Operating manual

DULCOTEST® DT3B
Photometer

A0945

Please carefully read these operating instructions before use! · Do not discard!
The operator shall be liable for any damage caused by installation or operating errors!
Technical changes reserved.

Part number 985616 **Target group: instructed personnel** BA DT 037 02/12 EN

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General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

Please read the supplementary information in its entirety.

The following are highlighted separately in the document:

- Enumerated lists

→ Instructions

⇨ Outcome of the instructions

Information

This provides important information relating to the correct operation of the device or is intended to make your work easier.

Safety information

The safety information includes detailed descriptions of the hazardous situation.

Table of contents

1 General information

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

WARNING!

25 % sulphuric acid

Possible consequence: Fatal or very serious injuries.

The analysis reagent contains 25 % sulphuric acid.

Observe the latest safety data sheet.

1.1 Scope of supply

The following components are included as standard:

Description	Quantity
■ Case, blue with blue fasteners – with ProMinent sticker, Dulcotest DT3B photometer, code 1039317 – and danger symbol	1
Foam insert for the case	1
Cover foam for the case	1
■ Photometer DT3B – Hydrogen peroxide – Battery compartment lid with O-ring	1
Screwdriver with clip, red	1
Countersunk screws	4
Batteries, 1.5 V alkali-manganese, type AA	4
Round cuvettes, d = 16 mm, h = 90 mm	3
Lid for round cuvette, 16 mm, white	3
Adapter attachment, grey for 16 mm cuvettes	1
Syringe, 10 ml	1
Cleaning brush	1
Measurement beaker, plastic, 100 ml	1
Operating instructions for Dulcotest DT3B	1
Reagent for H_2O_2, 15 ml, white	1

1.2 Instructions for use

- *Request the safety data sheets.*
- *Reagents are intended for chemical analysis and access to them by unauthorised persons must not be permitted.*
- *You must dispose of reagent solutions properly.*
- *Observe the application possibilities, analysis instruction and matrix effects of the methods.*

1. You must thoroughly clean the cuvettes, lids and stirring rod after each analysis to avoid carry-over errors.

   Even slight reagent residue can lead to incorrect measurement results. For cleaning use the supplied brush.

   If the fully reacted water sample is left for any length of time it may produce stubborn coloured deposits, which you can remove using dilute (= 4 %) hydrochloric acid.

2. The outer walls of the cuvettes must be clean and dry before the analysis is carried out. Fingerprints or water droplets on the light-entry surfaces of the cuvette will result in faulty measurements. The cuvette should therefore be wiped clean with a soft paper tissue (paper handkerchief) before carrying out the measurement.

3. The zero correction and the analysis must both be carried out using the same cuvette, as the cuvettes may have slightly varying tolerances.

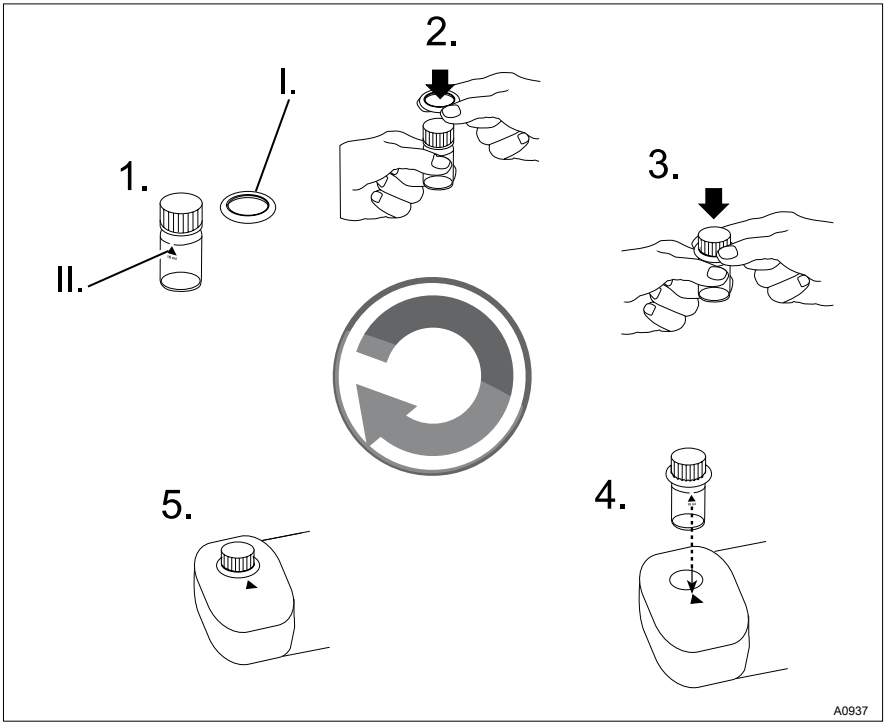

Fig. 1: Cuvette positioning (Ø 24 mm):

