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NITRATAX sc

USER MANUAL

11/2014, Edition 6A

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Section 1 Specifications

Specifications are subject to change without notice.

| Component | NITRATAX <i>plus</i> sc | NITRATAX <i>eco</i> sc | NITRATAX <i>clear</i> sc |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------|
| NITRATAX sc tank sensor | | | |
| Measuring technique | UV absorption measurement, reagent-free | | |
| Measuring method | Patented 2-beam method | | |
| Measuring path | 1 mm (0.04 in.), 2 mm (0.08 in.), 5 mm (0.20 in.) | 1 mm (0.04 in.) | 5 mm (0.20 in.) |
| Measuring range with NO ₃ -N standard solutions | 0.1–100.0 mg/L NO ₂₊₃ -N (1 mm/0.04 in.) 0.1–50.0 mg/L NO ₂₊₃ -N (2 mm/0.08 in.) 0.1–25.0 mg/L NO ₂₊₃ -N (5 mm/0.20 in.) | 1.0–20.0 mg/L NO ₂₊₃ -N | 0.5–20.0 mg/L NO ₂₊₃ -N |
| Lower detection limit (mg/L) NO ₃ -N | 0.1 (5 mm/0.20 in.) | 1 | 0.5 |
| Upper detection limit (mg/L) NO ₃ -N | 100 (1 mm/0.04 in.) | 20 | 20 |
| Measuring error (mg/L) NO ₃ -N | ±3 % of the mean MW ±0.5 | ±5 % of the mean MW ±1.0 | ±5 % of the mean MW ±0.5 |
| Resolution (mg/L) | 0.1 | 0.5 | 0.1 |
| Sludge compensation | yes | yes | — |
| Measuring interval (>= min) | 1 | 5 | 5 |
| T100 response time (min) | 1 | 15 | 5 |
| Integration | >1 min, adjustable | 15–30 min, adjustable | >5 min, adjustable |
| Power consumption | 2 W | | |
| Cable length | 10 m (30 ft) | | |
| Sensor pressure limit | maximum 0.5 bar (7 psi) | | |
| Ambient temperature | 2 to 40 °C (36 to 100 °F) | | |
| Dimensions D x L (Figure 1 on page 5) | approximately 70 x 229–333 mm (3 x 13.1 in.) | approximately 75 x 323 mm (3 x 12.9 in.) | approximately 75 x 327 mm (3 x 12.7 in.) |
| Weight | approximately 3.6 kg (7.9 lb) | approximately 3.3 kg (7.3 lb) | approximately 3.3 kg (7.3 lb) |
| NITRATAX sc sensors flow through units | | | |
| Sample flow rate | 0.5–10 L/h sample | — | 0.5–10 L/h sample |
| Sample connection | Tube ID 4 mm/AD 6 mm | — | Tube ID 4 mm/AD 6 mm |
| Sample temperature | 2 to 40 °C (36 to 100 °F) | — | 2 to 40 °C (36 to 100 °F) |
| Dimensions | W x H x D approximately 500 x 210 x 160 mm (20 x 8.3 x 6.3 in.) | — | W x H x D approximately 500 x 210 x 160 mm (20 x 8.3 x 6.3 in.) |
| Weight (without sensor) | approximately 3.6 kg (7.9 lb) | — | approximately 3.6 kg (7.9 lb) |

Specifications

| Component | NITRATAX <i>plus</i> sc | NITRATAX <i>eco</i> sc | NITRATAX <i>clear</i> sc |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|
| NITRATAX sc sensor material | | | |
| Sensor | | | |
| Sensor enclosure | Stainless steel 1.4571 | | Stainless steel 1.4581 |
| Wiper axle | Stainless steel 1.4104 | Stainless steel 1.4571 | |
| Cable gland | Stainless steel 1.4305 | | |
| Profile carrier 1 mm/2 mm | Stainless steel 1.4310 | | |
| Wiper arm 5 mm | Stainless steel 1.4581 | | |
| Wiper profile | Silicone | | |
| Measuring windows | SUPRASIL (quartz glass) | | |
| Enclosure seals | Silicone | | |
| Seal, cable gland | PVDF | | |
| Sensor cable | PUR 10 m (33 ft) standard Optional extension cables available in 5, 10, 15, 20, 30, 50 m Total maximum length: 60 m (196 ft) | | |
| Struts | | | |
| Adaptor for filtration sensor | Stainless steel 1.4308 | | |
| Struts | Stainless steel 1.4301 | | |
| Flow through cell (bypass) | | | |
| Measuring cell | PVC | | |
| Seals | EPDM | | |
| Glands | PVDF | | |
| Sample tube | PVC | | |

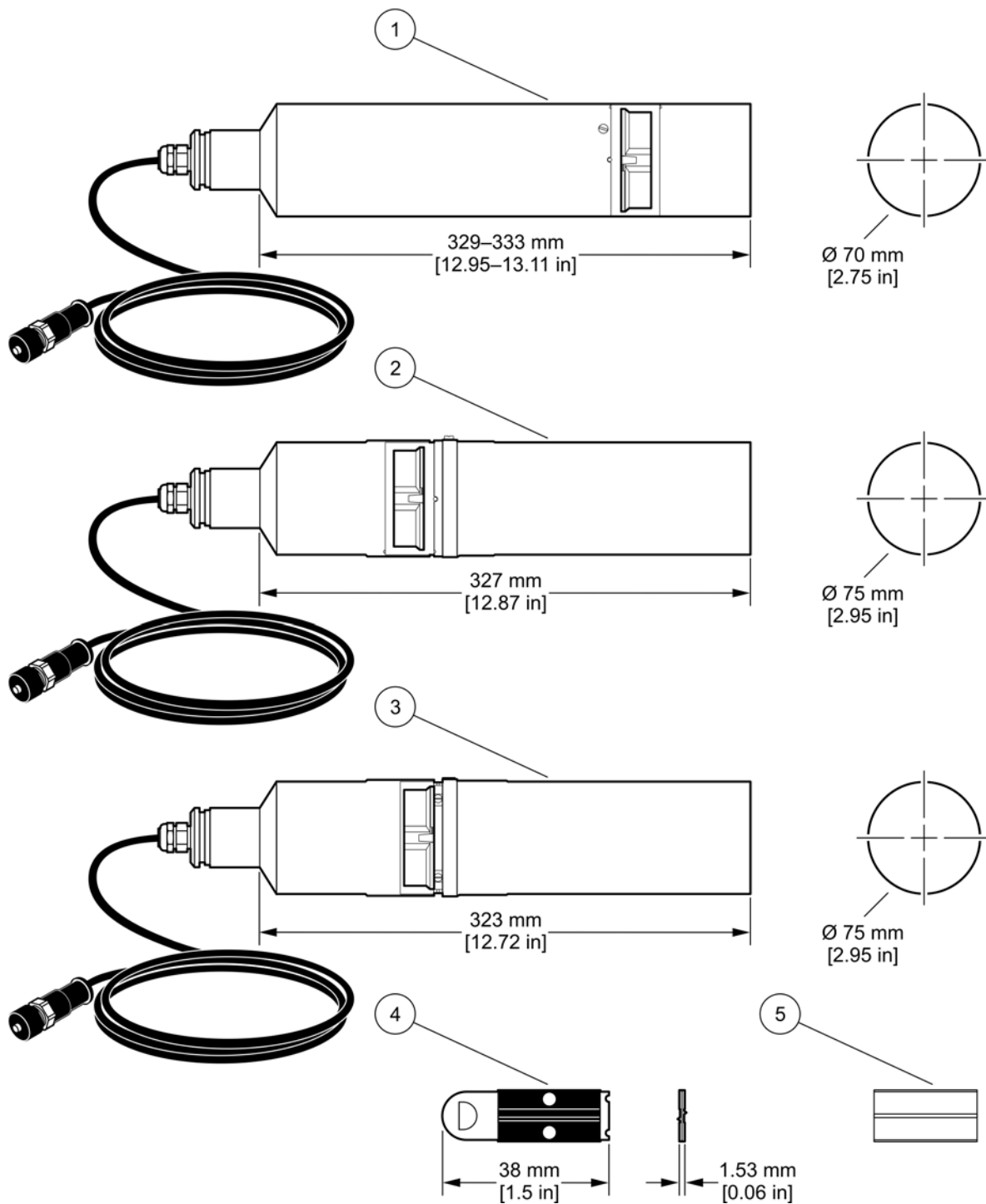


Figure 1 Sensor dimensions

| | | | |
|---|-------------------|---|--------------------------------------------------|
| 1 | NITRATAX plus sc | 4 | Wiper profile 1 and 2 mm (0.04 in. and 0.08 in.) |
| 2 | NITRATAX clear sc | 5 | Wiper profile 5 mm (0.20 in.) |
| 3 | NITRATAX eco sc | | |

