

Lovibond® Water Testing

Tintometer® Group



Manual of Methods

MD 100 • MD 110 • MD 200

Chlorine | pH

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KS4.3 T / 20


Method name

Method number

Bar code for the detection of the methods

Measuring range

20

S:4.3

Display in the MD 100 / MD 110 / MD 200

Chemical Method

Instrument specific information

The test can be performed on the following devices. In addition, the required cuvette and the absorption range of the photometer are indicated.

| Instrument Type | Cuvette | λ | Measuring Range |
|---|---------|--------|---------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | ø 24 mm | 610 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |
| SpectroDirect, XD 7000, XD 7500 | ø 24 mm | 615 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |

Material

Required material (partly optional):

| Reagents | Packaging Unit | Part Number |
|-------------------|----------------|-------------|
| Alka-M-Photometer | Tablet / 100 | 513210BT |
| Alka-M-Photometer | Tablet / 250 | 513211BT |

Application List

- Waste Water Treatment
- Drinking Water Treatment
- Raw Water Treatment

Notes

1. The terms Alkalinity-m, m-Value, total alkalinity and Acid demand to $K_{S4.3}$ are identical.
2. For accurate results, exactly 10 ml of water sample must be used for the test.

Language codes ISO 639-1

Revision status

EN Handbook of Methods 01/20

Performing test procedure

Implementation of the provision Acid capacity $K_{S_{4.3}}$ with Tablet

Select the method on the device

For this method, no ZERO measurements are to be carried out with the following devices: XD 7000, XD 7500



Fill 24 mm vial with **10 ml sample**.



Close vial(s).



Place **sample vial** in the sample chamber. • Pay attention to the positioning.

• • •



Dissolve tablet(s) by inverting.



Place **sample vial** in the sample chamber. • Pay attention to the positioning.



Press the **TEST (XD: START)** button.

The result in Acid Capacity $K_{S_{4.3}}$ appears on the display.



Chlorine PP

M110

0.02 - 2 mg/L Cl₂ ^{a)}

CL2

DPD

Material

EN

Required material (partly optional):

| Reagents | Packaging Unit | Part Number |
|------------------------|----------------------|-------------|
| Chlorine Free DPD F10 | Powder / 100 pc. | 530100 |
| Chlorine Free DPD F10 | Powder / 1000 pc. | 530103 |
| Chlorine Total DPD F10 | Powder / 100 pc. | 530120 |
| Chlorine Total DPD F10 | Powder / 1000 pc. | 530123 |

Available Standards

| Title | Packaging Unit | Part Number |
|------------------------------|----------------|-------------|
| ValidCheck Chlorine 1,5 mg/l | 1 pc. | 48105510 |

Sampling

1. When preparing the sample, Chlorine outgassing, e.g. through the pipette or shaking, must be avoided.
2. The analysis must take place immediately after taking the sample.

Preparation

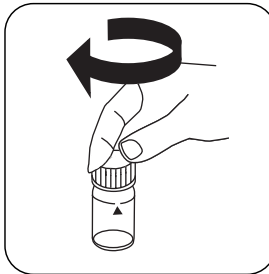
1. Cleaning of vials:
As many household cleaners (e.g. dishwasher detergent) contain reducing substances, this can lead to lower results with the determination of Chlorine. To avoid measurement errors, the glassware used should be free of chlorine consumption. To achieve this, all glassware should be placed in a sodium hypochlorite solution (0.1 g/L) for one hour and then rinsed thoroughly with deionised water.
2. For individual testing of free and total Chlorine, the use of different sets of glassware is recommended (EN ISO 7393-2, 5.3)
3. The DPD colour development is carried out at a pH value of 6.2 to 6.5. The reagents therefore contain a buffer for the pH adjustment. Strong alkaline or acidic water samples must therefore be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

Determination of free chlorine with powder packs

Select the method on the device.



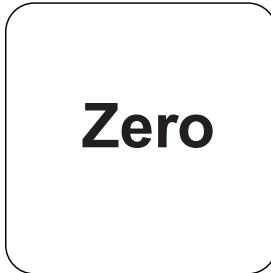
Fill 24 mm vial with **10 mL sample**.



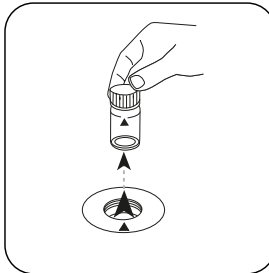
Close vial(s).



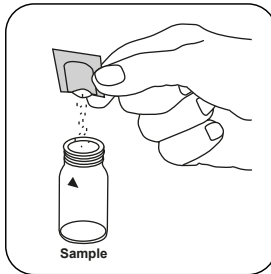
Place **sample vial** in the sample chamber. Pay attention to the positioning.



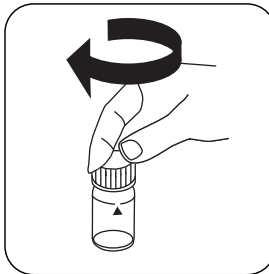
Press the **ZERO** button.



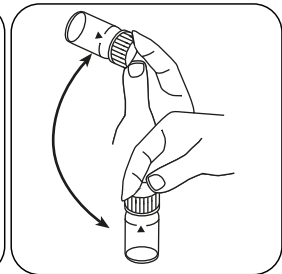
Remove the vial from the sample chamber.



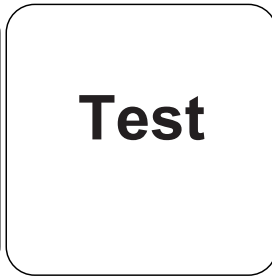
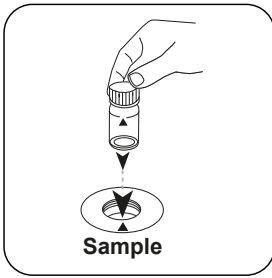
Add **Chlorine FREE-DPD/ F10 powder pack**.



Close vial(s).



Invert several times to mix the contents (20 sec.).



Place **sample vial** in the sample chamber. Pay attention to the positioning.

Press the **TEST** (XD: **START**) button.

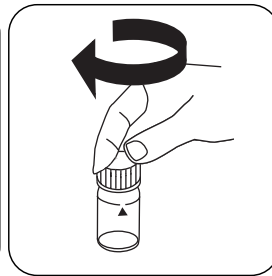
The result in mg/L free chlorine appears on the display.

Determination of totale Chlorine with powder packs

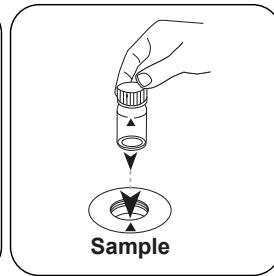
Select the method on the device.



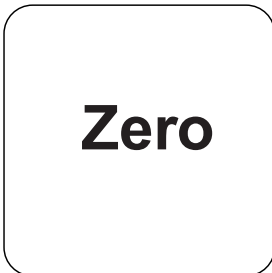
Fill 24 mm vial with **10 mL sample**.



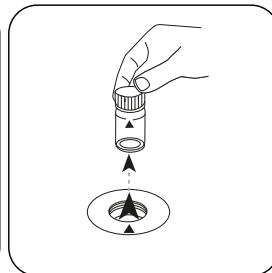
Close vial(s).



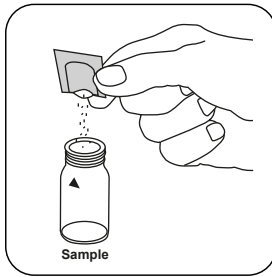
Place **sample vial** in the sample chamber. Pay attention to the positioning.



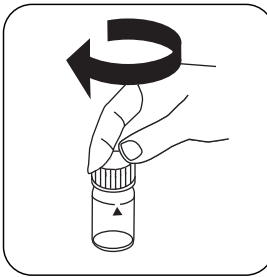
Press the **ZERO** button.



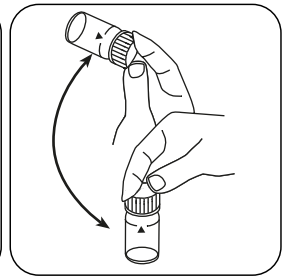
Remove the vial from the sample chamber.



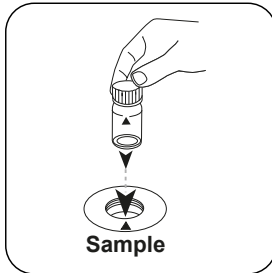
Add **Chlorine TOTAL-DPD/ F10 powder pack**.



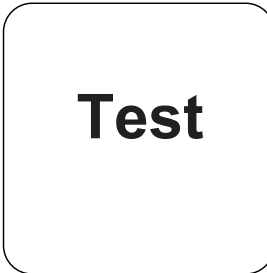
Close vial(s).



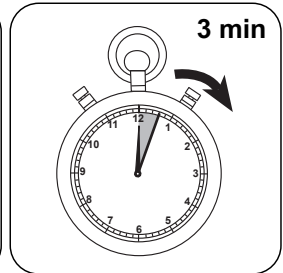
Invert several times to mix the contents (20 sec.).



Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **TEST** (XD: **START**) button.



Wait for **3 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically. The result in mg/L total Chlorine appears on the display.

EN



Chemical Method

DPD

Appendix

EN

Interferences

Persistent Interferences

- All oxidising agents in the samples react like chlorine, which leads to higher results.

Removeable Interferences

- Interference from Copper and Iron (III) are eliminated by the addition of EDTA.
- Concentrations above 2 mg/L Chlorine, in the event of using Powder Packs, can lead to results within the measuring range of up to 0 mg/L. In this case, the sample must be diluted with chlorine-free water. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

| Interference | from / [mg/L] |
|--------------------------------|---------------|
| CrO ₄ ²⁻ | 0,01 |
| MnO ₂ | 0,01 |

Method Validation

| | |
|-------------------------|-----------------|
| Limit of Detection | 0.01 mg/L |
| Limit of Quantification | 0.03 mg/L |
| End of Measuring Range | 2 mg/L |
| Sensitivity | 1.68 mg/L / Abs |
| Confidence Intervall | 0.033 mg/L |
| Standard Deviation | 0.014 mg/L |
| Variation Coefficient | 1.34 % |

Conformity

EN ISO 7393-2

^{a)} determination of free, combined and total



Chlorine HR PP

M111

0.1 - 8 mg/L Cl₂ ^{a)}

CL8

DPD

Material

EN

Required material (partly optional):

| Reagents | Packaging Unit | Part Number |
|------------------------|----------------------|-------------|
| Chlorine Free DPD F10 | Powder / 100 pc. | 530100 |
| Chlorine Free DPD F10 | Powder / 1000 pc. | 530103 |
| Chlorine Total DPD F10 | Powder / 100 pc. | 530120 |
| Chlorine Total DPD F10 | Powder / 1000 pc. | 530123 |

Sampling

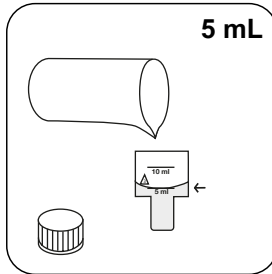
1. When preparing the sample, Chlorine outgassing, e.g. through the pipette or shaking, must be avoided.
2. The analysis must take place immediately after taking the sample.

Preparation

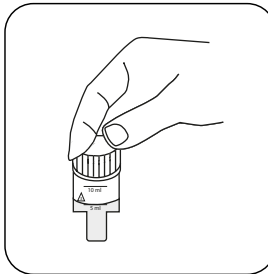
1. Cleaning of vials:
As many household cleaners (e.g. dishwasher detergent) contain reducing substances, this can lead to lower results with the determination of Chlorine. To avoid measurement errors, the glassware used should be free of chlorine consumption. To achieve this, all glassware should be placed in a sodium hypochlorite solution (0.1 g/L) for one hour and then rinsed thoroughly with deionised water.
2. For individual testing of free and total Chlorine, the use of different sets of glassware is recommended (EN ISO 7393-2, 5.3)
3. The DPD colour development is carried out at a pH value of 6.2 to 6.5. The reagents therefore contain a buffer for the pH adjustment. Strong alkaline or acidic water samples must therefore be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

Determination of free chlorine HR with powder packs

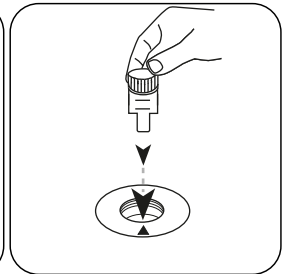
Select the method on the device.



Fill 10 mm vial with **5 mL sample**.



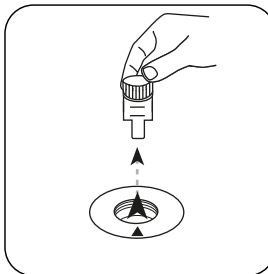
Close vial(s).



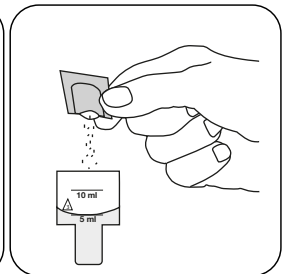
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



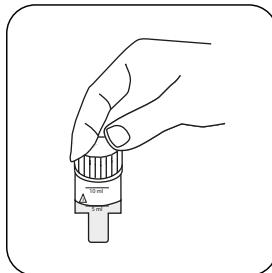
Press the **ZERO** button.



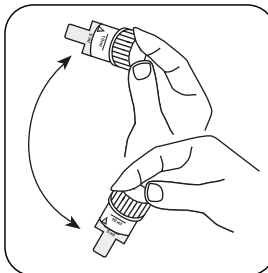
Remove **vial** from the sample chamber.



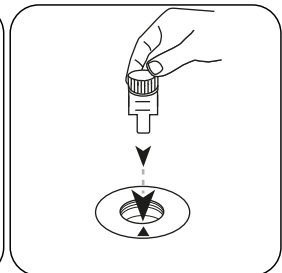
Add **two Chlorine FREE-DPD / F10 powder packs**.



Close vial(s).



Invert several times to mix the contents (20 sec.).



Place **sample vial** in the sample chamber. • Pay attention to the positioning.



Test

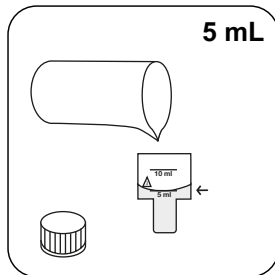
EN

Press the **TEST** (XD:
START) button.

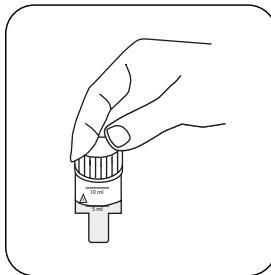
The result in mg/L free chlorine appears on the display.

Determination of totale Chlorine HR with powder packs

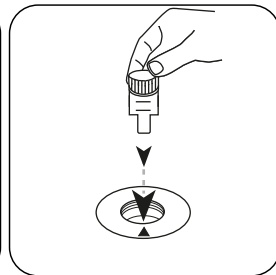
Select the method on the device.



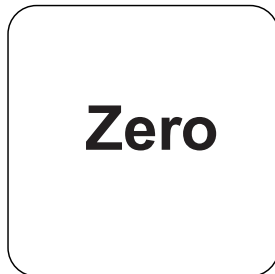
Fill 10 mm vial with **5 mL**
sample.



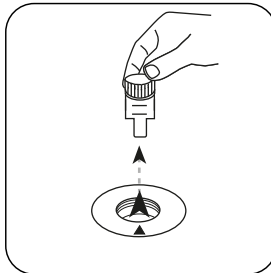
Close vial(s).



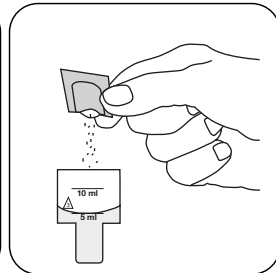
Place **sample vial** in the
sample chamber. • Pay
attention to the positioning.



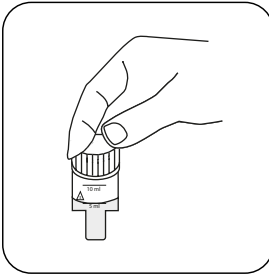
Press the **ZERO** button.



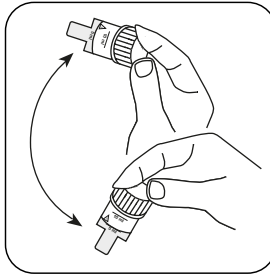
Remove **vial** from the
sample chamber.



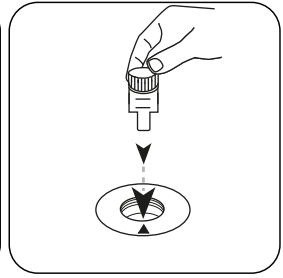
Add **two Chlorine TOTAL-
DPD / F10** powder packs .



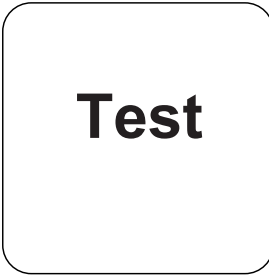
Close vial(s).



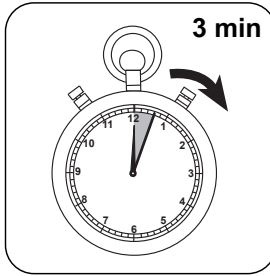
Invert several times to mix the contents (20 sec.).



Place **sample vial** in the sample chamber. • Pay attention to the positioning.



Press the **TEST** (XD: **START**) button.



Wait for **3 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically.

The result in mg/L total Chlorine appears on the display.



Chemical Method

DPD

Appendix

EN

Interferences

Persistent Interferences

- All oxidising agents in the samples react like chlorine, which leads to higher results.

Removeable Interferences

- Interference from Copper and Iron (III) are eliminated by the addition of EDTA.
- Concentrations above 8 mg/L Chlorine, in the event of using Powder Packs, can lead to results within the measuring range of up to 0 mg/L. In this case, the sample must be diluted with chlorine-free water. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

Conformity

EN ISO 7393-2

^{a)} determination of free, combined and total



pH-value T

M330

6.5 - 8.4 pH

PH

Phenol Red

EN

Material

Required material (partly optional):

| Reagents | Packaging Unit | Part Number |
|-----------------------|----------------|-------------|
| Phenol Red Photometer | Tablet / 100 | 511770BT |
| Phenol Red Photometer | Tablet / 250 | 511771BT |
| Phenol Red Photometer | Tablet / 500 | 511772BT |

Notes

1. For photometric determination of pH values only use PHENOL RED tablets in black printed foil pack and marked with PHOTOMETER.

Determination of pH-value with Tablet

Select the method on the device.



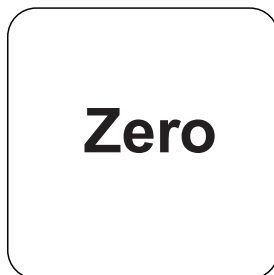
Fill 24 mm vial with **10 mL sample**.



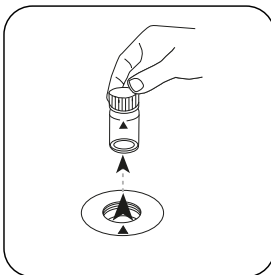
Close vial(s).



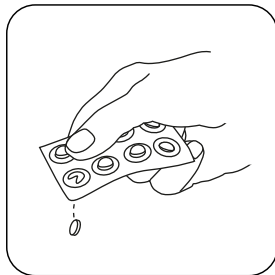
Place **sample vial** in the sample chamber. Pay attention to the positioning.



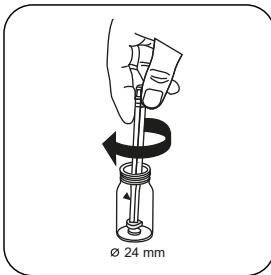
Press the **ZERO** button.



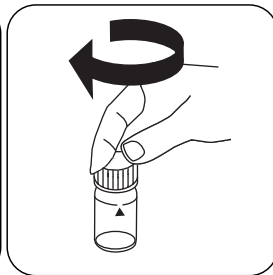
Remove the vial from the sample chamber.



Add **PHENOL RED PHOTOMETER** tablet.



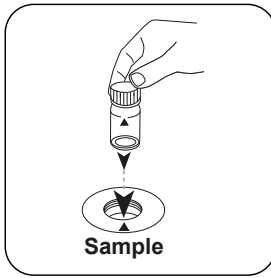
Crush tablet(s) by rotating slightly.



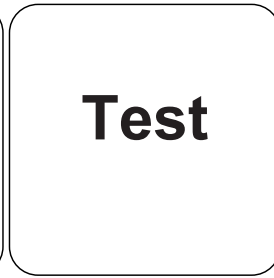
Close vial(s).



Dissolve tablet(s) by inverting.



Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **TEST** (XD: **START**) button.

The result in pH value appears on the display.

Chemical Method

Phenol Red

Appendix

Interferences

EN

Persistent Interferences

1. Water samples with little Carbonate hardness* can lead to false pH values.
* $K_{S4,3} < 0.7 \text{ mmol/l} \triangleq \text{total alkalinity} < 35 \text{ mg/L CaCO}_3$.

Removeable Interferences

1. pH values below 6.5 and above 8.4 can produce results inside the measuring range. A plausibility test (pH-meter) is recommended.
2. Salt error
For salt concentrations below 2 g/L, no significant error, is expected due to the salt concentration of the reagent tablet. For higher salt concentrations the measurement values have to be adjusted as follows:

| Salt content per sample in g/L | 30 (seawater) | 60 | 120 | 180 |
|--------------------------------|---------------------|---------------------|---------------------|---------------------|
| Correction | -0.15 ¹⁾ | -0.21 ²⁾ | -0.26 ²⁾ | -0.29 ²⁾ |

¹⁾ according to Kolthoff (1922)

²⁾ according to Parson and Douglas (1926)

Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, London



pH value L

M331

6.5 - 8.4 pH

PH

Phenol Red

EN

Material

Required material (partly optional):

| Reagents | Packaging Unit | Part Number |
|-------------------------------|----------------|-------------|
| Phenol Red Solution | 15 mL | 471040 |
| Phenol Red Solution | 100 mL | 471041 |
| Phenol Red Solution in 6-pack | 1 pc. | 471046 |

Preparation

1. Due to differing drop sizes results can show a discrepancy in accuracy by comparison with tablets.
This can be minimised by using a pipette (0.18 ml equivalent to 6 drops).