I. Seal
II. Marking with the white triangle

4. For the zero correction and test, the cuvette must be positioned in the sample chamber in such a way that the marking with the white triangle (II.) points towards the housing marking.

5. You must carry out the zero correction and test with the cuvette lid closed. You must provide the cuvette lid with a sealing ring (I.) to prevent the entrance of light into the sample chamber.

6. Formation of bubbles on the inside walls of the cuvette will result in faulty measurements. Should this happen, seal the cuvette with the cuvette lid and tip it back and forth to dissolve/ remove the bubbles before carrying out the test.

7. It is important to prevent water getting into the sample chamber because this leads to incorrect measurement results.

8. Dirt in the transparent sample chamber leads to incorrect measurement results. The light entry surfaces should be checked at regular intervals and cleaned as necessary.

Standard spectacle cleaning cloths and cotton buds are suitable for cleaning.

9. Pronounced differences in temperature between the photometer and the surroundings can lead to incorrect measurements, e.g. due to the formation of condensation in the sample chamber and on the cuvette.

10. Protect the device from direct sunlight.

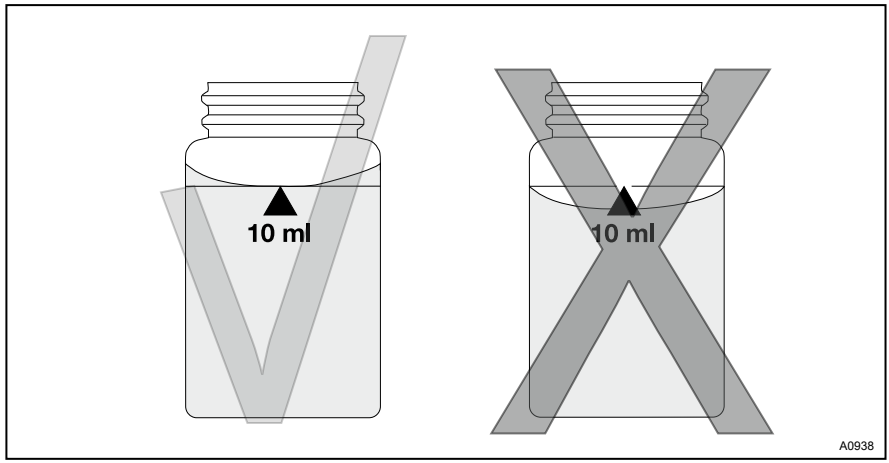

Fig. 2: Correct filling of the cuvette: Left = correct / right = incorrect

11. Fill the cuvette as shown in Fig. 2.

12. Insert the reagent tablets directly from the blister pack into the water sample, without touching them with your fingers.

13. After use immediately close the dropping bottles containing the liquid reagents by closing them with the screw caps of the same colour.

