Lovibond® Water Testing

Tintometer® Group

Turbidimeter TB 250 WL

GB **Instruction Manual**

Aqua Inte

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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 wipe, dry and then oil 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 0.02 NTU standard in the sample chamber, making sure that the marks are aligned. Press [↵] key. Reading starts automatically after count down.
5. At the end of the successful calibration „-rd-“ is displayed

NOTE: any flashing or numerical value indicates that a questionable calibration has taken place. Please see the calibration section

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DE

Wichtige Information

Um die Qualität unserer Umwelt zu erhalten, beschützen und zu verbessern
Entsorgung von elektronischen Geräten in der Europäischen Union

Aufgrund der Europäischen Verordnung 2002/96/EC darf Ihr elektronisches Gerät nicht mit dem normalen Hausmüll entsorgt werden!
Tintometer GmbH entsorgt ihr elektrisches Gerät auf eine professionelle und für die Umwelt verantwortungsvolle Weise. Dieser Service ist, **die Transportkosten nicht inbegriffen**, kostenlos. Dieser Service gilt ausschließlich für elektrische Geräte die nach dem 13.08.2005 erworben wurden. Senden Sie Ihre zu entsorgenden Tintometer Geräte frei Haus an Ihren Lieferanten.

GB

Important Information

To Preserve, Protect and Improve the Quality of the Environment
Disposal of Electrical Equipment in the European Union

Because of the European Directive 2002/96/EC your electrical instrument must not be disposed of with normal household waste!
Tintometer GmbH will dispose of your electrical instrument in a professional and environmentally responsible manner. This service, **excluding the cost of transportation** is free of charge. This service only applies to electrical instruments purchased after 13th August 2005. Send your electrical Tintometer instruments for disposal freight prepaid to your supplier.

FR

Notice importante

Conserver, protéger et optimiser la qualité de l'environnement
Élimination du matériel électrique dans l'Union Européenne

Conformément à la directive européenne n° 2002/96/EC, vous ne devez plus jeter vos instruments électriques dans les ordures ménagères ordinaires !
La société Tintometer GmbH se charge d'éliminer vos instruments électriques de façon professionnelle et dans le respect de l'environnement. Ce service, **qui ne comprend pas les frais de transport**, est gratuit. Ce service n'est valable que pour des instruments électriques achetés après le 13 août 2005. Nous vous prions d'envoyer vos instruments électriques Tintometer usés à vos frais à votre fournisseur.

NL

Belangrijke informatie

Om de kwaliteit van ons leefmilieu te behouden, te verbeteren en te beschermen is voor landen binnen de Europese Unie de Europese richtlijn 2002/96/EG voor het verwijderen van elektronische apparatuur opgesteld.

Volgens deze richtlijn mag elektronische apparatuur niet met het huishoudelijk afval worden afgevoerd.
Tintometer GmbH verwijdert uw elektronisch apparaat op een professionele en milieubewuste wijze. Deze service is, **exclusief de verzendkosten**, gratis en alleen geldig voor elektrische apparatuur die na 13 augustus 2005 is gekocht. Stuur uw te verwijderen Tintometer apparatuur franco aan uw leverancier.

ES

Información Importante
Para preservar, proteger y mejorar la calidad del medio ambiente
Eliminación de equipos eléctricos en la Unión Europea

Con motivo de la Directiva Europea 2002/96/CE, ¡ningún instrumento eléctrico deberá eliminarse junto con los residuos domésticos diarios!
Tintometer GmbH se encargará de dichos instrumentos eléctricos de una manera profesional y sin dañar el medio ambiente. Este servicio, **el cual escluye los gastos de transporte**, es gratis y se aplicará únicamente a aquellos instrumentos eléctricos adquiridos después del 13 de agosto de 2005. Se ruega enviar aquellos instrumentos eléctricos inservibles de Tintometer a carga pagada a su distribuidor.