Notes

1. After use, ensure the cuvette is once again closed with the same-coloured screw caps.
2. Reagents are to be stored in the cool at +6 °C to +10 °C.

Determination of pH-value with liquid reagent

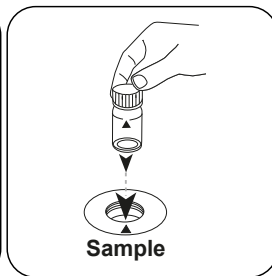
Select the method on the device.



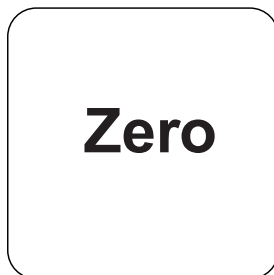
Fill 24 mm vial with **10 mL sample**.



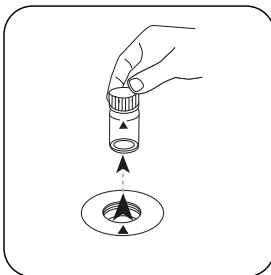
Close vial(s).



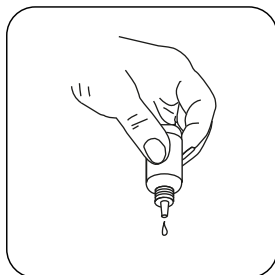
Place **sample vial** in the sample chamber. Pay attention to the positioning.



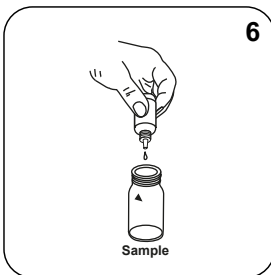
Press the **ZERO** button.



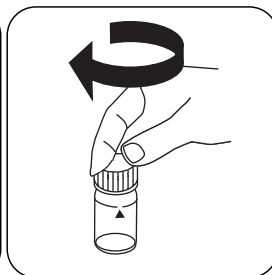
Remove the vial from the sample chamber.



Hold cuvettes vertically and add equal drops by pressing slowly.



Add **6 drops PHENOL Red-Lösung** to the **sample vial**.



Close vial(s).



Invert several times to mix the contents.



Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **TEST** (XD: **START**) button.

The result in pH value appears on the display.

EN

Chemical Method

Phenol Red

Appendix

Interferences

EN

Removeable Interferences

1. Salt error Correction of test results (average values) for samples with salt contents of:

| 2. | Salt content of the sample | Correction |
|----|--|--|
| | 30 g/L (seawater) | -0.15 ¹⁾ |
| | 60 g/L | -0.21 ²⁾ |
| | 120 g/L | -0.26 ²⁾ |
| | 180 g/L | -0.29 ²⁾ |
| | ¹⁾ according to Kolthoff (1922) | ²⁾ according to Parson and Douglas (1926) |

3. When testing chlorinated water the residual chlorine contents can influence the colour reaction of the liquid reagent. This can be avoided by adding a small crystal of Sodiumthiosulphate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$) to the sample solution before adding the PHENOL RED solution.

Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, London

KS4.3 T / 20


Methoden Name

Methodennummer

Barcode zur Methodenerkennung

Messbereich

20

S:4.3

Chemische Methode

$K_{S_{4.3} T}$
0,1 - 4 mmol/l $K_{S_{4.3}}$
Säure / Indikator

Instrumentenspezifische Informationen

Der Test kann auf den folgenden Geräten durchgeführt werden. Zusätzlich sind die benötigte Küvette und der Absorptionsbereich der Photometer angegeben.

| Geräte | Küvette | λ | Messbereich |
|---|---------|-----------|------------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | ø 24 mm | 610 nm | 0,1 - 4 mmol/l $K_{S_{4.3}}$ |
| SpectroDirect, XD 7000, XD 7500 | ø 24 mm | 615 nm | 0,1 - 4 mmol/l $K_{S_{4.3}}$ |

Material

Benötigtes Material (zum Teil optional):

| Reagenzien | Form/Menge | Bestell-Nr. |
|-------------------|----------------|-------------|
| Alka-M-Photometer | Tablette / 100 | 513210BT |
| Alka-M-Photometer | Tablette / 250 | 513211BT |

Anwendungsbereich

- Abwasserbehandlung
- Trinkwasseraufbereitung
- Rohwasserbehandlung

Anmerkungen

1. Die Begriffe Alkalität-m, m-Wert, Gesamtalkalität und Säurekapazität $K_{S_{4.3}}$ sind identisch.
2. Die exakte Einhaltung des Probevolumens von 10 ml ist für die Genauigkeit des Analyseergebnisses entscheidend.

Sprachkürzel nach ISO 639-1

Revisionsstand

DE Methodenhandbuch 01/20

Durchführung der
Messung**Durchführung der Bestimmung Säurekapazität $K_{s4,3}$ mit Tablette**

Die Methode im Gerät auswählen.

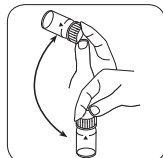
Für diese Methode muss bei folgenden Geräten keine ZERO-Messung durchgeführt werden: XD 7000, XD 7500

24-mm-Küvette mit **10 ml Probe** füllen.

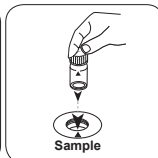
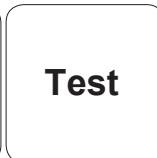
Küvette(n) verschließen.

Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.

• • •



Tablette(n) durch Umschwenken lösen.

Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.Taste **TEST** (XD: **START**) drücken.In der Anzeige erscheint das Ergebnis als Säurekapazität $K_{s4,3}$.



Chlor PP

M110

0,02 - 2 mg/L Cl₂^{a)}

CL2

DPD

DE

Material

Benötigtes Material (zum Teil optional):

| Reagenzien | Form/Menge | Bestell-Nr. |
|------------------------|-------------------|-------------|
| Chlorine Free DPD F10 | Pulver / 100 St. | 530100 |
| Chlorine Free DPD F10 | Pulver / 1000 St. | 530103 |
| Chlorine Total DPD F10 | Pulver / 100 St. | 530120 |
| Chlorine Total DPD F10 | Pulver / 1000 St. | 530123 |

Verfügbare Standards

| Titel | Verpackungseinheit | Bestell-Nr. |
|---------------------------|--------------------|-------------|
| ValidCheck Chlor 1,5 mg/L | 1 St. | 48105510 |

Probenahme

- Bei der Probenvorbereitung muss das Ausgasen von Chlor, z.B. durch Pipettieren und Schütteln, vermieden werden.
- Die Analyse muss unmittelbar nach der Probenahme erfolgen.

Vorbereitung

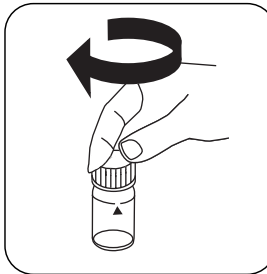
- Reinigung der Küvetten:
Da viele Haushaltsreiniger (z.B. Geschirrspülmittel) reduzierende Stoffe enthalten, kann es bei der Bestimmung von Chlor zu Minderbefunden kommen. Um diesen Messfehler auszuschließen, sollten die Glasgeräte chlorzehrungsfrei sein. Dazu werden die Glasgeräte für eine Stunde unter Natriumhypochloritlösung (0,1 g/L) aufbewahrt und danach gründlich mit VE-Wasser (Vollentsalztes Wasser) gespült.
- Für die Einzelbestimmung von freiem Chlor und Gesamtchlor ist es sinnvoll, jeweils einen eigenen Satz Küvetten zu verwenden (siehe EN ISO 7393-2, Abs. 5.3).
- Die DPD-Farbenentwicklung erfolgt bei einem pH-Wert von 6,2 bis 6,5. Die Reagenzien enthalten daher einen Puffer zur pH-Wert Einstellung. Stark alkalische oder saure Wässer müssen jedoch vor der Analyse in einen pH-Bereich zwischen 6 und 7 gebracht werden (mit 0,5 mol/l Schwefelsäure bzw. 1 mol/l Natronlauge).

Durchführung der Bestimmung freies Chlor mit Pulverpäckchen

Die Methode im Gerät auswählen.



24-mm-Küvette mit **10 mL Probe** füllen.



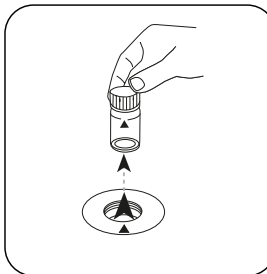
Küvette(n) verschließen.



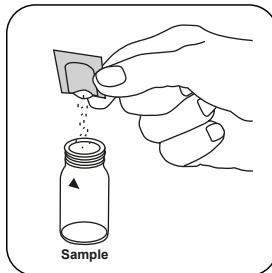
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



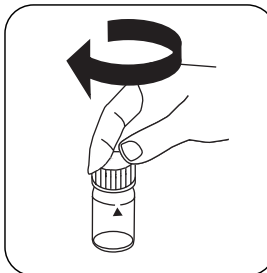
Taste **ZERO** drücken.



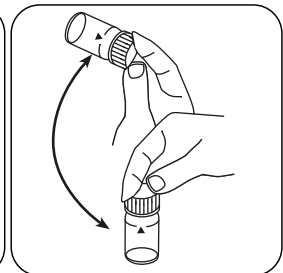
Küvette aus dem Messschacht nehmen.



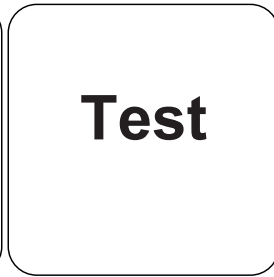
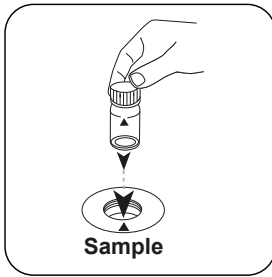
Ein **Chlorine FREE-DPD/ F10 Pulverpäckchen** zugeben.



Küvette(n) verschließen.



Inhalt durch Umschwenken mischen (20 Sek.).



DE

Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.

Taste **TEST** (XD: **START**) drücken.

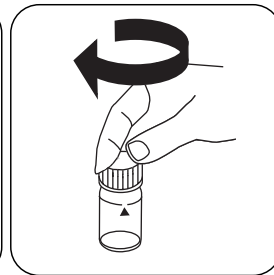
In der Anzeige erscheint das Ergebnis in mg/L freies Chlor.

Durchführung der Bestimmung gesamtes Chlor mit Pulverpäckchen

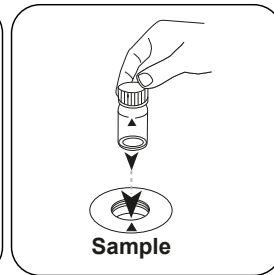
Die Methode im Gerät auswählen.



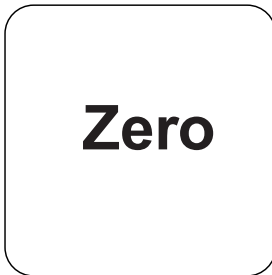
24-mm-Küvette mit **10 mL Probe** füllen.



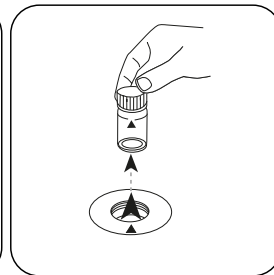
Küvette(n) verschließen.



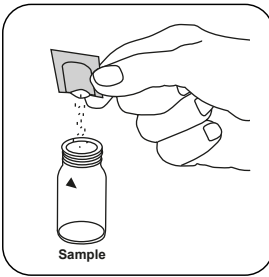
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



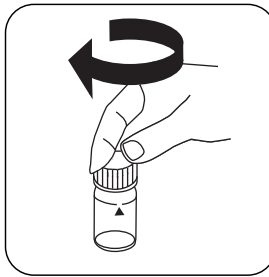
Taste **ZERO** drücken.



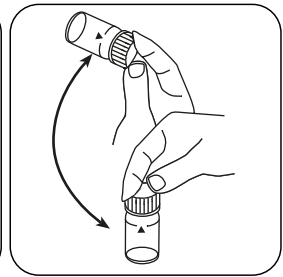
Küvette aus dem Messschacht nehmen.



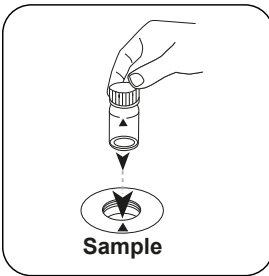
Ein **Chlorine TOTAL-DPD/ F10 Pulverpäckchen** zugeben.



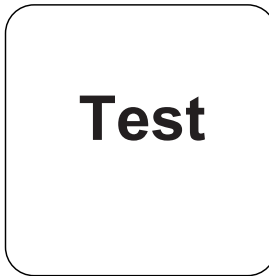
Küvette(n) verschließen.



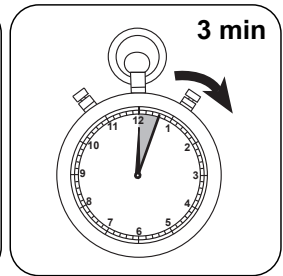
Inhalt durch Umschwenken mischen (20 Sek.).



Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.



Taste **TEST (XD: START)** drücken.



3 Minute(n) Reaktionszeit abwarten.

Nach Ablauf der Reaktionszeit erfolgt automatisch die Messung.

In der Anzeige erscheint das Ergebnis in mg/L Gesamtchlor.



Chemische Methode

DPD

Appendix

DE

Störungen

Permanente Störungen

- Alle in den Proben vorhandenen Oxidationsmittel reagieren wie Chlor, was zu Mehrbefunden führt.

Ausschließbare Störungen

- Störungen durch Kupfer und Eisen(III) sind durch EDTA zu beseitigen.
- Konzentrationen über 2 mg/L Chlor, bei Verwendung von Powder Packs, können zu Ergebnissen innerhalb des Messbereichs bis hin zu 0 mg/L führen. In diesem Fall muss die Probe mit chlorfreiem Wasser verdünnt werden. 10 ml der verdünnten Probe werden mit Reagenz versetzt und die Messung wiederholt (Plausibilitätstest).

| Störung | Stört ab / [mg/L] |
|---------------------|-------------------|
| CrO_4^{2-} | 0,01 |
| MnO_2 | 0,01 |

Methodenvalidierung

| | |
|--|-----------------|
| Nachweisgrenze | 0.01 mg/L |
| Bestimmungsgrenze | 0.03 mg/L |
| Messbereichsende | 2 mg/L |
| Empfindlichkeit | 1.68 mg/L / Abs |
| Vertrauensbereich | 0.033 mg/L |
| Verfahrensstandardabweichung | 0.014 mg/L |
| Verfahrensvariationskoeffizient | 1.34 % |

Konform

EN ISO 7393-2

^{a)} Bestimmung von frei, gebunden, gesamt möglich



Chlor HR PP

M111

0,1 - 8 mg/L Cl₂ ^{a)}

CL8

DPD

DE

Material

Benötigtes Material (zum Teil optional):

| Reagenzien | Form/Menge | Bestell-Nr. |
|------------------------|-------------------|-------------|
| Chlorine Free DPD F10 | Pulver / 100 St. | 530100 |
| Chlorine Free DPD F10 | Pulver / 1000 St. | 530103 |
| Chlorine Total DPD F10 | Pulver / 100 St. | 530120 |
| Chlorine Total DPD F10 | Pulver / 1000 St. | 530123 |

Probenahme

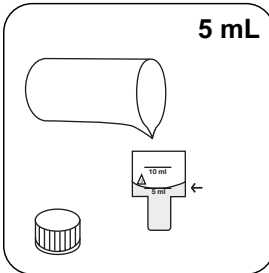
1. Bei der Probenvorbereitung muss das Ausgasen von Chlor, z.B. durch Pipettieren und Schütteln, vermieden werden.
2. Die Analyse muss unmittelbar nach der Probenahme erfolgen.

Vorbereitung

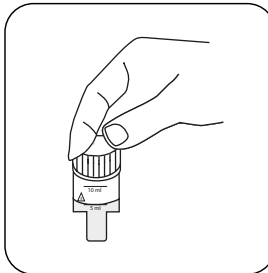
1. Reinigung der Küvetten:
Da viele Haushaltsreiniger (z.B. Geschirrspülmittel) reduzierende Stoffe enthalten, kann es bei der Bestimmung von Chlor zu Minderbefunden kommen. Um diesen Messfehler auszuschließen, sollten die Glasgeräte chlorzehrungsfrei sein. Dazu werden die Glasgeräte für eine Stunde unter Natriumhypochloritlösung (0,1 g/L) aufbewahrt und danach gründlich mit VE-Wasser (Vollentsalztes Wasser) gespült.
2. Für die Einzelbestimmung von freiem Chlor und Gesamtchlor ist es sinnvoll, jeweils einen eigenen Satz Küvetten zu verwenden (siehe EN ISO 7393-2, Abs. 5.3).
3. Die DPD-Farbtentwicklung erfolgt bei einem pH-Wert von 6,2 bis 6,5. Die Reagenzien enthalten daher einen Puffer zur pH-Wert Einstellung. Stark alkalische oder saure Wässer müssen jedoch vor der Analyse in einen pH-Bereich zwischen 6 und 7 gebracht werden (mit 0,5 mol/l Schwefelsäure bzw. 1 mol/l Natronlauge).

Durchführung der Bestimmung freies Chlor HR, mit Pulverpäckchen

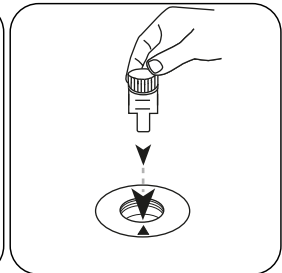
Die Methode im Gerät auswählen.



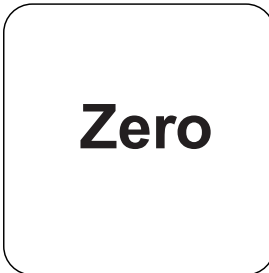
10-mm-Küvette mit **5 mL Probe** füllen.



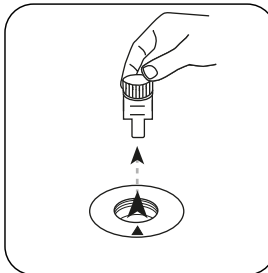
Küvette(n) verschließen.



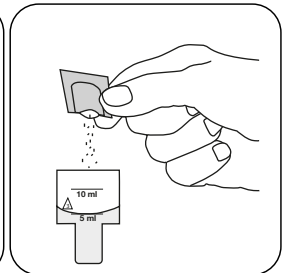
Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.



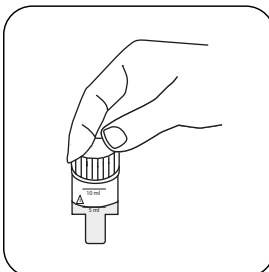
Taste **ZERO** drücken.



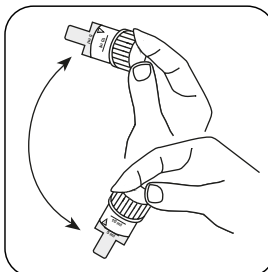
Die **Küvette** aus dem Messschacht nehmen.



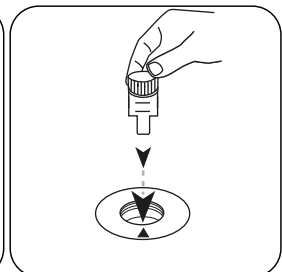
Der Probe **zwei Chlorine FREE-DPD / F10 Pulverpäckchen** zugeben.



Küvette(n) verschließen.



Inhalt durch Umschwenken mischen (20 Sek.).



Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.

DE



Test

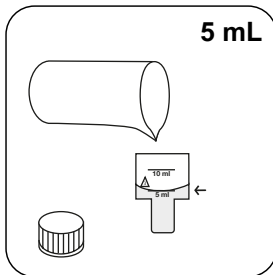
DE

Taste **TEST** (XD: **START**) drücken.

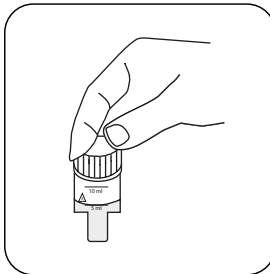
In der Anzeige erscheint das Ergebnis in mg/L freies Chlor.

Durchführung der Bestimmung gesamtes Chlor HR, mit Pulverpäckchen

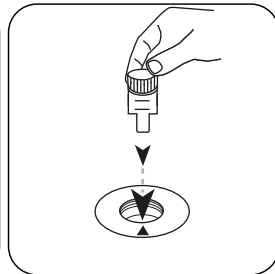
Die Methode im Gerät auswählen.



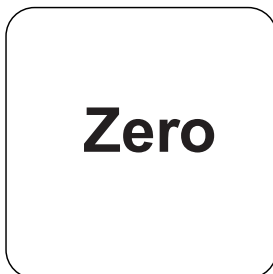
10-mm-Küvette mit **5 mL Probe** füllen.



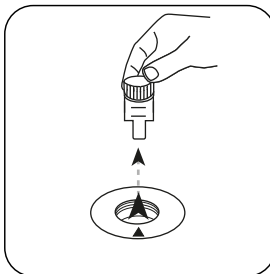
Küvette(n) verschließen.



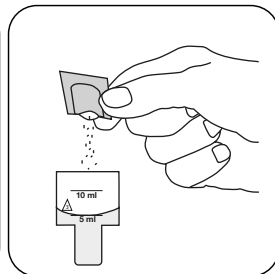
Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.



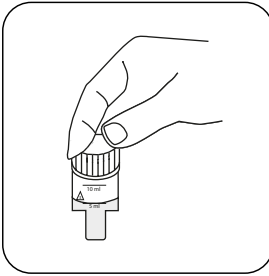
Taste **ZERO** drücken.



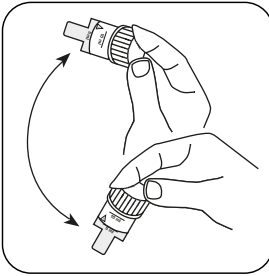
Die **Küvette** aus dem Messschacht nehmen.



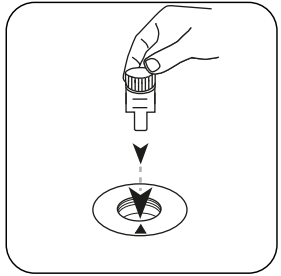
Der Probe **zwei Chlorine TOTAL-DPD / F10 Pulverpäckchen** zugeben.



Küvette(n) verschließen.

