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AN-ISE sc probe
AISE sc probe
NISE sc probe

USER MANUAL

10/2018, Edition 6

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Section 1 Technical data

Subject to change.

General information	AN-ISE sc	AISE sc	NISE sc
Measurement method	Potentiometric measurement using ion-selective electrodes (ISE)		
	Ammonium and potassium, nitrate and chloride, reference system	Ammonium and potassium, reference system	Nitrate and chloride, reference system
Measurement range	0 to 1000 mg/L [NH ₄ –N] 0 to 1000 mg/L [K ⁺] 0 to 1000 mg/L [NO ₃ –N] 0 to 1000 mg/L [Cl [–]]	0 to 1000 mg/L [NH ₄ –N] 0 to 1000 mg/L [K ⁺]	0 to 1000 mg/L [NO ₃ –N] 0 to 1000 mg/L [Cl [–]]
Precision	5% of the measured value + 0.2 mg/L ¹		
Reproducibility	5% of the measured value + 0.2 mg/L ¹		
Response time (90%)	< 3 minutes (5 to 50 mg/L)		
Measurement interval	Continuous		
pH range	pH 5 to pH 9		
Calibration methods	Sensor code for sensor cartridge, 1 and 2-point value correction or matrix correction		
Power consumption	1 W		
Power supply	Via sc controller		
Data transfer	Via sc controller		
Ambient data			
Typical environment	Used in the biological phase of municipal waste water treatment		
Storage temperature	Sensor: –20 to 60 °C (–4 to 140 °F) Sensor cartridge: 5 to 40 °C (41 to 104 °F)		
Operating temperature	Air: –20 to 45 °C (–4 to 113 °F)		
Sample temperature	+2 to 40 °C (35 to 104 °F)		
Maximum flow velocity	< 4 m/s		
Maximum sensor immersion depth/pressure	Can be immersed to a depth of 0.3 to 3.0 m (1 to 10 ft); maximum pressure: 0.3 bar (4.4 psi).		
Maximum Compressed air output during cleaning unit operation	3.1 bar (45 psi)		

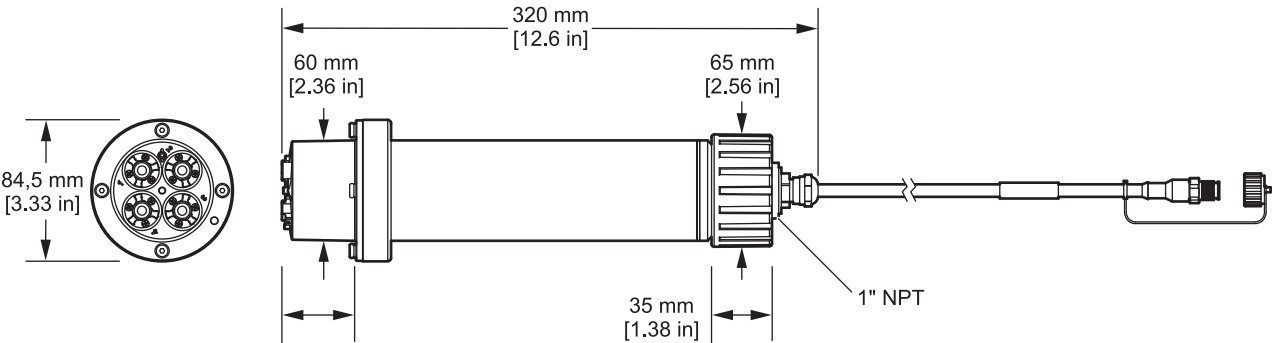
Technical data

General information about the probe	
Probe dimensions	320 mm x 84.5 mm (12.6 x 3.3 in.) (length x Ø) Refer to Figure 1, Page 6 .
Length of probe cable	Standard: 10 m (33.8 ft) Extension cables are available as an option in the following lengths: 5, 10, 15, 20, 30, 50 m (16.4, 33.8, 49.2, 65.6, 98.4, 164 ft). Maximum overall length: 100 m [328 ft]
Probe weight	Approximately 2380 g (83.95 oz)
Wetted materials	Only for immersed installations: Probe: stainless steel (1.4571), ASA + PC, silicon, PVC and PU Sensor cartridge: PVC, POM, ABS, stainless steel (1.4571), NBR Optional cleaning unit: TPE, PUR, stainless steel (1.4571)
Installation angle	45° +/- 15° vertically in flow direction

¹ With standard solutions and ISE electrodes under laboratory conditions

1.1 Dimensions

Figure 1 Probe dimensions






Section 2 General information

2.1 Safety information

Read the entire operating instructions before the instrument is unpacked, set up or put into operation. Observe all hazard and warning notes. Non-observance could lead to serious injury of the operator or damage to the device.

To make sure that the protection provided by this instrument is not impaired, do not use or install this instrument in any manner other than that specified in these operating instructions.



2.1.1 Hazard information in these operating instructions

 DANGER
Indicates a potentially or imminently hazardous situation that, if not avoided, can result in death or serious injury.
 WARNING
Indicates a potentially or imminently dangerous situation that, if it is not avoided, can lead to death or to serious injuries.
 CAUTION
Indicates a possible dangerous situation that can have minor or moderate injuries as the result.
NOTICE
Indicates a situation that, if it is not avoided, can lead to damage to the device. Information that should be particularly emphasized.

Note: Information that supplements aspects of the main text.

2.1.2 Precautionary labels

Observe all labels and tags attached to the instrument. Non-observance may result in personal injury or damage to the device. For symbols attached to the instrument, corresponding warning notes are found in the user manual.

	This symbol may be attached to the device and references the operation- and/or safety notes in the user manual.
	Electrical devices marked with this symbol may no longer be disposed of in unsorted domestic or industrial waste in Europe after August 12, 2005. According to valid provisions (EU Directive 2002/96/EC), consumers in the EU must return old electrical devices to the manufacturer for disposal from this date. This is at no cost to the consumer. Note: Contact the manufacturer or supplier for instructions on how to return end-of-life equipment, manufacturer-supplied electrical accessories and all auxiliary items for recycling or proper disposal.

2.2 General information about the probes

The probes have been developed for use in municipal waste water applications.

The ISE probes (refer to [Figure 2](#)) feature ion-selective electrodes for continuous measurement of ammonium and/or nitrate in the tank itself. They operate without reagents and require no further processing of the sample. The ammonium/nitrate ions are measured using an ion-selective electrode.

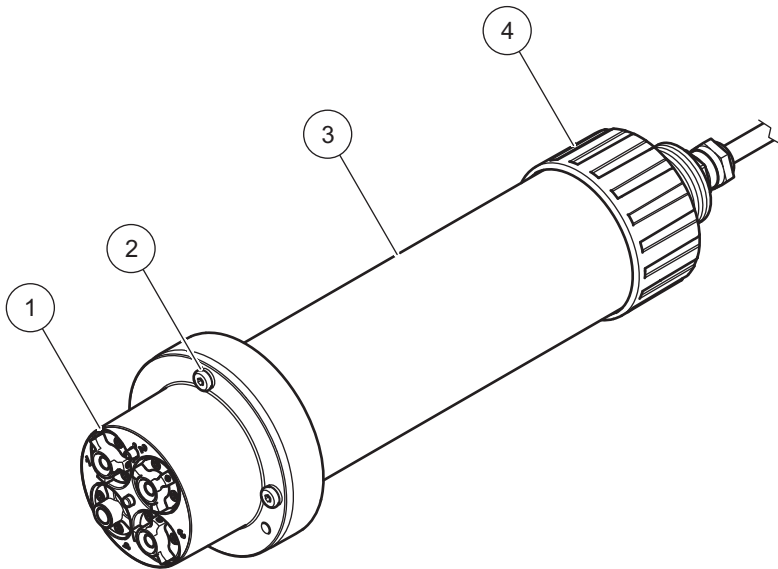
The only wearing part is the sensor cartridge (refer to [Figure 3, Page 9](#)) (order number LZY694). The sensor cartridge consists of the ion-selective electrodes for ammonium and potassium (compensation electrode for ammonium) or nitrate and chloride (compensation electrode for nitrate), a pHD reference system and a temperature sensor for comparing temperatures.

Note: Note that the nitrate and chloride electrodes are deactivated when using the AISE sc probe. When using the NISE sc probe, the ammonium and potassium electrodes are deactivated.

An additional cleaning unit designed for automatically cleaning the sensor cartridge membranes can be ordered separately. For details, refer to the instruction sheet supplied with the cleaning unit.

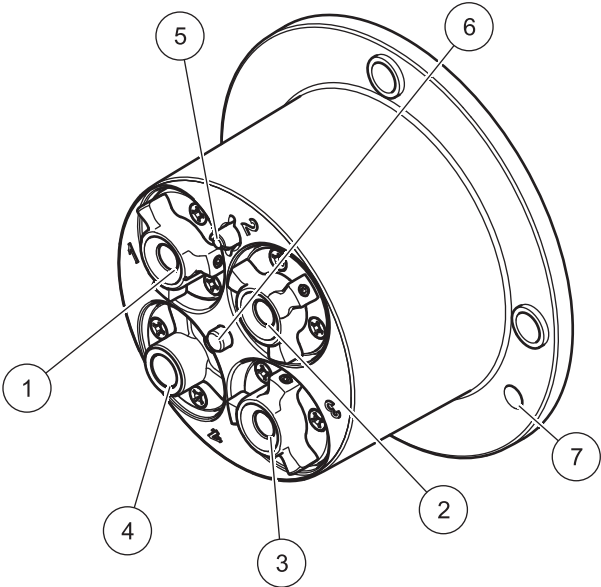
The manufacturer recommends to use the High Output Air Blast system for the compressed air supply (refer to [7.2 Accessories, page 39](#)); This is a compressor in weather-proof plastic housing.

Figure 2 ISE probe



1	Sensor cartridge	3	Probe body
2	Fixing bolt for sensor cartridge	4	Union nut

Figure 3 Sensor cartridge



1	Ammonium electrode ^{1,2}	5	Reference system
2	Nitrate electrode ^{1,3}	6	Temperature sensor
3	Potassium electrode ^{1,2}	7	Marker hole for assembling the probe
4	Chloride electrode ^{1,3}		

¹ Active with AN-ISE sc

² Active with AISE sc

³ Active with NISE sc

2.3 Functional principle

Ion-selective electrodes have a special membrane to which only a specific type of ion can adhere. As a result, an ion-specific potential forms on the membrane surface. To measure a potential difference, a reference system is required that will not be affected by the sample to be measured.

The CARTRICAL™ technology reduces cross-sensitivity by calibrating not only the individual electrodes but also the measuring electrode against the compensation electrode and the reference; this is carried out at the factory. The reference system is designed using pH-differential technology and is therefore particularly stable in terms of drift and contamination.

2.3.1 AN-ISE sc probe

The AN-ISE sc probe uses the ion-selective electrode technology to measure ammonium ions (NH_4^+) and nitrate ions (NO_3^-) in a waste water sample.

