

# Turbidimeter

## AL450T-IR



TurbiDirect

<p><b>Routine Measurement</b></p> <ol style="list-style-type: none"> <li>1. Press <b>ON/OFF</b> key.</li> <li>2. Rinse out a clean vial three times with the sample to be tested. Fill the vial with the sample and cap ensuring that all outside surfaces are clean and dry.</li> <li>3. Place the vial in the sample chamber and align correctly X.</li> <li>4. Put on the sample chamber cover (light shield).</li> <li>5. Press <b>Read/Avg</b> or <b>Read/Avg</b> key to start measurement.</li> <li>6. Record the NTU value.</li> </ol> <p>Read/Avg = Measurement with averaging</p> <p><b>User-Calibration</b></p> <ol style="list-style-type: none"> <li>1. Press <b>Cal</b> key.</li> <li>2. Place the &lt;0.1 NTU standard in the sample chamber, making sure that the marks X are aligned. Put the sample chamber cover on and press <b>Read/Avg</b> key. Reading starts automatically after count down.</li> <li>3. Invert the 20 NTU standard and place it into the sample chamber, making sure that the marks X are aligned. Put the sample chamber cover on and press <b>Read/Avg</b> key. Reading starts automatically after count down.</li> <li>4. Invert the 200 NTU standard and place it into the sample chamber, making sure that the marks X are aligned. Put the sample chamber cover on and press <b>Read/Avg</b> key. Reading starts automatically after count down.</li> <li>5. Invert the 800 NTU standard and place it into the sample chamber, making sure that the marks X are aligned. Put the sample chamber cover on and press <b>Read/Avg</b> key. Reading starts automatically after count down.</li> <li>6. Press <b>↶</b> key to store or press <b>Esc</b> to cancel calibration.</li> </ol>	<p><b>Correct Storing and Handling Standards</b></p> <ul style="list-style-type: none"> <li>• T-CAL standards should always be stored in their original vial.</li> <li>• Store standards between 5 and 25°C (avoid prolonged exposure to temperatures exceeding 35°C).</li> <li>• Store away from direct sunlight.</li> <li>• Always allow the standard to acclimatise to ambient instrument temperature before use (not to exceed 35°C).</li> <li>• T-CAL Standards have a shelf life of minimum 12 months if stored correctly.</li> </ul> <p><b>Using &lt;0.1 NTU Standard</b></p> <p>After delivery allow the vial to stand for at least 24 hours before use.</p> <p><b>Never shake or invert this &lt;0.1 NTU standard.</b></p> <p>If the standard has been shaken it can take several hours for all the bubbles dissipate and we suggest the vial is left for at least 24 hours as outlined above.</p> <p>If the standard has been inverted accidentally wait at least 15 minutes before using.</p> <p><b>Preparing and Using Standards – infrequent use</b></p> <p>Note: These instructions apply to all standards excepted the &lt;0.1 NTU standard. If you are using the &lt;0.1 NTU standard follow the instructions given above.</p> <ol style="list-style-type: none"> <li>1. Shake the standard vigorously for 2-3 minutes.</li> <li>2. Let the vial stand undisturbed for 5 minutes.</li> <li>3. Invert the vial between 5-10 times.</li> <li>4. Immediately place the vial in the sample chamber and wait for 1 minute (count down).</li> </ol> <p><b>Preparing and Using Standards – frequent use</b></p> <p>Note: These instructions apply to all standards excepted the &lt;0.1 NTU standard. If you are using the &lt;0.1 NTU standard follow the instructions given above.</p> <p>These instructions apply to frequently used standards (daily or weekly usage).</p> <ol style="list-style-type: none"> <li>1. Invert the vial 10 times.</li> <li>2. Immediately place the vial in the sample chamber and wait for 1 minute (count down).</li> </ol>
--	---

GB

TJND06KCAL4507RM Rev. 3.19.11.2012

GB

TJND06KCAL4507RM Rev. 3.19.11.2012

## Important steps before using the TB300 IR

Please carry out the following steps as described in the Instruction manual. Become familiar with your new TB300 IR before starting with the first tests:

- Unpacking and inspection of delivery contents, see page 42.
- Install the rechargeable batteries/batteries and the Lithium-battery, see page 10.
- Using rechargeable batteries:  
**Charge the rechargeable batteries** in the instrument **for 5 days** (it is possible to continue using the instrument). Now use the instrument without mains power until the first battery warning comes up. Charge again, for 4 days this time. Repeat this cycle four times.

Perform the following settings in the Mode-Menu;

Instruction manual from page 27 and following:

- MODE 10: select language
- MODE 12: set date and time
- **MODE 34: perform "Delete data"**

If required set other functions.

### **IMPORTANT NOTE:**

The Lithium battery (for saving data and clock) works for approx. ½ year in case of no power from mains adapter or rechargeable batteries/batteries.

**The delivered instrument is factory calibrated and can be used immediately.**

For later user-calibration please refer to the instruction manual.





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 excluye 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 não 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 Usunięcie urządzeń elektronicznych w Unii Europejskiej

Na podstawie Dyrektywy Parlamentu Europejskiego 2002/96/EC nie jest dozwolone usunięcie 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 Lieferumfang 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 contém 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****Istożna 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



Turbidity Standards and T-CAL Standards are formulated for chemical analysis and must not be used for any other purpose. Reagents must not get into the hands of children. Some of the reagents contain substances which are not entirely harmless environmentally. Be aware of the ingredients and take proper care when disposing of the test solution.



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 reagents by reading the MSDS (Material Safety Data Sheets). Failure could result in serious injury to the operator or damage to the instrument.

### MSDS:

[www.aqualytic.com](http://www.aqualytic.com)



Use the charger unit only with rechargeable batteries. Failure can result in serious injury to the operator or damage to the instrument.

**Do not use charger with non rechargeable batteries.**



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.

