Lovibond®

Turbidimeter

TurbiCheck WL

GB Instruction Manual

Short manual

Routine Measurement

1. Press [On/Off] key.
2. Rinse a clean vial with the sample three times. Fill the vial with the sample. Replace cap and clean the vial with the supplied cleaning tissue ensuring that the surface is clean and dry.
3. Place the vial in the sample chamber and align correctly.
4. Press [↵] key to start measurement.
5. Record the NTU value

User Calibration

1. Press [Cal] key.
2. Place the 1000 NTU standard in the sample chamber, making sure that the marks are aligned. Press [↵] key. Reading starts automatically after count down.
3. Place the 10 NTU standard in the sample chamber, making sure that the marks are aligned. Press [↵] key. Reading starts automatically after count down.
4. Place the 0,2 NTU standard in the sample chamber, making sure that the marks are aligned. Press [↵] key. Reading starts automatically after count down.

Safety precautions

⚠ CAUTION ⚠

Please read the instruction manual before unpacking, setting up or using the turbidimeter. Please read the description completely before performing the test. Be aware of the risks of using the required standards by reading the MSDS (Material Safety Data Sheets). Failure could result in serious injury to the operator or damage to the instrument.

MSDS:

www.lovibond.com

⚠ CAUTION ⚠

The accuracy of the instrument is only valid if the instrument is used in an environment with controlled electromagnetic disturbances according to DIN 61326.
Wireless devices. e.g. wireless phones, must not be used near the instrument.

TurbiCheck WL 03/2011

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Part 1

Descriptions

1.1 General description

The TurbiCheck WL is designed to meet the criteria specified in U.S. EPA 180.1 on turbidity measurement. The TurbiCheck WL allows for the measurement of turbidity in the field. The instrument features auto ranging over the range of 0.01 to 1100 NTU/FNU.

The turbidimeter is supplied in a case complete with accessories and spares. The delivered standards guarantee stable and reproducible results.

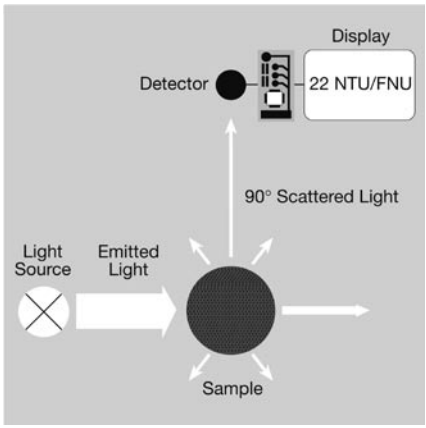
1.2 Operating principles

The instrument measures turbidity in the range 0.01 to 1100 NTU/FTU featuring auto ranging. The light source is a tungsten lamp compliant with U.S. EPA 180.1.

The emitted light is reflected by turbidity in the sample. The scattered light will be detected at an angle of 90° by a photo-diode.

This principle is part of ISO 7027.

The international Reference Standard for turbidity is a Formazin solution. The TurbiCheck WL is based on secondary standards which are a U.S. EPA approved alternative standard to Formazin.



1.3 Factory calibration

The turbidimeter TurbiCheck WL is factory calibrated with secondary standards and does not require user calibration before use. See chapter 2.3.2 User Calibration.

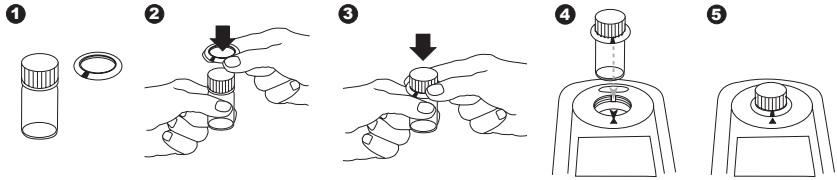
1.4 Important Notes

1.4.1 Guidelines for turbidity measurements

a) Vials and caps should be cleaned thoroughly after each test to avoid interferences. Minor residuals can cause errors.

b) The outside of the vial must be clean and dry, before starting the test. Wipe the vials with a smooth cloth to remove fingerprints or waterdrops.

