Operating manual

DULCOTEST® DT1B
Photometer

ProMinent®

EN

A0943

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.
The latest version of the operating instructions are available on our homepage.

Part number 985629 **Target group: instructed personnel** BA DT 057 03/17 EN

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.

Information

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

Warning information

Warning information include detailed descriptions of the hazardous situation.

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

More symbols

Symbol	Description
1.	Action, step by step.
⇨	Outcome of an action.
	Links to elements or sections of these instructions or other applicable documents.
■	List without set order.

Symbol	Description
[Button]	Display element (e.g. indicators). Operating element (e.g. button, switch).
„Display / GUI“	Screen elements (e.g. buttons, assignment of function keys).
CODE	Presentation of software elements and/or texts.

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.

1.1 Scope of delivery

The following components are included as standard:

Description	Quantity
■ Case, blue with blue fasteners – with ProMinent sticker, Photometer Dulcotest DT1B, code 1039315 – and hazard symbol	1
Foam insert for the case	1
Cover foam for the case	1
■ Photometer DT1B – Chlorine, bromine, chlorine dioxide, ozone, pH, CyA – 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, 10 ml, d = 24 mm, h = 48 mm	3
Lid for round cuvette, 24 mm, grey	3
Sealing rings for cuvettes, grey	3
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
Plastic mixing rod, 13 cm long	1
Cleaning brush	1
Operating instructions for Dulcotest DT1B	1
DPD -1 tablets	100

Description	Quantity
DPD -3 tablets	100
PHENOLRED PHOTOMETER tablets	100
CyA TEST tablets	100
CHLORINE HR (KI) tablets	100
ACIDIFYING GP tablets	100
Glycine tablets	20

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.

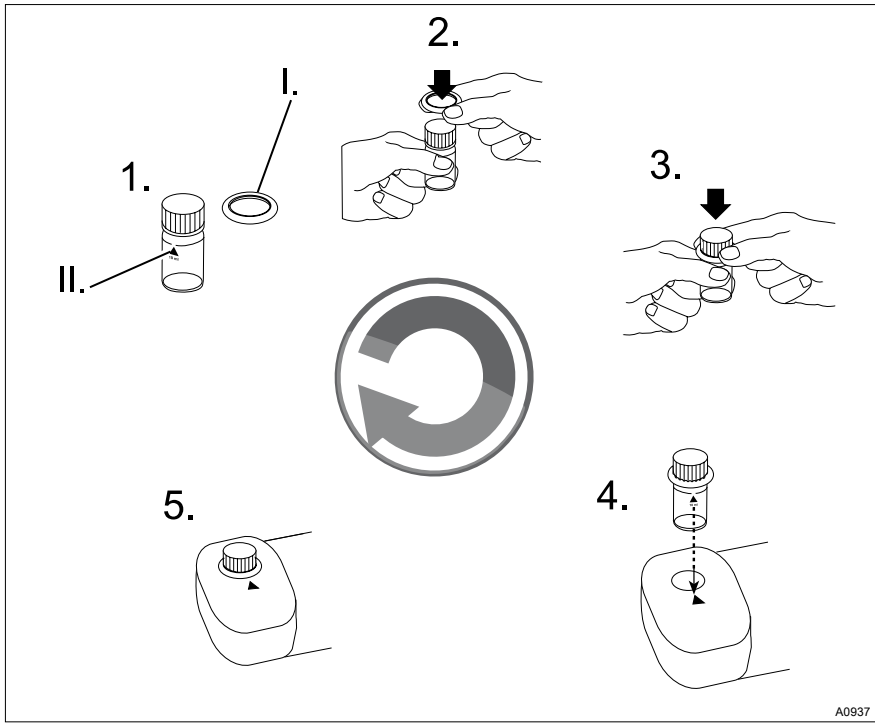

Fig. 1: Cuvette positioning (Ø 24 mm):

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.

