TresCon ba43110e05 operating manual

NOx-N analyzer module

Note

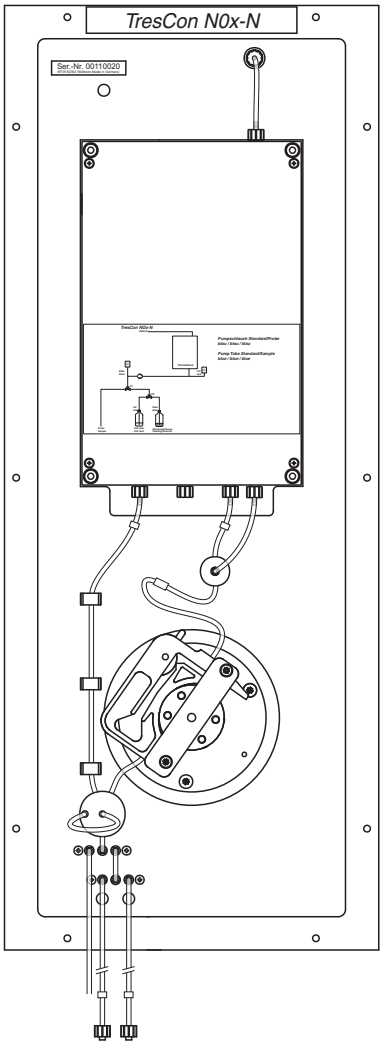
- Remove this cover sheet.
- Insert this operating manual into the TresCon main folder in the 2nd, 3rd or 4th position depending on the modules installed.

Cover sheet

Operating Manual

TresCon

Analyzer module NOx-N



ba43110e05 01/2011

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 NOx-N* measuring module (highlighted in gray in Fig. 1-1).

Structure of the operating manual

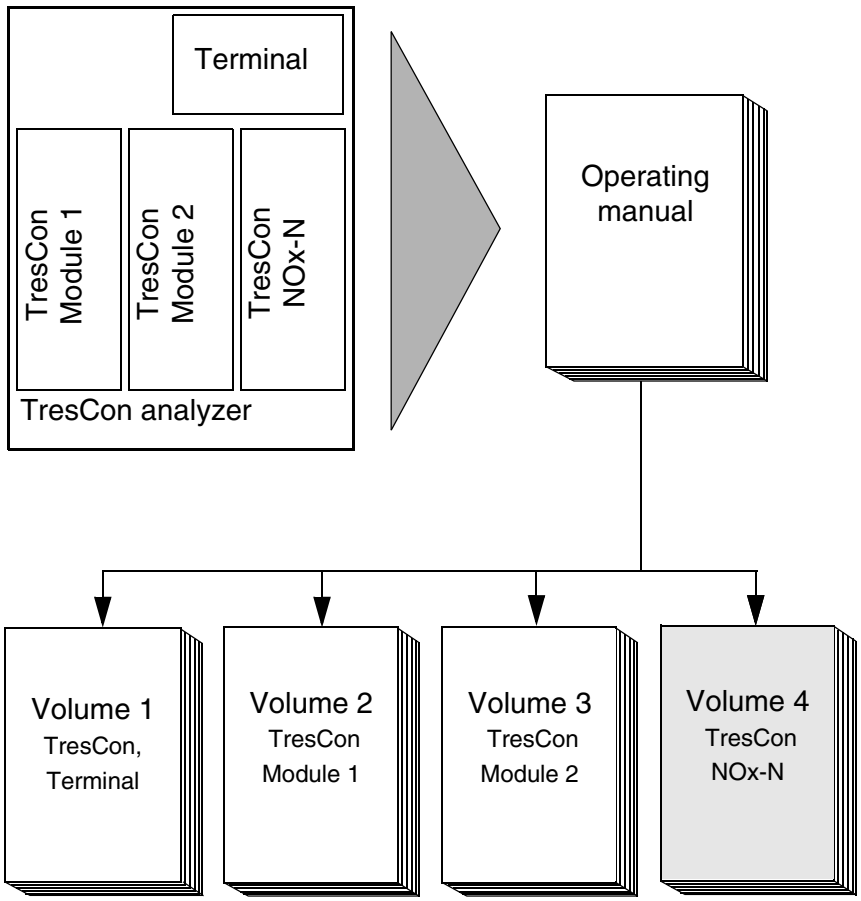


Fig. 1-1 Structure of the operating manual (example)

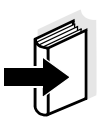
Note
Please read chapter 2, SAFETY, in volume 1, TERMINAL, of this operating manual before starting to work with the measuring module.

1.1 Function

The TresCon NOx-N analyzing module operates according to the photometric UV absorption procedure. This is used to detect nitrate (NO_3^-). As this measuring method cannot differentiate between nitrate and nitrite ions (NO_2^-), a cumulative value (NOx-N) is calculated if any nitrate is present. A 4-beam photometer is used. It grants the highest stability and absolute accuracy. A WTW background correction procedure ensures high accuracy - even in highly colored samples. Measurement is performed without any additional reagents.

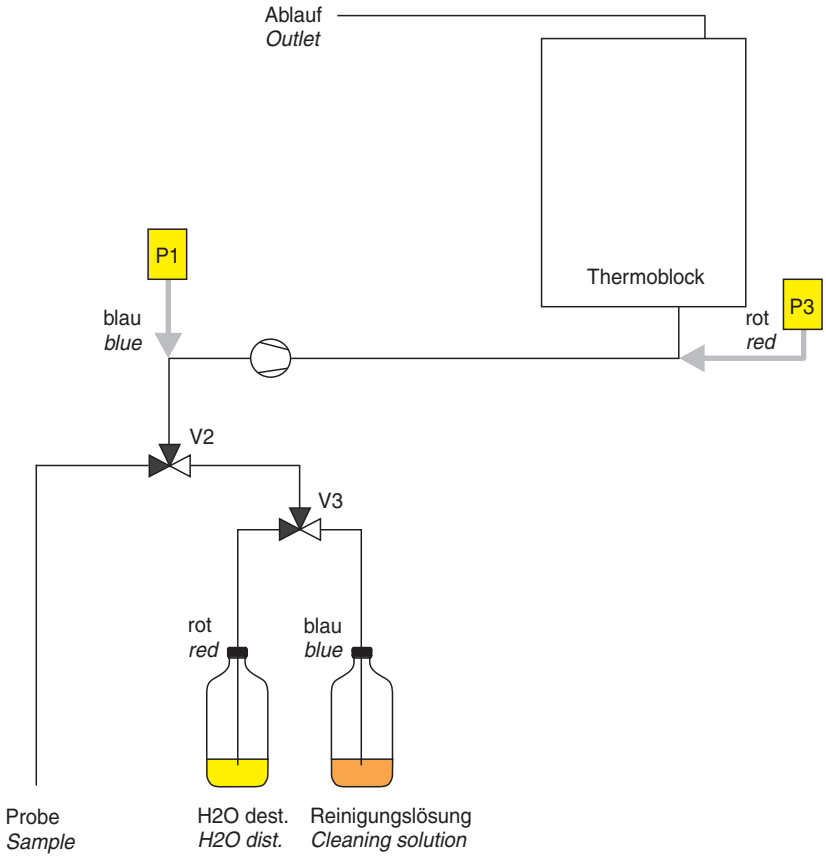
The following points describe the fundamental features of the TresCon NOx-N:

- AutoCal
  TresCon NOx-N performs an automatic zero-point calibration (AutoCal) so that the instrument can always maintain its high degree of absolute accuracy.
- AutoClean
  The TresCon NOx-N can clean the entire analyzer system itself so that the user only has to perform a minimum amount of maintenance.
- AutoFlow
  The TresCon NOx-N can 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 NOx-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 NOx-N automatically checks and regulates the temperature of the measuring block. This ensures that the instrument always functions safely.
- Interfaces
  The TresCon NOx-N is equipped with 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).



Note
Please read chapters 2 SAFETY and 5 OPERATIONin volume 1, TERMINAL, of this operating manual. It contains basic instructions.

Schematic diagram



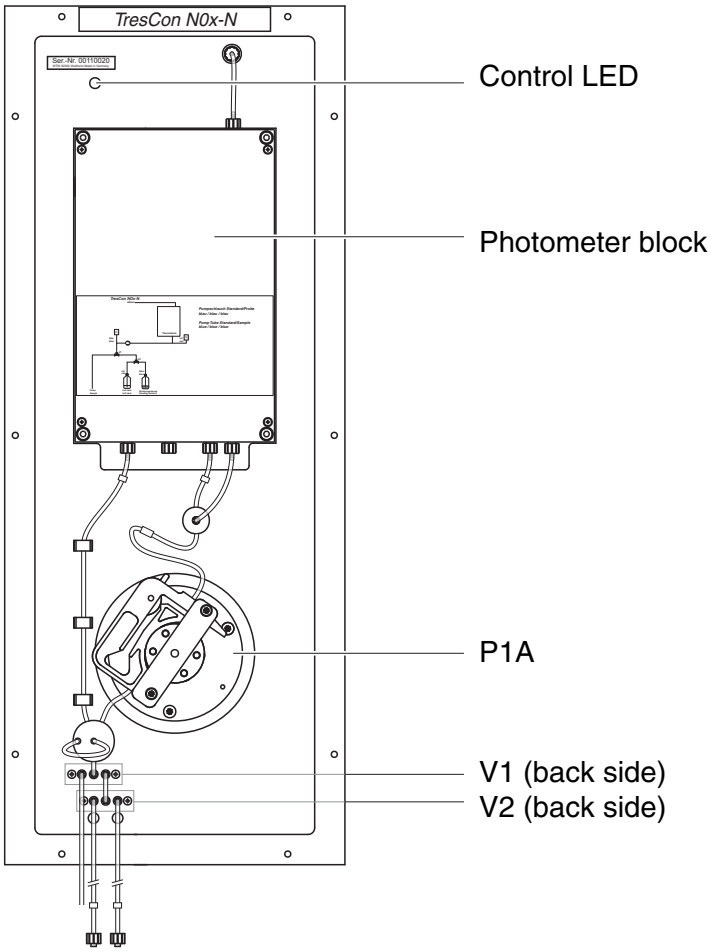
Standard/sample pump tubing: blue/blue/blue

Fig. 1-2 Schematic diagram

Configuration

Component (quantity)	Designation
Valves (2)	V1, V2
Pumps (1)	P1 A
Pressure sensors (2)	P1, P2

View of the TresCon NOx-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 measuring module or a designation is being given to the measuring 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 operation.

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

- ON 210: TresCon NOx-N measuring module
- Operating manual to be added to the main folder
- Chemicals
  - S/ AI - N211: 10 l standard A-I (zero standard, dist. H2O)
  - C/ N211: 1.5 l cleaning solution
- 2 Wpack/ N211: set of replacement tubes
- TC/ÜB 1: overflow vessel
- 1 lid for standard A-I (zero standard, dist. H2O), red
- 1 lid for cleaning solution, blue

Safety datasheets

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

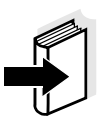
1.2.2 Retrofitting the TresCon NOx-N

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

Preparatory activities

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

- Permeate supply:
  Setting up a separate permeate supply (with its own catch location) or connecting it to an existing permeate supply (catch location with further analyzer modules)
- Chemicals:
  If necessary, a larger tray can be mounted on the mounting stand of TresCon for the chemical containers.



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.

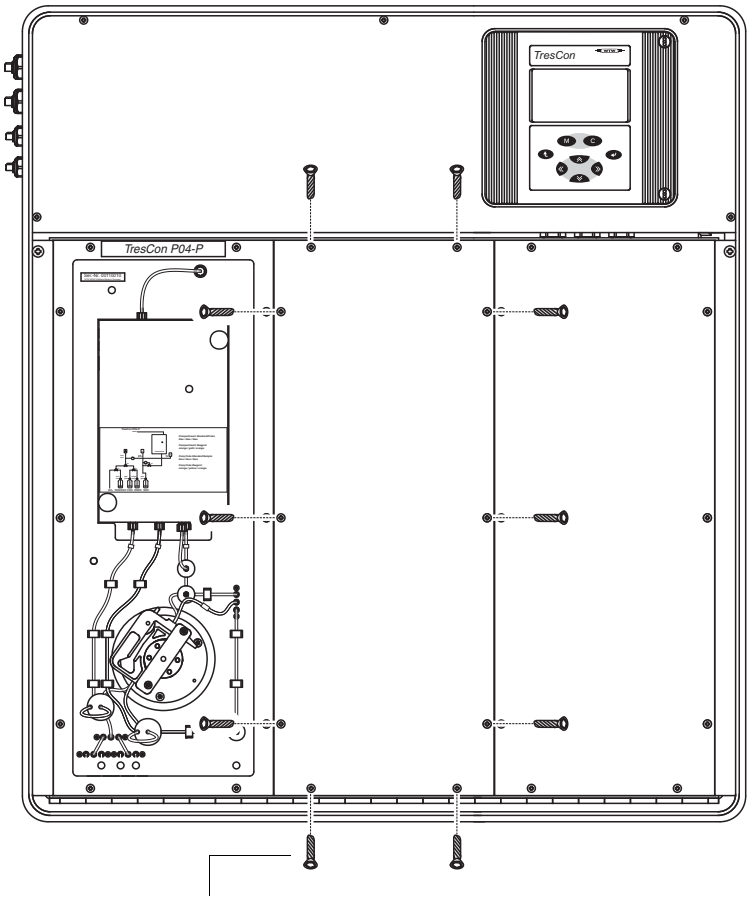


Fig. 1-3 Remove the cover plate

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 NOx-N in the mounting frame and screw it into place with the 10 screws (B).

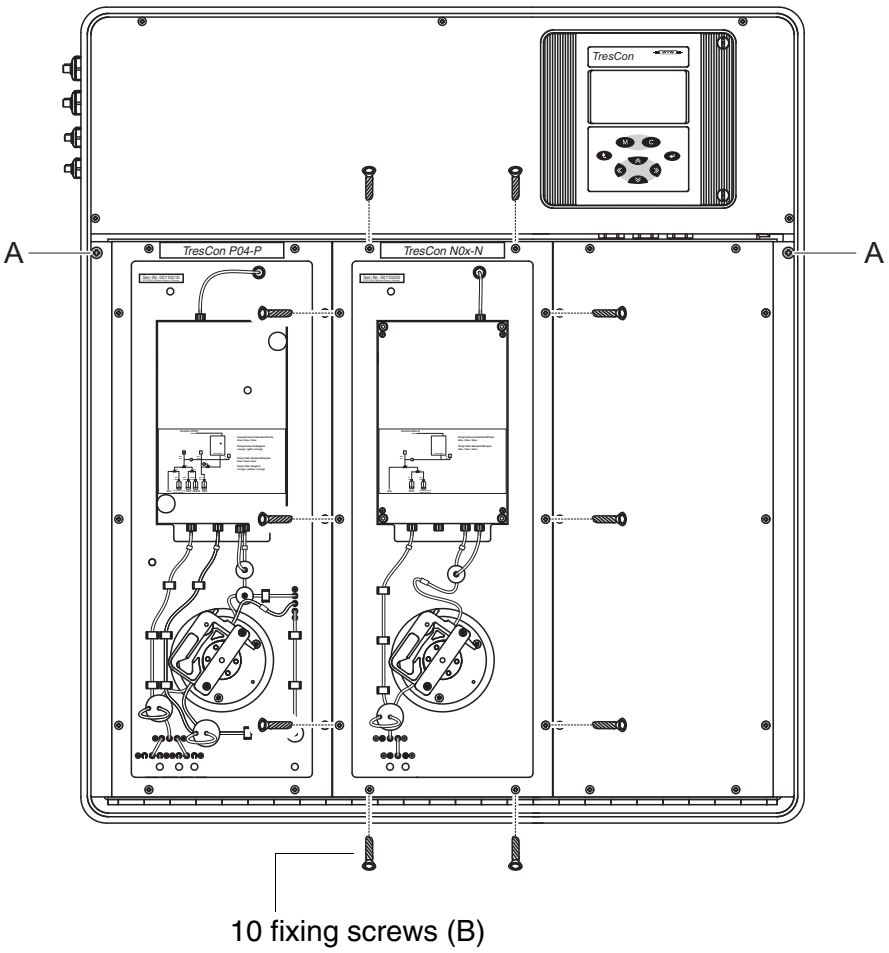


Fig. 1-4 Installing the TresCon NOx-N measuring module

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 NOx-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 NOx-N in the frame (see Fig. 1-5).