Section 2 General Information

2.1 Safety information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

2.1.1 Use of hazard information

| |
|--------------------------------------------------------------------------------------------------------------------------|
| ⚠ DANGER |
| Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury. |

| |
|---------------------------------------------------------------------------------------------------------------------------|
| ⚠ WARNING |
| Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury. |







| |
|------------------------------------------------------------------------------------------|
| ⚠ CAUTION |
| Indicates a potentially hazardous situation that may result in minor or moderate injury. |

| |
|------------------------------------------------------------------------------------------------------------------------------|
| NOTICE |
| Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis. |

Note: Information that supplements points in the main text.

2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol, if noted on the instrument, will be included with a danger or caution statement in the manual.

| | |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information. |
|  | Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user. Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal. |
|  | This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists. |
|  | This symbol, if noted on the product, indicates the need for protective eye wear. |
|  | This symbol, when noted on the product, identifies the location of the connection for Protective Earth (ground). |
|  | This symbol, when noted on the product, identifies the location of a fuse or current limiting device. |

2.2 Product overview

The **NITRATAX plus sc** (Figure 2, item 1) measures the nitrate concentration up to 100 mg/L N directly immersed in the medium. Use the sensor without the need for pumping and conditioning in activated sludge tanks in municipal sewage treatment plants, surface water, untreated water and treated drinking water. The system can also be used for checking the outlet on waste water treatment plants.

The **NITRATAX eco sc** (Figure 2, item 2) measures the nitrate concentration up to 20 mg/L N directly immersed in the medium. Use the sensor without the need for pumping and conditioning in activated sludge tanks in municipal sewage treatment plants.

The **NITRATAX clear sc** (Figure 2, item 3) measures the nitrate concentration up to 20 mg/L N directly immersed in the medium. Use the sensor without the need for pumping and conditioning in clear media such as surface water, treated drinking water and sewage treatment plant outlets.

Note: The flow-through units of the high precision NITRATAX plus sc and the NITRATAX clear sc sensors are used wherever direct measurement in the medium is not possible for structural reasons, or the medium load makes it necessary to measure a filtered sample (very high TS content, sewage treatment plant inlet, waste dump leachate, etc.).

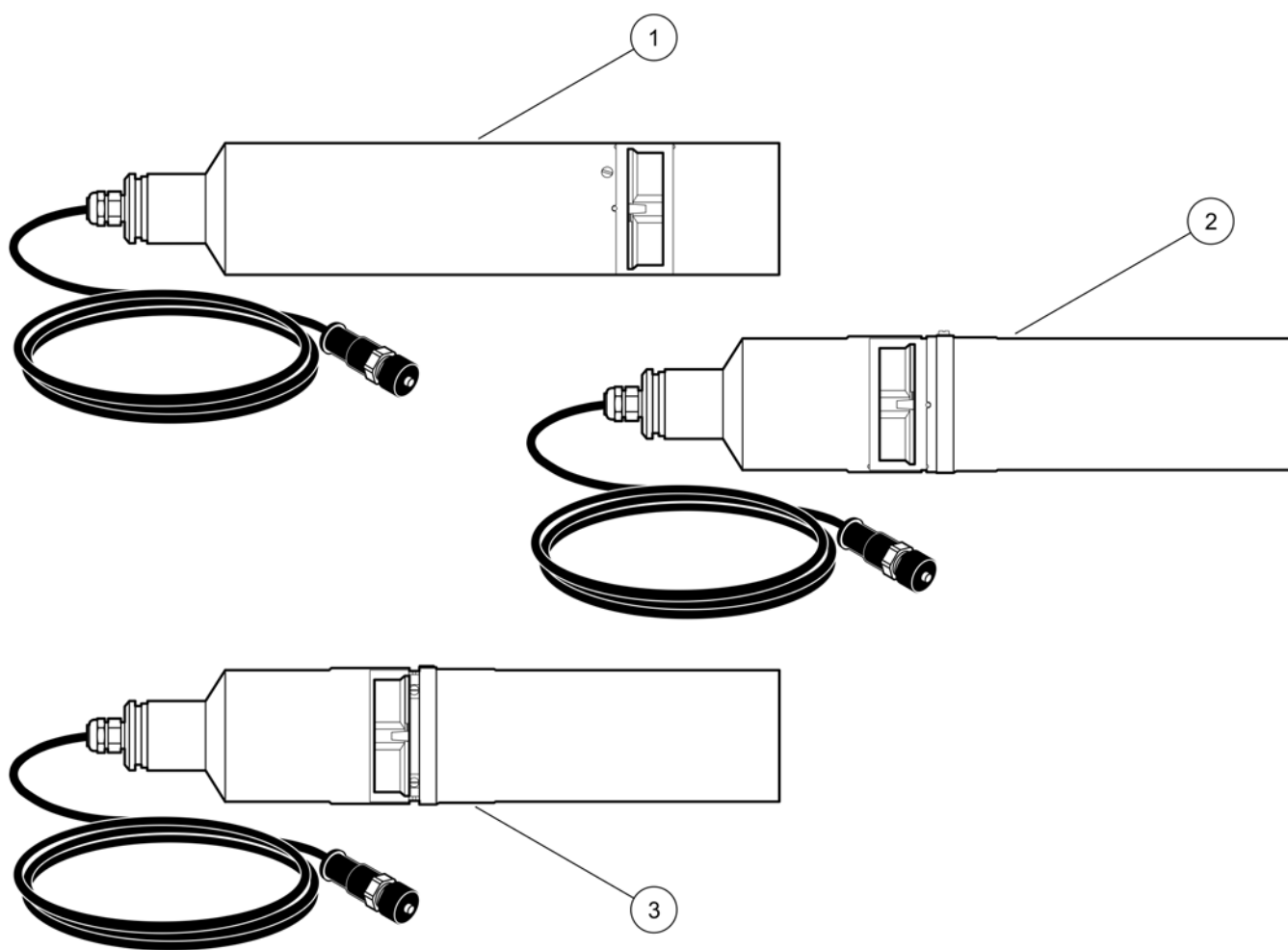


Figure 2 NITRATAX sc sensor versions

| | | | | | |
|---|------------------|---|-----------------|---|-------------------|
| 1 | NITRATAX sc plus | 2 | NITRATAX sc eco | 3 | NITRATAX sc clear |
|---|------------------|---|-----------------|---|-------------------|

2.3 Theory of operation

Nitrate dissolved in water absorbs UV light with wavelengths below 250 nm. This inherent absorption by nitrate makes it possible to photometrically determine the nitrate concentration without reagents by using a sensor positioned directly in the medium. As the measuring principle (Figure 3) is based on the evaluation of (invisible) UV light, the color of the medium has no effect.

The sensor contains a two-beam absorption photometer with turbidity compensation. The measuring window is mechanically cleaned using a wiper.

