TresCon BA43111e07 operating manual

Analyzer module NH4-N



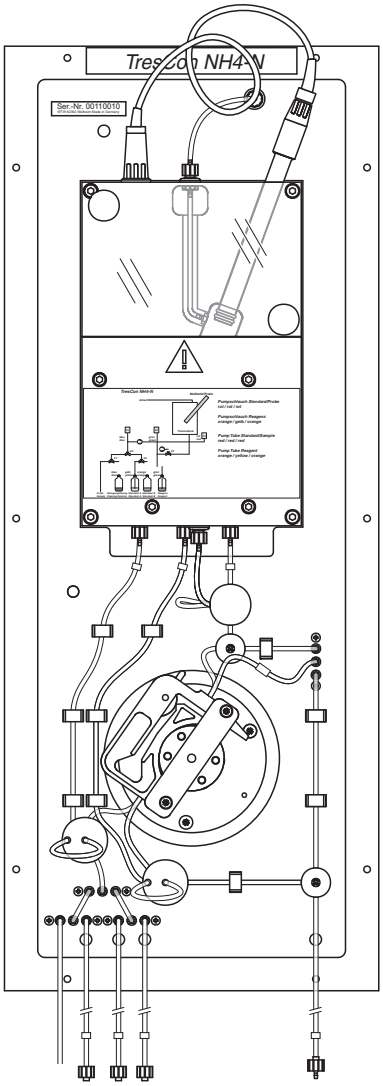
- Remove this cover sheet!
- Insert the operating manual in the TresCon main folder in the 2nd, 3rd or 4th position depending on the mounting slot!

Cover sheet

Operating manual

TresCon

Analyzer module NH4-N



ba43111e07 05/2017

Target group

This manual is intended for all persons who are familiar with the installation, operation and maintenance of WTW analyzers.
Detailed information on the previous experience required and the qualification of the user are given in the chapter, SAFETY, on page 2-1 in the TERMINAL volume of this manual.

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1 Overview

This operating manual has a modular structure, i. e. it contains a separate operating manual for the individual components of the multiparameter analyzer (see Fig. 1-1). This volume covers the operation of the *TresCon* analyzer module for NH4-N (Fig. 1-1, highlighted in gray).

Structure of the operating manual

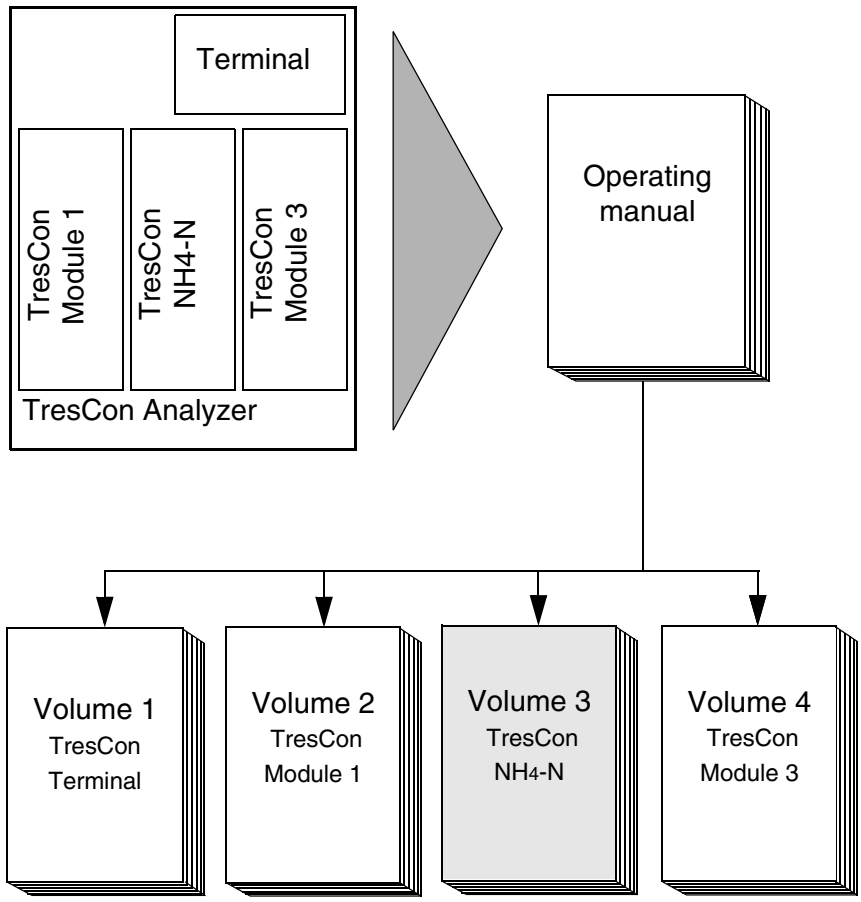


Fig. 1-1 Structure of the operating manual (example)

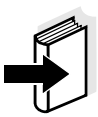
Note
Please read chapter 2, SAFETY, in volume 1, TERMINAL, of this operating manual before starting to work with the analyzer module.

1.1 Function

The TresCon NH4-N analyzing module operates according to the potentiometric measuring principle with an ion-selective electrode. It detects ammonium ($NH4_4^+$) while doing so. A reagent is added to the sample or – depending on the operating mode – to the standard. The TresCon NH4-N operates either discontinuously or continuously as required. Various settings and modes are available to the user so that the instrument can be optimally adapted to any application.

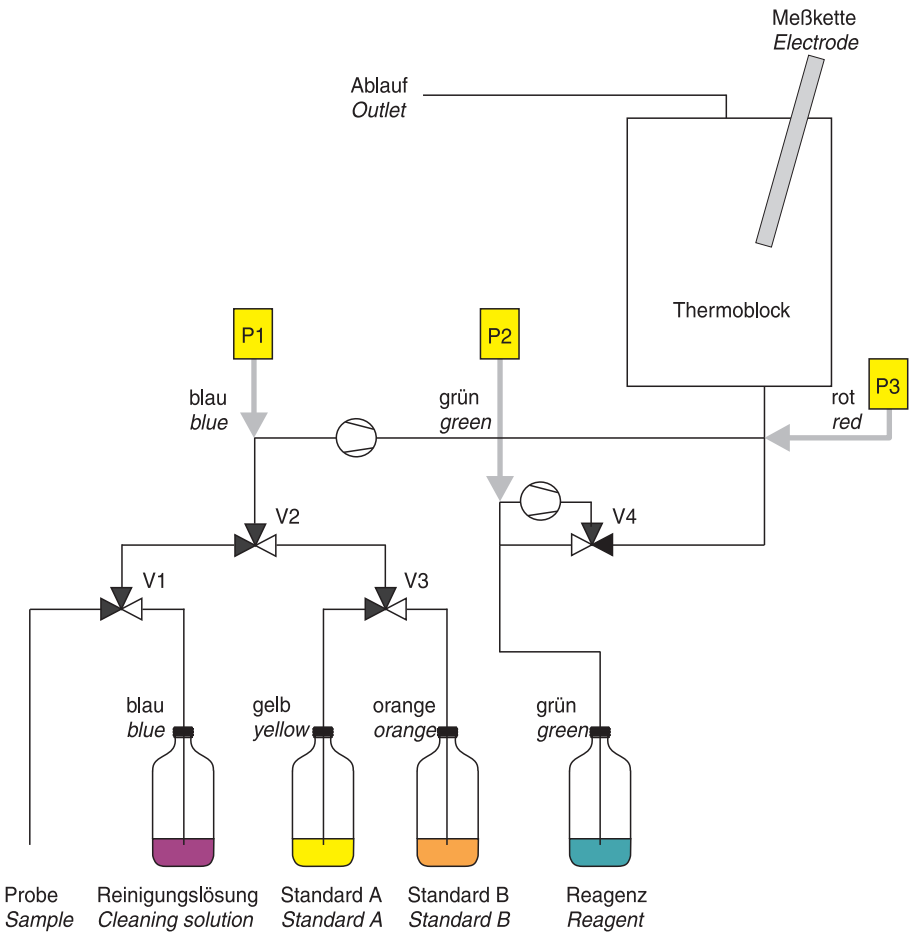
The following points describe the fundamental features of the TresCon NH4-N:

- AutoCal:
  The TresCon NH4-N performs an automatic 2-point calibration (AutoCal) so that the instrument can always maintain its high degree of absolute accuracy. To do so, aqueous ammonium solutions of different concentrations are used as calibration standards.
- AutoClean
  Moreover, the TresCon NH4-N can clean the entire analyzer system itself so that the user only has to perform a minimum amount of maintenance.
- AutoFlow
  The TresCon NH4-N can also monitor the entire analyzer system itself so it can measure fluid levels and provide early warnings and instructions to the operator to replace specific chemicals.
- AutoAdapt
  The TresCon NH4-N optimizes its measuring interval according to the current change in the measured value. As a result, reagent consumption is reduced to a minimum.
- AutoTherm
  The TresCon NH4-N automatically checks and regulates the temperature of the electrode. This ensures that the instrument always functions safely (see section 6.1 AUTOTHERM).
- Interfaces
  The TresCon NH4-N has all the digital and analog interfaces required by the industry. Thus, a standard connection is possible to digital interfaces (RS232 and RS485), analog interfaces (0/4-20 mA) and PLC interfaces (12 relay contacts). A connection for an external modem is also provided.



Note
Please read chapter 5, OPERATION, in volume 1, TERMINAL, of this operating manual. It contains basic instructions.

Schematic diagram



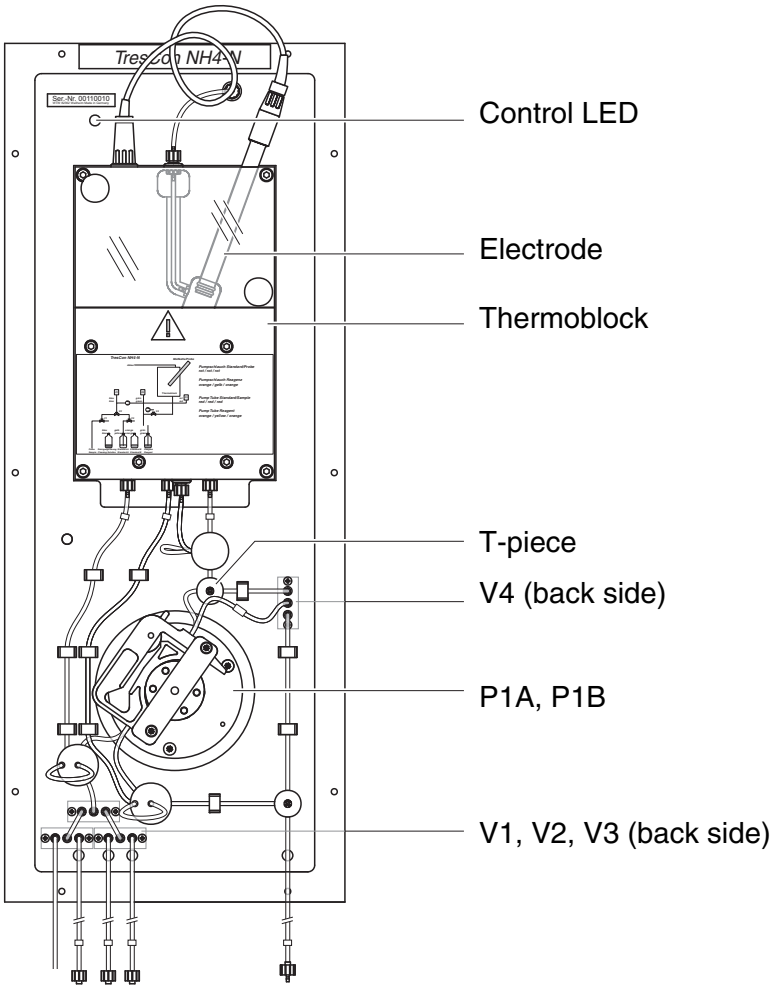
Standard/sample pump tubing: red/red/red
Reagent pump tubing: orange/yellow/orange

Fig. 1-2 Schematic diagram

Configuration

Component (quantity)	Designation
Valves (4)	V1,...V4
Pumps (1)	P1A/B
Pressure sensors (3)	P1, P2, P3

View of the TresCon NH4-N



Control LED

A light emitting diode located on the measuring block provides the following information:

LED illuminates	Meaning
red, continuous	Malfunction of any type
green, continuous	A service is being performed on the analyzer module or a designation is being given to the analyzer module (terminal software)
green, flashing	System OK

1.2 Commissioning

1.2.1 Scope of delivery

When the analyzer is delivered, it already has individual analyzer modules integrated in it and is ready for use.

TresCon NH4-N is available as a retrofit kit with the following scope of delivery:

- TresCon NH4-N analyzer module
- Operating manual to be added to the main folder
- Reagents for 4 months
  - 8 packages of sodium hydroxide pellets and Na_2EDTA (for a total of 80 l reagent)
  - 2 bottles of S/ AII - A111: 1.5 l standard AII 5 mg/l NH4-N
  - 2 bottles of S/ BII - A111: 1.5 l standard BII 50 mg/l NH4-N
  - 2 bottles of C/ A111: 1.5 l cleaning solution (10 % citric acid)
- NH500/TC: Ammonium electrode incl. 3 exchange membrane caps
- 2 Wpack/ A111: set of replacement tubes
- TC/ÜB 1: overflow vessel
- S/ AI - N 211: 10 l container with label, filled with deionized water to prepare the reagent solution
- 1 lid for standard A, yellow
- 1 lid for standard B, orange
- 1 lid for cleaning solution, blue
- 1 lid for reagent, green

Safety datasheets

The current safety datasheets for all chemicals and solutions used can be found on the Internet under www.WTW.com.

1.2.2 Retrofitting the TresCon NH4-N

This section is only necessary if the TresCon NH4-N was purchased as a retrofit kit.

Preparatory activities

Installing the TresCon NH4-N in a measuring system can -depending on the configuration- necessitate various preparations:

- Permeate supply:
  Set up a separate permeate supply (with its own catch location) or connect it to an existing permeate supply (catch location with further analyzer modules)
- Chemicals:
  The reagent must be prepared according to section 6.6 PREPARING THE REAGENT.



Note
Read the INSTALLATION section in the TERMINAL volume of the operating manual before starting the retrofit!

Installing the analyzer module

1	Switch off the TresCon at the power switch (on the mounting stand).
2	Open the door of the TresCon.

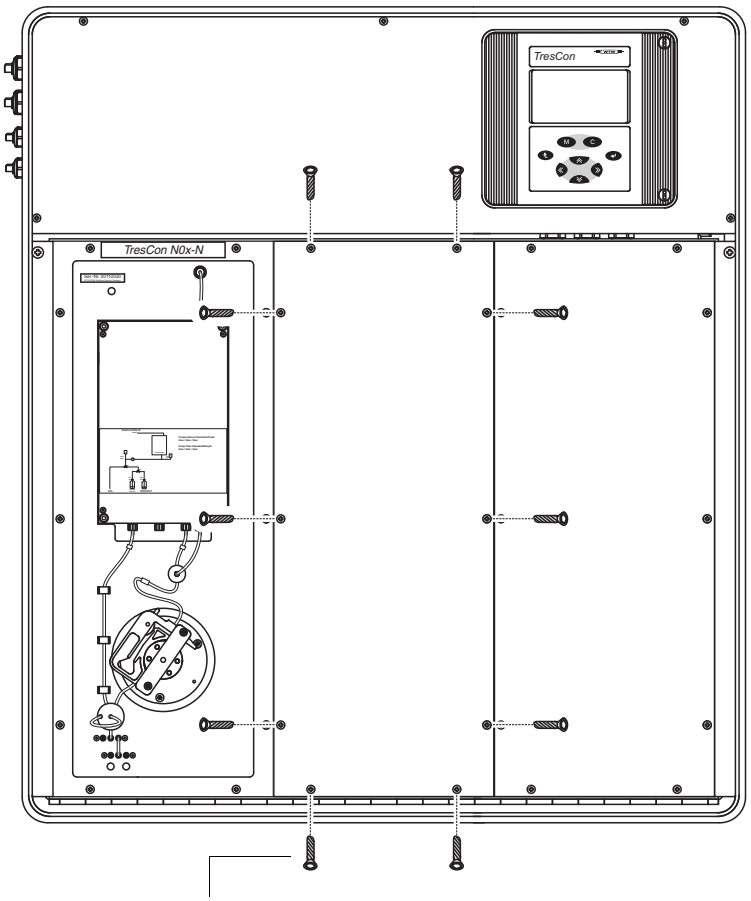


Fig. 1-3 Removing the cover plate

3	Undo the screws (B) of the dummy plate at the mounting location (see Fig. 1-3). The screws and nuts are required in step 5!
4	Remove the dummy plate at the mounting location.

5	Place the TresCon NH4-N in the mounting frame and screw it into place with the 10 screws (B).

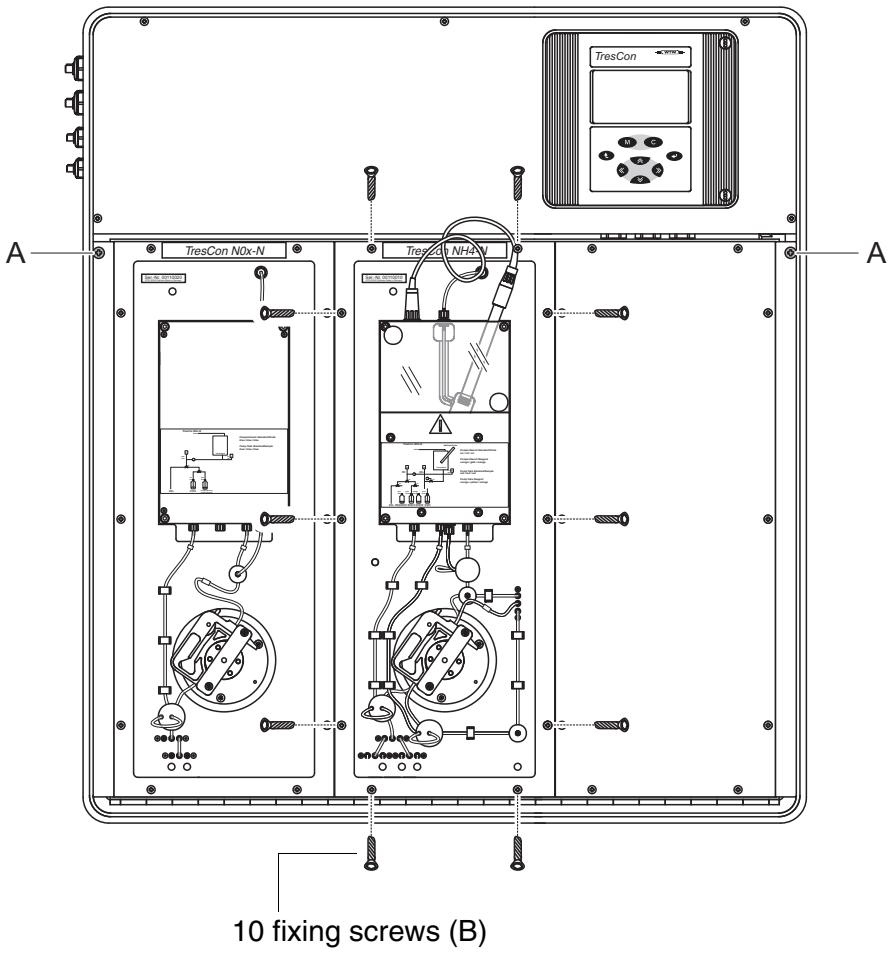


Fig. 1-4 Installing the TresCon NH4-N

6	Undo the screws (A) of the mounting frame (see Fig. 1-4).
7	Carefully tilt out the mounting frame forwards.

Cable connection

8	Plug the open cable connector of the TresCon NH4-N into the open socket with the internal number of the mounting slot.

Note
The number (1...3) of the open socket must agree with the position of the TresCon NH4-N in the frame (see figure).

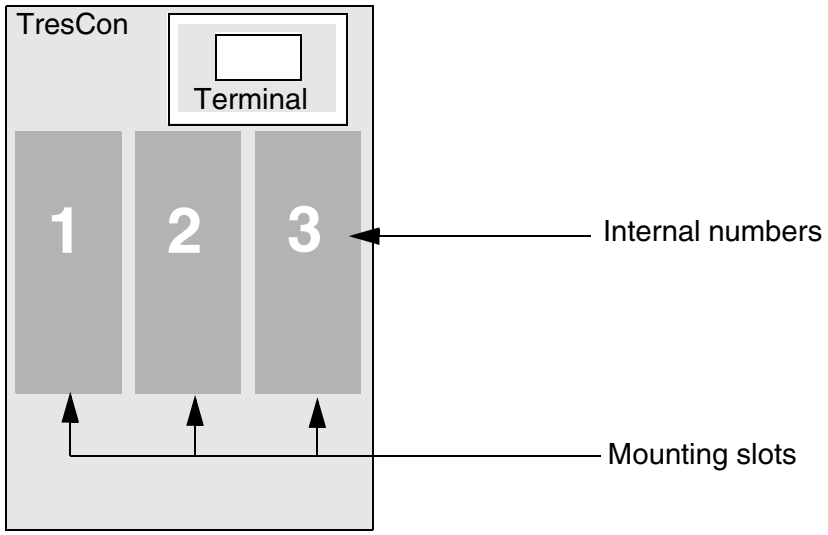


Fig. 1-5 Numbers of the mounting slots

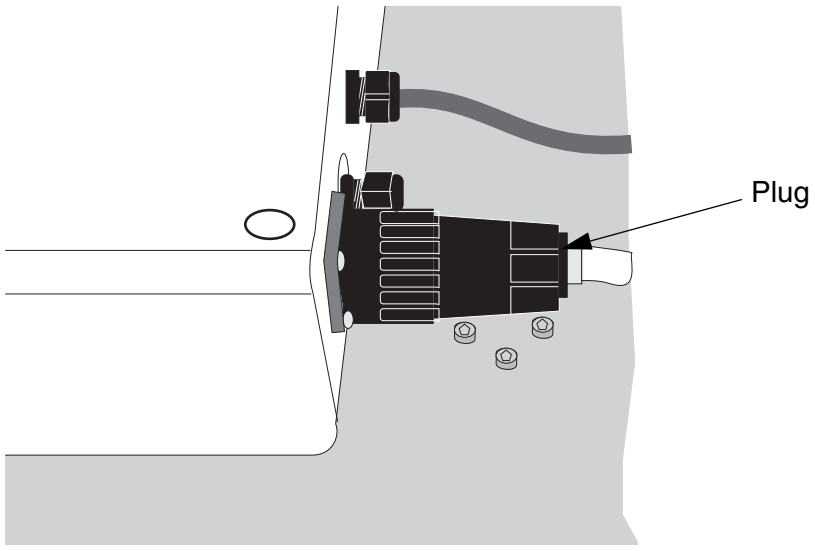


Fig. 1-6 Plug connector on the back of the TresCon NH4-N

Connecting the outlet

9	Use scissors to cut the outlet and ventilation tubes to a suitable length for the mounting slot (see table).

Tube dimensions

Mounting slot	**1**	**2**	**3**
Length	0.80 m	1.00 m	1.20 m

Inside diameter (ID) of outlet tube: 10 mm

Inside diameter (ID) of ventilation tube: 3 mm

10	Connect the open outlet tube of the TresCon NH4-N to the adapter inside the enclosure (see Fig. 1-7).
11	Also connect the ventilation tube to the adapter.