14. You must observe the sequence for the addition of reagents without fail.

1.3 Adapter for 16 mm cuvettes

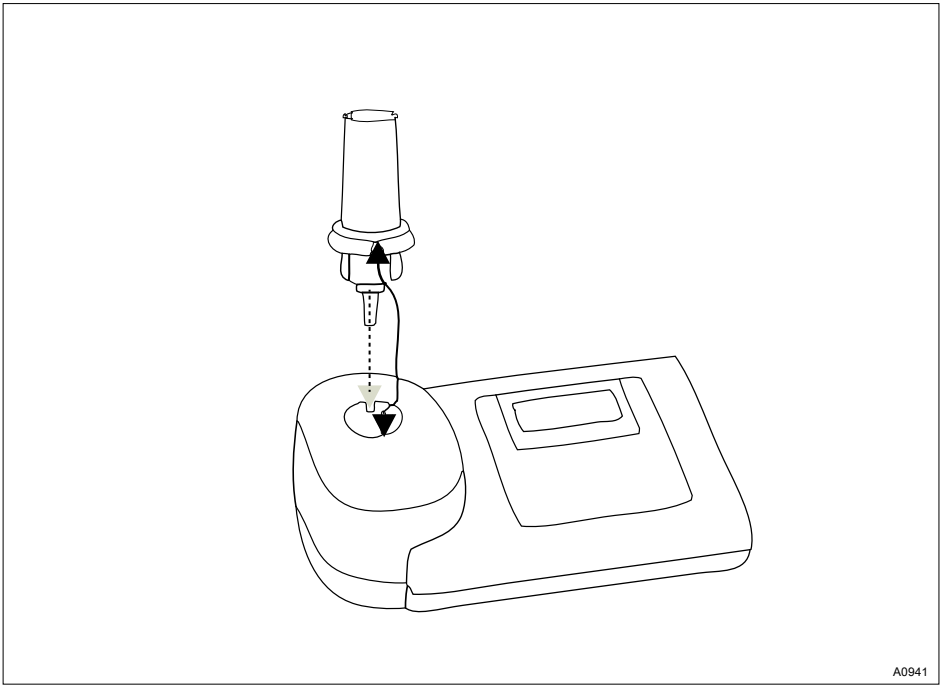

Fig. 3: Place the adapter for 16 mm cuvettes on the sample chamber

Insert the adapter for the 16 mm cuvette as shown in Fig. 3.

This adapter is required for all analysis methods which must be carried out using a 16 mm cuvette.

1.4 Operations carried out on the device

Battery replacement:

To ensure complete leak-tightness of the photometer, you must insert the gasket (2) and screw on the battery compartment lid (1).

If the battery is removed for more than 1 minute from the device, then when the device is switched on again with new inserted batteries, the date/time program appears automatically.

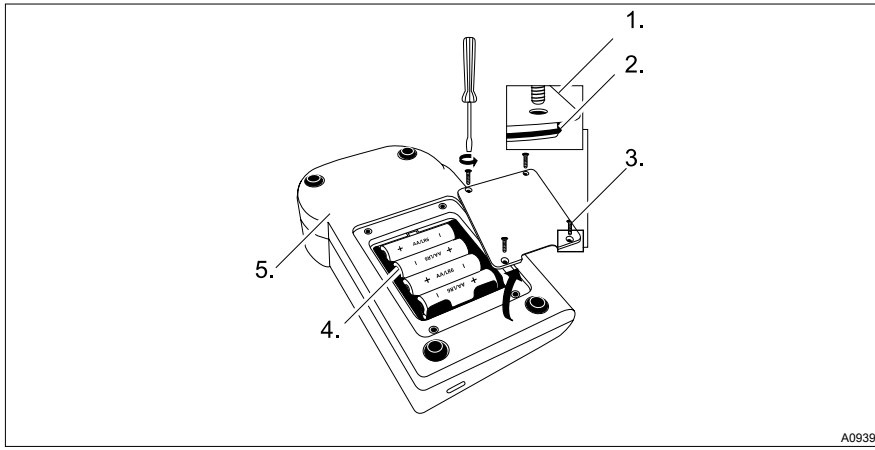

Fig. 4: Battery replacement

1. Battery compartment cover
2. Seal
3. Screw
4. Batteries
5. Rear of the device

2 Commissioning DT 3B

2.1 Commissioning

Scroll memory (SM)

With multi-parameter devices the sequence of the various methods is specified. After switching on the device, the method which was last selected before the device was switched off is automatically displayed. This permits rapid access to favoured methods.

OTZ [One Time Zero]

The zero correction [zero] is saved until the device is switched off. It is not necessary to carry out a new zero correction before each analysis, if the analysis is taken form the same water sample and the test conditions are identical. If necessary you can carry out a zero correction at any time.

New zero correction

→ Press the key *[ZERO/TEST]* for 2 seconds

Repeating the analysis

→ Press the key *[ZERO/TEST]* again

Displaying stored data

The device has a ring buffer for 16 data records.