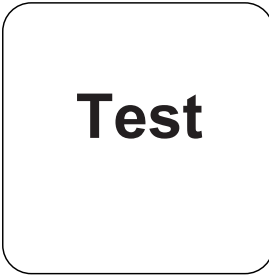


Inhalt durch Umschwenken
mischen (20 Sek.).

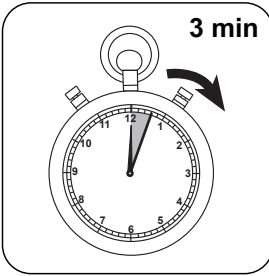


Die **Probeküvette** in
den Messschacht stellen.
Positionierung beachten.

DE



Taste **TEST** (XD: **START**)
drücken.



3 Minute(n) Reaktionszeit
abwarten.

Nach Ablauf der Reaktionszeit erfolgt automatisch die Messung.

In der Anzeige erscheint das Ergebnis in mg/L Gesamtchlor.



Chemische Methode

DPD

Appendix

DE

Störungen

Permanente Störungen

- Alle in den Proben vorhandenen Oxidationsmittel reagieren wie Chlor, was zu Mehrbefunden führt.

Ausschließbare Störungen

- Störungen durch Kupfer und Eisen(III) sind durch EDTA zu beseitigen.
- Konzentrationen über 8 mg/L Chlor, bei Verwendung von Powder Packs, können zu Ergebnissen innerhalb des Messbereichs bis hin zu 0 mg/L führen. In diesem Fall muss die Probe mit chlorfreiem Wasser verdünnt werden. 10 ml der verdünnten Probe werden mit Reagenz versetzt und die Messung wiederholt (Plausibilitätstest).

Konform

EN ISO 7393-2

^{a)} Bestimmung von frei, gebunden, gesamt möglich



pH-Wert T

M330

6,5 - 8,4 pH

PH

Phenolrot

DE

Material

Benötigtes Material (zum Teil optional):

| Reagenzien | Form/Menge | Bestell-Nr. |
|-----------------------|----------------|-------------|
| Phenol Red Photometer | Tablette / 100 | 511770BT |
| Phenol Red Photometer | Tablette / 250 | 511771BT |
| Phenol Red Photometer | Tablette / 500 | 511772BT |

Anmerkungen

1. Für die photometrische pH-Wert Bestimmung sind nur PHENOL RED-Tabletten mit schwarzem Folienaufdruck zu verwenden, die mit dem Begriff PHOTOMETER gekennzeichnet sind.

Durchführung der Bestimmung pH-Wert mit Tablette

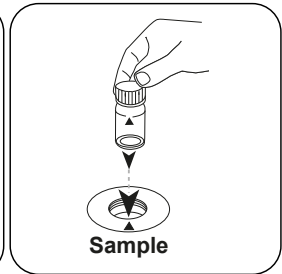
Die Methode im Gerät auswählen.



24-mm-Küvette mit **10 mL Probe** füllen.



Küvette(n) verschließen.



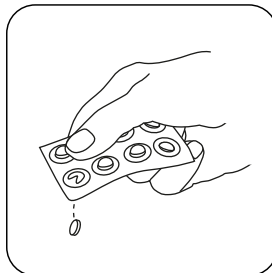
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



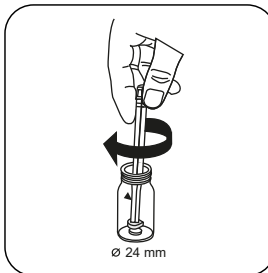
Taste **ZERO** drücken.



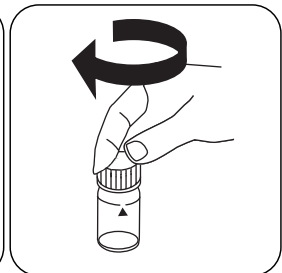
Küvette aus dem Messschacht nehmen.



Eine **PHENOL RED PHOTOMETER** Tablette zugeben.



Tablette(n) unter leichter Drehung zerdrücken.



Küvette(n) verschließen.



Tablette(n) durch Umschwenken lösen.



Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.



Taste **TEST** (XD: **START**) drücken.

In der Anzeige erscheint das Ergebnis als pH-Wert.

DE

Chemische Methode

Phenolrot

Appendix

Störungen

DE

Permanente Störungen

1. Wasserproben mit geringer Carbonathärte* können falsche pH-Werte ergeben.
* $K_{S4,3} < 0,7 \text{ mmol/l} \triangleq \text{Gesamthärte} < 35 \text{ mg/L CaCO}_3$.

Ausschließbare Störungen

1. pH-Werte unter 6,5 und über 8,4 können zu Ergebnissen innerhalb des Messbereiches führen. Es wird ein Plausibilitätstest (pH-Meter) empfohlen.
2. Salzfehler:
Bei Salzgehalten bis 2 g/L ist kein nennenswerter Salzfehler aufgrund des Salzgehaltes der Reagenztablette zu erwarten. Bei höheren Salzgehalten sind die Messwerte wie folgt zu korrigieren:

| Salzgehalt der Probe in g/L | 30 (Meerwasser) | 60 | 120 | 180 |
|--------------------------------------|---------------------|---------------------|---------------------|---------------------|
| Korrektur | -0,15 ¹⁾ | -0,21 ²⁾ | -0,26 ²⁾ | -0,29 ²⁾ |

¹⁾ nach Kolthoff (1922)

²⁾ nach Parson und Douglas (1926)

Literaturverweise

Colorimetric Chemical Analytical Methods, 9th Edition, London



pH-Wert L

M331

6,5 - 8,4 pH

PH

Phenolrot

Material

DE

Benötigtes Material (zum Teil optional):

| Reagenzien | Form/Menge | Bestell-Nr. |
|-------------------------------|------------|-------------|
| Phenolrot Lösung | 15 mL | 471040 |
| Phenolrot Lösung | 100 mL | 471041 |
| Phenolrot Lösung im -6er Pack | 1 St. | 471046 |

Vorbereitung

1. Auf Grund unterschiedlicher Tropfengröße kann das Messergebnis größere Abweichungen als bei Verwendung von Tabletten aufweisen.
Bei Verwendung einer Pipette (0,18 ml entsprechen 6 Tropfen) kann diese Abweichung minimiert werden.

Anmerkungen

1. Nach Gebrauch ist die Trofflasche mit der gleichfarbigen Schraubkappe sofort wieder zu verschließen.
2. Das Reagenz bei +6 °C bis +10 °C kühl lagern.



Durchführung der Bestimmung pH-Wert mit Flüssigreagenz

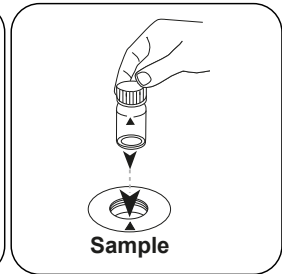
Die Methode im Gerät auswählen.



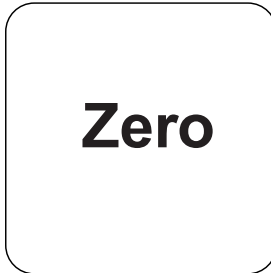
24-mm-Küvette mit **10 mL Probe** füllen.



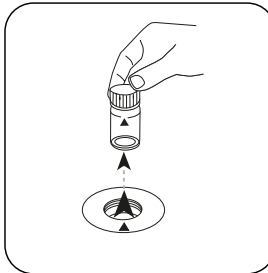
Küvette(n) verschließen.



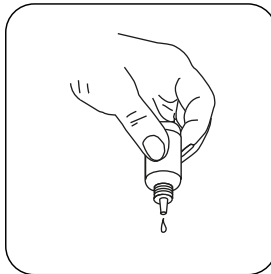
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



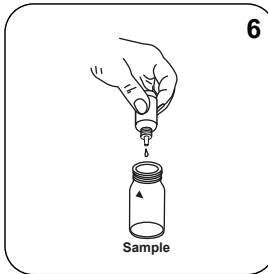
Taste **ZERO** drücken.



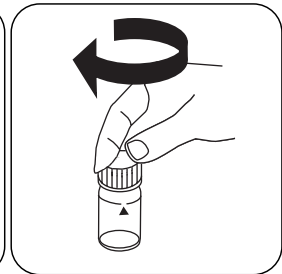
Küvette aus dem Messschacht nehmen.



Die Tropfflaschen senkrecht halten und durch langsames Drücken gleich große Tropfen zugeben.



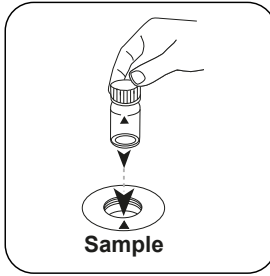
6 Tropfen PHENOL Red-Lösung in die **Probeküvette** geben.



Küvette(n) verschließen.



Inhalt durch Umschwenken mischen.



Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.



Taste **TEST** (XD: **START**) drücken.

In der Anzeige erscheint das Ergebnis als pH-Wert.

DE

Chemische Methode

Phenolrot

Appendix

Störungen

DE

Ausschließbare Störungen


1. Salzfehler: Korrektur des Messwertes (durchschnittliche Werte) für Proben mit einem Salzgehalt von:

| 2. | Salzgehalt der Probe | Korrektur |
|----|------------------------------------|--|
| | 30 g/L (Meerwasser) | -0,15 ¹⁾ |
| | 60 g/L | -0,21 ²⁾ |
| | 120 g/L | -0,26 ²⁾ |
| | 180 g/L | -0,29 ²⁾ |
| | ¹⁾ nach Kolthoff (1922) | ²⁾ nach Parson und Douglas (1926) |

3. Bei der Untersuchung von gechlortem Wasser kann der vorhandene Restchlorgehalt die Farbreaktion des Flüssigreagenzes beeinflussen. Dies wird verhindert, indem ein kleiner Kristall Natriumthiosulfat ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$) in die Probelösung gegeben wird, bevor die PHENOL RED-Lösung zugesetzt wird.

Literaturverweise

Colorimetric Chemical Analytical Methods, 9th Edition, London

KS4.3 T / 20


Nombre del método

Número de método

Código de barras para reconocer el método

Rango de medición

20

S:4.3

Indicación en la pantalla de MD 100 / MD 110 / MD 200

Método químico

Información específica del instrumento

La prueba puede realizarse en los siguientes dispositivos. Además, se muestran la cubeta requerida y el rango de absorción del fotómetro.

| Dispositivos | Cubeta | λ | Rango de medición |
|---|---------------------|-----------|---------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | \varnothing 24 mm | 610 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |
| SpectroDirect, XD 7000, XD 7500 | \varnothing 24 mm | 615 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |

Material

Material requerido (parcialmente opcional):

| Título | Unidad de embalaje | Referencia No |
|-------------------|--------------------|---------------|
| Fotómetro alcal-M | Tabletas / 100 | 513210BT |
| Fotómetro alcal-M | Tabletas / 250 | 513211BT |

Lista de aplicaciones

- Tratamiento de aguas residuales
- Tratamiento de aguas potables
- Tratamiento de aguas de aporte

Notas

1. Las definiciones de alcalinidad-m, valor-m y capacidad ácida $K_{S4.3}$ son idénticas.
2. Añadir un volumen de muestra de exactamente 10 ml, ya que este volumen influye de forma decisiva en la exactitud del resultado.

Códigos de idioma ISO 639-1

Estado de revisión

ES Manual de Métodos 01/20

ES

Realización de la determinación

Ejecución de la determinación Capacidad ácida $K_{24.3}$ con tableta

Seleccionar el método en el aparato.

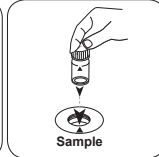
Para este método no es necesario realizar medición CERO en los aparatos siguientes: XD 7000, XD 7500



Llenar la cubeta de 24 mm con **10 ml de muestra**.

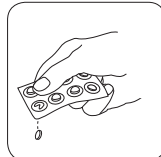


Cerrar la(s) cubeta(s).

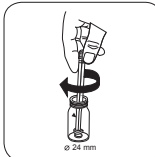


Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!

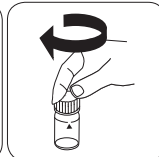
• • •



Añadir **tableta ALKA-M-PHOTOMETER**.



Triturar la(s) tableta(s) girando ligeramente.



Cerrar la(s) cubeta(s).

**Cloro PP****M110****0.02 - 2 mg/L Cl₂^{a)}****CL2****DPD**

ES

Material

Material requerido (parcialmente opcional):

| Reactivos | Unidad de embalaje | No. de referencia |
|---------------------|---------------------------|--------------------------|
| Cloro libre DPD F10 | Polvos / 100 Cantidad | 530100 |
| Cloro libre DPD F10 | Polvos / 1000 Cantidad | 530103 |
| Cloro total DPD F10 | Polvos / 100 Cantidad | 530120 |
| Cloro total DPD F10 | Polvos / 1000 Cantidad | 530123 |

Standards disponibles

| Título | Unidad de embalaje | No. de referencia |
|---------------------------|---------------------------|--------------------------|
| ValidCheck cloro 1,5 mg/l | 1 Cantidad | 48105510 |

Muestreo

1. Evitar durante la preparación de la muestra la desgasificación de cloro, p. ej., al pipetar o agitar.
2. La determinación se ha de realizar inmediatamente después de la toma de la muestra.

Preparación

1. Limpieza de las cubetas:
Muchos productos de limpieza (p. ej., detergentes de lavavajillas) poseen componentes reductores, que pueden reducir los resultados en la determinación del cloro. Para evitar estas alteraciones, los aparatos de vidrio deben estar exentos de componentes corrosivos al cloro. Para ello, deberá sumergir los aparatos de vidrio durante una hora en una solución de hipoclorito sódico (0,1 g/L), enjuagándolos minuciosamente a continuación con agua desionizada.
2. Para la determinación individual de cloro libre y cloro total se recomienda utilizar siempre los mismos sets de cubetas respectivamente (véase EN ISO 7393-2, párrafo 5.3).
3. El desarrollo coloreo por DPD se efectúa entre un valor de pH de 6,2 - 6,5. Por ello poseen las tabletas un tampón para la graduación del valor de pH. Sin embargo, las muestras acuosas muy ácidas o muy básicas se deberán neutralizar a un valor de pH entre 6 y 7 antes de realizar el análisis (con 0,5 mol/l de ácido sulfúrico o 1 mol/l de hidróxido sódico).

ES

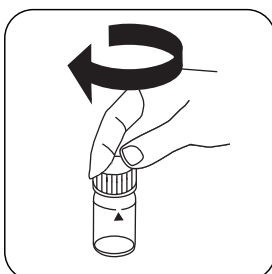


Ejecución de la determinación cloro libre con reactivo Powder Pack

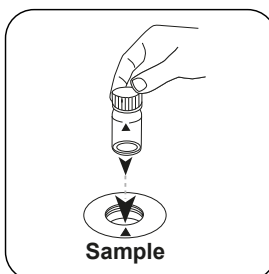
Seleccionar el método en el aparato.



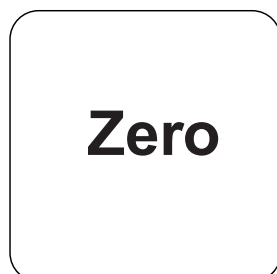
Llenar la cubeta de 24 mm con **10 mL de muestra** .



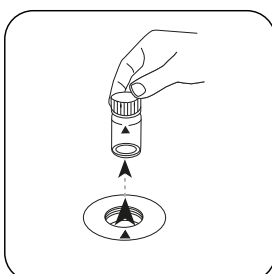
Cerrar la(s) cubeta(s).



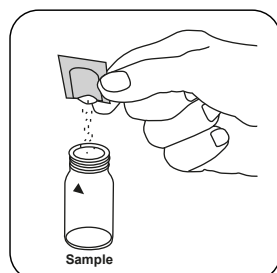
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



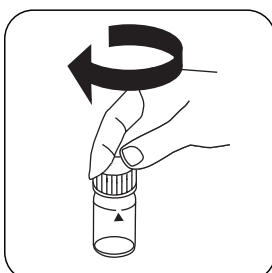
Pulsar la tecla **ZERO**.



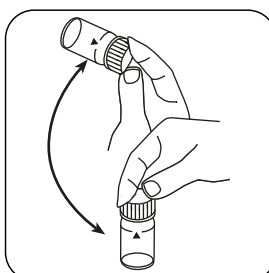
Extraer la cubeta del compartimiento de medición.



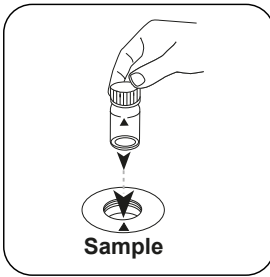
Añadir un **sobre de polvos Chlorine FREE-DPD/ F10** .



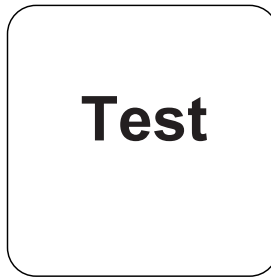
Cerrar la(s) cubeta(s).



Mezclar el contenido girando (20 sec.).



Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



Pulsar la tecla **TEST** (XD: **START**).

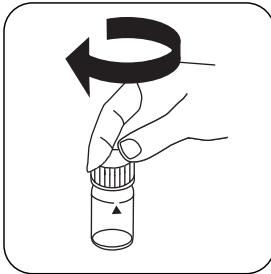
A continuación se visualizará el resultado en mg/L cloro libre.

Ejecución de la determinación cloro total con reactivo Powder Pack

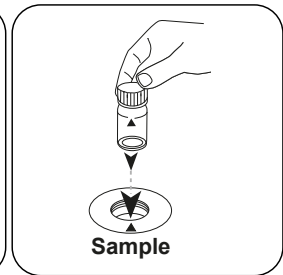
Seleccionar el método en el aparato.



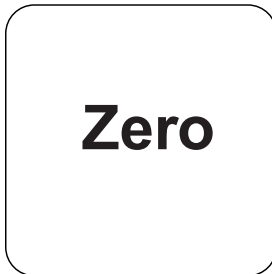
Llenar la cubeta de 24 mm con **10 mL de muestra**.



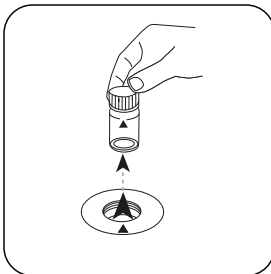
Cerrar la(s) cubeta(s).



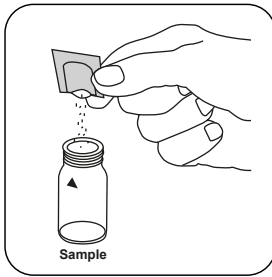
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



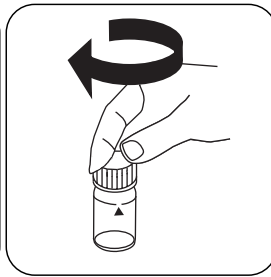
Pulsar la tecla **ZERO**.



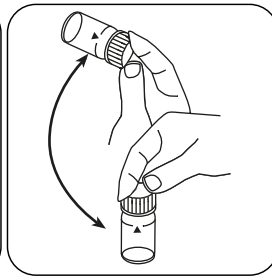
Extraer la cubeta del compartimiento de medición.



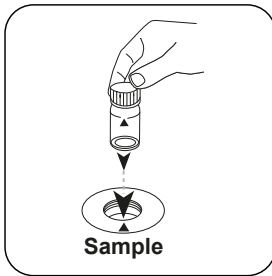
Añadir un **sobre de polvos Chlorine TOTAL-DPD/F10**.



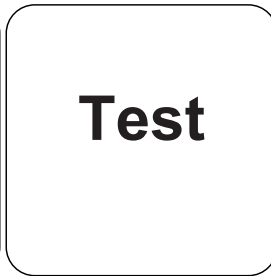
Cerrar la(s) cubeta(s).



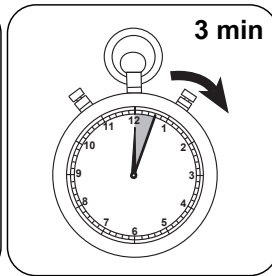
Mezclar el contenido girando (20 sec.).



Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



Pulsar la tecla **TEST (XD: START)**.



Esperar **3 minutos como periodo de reacción**.

Finalizado el periodo de reacción se realizará la determinación automáticamente.

A continuación se visualizará el resultado en mg/L cloro total.





Método químico

DPD

Apéndice

ES

Interferencia

Interferencias persistentes

- Todos los elementos oxidantes existentes en la muestra reaccionan como el cloro, lo que produce un resultado más elevado.

Interferencias extraíbles

- Las perturbaciones debido a cobre y hierro (III) deben suprimirse mediante EDTA.
- Las concentraciones de cloro mayores a 2 mg/L, cuando se usan sobres de polvos pueden conducir a resultados de dentro del campo de medición hasta 0 mg/L. En este caso, se deberá diluir la muestra con agua sin cloro. Se mezclan 10 ml de muestra diluida con reactivo y se repite la medición (prueba de plausibilidad).

| Interferencia | de / [mg/L] |
|---------------------|-------------|
| CrO_4^{2-} | 0,01 |
| MnO_2 | 0,01 |

Validación del método

| | |
|------------------------------|-----------------|
| Límite de detección | 0.01 mg/L |
| Límite de determinación | 0.03 mg/L |
| Límite del rango de medición | 2 mg/L |
| Sensibilidad | 1.68 mg/L / Abs |
| Intervalo de confianza | 0.033 mg/L |
| Desviación estándar | 0.014 mg/L |
| Coefficiente de variación | 1.34 % |

Conforme a

EN ISO 7393-2

^{a)} Posible determinación de libre, combinado, total



Cloro HR PP

M111

0.1 - 8 mg/L Cl₂^{a)}

CL8

DPD

ES

Material

Material requerido (parcialmente opcional):

| Reactivos | Unidad de embalaje | No. de referencia |
|---------------------|---------------------------|-------------------|
| Cloro libre DPD F10 | Polvos / 100 Cantidad | 530100 |
| Cloro libre DPD F10 | Polvos / 1000 Cantidad | 530103 |
| Cloro total DPD F10 | Polvos / 100 Cantidad | 530120 |
| Cloro total DPD F10 | Polvos / 1000 Cantidad | 530123 |

Muestreo

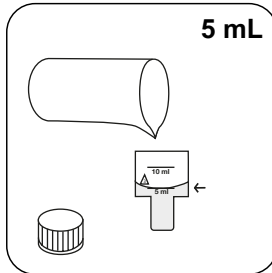
1. Evitar durante la preparación de la muestra la desgasificación de cloro, p. ej., al pipetar o agitar.
2. La determinación se ha de realizar inmediatamente después de la toma de la muestra.

