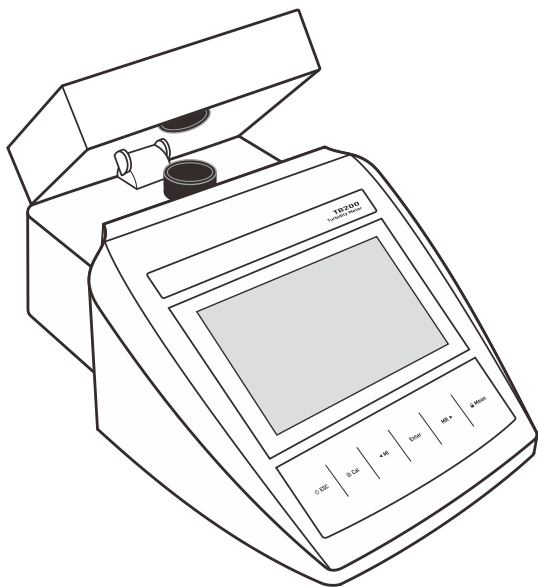


TB200 Laboratory Turbidity Meter

USER MANUAL



Introduction

Thank you for selecting the TB200 laboratory turbidity meter. This user manual provides a step-by-step guide to help you operate the meter, please carefully read the following instructions before use. Any use outside of these instructions may invalidate your warranty and cause permanent damage to the meter.

Environmental Conditions

Before unpacking, ensure that current environmental conditions meet the following requirements.

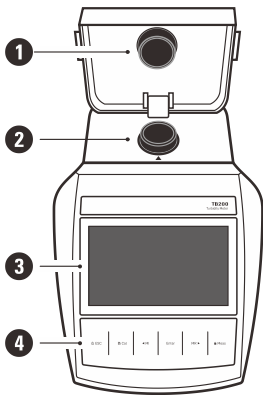
- Relative humidity is less than 80%
- Ambient temperature between 0°C (32°F) and 50°C (122°F)
- No ambient light and electromagnetic interference

Packing List

The following list describes all components of the meter. If any items are missing or damaged, contact the supplier immediately.

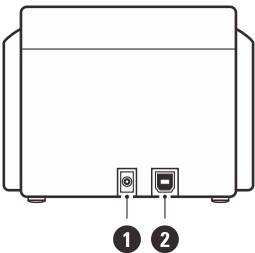
TB200 turbidity meter
Formazin standard solutions 0.02, 200, 500, 1000 NTU
Two sample vials
Lint-free cloth
DC 12V power adapter

Meter Overview



1	Light shield lid
2	Measurement chamber
3	Display
4	Membrane keypad

Connectors



1	Socket for power adapter
2	USB-B interface to computer

Keypad

Key	Function
ESC	<ul style="list-style-type: none">• Switch the meter on or off• Exit the calibration, settings, data logs and return to the measurement mode
Cal	<ul style="list-style-type: none">• Start calibration• Press and hold the key to enter the setup menu
MI	<ul style="list-style-type: none">• Store current reading to memory• Increase value or scroll up through a list of options
MR	<ul style="list-style-type: none">• View the data logs• Decrease value or scroll down through a list of options
Enter	Confirm the calibration or displayed option
Meas	<ul style="list-style-type: none">• Start measurement• Lock or unlock the measurement

Switching the Meter On and Off

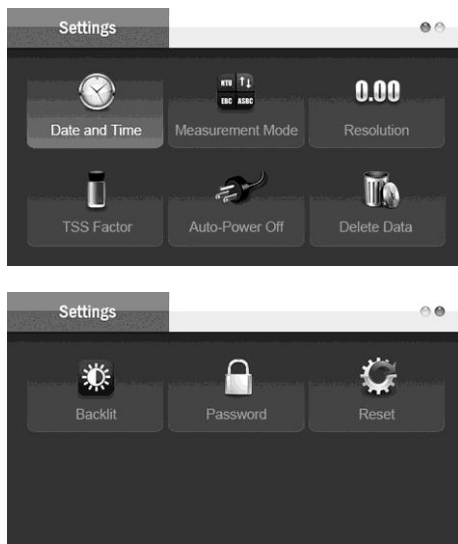
- Connect the 12V DC power adapter to the meter and wall outlet.
- Press the key and release to switch on the meter.
- Press and hold the key to switch off the meter.

