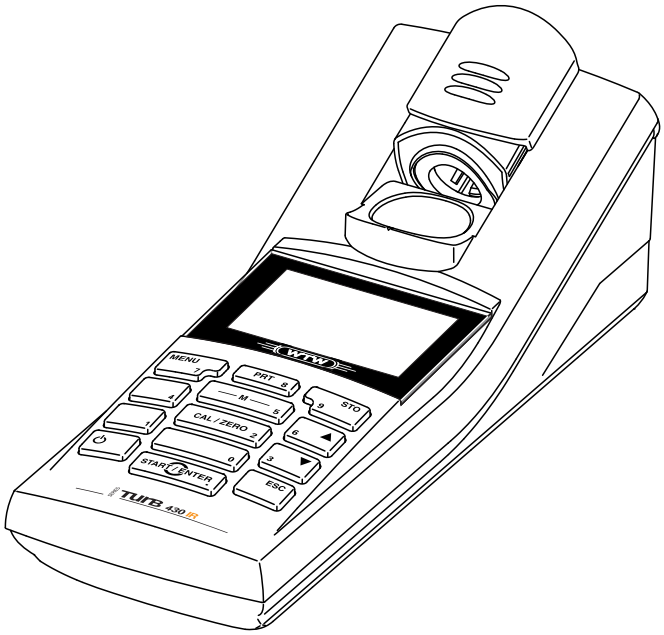
OPERATING MANUAL

ba75507e08 11/2020



Turb 430 IR/T

HANDHELD TURBIDIMETER

WTW

a xylem brand

Contents

1 Overview

1.1 General features

The compact Turb 430 IR/T handheld precision turbidimeter enables you to carry out turbidity measurements quickly and reliably.

The Turb 430 IR/T turbidimeter provides the maximum degree of operating comfort, reliability and measuring certainty for all applications.

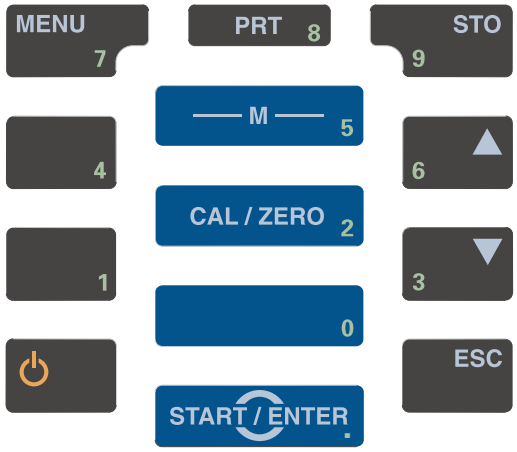
1 Keypad
2 Display
3 Cell shaft
4 Connectors

If you need further information or application notes, you can obtain the following material from WTW:

- Application reports
- Primers
- Safety datasheets.

Information on available literature is given in the WTW catalog or on the Internet at www.WTW.com.

1.2 Keypad



Key functions

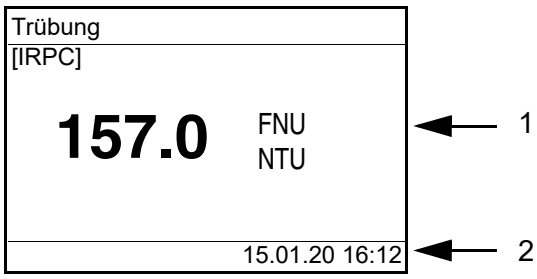
	Switch to the measured value display **<M>**
	Start calibration **<CAL/ZERO>**
	Open menus / confirm entries / start measurement **<START/ENTER>**
	Call up the *Configuration* menu (all settings are made here) **<MENU>**
	Switch the meter on or off **<ON/OFF>**
	Output the display contents to the RS232 interface (e.g. print) **<PRT>**
	Open the *Store* menu: **<STO>** Quick storing: 2 x **<STO>**
	Highlight menu items or selection; Set values **<▲ >, <▼ >**
	Switch to the next higher menu level / cancel input **<ESC>**

Entering numerals with the number keys (see ENTERING NUMERALS WITH THE NUMBER KEYS, page 20).

1.3 Display

The graphic display shows all information of the current measurement in the measured value display. The illumination enables to read the display even in the dark.

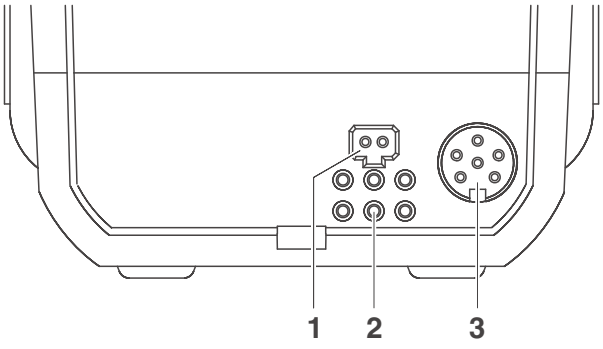
Example



1 Measured value (with unit)

2 Program and citation form
Diameter of the cell and measuring range
Status line with date and time

1.4 Socket field



1 Power pack

2 Contact for operation with the LabStation

3 RS232 (serial) interface

1.5 LabStation (optional)

With the LabStation, which is available as an accessory, you can conveniently use the Turb 430 IR/T in the laboratory.
Laboratory operation with the LabStation enables the following additional functions:

- Line power operation is possible to save the batteries or battery pack
- The battery pack in the Turb 430 IR/T is automatically charged as soon as the meter is placed in the LabStation.

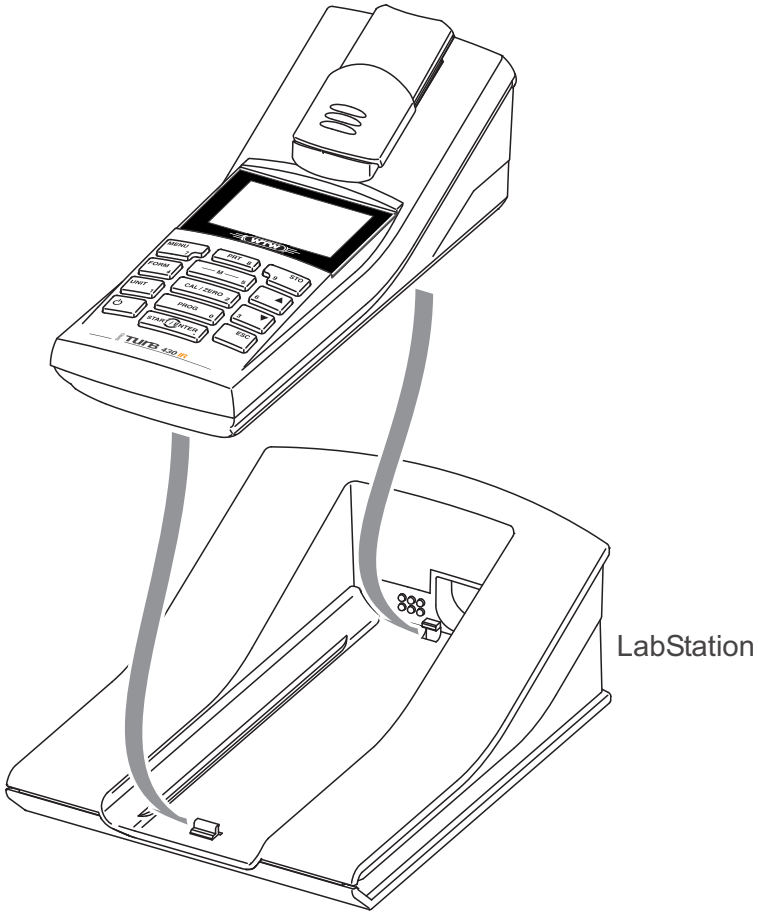


figure 1-1 LabStation

2 Safety

2.1 Safety information

2.1.1 Safety information in the operating manual

This operating manual provides important information on the safe operation of the meter. Read this operating manual thoroughly and make yourself familiar with the meter before putting it into operation or working with it. The operating manual must be kept in the vicinity of the meter so you can always find the information you need.

Important safety instructions are highlighted in this operating manual. They are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "CAUTION") indicates the level of danger:

WARNING
indicates a possibly dangerous situation that can lead to serious (irreversible) injury or death if the safety instruction is not followed.

CAUTION
indicates a possibly dangerous situation that can lead to slight (reversible) injury if the safety instruction is not followed.

NOTE
indicates a possibly dangerous situation where goods might be damaged if the actions mentioned are not taken.

2.1.2 Safety signs on the meter

Note all labels, information signs and safety symbols on the meter and in the battery compartment. A warning symbol (triangle) without text refers to safety information in this operating manual.

2.1.3 Further documents providing safety information

The following documents provide additional information, which you should observe for your safety when working with the measuring system:

- Operating manuals of further accessories
- Safety datasheets of calibration or maintenance accessories (such as buffer solutions, electrolyte solutions, etc.)

2.2 Safe operation

CAUTION

Danger of eye damage by visible and invisible LED radiation.
In the cell shaft of the Turb 430 IR there are light emitting diodes (LEDs) of the 1M class.
Do not look at the radiation using optical instruments.
With normal, authorized use there is no hazard.