The measuring and cleaning intervals can be entered using the related controller. The measured value is displayed as NO_x-nitrogen in mg/L NO_x-N (NO₂-N is included in the measured result as nitrite nitrogen) and provided on current outputs. Various operating modes for the outputs permit local regulation without further process data processing.

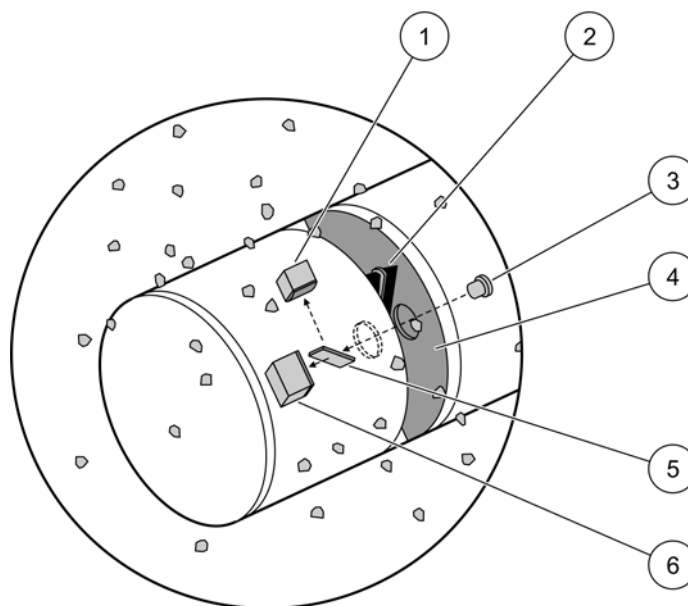


Figure 3 Measurement principle of the NITRATAX sc

| | | | | | |
|---|-----------------------------|---|------------------|---|-----------------------------|
| 1 | Receiver, Reference Element | 3 | UV Lamp | 5 | Mirror |
| 2 | Two-sided Wiper | 4 | Measurement Slit | 6 | Receiver, Measuring Element |

Section 3 Installation

⚠ CAUTION

Installation of this system may only be carried out by qualified experts in accordance with all local safety regulations. See the mounting instruction sheet for more information.

3.1 Installation overview

Figure 4 shows an example of a NITRATAX sc sensor attached to an sc controller with a bracket installation option.

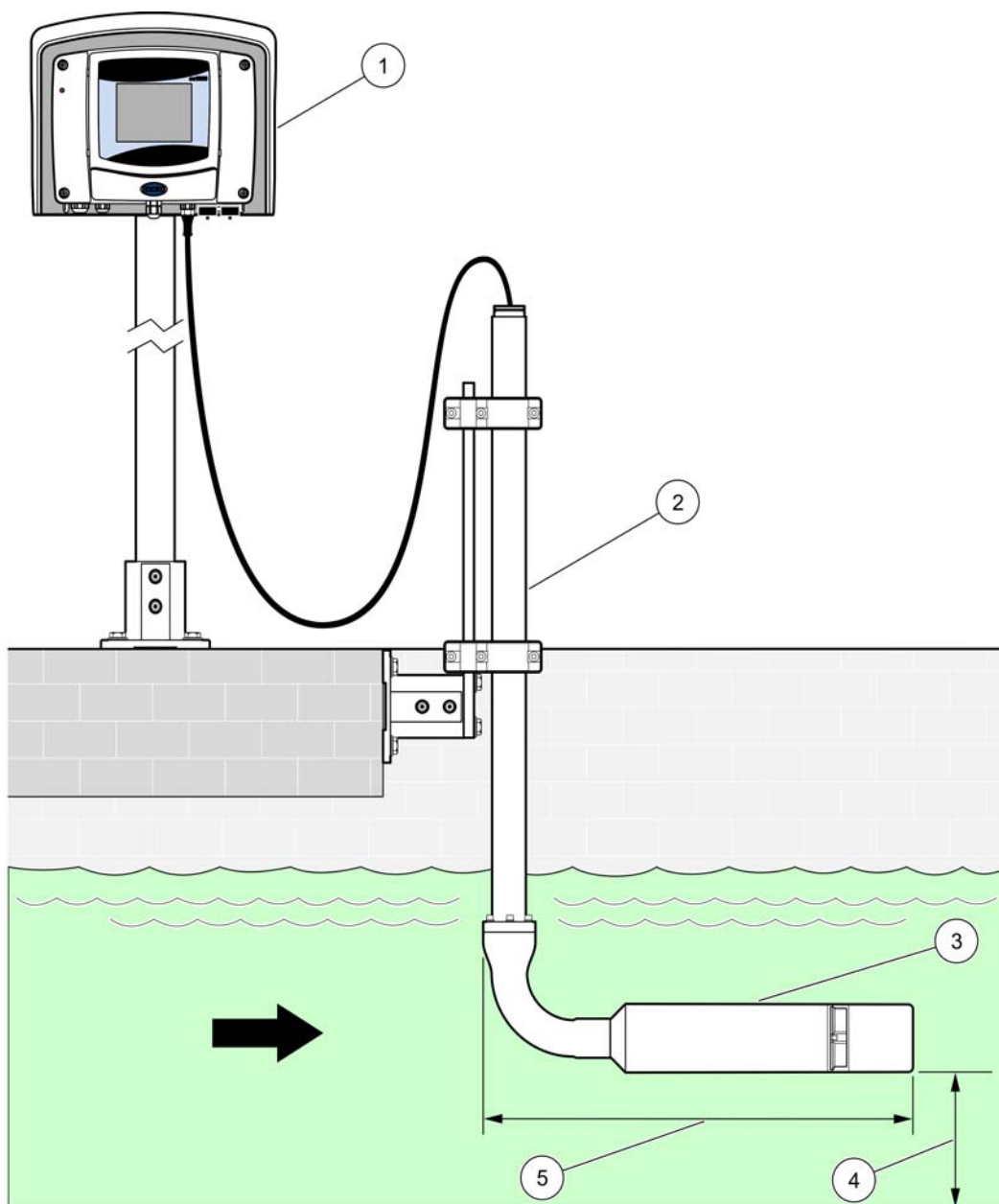


Figure 4 Installation example with optional accessories

| | | | |
|---|--------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------|
| 1 | sc controller with optional sun roof | 4 | Minimum distance of 100 mm (3.94 in.) to the ground |
| 2 | Sensor bracket | 5 | NITRATAX plus sc: 468–472 mm (18.4–19.6 in.) NITRATAX eco sc: 466 mm (18.3 in.) NITRATAX clear sc: 462 mm (18.1 in.) |
| 3 | NITRATAX sc sensor | | |

3.2 Unpack the sensor

Remove the sensor from the shipping container and inspect the sensor for damage. Verify that all items listed in [Figure 5](#) are included. If any items are missing or damaged, contact the manufacturer or distributor.