Preparación

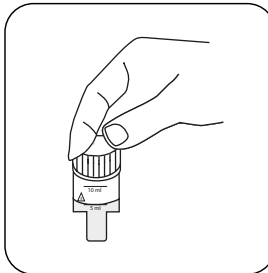
1. Limpieza de las cubetas:
Muchos productos de limpieza (p. ej., detergentes de lavavajillas) poseen componentes reductores, que pueden reducir los resultados en la determinación del cloro. Para evitar estas alteraciones, los aparatos de vidrio deben estar exentos de componentes corrosivos al cloro. Para ello, deberá sumergir los aparatos de vidrio durante una hora en una solución de hipoclorito sódico (0,1 g/L), enjuagándolos minuciosamente a continuación con agua desionizada.
2. Para la determinación individual de cloro libre y cloro total se recomienda utilizar siempre los mismos sets de cubetas respectivamente (véase EN ISO 7393-2, párrafo 5.3).
3. El desarrollo coloreo por DPD se efectúa entre un valor de pH de 6,2 - 6,5. Por ello poseen las tabletas un tampón para la graduación del valor de pH. Sin embargo, las muestras acuosas muy ácidas o muy básicas se deberán neutralizar a un valor de pH entre 6 y 7 antes de realizar el análisis (con 0,5 mol/l de ácido sulfúrico o 1 mol/l de hidróxido sódico).

Ejecución de la determinación cloro libre HR con reactivo Powder Pack

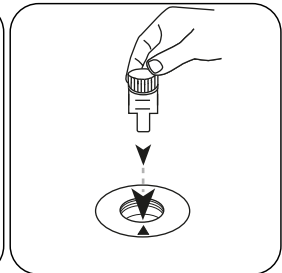
Seleccionar el método en el aparato.



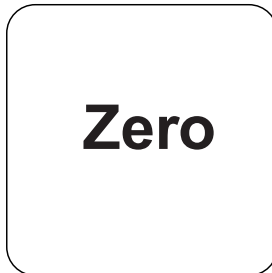
Llenar la cubeta de 10 mm con **5 mL de muestra**.



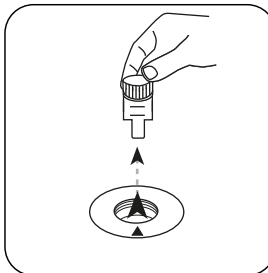
Cerrar la(s) cubeta(s).



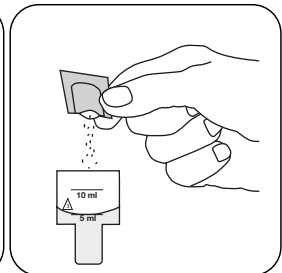
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



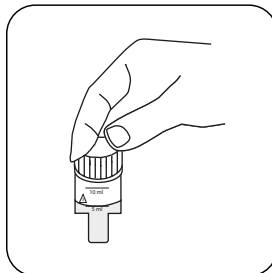
Pulsar la tecla **ZERO**.



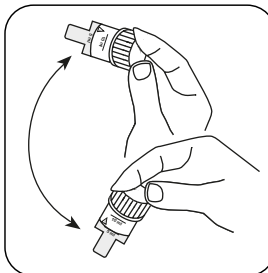
Extraer la **cubeta** del compartimiento de medición.



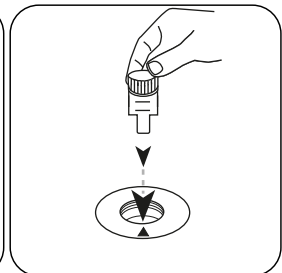
Añadir **dos sobres de polvos Chlorine FREE-DPD / F10** a la muestra.



Cerrar la(s) cubeta(s).



Mezclar el contenido girando (20 sec.).



Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!

ES



Test

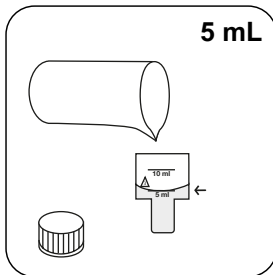
ES

Pulsar la tecla **TEST** (XD: **START**).

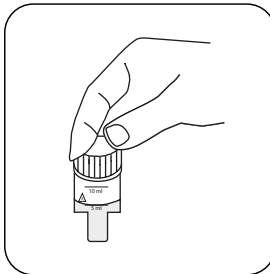
A continuación se visualizará el resultado en mg/L cloro libre.

Ejecución de la determinación cloro total HR con reactivo Powder Pack

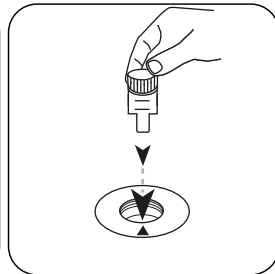
Seleccionar el método en el aparato.



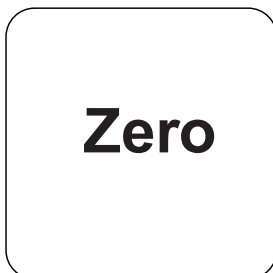
Llenar la cubeta de 10 mm con **5 mL de muestra**.



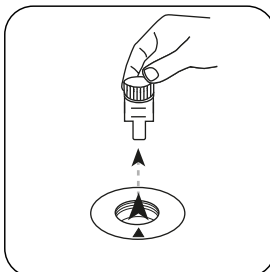
Cerrar la(s) cubeta(s).



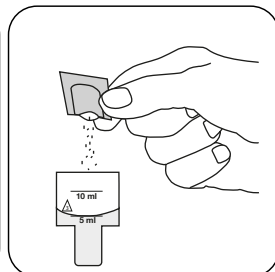
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



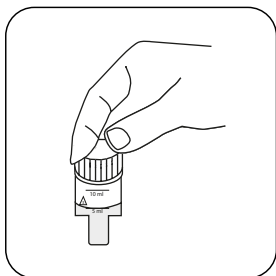
Pulsar la tecla **ZERO**.



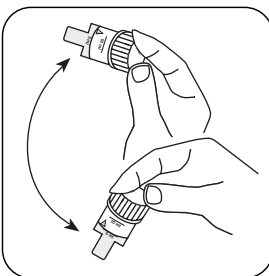
Extraer la **cubeta** del compartimiento de medición.



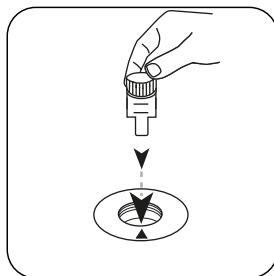
Añadir **dos sobres de polvos Chlorine TOTAL-DPD / F10** a la muestra.



Cerrar la(s) cubeta(s).

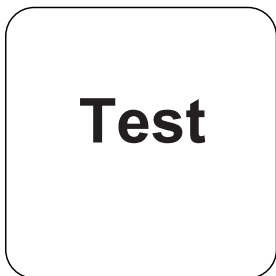


Mezclar el contenido girando (20 sec.).

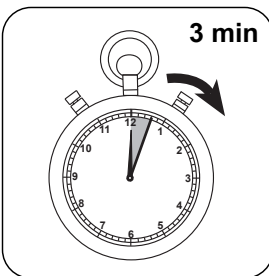


Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!

ES



Pulsar la tecla **TEST** (XD: **START**).



Esperar **3 minutos como periodo de reacción**.

Finalizado el periodo de reacción se realizará la determinación automáticamente.

A continuación se visualizará el resultado en mg/L cloro total.



Método químico

DPD

Apéndice

ES

Interferencia

Interferencias persistentes

- Todos los elementos oxidantes existentes en la muestra reaccionan como el cloro, lo que produce un resultado más elevado.

Interferencias extraíbles

- Las perturbaciones debido a cobre y hierro (III) deben suprimirse mediante EDTA.
- Las concentraciones de cloro mayores a 8 mg/L, cuando se usan sobres de polvos pueden conducir a resultados de dentro del campo de medición hasta 0 mg/L. En este caso, se deberá diluir la muestra con agua sin cloro. Se mezclan 10 ml de muestra diluida con reactivo y se repite la medición (prueba de plausibilidad).

Conforme a

EN ISO 7393-2

^{a)} Posible determinación de libre, combinado, total



Valor de pH T

M330

6.5 - 8.4 pH

PH

Rojo de fenol

Material

ES

Material requerido (parcialmente opcional):

| Reactivos | Unidad de embalaje | No. de referencia |
|-------------------------|--------------------|-------------------|
| Rojo de fenol fotómetro | Tabletas / 100 | 511770BT |
| Rojo de fenol fotómetro | Tabletas / 250 | 511771BT |
| Rojo de fenol fotómetro | Tabletas / 500 | 511772BT |

Notas

1. Para la determinación fotométrica del valor de pH solo deben usarse tabletas PHENOL RED selladas en una lámina negra con la palabra adicional PHOTOMETER.



Ejecución de la determinación Valor de pH con tableta

Seleccionar el método en el aparato.



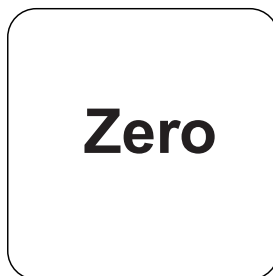
Llenar la cubeta de 24 mm con **10 mL de muestra** .



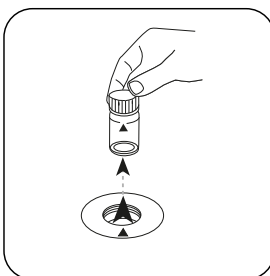
Cerrar la(s) cubeta(s).



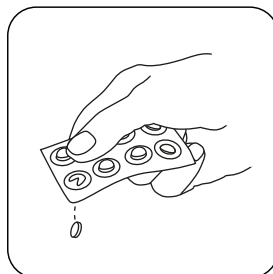
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



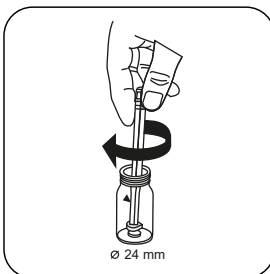
Pulsar la tecla **ZERO**.



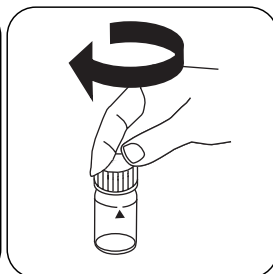
Extraer la cubeta del compartimiento de medición.



Añadir tableta **PHENOL RED PHOTOMETER**.



Triturar la(s) tableta(s) girando ligeramente.



Cerrar la(s) cubeta(s).

ES



Disolver la(s) tableta(s) girando.



Poner la **cubeta de muestra** en el compartimento de medición. ¡Debe tenerse en cuenta el posicionamiento!



Pulsar la tecla **TEST** (XD: **START**).

A continuación se visualizará el resultado como valor de pH.

Método químico

Rojo de fenol

Apéndice

Interferencia

ES

Interferencias persistentes

1. Las muestras de agua con baja dureza de carbonato* pueden entregar valores de pH falsos.

* $K_{S4.3} < 0,7 \text{ mmol/l} \triangleq \text{Alcalinidad total} < 35 \text{ mg/L CaCO}_3$.

Interferencias extraíbles

1. Los valores de pH inferiores a 6,5 y superiores a 8,4 pueden conducir a resultados dentro del campo de medición. Se recomienda realizar una prueba de plausibilidad (medidor de pH).
2. Error de sal:
Con concentraciones de sal de hasta 2 g/L no cabe esperar un error de sal destacable, debido a la concentración de sal de la tableta de reactivo. Cuando las concentraciones de sal son mayores, los valores de medición deben corregirse del modo siguiente:

| | | | | |
|---|---------------------|---------------------|---------------------|---------------------|
| Concentración salina de la muestra en g/L | 30 (agua de mar) | 60 | 120 | 180 |
| Corrección | -0,15 ¹⁾ | -0,21 ²⁾ | -0,26 ²⁾ | -0,29 ²⁾ |

¹⁾según Kolthoff (1922)

²⁾según Parson y Douglas (1926)

Bibliografía

Colorimetric Chemical Analytical Methods, 9th Edition, London



Valor de pH L

M331

6.5 - 8.4 pH

PH

Rojo de fenol

Material

ES

Material requerido (parcialmente opcional):

| Reactivos | Unidad de embalaje | No. de referencia |
|-------------------------------------|--------------------|-------------------|
| Solución de rojo de fenol | 15 mL | 471040 |
| Solución de rojo de fenol | 100 mL | 471041 |
| Solución rojo de fenol en pack de 6 | 1 Cantidad | 471046 |

Preparación

1. El tamaño de las gotas, al contrario de las tabletas, puede aumentar las desviaciones del resultado. Mediante el uso de una pipeta (0,18 ml corresponden a 6 gotas) se pueden minimizar estas desviaciones.

Notas

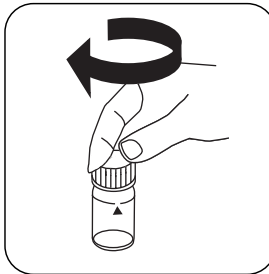
1. Después de usarla, la botella cuentagotas debe cerrarse de nuevo inmediatamente con la tapa roscada del mismo color.
2. Guardar el reactivo a una temperatura entre +6 °C y +10 °C.

Ejecución de la determinación Valor de pH con reactivos líquidos

Seleccionar el método en el aparato.



Llenar la cubeta de 24 mm con **10 mL de muestra** .



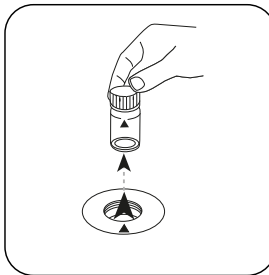
Cerrar la(s) cubeta(s).



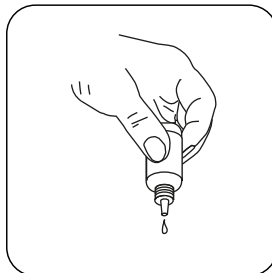
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



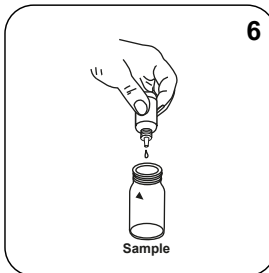
Pulsar la tecla **ZERO**.



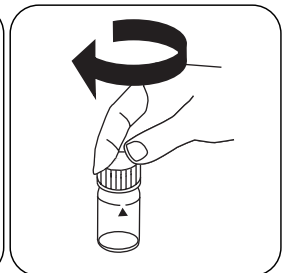
Extraer la cubeta del compartimiento de medición.



Mantener la botella cuentagotas vertical y añadir gotas del mismo tamaño presionando lentamente.



Añadir **6 gotas de PHENOL Red-Lösung** en la cubeta con la muestra.



Cerrar la(s) cubeta(s).



Mezclar el contenido girando.



Poner la **cupeta de muestra** en el compartimento de medición. ¡Debe tenerse en cuenta el posicionamiento!



Pulsar la tecla **TEST** (XD: **START**).

A continuación se visualizará el resultado como valor de pH.

ES

Método químico

Rojo de fenol

Apéndice

Interferencia

ES

Interferencias extraíbles

1. Error de sal: Corrección de valor analizado (valores medios) para muestras con una concentración salina de:


| 2. | Concentración salina de la muestra | Corrección |
|----|-------------------------------------|---|
| | 30 g/L (agua de mar) | -0,15 ¹⁾ |
| | 60 g/L | -0,21 ²⁾ |
| | 120 g/L | -0,26 ²⁾ |
| | 180 g/L | -0,29 ²⁾ |
| | ¹⁾ según Kolthoff (1922) | ²⁾ según Parson y Douglas (1926) |

3. En la determinación de muestras acuosas cloradas pueden influir los restos de cloro en la reacción coloreada del reactivo líquido. Esto puede evitarse añadiendo a la muestra un pequeño cristal de tiosulfato sódico ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$), antes de incorporar el reactivo PHENOL RED.

Bibliografía

Colorimetric Chemical Analytical Methods, 9th Edition, London

KS4.3 T / 20



Nom de la méthode → KS4.3 T

Numéro de méthode → 20

Code à barres pour reconnaître la méthode → [Barcode]

Plage de mesure → 0.1 - 4 mmol/l $K_{S4.3}$

Méthode chimique → Acide / Indicateur

Affichage dans le MD 100 / MD 110 / MD 200 → S:4.3

Informations spécifiques à l'instrument

Le test peut être effectué sur les appareils suivants. De plus, la cuvette requise et la plage d'absorption du photomètre sont indiquées.

| Appareils | Cuvette | λ | Gamme de mesure |
|---|---------|-----------|---------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | ø 24 mm | 610 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |
| SpectroDirect, XD 7000, XD 7500 | ø 24 mm | 615 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |

Matériel

Matériel requis (partiellement optionnel):

| Titre | Pack contenant | Code |
|-------------------|-----------------|----------|
| Alka-M-Photometer | Pastilles / 100 | 513210BT |
| Alka-M-Photometer | Pastilles / 250 | 513211BT |

Liste d'applications

- Traitement des eaux usées
- Traitement de l'eau potable
- Traitement de l'eau brute

Indication

1. Les termes Alcalinité-m, Valeur m, Alcalinité totale et Capacité acide $K_{S4.3}$ sont identiques.
2. L'observation exacte du volume d'échantillon de 10 ml est décisive pour l'exactitude du résultat de l'analyse.

Codes de langue ISO 639-1 → FR

État de révision → 01/20

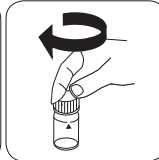
FR Méthodes Manuel 01/20

Procédure du test

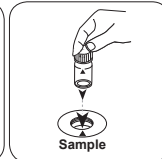
Réalisation de la quantification Capacité acide $K_{s4.3}$ avec pastille

Sélectionnez la méthode sur l'appareil.

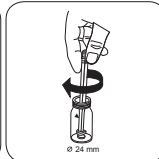
Cette méthode ne nécessite aucune mesure du zéro sur les appareils suivants : XD 7000, XD 7500

Remplissez une cuvette de 24 mm de **10 ml d'échantillon**.

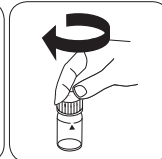
Fermez la(les) cuvette(s).

Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

• • •

Ajoutez une **pastille de ALKA-M-PHOTOMETER**.

Écrasez la(les) pastille(s) en la(les) tournant un peu.



Fermez la(les) cuvette(s).



Chlore PP

M110

0.02 - 2 mg/L Cl₂ ^{a)}

CL2

DPD

FR

Matériel

Matériel requis (partiellement optionnel):

| Réactifs | Pack contenant | Code |
|----------------------|-------------------------|--------|
| Chlore libre DPD F10 | Poudre / 100 Pièces | 530100 |
| Chlore libre DPD F10 | Poudre / 1000 Pièces | 530103 |
| Chlore total DPD F10 | Poudre / 100 Pièces | 530120 |
| Chlore total DPD F10 | Poudre / 1000 Pièces | 530123 |

Standards disponibles

| Titre | Pack contenant | Code |
|----------------------------|----------------|----------|
| ValidCheck Chlore 1,5 mg/l | 1 Pièces | 48105510 |

Échantillonnage

1. Lors de la préparation de l'échantillon, il faudra éviter le dégazage du chrome, par ex. par pipetage ou agitation.
2. L'analyse devra avoir lieu immédiatement après le prélèvement de l'échantillon.

Préparation

1. Nettoyage des cuvettes :
Beaucoup de produits de nettoyage domestiques (par ex. liquide vaisselle) contenant des agents réducteurs, il est possible que lors de la quantification du chlore, les résultats soient plus bas. Pour exclure ces erreurs, les instruments en verre utilisés devraient être insensibles aux effets du chlore. Pour ce faire, il convient de laisser les instruments en verre pendant une heure dans une solution d'hypochlorite de sodium (0,1 g/L) et de bien les rincer ensuite à l'eau déminéralisée (eau entièrement dessalée).
2. Pour la quantification individuelle du chlore libre et du chlore total, il est recommandé d'utiliser à chaque fois un nouveau lot de cuvettes (voir EN ISO 7393-2, § 5.3).
3. La coloration due au DPD a lieu à un pH compris entre 6,2 et 6,5. C'est pourquoi, les réactifs contiennent un tampon pour l'ajustage du pH. Avant l'analyse, les eaux fortement alcalines ou acides devraient être cependant ajustées sur un pH compris entre 6 et 7 (avec 0,5 mol/l d'acide sulfurique ou 1 mol/l de soude caustique).

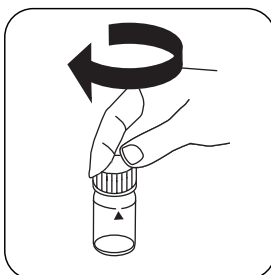


Réalisation de la quantification Chlore libre avec réactifs en sachet de poudre (PP)

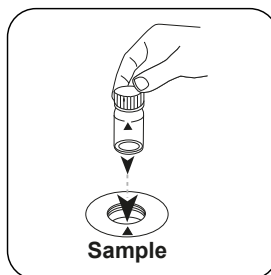
Sélectionnez la méthode sur l'appareil.



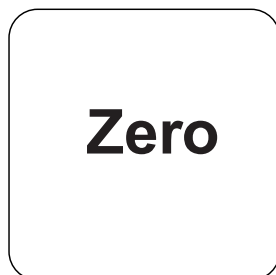
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



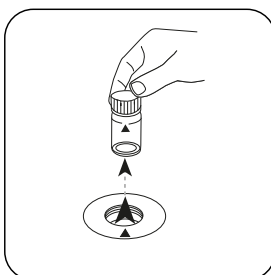
Fermez la(les) cuvette(s).



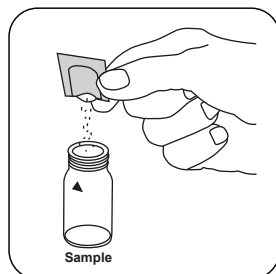
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



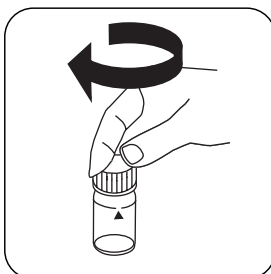
Appuyez sur la touche **ZERO**.



