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Manual

Sensors V1.1

May 2018 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), how to perform a functional check (chapter 7) and maintenance (chapter 8) can be found in this manual. Information regarding troubleshooting (chapter 9) and the technical specifications (chapter 10) complete the document.

Each term in this document that is marked *italic and underlined*, can be found on the display of your controller unit CU 382 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 crepancies occur in versions of the manual after translation into third languages.

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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 can be downloaded via the QR-code displayed below.

http://net.grundfos.com/
qr/i/99037650

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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 have to follow the instructions contained in this manual.

For proper initial startup of the complete monitoring station / dosing station, the DID-manual (Dosing Instrumentation Digital) for the controller unit CU 382 incl. the operating software has 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

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

The CE-mark is applied on the devices and the printed declarations of conformity are added as appendix to this manual.

2.2 Special Hazard Warning

Because the s::can measuring systems are frequently installed in industrial and communal 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.

Some electrolytes contain diluted acids. Do not swallow the electrolyte. Avoid contact of the electrolyte with skin and eyes. Otherwise wash with a lot of water. In case of eye inflammation, contact a doctor.

3 Technical Description

3.1 Intended Use

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 Messtechnik 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.

3.1.1 Intended Use of chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser

The chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser are electrochemical based sensors designed for continuous monitoring of free or total chlorine, chlorine dioxide, hydrogen peroxide and peracetic acid content in water. All values are expressed in mg/l. All sensor types provide the measured temperature as an additional parameter. For more information regarding intended use of the different sensor types, please refer to section 3.2.1 and 3.2.2 also.

The sensors are not suitable for checking the absence of these substances.

These sensors were developed for use in drinking water, pool water and different types of water treatment. The use in waste water is possible, but has to be evaluated in the specific application. These sensors have only a low dependence on fluctuations of the measuring flow. Nevertheless a constant flow of the measuring medium is recommended.

3.1.2 Intended Use of pH::lyser and redo::lyser

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 extreme long-lived and stable solid state reference electrode, suitable for most 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.

3.1.3 Intended Use of condu::lyser

The condu::lyser is a sensor designed for the continuous monitoring of the conductivity in water. This value indicates the capability of the medium to transmit electrical power and is expressed in µS/cm.

The sensor provides the measured temperature as additional parameter.

3.2 Functional Principle

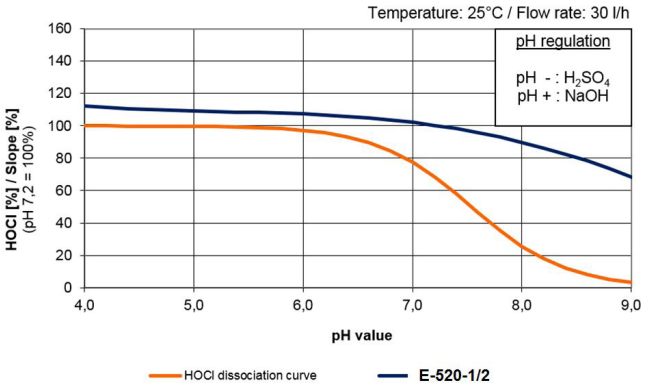
3.2.1 Functional Principle of chlori::lyser

The chlori::lyser is a membrane covered amperometric 3 electrode sensor. The hydrophilic membrane, which is not ion specific but permeable to ionic species in general, is stretched over a gold cathode (working electrode). A reference electrode (silver / silver chloride) and a counter electrode (stainless steel), that is special placed on the outside measuring cell, complete the electric circuit.

Free chlorine is defined as the concentration of residual chlorine in water present as dissolved gas (Cl_2), hypochlorous acid (HOCl), and / or hypochlorite ion (OCl^-). These three forms of free chlorine are existent in a pH-dependent equilibrium (see orange line in the figure on the right). The sensor can be used in applications where chlorine gas Cl_2(g), sodium hypochlorite NaClO, calcium hypochlorite $Ca(OCl)_2$ or electrically generated chlorine are used as disinfectants.

Total chlorine is the sum of free chlorine and combined chlorine (e.g. chloramines).

Due to an internal pH correction, the chlori::lyser reduces the pH dependence of the measurements. As a result, variations of the pH value only have a small influence on the measured value (see blue line in the figure on the right).



3.2.2 Functional Principle of chlodi::lyser, hyper::lyser and peroxy::lyser

The chlodi::lyser, hyper::lyser and peroxy::lyser are membrane covered amperometric 2 electrode sensors. The measuring electrode with the combined working and reference electrode are inside the membrane cap which is filled with electrolyte. The substances will diffuse out of the water, through the membrane and will cause an electrical signal at the measuring electrode. This signal is proportional to the concentration.

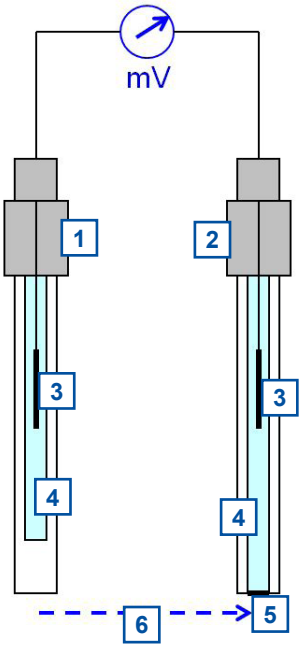
Due to an integrated temperature compensation, the measurement is independent from the temperature.

3.2.3 Functional Principle of pH::lyser and redo::lyser

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.

3.2.4 Functional Principle of condu::lyser

In general the conductivity is calculated from the electrochemical resistance measured between two electrodes. The condu::lyser is equipped with two electrodes for applying alternating current and additionally two electrodes for measuring the voltage drop caused by the measured medium. This 4 electrodes measuring principle enables higher accuracy, especially in higher measuring ranges and smaller influence of possible contamination.

As the measured value is highly temperature dependent, the conductivity is corrected by the sensor due to the actual temperature. The used reference temperature of the factory pre-calibrated measuring cell is 25°C, i.e. the displayed conductivity value is related to 25 °C always.

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3.3 Product

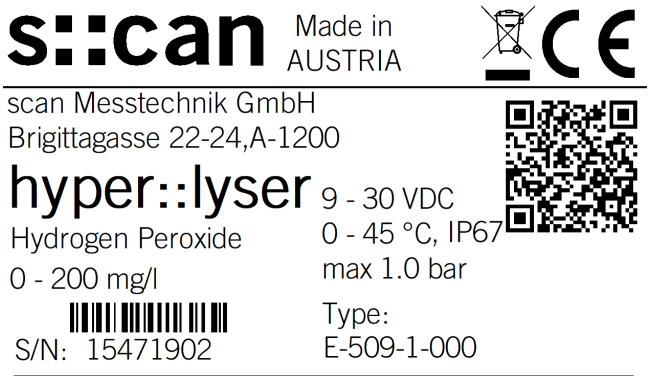
The following device variants of sensors are available. Regarding detailed information of the device variants please refer to the technical specifications located at the end of this manual:

