

Turb[®] 750 T

LABORATORY TURBIDIMETER



a xylem brand

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All current data for the Turb[®] 750 T can be found on the Internet under www.xylemanalytics.com:

- Firmware
- Operating manual

More detailed information can be found in the appendix of the detailed operating manual on the CD-ROM provided.

Safety

Safety information

Safety instructions point out dangers:



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.

Safe operation



CAUTION

Danger of eye damage by visible and invisible LED radiation. In the cell shaft of the Turb® 750 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.

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 TECHNICAL DATA, page 17).

Any other use is considered unauthorized.

Display and jack field

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 darkness.

The screenshot shows a digital display with the following layout:

- Top line: Turbidity [IRPC] [AQA]
- Second line: 157.0 FNU
- Third line: NTU
- Fourth line: [3-P StdCAL]
- Fifth line: 15.01.20 16:12

Four arrows point to specific elements on the right side of the display:

- 1: Points to the status indicators [IRPC] and [AQA] in the top line.
- 2: Points to the measured value 157.0 and its units FNU/NTU.
- 3: Points to the status indicator [3-P StdCAL] in the fourth line.
- 4: Points to the date and time 15.01.20 16:12 in the fifth line.

1 Status display indicators, e.g.:
 [IRPC] = Intelligent reproducibility and plausibility check
 [AQA] = Valid AQA check available

2 Measured value (with unit)

3 Status display indicators, e.g.
 [3-P StdCAL] = Valid calibration available
 (calibration type: 3-P StdCAL)

4 Status line with date and time

Socket field

The diagram shows a rectangular panel with three ports on the right side, labeled 1, 2, and 3:

- 1: USB-B (micro) interface
- 2: Power pack
- 3: RS232 serial interface

1 USB-B (micro) interface

2 Power pack

3 RS232 serial interface

Power supply

The Turb® 750 T is supplied with power by the power pack included in the scope of delivery. The batteries (4 batteries 1.5 V Mignon type AA) in the battery compartment supply the integrated clock with power when the power supply is missing.

General operating principles

This section contains basic information on the operation of the Turb® 750 T.

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 interface
- Configuration
The display indicates a menu with further menus, settings and functions

Keypad

<M ⁽⁹⁾ >	Switch to the measured value display
<CAL ⁽⁴⁾ >	Start calibration
<QuickCAL ⁽¹⁾ >	Start simplified calibration with one standard.
<AQA ⁽²⁾ >	Start checking the meter with AQA standards
<A-Z ⁽⁵⁾ _>	Select the entry mode in an entry field Numerical or alphanumeric entry
<A-Z ⁽⁵⁾ >	Display the next digit in an entry field with active alphanumeric entry (same function as <▲ ⁽⁶⁾ >)
<START/ENTER ^(·) >	Open menus / confirm entries / start measurement
<MENU ⁽⁷⁾ >	Call up the <i>Configuration</i> menu (all settings are made here)
<On/Off>	Switch the meter on or off
<PRT ⁽⁸⁾ >	Output display contents to RS232 or USB interface (e.g. print)
<STO ⁽⁰⁾ >	Open the <i>Store</i> menu: <STO ⁽⁰⁾ > Quick storing: 2 x <STO ⁽⁰⁾ >
<STO ⁽⁰⁾ _>	Open the measured value memory
<▲ ⁽⁶⁾ >, <▼ ⁽³⁾ >	Highlight menu items or selection; Set values
<ESC>	Switch to the next higher menu level / cancel input



Entering numerals with the number keys (see ENTERING NUMERALS WITH THE NUMBER KEYS, page 8).

Measured value display

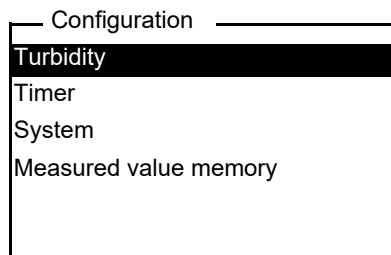
Menus and dialogs

In the measured value display, open the menu with **<MENU (7) >**.

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**

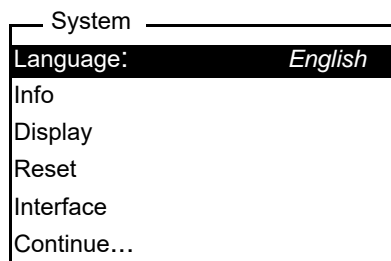
The name of the menu is displayed at the upper edge of the frame. Menus are opened by confirming with **<START/ENTER (.) >**. Example:



- **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 (.) >**.