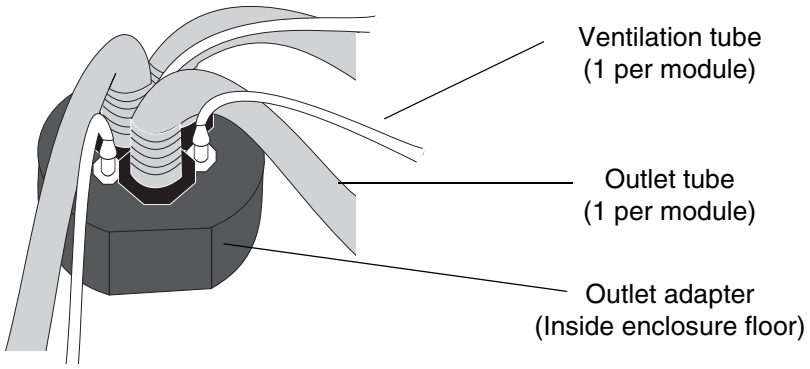


Fig. 1-7 Adapter for outlet

12	Carefully swing the mounting frame back into place.
13	Fix the mounting frame in place with the two screws (A) as shown in Fig. 1-4.

1.2.3 Connecting up the TresCon NH4-N

This section describes how to connect the permeate supply, outlet and chemicals.

Warning
Only specially trained employees are allowed to work on the analyzing section. Always take safety precautions when handling chemicals and comply with the relevant regulations. This applies in particular to the warning instructions on the chemical containers and in the safety datasheets.
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing

Connecting the permeate supply

1	Feed the permeate tubing of the TresCon NH4-N (black, ID = 1.5 mm) through the hole drilled in the bottom of the enclosure.
2	Insert the permeate tubing into the overflow vessel provided.

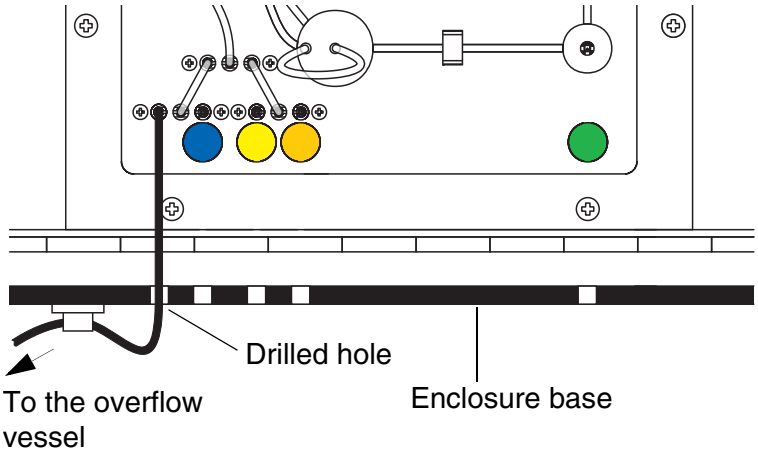
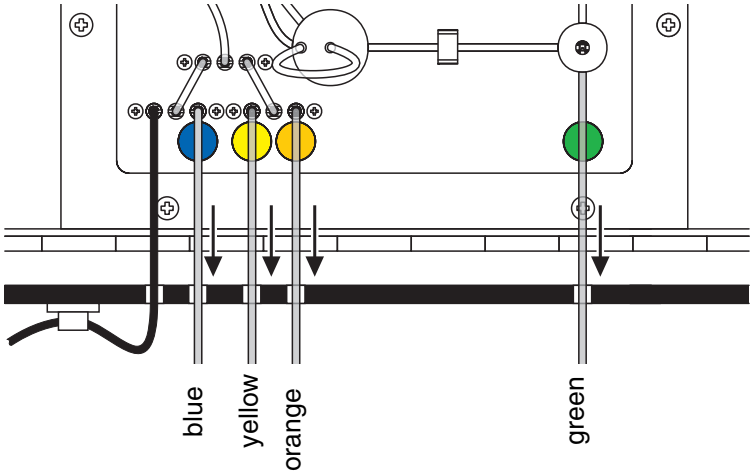


Fig. 1-8 Connecting the permeate supply

Note
If the TresCon NH4-N is to be connected to an overflow vessel that is already installed (measuring several parameters at a single sample catch location), the overflow vessel at this position must have 3 permeate connecting pieces. If this is not the case, replace the overflow vessel.
If the TresCon NH4-N is to measure a new sample location, another overflow vessel must be mounted.

Connecting the supply of consumables

1	Push the tubes (color coding given below) for standard A, standard B, reagent and cleaning solution through the holes drilled in the bottom of the enclosure.



Color coding of the consumables

blue	Cleaning solution (10 % citric acid)
yellow	Standard A
orange	Standard B
green	Reagent (NaOH)

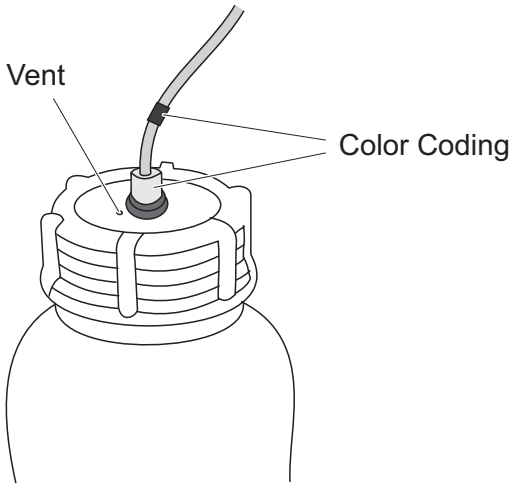


Fig. 1-9 Color coding

Connecting the cleaning solution

2	Place a full container of cleaning solution (10% citric acid) on the tray.
3	Connect the (blue) screw cap with the (blue) suction hose (see Fig. 1-9).

Connecting standard A

4	Place a full container of standard A on the tray.
5	Connect the (yellow) screw cap with the (yellow) suction hose.

Connecting standard B

6	Place a full container of standard B on the tray.
7	Connect the (orange) screw cap with the (orange) suction hose (see Fig. 1-9).

Connecting the reagent

The reagent must be prepared according to section 6.6 PREPARING THE REAGENT. Reagent contains NaOH.



Reagent causes severe corrosion
Do not allow this substance to get into the hands of children. Wear suitable protective gloves and goggles/face mask when working with this substance.
If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.

8	Place a full container of reagent on the tray.

9	Connect the (green) screw cap with the (green) suction hose (see Fig. 1-9). When doing so make sure the vent in the lid is free and dry.

1.2.4 Installing the electrode

An electrode of type NH500/TC is contained within the scope of delivery.

Note
Prepare the electrode according to the operating manual of the electrode.

Attention
Do not touch the electrical contacts on the connector! Contamination leads to a change in resistance.

Removing the transport protection

1	Unscrew the knurled screws on the measuring block and remove the plexiglass cover (1).

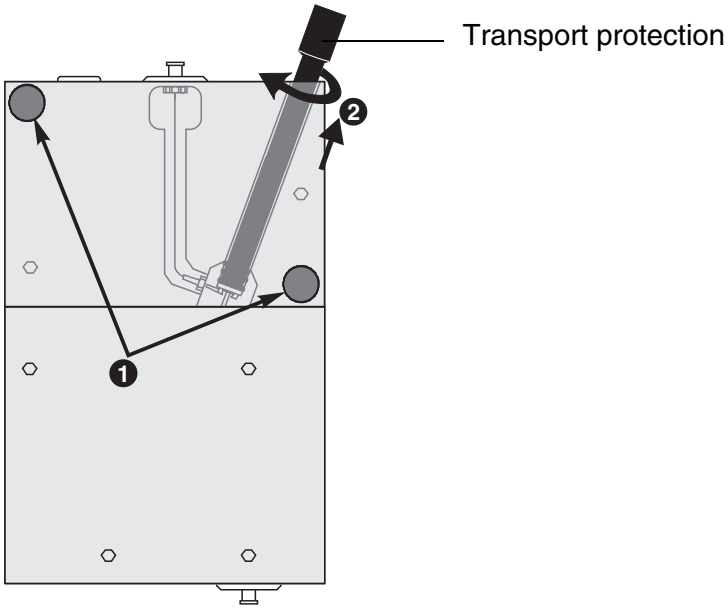


Fig. 1-10 Removing the transport protection

2	Unscrew the transport protection from the flow-thru vessel: Turn it in the direction of rotation and, at the same time, pull it (2).

Note
Keep the transport protection. It protects the measuring block against contamination when no electrode is installed.

Installing the electrode

1	Insert the prepared electrode into the flow-thru vessel: Twist the electrode in the direction of rotation and, at the same time, pull it (4).

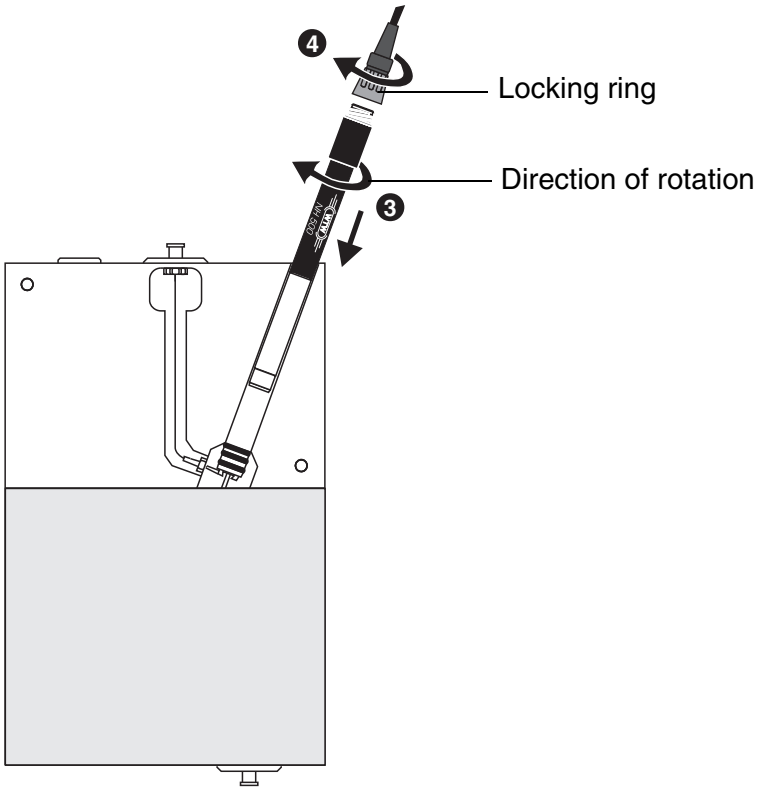


Fig. 1-11 Installing the electrode

2	Remove the connector dust cap.
3	Connect the connecting cable and screw the locking ring tight (4).
4	Replace the plexiglass cover and fix it with the knurled screws.

1.2.5 Initial commissioning

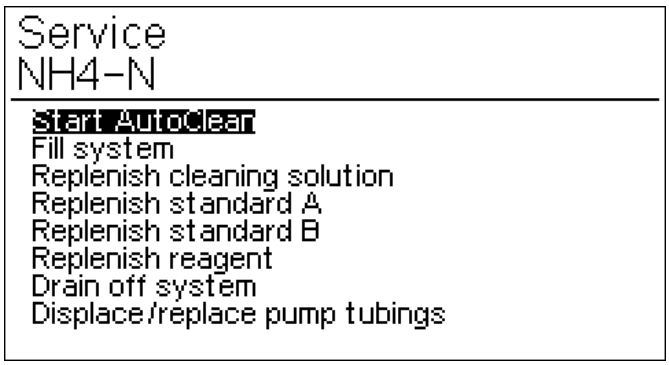
When the TresCon NH4-N is installed and connected, the initial commissioning can be started.



Note
Read the BASIC OPERATION section in the TERMINAL volume of this operating manual if you are not yet familiar with the operation of the TresCon.

Switching on the TresCon

1	Switch on the TresCon at the power switch (mounting stand). The analyzer modules warm up. After the analyzer modules reach their operating temperature, the TresCon NH4-N is ready for operation.
2	**Measuring mode** Select TresCon NH4-N with ⌄ ⌃.
3	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
4	Select the *Service* menu item with ⌄ ⌃ and confirm with ↵. The service menu appears.



Filling the system

5	Perform the *Fill system* service according to section 3.2, page 3-5 of the operating manual.

1.3 Removal from service

Depending on the duration of the shutdown, some precautionary measures need to be taken when removing the analyzer module from service.

Shutdown of up to 7 days

1	Perform the *Empty system* service, see section 3.7, page 3-17.
2	Remove the electrode and store the electrode correctly as described in the manual of the electrode.
3	Insert the transport protection in the flow-thru vessel instead of the electrode.

Shutdown of more than 7 days

1	Perform the *AutoClean* service, see section 3.1, page 3-4.
2	Perform the *AutoClean* service again using deionized water instead of cleaning solution.
3	Perform the *Empty system* service, see section 3.7, page 3-17.
4	Remove the electrode and store the electrode correctly as described in the manual of the electrode.
5	Insert the transport protection in the flow-thru vessel instead of the electrode.

1.4 Instrument parameters

You can call up the following menu items via the main menu, *Parameters NH4-N*, and display or change parameters there.

- Display of calibration data
  To display the values of the last calibration, page 2-6
- Service
  To perform maintenance activities with support from the service menu. Numerous service steps are described from page 3-1
- AutoCal
  Determines the parameters of the automatic calibration function, page 2-8
- AutoClean
  To determine the parameters of the automatic cleaning function, page 3-1
- Display
  To select the dimensions and citation form, page 2-13
- Attenuation
  To parameterize the integrated low pass filter, page 2-15
- Interval program
  To select the intervals of the interval program, page 2-17
- AutoAdapt
  To select the parameters of AutoAdapt, page 2-20
- Measuring interval
  To select the type of function and the intervals, page 2-22
- Dilution
  To enter a dilution factor, page 2-24

2 Operation

The following sections contain all the operating steps and tasks that are required in connection with the TresCon NH4-N. The sequence corresponds to the menu sequence of the main menu.

After calling up most of the menu items, you can select the presentation of data or change mode. In order to change a parameter, you must enter the four-digit identification number (PIN).

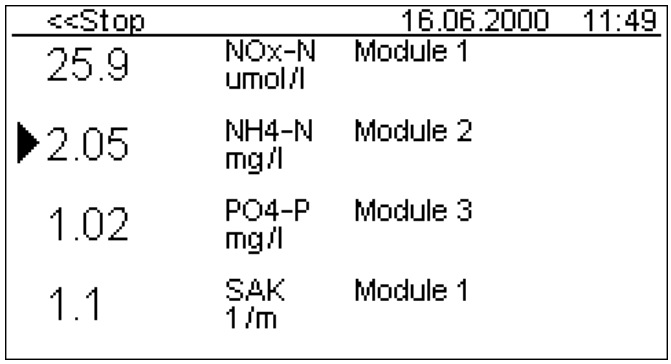
Note
How to enter the PIN to change parameters is described in volume 1, TERMINAL, of this operating manual.

Note
The operating sequences are described explicitly for the *Change* mode. If you want to display the parameter, proceed to the operating step "Selecting the change mode" of the instructions and, instead, select the "Presentation of data" mode.

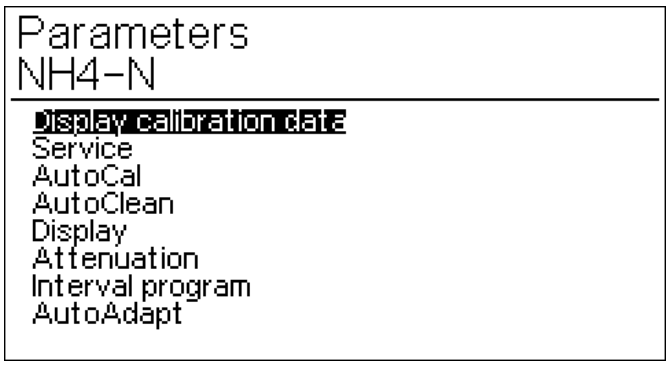
Attention
If you select the *Presentation of data* mode, the analyzer continues to run in the background.
If you select the *Change* mode, after the PIN has been entered, the analyzer goes into the STOP mode as important operating parameters could be changed.

Calling up the main menu, Parameters NH4-N

1	**Measuring mode** Select TresCon NH4-N: Move the arrow (cursor) with ⏬ ⏫ to the display line of the analyzer module, NH4-N.

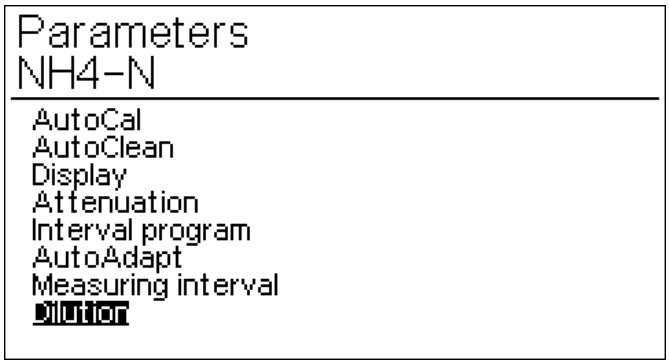


2	Call up the PARAMETERS NH4-N menu with ↵. The main menu appears on the display.



Note
Further menu items appear if you move the cursor further down or up in the selection list!

3 | Select further menu items with ⏬.



2.1 Measuring

The NH4-N analyzer module operates continuously or discontinuously. The respective start time of a discontinuous measurement depends on the settings in the *Measuring interval*, *Interval program* and *AutoAdapt* menus.

Continuous measurement

The measuring procedure consists of a sequence of several steps that are listed in the following overview. Subsequently, the TresCon NH4-N remains in the "measuring" mode. The measured value is continuously updated.

Step	Instrument status/action	Display*
1	Rinse with sample with reagent	Rinse sample
2	Wait for the reaction	Sample reaction
3	Measuring the sample	Measure sample
4	Continuous measurement	Continuously updated measured value

*This display only appears on the screen during measuring after AutoCal or after the "Stop" mode. Otherwise, only the measured value is displayed.

Discontinuous measurement

The measuring procedure consists of a sequence of several steps that are listed in the following overview. Subsequently, the TresCon waits for the start of the next measuring procedure. During this time the last measured value is displayed.

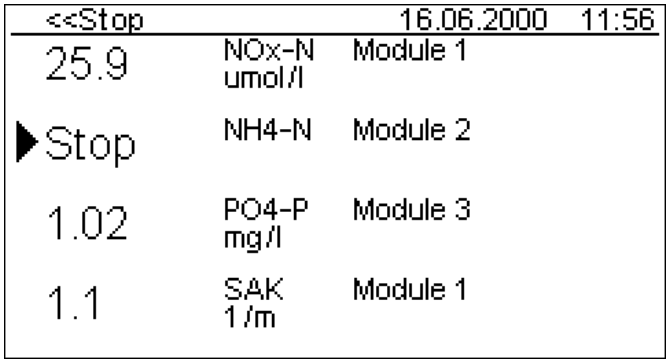
Step	Instrument status/action	Display
1	Rinse with sample with reagent	Old measured value
2	Wait for the reaction	Old measured value
3	Measuring the sample Calculating the mean value from the last 10 individual measurements	Old measured value
4	Displaying the concentration	Measured value, new

Duration

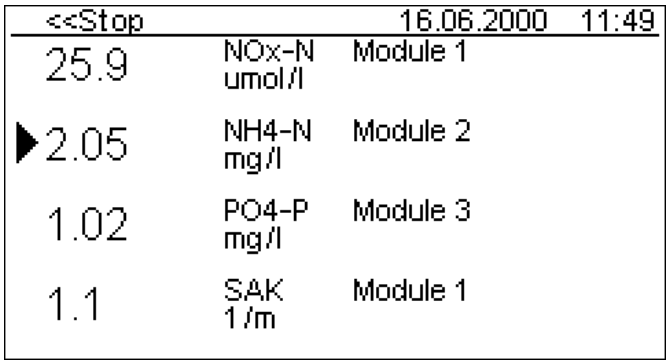
approx. 8 - 9 minutes;
with 60 minutes interval duration: 14 - 15 minutes.

Starting the measuring procedure

1	**Measuring mode** Select TresCon NH4-N: Move the arrow (cursor) with ⏬ ⏫ to the display line of the analyzer module, NH4-N.



2	Press the M key. The current process (e.g. Stop, Parameterizing, ...) is canceled, the measuring procedure starts. First, *Rinse sample* appears on the display.
3	After the operating steps, *Rinsing sample* and *Reaction*, the current measured value appears on the display.