IT

Informazioni importanti
Conservare, proteggere e migliorare la qualità dell'ambiente
Smaltimento di apparecchiature elettriche nell'Unione Europea

In base alla Direttiva europea 2002/96/EC, gli apparecchi elettrici non devono essere smaltiti insieme ai normali rifiuti domestici!
Tintometer GmbH provvederà a smaltire i vostri apparecchi elettrici in maniera professionale e responsabile verso l'ambiente. Questo servizio, **escluso il trasporto**, è completamente gratuito. Il servizio si applica agli apparecchi elettrici acquistati successivamente al 13 agosto 2005. Siete pregati di inviare gli apparecchi elettrici Tintometer divenuti inutilizzabili a trasporto pagato al vostro rivenditore.

PT

Informação Importante
Para Preservar, Proteger e Melhorar a Qualidade do Ambiente
Remoção de Equipamento Eléctrico na União Europeia

Devido à Directiva Europeia 2002/96/CE, o seu equipamento eléctrico naõ deve ser removido com o lixo doméstico habitual!
A Tintometer GmbH tratará da remoção do seu equipamento eléctrico de forma profissional e responsável em termos ambientais. Este serviço, **não incluindo os custos de transporte**, é gratuito. Este serviço só é aplicável no caso de equipamentos eléctricos comprados depois de 13 de Agosto de 2005. Por favor, envie os seus equipamentos eléctricos Tintometer que devem ser removidos ao seu fornecedor (transporte pago).

PL

Istotna informacja
Dla zachowania, ochrony oraz poprawy naszego środowiska
Usuwanie urządzeń elektronicznych w Unii Europejskiej

Na podstawie Dyrektywy Parlamentu Europejskiego 2002/96/EC nie jest dozwolone usuwanie zakupionych przez Państwo urządzeń elektronicznych wraz z normalnymi odpadami z gospodarstwa domowego!
Tintometer GmbH usunie urządzenia elektrycznego Państwa w sposób profesjonalny i odpowiedzialny z punktu widzenia środowiska. Serwis ten jest, za wyjątkiem kosztów transportu, bezpłatny. Serwis ten odnosi się wyłącznie do urządzeń elektrycznych zakupionych po 13.08.2005r. Przeznaczone do usunięcia urządzenia firmy Tintometer mogą Państwo przesyłać na koszt własny do swojego dostawcy.

DE

Wichtiger Entsorgungshinweis zu Batterien und Akkus

Jeder Verbraucher ist aufgrund der Batterieverordnung (Richtlinie 2006/66/EG) gesetzlich zur Rückgabe aller ge- und verbrauchten Batterien bzw. Akkus verpflichtet. Die Entsorgung über den Hausmüll ist verboten. Da auch bei Produkten aus unserem Sortiment Batterien und Akkus im Lieferumgang enthalten sind, weisen wir Sie auf folgendes hin:

Verbrauchte Batterien und Akkus gehören nicht in den Hausmüll, sondern können unentgeltlich bei den öffentlichen Sammelstellen Ihrer Gemeinde und überall dort abgegeben werden, wo Batterien und Akkus der betreffenden Art verkauft werden. Weiterhin besteht für den Endverbraucher die Möglichkeit, Batterien und Akkus an den Händler, bei dem sie erworben wurden, zurückzugeben (gesetzliche Rücknahmepflicht).

GB

Important disposal instructions for batteries and accumulators

EC Guideline 2006/66/EG requires users to return all used and worn-out batteries and accumulators. They must not be disposed of in normal domestic waste. Because our products include batteries and accumulators in the delivery package our advice is as follows :

Used batteries and accumulators are not items of domestic waste. They must be disposed of in a proper manner. Your local authority may have a disposal facility; alternatively you can hand them in at any shop selling batteries and accumulators. You can also return them to the company which supplied them to you; the company is obliged to accept them.