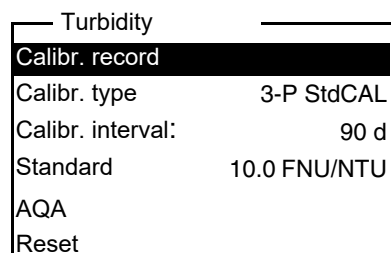
Example:



- **Functions**

Functions are designated by the name of the function. They are immediately carried out when you confirm them with **<START/ENTER (.) >**.

Example: display the *Calibr. record* function (in the *Turbidity* menu).

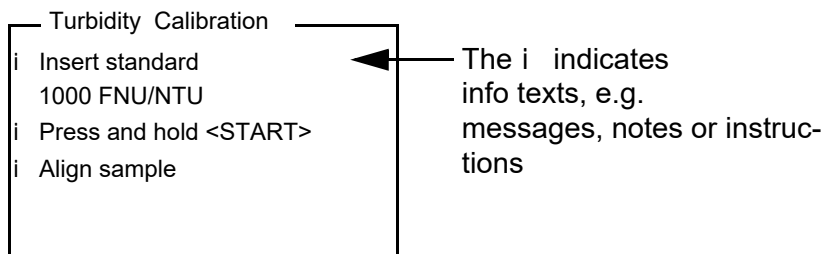


- **Messages**

Information or operating instructions are designated by the *i* symbol.

They cannot be selected.

Example:



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.

Initial commissioning

Switching on the meter

Press the **<On/Off>** key.

Setting the language

The English language is set on delivery. Set a different language as follows:

- 1 Open the *Configuration* menu with the **<MENU (7) >** key.
- 2 Open the *Configuration / System / Language* menu with the **<▲> <▼>** and **<START/ENTER (.) >** keys.
- 3 Select the required language with the **<▲> <▼>** keys and confirm with **<START/ENTER (.) >**.
- 4 Quit the menu with the **<M (9) >** key.

Setting the date and time

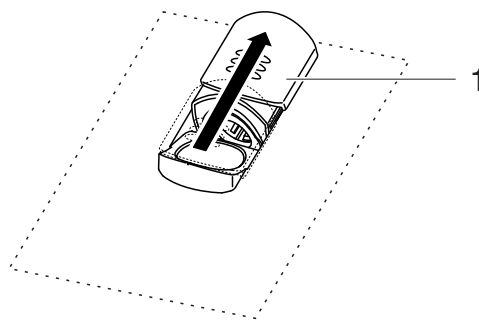
Configuration The date and time are set in the menu, */ System / Continue ... / Date/time.*

Operation

Inserting a cell

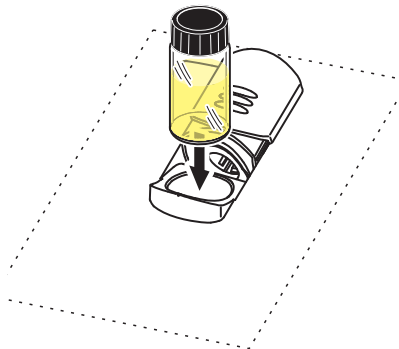
Before using a cell for the first time, determine and mark the suitable measuring position for the cell (see PREPARING THE CELL, page 9).

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



Inserting a 28 mm cell

- 2 Insert the marked cell so that it is positioned on the bottom of the cell shaft.



- 3 Align the cell marking (3) with the marking (4) of the cell shaft.
The cell is ready to be measured.

Preparing the cell and sample

Preparing the cell

Even completely clean quality cells exhibit tiny differences in their light transmittance, e.g. inhomogeneities of the glass or small defects (e.g. scratches). Therefore, guidelines for accurate and reproducible measurements (e.g. US EPA) recommend that you always align the cell in the same way for

measuring with the aid of arrows printed on or markings. This refers to sample cells and cells for calibration standards.

Prior to using a cell for the first time, the suitable position of the cell in the cell shaft is determined and marked to make sure the optical path is not disturbed. For the following measurements, the cell marking can just be aligned with the meter marking.

The cell marking should be checked regularly and renewed as necessary. The cell can be used until no suitable position for the optical path can be found.



We recommend that you do not treat any scratches in the cell with oily liquids (not even with so-called "special silicone oils"). They could unnecessarily soil the meter and your working environment. The optimum measurement accuracy is ensured by aligning the cells. Scratched cells have to be replaced.