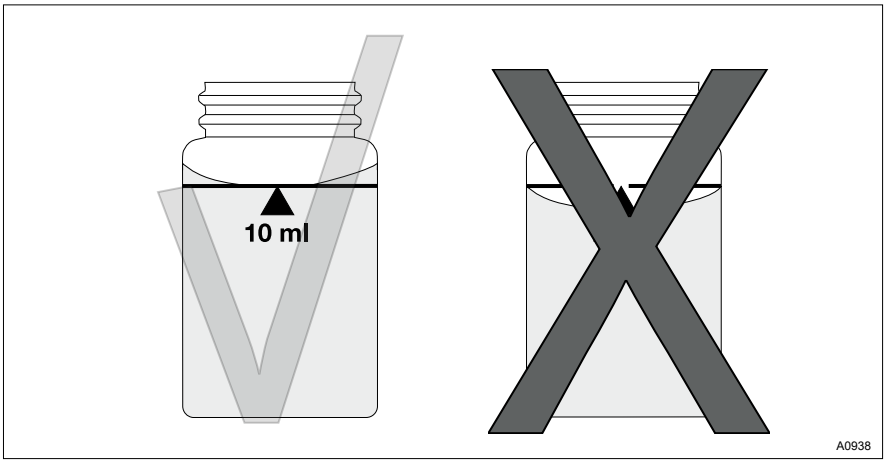

Fig. 2: Correct filling of the cuvette: Left = correct / right = incorrect

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

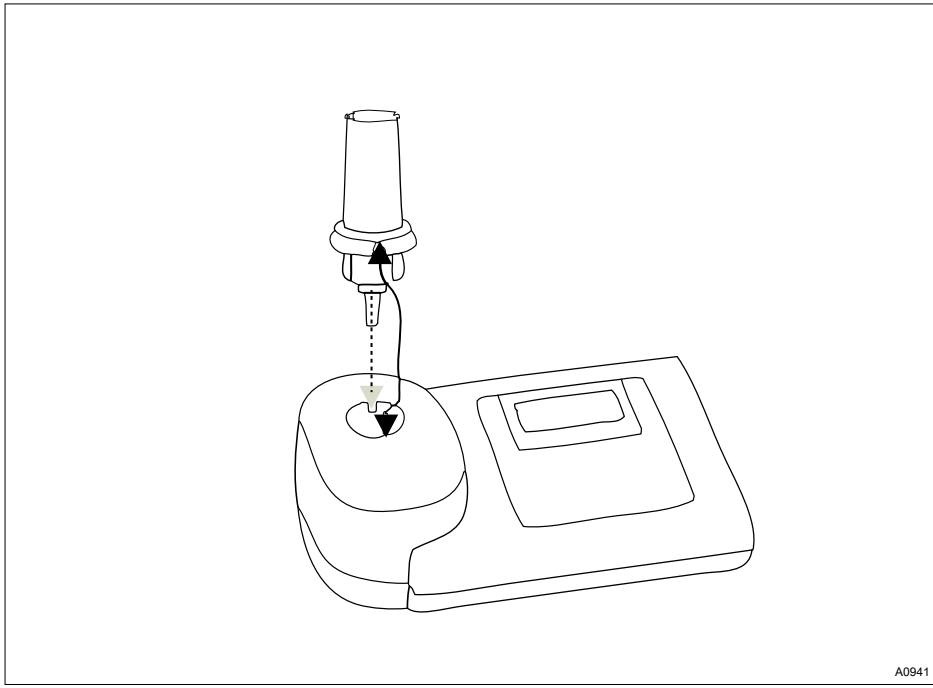

Fig. 3: Place the adapter for 16 mm cuvettes on the sample chamber

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.

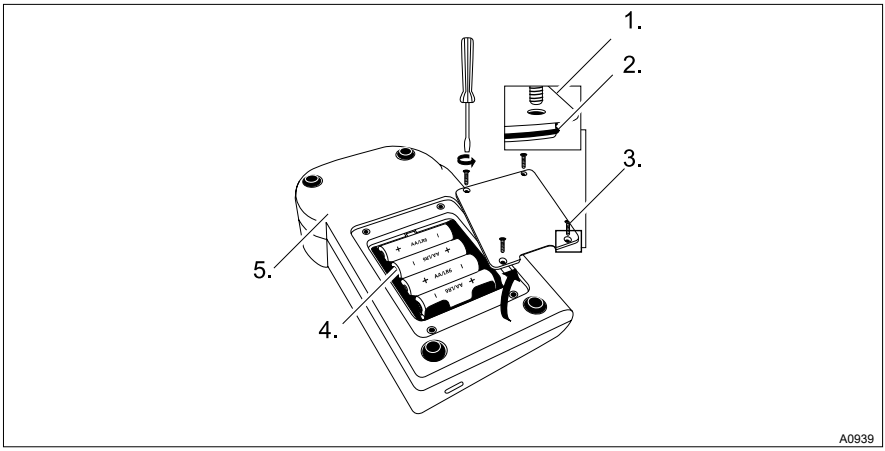

Fig. 4: Battery replacement

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

2 Commissioning DT 1B

2.1 Commissioning

Switching on and zero correction

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 a favoured method.

1. Switch the device on using the *[ON/OFF]* key
   - ⇨ The display outputs: The last selected *[METHOD]*.
2. Select the *[METHOD]* using the *[MODE]* key
   - ⇨ The display outputs: *[METHOD]*.

Zero correction

3. Fill the cuvette up to the 10-ml marking with the water sample, see Fig. 2
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.

     [0.0.0] appears in the display.
7. Remove the cuvette from the sample chamber
   - ⇨ Zero correction is ended.

Analysis

8. Fill the cuvette up to the 10-ml marking with the water sample, see Fig. 2
9. Add reagents to the water sample
   - ⇨ The characteristic colouring develops.
10. Close the cuvette using the cuvette lid
11. Position the cuvette in the sample chamber
12. Press the *[ZERO/TEST]* key, in so doing adhere to any possibly required reaction time, see ↳ *„Switching the countdown function on“ on page 14*
    - ⇨ *[METHOD]* flashes for approximately 3 seconds.

      The result is output to the display.

The result is automatically saved.

Repeating the analysis

Press the key *[ZERO/TEST]* again

⇨ The process runs as described here „*Switching on and zero correction*“ *on page 13*.

New zero correction

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

⇨ The process runs as described here „*Switching on and zero correction*“ *on page 13*.

Switching the countdown function on

NOTICE!

If reaction times are not observed, the result may be incorrect measurement results.

The countdown can only be activated directly prior to a measurement.

The countdown time equals 2 minutes and is non-adjustable.

The currently running countdown can be ended by pressing the key [ZERO/TEST]. The measurement then takes place immediately.

For methods with a reaction time, you can optionally switch on a countdown function:

1. Press the key *[!]* and then keep the key depressed
2. Press the key *[ZERO/TEST]*
3. Release the *[!]* key

⇨ The countdown starts After the countdown has elapsed (2 minutes), measurement takes place automatically

Displaying stored data

The device has a ring buffer for 16 data records.

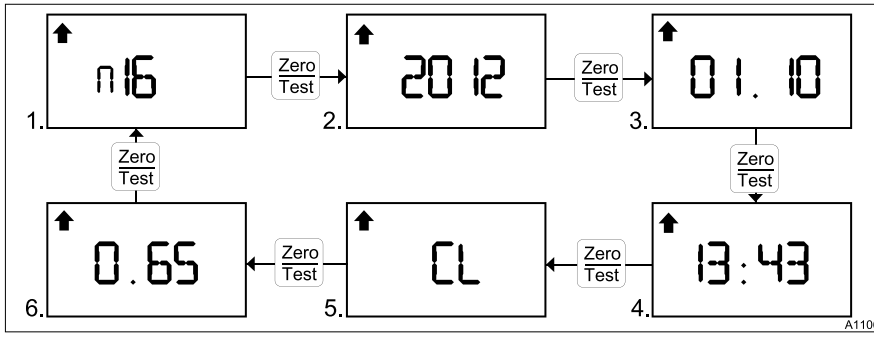

Fig. 5: Displaying stored data

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 and hold down the *[MODE]* key
2. Use the *[ON/OFF]* key to switch on the device
   ⇨ 3 decimal points appear in the display.
3. Release the *[MODE]* key
4. The [!] key allows you to select the following operating menu items:
   - *[diS]* = read out of stored data
   - Set date and time
   - User adjustment

   ⇨ The selected operating menu item is indicated by an arrow in the display.
5. Use the *[!]* key to select the *„Set date and time“* operating menu item (arrow at top right and bottom left in the display)

Setting date and time (24-hour format)

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

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

Pressing the [!] key takes you to 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 the minutes in 10 minute increments

   Press the *[!]* key

   Enter minutes in 1 minute increments
7. After setting the minutes, press the *[!]* key
   ⇨ *[IS SET]* appears in the display and the device automatically returns to measuring mode.