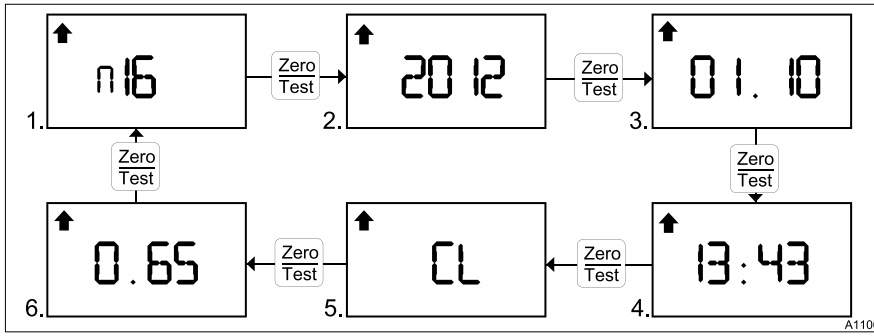

Fig. 5: Displaying stored data

1. Data record (n01 ... n16)
2. Year
3. Month/day
4. Time
5. Measured variable (e.g. chlorine, dependent upon the device version)
6. Value in mg/l

1. With the device switched on press the *[!]* key for more than 4 seconds then release the key again

   ⇨ The display immediately switches to the memory menu.

2. Press the *[MODE]* key to scroll through the 16 data records
3. Press the *[ZERO/TEST]* key to scroll through the values of a data record
4. Press the *[!]* key to return to the *[METHOD]* display

Display background lighting

Press the *[!]* key

⇨ The display's background lighting switches on or off.

During measuring the background lighting switches off automatically.

3 Operating Menu

3.1 Operating menu options

Operating menu selection

1. The device is switched off Press the *[MODE]* key and then keep it depressed
2. Switch the device on using the *[ON/OFF]* key

   ⇨ 3 decimal points appear in the display.
3. Release the *[MODE]* key
4. The [!] key provides you with the following selection of operating menu items.

   - *[diS]* = read out of stored data
   - Setting of date and time
   - User calibration

   ⇨ The selected operating menu item is indicated to you by an arrow in the display.
5. Using key *[!]* select the operating menu item *'Setting of date and time'* (arrow upper right and bottom left in the display)

Setting date and time (24 h format)

Increase the value to be set by pressing the [MODE] key.

Reduce the value to be set by pressing the [ZERO/TEST] key.

By pressing the key [!] you can access the next value to be set.

1. Press the *[MODE]* key

   ⇨ The parameter to be set appears for 2 seconds.
2. Enter the year *[YYYY]*
3. Enter the month *[MM]*
4. Enter the day *[dd]*
5. Enter the hour *[hh]*
6. Enter the minutes *[mm]*

   Enter minutes in 10 minute steps

   Press the *[!]* key

   Enter minutes in 1 minute steps
7. After setting the minutes, press the *[!]* key

   ⇨ *[IS SET]* appears in the display and the device automatically returns to the measuring mode.

3.2 Operating instructions

Display	Meaning
Hi	Measuring range exceeded or turbidity too large.
Lo	Measuring range undershot.
	Change the batteries immediately, further processing not possible.
btLo	Battery voltage for background lighting too low, measurement not possible.
RESULT	In a method which was calibrated by the user, when the result is output in the display an arrow is displayed in the *[Cal]* position.

3.3 Error messages

Display	Meaning
E 27 / E 28 / E 29	Light absorption too great. Cause e.g. dirty optics.
E 10 / E 11	Calibration factor outside the permissible range.
E 20 / E 21	Detector receives too much light.
E 23 / E 24 / E 25	Detector receives too much light.
E 22	The battery power was too low during the measurement. Replace the battery.
E 70	H_2O_2 *[LR]* factory calibration not OK / deleted.
E 71	H_2O_2 *[LR]* user calibration not OK / deleted.
E 72	H_2O_2 *[HR]* factory calibration not OK / deleted.
E 73	H_2O_2 *[HR]* user calibration not OK / deleted.

4 Analysis methods

Determination of hydrogen peroxide content

The determination of hydrogen peroxide content takes place using yellow-orange coloured peroxo-titanic acids in strongly acidic medium. With neutral to weakly alkaline (~ pH 10) water samples the acid available in the reagent is sufficient to produce a suitable medium for the determination. In the presence of highly alkaline water samples (> pH 10), you must acidify the water sample before the determination as otherwise the outcome will be false low readings. This is achieved by diluting the water sample with, for example, 5% sulphuric acid in the ratio 1:1.