**Revision\_5a 12/2014**

# Table of contents

<b>Part 1 Descriptions</b> .....	5
1.1 General description .....	6
1.2 Operating principles .....	6
1.3 Factory calibration .....	7
1.4 Important Notes .....	7
1.4.1 Guidelines for turbidity measurements .....	7
1.4.2 Cleaning of vials & sampling containers .....	8
<b>Part 2 Operating manual</b> .....	9
<b>2.1 Operation</b> .....	10
2.1.1 Commissioning .....	10
2.1.2 Saving data – Important Notes .....	10
2.1.3 Replacement of rechargeable batteries resp. Lithium-battery .....	10
2.1.4 Charging the rechargeable batteries .....	10
2.1.5 Fuse .....	11
2.1.6 Protective caps .....	11
2.1.7 Instrument view .....	11
<b>2.2 Overview of funktion keys</b> .....	12
2.2.1 Overview .....	12
2.1.3 Displaying date and time .....	12
2.2.3 User countdown .....	13
<b>2.3 Operation mode</b> .....	14
2.3.1 Automatic switch off .....	14
2.3.2 Turbidity measurement .....	14
2.3.2.1 Read/ Avg key - measurement with Signal Average .....	14
2.3.2.2 Read key – quick measurement .....	14
2.3.2.3 Performing Turbidity measurement .....	15
2.3.3 Storing results .....	16
2.3.4 Printing results .....	17
2.3.5 User calibration .....	18
2.3.5.1 When to calibrate .....	18
2.3.5.2 Calibration procedure .....	18
2.3.6 Calibration standards .....	19
2.3.6.1 T-CAL standards – correct storage and using .....	19
2.3.7 Formazin standards – preparation and handling .....	20

2.3.7.1	Preparation of dilution water .....	20
2.3.7.2	Preparation of 4000 NTU Formazin Stock Solution .....	20
2.3.7.3	Preparation of dilutions from the 4000 NTU Formazin Stock Solution .....	21
2.3.8	Measurement techniques .....	22
2.3.8.1	Degassing – Removal of Bubbles .....	22
2.3.8.2	Measurement of high turbidity values .....	23
2.3.8.3	Measurement of low turbidity values .....	23
2.3.8.4	Indexing and matching sample vials .....	24
2.3.8.5	Indexing a single sample vial .....	24
2.3.8.6	Indexing a set of sample vials .....	25
<b>2.4</b>	<b>Settings: Table of MODE Functions .....</b>	<b>27</b>
2.4.1	blank because of technical requirements .....	28
2.4.2	Instrument basic settings 1 .....	28
2.4.3	Printing of stored results .....	31
2.4.4	Recall / delete stored results .....	35
2.4.5 - 2.4.8	blank because of technical requirements .....	39
2.4.9	Instrument basic settings 2 .....	39
2.4.10	Instrument special functions/service .....	39
<b>2.5</b>	<b>Data transfer .....</b>	<b>40</b>
2.5.1	Connection to a printer .....	40
2.5.2	Data transfer to a personal computer .....	40
2.5.3	Internet Updates .....	40
<b>Part 3</b>	<b>Enclosure .....</b>	<b>41</b>
3.1	Unpacking the instrument .....	42
3.2	Delivery content .....	42
3.3	blank because of technical requirements .....	42
3.4	Technical data .....	43
3.5	Abbreviations .....	44
3.6	Trouble-shooting .....	45
3.6.1	Operating messages in the display / error display .....	45
3.7	Declaration of CE-Conformity .....	46

2.3.7.1	Preparation of dilution water .....	20
2.3.7.2	Preparation of 4000 NTU Formazin-stock solution .....	20
2.3.7.3	Preparation of dilutions from the 4000 NTU Formazin-stock solution .....	21
2.3.8	Measurement techniques .....	22
2.3.8.1	Degassing – removal of bubbles .....	22
2.3.8.2	Measurement of high turbidity values.....	23
2.3.8.3	Measurement of low turbidity values.....	23
2.3.8.4	Indexing and matching sample vials.....	24
2.3.8.5	Indexing a single sample vial.....	24
2.3.8.6	Indexing a set of sample cells .....	25
<b>2.4</b>	<b>Settings: Table of MODE Functions .....</b>	<b>27</b>
2.4.1	blank because of technical requirements	
2.4.2	Instrument basic settings 1 .....	31
2.4.3	Printing of stored results.....	35
2.4.4	Recall / delete stored results.....	33
2.4.5 – 2.4.8	blank because of technical requirements	
2.4.9	Instrument basic settings 2 .....	39
2.4.10	Instrument special functions / service.....	39
<b>2.5</b>	<b>Data transfer .....</b>	<b>40</b>
2.5.1	Connection to a Printer .....	40
2.5.2	Data transfer to a personal computer (PC).....	40
2.5.3	Internet Updates .....	40
<b>Part 3</b>	<b>Enclosure.....</b>	<b>41</b>
3.1	Unpacking.....	42
3.2	Delivery content .....	42
3.3	blank because of technical requirements	
3.4	Technical data .....	43
3.5	Abbreviations .....	44
3.6	Trouble-shooting .....	45
3.6.1	Operating messages in the display / error display .....	45
3.7	Declaration of CE-Conformity.....	46

# **Part 1**

## **Descriptions**

## 1.1 General description

The TurbiDirect is a portable turbidity meter, based on the requirements of ISO 7027 (Water Quality – Determination of Turbidity). The instrument works with rechargeable batteries as well as with mains. As soon as the TurbiDirect is connected with the adapter to the mains the batteries are charged.

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. Calibration Standards guarantee stability and reproducibility of the results. Always replace the cover on the sample chamber to protect against dust.

It is possible to update new software applications via internet ([www.aqualytic.com](http://www.aqualytic.com)). Please find detailed information at our homepage on the download-area.

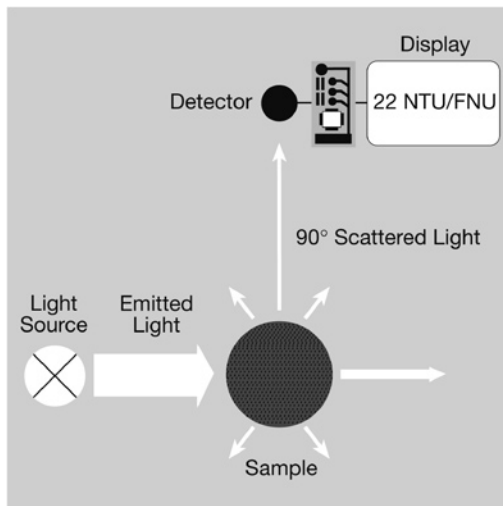
## 1.2 Operating principles

The instrument measures turbidity in the range 0.01 to 1100 NTU/FTU featuring auto ranging. The light source is an infrared LED (light emitting diode) with a wavelength of 860 nm.

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

This principle is part of ISO 7027.

The international Reference Standard for turbidity is a Formazin solution. Results related to these standards are indicated as FNU (Formazine Nephelometric Units).