2.2.1 Authorized use

This meter is authorized exclusively for turbidity measurements in the laboratory.

Only the operation and running of the meter according to the instructions and technical specifications given in this operating manual is authorized (see chapter 7 TECHNICAL DATA).

Any other use is considered unauthorized.

2.2.2 Requirements for safe operation

Note the following points for safe operation:

- The meter may only be operated according to the authorized use specified above.
- The meter may only be supplied with power by the energy sources mentioned in this operating manual.
- The meter may only be operated under the environmental conditions mentioned in this operating manual.
- The meter may only be opened if this is explicitly described in this operating manual (example: Inserting the batteries).

2.2.3 Unauthorized use

The meter must not be put into operation if:

- it is visibly damaged (e.g. after being transported)
- it was stored under adverse conditions for a lengthy period of time (storing conditions, see chapter 7 TECHNICAL DATA).

3 Commissioning

3.1 Scope of delivery

- Handheld turbidimeter Turb 430 IR or Turb 430 T
- 4 batteries 1.5 V type AA (in the battery compartment)
- Option: battery pack and power pack with Euro plug and exchange plugs for USA, UK, and Australia
- Option: LabStation
- 5 empty cells 28 mm with label to mark the cell
- AMCO®-Clear turbidity standard
- Microfiber cloth to clean the meter
- Compact operating manual and short operating manual
- CD-ROM with detailed operating manual

The optional parts of the scope of delivery are available as accessories (see section 8.1).

3.2 Power supply

You can operate the meter either with batteries, battery pack or a power pack. The power pack supplies the meter with low voltage (9 V DC). At the same time, the battery pack is charged. The battery pack is charged even while the meter is switched off.

The *LoBat* display indicator appears when the batteries or battery pack are nearly discharged.

Charging time of the battery pack

approx. 36 hours.

CAUTION

The line voltage at the operating site must lie within the input voltage range of the original power pack (see chapter 7 TECHNICAL DATA).
Use original power packs only (see chapter 7 TECHNICAL DATA).

NOTE

The battery pack should not be completely discharged. If you do not operate the instrument for a longer period of time you should charge the battery pack every six months.

Automatic switch-off function

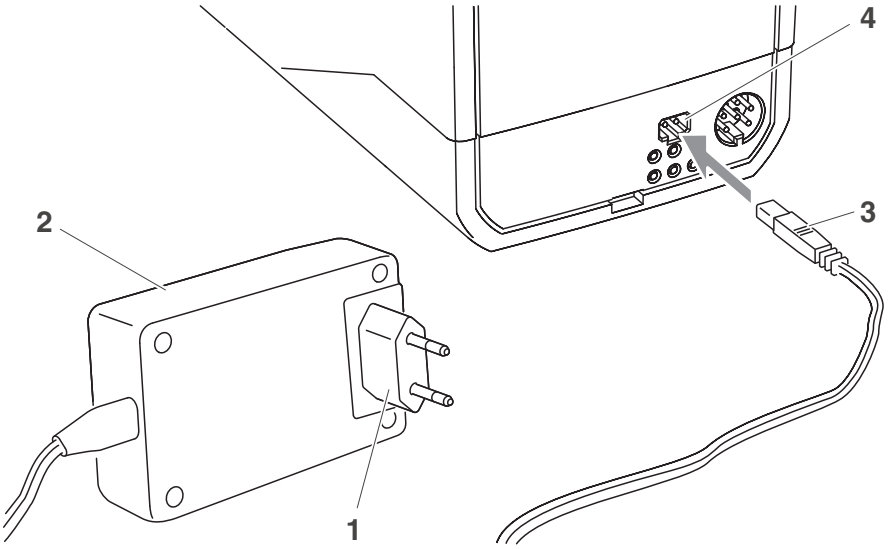
The meter has an automatic switch-off function in order to save the batteries or battery pack (see section 4.4).

Display illumination

During operation with the batteries or battery pack the meter automatically switches off the display illumination if no key is pressed for 30 seconds. The illumination is switched on with the next keystroke again. The display illumination can also be switched off completely (see section 4.4.2).

The power pack and battery pack are available as accessories (see section 8.1).

Connecting the power pack (optional)



1 If necessary, replace the Euro plug (1) on the power pack (2) by the country-specific plug suitable for your country.

2 Connect the plug (3) to the socket (4) of the turbidimeter.

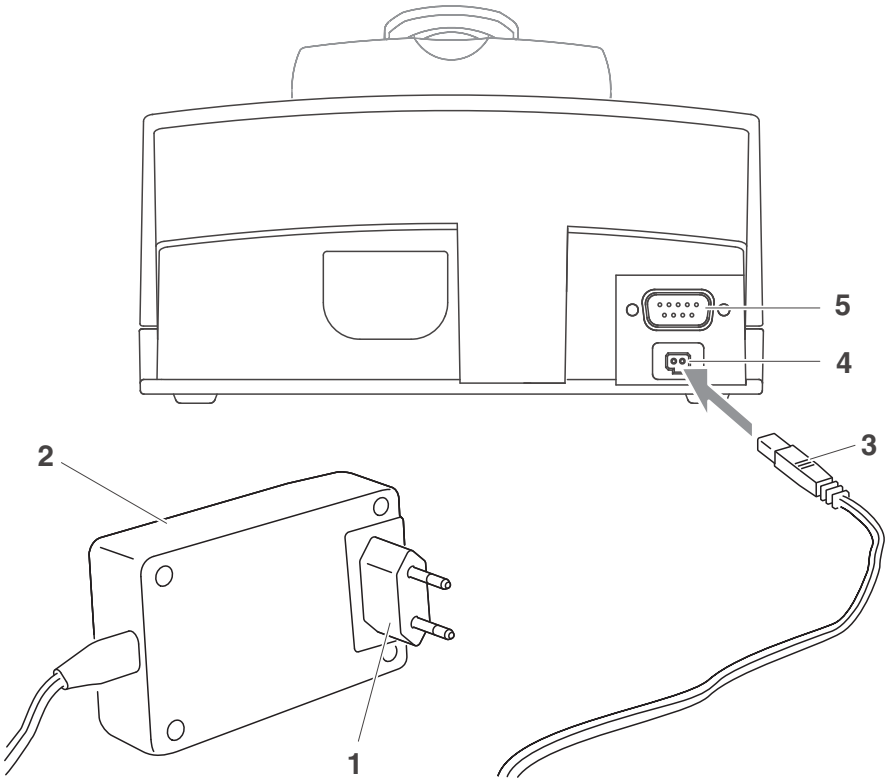
3 Connect the power pack unit to an easily accessible mains socket.

3.3 Connecting the LabStation

The LabStation is available as an accessory (see section 8.1).

In order to use the functions of the LabStation for operation in the laboratory, connect the LabStation and place the Turb 430 IR/T in the LabStation.

Connecting the LabStation (optional)



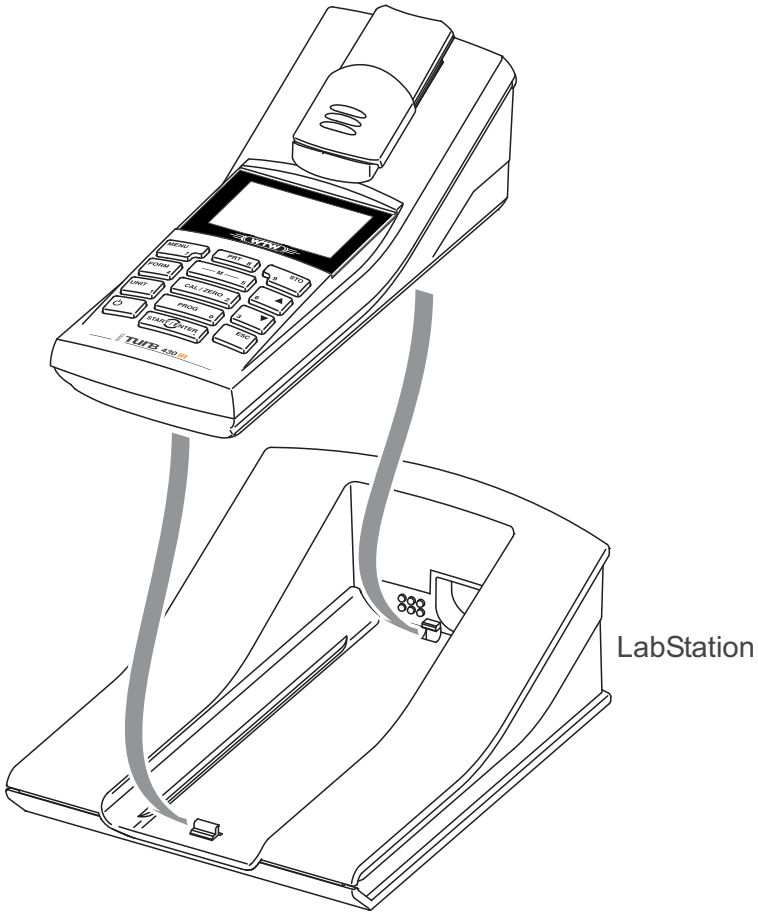
1 If necessary, replace the Euro plug (1) on the power pack (2) by the country-specific plug suitable for your country.