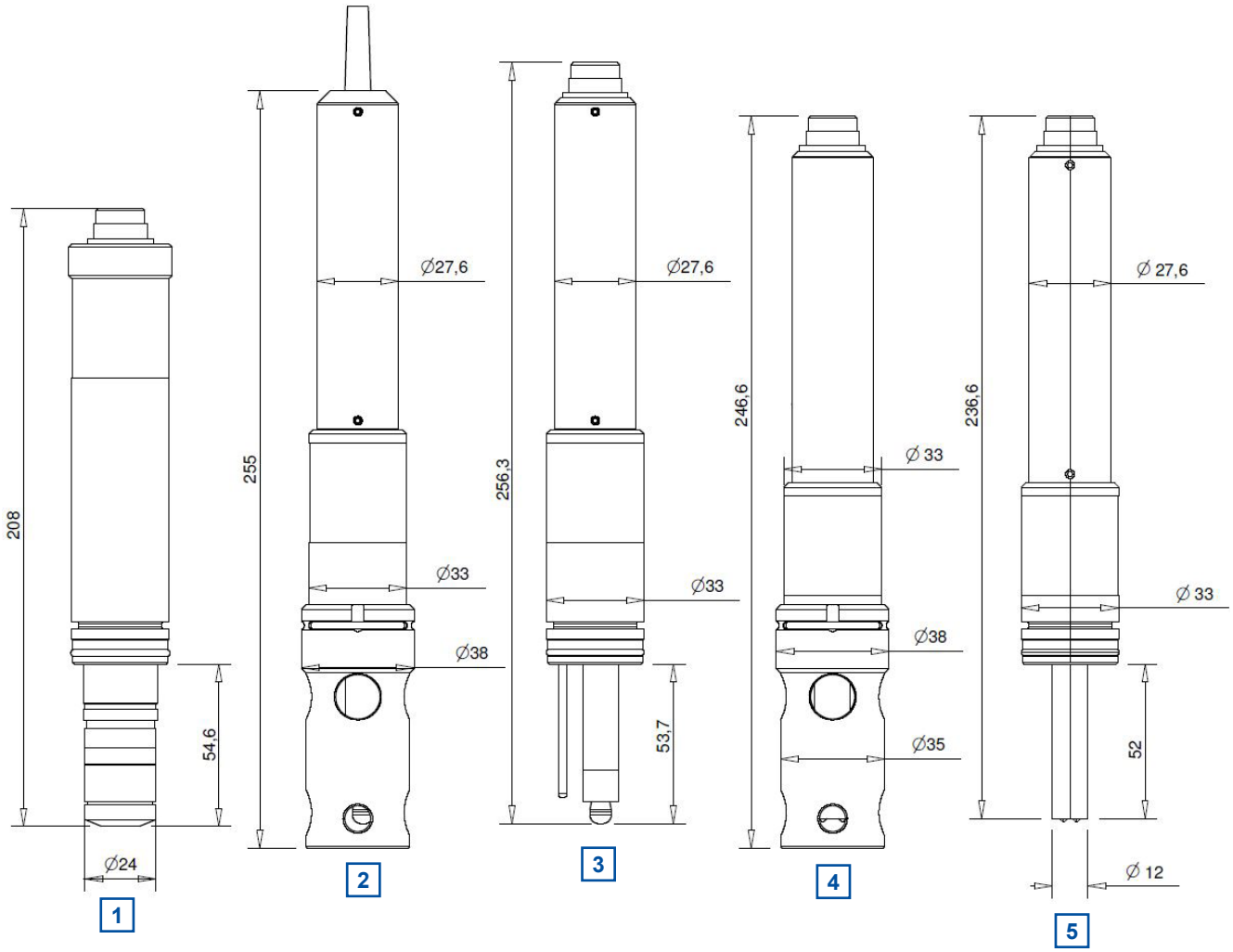
Part-no. [Previous version [1)]]	Order-no.	Specification	Range
E-520-1-000 [E-507-1-000 [1)]]	99290639 [98915674 [1)]]	chlori::lyser for free chlorine (FCL) with plug connection	0 - 2 mg/l
E-520-2-000 [E-507-2-000 [1)]]	99290641 [98915675 [1)]]	chlori::lyser for free chlorine (FCL) with plug connection	0 - 20 mg/l
E-525-1-000 [E-507-3-000 [1)]]	99290664 [98915676 [1)]]	chlori::lyser for total chlorine (TCL) with plug connection	0 - 2 mg/l
E-525-2-000 [E-507-4-000 [1)]]	99290665 [98915677 [1)]]	chlori::lyser for total chlorine (TCL) with plug connection	0 - 20 mg/l
E-508-1-000	98915678	chlodi::lyser for chlorine dioxide (ClO_2) with plug connection	0 - 2 mg/l
E-508-2-000	98915679	chlodi::lyser for chlorine dioxide (ClO_2) with plug connection	0 - 20 mg/l
E-509-1-000	98915680	hyper::lyser for hydrogen peroxide (H_2O_2) with plug connection	0 - 200 mg/l
E-509-2-000	98915681	hyper::lyser for hydrogen peroxide (H_2O_2) with plug connection	0 - 2000 mg/l
E-515-1-000	98915682	peroxy::lyser for peracetic acid (CH_3CO_3H) with plug connection	0 - 200 mg/l
E-515-2-000	98915683	peroxy::lyser for peracetic acid (CH_3CO_3H) with plug connection	0 - 2000 mg/l
E-514-2-000	98915684	pH::lyser for pH (pH) with plug connection	2 - 12
E-514-2-075	98915685	pH::lyser for pH (pH) with 7.5 m fixed cable	2 - 12
E-513-2-000	98915686	redo::lyser for redox potential (ORP) with plug connection	-2000 - 2000 mV
E-513-2-075	98915687	redo::lyser for redox potential (ORP) with 7.5 m fixed cable	-2000 - 2000 mV
E-511-2-000	98915688	condu::lyser for conductivity with plug connection	0 - 500.000 µS/cm
E-511-2-075	98915689	condu::lyser for conductivity with 7.5 m fixed cable	0 - 500.000 µS/cm
C-1-010-SENSOR	98915690	Sensor connection cable 1 m	
C-210-SENSOR	98915691	Sensor extension cable 10 m	
C-220-SENSOR	98915692	Sensor extension cable 20 m	
F-12-SENSOR	99074490	Sensor carrier for submersed installation	
E-520-1/2-KIT [E-507-1/2-KIT [2)]]	99290666 [99074494 [2)]]	Free chlorine electrolyte and membrane cap	
E-525-1/2-KIT [E-507-3/4-KIT [2)]]	99290667 [99074495 [2)]]	Total chlorine electrolyte and membrane cap	
E-508-1/2-KIT	99074496	Chlorine dioxide electrolyte and membrane cap	
E-509-1/2-KIT	99074497	Hydrogen peroxide electrolyte and membrane cap	
E-515-1/2-KIT	99074498	Peracetic acid electrolyte and membrane cap	
E-514-pH	99074499	pH electrode	
E-513-ORP	99074500	Redox electrode	
E-510-GUARD	99074487	Basket guard for submersed sensor installation	

[1)] Previous version of chlori::lyser (has been delivered from s::can until April 2017)
[2)] Maintenance kit for previous version of chlori::lyser still available

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
- Measuring range
- Bar code
- Device serial number (S/N)
- Information on power supply
- Acceptable temperature limits
- Environment rating (IP)
- Acceptable pressure limits
- Item number (Type)
- QR code to Grundfos Support





1 Dimensions in mm of chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser

2 Dimensions in mm of pH::lyser and redo::lyser (cable version with basket guard)

3 Dimensions in mm of pH::lyser and redo::lyser (plug version for flow cell)

4 Dimensions in mm of condu::lyser (cable version with basket guard)

5 Dimensions in mm of condu::lyser (plug version for flow cell)

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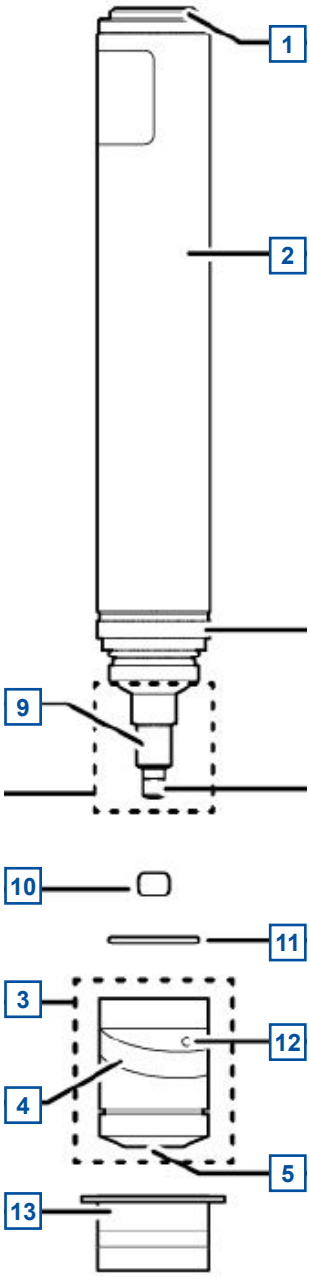
1. Connector plug
2. Sensor housing
3. Membrane cap filled with electrolyte (protected with transparent protective cap during transport)
4. Rubber band (for vent hole protection)
5. Membrane
6. Electrode with integrated reference
7. Temperature sensor
8. Measuring electrode with current and potential electrodes
9. Electrode finger (visible if membrane cap is screwed off)
10. Spacer (not part of all sensor types)
11. O-ring (not part of all sensor types)
12. Vent hole (not part of all sensor types)
13. Protective cap



3.4 Storage, Transport and Disposal

The temperature limits for device storage and transport, which are described in the section technical specifications, have to 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 strong electromagnetic radiation.

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

Please note the information on the packaging especially regarding the vertical storage of the sensors. Damage of the sensor caused by wrong storage will not be covered by warranty.

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.

3.4.1 Specific Storage and Transport for chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser

For short term storage (up to 24 hours) the sensor can stay in the flow cell with water or can be covered with the protective cap filled with water to prevent the sensor from drying out.

For long term storage the membrane cap has to be unscrewed. Then the membrane cap, the spacer and electrode must be rinsed with clean water. Finally the dry membrane cap is screwed onto the sensor loosely, to protect the electrode finger. The membrane itself should not touch the electrode finger. For recommissioning after long term storage please refer to section 8.

Membrane caps that have been in operation for more than one day cannot be used again after storage.

3.4.2 Specific Storage and Transport for pH::lyser and redo::lyser

The electrode has to be stored with the provided protective cap. The protective cap needs to be filled with KCl (approx. 2 molar). 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.

3.4.3 Specific Storage and Transport for condu::lyser

The measuring head is protected with a yellow cap during transport to protect the sensor against damage and pollution. This cap has to be removed before initial operation. For storage the protective cap can be used again.

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 patcher and supplier immediately in case of any damages during transport.

In case of incompleteness please contact your supplier 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.

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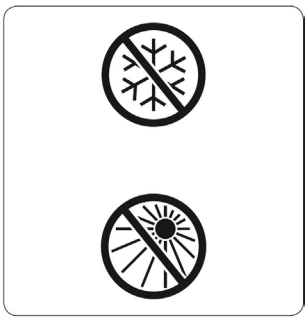
4 Installation

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.