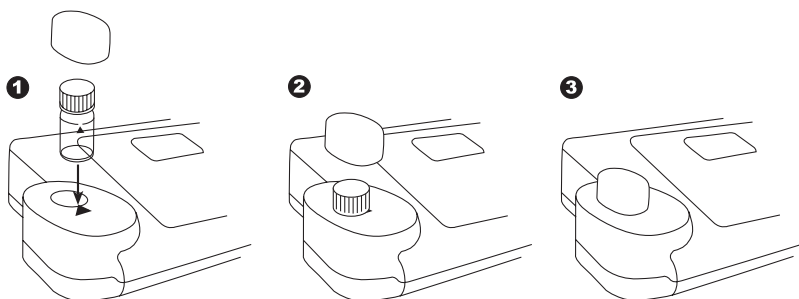
## 1.3 Factory calibration

The turbidimeter TurbiDirect is factory calibrated with Formazin Primary Standard and does not require user calibration before use (see chapter 2.3.5 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 2.3.8.1 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) Contamination of the lens in the sample chamber can result in errors. Check at regular intervals – and if necessary – clean the light entry surfaces of the sample chamber using a moist cloth or cotton buds.
- 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 interferences. Minor residuals can cause errors.

### **Residuals:**

The vial must be cleaned according to the type of sample measured.

- 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 the delivered cleaning cloth to remove waterdrops and fingerprints.



## **Part 2**

# **Operating manual**

## 2.1 Operation

### 2.1.1 Commissioning

Before working with the TurbiDirect insert the rechargeable batteries and the Lithium battery (part of delivery). The rechargeable batteries are not charged. See chapter 2.1.2 Saving data – Important Notes, 2.1.3 Replacement of rechargeable batteries resp. Lithium battery. and 2.1.4 Charging the rechargeable batteries.

**Before working perform the following settings in the Mode-Menu:**

- MODE 10: Select language
- MODE 34: perform „Delete data“
- MODE 12: Set date and time

See chapter 2.4 Photometer settings.

### 2.1.2 Saving data – Important Notes

The Lithium battery saves data (stored results and photometer setting) if there is no power from the power supply from the rechargeable batteries or the mains adapter.

**Recommendation:** Exchange of the lithium battery every 5 years.

**Note:** When neither mains adapter nor batteries supply energy to the instrument, all stored data and settings will be lost, if the lithium battery is taken out.

**Recommendation:** Keep the instrument connected to mains adapter supply while changing the lithium battery.

### 2.1.3 Replacement of rechargeable batteries resp. Lithium-battery

1. Switch the instrument off.
2. If necessary remove vial from the sample chamber.
3. Place the instrument upside down on a clean and even surface.
4. Unscrew the two screws (A) of the battery compartment cover (B).
5. Lift battery compartment cover off.
6. If necessary remove old rechargeable batteries (C) and/or the Lithium-battery (D).
7. Place 7 new rechargeable batteries and/or the Lithium-battery.

**Ensuring the correct polarity!**

8. Replace the battery compartment cover.
9. Tighten the screws carefully.

**CAUTION:**

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

### 2.1.4 Charging the rechargeable batteries

The rechargeable batteries are uncharged in the instrument. As soon the TurbiDirect is connected by the adapter to the mains the batteries are charged.

Empty rechargeable batteries should be charged in the instrument for at least 5 days.

10 charging and discharging cycles are necessary before the rechargeable batteries obtain their full capacity.

**It is possible to operate the instrument with the adapter with or without inserted rechargeable batteries.**

## 2.1.5 Fuse

The instrument has a fuse (E) (type: 1 A, inert, 20 mm).

If a replacement is necessary proceed as described in "Replacement of rechargeable batteries resp. Lithium-battery". If the instrument can be operated with the mains adapter but not with the rechargeable batteries, the fuse could be defect (try new rechargeable batteries first).

## 2.1.6 Protective caps

If not used protect the two connections against damage (e.g. corrosion) caused by environmental influences (e.g. dust or splashing) keep the protective caps in place (G).

## 2.1.7 Instrument view

(A) screws

(B) battery compartment cover

(C) rechargeable batteries:

7 Ni-MH-rechargeable batteries (Typ AA, 1100 mAh)

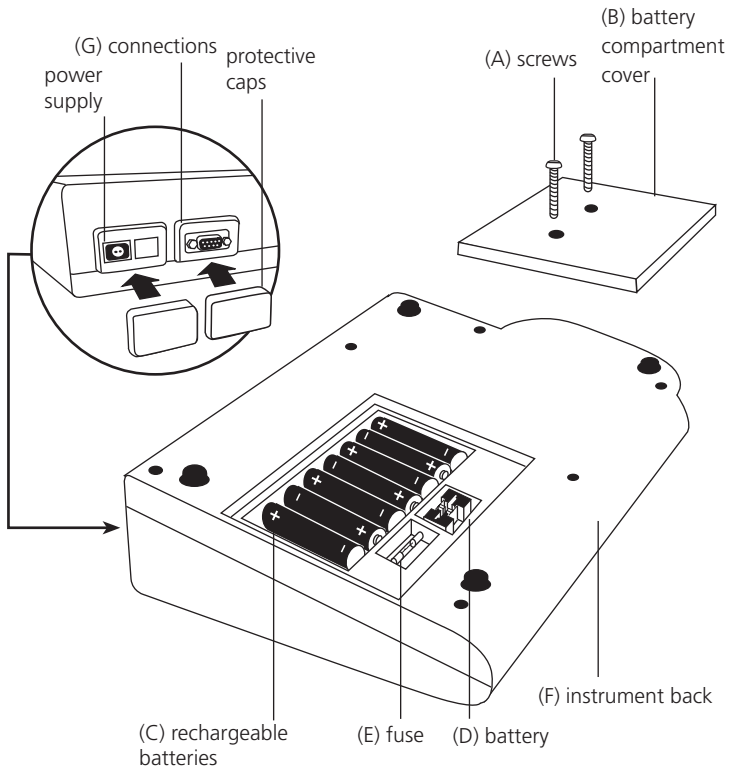
(D) battery:

Lithium battery (Typ CR 2032, 3V)

(E) fuse














1 A, inert, 20 mm

(F) instrument


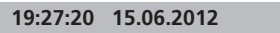




## 2.2 Overview of funktion keys

### 2.2.1 Overview

	Switching the instrument on or off
	Returning to previous menu
	Function key: description in the text if key available
	Function key: description in the text if key available
	Function key: description in the text if key available
	Confirming
	Menu of instrument settings and further functions
	Moving the cursor up resp. down
	Storing of displayed test result
	Perform a measurement with signal averaging
	Perform a measurement
	Displaying date and time / user countdown
	Perform a calibration

### 2.2.2 Displaying date and time

	Press [„clock“] key.
	The display shows: After 15 seconds the turbidity meter reverts to the previous display automatically or press [↵] key or [ESC].
	