FR

Information importante pour l'élimination des piles et des accumulateurs

En vertu de la Directive européenne 2006/66/CE relative aux piles et accumulateurs, chaque utilisateur est tenu de restituer toutes les piles et tous les accumulateurs utilisés et épuisés. L'élimination avec les déchets ménagers est interdite. Etant donné que l'étendue de livraison des produits de notre gamme contient également des piles et des accumulateurs, nous vous signalons ce qui suit :

les piles et les accumulateurs utilisés ne sont pas des ordures ménagères, ils peuvent être remis sans frais aux points de collecte publics de votre municipalité et partout où sont vendus des piles et accumulateurs du type concerné. Par ailleurs, l'utilisateur final a la possibilité de remettre les piles et les accumulateurs au commerçant auprès duquel ils ont été achetés (obligation de reprise légale).

NL

Belangrijke mededeling omtrent afvoer van batterijen en accu's

Ledere verbruiker is op basis van de richtlijn 2006/66/EG verplicht om alle gebruikte batterijen en accu's in te leveren. Het is verboden deze af te voeren via het huisvuil. Aangezien ook onze producten geleverd worden met batterijen en accu's wijzen wij u op het volgende; Lege batterijen en accu's horen niet in het huisvuil thuis. Men kan deze inleveren bij inzamelpunten van uw gemeente of overal daar waar deze verkocht worden. Tevens bestaat de mogelijkheid batterijen en accu's daar in te leveren waar u ze gekocht heeft. (wettelijke terugnameplicht)

ES

Indicación importante acerca de la eliminación de pilas y acumuladores

Basado en la norma relativa a pilas/ baterías (directiva 2006/66/CE), cada consumidor, está obligado por ley, a la devolución de todas las pilas/ baterías y acumuladores usados y consumidos. Está prohibida la eliminación en la basura doméstica. Ya que en productos de nuestra gama, también se incluyen en el suministro pilas y acumuladores, le sugerimos lo siguiente:

Las pilas y acumuladores usados no pertenecen a la basura doméstica, sino que pueden ser entregados en forma gratuita en cada uno de los puntos de recolección públicos de su comunidad en los cuales se vendan pilas y acumuladores del tipo respectivo. Además, para el consumidor final existe la posibilidad de devolver las pilas y baterías recargables a los distribuidores donde se hayan adquirido (obligación legal de devolución).

IT

Indicazioni importanti sullo smaltimento di pile e accumulatori

In base alla normativa concernente le batterie (Direttiva 2006/66/CE) ogni consumatore è tenuto per legge alla restituzione di tutte le batterie o accumulatori usati ed esauriti. È vietato lo smaltimento con i rifiuti domestici. Dato che anche alcuni prodotti del nostro assortimento sono provvisti di pile e accumulatori, vi diamo di seguito delle indicazioni:

Pile e accumulatori esauriti non vanno smaltiti insieme ai rifiuti domestici, ma depositati gratuitamente nei punti di raccolta del proprio comune o nei punti vendita di pile e accumulatori dello stesso tipo. Inoltre il consumatore finale può portare batterie e accumulatori al rivenditore presso il quale li ha acquistati (obbligo di raccolta previsto per legge).

PT

Instruções importantes para a eliminação residual de pilhas e acumuladores

Os utilizadores finais são legalmente responsáveis, nos termos do Regulamento relativo a pilhas e acumuladores (Directiva 2006/66/CE), pela entrega de todas as pilhas e acumuladores usados e gastos. É proibida a sua eliminação juntamente com o lixo doméstico. Uma vez que determinados produtos da nossa gama contêm pilhas e/ou acumuladores, alertamos para os seguintes aspectos:

As pilhas e acumuladores usados não podem ser eliminados com o lixo doméstico, devendo sim ser entregues, sem encargos, junto dos pontos de recolha públicos do seu município, ou em qualquer ponto de venda de pilhas e acumuladores. O utilizador final dispõe ainda da possibilidade de entregar as pilhas e/ou acumuladores no estabelecimento comerciante onde os adquiriu (dever legal de aceitar a devolução).

