Lovibond® Water Testing

Tintometer® Group

Photometer-System MD100

Boiler Water

www.lovibond.com

CE-Konformitätserklärung / Declaration of CE-Conformity
Déclaration de conformité CE / Dichiarazione di conformità CE / CE-Declaración de conformidad

Hersteller / manufacturer / fabricant / produttore / fabricante:
Tintometer GmbH / Schleefstraße 8-12 / 44287 Dortmund / Deutschland

Produktname / Product name / Nom du fabricant / Nome del prodotto / Nombre del productor: **MD 100**

DE EG-Konformitätserklärung gemäß RICHTLINIE **2004/108/EG** DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 15. Dezember 2004 und RICHTLINIE **2011/65/EU** DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 8. Juni 2011. Der Hersteller erklärt, dass dieses Produkt die Anforderungen der folgenden Produktfamiliennorm erfüllt:

GB Declaration of EC-Conformity according to DIRECTIVE **2004/108/EC** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 2004, December the 15th and DIRECTIVE **2011/65/EU** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 2011, June the 8th. The manufacturer declares that this product meets the requirements of the following product family standard:

FR Déclaration de conformité CE conformément à la DIRECTIVE **2004/108/CE** DU PARLEMENT EUROPÉEN ET DU CONSEIL du 15 décembre 2004 et DIRECTIVE **2011/65/UE** DU PARLEMENT EUROPÉEN ET DU CONSEIL du 8 juin 2011. La fabricant déclare que le produit est conforme aux exigences de la norme de famille de produits suivante :

IT Dichiarazione di conformità CE in conformità alla DIRETTIVA **2004/108/CE** DEL PARLAMENTO EUROPEO E DEL CONSIGLIO del 15 dicembre 2004 e DIRETTIVA **2011/65/UE** DEL PARLAMENTO EUROPEO E DEL CONSIGLIO del 8 Giugno 2011. Il produttore dichiara che il seguente prodotto soddisfa i requisiti della seguente norma per famiglia di prodotti:

ES CE - Declaración de conformidad conforme a la NORMA **2004/108/CE** DEL PARLAMENTO Y DEL CONSEJO EUROPEO del 15 de diciembre de 2004 y NORMA **2011/65/UE** DEL PARLAMENTO Y DEL CONSEJO EUROPEO del 8 de junio de 2011. El fabricante declara, que este producto cumple con las exigencias de la siguiente norma correspondiente a la familia de productos:

DIN EN 61326-1:2006

DE Gemäß den grundlegenden Prüfanforderungen für die Störfestigkeit (Tabelle 1) / Störaussendungen gemäß den Anforderungen für Geräte der Klasse B

GB Basic immunity test requirements (Table1) / Emission according to the requirements for class B equipment

FR Conformément aux exigences fondamentales relatives aux essais d'immunité (tableau 1) / Émissions parasites conformément aux exigences applicables aux appareils de la classe B

IT Conforme ai requisiti relativi al test di resistenza alle interferenze (Tabella 1) / Emissione in conformità ai requisiti per i dispositivi della classe B

ES De acuerdo a los requisitos básicos de verificación para la resistencia a interferencias (tabla 1) / Emisión de interferencias conforme a las exigencias para aparatos de clase B

Dortmund, 07.10.2014

Cay-Peter Voss, Managing Director

GB Important Information

⚠ 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.

Important disposal instructions for batteries and accumulators

EC Guideline 2006/66/EC 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.

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 2012/19/EU 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.

GB Contents

GB General notes

Guidelines for photometric measurements

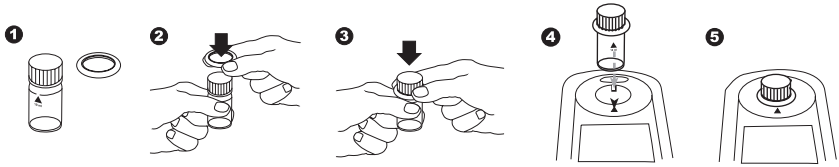
1. Vials, caps and stirring rods should be cleaned thoroughly **after each analysis** to prevent interference. Even minor reagent residues can cause errors in the test result.
2. The outside of the vial must be clean and dry before starting the analysis. Clean the outside of the vials with a towel to remove fingerprints or other marks.
3. Zero calibration and test must be carried out with the same vial as there may be slight differences in optical performance between vials.
4. The vials must be positioned in the sample chamber for zeroing and test with the Δ mark on the vial aligned with the ∇ mark on the instrument.
5. Always perform zeroing and test with the vial cap tightly closed. Only use the cap with a sealing ring.
6. Bubbles on the inside wall of the vial lead to incorrect measurements. To prevent this, remove the bubbles by swirling the vial before performing the test.
7. Avoid spillage of water into the sample chamber because this can lead to incorrect test results.
8. Contamination of the transparent cell chamber can result in wrong readings. Check at regular intervals and – if necessary – clean the transparent cell chamber using a moist cloth or cotton buds.
9. Large temperature differences between the instrument and the environment can lead to errors – e.g. due to the formation of condensation in the cell chamber or on the vial.
10. To avoid errors caused by stray light do not use the instrument in bright sunlight.
11. Always add the reagent tablets to the water sample straight from the foil without touching them with the fingers.
12. The reagents must be added in the correct sequence.