Prior to Use

Switch on the meter and wait 10 minutes for meter to warm up.

Meter Setup

The TB200 turbidity meter contains an integrated setup menu for customizing the displayed option to meet measurement requirements. The following table describes the functions of each menu item.



Setup Menu

Date and Time

Set the year, month, day, hour, minute for data log.

Measurement Mode

Select the desired measurement mode and unit.

NTU	Nephelometric turbidity unit (default)
FNU	Formazin nephelometric unit
EBC	Turbidity unit of the European Brewing Convention
ASBC	Turbidity unit of American Society of Brewing Chemists
mg/L	Total suspended solids unit

Resolution

Set the resolution of the turbidity measurement.

0.1	default
0.01	

TSS Factor

Set the conversion factor for measurement of the total suspended solids.

0.13	default
------	---------

Auto-Power Off

If enabled, the meter will automatically switch off if no key is pressed within 2 hours.

2 hours	default
Disable	

Delete Data

Delete all data logs in the memory.

Delete all stored data	
Cancel	default

Brightness

Set the brightness level of backlight.

Password

Set the password protection for setup menu and calibration.

Enable	
Disable	default

Reset

Reset the meter to factory default settings. Note, the meter must be recalibrated.

Restore Factory Settings	
Cancel	default

Setting a Default Option

- 1.1 Press and hold the **⏏** key to enter the setup menu.
- 1.2 Press the **◀ / ▶** key to select a menu item or an option.
- 1.3 Press the **Enter** key to save.

i To exit the setting without saving changes, press the **ESC** key.

Setting the Password

The password protection feature is used to prevent the unauthorized calibration and settings. If enabled, the user must enter a 4-digit password to enter the setup menu or calibration mode.

- 2.1 Press and hold the **⏏** key to enter the setup menu.
- 2.2 Press the **◀** key to select the *Password*, press the **Enter** key to confirm.
- 2.3 Press the **◀** key to select the *Enable*. Press the **Enter** key, the screen shows 0000 and the cursor appears below the first digit.
- 2.4 Press the **◀ / ▶** key to set the password, press the **Enter** key to confirm until the meter returns to the measurement mode.




Unlock the Password

If your password has created, the meter will show Password Protection screen when pressing the **⏏** **Cal** key. Press the **◀ / ▶** key to enter the password, press the **Enter** key to confirm, the meter will unlock immediately. If you forgot your password, please contact supplier and providing the serial number of the meter.

Factory Reset

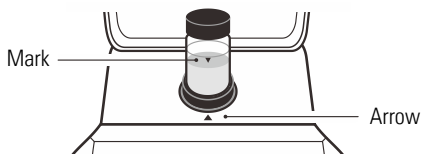
The Reset feature is used to restore the meter back to factory default settings. If enabled, all of the calibration data and selected options will be deleted or reset, the meter must be recalibrated.

i Note, the data logs will not be deleted.

- 3.1 Press and hold the  key to enter the setup menu.
- 3.2 Press the  key to select the *Reset*, press the **Enter** key to confirm.
- 3.3 Press the  key to select the *Restore Factory Settings*. Press the **Enter** key, the screen shows "Are you sure you want to restore factory settings?".
- 3.4 Press the **Enter** key to confirm or the ESC key to cancel.