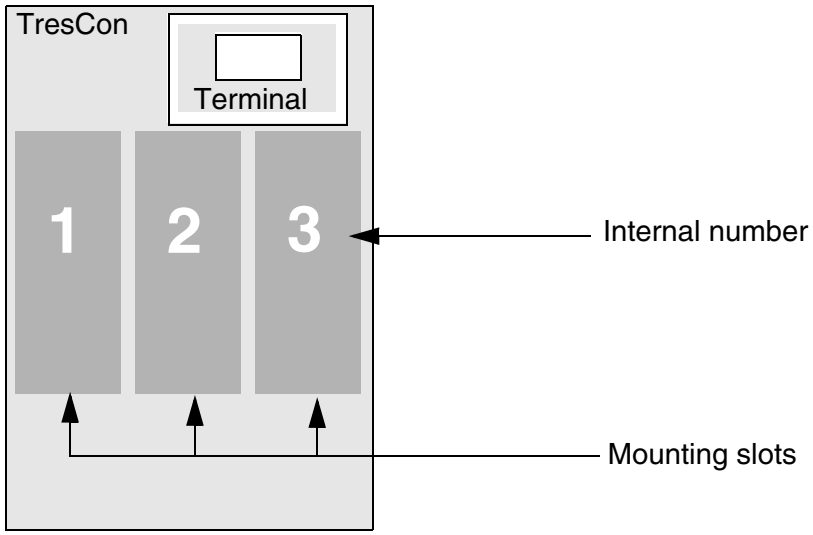


Fig. 1-5 Numbers of the mounting slots

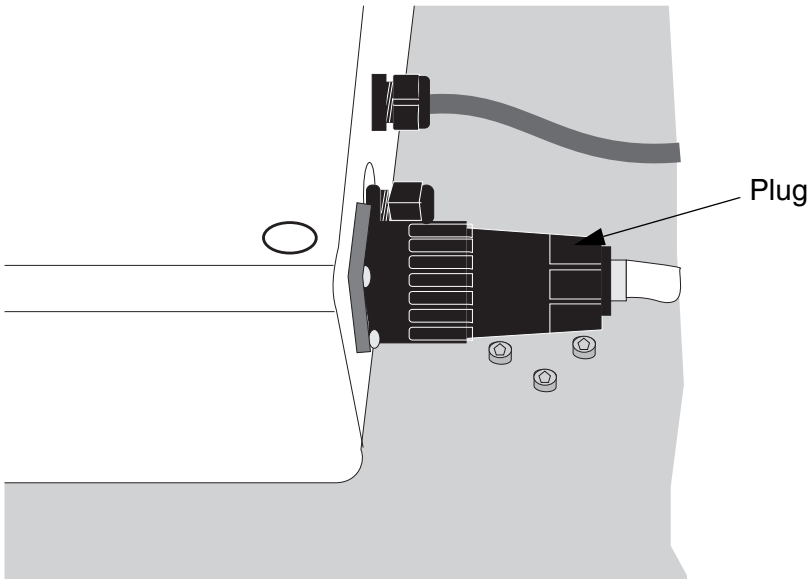


Fig. 1-6 Plug connector on the back of the TresCon NOx-N

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 tubing of the TresCon NOx-N with the outlet adapter inside the enclosure (see Fig. 1-7).
11	Also connect the ventilation tube to the adapter.

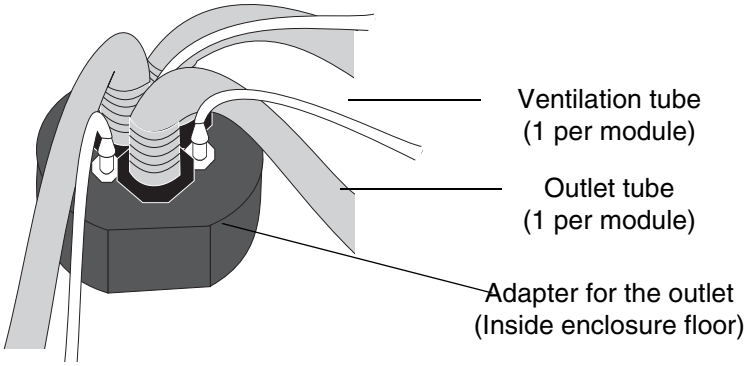


Fig. 1-7 Outlet adapter

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 NOx-N

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

Warning
Only trained personnel is 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 protective equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing

Connecting the permeate supply

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

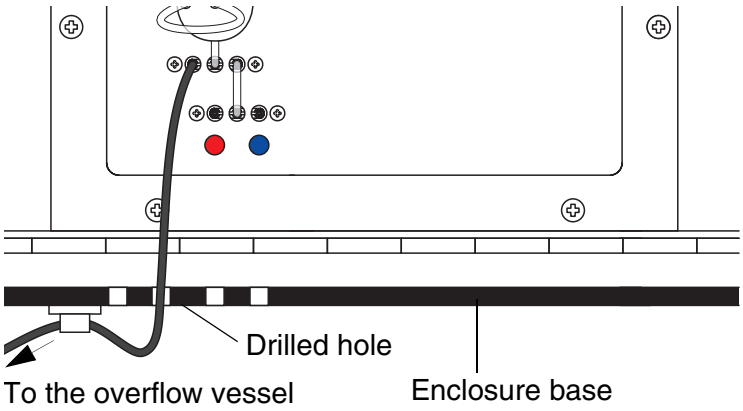
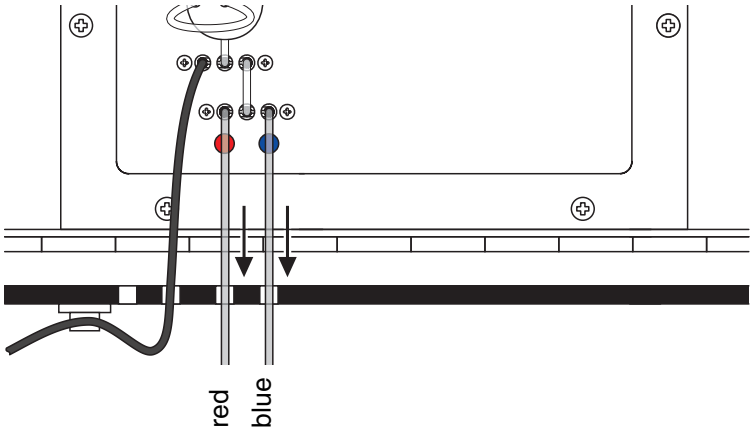


Fig. 1-8 Connecting the permeate supply

Note
If the TresCon NOx-N measuring module 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 NOx-N is to measure a new sample location, another overflow vessel must be mounted.

Connecting the supply of consumables

3	Push the tubes for dist. H2O and cleaning solution through the holes drilled in the bottom of the enclosure.



Color coding of the consumables

The tubes of the consumables are nontransparent and are color coded:

red	Dist. H2O
blue	Cleaning solution

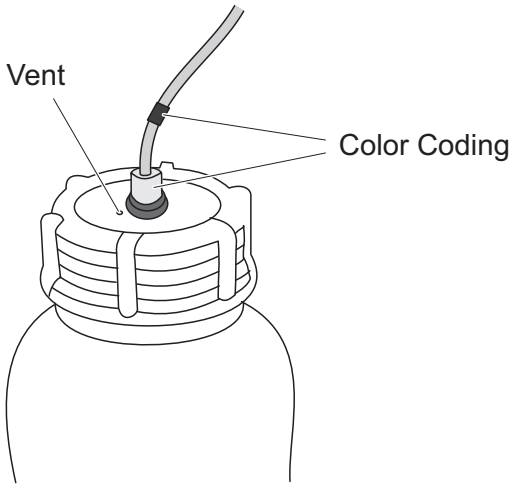


Fig. 1-9 Color coding

Connecting the cleaning solution



Cleaning solution 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.

4	Briefly shake the closed container with cleaning solution.
5	Place a container of cleaning solution on the tray.
6	Connect the (blue) screw cap with the (blue) suction hose (see Fig. 1-9).

Connecting dist. H2O

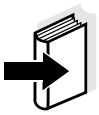


Caution
Only use distilled water without any contamination (softener or similar)! Dist. H2O is also used for zero point calibration. Contaminated dist. H2O causes incorrect measurement results.

7	Place a filled container for dist. H2O on the tray.
8	Attach the (red) screw cap to the (red) suction hose.

1.2.4 Initial commissioning

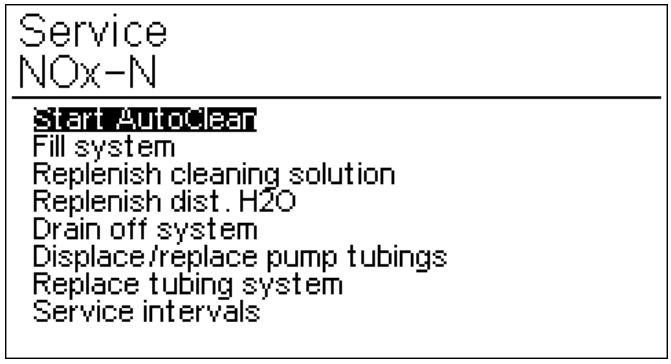
When the TresCon NOx-N is installed and connected, the initial commissioning can start.



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. The TresCon NOx-N is ready for operation after it reaches the operating temperature.
2	**Measuring mode** Select TresCon NOx-N with ⏬ ⏫.
3	Call up the *Parameters NOx-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 3-4 of this 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 3.5, page 3-11.

Shutdown of more than 7 days

1	Perform the *AutoClean* service, see section 3.1, page 3-3.
2	Perform the *AutoClean* service again using deionized water instead of cleaning solution.
3	Perform the *Empty system* service, see section 3.5, page 3-11.

1.4 Instrument parameters

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

- Service
  Performs maintenance activities with support from the service menu. Numerous service steps are described from page 3-1.
- AutoCal
  To define the parameters of the automatic calibration function for the zero point calibration, page 2-5.
- AutoClean
  To define the parameters of the automatic cleaning function, page 2-10.
- Manual correction
  To adapt the measuring device by entering a comparison measured value, page 2-12.
- Display
  Selecting the dimensions and citation form, page 2-16.
- Attenuation
  To parameterize the integrated low pass filter, page 2-18.
- Interval program
  To select the intervals of the interval program, page 2-20.
- AutoAdapt
  To select the parameters of the AutoAdapt procedure, page 2-23.
- AutoFlow
  Selecting the individual features of the monitoring function, page 3-42.
- Measuring interval
  To select the type of function and the intervals, page 2-23.
- Dilution
  To enter a dilution factor, page 2-27.

2 Operation

The following sections contain all the operating steps and tasks that are required in connection with the NOx-N analyzer module. 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).

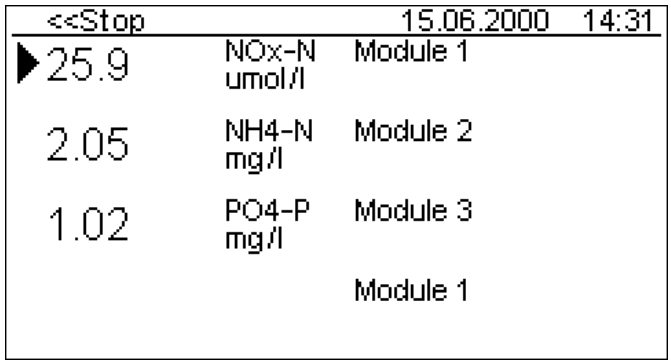
Note
How to enter the PIN to change parameters is described in volume 1, TERMINAL, of this operating manual.

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.

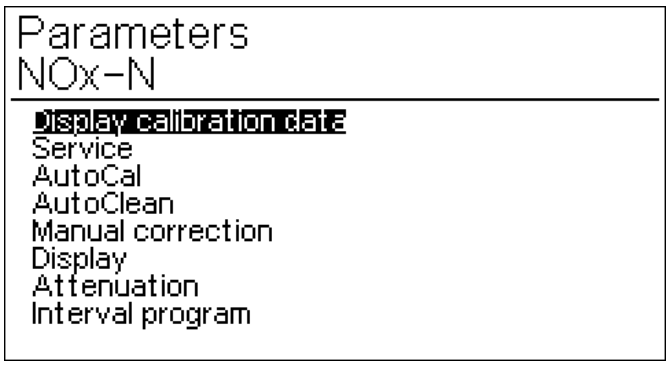
Caution
If you select the *Presentation of data* mode, the measuring module continues to run in the background.
If you select the *Change* mode, after the identification number has been entered, the measuring module goes into STOP mode as important operating parameters could be changed.

Calling up the main menu, Parameters NOx-N

1	**Measuring mode** Select TresCon NOx-N: Move the arrow (cursor) to the NOx-N measured value display with ⏬ ⏫.

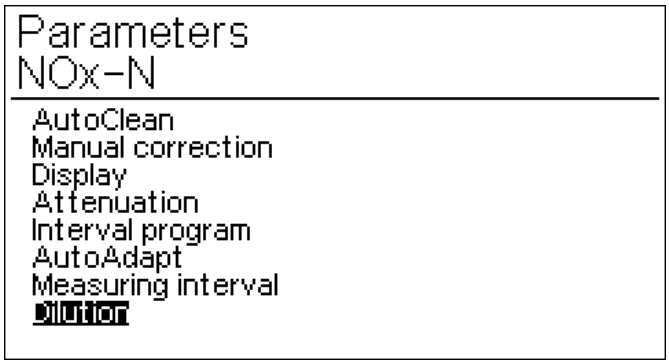


2	Call up the *Parameters NOx-N* menu with ↵. The main menu appears on the display.



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 outlet of the measuring procedure can be continuous or discontinuous. The setting is performed in the Interval Program menu. If you define a measuring interval in the *Interval program* menu, measurement is performed non continuously. If you select *Cont.*, measurement will be continuous.



Note
The type of measuring and the intervals are specified in the *Interval Program* menu (See “DISPLAYING/CHANGING THE INTERVAL PROGRAM PARAMETERS” on page 2-20.).

Continuous measurement

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

Program operating sequence

Step	Instrument status/action	Display*
1	Rinse sample	Rinse sample
2	Feeding sample	Rinse sample
4	Measuring the sample	Measurement
5	Continuous measurement	Continuously updated measured value

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

Duration

Approx. 1 ½ minutes

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.

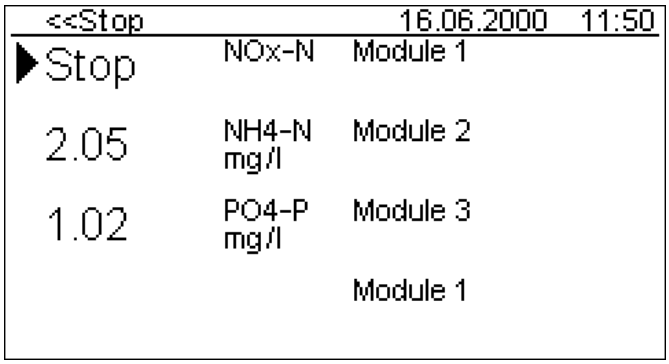
Program operating sequence

Step	Instrument status/action	Display
1	Rinse sample	Old measured value
2	Feeding sample	Old measured value
3	Measuring the sample Calculating the mean value from the last 10 individual measurements	Old measured value
4	Display of the mean value	Measured value, new

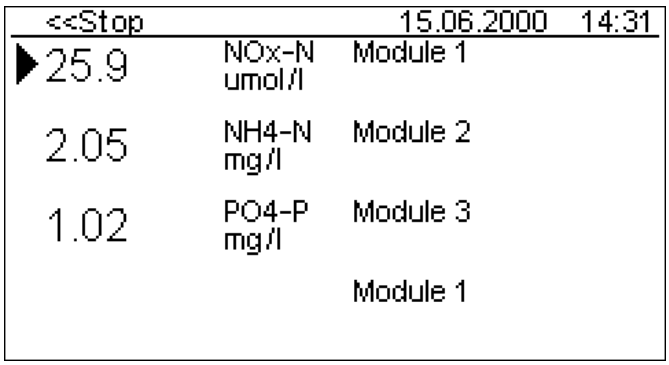
Duration Approx. 1 ½ minutes

Starting the measuring procedure

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



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



Note
The display of the concentration up to the end of the respective measuring range appears in a larger format. From the end of the respective measuring range, the display appears in a small format and an appropriate message is given.

2.2 Triggering a zero point calibration (AutoCal)

The individual steps required for a zero-point calibration run automatically and are designated by AutoCal. The TresCon NOx-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.