2 Connect the plug (3) to the socket (4) of the LabStation.

3 Connect a PC or printer to the socket (5) of the LabStation as necessary.

4 Connect the power pack unit to an easily accessible mains socket.

5 Place the Turb 430 IR/T in the LabStation.



3.4 Initial commissioning

Perform the following activities:

- For
  - battery operation: Insert the battery pack (see section 5.1.2)
  - line power operation and charging the battery pack: Connect the power pack (see section 3.2)
  - operation with LabStation: connect the LabStation and place the Turb 430 IR/T in the LabStation (see section 3.3)
- Switch on the meter (see section 4.1)
- Set the language as necessary (see section 4.3.3)
- Set the date and time as necessary (see section 4.3.4)

When you set the language, date and time according to the mentioned sections of this operating manual you will quickly become familiar with the simple operation of the Turb 430 IR/T.

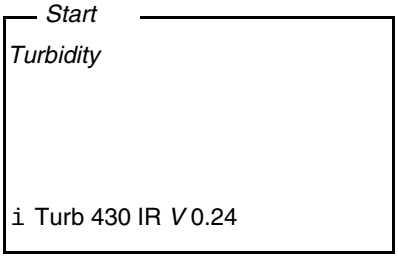
4 Operation

4.1 Switching on the meter

Switching on

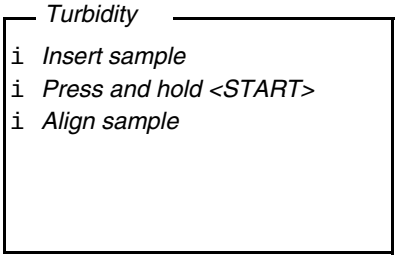
Press the **<ON/OFF>** key.
The *Start* menu appears for 30 seconds.

The status line indicates the meter designation and the version number of the software.



You can access the menu *Start* when the device is switched on by pressing the **<ESC>** key several times, if necessary.

After a few seconds the meter automatically switches to the measuring mode.



Switching off

Press the **<ON/OFF>** key.

Automatic switch-off function

The meter has an automatic switch-off function in order to save the batteries or battery pack (see section 4.4). The automatic switchoff switches off the meter if no key is pressed for an adjustable period.

The automatic switch-off function is not active

- if the power is supplied by the power pack (optional),
- if the power is supplied by the LabStation (optional),
- if the *Timer* function is running.

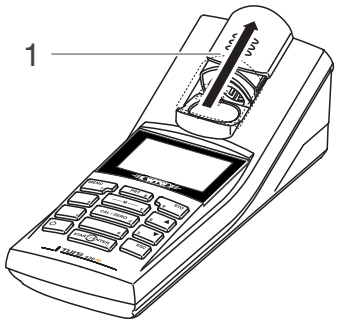
Display illumination with battery-powered operation

During operation with batteries or battery pack the meter automatically switches off the display illumination if no key is pressed for 30 seconds. The illumination is switched on with the next keystroke again.

4.2 Inserting a cell

In order to be able to insert cells into the Turb 430 IR/T, the cell shaft must be prepared for holding a cell.

1 Push the dust cover (1) upward.
The cell shaft for 28 mm cells is open.



Inserting a 28 mm cell

2 Insert the cell until it is positioned on the bottom of the cell shaft.The cell is ready to be measured.

3 Align the cell (see section 4.5.2).

4.3 General operating principles

This section contains basic information on the operation of the Turb 430 IR/T.

Operating elements, display

An overview of the operating elements and the display is given in section 1.2 and section 1.3.

Operating modes, navigation

An overview of the operating modes of the Turb 430 IR/T and the navigation through menus and functions can be found in section 4.3.1 and section 4.3.2.

4.3.1 Operating modes

The instrument has the following operating modes:

- Measurement
  The display indicates measurement data in the measured value display
- Calibration
  The display indicates a calibration procedure with calibration information
- Data transmission
  The meter transmits measuring datasets or calibration records to the serial interface
- Configuration
  The display indicates a menu with further menus, settings and functions

4.3.2 Navigation

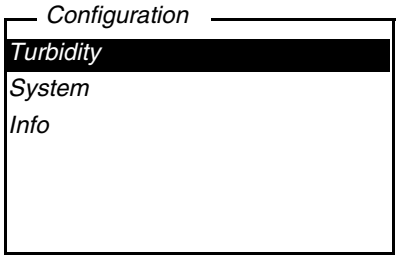
Measured value display

In the measured value display, open the menu with **<MENU>**.

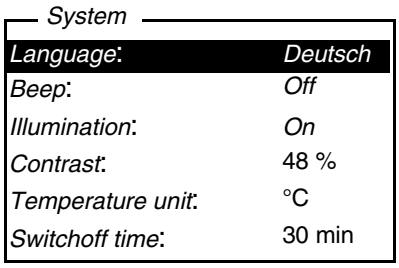
Menus and dialogs

The menus for settings and dialogs in procedures contain further subelements. The selection is done with the keys **<▲ > <▼ >**.
The current selection is displayed inverse.

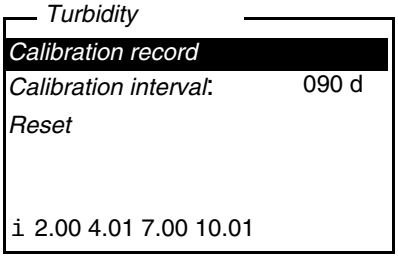
- Menus
  The name of the menu is displayed at the upper edge of the frame. Menus are opened by confirming with **<START/ENTER>**. Example:



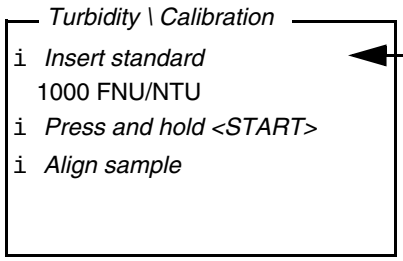
- Settings
  Settings are indicated by a colon. The current setting is displayed on the right-hand side. With **<START/ENTER>**, the selection of the possible settings is opened. Subsequently, the setting can be changed with **<▲ > <▼ >** and **<START/ENTER>**.
  Example:



- Functions
  Functions are designated by the name of the function. They are immediately carried out by confirming with **<START/ENTER>**.
  Example: display the *Calibration record* function
  (in the *Turbidity* menu).



- Messages
  Information or operating instructions are designated by the `i` symbol. They cannot be selected.
  Example:



The `i` indicates info texts, e.g. messages, notes or instructions

The principles of navigation are explained in the two following sections by reference of examples:

- Setting the language (section 4.3.3)
- Setting the date and time (see section 4.3.4).

Entering numerals with the number keys

Keys with additional characters printed on (orange) are assigned doubly. In the input fields you can directly enter digits with the orange number keys (e.g. date and time). Complete entering a number with the key **<START/ENTER>**.

When entering numeric values with decimal separators (e.g. turbidity nominal

values), pressing **<START/ENTER>** for the first time will set the decimal separator. Pressing **<START/ENTER>** for the second time will complete the entering of the numeric value. The numeric value is always displayed with decimal places and, if necessary, rounded.

4.3.3 Navigation example 1: Setting the language

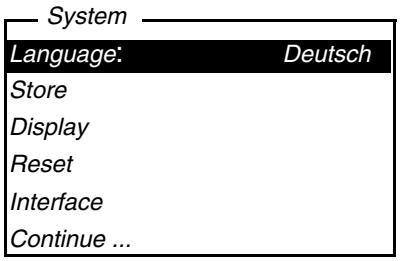
The following example describes in the language of the country how to set the language. On delivery, English is set as the language in the Turb 430 IR/T. During initial commissioning, the language is set in the menu, *Configuration* / *System* / *Language.*

1 In the measured value display:
Open the *Configuration* menu with **<MENU>**.
The instrument is in the configuration mode.

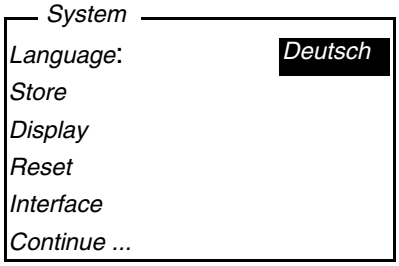
2 Select the *System* menu with **<▲ > <▼ >**.
The current selection is displayed in reverse video.

3 Using **<START/ENTER>**, open the *System* menu.

4 Select the *Language* menu with **<▲ > <▼ >**.
The current selection is displayed in reverse video.



5 Open the setting of the *Language* with **<START/ENTER>**.



6 Select the required language with **<▲ > <▼ >**.

7 Confirm the setting with **<START/ENTER>**.
The setting is active. The menu is displayed in the selected language.

8 To make further settings, switch to the next higher menu level with **<ESC>**.

4.3.4 Example 2 on navigation: Setting the date and time

The meter has a clock with a date function. The date and time are indicated in the status line of the measured value display. When storing measured values and calibrating, the current date and time are automatically stored as well.