	

## 2.2.3 User countdown

With this function the operator is able to define his own countdown.



Press [“clock”] key.

**19:20:20 15.06.2012**

The display shows time and date:



Press [“clock”] key.

**Count-Down**  
**mm : ss**  
**99 : 99**

The display shows:

Either press [↵] key to accept the last used user count-down

or

press any number key to start entering a new value



The entering comprises two digits each.

Enter minutes and seconds

e.g.: 2 minutes, 0 seconds = [0][2][0][0]

Confirm with [↵] key.

**Count-Down**  
**02:00**

The display shows:

Start countdown with [↵] key.

**Start:** ↵

After countdown has finished the Instrument reverts to the previous display automatically.

## 2.3 Operation mode



Switch the instrument on by pressing the [ON/OFF] key.

### Autotest ...

The instrument performs an electronic self-test.

### 2.3.1 Automatic switch off

The instrument switches off automatically after 20 minutes. This is indicated 30 seconds before by a beeper. Press any key to avoid the instrument switching off. As long as the instrument is working (for example countdown or printing) the automatic switch off is inactive.

### 2.3.2 Turbidity measurement

#### 2.3.2.1 Read/ Avg key - measurement with Signal Average



Press [Read/Avg] key to perform a test with signal average function.

By pressing the [Read/Avg] key Signal Average function is active. Signal averaging measures and averages 45 measurements. The signal averaging feature provides compensation for fluctuations caused by random drifting particles in the sample. The result is shown in **NTU**.

#### 2.3.2.2 Read key – quick measurement



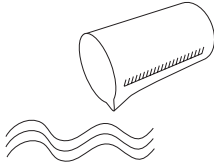
Press [Read] key to perform a quick test.

By pressing the [Read] key Signal averaging function is not active. The TurbiDirect measures and averages 9 measurements. The result is shown in **NTU\***.

### 2.3.2.3 Performing 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:



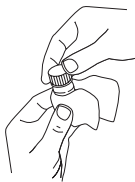
Take a representative sample in a clean container.



Fill a clean and dry vial with the water sample up to the mark (approx. 12 ml).



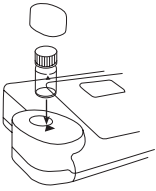
Cap the vial.



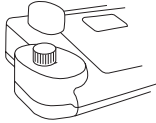
Take care to handle the vial by the top. Wipe the vial with the supplied cleaning tissue to remove waterdrops and finger prints.



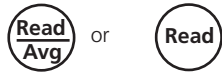
Switch the instrument on.



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



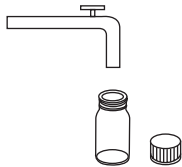
Close the sample chamber with the cap.



Press [Read/Avg] or [Read] key.

**1.00 NTU** or **1.02 NTU\***

The result is shown in the display in NTU.



Remove the vial and clean it.

### 2.3.3 Storing results



Press [STORE] during the test result is displayed.

**Code-No.:**  
-----

The display shows:

① ① ① ① ① ① ⑥

- We advise you to enter a numeric code (up to 6 digits long). (A code-No. can contain references to the operator or the sampling location.)



After entering confirm with [↵] key.

- If a code number is not necessary confirm by pressing [↵] directly. (The assignment for the Code-No. is then 0 automatically.)



The data set is stored with date, time, code-No. and test result.

**Stored!**

The display shows:

The test result is then shown again.

**Note:**

The display shows the number of free data sets.

**Storage: 900  
free records left**

**Storage:  
only 29 free records left**

If there are less than 30 data sets free the display shows:

Clear the memory as soon as possible (see chapter 2.4.4 Delete stored results). If memory capacity is used up it would be impossible to save additional test results.

## 2.3.4 Printing results

If a printer is installed and switched on, it is possible to print out the test results (without saving before).



Press [F3] key.

The entire data set is printed with date, time, code-No. and test result. Printing example:

```
2012-07-01 14:53:09
Test No.:1
Code-No.:1
2,13 NTU*
```

The Test No. is an internal number that is set automatically if a test result is stored. It appears only at the print out.

## 2.3.5 User calibration





### 2.3.5.1 When to calibrate

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

As the electronic and optical design of this instrument provides long-term stability the need for frequent calibration is minimised. Perform calibration with T-CAL every 3 months or if required, more often.

### 2.3.5.2 Calibration procedure

**Note:** Calibration may be canceled at any time by pressing the [ESC] key (not during a current countdowns). The latest calibration persist.

	Press the [Cal] key to start the calibration.
<b>&lt;NTU adjustment&gt; standard: &lt; 0,1 NTU</b>	Place the < 0.1 NTU standard in the sample chamber making sure that the marks aligned. Place the cover on the instrument.
	Press [Read/Avg] key.
<b>Count-Down 1:00</b>	The countdown starts. After the countdown is finished the reading starts automatically.
<b>&lt;NTU adjustment&gt; standard: 20 NTU</b>	Invert the 20 NTU standard and place in the sample chamber, making sure that the marks aligned. Place the cover on the instrument.
	Press [Read/Avg] key.
<b>Count-Down 1:00</b>	The countdown starts. After the countdown is finished the reading starts automatically.
<b>&lt;NTU adjustment&gt; standard: 200 NTU</b>	Invert the 200 NTU standard and place in the sample chamber, making sure that the marks aligned. Place the cover on the instrument.
	Press [Read/Avg] key.
<b>Count-Down 1:00</b>	The countdown starts. After the countdown is finished the reading starts automatically.
<b>&lt;NTU adjustment&gt; standard: 800 NTU</b>	Invert the 800 NTU standard and place in the sample chamber, making sure that the marks aligned. Place the cover on the instrument.



Press [Read/Avg] key.

Count-Down  
1:00

The countdown starts.  
After the countdown is finished the reading starts automatically.

<NTU adjustment>  
store



Press [←] key to store.

Press [Esc] key to cancel the calibration.