Known interfering factors due to potassium (when measuring ammonium), chloride (when measuring nitrate) and temperature are compensated by suitable built-in electrodes.

2.3.2 AISE sc probe

The AISE sc probe uses the ion-selective electrode technology to measure ammonium ions (NH_4^+) in a waste water sample.

Known interfering factors due to potassium and temperature are compensated by suitable built-in electrodes.

2.3.3 NISE sc probe

The NISE sc probe uses the ion-selective electrode technology to measure nitrate ions (NO_3^-) in a waste water sample.

Known interfering factors due to chloride and temperature are compensated by suitable built-in electrodes.

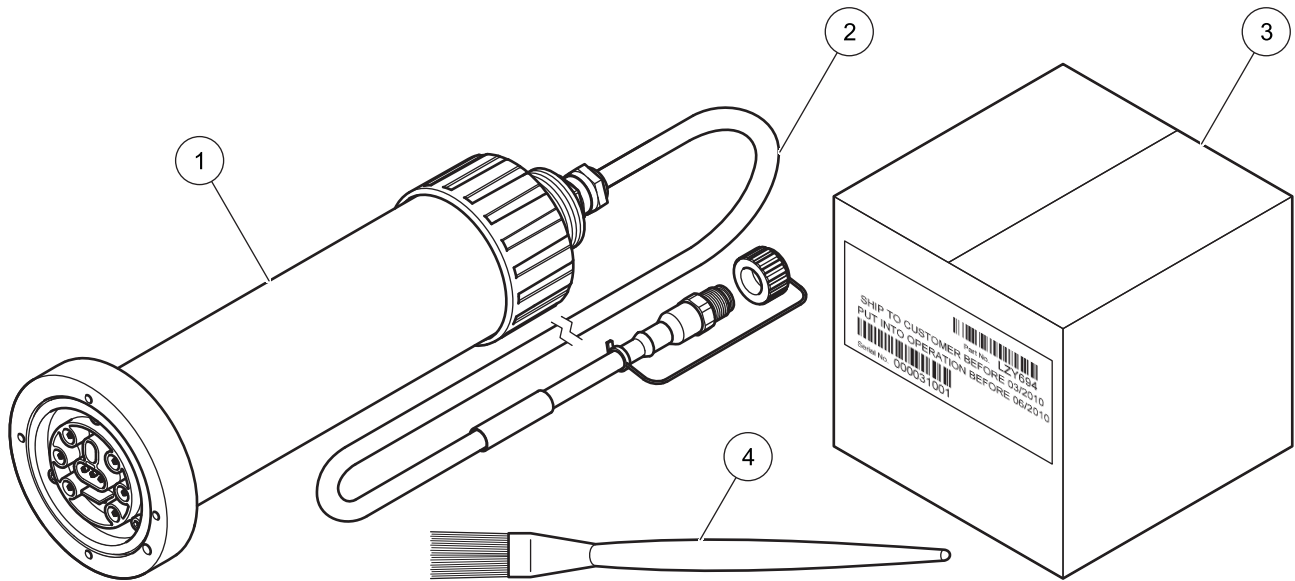
NOTICE

Only qualified personnel should conduct the tasks described in this section of the operating manual.

3.1 Unpack the probe

Remove the probe from the shipping container and inspect it for damage. Verify that all items listed in [Figure 4](#) are included. If any items are missing or damaged, contact the manufacturer or your distributor.

Figure 4 Scope of delivery



1	Probe	3	Sensor cartridge packaging
2	Probe cable	4	Cleaning brush

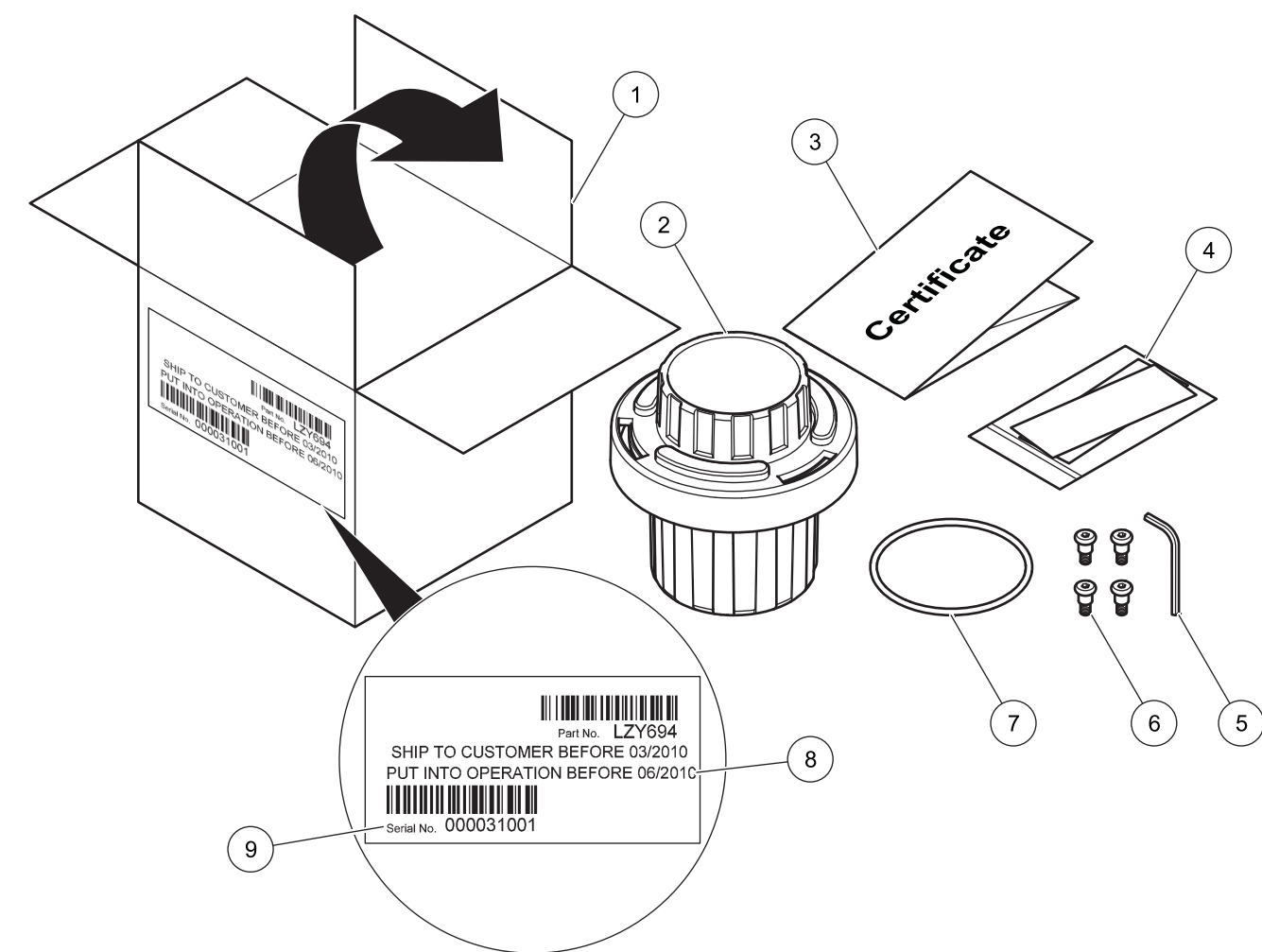
3.2 Unpack the sensor cartridge

NOTICE

Do not touch the membrane on the sensor cartridge to avoid damage of the sensor.

Make a note of the date on the sensor cartridge certificate. It is not an expiration date, but indicates the optimum date to put the sensor cartridge into operation to ensure a maximum service life.

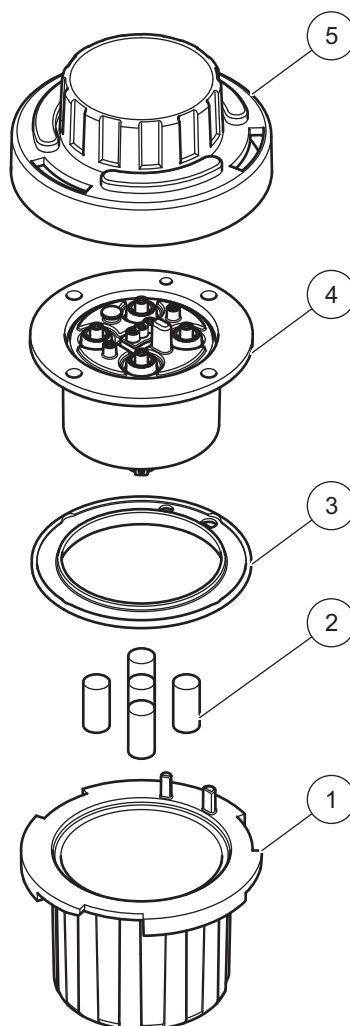
Figure 5 Sensor cartridge packaging



1	Sensor cartridge packaging	6	Socket head screws
2	Storage container for sensor cartridge	7	Black gasket
3	Test certificate for cartridge with sensor code	8	Latest date to put into operation
4	Polishing paper for chloride electrode	9	Serial Number
5	Socket head wrench		

3.2.1 Assemble the storage container including sensor cartridge

Figure 6 Storage container for the sensor cartridge

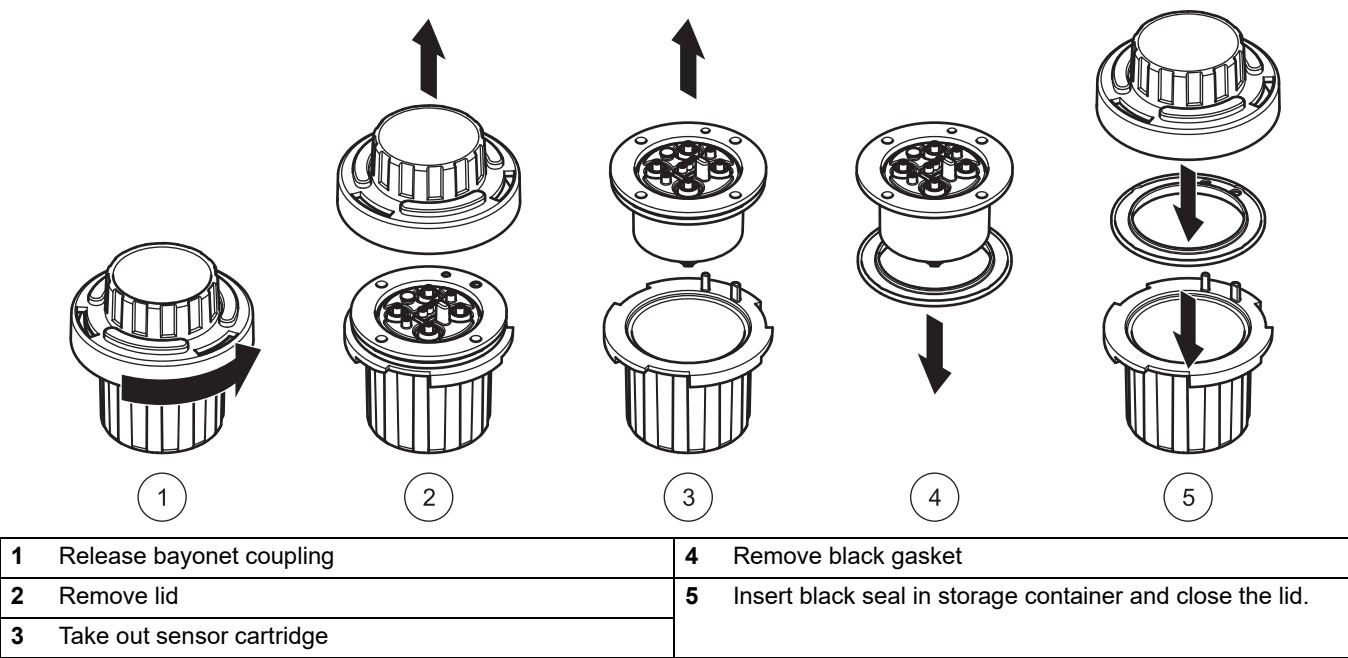


1	Storage container	4	Sensor cartridge
2	Sponges soaked in storage solution	5	Lid with bayonet coupling
3	Black gasket		

Note: Keep items 1, 2, 3 and 5 for subsequent storage of the sensor cartridge.