2.2 Manually triggering (AutoCal) calibration

The individual steps required for a calibration run automatically and are designated by AutoCal. The TresCon NH4-N performs AutoCal at intervals. You can select the times and intervals in the AutoCal menu, see section 2.5 DISPLAYING/CHANGING THE AUTOCAL PARAMETERS, page 2-8.

Calibration

Step	Instrument status/action	Display
1	Rinse with standard A with reagent	Rinse standard A
2	Wait for the reaction	Reaction of standard A
3	Measuring standard A	Electrode voltage
4	Rinse with standard B with reagent	Rinse standard B
5	Wait for the reaction	Reaction of standard B
6	Measuring standard B	Electrode voltage
7	Evaluation	

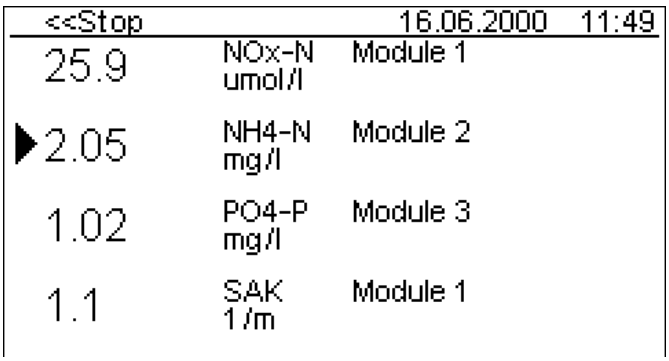
Duration

approx. 20 minutes in HQ calibration mode

Starting AutoCal

You can perform the AutoCal procedure for the analyzer module, NH4-N.

1 **Measuring mode**
Select TresCon NH4-N with ⌄⌃.



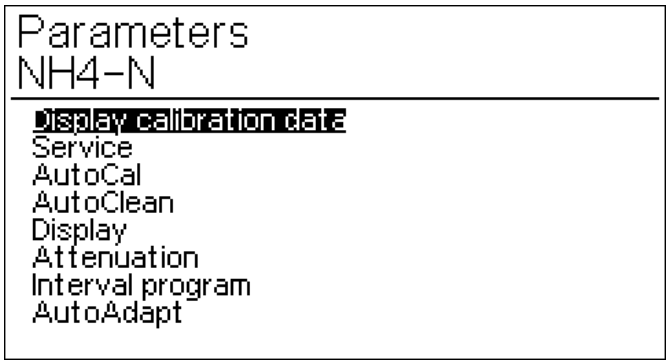
2 Press the C key. The AutoCal procedure begins immediately. Firstly, *Rinse standard A* appears on the display.

2.3 Displaying calibration data

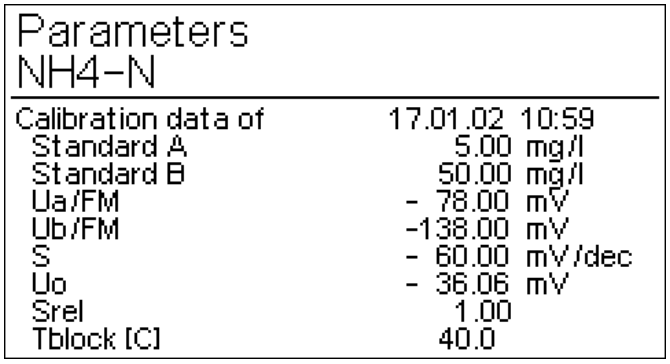
You can display the calibration data of the last AutoCal procedure with this menu item.

Displaying calibration data

1	**Measuring mode** Select TresCon NH4-N with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.



3	Confirm the menu item *Display calibration data* with ↵. The current calibration data appears on the display.



Calibration data

The displayed information refers to the last calibration and has the following meaning:

Parameter	Meaning
Standard A	Concentration of NH_4-N [mg/l] in standard A
Standard B	Concentration of NH4-N [mg/l] in standard B
Ua	Electrode voltage of standard A (allowable range: - 350 mV ... +100 mV; at least 20 mV higher than U_b) The calibration mode (*Cal Mode*) is displayed additionally.
Ub	Electrode voltage of standard B (allowable range: - 350 mV ... +100 mV) The calibration mode (*Cal Mode*) is displayed additionally.
S	Measured slope
Uo	Reference voltage (allowable range: - 150 mV ... + 50 mV)
Srel	Relative slope, calculated according to the following formula: $$S_{rel} = \frac{S_{measured}}{S_{theoretical}}$$ $S_{theoretical}$ is the slope to be expected from the physical conditions. In the ideal case, the following applies: $S_{rel} = 1$. The allowable range of Srel lies between 0.75 and 1.2
Tblock [C]	Temperature of the thermoblock

Calibration error

if the instrument could not determine any valid calibration data, for example because wrong standard solutions were connected, "err" appears on the right side of the time. The analyzer module switches to the STOP mode. The "Calibration defective" message appears in the measured value display. To continue to measure with the last valid calibration data, first press « to acknowledge the message and then press M.

2.4 Service

The *Service* menu item opens a comprehensive service menu.



Note
The service menu and maintenance activities are described in detail in chapter 3, MAINTENANCE.

2.5 Displaying/changing the AutoCal parameters

You can display or change the parameters of the AutoCal function in this menu. The factory settings correspond to the values obtained from practical experience in normal wastewater treatment plants.

Calibration standards

Depending on the measured values expected, use the following calibration standards:

Typical measured values	Calibration standards
< 5 mg/l	Standard AI and BI (1.0 and 10.0 mg/l)
> 5 mg/l	Standard AII and BII (5.0 and 50.0 mg/l)

Ordering information concerning the calibration standards can be found in section 6.2 ACCESSORIES AND MATERIAL SUBJECT TO WEAR.



Note
Displaying the calibration parameters of the last calibration is described in section, DISPLAYING CALIBRATION DATA on page 2-6

Changing parameters

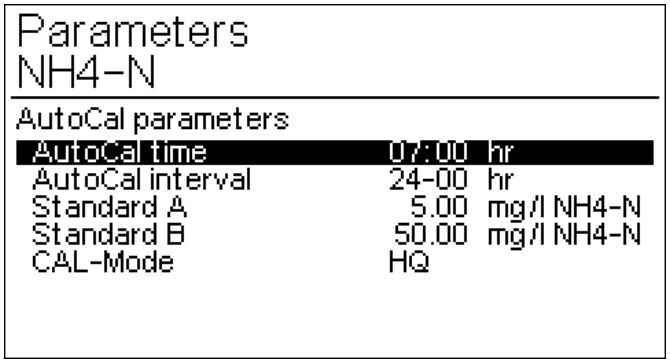
Parameter	Values
AutoCal time	Reference time at which a calibration should be started. Further calibrations are carried out according to the adjusted calibration interval (AutoCal interval). Format hh:mm, input step-by-step, minimum step: 30 min
AutoCal interval	Calibration interval: 1, 2, 3, 6, 12, 24 h
Standard A	0.20 mg/l NH4-N to 50.00 mg/l NH4-N
Standard B	2.00 mg/l NH4-N to 500.00 mg/l NH4-N Value must be larger than *standard A* by a factor of at least 10

Parameter	Values
Cal Mode	– FM (Fast Mode) – HQ (High Quality - standard setting) – SHQ (Super High Quality) Calibration mode: This setting changes the running-in time of the electrode compared to the standard running-in time (300 s) when measuring standard A and B. *FM*: Running-in time = 1/2 x default running-in time (recommended for measurements above 30 mg/l NH4-N) *HQ*: Running-in time = Default running-in time *SHQ*: Running-in time = 2 x default running-in time (recommended for measurements below 5 mg/l NH4-N) Longer running-in times increase the consumption of standard solutions: *FM*: 0.5 x normal consumption *HQ*: 1 x normal consumption *SHQ*: 2 x normal consumption The calibration mode has no influence on the running-in time of the electrode in the measuring operation.

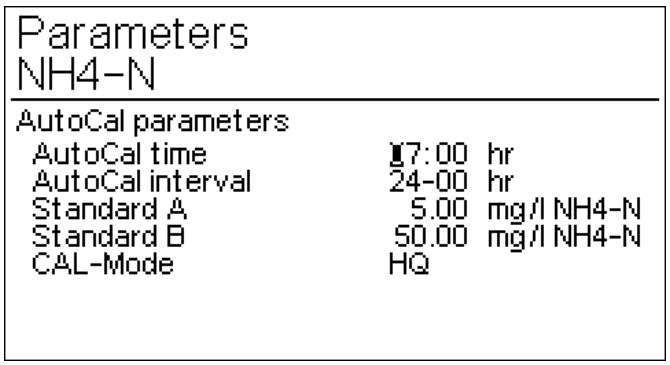
Note
The times of AutoCal and AutoClean are linked with one another. Setting the AutoCal time in this menu also changes the AutoClean time automatically (see section 2.6 on page 2-11).

1	**Measuring mode** Select TresCon NH4-N with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *AutoCal* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.

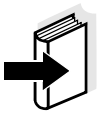
5	Input the PIN digit-by-digit with ⌄ ⌃. Change the digit with « » and confirm with ↵. The analyzer switches into STOP mode.



6	Select the parameters to be changed with ⌄ ⌃ and switch into input mode with ↵.



7	Input the values required, digit-by-digit if necessary, with ⌄ ⌃. Change the digit with « ».
8	Confirm inputs with ↵. If necessary, repeat steps 6 and 7 for any other parameters.
9	Leave the menu with ↑. The request *Store* appears.
10	Select *Yes* or *No* with ⌄ ⌃ and confirm with ↵.



Note
AutoCal consists of several operating steps (see MANUALLY TRIGGERING (AUTOCAL) CALIBRATION on page 2-5).

2.6 Displaying/changing AutoClean parameters

You can display or change the parameters of the automatic AutoClean cleaning procedure.

Dependencies

- An AutoCal procedure automatically follows an AutoClean procedure.
- The AutoClean time and AutoCal time are linked (see below).



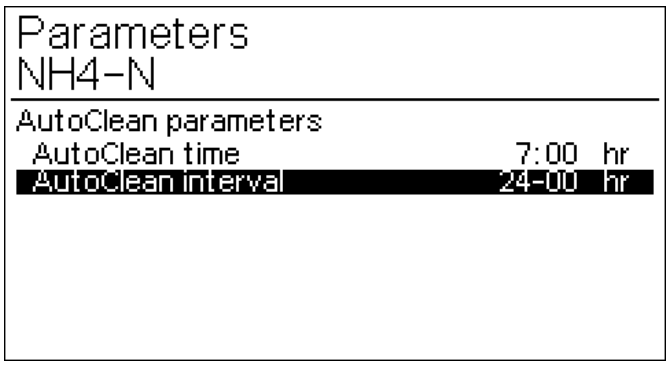
Note
You can trigger an exceptional AutoClean procedure. Read the section STARTING THE AUTOCLEAN PROCEDURE on page 3-4 in this manual for more information. The operating sequence is described in detail there.

Changing the AutoClean parameters

The factory settings correspond to the values obtained from practical experience in normal wastewater treatment plants. The AutoClean time parameter is linked with the AutoCal time and can only be changed in the *Changing the AutoCal Parameter* menu (see section 2.5, page 2-8).

Parameter	Values
AutoClean time	Reference time at which an AutoClean procedure should be started. Further AutoClean procedures are carried out according to the adjusted AutoClean interval. The AutoClean time corresponds to the AutoCal time and cannot be changed here.
AutoClean interval	1, 2, 3, 4, 6, 12, 24 ... 168 h (from 24 h, adjustable in 12 h-steps)

1	**Measuring mode** Select TresCon NH4-N with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *AutoClean* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.
5	Input the PIN digit-by-digit with ⏬ ⏫. Change the digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into STOP mode.



6	Switch into input mode with ↵.
7	Input the values required, digit-by-digit if necessary, with ⌄ ⌃. Change the digit with « ».
8	Leave the menu with ↑. The request *Store* appears.
9	Select *Yes* or *No* with ⌄ ⌃ and confirm with ↵.

2.7 Displaying/changing the Display parameters

You can display or change the dimension/citation form in this menu.

Converting the citation forms and units

The reference quantity is NH4-N (ammonium nitrogen NH_4^+-N) in mg/l. Using this value, the displays are calculated in another unit or cited form by multiplying them with the specified factor.

Dimension	Citation forms	
	NH4-N (NH_4^+-N), NH_3-N	NH4 (NH_4^+)
mg/l or ppm	1.0	1.29
mmol/l	0.07139	0.07139

Note
The conversion of the dimension and citation form does not apply to the input of the values for the calibration standards. These never change and are displayed in mg/l NH4-N.

Effects of the conversion

The following table demonstrates where the adjusted citation form has an effect:

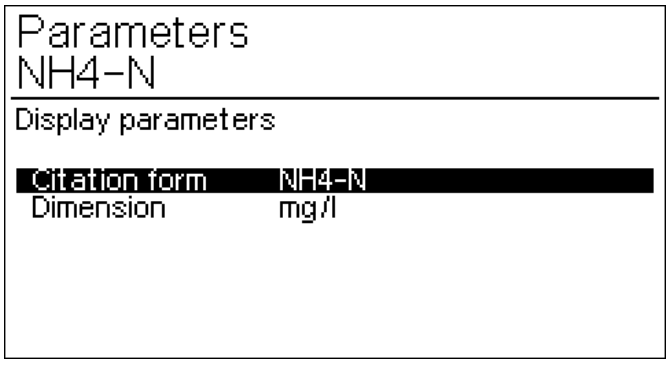
Measured value	yes
Measuring range	yes
Input and display of Cnominal	yes
Concentration details for Standards A and B	No
Relay functions	yes (*General Parameters* menu)
Recorder functions	yes (*General Parameters* menu)

Inputs

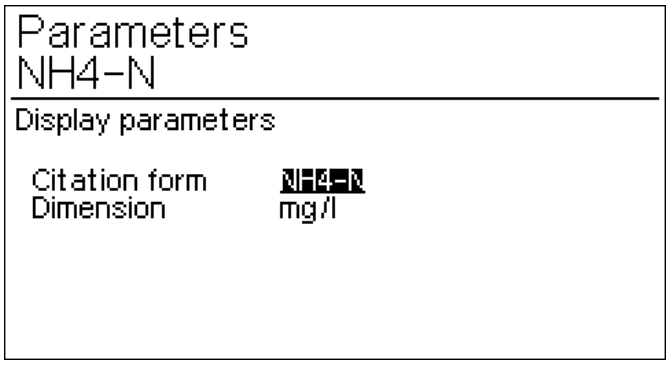
Parameter	Values
Citation form	NH4-N NH4 NH_3-N
Dimension	mg/l mmol/l ppm

Changing parameters

1	**Measuring mode** Select TresCon NH4-N with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Presentation of data* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.
5	Input the PIN digit-by-digit with ⏬ ⏫. Change the digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into STOP mode.



6	Select the parameters to be changed with ⏬ ⏫ and switch into input mode with ↵.



7	Select the required type of display with ⏬ ⏫.

8	Confirm inputs with ↵. If necessary, repeat steps 6 and 7 for any other parameters.
9	Leave the menu with ↑. The request *Store* appears.
10	Select *Yes* or *No* with ↓ ↑ and confirm with ↵.

Resolution of the display

The resolution of the display depends on:

- Size of the measured value
- Dimension
- Citation form
- Dilution



Note
A list of the resolution for all measuring ranges, citation forms and units can be found in chapter 5 TECHNICAL DATA.

2.8 Displaying/changing the attenuation parameters

You can select the attenuation of the measured value calculation in four steps in this menu.

How it functions

The measured values are acted upon mathematically by a digital lowpass filter and, thus, the measured value that is output to the central unit is damped.

The calculation of new values is performed at intervals of 20 s. At the intervals of the measurement (5, 10, 15 min., etc. depending on the setting), a new x value is used for the lowpass filter calculation.

If the analyzer begins a new measuring cycle (after STOP or AutoCal), all the x_n are first set to the newly calculated concentration values. This prevents the filter from oscillating and the new measured value is displayed immediately.

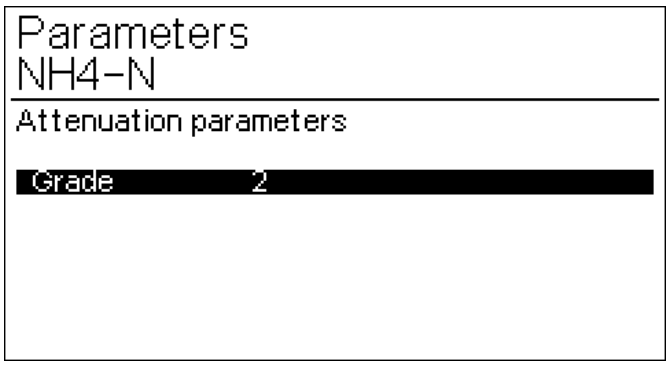
The digital attenuation results in an extremely smooth response of any successive control unit.

You can display or change the current setting in this menu. Each step corresponds to a fixed rise time (data in parentheses).

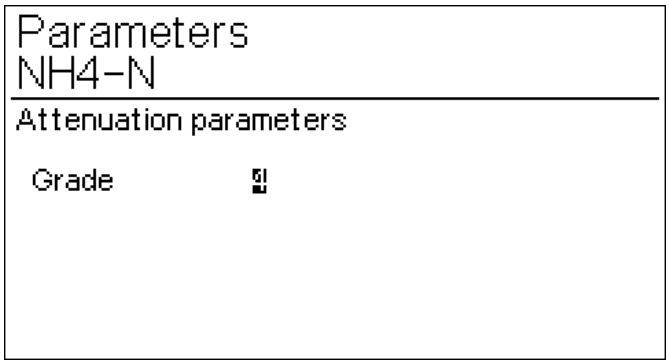
Inputs

Parameter	Values
Step	**off**, 1 (= 100 s), 2 (= 200 s), 3 (= 300 s), 4 (= 400 s)

1	**Measuring mode** Select TresCon NH4-N with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Attenuation* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.
5	Input the PIN digit-by-digit with ⏬ ⏫. Change the digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into STOP mode.



6	Switch into input mode with ↵.



7	Input the rise time with ⏬ ⏫ and confirm with ↵.
8	Leave the menu with ⏎. The request *Store No* appears.
9	Select *Yes* or *No* with ⏬ ⏫ and confirm with ↵.

2.9 Displaying/changing the interval program parameters

You can input a weekly program for the measuring intervals.
This weekly program is used for adapting the analyzer to the daily load of the wastewater treatment plant. This minimizes the consumption of reagents.

Principle

Each weekday is divided into 2-hourly periods. You can select each 2-hour period for each weekday and allocate a measuring interval to these periods. You can select between fixed intervals and the "continuous" (*cont.*) setting.

Note
The interval program is switched on in the *Measuring Interval* menu (see section 2.11 DISPLAYING/CHANGING THE MEASURING INTERVAL on page 2-22).

Basic settings

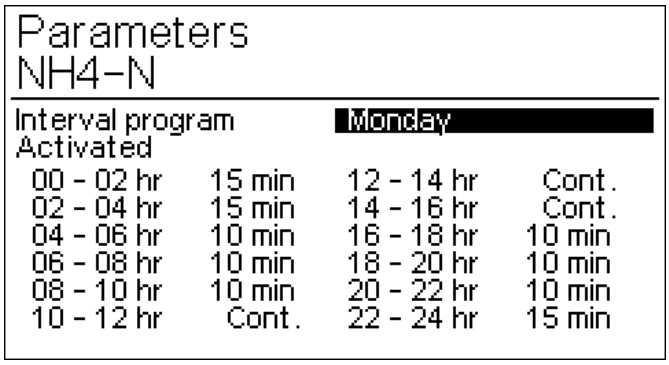
The following table contains the basic factory settings of the intervals. The numbers specified are the intervals in minutes where "cont." stands for continuous measurement.

	MON	TUE	WED	THU	FRI	SAT	SUN
00-02 hours	15	15	15	15	15	15	15
02-04 hours	15	15	15	15	15	15	15
04-06 hours	10	10	10	10	10	15	15
06-08 hours	10	10	10	10	10	15	15
08-10 hours	10	10	10	10	10	15	15
10-12 hours	cont.	cont.	cont.	cont.	cont.	15	15
12-14 hours	cont.	cont.	cont.	cont.	cont.	15	15
14-16 hours	cont.	cont.	cont.	cont.	cont.	15	15
16-18 hours	10	10	10	10	10	15	15
18-20 hours	10	10	10	10	10	15	15
20-22 hours	10	10	10	10	10	15	15
22-00 hours	15	15	15	15	15	15	15

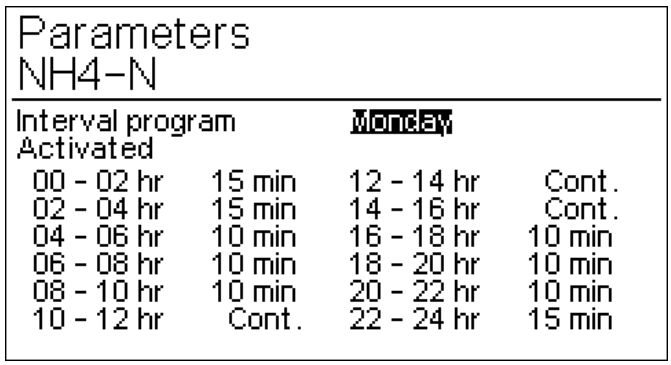
Changing the interval program

Parameter	Values
Weekday	Monday, Tuesday... Sunday
-no name-	Display of whether the interval program is active (can be changed in the *Measuring Interval* menu).
Interval	cont., 10, 15, 20, 25, 30, 60 min.

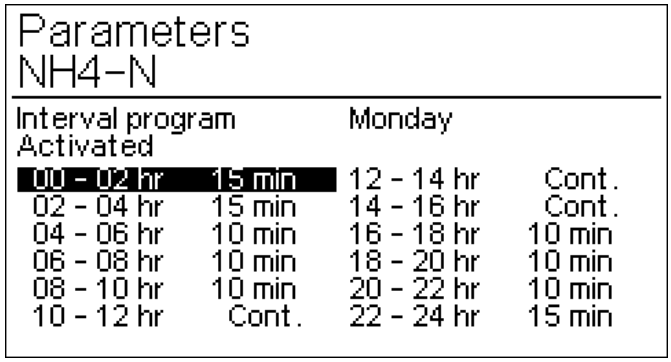
1	**Measuring mode** Select TresCon NH4-N with ⌄⌃.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Interval program* menu item with ⌄⌃ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⌄⌃ and confirm with ↵.
5	Input the PIN digit-by-digit with ⌄⌃. Change the digit with ‹› and confirm with ↵. The analyzer switches into STOP mode.