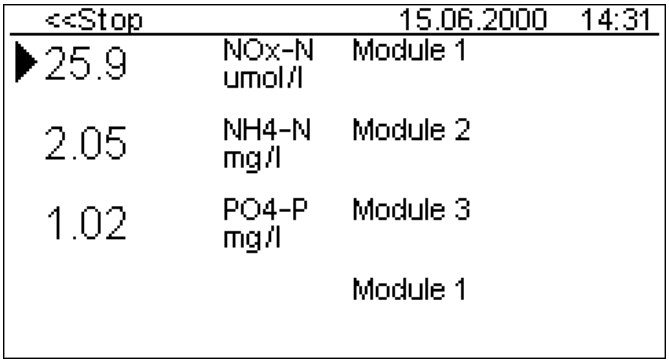
Calibration

Step	Instrument status/action
1	Rinsing dist. H2O
2	Feeding H2O dest
3	Wait
4	Measuring the E1H2O and E2H2O absorbance

Duration Approx. 1 ½ minutes

Starting AutoCal

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



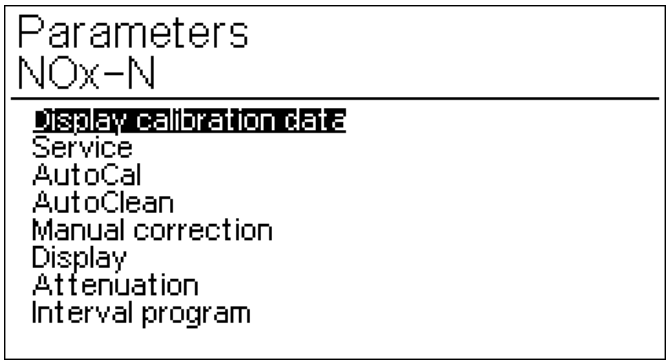
2 Press the key, C. The AutoCal procedure begins immediately. Firstly, *Rinse dist. H2O* appears on the display.

2.3 Displaying calibration data

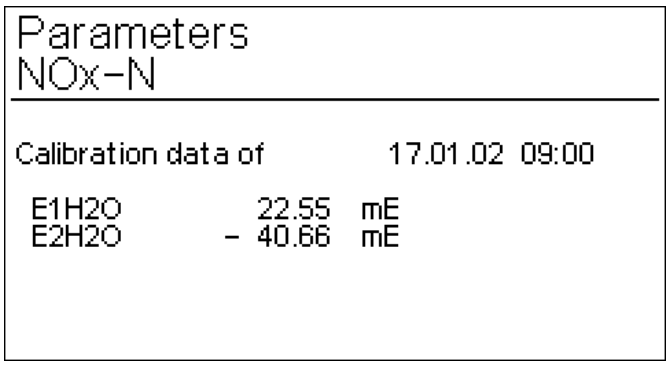
Under this menu item, you can view the result of the zero point calibration (AutoCal).

Displaying the calibration

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



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



Calibration data

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

Parameter	Meaning
E1H2O	Absorbance of the zero point calibration for measuring NOx-N
E2H2O	Absorbance of the zero point calibration for background measurement

Calibration error

If the instrument could not determine any valid calibration data, for example because the distilled water is contaminated or the thermoblock (cell) is strongly contaminated, "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.



Note
The detailed calibration data of the last multi-point calibration can be called up in the Service menu (see section 3.9 VIEWING CALIBRATION DATA OF THE MULTI-POINT CALIBRATION on page 3-33).

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. AutoCal automatically performs a zero-point calibration. The factory settings correspond to the values obtained from practical experience in normal wastewater treatment plants.

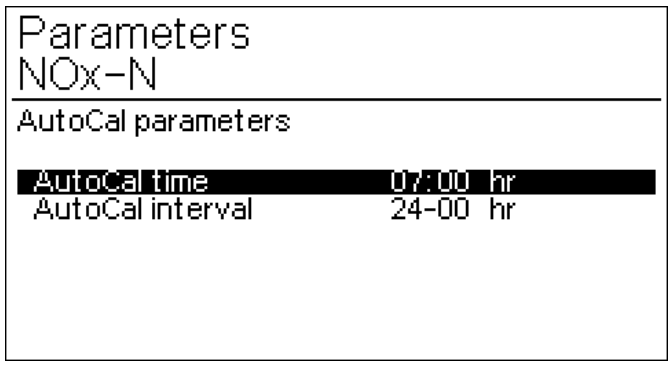


Note
You can also perform a multi-point calibration manually. The operating steps for this are described in section 3.10 TRIGGERING A MULTI-POINT CALIBRATION on page 3-35.

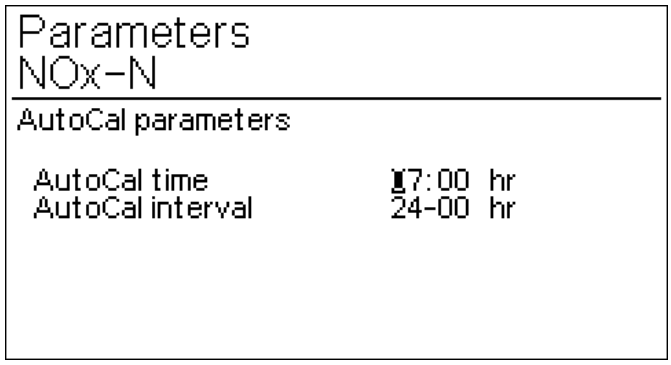
Changing parameters

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

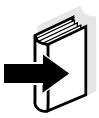
1	**Measuring mode** Select TresCon NOx-N with ⏬ ⏫.
2	Call up the *Parameters NOx-N* menu with ↵. The main menu appears on the display.
3	Select the *AutoCal* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.
5	Enter the PIN digit-by-digit with ⏬ ⏫. Change to the next digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into the 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 TRIGGERING A ZERO POINT CALIBRATION (AUTOCAL) on page 2-5).

2.6 Displaying/changing AutoCleanParameters

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

Dependency

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



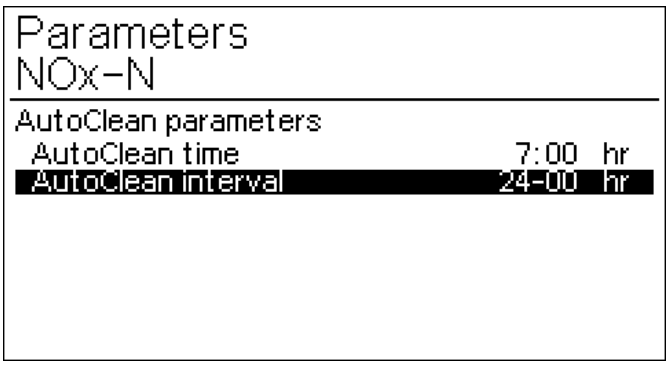
Note
You can trigger an exceptional AutoClean procedure. Read the section STARTING THE AUTOCLEAN PROCEDURE on page 3-3 in this manual for more information. The operating sequence is described in detail there.

Changing the AutoClean interval

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
AutoCal 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, 6, 12, 24 h

1	**Measuring mode** Select TresCon NOx-N with ⏬ ⏫.
2	Call up the *Parameters NOx-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	Enter the PIN digit-by-digit with ⏬ ⏫. Change to the next digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into the stop mode.



6	Select the parameter 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 ↵.

2.7 Manual correction

The background color is newly determined and calculated each time the measuring value is updated.

- The TresCon NOx-N uses internally stored standard values to suppress the background color.
- These standard values provide complete suppression of the background colors for the majority of all wastewater treatment plants.
- You can also adapt the TresCon NOx-N to special conditions (manual correction).

In some cases, manual correction of the internal standard values for background correction may be required. This is the case if the measured value of the TresCon shows deviations > 7 % of the measuring range final value in comparison with laboratory photometers.

Note
Manual correction (input of Cnominal) is only possible if the TresCon NOx-N has performed at least one measurement.

Principle

The concentration of NOx is - **at the same time and place as possible -** measured in a representative sample using a selected comparison procedure (e. g. a laboratory photometer and WTW reaction cell test) and the TresCon NOx-N. The measured value from the comparison procedure is entered as the nominal value for TresCon NOx-N. From the nominal value and its own measured value, TresCon calculates a correction factor h that is used for all further measurements.

Note
Manual correction is only possible within physically sensible limits. When Cnom is input, the analyzer checks whether the correction is possible and calculates the optimum background correction.

Process instructions for the comparison measurement using a laboratory photometer

For sampling and measurement, perform the following steps:

- Open the overflow vessel of the TresCon NOx-N.
- Using a pipette, carefully take the required amount of sample for the comparison measurement. Make sure no sediment is dispersed and sucked in. The level of the liquid should not sink below the catch point of the sample (fitting of the sample tube).
- Close the overflow vessel of the TresCon NOx-N.
- Immediately afterwards start a measuring procedure on the TresCon NOx-N.

- After the measuring procedure is completed call up the *Parameter Manual correction* menu. Leave the TresCon in this mode until Cnom is input so that the determined measured value is not overwritten by following measured values (sampling at the same time).
- Perform a comparison measurement (determine Cnominal), e. g. using a laboratory photometer according to the following process instructions.



Caution
Do not remove any particles! Perform a counter measurement immediately after taking the sample! NOx must be determined!

- Enter Cnominal in the *Parameter Manual correction* menu of the TresCon NOx-N.

Process instructions for the comparison measurement (determination of Cnominal)

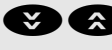
Proceed as follows to determined Cnominal:

1	Use a WTW test (e.g. model 14764) for the comparison measurement.
2	Measure the sample with the photometer: Perform at least 5 tests according to the operating manual of the photometer.
3	Calculate the average value from the tests: $Cnom = \frac{\text{Sum of measured values}}{(\text{Number of measured values})}$

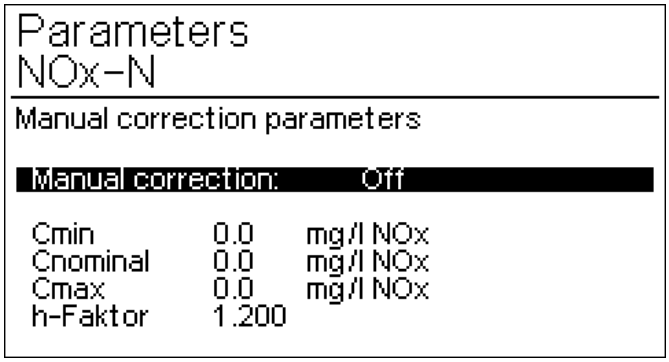
Input Cnominal

You have determined the value, Cnominal, from the NOx counter measurement according to the regulatory process standard.

Parameter	Values
Manual correction	On, Off
Cnominal	Concentration (mg/l), input digit-by-digit within the limits
Cmin	Display of the limits for the input of Cnom (the values take into account the background color present)
Cmax	
h factor	Display of the correction factor, h

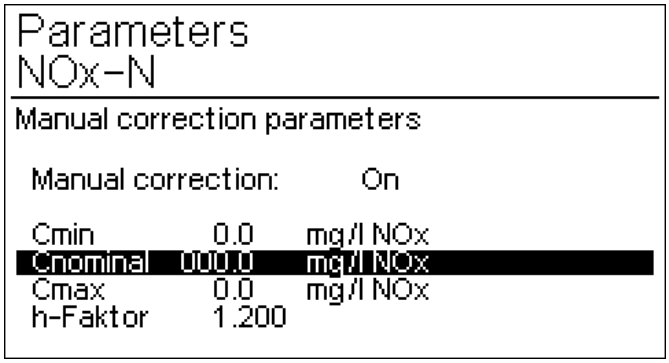
1	**Measuring mode** Select TresCon NOx-N with .

2	Call up the *Parameters NOx-N* menu with ↵. The main menu appears on the display.
3	Select the *Manual correction* menu item with ⌄⌃ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⌄⌃ and confirm with ↵.
5	Enter the PIN digit-by-digit with ⌄⌃. Change to the next digit with «» and confirm with ↵. The analyzer switches into STOP mode.

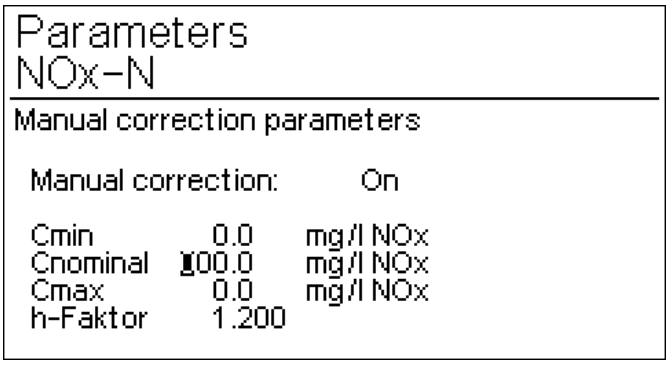


6	The *Manual correction* parameter is selected. Switch into input mode with ↵.
7	Select *On* with ⌄⌃ and confirm with ↵. The cursor skips to the line for the input of Cnominal.

Caution
Only change Cnominal in special cases!
Read the prerequisites in this section for more information!



8	Switch into input mode with ↵.



9	Input the value calculated for Cnominal from the counter measurement digit-by-digit with ⌄ ⌃. Change the digit with « ».

Note
The input of Cnominal is only possible within physically sensible limits (Cmin and Cmax). The limits depend on the values of the background color from the preceding measurements. Values of Cnom that lie outside these limits cannot be stored.

Note
The values for C shown here serve as wild cards and are without significance.

10	Confirm the input with ↵.
11	Leave the menu with ↵. The request *Store* appears.
12	Select *Yes* or *No* with ⌄ ⌃ and confirm with ↵.

2.8 Displaying/changing the display parameter

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

Converting the citation forms and units

The reference value is NOx [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	
	NOx	NOx-N
mg/l	1.0	0.2259
µmol/l	16.13	16.13

Effects of the conversion

The following table demonstrates what effects the adjusted citation form has where:

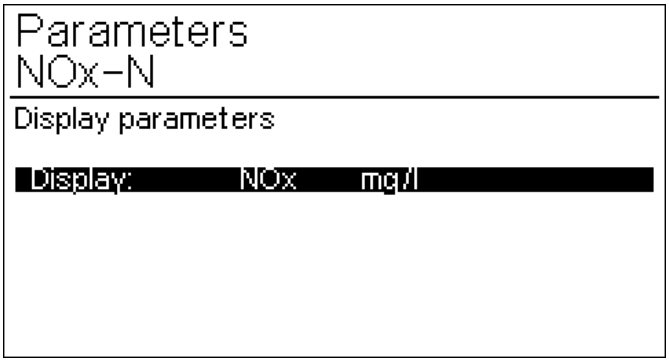
Measured value	Yes
Measuring range	Yes
Input and display of Cnominal	Yes
Relay functions	Yes (*General Parameters* menu)
Recorder functions	Yes (*General Parameters* menu)

Inputs

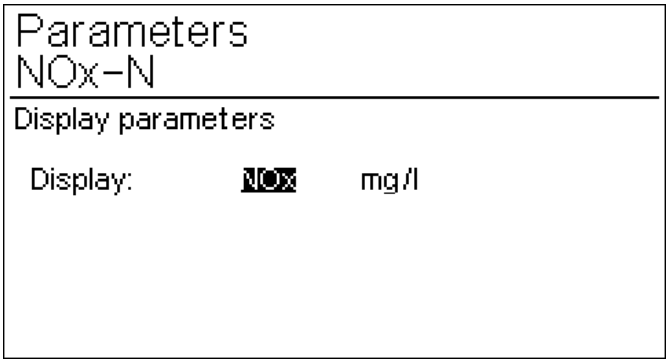
Parameter	Values
Citation form	NOx-N NOx
Dimension	mg/l µmol/l

1	**Measuring mode** Select TresCon NOx-N with ⏬ ⏫.
2	Call up the *Parameters NOx-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	Enter the PIN digit-by-digit with ⏬ ⏫. Change to the next digit with « » and confirm with ↵. The analyzer switches into the stop mode.



6	To change the display, switch to the input mode with ↵.



7	Select the required citation form with ⏬ ⏫.
8	Switch to the input of the unit with ».
9	Select the required unit with ⏬ ⏫.
10	Confirm the inputs with ↵.
11	Leave the menu with ↩. The request *Store* appears.
12	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.

2.9 Displaying/changing the attenuation parameters

You can set 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 the measured value that is output to the central unit is thus damped.

The calculation of the new values is performed at intervals of 20 s. At 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), firstly, all the x_n are 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).