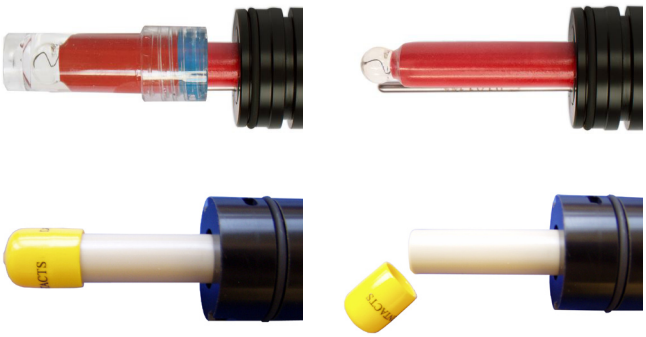
- Favourable flow conditions (acceptable flow rate, pressure, etc.)
- Unadulterated, representative measuring medium
- Measuring medium is in equilibrium state (no gas release, no precipitation etc.)
- No external interferences (no electric and electro-magnetic interferences by leakage current, earth fault of pumps, electric motors, electric power lines, etc.)
- Easy accessibility (mounting, sampling, functional check, demounting)
- Availability of sufficient space (sensor, installation fitting, controller unit CU 382, etc.)
- Adherence to limit values (see technical specifications located at the end of this manual)



- Power supply of controller unit CU 382 (operational reliability, voltage, power, peak free)
- Best possible weather and splash water proof conditions (see figures on the right)
- Shortest possible distances between system components (sensor – controller – 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, the redo::lyser or the condu::lyser the protective cap has to be removed carefully and should be stored for later shipment.



All other sensors (chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser) are not ready for use after shipment. The following sections will guide you through the steps needed to prepare these sensors for measurement. Please mind the following important notes when handling these sensors:

- Never touch the surface of the membrane, the electrode finger or the gold electrode at the tip of it with your fingers.
- Do not shake the electrolyte bottle, store it always upside-down and fill the membrane cap slowly to avoid air bubbles within the electrolyte. Air bubbles between gold electrode and membrane will falsify your readings.
- Do not cover the vent hole with your fingers, when the membrane cap is screwed on or off (for chlori::lyser only).



- Please note the correct handling of electrolyte bottle during filling, to avoid air bubbles entering the electrolyte.

1. Press bottle when upside down for filling.
2. Turn your hand to brings the bottle upright.
3. Only now open hand to let air flow into the bottle.

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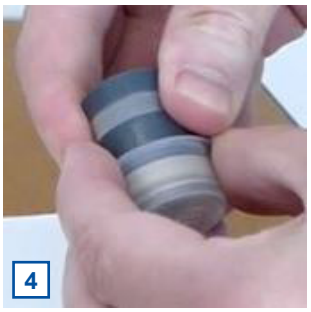
4.2.1 Specific Assembling of chlori::lyser

1 Place the sensor package and a clean plastic sheet onto a flat table. Carefully put the provided parts (sensor with membrane cap and protective cap, electrolyte and, if included, spacer) onto the clean plastic sheet.

2 Place the bottle of electrolyte upside down. Ideally some days before.

3 Unscrew the membrane cap from the sensor body.

4 Remove the protective cap carefully. Don‘t touch the membrane.



5 Place the membrane cap onto the clean plastic with the opening upwards.

6 Take the bottle with electrolyte and open it and keep it always upside down. Let the electrolyte flow onto the plastic sheet. Don‘t stop the flow.

7 For previous sensor version E-507-1/2 only the following step is needed:
Put a drop of the electrolyte on the plastic sheet, place the spacer on it and fill the spacer with electrolyte.

8 Now move the bottle over the membrane cap without stopping the flow. Let the electrolyte flow slowly along the edge into the membrane cap up to the top. This procedure will avoid air bubbles within the electrolyte.

9 For previous sensor version E-507-1/2 only the following step is needed:
Hold the sensor body upright and push the electrode tip carefully into the filled spacer to take it up.

10 Hold the sensor upright and immerge the electrode tip slowly into the filled membrane cap.

11 Screw the membrane cap onto the sensor body. Electrolyte will escape through the vent hole while screwing. Be careful not to block this vent with your fingers.

12 Spill the excessive electrolyte from the sensor body with clean tap water or distilled water.

Once the sensor has been assembled, it should be supplied with power as soon as possible and ensure that the sensor is always wetted with disinfected water.

4.2.2 Specific Assembling of chlodi::lyser, hyper::lyser and peroxy::lyser

1 Place the sensor package and a clean plastic sheet onto a flat table. Carefully put the provided parts (sensor with membrane cap and protective cap, electrolyte, spacer and tweezer) onto the clean plastic sheet.

2 Place the bottle of electrolyte upside down. Ideally some days before

3 Unscrew the membrane cap from the sensor body.

4 Remove the protective cap carefully. Don‘t touch the membrane.

5 Place the membrane cap onto the clean plastic with the opening upwards.

6 Take the bottle with electrolyte and open it and keep it always upside down. Let the electrolyte flow onto the plastic sheet. Wet the spacer with electrolyte. Don‘t stop the flow.

7 Now move the bottle over the membrane cap without stopping the flow. Let the electrolyte flow slowly along the edge into the membrane cap up to the top. This procedure will avoid air bubbles within the electrolyte.

8 Take the spacer with the tweezer and submerse it with the opening upwards carefully into the filled membrane cap.

9 Check visually if the spacer is placed centric with opening upwards and no air bubbles are visible. In case of any air bubble, empty the membrane cap and start again filling with electrolyte.

10 Hold the sensor upright and immerge the electrode tip slowly into the filled membrane cap.

11 Screw the membrane cap onto the sensor body. Electrolyte will escape while screwing.

12 Ensure the red O-ring is positioned correctly.

13 The membrane cap is correctly screwed when the cap hits the sensor body completely. Check again the position of the red O-ring.

14 Spill the excessive electrolyte from the sensor body with tap water.

Once the sensor has been assembled, it should be supplied with power as soon as possible and ensure that the sensor is always wetted with disinfected water.

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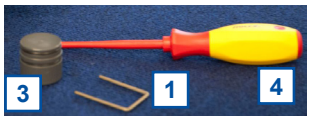
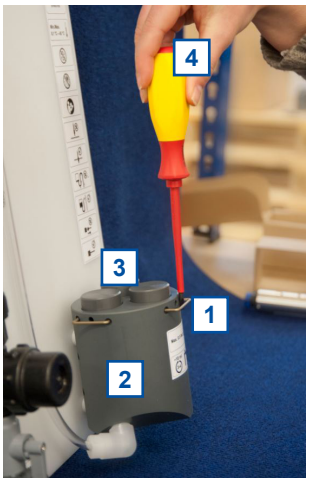
4.3 Mounting in Flow Cell Tap Water

This section explains how the sensors can be installed in the flow cell of the DID station. There are two types of flow cells available, a single sensor flow cell and a flow cell for up to three sensors.

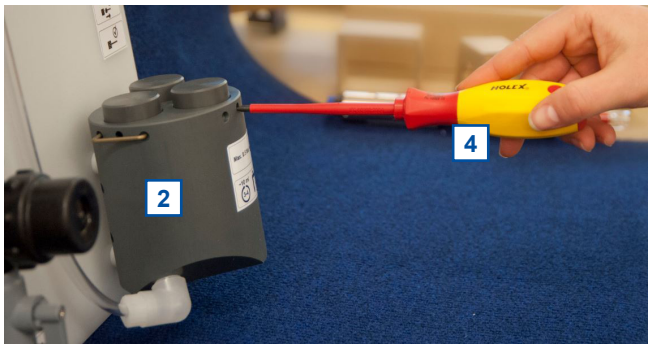


The installation of the sensors in the flow cell is performed by the following steps:

- Pull out the metal bracket [1] from the flow cell [2] that fixes the plug [3]. A flat screw driver [4] can be used to do this, if needed.



- Remove the plug [3] from the flow cell [2].To remove the plug insert a flat screw driver [4] into the small hole on the side of the flow cell and move the plug out by moving the screw driver downwards.



- Remove the protective cap from the sensor, if existing.
- Insert sensor [5] in the opening of the flow cell [2] and push sensor down carefully until O-ring snaps into the correct sensor position.
- Push the metal bracket [1] back into the flow cell [2] to secure the sensor [5] in place. The metal bracket can only be inserted if sensor is in the correct position.
- Ensure that all other openings of the flow cell [2] are covered with plugs [3] before putting the monitoring station into operation.
- To demount the sensor [5] use a flat screw driver [4] to remove the metal bracket [1] first and pull the sensor out.

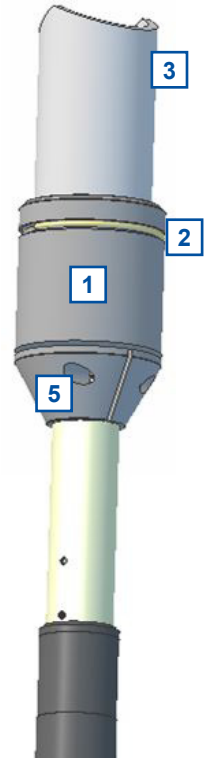
The flow cell [2] is mounted onto the panel [7] of the DID station with two fixing holders [6]. The position of the flow cell is secured by a metal bracket [1].

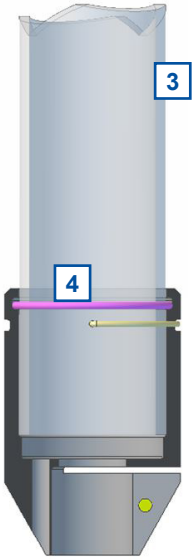
4.4 Mounting with Sensor Carrier

This section explains how the sensor with fixed cable can be installed directly (submersed) in the medium using the sensor carrier.