3.2.2 Remove the cartridge from the storage container

Figure 7 Open the storage container

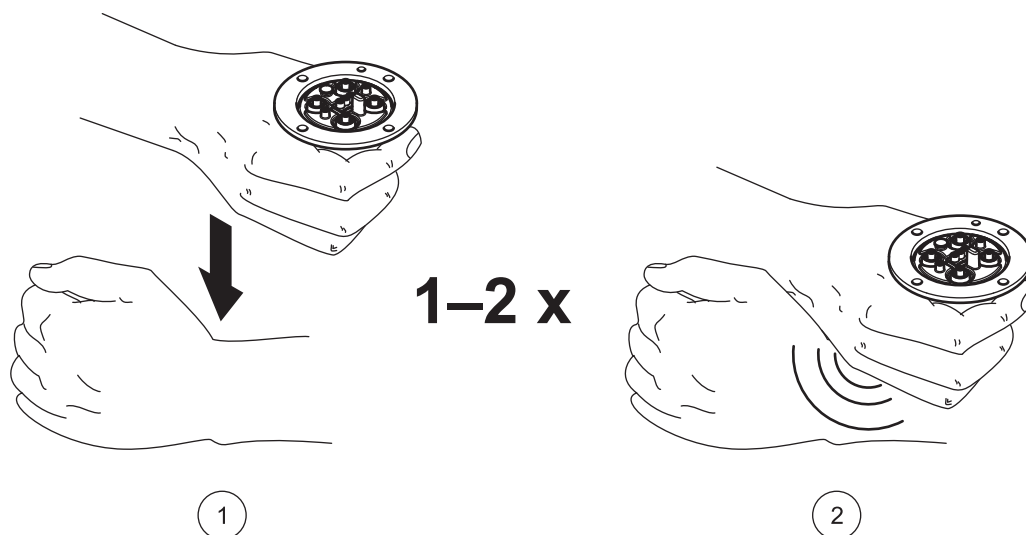


Note: This black gasket is not required for installation. It is advisable to keep the black gasket in the sensor cartridge storage container.

NOTICE

The sensor cartridge must not be in contact with air for more than 30 minutes. Make sure that the electrodes do not dry out.

Complete the following movement when you have unpacked the cartridge in order to moisten the inside of the membranes.

Figure 8 Knock the air out of the sensor cartridge

1 Hold the sensor cartridge in one hand with the membranes facing downward.

2 Now hit sharply downward over your other hand.

3.3 Probe assembly

NOTICE

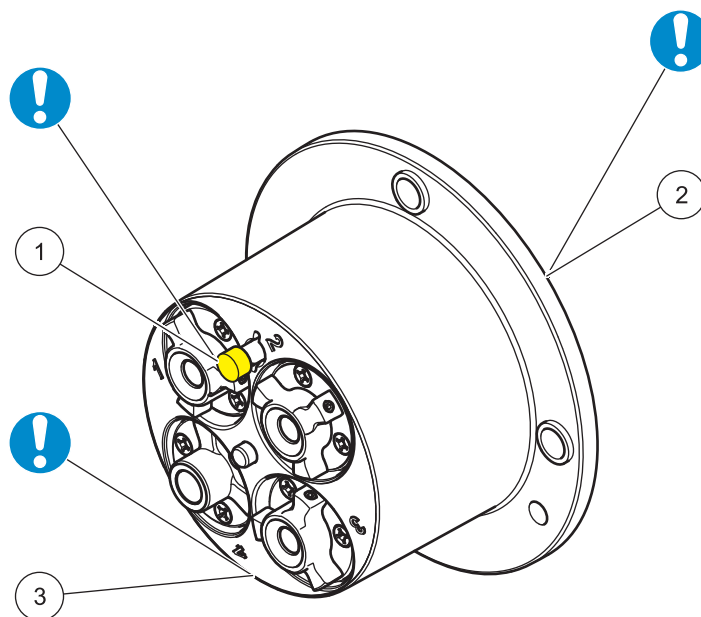
Do not touch the membrane on the sensor cartridge to avoid damage of the sensor.

1. Place the black gasket [Figure 10, Page 17](#) in the recess on the sensor body.
2. Make sure that the black gasket is correctly positioned.

NOTICE

The black gasket prevents sensor damage caused by moisture penetration.

Figure 9 Sensor cartridge



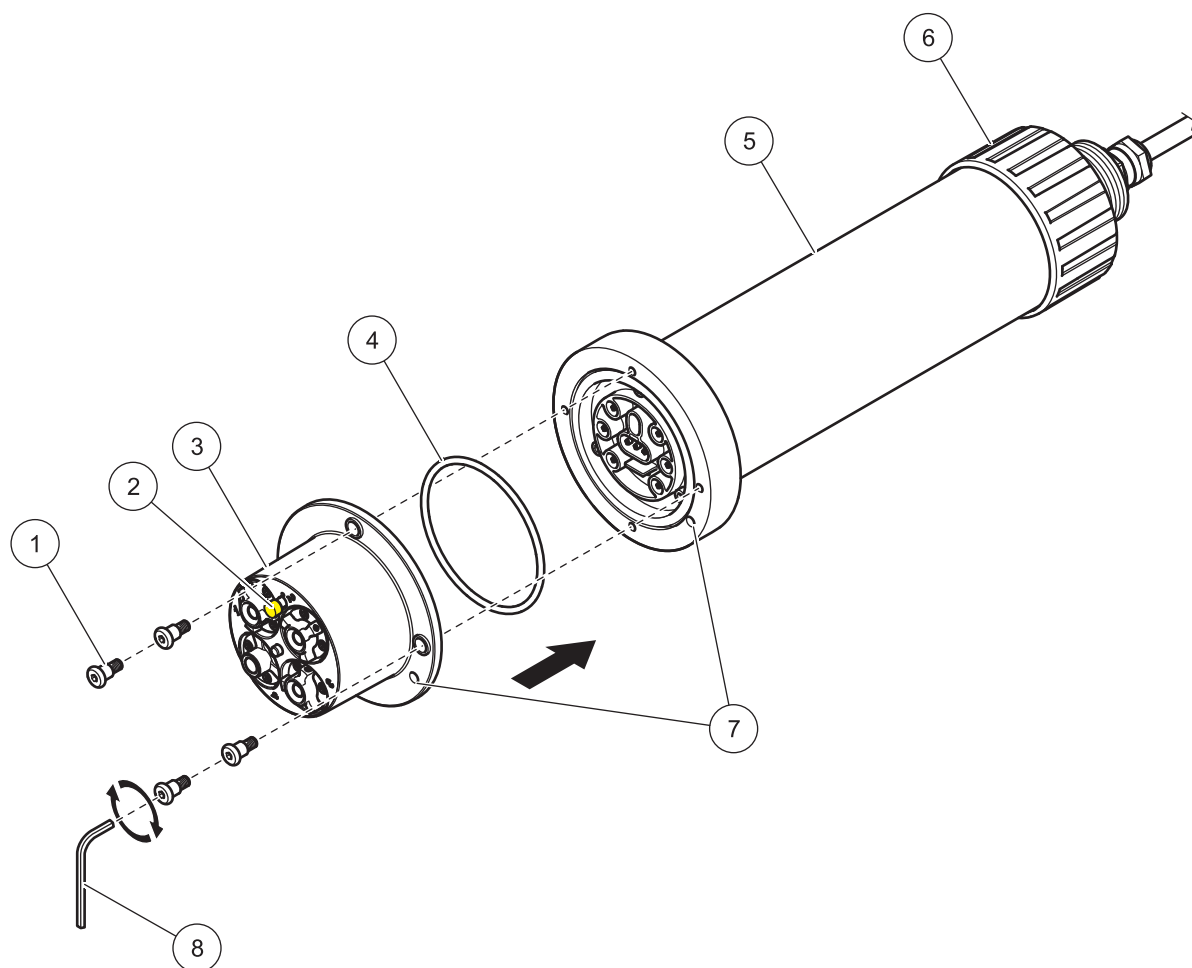
1	Reference system cap	3	Front side with membranes
2	Rear side with contacts		

NOTICE

The sensor cartridge must not be in contact with air for more than 30 minutes.
The contacts in the sensor cartridge must be dry and must not become contaminated.

3. Align the marker hole on the sensor cartridge with the marker hole on the probe adapter (refer to [Figure 10, Page 17](#))
4. Place the 4 socket head screws in the corresponding screw holes and tighten gently with the long side of the wrench. Then cross-tighten the screws by hand with the short side of the wrench. Only use the screws supplied.

Figure 10 Probe assembly



1	Socket head screw	5	Probe housing
2	Reference system cap	6	Union nut
3	Sensor cartridge	7	Marker hole
4	Black gasket	8	Socket head wrench

3.4 Installation of the cleaning unit (optional)

Refer to the installation instructions for the cleaning unit for information on how to install this on the probe.

Use the relay control on the sc controller to set the cleaning interval. Select RTC (Real Time Clock) as the signal source. For details on more advanced relay configuration, refer to the User Manual for the relevant sc controller.

3.5 Installation of the probe in the sample flow

NOTICE

Handle the sensor cartridge carefully and avoid contact with the membranes when installing the sensor.

There are mounts with separate installation instructions available for installation of the probe, with or without a cleaning unit, to suit a number of different requirements.