Method notes

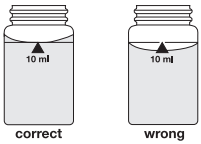
- Prior to measurement ensure that the sample is suitable for analysis (no major interferences) and does not require any preparation i.e. pH adjustment, filtration etc.
- Method specific validation data are available on the Internet (www.lovibond.com) or on request.
- Different Refill Packs available on request.
- Reagents are designed for use in chemical analysis only and should be kept well out of the reach of children.
- Ensure proper disposal of reagent solutions.
- Material Safety Data Sheets are available on request (Internet: www.lovibond.com)

GB General notes

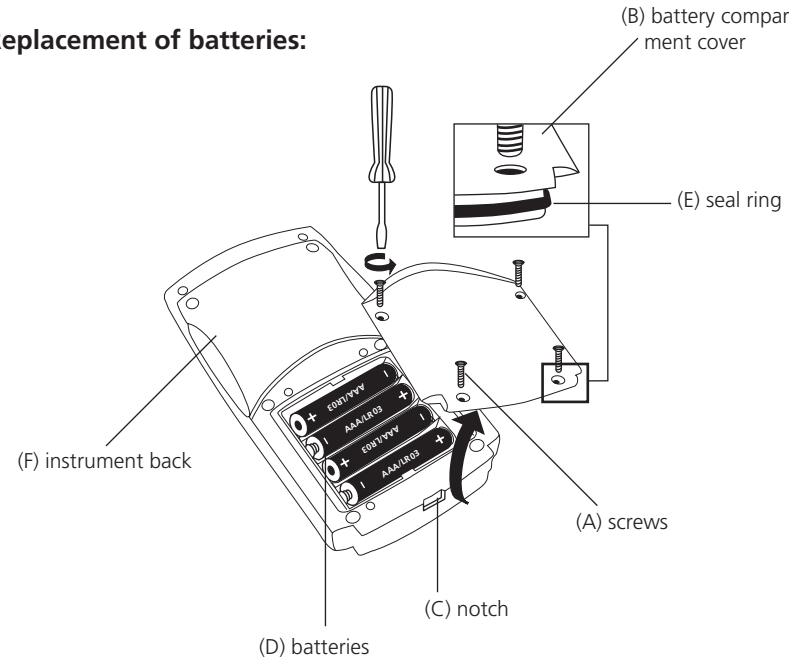
Correct position of the vial (Ø 24 mm):



Correct filling of the vial:



Replacement of batteries:



CAUTION:

To ensure that the instrument is water proof:

- **seal ring (E) must be in position**
- **battery compartment cover (B) must be fixed with the four screws**

If the batteries are removed for more than one minute the date and time menu starts automatically when the photometer is switched on the next time.

Operation

On/Off

Switch the unit on using the [ON/OFF] key.

METHOD

The display shows the following:

Mode

Select the required test using the [MODE] key.

Scroll Memory (SM)
To avoid unnecessary scrolling for the required test method, the instrument memorizes the last method used before being switched off. When the instrument is switched on again, the scroll list comes up with the last used test method first.

METHOD

The display shows the following:

Fill a clean vial with the water sample up to the 10 ml mark, screw the cap on and place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero/Test

Press the [ZERO/TEST] key.

METHOD

The "Method" symbol flashes for approx. 8 seconds.

0.0.0

The display shows the following:

After zero calibration is completed, remove the vial from the sample chamber. The characteristic coloration appears after the addition of the reagents.

Replace the cap on the vial and place in the sample chamber making sure that the ⧖ marks are aligned.

Zero/Test

Press the [ZERO/TEST] key.
(For Countdown/reaction period see page 43)

METHOD

The "Method" symbol flashes for approx. 3 seconds.

RESULT

The result appears in the display.

The result is saved automatically.

Zero/Test

Repeating the test:

Press the [ZERO/TEST] key again.

Zero/Test

Repeating the zero:

Press the [ZERO/TEST] key for 2 seconds.

Display backlight

Press the [!] key to turn the display backlight on or off. The backlight is switched off automatically during the measurement.

Recall of stored data

If the instrument is switched on, press the [!] key for more than 4 seconds, then release the [!] key to access the recall menu.

Countdown / reaction period

If a reaction period is included in a method a countdown function can be used:

Press the [!] key and hold.
Press the [ZERO/TEST] key.
Release the [!] key; the countdown starts.
After the countdown is finished the measurement starts automatically.

It is possible to interrupt the countdown by pressing the [ZERO/TEST] key. Measurement starts immediately.

Caution:
An incomplete reaction period can lead to incorrect test results.

AL

Aluminium with VARIO Powder Pack 0.01 – 0.25 mg/l Al

Use two clean vials (24 mm Ø) and mark one as blank for zeroing.

Fill **20 ml of the water sample** in a 100 ml beaker.

Add the contents of **one VARIO Aluminum ECR F20 Powder Pack** straight from the foil to the water sample.

Dissolve the powder using a clean stirring rod.

Wait for a **reaction period of 30 seconds.**

After the reaction period is finished proceed as follows:

Add the contents of **one VARIO Hexamine F20 Powder Pack** straight from the foil to the same water sample.