PL

Istotna wskazówka dotycząca utylizacji baterii i akumulatorów

Każdy użytkownik na mocy rozporządzenia w sprawie baterii (wytyczna 2006/66/WE) jest ustawowo zobowiązany do oddawania wszystkich rozładowanych i zużytych baterii lub akumulatorów. Utylizacja wraz z odpadkami domowymi jest zabroniona. Ponieważ także w produktach z naszego asortymentu zawarte są w zakresie dostawy baterie i akumulatory, zwracamy uwagę na poniższe zasady:

zużyte baterie i akumulatory nie mogą być wyrzucane wraz z odpadkami domowymi, lecz powinny być bezpłatnie przekazywane w publicznych miejscach zbiórki wyznaczonych przez gminę lub oddawane w punktach, gdzie sprzedawane są baterie i akumulatory danego rodzaju. Poza tym użytkownik końcowy ma możliwość zwrócenia baterii i akumulatorów do przedstawiciela handlowego, u którego je nabył (ustawowy obowiązek przyjęcia).

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.

TB 250 WL 3c 02/2021

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Part 1

Descriptions

1.1 General description

The TB 250 WL is designed to meet the criteria specified in U.S. EPA 180.1 on turbidity measurement. The TB 250 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. The included standards guarantee accurate, stable and reproducible results.

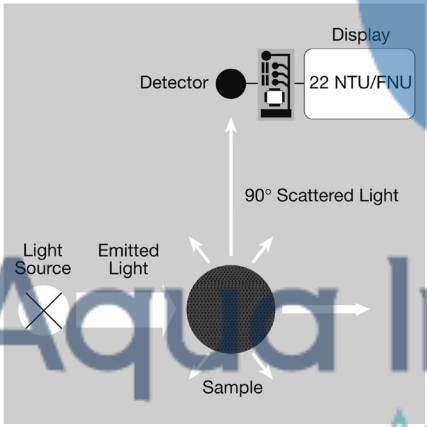
1.2 Operating principles

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

The emitted light is reflected by turbidity in the sample. The scattered light will be detected at an angle of 90° relative to the incident light beam by a photodiode.

This principle is part of ISO 7027, except the emitted light source is at 860±60 nm.

The international Reference Standard for turbidity is a Formazin solution. The TB250 WL calibration is based upon an US EPA approved standard.



1.3 Factory calibration

The turbidimeter TB 250 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

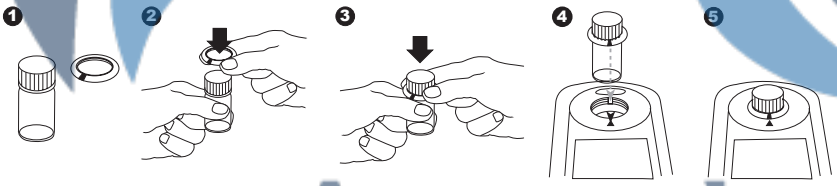
1.4.1 Guidelines for turbidity measurements

a) Vials and caps should be cleaned thoroughly after each test to avoid interferences. Store washed vials with deionized water until ready to use. Minor residuals can cause errors.

b) Always rinse the vial at least three (3) times with sample. When filling the vial the final time, use care not to introduce bubbles into the sample. Immediately cap the vial after filling. Never shake the sample. Gentle inversion of the sample vial is the best practice.

c) 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. Follow with oiling the vial, by placing a very thin bead of silicone oil down the side of the vial. Evenly spread the bead of oil over the bottom 2/3's of the vial. Then wipe the silicone from the vial through rotation of the vial against a clean, dust-free tissue.

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



e) Always perform the test with securely capped vials.

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

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

h) 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).