## 2.3.6 Calibration standards

The T-CAL standards purchased with the instrument should be used to calibrate the instrument. It is possible to perform calibration with fresh dilutions of a Formazin Stock Solution. Using dilutions of a Formazin Stock Solution it is recommended to calibrate and measure with an indexed single vial or a set of matched vials.

### 2.3.6.1 T-CAL standards – correct storage and using

For optimum results when using T-CAL standards, adhere to the following recommendations:

#### Storing T-CAL standards

- T-CAL standards should always be stored in their original vial.
- Preferably store the vials upright.
- Store standards between 5 and 25°C.
- Avoid prolonged exposure to temperatures exceeding 35°C.
- Store away from direct sunlight.
- Always allow the standards to acclimatise to ambient instrument temperature before use (not to exceed 35°C).
- T-CAL standards have a shelf life of 12 months if stored correctly.

#### Using of T-CAL Standards

##### Using < 0.1 NTU Standards

**Caution: Never shake or invert this < 0.1 NTU standard.**

- After delivery allow the vial to stand for at least 24 hours before use.
- If the standard has been shaken it can take several hours for all the bubbles to dissipate and we suggest the vial is left for at least 24 hours as outlined above.
- If the standard has been inverted accidentally wait at least 15 minutes before using.

## Preparing and using standards – infrequent use

**Note:** These instructions apply to all standards except the < 0.1 NTU standard. If you are using the < 0.1 NTU standard follow the instructions given above. These instructions apply to standards that have been sitting undisturbed for more than one week or to new standards.

1. Shake the standard vigorously for 2-3 minutes.
2. Let the vial stand undisturbed for 5 minutes.
3. Invert the vial between 5-10 times.
4. Immediately place the vial in the sample chamber and wait for 1 minute (countdown).

## Preparing and using standards – frequent use

**Note:** These instructions apply to all standards except the < 0.1 NTU standard. If you are using the < 0.1 NTU standard follow the instructions given above. These instructions apply to frequently used standards (daily or weekly usage).

1. Invert the vial 10 times.
2. Immediately place the vial in the sample chamber and wait for 1 minute (countdown).

## 2.3.7 Formazin standards – preparation and handling

### 2.3.7.1 Preparation of dilution water

Obtain at least 1000 ml of high quality water (e.g. distilled, demineralised or deionised water). Check the turbidity of the dilution water before use. If the turbidity is greater than 0.5 NTU (FNU) the water should be filtered with membrane filter (0.1 µm). Clean the required glassware with 1:1 hydrochloric acid and rinse several times with the dilution water.

### 2.3.7.2 Preparation of 4000 NTU Formazin Stock Solution

In lieu of preparations we recommend using a 4000 NTU Stock Solution that is available from specialised suppliers because these standards are high quality and you do not have to handle the raw materials.

**Caution: Please observe the handling instructions of the MSDS. Gloves, goggles and breathing equipment must be worn!**

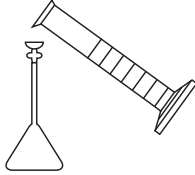
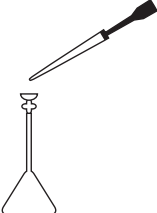
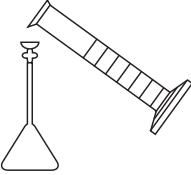
To prepare a Formazin Stock Solution from raw materials:

1. Dissolve 0.5 g Hydrazine sulfate ( $\text{NH}_2)_2\text{H}_2\text{SO}_4$  in 40 ml dilution water.
2. Dissolve 5.0 g Hexamethylenetetramine in 40 ml dilution water.
3. Transfer both solutions quantitatively to a 100 mL volumetric flask and fill to the mark with dilution water.
4. Mix the solution thoroughly.
5. Allow this solution to stand for at least 24 hours at  $25 \pm 3^\circ\text{C}$  ( $77 \pm 5^\circ\text{F}$ ) in a dark place (brown glass bottle).
6. The turbidity is developed over this period.

The Formazin Stock Solution has a maximum shelf life of 1 year if stored correctly (in a dark place). Production of a Formazin Stock Solution is described in "EN ISO 7027" and "Standard Methods for Examination of Water and Wastewater".

### 2.3.7.3 Preparation of dilutions from the 4000 NTU Formazin Stock Solution

To prepare the dilutions from a 4000 NTU Formazin Stock Solution and dilution water:

Standard	Step 1	Step 2	Step 3
			
<b>20 NTU</b>	Add 100 ml of dilution water to a clean 200 ml volumetric flask.	Pipette 1.00 ml well mixed 4000 NTU Formazin Stock Solution to this 200 ml flask.	Fill to the mark with dilution water. Close and mix the flask.
<b>200 NTU</b>	Add 50 ml of dilution water to a clean 100 ml volumetric flask.	Pipette 5.00 ml well mixed 4000 NTU Formazin Stock Solution to this 100 ml flask.	Fill to the mark with dilution water. Close and mix the flask.
<b>800 NTU</b>	Add 50 ml of dilution water to a clean 100 ml volumetric flask.	Pipette 20.00 ml well mixed 4000 NTU Formazin Stock Solution to this 100 ml flask.	Fill to the mark with dilution water. Close and mix the flask.

Use class A volume pipette and glass flasks.

**Use dilution water for the < 0.1 NTU standard.**

## 2.3.8 Measurement techniques

### 2.3.8.1 Degassing – Removal of Bubbles

**Note: Do not use with T-Cal 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

**Note:**

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. Avoid vigorous shaking as this 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 a vial. 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.

### 2.3.8.2 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 as described in chapter 2.3.7.1 "Preparing dilution water".

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 the mark and mix gently.

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

Fill the diluted water sample into 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.**

### 2.3.8.3 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. Add the water sample to the mark.
- 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 Read/Avg key.
- Perform multiple measurements, until a reproducible value is displayed (leave the vial in the sample chamber).

Note the smallest consistent and reproducible value.

### 2.3.8.4 Indexing and matching sample vials

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. Once vial orientation in the sample chamber is located, always use this new orientation mark for all measurements independent of the white pre-printed triangle mark.

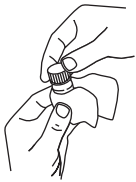
### 2.3.8.5 Indexing a single sample vial



Fill a clean and dry vial up to the mark with dilution water (see chapter 2.3.7.1 Preparing Dilution Water).



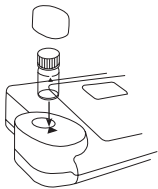
Cap the vial.