Dissolve the powder using a clean stirring rod.

Add **1 drop of VARIO Aluminum ECR Masking Reagent** in the vial marked as blank.

Add 10 ml of the prepared water sample to the vial (this is the blank).

Add the remaining 10 ml of the prepared water sample in the second clean vial (this is the sample).

Close the vials tightly with the caps and invert several times to mix the contents.

Place the vial (the blank) in the sample chamber making sure that the ⧖ marks are aligned.

Wait for a reaction period of 5 minutes.

Zero Test

Press the [ZERO/TEST] key.

AL

The method symbol flashes for approx. 8 seconds.

0.0.0

The display shows:

Remove the vial from the sample chamber.

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

Zero Test

Press the [ZERO/TEST] key.

AL

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display as mg/l Aluminium.

Notes:

1. Before use, clean the vials and the accessories with Hydrochloric acid (approx. 20%). Rinse them thoroughly with deionised water.
2. To get accurate results the sample temperature must be between 20°C and 25°C.
3. A low test result may be given in the presence of Fluorides and Polyphosphates. The effect of this is generally insignificant unless the water has fluoride added artificially. In this case, the following table should be used:

Fluoride [mg/l F]	Displayed value: Aluminium [mg/l Al]					
	0.05	0.10	0.15	0.20	0.25	0.30
0.2	0.05	0.11	0.16	0.21	0.27	0.32
0.4	0.06	0.11	0.17	0.23	0.28	0.34
0.6	0.06	0.12	0.18	0.24	0.30	0.37
0.8	0.06	0.13	0.20	0.26	0.32	0.40
1.0	0.07	0.13	0.21	0.28	0.36	0.45
1.5	0.09	0.20	0.29	0.37	0.48	---

Example: If the result of Aluminium determination is 0.15 mg/l Al and the Fluoride concentration is known to be 0.4 mg/l F, the true concentration of Aluminium is 0.17 mg/l Al.

Reagent	**Form of reagent/Quantity**	**Order-No.**
Set		535000
VARIO Aluminium ECR F20	Powder Pack / 100	
VARIO Aluminium Hexamine F 20	Powder Pack / 100	
VARIO Aluminium ECR Masking Reagent	Liquid reagent / 25 ml	

FE

Iron LR with Liquid reagent
0.03 – 2 mg/l $Fe^{2+/3+}$

This test is suitable for determining total soluble iron. The sample should be pre-filtered using a 0.45 µm membrane if total dissolved iron is required. Particulate or suspended iron will otherwise add to the result.

0.0.0

Fill a clean vial (24 mm Ø) with **10 ml of the prepared water sample** and perform zero calibration (see "Operation").

Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

10 drops KS61 (Ferrozine / Thioglycolate)

Close the vial tightly with the cap and invert several times to mix the contents.

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

! Zero Test

Wait for a reaction period of 5 minutes (Note 1).
(Countdown can be activated, see page 43)

FE

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in mg/l Iron.

Notes:

1. Complexed iron may be measured by increasing the development period until no further colour development is seen. Very strongly complexed iron may not be included in the measured iron. In this case the complexing agent must be destroyed by oxidation with acid/persulphate followed by neutralisation to pH 6–9.
2. For total iron (suspended and dissolved), boil sample with acid/persulphate. Neutralise back to pH 6–9 making back up to original volume with distilled or deionised water.
3. When using KS61 (Ferrozine/Thioglycolate), high levels of molybdate will produce an intense yellow colour.
   In this case a reagent blank is required:
   - Use two clean vials (24 mm Ø).
   - Mark one as blank for zeroing.
   - Fill the blank with **10 ml sample**.
   - Add **10 drops KS63 (Thioglycolate).**
   - Close the vial tightly with the cap and swirl gently several times.
   - Place the blank in the sample chamber making sure that the marks ⧖ are aligned.
   - Press **ZERO** key.
   - Remove the vial from the sample chamber.
   - Fill a second clean 24 mm vial with **10 ml water sample** (this is the sample).

     Perform as described on page 46:
   - Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:
     10 drops KS61 (Ferrozine / Thioglycolate)
   - Close the vial tightly with the cap and invert several times to mix the contents.
   - Place the vial in the sample chamber making sure that the ⧖ marks are aligned.
   - **Wait for a reaction period of 5 minutes (Note 1).**
     (Countdown can be activated, see page 43)
   - The method symbol flashes for approx. 3 seconds.
   - The result is shown in the display in mg/l Iron.

Reagent / Accessories	Form of reagent/Quantity	Order-No.
KS61 (Ferrozine/ Thioglycolate) KS63 (Thioglycolate Reagent)	Liquid reagent / 65 ml Liquid reagent / 65 ml	56L006165 56L006365
Membrane-filter-set	25 filter 0,45 µm 2 syringe 20 mL	366150

Cu

Copper with Tablet
0.3 – 5.0 mg/l Cu

a) free Copper

0.0.0

Fill a clean vial (24 mm Ø) with **10 ml of the water sample** and perform zero calibration (see "Operation").

Add **one COPPER No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

Close the vial tightly with the cap and swirl gently several times until the tablet is dissolved.

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

Zero Test

Press the [ZERO/TEST] key.