Numerals are generally entered via the number keys.

The correct setting of the date and time and date format is important for the following functions and displays:

- Current date and time
- Calibration date
- Identification of stored measured values.

Therefore, check the time at regular intervals.

After a fall of the supply voltage (empty batteries, empty battery pack), the date and time are reset to 01.01.2003 00, 00:00 hours.

Setting the date, time and date format

The date format can be switched from the display of day, month, year (*dd.mm.yy*) to the display of month, day, year (*mm/dd/yy* or *mm.dd.yy*).

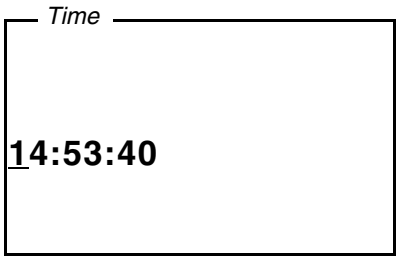
1 In the measured value display:
Open the *Configuration* menu with **<MENU>**.
The instrument is in the configuration mode.

2 Select and confirm the *System* / *Continue ...* / *Date/time* menu with **<▲ >** **<▼ >** and **<START/ENTER>**.

Date/time

Time:	14:53:40
Date:	30.10.03
Date format:	*dd.mm.yy*

3 Select and confirm the *Time* menu with <▲ > <▼ > and **<START/ENTER>**.
A display for the entry of numerals with the number keys opens up.



4 Enter the time using the number keys.
The digit to be changed is displayed underlined.

In the case of wrong entries, you can cancel the procedure with **<ESC>**.
After canceling with **<ESC>**, it is possible to enter all digits once again. The new digits are only taken over by confirming with **<START/ENTER>**.

5 Confirm the setting with **<START/ENTER>**.
The time is set.

6 Set the current *Date* as necessary. The setting is made similarly to that of the time.

7 Change the date format as necessary.

8 To make further settings, switch to the next higher menu level with **<ESC>**.
or
Switch to the measured value display with **<M>** (short pressure).
The instrument is in the measuring mode.

4.3.5 Menu overview

Turbidity	*Calibration record*		
	Calibration interval		
	Reset		
Timer			
System	*Language*	*Deutsch* *English* *Français* *Español*	
	Measured value memory	*Display*	
		RS232 download	
		Data filter	*Filter* *ID* *Date*
		Delete	
		i 4 *of* 1000 *occupied*	
		i *Filter*: *No filter*	
	Display	*Illumination*	*Auto off* *On* *Off*
		Contrast	0 ... 100 %
		Brightness	0 ... 100 %
	Reset		
	Interface	*Baud rate*	1200, 2400, 4800, 9600, 19200
		Output format	*ASCII* *CSV*
	Continue ... / Date/time	*Time*	hh:mm:ss
		Date	
		Date format	*dd.mm.yy* *mm.dd.yy* *mm/dd/yy*

	Continue ... / Switchoff time	10, 20, 30, 40, 50 min, 1, 2, 3, 4, 5, 10, 15, 20, 24 h
	Continue ... / Beep	*On* *Off*
Info		

4.4 System settings (*System* menu)

The following meter characteristics and general functions are in the menu *Configuration* / *System*:

- Language selection (*Language*)
- Memory- and database functions (*Store*)
- Display settings (*Display*)
- Restoring the basic settings (*Reset*)
- Configuring the interface for the PC/printer (*Interface*)
- Setting the date/time (*Date/time*)
- Setting the switch-off time (*Switchoff time*)
- Setting the keyboard sound (*Beep*)

Settings/functions

The settings are in the menu, *Configuration* / *System*.
Move to the *Configuration* menu with the **<MENU>** key.

Menu item	Setting	Explanation
Language	*Deutsch* *English* *Français* *Español*	Select the language (see section 4.3.3)
Store	*Display* *RS232 download* *Data filter* *Delete*	Memory- and database functions (see section 4.6.2)
Display	*Illumination* *Contrast* *Brightness*	Switch on/off the display illumination (see section 4.4.2)

Menu item	Setting	Explanation
Reset	-	Reset the system settings to the delivery condition (see section 4.8.1).
Interface	*Baud rate* *Output format*	Baud rate of the data interface (see section 4.4.3)
Continue ... / *Date/time*	*Time* *Date* *Date format*	Time and date settings (see section 4.3.4)
Continue ... / *Switchoff time*	10, 20, 30, 40, 50 min, 1, 2, 3, 4, 5, 10, 15, 20, 24 h	The automatic switchoff function switches the meter off if no entry is made for a specified period of time (*Switchoff time*). This conserves the batteries or the battery pack.
Continue ... / *Beep*	*On* *Off*	Switches on/off the beep on keystroke

4.4.1 *Measured value memory*

In the *Measured value memory* menu, you find functions to display and edit the stored measurement datasets:

- Show measurement datasets on the display (*Display*)
- Output measurement datasets to the RS232 interface (*RS232 download*)
- Define filter rules for the stored measurement datasets (*Data filter*)
- Erase all stored measurement datasets (*Delete*)
- Information on the number of occupied memory locations

The settings are in the menu, *Configuration* / *System* / *Measured value memory*.
Move to the *Configuration* menu with the **<MENU>** key.

Settings/functions

Menu item	Setting/function	Explanation
Display	-	Displays in pages all measurement datasets that correspond to the filter settings. Further options: ● Scroll through the datasets with <▲ > <▼ >. ● Output the displayed dataset to the interface with **<PRT>**. ● Quit the display with **<ESC>**.
RS232 download	-	Downloads to the interface all measurement datasets that correspond to the filter settings. The download is ordered according to the date and time. The process can take several minutes. To terminate the process prematurely, press **<ESC>**.
Data filter	see section 4.6.2	Allows to set filter criteria in order to display and download datasets to the interface.
Delete	-	Erases the entire contents of the measuring data memory, independent of the filter settings. Note: All calibration data remain stored when this action is performed.

All details on the subjects of memory and stored data are given in section 4.6.2.

4.4.2 *Display*

In the *Configuration* / *System* / *Display* menu, you set the display features:

- Switching on/off the display illumination (*Illumination*)
- Display contrast (*Contrast*)

The settings are in the menu, *Configuration* / *System* / *Display*.

Move to the *Configuration* menu with the **<MENU>** key.

Settings

Menu item	Setting	Explanation
Illumination	*Auto off*	The display illumination switches itself off if no key has been pressed for 30 seconds.
	On *Off*	Switches the display illumination on or off permanently
Contrast	0 ... 100 %	Changes the display contrast
Brightness	0 ... 100 %	Changes the display brightness

4.4.3 *Interface*

In the *Interface* menu, you set the features of the interface.

- Transmission speed (*Baud rate*)
- Output format (*Output format*)

The settings are in the menu, *Configuration* / *System* / *Interface*.
Move to the *Configuration* menu with the **<MENU>** key.

Settings

Menu item	Setting	Explanation
Baud rate	1200, 2400, 4800, 9600, 19200	Baud rate of the data interface
Output format	*ASCII* *CSV*	Output format for data transmission For details, see section 4.7

4.4.4 *Date/time*

In the *Configuration* / *System* / *Continue ...* / *Date/time* menu, you set the system clock:

- Current time (*Time*)
- Current date (*Date*)
- Format of the date display (*Date format*)

The settings are in the menu, *Configuration* / *System* / *Continue ...* / *Date/time*.

Move to the *Configuration* menu with the **<MENU>** key.

Settings

Menu item	Setting	Explanation
Time	hh:mm:ss	Enter the time with the number keys
Date		Enter the date with the number keys
Date format	*dd.mm.yy* *mm.dd.yy* *mm/dd/yy*	Settings of time and date.

4.5 Turbidity

4.5.1 General information

Venting the sample

Air bubbles in the sample affect the measuring result to a massive extent because they have a large scattering effect on the incident light. Larger air bubbles cause sudden changes in the measured values whereas smaller air bubbles are recorded by the instrument as turbidity. Therefore, avoid or remove air bubbles:

Avoiding or removing air bubbles

- During sampling, ensure all movement is kept to a minimum
- If necessary, vent the sample (ultrasonic baths, heating or adding a surface-active substance to reduce the surface tension)

For turbidity values below 1 FNU/NTU, also observe the notes in the appendix (see APPENDIX 2: TURBIDITY VALUES UNDER 1 FNU/NTU).

4.5.2 Aligning and marking a cell

Even completely clean quality cells exhibit tiny directional differences in their light transmittance. Therefore, for accurate and reproducible measurement results, it is necessary to always align both the sample cells and the cells for calibration standards in the same way (see section 2130 of the "Standard Methods for the Examination of Water and Wastewater", 19th issue).
To do so, the optimum alignment of the cell is determined.

Never apply oily liquids to "smooth" any scratches (not even so-called "special silicone oils"). They unnecessarily contaminate the meter and your working environment. Measurement accuracy is ensured by aligning the cells. Scratched cells have to be replaced.