Determining a suitable position in the cell shaft

- 1 Clean the cell.
- 2 Stick the label for the marking onto the cell cap.
- 3 Fill the cell with a homogeneous solution (e.g. calibration standard 10.0 NTU).
- 4 Insert the cell.
- 5
 - Press and hold the **<START/ENTER (^) >** key.
 - Turn the cell slowly and check the measured value:
 - The measured value at the position should be no maximum.
 - At the directly neighboring positions there should not be any sudden changes of the measured values. The deviations of measured values at the neighboring positions should not exceed the following values:
 Measured value < 1 NTU: max. +/- 0.02 NTU
 Measured value > 1 NTU: max. +/- 2 %
- 6 Release the **<START/ENTER (^) >** key. Measurement starts. The measured value is displayed.

Marking a cell

- 7 Mark the determined position (aligning) of the cell on the label. The cell is now prepared for all following measuring and calibration actions.

Preparing 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:

- 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)

Measuring the turbidity

NOTE

Never pour any liquids directly into the cell shaft. Always use a cell for measurement. The meter only measures precisely if the cell is closed with the black light protection cap and aligned with the marking of the measuring position determined.



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 CLEANING THE CELLS, page 15). Only hold the cells by the top or by the black light protection cap.



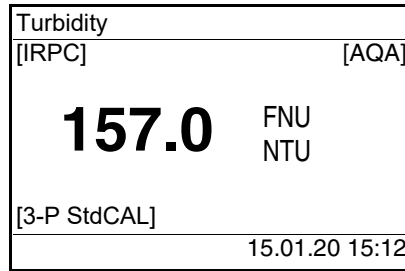
With turbidity values under 1 FNU/NTU, the measured value is strongly influenced by the cell and its alignment.

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 quick and easy measuring we recommend that you use marked cells (see PREPARING THE CELL, page 9).

If your cells are not marked you can determine the suitable position of the individual cells in the cell shaft while measuring.

- 1 Clean the cell (see CLEANING THE CELLS, page 15).
- 2 Rinse the cell:
Pour approximately 10 ml sample into the cell. Close the cell and rotate it several times before throwing the sample away.
- 3 Repeat the rinsing procedure twice more.
- 4 Fill the cell with the sample to be measured (approx. 15 ml). Close the cell with the black light protection cap.
- 5 Insert the cell.
- 6 Align the marking on the cell cap with the marking at the cell shaft.
or
Determine the suitable position of the cell in the cell shaft (see DETERMINING A SUITABLE POSITION IN THE CELL SHAFT, page 10).
- 7 Press the **<START/ENTER (-) >** key.
Measurement starts. The measured value is displayed.



The measured value is automatically output to the interfaces (= AutoPrint).

8 Repeat the steps 2 to 8 for further samples.

Intelligent reproducibility and plausibility check (IRPC)

With the intelligent reproducibility and plausibility check (IRPC) a multiple measurement is carried out, evaluated and, by eliminating the outliers, the plausible measured value is indicated on the display. The intelligent reproducibility and plausibility check (IRPC) is active with all measurements. It is displayed in the upper status line [IRPC].

Calibration

When to calibrate?

- Routinely within the framework of the company quality assurance
- When the calibration interval has expired
- With a temperature change

Preparing the calibration

For quick and easy measuring we recommend that you use marked cells with the calibration standards (see PREPARING THE CELL, page 9).

If your cells are not marked you can determine the suitable position of the individual cells in the cell shaft while measuring.

Perform the following preparatory activities when you want to calibrate:

- 1 Select the calibration type (menu *Configuration / Turbidity / Calibr. type.*).



For *QuickCAL* calibration with the <QuickCAL⁽¹⁾> key, the setting of the *QuickCAL* calibration type and limitation of the measuring range are done automatically.

- 2 Clean the cell (see CLEANING THE CELLS, page 15).
- 3 Insert the cell (see INSERTING A CELL, page 9).

Carrying out a calibration (example: 3-P StdCAL)

- 4 Press the **<CAL (4) >** key.
The guided calibration with the selected calibration type starts.
Follow the instructions on the display.

```

Turbidity Calibration
i Insert standard
  1000 FNU/NTU
i Press and hold <START>
i Align sample
  
```

- 5 Insert the cell with the displayed calibration standard (here e.g. 1000 FNU/NTU) in the cell shaft.
- 6 Align the marking on the cell cap with the marking at the cell shaft.
or
Determine the suitable position of the cell in the cell shaft (see DETERMINING A SUITABLE POSITION IN THE CELL SHAFT, page 10).

```

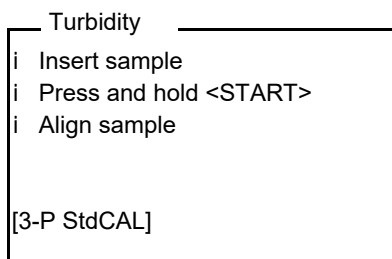
Turbidity Calibration
i Turb. = 1000 FNU/NTU
i Start calibration
  by releasing <START>
  
```

- 7 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.