3.2 Operating instructions

Display	Meaning
Hi	Measuring range exceeded or turbidity too high.
Lo	Measuring range undershot.
	Change the batteries immediately, continuing work impossible.
btLo	Battery voltage for background lighting too low, although measurement is possible.
	With a method adjusted by the user, when the result is shown in the display, an arrow appears 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 / E24 / E 25	Detector receives too much light.
E 22	The battery power was too low during the measurement. Replace the battery.
E 70	Cl: Factory calibration not OK / deleted
E 71	Cl: User calibration not OK / deleted
E 72	Cl HR factory calibration not in order / deleted
E 73	Cl HR user calibration not OK / deleted

Display	Meaning
E 80	pH: Factory calibration not OK / deleted
E 81	pH: User calibration not OK / deleted
E 82	CyA: Factory calibration not OK / deleted
E 83	CyA: User calibration not OK / deleted

4 Analysis methods

4.1 Procedure instructions when using liquid reagents

When calculating non-directly determinable parameters from individual measured values error propagation based on the possible tolerances of the individual methods must be considered.

1. Cleaning the cuvettes Many domestic cleaning agents contain reducing substances. Use of these substances leads to false low readings when measuring chlorine/bromine/chlorine dioxide/ozone. To exclude this measurement error, the cuvettes must not contain any substances that have a chlorine demand. Therefore the cuvettes must be stored in a sodium hypochlorite solution (0.1 g/l) for one hour and then thoroughly rinsed with deionised water.
2. For the relevant specification of free chlorine and total chlorine use a separate set of cuvettes for each determination (see EN ISO 7393-2, section. 5.3).

Label the cuvettes set on the top and bottom so that inadvertent interchanging of the cuvettes is not possible.

3. When preparing water samples you must avoid the outgassing of chlorine/bromine/chlorine dioxide/ozone, e.g. by pipetting and shaking. This applies particularly for the dissolved gases chlorine dioxide and ozone, especially at temperatures > 30 °C. You must carry out the analysis immediately after taking the water sample.
4. The DPD colour development takes place at a pH-value of 6.2 to 6.5. Therefore the reagents contain a buffer for pH value adjustment. You must ensure strongly alkaline or acidic water samples come within a pH range between 6 and 7 (using 0.5 mol/l sulphuric acid solution or 1 mol/l sodium hydroxide solution).
5. Concentrations above the measuring range with ...
   - 4 mg/l chlorine when using liquid reagents
   - 9 mg/l bromine when using liquid reagents

- 7.6 mg/l chlorine dioxide when using liquid reagents
- 2.7 mg/l ozone when using liquid reagents

⇨ may lead to results within the measuring range down to 0 mg/l. In this case, you must dilute the water sample with water free from oxidizing agent and repeat the measurement (plausibility test).

6. Any turbidity that occurs during the colour reaction leads to too-high results. You can prevent this error by pre-diluting the sample with oxidizing agent-free water. You must consider the diluting ratio (e.g. 1:2) when calculating the measurement result.

7. After use immediately close the dropping bottles containing the liquid reagents using the respective screw caps of the matching colour. Store the reagent set at + 6 °C to + 10 °C.

8. The DPD method used responds to many oxidising media, hence you must ensure that the selected oxidising agent is present on its own. Mixtures, e.g. from chlorine and chlorine dioxide only yield total values. These total values must then be differentiated using additional steps. To differentiate between chlorine and chlorine dioxide, see *[Chlorine with liquid reagent method, section d.]*. To differentiate between chlorine and ozone, see *[Chlorine with liquid reagent method, section e.]*.

9. In water containing bromide and iodide (primarily seawater), the free and, as the case may be, bound halogens formed by chlorination are stated as chlorine.

   A steady increase in the measured value of a water sample therefore indicates that alongside the selected oxidising agent (e.g. chlorine) a further oxidising agent (e.g. bromide or iodide) is present. This additional oxidising agent (e.g. bromide or iodide) may due to certain circumstances (many times higher concentration, equilibria, higher temperature) bleed through into the measurement. By working quickly and reading off the measurement immediately, the resulting error can be minimised.

   ⇨ These interference effects are also known to occur with these systems {combined chlorine ⇛ free chlorine} and {chloride ⇛ chlorine dioxide}.

4.2 Quantitative determination using liquid reagents

Chlorine with liquid reagents 0.01 ... 4.0 mg/l

Use the *[MODE]* key to select *[Cl]*.

a) Free chlorine

1. Take your cuvette set 1
2. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see *„Switching on and zero correction“ on page 13*
3. Remove the cuvette from the sample chamber and empty the cuvette completely
4. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution

   Fill the cuvette up to the 10 ml marking with the water sample
5. Close the cuvette using the cuvette lid
6. Mix the contents of the cuvette by tipping it back and forth
7. Position the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette.
8. Press the key *[ZERO/TEST]*
   ⇨ *[METHOD]* flashes for approximately 3 seconds.

   The result in mg/l of free chlorine appears in the display.

b) Total chlorine

1. Take your cuvette set 2
2. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see *„Switching on and zero correction“ on page 13*
3. Remove the cuvette from the sample chamber and empty the cuvette completely
4. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution
   - 3 drops ➡ DPD 3 solution

   Fill the cuvette up to the 10 ml marking with the water sample
5. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth
6. Place the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette.

