the device by the operator.
- Manufacturer name of the sensor (*Vendor*)
- Type of the sensor (*Model*)
- Serial number of the sensor (*Serial Number*)
- Number of available parameters (*Parameter count*)
- Information regarding the purchase (*Purchase date*, *Warranty expiry date*). Can be entered by the operator at initial startup.
- Actual hardware and software version of the sensor (*HW Version*, *SW Version*)
- Cleaning device allocated to the sensor (*Cleaning device*). Not used for this type of sensor.
- *Sensor Model* of the connected sensor
- *Logging interval* for Datalogger (not available for this type of sensor)
- History information about installation and last modification of the sensor (*Installed on*, *Installed by* and *Reason*)



10.3.3 Check of Device Settings using con::line (lo::Tool)

For checking the sensor settings select the menu *Service / Sensors & Outputs*. Push the button *Enter Service Mode* and click on the blue tool icon located on the left side of the pH::lyser / redo::lyser (*ise::lyser*). Within the window that pops up (*Sensor Settings*) the following information will be displayed:



- The sensor name (*Name*) which can be edited by the operator.
- The *serial number* of the sensor.
- The type of *connection* to the sensor (e.g. *Modbus*).
- The used *address* for this sensor.
- The used output of the con::line for power supply of this sensor (*Used Output*).
- The *type* of the sensor.
- The required period of time that the sensor must be energised before measuring (*Warmup Time*). This information is important for sleep mode.
- The sensor can be removed by pushing the button *Delete Sensor*.

10.4 Return Consignment (RMA - Return Material Authorization)

Return consignments of the s::can monitoring system, or parts of the system, shall be done in a packaging that protects the device (original packaging or protective covering if possible). Before returning a consignment, please contact your s::can sales partner or s::can customer support (support@s-can.at). A RMA number will be assigned for each device, independent if the reason of the return consignment is service, repair or demo equipment.

RMA numbers can be requested from the s::can Customer Portal available on the s::can website directly. Return consignments without an RMA number will not be accepted. The customer always has to bear the costs for return consignment.

11 Accessories

11.1 Installation

11.1.1 Connection Cable

For operation of pH::lyser / redo::lyser with plug a connection cable is necessary. This is included in the standard order.

Name	Specification	Remark
Part-no.	C-1-010-SENSOR	
Cable lenght	1 m	
Assembling	ex works	
Dimensions plug	20 mm (0.79 inch)	outer diameter
Material	PU	Cable sheathing
Environment rating (IP)	IP 68	
Interface connection	IP 67, RS 485, 12 VDC	to s::can sensors

11.1.2 Extension Cable

The cable of the pH::lyser / redo::lyser can be elongated when necessary with an extension cable (10 m or 20 m length). The extension cable is attached using the sensor cable connector plug.

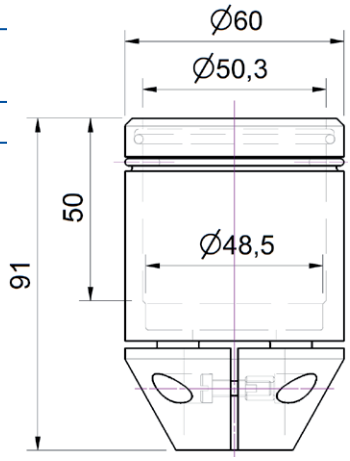
⚠ A direct connetion of the extension cable to pH::lyser / redo::lyser with sensor plug (E-513-X-000 or E-514-X-000) is not possible. A connection cable (see section 11.1.1) is needed also.

Name	Specification	Remark
Part-no.	C-210-SENSOR C-220-SENSOR	
Cable lenght	10 m 20 m	C-210-SENSOR C-220-SENSOR
Assembling	ex works	
Dimensions plug	20 mm (0.79 inch)	outer diameter
Material	PU	Cable sheathing
Environment rating (IP)	IP 68	
Interface connection	IP 67, RS 485, 12 VDC	to s::can sensors

11.1.3 Probe Mounting

For proper and easy submersed installation of the pH::lyser / redo::lyser a seperate sensor carrier is available. This part can be fixed on the sensor directly and extended by a pipe (to be provided by the customer) if necessary. For tube length > 1 m stainless steel pipes or plastic pipes with higher wall thickness are recommended.