The installation of the sensor using the sensor carrier is performed by the following steps:

- Remove retaining clip [2] from the sensor carrier [1].
- Put 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 50 mm and O-ring 50 x 3.5 mm can be used for $1^1/_2$ inch.

- Lead the sensor cable and the air hose for automatic sensor cleaning through the sensor carrier (see left figure below).
- Push the sensor into the sensor carrier (see middle figure below).
- Tight the screw [5] on the sensor carrier using a screw driver until the sensor is firmly fixed (see right figure below).

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5 Initial Startup

Once the assembling, mounting and installation of the sensors have been completed and checked (see chapter 4) the initial startup of the DID-station will require the following actions, in the order presented below:

- Connect all sensors to the controller unit CU 382 (see section 5.1).
- Establish power supply to the controller unit CU 382 (please refer to the DID-manual) and wait until the operation software has started up.
- Configure the controller unit CU 382 (e.g. select language, see DID-manual).
- Perform initialisation of all sensors (see DID-manual).
- Perform parameterisation of all sensors (see DID-manual).
- Configure the controller for steering the desinfection (see DID-manual).
- Configure the digital, analogue and fieldbus outputs of the controller unit CU 382, if required.
- Check the readings obtained for plausibility after sufficient running-in time (see section 10 regarding running-in time).
- Calibrate the readings of the sensor in stable water quality (see chapter 6), if required.

5.1 Connection to the Controller Unit CU 382

For all sensors delivered with a plug connection, the connection cable C-1-010 has to be used for connecting the sensor to a compatible socket provided on the controller unit CU 382. Sensors delivered with a fixed cable already including the plug. Ensure that the sensor plug and the connector are dry and clean. Otherwise communication errors and / or device damage might occur.

5.2 Sensor Parameterisation

The following table is an overview of the parameters that can be measured with the different sensors:

Sensor / Part-no.	Previous Version	Parameter	Parameter-index	Name [Unit]	Decimal places
chlori::lyser E-520-1	E-507-1	Free chlorine	0	FCL [mg/l]	3
chlori::lyser E-520-1	E-507-1	Temperature	1	Temp. [°C]	1
chlori::lyser E-520-2	E-507-2	Free chlorine	0	FCL [mg/l]	2
chlori::lyser E-520-2	E-507-2	Temperature	1	Temp. [°C]	1
chlori::lyser E-525-1	E-507-3	Total chlorine	0	TCL [mg/l]	3
chlori::lyser E-525-1	E-507-3	Temperature	1	Temp. [°C]	1
chlori::lyser E-525-2	E-507-4	Total chlorine	0	TCL [mg/l]	2
chlori::lyser E-525-2	E-507-4	Temperature	1	Temp. [°C]	1
chlodi::lyser E-508-1		Chlorine dioxide	0	CLD [mg/l]	3
chlodi::lyser E-508-1		Temperature	1	Temp. [°C]	1
chlodi::lyser E-508-2		Chlorine dioxide	0	CLD [mg/l]	2
chlodi::lyser E-508-2		Temperature	1	Temp. [°C]	1
hyper::lyser E-509-1		Hydrogen peroxide	0	HYP [mg/l]	1
hyper::lyser E-509-1		Temperature	1	Temp. [°C]	1
hyper::lyser E-509-2		Hydrogen peroxide	0	HYP [mg/l]	0
hyper::lyser E-509-2		Temperature	1	Temp. [°C]	1
peroxy::lyser E-515-1		Peracetic acid	0	PAA [mg/l]	1
peroxy::lyser E-515-1		Temperature	1	Temp. [°C]	1
peroxy::lyser E-515-2		Peracetic acid	0	PAA [mg/l]	0
peroxy::lyser E-515-2		Temperature	1	Temp. [°C]	1

Sensor / Part-no.	Previous Version	Parameter	Parameter-index	Name [Unit]	Decimal places
pH::lyser E-514-2		pH	0	pH	2
pH::lyser E-514-2		pH - mV	1	pH [mV]	1
pH::lyser E-514-2		Temperature	2	Temp. [°C]	1
redo::lyser E-513-2		ORP	0	ORP [mV]	0
redo::lyser E-513-2		ORP - mV	1	ORP [mV]	0
redo::lyser E-513-2		Temperature	2	Temp. [°C]	1
condu::lyser E-511-2		Conductivity	0	Cond [µS/cm]	0
condu::lyser E-511-2		Temperature	1	T [°C]	1

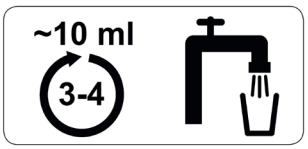
6 Calibration

The chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser are delivered with membrane cap and electrolyte separately. Therefore the electrode slope needs to be calibrated after initial startup (see chapter 5). Subsequently a calibration is needed whenever maintenaince activities (changing the electrolyte or the membrane cap) have been performed. The zero point is precalibrated in the factory and does not need to be recalibrated in the field.

The pH::lyser, redo::lyser and condu::lyser are precalibrated in the factory and as such can be used immediately after delivery. However, for the best possible results, s::can recommends to check the calibration in the specified application and subsequently perform a functional check for validity and correctness on a regular basis (see chapter 7).

6.1 General Notes for Calibration

- Before performing any kind of calibration ensure appropriate conditioning time (at least 2 hours after initial operation or longer, depending on the sensor type, please see the technical specifications).
- Before performing any kind of calibration the correct function of the sensor should be ensured (sensor is clean and properly assembled - see section 7 also).
- For highest accuracy the same environment conditions (temperature, flow velocity, pH) have to be ensured during the calibration as for the normal operation. Therefore the calibration should always be performed with the installed sensor directly in the measured medium and only in exeptional cases outside the flow cell.
- When calibration is performed outside the flow cell in a small beaker, ensure constant medium flow and check that the sensor is not in direct contact with the wall or bottom.



- Rinse the sampling point of the DID-station by removing approx. 10 ml of medium 3-4 times.
- Take a sample from the medium at the same time when pushing the sample button in the calibration menu (actual measurement will be stored).
- Existing (stored) readings (sample) are overwritten whenever a new sample measurement is triggered.
- The measurement results of sensor shown during the calibration procedure and stored onto the sensor are the raw signals of the electrodes. Therefore they can be negative numbers.

- Perform laboratory analysis for actual concentration of the sample as soon as possible.
- The corresponding value (laboratory value) can also be entered later in the controller unit CU 382.
- The calibration will not be executed and used until the menu item *Perform Calibration* is confirmed.
- When performing a parameter calibration the result will be checked for plausibility. In case of faulty calibration an error message will be displayed on the controller unit CU 382.
- Further important notes how to perform a local calibration are included in the DID-manual.

6.1.1 Specific Notes for Calibration of chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser

- s::can recommends to use DPD methodes with reagents for free chlorine (DPD-1) or total chlorine (DPD-4) as reference methode for the chlori::lyser.

- As reference methode for chlorine dioxide (chlodi::lyser) also the DPD methodes can be used.

- For highest accuracy use a photometer for measuring chlorine- and chlorine dioxide concentration of the sample and perform zero-point calibration of the photometer before usage.

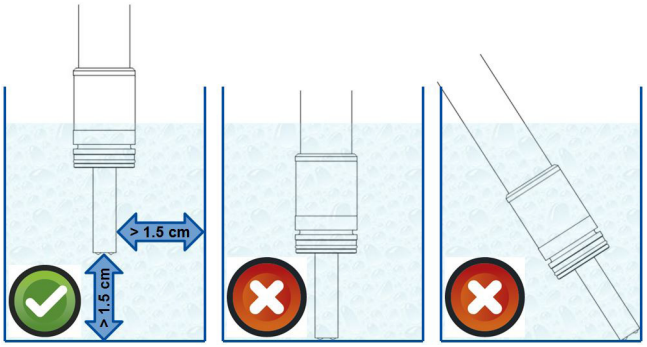
- For hyper::lyser and peroxy::lyser s::can recommends to use standard titration methods to archieve adequate accuracy.

6.1.2 Specific Notes for Calibration of pH::lyser and redo::lyser

- 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.
- Due to high quality manufacturing process, it is not necessary to perform a linear calibration before start-up of the sensor or after replacement of the electrode.
- 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.
- First check of the slope by using pH standards will typically not be necessary before 4-6 months in operation. For 2-point calibration of slope, use two different buffer. Keep the pH::lyser in each buffer for sufficient time to provide stable values.

6.1.3 Specific Notes for Calibration of condu::lyser

- The entered laboratory value for local calibration has to be the conductivity at actual temperature (not compensated reference value). Temperature compenation is performed on the sensor directly. Therefore the displayed measurement after performed calibration can deviate from to the entered laboratory value.
- In case of any measurement outside the flow cell, the measuring electrode should not contact the wall of the tank directly (see figure on the right).

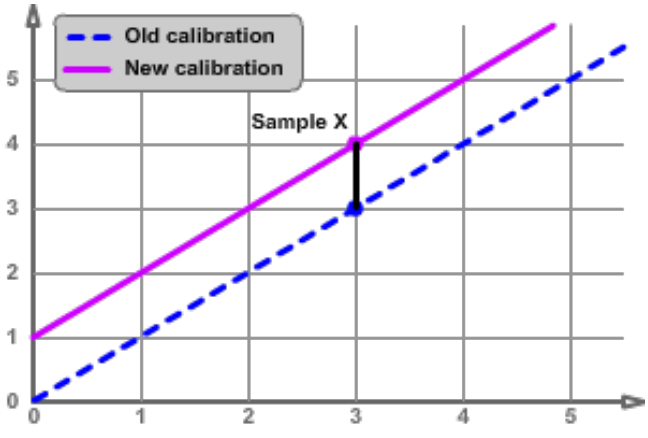


6.2 Types of Calibration

Depending on the sensor type different options for a local calibration of the single parameter are supported. The table below provides an overview of the types of calibration for each sensor.