- 8 Repeat the steps 4 - 6 with the calibration standards 10.00 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.
- 9 Confirm the calibration result with **<START/ENTER (.) >**.
The calibration record is displayed.
- 10 Confirm the calibration record with **<START/ENTER (.) >**.
The display shows instructions for the first measurement.
The valid calibration is indicated on the display as a status, e.g. [3-P StdCAL].



Calibration record

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

For each calibration type the last calibration is stored in the calibration memory.

Maintenance, cleaning

Maintenance

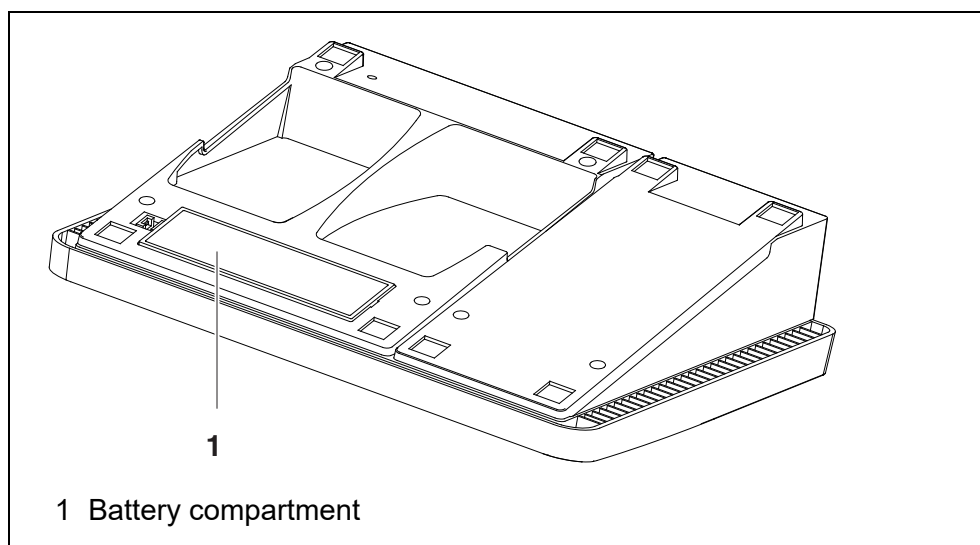
The meter is almost maintenance-free.

The only maintenance task is replacing the batteries.

NOTE

Make sure that the poles of the batteries are positioned correctly. The ± signs on the batteries must correspond to the ± signs in the battery compartment.

- 1 Open the battery compartment (1) on the underside of the meter.



- 2 Place four batteries (type Mignon AA) in the battery compartment.

- 3 Close the battery compartment (1).
- 4 Set the date and time

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.

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[®] 750 T off and pull out the power plug.
- 2 Rinse the cell shaft with distilled water.

Cleaning the cells

Cells have to be clean, dry, and free of fingerprints and scratches. 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.



Scratches in the glass change the optical characteristics of the cell and falsify the measured value. For this reason, never use scratched cells!

What to do if...

General information

Display, *LoBat*

Cause	Remedy
– Batteries almost empty	– Insert new batteries

Meter does not react to keystroke

Cause	Remedy
– Software error	– Processor reset: Press the < START/ENTER (-) > and < PRT ⁽⁸⁾ > keys simultaneously.
– Operating condition undefined or EMC load unallowed	

Error message i *AQA not activated!*

Cause	Remedy
– The function AQA was not activated.	– Activate the AQA check

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

Cause	Remedy
– Instrument error	– Repeat measurement
	– Meter defective, contact the service department

You want to know which software version is in the meter

Cause	Remedy
– E.g., a question by the service department	– Switch on the meter.
	– Open the menu <i>Configuration/ System/ Info</i> . The instrument data are displayed.