Name	Specification	Remark
Part-no.	F-12-SENSOR	
Material	PVC, stainless steel	
Dimensions	60 / 91 mm 2.36 / 3.58 inch	Diameter / height
Weight	approx. 150 g	
Process connection	DN 50 mm inside (1.97 Zoll)	to mounting pipe
Installation / mounting	submersed	see section 4.4

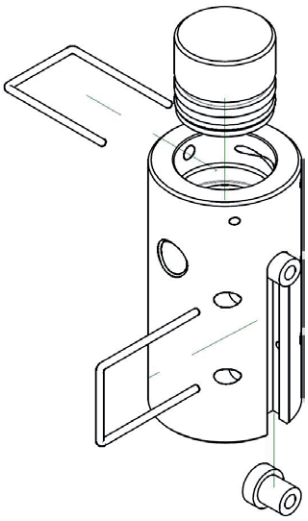


11.1.4 Railing Bracket / Fixing Adapter

For proper and easy mounting of installation pipes onto the railing a seperate fixing adapter carrier is available.

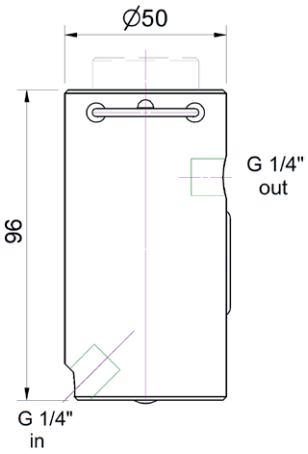
Name	Specification	Remark
Part-no.	F-15	
Material	Stainless steel	
Dimensions	158 / 267 / 73 mm 6.22 / 10.51 / 2.87 inch	W / H / D
Weight	approx. 2.8 kg	
Process connection	50 mm (1.97 inch)	OD extension pipe
Installation / mounting	up to 64 mm (2.5 inch)	OD of railing

11.1.5 Flow Cell Clean Water for single Sensor

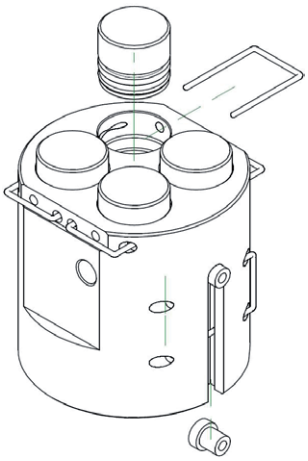


For measurement of sample stream outside the medium with a pH::lyser / redo::lyser as a single sensor a separate flow-through installation is available.

Name	Specification	Remark
Part-no.	F-45-SENSOR	suitable for one sensor
Material	POM-C white POM-C white stainless steel	flow cell blanking plug fixing bracket
Dimensions	50 / 96 mm 1.97 / 3.78 inch	diameter / height
Weight	approx. 0.25 kg	
Process connection	$^1/_4$ inch inside	for inlet and outlet
Installation	flow-through (by pass)	
Mounting	2 fixing holders	
Operating temperature	0 to 50 °C (32 to 122 °F)	
Operating pressure	0 to 6 bar (0 to 87 psi)	
Accessories - F46-PROCESS	Connection fitting $^1/_4$ inch to hose ID 6 mm	2 pcs. fitting straight 2 pcs. fitting 90°

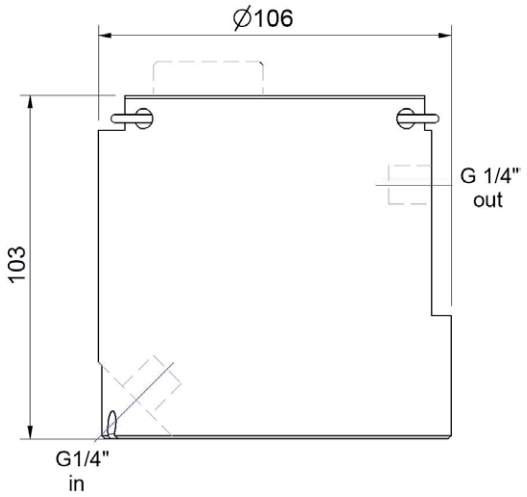


11.1.6 Flow Cell Clean Water for 4 Sensors



For measurement of sample stream outside the medium with a pH::lyser / redo::lyser and up to 3 other s::can Sensors a separate flow-through installation is available.