6	Switch into input mode with ↵.



7	Select the required weekday with ⏬ ⏫ and confirm with ↵. The cursor skips to the line of the first interval.



8	Select the interval to be changed with ⏬ ⏫ and switch into input mode with ↵.
9	Input the required value with ⏬ ⏫ and confirm with ↵.
10	If necessary, repeat steps 7 to 9 for any other intervals.
11	Leave the menu with ↩. The request *Store* appears.
12	Select *Yes* or *No* with ⏬ ⏫ and confirm with ↵.

2.10 Displaying/changing the AutoAdapt parameters

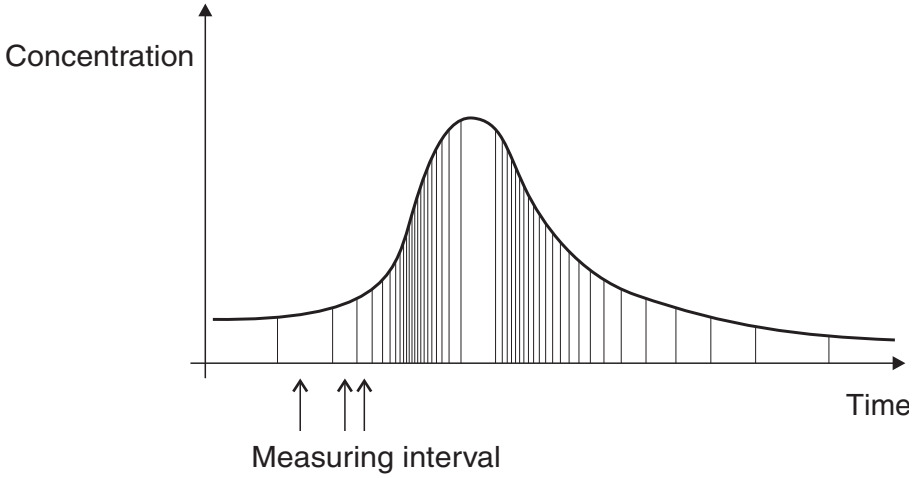
The AutoAdapt system can be used to minimize the consumption of reagents. The measuring intervals adapt automatically to changes in concentration.

How it functions

The regression line is calculated from the last three measured values. The slope of the lines is evaluated. The measuring interval is changed as a result so that it does not exceed the maximum allowed change in concentration per measurement. AutoAdapt sets the interval to "Continuous" (corresponds to approx. 2 minutes) or to fixed interval times, e.g. from 10 minutes to 20 minutes.

Relationship Measured value-duration of the interval

The following figure shows the relationship between the measured value and duration of the interval:



Parameter

You can specify the concentration change per time (DC/time) and the interval limits (Minimum/Maximum interval). AutoAdapt sets the duration of the interval within the limits to one of the following values: 10, 15 ... 30, 60 minutes or to "Continuous" (corresponds to approx. 5 seconds).

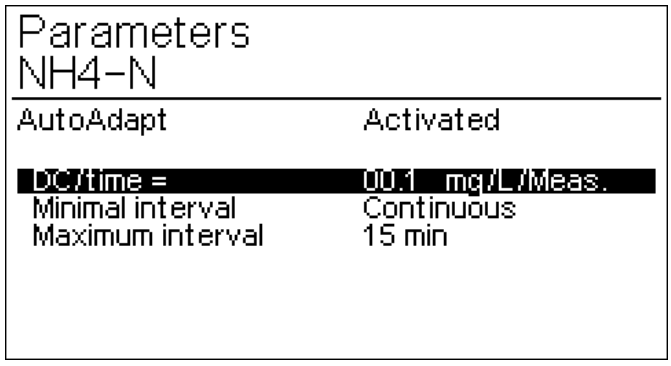
Note

The AutoAdapt function is switched on in the *Measuring Interval* menu (see section 2.11 DISPLAYING/CHANGING THE MEASURING INTERVAL on page 2-22).

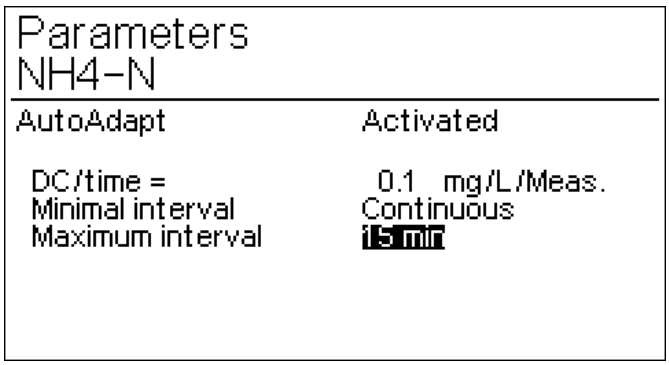
Changing the AutoAdapt parameters

Parameter	Values	
-no name-	Display of whether AutoAdapt is active (is changed in the *Measuring Interval* menu).	
DC/time	0.1 - 10.0 mg/L/Measurement (NH4-N)	
Minimum interval	Continuous, 10, 15, 20, 25, 30, 60 min	The minimum interval must be selected so that it is lower than the maximum interval!
Maximum interval	10, 15, 20, 25, 30, 60 min	

1	**Measuring mode** Select TresCon NH4-N with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *AutoAdapt* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.
5	Input the PIN digit-by-digit with ⏬ ⏫. Change the digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into STOP mode.



6	Select the parameters to be changed with ⏬ ⏫ and switch into input mode with ↵.



7	Input the values required, digit-by-digit if necessary, with ▼ ▲. Change the digit with ◀ ▶.
8	Confirm inputs with ↵. If necessary, repeat steps 6 and 7 for any other parameters.
9	Leave the menu with ESC. The request *Store* appears.
10	Select *Yes* or *No* with ▼ ▲ and confirm with ↵.

2.11 Displaying/changing the measuring interval

You can specify which TresCon features that concern the measuring intervals are active in this menu. You can select a measuring interval or select one of the following options:

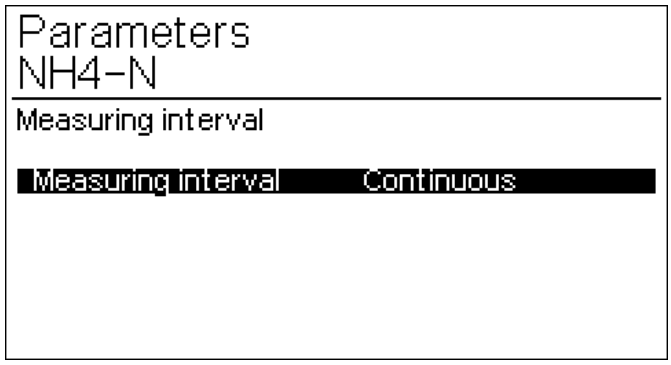
- AutoAdapt (for information on adapting the measuring interval to the change in the measured value, see page 2-20)
- Interval program (for information on the fixed setting of 12 periods on each weekday, see page 2-17)
- Continuous

Setting up the measuring interval

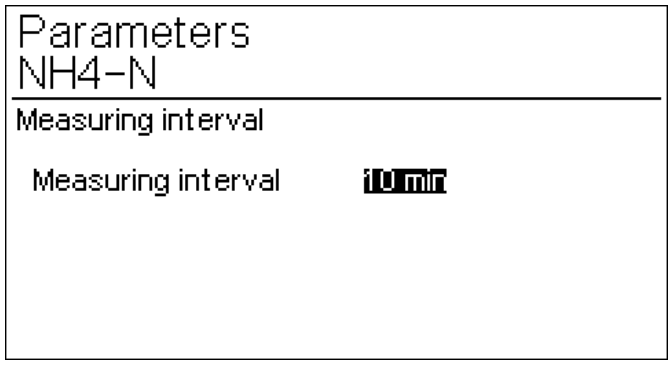
Parameter	Values
Measuring interval	10, 15, 20, 25, 30, 60 min. AutoAdapt, interval program, continuous

1	**Measuring mode** Select TresCon NH4-N with ▼ ▲.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.

3	Select the *Measuring interval* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.
5	Input the PIN digit-by-digit with ⏬ ⏫. Change the digit with « » and confirm with ↵. The analyzer switches into STOP mode.



6	Switch into input mode with ↵.



7	Input the measuring interval with ⏬ ⏫ and confirm with ↵.
8	Leave the menu with ↰. The request *Store* appears.
9	Select *Yes* or *No* with ⏬ ⏫ and confirm with ↵.

2.12 Displaying/changing the dilution parameter

You can select the dilution of the sample in this menu.

How it functions

If the sample is diluted before it reaches the TresCon, the dilution factor can be selected so that the actual concentration value is displayed.

Example

The dilution is set to 1+3 (1 part test sample, with the aid of PurCon diluted with 3 parts H2O).
The analyzer measures 1.00 mg/l NH4-N and multiplies the value by the factor 4.
4.00 mg/l NH4-N appears on the display.

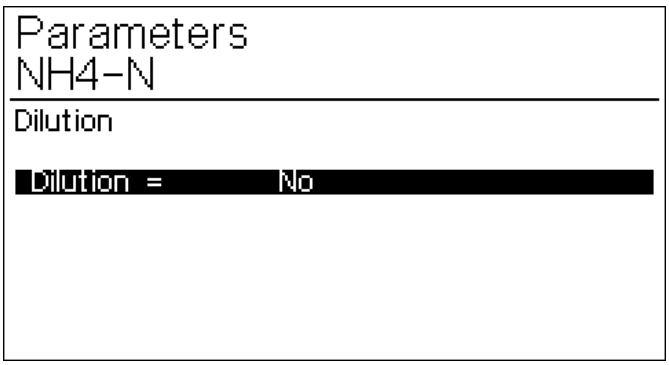


Note
The measuring range corresponding to the resolution is given in the parameter ticket. By using a dilution device before the TresCon, the dilution error becomes part of the total error.

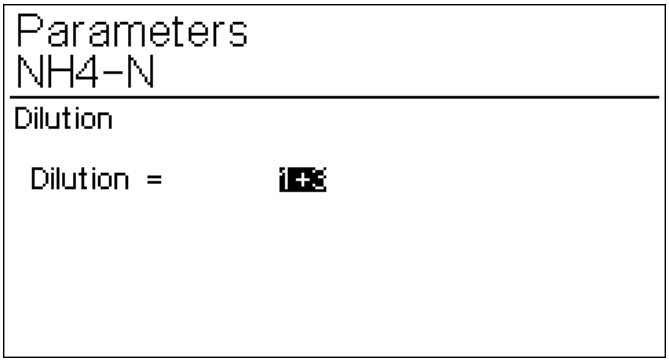
Changing the dilution parameter

Parameter	Values
Dilution	no, 1+1, 1+2, 1+3, 1+4, 1+5, 1+6, 1+7, 1+8, 1+9, 1+11, 1+13, 1+15, 1+17, 1+19

1	**Measuring mode** Select TresCon NH4-N with ⌄ ⌃.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Dilution* menu item with ⌄ ⌃ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⌄ ⌃ and confirm with ↵.
5	Input the PIN digit-by-digit with ⌄ ⌃. Change the digit with « » and confirm with ↵. The analyzer switches into STOP mode.

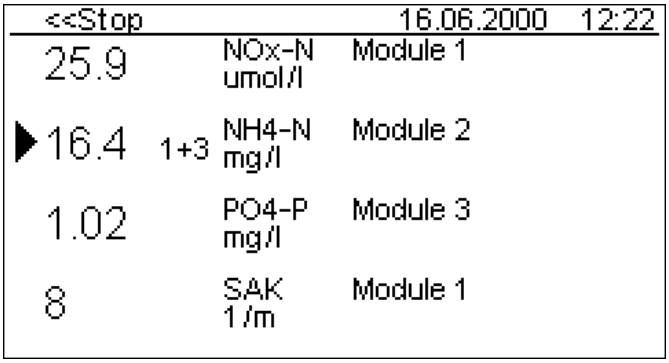


6	Switch into input mode with ↵.



7	Input the required dilution with ⌄ ⌃ and confirm with ↵.
8	Leave the menu with ↰. The request *Store* appears.
9	Select *Yes* or *No* with ⌄ ⌃ and confirm with ↵.

Measuring mode: Display of the dilution



As soon as a measured value is displayed, the display of the dilution appears after the measured value of the TresCon NH4-N. Here, a dilution of 1+3 is selected.

3 Maintenance

TresCon NH4-N has a service menu for maintenance activities. Always follow the instructions given in this operating manual when performing maintenance activities.

Note
Read chapter 2, SAFETY, in volume 1, TERMINAL, of this operating manual before starting maintenance activities.

Warning
Only specially trained employees are allowed to work on the analyzing section. Always take safety precautions when handling chemicals and comply with the relevant regulations. This applies in particular to the warning instructions on the chemical containers and in the safety datasheets.
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves

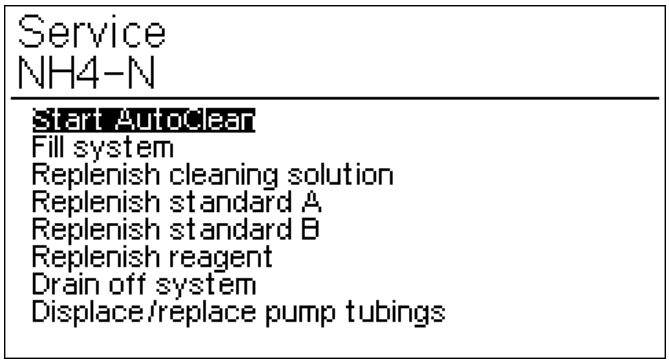


Wear protective clothing

Note
Each service is made up of several steps. You cannot quit the individual service routines. Press the ↵ key to skip individual steps.

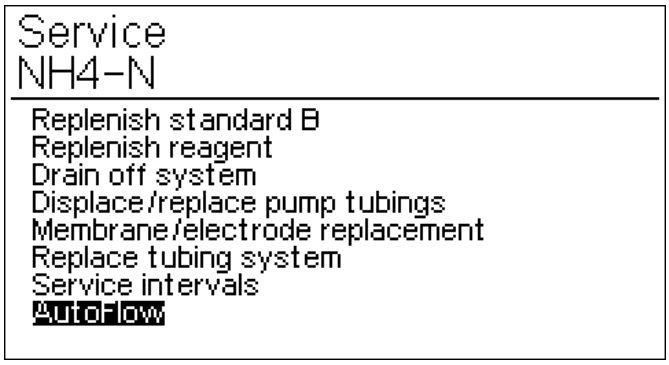
Calling up the service menu

1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.



Note
All the menu items of the service menu cannot be displayed at the same time (see step 4).

4	Move the selection to the lowest menu item with ⏬ and display further menu items with ⏬ again.



After calling up the menu items:

- Service intervals
- AutoFlow

you have the option to select the *Presentation of data* or *Change* mode. To change parameters, you must enter the four-digit PIN.



Attention
If you select the *Presentation of data* mode, the analyzer continues to run in the background.
If you select the *Change* mode, after the PIN has been entered, the analyzer goes into the STOP mode as important operating parameters could be changed.

3.1 Starting the AutoClean procedure

You can trigger an exceptional cleaning procedure. This AutoClean procedure has no effect on the automatic AutoClean procedures.

The cleaning procedure consists of several individual steps that are listed in the following overview:

Program sequence

Step	Instrument status/action
1	Rinse with cleaning solution but without any reagent
2	Flush back the sample without any reagent
3	Rinse with cleaning solution but without any reagent
4	Wait
5	Rinse with sample but without any reagent
6	Rinse with cleaning solution but without any reagent
7	Wait
8	Rinse with cleaning solution but without any reagent

Duration

approx. 12 minutes

Note
You cannot quit the AutoClean procedure. At the end of the cleaning procedure, a calibration is automatically triggered. After this procedure, the instrument switches into measuring mode.

Starting the AutoClean procedure

1	**Measuring mode** Select the NH4-N analyzer module with .
2	Call up the *Parameters NH4-N* menu with . The main menu appears on the display.
3	Select the *Service* menu item with and confirm with . The service menu appears.
4	Select the *AutoClean Start* menu item with and confirm with . The procedure begins immediately. *Rinse cleaning solution* appears in the measured value display.
5	At the end of the procedure, an AutoCal procedure is automatically triggered. Afterwards, the TresCon switches into the measuring mode.

3.2 Filling the system

This routine fills the wet chemical system with chemicals. This determines the readiness for use of the instrument. The TresCon guides the user through the service. The steps and activities required appear on the display. Only start this service during initial commissioning or when returning the instrument to service.

Consumables

The following consumables are required for the operation of the TresCon NH4-N:

- 1.5 l standard A
- 1.5 l standard B
- 1.5 l cleaning solution (10% citric acid)
- 10 l reagent (NaOH)



Reagent causes severe corrosion
Do not allow this substance to get into the hands of children. Wear suitable protective gloves and goggles/face mask when working with this substance. If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.



Warning
Only specially trained employees are allowed to work on the analyzing section. Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing

Program sequence

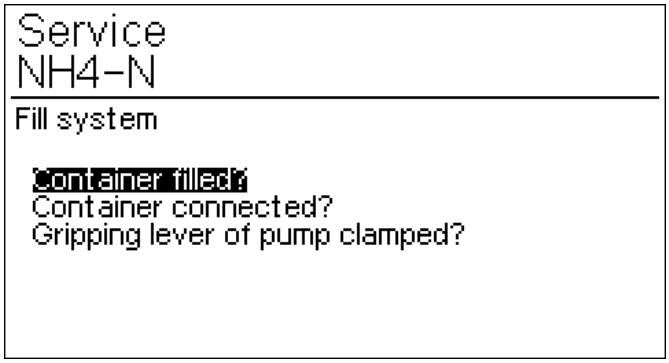
Step	Instrument status/action
1	Rinse with cleaning solution with reagent
2	Rinse with standard A with reagent
3	Rinse with standard B with reagent
4	Rinse with sample with reagent
5	Rinse with sample but without any reagent
6	Rinse with sample with reagent
7	Rinse with sample but without any reagent
8	Rinse with sample with reagent

Duration approx. 3 minutes

Note
You cannot quit the procedure. At the end of the filling procedure, an AutoClean (cleaning) and calibration procedure are triggered.

Starting the procedure

1	**Measuring mode** Select the NH4-N analyzer module with .
2	Call up the *Parameters NH4-N* menu with . The main menu appears on the display.
3	Select the *Service* menu item with and confirm with . The service menu appears.
4	Select the *Fill system* menu item with and confirm with . A checklist appears on the display.

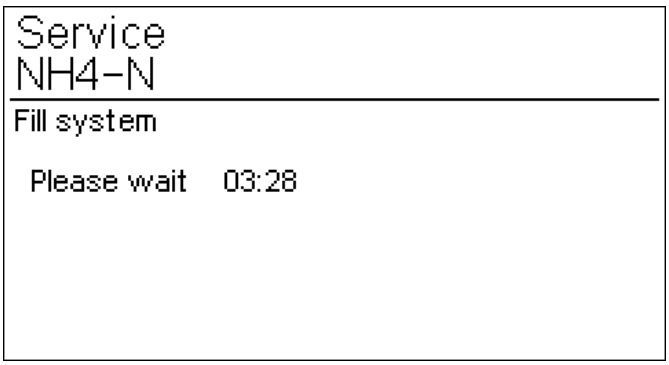


5	Place the full containers on the tray.
6	Connect the consumables. Follow the color coding!

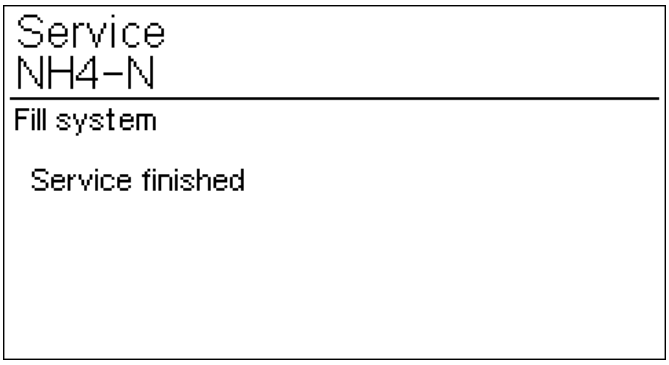
Color coding of the consumables

blue	Cleaning solution (10 % citric acid)
yellow	Standard A
orange	Standard B
green	Reagent (NaOH)

7	Confirm the prompts each time with after checking. After the last confirmation, the procedure begins immediately and the remaining duration appears on the display.



8	At the end of the procedure, *Service finished* appears on the display.



9	Return to the service menu with ↵.

3.3 Replenishing the cleaning solution

This routine replenishes the wet chemical system with cleaning solution (10% citric acid).

Program sequence

Step	Instrument status/action
1	Rinse with cleaning solution but without any reagent

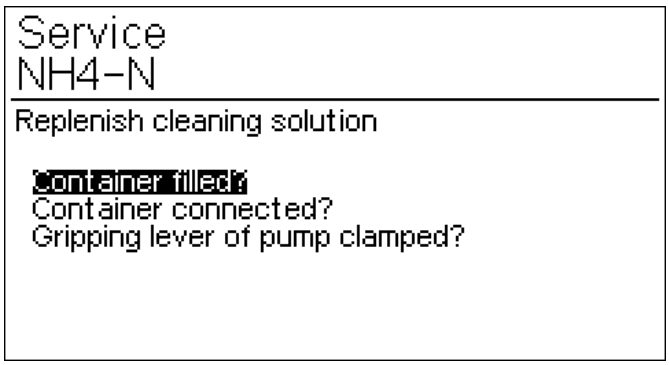
Duration

approx. ½ minute

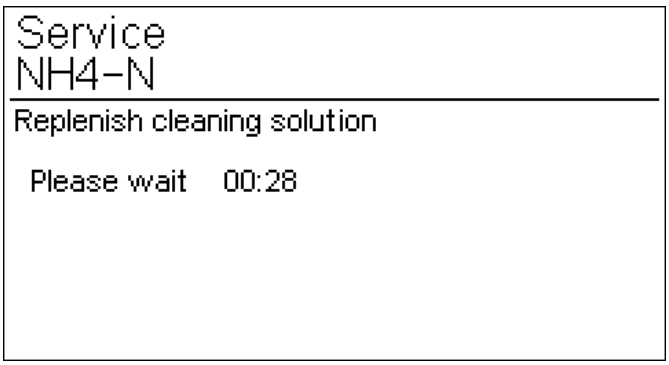
Note
You cannot quit the procedure.