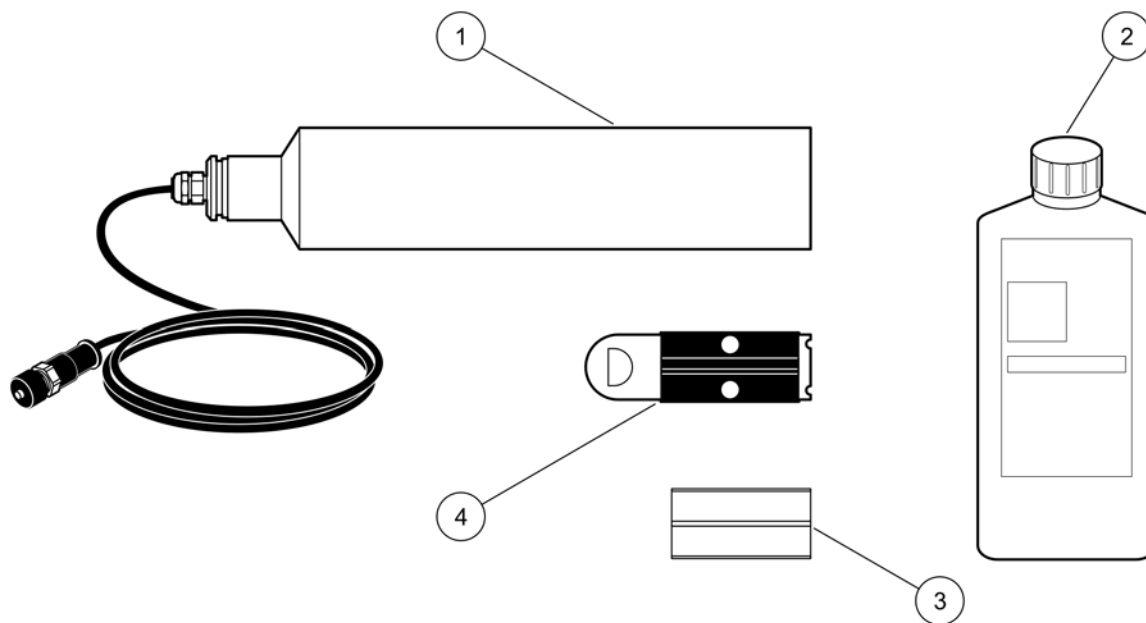


Figure 5 Items supplied

| | |
|-----------------------------------|------------------------------------------------------------------------|
| 1 NITRATAX sc sensor with cable | 3 1 wiper set (5 pieces) for 1 or 2 mm (0.04 in. and 0.08 in.) sensors |
| 2 Nitrate standard solution (1 L) | 4 1 wiper set (5 pieces) for 5 mm (0.20 in.) sensors |

3.3 Wiring safety information

| |
|------------------------------------------------------------------------------------------------------------|
| ⚠ WARNING |
| Electrical shock hazard. Always disconnect power to the instrument when making any electrical connections. |

3.3.1 Sensor connection and wiring

| |
|--------------------------------------------------------------------------|
| ⚠ CAUTION |
| Before power is applied, refer to the controller operation instructions. |

The sensor can be connected to any sc controller using the supplied keyed quick-connect fitting. The sensor can also be hard-wired to an sc 100 or sc 1000 controller (Refer to [Figure 7](#) for more information).

To attach the sensor to the controller with the quick-connect fitting:

1. Unscrew the protective cap on the socket on the controller ([Figure 6](#)). Retain the protective cap to seal the connector opening in case the sensor must be removed.

2. Insert the connector in the socket and hand-tighten the union nut.

Note: The middle connection of a sc1000 controller is solely reserved for the display module.

Note: Optional cables may be purchased to extend the sensor cable length (see [Section 8 on page 31](#)).

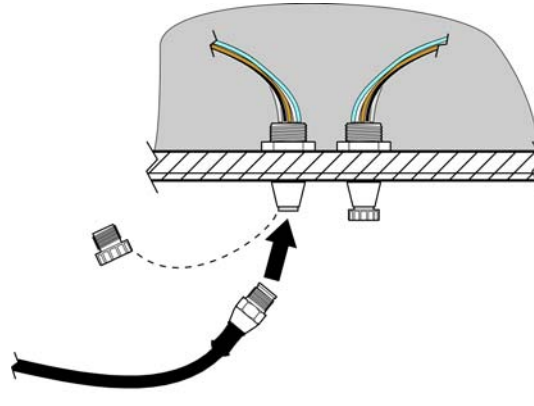


Figure 6 Attach the sensor to the controller with the quick-connect fitting

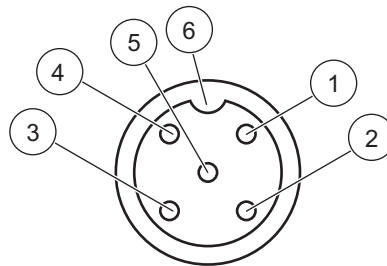


Figure 7 Sensor connector pin assignment

| Terminal number | Terminal description | Wire color code |
|-----------------|----------------------|----------------------|
| 1 | +12 VDC | brown |
| 2 | Mass/Circuit common | black |
| 3 | Data (+) | blue |
| 4 | Data (-) | white |
| 5 | Screen/Shield | Screen/Shield (grey) |
| 6 | Notch | — |

Section 4 System Start Up

4.1 Power the instrument

1. Plug the sensor into the controller.
2. Supply power to the controller.
3. When the controller is switched on for the first time, a menu for selecting the language opens automatically. Select the required language.
4. Following language selection and upon subsequent power-up, the controller will search for connected sensors. The display will show the main measurement screen. Press the MENU key to access the menus.

5.1 Use of an sc controller

Before using the sensor in combination with an sc controller, refer to the controller user manual for navigation information.

5.2 Sensor setup

When a sensor is installed for the first time, the serial number of the sensor is displayed as the sensor name. The sensor name can be changed as follows:

1. Select MENU.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor, if more than one sensor is attached and confirm.
4. Select CONFIGURATION and confirm.
5. Select EDIT NAME and edit the name. Confirm or cancel to return to the Configuration menu.

Use the following commands to complete the sensor configuration, see [section 5.5 on page 18](#).

- PARAMETER
- MEAS UNIT
- MEAS INTERVAL
- RESPONSE TIME
- CLEANING
- WIPER MODE
- BYPASS
- TEST/MAINT
- SET DEFAULTS

5.3 Sensor data logging

The sc controller provides a data log and an event log for each sensor. The data log contains the measured data at selected intervals. The event log contains a large number of events that occur on the instruments, such as configuration changes, alarms and warnings, etc. The data log and the event log can be exported to CSV format. The logs can be downloaded through the digital network port, service port, or the IrDA port. DataCom is needed for downloading logs to a computer. For information on downloading the logs, refer to the sc controller user manual.

The data logger of the sc100 contains the last 7000 values of the NITRATAX sc sensor. The data logger of the sc1000 can log more than 7000 values. The log interval is the same like the measuring interval of the NITRATAX sc sensor.

5.4 Sensor diagnostics menu

| SELECT SENSOR STATUS>SELECT SENSOR (if more than one sensor is attached) | |
|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ERROR LIST | Displays all actual error messages: MOIST, R < M, DEXT < 0.0, W. POS. UNKNOWN, W. BLOCKED, FLASH FAILURE, R TOO HIGH, REPLACE SHAFT SEAL, SENSOR MISSING |
| WARNING LIST | Displays all actual error messages: EM TOO HIGH, CONC. TOO HIGH, CHECK CALIBR., REPLACE PROFILE, SERVICE REQUIRED, REPLACE SEALS, SHAFTSEALS REPL. |

Note: For more information about error messages and warnings refer to [Section 7 on page 29](#).

5.5 Sensor setup menu

SELECT SENSOR (if more than one sensor is attached)

| CALIBRATE (see 5.6 on page 20) | |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FACTOR | Correction factor for the measured value. Possible settings: 0.80–1.20 Default: FACTOR = 1 |
| OFFSET | Adjustable from –250 to +250 mE for zero point correction Default: OFFSET = 0 |
| OFFSET ADJUST | Perform a zero point calibration |
| 1 SAMPLE CAL | Perform a single point calibration |
| CAL CONFIG | Select OUTPUT MODE or CAL INTERVAL |
| | OUTPUT MODE: Select the behavior of the outputs during calibration for zero point setting (Hold, Active, Transfer, Choice). Hold maintains the last reading prior to going into the menu. Active transmits the current level readings, corrected with previous calibration data until new data is entered. Set Transfer transmits the value designated during the system setup |
| | CAL INTERVAL: Enter number of days |
| SET CAL DEFLT | The instrument resets the settings to the default configuration. |
| CONFIGURATION | |
| EDIT NAME | Can be edited as required (up to 10 characters) |
| PARAMETER | NOx-N or NO3 (eco only NOx-N) |
| MEAS UNIT | Unit for the measured result. Possible settings: mg/l, ppm |
| MEAS INTERVAL | eco/clear: 5, 6, 10, 12, 15, 20, 30 min plus: 15, 20, 30 sec; 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 min Note: Intervall of the data log is the same like the measuring intervall. |
| RESPONSE TIME | Indication of the actual response time in Counts (count x measuring interval = response time) eco: 3–6 x MEAS INTERVAL clear: 1–6 x MEAS INTERVAL plus: 1–12 x MEAS INTERVAL Note: Gliding average over 2-12 measurements. |
| CLEANING | eco, clear: 1/MEASURE plus: 1/MEASURE; 1,2,3,5,6,10,12,15,20,30 min; 1,2,3,4,6,12 h, 10:00 h |
| WIPER MODE | Wiping interval. Select SINGLE or DOUBLE A-B-A or DOUBLE B-A-B SINGLE: Default setting (Default: eco) DOUBLE A-B-A: Double wiping frequency DOUBLE B-A-B: Double wiping frequency (Default: plus, clear) |
| BYPASS | YES/NO (plus and clear) YES: Setting for bypass application (inhibits wiper "extension") |