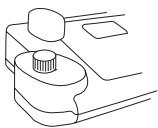
Hold the vial by the cap and clean it with the supplied cleaning tissue to remove water spots and finger prints.



Switch the turbidimeter on.



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



Place the cover on the instrument.





or



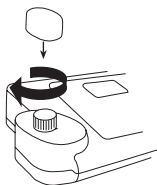
Press [Read/Avg] or [Read] key.

**1.00 NTU**

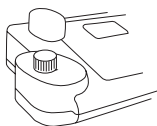
or

**1.02 NTU\***

Note the displayed result.



Rotate the vial in the sample chamber about 45°.



Place the cover on the instrument.



or



Press [Read/Avg] or [Read] key.

**1.00 NTU**

or

**1.02 NTU\***

Note the displayed result.

Repeat this procedure until the smallest NTU value is obtained.

Mark the vial at this point. Use this orientation mark for all further measurements.

**Note:**

Assume the indication "Underrange" is equal to 0.00 NTU.

### 2.3.8.6 Indexing a set of sample vials

1. Fill several clean and dry vials up to the mark with dilution water.
2. Cap the vials.
3. Hold the vial by the cap and clean it with the supplied cleaning tissue to remove water spots and finger prints.
4. Switch the turbidimeter on.
5. Place the first vial in the sample chamber making sure that the marks are aligned.
6. Place the cover on the instrument.
7. Press [Read/Avg] or [Read] key.
8. Note the displayed result.
9. Rotate the vial in the sample chamber about 45°.
10. Place the cover on the instrument.

11. Press [Read/Avg] or [Read] key.
12. Note the displayed result.  
Repeat this procedure until the smallest NTU value is obtained.
13. Mark the vial.
14. To index more vials, repeat points 1. to 13. for each vial.
15. Repeat this procedure until the reading matches the first vial reading within  $\pm 0,01$  NTU.
16. Mark the vial.
17. Repeat this procedure to match other vials.

**Note:**

It may not be possible to match all vials due to variation in the glass.

## 2.4 Settings: Table of MODE Functions

Mode-Function	No.	Description	Page
Clear calibration	46	Deleting user calibration	38
Clock	12	Setting date and time	38
Delete data	34	Deleting all stored results	35
Key beep	11	Switching the acoustic signal on/off to indicate key-pressing	37
Language	10	Selecting language	36
LCD contrast	80	Setting the display contrast	31
Print	20	Printing all stored results	33
Print code no.	22	Print only results of a selected code no. range	32
Print date	21	Print only results of a selected time period	34
Printing parameters	29	Setting of printing options	39
Signal beep	14	Switching the acoustic signal on/off to indicate end of reading	39
Storage	30	Displaying all stored results	30
Storage code no.	32	Displaying only results of a selected code no. range	28
Storage date	31	Displaying only results of a selected time period	28
System info	91	Information about the instrument e.g. current software version	29

**The selected settings are kept by the instrument even when switched off.  
To change instrument settings a new setting is required.**

## 2.4.1 blank because of technical requirements

### 2.4.2 Instrument basic settings 1

#### Selecting a language



Press [MODE] [1] [0] keys.



Confirm with [↵] key.



The display shows:

Press arrow key [▼] or [▲] to select the required language from the displayed list.



Confirm with [↵] key.

#### Key beep



Press [MODE] [1] [1] keys.



Confirm with [↵] key.



The display shows:



- Press [0] key to switch the key beep off.



- Press [1] key to switch the key beep on.



Confirm with [↵] key.

## Setting date and time



Press [MODE] [1] [2] keys.



Confirm with [↵] key.

<b>&lt;Clock&gt;</b>	
<b>yy-mm-dd</b>	<b>hh:mm</b>
--:--:--	--:--

The display shows:

The entry comprises two digits each.

<b>yy-mm-dd</b>	<b>hh:mm</b>
<b>12-05-14</b>	--:--

Enter year, month and day,

e.g.: 14. May 2012 = [1][2][0][5][1][4]

The display shows:

<b>yy-mm-dd</b>	<b>hh:mm</b>
<b>08-05-14</b>	<b>15:07</b>

Enter hours and minutes

e.g.: 3.07 p.m. = [1][5][0][7]



Confirm with [↵] key.

### Note:

While confirming date and time with [↵] key the seconds are adjusted to zero automatically.

## Signal beep

Performing a measurement takes several seconds. The instrument indicates the end of measuring by a short beep.



Press MODE [1] [4] keys.



Confirm with [↔] key.

<Signal-Beep>  
ON: 1 OFF: 0

The display shows:



- Press [0] key to switch the signal beep off.



- Press [1] key to switch the signal beep on.



Confirm with [↔] key.

## 2.4.3 Printing of stored results

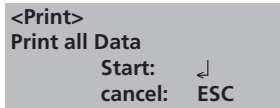
### Printing all results



Press MODE [2] [0] keys.



Confirm with [↵] key.



The display shows:

Press [↵] key for printing out all stored test results.



The display shows e.g.:

After printing the instrument goes back to mode menu automatically.

#### **Note:**

It is possible to cancel the entry by [ESC].  
All stored data are printed out.

## Printing results of a selected time period



Press MODE [2] [1] keys.



Confirm with [↵] key.

<Print>  
sorted: date  
from yy-mm-dd  
\_ \_ - \_ - \_

The display shows:

Enter year, month and day for the first day of the required period, e.g.: 14 May 2012 = [1][2][0][5][1][4]



Confirm with [↵] key.

to yy-mm-dd  
\_ \_ - \_ - \_

The display shows:

Enter year, month and day for the last day of the required period, e.g.: 19 May 2012 = [1][2][0][5][1][9]



Confirm with [↵] key.

from 2012-05-14  
to 2012-05-19  
Start: ↵  
cancel: ESC

The display shows:

Press [↵] key and all stored results in the selected date range are printed.

After printing the instrument goes back to mode menu automatically.

### Note:

It is possible to cancel the entry by [ESC].

If you want to print only results of one day enter the same date twice to determine the period.



## Printing results of a selected Code No. range



Press MODE [2] [2] keys.



Confirm with [↵] key.

```
<Print>
sorted: Code-No.
from  _ _ _ _ _
```

The display shows:

Enter numeric code number (up to 6 places) for the first required code no., e.g.: [1].



Confirm with [↵] key.

```
to  _ _ _ _ _
```

The display shows:

Enter numeric code number (up to 6 places) for the last required code no., e.g.: [1] [0].