Turbidity

Error message Measured values obviously incorrect

Cause	Remedy
– Cell not correctly inserted	– Lock the cell into place
– Cell contaminated	– Clean the cell

	Cause	Remedy
	– Calibration too old	– Carry out calibration
Measured value display < 0.01 FNU/NTU	– Calibration defective	– Carry out calibration
	– Measured value outside the measuring range	– Not possible

Technical data

General data

Dimensions	Approx. 290 x 190 x 80 mm		
Weight	Approx. 1.0 kg		
Mechanical structure	Type of protection	IP 43	
	Protective class	III	
Electrical safety	CE		
Test certificates	CE		
	Ambient conditions	Storage	-25 °C... +65 °C
		Operation	+5 °C ... +40 °C
		Admissible relative humidity	Yearly mean: < 75 % 30 days/year: 95 % Other days: 85 %
Power supply	Batteries	4 x 1.5 V alkali-manganese batteries, type AA	
	Power pack	ShenZhen RiHuiDa Power Supply Co Ltd RHD20W090150 Input: 100... 240 V ~ / 50... 60 Hz / 400 mA Output: 9 V = / 1.5 A Connection max. overvoltage category II	
	Primary plugs	Primary plugs included in the scope of delivery: Euro, US, UK and Australian.	

Serial interface (printer)

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

USB interface (PC)

Type	USB 1.1 USB-B (Device), PC
Baud rate	Adjustable: 1200, 2400, 4800, 9600, 19200 baud
Data bits	8
Stop bits	2
Parity	None
Handshake	RTS/CTS
Cable length	max. 3 m (9.843 feet)

Guidelines and norms used

EMC	EC directive 2014/30/EC EN 61326-1 FCC Class A
Meter safety	EC directive 2014/35/EC EN 61010-1
IP protection class	EN 60529

Turbidity (Turb® 750 IR)

Measuring principle

Nephelometric measurement according to DIN EN ISO 7027

Light source

Infrared LED

Calibration	3-P StdCAL	QuickCAL	FreeCAL
Measuring range depending on the calibration type	0.01... 1100 FNU/NTU	0 - 40 FNU/NTU	lowest - highest standard FNU/NTU
Resolution	with the setting <i>Resolution</i> 0.001		
	In the range 0.001... 0.999 FNU/NTU	max. 0,001 FNU/NTU	
	In the range 1.00... 9.99 FNU/NTU	max. 0.01 FNU/NTU	
	with the setting <i>Resolution</i> 0.01		
	In the range 0.01... 9.99 FNU/NTU	max. 0.01 FNU/NTU	
	irrespective of the setting <i>Resolution</i>		
	In the range 10.0... 99.9 FNU/NTU	max. 0.1 FNU/NTU	
	In the range 100... 1100 FNU/NTU	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		
Minimum filling volume of the cell	15 ml		

Turbidity (Turb[®] 750 T)

Measuring principle	Nephelometric measurement according to US EPA 180.1
Light source	White light tungsten lamp

Calibration	3-P StdCAL	QuickCAL	FreeCAL
Measuring range depending on the calibration type	0.01... 1100 NTU	0 - 40 NTU	lowest - highest standard NTU
Resolution with the setting <i>Resolution</i> 0.001			
	In the range 0.001... 0.999 NTU	max. 0.001 NTU	
	In the range 1.00... 9.99 NTU	max. 0.01 NTU	
with the setting <i>Resolution</i> 0.01			
	In the range 0.01... 9.99 NTU	max. 0.01 NTU	
irrespective of the setting <i>Resolution</i>			
	In the range 10.0... 99.9 NTU	max. 0.1 NTU	
	In the range 100... 1100 NTU	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		
Minimum filling volume of the cell	15 ml		

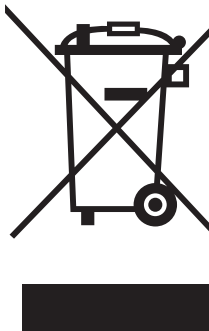
FCC Class A Equipment Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Disposal

Handle and dispose of all waste in compliance with local laws and regulations.

EU only: Correct disposal of this product — WEEE Directive on waste electrical and electronic equipment

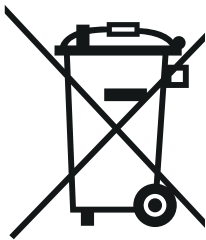


This marking on the product, accessories or literature indicates that the product should not be disposed of with other waste at the end of its working life.

To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

Waste from electrical and electronic equipment can be returned to the producer or distributor.

EU only: Correct disposal of batteries in this product



This marking on the battery, manual or packaging indicates that the batteries in this product should not be disposed of with other waste at the end of its working life. Where marked, the chemical symbols Hg, Cd or Pb indicate that the battery contains mercury, cadmium or lead above the reference levels in Directive 2006/66/EC. If batteries are not properly disposed of, these substances can cause harm to human health or the environment.

To protect natural resources and to promote material re-use, please separate batteries from other types of waste and recycle them through your local, free battery return system.

Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com.



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