Sensor	Offset (1 Sample)	Span (1 Sample)	Linear (2 Samples)
chlori::lyser		FCL and TCL	
chlodi::lyser		CLD	
hyper::lyser		HYP	
peroxy::lyser		PAA	
pH::lyser	pH and Temp.		pH and Temp.
redo::lyser	ORP and Temp.		ORP and Temp.
condu::lyser		Conductivity	

- For offset and span calibration only one sample (Sample X) is needed.
- For linear calibration two samples (Sample X and Sample Y) are needed. Sample 1 (Sample X) is the same sample that can be used for offset calibration.
- An offset calibration changes the offset, the slope keeps unchanged (see figure on the right).



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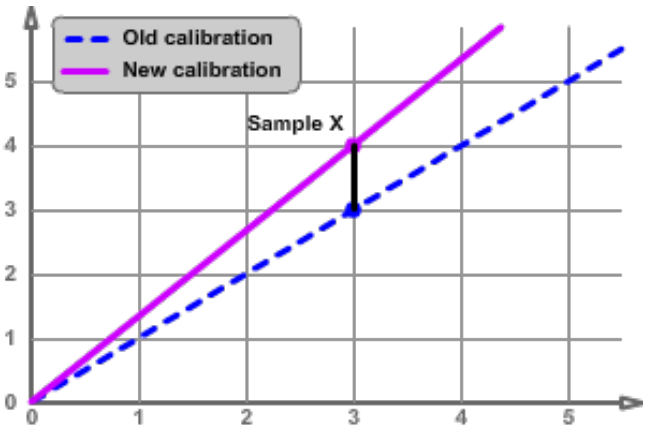
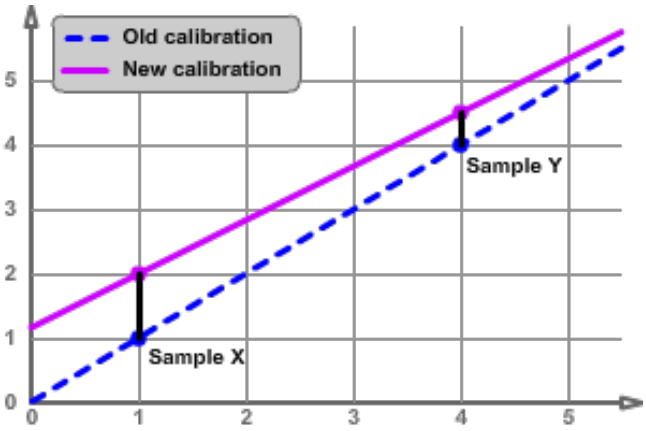
- A span calibration changes the slope, the offset keeps unchanged at the zero point (see figure on the right).



- A linear calibration changes the offset and the slope (see figure on the right).



A local calibrated parameter can be reset to the factory settings (Global). This is recommended after exchange of an aged electrode until a new calibration is performed. Reset to Global can also be helpful in case of an improper local calibration.

6.3 Performing a Calibration

The way how to perform a local calibration of the parameter readings is explained in the DID-manual very detailed. Furthermore quick calibration notes are available on the DID-station directly.

7 Functional Check

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

- Initial startup
- Routine functional check
- Suspicion of DID-station malfunction
- Modification of DID-station (e.g. integration of additional sensor or device)
- Change of measuring location

Depending on the application (water composition), the sensors connected and the environmental conditions a regular functional check (weekly to monthly) is recommended. The following sections provide an overview of all the actions that have to be performed to check the monitoring system quickly (see section 7.1), to check the plausibility of the collected readings (see section 7.2) and to check the integrity of a single sensor (see section 7.3).

7.1 Check of System

What to check	How to check on controller unit CU 382
Power supply controller unit CU 382	Green LED is on? Text is visible on the display?
System running (up-to-date)	Displayed system time is up-to-date and is updated every second? Use arrow button < to reach the *Status* view.
System status	No error message or error symbol is displayed?
Reason for bad system status	Check logbook entries since last functional check.

Check	Remark
Function of automatic cleaning	Wait for next cleaning cycle. Watch for air bubbles when cleaning is activated (for submersed installation only).
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. Check pressure.
DID-station (by-pass)	All tubes and fittings are tight and all sensors are supplied with medium? No air bubbles within the tubes? Inlet strainer is clean?
Installation submersed (in-situ)	Mounting equipment of all devices is ok and all sensors are submersed?
Data transfer	Check if displayed readings on local controller unit CU 382 are equal to displayed readings on customer display system.

7.2 Check of Results

Check	How to check on controller unit CU 382
Current readings displayed completely	No *NaN* and no dashes (- - - -,- -) or plus signs (++++,++) are displayed. Use arrow buttons to scroll through all displayed parameters.
Current parameter status of displayed readings	Parameter name is flashing in case of any error. Check logbook entries since last functional check. Use menu function *Monitore...* to check actual parameter status.

Check	Reason / possible error	Remark
Up-to-date: Readings actualised on regulary base?	- Measuring interval is too long - Automatic measurement has been stopped manually - Service mode activated	Consider measuring interval and smoothing.
Continuity: Check historical data (timeseries) for inter-ruptions or discontinuities	- Change of medium - Local calibration - Maintenance of sensor (cleaning, etc.) - Readings out of range - System failure (loss of power, communication error, etc.)	Only possible if timeseries are availbale.
Plausibility: Timeseries look plausible with daily or seasonal fluctuation	- Drift of readings (can be caused by fouling) - Increasing noise (can be caused by flow conditions) - Fixed readings / no fluctuation	Check logbook of plant operator if possible. Refer to section 9 for troubleshooting.
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 values and readings of the sensor	In case of significant difference a calibration has to be performed (please refer to section 6).	To verify the accuracy of the displayed readings, only a reliable and validated comparison method has to be used.

7.3 Check of Sensor Integrity

When there is any doubt regarding the integrity of the sensor, please use the following list to check sensor and installation (refer to section 9 for troubleshooting also):

- Check of displayed parameter readings.
- Check supply of measuring medium and if sensor is submersed.
- Check sensor itself for any contamination or damage.
- Check sensor in a bucket with measuring medium outside the flow cell.
- Install sensor again and perform local calibration.

8 Maintenance

Please note that during any cleaning or maintenance activity of the chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser the following important notes have to be obtained:

- Never touch the surface of the membrane, the electrode finger or the gold electrode at the tip of it with your fingers.
- Do not use any acids on the electrode finger, the spacer or the housing.
- Do not power off the sensor for more than 24 hours when it is in operation.
- Do not shake the electrolyte bottle, store it always upside-down and fill the membrane cap slowly to avoid air bubbles within the electrolyte. Air bubbles between gold electrode and membrane will falsify your readings.
- Do not cover the vent hole with your fingers, when the membrane cap is screwed on or off (for chlori::lyser only).
- Please note the correct handling of electrolyte bottle during filling, to avoid air bubbles entering the electrolyte (see section 4.2)

8.1 Cleaning of submersed sensors

All sensor types with fixed sensor cable for submersed installation can be cleaned automatically using the integrated pressurised air system. For manual cleaning of the sensor the following steps are recommended:

- Rinse sensor with hand-hot drinking water to remove course deposits.
- Put the sensor in a bucket of hand-hot drinking water for several minutes to remove deposits on the sensor and the electrode.
- For cleaning a soft cloth, tissue or a soft brush can be used. Do not use abrasive materials such as scouring sponges or stiff brushes.
- To clean the electrode, the electrode guard 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.
- Resistant deposits / fouling on the sensor housing can be treated with weak acid (2% aqueous solution of hydrochloric acid (HCl)) or weak basic cleaning solutions (e.g. a 2% aqueous solution of sodium hydroxide (NaOH)).
- Finally the sensor has to be rinsed with drinking water and the stainless steel housing has to be dried off.

When cleaning the condu::lyser electrode, care has to be taken that the electrical contacts on the tip are not damaged.

8.2 Cleaning of membrane cap

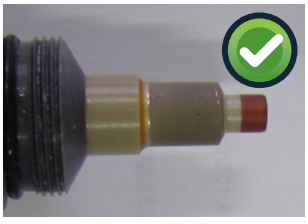
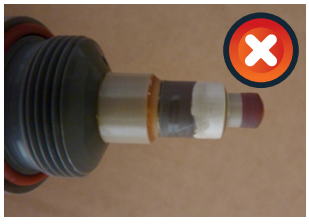
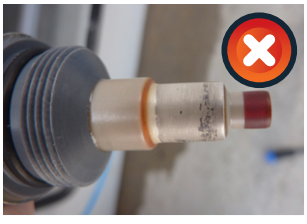
If the membrane has a coating or is covered with organic material, it can be cleaned with hand warm tap water carefully. Please ensure that the rubber band of the chlori::lyser is positioned correctly to avoid any dilution of the electrolyte. If this cleaning procedure will not improve the measurement, the membrane cap and the electrolyte have to be replaced.