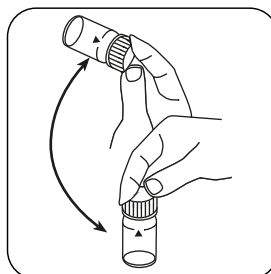
Retirez la cuvette de la chambre de mesure.



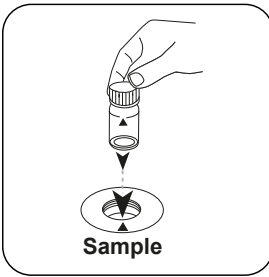
Ajoutez un **sachet de poudre Chlorine FREE-DPD/ F10**.



Fermez la(les) cuvette(s).



Retourner plusieurs fois pour mélanger le contenu (20 sec.) .



Test

Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

Appuyez sur la touche **TEST** (XD: **START**).

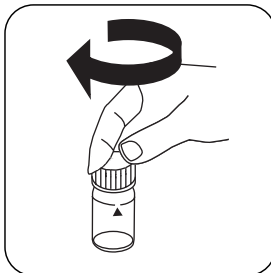
Le résultat s'affiche à l'écran en mg/L chlore libre.

Réalisation de la quantification Chlore total avec réactifs en sachet de poudre (PP)

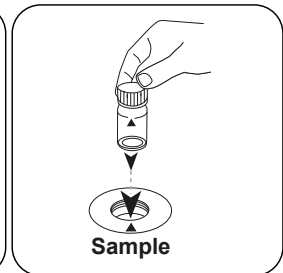
Sélectionnez la méthode sur l'appareil.



Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



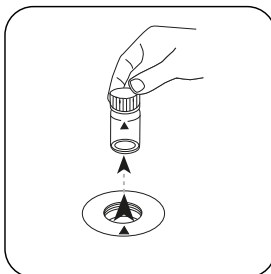
Fermez la(les) cuvette(s).



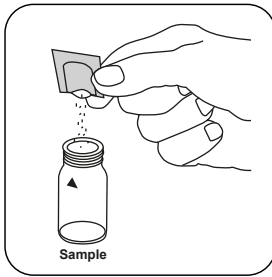
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

Zero

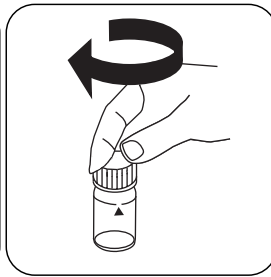
Appuyez sur la touche **ZERO**.



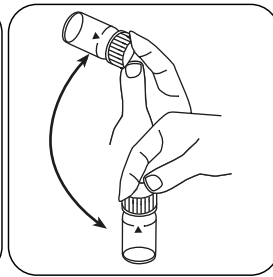
Retirez la cuvette de la chambre de mesure.



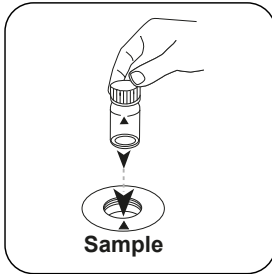
Ajoutez un **sachet de poudre Chlorine TOTAL- DPD/ F10**.



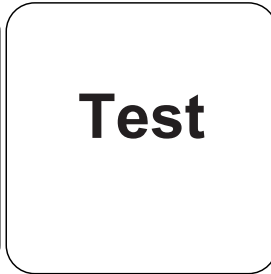
Fermez la(les) cuvette(s).



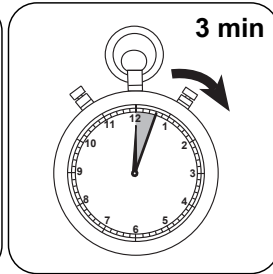
Retourner plusieurs fois pour mélanger le contenu (20 sec.) .



Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



Appuyez sur la touche **TEST (XD: START)**.



Attendez la fin du **temps de réaction de 3 minute(s)** .

À l'issue du temps de réaction, la mesure est effectuée automatiquement.

Le résultat s'affiche à l'écran en mg/L chlore total.





Méthode chimique

DPD

Appendice

FR

Interférences

Interférences persistantes

- Les agents oxydants contenus dans les échantillons réagissent tous comme le chlore, ce qui entraîne des résultats plus élevés.

Interférences exclues

- Les perturbations causées par le cuivre et le fer (III) seront éliminées par EDTA.
- Les concentrations de chlore supérieures à 2 mg/L peuvent provoquer des résultats dans la plage de mesure allant jusqu'à 0 mg/L en utilisant des sachets de poudre. Dans ce cas, diluez l'échantillon à l'eau déchlorée. Le réactif est ajouté à 10 ml d'échantillon dilué. Ensuite, la mesure est répétée (test de plausibilité).

| Interférences | de / [mg/L] |
|--------------------------------|-------------|
| CrO ₄ ²⁻ | 0,01 |
| MnO ₂ | 0,01 |

Méthode Validation

| | |
|---------------------------|-----------------|
| Limite de détection | 0.01 mg/L |
| Limite de détermination | 0.03 mg/L |
| Fin de la gamme de mesure | 2 mg/L |
| Sensibilité | 1.68 mg/L / Abs |
| Intervalle de confiance | 0.033 mg/L |
| Déviation standard | 0.014 mg/L |
| Coefficient de variation | 1.34 % |

Conformité

EN ISO 7393-2

^{*)}Détermination du libre, combiné et total



Chlore HR PP

M111

0.1 - 8 mg/L Cl₂^{a)}

CL8

DPD

FR

Matériel

Matériel requis (partiellement optionnel):

| Réactifs | Pack contenant | Code |
|----------------------|-------------------------|--------|
| Chlore libre DPD F10 | Poudre / 100 Pièces | 530100 |
| Chlore libre DPD F10 | Poudre / 1000 Pièces | 530103 |
| Chlore total DPD F10 | Poudre / 100 Pièces | 530120 |
| Chlore total DPD F10 | Poudre / 1000 Pièces | 530123 |

Échantillonnage

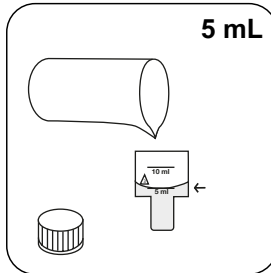
1. Lors de la préparation de l'échantillon, il faudra éviter le dégazage du chrome, par ex. par pipetage ou agitation.
2. L'analyse devra avoir lieu immédiatement après le prélèvement de l'échantillon.

Préparation

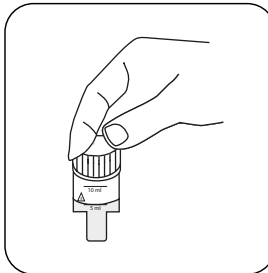
1. Nettoyage des cuvettes :
Beaucoup de produits de nettoyage domestiques (par ex. liquide vaisselle) contenant des agents réducteurs, il est possible que lors de la quantification du chlore, les résultats soient plus bas. Pour exclure ces erreurs, les instruments en verre utilisés devraient être insensibles aux effets du chlore. Pour ce faire, il convient de laisser les instruments en verre pendant une heure dans une solution d'hypochlorite de sodium (0,1 g/L) et de bien les rincer ensuite à l'eau déminéralisée (eau entièrement dessalée).
2. Pour la quantification individuelle du chlore libre et du chlore total, il est recommandé d'utiliser à chaque fois un nouveau lot de cuvettes (voir EN ISO 7393-2, § 5.3).
3. La coloration due au DPD a lieu à un pH compris entre 6,2 et 6,5. C'est pourquoi, les réactifs contiennent un tampon pour l'ajustage du pH. Avant l'analyse, les eaux fortement alcalines ou acides devraient être cependant ajustées sur un pH compris entre 6 et 7 (avec 0,5 mol/l d'acide sulfurique ou 1 mol/l de soude caustique).

Réalisation de la quantification Chlore HR libre avec réactifs en sachet de poudre (PP)

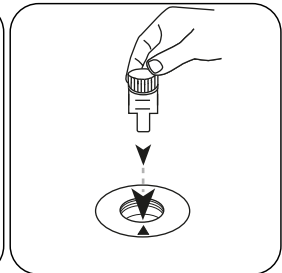
Sélectionnez la méthode sur l'appareil.



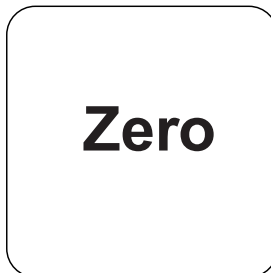
Remplissez une cuvette de 10 mm de **5 mL** d'échantillon.



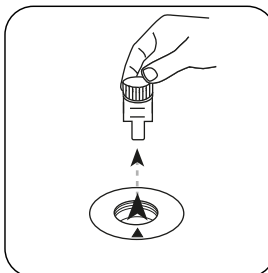
Fermez la(les) cuvette(s).



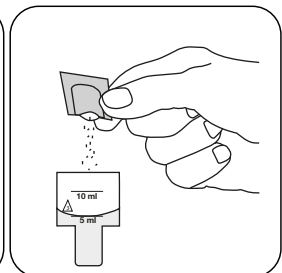
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



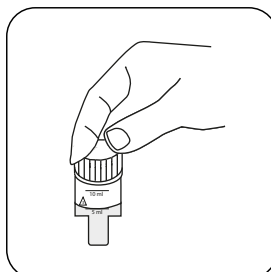
Appuyez sur la touche **ZERO**.



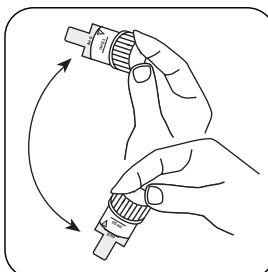
Retirez la **cuvette** de la chambre de mesure.



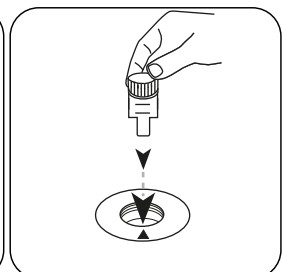
Ajoutez à l'échantillon **deux sachets de poudre Chlorine FREE-DPD / F10**.



Fermez la(les) cuvette(s).



Mélangez le contenu en mettant le tube plusieurs fois à l'envers (20 sec.) puis à l'endroit.



Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

FR



Test

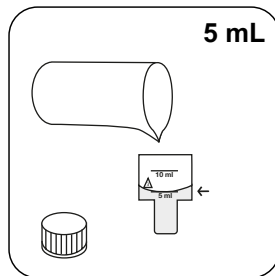
FR

Appuyez sur la touche
TEST (XD: **START**).

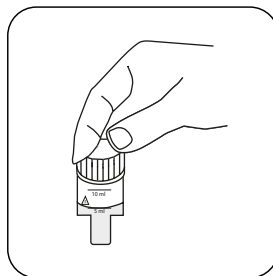
Le résultat s'affiche à l'écran en mg/L chlore libre.

Réalisation de la quantification Chlore HR total avec réactifs en sachet de poudre (PP)

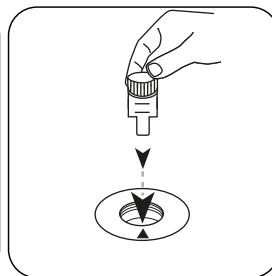
Sélectionnez la méthode sur l'appareil.



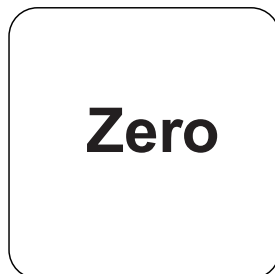
Remplissez une cuvette
de 10 mm de **5 mL**
d'échantillon.



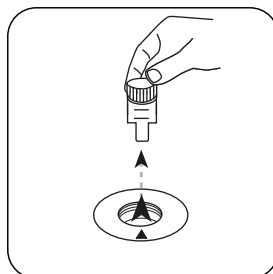
Fermez la(les) cuvette(s).



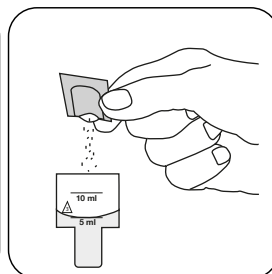
Placez la **cuvette réservée**
à l'échantillon dans la
chambre de mesure.
Attention à la positionner
correctement.



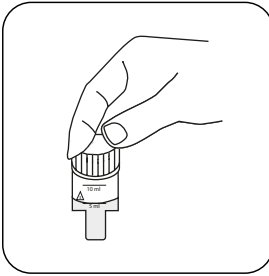
Appuyez sur la touche
ZERO.



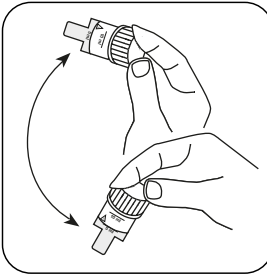
Retirez la **cuvette** de la
chambre de mesure.



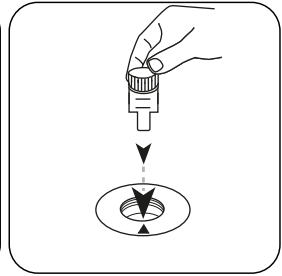
Ajoutez à l'échantillon
deux sachets de poudre
Chlore TOTAL-DPD / F10.



Fermez la(les) cuvette(s).

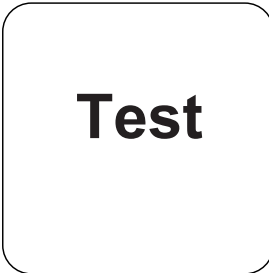


Mélangez le contenu en mettant le tube plusieurs fois à l'envers (20 sec.) puis à l'endroit.

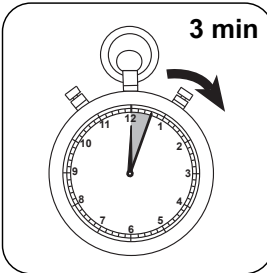


Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

FR



Appuyez sur la touche **TEST (XD: START)**.



Attendez la fin du **temps de réaction de 3 minute(s)**.

À l'issue du temps de réaction, la mesure est effectuée automatiquement.

Le résultat s'affiche à l'écran en mg/L chlore total.



Méthode chimique

DPD

Appendice

FR

Interférences

Interférences persistantes

- Les agents oxydants contenus dans les échantillons réagissent tous comme le chlore, ce qui entraîne des résultats plus élevés.

Interférences exclues

- Les perturbations causées par le cuivre et le fer (III) seront éliminées par EDTA.
- Les concentrations de chlore supérieures à 8 mg/L peuvent provoquer des résultats dans la plage de mesure allant jusqu'à 0 mg/L en utilisant des sachets de poudre. Dans ce cas, diluez l'échantillon à l'eau déchlorée. Le réactif est ajouté à 10 ml d'échantillon dilué. Ensuite, la mesure est répétée (test de plausibilité).

Conformité

EN ISO 7393-2

^{a)}Détermination du libre, combiné et total



Valeur du pH T

M330

6.5 - 8.4 pH

PH

Rouge de phénol

Matériel

FR

Matériel requis (partiellement optionnel):

| Réactifs | Pack contenant | Code |
|----------------------------|-----------------|----------|
| Rouge de phénol Photomètre | Pastilles / 100 | 511770BT |
| Rouge de phénol Photomètre | Pastilles / 250 | 511771BT |
| Rouge de phénol Photomètre | Pastilles / 500 | 511772BT |

Indication

1. Pour la quantification photométrique du pH, n'utilisez que des pastilles PHENOL RED avec étiquette noire, sur lesquelles le terme PHOTOMER est apposé.

Réalisation de la quantification Valeur du pH avec pastille

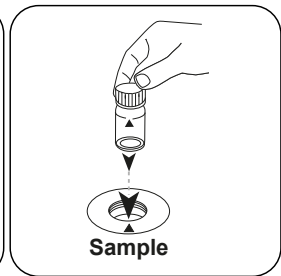
Sélectionnez la méthode sur l'appareil.



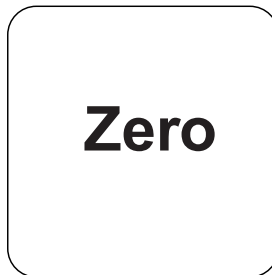
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



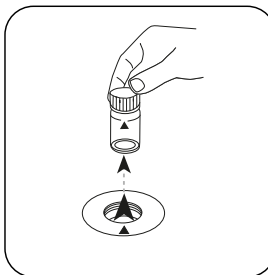
Fermez la(les) cuvette(s).



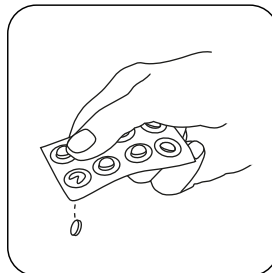
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



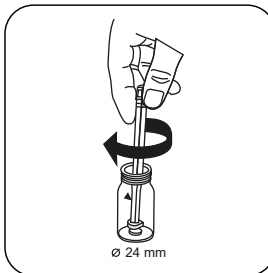
Appuyez sur la touche **ZERO**.



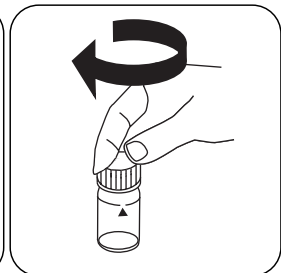
Retirez la cuvette de la chambre de mesure.



Ajoutez une **pastille de PHENOL RED PHOTOMETER**.



Écrasez la(les) pastille(s) en la(les) tournant un peu.



Fermez la(les) cuvette(s).



FR

Dissolvez la(les) pastille(s) en mettant le tube plusieurs fois à l'envers.

Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

Appuyez sur la touche **TEST** (XD: **START**).

Le résultat s'affiche à l'écran en valeur du pH.

Méthode chimique

Rouge de phénol

Appendice

Interférences

FR

Interférences persistantes

1. Les échantillons d'eau avec faible dureté carbonatée* peuvent fausser les pH.
* $K_{S_{4,3}} < 0,7$ mmol/l \triangleq alcalinité totale < 35 mg/L CaCO_3 .

Interférences exclues

1. Les pH inférieurs à 6,5 et supérieurs à 8,4 peuvent provoquer des résultats dans la plage de mesure. Il est recommandé d'effectuer un test de plausibilité (appareil de mesure du pH).
2. Erreur de sel :
À des concentrations du sel jusqu'à 2 g/L, il ne faut s'attendre à aucune erreur digne de ce nom en raison de la concentration en sel de la pastille de réactif. À des concentrations supérieures, les valeurs mesurées seront corrigées comme suit :

| Concentration en sel de l'échantillon en g/L | 30 (eau de mer) | 60 | 120 | 180 |
|--|---------------------|---------------------|---------------------|---------------------|
| Correction | -0,15 ¹⁾ | -0,21 ²⁾ | -0,26 ²⁾ | -0,29 ²⁾ |

¹⁾selon Kolthoff (1922)

²⁾selon Parson et Douglas (1926)

Bibliographie

Colorimetric Chemical Analytical Methods, 9th Edition, London



Valeur du pH L

M331

6.5 - 8.4 pH

PH

Rouge de phénol

FR

Matériel

Matériel requis (partiellement optionnel):

| Réactifs | Pack contenant | Code |
|---|----------------|--------|
| Solution de phénol rouge | 15 mL | 471040 |
| Solution de phénol rouge | 100 mL | 471041 |
| Solution de phénol rouge dans un lot de 6 | 1 Pièces | 471046 |

Préparation

- En raison des différentes tailles de gouttes, le résultat peut présenter des écarts supérieurs à ceux des pastilles.
Cet écart peut être réduit à un minimum en utilisant une pipette (0,18 ml correspondent à 6 gouttes).

Indication

- Après emploi, refermez immédiatement le flacon compte-goutte en utilisant le capot de même couleur.
- Conservez le réactif à une température de +6 °C à +10 °C.

Réalisation de la quantification Valeur du pH avec réactif liquide

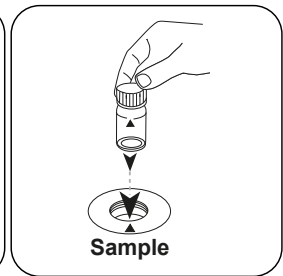
Sélectionnez la méthode sur l'appareil.



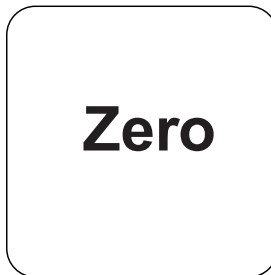
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



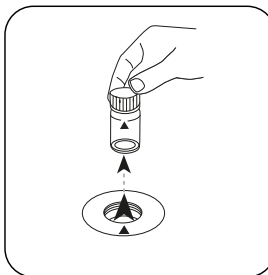
Fermez la(les) cuvette(s).



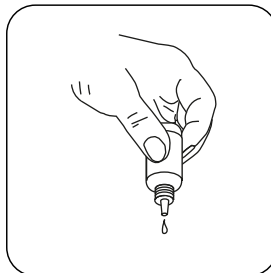
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



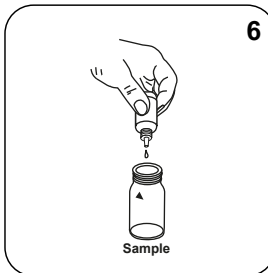
Appuyez sur la touche **ZERO**.



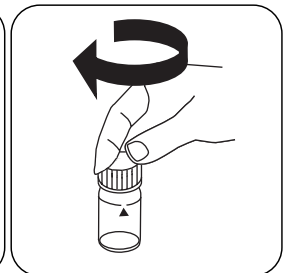
Retirez la cuvette de la chambre de mesure.



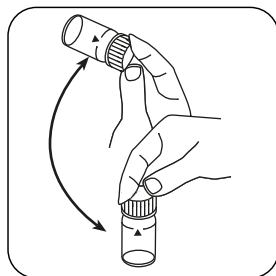
Tenez les flacons compte-goutte à la verticale et ajoutez des gouttes uniformes en appuyant lentement.



Ajoutez **6 gouttes de PHENOL Red-Lösung** dans la cuvette réservée à l'échantillon.



Fermez la(les) cuvette(s).



Mélangez le contenu en mettant le tube plusieurs fois à l'envers puis à l'endroit.



Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



Appuyez sur la touche **TEST** (XD: **START**).

Le résultat s'affiche à l'écran en valeur du pH.