Measurement and Calibration Hints

- Never pour the sample directly into the measurement chamber and using a vial to perform measurement.
- Make sure the sample in vial is homogeneous. Do not shake or agitate the solution violently to prevent air bubbles.
- Keep the outside of vial clean and dry. If necessary, wipe the vial with a lint-free cloth.
- If the vial has scratches or scuffs, replace a new one (order code TB-GV).
- During the calibration and measurement processes, make sure the vial is positioned in the measurement chamber and the triangle mark on the vial must be aligned with the arrow on the meter.





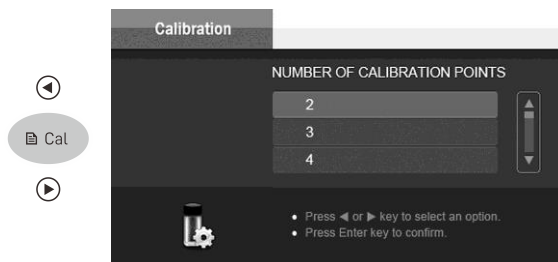
- Always close the light shield lid to prevent the measurement errors from ambient light.
- Wash the sample vial with distilled water after measurement. Any residues can cause inaccurate readings.



Turbidity Calibration

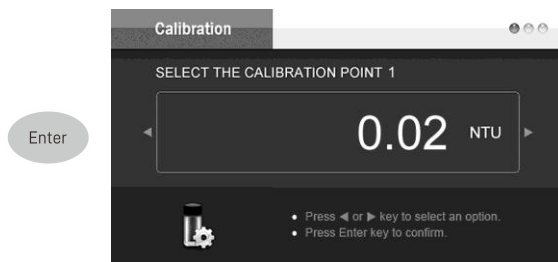
The TB200 turbidity meter allows turbidity calibration up to 7 points with minimum of 2 points, the default calibration points include the 0.02, 10, 200, 500, 1000, 1500 and 2000 NTU. For better accuracy, we recommend to select a calibration point close to the sample value you are measuring. Note, the meter is calibrated with Formazin Standards at the factory and does not require user calibration before use.

Calibrating the Meter

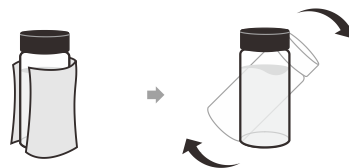
1. Press the **Cal** key to enter the calibration mode. Press the  /  key to select the number of calibration points.



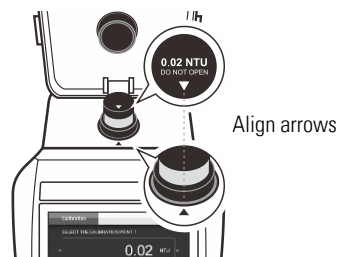
2. Press the **Enter** key, the screen shows 0.02 NTU. If necessary, press the  /  key to select first calibration point, the meter will perform the calibration from the low to high turbidity.



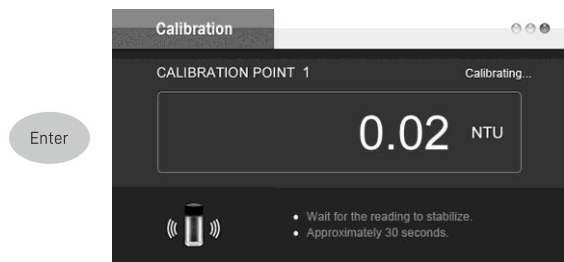
3. Take out the corresponding turbidity standard from accessory box (e.g., 0.02 NTU), wipe the vial with a lint-free cloth to remove fingerprints. Hold the vial cap and gently inverting vial several times, ensure that the turbidity standard is homogeneous and no air bubbles.



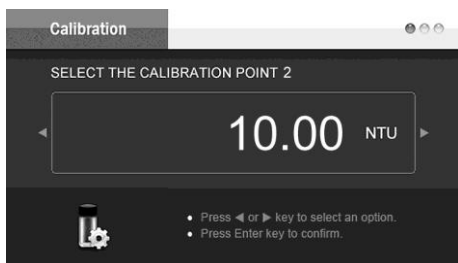
4. Insert the vial into the measurement chamber. Align the triangle mark on the vial cap with the arrow on the meter. Close the light shield lid.