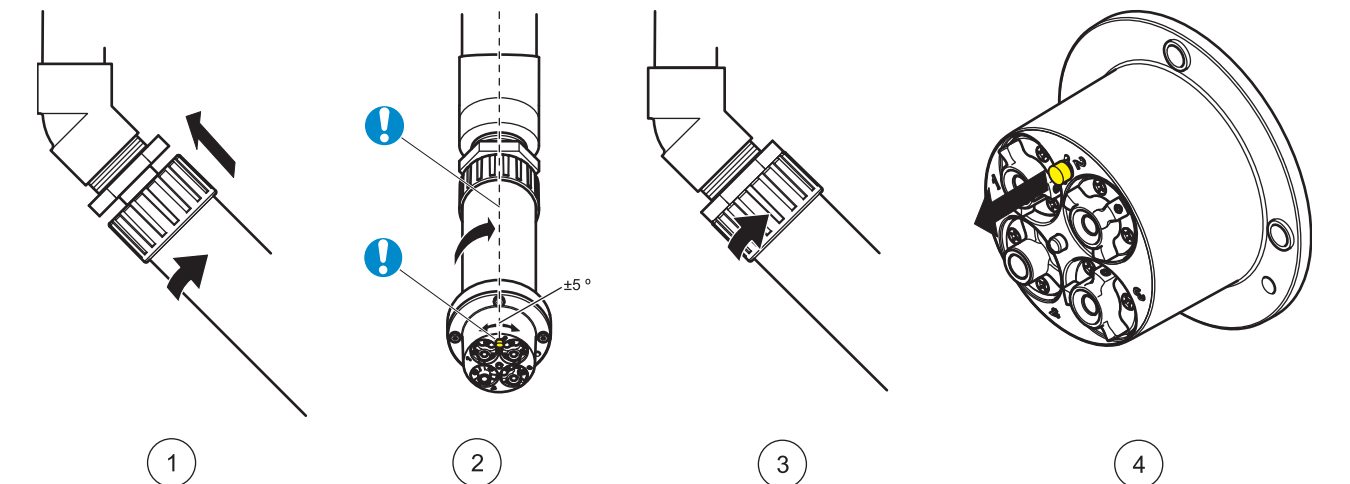
Always observe the following prior to installation:

- The probe must be aligned with the bracket, as described in [section 3.5.1, page 18](#).
- Position the probe at a distance of at least 200 mm (7.87 in.) from the tank wall.
- If the probe is attached using a chain mount, make sure that the probe cannot strike the tank wall.
- Immerse the probe at an angle of approx. $45^{\circ} \pm 15^{\circ}$.
- Make sure that the probe is fully immersed.
- When using the cleaning unit, refer to the supplied instruction sheet.

3.5.1 Position of the probe on the mount

The probe must be attached in a specific position on the mount:

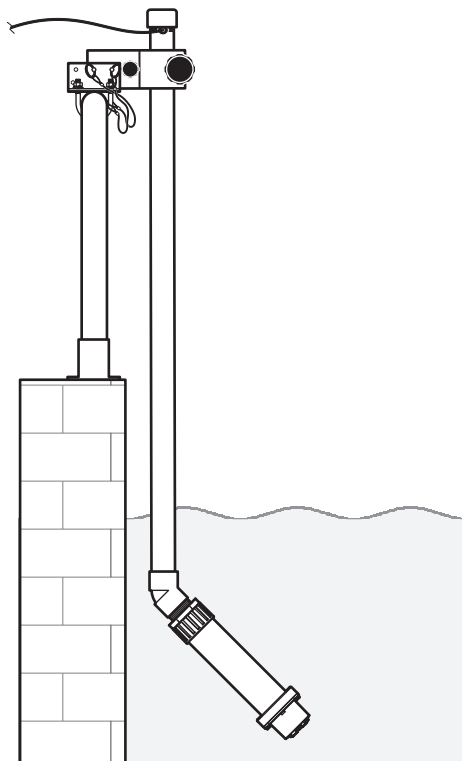
Figure 11 Mount the probe



1	Mount the probe on the bracket. 45° adapter and transition piece should be preassembled.	3	Attaching the aligned probe to the bracket using the union nut
2	Aligning the probe using the colored reference system cap. The salt bridge should be oriented upward (12 o' clock, +/- 5°).	4	Removing the reference system cap

3.5.2 Example of mounting the probe

Figure 12 Example of mounting the probe using a rail mount



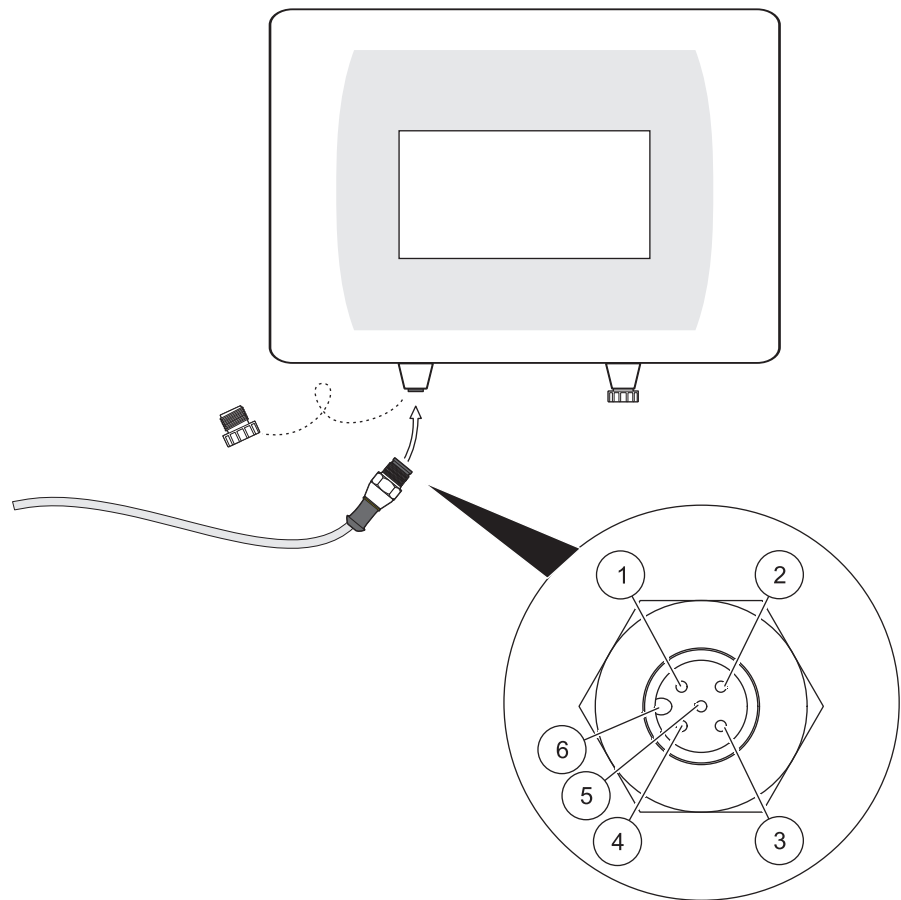
3.6 Connect the probe to the sc controller (non-hazardous location) with screw fittings

The probe cable is supplied with a screw fitting with reverse polarity protection (refer to [Figure 13, Page 20](#)). Retain the connector cap to seal the connector opening in case the probe ever needs to be removed. Additional extension cables are available to increase the probe cable length.

1. Unscrew the protective cap from the socket on the controller.
2. Insert the connector into the socket and hand-tighten the union nut.

Note: The middle connection on the sc1000 controller must not be used for probes as this is reserved for the display module.

Figure 13 Connecting the probe to the sc controller with the screw fitting



Number	Description	Cable color
1	+12 VDC	Brown
2	Earth	Black
3	Data (+)	Blue
4	Data (-)	White
5	Shield	Shield (gray)
6	Guide	

Section 4 Operation

4.1 How to use an sc controller

The probe can be used with all sc controllers. Become familiarized with the controller's functions before using the probe.

4.2 Sensor setup

When the sensor is connected for the first time, the sensor serial number is displayed as the name of the sensor. To change the sensor name.

1. Open the MAIN MENU.
2. Select SENSOR SETUP and confirm.
3. Select the corresponding sensor and confirm.
4. Select CONFIGURE and confirm.
5. Select EDIT and confirm.
6. Edit the name and confirm to return to the CONFIGURE menu.
7. Check the sensor configuration and adjust as needed to meet requirements.
8. Go back to the MAIN MENU or the Measurement mode display.

4.3 Sensor data logger

Pro Sensor provides a data memory and event memory within the sc controller. The data memory is used to store measurement data at preset intervals; the event memory stores events such as configuration changes, alarms and warning conditions. Both memories can be read in CSV format (refer to the operating instructions for the sc controller).

4.4 Sensor diagnostics menu

SENSOR STATUS		
AN-ISE sc or AISE sc or NISE sc		
ERROR LIST	Shows all current error messages.	
WARNING LIST	Shows all current warnings.	

4.5 Sensor menu

The following table shows the sensor menu for the AN-ISE sc probe, AISE sc probe and NISE sc probe. If a menu item does not apply to all three probes, its applicability is explained in footnotes.

Footnote ¹ indicates applicability to the AN-ISE sc probe. The AN-ISE sc probe is used to determine the ammonium and nitrate concentration, as well as the potassium and chloride concentration.

Footnote ² indicates applicability to the AISE sc probe. The AISE sc probe is used to determine the ammonium and potassium concentration.

Footnote ³ indicates applicability to the NISE sc probe. The NISE sc probe is used to determine the nitrate concentration and chloride concentration.