Confirm with [↵] key.

```
from  000001
to    000010
Start: ↵
cancel: ESC
```

The display shows:

Press [↵] key and all stored results in the selected code number range are printed.

After printing the instrument goes back to mode menu automatically.

### Note:

It is possible to cancel the entry by [ESC].

If you want to print only results of one code number enter the same code number twice.

If you want to print all results without code no. (code no. is 0) enter Zero [0] twice.

## Printing Parameter



Press MODE [2] [9] keys.



Confirm with [↵] key.

```
<printing parameter>
1: Flow control
2: Baud rate
cancel: ESC
```

The display shows:



Press [1] key to select "Protocol".

```
<Flow Control>
is: Hardware
select: [▲] [▼]
save:  ↵
cancel: ESC
```

The display shows:



Press arrow key [▼] or [▲] to select the required Protocol (Xon/Xoff, Hardware, no control)



Confirm with [↵] key.



Finish with [ESC] key.  
Flow Control will be set to the selection displayed at "is".



Press [2] key to select "Baudrate".

```
<Baud rate>
is: 19200
select: [▲] [▼]
save:  ↵
cancel:  ESC
```

The display shows:



Press arrow key [▼] or [▲] to select the required Baud rate. (600, 1200, 2400, 4800, 9600, 14400, 19200)



Confirm with [↵] key.



End with [ESC] key.

Back to Mode Menu with [ESC] key.

**Note:**

Select "Hardware" as Flow control and "9600" as Baud rate for using the printer **DPN 2335**.

Select "Hardware" as Flow control and "19200" as Baud rate for using the printer **DP 1012**. For setting of the printer see chapter 2.5.1 Connection to a printer.

## 2.4.4 Recall / delete stored results

### Recall all stored results



Press [MODE] [3] [0] keys.



Confirm with [↵] key.

```
<Storage>
display all data
Start:  ↓ cancel:  ESC
print:  F3
print all: F2
```

The display shows:

The stored data sets are displayed in chronological order, starting with the latest stored test result.

- Press [↵] key and all stored results are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].
- Press arrow key [▼] to display the following test result.
- Press arrow key [▲] to display the previous test result.



```
no Data
```

If there are no test results in memory the display shows:

## Recall results of a selected time period



Press MODE [3] [1] keys.



Confirm with [↵] key.

<Storage>  
sorted: date  
from yy-mm-dd  
\_ \_ - \_ - \_

The display shows:

Enter year, month and day for the first day of the required period, e.g.: 14 May 2012 = [1][2][0][5][1][4]



Confirm with [↵] key.

to yy-mm-dd  
\_ \_ - \_ - \_

The display shows:

Enter year, month and day for the last day of the required period, e.g.: 19 May 2012 = [1][2][0][5][1][9]



Confirm with [↵] key.

from 2012-05-14  
to 2012-05-19  
Start: ↵ cancel: ESC  
print: F3  
print all: F2

The display shows:

- Press [↵] key and all stored results in the selected date range are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

### Note:

It is possible to cancel the entry by [ESC].

If you want to recall only results of one day enter the same date twice to determine the time period.

## Recall results of a selected Code No. range



Press MODE [3] [2] keys.



Confirm with [↵] key.

```
<Storage>
sorted: Code-No.
from _____
```

The display shows:

Enter numeric code number (up to 6 places for the first required code no., e.g.: [1]).



Confirm with [↵] key.

```
to _____
```

The display shows:

Enter numeric code number (up to 6 places) for the last required code no., e.g.: [1] [0].



Confirm with [↵] key.

```
from 000001
to 000010
Start: ↵ cancel: ESC
print: F3
print all: F2
```

The display shows:

- Press [↵] key and all stored results in the selected code no. range are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

### Note:

It is possible to cancel the entry by [ESC].

If you want to recall only results of one code number enter the same code number twice.

If you want to recall all results without code no. (code no. is 0) enter Zero [0] twice.

## Delete stored results



Press MODE [3] [4] keys.



Confirm with [↵] key.

<Delete data>  
Delete all data?  
YES : 1 NO : 0

The display shows:



- Press [0] key to retain the data sets in memory.



- After pressing key [1] the following acknowledgment is displayed:

<Delete data>  
Delete data ↵  
Do not delete: ESC

Press [↵] key to delete.

**ATTENTION:**  
**All stored test results are deleted.**

or cancel without deleting data by pressing [ESC] key.

## Delete user calibration



Press MODE [4] [6] keys.



Confirm with [↵] key.

<Clear calibr.>  
Clear user  
calibration?  
YES: 1, NO: 0

The display shows:



- Press [1] key to delete user calibration.



- Press [0] key to keep the valid user calibration.

Finish with [↵] key.

## 2.4.5 – 2.4.8 blank because of technical requirements

### 2.4.9 Instrument basic settings 2

#### Adjusting display contrast



Press [MODE] [8] [0] keys.



Confirm with [↵] key.



The display shows:



- Press arrow key [▲] to increase contrast of the LCD display.



- Press arrow key [▼] to decrease contrast of the LCD display.



Confirm with [↵] key..

### 2.4.10 Instrument special functions/service

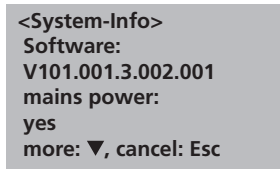
#### Instrument-Information



Press [MODE] [9] [1] keys.



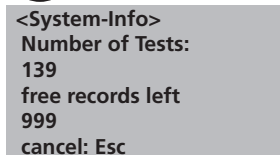
Confirm with [↵] key.



This function informs you about the current software version, about the current detected mains power supply, about the number of performed tests and free memory capacity.



Press arrow key [▼] to display the number of performed tests and free memory capacity.



Finish with [ESC] key.

## 2.5 Data transfer

Switch the instrument and the personal computer or printer off. Connect the instrument (RS232 interface) and the serial interface of the personal computer or printer using a cable in line with the specified assignment (see technical data). The cable for connection to a personal computer is included in delivery contents.

### 2.5.1 Connection to a printer

Printer with a serial connection are suitable for connection with the instrument (see chapter 3.4 Technical data interface).

A suitable paper label printer is the printer DPN 2335.

Before using the printer **DPN 2335** with the instrument you should change the following standard adjustments:

(Detailed information of changing the adjustment you will find in the printer manual).