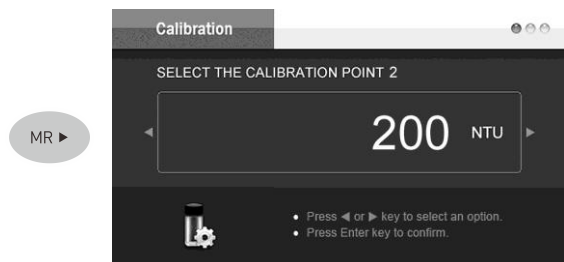
5. Press the **Enter** key, the meter begins calibration. The Calibrating icon shows on the upper right corner of the screen.



When the reading stabilizes, the meter will automatically show next calibration point.



If necessary, press the **>** key to select a desired calibration point.



6. Repeat steps 3 through 5 until the screen shows "Calibration is Completed", the meter returns to the measurement mode.



To exit the calibration without saving calibrated values, press the **ESC** key.

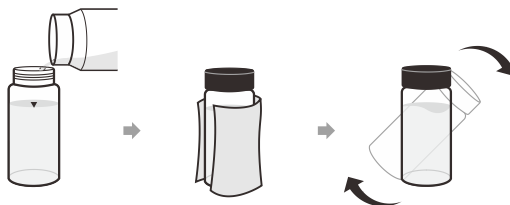
Turbidity Measurement

An accurate turbidity measurement depends on good measurement techniques. Factors such as clean sample vial, positioning of vial in the measurement chamber, covering the vial with the light shield lid, meter calibration, removal of bubbles, etc. Refer to the **Measurement and Calibration Hints** section for detailed instructions on page 3.

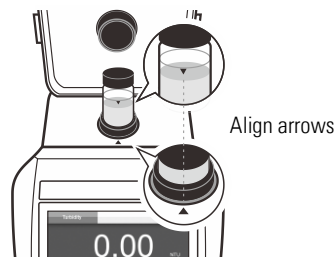
Measuring the Low Turbidity Sample



For the low turbidity samples (< 200 NTU), we recommend that using the same vial to perform the calibration and measurement.

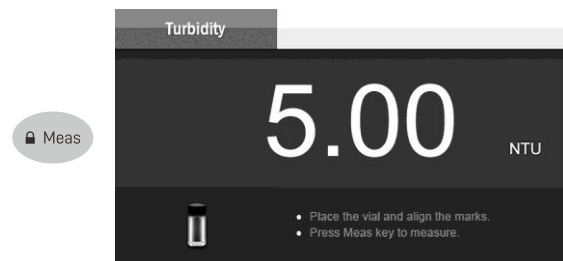
- 1.1 Rinse the vial with approximately 10 ml of sample. Cap and upend the vial several times. Discard the used sample and repeat the rinsing procedure two more times.
- 1.2 Fill the vial with the sample. Cap the vial and wipe with a lint-free cloth to remove waterdrops and fingerprints. Hold the vial cap and gently inverting vial several times, ensure that the sample is homogeneous and no air bubbles.



- 1.3 Insert the vial into the measurement chamber. Align the triangle mark on the vial with the arrow on the meter. Close the light shield lid.



- 1.4 Press the **Meas** key, the meter begins measurement, the  icon shows on the screen. When the reading stabilizes, the icon will automatically switch to .



- 1.5 If necessary, press the **Meas** key to take a new measurement.



During the measurement, press the **Lock** key, the reading will be locked. Press the key again to resume measurement.

Measuring the High Turbidity Sample

For the high turbidity samples (>2000 NTU), the solution must be diluted before measurement. The dilution water can be obtained by filtering distilled water through a < 0.45 µm filter membrane.