Starting the procedure

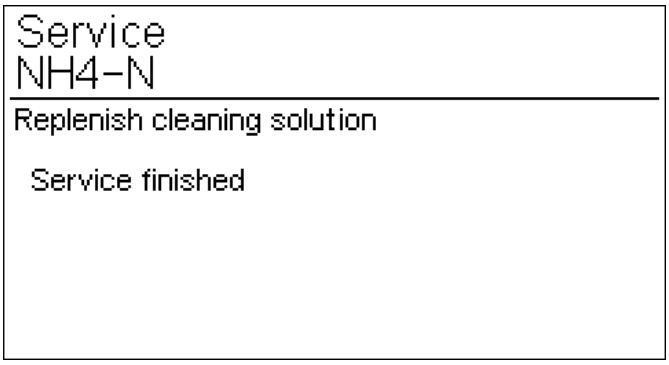
1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Replenishing cleaning solution* menu item with ⏬ ⏫ and confirm with ↵. A checklist appears on the display.



5	Place a full container of cleaning solution on the tray.
6	Connect the container. Follow the color coding (blue)!
7	Confirm the prompts each time with ↵ after checking. After the last confirmation, the procedure begins immediately. The remaining duration appears on the display.



8	At the end of the procedure, *Service finished* appears on the display.



9	Return to the service menu with ↵.

3.4 Replenishing standard A

This routine fills the wet chemical system with standard A.

Program sequence

Step	Instrument status/action
1	Rinse standard A without any reagent

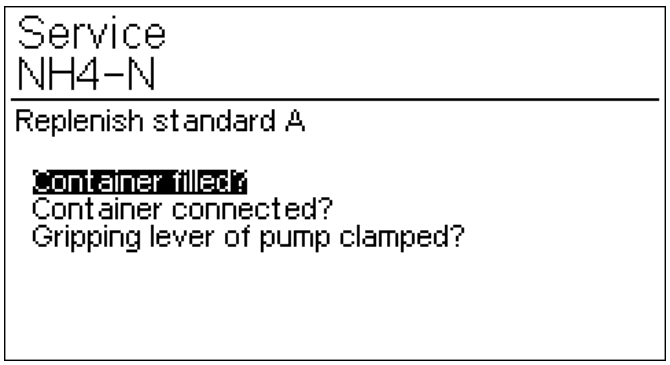
Duration

approx. ½ minute

Note
You cannot quit the procedure.

Starting the procedure

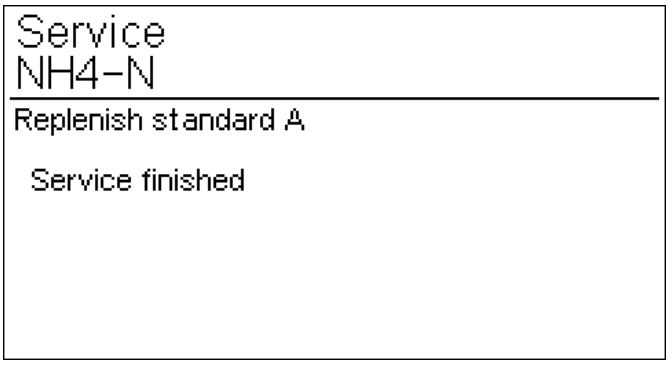
1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Replenish standard A* with ⏬ ⏫ and confirm with ↵. A checklist appears on the display.



5	Place a full container of standard A on the tray.
6	Connect the container. Follow the color coding (yellow)!
7	Confirm the prompts each time with ↵ after checking. After the last confirmation, the procedure begins immediately and the remaining duration appears on the display.



8	At the end of the procedure, *Service finished* appears on the display.



9	Return to the service menu with ↵.

3.5 Replenishing standard B

This routine fills the wet chemical system with standard B.

Program sequence

Step	Instrument status/action
1	Rinse standard B without any reagent

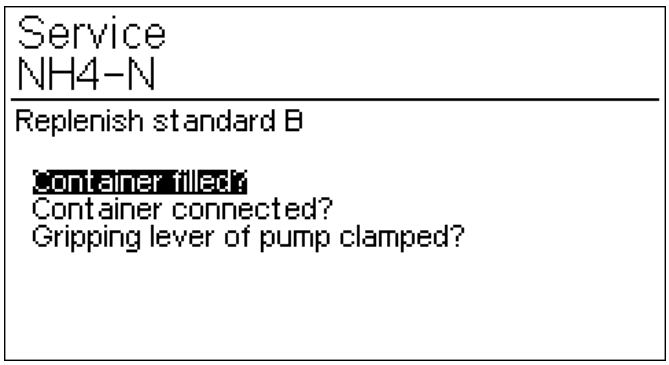
Duration

approx. ½ minute

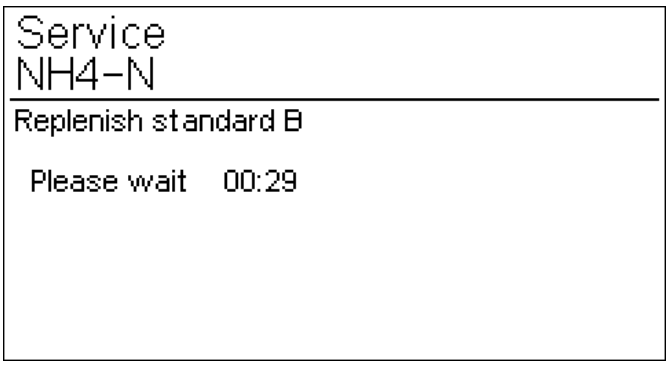
Note
You cannot quit the procedure.

Starting the procedure

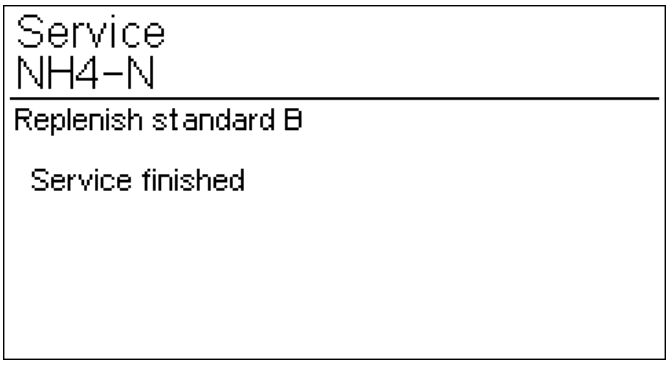
1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Replenish standard B* menu item with ⏬ ⏫ and confirm with ↵. A checklist appears on the display.



5	Place a full container of standard B on the tray.
6	Connect the container. Follow the color coding (orange)!
7	Confirm the prompts each time with ↵ after checking. After the last confirmation, the procedure begins immediately and the remaining duration appears on the display.



8	At the end of the procedure, *Service finished* appears on the display.



9	Return to the service menu with ↵.

3.6 Replenishing the reagent

This routine fills the wet chemical system with reagent. This establishes the readiness for use of the instrument. The reagent must be prepared according to section 6.6 PREPARING THE REAGENT. Reagent contains NaOH.



Reagent causes severe corrosion
Do not allow this substance to get into the hands of children. Wear suitable protective gloves and goggles/face mask when working with this substance.
If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.



Warning
Only specially trained employees are allowed to work on the analyzing section. Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing

Program sequence

Step	Instrument status/action
1	Rinse with sample with reagent
2	Rinse with sample but without any reagent
3	Rinse with sample with reagent
4	Rinse with sample but without any reagent
5	Rinse with sample with reagent

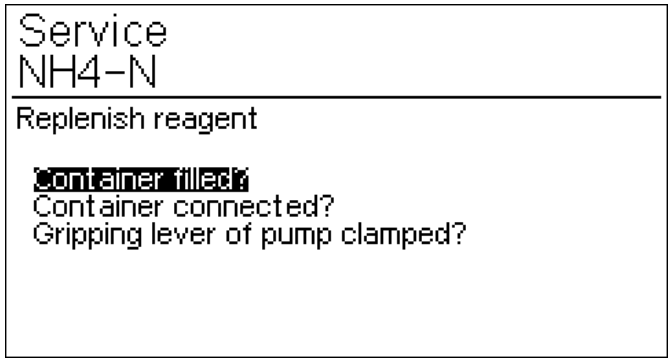
Duration approx. 3 minutes



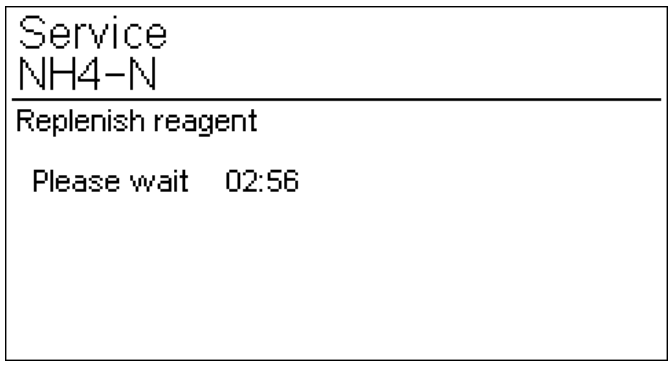
Note
You cannot quit the procedure.
This procedure causes a calibration (AutoCal) when the measuring procedure is subsequently triggered. This prevents any possible tolerances of the chemicals appearing as an error in the measuring results.

Starting the procedure

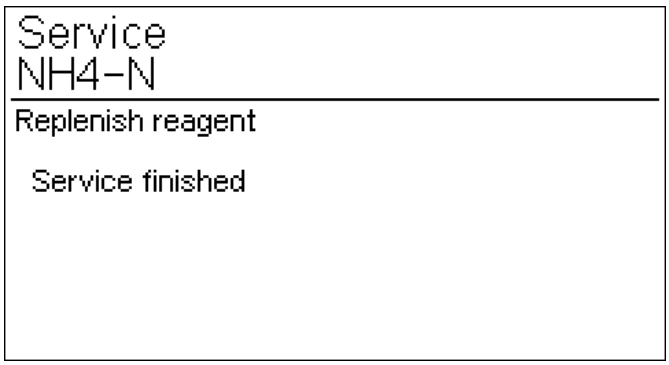
1	**Measuring mode** Select the NH4-N analyzer module with .
2	Call up the *Parameters NH4-N* menu with . The main menu appears on the display.
3	Select the *Service* menu item with and confirm with . The service menu appears.
4	Select the *Replenish reagent* menu item with and confirm with . A checklist appears on the display.



5	Place a full container of reagent on the tray.
6	Connect the container. Follow the color coding (green)!
7	Confirm the prompts each time with after checking. After the last confirmation, the procedure begins immediately and the remaining duration appears on the display.



8	At the end of the procedure, *Service finished* appears on the display.



9	Return to the service menu with ↵.

3.7 Emptying the system

This service routine empties the wet chemical system of the instrument.

- Standard A
- Standard B
- Cleaning solution (10% citric acid)
- Reagent (NaOH)



Reagent causes severe corrosion
Do not allow this substance to get into the hands of children. Wear suitable protective gloves and goggles/face mask when working with this substance. If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.



Warning
Only specially trained employees are allowed to work on the analyzing section. Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing



Note
If the TresCon is taken out of service for more than 24 hours, the *Empty system* service routine must be performed!

Program sequence

Step	Instrument status/action
1	Flush back standard A with reagent
2	Flush back the cleaning solution with reagent
3	Flush back standard B with reagent
4	Flush back the sample with reagent
5	Flush back the sample without any reagent
6	Flush back the sample with reagent
7	Flush back the sample without any reagent
8	Flush back the sample with reagent

Duration approx. 5 minutes

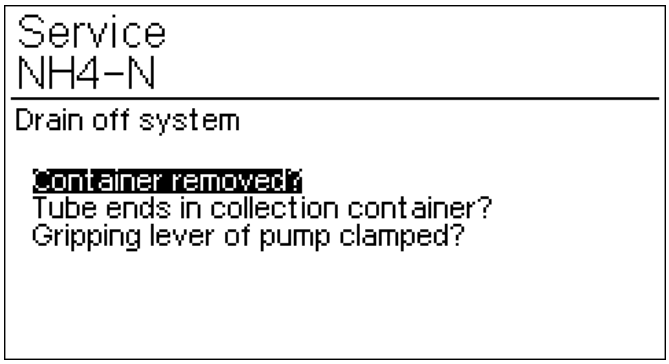
Attention
The pump empties the system via the tubes. If the containers are not removed, the reagent and standards will become unusable! You cannot quit the procedure.

Preparation

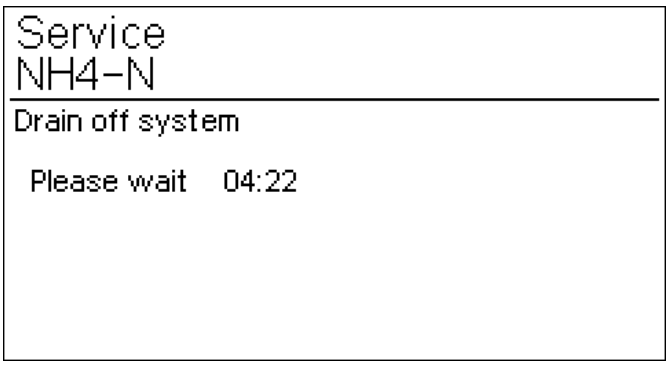
1	Pull the sample tubing out of the overflow vessel.
2	Disconnect the tubes from the consumables containers.
3	Place a suitable collecting container (recommended volume 0.5 l) on the tray of reagents.
4	Insert all ends of the tubes into the collecting container.

Starting the procedure

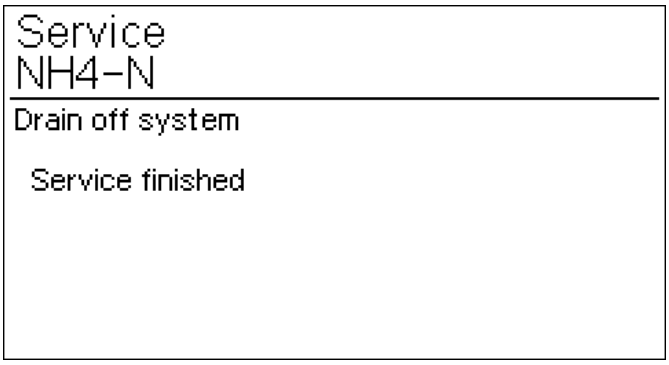
1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Empty system* menu item with ⏬ ⏫ and confirm with ↵. A checklist appears on the display.



5	Confirm the prompts each time with ↵ after checking. After the last confirmation, the procedure begins immediately and the remaining duration appears on the display.



6	At the end of the procedure, *Service finished* appears on the display.



7	Return to the service menu with ↵.

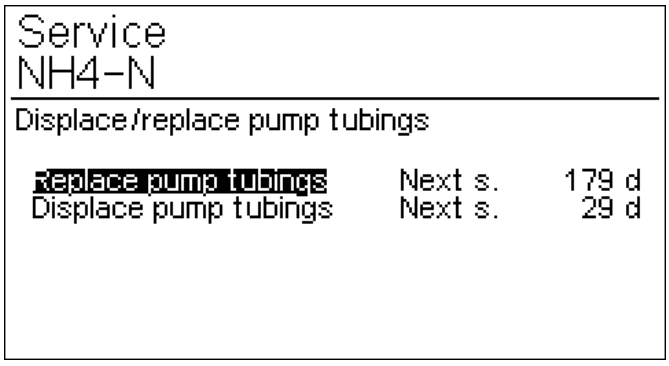
3.8 Displacing/replacing pump tubings

The pump tubings must be displaced or replaced at regular intervals. The TresCon has timers for this that indicate the maintenance activities required when the relevant service intervals expire. This service menu "guides" you through the necessary steps. The service routine consists of two parts to enable the work on the instrument to be performed at the correct time.

Note
The instrument indicates when the pump tubings must be displaced/ replaced by a timely message (service intervals).

Displaying service intervals

1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Displace/replace pump tubings* menu item with ⏬ ⏫ and confirm with ↵. The time until the necessary displacing/replacement based on the service intervals appears on the display.



5	Return to the service menu with ⮌.

The operating sequences of the service routines, Displace pump tubings and Replace pump tubings, are identical:

Operating sequences

The operating sequences of the service routines, *Displace pump tubings* and *Replace pump tubings*, are identical:

Part 1
Emptying the system

Step	Instrument status/action
1	Flush back the sample without any reagent
2	Flush back the sample with reagent

Displace/replace tubing. During this operation, the TresCon NH4-N remains in the Wait mode. After confirmation of the tasks by pressing a key, the sequence of operations is continued.

Part 2
Filling the system

3	Rinse with sample with reagent

Duration

- Part 1: approx. 7 minutes
- Part 2: approx. 2 minutes



Note
You can display the intervals, leave the menu or start a service procedure. You can then no longer quit this procedure. If the tubings have been replaced or displaced, an AutoCal procedure is triggered when the measuring procedure is started.

3.8.1 Replacing the pump tubings

For this service, the consumables are first pumped back out of the system via the sample tube.



Reagent causes severe corrosion
Do not allow this substance to get into the hands of children. Wear suitable protective gloves and goggles/face mask when working with this substance.
If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.



Warning
Only specially trained employees are allowed to work on the analyzing section. Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves



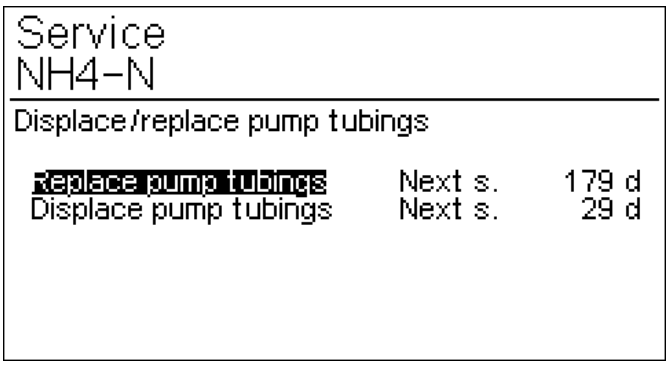
Wear protective clothing

Effects

Replacing the pump tubings	The *Replace pump tubings* timer is reset and the *Displace pump tubings* timer is reset

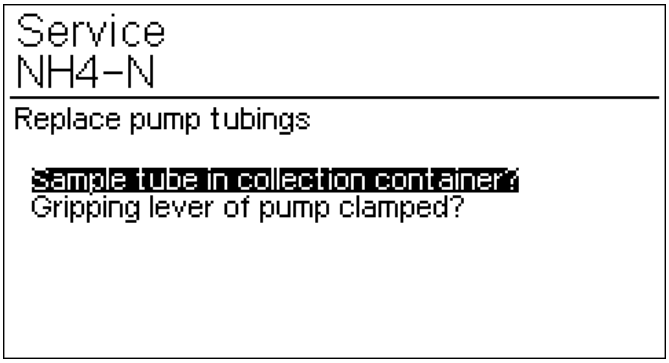
Replace pump tubings

1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Displace/replace pump tubings* menu item with ⏬ ⏫ and confirm with ↵.

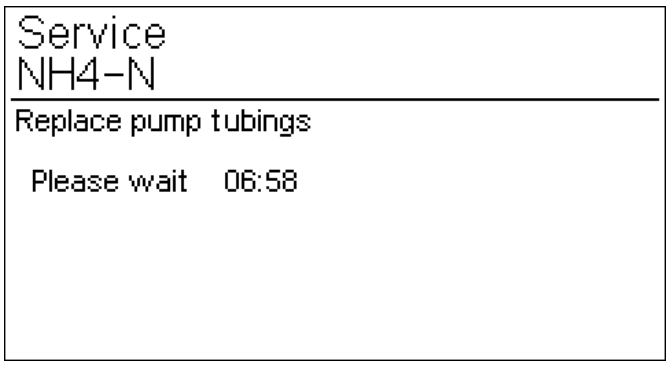


Attention
After step 5, you can no longer quit the procedure!

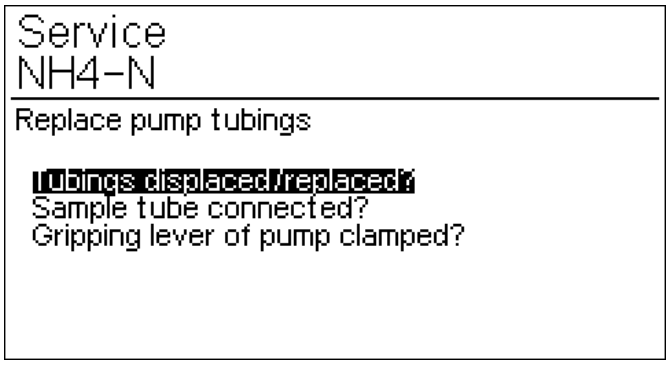
5	Select the *Replace the pump tubings* service with ⏬ ⏫ and confirm with ↵. The 1st part of the checklist appears on the display.



6	Pull the sample tubing out of the overflow vessel.
7	Insert the open end of the tube into a collecting container.
8	Confirm each of the requests of the 1st part of the checklist with ↵ after checking them. After the last confirmation, the procedure begins immediately and the remaining duration appears on the display.