8.3 Replacement of Electrolyte and Membrane Cap

Electrolyte and membrane cap have to be replaced on regular interval. The maintenance interval depends on the sensor type and the measured medium. The typical maintenance interval is mentioned in the technical specifications.

In case of troubles outside the scheduled maintenance interval (see section 9) the following step by step procedure is recommended:

- Cleaning of membrane cap (see section 8.2).
- Visual check of the electrode finger (see figures below). If electrode finger looks not ok, please check your application for unexpected aggressive substances.
- Replacement of electrolyte and cleaning of gold electrode (tip of electrode finger), as described afterwards.
- Replacement of electrolyte and membran cap and cleaning of gold electrode (tip of electrode finger), as described afterwards.

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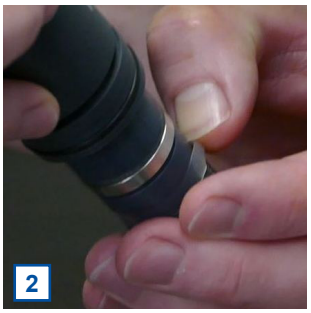
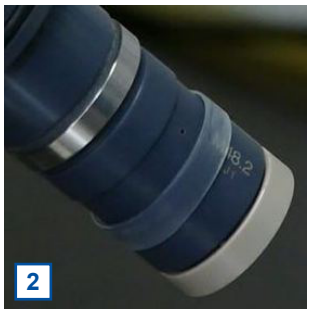
8.3.1 Replacement of Electrolyte and Memrane Cap for chlori::lyser

The electrolyte and membrane cap need to be replaced every 12 months or if the local calibration failed (see section 6). The replacement is performed by the following steps:

1. Clean the sensor as explained in section 8.1.

2. Lift the rubber band so that the vent hole is not covered when unscrewing the cap.





3. Unscrew the membrane cap.

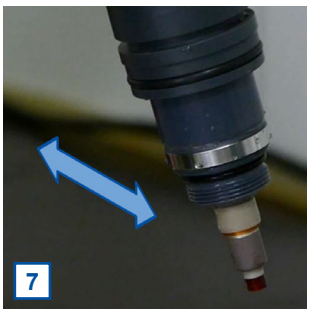
4. Empty the used electrolyte. For previous sensor version E-507-1/2 only take care not to loose the spacer in case only electrolyte will be replaced.

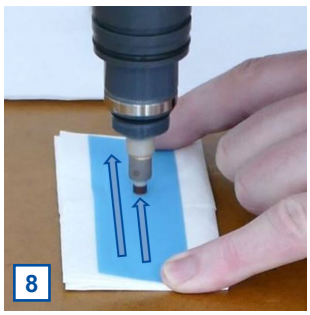
5. In case the electrolyte has to be changed only, spill the membrane cap with clean tap water or distilled water before refilling.

6. Clean the electrode finger by rinsing with clean tap water or distilled water without touching it directly.

7. Shake excessive water off the electrode finger. Do not use tissues to dry the electrode finger or the inner of the membrane cap.

8. Place the supplied fine polishing paper onto a soft surface (e.g. a paper tissue) and fix it with your fingers. Clean the gold electrode by softly wiping the electrode finger three times over the fine polishing paper. Keep the sensor upright.





9. Perform refilling with electrolyte and fixing of the membrane cap as explained in section 4.2.1.

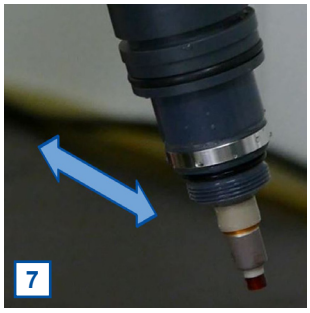
8.3.2 Replacement of Electrolyte and Membrane Cap for chlodi::lyser, hyper::lyser and peroxy::lyser

The electrolyte need to be replaced every 3 - 6 months and membrane cap need to be replaced every 12 months. A replacement is also needed if the local calibration failed (see section 6). The replacement is performed by the following steps:

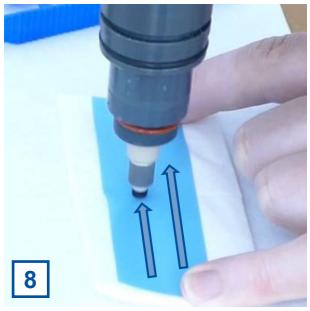
1. Clean the sensor as explained in section 8.1.
2. Unscrew the membrane cap.
3. Empty the used electrolyte.

4. Take care not to loose the spacer in case only electrolyte will be replaced.
5. In case the electrolyte has to be changed only, spill the membrane cap and the spacer with clean tap water or distilled water before refilling.

6. Clean the membrane finger with clean tap water or distilled water without touching it directly.
7. Shake excessive water off the electrode finger. Do not use tissues to dry the electrode finger or the inner of the membrane cap.



8. Place the supplied fine polishing paper onto a soft surface (e.g. a paper tissue) and fix it with your fingers. Clean the gold electrode by softly wiping the electrode finger three times over the fine polishing paper. Keep the sensor upright.
9. Perform refilling with electrolyte and fixing of the new membrane cap as explained in section 4.2.2.



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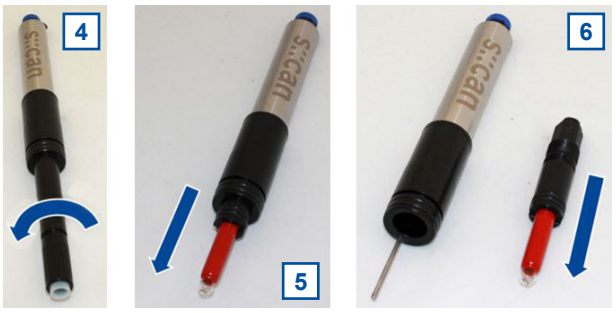
8.4 Replacement of Electrode for pH::lyser and redo::lyser

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

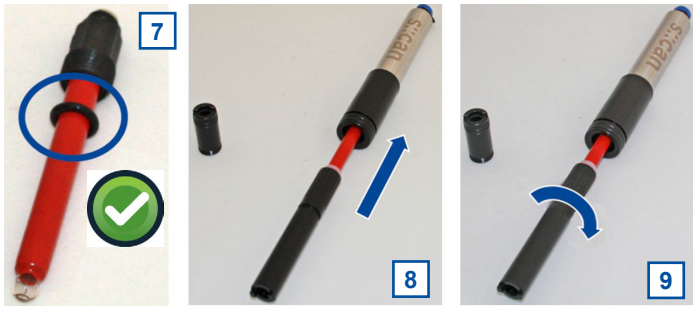
- Deactivate automatic cleaning (if applicable) and demount the sensor.
- Clean the sensor and wipe dry thoroughly.

Items required for replacement:

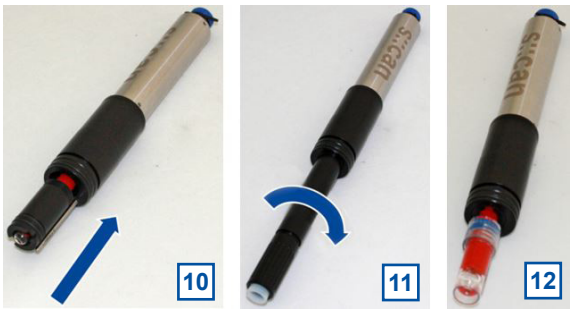
1. Service tool (E-532-tool)
2. pH::lyser / redo::lyser
3. Spare electrode (E-514-pH / E-513-ORP)



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 needs to 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.

9 Troubleshooting

9.1 Typical Error Pattern of chlori::lyser, chlodi::lyser, hyper::lyser and peroxy::lyser

Error	Reason	Removal
Drift of readings	■ Change in the medium	■ Check measuring medium for plausibility (reference method)
	■ Fouling of the membrane	■ Check sensor head for cleanliness
	■ Electrolyte aged	■ Replace electrolyte
	■ Membrane aged	■ Replace membrane cap
Drift of readings after change of electrolyte or membrane cap or after loss of power supply	■ Sensor not fully conditioned	■ Condition sensor after recommissioning in the medium (see section 10 for conditioning time)
	■ Medium flow insufficient	■ Check water supply, check inlet strainer
	■ Membrane not clean	■ Check membrane cap for cleanliness
	■ Air bubbles in electrolyte	■ Replace electrolyte
	■ Electrolyte aged (e.g. due to wrong storage conditions)	■ Use a new bottle of electrolyte and store it correctly
Periodical deviation of the readings (outliers of readings)	■ Periodical fluctuation of pressure	■ Ensure pressure conditions are stable
	■ Attaching and detaching of air bubbles on the membrane	■ Ensure no air bubbles are within the tubes and flow cell
	■ Periodical fluctuation of flow	■ Check medium supply and installation
Unstable readings (scattering of readings)	■ Air bubbles on the membrane	■ Increase flow rate for short time to remove all air bubbles and ensure stable medium flow without bubbles
	■ Air bubbles in the electrolyte	■ Replace electrolyte and do refilling carefully
	■ Membrane destroyed	■ Check membrane visually and replace it
No response to changes in concentration	■ No power supply for more that 24 hours	■ Clean membrane cap and replace electrolyte
	■ Longterm measurement in medium without disinfection	■ Store sensor in chlorine medium and check it again after 20 minutes
	■ Flow too low	■ Check water supply, check inlet strainer
	■ Electrolyte aged	■ Perform calibration or replace electrolyte
	■ Membrane aged	■ Perform calibration or replace membrane cap
Measurement results deviate from laboratory results	■ Cross-sensitivity of the reference method (e.g. ammonium)	■ Obey limits of the reference method regarding pH and cross sensitivities
	■ Incorrect calibration	■ Perform calibration again
	■ Different pH value during calibration and measurement	■ Calibration should be done on the expected mean of the pH value
	■ Reference methode	■ Be aware that all reference methodes are limited in accuracy (e.g. accuracy of DPD methode for free chlorine up to +/- 0.23 mg/L FCL)
	■ Too low or too high flow	■ Check water flow
Sensor cannot be calibrated	■ Start-up time too short	■ See section 10 for start-up / conditioning time
	■ No electrolyte in the membrane cap	■ Perform correct sensor assembly according to manual
	■ Protective cap still on the sensor head	■ Remove protective cap from the sensor head
	■ Measurement with reference method performed incorrect	■ Perform lab measurement according the instruction
	■ Sensor with filled membrane cap without power for longer time	■ Repeat calibration after 24 hours of operation