Operation

SENSOR MENU		
AN-ISE sc or AISE sc or NISE sc		
CALIBRATE		
MATRIX CORR	Matrix correction options. The most recently used menu is displayed. The currently active corrections are shown in Information.	
NONE	No MATRIX CORR. is activated	
MATRIX 1	1-point matrix correction	
NH4 + NO3 ¹	1 point matrix correction for ammonium and nitrate	
NH4 ^{1,2}	1-point matrix correction for ammonium	
NO3 ^{1,3}	1 point matrix correction for nitrate	
NH4 + K ^{1,2}	1 point matrix correction for ammonium and potassium	
NO3 + CL ^{1,3}	1 point matrix correction for nitrate and chloride	
NH4+K NO3+CL ¹	1 point matrix correction for ammonium, potassium, nitrate and chloride	
TAKE SAMPLE IMMEDIATELY AND ANALYSE IN LABORATORY	Information window: When this window appears, the sample must be taken immediately and then analyzed in the laboratory.	
VALUE CORR. 1	Perform 1 point value correction. The most recently used menu is displayed. The currently active corrections are shown in Information.	
NH4–N ¹	Select parameter for the 1 point value correction	
NO3–N ¹		
VALUE POINT	Enter the values for the 1 point value correction Note: The following example shows the input when using a AN-ISE sc probe for ammonium. When using the AISE sc probe, the input is the same. When using the NISE sc, it is only possible to input the nitrate and chloride values.	
AN-ISE SC NH4–N	Enter the displayed ammonium value	
AN-ISE SC K	Enter the displayed potassium value	
LAB NH4–N	Enter the laboratory ammonium value	
ENTRY COMPLETE	Confirm the values entered	
CORR-RESULT	Display the correction results	
VALUE CORR. 2	Perform 2-point value correction	
NH4–N ¹	Select parameter for the 2 point value correction	
NO3–N ¹		
VALUE POINT 1	Enter the values for the 2 point value correction (first point) Note: The following example shows the input when using a AN-ISE sc probe for ammonium. When using the AISE sc probe, the input is the same. When using the NISE sc, it is only possible to input the nitrate and chloride values.	
AN-ISE SC NH4–N	Enter the displayed ammonium value	
AN-ISE SC K	Enter the displayed potassium value	
LAB NH4–N	Enter the laboratory ammonium value	
ENTRY COMPLETE	Confirm the values entered	

SENSOR MENU		
VALUE POINT 2		Enter the values for the 2 point value correction (second point). Note: The following example shows the input when using a AN-ISE sc probe for ammonium. When using the AISE sc probe, the input is the same. When using the NISE sc, it is only possible to input the nitrate and chloride values.
	AN-ISE SC NH ₄ -N	Enter the displayed ammonium value
	AN-ISE SC K	Enter the displayed potassium value
	LAB NH ₄ -N	Enter the laboratory ammonium value
	ENTRY COMPLETE	Confirm the values entered
	CORR-RESULT	Display the correction results
FURTHER CORR.		Other matrix correction options
None		No FURTHER CORR. is activated
MATRIX 2		A 2-point matrix correction can be performed here
	NH ₄ ¹	Parameter selection for the MATRIX2 correction.
	NO ₃ ¹	
	MEAS CONC 1	Saves the currently measured measurement for the first point
	DATE	Displays the date of the current correction of the first point
	CONC. LABVALUE 1	Entry and display of reference value for the first point
	MEAS CONC 2	Saves the currently measured measurement for the second point
	DATE	Displays the date of the current correction of the second point
	CONC. LABVALUE 2	Entry and display of the reference value for the second point
HIST. CORR.		Selection of one of the last corrections performed
SENSOR CODE		The sensor code can be activated or entered here
	ACTIVATION	Activates the sensor code for the individual channels
	NH ₄ + K ¹	Activate the sensor code for ammonium and potassium
	NO ₃ + CL ¹	Activate the sensor code for nitrate and chloride
	NH ₄ +K NO ₃ +CL ¹	Activate the sensor code for ammonium, potassium, nitrate and chloride
	FACTORY CALIBRATION	Activates factory calibration
INPUT		Entry of the sensor code
ENTER CORR.		The laboratory values of the last matrix correction can be changed
ENTER LABVALUE (displayed when MATRIX 1 or MATRIX 2 is performed)		Enter the laboratory values if MATRIX 1 or MATRIX 2 has been selected
AMMONIUM ^{1,2}		Entry of ammonium laboratory value
NITRATE ^{1,3}		Enter the laboratory value for nitrate
POTASSIUM ^{1,2}		Enter the laboratory value for potassium
CHLORIDE ^{1,3}		Enter the laboratory value for chloride
ENTRY COMPLETE		Confirm the values entered
CORR-RESULT		Display the correction results
NH ₄ -N ^{1,2}		Displays whether or not the ammonium correction was successful
NO ₃ -N ^{1,3}		Shows whether or not the nitrate correction was successful
K ⁺ ^{1,2}		Displays whether or not the potassium correction was successful
CL ^{1,3}		Displays whether or not the chloride correction was successful

Operation

SENSOR MENU		
INFORMATION		Information on the matrix correction used per parameter
	NH ₄ -N ^{1,2}	Matrix correction used for ammonium
	NO ₃ -N ^{1,3}	Matrix correction used for nitrate
	K ⁺ ^{1,2}	Matrix correction used for potassium
	CL ^{1,3}	Matrix correction used for chloride
CONFIGURE		
EDIT NAME		Enter or edit the name. Up to 10 alphanumeric characters
MEAS UNITS		Select either mg/L or ppm as the measurement unit
PARAMETERS		Select NH ₄ -N or NH ₄ and/or NO ₃ -N or NO ₃
TEMP UNITS		Selection of °C or °F as temperature unit
TEMP OFFSET		Enter a temperature offset
RESPONSE TIME		Entry of the response time (30 sec to 300 sec)
DATALOG INTRVL		Select the data log interval (OFF, 30 sec, 1 min, 2 min, 5 min, 10 min, 15 min and 30 min), 5 min is the factory setting
K ⁺ COMPENSATE ^{1,2}		Select automatic potassium compensation: On Off 0 = compensation OFF 0.1–2000 mg/L CL = Fixed compensation value
SET K ⁺ CONC ^{1,2}		Only shown when K ⁺ COMPENSATE is OFF
CL COMPENSATE ^{1,3}		Select automatic chloride compensation: On Off 0 = compensation OFF 0.1–2000 mg/L CL = Fixed compensation value
SET CL CONC ^{1,3}		Only shown when CL COMPENSATE is OFF
FACTORY CONFIG		Resets the configuration to the factory setting
DIAG/TEST		
SENSOR INFO		Information on the connected sensor
	SENSOR NAME	Name of the connected sensor
	EDIT NAME	Serial number or name of the measurement location
	SERIAL NUMBER	Serial number of the connected sensor
	SENSOR TYPE	Instrument designation of the connected sensor
	CODE VERS	Software version
CAL DATA		Data of the selected MATRIX correction and information about slope and offset of the individual channels, for example
	NH ₄ -N ^{1,2}	Matrix correction selected for ammonium
	NO ₃ -N ^{1,3}	Matrix correction selected for nitrate
	K ⁺ ^{1,2}	Matrix correction selected for potassium
	CL ^{1,3}	Matrix correction selected for chloride

SENSOR MENU		
SIGNALS		Signals and measurement results of the individual measurement channels
	AMMONIUM ^{1,2}	Display the signals and measurement results for ammonium
	NITRATE ^{1,3}	Shows the signals and measurement results for nitrate
	POTASSIUM ^{1,2}	Display the signals and measurement results for potassium
	CHLORIDE ^{1,3}	Display the signals and measurement results for chloride
	REF. ELECTRODE	Displays the signals and measurement results for the reference system
	MV RAW	Display the signals and measurement results for MV RAW
	IMPED STATUS	Display the signals and measurement results for impedance
	TEMP	Display the signals and measurement results for temperature
	HUMIDITY	Display the signals and measurement results for humidity
	RFID	Display the signals and measurement results for RFID
CAL DAYS		Shows the age of the last matrix correction
	AMMONIUM ^{1,2}	Display the age of the last matrix correction for ammonium
	NITRATE ^{1,3}	Display the age of the last matrix correction for nitrate
SERVICE		
	TEST CARTRIDGE	Perform a sensor check with the test cartridge
TEST CARTRIDGE READY? PRESS ENTER		
	TEST CARTRIDGE	Display whether the individual sensor channels are OK or not
	DIAG/TEST	Displays whether or not DIAG/TEST is OK
	GNDROD	Displays whether or not GNDROD is OK
	REF	Displays whether or not REF channel is OK
	NO3 ^{1,3}	Displays whether or not NO3 channel is OK
	NH4 ^{1,2}	Displays whether or not NH4 channel is OK
	ORP	Displays whether or not ORP channel is OK
	CL ^{1,3}	Shows whether or not Cl channel is OK
	K+ ^{1,2}	Displays whether or not K channel is OK
	TEMP	Displays whether or not temperature channel is OK
CHANGE CARTR.		Follow the menu process
CLEANING		Follow the menu process

¹ Applies to AN-ISE sc

² Applies to AISE sc

³ Applies to NISE sc

4.6 Calibration/matrix correction

The four electrodes with the reference system of the compact sensor cartridge were calibrated with one another at the factory using special standard solutions (CARTICAL™). However, the membranes on the ion-selective electrodes are not 100% selective due to other substances that may affect the measurement. Perform a matrix correction (refer to [4.6.4, page 28](#)) to compensate for other ions present on the ISE electrodes.

Potassium has the largest interference effect on the ammonium membrane, while chloride has the largest effect on the nitrate membrane. The AN-ISE sc probe compensates for this problem with the aid of a built-in potassium/chloride electrode.

When using the AISE sc probe, only the ammonium membrane and the integrated potassium electrode are active.

When using the NISE sc probe, only the nitrate membrane and the integrated chloride electrode are active.

Cross sensitivities between ammonium and potassium/nitrate are automatically eliminated. Solids do not interfere with the measurement. Due to matrix effects, correction and validation cannot be performed with standard solutions. A matrix correction can be carried out quickly and easily at any time.

NOTICE

A matrix correction may only be performed if the sensor has been immersed in the corresponding waste water matrix for over 12 hours. This is the minimum time required to adapt the ISE membranes to the waste water matrix.

4.6.1 Sensor code calibration

The sensor code is a calibration code and is delivered with the sensor cartridge certificate. It contains the factory calibration described in [section 4.6, page 25](#) for the sensor cartridge.

Instruments with automatic sensor code recognition (LXG440.99.x000x) read this automatically and assume the Cartrical calibration.

Instruments without automatic sensor code recognition (LXG440.99.x001x) require the sensor code to be entered during the initial setup and whenever a new sensor cartridge is activated. If the sensor code certificate has been lost, carry out factory calibration (under the sensor code menu) as a temporary solution.

After activating the code, the sensor is fully calibrated but not yet adapted to the specific matrix of the relevant application on a waste water treatment plant. At least 12 hours must elapse before a matrix correction is performed to allow the cartridge to adapt to the specific matrix.

Proceed as follows to change the sensor code:

1. Select **SENSOR MENU > AN-ISE SC** or **AISE SC** or **NISE SC > CALIBRATE > FURTHER CORR. > SENSOR CODE > ENTER**
2. Enter the sensor code.
3. Press **ENTER** to confirm and activate the sensor code. The day meter for the cartridge is set to zero.

All old calibration data are now overwritten with the new calibration data from the sensor code. The sensor code data is checked by the system. If an error is indicated, check the sensor code and, if necessary, enter the sensor code again.

4.6.2 Matrix correction via LINK2SC

The LINK2SC procedure offers a secure method of data exchange between process probes and LINK2SC-compatible photometers using an SD memory card or via a local area network (LAN). Two different options are available:

- a. The pure laboratory control measurement
- b. A matrix correction that involves the measurement data generated in the laboratory being used to correct the probe

During a pure control measurement, the measurement data is transferred from the probe to the photometer where it is then archived together with the photometric reference data that has been recorded.

During a matrix correction, the reference data generated in the laboratory is transferred to the probe to be used for the correction.

The matrix correction process requires operating steps to be completed on the sc controller and on a LINK2SC-compatible photometer.

Refer to the LINK2SC user manual for a detailed description of the LINK2SC procedure.

When using the LINK2SC software, sections 4.6.3 and 4.6.4 are not relevant.

4.6.3 Matrix correction – manual

ISE probes offer different options (refer to Table 1) for correcting the sensor value with laboratory values (as a reference value).