Aligning a cell

1 Clean the cell (see section 5.2.2).

2 Insert the cell (see section 4.2).

3 Align the cell:
- Press and keep the **<START/ENTER>** key depressed.
- Slowly rotate the cell once completely in small steps (by 360 °). After each step, wait briefly until the displayed measured value is stable.
- Turn the cell back to the position with the lowest measured value.

To keep the drift as low as possible, the time for aligning the cell while the **<START/ENTER>** key is pressed is limited to 30 seconds. After this time, the meter starts the measurement automatically.

4 Release the **<START/ENTER>** key.
Measurement starts. The measured value is displayed.

Marking a cell

In order to quickly bring a cell into the optimum alignment, it is helpful to mark the optimum alignment of the cell once it has been determined. This shortens each measurement or calibration with this cell considerably.

The marking can be made, for example, on a label on the cap of the cell.

5 Mark the optimum alignment of the cell.
The cell is prepared for the shortened measuring or calibration procedures.

4.5.3 Measuring the turbidity

CAUTION
Never pour any liquids directly into the cell shaft.
Always use a cell for measurement. The meter only measures accurately if the cell is closed with the black light protection cap (WTW cells).

The outside of the cell always has to be clean, dry, and free of fingerprints and scratches. Clean the cells before starting to measure (see section 5.2.2). Only hold the cells by the top or by the black light protection cap.

Measuring

1 Rinse a clean cell with the sample to be measured:
Pour approximately 10 ml sample into the cell. Close the cell and rotate it several times before throwing the sample away.

2 Repeat the rinsing procedure twice more.

3 Fill the cell with the sample to be measured (approx. 15 ml). Close the cell with the black light protection cap.

4 Clean the cell (see section 5.2.2).

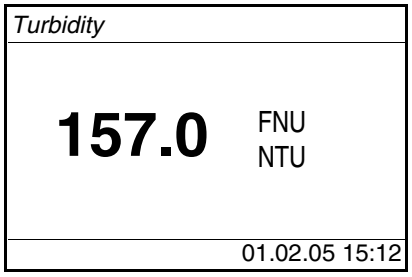
5 Insert the cell (see section 4.2).

6 Align the cell:

- Marked cell
  - Align the marking on the cell cap with the marking at the cell shaft.
  - Press the **<START/ENTER>** key and for a short time keep it depressed until the measured value is displayed.
- Unmarked cell (see page 30)
  - Press and keep the **<START/ENTER>** key depressed.
  - Slowly rotate the cell once completely in small steps (by 360 °). After each step, wait briefly until the displayed measured value is stable.
  - Turn the cell back to the position with the lowest measured value.

To keep the drift as low as possible, the time for aligning the cell while the **<START/ENTER>** key is pressed is limited to 30 seconds. After this time, the meter starts the measurement or calibration automatically.

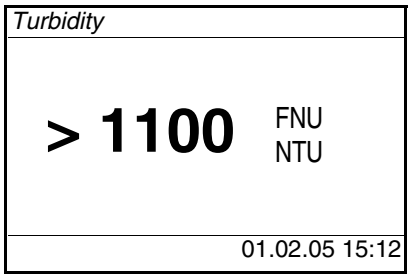
7 Release the **<START/ENTER>** key.
Measurement starts. The measured value is displayed.



8 Repeat the steps 2 to 8 for further samples.

Display with measuring range overflow

If the measured value is outside the measuring range of the Turb 430 IR/T, this is indicated on the display:



4.5.4 Settings for turbidity measurements

Overview

For turbidity measurements, the following settings are possible in the menu *Configuration* / *Turbidity*:

- *Calibration record* (display, print)
- Enter the *Calibration interval*
- *Reset*

Settings/functions

The settings are in the menu, *Configuration* / *Turbidity*.
Move to the *Configuration* menu with the **<MENU>** key.

Menu item	Possible setting	Explanation
Calibration record	-	Display the calibration record of the last calibration.
Calibration interval	1 ... 999 d	*Calibration interval* for the turbidity measurement (in days). If the calibration interval has expired, the meter reminds you to calibrate before each measurement.
Reset		Reset all settings for the *Turbidity* measuring mode (see section 4.8.2)

4.5.5 Calibration

When to calibrate?

- After the calibration interval has expired
- With a temperature change

Calibration procedure and calibration standards

For the menu-guided three-point calibration, you need the following three calibration standards in the specified order:

Standard no.	FNU/NTU
1	1000
2	10.0
3	0.02

Calibration record

At the end of each calibration procedure a calibration info (`i` symbol) and the calibration record is displayed.

Display calibration data and output to interface

You can view the data of the last calibration on the display. Subsequently, you can download the displayed calibration data to the interface, e. g. to a printer or PC, with the **<PRT>** key.

The calibration record of the last calibration is to be found under the menu item, *Configuration* / *Turbidity* / *Calibration record*.

Sample printout of a record

```
31.10.03  16:13
Turb 430 IR Ser. no. 12345678
Calibration Turbidity
Calibration date 31.10.03  16:13:33
Calibration interval 90 d
```

Preparing the calibration

Perform the following preparatory activities when you want to calibrate:

1 Keep the cells with the required calibration standards ready and mark them as necessary (see page 30).

2 Clean the cell (see section 5.2.2).

3 Insert the cell (see section 4.2).

For turbidity values below 1 FNU/NTU, observe the notes in the appendix (see APPENDIX 2: TURBIDITY VALUES UNDER 1 FNU/NTU).

Carrying out calibration

1 Press the **<CAL/ZERO>** key.

The menu-guided calibration starts.Follow the instructions on the display.

Turbidity \ Calibration

i *Insert standard*
1000 FNU/NTU
i *Press and hold <START>*
i *Align sample*

2 Insert the cell with the displayed calibration standard (here e.g. 1000 FNU/NTU) in the cell shaft (see section 4.2).

3 Align the cell:

- Marked cell:
  - Align the marking on the cell cap with the marking at the cell shaft.
  - Press the **<START/ENTER>** key and keep it depressed until the measured value is displayed.
- Unmarked cell (see page 30)
  - Press and keep the **<START/ENTER>** key depressed.
  - Slowly rotate the cell once completely in small steps (by 360 °).
  - After each step, wait briefly until the displayed measured value is stable.
  - Turn the cell back to the position with the lowest measured value.

Turbidity \ Calibration

i *Turb.* = 1000 FNU/NTU
i *Start calibration*
by releasing <START>

4 Release the **<START/ENTER>** key.
Measurement of the calibration standard begins.

Before measuring the third calibration standard of 0.02 FNU/NTU you can exit the calibration with **<ESC>** at any time.
The new calibration data are discarded. The old calibration data are used.

5 Repeat the steps 4 - 6 with the calibration standards, 10.0 FNU/NTU and 0.02 FNU/NTU.

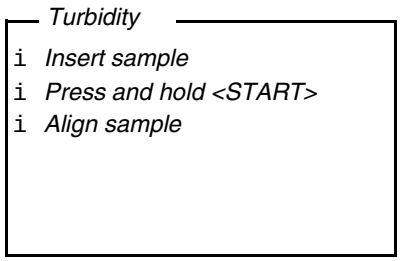
After measuring the 0.02 FNU/NTU calibration standard, the calibration result is displayed.
The calibration is complete.

6 Confirm the calibration result with **<START/ENTER>**.

The calibration record is displayed.

7 Confirm the calibration record with **<START/ENTER>**.

The display shows instructions for the first measurement.



If `i` *Calibration error!* is displayed as the calibration result, the display indicates that a new calibration is required before a measurement is taken.
If a valid calibration is not possible, the meter also offers to continue measuring with the last valid calibration data.

4.6 Memory

The meter has 2000 storage locations for measurement datasets.

You can transmit measured values (datasets) to the data memory with the **<STO>** key.

Each data storing process transmits the current dataset to the interface at the same time.

The number of memory locations that are still free is displayed in the *Store* menu. The number of memory locations that are occupied is displayed in the *System* / *Measured value memory* menu.

Measurement dataset

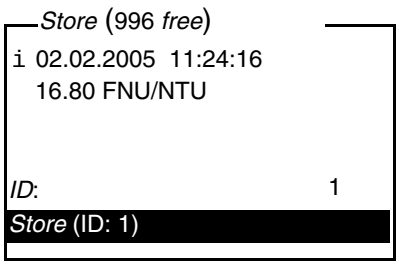
A complete dataset consists of:

- Date/time
- ID number (ID)
- Measured value

4.6.1 Storing measurement datasets

Proceed as follows to transmit to the data memory and simultaneously output to the interface a measurement dataset:

1 Press the **<STO>** key.
The *Store* display appears.



2 Using **<▲ > <▼ >**, **<START/ENTER>** and the number keys, change and confirm the ID number (*ID*) as necessary (0 ... 999).

3 Using **<START/ENTER>** or **<STO>**, confirm *Store*.
The dataset is stored. The meter switches to the measured value display.

A measurement dataset is quickly stored by twice pressing **<STO>**. It is stored with the ID last set.

If the memory is full

You can erase the entire memory (see section 4.6.5), or overwrite the oldest dataset with the next storing procedure.
A security prompt appears before a dataset is overwritten.