7. Switch the countdown on, see „ *Switching the countdown function on“ on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key

   ⇨ Wait for the 2 minutes reaction time to elapse

8. The METHOD symbol flashes for approximately 3 seconds

   ⇨ The result in mg/l of total chlorine appears in the display.

c) combined chlorine

Combined chlorine = total chlorine minus free chlorine

Calculate the combined chlorine

d) Chlorine together with chlorine dioxide

1. Fill a cuvette with a 10 ml water sample
2. Insert a *[GLYCINE]* tablet directly from the foil into the water sample and crush the *[GLYCINE]* tablet with a stirring rod
3. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablet has dissolved
4. In a second 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction“ on page 13*
5. Remove the cuvette from the sample chamber for the zero correction and empty the cuvette out
6. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution
7. Pour the contents of the first cuvette (*[GLYCINE]* solution) into the prepared cuvette
8. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth
9. Place the cuvette in the sample chamber

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

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

    The display value *[G]* = chlorine dioxide reappears in the display.
11. Remove the cuvette from the sample chamber
12. Thoroughly clean the cuvette and the cuvette lid

13. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
    - 6 drops ➡ DPD 1 buffer solution
    - 2 drops ➡ DPD 1 reagent solution

    Fill the cuvette up to the 10 ml marking with the water sample
14. Close the cuvette using the cuvette lid
15. Mix the contents of the cuvette by tipping it back and forth
16. Position the cuvette in the sample chamber
    ⇨ Observe the correct positioning of the cuvette
17. Press the key *[ZERO/TEST]*
    ⇨ *[METHOD]* flashes for approximately 3 seconds.

    The display value *[A]* = sum of free chlorine plus chlorine dioxide appears in the display.
18. Remove the cuvette from the sample chamber
19. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
    - 3 drops ➡ DPD 3 solution
20. Close the cuvette using the cuvette lid
21. Mix the contents of the cuvette by tipping it back and forth
22. Position the cuvette in the sample chamber
    ⇨ Observe the correct positioning of the cuvette
23. Switch the countdown on, see „ *Switching the countdown function on“ on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key
    ⇨ Wait for the 2 minutes reaction time to elapse
24. *[METHOD]* flashes for approximately 3 seconds.
    ⇨ The display value *[C]* = sum of free chlorine plus combined chlorine plus chlorine dioxide appears in the display.
25. Calculation:
    - Chlorine dioxide (mg/l) = display value *[G]* x 1.9
    - Free chlorine (mg/l) = display value *[A]* minus display value *[G]*
    - Combined chlorine (mg/l) = display value *[C]* minus display value *[A]*

d) Chlorine together with ozone

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see *„Switching on and zero correction“ on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette completely
3. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution
   - 3 drops ➡ DPD 3 solution

   Fill the cuvette up to the 10 ml marking with the water sample
4. Close the cuvette using the cuvette lid
5. Mix the contents of the cuvette by tipping it back and forth
6. Position the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette.
7. Switch the countdown on, see *„ Switching the countdown function on“ on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key
   ⇨ Wait for the 2 minutes reaction time to elapse
8. The METHOD symbol flashes for approximately 3 seconds
   ⇨ The result of Total chlorine + ozone = display value *[A]* appears in mg/l in the display.
9. Remove the first cuvette from the sample chamber
10. Thoroughly clean the cuvette and the cuvette lid
11. Fill a second cuvette with a 10 ml water sample
12. Insert a *[GLYCINE]* tablet directly from the foil into the water sample and crush the *[GLYCINE]* tablet with a stirring rod
13. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablet has dissolved
14. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the first cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution
   - 3 drops ➡ DPD 3 solution
15. Pour the contents of the second cuvette (*[GLYCINE]* solution) into the prepared cuvette
16. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth

17. Place the cuvette in the sample chamber

    ⇨ Observe the correct positioning of the cuvette.

18. Switch the countdown on, see „ *Switching the countdown function on“ on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key

    ⇨ Wait for the 2 minutes reaction time to elapse

19. The METHOD symbol flashes for approximately 3 seconds

    ⇨ The result in mg/l of Total chlorine = display value *[G]* appears in the display.

20. Calculation:

    - Ozone (mg/l) = (Display value *[A]* minus display value *[G]*) x 0.67

Measuring tolerances when determining the chlorine content:

- *0 ... 1 mg/l: ± 0.05 mg/l*
- *> 1 ... 2 mg/l: ± 0.10 mg/l*
- *> 2 ... 3 mg/l: ± 0.20 mg/l*
- *> 3 ... 4 mg/l: ± 0.30 mg/l*

Bromine with liquid reagents 0.02 ... 9 mg/l

Use the *[MODE]* key to select *[Br]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction“ on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette completely
3. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution
   - 3 drops ➡ DPD 3 solution

   Fill the cuvette up to the 10 ml marking with the water sample
4. Use the cuvette lid to seal the cuvette
5. Mix the contents of the cuvette by tipping it back and forth
6. Position the cuvette in the sample chamber

   ⇨ Observe the correct positioning of the cuvette.
7. Switch the countdown on, see „ *Switching the countdown function on“ on page 14*. To do this, press *[!]* and *[ZERO/TEST]*

   ⇨ Wait for the 2 minutes reaction time to elapse

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

   ⇨ The result in mg/l of bromine appears in the display.

9. *Measuring tolerances when determining the bromine content:*

   – *0 ... 2.3 mg/l: ± 0.12 mg/l*
   – *> 2.3 ... 4.5 mg/l: ± 0.25 mg/l*
   – *> 4.5 ... 6.8 mg/l: ± 0.45 mg/l*
   – *> 6.8 ... 9 mg/l: ± 0.68 mg/l*

   ⇨ Explanatory notes, see *Further information on page 20*.

Chlorine dioxide with liquid reagents 0.02 ... 7.6 mg/l

Use the *[MODE]* key to select *[CdO]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see *„Switching on and zero correction“ on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette completely
3. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution

   Fill the cuvette up to the 10 ml marking with the water sample
4. Close the cuvette using the cuvette lid
5. Mix the contents of the cuvette by tipping it back and forth
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 3 seconds.

   The result in mg/l of chlorine dioxide appears in the display.