FR

Méthode chimique

Rouge de phénol

Appendice

Interférences

FR

Interférences exclues

1. Erreur de sel : Correction de la mesure du sel (valeurs moyennes) pour les échantillons présentant une concentration en sel de :


| 2. | Concentration en sel de l'échantillon | Correction |
|----|---------------------------------------|--|
| | 30 g/L (eau de mer) | -0,15 ¹⁾ |
| | 60 g/L | -0,21 ²⁾ |
| | 120 g/L | -0,26 ²⁾ |
| | 180 g/L | -0,29 ²⁾ |
| | ¹⁾ selon Kolthoff (1922) | ²⁾ selon Parson et Douglas (1926) |

3. Lors de l'analyse de l'eau chlorée, la concentration résiduelle en chlore peut influencer la coloration du réactif liquide. Ceci est empêché en introduisant un petit cristal de hiosulfate de sodium ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$) dans la solution d'échantillonnage avant d'ajouter la solution PHENOL RED.

Bibliographie

Colorimetric Chemical Analytical Methods, 9th Edition, London

KS4.3 T / 20



Denominazione metodo

Numero metodo

Codice a barre per riconoscere il metodo

Range di misura

$K_{S_{4.3} T}$
0.1 - 4 mmol/l $K_{S_{4.3}}$

Acido/indicatore

20
S:4.3

Indicazione sul display del MD 100 / MD 110 / MD 200

Metodo chimico

Informazioni specifiche dello strumento

Il test può essere eseguito sui seguenti dispositivi. Inoltre, sono indicate la cuvetta richiesta e il range di assorbimento del fotometro.

| Dispositivi | Cuvetta | λ | Campo di misura |
|---|---------|-----------|------------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | ø 24 mm | 610 nm | 0.1 - 4 mmol/l $K_{S_{4.3}}$ |
| SpectroDirect, XD 7000, XD 7500 | ø 24 mm | 615 nm | 0.1 - 4 mmol/l $K_{S_{4.3}}$ |

Materiale

Materiale richiesto (in parte facoltativo):

| Titolo | Unità di imballaggio | N. ordine |
|-------------------|----------------------|-----------|
| Alka-M-Photometer | Pastiglia / 100 | 513210BT |
| Alka-M-Photometer | Pastiglia / 250 | 513211BT |

Campo di applicazione

- Trattamento acqua di scarico
- Trattamento acqua potabile
- Trattamento acqua non depurata

Note

1. I termini alcalinità M, valore M, alcalinità totale e capacità acida $K_{S_{4.3}}$ sono equivalenti.
2. Per l'accuratezza del risultato dell'analisi è fondamentale che il volume del campione misuri esattamente 10 ml.

ISO 639-1 codici linguistici

Stato di revisione

IT Manuale dei Metodi 01/20

**Svolgimento della
misurazione**

Esecuzione della rilevazione Capacità acida $K_{s4,3}$ con pastiglia

Selezionare il metodo nel dispositivo.

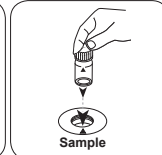
Con i seguenti dispositivi, per questo metodo non è necessario eseguire una misurazione ZERO: XD 7000, XD 7500



Riempire una cuvetta da 24 mm con **10 ml di campione**.



Chiudere la/e cuvetta/e.

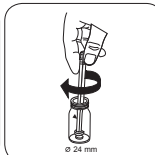


Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.

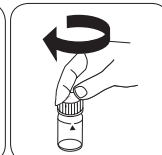
• • •



Aggiungere una **pastiglia ALKA-M-PHOTOMETER**.



Frantumare la/e pastiglia/e con una leggera rotazione.



Chiudere la/e cuvetta/e.

**Cloro PP****M110****0.02 - 2 mg/L Cl₂^{a)}****CL2****DPD**

IT

Materiale

Materiale richiesto (in parte facoltativo):

| Reagenti | Unità di imballaggio | N. ordine |
|----------------------|-----------------------------|------------------|
| Cloro libero DPD F10 | Polvere / 100 pz. | 530100 |
| Cloro libero DPD F10 | Polvere / 1000 pz. | 530103 |
| Cloro totale DPD F10 | Polvere / 100 pz. | 530120 |
| Cloro totale DPD F10 | Polvere / 1000 pz. | 530123 |

Standards disponibles

| Titolo | Unità di imballaggio | N. ordine |
|---------------------------|-----------------------------|------------------|
| ValidCheck Cloro 1,5 mg/l | 1 pz. | 48105510 |

Prelievo del campione

1. Nella preparazione del campione occorre evitare la degassificazione del cloro, ad es. utilizzando pipette e agitando.
2. L'analisi deve essere eseguita subito dopo il prelievo del campione.

Preparazione

1. Pulizia delle cuvette:
Poiché molti detersivi ad uso domestico (ad es. detersivo per piatti) contengono sostanze riducenti, nella rilevazione del cloro si potrebbero ottenere risultati troppo bassi. Per escludere tali errori di misura è necessario che i dispositivi in vetro siano esenti dal consumo di cloro. I dispositivi in vetro inoltre vengono conservati in una soluzione di ipoclorito di sodio (0,1 g/L) per un'ora e successivamente vengono risciacquati abbondantemente con acqua demineralizzata.
2. Per la singola rilevazione del cloro libero e del cloro totale è opportuno utilizzare un apposito kit di cuvette per ciascuna procedura (vedere EN ISO 7393-2, par. 5.3).
3. Lo sviluppo della colorazione del DPD avviene con un valore di pH compreso tra 6,2 e 6,5. I reagenti contengono pertanto un tampone per la regolazione del valore di pH. Le acque fortemente alcaline o acide tuttavia devono essere portate prima dell'analisi entro un range di pH compreso tra 6 e 7 (con 0,5 mol/l di acido solforico o 1 mol/l di liscivia).

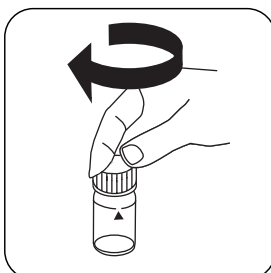


Esecuzione della rilevazione cloro libero con confezioni in polvere

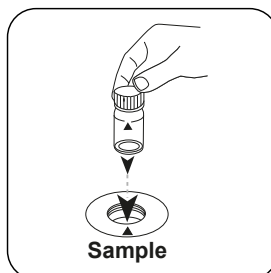
Selezionare il metodo nel dispositivo.



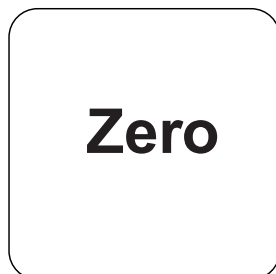
Riempire una cuvetta da 24 mm con **10 mL di campione**.



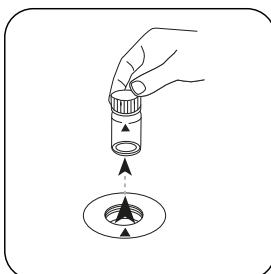
Chiudere la/e cuvetta/e.



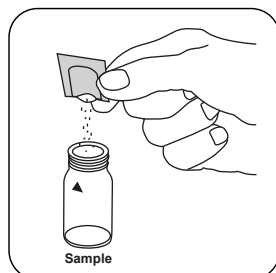
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



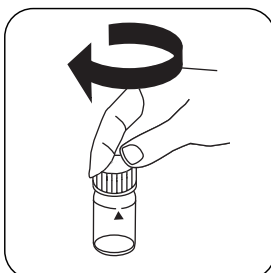
Premere il tasto **ZERO**.



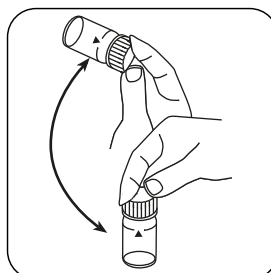
Prelevare la cuvetta dal vano di misurazione.



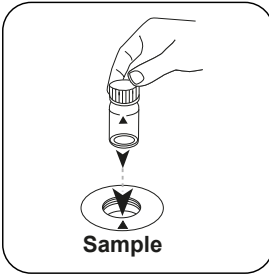
Aggiungere **una bustina di polvere Chlorine FREE-DPD/ F10**.



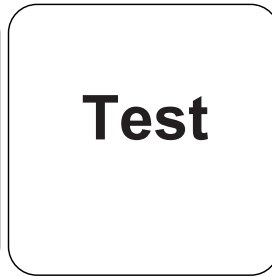
Chiudere la/e cuvetta/e.



Miscelare il contenuto capovolgendo (20 sec.).



Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



Premere il tasto **TEST** (XD: **START**).

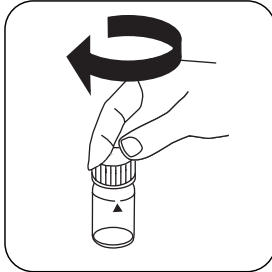
Sul display compare il risultato in mg/L di Cloro libero.

Esecuzione della rilevazione cloro totale con confezioni in polvere

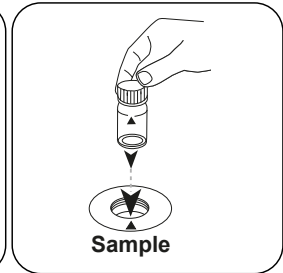
Selezionare il metodo nel dispositivo.



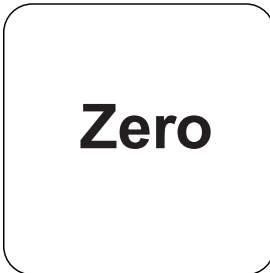
Riempire una cuvetta da 24 mm con **10 mL di campione**.



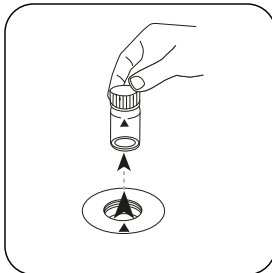
Chiudere la/e cuvetta/e.



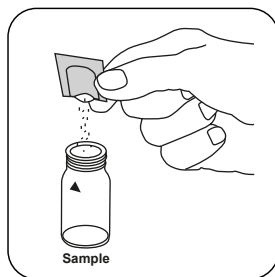
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



Premere il tasto **ZERO**.



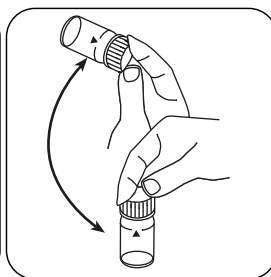
Prelevare la cuvetta dal vano di misurazione.



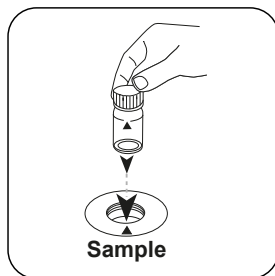
Aggiungere **una bustina di polvere Chlorine TOTAL-DPD/ F10**.



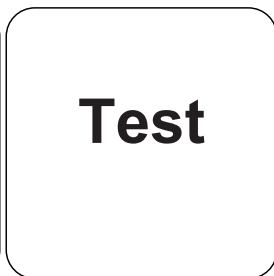
Chiudere la/e cuvetta/e.



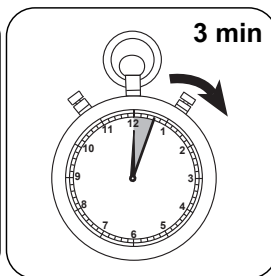
Miscelare il contenuto capovolgendo (20 sec.).



Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



Premere il tasto **TEST (XD: START)**.



Attendere un **tempo di reazione di 3 minuto/i**.

Allo scadere del tempo di reazione viene effettuata automaticamente la misurazione. Sul display compare il risultato in mg/L di Cloro totale.





Metodo chimico

DPD

Appendice

IT

Interferenze

Interferenze permanenti

- Tutti gli ossidanti presenti nei campioni reagiscono come il cloro dando risultati troppo elevati.

Interferenze escludibili

- Le interferenze da parte di rame e ferro(III) devono essere eliminate con EDTA.
- Se si utilizzano Powder Packs, le concentrazioni di cloro maggiori di 2 mg/L possono dare risultati entro il range di misura fino a 0 mg/L. In questo caso il campione deve essere diluito con acqua priva di cloro. 10 ml del campione diluito vengono addizionati con il reagente e la misurazione viene ripetuta (test di plausibilità).

| Interferenze | da / [mg/L] |
|---------------------|-------------|
| CrO_4^{2-} | 0,01 |
| MnO_2 | 0,01 |

Validazione metodo

| | |
|--|-----------------|
| Limite di rilevabilità | 0.01 mg/L |
| Limite di quantificazione | 0.03 mg/L |
| Estremità campo di misura | 2 mg/L |
| Sensibilità | 1.68 mg/L / Abs |
| Intervallo di confidenza | 0.033 mg/L |
| Deviazione standard della procedura | 0.014 mg/L |
| Coefficiente di variazione della procedura | 1.34 % |

Conforme

EN ISO 7393-2

^aDeterminazione di libero, vincolato, totale possibile



Cloro HR PP

M111

0.1 - 8 mg/L Cl₂^{a)}

CL8

DPD

IT

Materiale

Materiale richiesto (in parte facoltativo):

| Reagenti | Unità di imballaggio | N. ordine |
|----------------------|-------------------------|-----------|
| Cloro libero DPD F10 | Polvere / 100 pz. | 530100 |
| Cloro libero DPD F10 | Polvere / 1000 pz. | 530103 |
| Cloro totale DPD F10 | Polvere / 100 pz. | 530120 |
| Cloro totale DPD F10 | Polvere / 1000 pz. | 530123 |

Prelievo del campione

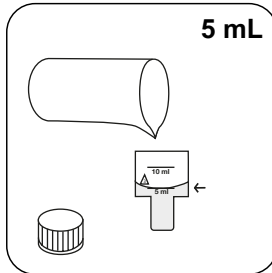
1. Nella preparazione del campione occorre evitare la degassificazione del cloro, ad es. utilizzando pipette e agitando.
2. L'analisi deve essere eseguita subito dopo il prelievo del campione.

Preparazione

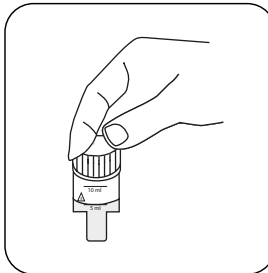
1. Pulizia delle cuvette:
Poiché molti detersivi ad uso domestico (ad es. detersivo per piatti) contengono sostanze riducenti, nel rilevamento del cloro si potrebbero ottenere risultati troppo bassi. Per escludere tali errori di misura è necessario che i dispositivi in vetro siano esenti dal consumo di cloro. I dispositivi in vetro inoltre vengono conservati in una soluzione di ipoclorito di sodio (0,1 g/L) per un'ora e successivamente vengono risciacquati abbondantemente con acqua demineralizzata.
2. Per la singola rilevazione del cloro libero e del cloro totale è opportuno utilizzare un apposito kit di cuvette per ciascuna procedura (vedere EN ISO 7393-2, par. 5.3).
3. Lo sviluppo della colorazione del DPD avviene con un valore di pH compreso tra 6,2 e 6,5. I reagenti contengono pertanto un tampone per la regolazione del valore di pH. Le acque fortemente alcaline o acide tuttavia devono essere portate prima dell'analisi entro un range di pH compreso tra 6 e 7 (con 0,5 mol/l di acido solforico o 1 mol/l di liscivia).

Esecuzione della rilevazione cloro libero HR con confezioni in polvere

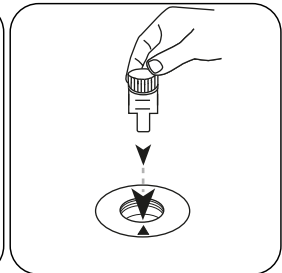
Selezionare il metodo nel dispositivo.



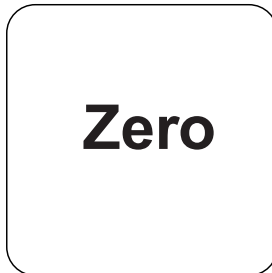
Riempire una cuvetta da 10 mm con **5 mL di campione**.



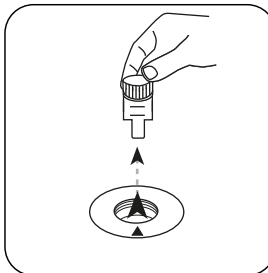
Chiudere la/e cuvetta/e.



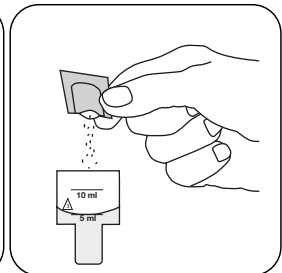
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



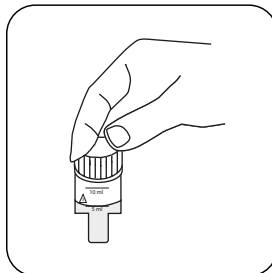
Premere il tasto **ZERO**.



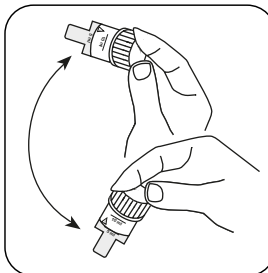
Prelevare la **cuvetta** dal vano di misurazione.



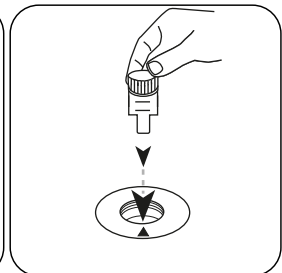
Aggiungere al campione **due bustine di polvere Chlorine FREE-DPD / F10**.



Chiudere la/e cuvetta/e.



Miscelare il contenuto capovolgendo (20 sec.).



Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



Test

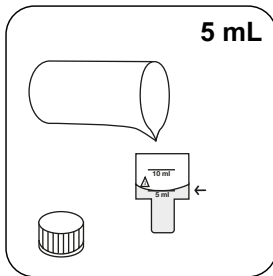
IT

Premere il tasto **TEST** (XD: **START**).

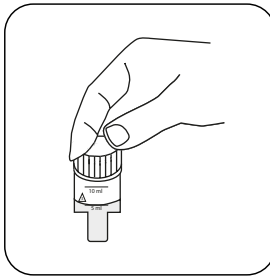
Sul display compare il risultato in mg/L di Cloro libero.

Esecuzione della rilevazione cloro totale HR con confezioni in polvere

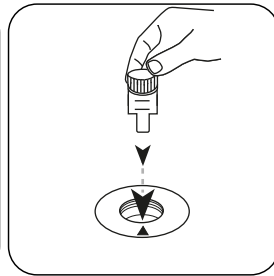
Selezionare il metodo nel dispositivo.



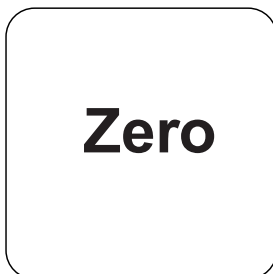
Riempire una cuvetta da 10 mm con **5 mL di campione**.



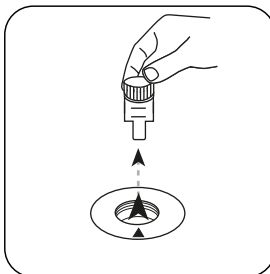
Chiudere la/e cuvetta/e.



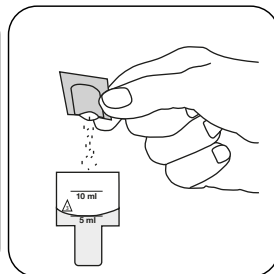
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



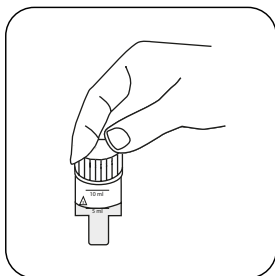
Premere il tasto **ZERO**.



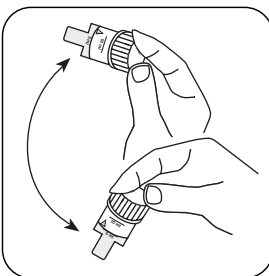
Prelevare la **cuvetta** dal vano di misurazione.



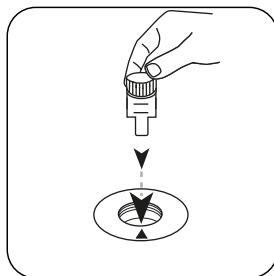
Aggiungere al campione **due bustine di polvere Chlorine TOTAL-DPD / F10**.



Chiudere la/e cuvetta/e.

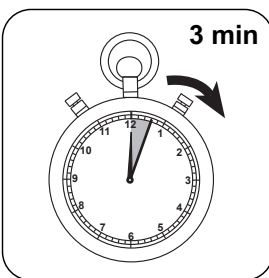
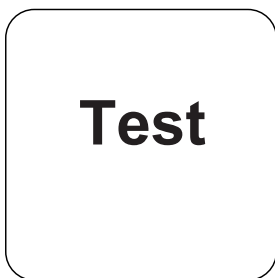


Miscelare il contenuto capovolgendo (20 sec.).



Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.

IT



Premere il tasto **TEST** (XD: **START**). Attendere un **tempo di reazione di 3 minuti/i**.

Allo scadere del tempo di reazione viene effettuata automaticamente la misurazione.

Sul display compare il risultato in mg/L di Cloro totale.



Metodo chimico

DPD

Appendice

IT

Interferenze

Interferenze permanenti

- Tutti gli ossidanti presenti nei campioni reagiscono come il cloro dando risultati troppo elevati.

Interferenze escludibili

- Le interferenze da parte di rame e ferro(III) devono essere eliminate con EDTA.
- Se si utilizzano Powder Packs, le concentrazioni di cloro maggiori di 8 mg/L possono dare risultati entro il range di misura fino a 0 mg/L. In questo caso il campione deve essere diluito con acqua priva di cloro. 10 ml del campione diluito vengono addizionati con il reagente e la misurazione viene ripetuta (test di plausibilità).

Conforme

EN ISO 7393-2

^{a)}Determinazione di libero, vincolato, totale possibile

**Valore pH T****M330****6.5 - 8.4 pH****PH****Rosso fenolo**

IT

Materiale

Materiale richiesto (in parte facoltativo):

| Reagenti | Unità di imballaggio | N. ordine |
|------------------------|---------------------------------|------------------|
| Fotometro rosso fenolo | Pastiglia / 100 | 511770BT |
| Fotometro rosso fenolo | Pastiglia / 250 | 511771BT |
| Fotometro rosso fenolo | Pastiglia / 500 | 511772BT |

Note

1. Per la rilevazione fotometrica del valore di pH si devono utilizzare soltanto pastiglie PHENOL RED con etichetta nera contrassegnate con il termine PHOTOMETER.