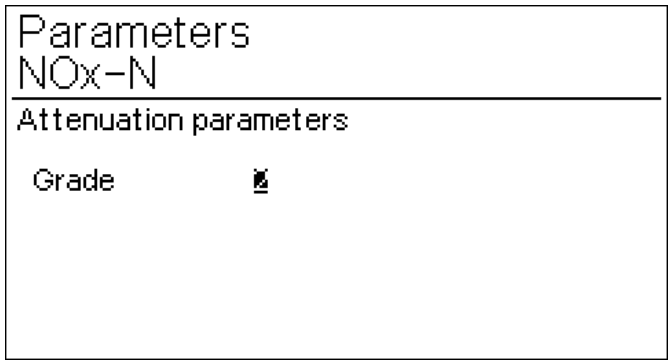
Inputs

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

1	**Measuring mode** Select TresCon NOx-N with .
2	Call up the *Parameters NOx-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	Enter the PIN digit-by-digit with . Change to the next digit with and confirm with . The analyzer switches into the stop mode.



6	Switch into input mode with .



7	Input the rise time with and confirm with .
8	Leave the menu with . The prompt *Store No* appears.
9	Select *Yes* or *No* with and confirm with .

2.10 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. You can select between fixed intervals and the "continuous" (*cont.*) setting. The AutoAdapt function is active in this setting (section 2.11 DISPLAYING/CHANGING THE AUTOADAPT PARAMETERS, on page 2-23).



Note
The interval program is switched on in the *Measuring Interval* menu (see section 2.12 DISPLAYING/CHANGING THE MEASURING INTERVAL on page 2-25).

Basic settings

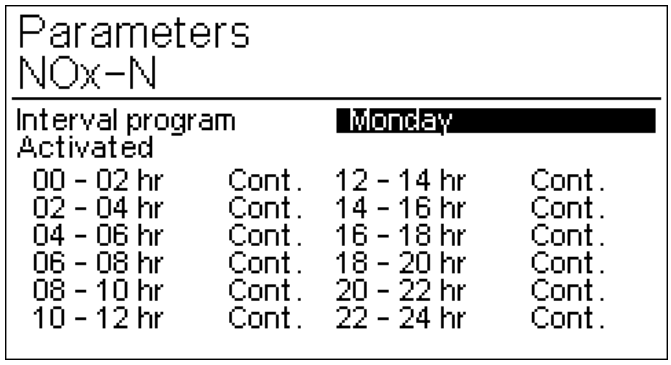
The following table contains the basic factory settings of the intervals. The numbers are the interval times in minutes.

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

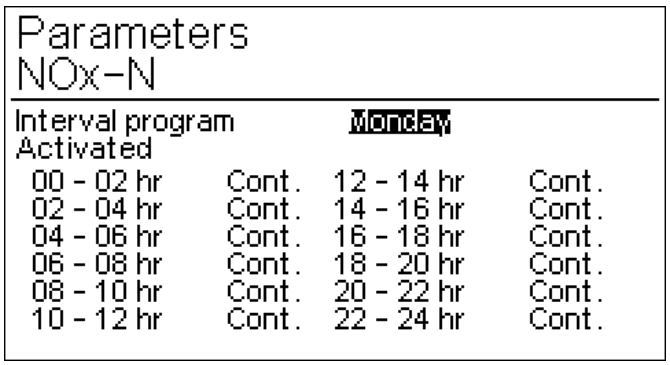
Changing the interval program

Parameter	Values
Weekday	Monday, Tuesday, Wednesday ... Sunday
-no designation-	Display of whether the interval program is active (can be changed in the *Measuring Interval* menu).
Interval	cont., 5, 10, 15, 20, 25, 30 min.

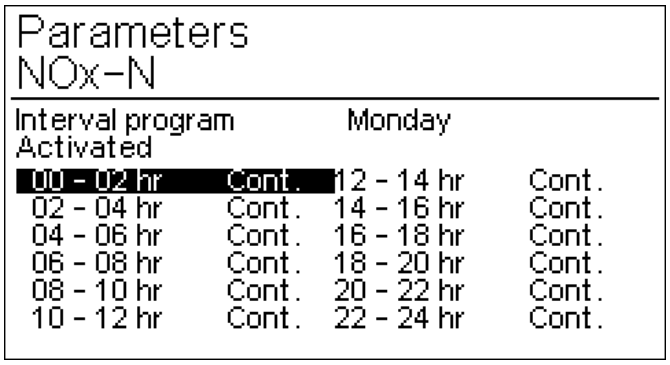
1	**Measuring mode** Select TresCon NOx-N with ⏬ ⏫.
2	Call up the *Parameters NOx-N* menu with ↵. The main menu appears on the display.
3	Select the *Interval program* menu item with ⏬ ⏫ and confirm with ↵. The prompt *Presentation of data/Change* appears.
4	Select the *Change* mode with ⏬ ⏫ and confirm with ↵.
5	Enter the PIN digit-by-digit with ⏬ ⏫. Change to the next digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into the 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 6 to 9 for any other weekdays/ intervals.
11	Leave the menu with ⏎. The request *Store* appears.
12	Select *Yes* or *No* with ⏬ ⏫ and confirm with ↵.

2.11 Displaying/changing the AutoAdapt parameters

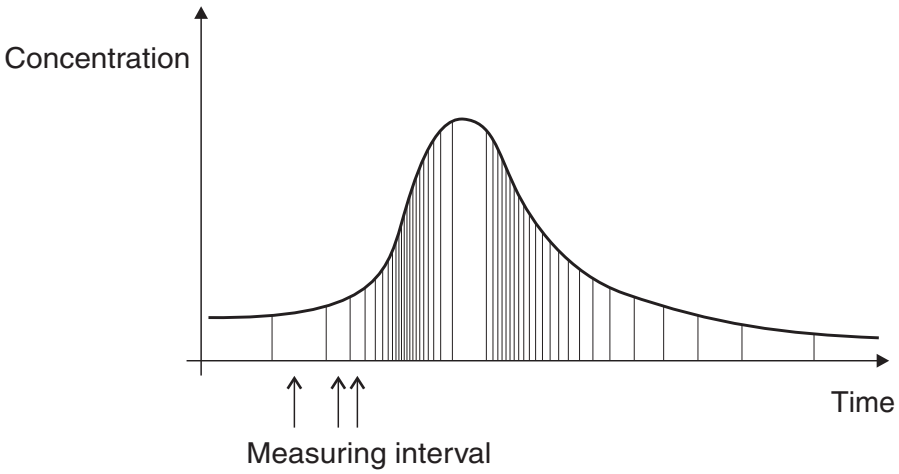
The AutoAdapt system can be used to minimize the consumption of reagents. The measuring intervals adapt automatically to the changes in concentration.

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 the maximum allowed change in concentration per measurement is not exceeded. AutoAdapt sets the interval to "Continuous" (corresponds to approx. 1½ minutes) or to fixed interval times, e.g. from 5 minutes to 20 minutes.

Relationship Measured value-interval

The following figure shows the relationship between the measured value and 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: 5, 10, 15 ... 30 minutes or to "Continuous" (corresponds to approx. 2 minutes).

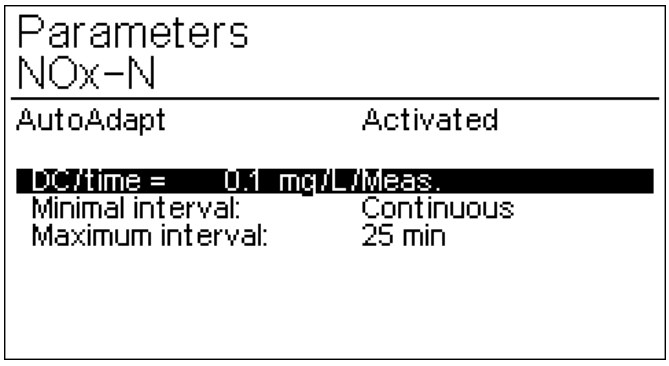
Note

The AutoAdapt function is switched on in the *Measuring Interval* menu (see section 2.12 DISPLAYING/CHANGING THE MEASURING INTERVAL on page 2-25).

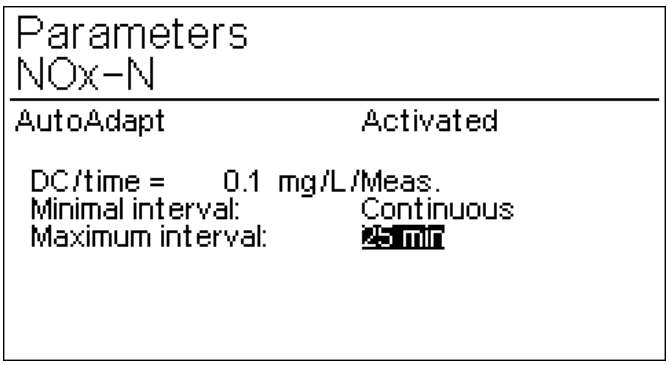
Changing the AutoAdapt parameter

Parameter	Values	
-no designation-	Display of whether AutoAdapt is active (can be changed in the *Measuring Interval* menu).	
DC/time	0.1 - 10.0 mg/L/Measurement (NOx-N)	
Minimum interval	Continuous, 5, 10, 15, 20, 25, 30 min	The minimum interval must be selected to be lower than the maximum interval!
Maximum interval	5, 10, 15, 20, 25, 30 min	

1	**Measuring mode** Select TresCon NOx-N with ⏬ ⏫.
2	Call up the *Parameters NOx-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	Enter the PIN digit-by-digit with ⏬ ⏫. Change to the next digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into the 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 ↵.

2.12 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:

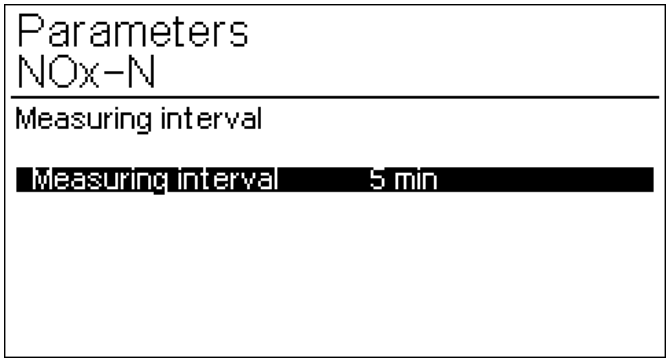
- AutoAdapt (for information on adapting the measuring interval to the change in the measured value, see page 2-23)
- Interval program (for information on the fixed setting of 12 periods on each weekday, see page 2-20)
- Continuous or in fixed intervals

Setting up the measuring interval

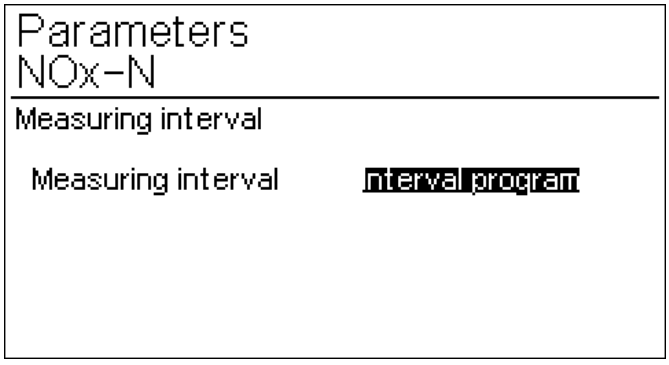
Parameter	Values
Measuring interval	5, 10, 15, 20, 25, 30 minutes AutoAdapt Interval program continuous

1	**Measuring mode** Select TresCon NOx-N with ▼ ▲.

2	Call up the *Parameters NOx-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	Enter the PIN digit-by-digit with ⌄ ⌃. Change to the next digit with « » and confirm with ↵. The analyzer switches into the 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 ↵.

2.13 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. The actual concentration value is displayed.

Example

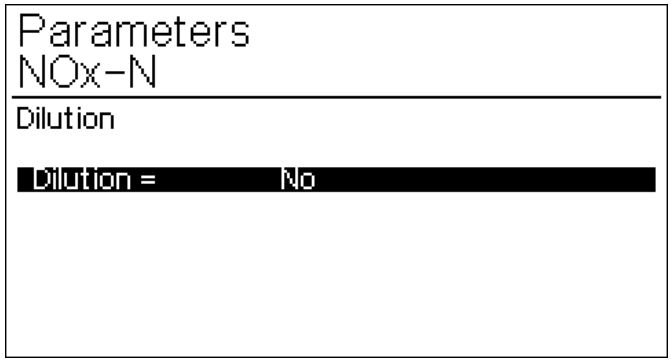
The dilution is set to 1+3 (1 part test sample, with the aid of PurCon diluted with 3 parts H2O).
The analyzer measured 1.00 mg/l NOx-N and multiplies the value with the factor 4. 4.00 mg/l NOx-N appears on the display.

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.

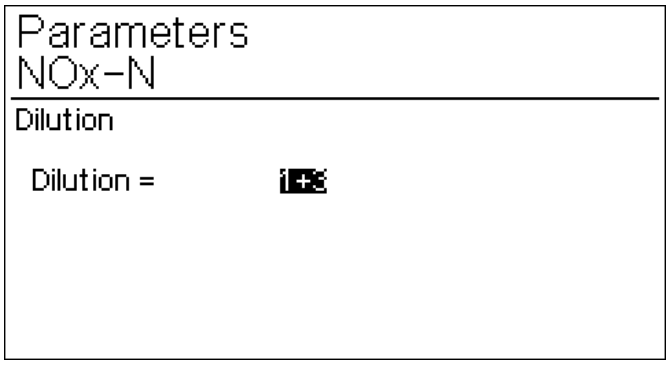
Changing the dilution parameter

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 NOx-N with ⏬ ⏫.
2	Call up the *Parameters NOx-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	Enter the PIN digit-by-digit with ⏬ ⏫. Change to the next digit with ⏪ ⏩ and confirm with ↵. The analyzer switches into the stop mode.

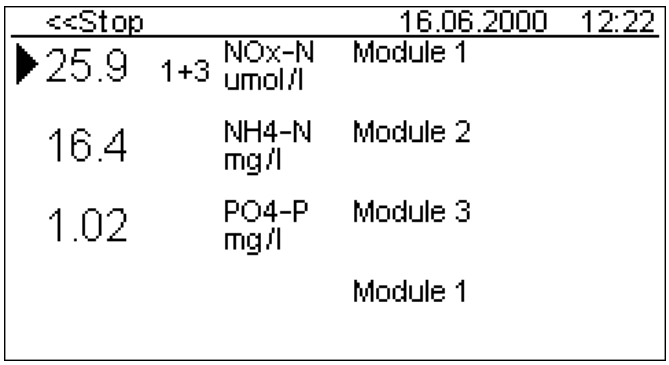


6	Switch into input mode with ↵.



7	Input the required dilution with ▼ ▲ and confirm with ↵.
8	Leave the menu with ESC. The request *Store* appears.
9	Select *Yes* or *No* with ▼ ▲ and confirm with ↵.

Measuring mode: Display of the dilution



The display of the dilution appears on the measured value display behind the current measured value. Here, a dilution of 1+3 has been selected by the TresCon NOx-N.

Note
The dilution is only displayed in the measuring mode. The dilution does not appear in the STOP mode.

3 Maintenance

TresCon NOx-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 trained personnel is 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 protective equipment!



Wear protective goggles



Wear protective gloves



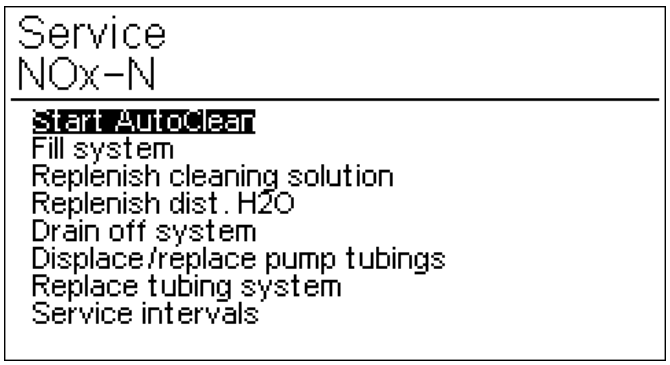
Wear protective clothing



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

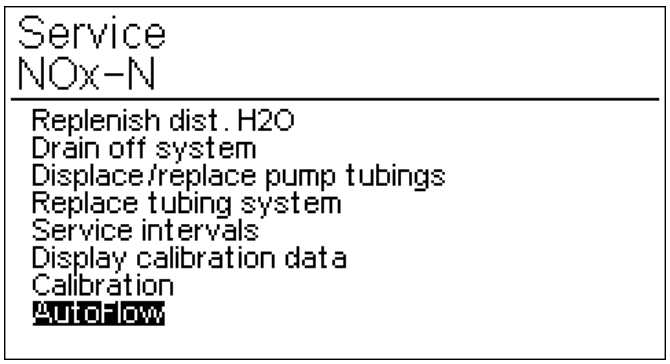
Calling up the service menu

1	**Measuring mode** Select the NOx-N measuring module with ⌄ ⌃.
2	Call up the *Parameters NOx-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.