In contrast to many other colour reactions, with this analysis of hydrogen peroxide there is a long-term stable colouration, which can still be measured after 24 hours. Particles in the sample solution or turbidity, falsify the determination. These particles must be removed before the determination. This can be done by centrifuging or filtering the sample solution.

Oxidation agents such as chlorine, bromine, chlorine dioxide and ozone do not affect the determination.

Even with coloured solutions the possibility of an incorrect measurement result must be allowed for.

Possible error sources

If the water already has its own colouring it can interfere with the investigation. In this case, proceed as follows.

1. Determine the zero point with distilled water
2. Then measure the sample solution with the addition of reagent drops *[value B]*
3. Then measure the sample solution with the addition of reagent drops *[value A]*
4. *[Value A]* minus *[Value B]* = approximate value of the hydrogen peroxide concentration

4.1 Quantitative determination using liquid reagents

Hydrogen peroxide 1 ... 50 mg/l

1. Switch the device on using the *[ON/OFF]* key
2. Select the measuring range using the *[MODE]* key
   ⇨ *[Lr]* appears in the display.
3. Using the enclosed plastic syringe draw up 10 ml of clear sample solution
4. Add the 10 ml of clear sample solution to the 16 mm round cuvette
5. Close the cuvette using the cuvette lid
6. Position the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette.
7. Press the key *[ZERO/TEST]*
   ⇨ *[METHOD]* flashes for approximately 8 seconds.
8. Remove the cuvette from the sample chamber once the zero correction is completed
9. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ H_2O_2 reagent solution
10. Close the cuvette using the cuvette lid
11. Mix the contents of the cuvette by tipping it back and forth
12. Position the cuvette in the sample chamber
    ⇨ Observe the correct positioning of the cuvette.
13. Press the key *[ZERO/TEST]*
    ⇨ *[METHOD]* flashes for approximately 3 seconds.
    The result in mg/l of H_2O_2 appears in the display.

Measured tolerances:

approx 2 % of the upper range value

Remarks:

If the output to the display shows [Hi] rather than a measurement result, then the measuring range has been exceeded.

Dilute the sample solution by a defined amount with distilled water. In this case, you must correct the displayed result by the dilution factor, or repeat the analysis in the upper measuring range.

Hydrogen peroxide 40 ... 500 mg/l

1. Switch the device on using the *[ON/OFF]* key
2. Select the measuring range using the *[MODE]* key

   ⇨ *[Hr]* appears in the display.
3. Using the enclosed plastic syringe draw up 10 ml of clear sample solution
4. Add the 10 ml of clear sample solution to the 16 mm round cuvette
5. Close the cuvette using the cuvette lid
6. Position the cuvette in the sample chamber

   ⇨ Observe the correct positioning of the cuvette.
7. Press the key *[ZERO/TEST]*

   ⇨ *[METHOD]* flashes for approximately 8 seconds.
8. Remove the cuvette from the sample chamber once the zero correction is completed
9. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:

   - 6 drops ➡ H_2O_2 reagent solution
10. Close the cuvette using the cuvette lid
11. Mix the contents of the cuvette by tipping it back and forth
12. Position the cuvette in the sample chamber

    ⇨ Observe the correct positioning of the cuvette.
13. Press the key *[ZERO/TEST]*

    ⇨ *[METHOD]* flashes for approximately 3 seconds.

The result in mg/l of H_2O_2 appears in the display.

Measuring tolerances when determining the hydrogen peroxide content:

approx 2 % of the upper range value

Remarks:

If the output to the display shows [Hi] rather than a measurement result, then the measuring range has been exceeded.

Dilute the sample solution by a defined amount with distilled water. In this case, you must correct the displayed result by the dilution factor.

5 Calibration

User calibration

User calibration (display in calibration mode) = *[cCAL]*

Factory calibration (display in calibration mode) = *[cCAL]*

1. Confirm the selection by pressing the *[MODE]* key

   ⇨ The display toggles between *[CAL / METHOD]*

2. Select the method to be calibrated using the *[MODE]* key

3. Fill the cuvette up to the 10 ml marking with the standard solution

4. Close the cuvette using the cuvette lid

5. Position the cuvette in the sample chamber

   ⇨ Observe the correct positioning of the cuvette

6. Press the key *[ZERO/TEST]*

   ⇨ *[METHOD]* flashes for approximately 8 seconds.