Cu

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in mg/l free Copper.

b) total Copper

Add **one COPPER No. 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

Close the vial tightly with the cap and swirl gently several times until the tablet is dissolved.

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

Zero Test

Press the [ZERO/TEST] key.

Cu

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in mg/l total Copper.

c) combined Copper

combined Copper = total Copper – free Copper

Reagent	Form of reagent/Quantity	Order-No.
Set COPPER No. 1 / No. 2	Tablet / per 100 inclusive stirring rod	517691BT
COPPER No. 1	Tablet / 100	513550BT
COPPER No. 2	Tablet / 100	513560BT

Si Hr

Silica HR with VARIO Powder Pack
1 – 90 mg/l SiO_2

0.0.0

Fill a clean vial (24 mm Ø) with **10 ml of the water sample** (Note 1) and perform zero calibration (see "Operation").

Add the contents of **one Silica HR Molybdate F10 Powder Pack** straight from the foil into the water sample.

Close the vial tightly with the cap and swirl several times to dissolve the powder.

Add the contents of **one VARIO Silica HR Acid Rgt F10 Powder Pack** straight from the foil into the same water sample (Note 2).

Close the vial tightly with the cap and invert several times to mix the contents.

Wait for a reaction period of 10 minutes.

After the reaction period is finished proceed as follows:
Add the contents of **one VARIO Silica Citric Acid F10 Powder Pack** straight from the foil into the same water sample (Note 3).

Close the vial tightly with the cap and swirl several times to dissolve the powder.

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

! Zero Test

Wait for a reaction period of 2 minutes.
(Countdown can be activated, see page 43)

Si Hr

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in mg/l Silica.

Notes:

1. Temperature of the sample should be 15°C – 25°C.
2. If Silica or Phosphate is present a yellow colour is developed.
3. In this step any yellow colour due to Phosphate is removed.
4. Substances who may interfere when present in concentrations at:

Substance	Interference
Iron	large amounts interfere
Phosphate	does not interfere at concentrations less than 50 mg/l PO_4 at 60 mg/l PO_4 the interference is approx. – 2 % at 75 mg/l PO_4 the interference is approx. – 11 %
Sulfide	interferes at all levels

   Occasionally water samples contain forms of silica which reacts very slowly with Molybdate. The nature of these forms is not known.
   A pre-treatment with Sodium hydrogencarbonate and then with Sulfuric Acid will make these forms reactive to Molybdate (pre-treatment is given in "Standard Methods for the Examination of Water and Wastewater" under "Silica Digestion with Sodium Bicarbonate").
5. Conversion:
   mg/l Si = mg/l SiO_2 x 0.47

Reagent	Form of reagent/Quantity	Order-No.
Set		535700
VARIO Silica HR Molybdate F10	Powder Pack / 100	
VARIO Silica HR Acid Rgt F10	Powder Pack / 100	
VARIO Silica HR Citric Acid F10	Powder Pack / 100	

CL⁻

Chloride with Liquid Reagent
0.5 – 20 mg/l Cl⁻

0.0.0

Fill a clean vial (24 mm Ø) with **10 ml of the water sample** and perform zero calibration (see "Operation").

Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

20 drops KS251 (Chloride Reagent A)

Close the vial tightly with the cap and invert several times to mix the contents.

Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

20 drops KS253 (Chloride Reagent B)

Close the vial tightly with the cap and invert several times to mix the contents.

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

! Zero/Test

Wait for a reaction period of 5 minutes.
(Countdown can be activated, see page 43)

CL⁻

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in mg/l Chloride.

Notes:

1. Chloride causes an extremely fine distributed turbidity with a milky appearance. **Heavy shaking leads to bigger sized particles which can cause false readings**.
2. Conversion:
   mg/l NaCl = mg/l Cl^- x 1.65

Reagent	Form of reagent/Quantity	Order-No.
Chloride Reagenz A	Liquid reagent / 65 ml	56L025165
Chloride Reagenz B	Liquid reagent / 65 ml	56L025365

PO4

Phosphate HR with Liquid Reagent
5 – 80 mg/l PO_4

This test is suitable for determining ortho-Phosphate in boiler waters and potable water supplies. Samples should be filtered prior to analysis to remove any suspended insoluble phosphate. A GF/C filter is suitable.

Unscrew the two halves of the filter holder and place one GF/C filter circle onto the base section. Screw the two parts together again, **ensuring the O ring is correctly located**.

Fill a clean 20 ml syringe with approx. 14 ml water sample.

Connect the syringe to the filtration assembly and discharge the syringe to waste, down to the 10 ml mark.

Fill a clean vial (24 mm Ø) with **10 ml of water sample from the prepared syringe.**

0.0.0

Perform zero calibration (see "Operation").

Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

25 drops KS228 (Ammonium Molybdate)

Close the vial tightly with the cap and invert several times to mix the contents.

Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

25 drops of KS229 (Ammonium Metavanadate)

Close the vial tightly with the cap and invert several times to mix the contents.

! Zero/Test

Wait for a reaction period of 10 minutes.
(Countdown can be activated, see page 43)

PO4

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in mg/l Phosphate.