Caution
If you select the *Presentation of data* mode, the measuring module continues to run in the background.
If you select the *Change* mode, after the identification number has been entered, the measuring module goes into 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	Rinsing cleaning solution
2	Flushing back sample
3	Rinsing cleaning solution
4	Wait
5	Rinsing sample
6	Rinsing dist. H2O
7	Wait
8	Rinsing dist. H2O

Duration

Approx. 14 minutes

Note
You can quit the AutoClean procedure with Stop. At the end of the cleaning procedure, a calibration is automatically triggered. After this procedure, the instrument switches into the measuring mode.

Starting the AutoClean procedure

1	**Measuring mode** Select the NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-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 *Start AutoClean* 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 calibration is automatically triggered. Afterwards, the TresCon switches into 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.

Consumables

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

- 10 l dist. H2O

Caution
Only use distilled water without any contamination (softener orsimilar)! Dist. H2O is also used for zero point calibration. Contaminated dist. H2O causes incorrect measurement results.

- 1.5 l cleaning solution



Cleaning solution 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 trained personnel is allowed to work on the analyzing section. Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use protective equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing

Program sequence

Step	Instrument status/action
1	Rinsing cleaning solution
2	Rinsing dist. H2O

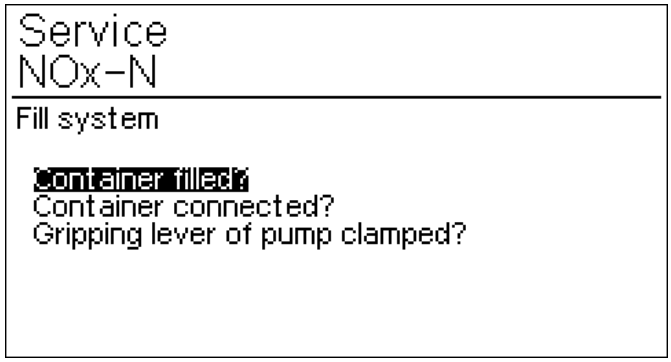
Duration

Approx. 1 minute

Note
You cannot quit the procedure. When the next measurement is started, an AutoClean cleaning procedure and a calibration are triggered automatically.

Starting the procedure

1	**Measuring mode** Select the NOx-N measuring module WITH ⏬ ⏫.
2	Call up the *Parameters NOx-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 a full container on the tray.
6	Connect the consumables. Follow the color coding!

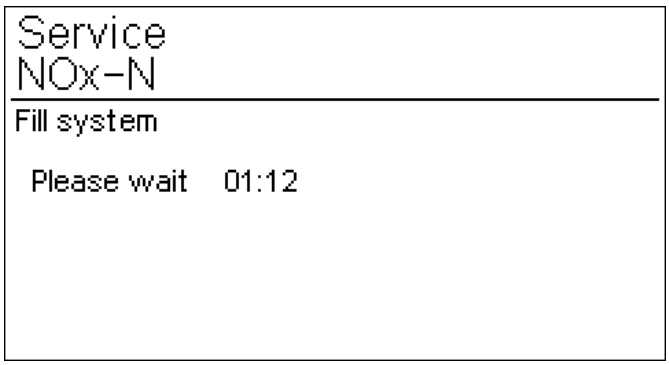


Caution
Only use distilled water without any contamination (softener orsimilar)! Dist. H2O is also used for zero point calibration. Contaminated dist. H2O causes incorrect measurement results.

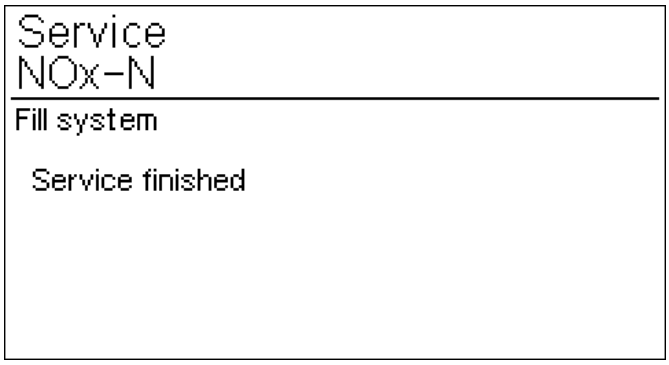
Color coding of the consumables

red	Dist. H2O
blue	Cleaning solution

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 fills the wet chemical system with cleaning solution.



Cleaning solution 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 trained personnel is allowed to work on the analyzing section.
Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use protective equipment!



Wear protective goggles



Wear protective gloves



Wear protective clothing

Program sequence

Step	Instrument status/action
1	Rinsing cleaning solution

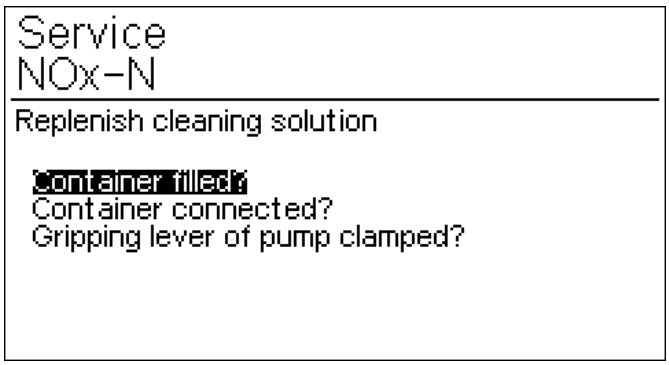
Duration Approx. ½ minute



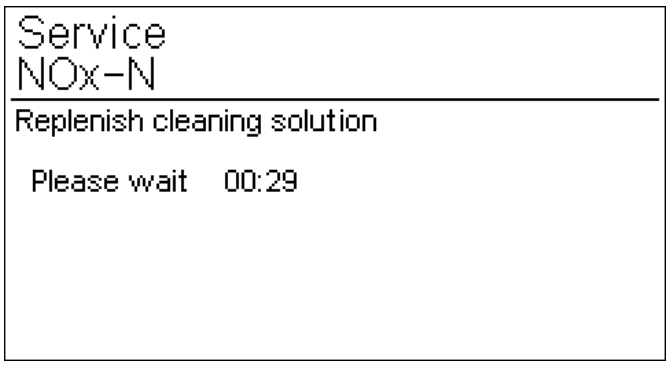
Note
You cannot quit the procedure.

Starting the procedure

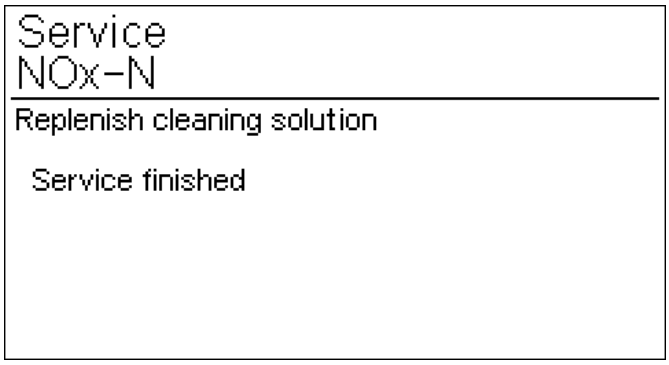
1	**Measuring mode** Select the NOx-N measuring module with ▼▲.
2	Call up the *Parameters NOx-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ▼▲ and confirm with ↵. The service menu appears.
4	Select the *Replenishing cleaning solution* menu item with ▼▲ and 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 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 ↵.

3.4 Replenishing dist. H2O

This routine replenishes the wet chemical system with dist. H2O. The distilled water must be free of contamination (softener or similar) as it is also used for the zero-point calibration.

Program sequence

Step	Instrument status/action
1	Rinsing dist. H2O

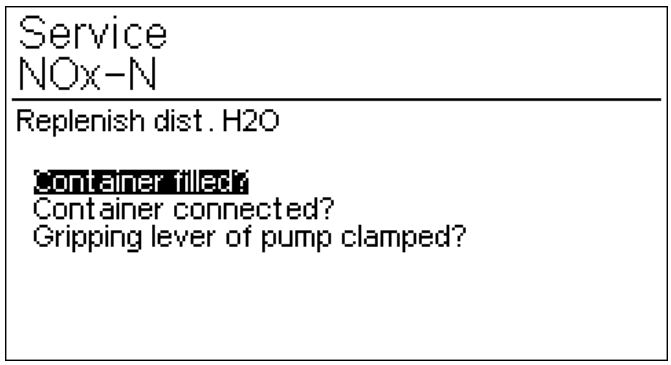
Duration

Approx. ½ minute

Note
You cannot quit the procedure.

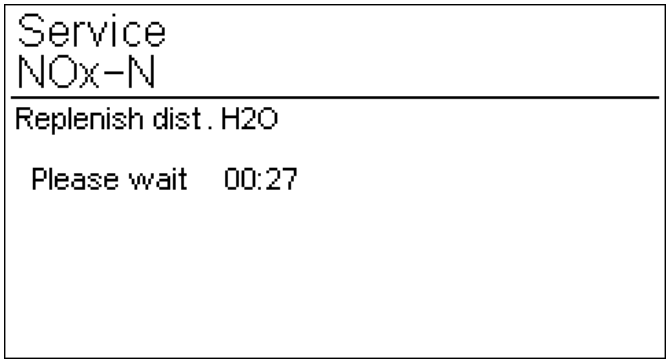
Starting the procedure

1	**Measuring mode** Select the NOx-N measuring module with ⌄ ⌃.
2	Call up the *Parameters NOx-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 H2O dest* menu item with ⌄ ⌃ and confirm with ↵. A checklist appears on the display.

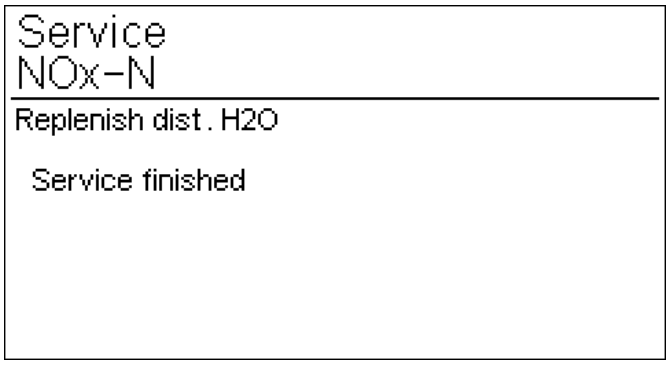


Caution
Only use distilled water without any contamination (softener or similar)! Dist. H2O is also used for zero point calibration. Contaminated dist. H2O causes incorrect measurement results.

5	Place a filled container of dist. H2O on the tray.
6	Connect the container. Follow the color coding (red)!
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 Emptying the system

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

- Dist. H2O
- Cleaning solution



Cleaning solution 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 trained personnel is allowed to work on the analyzing section.
Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use protective 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 dist. H2O
2	Flushing back cleaning solution
3	Flushing back sample

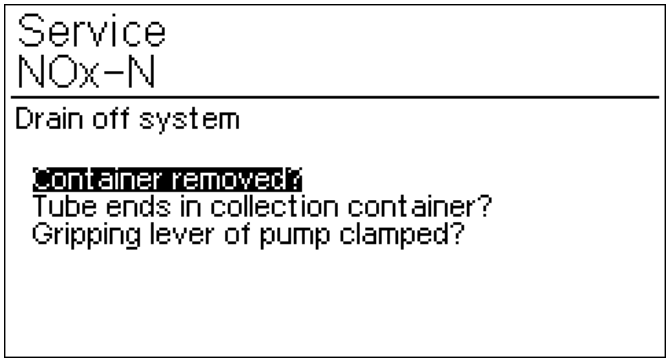
Duration Approx. 1 ½ minutes



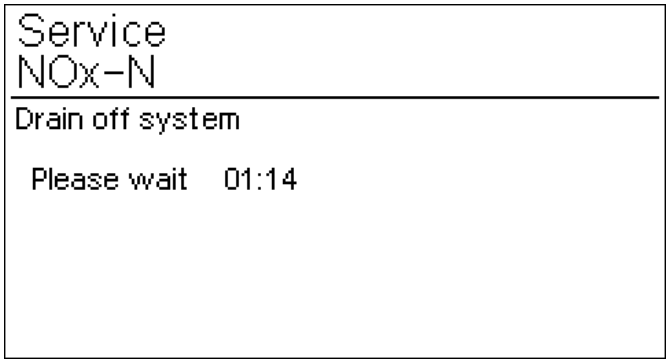
Caution
The pump empties the system via the tubes. If the canisters are not removed, the cleaning solution and dist. H2O will become unusable!
You cannot quit the procedure.

Starting the procedure

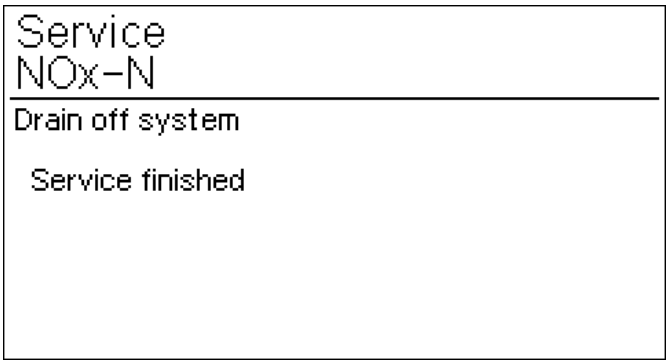
1	**Measuring mode** Select the NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-N* menu with ↵. The main menu appears on the display.
3	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
4	Select the *Empty system* menu item with ⏬ ⏫ and confirm with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



5	Disconnect the canisters with consumables from the tubes.
6	Stick the ends of the tubes into the collecting container.
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 ↵.

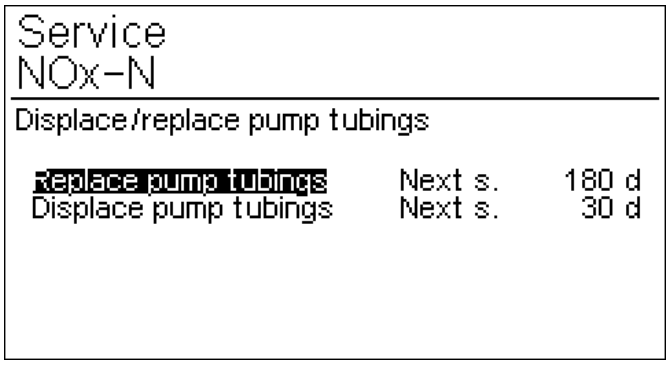
3.6 Displacing/replacing pump tubings

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 NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-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 ⏎.

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 sample
Displace/replace tubing. During this operation, the TresCon NOx-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

2	Rinse sample

Duration

- Part 1: approx. 1½ minutes
- Part 2: approx. 1½ minutes



Note
You can display the intervals and leave the menu or start a sequence of operations. 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.

3.6.1 Replacing the pump tubings

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



Cleaning solution 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 trained personnel is allowed to work on the analyzing section.
Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use protective equipment!



Wear protective goggles



Wear protective gloves



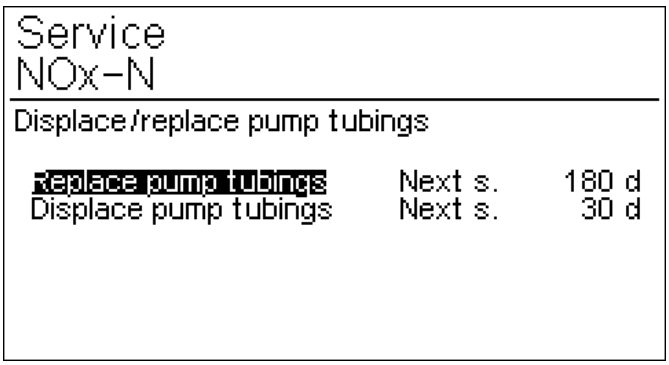
Wear protective clothing

Effects

Replacing the pump tubings	Reset the *Replace pump tubings* timer and reset the *Displace pump tubings* timer

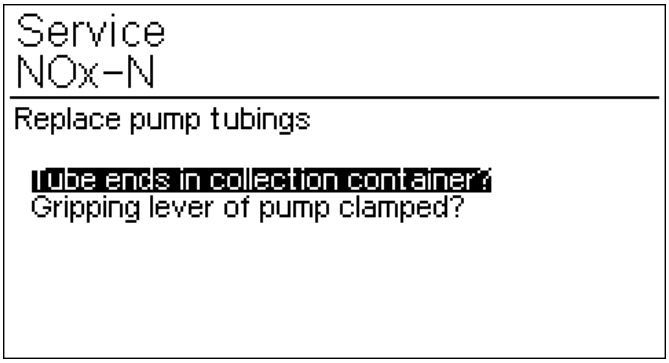
Replace pump tubings

1	**Measuring mode** Select the NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-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 ↵.