- 2.1 Repeat steps 1.1 through 1.4 above and record the reading.
- 2.2 Calculate the true turbidity of the original sample using the following formula.

$$T = [T_d (V_s + V_d)] / V_s$$

Where:

T = True turbidity of the original sample

T_d = Measured value

V_s = Volume of the original sample (ml)

V_d = Volume of the dilution water (ml)

Total Suspended Solids Measurement

The TB200 turbidity meter contains a Total Suspended Solids mode and needs to enter a conversion factor before measurement.

Calculating the TSS Factor




1. Rinse the filter disk with distilled water to remove any solids that may remain. Put the filter disk in a watch glass and dry them in a 104°C (219°F) drying oven for 1 hour.
2. Remove the filter disk and watch glass and put in a desiccator. Immediately cover the desiccator. Wait for them decrease to room temperature.
3. Weigh the filter disk and watch glass and record the mg value as B.
4. Filter the 100 ml of sample through pre-weighed filter disk. Put the filter disk and watch glass in a 104°C (219°F) drying oven for 1 hour.
5. Remove the filter disk and watch glass and put in a desiccator. Immediately cover the desiccator. Wait for them decrease to room temperature.
6. Weigh the filter disk and watch glass and record the mg value as A.
7. Calculate the TSS value using the formula below.

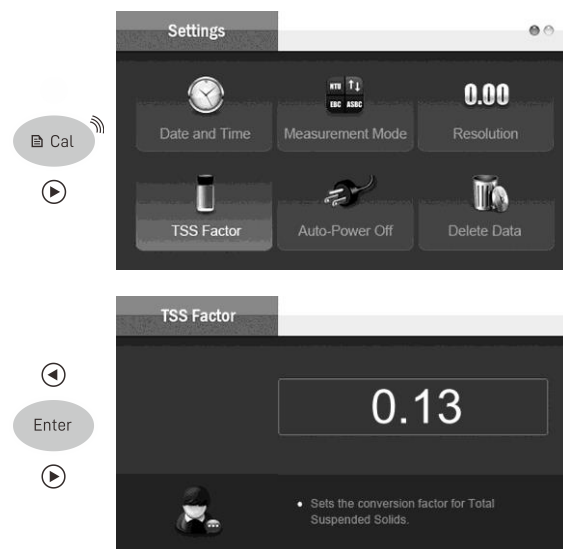
$$TSS \text{ (mg/L)} = (A - B) / 0.1$$

8. Fill the vial with the sample.
9. Repeat turbidity measurement steps 1.1 through 1.5 and record the NTU value. Calculate the TSS conversion factor using the formula below.




$$\text{Factor} = \text{NTU} / \text{TSS (mg/L)}$$

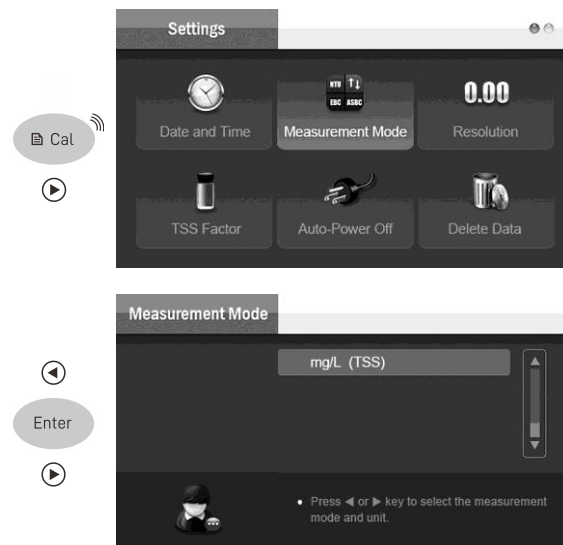
Setting the TSS Factor

1. Press and hold the  key to enter the setup menu.
2. Press the  key to select the *TSS Factor*, press the **Enter** key to confirm.
3. Press the  key to set the conversion factor, press the **Enter** key to save.