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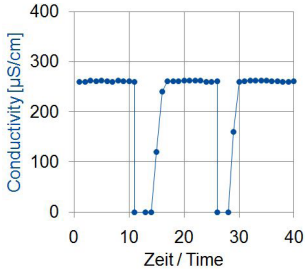
9.2 Typical Error Pattern of pH::lyser and redo::lyser

Error	Reason	Removal
Drift of readings	■ Change in the medium ■ Fouling of the electrode ■ Electrode aged	■ Check measuring medium for plausibility (reference method) ■ Check electrode for cleanliness ■ Replace electrode
Drift of readings after change of electrode or after loss of medium supply	■ Sensor not fully conditioned ■ Medium flow insufficient ■ Electrode aged (e.g. due to wrong storage conditions)	■ Condition sensor after recommissioning in the medium ■ Check water supply, check inlet strainer ■ Replace electrode
Periodical deviation of the readings (outliers of readings)	■ Periodical fluctuation of pressure ■ Attaching and detaching of air bubbles on the electrode ■ Periodical fluctuation of flow	■ Ensure pressure conditions are stable ■ Ensure no air bubbles are within the tubes and flow cells ■ Check medium supply and installation
Unstable readings (scattering of readings)	■ Air bubbles on the electrode	■ Increase flow rate for short time to remove all air bubbles and ensure stable medium flow without bubbles
No response to changes in concentration	■ Electrode aged	■ Perform linear calibration in buffer solution ■ Replace electrode
Deviation of readings after linear calibration in buffer solution	■ Due to solid state reference there might be an offset in the online readings	■ Perform offset calibration without removing the pH::lyser from the medium
Sensor cannot be calibrated	■ Conditioning time too short ■ Protective cap still on the sensor head ■ Electrode aged	■ Wait at least 20 minutes before measurement ■ Remove protective cap from the sensor head ■ Replace electrode

9.3 Typical Error Pattern of condu::lyser

Error	Reason	Removal
No response to changes in concentration	■ Protective cap still on the sensor head	■ Remove protective cap from the sensor head
	■ Sensor not continuously submersed. ■ Sensor temporarily on air.	■ Improve installation ■ Ensure sensor head is submersed all the time

9.4 Error Messages and Status Messages

During execution of a measurement the DID-station (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.

These messages will be shown on the display of the controller unit CU 382 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 controller unit CU 382 will add up all the status bits. This detailed information might be important if you request 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

The status message of the sensor and the parameters will be displayed on the controller unit CU 382 within the menu *Monitor...*. In case *0000* is displayed the status is ok. All other messages are explained in the following sections.

9.4.1 Sensor Messages

The table below shows all errors regarding the used sensor incl. the user message, the reason of the error and notes for troubleshooting.

Sensor Status Error	Display Controller Unit CU 382	Reason	Removal
0x0001 - b0	0001	General sensor error. 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 local support.
0x0002 - b1	0002	Sensor misuse; operation outside the specification can damage the device permanently (e.g. temperature too high).	Take the sensor out of the medium immediately and check environmental conditions.
0x8000 - b15	8000	Sensor maintenance required. At least one internal sensor check reports a warning.	Perform function check of the sensor according the manual.

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9.4.2 Parameter Messages

The table below shows all errors regarding the measured parameters incl. the user message, the reason of the error and notes for troubleshooting.

Parameter Status Error	Display Controller Unit CU 382	Reason	Removal
0x0001 - b0	0001	General parameter error. At least one internal parameter check failed.	Note additional status message below. If no further message is displayed, note the error code and contact your local support.
0x0002 - b1	0002	Parameter or hardware error. Electrode signal not ok. An electrode is missing, too old or defect.	Check the electrode or replace the electrode.
0x0010 - b4	0010	Parameter error. Incorrect calibration. Invalid sensor configuration. At least one calibration coefficient is invalid.	Check readings and lab values. Set back to factory settings. Repeat local calibration.
0x0020 - b5	0020	Parameter not ready. Sensor still in warm up phase.	Wait until sensor is fully operational.
0x8000 - b15	8000	Reading out of measuring range. Measured parameter is outside the defined measuring range.	Check if sensor is in the medium. Perform functional check.

Further support for any troubleshooting is available via the QR-code displayed below.

http://www.grundfos.com/nav/contact.html#service_center

10 Technical Specifications

10.1 Technical Specifications for chlori::lyser

Name	chlori::lyser E-520-x	chlori::lyser E-525-x	Remark
Measuring parameter	Free chlorine (FCL), Temperature	Total chlorine (TCL), Temperature	
Measuring range	E-520-1: 0 - 2 mg/l E-520-2: 0 - 20 mg/l	E-525-1: 0 - 2 mg/l E-525-2: 0 - 20 mg/l	
Measuring principle	amperometric 3 electrode sensor, membrane covered		
Compensation	Temperature and pH	Temperature and pH	
Resolution	E-520-1: 0.001 mg/l E-520-2: 0.01 mg/l	E-525-1: 0.001 mg/l E-525-2: 0.01 mg/l	
Accuracy	E-520-1: +/- 0.02 at 0.4 +/- 0.02 at 1.6 E-520-2: +/- 0.2 at 4 +/- 0.6 at 16	E-525-1: +/- 0.04 at 0.4 +/- 0.04 at 1.6 E-525-2: +/- 0.2 at 4 +/- 0.6 at 16	in [mg/l] after calibration in drinking water
Reference measurement	DPD-1	DPD-4	for span calibration, zero point factory calibrated
Response time (T_{90})	2 min	2 min	
Running in time (start up)	2 h	2 h	
Operating temperature	0 - 45 °C (32 - 113 °F)	0 - 45 °C (32 - 113 °F)	
Operating pressure	0 to 3 bar (0 to 43.5 psi)	0 to 3 bar (0 to 43.5 psi)	no pressure peaks and / or pressure fluctuation
Operating flow	15 - 30 l/h	15 - 30 l/h	low discharge dependency
Operating pH range	4 - 9	4 - 12	
Cross sensitivity	75 % ClO_2 80 % O_3 Combined chlorine can increase FCL reading	100 % ClO_2 130 % O_3	reducing and oxidizing agents, corrosion inhibitors and stabilisers for water hardness might influence the measurment
Absence of disinfectant	max. 24 h	max. 24 h	biofilm will clog membrane

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Name	chlori::lyser E-520-x and E-525-x	Remark
Power supply	9 to 30 VDC	power supply and output signal galvanically isolated
Power consumption	0.5 W (typ)	
Dimension	35 x 208 mm	
Weight	150 g	
Housing material	PVC-U, stainless steel 1.4571	
Interface connection	sys plug (IP 67), RS 485 to controller unit CU 382	
Sensor cable length	1.0 m (plug connector on top of sensor)	
Sensor cable specification	PUR (polyurethane jacket), 22 AWG, 6.3 mm (outside diameter); -30 to 80 °C (-22 to 176 °F)	
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)	
Environment rating	IP 67 (due to connection plug on sensor)	
Installation	in flow cell	
Storage temperature	Sensor: 0 to 45 °C (32 to 113 °F) Electrolyte: 10 to 35 °C (50 to 95 °F)	frost free in original bottle
Storage of sensor	dry, without electrolyte and cleaned membrane cap only	with protective cap to avoid contamination of membrane
Typical lifespan (application)	Membrane: 12 months Electrolyte: 12 months	depending on medium
Typical lifespan (storage)	1 - 2 years for electrolyte in original bottle, protected from sun light	check date of expiry on package
Conformity - EMC	EN 61326-1:2013 EN 61326-2-3:2013	