4.6.2 Filtering measurement datasets

The functions to display and download stored measurement datasets (see section 4.4.1) refer to all stored measurement datasets that correspond to the specified filter criteria.

The settings are in the menu, *Configuration* / *System* / *Measured value memory* / *Data filter*.
Move to the *Configuration* menu with the **<MENU>** key.

Data filter

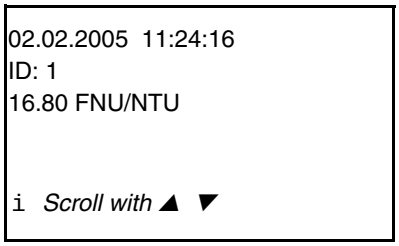
Menu item	Setting/function	Explanation
Filter		Filter criteria:
	No filter	Data filter switched off
	ID	Selection according to ID number
	Date	Selection according to period
	ID + Date	Selection according to period and ID number
ID		Entry of filter criteria These menu items are made visible by selecting the filter criteria in the *Filter* menu.
Date		

4.6.3 Displaying measurement datasets

You can read out stored datasets to the display. Only those datasets are displayed that correspond to the selected filter criteria (see section 4.6.2).

Start reading out the data to the display in the menu, *Configuration* / *System* / *Measured value memory* / *Display*.

Representation of a dataset



Further datasets that correspond to the filter criteria are displayed with the <▲ > <▼ > keys.

Quitting the display

To quit the display of stored measurement datasets, you have the following options:

- Switch directly to the measured value display with **<M>** (short pressure).
- Leave the display and switch to the superordinate menu with **<ESC>** or **<START/ENTER>**.

4.6.4 Outputting measurement datasets to the RS232 interface

You can output stored datasets to the RS232 interface (see section 4.7). Only those datasets are output that correspond to the selected filter criteria (see section 4.6.2).

The datasets are output in the specified output format (see section 4.7.4).

The output of the data to the interface is started in the menu, *Configuration* / *System* / *Measured value memory* / *RS232 download*.

4.6.5 Erasing stored measurement datasets

You can erase the stored measurement datasets altogether if you no longer need them.

Erasing all measurement datasets is done in the menu, *Configuration* / *System* / *Measured value memory* / *Delete*.

Erasing individual datasets is not possible. If all memory locations are occupied, however, it is possible to overwrite the oldest dataset at a time. A security prompt appears before a dataset is overwritten.

4.7 Transmitting data

To transfer data from the Turb 430 IR/T to a PC or printer, first establish a connection to a PC or printer (see section 4.7.1).

With the PC LS Data you can, without further configuration, transmit or save measurement and calibration data for GLP-compliant data management to LS Data or transmit them to Excel and thus to LIMS (see section 4.7.2).

With the MultiLab® Importer (an add-in for Microsoft Excel) you can transmit data from the meter directly to an open Excel sheet (see section 4.7.3).

The connection to a printer or terminal program has to be configured so data can be safely transmitted (see section 4.7.5).

4.7.1 Establishing the connection to a PC

You have the following possibilities of transmitting data from the Turb 430 IR/T to a PC

- via the RS232 interface of the Turb 430 IR/T
  or
- via the RS232 interface of the LabStation LS Flex/430
  (accessories, see chapter 8)

?Prerequisites

- Microsoft Windows PC with one of the following operating systems:
  - Windows 7
  - Windows 8
  - Windows 10.
- Free interface of the PC
  - Serial COM interface
    or
  - USB interface:
    and USB adapter (accessory)
- Connection to the PC
  - Connecting cable AK 540/B (accessory, see chapter 8)
    or
  - LabStation LS Flex/430 (accessory, see chapter 8)

Establishing a connection

1 Connect the Turb 430 IR/T to the PC via the RS232 or via the LabStation LS Flex/430 (see operating manual LS Flex/430).

The connection to the PC is established. The data can be transferred to the PC:

- via the PC software LS Data (see section 4.7.2)
- via the MultiLab® Importer (see section 4.7.3)
- via a terminal program (see section 4.7.6).

4.7.2 Data transmission with the PC software LS Data

With the PC software LS Data you can transmit and save to the LS Data any measurement- and calibration data for GLP compliant data management (menu item *File / Save As...* / *. csv (CSV format)) or transmit and save to Excel (menu item *Data exchange* / *Export (.xls)*) and thus transfer to LIMS.

The PC software LS Data is available as an accessory (LabStation LS Flex/430 with PC software LS Data, see chapter 8).

1 Establish the connection to a PC (see section 4.7.1 and operating manual of the PC software LS Data).

2 Transmit data (see operating manual of the PC software LS Data).

4.7.3 Data transmission with the Excel add-in MultiLab® Importer

Set the CSV output format for datasets at the Turb 430 IR/T. It is selected in the menu, *Configuration* / *System* / *Interface* / *Output format* (see section 4.7.4 ESTABLISHING THE CONNECTION TO A PRINTER).

1 Establish the connection to a PC (see section 4.7.1).

2 Establish a data connection (see operating manual MultiLab® Importer).

3 Transmitting data (see section 4.7.6**).**

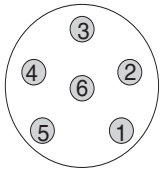
4.7.4 Establishing the connection to a printer

Via the RS 232 interface, you can transmit data to an external printer.

Suitable printers

- P3002 (see section 8 ACCESSORIES AND OPTIONS)
- P3001 (no longer available as accessory)

Socket assignment (RS232)



RS 232
REC

1 RTS
2 RxD
3 TxD
4 DTR
5 SG
6 CTS

1 Connect the RS232 interface to the external printer with the AK540/S cable.

The Turb 430 IR/T is pre-configured for the connection of the printer.

2 For error-free data transmission:
The RS232 interface of the Turb 430 IR/T and the printer have to be set to the same transmission speed (*Baud rate*).
- The baud rate of the Turb 430 IR/T is selected in the menu *Configuration* / *System* / *Interface* / *Baud rate*.
- The setting of the baud rate of the printer and the default setting are in the documentation of your printer.

3 Selecting the output format of datasets (Turb 430 IR/T)
It is selected in the menu, *Configuration* / *System* / *Interface* / *Output format*.
Examples of the output formats (see section 4.7.6)

4 Transmitting data (see section 4.7.6).
Examples of transmitted data (see section 4.7.7)

4.7.5 Configuration for the data transmission to a terminal program

Via the RS232 interface you can also transmit data to a PC with the aid of a so-called terminal program.

When using the terminal program "HyperTerminal", you can load the transfer data automatically with the *.ht file stored on the CD.

1 Establish the connection to a PC (see section 4.7.1).

2 Determine the output format of datasets at the Turb 430 IR/T (see section 4.7.4 ESTABLISHING THE CONNECTION TO A PRINTER
It is selected in the menu, *Configuration* / *System* / *Interface* / *Output format*.
Examples of the output formats (see section 4.7.6)

3 Configure the RS232 interface of the Turb 430 IR/T and the terminal program.
The transmission data specified in the Turb 430 IR/T and terminal program have to match.
- RS232 interface (see section 4.4.3).
- Terminal (see operating manual of your terminal).

Transmission data:

Baud rate	can be selected from: 1200, 2400, 4800, 9600, 19200
Handshake	none
Parity	none
Data bits	8
Stop bits	1

4 Transmit data (see section 4.7.6).
Examples of transmitted data (see section 4.7.7)

4.7.6 Starting the data transmission at the Turb 430 IR/T (at MultiLab® Importer, printer, terminal program)

With an existing connection to a PC (e.g. via the MultiLab® Importer or a terminal program) or with a printer connected, you can transfer data in the following ways:

Individual data (e.g. measured value, calibration protocol, AQA protocol)	● Display the data and press **<PRT>**. The data being shown on the display are transmitted to the interface. ● Simultaneously with every manual storage process.
Stored measured values	● Display the saved data and press **<PRT>**. ● All datasets according to the filter criteria (section 4.4) via the *Ausgabe RS232/USB* function (see section 4.6.2.).

4.7.7 Examples of data transmitted (printer, terminal program)

The data are output according to the selected output format.

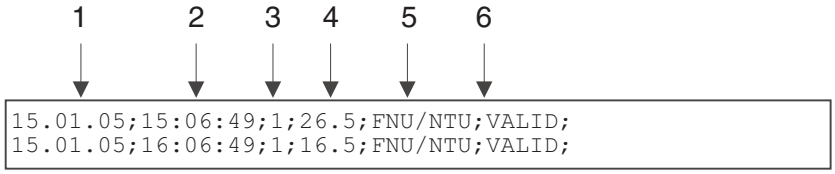
Example; output format ASCII

The ASCII output format delivers formatted datasets.

```
Turb 430 IR Ser. no. 12345678
31.10.04 09:56:20
ID: 1
16.01 FNU/NTU

_____________________________________

Turb 430 IR Ser. no. 12345678
31.10.04 15:48:08
ID: 1
26.01 FNU/NTU

_____________________________________

etc...
```

Example, output format CSV

The CSV output format delivers datasets separated by ";".
The data are output in the following order:



1 Date of storing
2 Time of storing
3 Selected ID
4 Measured value or
Upper/lower measuring range limit
(only with measured value status, OFL/UFL)
5 Unit of the measured value
6 Measured value status
* VALID: Measured value valid
* INVALID: Measured value invalid
* UFL: Measured value below the lower measuring range limit
* OFL: Measured value above the upper measuring range limit
7 AQA status
* [AQA]: a valid AQA check is available
* : no valid AQA check is available
8 Calibration status: Calibration type that was selected for the measurement
9 Calibration status: Date of calibration
10 Calibration status: Time of calibration

If the connected external printer does not print, please check whether the same baud rate is set at the Turb 430 IR/T and printer.