5.5 Sensor setup menu (continued)

| | |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TEST/MAINT | Counter for customer service settings: 0–1000 days (180 days are recommended) Check the service contract and enter the defined value (number of days). 0 = Service deactivated |
| SET DEFAULTS | The instrument resets the settings to the default configuration. PARAMETER: eco: NO _x -N; plus, clear: NO ₃ MEAS UNIT: mg/l MEAS INTERVAL: 5 min RESPONSE TIME: eco, plus: 3 Counts; clear: 1 Count WIPER MODE: eco: SINGLE ; plus, clear: B-A-B, B-A-B |

TEST/MAINT

| | |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| PROBE INFO | Select NITRATAxplus/eco/clear, LOCATION, SERIAL NUMBER, RANGE, PATH LENGTH, WIPER P/N, MODEL NUMBER, SOFTWARE VERS, DRIVER VERS., PRODUCTION DATE |
| | Name of connected sensor: NITRATAx plus/eco/clear |
| | LOCATION |
| | SERIAL NUMBER: serial number of connected sensor |
| | RANGE: Measuring range corresponding to the measuring path |
| | PATH LENGTH: Width of the measuring path |
| | WIPER P/N: Item number |
| | MODEL NUMBER: Item number |
| | SOFTWARE VERS: Sensor software |
| | DRIVER VERS.: STRUCTURE, FIRMWARE, CONTENT |
| CAL DATA | PRODUCTION DATE: Production date |
| | Overview of OFFSET, FACTOR, DATE, DEXT 100%, DEXT 50%, DEXT 25%, CAL, R, M, IR and IM |
| | OFFSET: Adjustable on the CALIBRATION menu |
| | FACTOR: Adjustable on the CALIBRATION menu |
| | DATE: Date of the last change of OFFSET and/or FACTOR |
| | Internal calibration data: DEXT 100% DEXT 50% DEXT 25% |
| | CAL.: Internal calibration data |
| | R: Internal calibration data |
| | M: Internal calibration data |
| IR: Internal calibration data | |
| IM: Internal calibration data | |

5.5 Sensor setup menu (continued)

| | |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COUNTERS | Overview of TOTAL TIME, PROFILE, CAL CHECK, SERVICE, SEALS, SHAFTSEAL, MOTOR and FLASH |
| | TOTAL TIME: Counter |
| | PROFILE: Counter 50000–0-negative number Note: Negative if passed. Negative numbers create warning messages. |
| | CAL CHECK: Counter xdays–0 - negative number Note: Negative if passed. Negative numbers create warning messages. |
| | SERVICE: Counter 180 days–0-negative number Note: Negative if passed. Negative numbers create warning messages. |
| | SEALS: Counter 365 days–0-negative number Note: Negative if passed. Negative numbers create warning messages. |
| | SHAFTSEAL: Counter 500000–0-negative number Note: Negative if passed. Negative numbers create warning messages. |
| | MOTOR: Counter |
| | FLASH: Counter |
| MAINT. PROC. | Select REPLACE PROFILE, SERVICE DONE, WIPERTEST, SIGNALS or OUTPUT MODE |
| | REPLACE PROFILE: see 6.3 on page 25 |
| | SERVICE DONE: ARE YOU SURE? Confirm or press BACK key Confirm: The instrument resets the settings after a prompt confirmation to the default configuration. Press BACK key to return to the MAINT. PROC. menu. |
| | WIPERTEST: Select WIPE or DRIVE OUT WIPER or MOTOR CURRENT. WIPE: Wiping process DRIVE OUT WIPER: Wiper profile extends, on flow-through versions inhibited (see 6.2 on page 24) MOTOR CURRENT: Measurement during the wiping process (motor current < 100 mA) |
| | SIGNALS: ENTER = WIPE: Confirm. Average value: target: < 100 mA Individual measured value = displayed value Single measured value for AQA (FACTOR = 1, OFFSET = 0) W.POS (wiper position) DEXT (delta extinction between EM and ER) EM (extinction measuring channel) ER (extinction reference channel) M (measured level) R (reference level) IM (intensity measuring channel) IR (intensity reference channel) MOIST |
| | OUTPUT MODE: Select ACTIVE or HOLD or TRANSFER or CHOICE |

5.6 Sensor calibration

1. Select MENU.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor, if more than one sensor is attached and confirm.
4. Select CALIBRATE and confirm.

5. Close the hole of the back of the measuring path of 2 and 5 mm sensors with a sticky tape that filled water cannot flow out.
 6. Select OFFSET ADJUST and confirm.
 7. Confirm the displayed OUTPUT MODE information.
 8. FILL IN AQUA DEST PRESS ENTER TO CONTINUE is displayed. Remove the sensor from the tank and the rinse measuring path with distilled water. Align the measuring path horizontally and completely fill with distilled water. Confirm.
 9. PRESS ENTER WHEN STABLE, CONC. X.X mg/l NO₃, DEXT X.X mE is displayed. Confirm when a stable value is reached.
 10. Select WIPE. Wiping process occurs.
 11. PRESS ENTER WHEN STABLE , CONC. X.X mg/l NO₃, DEXT X.X mE is displayed. Add distilled water until the measured value is stable and confirm.
 12. Select CALIBRATE and confirm.
 13. COMPLETE OFFSET X.X mE is displayed. Confirm.
 14. PRESS ENTER WHEN STABLE, CONC. X.X mg/l NO₃, DEXT X.X mE is displayed. Confirm when a stable value is reached.
 15. Select COMPLETE and confirm.
 16. Select 1 SAMPLE CAL and confirm.
 17. FILL IN STANDARD PRESS ENTER TO CONTINUE is displayed. Select Option 1 or Option 2:
 - **Option 1:** Insert the verification filter now to calibrate.
 - **Option 2:** Adjust the sensor calibration using a standard solution (or a user-specific measuring solution) and laboratory spectrophotometer.Confirm.
 18. PRESS ENTER WHEN STABLE, CONC. X.X mg/l NO₃, DEXT X.X mE is displayed. Note the mE value if working with the sample and confirm.
 19. Select CALIBRATE. Adjust the XX.X mE value of the filter or sample from the previously noted value and confirm.
 20. Confirm COMPLETE FACTOR and the factor will be adjusted automatically.
 21. PRESS ENTER WHEN STABLE, X.X mg/l NO₃, X.X mE is displayed.
 - **Option 1:** Completed after confirming. If this message is not displayed and Option 1 was chosen, clean the lens and repeat.
 - **Option 2:** Continue with the following steps.
 22. Select WIPE and confirm.
 23. PRESS ENTER WHEN STABLE, X.X mg/l NO₃, X.X mE is displayed.
 24. Check the values. Confirm when the mE value is close to noted previous one. Option 2 is now completed.
 25. Select COMPLETE and confirm.
- Note: Only NITRATAXeco has a one point calibration which influences the offset.*
26. The sensor calibration is completed.