10.2 Technical Specifications for chlodi::lyser, hyper::lyser and peroxy::lyser

Name	chlodi::lyser E-508-x	hyper::lyser E-509-x	peroxy::lyser E-515-x	Remark
Measuring parameter	Chlorine dioxide (CLD), Temperature	Hydrogen peroxide (HYP), Temperature	Peracetic acid (PAA), Temperature	
Measuring range	E-508-1: 0 - 2 mg/l E-508-2: 0 - 20 mg/l	E-509-1: 0 - 200 mg/l E-509-2: 0-2000 mg/l	E-515-1: 0 - 200 mg/l E-515-2: 0-2000 mg/l	
Measuring principle	amperometric 2 electrode sensor, membrane covered			
Compensation	Temperature	Temperature	Temperature	
Resolution	E-508-1: 0.001 mg/l E-508-2: 0.01 mg/l	E-509-1: 0.1 mg/l E-509-2: 1 mg/l	E-515-1: 0.1 mg/l E-515-2: 1 mg/l	
Accuracy	E-508-1: +/- 0.02 at 0.4 +/- 0.02 at 1.6 E-508-2: +/- 0.02 at 1.5	E-509-1: +/- 4 at 40 +/- 4 at 160 E-509-2: +/- 10 at 400 +/- 40 at 1600	E-515-1: +/- 4 at 40 +/- 4 at 160 E-515-2: +/- 10 at 400 +/- 40 at 1600	in [mg/l] after calibration in drinking water
Response time (T_{90})	1 min	8 min	5 min at 10°C (50 °F) 1.5 min at 45°C (113 °F)	
Running in time (start up)	1 h	3 h	E-515-1: 3 h E-515-2: 1 h	
Operating temperature	0 - 50 °C (32 - 122 °F)	0 - 45 °C (32 - 113 °F)	0 - 45 °C (32 - 113 °F)	
Operating pressure	0 to 1 bar (0 to 14.5 psi)	0 to 1 bar (0 to 14.5 psi)	0 to 1 bar (0 to 14.5 psi)	no pressure peaks and / or pressure fluctuation
Operating discharge / flow (recommended)	15 - 30 l/h	15 - 30 l/h	15 - 30 l/h	low discharge dependency
Operating pH range	2 - 11	2 - 11	1 - 6 > 6: peracetic anion present that cannot be measured	
Cross sensitivity	O_3: 25 times higher than ClO_2	O_3, Cl_2 and PAA must not be present. Sulfide poisons membrane. Aqueous solution with Phenolic > 3% destroys membrane.	O_3: reading 2500 times increased ClO_2: 100 %	
No cross sensitivity to	HOCl		H_2O_2	
Absence of disinfectant	max. 24 h	max. 24 h	max. 24 h	biofilm will clog membrane

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Name	chlodi::lyser E-508-x, hyper::lyser E-509-x and peroxy::lyser E-515-x	Remark
Power supply	9 to 30 VDC	power supply and output signal galvanically isolated
Power consumption	0.5 W (typ)	
Dimension	35 x 208 mm	
Weight	150 g	
Housing material	PVC-U, stainless steel 1.4571	
Interface connection	sys plug (IP 67), RS 485 to controller unit CU 382	
Sensor cable length	1.0 m (plug connector on top of sensor)	
Sensor cable specification	PUR (polyurethane jacket), 22 AWG, 6.3 mm (outside diameter); -30 to 80 °C (-22 to 176 °F)	
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)	
Environment rating	IP 67 (due to connection plug on sensor)	
Installation	in flow cell	
Storage temperature	Sensor: 0 to 45 °C (32 to 113 °F) Electrolyte: 10 to 35 °C (50 to 95 °F)	frost free in original bottle
Storage of sensor	dry, without electrolyte and cleaned membrane cap only	with protective cap to avoid contamination of membrane
Typical lifespan (application)	Membrane: 12 months Electrolyte: 3 - 6 months	depending on medium
Typical lifespan (storage)	1 - 2 years for electrolyte in original bottle, protected from sun light	check date of expiry on package
Conformity - EMC	EN 61326-1:2013 EN 61326-2-3:2013	

10.3 Technical Specifications for pH::lyser, redo::lyser and condu::lyser

Name	pH::lyser E-514-2-xxx	redo::lyser E-513-2-xxx	condu::lyser E-511-2-xxx	Remark
Measuring parameter	pH Temperature	redox potential ORP Temperature	conductivity Temperature	
Measuring range	2 - 12 pH 0 - 70 °C	-2000 - 2000 mV 0 - 70 °C	0 - 500.000 µS/cm 0 - 70 °C	
Measuring principle	potentiometric with combined, nonporous reference electrode; temperature with Pt100 (class B)		4 electrode contacting	
Compensation	Temperature	no	Temperature	
Resolution	0.01 pH 0.1 °C	1 mV 0.1 °C	1 µS/cm 0.1 °C	
Accuracy	+/- 0.1 pH	+/- 10 mV in standard solution	+/- 1% of current reading in standard solution	
Response time (T_{90})	30 s	30 s	60 s	
Operating temperature	0 - 70 °C (32 - 158 °F)	0 - 70 °C (32 - 158 °F)	0 - 70 °C (32 - 158 °F)	
Operating pressure	0 - 10 bar (0 - 145 psi)	0 - 10 bar (0 - 145 psi)	0 - 20 bar (0 - 290 psi)	
Operating charge / flow	0.01 - 3 m/s	0.01 - 3 m/s	0.01 - 3 m/s	
Power supply	9 to 18 VDC	9 to 18 VDC	7 to 30 VDC	
Power consumption	< 1 W	< 1 W	0.06 W (typical) 0.15 W (max.)	
Dimension	33 x 257 mm	33 x 257 mm	38 x 237 mm	
Weight	250 g	250 g	250 g	
Electrode material	n/a	n/a	stainless steel 316 / DIN 1.4435, FDA-approved PEEK and EPDM	
Housing material	stainless steel 1.4571, POM-C			
Interface connection	sys plug, IP 67, RS 485 to controller unit CU 382			
Sensor cable length	E-5xx-x-075: 7.5 m E-5xx-x-000: plug connector on top of sensor with connection cable (1.0 m)			
Sensor cable specification	PUR (polyurethane jacket), 22 AWG, 6.3 mm (outside diameter); -30 to 80 °C (-22 togrundfos 176 °F)			
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)			
Environment rating	E-5xx-x-075: IP 68 E-5xx-x-000: IP 67 (due to connection plug on sensor)			
Installation	E-5xx-x-075: submersed E-5xx-x-000: in flow cell			
Automatic cleaning	3 to 6 bar (43.5 to 87 psi) at sensor cleaning connection			

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Name	pH::lyser E-414-2-xxx	redo::lyser E-513-2-xxx	condu::lyser E-511-2-xxx	Remark
Storage temperature	0 - 90 °C (32 - 194 °F)		0 - 60 °C (32 - 140 °F)	
Typical lifespan (application)	1 year for electrode (depending on application)			
Typical lifespan (storage)	approx. 1 year (see date of expiry on electrode), with filled protective cap absolute		no limitation, with protective cap	
Conformity - EMC	EN 61326-1:2013 EN 61326-2-3:2013			

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DECLARATION OF CONFORMITY

We, s::can Messtechnik GmbH, hereby declare that the product listed below, to which this Declaration of Conformity relates, is in conformity with Directives, Standards and other Normative Documents as listed.

Type of product:	Measurement & Process Control
Name of product:	**chlori::lyser, chlodi::lyser, hyper::lyser, peroxy::lyser**
Model number:	**E-507-1-xxx, E-507-2-xxx, E-507-3-xxx, E-507-4-xxx,** **E-508-1-xxx, E-508-2-xxx,** **E-509-1-xxx, E-509-2-xxx,** **E-515-1-xxx, E-515-2-xxx,** **E-520-1-xxx, E-520-2-xxx,** **E-525-1-xxx, E-525-2-xxx** (x = digit is not important for this declaration)

In the supplied version, this s::can product complies with the requirements of the European Directives:

2014/30/EU	**Electromagnetic Compatibility (EMC)**
2011/65/EU	**Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS2)**

Conformance of the product with EMC Directive 2014/30/EU is given according to the following harmonized European standard:

EN 61326-1:2013 *Emission: Class B* *Immunity: Class A*	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
EN 61326-2-3:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

Conformance of the product with RoHS2 Directive 2011/65/EU is given according to the following harmonized European standard:

EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Vienna, 2017-05-04

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DECLARATION OF CONFORMITY

We, s::can Messtechnik GmbH, hereby declare that the product listed below, to which this Declaration of Conformity relates, is in conformity with Directives, Standards and other Normative Documents as listed.

Type of product:	Measurement & Process Control
Name of product:	**condu::lyser**
Model number:	**E-511-2-xxx**
	(x = digit is not important for this declaration)

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2014/30/EU	**Electromagnetic Compatibility (EMC)**
2011/65/EU	**Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS2)**

Conformance of the product with EMC Directive 2014/30/EU is given according to the following harmonized European standard:

EN 61326-1:2013 *Emission: Class B* *Immunity: Class A*	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

Conformance of the product with RoHS2 Directive 2011/65/EU is given according to the following harmonized European standard:

EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Vienna, 2016-04-20

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DECLARATION OF CONFORMITY

We, s::can Messtechnik GmbH, hereby declare that the product listed below, to which this Declaration of Conformity relates, is in conformity with Directives, Standards and other Normative Documents as listed.

Type of product:	Measurement & Process Control
Name of product:	**pH::lyser eco, pH::lyser pro, redo::lyser eco, redo::lyser pro**
Model number:	**E-514-2-xxx, E-514-3-xxx E-513-2-xxx, E-513-3-xxx** (x = digit is not important for this declaration)

In the supplied version, this s::can product complies with the requirements of the European Directives:

2014/30/EU	**Electromagnetic Compatibility (EMC)**
2011/65/EU	**Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS2)**

Conformance of the product with EMC Directive 2014/30/EU is given according to the following harmonized European standard:

EN 61326-1:2013 *Emission: Class B* *Immunity: Class A*	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
EN 61326-2-3:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

Conformance of the product with RoHS2 Directive 2011/65/EU is given according to the following harmonized European standard:

EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Vienna, 2016-04-20

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