Name	Specification	Remark
Part-no.	F-45-FOUR	suitable for max.4 sensor
Material	POM-C white POM-C white stainless steel	flow cell blanking plug fixing bracket
Dimensions	106 / 103 mm 4.17 / 4.06 inch	diameter / height
Weight	approx. 1.0 kg	
Process connection	$^1/_4$ inch inside	for inlet and outlet
Installation	flow-through (by pass)	
Mounting	2 fixing holders	
Operating temperature	0 to 50 °C (32 to 122 °F)	
Operating pressure	0 to 6 bar (0 to 87 psi)	
Accessories - F46-PROCESS	Connection fitting $^1/_4$ inch to hose ID 6 mm	2 pcs. fitting straight 2 pcs. fitting 90°

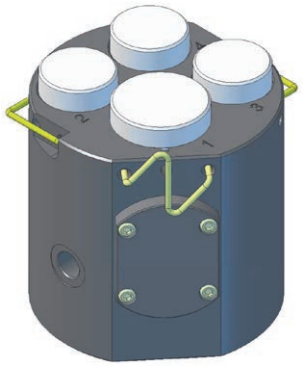


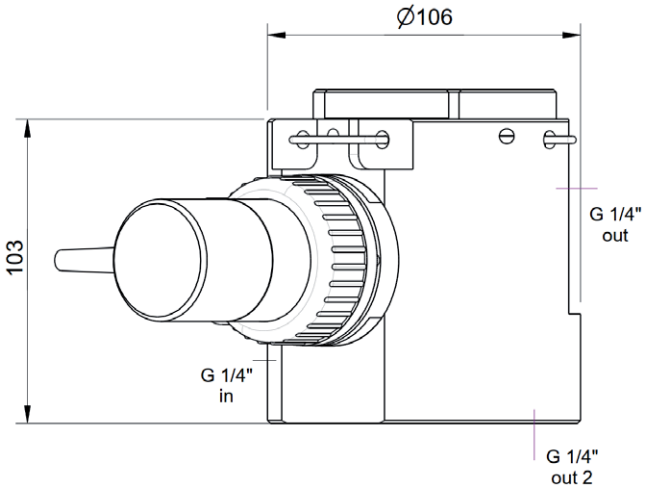
Dimensios of flow cell clean water
for 4 sensors (F-45-FOUR) in mm

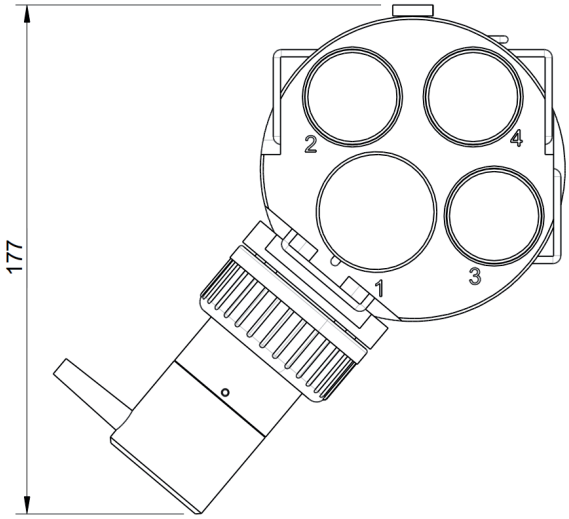
11.1.7 Flow Cell Clean Water for i::scan and 3 Sensors

For measurement of sample stream outside the medium with an i::scan and up to 3 additional s::can sensors (e.g. pH::lyser / redo::lyser), a separate flow-through installation with an optional automatic brush cleaning for the i::scan is available.

Name	Specification	Remark
Part-no.	F-46-FOUR-ISCAN F-446-FOUR-ISCAN	without autobrsh i::scan with autobrush i::scan
Material	POM-C black POM-C white stainless steel	flow cell blanking plug fixing bracket
Dimensions	106 / 103 / 177 mm 4.17 / 4.06 / 6.97 inch	diameter / H / D
Weight	approx . 1.3 kg	
Process connection	$^1/_4$ inch inside	for inlet and outlet
Installation / mounting	flow-through (by pass)	
Operating temperature	0 to 50 °C (32 to 122 °F)	
Operating pressure	0 to 6 bar (0 to 87 psi)	
Accessories - F46-PROCESS	Connection fitting $^1/_4$ inch to hose ID 6 mm	2 pcs. fitting straight 2 pcs. fitting 90°