c) The vials must be positioned in the sample chamber with the mark on the vial aligned with the mark on the instrument.



d) Always perform the test with securely capped vials.

e) Bubbles on the inside of the vial lead to errors. See chapter 2.3.3.1 Removing bubbles (Degassing).

f) Avoid spillage of water in the sample chamber. If water should leak into the instrument, it can destroy electronic components and cause corrosion.

g) Large temperature differences between the instrument and the environment can lead to errors – e.g. due to the formation of condensation in the area of the lens or on the vial. For best results, perform tests with sample temperatures between 20°C (68°F) and 25°C (77°F).

h) To avoid errors caused by stray light do not use the instrument in bright sunlight.

i) Use the instrument in a clean, dust-free environment on a table that is free from vibration / agitation.

1.4.2 Cleaning of vials & sampling containers

Vials, caps and sampling containers should be cleaned thoroughly after each test to avoid influences. Minor residuals can cause errors.

Residuals:

Cleaning of the vials will vary according to the different types of water sample used.

- Replace scratched vials immediately.
- Rinse vials thoroughly with deionised water after each measurement.
- Clean all glassware thoroughly with laboratory detergent and rinse with deionised water.
- Clean heavy contamination by filling the vials with 1:1 HCL followed by multiple rinses with distilled or deionised water.
- Allow vials to air dry.
- Touch vials only at the top to minimise dirt and fingerprints.
- Wipe the vials with a lint-free cloth to remove waterdrops and fingerprints.

Part 2

Operating manual

2.1 Operation

2.1.1 Commissioning

This manual contains basic instructions for the operation, care and maintenance of the instrument. The safety protection provided by this equipment may be impaired if it is used in a manner not described in this manual. It is recommended that all operators should read this manual prior to working with this instrument.

Before working with the TurbiCheck WL insert the batteries (part of delivery). See chapter 2.1.2 Replacement of batteries.

2.1.2 Replacement of batteries

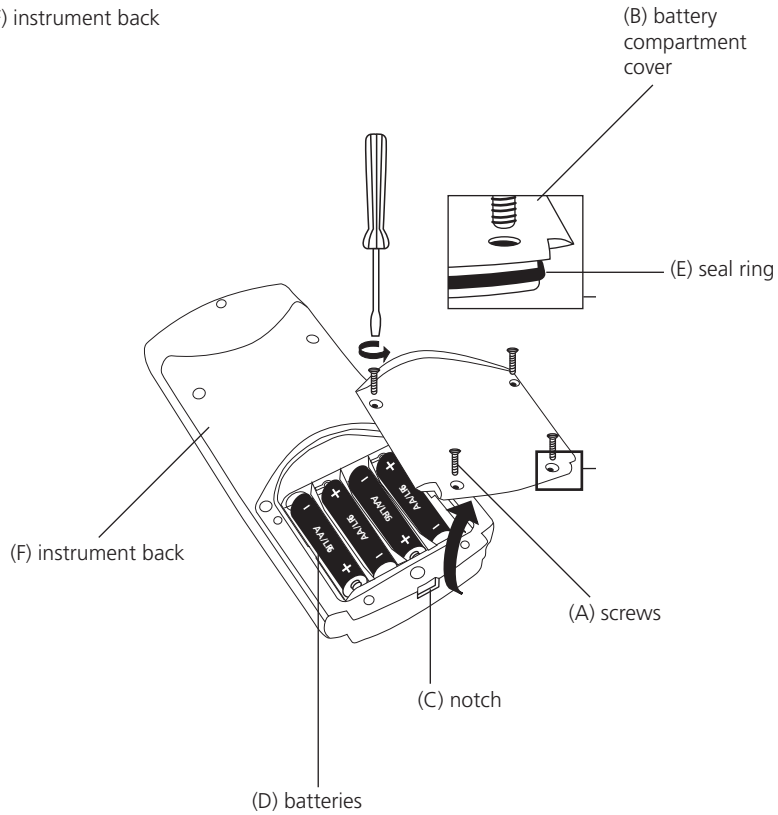
Recommendation: Don't use rechargeable batteries!