5.6.1 Adjusting turbidity compensation

1. Take a sample of activated sludge at the measuring location after the first half of the aeration phase. Immediately after sampling approximately 100 mL, filter the sample using a folded filter.
2. Similar to a standard solution, pour the filtrate into the measuring path of the sensor. As an alternative, the measured value can also be determined by a laboratory measurement (for $\text{NO}_2\text{-N}$ and $\text{NO}_3\text{-N}$).
3. Select 1 SAMPLE CAL and measure the filtered sample.
4. Turn the wiper on and add sample until the measured value is stable.
5. Immerse the sensor in the activated sludge tank.
6. Start the wiper several times until a stable result is obtained for the activated sludge. Add the difference $mE_{\text{filtered}} - mE_{\text{aeration}}$ to the adjusted offset value.

Section 6 Maintenance

⚠ CAUTION

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

Proper maintenance of the measuring windows in the sensor is critical for accurate measurements. The measuring windows should be checked monthly for soiling and the wiper profile checked for wear.

NOTICE

The seals must be replaced by the manufacturer's Service Department. For more information, see the instruction sheet of the flow-through accessories for NITRATAX sc.

6.1 Maintenance schedule

| Maintenance Task | weekly | 6 months | Annually | as per counter |
|----------------------|--------------------------------------------|-------------|-------------|----------------|
| Visual inspection | X | | | |
| Check calibration | X (depending on the ambient conditions) | | | |
| Inspection | | X (counter) | | |
| Seal change | | | X (counter) | |
| Wiper profile change | | | | X |

| Wearing parts | | |
|---------------|------------------|-----------------------------------|
| Quantity | Description | Average service life ¹ |
| 1 | Wiper sets | 1 year |
| 1 | Wiper motor | 5 years |
| 1 | Seal set | 1 year |
| 1 | Light bulb | 10 years |
| 2 | Measuring window | 5 years |
| 1 | Filter set | 5 years |
| 2 | O-ring flow unit | 1 year |

¹ Under normal operating conditions using factory settings.

6.2 Clean the measuring path

DANGER

Potential danger with contact with chemical/biological substances.
Working with chemical samples, standards and reagents can be dangerous.
Make yourself familiar with the necessary safety procedures and the correct handling of the chemicals before use and read and follow all relevant safety data sheets.

Normal operation of this device may require the use of chemicals or samples that are biologically unsafe.

- Observe all cautionary information printed on the original solution containers and safety data sheets prior to their use.
- Dispose of all consumed solutions in accordance with the local and national regulations and laws.
- Select the type of protective equipment suitable to the concentration and quantity of the dangerous material being used.

Additional cleaning of the measuring path is not necessary if the wiper interval is set for the appropriate application and the wiper profile is replaced regularly.

To clean the measuring path:

1. Select MENU.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor, if more than one sensor is attached and confirm.
4. Select TEST/MAINT and confirm.
5. Select MAINT.PROC. and confirm.
6. Confirm the displayed OUTPUT MODE information.
7. Select SIGNALS and confirm.
8. Confirm ENTER = WIPE.
9. Remove sensor from the tank. Depending on the degree and nature of the soiling, clean measuring path using window cleaner, grease remover or 5 % hydrochloric acid (the operation of the wiper arm using [WIPERTEST], [WIPE] can assist the cleaning process).
10. Soak for 5–10 minutes, then carefully clean the measuring path with distilled water.
Objective: [ER] and [EM] < 500
11. Press BACK to return to MAINT.PROC.
12. Press BACK again. Confirm RETURN PROBE TO PROCESS (Measuring operation after automatic wiping).
13. The cleaning of the measuring path is completed.

6.3 Change the wiper profile

⚠ CAUTION

Obey the locally applicable accident prevention regulations. Wear protective gloves where necessary during the change of the wiper rubber.

Refer to [Figure 8](#) and the following steps to change the wiper profile.

Note: First remove the sensor out of the flow-through unit until the wiper can be extended without resistance.

For this purpose on the menu set SENSOR SETUP>CONFIGURATION>BYPASS to "NO". For more information about the flow-through unit refer to the instruction sheet of the flow-through accessories for NITRATAX sc.

1. Select MENU.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor, if more than one sensor is attached and confirm.
4. Select TEST/MAINT and confirm.
5. Select MAINT.PROC. and confirm.
6. Remove the sensor out of the basin.

Note: For disassembly the sensor from the flow-through unit, refer to the instruction sheet of the flow-through accessories for NITRATAX sc.

7. Confirm the displayed OUTPUT MODE information.
8. Select REPLACE PROFILE and confirm.
9. Lift the retaining strap ([Figure 8](#), item 1), move the cap bottom up and remove it ([Figure 8](#), item 2 and 3).
10. Confirm REMOVE CAP!

Note: Only on instrument versions with 1 or 2 mm measuring path.

11. The wiper extends automatically. Exchange the wiper profile ([Figure 8](#), item 4) and replace the cap to lock in place ([Figure 8](#), item 5).
12. Confirm REPLACE PROFILE! PUT ON CAP!

Note: Only on instrument versions with 1 or 2 mm measuring path.

13. Press BACK.
14. Remove the sensor back to the tank or install it in the flow-through unit. If necessary adjust "YES" for the flow-through unit in the configuration menu.
15. Confirm RETURN PROBE TO PROCESS (Measuring operation after automatic wiping).
16. The exchange of the wiper profile is completed.

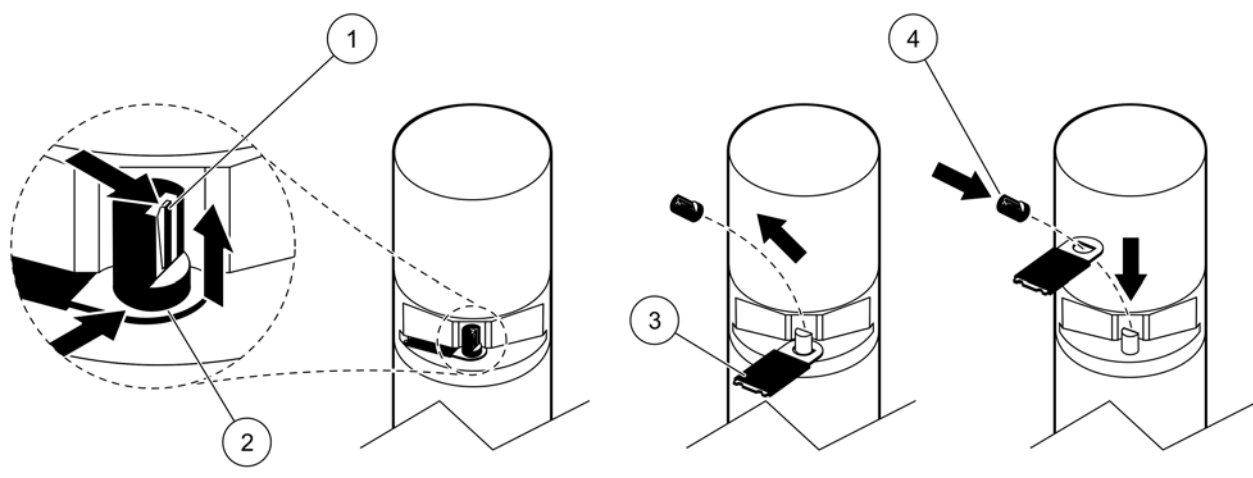


Figure 8 Changing wiper profile

| | |
|-------------------|--------------------------------------|
| 1 Retaining strap | 3 Wiper profile |
| 2 Cap bottom | 4 Locking the wiper and cap in place |

6.4 Check the calibration

The NITRATAX sc program supports comparative measurements as part of Analytical Quality Assurance (AQA) using a command that automatically sets the factor to "1" and the offset to "0" so that standard solutions can be measured directly without further adjustments.