Esecuzione della rilevazione Valore pH con pastiglia

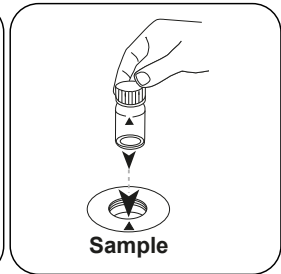
Selezionare il metodo nel dispositivo.



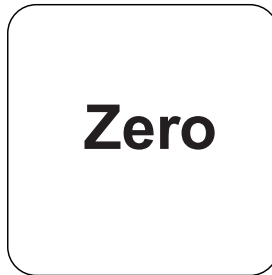
Riempire una cuvetta da 24 mm con **10 mL di campione**.



Chiudere la/e cuvetta/e.



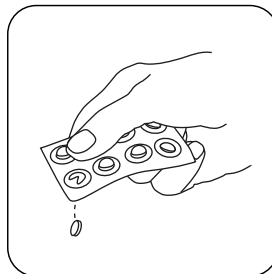
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



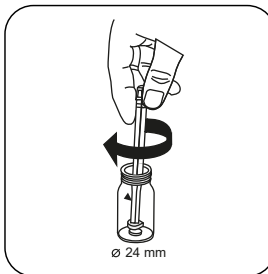
Premere il tasto **ZERO**.



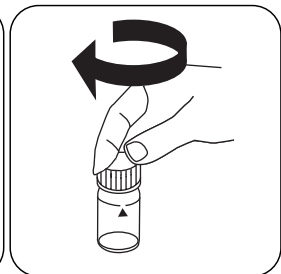
Prelevare la cuvetta dal vano di misurazione.



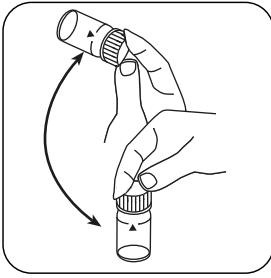
Aggiungere **una pastiglia PHENOL RED PHOTOMETER**.



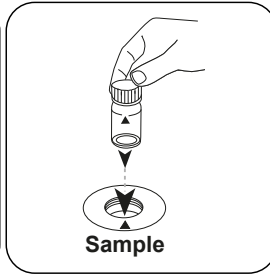
Frantumare la/e pastiglia/e con una leggera rotazione.



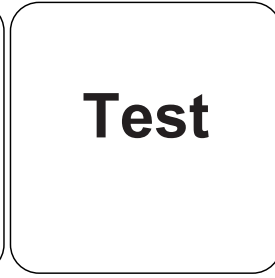
Chiudere la/e cuvetta/e.



Far sciogliere la/e pastiglia/e agitando.



Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



Premere il tasto **TEST** (XD: **START**).

Sul display compare il risultato come valore pH.

Metodo chimico

Rosso fenolo

Appendice

Interferenze

Interferenze permanenti

1. I campioni di acqua con una bassa durezza carbonatica* possono far ottenere valori di pH errati.

* $K_{S4,3} < 0,7 \text{ mmol/l} \triangleq \text{alcalinità totale} < 35 \text{ mg/L CaCO}_3$.

Interferenze escludibili

1. I valori di pH minori di 6,5 e maggiori di 8,4 possono dare risultati entro il range di misura. Si consiglia un test di plausibilità (misuratore di pH).

2. Errore salino:

Con una salinità fino a 2 g/L non è previsto alcun errore salino significativo dovuto alla salinità della pastiglia di reagente. Con salinità maggiori è necessario correggere i valori di misura nel modo seguente:

| | | | | |
|---------------------------------------|--------------------------|---------------------|---------------------|---------------------|
| Salinità del campione in g/L | 30 (acqua di mare) | 60 | 120 | 180 |
| Correzione | -0,15 ¹⁾ | -0,21 ²⁾ | -0,26 ²⁾ | -0,29 ²⁾ |

¹⁾ secondo Kolthoff (1922)

²⁾ secondo Parson e Douglas (1926)

Riferimenti bibliografici

Colorimetric Chemical Analytical Methods, 9th Edition, London



Valore pH L

M331

6.5 - 8.4 pH

PH

Rosso fenolo

IT

Materiale

Materiale richiesto (in parte facoltativo):

| Reagenti | Unità di imballaggio | N. ordine |
|--|----------------------|-----------|
| Soluzione di rosso fenolo | 15 mL | 471040 |
| Soluzione di rosso fenolo | 100 mL | 471041 |
| Soluzione di rosso fenolo in confezione da 6 | 1 pz. | 471046 |

Preparazione

1. Per via della dimensione variabile delle gocce, il risultato della misurazione può presentare divergenze maggiori di quanto avvenga con l'uso delle pastiglie. Utilizzando una pipetta (0,18 ml corrispondono a 6 gocce) si può ridurre al minimo questa divergenza.

Note

1. Dopo l'uso bisogna richiudere immediatamente la boccetta contagocce con il relativo tappo dello stesso colore.
2. Conservare al fresco il reagente a una temperatura compresa tra +6 °C e +10 °C.

Esecuzione della rilevazione Valore pH con reagente liquido

Selezionare il metodo nel dispositivo.



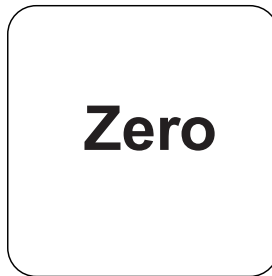
Riempire una cuvetta da 24 mm con **10 mL di campione**.



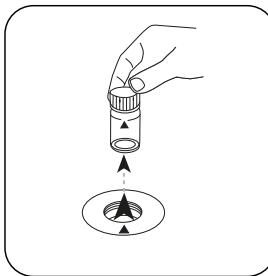
Chiudere la/e cuvetta/e.



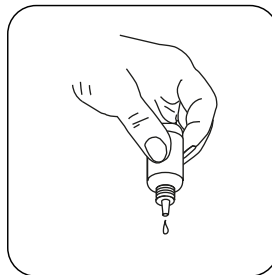
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



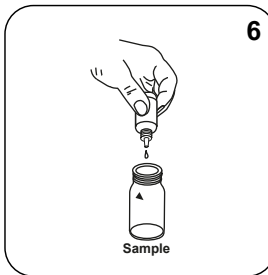
Premere il tasto **ZERO**.



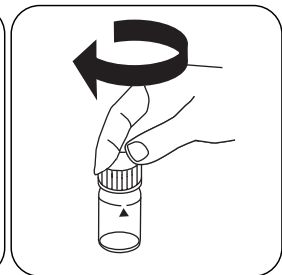
Prelevare la cuvetta dal vano di misurazione.



Tenere le boccette contagocce in posizione verticale e introdurre, premendo lentamente, gocce della stessa dimensione nella cuvetta.



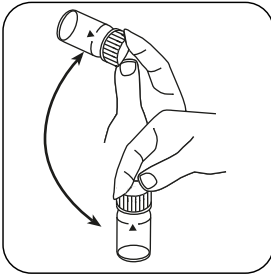
Introdurre **6 gocce di PHENOL Red-Lösung** nella cuvetta del campione.



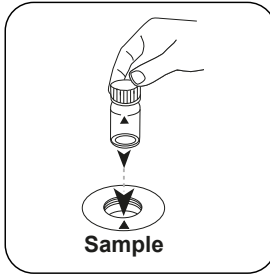
Chiudere la/e cuvetta/e.



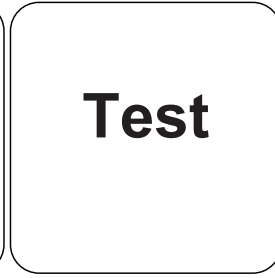
IT



Miscelare il contenuto capovolgendo.



Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



Premere il tasto **TEST** (XD: **START**).

Sul display compare il risultato come valore pH.

Metodo chimico

Rosso fenolo

Appendice

Interferenze

Interferenze escludibili

1. Errore salino: Correzione del valore di misura (valori medi) per i campioni con una salinità di:


| 2. | Salinità del campione | Correzione |
|----|---------------------------------------|---|
| | 30 g/L (acqua di mare) | -0,15 ¹⁾ |
| | 60 g/L | -0,21 ²⁾ |
| | 120 g/L | -0,26 ²⁾ |
| | 180 g/L | -0,29 ²⁾ |
| | ¹⁾ secondo Kolthoff (1922) | ²⁾ secondo Parson e Douglas (1926) |

3. Nell'analisi di acqua clorurata, il tenore di cloro residuo può influenzare la reazione cromatica del reagente liquido. Tale interferenza viene evitata immettendo un piccolo cristallo di tiosolfato di sodio ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$) nella soluzione campione prima di aggiungere la soluzione PHENOL RED.

Riferimenti bibliografici

Colorimetric Chemical Analytical Methods, 9th Edition, London

KS4.3 T / 20



Nome do método

Número do método

Código de barras para a detecção dos métodos

Área de medição

$K_{S_{4.3}} T$
0.1 - 4 mmol/l $K_{S_{4.3}}$
Ácido / Indicador

20
S:4.3

Indicado no display: MD 100 / MD 110 / MD 200

Método Químico

Informação específica do instrumento

O teste pode ser realizado nos seguintes dispositivos. Além disso, a cubeta necessária e a faixa de absorção do fotómetro são indicadas.

| Dispositivos | Cubeta | λ | Faixa de Medição |
|---|---------|-----------|------------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | ø 24 mm | 610 nm | 0.1 - 4 mmol/l $K_{S_{4.3}}$ |
| SpectroDirect, XD 7000, XD 7500 | ø 24 mm | 615 nm | 0.1 - 4 mmol/l $K_{S_{4.3}}$ |

Material

Material necessário (parcialmente opcional):

| Título | Unidade de Embalagem | Artigo No |
|-------------------|----------------------|-----------|
| Alka-M-Photometer | Pastilhas / 100 | 513210BT |
| Alka-M-Photometer | Pastilhas / 250 | 513211BT |

Lista de Aplicações

- Tratamento de Esgotos
- Tratamento de Água Potável
- Tratamento de Água Bruta

Notas

1. Os termos alcalinidade-m, m-valor, alcalinidade total e capacidade de acidez $K_{S_{4.3}}$ são idênticos.
2. O cumprimento exato do volume da amostra de 10 ml é decisivo para a precisão do resultado de análise.

Códigos de idioma ISO 639-1

Nível de revisão

PT Métodos Manual 01/20

Efetuar a medição

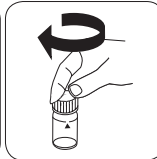
Realização da determinação Capacidade de acidez $K_{s4.3}$ com pastilha

Escolher o método no equipamento.

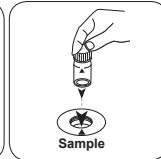
Para este método não tem de ser efetuada uma medição ZERO nos seguintes equipamentos: XD 7000, XD 7500



Encher a célula de 24 mm com 10 ml de amostra .

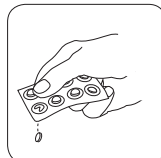


Fechar a(s) célula(s).

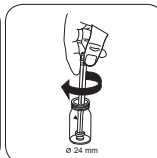


Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.

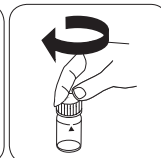
• • •



Pastilha ALKA-M-PHOTO-METER.



Esmagar a(s) pastilha(s) rodando ligeiramente.



Fechar a(s) célula(s).

PT Métodos Manual 01/20

PT



Cloro PP

M110

0.02 - 2 mg/L Cl₂ ^{a)}

CL2

DPD

PT

Material

Material necessário (parcialmente opcional):

| Reagentes | Unidade de Embalagem | Código do Produto |
|---------------------|----------------------|-------------------|
| Sem cloro DPD F10 | Pó / 100 pc. | 530100 |
| Sem cloro DPD F10 | Pó / 1000 pc. | 530103 |
| Cloro Total DPD F10 | Pó / 100 pc. | 530120 |
| Cloro Total DPD F10 | Pó / 1000 pc. | 530123 |

Padrões disponíveis

| Título | Unidade de Embalagem | Código do Produto |
|---------------------------|----------------------|-------------------|
| ValidCheck Cloro 1,5 mg/l | 1 pc. | 48105510 |

Amostragem

1. Na preparação da amostra é preciso evitar a libertação de gases de cloro, p. ex. através da pipetagem e agitação.
2. A análise tem de ser efetuada logo após a recolha da amostra.

Preparação

1. Limpeza das células:
Uma vez que muitos produtos de limpeza domésticos (p. ex. lava-louça) contêm substâncias redutoras, na determinação de cloro pode haver demasiadas reduções. Para excluir este erro de medição, os equipamentos de vidro não deviam ter a capacidade de absorção de cloro. Para esse efeito, os equipamentos de vidro são guardados por uma hora sob solução de hipoclorito de sódio (0,1 g/L) e depois devem ser bem enxaguados com água desmineralizada.
2. Para a determinação individual de cloro livre e cloro total é conveniente usar respetivamente um conjunto próprio de células (ver EN ISO 7393-2, alínea 5.3).
3. A formação de cores DPD ocorre com um valor pH entre 6,2 e 6,5. Os reagentes contêm, por isso, um tampão para ajustar o valor pH. As águas fortemente alcalinas ou ácidas devem, porém, antes da análise, ser ajustadas para um valor pH entre 6 e 7 (com 0,5 mol/l de ácido sulfúrico ou 1 mol/l soda cáustica).

Realização da determinação Cloro livre com pacotes de pó

Escolher o método no equipamento.



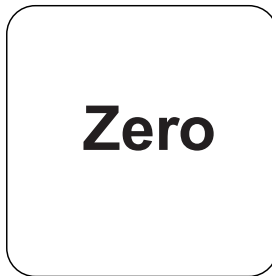
Encher a célula de 24 mm com **10 mL de amostra**.



Fechar a(s) célula(s).



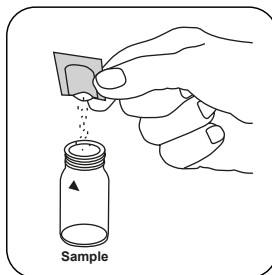
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



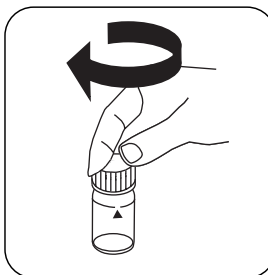
Premir a tecla **ZERO**.



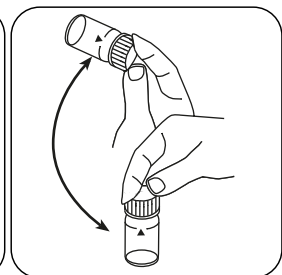
Retirar a célula do compartimento de medição.



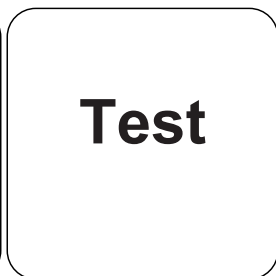
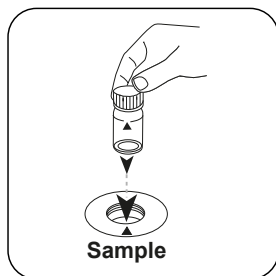
Adicionar um **pacote de pó Chlorine FREE-DPD/ F10**.



Fechar a(s) célula(s).



Misturar o conteúdo girando (20 sec.).



PT

Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.

Premir a tecla **TEST** (XD: **START**).

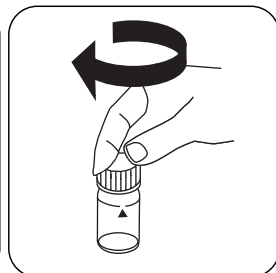
No visor aparece o resultado em mg/L Cloro livre.

Realização da determinação Cloro total com pacotes de pó

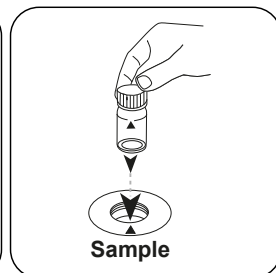
Escolher o método no equipamento.



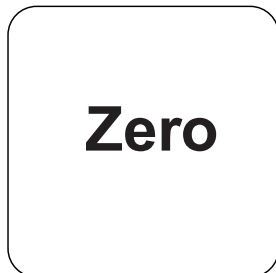
Encher a célula de 24 mm com **10 mL de amostra**.



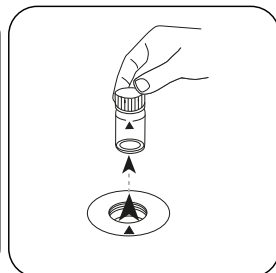
Fechar a(s) célula(s).



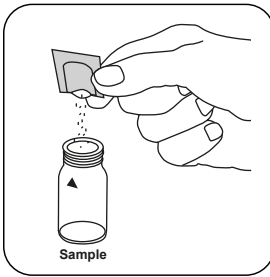
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



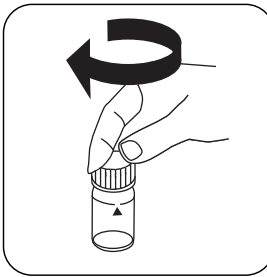
Premir a tecla **ZERO**.



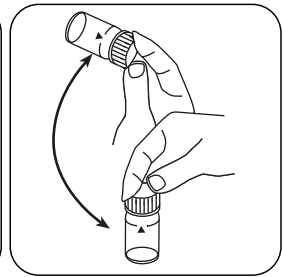
Retirar a célula do compartimento de medição.



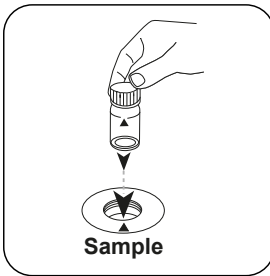
Adicionar um **pacote de pó Chlorine TOTAL-DPD/ F10**



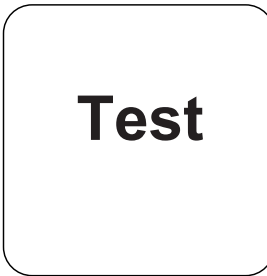
Fechar a(s) célula(s).



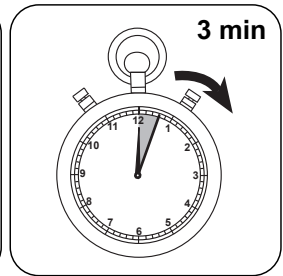
Misturar o conteúdo girando (20 sec.).



Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



Premir a tecla **TEST** (XD: **START**).



Aguardar **3 minuto(s) de tempo de reação**.

Decorrido o tempo de reação, a medição é efetuada automaticamente.

No visor aparece o resultado em mg/L Cloro total.



Método Químico

DPD

Apêndice

PT

Texto de Interferências

Interferências Persistentes

- Todos os oxidantes presentes nas amostras reagem como o cloro, o que leva a resultados demasiado altos.

Interferências Removíveis

- As interferências por cobre e ferro(III) devem ser eliminadas por EDTA.
- Concentrações de cloro superiores a 2 mg/L, se forem usados pacotes de pó, podem causar resultados dentro da área de medição até 0 mg/L. Neste caso, deve diluir a amostra com água sem cloro. 10 ml da amostra diluída é colocada em reagente e a medição é repetida (teste de plausibilidade).

| Interferências | a partir de / [mg/L] |
|---------------------|----------------------|
| CrO_4^{2-} | 0,01 |
| MnO_2 | 0,01 |

Validação de método

| | |
|--------------------------|-----------------|
| Limite de Detecção | 0.01 mg/L |
| Limite de Determinação | 0.03 mg/L |
| Fim da Faixa de Medição | 2 mg/L |
| Sensibilidade | 1.68 mg/L / Abs |
| Faixa de Confiança | 0.033 mg/L |
| Desvio Padrão | 0.014 mg/L |
| Coefficiente de Variação | 1.34 % |

Conformidade

EN ISO 7393-2

³⁾Determinação do possível livre, vinculado, total



Cloro HR PP

M111

0.1 - 8 mg/L Cl₂ ^{a)}

CL8

DPD

PT

Material

Material necessário (parcialmente opcional):

| Reagentes | Unidade de Embalagem | Código do Produto |
|---------------------|----------------------|-------------------|
| Sem cloro DPD F10 | Pó / 100 pc. | 530100 |
| Sem cloro DPD F10 | Pó / 1000 pc. | 530103 |
| Cloro Total DPD F10 | Pó / 100 pc. | 530120 |
| Cloro Total DPD F10 | Pó / 1000 pc. | 530123 |

Amostragem

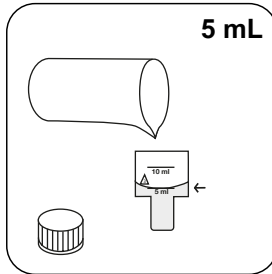
1. Na preparação da amostra é preciso evitar a libertação de gases de cloro, p. ex. através da pipetagem e agitação.
2. A análise tem de ser efetuada logo após a recolha da amostra.

Preparação

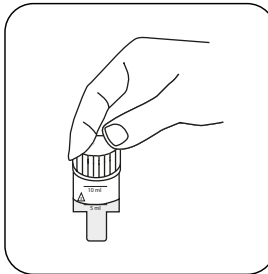
1. Limpeza das células:
Uma vez que muitos produtos de limpeza domésticos (p. ex. lava-louça) contêm substâncias redutoras, na determinação de cloro pode haver demasiadas reduções. Para excluir este erro de medição, os equipamentos de vidro não deviam ter a capacidade de absorção de cloro. Para esse efeito, os equipamentos de vidro são guardados por uma hora sob solução de hipoclorito de sódio (0,1 g/L) e depois devem ser bem enxaguados com água desmineralizada.
2. Para a determinação individual de cloro livre e cloro total é conveniente usar respetivamente um conjunto próprio de células (ver EN ISO 7393-2, alínea 5.3).
3. A formação de cores DPD ocorre com um valor pH entre 6,2 e 6,5. Os reagentes contêm, por isso, um tampão para ajustar o valor pH. As águas fortemente alcalinas ou ácidas devem, porém, antes da análise, ser ajustadas para um valor pH entre 6 e 7 (com 0,5 mol/l de ácido sulfúrico ou 1 mol/l soda cáustica).

Realização da determinação Cloro HR livre com pacotes de pó

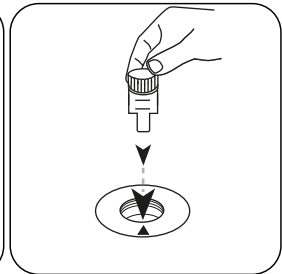
Escolher o método no equipamento.