The laboratory value of the water sample is entered as nitrate nitrogen ($\text{NO}_3\text{-N}$) and/or as ammoniacal nitrogen ($\text{NH}_4\text{-N}$). This laboratory value replaces the prior value measured by the sensor.

Table 1 Correction options for ISE probes

Correction option	Application
MATRIX 1	A MATRIX 1 is the most commonly used correction option and performs a 1 point matrix correction for ammonium and/or nitrate (4.6.4.1, page 28). It is advisable to perform a MATRIX1 as the first correction . The Matrix1 correction can be performed both with and without correction of the compensation electrodes (potassium or chloride); in most cases, it is sufficient to perform it without correction. A correction featuring potassium and/or chloride is only necessary if a high level of accuracy is required. With a MATRIX1, a sample must be taken when the correction is triggered and analyzed in the laboratory. The MATRIX1 is activated when the laboratory value is entered.
VALUE CORR. 1	Value correction 1 (correction at one concentration point) corresponds to a MATRIX1 correction with an alternative entry format . Comparison values between the ISE probe and the laboratory can be collected over a period of around a week with this correction. The correction can be performed at a later stage.
VALUE CORR. 2	Value correction 2 (correction at 2 different concentration points) should be performed if dynamic concentration fluctuations are present over at least half a decade¹ and a MATRIX1 or VALUE CORR. 1 does not achieve a sufficiently accurate result . Comparison values between the ISE probe and the laboratory can be collected over a period of around a week with this correction. The correction can be performed at a later stage.
MATRIX 2	The MATRIX 2 correction corresponds to a VALUE CORR. 2, but uses an alternative entry format and is recommended if there is a dynamic process with a large nitrate/ammonium fluctuation greater than at least half a decade ¹ . With a MATRIX2, a sample must be taken for both points when the correction is triggered and analyzed in the laboratory. The MATRIX2 is activated when the laboratory value is entered.
HIST. CORR.	Return to one of the last matrix and value corrections performed if a correction has not produced a successful result .

¹ Examples of half a decade: The concentration of nitrogen nitrate shifts between 1 and 5 mg $\text{NO}_3\text{-N}$ or between 5 and 25 mg/L $\text{NO}_3\text{-N}$. ($\text{conc2} = (\text{conc1} \times 10)/2$)

4.6.4 Performing the matrix correction

Note: Take laboratory value measurements or reference values promptly or, alternatively, take these from the stabilized sample. This will prevent changes in sample concentration, as time is a factor in comparative tests.

Refer to [7.3 Validation accessories, Page 39](#) for recommended laboratory measurement tests.

4.6.4.1 MATRIX 1 correction (1 point matrix correction)

Proceed as follows to perform MATRIX 1:

CALIBRATE
MATRIX CORR
FURTHER CORR.
INFORMATION

1. Select **SENSOR MENU > AN-ISE SC** or **AISE SC** or **NISE SC > CALIBRATE > MATRIX CORR..**
2. Select **MATRIX 1** from the selection window and press **ENTER**.
3. Select the parameters you wish to correct and confirm by pressing **ENTER**.

Selection options for AN-ISE sc:

NH₄ + NO₃; NH₄; NO₃; NH₄ + K; NO₃ + Cl; NH₄ + K NO₃ + Cl

Selection options for AISE sc:

NH₄; NH₄ + K

Selection options for NISE sc:

NO₃; NO₃ + Cl

MATRIX 1
TAKE SAMPLE
IMMEDIATELY
AND ANALYSE
IN LABORATORY

The sensor saves the current values of the selected parameters at this point.

4. Take a water sample immediately from the closest point possible to the sensor. Filter the sample as quickly as possible and carry out a **prompt** laboratory analysis of the selected parameters, as the measurement value can change quickly.

When the laboratory value has been determined, proceed as follows:

CALIBRATE
MATRIX CORR
FURTHER CORR.
LABORW: EING.
INFORMATION

5. Select **SENSOR MENU > AN-ISE SC** or **AISE SC** or **NISE SC > CALIBRATE > ENTER LABVALUE.**
6. The laboratory values for the parameters can only be entered if the MATRIX1 correction has been selected beforehand. Once the laboratory values have been entered, select **ENTRY COMPLETE** to confirm.

When the entered laboratory value is confirmed, the matrix correction is activated.

7. Once the correction is activated, the result **CORR-RESULT** is shown.

Note: This process must always be carried out in full to make sure the matrix correction is completed successfully.

If a correction does not produce a successful result, calculations are made with the previous correction.

4.6.4.2 Value correction 1

CALIBRATE
MATRIX CORR
FURTHER CORR.
INFORMATION

The one-point value correction **VALUE CORR. 1** offers the option of retrospectively performing a matrix correction at one point (**MATRIX1**).

1. Take several samples with different concentrations on various days, preferably within one week. Analyze the samples in the laboratory. During the time the samples are being taken, the sample temperature should vary a maximum of 5 °C, as temperature changes are not taken into account in the value correction.
2. Make a note of the two values measured in the samples and displayed for the parameters to be corrected (ammonium and potassium values, or nitrate and chloride values)
3. Also note the laboratory values measured for ammonium or nitrate.

These three values form the correction point.

4. From the values taken, select a correction point that lies in the middle of the expected concentration range.
5. Go to the sensor menu and select **CALIBRATE > MATRIXCORR > VALUE CORR. 1** and confirm by pressing **ENTER**.
6. Select the parameter¹ (NH₄-N or NO₃-N) that requires correction.

Note: The example opposite shows the NH₄-N and K correction of the AN-ISE sc probe.

7. Enter the three values for the sought correction point and confirm with **ENTRY COMPLETE** to activate the correction.

Correction result **CORR-RESULT** is shown.

Note: If a correction does not produce a successful result, calculations are made with the previous correction.

After successful completion of value correction, the corrected value is shown as the display value for ammonium or nitrate the next time the menu is opened.

4.6.4.3 Value correction 2

CALIBRATE
MATRIX CORR
FURTHER CORR.
INFORMATION

The two-point value correction **VALUE CORR. 2** makes it possible to perform a subsequent 2-point correction (**MATRIX2**) to achieve higher accuracy for a larger concentration range.

Note: Value correction 2 and MATRIX 2 are comparable from a calculation perspective.

1. Take several samples on various days with different concentrations, preferably within a week, and perform an analysis of the samples in the laboratory. During the time the samples are being taken, the sample temperature should be around a maximum of 5 °C, as temperature changes are not taken into account in the value correction.

Note: The **MATRIX CORR. 2 concentrations should be within a range greater than half a decade**. The following formula can assist in the calculation of the half decade:

$$\text{Conc2} \geq \frac{\text{Conc1} \times 10}{2}$$

2. Make a note of the two values measured with the sensor in the samples and displayed for the parameters to be corrected (ammonium and potassium values, or nitrate and chloride values).
3. Also note the laboratory value measured for ammonium or nitrate.

¹Applies to AN-ISE sc

All three values form one of the two correction points.

4. Look for two correction points where the laboratory values are at least half a decade apart and display typical operating conditions for the installation.
5. Go to the sensor menu and select **CALIBRATE > MATRIX CORR > VALUE CORR. 2** then confirm with **ENTER**.
6. Select the parameter¹ (NH₄-N or NO₃-N) that requires correction.

Note: When using the AN-ISE sc probe, you can only correct one parameter at a time. If both parameters need to be corrected, the procedure must be performed again.

VALUE POINT 1
AN-ISE SC NH4-N
AN-ISE SC K
LAB NH4-N
ENTRY COMPLETE

7. Enter the three values for the first correction point and confirm with **ENTRY COMPLETE**.

Note: The example opposite shows the NH₄-N and K correction of the AN-ISE sc probe.

VALUE POINT 2
AN-ISE SC NH4-N
AN-ISE SC K
LAB NH4-N
ENTRY COMPLETE

8. To activate the correction, enter the three values for the second correction point and confirm with **ENTRY COMPLETE**.

Correction result **CORR-RESULT** is shown.

Note: If a correction does not produce a successful result, calculations are made with the previous correction. After successful completion of value correction, the corrected value is shown as the display value for ammonium or nitrate the next time the menu is opened.

4.6.4.4 MATRIX 2 correction (2 point matrix correction)

Proceed as follows to perform MATRIX 2:

AMMONIUM
CONC MEAS1
DATE
CONC. LABVALUE.1
MEAS CONC 2
DATE
CONC. LABVALUE 2

1. Select **SENSOR MENU > AN-ISE SC** or **AISE SC** or **NISE SC > CALIBRATE > FURTHER CORR..**
2. Select **MATRIX 2** from the selection window and press **ENTER**.
3. Select the parameters¹ requiring a two-point matrix correction.
4. Select the point to be corrected.
5. **SELECT MEAS CONC 1** or **MEAS CONC 2**
6. Take a water sample from the closest point possible to the sensor. Filter this sample promptly and perform an immediate laboratory analysis of the selected parameters. The measurement value can change very quickly:

When the laboratory value has been determined, proceed as follows:

7. Select **SENSOR MENU > AN-ISE SC** or **AISE SC** or **NISE SC > CALIBRATE > FURTHER CORR. > MATRIX2**
8. Select the parameters to be corrected with the laboratory value entry:
9. Enter the laboratory reference value and confirm.

The **MATRIX2 CORR.** is activated when the entry is confirmed for both points.

¹Applies to AN-ISE sc

NOTICE

Only qualified personnel should conduct the tasks described in this section of the operating manual.

5.1 Maintenance schedule

Maintenance task	30 days ¹	6 months
Clean the probe ²	x	
Replace the sensor cartridge ^{3, 4}		x
Check probe for damage	x	
Compare the measured value with a reference laboratory analysis and correct the values as required via a matrix correction ³	x	

¹ Recommended: Weekly during the first month of operation

² The frequency of cleaning depends on the application. Some applications may require cleaning to take place more or less frequently.

³ In typical operating conditions, a different interval may be required depending on the specific application and local conditions.

⁴ Sensor cartridges are wearing parts and are not covered by the instrument warranty.

Note: Do not test the sensor with the usual $\text{NH}_4\text{-N}$ and/or $\text{NO}_3\text{-N}$ standard solutions, as the ion strength of normal solutions is not high enough.

5.2 Clean the sensor

NOTICE

Do not touch the membranes with fingers. To avoid scratches, do not clean the sensor cartridge using sharp objects and do not use chemical cleaning agents.

1. Clean the sensor cartridge using the soft brush supplied.
2. Clean the probe body (not the sensor cartridge) with a sponge or brush.
3. Rinse the sensor with clean, lukewarm water.