1. Switch the instrument off if neccessary.
2. If necessary remove vial from the sample chamber.
3. Place the instrument upside down on a clean and even surface.
4. Unscrew the four screws (A) of the battery compartment cover (B).
5. Lift off battery compartment cover at the notch (C).
6. Remove old batteries (D).
7. Place 4 new batteries.
   Ensuring the correct polarity!
8. Replace the battery compartment cover.
   Check the seal ring (E) of the notch to make sure if is tight-fitting
9. Tighten the screws carefully.

CAUTION
Dispose of used batteries in accordance with all federal, state and local regulations.

2.1.3 Instrument (explosion drawing):

(A) screws
(B) battery compartment cover
(C) notch
(D) batteries: 4 batteries (AA/LR6)
(E) seal ring
(F) instrument back



CAUTION:
To ensure that the battery compartment is water proof:
- **seal ring (E) must be in position**
- **battery compartment cover (B) must be fixed with the four screws**

2.2 Overview of function keys

The key pad has five buttons:

Switching the photometer on or off.

Perform a calibration.

Perform a measurement. When pressed and held this key can be used to index the current sample. When the key is released a reading or calibration starts.

Change the calibration points.

2.2.1 Automatic switch off

The instrument switches off automatically after 5 minutes. Press any key to avoid the instrument switching off.
As long as the instrument is working the automatic switch off is inactive.

2.3 Operation mode

This instrument measures turbidity. The turbidity is reported in **N**ephelometric **T**urbidity **U**nits (NTU) and **F**ormazin **N**ephelometric **U**nits (FNU). Readings above 1100 NTU are outside the range of this instrument.

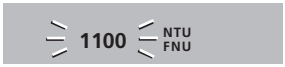
Note:
Nephelometric turbidity units (NTU's) are numerically equivalent to Formazin nephelometric units (FNU's).

Below are some typical screens and a description of when you would see them.

When turning on the instrument or after a calibration, this screen indicates that the instrument is ready to read.

The instrument will display moving dashes on the screen for 6-7 seconds prior to displaying a value. This will occur prior to taking a reading and indexing. No keypad presses will function during this time.

A typical reading in the display:

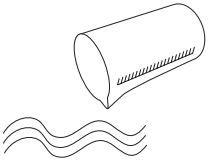


An overrange is indicated by a flashing 1100.

2.3.1 Perform turbidity measurement

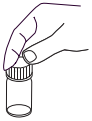
Accurate turbidity measurements depend on good, consistent measurement techniques. This includes working with clean sample vials in good condition and removing air bubbles. Samples should be measured immediately to prevent changes in sample characteristics due to temperature shifts and settling.

Instrument operation:

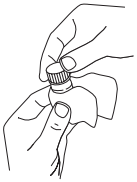


Take a representative sample in a clean container.

Rinse the vial with approximately 10 mL of the sample (2/3 of cuvette volume), capping the cuvette with the black light shield (cuvette top) and inverting several times. Discard the used sample and repeat the rinsing procedure two more times.

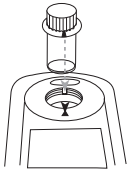


Fill a clean and dry vial with the sample up to the mark. Cap the vial.



Take care to handle the vial by the top. Wipe the vial with the supplied cleaning tissue to remove waterdrops and finger prints.

Switch on the instrument.

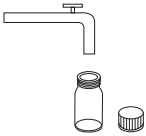


Place the vial in the sample chamber making sure that the positioning is correct, with the marks are aligned.

Index the cuvette by pressing and holding down the [↵] key while rotating the cuvette to identify the lowest reading (the displayed turbidity is continuously updated on the display). Once the cuvette is indexed, release the [↵] key to display the measured turbidity (see chapter 2.3.3.5 Indexing single sample vials).

1.00 NTU

The result is shown in the display in NTU.



Remove the vial and clean it.

2.3.2 User calibration

2.3.2.1 When to calibrate?

The turbidimeter was calibrated at the factory and does not require user calibration before use.

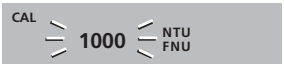
Therefore, it is possible to use the instrument directly out of the box. However, re-calibration of the instrument is recommended to help with familiarization and the operation of the instrument and the calibration procedures. In addition, re-calibration is recommended at least once every three months.