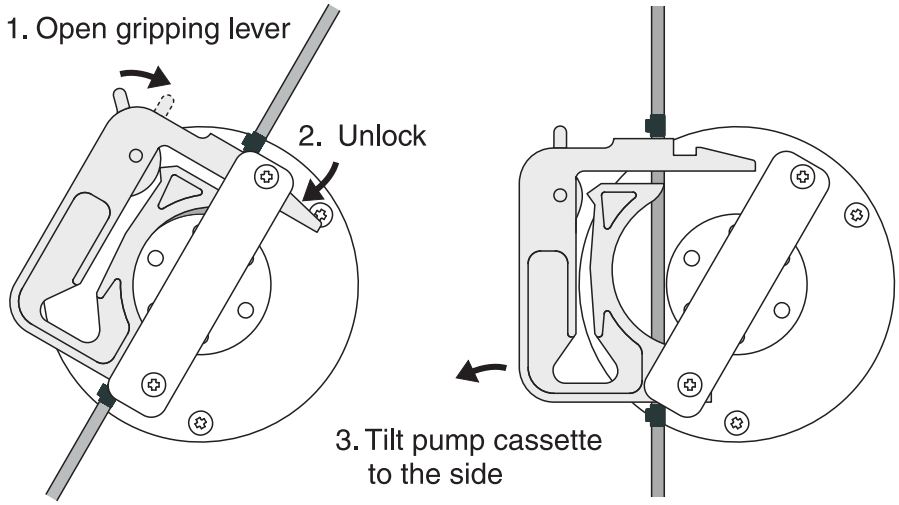


9	After the 1st part of the routine expires, the 2nd part of the checklist appears on the display.

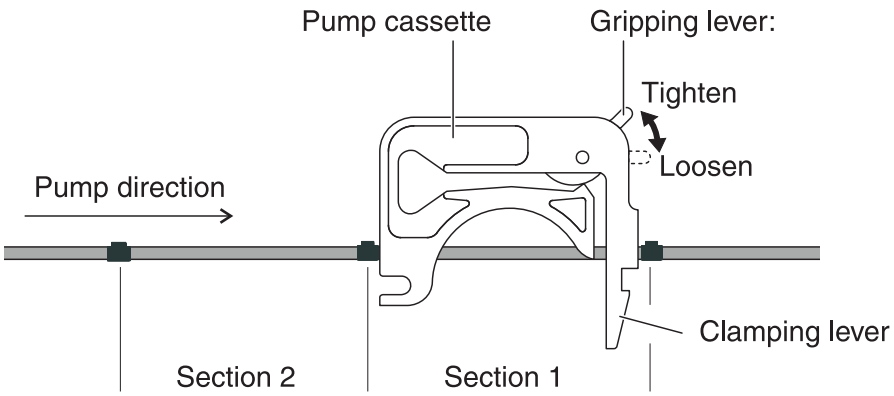


10	Swing out the pump cassette. To do so, open the gripping lever. Subsequently, unlock the pump cassette by pressing on the gripping lever and at the same time swing out the pump cassette.

Standard/sample pump tubing:
red/red/red
Reagent pump tubing:
orange/yellow/orange

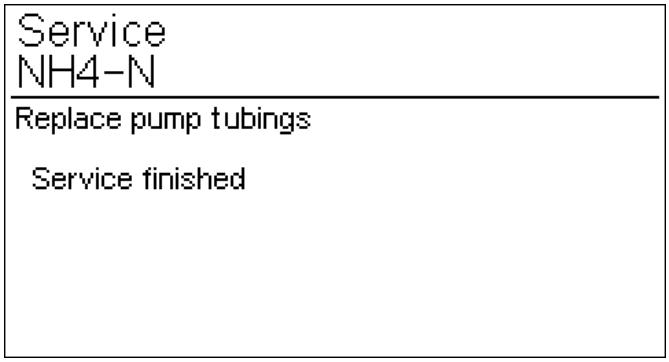


11	Replace the pump tubings. Insert a new pump tube in the pump cassette so that the second section is on the suction side.



12	Click the cassette into place in the peristaltic pump and close the gripping lever.
13	Connect the sample tubing to the overflow vessel again.

14	After starting the tasks, confirm each of the prompts on the display with ↵. After the last confirmation, the 2nd part of the procedure begins immediately. The remaining time appears on the display.
15	At the end of the procedure, *Service finished* appears on the display.



16	Return to the service menu with ↵.

Note
After this service, the TresCon NH4-N begins with AutoCal as soon as a new measurement starts.

3.8.2 Displacing the pump tubings

For this service, the consumables are first pumped back out of the system via the sample tube.

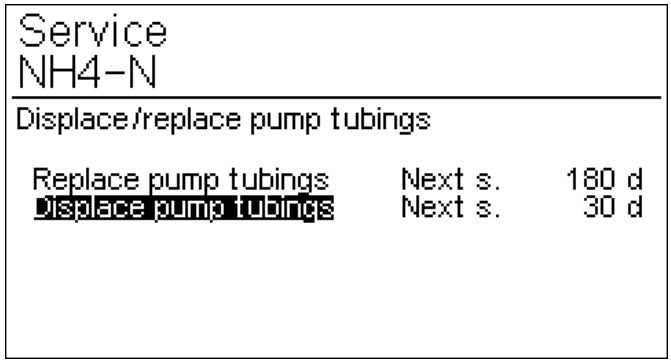
Attention
Only specially trained employees are allowed to work on the analyzing section.

Effects

Displacing the pump tubings	The *Displace pump tubings* timer is reset

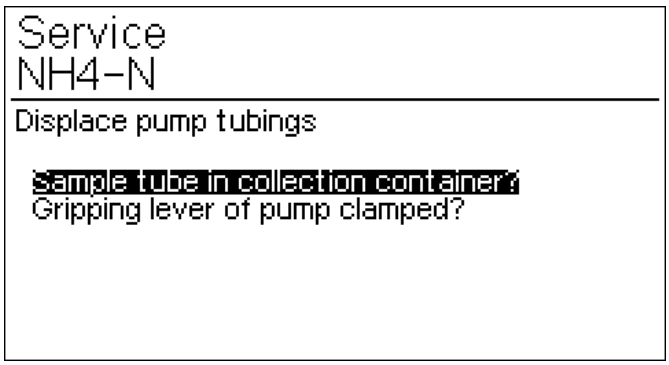
Displacing the pump tubings

1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Displace/replace pump tubings* menu item with ⏬ ⏫ and confirm with ↵.

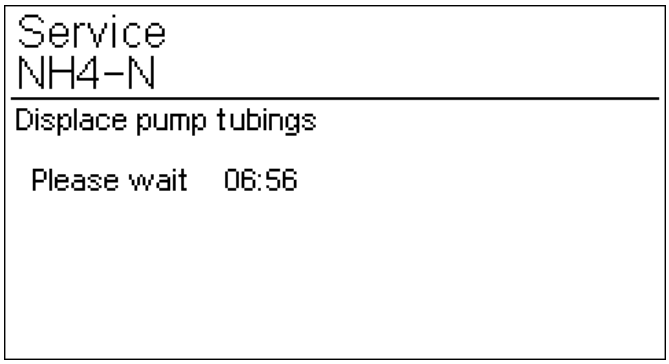


Attention
After step 5, you can no longer quit the procedure!

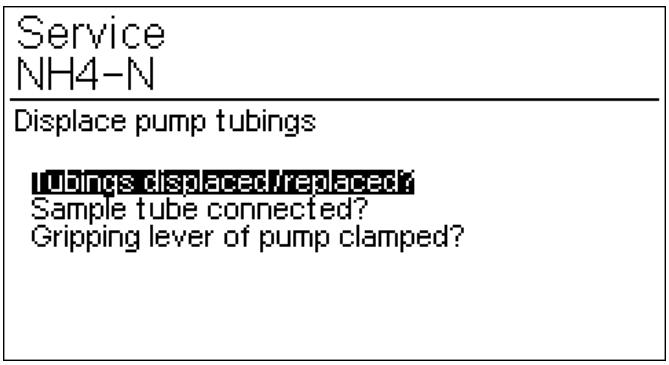
5	Select the *Displace pump tubings* service with ⏬ ⏫ and confirm with ↵. The 1st part of the checklist appears on the display.



6	Pull the sample tubing out of the overflow vessel.
7	Insert the open end of the tube into a collecting container.
8	Confirm each of the requests of the 1st part of the checklist with ↵ after checking them. After the last confirmation, the procedure begins immediately and the remaining duration appears on the display.

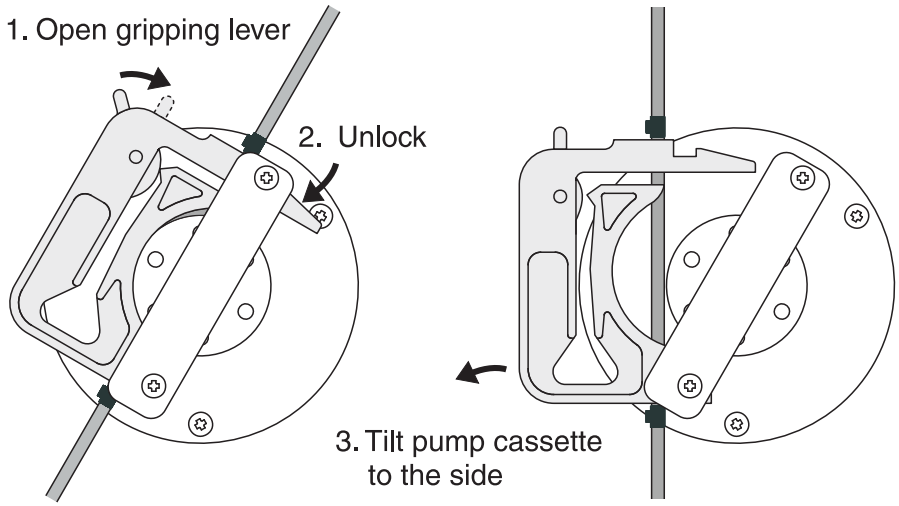


9	After the 1st part of the routine expires: The 2nd part of the checklist appears on the display. During this operation, the TresCon NH4-N remains in the Wait mode.

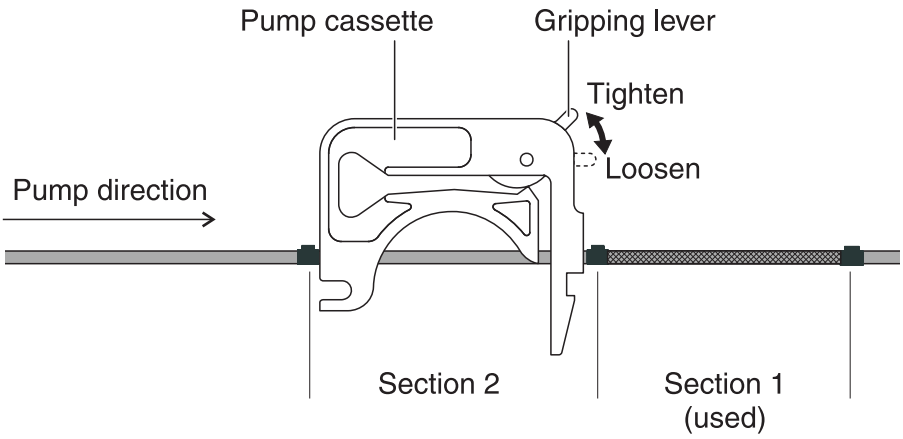


10	Swing out the pump cassette. To do so, open the gripping lever. Subsequently, unlock the pump cassette by pressing on the gripping lever and at the same time swing out the pump cassette.

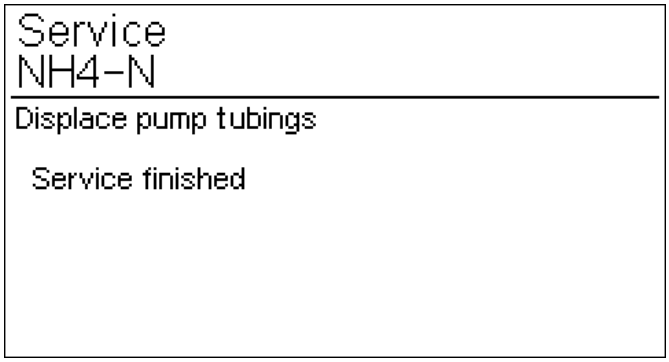
Standard/sample pump tubing:
red/red/red
Reagent pump tubing:
orange/yellow/orange



11	Displace the pump tubing. Insert the pump tube in the pump cassette so that the first (used) section is on the pressure side.



12	Click the cassette into place in the peristaltic pump and close the gripping lever.
13	Connect the sample tubing to the overflow vessel again.
14	After starting these tasks, confirm each of the prompts of the 2nd part of the checklist with ↵. After the last confirmation, the 2nd part of the procedure begins immediately. The remaining time appears on the display.
15	At the end of the procedure, *Service finished* appears on the display.

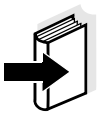


16	Return to the service menu with ↵.

Note
After this service, the TresCon NH4-N begins with AutoCal as soon as a new measurement starts.

3.9 Exchanging the membrane cap / electrode

This service step is used to renew the membrane cap of the electrode or the electrode itself.



Note
Instructions on how to exchange the membrane cap of the dismantled electrode can be found in the operating manual of the electrode. Ordering information about electrodes and membrane caps can be found in section 6.2 ACCESSORIES AND MATERIAL SUBJECT TO WEAR.

Program sequence

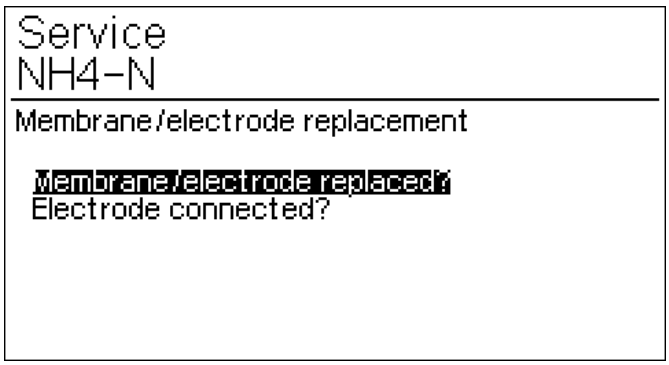
Step	Instrument status/action	Duration
1	Flush back the sample without any reagent	20 s
Replacing the membrane or electrode. During this operation, the analyzer remains in the wait mode. After the relevant key has been pressed to confirm the activities performed, the sequence is continued.		
2	Rinse with sample but without any reagent	20 s



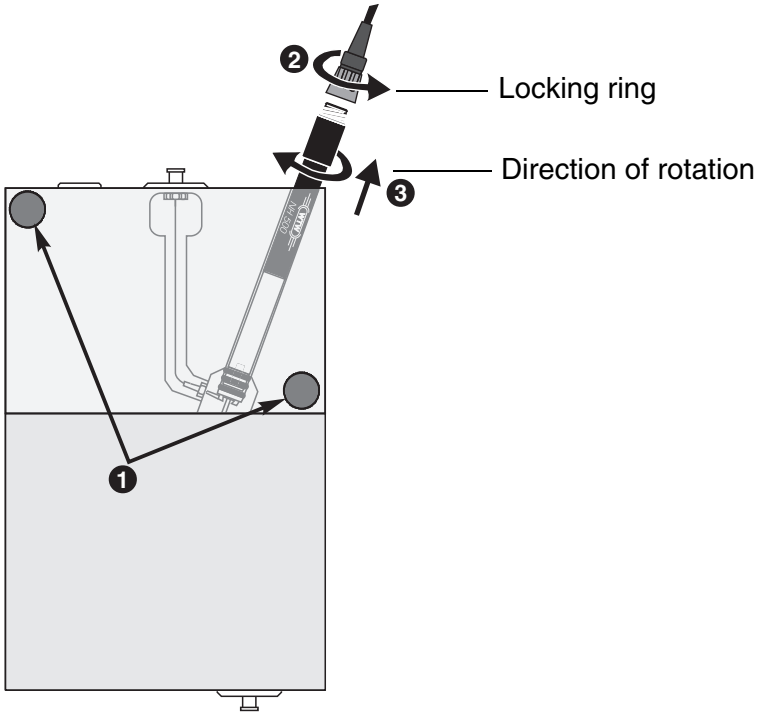
Attention
Do not touch the electrical contacts on the connector of the electrode! Contamination leads to a change in resistance.

Replacing the membrane/electrode

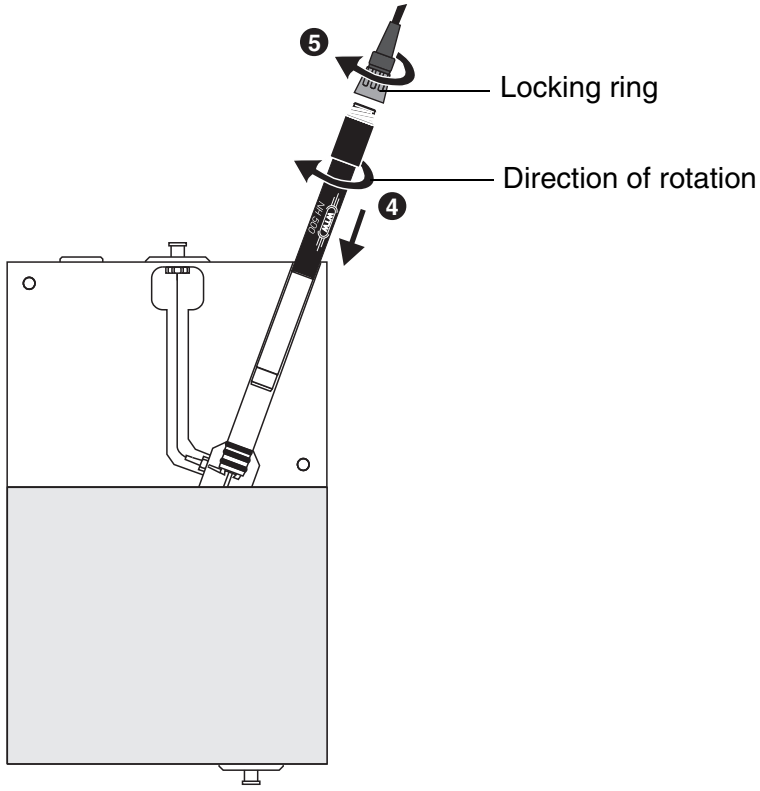
1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *membrane/electrode replacement* menu item with ⏬ ⏫ and confirm with ↵.
5	TresCon switches into the "Stop" status. The procedure begins and the electrode is ventilated. The checklist appears on the display.



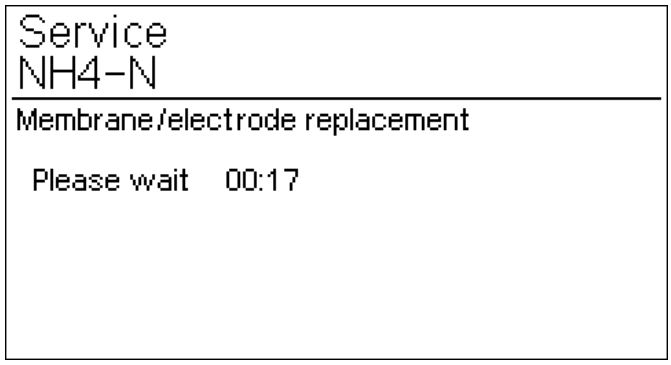
6	Unscrew the knurled screws on the measuring block and remove the plexiglass cover (1).



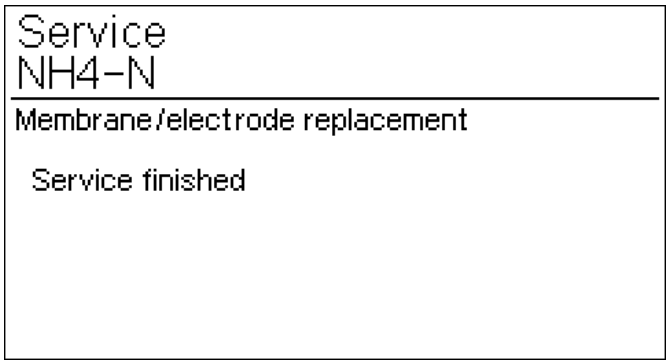
7	Open the locking ring and disconnect the connecting cable (2).
8	Unscrew the electrode from the flow-thru vessel: Turn it in the direction of rotation and, at the same time, pull it (3).
9	Replace the membrane cap or electrode (see operating manual of the electrode).
10	Insert the electrode in the flow-thru vessel: Twist the electrode in the direction of rotation and, at the same time, pull it (4).



11	Connect the connecting cable and screw the locking ring tight (5).
12	Replace the plexiglass cover and fix it with the knurled screws.
13	Confirm the prompts of the checklist with ↵ after checking. The system is filled. The remaining time appears on the display.



14	At the end of the procedure, *Service finished* appears on the display.



15	Return to the service menu with ↵.

Note
The parameters of the electrode have been changed. An AutoCal procedure (calibration) is triggered when the subsequent measuring procedure starts. You cannot quit the procedure.

3.10 Replacing the tubing system

The complete tubing system has to be replaced at regular intervals. The following components are part of the tubing system:

- permeate tube
- all tubing sections between consumable container and thermoblock, including the Viton tubing on the tubing coil
- all transition tubing pieces
- all connection pieces (T-pieces and L-pieces)
- all pump tubings
- tubing at the thermoblock outlet

Two packets with spare tubes (Wpack/ A111) are included in the scope of delivery of the analyzer module. Normally, the two packets are sufficient for one year's operation. For reordering, see section 6.2 ACCESSORIES AND MATERIAL SUBJECT TO WEAR.

The time of replacement depends on the sample preparation. The TresCon has adjustable timers that indicate the maintenance activities required when the relevant service intervals expire.



Reagent causes severe corrosion
Do not allow this substance to get into the hands of children. Wear suitable protective gloves and goggles/face mask when working with this substance.
If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.



Warning
Only specially trained employees are allowed to work on the analyzing section. Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing



Note
You are informed when the tubing system must be replaced by a timely message on the display (service intervals).

The service menu "guides" you through the necessary steps. The service routine consists of two parts.