4.8 Reset

You can reset (initialize) all system and measurement settings.

4.8.1 Resetting the system settings

With the *System* / *Reset* function, all resettable settings are reset.

- Settings for *Turbidity* (see section 4.8.2)
- System settings

System setting	Default settings
Baud rate	4800 Baud
Output format	ASCII
Illumination	*Auto off*
Contrast	50 %
Brightness	50 %
Switchoff time	30 min
Beep	*On*

4.8.2 Resetting turbidimeter settings

With the *Turbidity* / *Reset* function, all turbidimeter settings are reset.

Setting	Default settings
Calibration interval	90 d

4.9 Meter information

The following meter information is listed in the *Configuration* / *Info* menu:

- Model designation
- Software version
- Series number of the meter

Info

i *Model*: Turb 430 IR
i *Software*: V 0.35
i *Ser. no.*: 04280003

4.10 Software update

With a software update you obtain the current instrument software (see appendix).

The current software version can be found on the Internet at www.WTW.com.

The proceeding for updating the software is given in the appendix (see APPENDIX 1: FIRMWARE UPDATE).

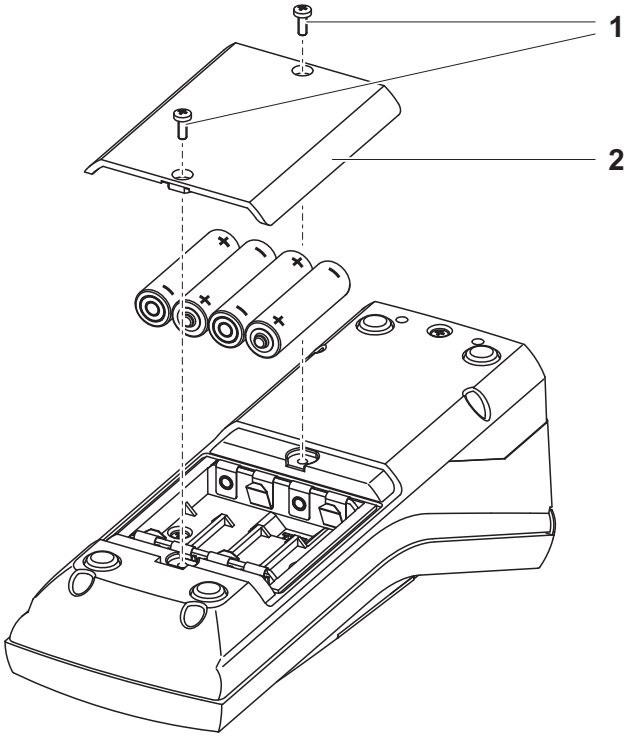
5 Maintenance, cleaning, disposal

5.1 Maintenance

The meter is almost maintenance-free.
The only maintenance task is replacing the batteries or battery pack.

5.1.1 Inserting/exchanging the batteries

NOTE
Make sure that the poles of the batteries are positioned correctly. The ± information in the battery compartment must match the information on the battery.



1 Open the battery compartment:
   – Unscrew the two screws (1) on the underside of the meter,
   – Remove the lid of the battery compartment (2).

2 If necessary, take four old batteries out of the battery compartment.

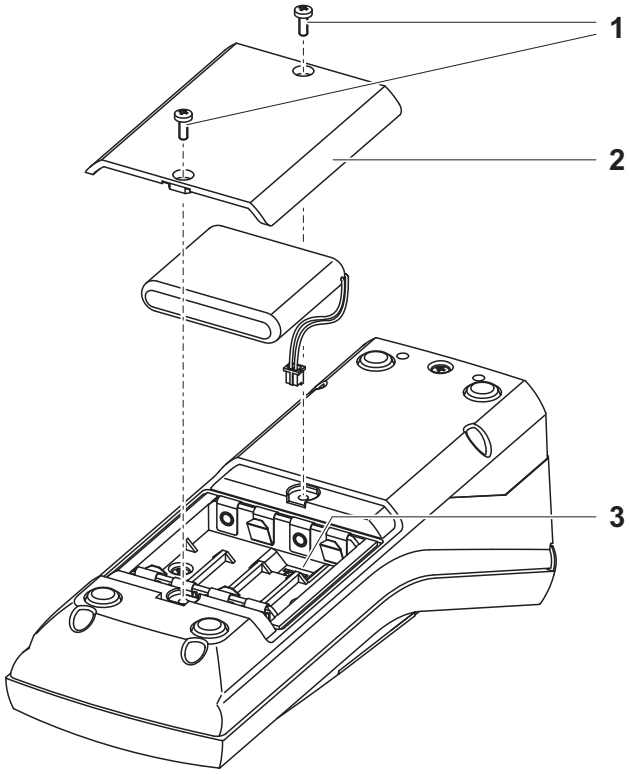
3 Insert four batteries (3) in the battery compartment.

4 Close the battery compartment and fix it with the screws.

5.1.2 Retrofitting the battery pack

NOTE
Use original WTW battery packs only.

Together with the power pack the battery pack is available as an accessory (see section 8.1).



1 Open the battery compartment:
   – Unscrew the two screws (1) on the underside of the meter,
   – Remove the lid of the battery compartment (2).

2 If necessary, take four old batteries out of the battery compartment.

3 Connect the cable of the battery pack with the socket (3) on the bottom of the battery compartment and insert the battery pack in the battery compartment.

4 Close the battery compartment and fix it with the screws.

5.2 Cleaning

Occasionally wipe the outside of the measuring instrument with a damp, lint-free cloth. Disinfect the housing with isopropanol as required.

NOTE
The housing components are made of synthetic materials (polyurethane, ABS and PMMA). Thus, avoid contact with acetone and similar detergents that contain solvents. Remove any splashes immediately.

5.2.1 Cleaning the cell shaft

If liquid is in the cell shaft (e.g. due to a spilled cell), clean the cell shaft as follows:

1 Switch the Turb 430 IR/T off and pull out the power plug.

2 Rinse the cell shaft with distilled water.

5.2.2 Cleaning the cells

Cells have to be clean, dry, and free of fingerprints. Therefore, clean them regularly:

1 Clean the cells inside and out with hydrochloric acid or laboratory soap.

2 Rinse several times with distilled water.

3 Let them dry in the air.

4 Only hold the cells by the top or by the light protection cap so that the optical path is not impaired.

5 Before measuring, clean the cell with the enclosed cleaning cloth.

5.3 Disposal

Packing

This meter is sent out in a protective transport packing.
We recommend: Keep the packing material. The original packing protects the meter against damage during transport.

Batteries/battery pack

Remove the batteries or battery pack from the meter (see section 5.1). Dispose of the batteries or battery pack at a suitable facility according to local legal requirements. It is illegal to dispose of them in household refuse.

NiMH

Meter

For final disposal, take the meter without batteries and without the battery pack as electronic waste to a collection point intended for this purpose.

6 What to do if...

6.1 General errors

Display, *LoBat*

Cause	Remedy
– Batteries or battery pack almost empty.	– Insert new batteries – Charge the battery pack (see section 3.2)

Meter does not react to keystroke

Cause	Remedy
– Software error – Operating condition undefined or EMC load unallowed	– Processor reset: Press the **<START/ENTER>** and **<PRT>** key simultaneously.

Error message, *Error 0, 8, 16, 16384*

Cause	Remedy
– Instrument error	– Repeat measurement – Meter defective, Send in the meter for repair, stating the error number

6.2 Turbidity

Error message Measured values obviously incorrect

Cause	Remedy
– Cell not correctly inserted	– Lock the cell into place
– Cell contaminated	– Clean the cell
– Calibration too old	– Carry out calibration

Measured value display *< 0.01 FNU*

Cause	Remedy
– Calibration defective	– Carry out calibration
– Measured value outside the measuring range	– Not possible

7 Technical data

7.1 General data

7.1.1 Turb 430 IR/T

Dimensions	Approx. 236 x 86 x 117 mm	
Weight	Approx. 0.6 kg (without batteries)	
Mechanical structure	Type of protection	IP 67
Electrical safety	Protective class	III
Test certificates	CE, FCC	
Ambient conditions	Storage	- 25 °C ... + 65 °C
	Operation	0 °C ... + 50 °C
	Climatic class	2
Allowable relative humidity	Yearly mean: 30 days /year: Other days:	75 % 95 % 85 %
Power supply	Batteries	4 x 1.5 V, type AA
	Operating time with battery operation	Turb 430 IR: approx. 3000 measurements Turb 430 T: approx. 2000 measurements
	Battery pack (optional)	5 x 1.2 V nickel metal hydride (NiMH), type AA
	Power pack Charging device (optional)	FRIWO FW7555M/09, 15.1432.500-00 Friwo Part. No. 1883259 ---------- RiHuiDa RHD20W090150 ---------- Input: 100 ... 240 V ~ / 50 ... 60 Hz / 400 mA Output: 9 V = / 1.5 A Connection max. overvoltage category II Primary plugs contained in the scope of delivery: Euro, US, UK and Australian.