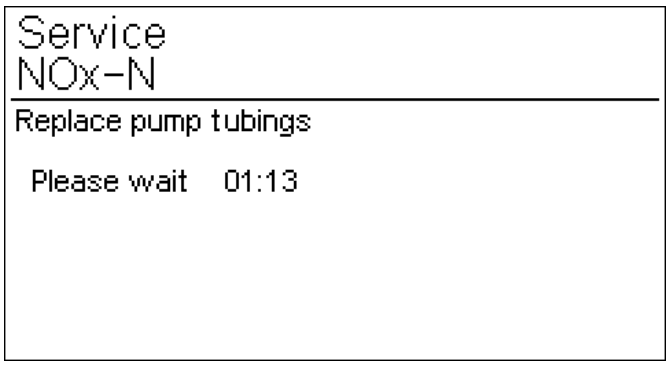


Caution
After step 5, you can no longer quit the procedure!

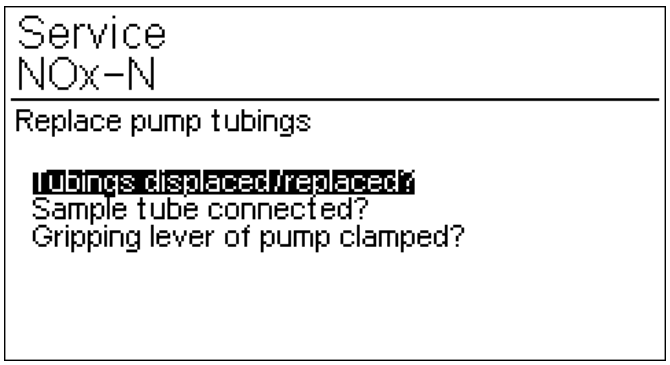
5	Select the *Replace pump tubings* service with ⏬ ⏫ and confirm with ↵. The 1st part of the checklist appears on the display.



6	Pull the sample tubing out of the overflow vessel and close the connector.
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.

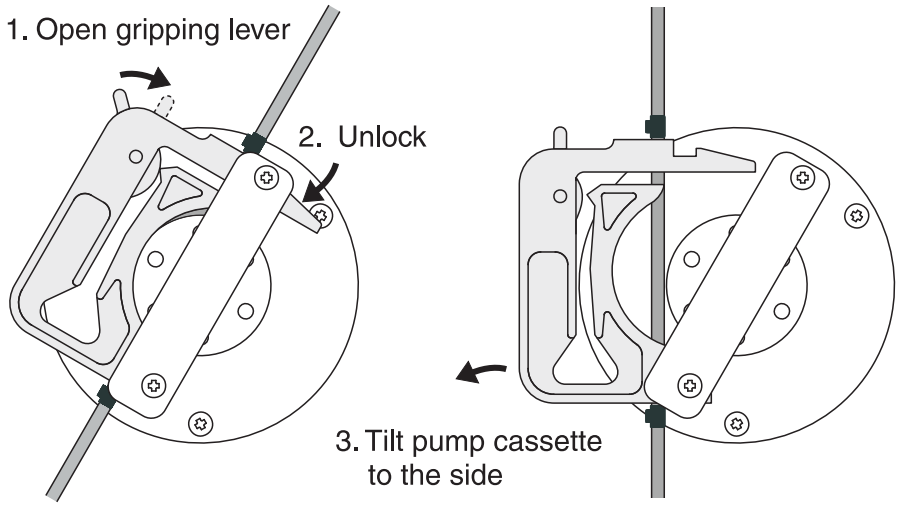


9	After expiry of the 1st part of the routine: The 2nd part of the checklist appears on the display. During the following activities, the TresCon NOx-N remains in the Wait mode.

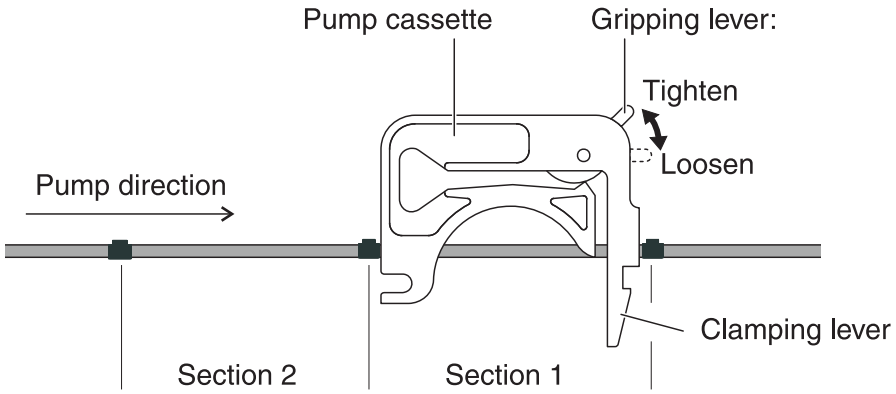


10	Swing out the pump cassette. To do so, open the gripping lever. Subsequently, unlock the pump cassette by pressing on the gripping lever and at the same time swing out the pump cassette.

Standard/sample pump tubing:
blue/blue/blue



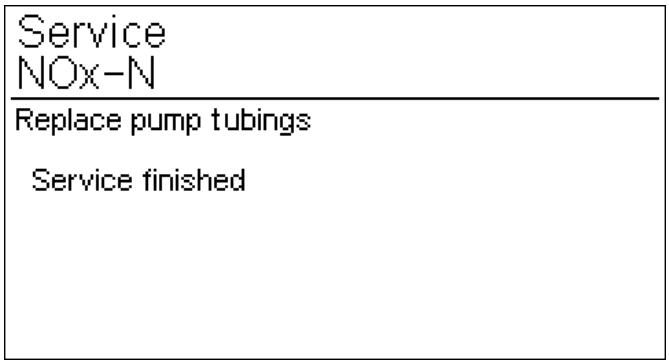
11	Replace the pump tubings. Insert a new pump tube in the pump cassette so that the second section is on the suction side.



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 performing 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 NOx-N begins with AutoCal as soon as a new measurement starts.

3.6.2 Displacing the pump tubings

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

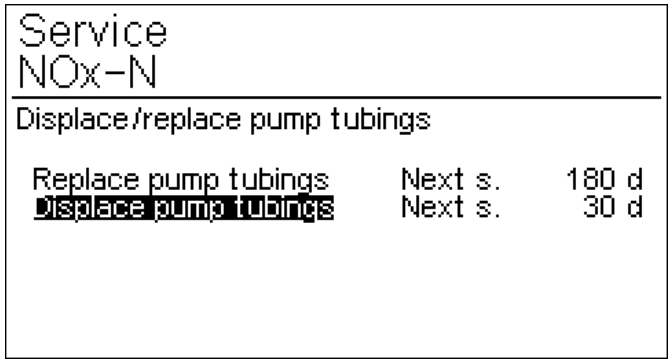
Caution
Only trained personnel is allowed to work on the analyzing section.

Effects

Displacing the pump tubings	Reset the *Displace pump tubings* timer

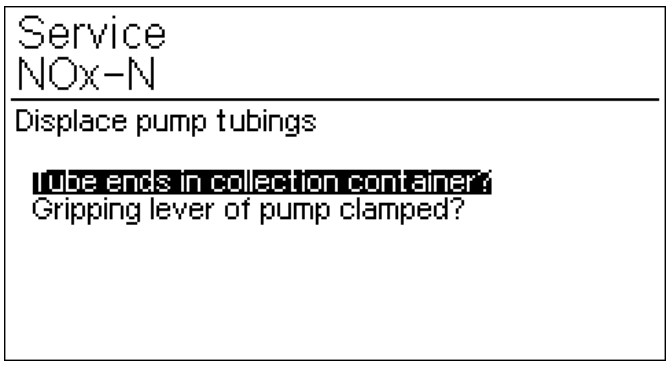
Displacing the pump tubings

1	**Measuring mode** Select the NOx-N measuring module with ▼▲.
2	Call up the *Parameters NOx-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 ↵.

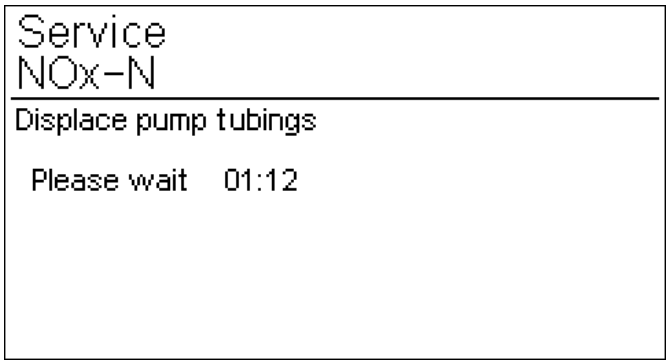


Caution
After step 5, you can no longer quit the procedure!

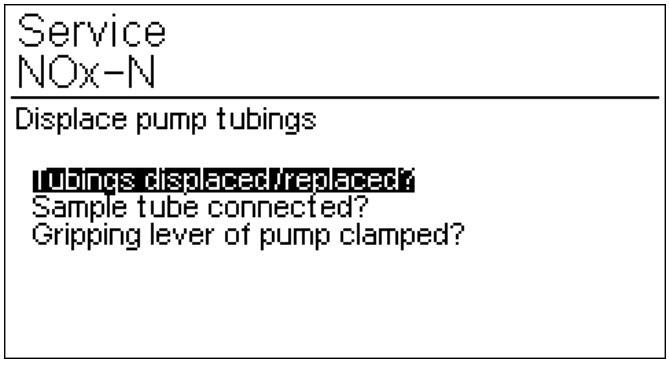
5	Select the *Displace pump tubings* service with ▼▲ and confirm with ↵. The 1st part of the checklist appears on the display.



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.

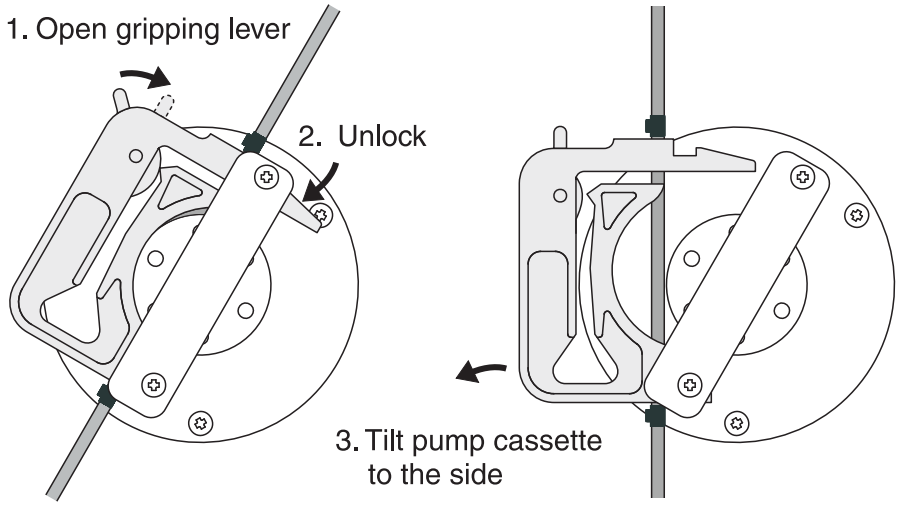


9	After expiry of the 1st part of the routine: The 2nd part of the checklist appears on the display. During the following activities, the TresCon NOx-N remains in the Wait mode.

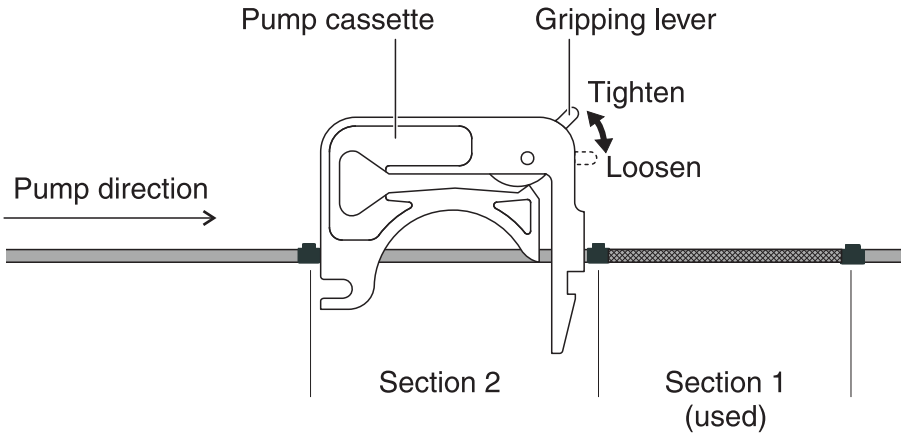


10	Swing out the pump cassette. To do so, open the gripping lever. Subsequently, unlock the pump cassette by pressing on the gripping lever and at the same time swing out the pump cassette.

Standard/sample pump tubing:
blue/blue/blue

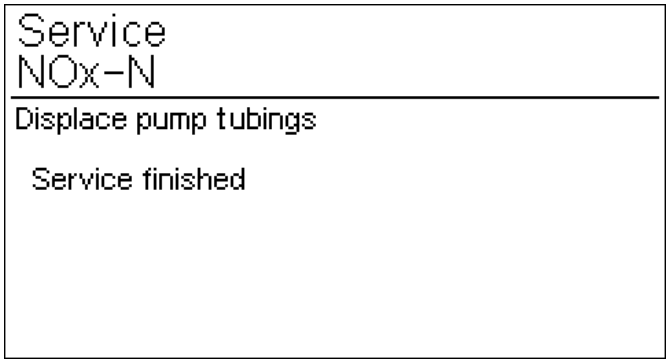


11	Displace the pump tubing. Insert the pump tube in the pump cassette so that the first (used) section is on the pressure side.



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 performing these tasks, confirm each of the prompts of 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 NOx-N begins with AutoCal as soon as a new measurement starts.

3.7 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
- 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/ N211) 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 6.1 ACCESSORIES AND MATERIAL SUBJECT TO WEAR.

When it is replaced depends on the sample preparation. The TresCon has adjustable timers that indicate the maintenance activities required when the relevant service intervals expire.



Cleaning solution 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 trained personnel is allowed to work on the analyzing section.
Always follow the warning instructions on the chemical containers and the safety datasheets!
Always use protective 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.

Part 1
Emptying the system

Step	Instrument status/action
1	Flush back sample
	Replace tubing system. During this operation, the TresCon NOx-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

2	Rinse sample

Duration

- Part 1: approx. 1½ minutes
- Part 2: approx. 1½ 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.



Caution
The pumps empty the system via the suction tubes. If the containers with the consumables are not removed, the distilled water can become unusable! You cannot quit the procedure.



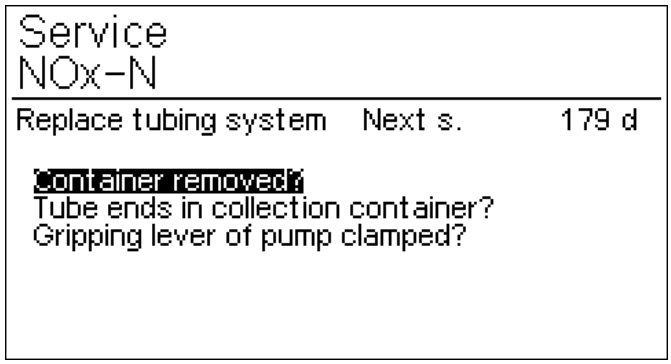
Caution
After step 9 of the following instructions, you can no longer quit the procedure!

Preparation

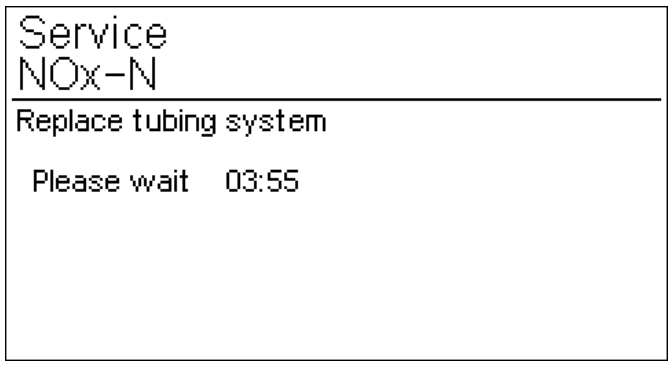
1	Pull the sample tubing out of the overflow vessel.
2	Unscrew all tubings from the consumable containers.
3	Place a suitable collecting container (recommended volume 0.5 l) on the tray of reagents.
4	Insert all ends of the tubes into the collecting container.