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

j) 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 filtered deionized water after each measurement. Filtered water is best produced by pushing deionized water through a 0.2 µm or smaller pore sized filter.
- Clean all glassware thoroughly with laboratory detergent and rinse with filtered deionized water.
- Clean heavy contamination by filling the vials with 1:1 HCL followed by multiple rinses with distilled or filtered deionized water.
- Allow vials to air dry.
- Touch vials only at the top to minimize 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 TB 250 WL insert the batteries (part of delivery). See chapter 2.1.2 Replacement of batteries.

2.1.2 Replacement of batteries

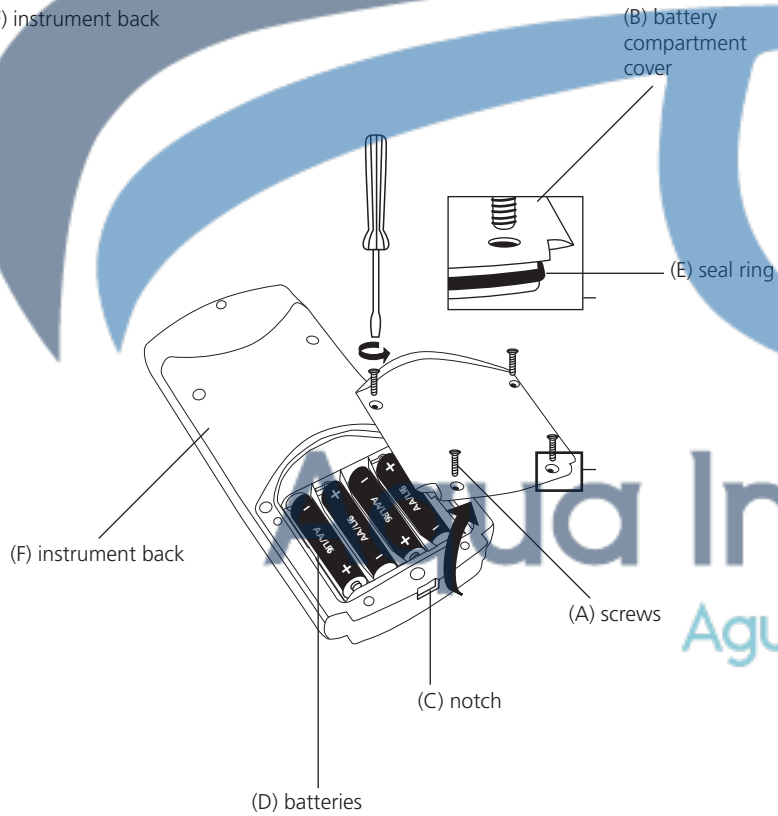
Recommendation: Don't use rechargeable batteries!

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:

ON/OFF	Switching the photometer on or off.
Cal	Perform a calibration.
↵	Perform a measurement. Press down and hold this key to index the current sample. When the key is released a reading or calibration begins.
▲ ▼	Change the calibration points.

2.2.1 Auto-Off Feature

The instrument auotmatically turns off after 5 minutes of non-use. Press any key to avoid the instrument from turning off.

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).

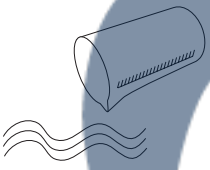
Below are some typical screens and a description of when you would see them.

- r d - NTU FNU	When turning on the instrument or after a calibration, this screen indicates that the instrument is ready to measure.
- - - NTU FNU	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 measurement and indexing. No keypad presses will function during this time.
0.05 NTU FNU	A typical measurement value in the display:
1100 NTU FNU	An overrange condition is indicated by a flashing 1100.

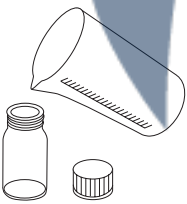
2.3.1 Perform turbidity measurement

Accurate turbidity measurements depend on good, consistent measurement techniques. This includes working with clean sample and polished 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:

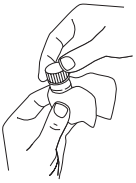


Take a representative sample in a clean container.