Serial interface

Connection of the cable AK 540/B or AK 540/S

Baud rate	Adjustable: 1200, 2400, 4800, 9600, 19200 baud
Type	RS232
Data bits	8
Stop bits	2
Parity	None
Handshake	RTS/CTS
Cable length	Max. 15 m

Guidelines and norms used

EMC	EC guideline 89/336/EEC EN 61326-1/A3:2003 FCC Class A
Meter safety	EEC guideline 73/23/EEC EN 61010-1 :2001
Climatic class	VDI/VDE 3540
IP protection class	EN 60529:1991

7.1.2 LabStation

Dimensions	Approx. 236 x 82 x 170 mm
Weight	Approx. 0.6 kg

7.2 Turbidity

7.2.1 Turb 430 IR

Measuring principle	Nephelometric measurement according to DIN EN ISO 7027	
Light source	Infrared LED	
Measuring range	0.01 ... 1100 FNU/NTU	
Resolution	in the range 0.01 ... 9.99	max. 0.01 FNU/NTU
	in the range 10.0 ... 99.9	max. 0.1 FNU/NTU
	in the range 100 ... 1100	max. 1 FNU/NTU
Accuracy	in the range 0 ... 1100 FNU/NTU	± 2 % of the measured value or ± 0.01 FNU/NTU
Repeatability	0.5% of the measured value	
Response time	4 seconds	
Calibration	Automatic 3-point calibration	

7.2.2 Turb 430 T

Measuring principle	Nephelometric measurement according to US EPA 180.1	
Light source	White light tungsten lamp	
Measuring range	0.01 ... 1100 NTU	
Resolution	in the range 0.01 ... 9.99	max. 0.01 NTU
	in the range 10.0 ... 99.9	max. 0.1 NTU
	in the range 100 ... 1100	max. 1 NTU
Accuracy	in the range 0 ... 500 NTU	± 2 % of the measured value or ± 0.01 NTU
	in the range 500 ... 1100 NTU	± 3% of measured value
Repeatability	1% of the measured value	
Response time	7 seconds	
Calibration	Automatic 3-point calibration	

8 Accessories and options

8.1 WTW accessories

Description	Model	Order no.
LabStation with PC software LSdata, battery pack and universal power pack	LS Flex/430	251 301
Battery pack with power packTurb 430 IR/T	pHotoFlex BB	251 300
3 replacement cells, 28 x 60 mm	LKS28-Set	251 302
Calibration set for Turb 430 IR	Kal.Kit Turb 430 IR	600 560
Calibration set for Turb 430 T	Kal.Kit Turb 430 T	600 561
Thermoprinter*	P3002	250 045
Matrix printer*	LQ 300+	250 046

* A connection cable is required to connect the printer (see section 8.1.1)

8.1.1 Connecting cable

PC You can connect a PC (USB or serial COM interface) to the Turb 430 IR/T in one of the following ways:

Description	Model	Order no.
Connection PC - Turb 430 IR/T		
– Cable	AK 540/B	902 842
+ USB adapter (for USB connection on PC)	Ada USB	902 881
Connection PC - LabStation		
– Zero modem cable	included in the scope of delivery of the LabStation	
+ USB adapter (for USB connection on PC)	Ada USB	902 881

Thermoprinter

You can connect the P3001 to the Turb 430 IR/T in the following ways:

Description	Model	Order no.
Connection P3001 - Turb 430 IR/T		
– Cable	AK 540/S	902 843
Connection P3001 - LabStation		
– Cable	AK 3000	250 745
in conjunction with an adapter (socket - socket) [GenderChanger]	Specialist shops	
or:		
– Cable, 2 x 9-pin (socket - plug)	Specialist shops	

Matrix printer

You can connect an LQ300 needle printer to the Turb 430 IR/T in one of the following ways:

Description	Model	Order no.
Connection LQ300 - Turb 430 IR/T		
– Cable	AK 540/B	902 842
with adapter 9-pin (plug) - 25-pin (plug)	Specialist shops	
Connection LQ300 - LabStation		
– Cable	AK/LQ300	250 746
in conjunction with an adapter (socket - socket) [GenderChanger]	Specialist shops	
or:		
– Zero modem cable, 9-pin (socket) - 25-pin (plug)	Specialist shops	

9 Lists

This chapter provides additional information and orientation aids.

Abbreviations

The list of abbreviations explains the indicators and the abbreviations that appear on the display and in the manual.

Specialist terms

The glossary briefly explains the meaning of the specialist terms. However, terms that should already be familiar to the target group are not described here.

Abbreviations

Cal	Calibration
d	Day
h	Hour
j	Year
LoBat	Batteries almost empty (Low battery)
m	Month
s	Second
S	Slope (internat. k)
SELV	Safety Extra Low Voltage
Slp.	Slope determined with calibration

Glossary

Adjusting To manipulate a measuring system so that the relevant value (e.g. the displayed value) differs as little as possible from the correct value or a value that is regarded as correct, or that the difference remains within the tolerance.

Calibration Comparing the value from a measuring system (e. g. the displayed value) to the correct value or a value that is regarded as correct. Often, this expression is also used when the measuring system is adjusted at the same time (see adjusting).

Cell Vessel that takes a liquid sample for measurement.

LED Light Emitting Diode
LEDs are used as the light source in the Turb 430 IR/T.

Measured parameter The measured parameter is the physical dimension determined by measuring, e. g. pH, conductivity or DO concentration.

Measured value The measured value is the special value of a measured parameter to be determined. It is given as a combination of the numerical value and unit (e. g. 3 m; 0.5 s; 5.2 A; 373.15 K).

Measuring system The measuring system comprises all the devices used for measuring, e. g. measuring instrument and probe. In addition, there is the cable and possibly an amplifier, terminal box and armature.

Molality Molality is the quantity (in Mol) of a dissolved substance in 1000 g solvent.

Reset Restoring the original condition of all settings of a measuring system.

Resolution Smallest difference between two measured values that can be displayed by a meter.

Standard solution The standard solution is a solution where the measured value is known by definition. It is used to calibrate a measuring system.

Test sample Designation of the test sample ready to be measured. Normally, a test sample is made by processing the original sample. The test sample and original sample are identical if the test sample was not processed.

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Appendix 1: Firmware update

General information

With the "Firmware Update Turb430" program you can update the firmware of the Turb 430 IR/T to the latest version with the aid of a Personal Computer.

A free serial interface (COM port) on your PC and an interface cable is required for this (see chapter 8 ACCESSORIES AND OPTIONS).

Prior to starting the update please make sure that the batteries are fully loaded, or operate the Turb 430 IR/T with the LabStation or with the power pack. Otherwise there is the risk of the Turb 430 IR/T crashing during the update.

Program installation

Install the firmware update program on your PC with the "Turb430_Vx-_yy_English.exe" installation program.

Program start

Start the "Firmware Update Turb430" program from the WTW directory in the Windows start menu. The program automatically selects the first free serial interface (COM port). The selected interface is displayed on the left side of the status line on the screen bottom.

Via the language menu you can change the adjusted language.

Firmware update

Proceed as follows:

1. With the aid of an interface cable, connect the Turb 430 IR/T to the serial interface (COM port) of the PC named in the status line.
2. Make sure the Turb 430 IR/T is switched on.
3. To start the updating process click the OK button.
4. Then follow the instructions of the program.
   During the programming process, a corresponding message and a progress bar (in %) appear.
   The programming process takes approx. four minutes.
   A terminatory message is displayed after a successful programming process. The firmware update is now completed.
5. Disconnect the meter from the PC.
   The meter is ready for operation.

After switching the meter off and on you can check whether the meter has taken over the new software version on the start display.

Appendix 2: Turbidity values under 1 FNU/NTU

With turbidity values under 1 FNU/NTU, the measured value is strongly influenced by the cell and its alignment.

To increase measurement accuracy with turbidity values under 1 FNU/NTU, calibration in the 0.02 FNU/NTU standard and later measurement should take place in the same cell. For calibration with the 10.0 and 1000 FNU/NTU standards, follow the instructions on the display.

To measure turbidity values below 1 FU/NTU, proceed as follows:

Calibration

1 Press the **<CAL/ZERO>** key.
The menu-guided calibration starts.

2 Perform calibration of the 1000 FNU/NTU and 10.0 FNU/NTU standards according to the menu guidance in a clean, unscratched cell.

3 Fill the cleaned cell with the standard 0.02 FNU/NTU and calibrate it.

4 Mark the alignment of the cell.

Calibrate

- After the calibration interval has expired
- With a temperature change

Measuring

5 Fill the marked, cleaned cell with test sample, align it with the marking and measure.

6 If necessary, fill the marked and cleaned cell with test sample again and carry out further measurements.

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