The instrument requires three standards to be fully calibrated.

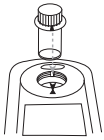
During calibration, the instrument performs several system self-diagnostics. As such, several warning messages may be displayed. If the instrument detects an irregularity (detectors or lamp) a warning message will be displayed. If this occurs please contact an authorised technical services department.

2.3.2.2 Calibration Procedure

The following procedure is recommended to perform a full range calibration. Ensure that the calibration standards have been indexed prior to proceeding.



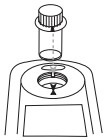
1. Select the calibration function of the instrument by pressing the **CAL** button once. The **"CAL"** icon will be illuminated on the display with **"1000"** flashing indicating the standard required for this step of the calibration.



2. Insert the 1000 NTU standard into the sample chamber and press down until the cuvette snaps fully into the instrument. Align the indexing ring with the arrow on the instrument (see section 2.3.3.4 if the standard is not already indexed).

3. Press and hold the [↵] key while making fine adjustments to the indexing. Release the button to initiate the calibration. The display will now show a 30 second countdown.

4. When the instrument has completed the calibration on the 1000 NTU standard, it will briefly display **1000** to indicate that it was calibrated and then prompts for the 10 NTU standard with a flashing **"10.0"**.



5. Insert the 10.0 NTU standard into the sample chamber and press down until the cuvette snaps fully into the instrument. Align the indexing ring with the arrow on the instrument (see section 2.3.3.4 if the standard is not already indexed).

6. Press and hold the [↵] button while making fine adjustments to the indexing. Release the button to initiate the calibration. The display will now show a 60 second countdown.

7. When the instrument has completed calibration on the **10.0** NTU standard, it will briefly display 10.0 to indicate that it was calibrated and then prompts for the 0.02 NTU standard with a flashing **"0.02"**.

8. Insert the 0.02 NTU standard into the sample chamber and press down until the cuvette snaps fully into the instrument. Align the indexing ring with the arrow on the instrument (see section 2.3.3.4 if the standard is not already indexed).

9. Press and hold the [↵] button while making fine adjustments to the indexing. Release the button to initiate the calibration. The display will now show a 30 second countdown.

10. When the instrument has completed the calibration on the 0.02 NTU standard, the instrument returns to the read mode and is ready to read.

Notes:

1. Exiting the calibration mode may be done at the end of any step by pressing the CAL button. The instrument will store any of the values calibrated prior to exiting.
2. Any of the three calibration points (1000 NTU, 10 NTU & 0.02 NTU) can be selected for individual calibration by using the [▲] and [▼] keys.
3. The required calibration values are set in software and cannot be changed.

2.3.2.3 Calibration Error

If the screen shown below is displayed after calibration, the internal diagnostics have determined that the calibration standards were bad or that they were inserted in the wrong order. Either check the standards and recalibrate or restore the factory calibration as mentioned below.

2.3.2.4 Restore Factory Calibration

If the above display appears and it cannot be corrected by recalibration, the operator can restore the factory calibration. Please note that the instrument may operate with reduced accuracy until a new calibration can be performed.

Push and hold the [▲] key. Now push and release the [↵] key then release the [▲] key. The instrument will turn off automatically when completed. When the instrument is switched on again the error message should be gone.

2.3.2.5 Calibration Standards

We recommend the following materials for calibration to achieve the accuracy stated in this manual:

1. 1000 NTU Secondary Standards*
2. 10.0 NTU Secondary Standards*
3. 0.02 NTU Secondary Standards*

It is well known that diluted Formazin is unstable. If Formazin is used to calibrate the instrument, ensure that fresh dilutions of Formazin are used only once to achieve the accuracy quoted for the instrument. A Formazin Stock Solution Kit is available.

Secondary standards* with the mentioned values above have a limited shelf life of one year. If secondary standards are used to calibrate the instrument, review the expiry date to ensure that the standards have not expired.

**Secondary standards are a U.S. EPA (Environmental Protection Agency of the USA) approved alternative standard to Formazin.*

2.3.3 Measurement techniques

2.3.3.1 Degassing – Removal of Bubbles

Attention: Do not use with secondary standards!