8.

Measuring tolerances when determining the chlorine dioxide content:

- *0 ... 1.9 mg/l: ± 0.1 mg/l*
- *> 1.9 ... 3.8 mg/l: ± 0.2 mg/l*
- *> 3.8 ... 5.7 mg/l: ± 0.4 mg/l*
- *> 5.7 ... 7.6 mg/l: ± 0.6 mg/l*

Ozone with liquid reagents 0.01 ... 2.7 mg/l

Use the *[MODE]* key to select *[O3]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction*“ *on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette completely
3. Hold the dropping bottle upright and by slow pressing, add equal sized drops into the cuvette:
   - 6 drops ➡ DPD 1 buffer solution
   - 2 drops ➡ DPD 1 reagent solution
   - 3 drops ➡ DPD 3 solution

   Fill the cuvette up to the 10 ml marking with the water sample
4. Close the cuvette using the cuvette lid
5. Mix the contents of the cuvette by tipping it back and forth
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 3 seconds.

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

8.

Measuring tolerances when determining the ozone content:

- *0 ... 0.67 mg/l: ± 0.03 mg/l*
- *> 0.67 ... 1.3 mg/l: ± 0.07 mg/l*
- *> 1.3 ... 2.0 mg/l: ± 0.13 mg/l*
- *> 2.0 ... 2.7 mg/l: ± 0.20 mg/l*

⇨ Explanatory notes, see *Further information on page 20*.

4.3 Procedure instructions when using tablets

When calculating non-directly determinable parameters from individual measured values error propagation based on the possible tolerances of the individual methods must be considered.

1. Cleaning the cuvettes Many domestic cleaning agents contain reducing substances. Use of these substances leads to false low readings when measuring chlorine/bromine/chlorine dioxide/ozone. To exclude this measurement error, the cuvettes must not contain any substances that have a chlorine demand. Therefore the cuvettes must be stored in a sodium hypochlorite solution (0.1 g/l) for one hour and then thoroughly rinsed with deionised water.
2. For the relevant specification of free chlorine and total chlorine use a separate set of cuvettes for each determination (see EN ISO 7393-2, section. 5.3).

Label the cuvettes set on the top and bottom so that inadvertent interchanging of the cuvettes is not possible.

3. When preparing water samples you must avoid the outgassing of chlorine/bromine/chlorine dioxide/ozone, e.g. by pipetting and shaking. This applies particularly for the dissolved gases chlorine dioxide and ozone, especially at temperatures > 30 °C. You must carry out the analysis immediately after taking the sample.

4. The DPD colour development takes place at a pH-value of 6.2 to 6.5. Therefore the reagents contain a buffer for pH value adjustment. You must ensure strongly alkaline or acidic water samples come within a pH range between 6 and 7 (using 0.5 mol/l sulphuric acid solution or 1 mol/l sodium hydroxide solution).

5. Concentrations above
   - 10 mg/l chlorine when using tablets
   - 22 mg/l bromine when using tablets
   - 19 mg/l chlorine dioxide when using tablets
   - 6 mg/l ozone when using tablets

   ⇨ may lead to results within the measuring range down to 0 mg/l. In this case, you must dilute the water sample with water free from oxidizing agent and repeat the measurement (plausibility test).

6. Turbidity (causes incorrect measurements): For water samples with High Calcium content* and/or high conductivity when using the *[DPD no. 1 tablet]* the result can be the rendering turbid of the water sample and consequently incorrect measurements. In this case, you must you must use the alternative reagent tablet *[DPD no. 1 High Calcium]*. If the turbidity only appears after the addition of the *[DPD No. 3]* tablet, you can prevent this by use of the *[DPD no. 1 High Calcium]* and the *[DPD no. 3 High Calcium]* tablet. The *[DPD No. 1 High Calcium]* tablet should only be used in conjunction with the *[DPD No. 3 High Calcium]*.

   ⇨ *exact values cannot be specified, as the formation of turbidity depends on the type and composition of the water sample.

7. The DPD method used responds to many oxidising media, hence you must ensure that the selected oxidising agent is present on its own. Mixtures,

e.g. of chlorine and chlorine dioxide only yield total values. These total values must then be differentiated using additional steps. To differentiate between chlorine and chlorine dioxide, see *[Chlorine with tablet method, section D "Chlorine together with chlorine dioxide"]* To differentiate between chlorine and ozone, see *[Chlorine with tablet method]*

8. In water containing bromide and iodide, the free and, as the case may be, bound halogens formed by chlorination are stated as chlorine. A steady increase in the measured value of a water sample therefore indicates that alongside the selected oxidising agent a further oxidising agent is present. This oxidising agent may due to certain circumstances (many times higher concentration, equilibria, higher temperature) bleed through into the measurement. By working quickly and reading off the measurement immediately, the resulting error can be minimised.

   ⇨ These interference effects are also known to occur with these systems {combined chlorine ⇛ free chlorine} and {chloride ⇛ chlorine dioxide}.

4.4 Quantitative determination using tablets

Fully dissolve tablets

Make sure that the tablets have fully dissolved before starting measurements. Otherwise incorrect measurements may result.

Chlorine with tablets 0.01 ... 6.0 mg/l

Use the *[MODE]* key to select *[Cl]*.

a) Free chlorine

1. Take your cuvette set 1
2. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction*“ *on page 13*
3. Remove the cuvette from the sample chamber and empty the cuvette down to the last few drops
4. Insert a *[DPD No. 1]* tablet directly from the foil into the water sample and crush the *[DPD No. 1]* tablet with a stirring rod
5. Fill the cuvette up to the 10 ml marking with the water sample
6. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablet has dissolved
7. Position the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette.
8. Press the key *[ZERO/TEST]*
   ⇨ *[METHOD]* flashes for approximately 3 seconds.
   The result in mg/l of free chlorine appears in the display.

b) Total chlorine

1. Take your cuvette set 2
2. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction*“ *on page 13*
3. Remove the cuvette from the sample chamber and empty the cuvette down to the last few drops
4. Insert a *[DPD No. 1]* tablet directly from the foil into the water sample and crush the *[DPD No. 1]* tablet with a stirring rod
5. Insert a *[DPD No. 3]* tablet directly from the foil into the water sample and crush the *[DPD No. 3]* tablet with a stirring rod
6. Fill the cuvette up to the 10 ml marking with the water sample
7. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablets have dissolved
8. Place the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette.