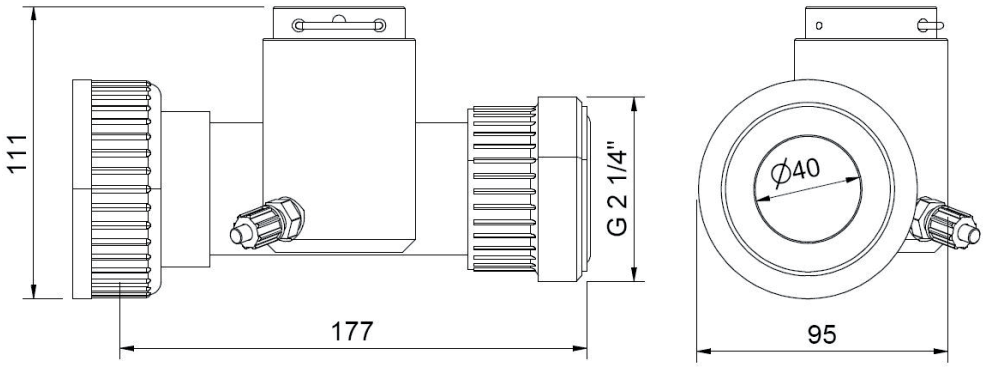




11.1.8 Flow Cell Waste Water

For measurement of waste water / raw water sample stream outside the medium with a pH::lyser / redo::lyser a separate flow-through installation is available.

Name	Specification	Remark
Part-no.	F-48-SENSOR	for single sensor
Material	PVC	
Dimensions	177 / 95 / 111 mm 6.97 / 3.74 / 4.37 inch	W / H / D
Weight	approx. 0.5 kg	
Process connection	1 inch inside (G 1“) 40 mm inside	via F-48-PROCESS direct connection to G 1“
Installation	flow-through (by pass)	
Discharge	< 40 l/min	recommended
Operating temperature	0 to 50 °C (32 to 122 °F)	
Operating pressure	0 to 3 bar (0 to 43.5 psi)	



Dimensions of flow cell in mm (F-48-SENSOR)

11.2 Automatic Cleaning

11.2.1 Pressure Connection Set

For connection of the automatic air cleaning system of the sensor a specific pressure connection set is available.

Name	Specification	Remark
Part-no.	B-41-SENSOR	
Material	PU Nickel-plated brass	tube connection fitting
Dimension	3 m ID 4 mm / OD 6 mm	tube
Process connection	$^{3}/_{8}$ inch	connection fitting
Operating pressure	0 to 6 bar (0 to 87 psi)	

11.3 Spare Parts

11.3.1 ORP-Electrode

The ORP electrode needs to be replaced by a new one regulary. Please refer to the technical specification (section 12) regarding lifetime of the electrode.

Name	Specification	Remark
Part-no.	E-513-ORP	
Scope of delivery	Electrode	with protective cap
Storage duration	max. 2 years	See expiry date on packaging
Storage temperature	2 to 40 °C (35 to 104 °F)	Vertical storage in fridge recommended

11.3.2 pH-Electrode

The pH electrode needs to be replaced by a new one regulary. Please refer to the technical specification (section 12) regarding lifetime of electrode.

Name	Specification	Remark
Part-no.	E-513-pH	
Scope of delivery	Electrode	with protective cap
Storage duration	max. 2 years	See expiry date on packaging
Storage temperature	2 to 40 °C (35 to 104 °F)	Vertical storage in fridge recommended

11.3.3 Tool for Electrode Replacement

To replace the measuring electrode, a separate tool is included in the scope of delivery of the pH::lyser / redo::lyser. This tool is also available as a spare part.

Name	Specification	Remark
Part-no.	E-532-TOOL	

11.3.4 Electrode Protective Cage

To protect the electrode from mechanical damage in submersed installations, the pH::lyser / redo::lyser can be equipped with a protective cage. This part is included in the delivery of a sensor with fixed cable and is also available as a spare part.