1. Select MENU.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor, if more than one sensor is attached and confirm.
4. Select TEST/MAINT and confirm.
5. Select MAINT.PROC. and confirm.
6. Confirm the displayed OUTPUT MODE information.
7. Select SIGNALS and confirm.
8. Confirm ENTER = WIPE.
9. **Tank version:** Remove sensor from the tank, rinse the measuring path with water and fill it with standard solution (pipette), see [Figure 9 on page 27](#).
Flow-through version: Interrupt sample feed and supply with standard solution (syringe).

Observe the individual measured values on the display (3rd numerical value from the top). The measurements are made automatically at an interval of 1 second. Then re-install the sensor or connect sample feed.

10. Press BACK to return to MAINT.PROC.
11. Press BACK again. Confirm RETURN PROBE TO PROCESS (Measuring operation after automatic wiping).
12. The calibration check is completed.

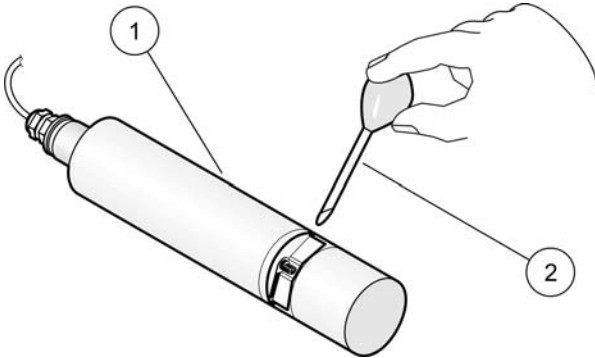


Figure 9 Check the calibration (tank version)

| | |
|---------------|----------------------------------|
| 1 NITRATAX sc | 2 Pipette with standard solution |
|---------------|----------------------------------|

Section 7 Troubleshooting

7.1 Error messages

When the sensor is experiencing an error condition, the sensor reading on the measurement screen will flash and the relays and outputs associated with this sensor will be held. Errors are defined in [Table 1](#).

From the Main Menu, select SENSOR STATUS and confirm to determine the cause of the fault.

Table 1 Error messages

| Error Displayed | Solution |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| NONE | — |
| MOIST | Check MOIST value on the SENSOR-SETUP menu >TEST/MAINT>MAINT. PROC.> SIGNALS>MOIST Remove sensor from the tank and call service |
| R < M | Call service |
| DEXT < 0.0 | Complete a Zero point calibration |
| W. POS. UNKNOWN | Check measuring path, complete a wiper test |
| W. BLOCKED | Check measuring path, complete a wiper test |
| FLASH FAILURE | Call service |
| R TOO HIGH | Call service |
| Wiper sealing | Call service, the wiper is deactivated |
| Sensor is missing | Prove connection |

7.2 Warnings

A sensor warning will leave all menus, relays and outputs functioning normally, but will cause a warning icon to flash.

Warnings may be used to trigger a relay and users can set warning levels to define the severity. Warnings are defined in [Table 2](#).

From the Main Menu, select SENSOR STATUS and confirm to determine the cause of the fault.

Table 2 Warnings

| Warning displayed | Cause | Solution |
|----------------------|----------------------------------------------------------------------------------------------------|-------------------------------------|
| NONE | Correct measuring operation | — |
| EM TOO HIGH | Turbidity, organic content or nitrate concentration too high, measuring range exceeded as a result | Check measurement in the laboratory |
| CONC. TOO HIGH | Nitrate concentration too high, as a result measuring range exceeded | Check measurement in the laboratory |
| CHECK CALIBR. | Test interval elapsed | Check calibration |
| REPLACE PROFILE | Counter elapsed | Change wiper profile |
| SERVICE REQUIRED | Counter elapsed | Call service |
| REPLACE SEALS | Counter elapsed | Call service |
| SHAFTSEALS REPL. | Counter elapsed | Call service |
| Inspection necessary | Counter elapsed | Call service |

Section 8 Replacement Parts and Accessories

8.1 Replacement parts

| Description | Catalog Number |
|-----------------------------------|-----------------|
| NITRATAX plus sc (1 mm/0.04 in.) | LXV417.00.10000 |
| NITRATAX plus sc (2 mm/0.08 in.) | LXV417.00.20000 |
| NITRATAX plus sc (5 mm/0.20 in.) | LXV417.00.50000 |
| NITRATAX clear sc (5 mm/0.20 in.) | LXV420.00.50000 |
| NITRATAX eco sc | LXV415.00.10000 |
| User Manual | DOC023.52.03211 |

8.2 Accessories

| Description | Catalog Number |
|--------------------------------------------------------------------------|-----------------|
| Cable extension set 5 m (16.4 ft) | LZX848 |
| Cable extension set 10 m (32.81 ft) | LZX849 |
| Cable extension set 15 m (49.21 ft) | LZX850 |
| Cable extension set 20 m (65.62 ft) | LZX851 |
| Cable extension set 30 m (98.43 ft) | LZX852 |
| Cable extension set 50 m (164.04 ft) | LZX853 |
| Cable extension set 100 m (328.08 ft) | LZY339 |
| Sensor bracket with 90° adapter | LZY714.99.53220 |
| Includes: | |
| Base | LZY827 |
| Fastening lug | LZY804 |
| Retaining clamp (2x) | LZX200 |
| Mounting pipe 2 m | LZY714.99.00020 |
| Hardware HS | LZY823 |
| 90° sensor adapter | LZY714.99.50000 |
| Set of small parts for mounting hardware | LZY822 |
| Extension pipe 1.8 m (5.91 ft) | LZY714.99.00030 |
| Extension pipe 1.0 m (3.28 ft) | LZY714.99.00040 |
| Second fastening point (with retaining clamp) | LZY714.99.03000 |
| Flow-through unit for NITRATAX plus sc (2 mm/0.08 in.) | LZX869 |
| Flow-through unit for NITRATAX plus sc (5 mm/0.20 in.) | LZX867 |
| Flow-through unit for NITRATAX clear sc (5 mm/0.20 in.) | LZX866 |
| Spare sealings | LZX428 |
| Tubing set | LZX407 |
| Allen key with setscrew | LZX875 |
| Sealing set for flow-through unit | LZX572 |
| Control standard 25 mg/L NO ₃ (5.56 mg/L NO ₃ -N) | LCW828 |
| Control standard 50 mg/L NO ₃ (11.3 mg/L NO ₃ -N) | LCW825 |
| Control standard 100 mg/L NO ₃ (22.6 mg/L NO ₃ -N) | LCW826 |
| Control standard 200 mg/L NO ₃ (45.2 mg/L NO ₃ -N) | LCW827 |
| Control standard 400 mg/L NO ₃ (90.4 mg/L NO ₃ -N) | LCW863 |

8.3 Wearing parts

| Description | Catalog Number |
|------------------------------------------|----------------|
| Wiper profile (1 mm/0.04 in.) (5 pieces) | LZX148 |
| Wiper profile (2 mm/0.08 in.) (5 pieces) | LZX012 |
| Wiper profile (5 mm/0.20 in.) (5 pieces) | LZX117 |

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Section 10 Warranty and liability

The manufacturer warrants that the product supplied is free of material and manufacturing defects and undertakes the obligation to repair or replace any defective parts at zero cost.

The warranty period for instruments is 24 months. If a service contract is taken out within 6 months of purchase, the warranty period is extended to 60 months.

With the exclusion of the further claims, the supplier is liable for defects including the lack of assured properties as follows: all those parts that, within the warranty period calculated from the day of the transfer of risk, can be demonstrated to have become unusable or that can only be used with significant limitations due to a situation present prior to the transfer of risk, in particular due to incorrect design, poor materials or inadequate finish will be improved or replaced, at the supplier's discretion. The identification of such defects must be notified to the supplier in writing without delay, however at the latest 7 days after the identification of the fault. If the customer fails to notify the supplier, the product is considered approved despite the defect. Further liability for any direct or indirect damages is not accepted.