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. This is called seasoning the vial.

Fill the seasoned vial with the sample up to the mark. Immediately cap the vial.



Take care to handle the vial by the top third only. Wipe the vial with the supplied cleaning tissue to remove water, dust and finger prints. If necessary, oil the outside of the vial with silicone oil. Place a very thin bead of silicone oil down the side of the vial. Evenly spread the bead of oil over the bottom 2/3's of the vial. Then wipe the silicone from the vial through rotation of the vial against a clean, dust-free tissue.

Note: Oiling cells is critical and recommended when measuring samples with an expected turbidity that is below 0.5 NTU.

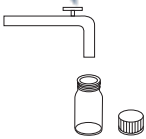
Switch on the instrument.

Place the prepared sample vial in the sample chamber making sure that the positioning is correct, with the index marks 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).
This is best performed with a vial that is filled with water that is filtered through a 0.2 µm of smaller filter.

1.00 NTU

The result is shown in the display in NTU.



Remove the vial, discard the sample and rinse several times with filtered water. Then fill the vial with filtered water and cap. Wipe the outside clean and store until next use

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

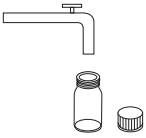
2.3.2.2.1 Vial Preparation and Inspection Prior to Calibration

To ensure calibration accuracy when measuring at low-levels of turbidity, the following protocols are advised during calibration and when measuring samples below 1 NTU.

1. Inspection of sample cells – Sample cells must be of high quality. Inspect for scratches, pitting, bulging or any other deficiency that could cause light to deviate from its path through a sample. Sample cells that possess defects should not be used for low-level turbidly measurement. Select only the best sample cells that are free from these defects.

2. Minor scratches can be minimized through the use of silicone oil. If silicone oil is used, it is best to apply the oil to a soft cloth and then use the cloth to spread it evenly over the surface of the vial. Wipe all excess silicone oil from the vial.

a. After the vial has been cleaned and oiled, only handle the vial by the top. Do not touch the walls of the vials.



3. Indexing vials – vials should be indexed to determine the orientation that produces minimum light scatter off its surface. To index a vial, the following steps should be followed:

   a. Rinse the vial several times with low turbidity water. Acceptable water is distilled water or water that is filtered through a 0.2 µm filter.

   b. Immediately after rinsing, fill the vial with the water and immediately cap the vial.

c. Allow the vial to stand for several minutes to allow the water to degas. Caution: use care not to drop the vial or knock it over on its side. This will cause an injection of air back into the water, thus falsely elevating the turbidity.

d. Wipe the vial and inspect to ensure outside walls are clean and free of any dust or particles. The use of standard glass cleaners is acceptable to clean the outside of the vials.

e. Place the vial into the turbidimeter with the index ring in place. Press read to measure the water. Record this value.

f. Carefully rotate the vial clockwise 45 degrees. Do not remove the vial. Press read to measure the water. Record this value.

g. Repeat step f, rotating the vial in the same (clockwise) direction each time until the vial is rotated back to the original index mark. Eight measurements will be taken.

h. Determine the orientation that delivers the lowest turbidity value. Mark this as the index location on the vial.

i. Insert this vial into the same indexed orientation for any measurement (sample, calibration standard or verification standard).

When measuring samples where the expected turbidity is less than 1 NTU, the above measurement protocols are advisable. These protocols will help to reduce the predominant sources of error which can be significant if ignored.

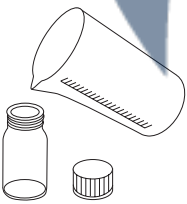
2.3.2.2.2 – Calibration Standard Transfer Into Vials

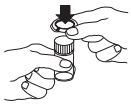
The calibration standards for the TB 250 are packaged at the calibration values, so no dilution of these standards are required. The standards come packaged in 60-ml bottles. The quantity allows for two rinses of the vials with each standard, with the third fill being the aliquot that will be used in calibration.