9. Switch the countdown on, see „ *Switching the countdown function on“ on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key

   ⇨ Wait for the 2 minutes reaction time to elapse

10. The METHOD symbol flashes for approximately 3 seconds

    ⇨ The result in mg/l of total chlorine appears in the display.

c) combined chlorine

Combined chlorine = total chlorine minus free chlorine

Calculate the combined chlorine

d) Chlorine together with chlorine dioxide

1. Fill a cuvette with a 10 ml water sample
2. Insert a *[GLYCINE]* tablet directly from the foil into the water sample and crush the *[GLYCINE]* tablet with a stirring rod
3. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablet has dissolved
4. In a second 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction“ on page 13*
5. Remove the cuvette from the sample chamber for the zero correction and empty the cuvette out
6. Insert a *[DPD No. 1]* tablet directly from the foil into the water sample and crush the *[DPD No. 1]* tablet with a stirring rod
7. Pour the contents of the first cuvette (*[GLYCINE]* solution) into the prepared cuvette
8. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablet has dissolved
9. Place the cuvette in the sample chamber

   ⇨ Observe the correct positioning of the cuvette.

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

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

    The display value *[G]* (chlorine dioxide) reappears in the display.

11. Remove the cuvette from the sample chamber
12. Thoroughly clean the cuvette and the cuvette lid

13. Fill a cuvette with a few drops of a water sample
14. Insert a *[DPD No. 1]* tablet directly from the foil into the water sample and crush the *[DPD No. 1]* tablet with a stirring rod
15. Fill the cuvette up to the 10 ml marking with the water sample
16. Close the cuvette using the cuvette lid
17. Mix the contents of the cuvette by tipping it back and forth, until the tablet has dissolved
18. Position the cuvette in the sample chamber

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

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

    The display value *[A]* (sum of free chlorine plus chlorine dioxide) appears in the display.
20. Remove the cuvette from the sample chamber
21. Insert a *[DPD No. 3]* tablet directly from the foil into the same water sample and crush the *[DPD No. 3]* tablet with a stirring rod
22. Close the cuvette using the cuvette lid
23. Mix the contents of the cuvette by tipping it back and forth, until the tablet has dissolved
24. Position the cuvette in the sample chamber

    ⇨ Observe the correct positioning of the cuvette.
25. Switch the countdown on, see „ *Switching the countdown function on“ on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key

    ⇨ Wait for the 2 minutes reaction time to elapse
26. The METHOD symbol flashes for approximately 3 seconds

    ⇨ The display value *[C]* (sum of free chlorine plus combined chlorine plus chlorine dioxide) appears in the display.
27. Calculation:

    - Chlorine dioxide (mg/l) = display value *[G]* x 1.9
    - Free chlorine (mg/l) = display value *[A]* minus display value *[G]*
    - Combined chlorine (mg/l) = display value *[C]* minus display value *[A]*

d) Chlorine together with ozone

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction*“ *on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette down to the last few drops
3. Insert a *[DPD No. 1]* tablet and a *[DPD No. 3]* tablet directly from the foil into the water sample and crush the tablets using a stirring rod
4. Fill the cuvette up to the 10 ml marking with the water sample
5. Close the cuvette using the cuvette lid
6. Mix the contents of the cuvette by tipping it back and forth, until the tablets have dissolved
7. Position the cuvette in the sample chamber
   - ⇨ Observe the correct positioning of the cuvette.
8. Switch the countdown on, see „ *Switching the countdown function on*“ *on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key
   - ⇨ Wait for the 2 minutes reaction time to elapse
9. The METHOD symbol flashes for approximately 3 seconds
   - ⇨ The result of Total chlorine + ozone = display value *[A]* appears in mg/l in the display.
10. Remove the first cuvette from the sample chamber
11. Thoroughly clean the cuvette and the cuvette lid
12. Fill a second cuvette with a 10 ml water sample
13. Insert a *[GLYCINE]* tablet directly from the foil into the water sample and crush the *[GLYCINE]* tablet with a stirring rod
14. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablet has dissolved
15. Insert a *[DPD No. 1]* tablet and a *[DPD No. 3]* tablet directly from the foil into the water sample and crush the tablets using a stirring rod
16. Pour the contents of the second cuvette (*[GLYCINE]* solution) into the prepared cuvette
17. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth
18. Place the cuvette in the sample chamber
    - ⇨ Observe the correct positioning of the cuvette.

19. Switch the countdown on, see *„ Switching the countdown function on“ on page 14*. To do this, press the *[!]* and *[ZERO/TEST]* key

    ⇨ Wait for the 2 minutes reaction time to elapse

20. The METHOD symbol flashes for approximately 3 seconds

    ⇨ The result in mg/l of Total chlorine = display value *[G]* appears in the display.

21. Calculation:

    - Ozone (mg/l) = (Display value *[A]* minus display value *[G]*) x 0.67

Measuring tolerances when determining the chlorine content:

- *0 ... 1 mg/l: ± 0.05 mg/l*
- *> 1 ... 2 mg/l: ± 0.10 mg/l*
- *> 2 ... 3 mg/l: ± 0.20 mg/l*
- *> 3 ... 4 mg/l: ± 0.30 mg/l*
- *> 4 ... 6 mg/l: ± 0.40 mg/l*

Chlorine HR with tablet 5 ... 200 mg/l

For the analysis method *„Chlor HR with tablet 5 ... 200 mg/l“* the adapter contained in the scope of supply is required, see *Chapter 1.3 „Adapter for 16 mm cuvettes“ on page 11*.