Replacing the tubing system

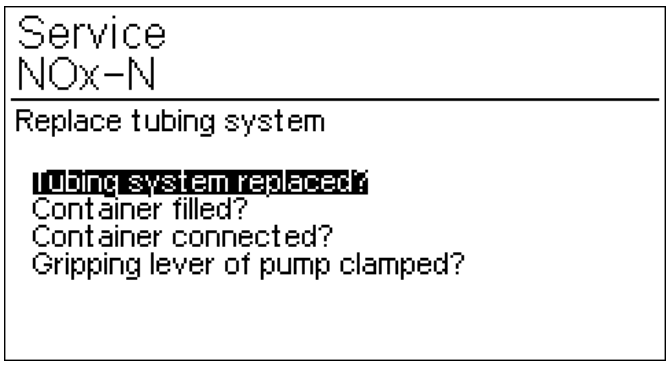
5	**Measuring mode** Select the NOx-N analyzer module with ⏬ ⏫.
6	Call up the *Parameter NOx-N* menu with ↵. The main menu appears on the display.
7	Select the *Service* menu item with ⏬ ⏫ and confirm with ↵. The service menu appears.
8	Select the *Replace tubing system* menu item with ⏬ ⏫ and confirm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



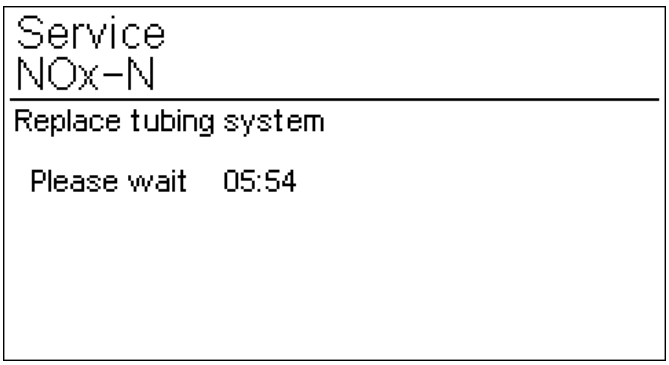
9	Confirm each of the requests of the 1st part of the checklist with ↵ after checking them. After the last confirmation, the procedure begins immediately. The duration appears on the display.



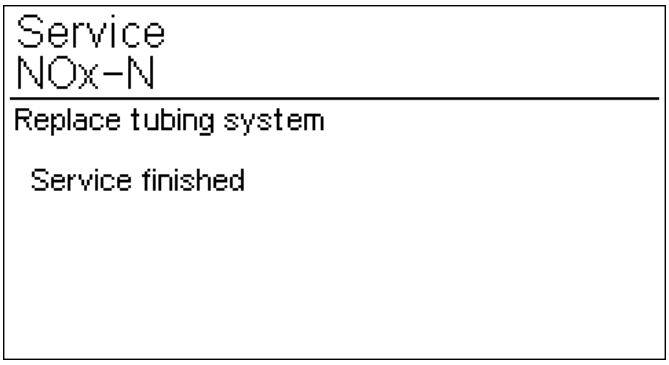
10	After completion of the 1st part of the routine, the 2nd part of the checklist appears on the display.



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 tube coil at the inlet of the photometer block. For details refer to the end of this section on page 3-29. – 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.



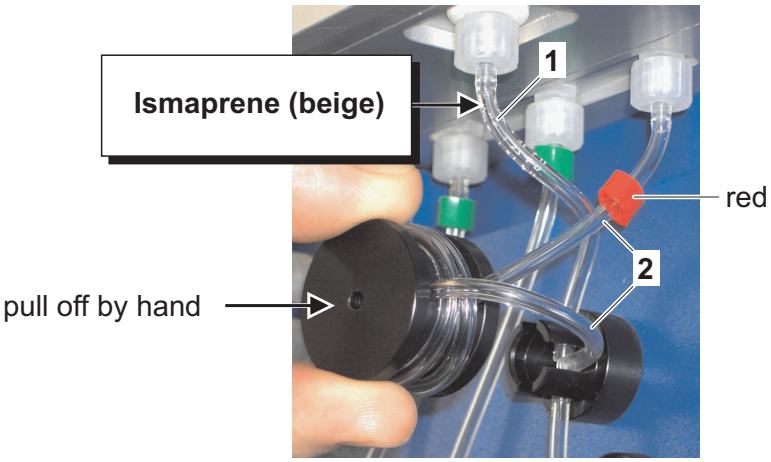
14	Return to the service menu with ↵.

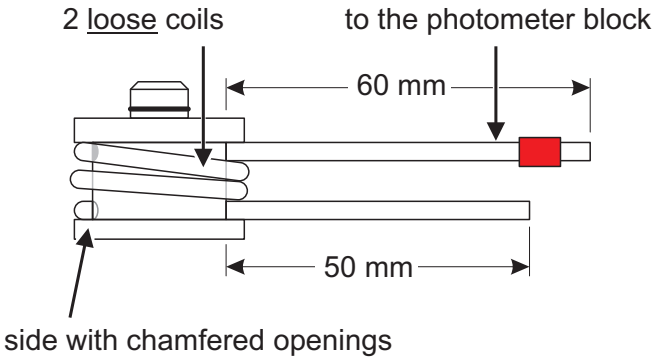
Note
An AutoCal is triggered when the subsequent measuring procedure starts. You cannot quit the procedure.

Tubing at the inlet of the photometer block

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

- Wind the tubings around the coil 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	Ismaprene (beige)	1.52 mm	70 mm
2	Tygon (transparent)	1.52 mm	330 mm

3.8 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 message is output on the display, e.g. „Replace pump tubings“. In this menu you can view and change the service intervals.

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.

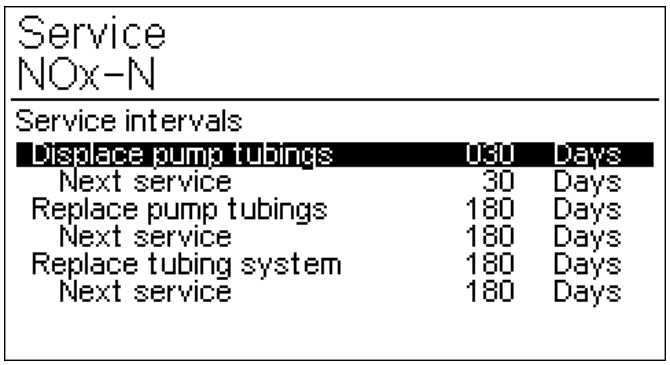
Service intervals

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.

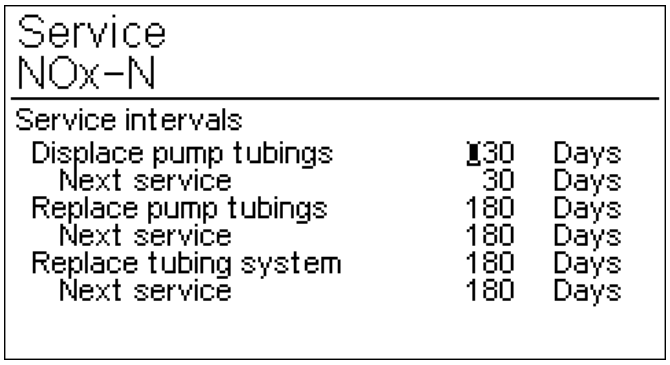
	Displacing the pump tubings	**Replacing the pump tubings**	**Replacing the tubing system**
Value range	1 ... 999 d	1 ... 999 d	1 ... 999 d
Basic setting	30 d	180 d	180 d
Operating with the PurCon	30 d	180 d	180 d
Operating without the PurCon	30 d	180 d	90 d

Changing the service intervals

1	**Measuring mode** Select the NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-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 *Service intervals* menu item with ⏬ ⏫ and confirm with ↵.



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



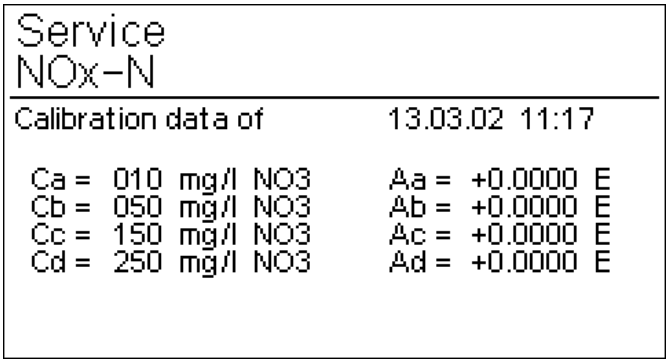
6	Input the values required, digit-by-digit if necessary, with ⏬ ⏫. Change the digit with ⏪ ⏩.
7	Confirm the inputs with ↵. If necessary, repeat steps 6 and 7 for any other parameters.
8	Leave the menu with ⏏. The request *Store* appears.
9	Select *Yes* or *No* with ⏬ ⏫ and confirm with ↵.

3.9 Viewing calibration data of the multi-point calibration

You can view the calibration data of the last multi-point calibration under this menu item.

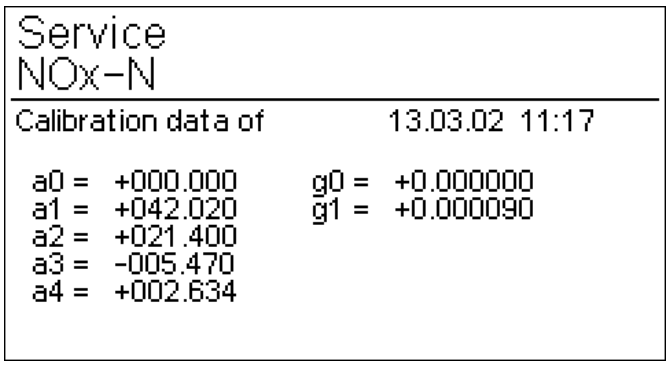
Displaying calibration data

1	**Measuring mode** Select the NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-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 *View calibration data* menu item with ⏬ ⏫ and confirm with ↵. The first page of the calibration data appears.



Note
The absorbance values of 0.0000 E shown here only serve as wild cards and are of no significance.

5	Change to the display of the second page of calibration data with ↵.



6 | Leave the menu with .

Calibration parameters

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

Parameter	Meaning
Ca	Concentration of standard A
Ea	Absorption of standard A
Cb	Concentration of standard B
Eb	Absorption of standard B
Cc	Concentration of standard C
Ec	Absorption of standard C
Cd	Concentration of standard D
Ed	Absorption of standard D
a0 ... a4	Polynomial parameter
g0, g1	Calibration parameters

3.10 Triggering a multi-point calibration

The TresCon NOx-N performs a zero-point calibration at regular intervals (see section 2.5 DISPLAYING/CHANGING THE AUTOCAL PARAMETERS on page 2-8). In addition, you can perform a multi-point calibration with 4 calibration standards. To do so, you have to connect the respective standards to the dist. H2O supply after being prompted.

During calibration, the consumables are pumped back out of the system via the sample tube.



Caution
Only perform this service using the recommended WTW standards! We recommend that you only allow the manual calibration to be performed by the WTW service department (maintenance contract).

Program operating sequence

Step	Instrument status/action
1	Rinsing cleaning solution
2	Flushing back sample
3	Rinsing cleaning solution
4	Rinsing dist. H2O
5	Rinse sample
6	Rinsing dist. H2O
7	Flushing back sample
8	Rinsing dist. H2O
9	Measuring the absorbance of dist. H2O

The following steps are performed for each calibration standard: Follow the instructions on the display when changing the standard solutions.

10	Rinsing standard X
11	Flushing back sample
12	Rinsing standard X
13	Measurement Ex

Preparing the calibration

To calibrate, you need the following four calibration standards (for ordering information, see section 6.1 ACCESSORIES AND MATERIAL SUBJECT TO WEAR):

Ca	10 mg/l $NO3^-$
Cb	50 mg/l $NO3^-$
Cc	150 mg/l $NO3^-$
Cd	250 mg/l $NO3^-$

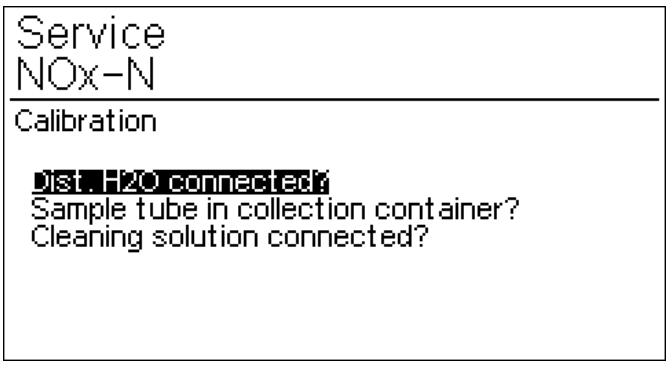


Cleaning solution causes severe corrosion
Do not allow this substance to get into the hands of children. Wear suitable protective gloves and goggles/face mask when working with this substance.
If this substance gets into the eyes, rinse thoroughly with water and consult a doctor.

1	Check that the dist. H2O is connected and, if necessary, connect it. Only use distilled water free of contamination (e.g. softeners).
2	Pull the sample tubing out of the overflow vessel.
3	Insert the open end of the tube into a collecting container.

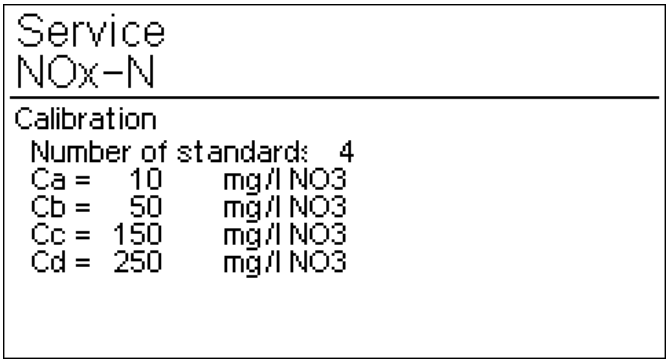
Starting calibration

1	**Measuring mode** Select the NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-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 *Calibration* menu item with ⏬ ⏫ and confirm with ↵.
5	Input the PIN digit-by-digit with ⏬ ⏫. Change the digit with ⏪ ⏩ and confirm with ↵. A checklist appears on the display.

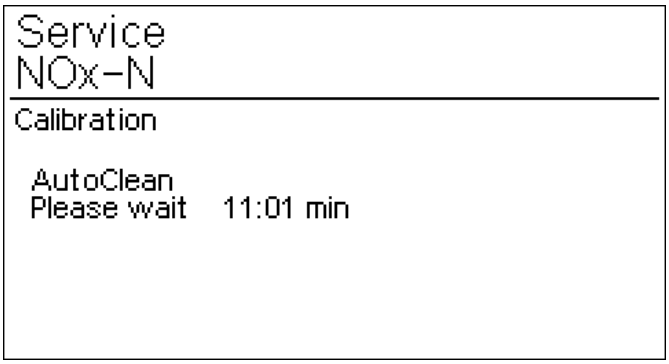


Caution
After step 8, you can no longer cancel the procedure.

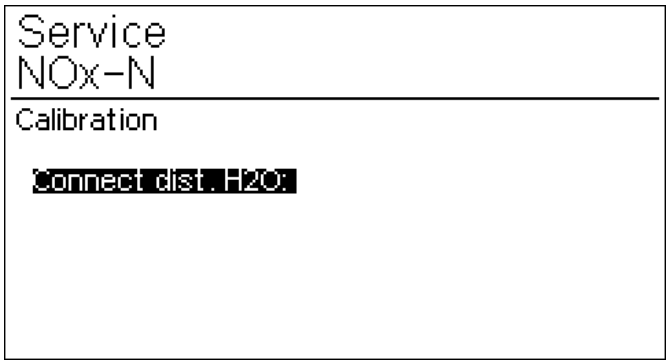
6	Confirm the requests of the checklist with ↵ after checking them. After the last confirmation, the required calibration standards are displayed.