Selecting the TSS Measurement Mode

1. Press and hold the  key to enter the setup menu.
2. Press the  key to select the *Measurement Mode*, press the **Enter** key to confirm.
3. Press the  key to select the *mg/L (TSS)*, press the **Enter** key to enter the Total Suspended Solids measurement mode.



TSS Measurement

The measurement method of the Total Suspended Solids is the same as the turbidity. Refer to the **Turbidity Measurement** section for detailed instructions on page 4.


Data Management

Storing a Measurement Result

In the measurement process, press the **MI** key to store the reading into the memory, the screen will show "Data is stored in memory".

Viewing the Data Logs

- 1.1 Press the **MR** key in the measurement mode, the screen shows the stored readings.




Data Log		
No.	Date and Time	Measured Value
1	2016 - 11 - 5 10 : 38 : 59	110.5 NTU
2	2016 - 11 - 5 15 : 20 : 33	22.7 NTU
-	- - : :	
-	- - : :	
-	- - : :	

- 1.2 Press the ◀ / ▶ key to switch pages.
- 1.3 Press the **ESC** key, the meter returns to the measurement mode.

Deleting the Data Logs

If the memory is full, the meter will automatically show a reminder when the **MI** key is pressed. To delete data logs, please follow the steps below.

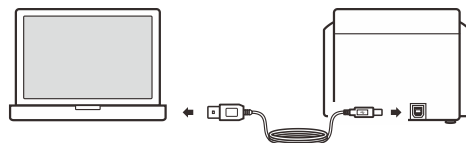
- 2.1 Press and hold the  key to enter the setup menu.
- 2.2 Press the ◀ / ▶ key to select the *Delete Data*, press the **Enter** key to confirm.
- 2.3 Press the ◀ / ▶ key to select the *Delete all stored data*, press the **Enter** key, the screen shows "Are you sure you want to delete all stored data?".
- 2.4 Press the **Enter** key to confirm or the **ESC** key to cancel.

Communication

The TB200 turbidity meter is capable of transferring the data to the computer or importing the data to Excel by a free DAS software. You are able to download this software from our official website. Before installation, ensure that the Windows 10 operating system has been installed on your computer.

Receiving the Data

1. Connect the USB cable to the meter and computer.



2. Click the **DAS** icon, the system automatically scans an available communication port and shows a message box "Found a port on your computer".
3. Click the **OK**, the application starts.
4. Click the **Connect**, the screen shows "Port is connected".
5. Click the **OK**, then click the **Receive**, the stored data will transfer to computer automatically.



If your computer can not find a communication port, please click the file "CP210xVCPInstaller_x64.exe or CP210xVCPInstaller_x86.exe" to update the drive program.

Creating an Excel File

When the transfer is completed, click the **Save as Excel** button, the readings in data sheet will automatically convert to Excel file.



Note, once the software is closed, all received data will be lost and can not be recovered.

Appendix

Indexing a Sample Vial

The United States Environmental Protection Agency recommends that the vial used for turbidity calibration or sample measurement be indexed. Its purpose is to obtain a position which provides the lowest turbidity reading. The indexing methods are as follows.

- 1.1 Fill the vial with the distilled water (< 0.5 NTU). Cap the vial.
- 1.2 Wipe the vial with the lint-free cloth. Ensure that the outside of vial is clean and dry.
- 1.3 Place the vial in the measurement chamber. Align the triangle mark on the vial with the arrow on the meter.
- 1.4 Press the **Meas** key, the meter begins the measurement.
- 1.5 Slowly rotate the vial approximately 45°. Close the light shield lid and record the reading.
- 1.6 Repeat the step 1.5 until the lowest turbidity reading is shown. Mark this position on the vial.

Matching the Sample Vials

For better accuracy and repeatability, using an indexed sample vial is best choice for turbidity measurement. If you need to use a few vials, match these vials are necessary.

- 2.1 Repeat steps 1.1 through 1.6 above for each vial and record the readings.
- 2.2 Find the closest position of these vials measuring value and mark it.