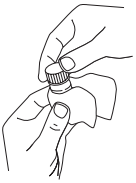
1. Mixing of standards - The 10 NTU and 1000 NTU standards should be mixed by repetitive inversions while these standards are in their plastic bottles. A total of ten inversions is sufficient to mix these standards.

   DO NOT MIX THE 0.02 NTU STANDARD. This will ensure the standard is void of bubbles. Even small bubbles can impart a significant calibration error. This standard never requires mixing.

   Note: If the 0.02 NTU standard is accidently mixed, dropped, knocked over, or disturbed will likely result in the formation of bubbles. To alleviate the bubbles, this standard should be allowed to stand for at least 30-minutes prior to being used in the calibration.







2. Rinse the outside of each bottle with filtered water to ensure there is no dust or debris on the outside of the bottles of calibrant. Then dry each bottle with a lint free cloth or tissue.

3. Transfer each calibrant to a cleaned and indexed sample vial. See 2.3.2.2.1 for indexing vials. Rinse the vial 2 times with the standard immediately prior filling the vial with the respective standard. Immediately cap the vial. Use care not to introduce any air into the standard solutions when filling the vial with the standard.

4. Wipe the vial dry with a dust free tissue (or cloth). If necessary, oil the vials. (Note, if the vials were previously oiled and are visibly clean, oiling is not required.

5. These standard are ready for use in calibration.

2.3.2.2.3 Calibration Procedure

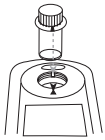
The following procedure is recommended to perform a full range calibration. Ensure that the calibration standards have been indexed prior to proceeding.

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 prepared 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 count-down.

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 prepared 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 count-down.

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 prepared 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 count-down.

10. When the instrument has completed the calibration on the 0.02 NTU standard, the instrument returns to the read (-rd) 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 new 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.
4. At the completion of the calibration, if the display flashes or displays a value instead of the "-rd-" icon, then the 0.02 NTU calibration standard is in question. Prepare a new 0.02 NTU standard in a cleaned vial and repeat this calibration point. **Take care not to agitate the 0.02 NTU standard prior to or during the calibration process.**
5. When measuring samples of very low turbidity (e.g. less than 0.1 NTU), the use of the same vial that contained the 0.02 NTU calibration standard, at the same index point, will generate the most accurate results.

2.3.2.3 Calibration Error

If the screen shown to the left 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.

A calibration error can result if the prepared 0.02 NTU standard was prepared and measured in error. A new aliquot of 0.02 NTU standard that is placed into a new and clean vial, that is free from imperfections should be prepared and used for calibration.

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 EPA Approved Standards*
2. 10.0 NTU EPA Approved Standards*
3. 0.02 NTU EPA Approved Standards*

It is documented that diluted Formazin standards are unstable. If Formazin is used to calibrate the instrument, ensure that fresh dilutions of Formazin are accurately prepared using 0.2 µm filtered water immediately before use. A 4000 NTU Formazin Stock Solution Kit is available.

EPA Approved* with the mentioned values above have a limited shelf life of one year when stored in their original container. Once they are transferred to glass vials, they are stable for 90-days. If secondary standards are used to calibrate the instrument, review the expiration 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 expected turbidity is low it is important to remove air bubbles from the sample using one, or a combination of the following methods:

- Allowing samples to stand, followed by gentle mixing.
- 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 outgassing with air	Allow samples to stand undisturbed for several minutes, Then slowly and gently invert the sample to suspend the turbidity.	Time allows bubbles to outgass, as the sample temperature adjusts to room temperature. Particles will settle and need to be responded immediately prior to measurement.	Allowing time for bubbles to dissipate is the best practice. The change in temperature will not impact the turbidity in the majority of water samples.
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. Always slowly vent the degassed sample back to atmosphere
Viscous samples	Use of an ultrasonic bath	The ultrasonic waves remove air bubbles from the sample	Ultrasonic waves can change the particle size in the sample, and cause particles to shed from walls of sample cells, therefore changing the turbidity.
Very viscous samples	Heating the sample	Heating the sample makes it less viscous, allowing air bubbles to exit. 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. Water that is filtered through a 0.2 µm filter or distilled water is appropriate for making dilutions.