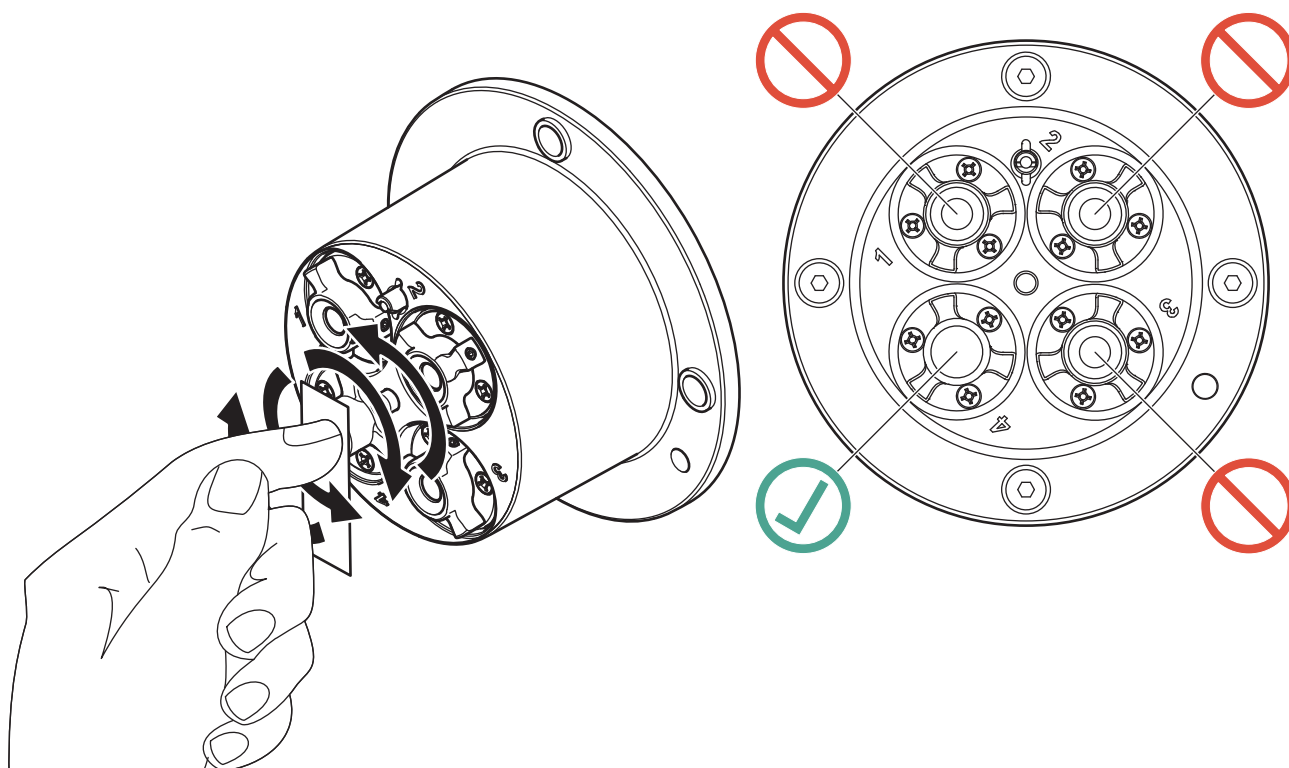
5.2.1 Polish the chloride electrode (AN-ISE sc and NISE sc only)

Polish the chloride electrode if it looks heavily coated/contaminated. After polishing, a new nitrate + chloride MATRIX1 correction should be performed after 12 hours.

NOTICE

Only use the LZY671 polishing paper supplied.

Figure 14 Chloride electrode



5.3 Replace the sensor cartridge

The sensor cartridge is replaced as described below and in [Figure 15, Page 33](#).

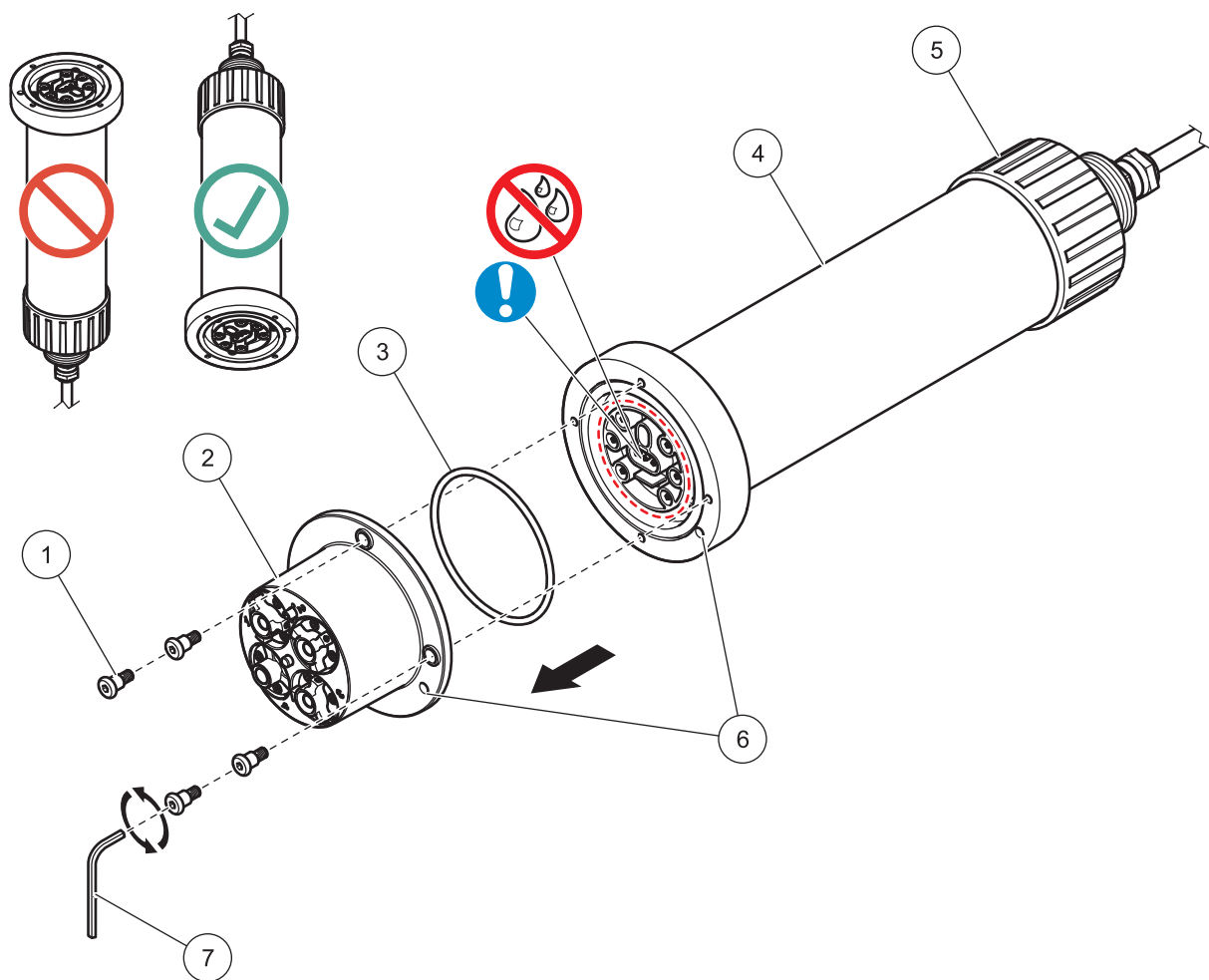
1. Replace the cartridge using menu item
AN-ISE SC or AISE SC or NISE SC > DIAG/TEST > SERVICE > CHANGE CARTR..
2. Clean the probe and thoroughly dry the sensor cartridge and probe adapter.
3. Loosen the 4 socket head screws.

NOTICE

The sensor cartridge must point downward such that no water can run into the probe adapter. Pay attention to the contacts between the probe and the sensor cartridge. These contacts must remain dry.

4. Pull the sensor cartridge out of the probe adapter and discard the old sensor cartridge as per the applicable regulations.
5. Make sure that a new black gasket is installed every time the sensor cartridge is replaced. Before the gasket is installed, clean the surface that faces the cartridge and the groove for the gasket.
6. Insert the new sensor cartridge into the probe adapter. Observe the marker hole on the sensor cartridge flange and the probe adapter.
7. Secure the sensor cartridge with the 4 socket head screws.
8. The sensor code (calibration data) is automatically read for instruments with automatic recognition (LXG440.99.x000x). For instruments with non-automatic recognition (LXG440.99.x001x), enter the new sensor code manually (refer to certificate).

Figure 15 Replace the sensor cartridge



1	Socket head screw	5	Union nut
2	Sensor cartridge	6	Marker hole
3	O-ring	7	Socket head wrench
4	Sensor		

5.4 Storage

Take the probe out of the sample flow and clean thoroughly.

Short term storage

Keep the membranes and reference system moist (do not use distilled or demineralized water).

This will help avoid long response times when the probe is placed back in the sample flow. Otherwise, the correct operation of the probe is no longer guaranteed.

Long term storage

NOTICE

Detach the cartridge and use the supplied storage container in the event of long-term storage. Moisten the little sponge in the storage container with drinking water (DO NOT USE DISTILLED WATER!) and make sure that the ISE membranes of the sensor cartridge remain wet. Attach the reference system cap.

Check the membranes and ensure they are still moist every 2–4 weeks, depending on environmental conditions.

Note: A storage container is supplied to keep the sensor cartridge moist. Keep the sensor cartridge sealed in the storage container during short and long term storage. Refer to [Section 1 Technical data, Page 5](#) for information on storage temperatures.

Probe and sensor cartridge

NOTICE

Pay attention to the contacts between the probe and the sensor cartridge. These contacts must be dry.

Section 6 Troubleshooting

6.1 Error messages

If the sensor is in an error state, the measurement value for this sensor will flash on the display and the relay contacts and current outputs associated with this sensor will be stopped. The errors are described in [Table 2](#).

Table 2 Error messages

Displayed errors	Cause	Resolution
NH4 mV RANGE! ^{1,2}	Ammonium mV value exceeds the measurement range	Refer to 6.3.1 Troubleshooting during operation, Page 37 .
K+ mV RANGE! ^{1,2}	Potassium mV value exceeds the measurement range	
NO3 mV RANGE! ^{1,3}	Nitrate mV value exceeds the measurement range	
Cl ⁻ mV RANGE! ^{1,3}	Chloride mV value exceeds the measurement range	
REF1 mV RANGE!	REF1 reference value is out of measuring range	
REF2 mV RANGE!	ORP electrode mV value is out of measuring range	
TEMP RANGE!	Temperature value exceeds measurement range	
NO CARTRIDGE	No sensor cartridge connected	Connect the sensor cartridge; refer to section 3.3, page 15 .
SENSOR CODE	Sensor code calibration failed	Refer to 6.3.2 Troubleshooting during calibration, Page 38
HUMIDITY	Humidity in the probe	Inform service engineer
NH4-N CONC HIGH ^{1,2}	Ammonium concentration value exceeds measuring range	Refer to 6.3.1 Troubleshooting during operation, Page 37 .
NH4-N CONC LOW ^{1,2}	Ammonium concentration value is below measuring range	
NO3-N CONC HIGH ^{1,3}	Nitrate concentration value exceeds measurement range	
NO3-N CONC LOW ^{1,3}	Nitrate concentration value is below measurement range	
K+ KONZ HOCH ^{1,2}	Potassium concentration value exceeds measuring range	
K+ CONC LOW ^{1,2}	Potassium concentration value is below measuring range	
CL CONC HIGH ^{1,3}	Chloride concentration value exceeds measuring range	
CL CONC LOW ^{1,3}	Chloride concentration value below measurement range	

¹ Applies to AN-ISE sc

² Applies to AISE sc

³ Applies to NISE sc

6.2 Warnings

In the event of a sensor warning, all menus, relays and outputs continue to function as normal but a warning symbol lights up.