Notes:

1. For the analysis of Polyphosphate and total Phosphate a prior digestion is required.
2. Conversions:
   mg/l P = mg/l PO_4 x 0.33
   mg/l P_2O_5 = mg/l PO_4 x 0.75

Reagent / Accessories	Form of reagent/Quantity	Order-No.
KS228 (Ammonium Molybdate)	Liquid reagent / 65 ml	56L022865
KS229 (Ammonium Metavanadate)	Liquid reagent / 65 ml	56L022965
GF/C filter		56A019950

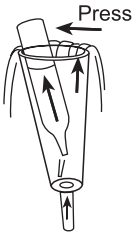
O2

Oxygen, dissolved with Vacu-vials® K-7553
10 – 800 µg/l O_2

Insert the adapter for 13 mm Ø round vials.

0.0.0

Place the blank in the sample chamber and perform zero calibration (see "Operation"). The blank is part of the test kit.



Water should flow through the special sample container for several minutes to remove any air bubbles sticking at the surface.

The water must flow from the bottom to the top.

When the sample container is bubble-free press one Vacu-vial® into the lower edge of the sample container. The Vacu-vial® breaks at the neck and the vial fills automatically.

A small volume of inert gas remains in the Vacu-vial®.

Remove the Vacu-vial® point downwards from the sample container immediately.

As the contents of the vial has a higher density than water, it is important to remove the vial from the sample container within 5 seconds to prevent any loss of reagent.

Invert the vial several times. Dry the outside of the vial.

Place the Vacu-vial® in the sample chamber.

Zero Test

Press the [ZERO/TEST] key.

O2

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in µg/l Oxygen.

Notes:

1. This method is adapted from CHEMetrics. The measuring range and wavelength used for this photometer may differ from the data specified by CHEMetrics.
2. Read the original test instruction and the MSDS (delivered with the test) before performing the test. MSDS also available at www.chemetrics.com.
3. Vacu-vials® should be stored in the dark and at room temperature.
4. Vacu-vials® is a registered trade mark of the company CHEMetrics, Inc. / Calverton, U.S.A.
5. Wear safety glasses and protective gloves.

Reagent / Accessories	Form of reagent/Quantity	Order-No.
Vacu-vials® / CHEMetrics K-7553	Test- Kit / 30 tests	380450
13-mm-adapter Ø		19802192

DEHA

DEHA (N,N-Diethylhydroxylamin) with VARIO Powder Pack and Liquid Reagent 20 – 500 µg/l DEHA

Use two clean vials (24 mm Ø) and mark one as blank for zeroing (Note 2).

Fill a clean vial with **10 ml deionised water** (this is the blank).

Fill the second clean vial with **10 ml of the water sample** (this is the sample).

Add the contents of **one VARIO OXYSCAV 1 Rgt Powder Pack** straight from the foil into each vial.

Close the vials tightly with the caps and swirl several times to mix the contents.

Add **0.20 ml VARIO DEHA 2 Rgt Solution** to each vial (Note 4).

Close the vials tightly with the caps and swirl several times to mix the contents.

Wait for a reaction **period of 10 minutes** (Note 5).

After the reaction period is finished proceed as follows:

Place the vial (the blank) in the sample chamber making sure that the ⧖ marks are aligned.

Zero Test

Press the [ZERO/TEST] key.

DEHA

The method symbol flashes for approx. 8 seconds.

0.0.0

The display shows:

Remove the vial from the sample chamber.

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

Zero Test

Press the [ZERO/TEST] key.

DEHA

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in µg/l DEHA.

Notes:

1. Application: Testing of residual corrosion inhibitors (Oxygen scavengers) in boiler feed water or condensate.
2. Before using clean the vials with Hydrochloric acid (approx. 20%). Rinse thoroughly with deionised water.
3. Ideally temperature for full colour development is 25°C ± 3 °C.
4. Volume should always be metered by using suitable pipette (class A).
5. Keep blank and sample dark during colour development time. UV-light (sunlight) causes high measurement results.
6. Interferences:
   - Iron (II) interferes at all concentrations:
     Repeat the test procedure but without adding the VARIO DEHA Rgt 2 solution. If the displayed result is above 20 µg/l subtract this value from the DEHA test result.
   - Substances which reduce Iron (III) interfere. Substances which complex iron strongly may interfere also.
   - Substances who may interfere when present in concentrations at:

Substance	**Interference**
Borate (as $Na_2B_4O_7$)	500 mg/l
Cobalt	0.025 mg/l
Copper	8.0 mg/l
Hardness (as $CaCO_3$)	1000 mg/l
Lignosulfonates	0.05 mg/l
Manganese	0.8 mg/l
Molybdenum	80 mg/l
Nickel	0.8 mg/l
Phosphate	10 mg/l
Phosphonates	10 mg/l
Sulfate	1000 mg/l
Zinc	50 mg/l

Reagent	**Form of reagent/Quantity**	**Order-No.**
Set (100 Tests) VARIO OXYSCAV 1 Rgt VARIO DEHA 2 Rgt Solution	 Powder Pack / 200 Liquid reagent / 100 ml	536000

Hydr

Hydrazine with Powder Reagent
50 – 500 µg/l N_2H_4

0.0.0

Fill a clean vial (24 mm Ø) with **10 ml of the water sample** (Note 1, 2) and perform zero calibration (see "Operation").