1. Insert the adapter for the 16 mm round cuvette in the device, see *Chapter 1.3 „Adapter for 16 mm cuvettes“ on page 11*
2. In a 16 mm cuvette add an 8 ml water sample and carry out a zero correction, see *„Switching on and zero correction“ on page 13*
3. Insert a *[CHLORINE HR (KI)]* tablet and an *[ACIDIFYING-GP]* tablet directly from the foil into the water sample and crush the tablets using a stirring rod
4. Close the cuvette with the cuvette lid and mix the contents by tipping back and forth until the tablet has dissolved
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 3 seconds.

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

Measuring tolerances when determining chlorine HR:

– *± 5 mg/l*

Oxidising agents lead to multiple results

All the oxidising agents contained in the water sample react like chlorine which leads to multiple findings.

Ensure, by using suitable methods and measures that for your particular process, such multiple finding cannot occur or that such multiple findings can be allowed for in another manner.

Bromine with tablet 0.02 ... 13 mg/l

Use the *[MODE]* key to select *[Br]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see ↬ *„Switching on and zero correction“ on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette down to the last few drops
3. Enter a *[DPD No. 1]* tablet and a *[DPD No. 3]* tablet directly from the foil into the water sample and crush the tablet with a stirring rod
4. Fill the cuvette up to the 10 ml marking with the water sample
5. Use the cuvette lid to seal the cuvette
6. Mix the contents of the cuvette by tipping it back and forth, until the tablet has dissolved
7. Position the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette.
8. Switch the countdown on, see ↬ *„ Switching the countdown function on“ on page 14*. To do this, press *[!]* and *[ZERO/TEST]*.
9. Press *[ZERO/TEST]*
   ⇨ *[METHOD]* flashes for approximately 3 seconds.

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

10.

Measuring tolerances when determining the bromine content:

- *0 ... 2.3 mg/l: ± 0.12 mg/l*
- *> 2.3 ... 4.5 mg/l: ± 0.25 mg/l*
- *> 4.5 ... 6.8 mg/l: ± 0.45 mg/l*
- *> 6.8 ... 9 mg/l: ± 0.68 mg/l*
- *> 9 ... 13 mg/l: ± 0.90 mg/l*

⇨ Explanatory notes, see ↳ *Further information on page 29*.

Chlorine dioxide with tablet 0.02 ... 11 mg/l

Use the *[MODE]* key to select *[CdO]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see ↳ *„Switching on and zero correction“ on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette down to the last few drops of the water sample
3. Insert a *[DPD No. 1]* tablet directly from the foil into the water sample and crush the tablet with a stirring rod
4. Fill the cuvette up to the 10 ml marking with the water sample
5. Close the cuvette using the cuvette lid
6. Mix the contents of the cuvette by tipping it back and forth, until the tablet has dissolved
7. Position the cuvette in the sample chamber

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

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

   The result in mg/l of chlorine dioxide appears in the display.

9.

Measuring tolerances when determining the chlorine dioxide content:

- *0 ... 1.9 mg/l: ± 0.1 mg/l*
- *> 1.9 ... 3.8 mg/l: ± 0.2 mg/l*
- *> 3.8 ... 5.7 mg/l: ± 0.4 mg/l*
- *> 5.7 ... 7.6 mg/l: ± 0.6 mg/l*
- *> 7.6 ... 11 mg/l: ± 0.8 mg/l*

Ozone with tablet 0.01 ... 4 mg/l

Use the *[MODE]* key to select *[O3]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see „*Switching on and zero correction*“ *on page 13*
2. Remove the cuvette from the sample chamber and empty the cuvette down to the last few drops
3. Insert a *[DPD No. 1]* tablet and a *[DPD No. 3]* tablet directly from the foil into the water sample and crush the tablets using a stirring rod
4. Fill the cuvette up to the 10 ml marking with the water sample
5. Close the cuvette using the cuvette lid
6. Mix the contents of the cuvette by tipping it back and forth, until the tablets have dissolved
7. Position the cuvette in the sample chamber

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

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

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

9.

Measuring tolerances when determining the ozone content:

- *0 ... 0.67 mg/l: ± 0.03 mg/l*
- *> 0.67 ... 1.3 mg/l: ± 0.07 mg/l*
- *> 1.3 ... 2.0 mg/l: ± 0.13 mg/l*
- *> 2.0 ... 2.7 mg/l: ± 0.20 mg/l*
- *> 2.7 ... 4.0 mg/l: ± 0.27 mg/l*

⇨ Explanatory notes, see ↳ *Further information on page 29*.

pH value with tablet 6.5 ... 8.4

Use the *[MODE]* key to select *[PH]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see ↳ *„Switching on and zero correction“ on page 13*
2. Insert a *[PHENOL RED PHOTOMETER]* tablet directly from the foil into the water sample and crush the tablet with a stirring rod
3. Fill the cuvette up to the 10 ml marking with the water sample
4. Close the cuvette using the cuvette lid
5. Mix the contents of the cuvette by tipping it back and forth, until the tablets have dissolved
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 3 seconds.

   The result is output to the display as a pH value.

8.

Measuring tolerances when determining pH:

– *up to ± 0.3 pH units*

⇨

Remarks:

– *For the photometric pH value determination only use [PHENOL RED] tablets with black foil printing, which are labelled with the term [PHOTOMETER].*
– *Water samples with low carbonate hardness* may result in incorrect pH values.*
  **KS4.3 < 0.7 mmol/l ≙ Total alkalinity < 35 mg/l $CaCO_3$.*
– *pH values under 6.5 and greater than 8.4 may lead to results within the measuring range. A plausibility test (pH meter) is recommended.*
– *The accuracy of pH values based upon colorimetric determination depends on var-*

ious boundary conditions (buffer capacity of the water sample, salt content, etc.).

– *The salt content of the water sample effects the result of the photometric pH measurement (salt error), hence this method is not suitable for checking the functioning of a potentiometric pH measurement (DIN 19643-2 ff, paragraph 4.2.4. functional check).*

Cyanuric acid with CyA test tablet 1 ... 80 mg/l

Use the *[MODE]* key to select *[CyA]*.