Program sequence

Step	Instrument status/action
Part 1: Empty system	
1	Flush back standard A with reagent
2	Flush back cleaning solution with reagent
3	Flush back standard B with reagent
4	Flush back the sample with reagent
5	Flush back the sample without any reagent
6	Flush back the sample with reagent
7	Flush back the sample without any reagent
8	Flush back the sample with reagent
	Replace tubing system. During this operation, the TresCon NH4-N remains in the Wait mode. After the tasks are confirmed by pressing a key, the sequence of operations is continued.
Part 2: Fill system	
9	Rinse with standard A with reagent
10	Rinse cleaning solution with reagent
11	Rinse with standard B with reagent
12	Rinse with sample with reagent
13	Rinse with sample but without any reagent
14	Rinse with sample with reagent
15	Rinse with sample but without any reagent
16	Rinse with sample with reagent

Duration

- Part 1: approx. 5 minutes
- Part 2: approx. 3 minutes

This service resets the timer of the interval *Replacing the tubing system*. An AutoCal is triggered when the subsequent measuring procedure starts. You cannot quit the procedure.



Attention
The pumps empty the system via the suction tubes. If the containers with the consumables are not removed, the reagents and standards become unusable! You cannot quit the procedure.

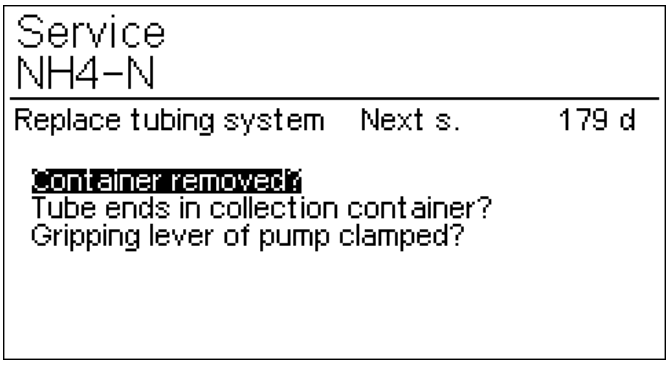
Attention
After step 9 of the following instructions, you can no longer quit the procedure!

Preparation

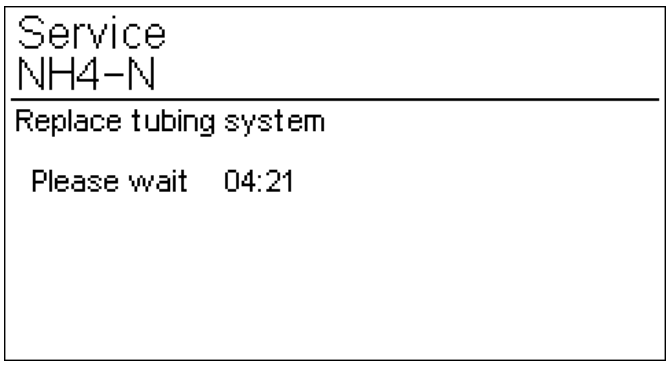
1	Pull the sample tubing out of the overflow vessel.
2	Unscrew all tubings from the consumable containers.
3	Place a suitable collecting container (recommended volume 0.5 l) on the tray of reagents.
4	Insert all ends of the tubes into the collecting container.

Replacing the tubing system

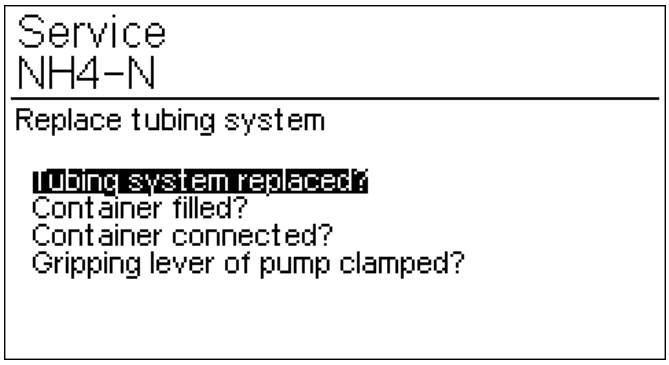
5	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
6	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
7	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
8	Select the *Replace tubing system* menu item with ⏬ ⏫ and confirm with ↵. The 1st part of the checklist appears.



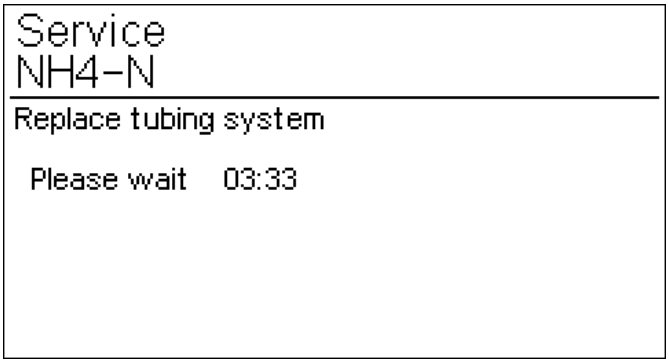
9	Confirm each of the requests of the 1st part of the checklist with ↵ after checking them. After the last confirmation, the procedure begins immediately. The duration appears on the display.



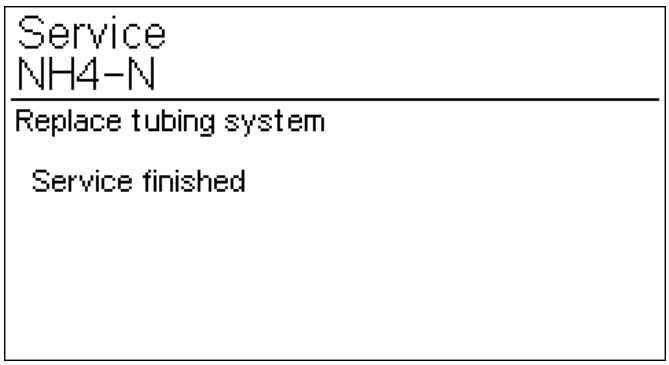
10	After completion of the 1st part of the routine, the 2nd part of the checklist appears on the display.



11	Replace tubing system. When doing this, observe the following points: – Replace the components of the tubing system step by step, starting at the overflow vessel or at the consumable containers. – Make sure that all the tubings assembled have the same dimensions (length and diameter) as the original tubings. – Observe the correct number of windings and proper tube guiding at the 2 tube coils at the inlet of the thermoblock. For details refer to the end of this section on page 3-40. – To change the connection pieces (T-pieces and L-pieces), pull off the cap at the corresponding holding device. Then pull out and exchange the connection piece. Assemble the connection piece again and secure it with the cap in reverse order. – When replacing the pump tubings, make sure they have the same color coding (tubing diameter). – When connecting the consumables make sure that the color coding at the tubing and the container screw cap is the same. – Dispose of exchanged tubings so that they cannot be used again.
12	After starting the tasks, confirm the prompts with ↵. The 2nd part of the routine starts. The remaining time appears on the display.



13	At the end of the procedure, *Service finished* appears on the display.



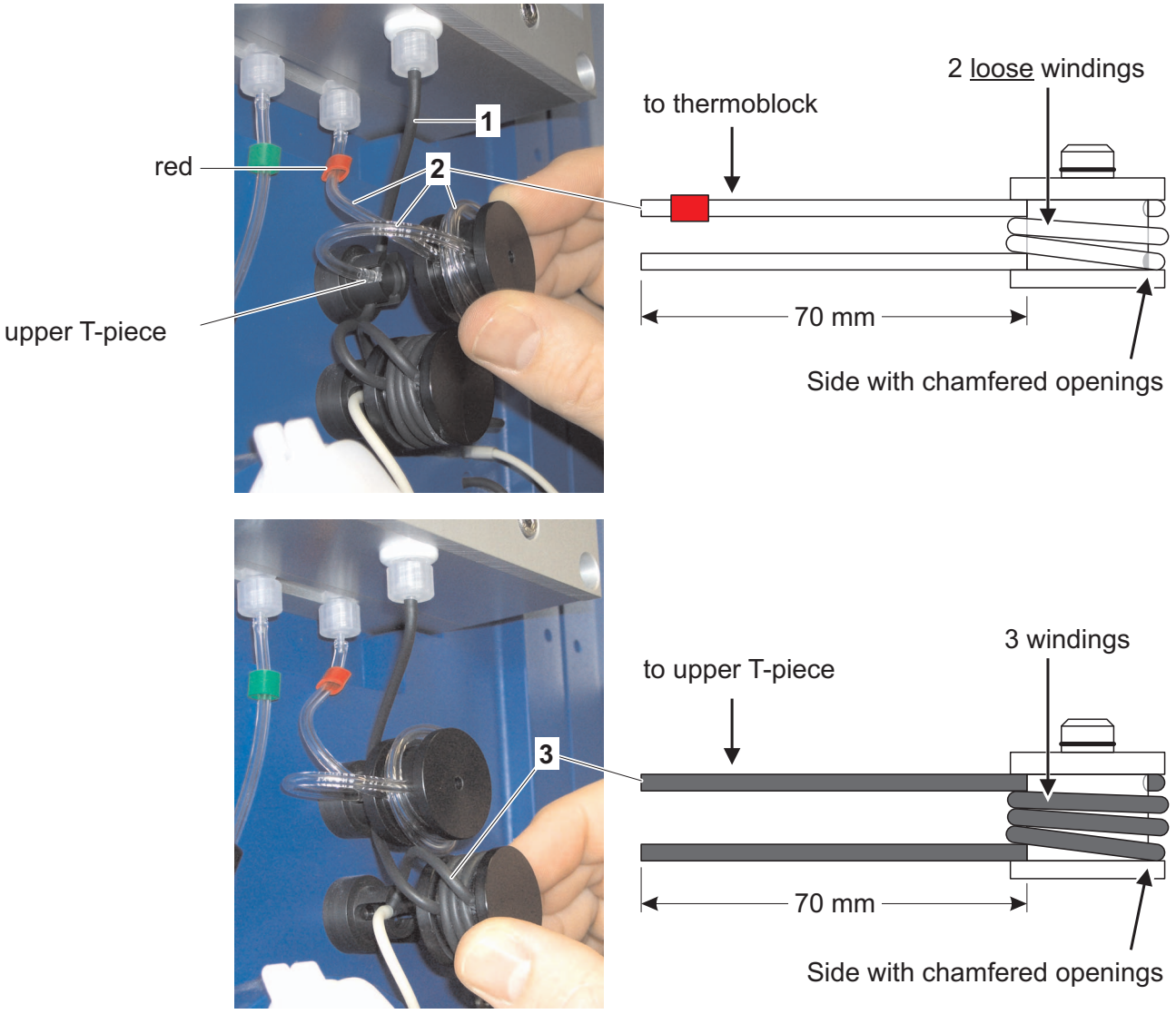
14	Return to the service menu with ↵.

Note
An AutoCal is triggered when the subsequent measuring procedure starts. You cannot quit the procedure.

Tubing at the inlet of the thermoblock

Install the tubes according to the picture on the following page. Please observe the following points:

- Wind the tubings around the coils loosely and without stretching.
- The openings of the tube borings are chamfered on one side so the tubings can be wound without bending. Make sure the chamfered openings are on the right side (see pictures). The chamfered edge determines the winding direction.
- If you have difficulties threading a tube end through the boring, slightly moisten the tube on the outside.



Pos.	Hose type	Inner Ø	Length
1	Viton (black)	1.5 mm	70 mm
2	Tygon (transparent)	1.52 mm	360 mm
3	Viton (black)	1.5 mm	420 mm

3.11 Displaying/changing service intervals

The service intervals are used to deliver information on the time remaining until important service activities. After a service interval has expired, a corresponding messages is output on the display, e.g. "Replace tubing system". You can display or change service intervals in this menu.

Note
The factory setting of the service intervals is based on the values obtained from practical experience in normal wastewater treatment plants. Only change the settings if the instrument is subject to special conditions.

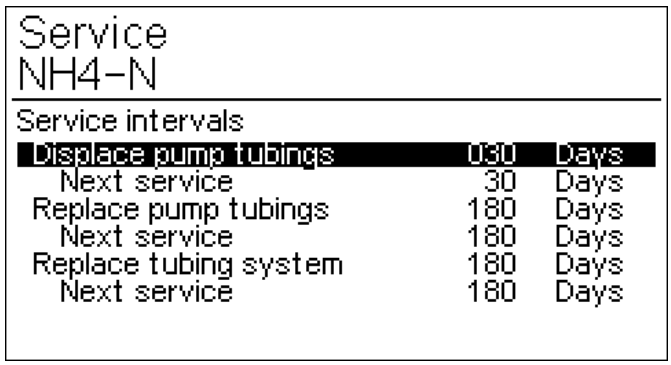
Service intervals

The time remaining until the next service appears on the display under the duration of the interval. If you change a service interval, the display of the remaining time also changes automatically correspondingly. The following table contains the service interval settings and the value ranges as well as the recommended interval times selected in the factory for the respective operating mode.

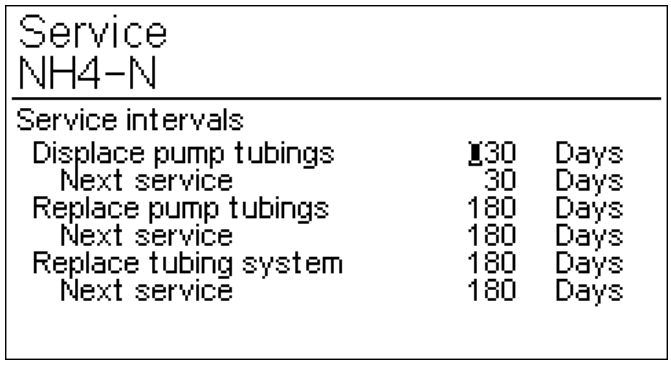
	Displacing the pump tubings	**Replacing the pump tubings**	**Replacing the tubing system**
Value range	1 ... 999 d	1 ... 999 d	1 ... 999 d
Basic setting	30 d	180 d	180 d
Operating with the PurCon	30 d	180 d	180 d
Operating without the PurCon	30 d	180 d	90 d

Changing service intervals

1	**Measuring mode** Select the NH4-N analyzer module with ⏬ ⏫.
2	Call up the *Parameters NH4-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears on the display.
4	Select the *Service intervals* menu item with ⏬ ⏫ and confirm with ↵.



5	Select the parameters to be changed with ⏬ ⏫ and switch into input mode with ↵.



6	Input the values required, digit-by-digit if necessary, with ⏬ ⏫. Change the digit with ⏪ ⏩.
7	Confirm the input with ↵ and, if required, repeat steps 5 and 6 for any other parameters.
8	Leave the menu with ↩. The request *Store* appears.
9	Select *Yes* or *No* with ⏬ ⏫ and confirm with ↵.

3.12 Switching AutoFlow on/off

The AutoFlow program is used to measure the current fluid levels of sample and reagents. As a result:

- Error messages are generated.
- The fluid levels of the reagents are determined.

Fluid level measurement

If the *Fluid level measurement* parameter is switched on, the current fluid levels in the containers are continuously determined by pressure measurements. If the fluid level sinks below 4 cm, an instruction is issued to fill the container, e.g. "Replenish cleaning solution".

Overpressure measurement

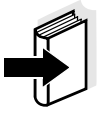
If the *Overpressure measurement* parameter is switched on, the sample flow is monitored.

If there is a lack of sample, the analyzer module signals "No sample" until sample is available again or until 15 minutes have passed. During this time, the peristaltic pump operates at low speed. The pressure measurement is performed continuously during this time so that a measuring cycle starts immediately when sample is available again. If no sample is available after 15 minutes, the analyzer module signals "NO SAMPLE".

Relationship Parameter/messages

If the relevant parameter is switched on, messages are output according to the following table:

Parameter	Values	Messages
Fluid level measurement	On, Off	Fill reagent containers Reagent clogged Reagent empty Replenish cleaning solution Cleaning solution clogged Cleaning solution empty Replenish standard A Standard A clogged Standard A empty Replenish standard B Standard B clogged Standard B empty Sample missing Sample clogged
Overpressure measurement	Off, On	Outlet clogged

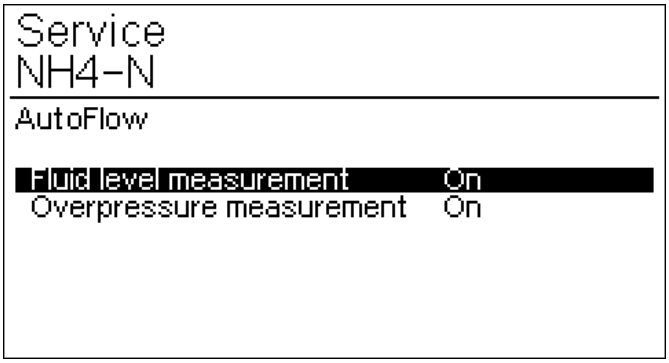


Note
Further information on how the pressure sensors function is given in

the appendix, section 6.3 PRESSURE SENSORS AND MESSAGES on page 6-5.

Switching AutoFlow on/off

1	**Measuring mode** Select the NH4-N analyzer module with .
2	Call up the *Parameters NH4-N* menu with . The main menu appears on the display.
3	Select the *Service* menu item with and confirm with . The service menu appears.
4	Select the *AutoFlow* menu item with and confirm with . The prompt *Presentation of data/Change* appears.
5	Select the *Change* mode with and confirm with .
6	Input the PIN digit-by-digit with . Change the digit with and confirm with . The analyzer switches into STOP mode.



7	Select the parameters to be changed with and switch into input mode with .
8	Input the required status with .
9	Confirm the input with and, if necessary, repeat steps 8 and 7 for any other parameters.
10	Leave the menu with . The request *Store* appears.
11	Select *Yes* or *No* with and confirm with .

4 What to do if...

Different types of messages can appear on the display:

- Error message
  Malfunction, TresCon is in the Stop mode
- Informative message
  Normal operation, consumables declining
- Service message
  Normal operation, interval for maintenance activities has expired



Note
If errors or instructive messages occur that are not listed here, further information is given in the section WHAT TO DO IF... of the TERMINAL volume of this operating manual.

4.1 Error messages

If an error occurs, an appropriate short text appears on the display and the analyzer module switches into the *Stop* mode. You must employ the appropriate measures depending on the error message to clear the fault.

The following overview contains all the possible messages and the measures required to clear the fault.

Reagent clogged

Cause	Action
Reagent cannot be transported, negative pressure in the hose connector.	Check the tubes for breaks and foreign bodies and replace them as necessary (including the tube in the container). Check whether air can pass through the vent in the container lid.

Reagent empty

Cause	Action
No more reagent in the container.	Replace the container with a full one. Start the *Replenish reagent* service.

Standard A clogged

Cause	Action
Standard A cannot be transported, negative pressure in the hose connector.	Check the tubes for breaks and foreign bodies and replace them as necessary (including the tube in the container). Check whether air can pass through the vent in the container lid.

Standard A empty

Cause	Action
No more standard A in the container.	Replace the container with a full one. Start the *Replenish standard A* service.

Standard B blocked

Cause	Action
Standard B cannot be transported, negative pressure in the hose connector.	Check the tubes for breaks and foreign bodies and replace them as necessary (including the tube in the container). Check whether air can pass through the vent in the container lid.

Standard B empty

Cause	Action
No more standard B in the container.	Replace the container with a full one. Start the *Replenish standard B* service.

Cleaning solution blocked

Cause	Action
Cleaning solution cannot be transported, negative pressure in the hose connector.	Check the tubes for breaks and foreign bodies and replace them as necessary (including the tube in the container). Check whether air can pass through the vent in the container lid.

Cleaning solution empty

Cause	Action
No more cleaning solution in the container.	Replace the container with a full one. Start the *Replenish cleaning solution* service.

Sample inlet clogged

Cause	Action
Lack of sample, negative pressure in the inlet.	Check the permeate hose for kinks and foreign bodies and replace them if necessary. Check the preconnected filter and dilution devices.

Sample missing

Cause	Action
Sample flow is quit, TresCon NH4-N sucks in air.	Check the sample inlet for leaks. Check the preconnected filter and dilution devices.

Outlet clogged

Cause	Action
Sample and chemicals cannot be pumped out, overpressure in the outlet.	Check the tubes of the outlet for kinks and foreign bodies and check the wastewater connection.

Calibration defective

Cause	Action
No stable measured values present (AutoRead criterion not fulfilled).	Replace the membrane and fill up the electrolyte.
The measured voltage of standard A is larger than that of standard B.	Check that the vessel is correctly connected (color coding). Connect the other standards.
Voltage of the electrode lies outside the allowable range.	Replace the electrode/membrane.
The relative slope lies outside the allowable range.	Replace the electrode/membrane.
Reference voltage U_0 lies outside the allowable range.	Replace the electrode/membrane.

Thermoblock defective

Cause	Action
The thermoblock cannot be brought to the required final temperature.	Contact the WTW service department.

Contact the service department of WTW

Cause	Action
Error within the software or hardware.	Contact the WTW service department.

Read error: Use factory setting YES

Cause	Action
An error occurred when reading parameter data.	Confirm the prompt with ↵ to perform a standard measurement. Contact the service department of WTW.

Write error: Use factory setting

Cause	Action
An error occurred when reading parameter data.	Confirm the prompt with ↵ to perform a standard measurement. Contact the service department of WTW.

4.2 Notes

A text appears on the display although the measuring mode is not, however, quit. Example *Replenish reagent*. You can perform the relevant measurement later.

The following overview contains all the possible instructive messages and the necessary measures.

Replenish reagent

Cause	Action
Fluid level in the container has fallen below 4 cm.	Replace the container with a full one. Start the *Replenish reagent* service.

Replenish standard A

Cause	Action
Fluid level in the container has fallen below 4 cm.	Replace the container with a full one. Start the *Replenish standard A* service.

Replenish standard B

Cause	Action
Fluid level in the container has fallen below 4 cm.	Replace the container with a full one. Start the *Replenish standard B* service.

Replenish cleaning solution

Cause	Action
Fluid level in the container has fallen below 4 cm.	Replace the container with a full one. Start the *Replenish cleaning solution* service.

Note
The messages disappear when the appropriate measure has been performed.