Add **1 g HYDRAZINE test powder** (Note 3) to the water sample.

Close the vial tightly with the cap and invert several times to mix the contents.

Wait for a reaction period of 10 minutes.

After the reaction period is finished proceed as follows:

The slight turbidity that occurs when the reagent is added must be removed by filtration (Note 4).

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

Zero / Test

Press the [ZERO/TEST] key.

Hydr

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in µg/l Hydrazine.

Notes:

1. If the water sample is cloudy, you must filter it before performing the zero calibration.
2. The temperature of the water sample should not exceed 21°C.
3. Using the Hydrazine spoon: 1 g is equivalent to one level spoon.
4. Qualitative folded filter papers for medium precipitates are recommended.
5. In order to check whether the reagent has aged (if it has been stored for a lengthy period), perform the test as described above using tap water. If the result is above the detection limit of 0.05 mg/l, you should only use the reagent with reservations as there may be a major deviation in results.

Reagent / Accessories	Form of reagent/Quantity	Order-No.
HYDRAZIN test powder	Powder / 30 g	462910
Spoon		384930

POLY

Polyacrylate with Liquid reagent
1 – 30 mg/l Polyacrylate

0.0.0

Fill a clean vial (24 mm Ø) with **10 ml of the water sample** and perform zero calibration (see "Operation").

Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

1 ml (25 drops) KS255 (Polyacrylate reagent 1) (note 1).

Close the vial tightly with the cap and invert several times to mix the contents.

Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

1 ml (25 drops) KS256 (Polyacrylate reagent 2)

Close the vial tightly with the cap and invert several times to mix the contents.

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

! Zero/Test

Wait for a reaction period of 10 minutes.
(Countdown can be activated, see page 43)

POLY

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display in mg/l Polyacrylic Acid 2'100 sodium salt.

Notes:

1. If little or no turbidity is present at correct dose concentrations, the sample will need a pre-concentration step in order to detect this level of polyacrylate/polymer. Carry out this procedure as directed then test the pre-concentrated sample as above (see next page).
2. Anomalous results occur when interferences are present as part of the product blend or from sample contaminants. In these instances follow the interference removal steps detailed below and test this treated sample as above (see next page).
3. This test has been calibrated using polyacrylic acid 2'100 sodium salt in the range 1-30 mg/l. Other polyacrylates/polymers will give differing responses and therefore the test range will vary.

Reagent	Form of reagent/Quantity	Order-No.
KS255 (Polyacrylate reagent 1)	Liquid reagent / 65 ml	56L025565
KS256 (Polyacrylate reagent 2)	Liquid reagent / 65 ml	56L025665

Interference removal and Pre-Concentration

Cartridge Preparation

1. Remove the plunger of the 20 ml syringe from the barrel and attach the C18 cartridge.
2. Add 5 ml of KS336 (Propan-2-ol) to the syringe barrel, attach the plunger and pass dropwise through the cartridge. Discard the eluent to waste.
3. Remove plunger and fill the syringe barrel with 20 ml of deionised/tap water. Attach the plunger and pass dropwise through the cartridge. Discard the eluent to waste. The cartridge is now ready to be used/reused.

Interference removal

1. Transfer exactly 20 ml of sample water to a 100 ml sample bottle and dilute to approximately 50-60 ml with deionised water or tap water.
2. Add drops of KS173 (2,4 Dinitrophenol) until a pale yellow colour is observed in the sample.
3. Add drops of KS183 (Nitric Acid) until the yellow colour **JUST** disappears.
4. Remove the plunger from the barrel of the 60ml plastic syringe and firmly attach the prepared C18 cartridge (see: Cartridge Preparation) to the end of the barrel.
5. Transfer the 50-60 ml of sample from the bottle to the syringe barrel and attach the plunger. Depress the plunger and allow the sample to flow dropwise from the cartridge. Do not use excessive force to elute the sample quickly. **LEAVE THE C18 CARTRIDGE ATTACHED** and remove the plunger. Discard all of eluted sample to waste.
6. Using the 20 ml syringe, add exactly 20 ml of deionised/tap water to the 60 ml syringe barrel attached to the cartridge followed by 1 ml (25 drops) of KS255 (Polyacrylate Reagent 1). Gently swirl the syringe to mix.
7. Attach the plunger and depress. Collect the eluted sample in a clean vessel. Allow the sample to flow dropwise from the cartridge. Do not use excessive force to elute the sample quickly.
8. Add 10 ml of the eluted water sample into clean vial (24 mm Ø).
9. Using this vial perform the measurement of the method polyacrylate (see page 62).

Pre-Concentration

Pre-concentration uses exactly the same procedure as interference removal, except a greater volume of sample is used in step 1, instead of deionised/tap water.

For calculation of the original sample concentration a concentration factor should be considered:

If a 50 ml sample is used the concentration factor is 20/50 = 0.4

If a 100 ml sample is used the concentration factor is 20/100 = 0.2

This can be extended as required in order to concentrate the polyacrylate/polymer sufficiently for analysis.

Example:

If the reading is 20 mg/l and 50 ml are taken for pre-concentration the original concentration should be calculated as 20 * 0.4 = 8 mg/l.