If the Turbidity is low it is important to remove air bubbles from the sample using one, or a combination of the following methods:

- Addition of a surfactant
- Application of a partial vacuum
- Application of heat
- Use of an ultrasonic bath

This procedure can influence the nature of the sample and therefore the turbidity reading.

Type of sample	Method	Description of the method	Notes:
Samples that are oversaturated with air	Addition of a surfactant	Surfactants minimise the surface tension of a sample, allowing entrained gases to disappear.	Particles in the sample settle more rapidly, so the sample must be swirled before being measured. Vigorous shaking causes the surfactant to foam.
Liquid samples without readily volatile components	Use of a partial vacuum	A vacuum can be created with the help of a clean, oil-free syringe or pump fitted onto the cuvette. The vacuum reduces the atmospheric pressure, so that trapped air bubbles can be removed.	Volatile components can escape from the sample. The vacuum may compound the air bubble problem in viscous samples.
Viscous samples	Use of an ultrasonic bath	The ultrasonic waves excite the sample, effectively removing air bubbles from most samples.	Ultrasonic waves can change the particle size in the sample, therefore changing the turbidity.
Very viscous samples	Heating the sample	Heating the sample makes it less viscous, air bubbles can disappear more easily. The sample has to cool to its original temperature.	Volatile components can disappear from the sample. The attributes of suspended particles change, therefore changing the turbidity.

2.3.3.2 Measurement of high turbidity values

High turbidity samples with more than 1100 NTU ("overrange") may be diluted. The dilution water should be a water with very low turbidity.

For accurate dilution proceed as follows:

Mix the water sample well and pipette x ml of the water sample (see table below) into a 100 ml volumetric flask. Fill with low turbidity water up to mark and mix gently.

Water sample (x ml)	Multiplication factor
10	10
25	4
50	2

Add the diluted water sample to the vial, perform reading and multiply the displayed result with the multiplication factor.

Note:
The dilution of the water sample may alter the characteristics of the suspended particles and produce erroneous results.

2.3.3.3 Measurement of low turbidity values

Accurate and repeatable measurements of low turbidity values depend on exact measurement techniques.

- Use a clean, unscratched and indexed vial.
- Rinse the vial three times with the sample.
- Allow the vial to stand for 1 – 5 minutes so that bubbles can disappear.
- Carefully invert the vial (so that settled particles disperse in the sample).
- Place the vial in the sample chamber and press the [↵] key (see chapter 2.3.3.5 Indexing a single sample vial).
- Perform multiple measurements, until a reproducible value is displayed (leave the vial in the sample chamber).

Note the smallest steady and reproducible value.

2.3.3.4 Indexing and matching sample vials

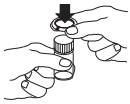
The United States Environmental Protection Agency (U.S. EPA) recommends that cuvettes used for instrument calibration or sample measurement be indexed. To comply with this recommendation, each calibration standard is supplied with an indexing ring and each instrument has a reference point for quick and repeatable indexing of the calibration standard.

Matched sample vials are required to minimise the effects of optical variation from glass vial to glass vial. Alternatively an indexed single sample vial can be used for every measurement.

2.3.3.5 Indexing a single sample vial

Switch the instrument on.

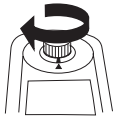
Hold the vial by the cap and clean it with the supplied cleaning tissue to remove water spots and finger prints.



Install the indexing ring.

Place the vial in the sample chamber making sure that the marks are aligned.

Press [↵] key and hold.



While holding down the [↵] key, slowly rotate the calibration standard one complete revolution (360°) pausing between increments to allow the display to update.

While rotating the standard, observe the turbidity reading and locate the cuvette position with the lowest turbidity reading.

With the calibration standard positioned at the location having the lowest turbidity reading, install the Indexing Ring over the black light shield on the standard so that the pointer on the ring aligns with the reference arrow on the instrument.

Part 3

Enclosure

3.1 Unpacking the instrument

Carefully inspect all items to ensure that every part of the list below is present and no visible damage has occurred during shipment. If there is any damage or something is missing, please contact your local distributor immediately.