Baud-rate:	<b>9600</b>
Parity:	<b>None</b>
Data bits:	<b>8</b>

**Note:** The printer must be connected and switched on before printing.

**Caution:** Adjust printing parameter in Mode 29. See chapter 2.4.3 Printing Parameter.

### 2.5.2 Data transfer to a personal computer

Transferring test results from the instrument to a personal computer requires a transfer program, e.g. HyperTerminal.

Please find detailed information at our homepage on the download-area.

### 2.5.3 Internet Updates

It is possible to update new software applications and additional languages via the internet. Please find detailed information at our homepage in the download-area.

**Please Note:**

To prevent loss of stored test results store or print them out before performing an Update.



## **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 for Turbidimeter:

- 
- 1 Turbidimeter in plastic case
- 1 Cap for Turbidimeter
- 2 Protective caps for connections
- 1 Rechargeable battery set (7 Ni-MH rechargeable batteries; Type AA; 1100 mAh)
- 1 Mains adapter, (100 – 240 V, 50 – 60 Hz)
- 1 Cable for connection to PC
- 4 Round vials with cap, height 54 mm, Ø 24 mm
- 1 Beaker cup, plastic, 100 ml
- 1 Standard T-Cal < 0.1 NTU
- 1 Standard T-Cal 20 NTU
- 1 Standard T-Cal 200 NTU
- 1 Standard T-Cal 800 NTU
- 1 Cleaning tissue
- 1 Screwdriver
- 1 Instruction manual
- 1 Short manual
- 1 Guarantee declaration

Please see the General Catalogue for details of available accessories and spare parts.

## 3.3 blank because of technical requirements

### 3.4 Technical data

Display	Graphic Display (7-line, 21-characters)
Serial Interface	serial RS232 for printer- and PC-connection; 9-pin D-sub-male connector, data format ASCII, 8-bit Data, no parity, 1 start-bit, 1 stop-bit, baud rate and protocol: adjustable Pin assignation: Pin 1 = free                      Pin 6 = free Pin 2 = Rx Data                  Pin 7 = RTS Pin 3 = Tx Data                  Pin 8 = CTS Pin 4 = free                      Pin 9 = free Pin 5 = GND
Light source	LED $\lambda = 860$ nm and photo sensor amplifier in protected cell compartment.
Principle	Nephelometric (Non Ratio)
Range	0.01 – 1100 NTU <sup>1)</sup>
Resolution	0.01 – 9.99 NTU = 0.01 NTU 10.0 – 99.9 NTU = 0.1 NTU 100 – 1100 NTU = 1 NTU
Accuracy	$\pm 2$ % of reading or $\pm 0.01$ NTU from 0.01 to 500 NTU $\pm 5$ % of reading from 500 to 1100 NTU
Repeatability	$\pm 1$ % of reading or $\pm 0.01$ NTU which ever is greater
Operation	Acid and solvent resistant touch-sensitive keyboard with integral beeper as acoustic indicator.
Power supply	7 Ni-MH rechargeable batteries (Type AA with 750 mAh); external main adapter (Input: 100–240 V, 50–60 Hz; Output: 15V=/530 mA) Lithium battery (CR 2032, 3V); for keeping data if there is no power supply from the rechargeable batteries or the main adapter.
Auto off	20 minutes after last function, 30 seconds acoustical signal before switching off.
Charging time	approx. 10 hours
Dimensions	approx. 265 x 195 x 70 mm (unit) approx. 440 x 370 x 105 mm (case)
Weight (unit)	approx. 1000 g (with main adapter and rechargeable batteries)
Working conditions	5–40°C at max. 30–90% relative humidity (without condensation)
Language options	German, English, French, Spanish, Italian; further languages via Internet Update
Storage capacity	ca.1000 data sets

<sup>1)</sup>FNU is applicable to "Non Ratio" instruments.

#### **Subject to technical modification!**


**To ensure maximum accuracy of test results, always use the reagent systems supplied by the instrument manufacturer.**

### 3.5 Abbreviations

<b>Abbreviation</b>	<b>Definition</b>
Read/Avg	Signal Average function
NTU	Nephelometric Turbidity Unit
FTU	Formazine Turbidity Unit
FNU	Formazine Nephelometric Units
FAU	Formazine Attenuation Units
ASBC	American Society of Brewing Chemists
EBC	European Brewery Convention
mg/l	Milligram per litre
ppm	Parts per million

## 3.6 Trouble-shooting

### 3.6.1 Operating messages in the display / error display

Display	Meaning	Trouble shooting
Overrange	Reading is exceeding the range too much light on the photo cell.	<ul style="list-style-type: none"> <li>• If possible dilute sample.</li> <li>• Cell chamber lid closed?</li> <li>• Repeat measurement with closed lid.</li> </ul>
Underrange	result is under detection limit	---
Storagesystem error use Mode 34	mains power fails or is not connected.	Insert or change Lithium battery. Delete data with Mode 34.
Capacity of rechargeable battery  	<p>Full Capacity</p> <p>Warning automaticly every 3 min.</p> <p>Warning automaticly every 12 min.</p> <p>Warning automaticly, the instrument switches of</p>	<ul style="list-style-type: none"> <li>• Capacity of rechargeable battery may be too low.</li> <li>• Charge the rechargeable batteries.</li> <li>• Operate imstrument with mains adapter.</li> </ul>
Printer „Timeout“	<ul style="list-style-type: none"> <li>• Printer switched off.</li> <li>• No conection.</li> </ul>	<ul style="list-style-type: none"> <li>• Connect printer.</li> <li>• Check connections.</li> <li>• Switch printer on.</li> </ul>
Instrument can be operated with the mains adapter but not with the rechargeable batteries.	Rechargeable batteries are not charged or defect. Fuse (Typ A, inert, 20 mm) may be defect.	Charge rechargeable batteries or change them. If the problem still exists change fuse.

### 3.7 Declaration of CE-Conformity

The manufacturer: **Tintometer GmbH**  
Schleefstraße 8 a  
44287 Dortmund  
Deutschland

declares, that this product

Product name: **TurbiDirect**

Conforms with DIN EN 61 326 for specific defined electromagnetic enviroments.  
Conforms with DIN EN 61 326 (domestic).

Dortmund, 06. August 2003



---

Cay-Peter Voss, Managing Director



**Tintometer GmbH, Division Aqualytic®**

Schleefstraße 8-12 | 44287 Dortmund | Germany

Tel.: (+49) (0)2 31 / 9 45 10-755 | Fax: (+49) (0)2 31 / 9 45 10-750

sales@aqualytic.de | www.aqualytic.de



Technical changes without notice  
Printed in Germany 12/14