If instrument-specific maintenance and servicing work defined by the supplier is to be performed within the warranty period by the customer (maintenance) or by the supplier (servicing) and these requirements are not met, claims for damages due to the failure to comply with the requirements are rendered void.

Any further claims, in particular claims for consequential damages cannot be made.

Consumables and damage caused by improper handling, poor installation or incorrect use are excluded from this clause.

The manufacturer process instruments are of proven reliability in many applications and are therefore often used in automatic control loops to provide the most economical possible operation of the related process.

To avoid or limit consequential damage, it is therefore recommended to design the control loop such that a malfunction in an instrument results in an automatic change over to the backup control system; this is the safest operating state for the environment and the process.

Table 3 Sensor Modbus Registers

| Group Name | Register # | Data Type | Length | R/W | Description |
|-----------------------|------------|------------------|--------|-----|----------------------------------|
| measurement | 40001 | Float | 2 | R | displayed measurement value |
| unit | 40003 | Unsigned Integer | 1 | R/W | unit : mg/l = 0 : g/l = 1 |
| parameter | 40004 | Unsigned Integer | 1 | R/W | parameter |
| Measure interval | 40005 | Unsigned Integer | 1 | R/W | measuring interval |
| correction | 40006 | Float | 2 | R/W | correction |
| offset | 40008 | Float | 2 | R/W | offset |
| integration | 40010 | Unsigned Integer | 1 | R/W | integration, always 1 |
| cleaning_interval | 40011 | Unsigned Integer | 1 | R/W | cleaning interval |
| wiper mode | 40012 | Unsigned Integer | 1 | R/W | wiper mode |
| wiper state | 40013 | Unsigned Integer | 1 | R/W | wiper state |
| resp time | 40014 | Unsigned Integer | 1 | R/W | response time |
| drv_struct_ver | 40015 | Unsigned Integer | 1 | R | driver structure version |
| drv_firmw_ver | 40016 | Unsigned Integer | 1 | R | driver firmware version |
| drv_cont_ver | 40017 | Unsigned Integer | 1 | R | driver content version |
| location | 40018 | String | 5 | R/W | location |
| path length | 40023 | Float | 2 | R | path length |
| profile | 40025 | Integer | 2 | R | profile counter |
| motor_cycles | 40027 | Integer | 2 | R | motor cycles |
| flash_counter | 40029 | Integer | 2 | R | flash counter |
| sealing_counter | 40031 | Integer | 2 | R | sealing counter |
| service_counter | 40033 | Integer | 2 | R | service counter |
| operating_hours | 40035 | Integer | 2 | R | operating hours |
| shaft_sealing_counter | 40037 | Integer | 2 | R | shaft sealing counter |
| profile reset val | 40039 | Integer | 2 | R/W | profile reset val |
| seals reset val | 40041 | Integer | 2 | R/W | seals reset val |
| service reset val | 40043 | Integer | 2 | R/W | service reset val |
| shaft seal reset val | 40045 | Integer | 2 | R/W | shaft seal reset val |
| des_measurement | 40047 | Float | 2 | R | desired measurement value |
| meas_single_value | 40049 | Float | 2 | R | measurement single value |
| dext | 40051 | Float | 2 | R | delta extinction |
| EM | 40053 | Float | 2 | R | m - extinction |
| ER | 40055 | Float | 2 | R | r - extinction |
| M | 40057 | Float | 2 | R | m |
| R | 40059 | Float | 2 | R | r |
| intensity_mes | 40061 | Float | 2 | R | m - intensity |
| intensity_ref | 40063 | Float | 2 | R | r - intensity |
| humidity_main | 40065 | Float | 2 | R | humidity - main |
| conc_blank | 40067 | Float | 2 | R | concentration without correction |
| cal_date | 40069 | Time | 2 | R | calibration time and date |
| user_cal_date | 40071 | Time | 2 | R | user calibration time and date |
| std_s3 | 40073 | Float | 2 | R | standard S3 |
| cal_L1 | 40075 | Float | 2 | R | cal. point 1 |

Modbus Register Information

Table 3 Sensor Modbus Registers (continued)

| | | | | | |
|-------------------|-------|------------------|---|-----|-------------------------------------------------------------|
| cal_L2 | 40077 | Float | 2 | R | cal. point 2 |
| cal_L3 | 40079 | Float | 2 | R | cal. point 3 |
| cal_mes | 40081 | Float | 2 | R | m - calibration |
| cal_ref | 40083 | Float | 2 | R | r - calibration |
| cal_intensity_mes | 40085 | Float | 2 | R | intensity m - calibration |
| cal_intensity_ref | 40087 | Float | 2 | R | intensity r - calibration |
| cal_ext | 40089 | Float | 2 | R | extinction - calibration |
| process | 40091 | Unsigned Integer | 1 | R/W | process register |
| menu | 40092 | Unsigned Integer | 1 | R | menu state |
| gain_ref | 40093 | Integer | 1 | R | low byte = gain ref-channel, high byte = second cap. on/off |
| gain_mes | 40094 | Integer | 1 | R | low byte = gain mes-channel, high byte = second cap. on/off |
| wiper_lim_a | 40095 | Integer | 1 | R | wiper limit a |
| wiper_lim_b | 40096 | Integer | 1 | R | wiper limit b |
| wiper_lim_out | 40097 | Integer | 1 | R | wiper limit out |
| prg_vers | 40098 | String | 4 | R | program version |
| ser_no | 40102 | Integer | 2 | R | serial number |
| cal_out_cfg | 40104 | Integer | 1 | R | cal. Output mode |
| user_cal_int | 40105 | Integer | 1 | R/W | user calibration interval |
| wiper_current | 40106 | Integer | 1 | R | wiper motor current in mA |
| resp_time_min | 40107 | Integer | 1 | R | response time in min |
| flash_per_fil | 40108 | Integer | 2 | R | flash per filter |
| cm1 | 40110 | Float | 2 | R/W | meas. Cap 1 |
| cm2 | 40112 | Float | 2 | R/W | meas cap 2 |
| cr1 | 40114 | Float | 2 | R/W | ref cap1 |
| cr2 | 40116 | Float | 2 | R/W | ref cap2 |
| lambda_m | 40118 | Float | 2 | R/W | lambda meas |
| lambda_r | 40120 | Float | 2 | R/W | lambda ref |
| transm_m | 40122 | Float | 2 | R/W | transmission meas |
| transm_r | 40124 | Float | 2 | R/W | ransmission ref |
| cal_menu | 40126 | Unsigned Integer | 1 | R/W | cal menu |
| wiper_menu | 40127 | Unsigned Integer | 1 | R/W | wiper menu |
| maint_menu | 40128 | Unsigned Integer | 1 | R/W | maint_menu |
| service_menu | 40129 | Unsigned Integer | 1 | R/W | service menu |
| flash_repl | 40130 | Unsigned Integer | 1 | R/W | flash replaced question |
| edit_menu | 40131 | Unsigned Integer | 1 | R/W | edit menu |
| def_menu | 40132 | Unsigned Integer | 1 | R/W | default menu |
| filter_data_menu | 40133 | Unsigned Integer | 1 | R/W | filter data menu |
| prod_date | 40134 | Time | 2 | R | production date |
| sensor_type | 40136 | String | 8 | R/W | sensor type |
| filter_set | 40144 | String | 3 | R/W | filter set |
| user_cal_counter | 40147 | Integer | 1 | R | user cal. Counter |
| pos_out_en | 40148 | Unsigned Integer | 1 | R/W | pos. Out enable |

| | | | |
|----------------------------|------|------------------------------|----|
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| Accessories | 31 | Pin assignment | 13 |
| C | | S | |
| Calibration | 20 | Sensor | |
| Check up | 26 | Calibration | 20 |
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