Name	Specification	Remark
Part-no.	E-510-GUARD	see section 4.3
Scope of delivery	cage, cleaning fitting, o-ring, fixing bracket	see Fig. on the right
Material	POM-C, PP, stainless steel	cage, fitting, fixing bracket
Dimensions	38 x 82 mm	diameter / height

12 Technical Specifications

Name	Specification	Remark
Part-no.	E-513-2-xxx E-513-3-xxx E-514-2-xxx E-514-3-xxx E-514-4-075	redo::lyser eco redo::lyser pro pH::lyser eco pH::lyser pro pH::lyser pro / PVC
Measuring parameter	redox potential, ORP, temperature pH, temperatur	redo::lyser pH::lyser
Measuring principle	potentiometric with combined, non-porous reference electrode; temperatur with Pt100 (class B)	
Automatic compensation	none temperatur (20 °C reference)	redo::lyser pH::lyser
Measuring range	-2000 - 2000 mV 2 - 12 pH 0 - 14 pH 0 - 70 °C 0 - 90°C	redo::lyser pH::lyser eco pH::lyser pro pH::lyser eco pH::lyser pro
Response time (T_{90})	30 Sek.	
Warmup time	900 sec. recommended	previously sporadic failures (NaN values) possible
Resolution	1 mV 0.01 pH 0.1 °C	redo::lyser pH::lyser
Accuracy	+ / - 10 mV + / - 0.1 pH in application	redo::lyser pH::lyser
Power supply	9 to 18 VDC	
Power consumption	0.8 W (typical) 1.0 W (max)	
Weight	250 g	without cable
Dimension	33 x 257 mm 38 x 255 mm	plug version cable version mit Schutzkorb
Installation / mounting	submersed or in flow cell	
Housing material	stainless steel, POM-C stainless steel, PVC	E-xxx-2, E-xxx-3 E-514-4-075
Material	EPDM	all o-rings in contact with water
Operating limits temperature	0 to 70 °C (32 to 158 °F) 0 to 90 °C (32 to 194 °F)	eco pro
Operating limits pressure	0 to 10 bar (0 to 145.0 psi)	
Operating limits others	min, 0.01 m/s max. 3 m/s max. 30 Nm	flow rate mechanical stability, centric load, adequate for most known application conditions and all s::can installation / mounting parts

Name	Specification	Remark
Sensor cable length	1.0 m connection cable 7.5 m fixed cable	-000, to be ordered seperately -075
Sensor cable specification	PUR (polyurethane jacket), 22 AWG, 6.3 mm (outside diameter), -30 to 80 °C (-22 to 176 °F)	min. bending radius 5 cm, no buckling allowed at sensor connection
Sensor cable assignment	Pin 1: Data - (green cable strand) Pin 2: Data + (pink cable strand) Pin 3: +12 VDC (red cable strand) Pin 4: Ground (black cable strand) Pin 5: not used Pin 6: Shielding (blank cable strand)	green (previous cable version) yellow (previous cable version) white (previous cable version) brown (previous cable version) black (previous cable version)
Interface connection	RS 485, Modbus	to s::can operator terminal
Storage limits temperature	-5 to 30 °C (23 - 86 °F) -10 to 60 °C (14 to 140 °F)	Sensor with electrodes Sensor without electrodes
Typical lifetime (application)	1 year for Electrode	depending on application
Typical lifetime (storage)	approx. 1 year (see date of expiry on electrode)	always with filled protecvtive cap
Automatic compressed air cleaning - sensor connection	G $^{1}/_{8}$ inch for air hose OD 6 mm	only for sensor with protective cage or F-48-SENSOR possible
Automatic compressed air cleaning - specification	compressed air, free of oil & particles min. 3 bar (43.5 psi) max. 6 bar (87 psi)	medium (drinking water alternative) allowed pressure at probe cleaning connection
Automatic compressed air cleaning - flow cell	min. 2 bar (29.0 psi) differential pressure to the existing water pressure	
Automatic cleaning - settings	duration: 2 to 10 sec. interval: 5 min. to 6 hours delay: 10 sec. (typical)	valve open depending on application delay until start of next measurement (consider that flow cell has to be filled up with new medium)
Warranty	2 years	
Guarantee	1 year	
Conformity - EMC	EN 61326-1: 2013 S.I. 2016/1091	EU UK
Conformity - RoHS2	EN IEC 63000: 2018 S.I. 2012/3032	EU UK
EAC certificate	available on the customer portal of the s::can website	https://www.s-can.at/wp_contents/uploads/2023/05/eac_neu_cp_23.pdf

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