3.2 Delivery content

Standard contents of the TurbiCheck WL:

☑

- ❑ 1 TurbiCheck WL in plastic case
- ❑ 4 batteries (Type AA/LR 6)
- ❑ 2 Round vials with cap, height 54 mm, Ø 24 mm
- ❑ 1 Beaker cup, plastic, 100 ml
- ❑ Secondary Standard 0.02 NTU
- ❑ Secondary Standard 10.0 NTU
- ❑ Secondary Standard 1000 NTU
- ❑ 1 Cleaning tissue
- ❑ 1 Screwdriver
- ❑ 1 Instruction manual
- ❑ 1 Short manual
- ❑ 1 Guarantee declaration

3.3 Technical data

Principle	nephelometric white light principle (Non Ratio)
Display	4 digit 7 segment LCD with specific characters
Light source	Tungsten lamp, according to U.S. EPA 180.1
Range	0.01 – 1100 NTU[1)]
Resolution	0.01 – 99.9 NTU = 0.01 NTU 100 – 999.9 NTU = 0.1 NTU 1000 – 1100 NTU = 1 NTU
Accuracy	± 2 % of reading or ± 0.01 NTU from 0.01 to 500 NTU ± 3 % of reading from 500 to 1100 NTU
Repeatability	± 1 % of reading or ± 0.01 NTU which ever is greater
Operation	Acid and solvent resistant touch-sensitive keyboard
Power supply	4 batteries (Type AA/LR 6); lifetime: approx. 26 h continuous use or 3500 tests
Auto off	5 minutes after last function
Dimensions	approx. 210 x 95 x 45 mm (unit) approx. 395 x 295 x 106 mm (case)
Weight (unit)	approx. 450 g
Working conditions	0 – 40°C at max. 0–90% relative humidity (without condensation)

[1)] FNU is equivalent to "Non Ratio" instruments.

Subject to technical modification!

To ensure maximum accuracy of test results, always use the calibration standards supplied by the instrument manufacturer.

3.4 Abbreviations

Abbreviation	Definition
NTU	Nephelometric Turbidity Unit
FTU	Formazine Turbidity Unit
FNU	Formazine Nephelometric Units
FAU	Formazine Attenuation Units
mg/l	Milligram per litre
ppm	Parts per million

3.5 Trouble-shooting

3.5.1 Operating messages in the display / error display

Display

All icons that can appear on the display are shown in the picture. The display is used for reporting the turbidity levels and to provide user guidance in the calibration routine. In addition, the display also has other icons that are used to indicate when the instrument is in calibration mode & to indicate error conditions and battery warnings.

System Warning Messages

Automatic warning messages are generated to provide specific diagnostic information about the instrument. These messages are for the operator's use and do not indicate a reduction in the performance of the instrument or a failure of any component in the instrument.

Battery Low Indicator

There are two battery warning levels. A flashing battery icon on the display indicates that the batteries need to be replaced, but the readings are still accurate. This is a warning that the batteries are low.

A steady battery icon on the display indicates that power level is too low and the readings may be out of specification. Under this condition, the batteries should be replaced as soon as possible to ensure that the instrument will continue to function properly. If the batteries get too low for operation, the instrument will turn off & the instrument may not turn on until the batteries have been replaced. See chapter 2.1.2. Replacement of batteries.

System Error Messages

If an error is identified the instrument will turn on the error icon (ERR).

Error	Trouble shooting
ERR Icon on	Internal Error – contact your local distributor
ERR Icon on Display reads **CAL**	Bad standards or standards in wrong order (see chapter 2.3.2.3)

3.6 Declaration of CE-Conformity

The manufactuer: **Tintometer GmbH**

Schleefstraße 8-12
44287 Dortmund
Deutschland

declares, that this product

Product name: **TurbiCheck WL**

Conforms with DIN EN 61 326 for specific defined electromagnetic environments.
Conforms with DIN EN 61 326 (domestic).
Conforms to the regulation for ESD (Electro Static Discharge) according to 61000-4-2.
Conforms to the regulation for transient emissions according to 61000-4-3.

Dortmund, 12. November 2008

Cay-Peter Voss, Geschäftsführer

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