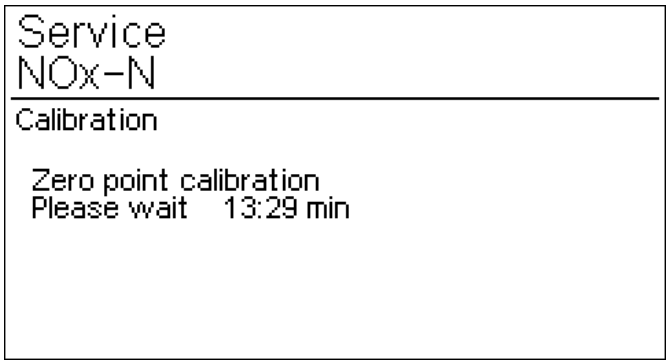
7	Confirm with ↵. The calibration starts with the first step (*AutoClean*).



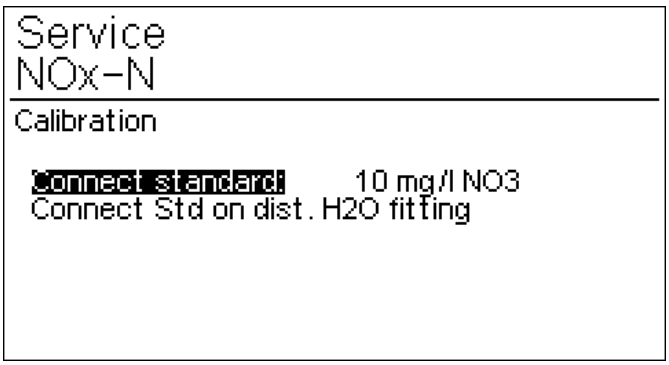
8	After the waiting time has expired, the following prompt appears on the display:



9	Confirm with ↵ when dist. H2O has been connected to the connection for dist. H2O (red). The zero-point measurement is performed. The remaining time appears on the display.

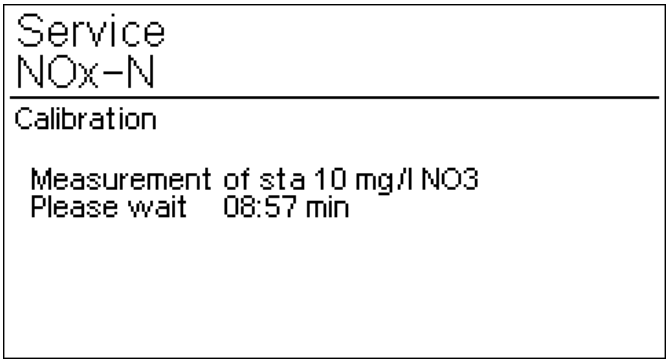


10	After the waiting time has expired, the following prompt appears on the display:

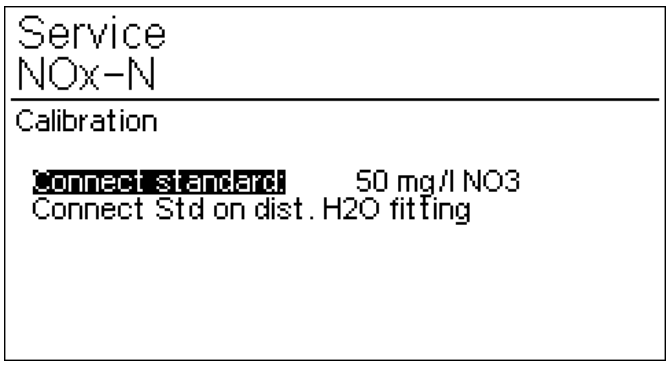


Caution
Standards must not be contaminated! A lid (orange) with suction tubing is included within the scope of delivery of the calibration standards. Use this lid for connecting the calibration standard. The suction tubing must be rinsed with the standard to be used beforehand.

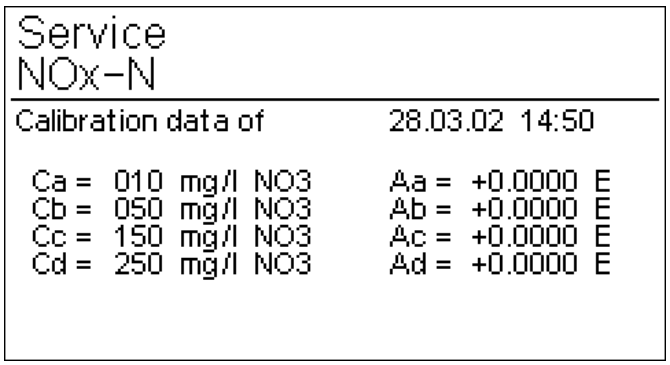
11	Pour a small amount of the first standard into a beaker.
12	Completely submerse the suction tube of the (orange) lid in the beaker.
13	Screw the lid onto the first calibration standard.
14	Connect the standard with the specified concentration of $NO3^-$ to the connection for dist. H2O (red) and confirm with ↵. The measurement is performed. The remaining time appears on the display.



15	After the waiting time has expired, the prompt for the next standard appears on the display:

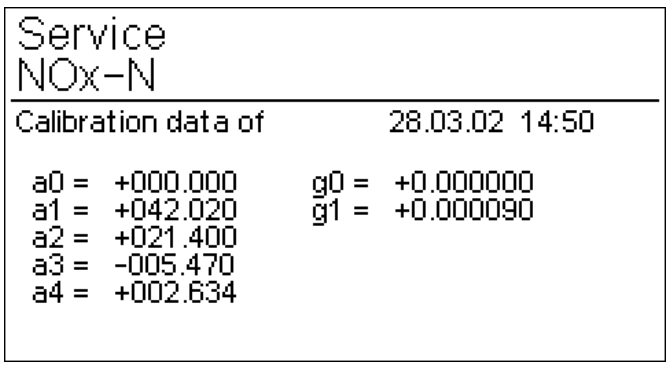


16	Repeat steps 13 to 17 for all other standards. After the last standard was measured, the result of the calibration (first page) appears on the display.



Note
The absorbance values of 0.0000 E shown here only serve as wild cards and are of no significance.

17	Change to the second page of calibration data with ↵.



18	Unscrew the lid (orange) with the suction tube from the last calibration standard.
19	Thoroughly rinse the suction tube with distilled water.
20	Connect the sample tubing to the overflow vessel again.
21	Connect dist. H2O to the connection of dist. H2O (red) again. Only use distilled water free of contamination (e.g. softeners).
22	Return to the service menu with ↵.



Note
The meaning of the calibration data is described in section 3.9 VIEWING CALIBRATION DATA OF THE MULTI-POINT CALIBRATION on page 3-33.



Note
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. Repeat calibration using the correct standards or quit the menu with ↵ to continue measuring with the last valid calibration.

3.11 Switching Auto Flow on/off

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

- 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 dist. H2O".

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:

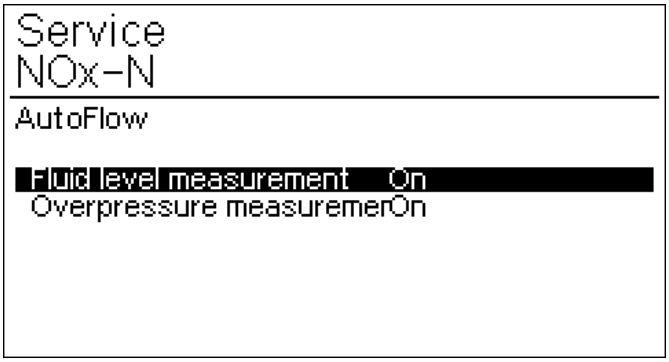
Parameter	Values	Messages
Fluid level measurement	On, Off	Replenish dist. H2O Dist. H2O blocked Dist . H2O empty Replenish cleaning solution Cleaning solution blocked Cleaning solution empty No sample Test sample blocked
Overpressure measurement	Off, On	Outlet clogged



Note
Further information on how the pressure sensors function is given in the appendix, section 6.2 PRESSURE SENSORS AND MESSAGES on page 6-2.

Changing the AutoFlow parameter

1	**Measuring mode** Select the NOx-N measuring module with ⏬ ⏫.
2	Call up the *Parameters NOx-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 the stop mode.

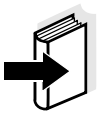


7	Select the parameters to be changed with ⏬ ⏫ and confirm with ↵.
8	Input the required status with ⏬ ⏫.
9	Confirm the input with ↵ and, if necessary, repeat steps 6 and 7 for any other parameters.
10	Leave the menu with ↩. The request *Store* appears.
11	Select *Yes* or *No* with ⏬ ⏫ and confirm with ↵.

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

When 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.

Dist. H2O clogged

Cause	Action
Dist. H2O 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.

Dist. H2O empty

Cause	Action
No more dist. H2O in the container.	Replace the container with a full one. Start the *Replenish H2O dist* 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 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.

Sample missing

Cause	Action
Sample flow is interrupted, TresCon NOx-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).	Trigger AutoClean (AutoCal automatically follows after this), replace pump tubings.
Contaminated dist. H2O	Replace dist. H2O. Thoroughly rinse the container with dist. H2O.
Highly ferrous test sample (e.g. sample taken in the vicinity of a phosphate precipitation)	Use other cleaning solution. Especially for highly ferrous test samples, WTW offers the C/N 211/Fe cleaning solution (see section 6.1 ACCESSORIES AND MATERIAL SUBJECT TO WEAR). A container lid with intake tube for the cleaning solution can be obtained from WTW on request.

Lamp defective

Cause	Action
The lamp in the measuring device is defective.	Contact the WTW service department.

Thermoblock defective

Cause	Action
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 ↵; contact the WTW service department in order to measure.

Write error: Use factory setting

Cause	Action
An error occurred when writing parameter data.	Confirm the prompt with ↵; contact the WTW service department in order to measure.

4.2 Messages

A text appears on the display although the measuring mode is not, however, quit. Example: *Replenish dist. H2O*. You can perform the relevant action later.

Fill dist. H2O

Cause	Action
Fluid level in the container has fallen below 4 cm.	Replace the container with a full one. Start the *Replenish dist. H2O* 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 (see chapter 3 MAINTENANCE, from page 3-1).

4.3 Service messages

The maintenance activities must be performed in rotation. If a service interval has expired, a text appears on the display.

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

Instrument check

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



Note
The instructions disappear and the internal timers are reset when the corresponding maintenance steps have been performed (see chapter 3 MAINTENANCE, from page 3-1).
An instrument check can only be performed by the WTW service department.

5 Technical data

Measurement

Measuring principle	4-wavelength photometric process	
Measuring method	Individual absorption of nitrate/nitrite	
Measuring ranges	mg/l	µmol/l
NOx-N	0.1 - 60.0	0 - 4000
NOx	0.1 - 250	0 - 4000
Resolution	Resolution	Range
mg/l NOx-N	0.1 mg/l	0.1 ... 60.0 mg/l
Resolution	Resolution	Range
mg/l NOx	0.1 mg/l	0.1 ... 99.9 mg/l
	1 mg/l	100 ... 250 mg/l
Resolution	Resolution	Range
µmol/l NOx-N / NOx	1 µmol/l	0 ... 4000 µmol/l
Measuring accuracy	Absolute error ± 2 % of measured value ± 0.4 mg/l NOx-N	
	Process variation coefficient 2 %	
Response time	Approx. 30 seconds (after a change in concentration at the input)	
Measuring interval	Selectable: Continuous, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min	

Note
All specifications of the measuring accuracy refer to the use of suitable standard solutions.

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

Calibration (AutoCal)

Type of calibration	Automatic zero-point balancing Fixed factory calibration
Calibration interval	Selectable: 1, 2, 3, 6, 12 and 24 hours
Reference time	Selectable in 30 min intervals

Test sample requirements

Quantity	Approx. 0.5 l/h
Solid component	< 50 mg/l

Environmental conditions

Operation temp.	0 ... + 40 °C
Storage temperature	- 25 °C ... + 60 °C

Consumption

10 l dist. H2O	every 120 calibrations
Cleaning solution	1.5 l cleaning solution for 120 cleanings

Maintenance interval

1/2 yearly

End of range for relays and alarms

Measuring range	End of range
0.1 - 60.0 mg/l NOx-N	120 mg/l
0.1 - 250 mg/l NOx	500 mg/l
0 - 4000 µmol/l NOx-N	8000 µmol/l
0 - 4000 µmol/l NOx	8000 µmol/l

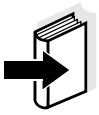
Recorder end 20mA

Measuring range	Recorder end
0.1 - 60.0 mg/l NOx-N	120 mg/l
0.1 - 250 mg/l NOx	500 mg/l
0 - 4000 µmol/l NOx-N	8000 µmol/l
0 - 4000 µmol/l NOx	8000 µmol/l

6 Appendix

6.1 Accessories and material subject to wear

Description	Model	Order no.
1 set of standards, NO3-N (4 x 1.5 l)	SSet/ N211	821 113
10 l standard A-l (Zero standard of dist. H2O)	S/ Al - N211	821 112
1.5 l cleaning solution	C/ N211	821 163
1.5 l cleaning solution (consult WTW service personnel before ordering)	C/TCM1	821 156
1.5 l cleaning solution (consult WTW service personnel before ordering)	C/N 211/Fe	821 165
Set of replacement tubings	Wpack/ N211	821 199
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 NH4-N).

6.2 Pressure sensors and messages

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

Dist. H2O

Display on the screen	Type of error	Pressure sensor
Fill dist. H2O	Dist. H2O must be replenished	P1 -60 cm < h1 < 4 cm
Dist. H2O clogged	Dist. H2O clogged	P1 h1 < -60 cm
Dist. H2O empty	Dist. H2O 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 > 150 mbar

6.3 RS commands

The RS commands for the TresCon NOx-N all begin with TX where X is the internal number of the measuring 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>
-----------------------------------------------
NOx-N  Module 1            : Start AutoCal
22.04.03             15:21:49
-----------------------------------------------
TresCon>
```

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

Instrument response:

```
TresCon>
-----------------------------------------------
NOx-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 The data of the last zero point calibration (AutoCal) is read.

Instrument response:

```
------------------------------------------------------------
Calibration data
NOx-N                Module 1
22.04.03             15:26:24
------------------------------------------------------------
Calibration data of  22.04.03  15:25:56
E1H2O:   1.66 mE
E2H2O:   -74.33 mE
------------------------------------------------------------
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.

TXRPOLYNOM The data of the last multi-point calibration is read.

Instrument response:

```
------------------------------------------------------------
Calibration data
NOx-N                Module 1
22.04.03             15:28:56
------------------------------------------------------------
Calibration data of  05.07.02  11:08:36
Standard A   : 10.0 mg/l NO3
Standard B   : 50.0 mg/l NO3
Standard C   : 150.0 mg/l NO3
Standard D   : 250.0 mg/l NO3
E1A:   232.50 mE    E2A:     1.85 mE
E1B:   907.80 mE    E2B:     5.74 mE
E1C:  1930.30 mE    E2C:    14.42 mE
E1D:  2446.80 mE    E2D:    22.20 mE
a0:  -0.00002
a1:  36.83043
a2:  30.13768
a3: -16.74767
a4:   6.27163
g0:   0.00081
g1:   0.00009

h: 1.200
------------------------------------------------------------
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:

```
------------------------------------------
NOx-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
------------------------------------------
1.22  mg/l NOx-N
------------------------------------------
TresCon>
```

TXRGPAR Read the instrument parameters.

Instrument response:

```
------------------------------------------------------------
Selected parameters
NOx-N                Module 1
22.04.03             15:32:42
------------------------------------------------------------
Display              : NOx mg/l
                   AutoCal time        : 07:00 h
AutoCal interval     : 24 h
AutoClean time       : 07:00 h
AutoClean interval   : 24 h
Measuring interval         : Continuous
Manual correction    : Off
Attenuation          : 2
AutoFlow
 Fluid level measurement    : On
 Overpressure measurement     : On
Dilution:            : None
------------------------------------------------------------
TresCon>
```

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

Instrument response:

```
-------------------------------------------
NOx-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:

```
-------------------------------------------
NOx-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:

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

6.4 Instrument activities

State/action	V1	V2	Pump
Rinse sample	0	X	SR
Flushing back sample	0	X	SL
Feed sample	0	X	LR
Measuring mode	X	X	0
Rinsing dist. H2O	1	0	SR
Feeding H2O dest	1	0	LR
Flush back dist. H2O	1	0	SL
Rinsing cleaning solution	1	1	SR
Flushing back cleaning solution	1	1	SL
Regulating the sample temperature	X	X	0

0	Current-free path active
1	Current-carrying path active
X	No function
SR	Quickly to the right (80 rpm)
SL	Quickly to the left (80 rpm)
LR	Slowly to the right (32 rpm)
LL	Slowly to the left (32 rpm)

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