For accurate dilutions proceed as follows:

Mix the water sample well to effectively homogenize the sample. Pipette x ml of the water sample (see table below) into a 100 ml volumetric flask. Dilute to volume with low turbidity water and gently invert several times to mix.

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

Transfer the well mixed portion of diluted sample to a sample vial. Perform the 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 clean, unscratched and indexed vials.
- Rinse the vial at least two times with the sample.
- Allow the vial to stand for 1 – 5 minutes so that bubbles can disappear.
- Slowly invert the vial (so that settled particles evenly 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 turbidity value is displayed (leave the vial in the sample chamber).

Note the smallest steady and reproducible value is the most accurate value.

2.3.3.4 Indexing and matching sample vials

The United States Environmental Protection Agency (U.S. EPA) Method 180.1 recommends that sample cuvettes used for instrument calibration or sample measurement be indexed. To comply with this recommendation, each calibration vial is supplied with an indexing ring and the TB 250 instrument has a reference point for quick and repeatable indexing of the calibration standard.

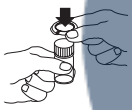
Matched sample vials are required to minimize the effects of optical variation from glass vial to glass vial. Alternatively an indexed single sample vial can be used for every measurement.

Always follow the recommended cleaning and oiling techniques prior to indexing sample cells. See Section 2.3.2.2.1.

2.3.3.5 Indexing a single sample vial

Turn the instrument on.

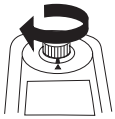
Rinse and then fill the vial with filtered water (0.2 µm or smaller filtration pore size or use distilled water). Hold the vial by the cap and wipe clean with the supplied cleaning tissue to remove water spots and finger prints. Follow by oiling the vial as described in 2.3.2.2.1.



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 repeatable turbidity reading.

With the calibration vial 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 TB 250 WL:

- ☑
- ❑ 1 TB 250 WL in plastic case
- ❑ 4 batteries (Type AA/LR 6)
- ❑ 2 Sample Vials with cap
- ❑ 3 Calibration Vials with cap
- ❑ Secondary Standard 0.02 NTU, 60 ml bottle
- ❑ Secondary Standard 10.0 NTU, 60 ml bottle
- ❑ Secondary Standard 1000 NTU, 60 ml bottle
- ❑ Silicone Oil, 15 ml
- ❑ 1 Cleaning cloth
- ❑ 1 Screwdriver
- ❑ 1 Instruction manual
- ❑ 1 Short manual
- ❑ 1 Guarantee declaration

3.2.2 Re-Order Codes

Part Number	Description
19 42 80	Calibration Set (0.02, 10 and 1000 NTU), in own case
19 42 81	Calibration Set (0.02, 10 and 1000 NTU), re-fill for TB 250 WL case
19 42 90	Sample Cells, 3 pack
19 42 95	Silicone Oil, 15 ml
36 6 170	Membrane Filter Set, 0.2 µm filter
19 76 35	Cleaning Cloth
19 41 41	4000 NTU Formazin Stock Solution, 100 ml
19 41 42	4000 NTU Formazin Stock Solution, 250 ml

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 Inc.**

6456 Parkland Drive
Sarasota, FL 34343
U.S.A.

declares, that this product

Product name: **TB 250 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, Managing Director

Aqua Inte

Agua pa

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