   The confirmation of the zero correction *[0.0.0]* alternates with *[CAL]*.

7. Remove the cuvette from the sample chamber and empty the cuvette completely

8. Thoroughly clean the cuvette and the cuvette lid

9. Fill the cuvette up to the 10-ml marking with a standard solution of known concentration

10. Close the cuvette using the cuvette lid

11. Position the cuvette in the sample chamber

    ⇨ Observe the correct positioning of the cuvette.

12. Press the key *[ZERO/TEST]*

    ⇨ *[METHOD]* flashes for approximately 3 seconds.

    The confirmation of the result alternates with *[CAL]*.

13. If the result matches the value of the standard used, (within the tolerance under consideration) you can quit calibration mode by pressing the *[ON/OFF]* key

Changing the displayed value:

Pressing the [MODE] key 1 x increases the displayed result by 1 digit.

Pressing the [ZERO/TEST] key 1 x reduces the displayed result by 1 digit.

1. Repeatedly press the keys until the displayed result matches the value of the standard used

2. Press the key *[ON/OFF]*

   ⇨ The new correction factor is calculated and saved in the user calibration level.

   The confirmation of the calibration appears in the display for 3 seconds.

Return to the factory calibration

A return from the user calibration to the factory calibration is only possible for all methods simultaneously.

In a method which was calibrated by the user, when the result is output in the display an arrow is displayed in the [Cal] position.

To return the device tot he factory calibration, proceed as follows:

1. The device is switched off. Simultaneously press the *[MODE]* and *[ZERO/TEST]* keys
2. Switch the device on using the *[ON/OFF]* key
   ⇨ After approximately 1 second release the *[MODE]* and *[ZERO/TEST]* keys.
3. The display toggles between: *[SEL]* and *[CAL]*
   ⇨ The device is in the as-supplied (factory) condition (*[SEL]* stands for select).
4. or
5. The display toggles between: *[SEL]* and *[CAL]*
   ⇨ The device operates with a calibration carried out by the user. If the user calibration is to be retained, switch the device off using the *[ON/OFF]* key.
6. By pressing the *[MODE]* key you can simultaneously activate the factory calibration for all methods.
7. The display toggles between *[SEL]* and *[CAL]*
8. Switch the device off using the *[ON/OFF]* key

6 Technical data

Device	Two wavelengths, automatic wavelength selection, colorimeter with direct measured value display
Optics	LEDs, interference filter (IF) and photo sensor at the transparent sample chamber Wavelength specifications of the interference filter: ■ 430 nm Δλ = 5 nm ■ 530 nm Δλ = 5 nm
Wavelength trueness	± 1 nm
Photometric accuracy*	3 % FS (**F**ull **S**cale) (T = 20 °C ... 25 °C)
Photometric resolution	0.01 A (**A**bsorption units)
Power supply	4 batteries (AA/LR 6)
Operating time	Approx. 53 h operating time or 15,000 measurements in continuous operation with background lighting switched off
Auto-OFF	Automatic device switch-off 10 minutes after the last key was pressed
Display	Backlit LCD (upon pressing of a key)
Memory	Internal ring buffer for 16 data records
Time	Real time clock and date
Calibration	Fabrication and user calibration. Return to the factory calibration possible.
Dimensions	190 x 110 x 55 mm (L x W x H)
Weight	Basic device approx. 455 g (with batteries)
Ambient conditions	Temperature: 5 ... 40 °C rel. humidity: 30 ... 90 % (non-condensing)
Water-tight	analogous to IP 68 (1 hour at 0.1m); buoyant device
***measured with standard solutions**	

The specified device accuracy is only obtained when using the original reagent system.

7 Consumables and spare parts

Consumables

Material	Part number
Reagent for H_2O_2, 15 ml, white	1023636

Spare parts

Material	Part number
5 pieces round cuvettes (d = 16 mm, h = 90 mm) with lid (replacement cuvettes)	1024072

8 Standards complied with and conformity declaration

Declaration of Conformity

You can find the EC Declaration of Conformity as a download under *http://www.prominent.de/Service/Download-Service.aspx*

Standards complied with

EC EMC Directive (2004/108/EC)

EN 61326 - 1

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