1. In a 24 mm cuvette add a 10 ml water sample and carry out a zero correction, see ↳ *„Switching on and zero correction“ on page 13*
2. Insert a *[CyA TEST]* tablet directly from the foil into the water sample and crush the tablet with a stirring rod
3. Fill the cuvette up to the 10 ml marking with the water sample
4. Close the cuvette using the cuvette lid
5. Mix the contents of the cuvette by tipping it back and forth, until the tablets have dissolved
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 3 seconds.

   The result in mg/l of cyanuric acid appears in the display.

8.

Measuring tolerances when determining the cyanuric acid content:

- *0 ... 25 mg/l: ± 5 mg/l*
- *25 ... 50 mg/l: ± 8 mg/l*
- *50 ... 80 mg/l: ± 10 mg/l*

⇨

Remarks:

- *Cyanuric acid causes a very finely distributed turbidity with a milky appearance in the water sample. Individual particles should not be traced back to the presence of cyanuric acid, rather are due to impurities in the water sample.*
- *Dissolve the tablet completely (tilt from side to side for approx. 1 minute). Undissolved particles may result in multiple findings.*

5 Calibration

1. The device is switched off. Press and hold down the *[MODE]* key
2. Use the *[ON/OFF]* key to switch on the device
   ⇨ 3 decimal points appear in the display.
3. Release the *[MODE]* key
4. The [!] key allows you to select the following operating menu items:
   - *[diS]* = read out of stored data
   - Set date and time
   - User calibration

   ⇨ The selected menu item is indicated by an arrow in the display.
5. Use the *[!]* key to select the *[CAL]* operating menu item (arrow top right in the display)

Chlorine (Cl) adjustment range

User adjustment

> **! NOTICE!**
> Separate adjustment of the bromine, chlorine dioxide or ozone measuring ranges is impossible. The device relies on the adjustment of the chlorine measuring range (Cl).

User adjustment (display in Adjustment mode) = *[cCAL]*

Factory calibration (display in Adjustment mode) = *[CCAL]*

1. Confirm the selection with *[MODE]*
   ⇨ The display toggles between *[CAL / METHOD]*.
2. Select the method to be adjusted using the *[MODE]* key
3. Fill the cuvette up to the 10-ml marking with the standard solution, without adding reagents
4. Use the cuvette lid to seal the cuvette
5. Position the cuvette in the sample chamber
   ⇨ Observe the correct positioning of the cuvette
6. Press *[ZERO/TEST]*
   ⇨ *[METHOD]* flashes for approximately 8 seconds.

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 and introduce the reagents as described under ↳ *„Chlorine with liquid reagents 0.01 ... 4.0 mg/l“ on page 22* or ↳ *„a) Free chlorine“ on page 32*
10. Use the cuvette lid to seal the cuvette
11. Position the cuvette in the sample chamber
    ⇨ Observe the correct positioning of the cuvette.
12. Press *[ZERO/TEST]*
    ⇨ *[METHOD]* flashes for approximately 3 seconds.

    Confirmation of the result alternates with *[CAL]*.
13. If the result matches the value of the standard used, (within the tolerance to be considered) you can exit Adjustment mode by pressing *[ON/OFF]*

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 *[ON/OFF]*
   ⇨ The new correction factor is calculated and saved in the user adjustment level.

   Confirmation of the adjustment appears in the display for 3 seconds.

Return to the factory calibration

Returning from user adjustment to factory calibration is only possible simultaneously for all methods.

With a method adjusted by the user, when the result is shown in the display, an arrow appears in the [Cal] position.

Proceed as follows to return the device to the factory calibration, proceed as follows:

1. Device is switched off. Simultaneously press *[MODE]* and *[ZERO/TEST]*
2. Switch the device on using the *[ON/OFF]* key
   ⇨ After approximately 1 second, release *[MODE]* and *[ZERO/TEST]*.
3. The display toggles between: *[SEL]* and *[CAL]*
   ⇨ The device is in the as-supplied condition (*[SEL]* stands for Select).
4. or
5. The display toggles between: *[SEL]* and *[cAL]*
   ⇨ The device operates with an adjustment performed by the user. If the user adjustment is to be retained, switch off the device using the *[ON/OFF]* key.
6. Pressing *[MODE]* lets you simultaneously activate 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: ■ 530 nm Δλ = 5 nm ■ 560 nm Δλ = 5 nm
Wavelength precision	± 1 nm
Photometric precision*	3% FS (**F**ull **S**cale) (T = 20°C ... 25°C)
Photometric resolution	0.01 A (**A**bsorption units)
Power supply	4 batteries (Mignon 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 (at the press of a key)
Memory	internal ring buffer for 16 data records
Time	Real time clock and date
Calibration (manufacturer) / Adjustment (user)	Factory calibration and user adjustment. Return to factory calibration is possible.
Dimensions	190 x 110 x 55 mm (L x W x H)
Weight	Basic device approx. 455 g (with batteries)
***measured with standard solutions**	

Ambient conditions	Temperature: 5 ... 40 °C Relative humidity: 30 ... 90% (non-condensing)
Water-tight	similar to IP 68 (1 hour at 0.1 m); buoyant device
***measured with standard solutions**	

The specified device precision is only obtained when the original reagent systems are used.

7 Consumables and Spare Parts

Consumables

Material	Part number
DPD-1 tablets (100 no.)	1061892
DPD-3 tablets (100 no.)	1061893
Phenol red tablets R 175 (100 no.)	305532
Cyanuric acid tablets R 263 (100 no.)	1039744
CHLORINE HR (KI) tablets (100 no.)	1075056
ACIDIFYING GP tablets (100 no.)	1075057
Glycine tablets (20 no.)	1061944

Spare parts

Material	Part number
3 no. round cuvettes (d = 24 mm, h = 48 mm) with lid (replacement cuvettes) for: ■ DPD identification ■ Phenol red identification ■ Cyanuric acid identification	1007566
5 no. round cuvettes (d = 16 mm, h = 90 mm) with lid (replacement cuvettes) for: ■ Chlorine HR identification with a tablet	1024072

8 Standards Complied with and Declaration of Conformity

Declaration of Conformity

You will find the EC Declaration of Conformity to download on our home-page.

Standards complied with

EC EMC Directive (2004/108/EC)

EN 61326 - 1

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