Preparation of Formazin Standards

Turbidity-Free Water:

The turbidity-free water is used for preparation of turbidity standards and is prepared by filtering distilled water through a 0.45 µm or smaller pore-sized membrane.

Turbidity Standards:

4000 NTU: Dissolve 1 gram hydrazine sulfate ($\text{NH}_2)_2 \bullet \text{H}_2\text{SO}_4$ in the turbidity-free water and dilute to 100 ml in a volumetric flask. Dissolve 10 grams hexamethylenetetramine ($\text{CH}_2)_6\text{N}_4$ in the turbidity-free water and dilute to 100 ml in a volumetric flask. Mix 5 ml of hydrazine sulfate and 5 ml of hexamethylenetetramine solutions in a 100 ml volumetric flask and let stand 24 hours at $25 \pm 3^\circ\text{C}$.

2000 NTU: Mix 50 ml of 4000 NTU standard in a 100 ml volumetric flask and dilute to the mark.

1500 NTU: Mix 37.5 ml of 4000 NTU standard in a 100 ml volumetric flask and dilute to the mark.

1000 NTU: Mix 25 ml of 4000 NTU standard in a 100 ml volumetric flask and dilute to the mark.

500 NTU: Mix 12.5 ml of 4000 NTU standard in a 100 ml volumetric flask and dilute to the mark.

200 NTU: Mix 10 ml of 4000 NTU standard in a 100 ml volumetric flask and dilute to the mark. Mix 50 ml of above standard in a 100 ml volumetric flask and dilute to the mark.

10 NTU: Mix 10 ml of 4000 NTU standard in a 100 ml volumetric flask and dilute to the mark. Mix 2.5 ml of above standard in a 100 ml volumetric flask and dilute to the mark.

- Or -

Mix 2 ml of 500 NTU standard in a 100 ml volumetric flask and dilute to the mark.

Optional Accessories

Order Code	Description
TB-GV	Glass sample vial, 60 (H) × 25 (Ø) mm (2.36 × 0.98 in.)
TB-CAL	Turbidity standards 0.02, 200, 500, 1000 NTU, 20 ml
USB-B	USB connector A to B, 1 m (3.3 ft.) cable
DCPA-12V	DC 12V power adapter, european standard plug

Specifications

Model	TB200
Measurement Method	ISO 7027 nephelometric method (90°)
Range	0 to 2000 NTU/FNU 0 to 500 EBC 0 to 9999 ASBC TSS range depends on conversion factor
Resolution	0.01 NTU (0 to 99 NTU) 0.1 NTU (100 to 999 NTU) 1 NTU (1000 to 2000 NTU)
Accuracy	±2% of reading (0 to 500 NTU) ±3% of reading (501 to 2000 NTU)
Calibration Points	2 to 7 points
Calibration Standards	0.02, 10.00, 200, 500, 1000, 1500, 2000 NTU
Light Source	Infrared-emitting diode (850 nm wavelength)
Detector	Silicon photodiode
Stray Light	< 0.02 NTU
Sample Vial	60 (H) × 25 (Ø) mm (2.36 × 0.98 in.)
Sample Volume	20 ml
Memory	200 data sets
Communication	USB interface
Operating Temperature	0 to 50°C (32 to 122°F)
Storage Temperature	0 to 60°C (32 to 140°F)
Relative Humidity	< 80% (non-condensing)
Display	4.5 in. TFT LCD
Power Requirements	DC 12V/2A power adapter
Dimensions	250 (L) × 177 (W) × 96 (H) mm (9.8 × 6.9 × 3.7 in.)
Weight	1.2 kg (2.6 lb)

Disposal

This product is required to comply with the European Union's Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC and may not be disposed of in domestic waste. Please dispose of product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.



Warranty

The warranty period for meter is one year from the date of shipment. Above warranty does not cover the turbidity standards and glass vials.

Out of warranty products will be repaired on a charged basis.

The warranty on your meter shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

For more information, please contact the supplier.