Note:

Samples exceeding 10,000 TDS should be diluted prior to loading onto the cartridge. Take this dilution into consideration when working out the overall concentration factor.

Reagent / Accessories	Form of reagent/Quantity	Order-No.
KS255 (Polyacrylate reagent 1)	Liquid reagent / 65 ml	56L025565
KS256 (Polyacrylate reagent 2)	Liquid reagent / 65 ml	56L025665
KS336 (Propan-2-ol)	Liquid reagent / 65 ml	56L033665
C18-cartridge		AS-K22811-KW
KS173 (2,4 Dinitrophenol)	Liquid reagent / 65 ml	56L017365
KS183 (Nitric Acid)	Liquid reagent / 65 ml	56L018365

Menu selections

Mode

On Off

!

Press the [MODE] key and **hold**.

Switch the unit on using the [ON/OFF] key.
Allow the 3 decimal points to be displayed before releasing the [MODE] key.

The [!] key allows for selection of the following menu points:

1 diS recall stored data

1 Prt printing stored data

2 3 setting the date and time

4 user calibration

The selected menu is indicated by an arrow in the display.

Mode

1 diS – Recall of stored data

After confirming the selection with the [MODE] key the photometer shows the last 16 data sets in the following format (automatically proceeds every 3 seconds until result is displayed):

Number	n xx (xx: 16...1)
Year	YYYY (e.g. 2014)
Date	mm.dd (monthmonth:dayday)
Time	hh:mm (hourhour:minuteminute)
Test	Method
Result	x,xx

Zero Test

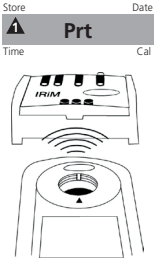
The [ZERO/TEST] key repeats the current data set.

Mode

The [MODE] key scrolls through all stored data sets.

!

Quit the menu by pressing [!] key.



1 Prt – Transmitting stored data (to Printer or PC)

Note: To print data, or to transmit to a PC, the optional IRiM (Infrared Interface Module) is required.

The IRiM Module and the connected printer/PC must be ready. Press the [MODE] key to start the transmitting, the instrument displays "PrtG" (Printing) for approx. 1 second followed by the number of the first data set and its transmission. All data sets will be transmitted one after the other. After finishing the instrument switches to test mode.

The print job can be cancelled by pressing the [On/Off] key. The instrument switches off.

On Off

E 132

If the instrument is not able to communicate with the IRiM, a timeout occurs after approx. 2 minutes. The error E 132 is displayed for approx. 4 seconds. Subsequently, the instrument switches to test mode (see also IRiM manual).

Mode

SET
DATE
YYYY
(2 sec.)

2 3 Setting date and time (24-hour-format)

After confirming the selection with the [MODE] key the value to be edited will be shown for 2 sec.

The setting starts with the year (YYYY) followed by the actual value to be edited. The same applies for month (mm), day (dd), hour (hh) and minutes (mm). Set the minutes first in steps of 10, press the [!] key to continue setting the minutes in steps of 1.

Mode

Increase the value by pressing the [MODE] key.

Zero / Test

Decrease the value by pressing [ZERO/TEST] key.

!

Proceed to the next value to be edited by pressing [!] key.

After setting the minutes and pressing the [!] key the display will show "IS SET" and the instrument returns to the measurement mode.

4 User calibration

cAL
CAL

Note:

user calibration (Display in calibration mode)

factory calibration (Display in calibration mode)

CAL
METHOD

After confirming the selection with the [MODE] key the instrument will show CAL/"Method".
Scroll through methods using the [MODE] key.

Fill a clean vial with the standard up to the 10 ml mark, screw the cap on and place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero / Test

Press the [ZERO/TEST] key.

METHOD

The method symbol flashes for approx. 8 seconds.

0.0.0

The display shows the following in alternating mode:

CAL

Perform calibration with a standard of known concentration (see "Operation").

Zero / Test

Press the [ZERO/TEST] key.

METHOD

The method symbol flashes for approx. 3 seconds.

RESULT

The result is shown in the display, alternating with CAL.

CAL

If the reading corresponds with the value of the calibration standard (within the specified tolerance), exit calibration mode by pressing the [ON/OFF] key.

Changing the displayed value:

Pressing the [MODE] key once increases the displayed value by 1 digit.

Pressing the [ZERO/TEST] key once decreases the displayed value by 1 digit.

CAL

RESULT + x

Press the corresponding key until the reading equals the value of the calibration standard.

By pressing the [ON/OFF] key, the new correction factor is calculated and stored in the user calibration software.

Cal

Confirmation of calibration (3 seconds).

Factory calibration reset

Resetting the user calibration to the original factory calibration will reset all methods and ranges.

A user calibrated method is indicated by an arrow while the test result is displayed.

To reset the calibration press both the [MODE] and [ZERO/TEST] key and **hold**.

Switch the unit on using the [ON/OFF] key.
Release the [MODE] and [ZERO/TEST] keys after approx. 1 second.

The following messages will appear in turn on the display:

The factory setting is active.
(SEL stands for Select)

or:

Calibration has been set by the user.
(If the user calibration is to be retained, switch the unit off using the [ON/OFF] key).

Calibration is reset to the factory setting by pressing the [MODE] key.