4.3 Service messages

The maintenance activities must be performed in rotation. If a service interval has expired, a text appears on the display. The intervals specified are the basic factory settings for operation with sample preparation (e.g. PurCon).



Note
You can change the intervals to adapt the TresCon to your operating conditions. The proceeding is described in section 3.11 DISPLAYING/ CHANGING SERVICE INTERVALS on page 3-42.

Displacing the pump tubings

Cause	Action	Interval
The hose system is worn.	Start the *Displace pump tubings* service.	30 days

Replace pump tubings

Cause	Action	Interval
Lifetime of the pump tubings is exceeded.	Start the *Replace pump tubings* service.	180 days

Replacing the tubing system

Cause	Action	Interval
Lifetime of the tubing system is exceeded.	Perform the *Replace tubing system* service.	180 days

Instrument check

Cause	Action	Interval
A general instrument maintenance is necessary.	Contact the service department of WTW.	

5 Technical data

Measurement

Measuring principle		Potentiometric measurement	
Measuring method		Gas-sensitive ammonia electrode	
Measuring range		mg/l	mmol/l
	NH_4-N or NH_3-N / NH_4^+	0.1 - 1000 / 1280	0.01 - 71.00
Resolution		Resolution	Range
	mg/l NH_4-N or NH_3-N / NH_4^+	0.01 mg/l	0.10 ... 9.99 mg/l
		0.1 mg/l	10.0 ... 99.9 mg/l
		1 mg/l	100 ... 1000 / 1280 mg/l
Resolution		Resolution	Range
	ppm NH_4-N or NH_3-N / NH_4^+	0.01 ppm	0.10 ... 9.99 ppm
		0.1 ppm	10.0 ... 99.9 ppm
		1 ppm	100 ... 1000 / 1280 ppm
Resolution		Resolution	Range
	mmol/l NH_4-N or NH_3-N / NH_4^+	0.001 mmol/l	0.010 ... 9.999 mmol/l
		0.01 mmol/l	10.00 ... 71.00 mmol/l
Measuring accuracy		Absolute error	Range
		± 5 % of the measured value ± 0.2 mg/l NH_4-N	< 1.0 mg/l
		± 5 % of the measured value ± 0.1 mg/l NH_4-N	1.0 ... 100 mg/l
		Depending on the condition of the electrode, a reduced measuring accuracy is possible above 100 mg/l	
	Process variation coefficient V	V	Range
		3 %	0.10 ... 9.99 mg/l
		4 %	10.0 ... 99.9 mg/l
		5 %	100 ... 1000/1280 mg/l

Response time	< 3 min (after concentration change at sample inlet)
Measuring interval	Selectable: Continuous, 10 min, 15 min, 20 min, 25 min, 30 min, 60 min, interval program, AutoAdapt

Note
All data on measuring accuracy refer to the use of suitable standard solutions and the calibration mode, HQ. The age of the electrode may affect the measuring accuracy.

Note
The TresCon NH4-N continues to measure outside the measuring range with lower accuracy. A note appears on the display.

Calibration (AutoCal)

Type of calibration	Automatic 2-point calibration with WTW calibration standards
Calibration standards	Selectable in the range: 0.2 - 500 mg/l NH_4-N
Calibration interval	Selectable: 1, 2, 3, 6, 12 and 24 hours
Reference time	Selectable in 30 min intervals

Test sample requirements

Quantity	approx. 0.3 l/h
Proportion of solids	< 50 mg/l

Environmental conditions

Operating temperature	0 ... + 40 °C
Storage temperature	- 25 °C ... + 40 °C (does not apply to the NH500/TC electrode)

Reagent consumption

10 l reagent	depending on the selected meas. interval	
	Measuring interval	Number of days
	cont.	approx. 14
	10 min	16
	15 min	25
	20 min	30
	25 min	40
	30 min	50
	60 min	42
1.5 l standard A/B	60 calibration procedures in the calibration mode, HQ	
	AutoCal interval	Number of days
	24 hours	60
	12 hours	30
	4 hours	10
Cleaning solution	1.5 l cleaning solution for 60 cleaning procedures	

Maintenance interval

1/2 yearly

End of range for relays and alarms

	End of range
Measuring range NH_4-N mg/l	1000
Measuring range NH_4^+ mg/l	1280
Measuring range NH_4-N mmol/l	71
Measuring range NH_4^+ mmol/l	71

Recorder end 20mA

	Recorder end
Measuring range NH_4-N mg/l	1000
Measuring range NH_4^+ mg/l	1280
Measuring range NH_4-N µmol/l	71

	Recorder end
Measuring range NH_4^+ µmol/l	71

6 Appendix

6.1 AutoTherm

The TresCon NH4-N is equipped with an automatic temperature stabilization procedure that ensures the highest precision of the measurement and the optimum lifetime of the membrane and electrode.

How it functions

A 2-point control procedure causes the temperature at the measuring device to always remain constant within a small range. A temperature probe measures the ambient temperature at the analyzer module, NH4-N. The nominal value of this control depends on the ambient temperature. If the ambient temperature exceeds the nominal temperature, the nominal temperature is increased by 10 °C. The nominal temperature is reduced in fixed steps of 10 °C if the ambient temperature lies more than 15 °C below the nominal temperature (hysteresis). The nominal temperatures are:

- Tnom 1 = 30 °C
- Tnom 2 = 40 °C
- Tnom 3 = 50 °C

Diagram
Tnom = f (Tambient)

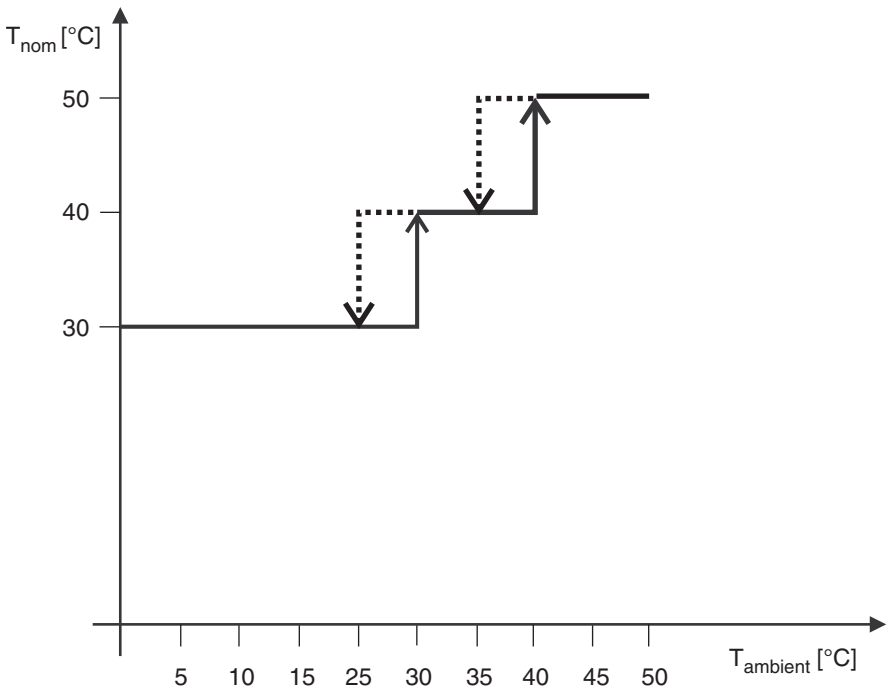


Fig. 6-1 AutoTherm: Nominal temperature dependent on the ambient temperature

Time dependency

The relationship of the block temperature to the ambient temperature with respect to time is shown in Fig. 6-2. At time T2, the ambient temperature reaches 30 °C. As a result, the nominal temperature increases to 40 °C. The block temperature follows this value. At time T3, the ambient temperature drops below 25 °C. Consequently, it lies more than 15 °C below the nominal temperature of 40 °C. The nominal temperature is reduced to 30 °C and the block temperature follows this value.

Diagram Temperatures and time

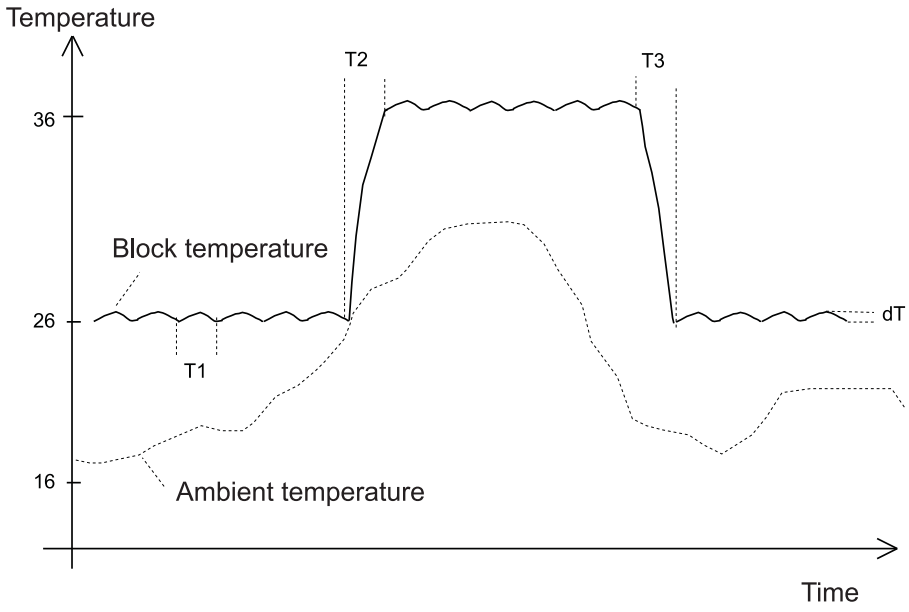


Fig. 6-2 Ambient temperature and Tnom with respect to time

6.2 Accessories and material subject to wear

Description	Model	Order no.
1.5 l standard AI 1.0 mg/l NH4-N	S/ AI - A111	821 100
1.5 l Standard AII 5.0 mg/l NH4-N	S/ AII - A111	821 101
1.5 l standard BI 10.0 mg/l NH4-N	S/ BI - A111	821 102
1.5 l standard BII 50.0 mg/l NH4-N	S/ BII - A111	821 103
1 package of sodium hydroxide pellets and Na_2EDTA for 10 l reagent	R/ A111	821 075
10 l deionized water	S/ AI - N 211	821 112
1.5 l cleaning solution (citric acid)	C/ A111	821 160
Ammonium electrode incl. 3 exchange membrane caps and electrolyte solution	NH500/TC	821 210
Accessory set for electrode: 3 exchange membrane caps and electrolyte solution	ZBK/NH500/TC	180 102
Set of replacement tubings	Wpack/ A111	821 197
Reagent set for 4 months – 8 packages of sodium hydroxide pellets and Na_2EDTA (for a total of 80 l reagent) – 2x 1.5 l standard AI – 2x 1.5 l standard BI – 2x 1.5 l cleaning solution	Rset/A111-1	821 138
Reagent set for 4 months – 8 packages of sodium hydroxide pellets and Na_2EDTA (for a total of 80 l reagent) – 2x 1.5 l standard AII – 2x 1.5 l standard BII – 2x 1.5 l cleaning solution	Rset/ A111-2	821 140
Na_2EDTA powder (additive for high water hardness of the sample)	R/ ADD/ TC	821 071
Empty 10 l container	BEH/ T 10	821 019

Description	Model	Order no.
Empty 1.5 l container	BEH/ T 1,5	821 017
Overflow vessel	TC/ÜB 1	821 004
Overflow vessel with valve	TC/ÜB V	821 005



Note
Specifications of accessories and consumables for the individual analyzer modules are given in chapter APPENDIX of the corresponding section of this operating manual (e.g. TresCon PO4-P).

6.3 Pressure sensors and messages

The following table shows the correlation between the fluid level measurement result and the internal error message, Ex or Hx.

Note
During pressure measurement, the valves are immediately in the mode before the pressure measurement and the pump is off.

Fluid level	Sample	Std. A	Std. B	Reagent *	Reag.
> 50 cm		empty (E4)	empty (E6)	empty (E8)	empty (E2)
4 < h < x cm		OK	OK	OK	OK
-10 < h < 4 cm		Fill container (H2)	Fill container (H3)	Fill container (H4)	Fill container (H1)
< -10 cm	Clogged (E9)	Clogged (E3)	Clogged (E5)	Clogged (E7)	Clogged (E1)

* only in AutoClean

An overview of the correlation between pressure sensors and messages is given below.

Reagent

Display on the screen	Type of error	Pressure sensor
Fill reagent container	Reagent container must be filled	P2 -10 cm < h2 < 4 cm
Reagent clogged	Reagent clogged	P2 h2 < -10 cm
Reagent empty	Reagent empty	P2 h2 > 50 cm

Standard A

Display on the screen	Type of error	Pressure sensor
Replenish standard A	Standard A must be filled	P1 -60 cm < h1 < 4 cm
Standard A clogged	Standard A clogged	P1 h1 < -60 cm
Standard A empty	Standard A empty	P1 h1 > 50 cm

Standard B

Display on the screen	Type of error	Pressure sensor
Replenish standard B	Standard B must be filled	P1 -60 cm < h1 < 4 cm
Standard B clogged	Standard B clogged	P1 h1 < -60 cm
Standard B empty	Standard B empty	P1 h1 > 50 cm

Cleaning solution

Display on the screen	Type of error	Pressure sensor
Replenish cleaning solution	Cleaning solution must be filled	P1 -60 cm < h1 < 4 cm
Cleaning solution clogged	Cleaning solution clogged	P1 h1 < -60 cm
Cleaning solution empty	Cleaning solution empty	P1 h1 > 50 cm

Sample inlet

Display on the screen	Type of error	Pressure sensor
Sample inlet clogged	Sample inlet clogged	P1 h1 < -60 cm
Sample missing	Sample missing	P3 P3 < 10 mbar
Outlet clogged	Outlet clogged	P3 P3 > 200 mbar

6.4 RS commands

The RS commands for the TresCon NH4-N all begin with TX where X is the internal number of the analyzer module (1 ... 3).

TXCCALI AutoCal is started. TresCon subsequently goes into the measuring mode. If the AutoClean interval has expired, AutoClean is called up first.

Instrument response:

```
TresCon>
-----------------------------------------------
NH4-N  Module 1          : Start AutoCal
22.04.03          15:21:49
-----------------------------------------------
TresCon>
```

TXCLEAN AutoClean is started and is followed by AutoCal. TresCon subsequently goes into the measuring mode.

Instrument response:

```
TresCon>
-----------------------------------------------
NH4-N  Module 1          : Start AutoClean
22.04.03          15:21:49
-----------------------------------------------
TresCon>
```

TXCMRUN TresCon is put into the measuring mode. If the intervals for AutoClean and AutoCal have expired, the respective routine begins automatically.
Instrument response: `TresCon>`

TXCSTOP TresCon is put into the Stop mode.
Instrument response: `TresCon>`

TXRCALI Read the calibration data.

Instrument response:

```
Calibration data
NH4-N                Module 1
23.04.03             13:11:00
-------------------------------------------------------------
Calibration data of  23.04.03  07:50:59
Standard A   : 5.00 mg/l NH4-N
Ua           : -78.0 mV
Standard B   : 50.00 mg/l NH4-N
Ub           : -137.0 mV
Srel         : 0.95
Uo           : -36.8 mV
S    :   -59.0  mV/dec
Tblock       : 40.0 C
CAL Mode     : HQ
-------------------------------------------------------------
TresCon>
```

If the last calibration was erroneous, the data of the erroneous calibration and the last valid calibration is displayed. The data of the erroneous calibration is marked with an "err" on the right-hand side of the time.

TXRCINT Read the following settings:

- AutoCal: time, interval
- AutoClean: time, interval

Instrument response:

```
---------------------------------------------
NH4-N                Module 1
22.04.03             15:30:37
---------------------------------------------
AutoCal:   07:00, 24 h
AutoClean: 07:00, 24 h
---------------------------------------------
TresCon>
```

TXRCONZ Read the current concentration.

Instrument response:

```
---------------------------------------------
NOx-N                Module 1
22.04.03             15:32:01
---------------------------------------------
10.93 mg/L NH4-N
---------------------------------------------
TresCon>
```

TXRGPAR Read the instrument parameters.

Instrument response:

```
------------------------------------------------------------
Selected parameters
NH4-N                Module 1
23.04.03             13:12:33
------------------------------------------------------------
Display              : NH4-N mg/l
Standard A           : 5.00 mg/l
Standard B           : 50.00 mg/l
AutoCal time         : 07:00 h
AutoCal interval     : 24 h
CAL Mode             : HQ
AutoClean time       : 07:00 h
AutoClean interval   : 24 h
Measuring interval         : Continuous
Attenuation          : 2
AutoFlow
 Fluid level measurement    : On
 Overpressure measurement     : On
Dilution             : No
------------------------------------------------------------
TresCon>
```

TXWCALINT12 Setting of the AutoCal interval, here: 12 hours.

Instrument response:

```
---------------------------------------------
NH4-N                Module 1
22.04.03             15:36:34
---------------------------------------------
AutoCal:   07:00, 12 h
AutoClean: 07:00, 24 h
---------------------------------------------
TresCon>
```

TXWCALTIMExx:yy Setting of the AutoCal time (xx = hours; yy = minutes, only 00 or 30 allowed), here: 03:00 hours.

Instrument response:

```
---------------------------------------------
NH4-N                Module 1
22.04.03             15:37:04
---------------------------------------------
AutoCal:   03:00, 12 h
AutoClean: 03:00, 24 h
---------------------------------------------
TresCon>
```

TXWCLEANINT12 Setting of the AutoClean interval, here: 12 hours.

Instrument response:

```
-----------------------------------------------
NH4-N                Module 1
22.04.03             15:37:19
-----------------------------------------------
AutoCal:   03:00, 12 h
AutoClean: 03:00, 12 h
-----------------------------------------------
TresCon>
```

6.5 Instrument activities

Activity	V	V2	V3	V4	Pump
Rinse with sample but without any reagent	0	0	0	1	SR
Flush back the sample without any reagent	0	0	0	1	SL
Rinse with sample with reagent	0	0	0	0	SR
Flush back the sample with reagent	0	0	0	0	SL
Transport sample without any reagent	0	0	0	1	LR
Transport sample with reagent	0	0	0	0	LR
Measure sample	0	0	0	0	LR
Measuring standard A	0	1	0	0	LR
Measuring standard B	0	1	1	0	LR
Rinse standard A without any reagent	0	1	0	1	SR
Rinse with standard A with reagent	0	1	0	0	SR
Transport standard A without any reagent	0	1	0	1	LR
Flush back standard A without any reagent	0	1	0	1	LR
Flush back standard A with reagent	0	1	0	0	SL
Rinse standard B without any reagent	0	1	1	1	SR
Rinse with standard B with reagent	0	1	1	0	SR
Transport standard B without any reagent	0	1	1	1	LR

Activity	V	V2	V3	V4	Pump
Flush back standard B without any reagent	0	1	1	0	SL
Flush back standard B with reagent	0	1	1	0	SL
Rinse cleaning solution without any reagent	1	0	0	1	SR
Flush back cleaning solution without any reagent	1	0	0	1	SL
Rinse with cleaning solution with reagent	1	0	0	0	SR
Flush back the cleaning solution with reagent	1	0	0	0	SL
Wait for the reaction of the sample	0	0	0	0	LR
Wait for the reaction of standard A	0	1	0	0	LR
Wait for the reaction of standard B	0	1	1	0	LR
Empty flow-thru vessel with sample	0	0	0	0	LLL
Fill flow-thru vessel with sample	0	0	0	0	LLR
Empty flow-thru vessel with standard A	0	1	0	0	LLL
Fill flow-thru vessel with standard A	0	1	0	0	LLR
Empty flow-thru vessel with standard B	0	1	1	0	LLL
Fill flow-thru vessel with standard B	0	1	1	0	LLR

0	Current-free path active
1	Current-carrying path active
X	No function
SR	Quickly to the right (60 rpm)
SL	Quickly to the left (60 rpm)
LR	Slowly to the right (24 rpm)
LL	Slowly to the left (24 rpm)
LLR	Slowly to the right (12 rpm)
LLL	Slowly to the left (12 rpm)

6.6 Preparing the reagent

The reagent consists of an aqueous sodium hydroxide/Na_2EDTA solution.



Caution corrosive
Causes severe corrosion. Do not allow this substance to get into the hands of children. If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.



Warning
Improper handling of sodium hydroxide and its aqueous solutions can lead to blindness or to severe eye and skin irritations.
Only specially trained personnel are allowed to prepare reagents!
Follow the safety datasheets and instructions when handling hazardous materials.
Always use the proper safety equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing

Instruments

- 10 l container with stopper (contained within the scope of delivery of the TresCon NH4-N)

Materials

10 l reagent requires

- Reagent R/ A111 with
  - Substance A:
    1 portion of sodium hydroxide pellets (NHP-A100)
  - Substance B:
    1 portion of Na_2EDTA ethylenediaminetetraacetic acid - disodium salt (KM-A100)
- 10 l deionized water

Water hardness of the sample

Depending on the water hardness of the sample, up to four times the amount of Na_2EDTA (substance B) must be used. Substance B is obtained under the designation R/ ADD/ TC.

Substance A in 10 liter	Max. allow. water hardness (°DH)
1 portion	98
2 portions	196
3 portions	294
4 portions	392

Preparation

1	Fill a well cleaned 10 l container with deionized water up to the shoulder.
2	Put on protective goggles and gloves.
3	Carefully add the required portion of sodium hydroxide pellets (substance A) to the container.
4	Tightly close the container.
5	Carefully rock the container to dissolve the solids. When doing so, the container noticeably warms up (particularly at the bottom!).



Attention
Ensure that the correct amount of substance B is used based on the water hardness of the sample (see table above)!

6	Carefully add the required portion of Na_2EDTA (substance B) to the container.



Note
Slight overfilling of the container by approx. 1 cm is tolerable.

7	Tightly close the container.
8	Carefully rock the container to dissolve the solids. When doing so, occasionally rock to avoid local overheating.
9	Let the container cool down to body temperature.
10	Stick a label on the container (included in the scope of delivery).

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