Warnings may be used to activate a relay; users can set warning levels to define the severity. Warnings are defined in [Table 3](#).

Table 3 Warnings

Displayed warnings	Cause	Resolution
RFID DATA	Cartridge faulty, read process failed	Replace cartridge, check probe with test cartridge
NH4 mV RANGE! ^{1,2}	Ammonium mV value is close to measuring range limit	Refer to 6.3.1 Troubleshooting during operation, Page 37 .
K+ mV RANGE! ^{1,2}	Potassium mV value is close to measuring range limit	
NO3 mV RANGE! ^{1,3}	Nitrate mV value is close to measurement range limit	
Cl- mV RANGE! ^{1,3}	Chloride mV value is close to measurement range limit	
REF1 mV RANGE!	1st reference value is close to limit	
REF2 mV RANGE!	2nd reference value is close to limit	
TEMPERATURE	Temperature is close to limit	
CARTRIDGE OLD	Sensor cartridge more than 1 year old	Replace the sensor cartridge
NH4-N CONC HIGH ^{1,2}	Ammonium concentration value exceeds measuring range	See 6.3.1 Troubleshooting during operation, Page 37 .
NH4-N CONC LOW ^{1,2}	Ammonium concentration value is below measuring range	
NO3-N CONC HIGH ^{1,3}	Nitrate concentration value exceeds measuring range	
NO3-N CONC LOW ^{1,3}	Nitrate concentration value is below measurement range	
K+ KONZ HOCH ^{1,2}	Potassium concentration value exceeds measuring range	
K+ CONC LOW ^{1,2}	Potassium concentration value is below measuring range	
CL CONC HIGH ^{1,3}	Chloride concentration value exceeds measuring range	
CL CONC LOW ^{1,3}	Chloride concentration value is below measurement range	
AMMONIUM ^{1,2}		Refer to 6.3.2 Troubleshooting during calibration, Page 38 .
OFFSET	Ammonium offset exceeds measurement range	
SLOPE	Ammonium slope exceeds measurement range	
POTASSIUM ^{1,2}		
OFFSET	Potassium offset exceeds measurement range	
SLOPE	Potassium slope is out of measuring range	
NITRATE ^{1,3}		
OFFSET	Nitrate offset is out of measurement range	
SLOPE	Nitrate slope is out of measurement range	
CHLORIDE ^{1,3}		
OFFSET	Chloride offset is out of measurement range	
SLOPE	Chloride slope is out of measurement range	

¹ Applies to AN-ISE sc

² Applies to AISE sc

³ Applies to NISE sc

6.3 Troubleshooting

6.3.1 Troubleshooting during operation

Symptom	Possible cause	Corrective measures
Incorrect measurement values	Calibration too old; calibration was not suitable for the particular application; large change in the waste water matrix	Perform a suitable calibration. Refer to 4.6 Calibration/matrix correction, Page 25
	Severely contaminated membranes and/or reference electrode	Clean the sensor cartridge using a brush and/or rinse the sensor cartridge with clean water (without cleaning agents), and wipe the sensor cartridge carefully with a soft, clean cloth. Clean all components (membranes/reference electrode/temperature sensor).
		Install the cleaning unit
		Increase the cleaning interval
	Sensor membrane damaged	Check the sensor installation/ replace the sensor cartridge
	Reference element damaged	
	NO3 mV RANGE! (Nitrate mV value is out of measurement range) ^{1,3}	Replace the sensor cartridge
	CL mV RANGE! (Chloride value is out of measurement range) ^{1,3}	
	REF1 RANGE! (measuring range exceeded on 1st reference value)	
	REF2 RANGE! (measuring range exceeded on 2nd reference value)	
	TEMPERATURE (Temperature value is out of measurement range)	Replace the sensor cartridge/check the waste water temperature
	CARTRIDGE OLD (sensor cartridge more than 1 year old)	Replace the sensor cartridge
Incorrect measurement values	Moisture at the contacts of the sensor cartridge	Dry the contact with a cloth or paper Check the black gasket for damage and make sure it is in the correct position. Screw the 4 socket head screws tight.
	Moisture inside the measurement probe/faulty sensor electronics Check the sensor electronics by using the test cartridge (section 7.2, page 39). 1 Select SENSOR MENU > DIAG/TEST > SERVICE > TEST CARTRIDGE > Test cartridge ready? Press ENTER 2 If all channels are confirmed with OK, the sensor electronics are operational: Test cartridge OK ENTER	If the test cartridge data is not within this range and/or if the test cartridge check is not successful, contact the service department.
	Potassium concentrations too high (e.g.: >700 mg/L in the case of small ammonium concentrations) or chloride concentrations too high (e.g.: >1000 mg/L in the case of small nitrate concentrations)	

6.3.1 Troubleshooting during operation (Continued)

Symptom	Possible cause	Corrective measures
Unstable measurement values	Air bubbles, depth of immersion	Check the sensor installation Check the cleaning unit configuration
	Moisture at the contacts of the sensor cartridge	Dry the contacts with a cloth or paper. Check the black gasket for damage and make sure it is in the correct position. Screw the 4 socket head screws tight
	Sensor membrane damaged	Check the sensor installation/ replace the sensor cartridge
	Reference element damaged	

1 applies to AN-ISE sc

3 applies to NISE sc

6.3.2 Troubleshooting during calibration

Symptom	Possible cause	Corrective measures
SENSOR CODE	Sensor code entered incorrectly	Using the certificate, check whether the sensor code was entered correctly.
AMMONIUM 1, 2		
OFFSET	Error during the last ammonium correction, sensor cartridge too old, contaminated, faulty	Repeat the correction.
SLOPE		Use the previous correction. Clean or replace the sensor cartridge.
POTASSIUM 1,2		
OFFSET	Error during the last potassium correction, sensor cartridge too old, contaminated, faulty	Repeat the correction.
SLOPE		Use the previous correction. Clean or replace the sensor cartridge.
NITRATE 1,3		
OFFSET	Error during the last nitrate correction, sensor cartridge too old, contaminated, faulty	Repeat the correction.
SLOPE		Use the previous correction. Clean or replace the sensor cartridge.
CHLORIDE 1,3		
OFFSET	Error during the last chloride correction, sensor cartridge too old, contaminated, faulty	Repeat the correction.
SLOPE		Use the previous correction. Clean or replace the sensor cartridge.

¹ Applies to AN-ISE sc

² Applies to AISE sc

³ Applies to NISE sc

Section 7 Replacement parts and accessories

7.1 Replacement parts

Description	Catalog number
AN-ISE sc (probe with built-in 10-m cable and a pre-calibrated sensor cartridge)	LXV440.99.000x1
AISE sc (probe with built-in 10 m cable and a pre-calibrated sensor cartridge)	LXV440.99.100x1
NISE sc (probe with built-in 10 m cable and a pre-calibrated sensor cartridge)	LXV440.99.200x1
Calibrated sensor cartridge ¹	LZY694
Cleaning brush	LZY589
Black gasket	LZY713
Cartridge screw set (4 screws and socket head wrench)	LZY715
Protective cap for reference system	LZY588
Cable clip for AN-ISE sc	LZY717
Cable clip for AISE sc	LZY697
Cable clip for NISE sc	LZY698

¹ Sensor cartridges are wearing parts and are not covered by the instrument warranty.

7.2 Accessories

Description	Catalog number
Cleaning unit	LZY706
Rail mount	6184900
Chain mount	LZX914.99.12400
Stainless steel rim mount	LZX414.00.80000
High Output Air Blast compressor 115 V/50 Hz	6860003.99.0001
High Output Air Blast compressor 230 V/50 Hz	6860103.99.0001
Test cartridge	LZY720
Polishing paper for chloride electrode (only for AN-ISE sc and NISE sc)	LZY671

7.3 Validation accessories

Description	Catalog number
Nitrate cuvette test (measurement range: 0.23–13.5 mg/L NO ₃ -N/1–60 mg/L NO ₃)	LCK 339
Nitrate cuvette test (measurement range: 5–35 mg/L NO ₃ -N/22–155 mg/L NO ₃)	LCK 340
Chloride cuvette test (measurement range: 1–1000 mg/L Cl)	LCK 311
Chloride test strips (measurement range: 30–600 mg/L Cl)	27449-40
Ammonium cuvette test (measurement range: 2–47 mg/L NH ₄ -N/2.5–60.0 mg/L NH ₄)	LCK 303
Ammonium cuvette test (measurement range 1–12 mg/L NH ₄ -N/1.3–15.0 mg/L NH ₄)	LCK 305
Potassium cuvette test (measurement range: 5–50 mg/L K)	LCK 228

7.4 Corresponding documentation

Description	Catalog number
Cleaning unit instruction sheet	DOC273.99.90203
Rail mount instruction sheet	DOC273.99.90201
Chain mount instruction sheet	DOC273.99.90322
Compressor operating instructions ("HOAB"), (xx = language code)	DOC023.xx.00811
sc100 operating instructions, (xx = language code)	DOC023.xx.00032
sc1000 operating instructions, (xx = language code)	DOC023.xx.03260

Section 8 Limited warranty

Hach Company warrants its products to the original purchaser against any defects that are due to faulty material or workmanship for a period of one year from date of shipment unless otherwise noted in the product manual.

In the event that a defect is discovered during the warranty period, Hach Company agrees that, at its discretion, it will repair or replace the defective product or refund the purchase price excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents; or consumable components of a product, such as, but not limited to, lamps and tubing.

Contact Hach Company or your distributor to initiate warranty support. Products may not be returned without authorization from the Hach Company.

Limitations

This warranty does not cover:

- Damage caused by acts of God, natural disasters, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction
- Damage caused by misuse, neglect, accident or improper application or installation
- Damage caused by any repair or attempted repair not authorized by the Hach Company
- Any product not used in accordance with the instructions furnished by the Hach Company
- Freight charges to return merchandise to the Hach Company
- Freight charges on expedited or express shipment of warranted parts or products
- Travel fees associated with on-site warranty repair

This warranty contains the sole express warranty made by the Hach Company in connection with its products. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Hach Company.

Limitation of Remedies

The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this

Limited warranty

warranty. On the basis of strict liability or under any other legal theory, in no event shall the Hach Company be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.

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