The following messages will appear in turn on the display:

Switch the unit off using the [ON/OFF] key.

Technical Data

Instrument	three wavelength, automatic wavelength selection, direct reading colorimeter
Light source:	LEDs, interference filters (IF) and photosensor in transparent cell chamber. Wavelength specifications of the IF: 430 nm $\Delta\lambda$ = 5 nm 530 nm $\Delta\lambda$ = 5 nm 560 nm $\Delta\lambda$ = 5 nm
Wavelength accuracy	± 1 nm
Photometric accuracy*	3% FS (T = 20° C – 25° C)
Photometric resolution	0.01 A
Power supply	4 batteries (AAA/LR 03)
Operating time	17hr operating time or 5000 test measurements in continuous mode when display backlight is off
Auto-OFF	automatic switch off 20 minutes after last keypress
Display	backlit LCD (on keypress)
Storage	internal ring memory for 16 data sets
Serial Interface	IR interface for data transfer
Time	real time clock und date
Calibration	user and factory calibration resetting to factory calibration possible
Dimensions	155 x 75 x 35 mm (LxWxH)
Weight	approx. 260 g (incl. batteries)
Ambient conditions	temperature: 5–40°C rel. humidity: 30–90% (non-condensing)
Waterproof	floating; as defined in IP 68 (1 hour at 0.1 meter)
CE	Certificate for Declaration of CE-Conformity at www.lovibond.com

**measured with standard solutions*

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

Operating messages

HI	Measuring range exceeded or excessive turbidity.
Lo	Result below the lowest limit of the measuring range.
	Replace batteries, no further tests possible.
btLo	Battery capacity is too low for the display backlight; measurement is still possible.
	A user calibrated method is indicated by an arrow while the test result is displayed (see "Factory calibration reset").

Error codes

E27 / E28 / E29	Light absorption too great. Reasons: e.g. dirty optics.
E 10 / E 11	Calibration factor "out of range"
E 20 / E 21	Too much light reaching the detector.
E23 / E24 / E25	Too much light reaching the detector.
E 22	Battery capacity was too low during measurement. Change battery.

E 70	AL:	Factory calibration incorrect / erased
E 71	AL:	User calibration incorrect / erased
E 72	FE:	Factory calibration incorrect / erased
E 73	FE:	User calibration incorrect / erased
E 74	Cu:	Factory calibration incorrect / erased
E 75	Cu:	User calibration incorrect / erased
E 76	Si Hr:	Factory calibration incorrect / erased
E 77	Si Hr:	User calibration incorrect / erased
E 78	CL^-:	Factory calibration incorrect / erased
E 79	CL^-:	User calibration incorrect / erased
E 80	PO4:	Factory calibration incorrect / erased
E 81	PO4:	User calibration incorrect / erased
E 82	O2:	Factory calibration incorrect / erased
E 83	O2:	User calibration incorrect / erased
E 84	DEHA:	Factory calibration incorrect / erased
E 85	DEHA:	User calibration incorrect / erased
E 86	Hydr:	Factory calibration incorrect / erased
E 87	Hydr:	User calibration incorrect / erased
E 88	POLY:	Factory calibration incorrect / erased
E 89	POLY:	User calibration incorrect / erased

Tintometer GmbH
Lovibond® Water Testing
Schleefstraße 8-12
44287 Dortmund
Tel.: +49 (0)231/94510-0
Fax: +49 (0)231/94510-20
sales@tintometer.de
www.lovibond.com

Germany

The Tintometer Ltd
Lovibond® House
Sun Rise Way
Amesbury
Salisbury
SP4 7GR
Tel.: +44 (0)1980 664800
Fax: +44 (0)1980 625412
sales@tintometer.com
www.lovibond.com

UK

Tintometer AG
Hauptstraße 2
5212 Hausen AG
Tel.: +41 (0)56/4422829
Fax: +41 (0)56/4424121
info@tintometer.ch
www.tintometer.ch

Switzerland

Tintometer Inc.
6456 Parkland Drive
Sarasota, FL 34243
Tel: 941.756.6410
Fax: 941.727.9654
sales@tintometer.us
www.lovibond.com

USA

Tintometer China
Room 1001, China Life Tower
16 Chaoyangmenwai Avenue,
Beijing, 100020
Tel.: +86 10 85251111 App. 330
Fax: +86 10 85251001

China

Tintometer South East Asia
Unit B-3-12, BBT One Boulevard,
Lebuh Nilam 2, Bandar Bukit Tinggi,
Klang, 41200, Selangor D.E
Tel.: +60 (0)3 3325 2285/6
Fax: +60 (0)3 3325 2287
lovibond.asia@tintometer.com
www.lovibond.com

Malaysia

Tintometer Brasilien
Caixa Postal: 271
CEP: 13201-970
Jundiaí – SP -
Tel.: +55 (11) 3230-6410
sales@tintometer.com.br
www.lovibond.com.br

Brazil

Tintometer Indien Pvt. Ltd.
B-91, A.P.I.E. Sanath Nagar,
Hyderabad, 500018
Tel: +91 (0) 40 4647 9911
Toll Free: 1 800 102 3891
indiaoffice@tintometer.com
www.lovibondwater.in

India

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