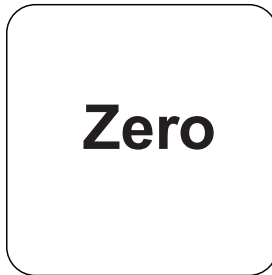
Encher a célula de 10 mm com **5 mL de amostra**.



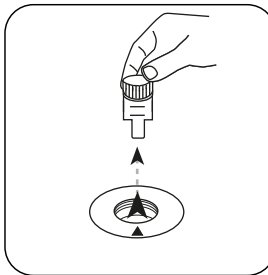
Fechar a(s) célula(s).



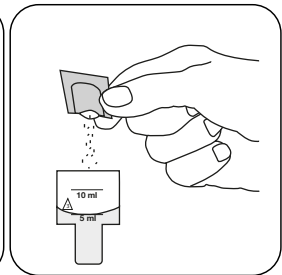
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



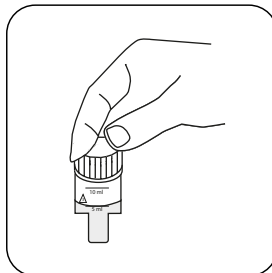
Premir a tecla **ZERO**.



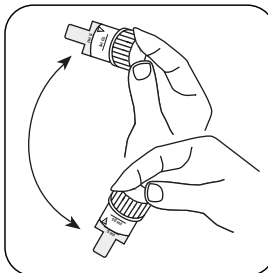
Retirar a **célula** do compartimento de medição.



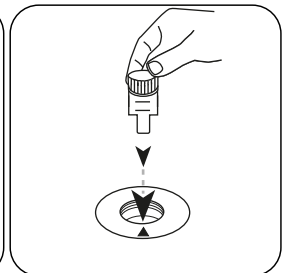
Adicionar à amostra **dois pacotes de pó Chlorine FREE-DPD / F10**.



Fechar a(s) célula(s).



Misturar o conteúdo girando (20 sec.).



Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.

PT



Test

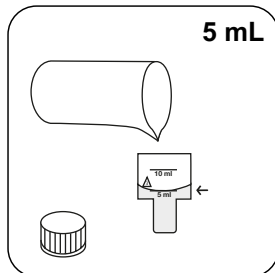
PT

Premir a tecla **TEST** (XD:
START).

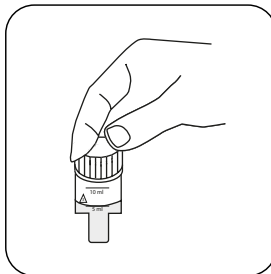
No visor aparece o resultado em mg/L Cloro livre.

Realização da determinação Cloro HR total com pacotes de pó

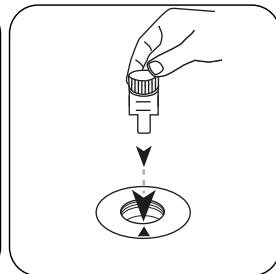
Escolher o método no equipamento.



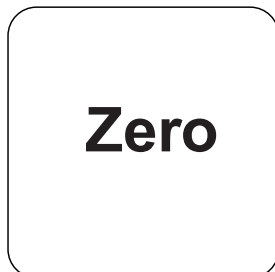
Encher a célula de 10 mm
com **5 mL de amostra** .



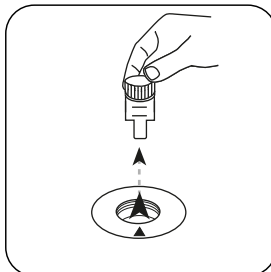
Fechar a(s) célula(s).



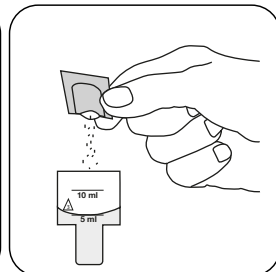
Colocar a **célula de amostra**
no compartimento de
medição. Observar o
posicionamento.



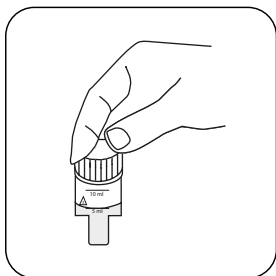
Premir a tecla **ZERO**.



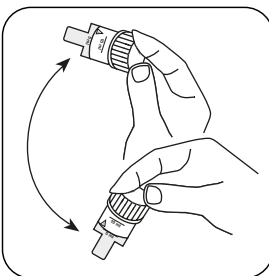
Retirar a **célula** do
compartimento de medição.



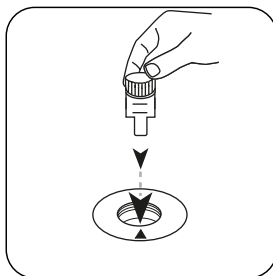
Adicionar à amostra **dois**
pacotes de pó **Chlorine**
TOTAL-DPD / F10 .



Fechar a(s) célula(s).

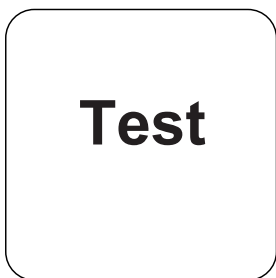


Misturar o conteúdo girando (20 sec.).

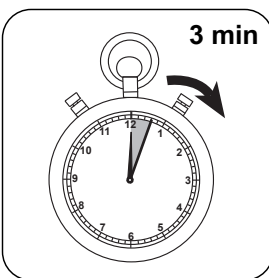


Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.

PT



Premir a tecla **TEST** (XD: **START**).



Aguardar **3 minuto(s) de tempo de reação**.

Decorrido o tempo de reação, a medição é efetuada automaticamente.

No visor aparece o resultado em mg/L Cloro total.



Método Químico

DPD

Apêndice

PT

Texto de Interferências

Interferências Persistentes

- Todos os oxidantes presentes nas amostras reagem como o cloro, o que leva a resultados demasiado altos.

Interferências Removíveis

- As interferências por cobre e ferro(III) devem ser eliminadas por EDTA.
- Concentrações de cloro superiores a 8 mg/L, se forem usados pacotes de pó, podem causar resultados dentro da área de medição até 0 mg/L. Neste caso, deve diluir a amostra com água sem cloro. 10 ml da amostra diluída é colocada em reagente e a medição é repetida (teste de plausibilidade).

Conformidade

EN ISO 7393-2

^{a)}Determinação do possível livre, vinculado, total



Valor pH T

M330

6.5 - 8.4 pH

PH

Phenol Red

PT

Material

Material necessário (parcialmente opcional):

| Reagentes | Unidade de Embalagem | Código do Produto |
|--------------------------|----------------------|-------------------|
| Fotômetro Fenol Vermelho | Pastilhas / 100 | 511770BT |
| Fotômetro Fenol Vermelho | Pastilhas / 250 | 511771BT |
| Fotômetro Fenol Vermelho | Pastilhas / 500 | 511772BT |

Notas

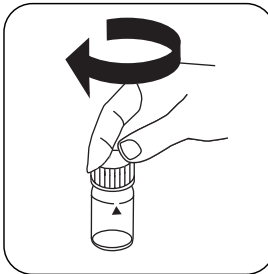
1. Para a determinação fotométrica do valor pH deve usar somente pastilhas PHENOL RED com impressão de película preta, que estão identificadas com o termo PHOTOMETER.

Realização da determinação Valor pH com pastilha

Escolher o método no equipamento.



Encher a célula de 24 mm com **10 mL de amostra**.



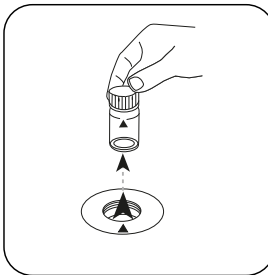
Fechar a(s) célula(s).



Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



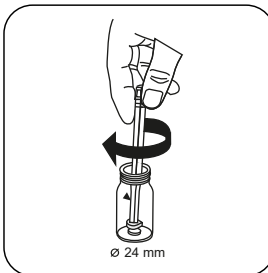
Premir a tecla **ZERO**.



Retirar a célula do compartimento de medição.



Pastilha PHENOL RED PHOTOMETER.



Esmagar a(s) pastilha(s) rodando ligeiramente.



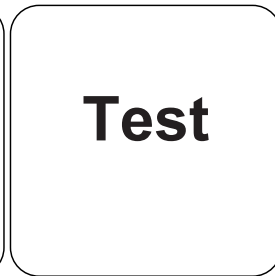
Fechar a(s) célula(s).



Dissolver a(s) pastilha(s) girando.



Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



Test

Premir a tecla **TEST** (XD: **START**).

No visor aparece o resultado como valor pH.

Método Químico

Phenol Red

Apêndice

Texto de Interferências

PT

Interferências Persistentes

1. As amostras de água com baixa dureza de carbonato* podem obter valores pH incorretos.

* $K_{S4.3} < 0,7 \text{ mmol/l} \triangleq \text{Alcalinidade total} < 35 \text{ mg/L CaCO}_3$.

Interferências Removíveis

1. Os valores pH inferiores a 6,5 e superiores a 8,4 podem causar resultados dentro da área de medição. Recomenda-se um teste de plausibilidade (medidor de pH).

2. Erro de sal:

No caso de teores de sal até 2 g/L não é expectável nenhum erro de sal significativo devido ao teor de sal da pastilha de reagente. No caso de teores de sal superiores, deve corrigir os valores de medição do seguinte modo:

| Teor de sal da amostra emg/L | 30 (água do mar) | 60 | 120 | 180 |
|------------------------------|---------------------|---------------------|---------------------|---------------------|
| Correção | -0,15 ¹⁾ | -0,21 ²⁾ | -0,26 ²⁾ | -0,29 ²⁾ |

¹⁾segundo Kolthoff (1922)

²⁾segundo Parson e Douglas (1926)

Bibliografia

Colorimetric Chemical Analytical Methods, 9th Edition, London



Valor pH L

M331

6.5 - 8.4 pH

PH

Phenol Red

PT

Material

Material necessário (parcialmente opcional):

| Reagentes | Unidade de Embalagem | Código do Produto |
|--|----------------------|-------------------|
| Solução de vermelho fenol | 15 mL | 471040 |
| Solução de vermelho fenol | 100 mL | 471041 |
| Solução de vermelho fenol em embalagem de -6 | 1 pc. | 471046 |

Preparação

1. Devido aos diferentes tamanhos de gotas, o resultado de medição pode apresentar desvios maiores do que ao utilizar pastilhas.
Se utilizar uma pipeta (0,18 ml corresponde a 6 gotas) pode reduzir este desvio.

Notas

1. Depois de usado, o frasco conta-gotas deve ser novamente fechado com a respetiva tampa de enroscar à cor.
2. Guardar o reagente em local fresco entre +6 °C e +10 °C.

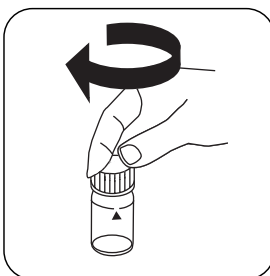


Realização da determinação Valor pH com reagente líquido

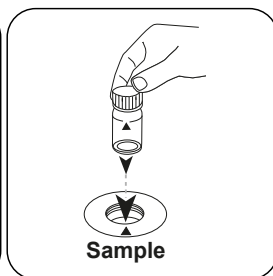
Escolher o método no equipamento.



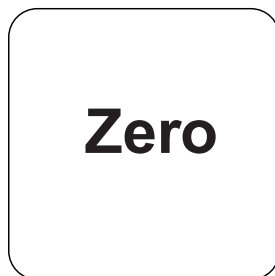
Encher a célula de 24 mm com **10 mL de amostra**.



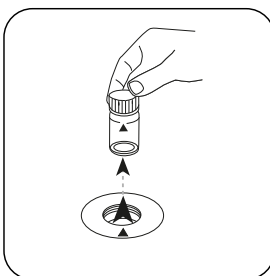
Fechar a(s) célula(s).



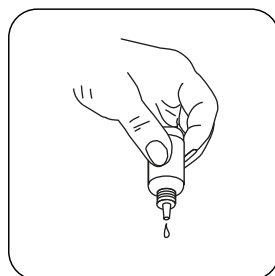
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



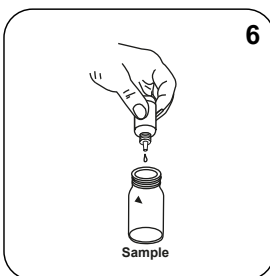
Premir a tecla **ZERO**.



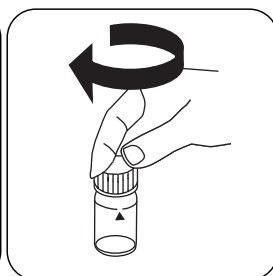
Retirar a célula do compartimento de medição.



Manter os frascos conta gotas na vertical e pressionar lentamente para adicionar gotas de igual dimensão.



Adicionar **6 gotas PHENOL Red-Lösung** à célula de amostra.



Fechar a(s) célula(s).



Misturar o conteúdo girando.



Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



Premir a tecla **TEST** (XD: **START**).

No visor aparece o resultado como valor pH.

Método Químico

Phenol Red

Apêndice

Texto de Interferências

PT

Interferências Removíveis

1. Erro de sal: Correção do valor de medição (valores médios) para amostras com um teor de sal de:


| 2. | Teor de sal da amostra | Correção |
|----|---------------------------------------|---|
| | 30 g/L (água do mar) | -0,15 ¹⁾ |
| | 60 g/L | -0,21 ²⁾ |
| | 120 g/L | -0,26 ²⁾ |
| | 180 g/L | -0,29 ²⁾ |
| | ¹⁾ segundo Kolthoff (1922) | ²⁾ segundo Parson e Douglas (1926) |

3. Na análise de água clorada, o teor de cloro residual existente pode influenciar a reação de cor do reagente líquido. Isto é evitado, na medida em que se insere um pequeno cristal de tiosulfato de sódio ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$) na solução de amostra antes de ser adicionada a solução PHENOL RED.

Bibliografia

Colorimetric Chemical Analytical Methods, 9th Edition, London

KS4.3 T / 20



Naam van de methode

Nummer methode

Streepjescode ter identificatie van de methode

Meetbereik

$K_{S_{4.3}} T$ M20
0.1 - 4 mmol/l $K_{S_{4.3}}$ S:4.3
Zuur / Indicator

Chemische methode

Uitlezing in MD
100 MD 110 / MD 200

Instrument specifieke informatie

De test kan op de volgende apparaten worden uitgevoerd. Bovendien worden de vereiste cuvette en het absorptiebereik van de fotometer aangegeven.

| Toestellen | Cuvet | λ | Meetbereik |
|---|---------------------|-----------|------------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | \varnothing 24 mm | 610 nm | 0.1 - 4 mmol/l $K_{S_{4.3}}$ |
| SpectroDirect, XD 7000, XD 7500 | \varnothing 24 mm | 615 nm | 0.1 - 4 mmol/l $K_{S_{4.3}}$ |

Reagentia

Benodigd materiaal (deels optioneel):

| Titel | Verpakkingseenheid | Bestelnr. |
|-------------------|--------------------|-----------|
| Alka-M-Photometer | Tablet / 100 | 513210BT |
| Alka-M-Photometer | Tablet / 250 | 513211BT |

Toepassingsbereik

- Afvalwaterzuivering
- Behandeling drinkwater
- Zuivering vervuild water

Aantekeningen

1. De termen alkaliteit-m, m-waarde, totale alkaliteit en zuurcapaciteit_{S_{4.3}} zijn identiek.
2. De exacte naleving van het monstervolume van 10 ml is bepalend voor de nauwkeurigheid van het analysesresultaat.

Beknopte naam conform de norm ISO 639-1

Herziene versie

NL Handboek van Methoden 01/20

Uitvoering van de meting

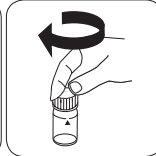
Uitvoering van de bepaling Zuurcapaciteit $K_{s4,3}$ met tablet

De methode in het apparaat selecteren.

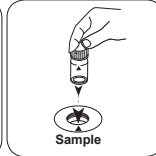
Voor deze methode moet bij de volgende apparaten geen nulmeting worden uitgevoerd:
XD 7000, XD 7500



Spoelbakje van 24 mm met **10 ml** staal vullen.

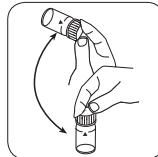


De spoelbakjes afsluiten.



Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.

• • •



Tabletten oplossen door om te draaien



Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



De toets **TEST** (XD: **START**) indrukken.

De display toont het resultaat als Zuurcapaciteit $K_{s4,3}$.



Chloor PP

M110

0.02 - 2 mg/L Cl₂ ^{a)}

CL2

DPD

NL

Reagentia

Benodigd materiaal (deels optioneel):

| Reagentia | Verpakkingseenheid | Bestelnr. |
|-----------------------|--------------------|-----------|
| Chloor vrij DPD F10 | Poeder / 100 St. | 530100 |
| Chloor vrij DPD F10 | Poeder / 1000 St. | 530103 |
| Chloor totaal DPD F10 | Poeder / 100 St. | 530120 |
| Chloor totaal DPD F10 | Poeder / 1000 St. | 530123 |

Beschikbare standaarden

| Omschrijving | Verpakkingseenheid | Bestelnr. |
|----------------------------|--------------------|-----------|
| ValidCheck Chloor 1,5 mg/l | 1 St. | 48105510 |

Bemonstering

1. Tijdens de monstervoorbereiding moet worden vermeden dat het chloor wordt uitgestoten, bijvoorbeeld door pipetteren en schudden.
2. De analyse moet onmiddellijk na de bemonstering worden uitgevoerd.

Voorbereiding

1. Het schoonmaken van de spoelbakjes:
Aangezien veel huishoudelijke reinigingsmiddelen (bijv. afwasmiddelen) minder schadelijke stoffen bevatten, kan de bepaling van chloor leiden tot minder goede resultaten. Om deze meetfout uit te sluiten, moeten de glasapparaten chloorvrij zijn. Hiertoe wordt het glaswerk gedurende één uur onder natriumhypochlorietoplossing (0,1 g/L) bewaard en vervolgens grondig gespoeld met gedeïoniseerd water.
2. Voor de individuele bepaling van vrij chloor en totaal chloor is het zinvol om een aparte set spoelbakjes te gebruiken (zie EN ISO 7393-2, paragraaf 5.3).
3. De DPD-kleurontwikkeling vindt plaats bij een pH-waarde van 6,2 tot 6,5. De reagentia bevatten daarom een buffer voor de aanpassing van de pH-waarde. Sterk alkalisch of zuur water moet echter vóór de analyse in een pH-gebied tussen 6 en 7 (met 0,5 mol/l-zwavelzuur of 1 mol/l-natriumhydroxideoplossing) worden geplaatst.

Uitvoering van de bepaling vrij chloor met poederpakjes

De methode in het apparaat selecteren.



Spoelbakje van 24 mm met **10 mL staal** vullen.



De spoelbakjes afsluiten.



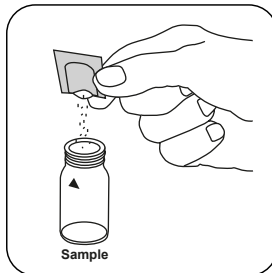
Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letteren.



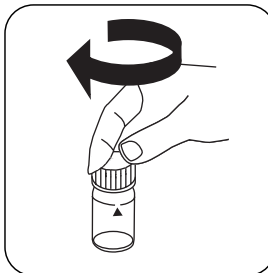
De toets **NUL** indrukken.



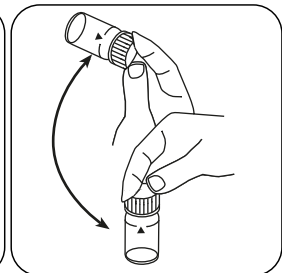
Het spoelbakje uit de meetschacht nemen.



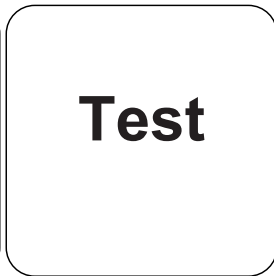
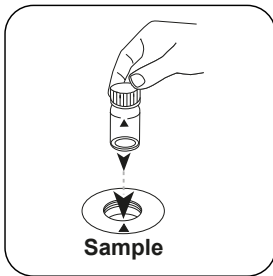
Een **Chloor FREE-DPD/ F10 poederpakje** toevoegen.



De spoelbakjes afsluiten.



De inhoud mengen door om te draaien (20 sec.).



Het **staalpoelbakje** in de meetschacht plaatsen. Op de positionering letten.

De toets **TEST** (XD: **START**) indrukken.

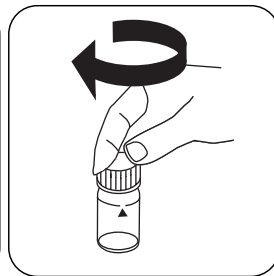
De display toont het resultaat in mg/L vrij chloor.

Uitvoering van de bepaling totaal chloor met poederpakjes

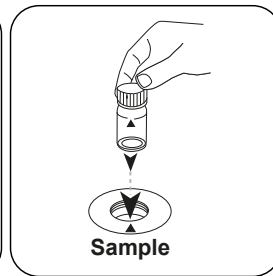
De methode in het apparaat selecteren.



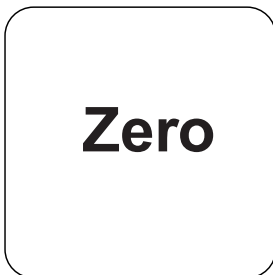
Spoelbakje van 24 mm met **10 mL** staal vullen.



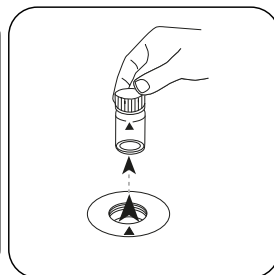
De spoelbakjes afsluiten.



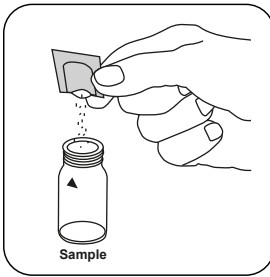
Het **staalpoelbakje** in de meetschacht plaatsen. Op de positionering letten.



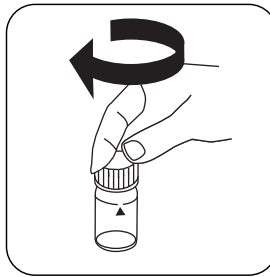
De toets **NUL** indrukken.



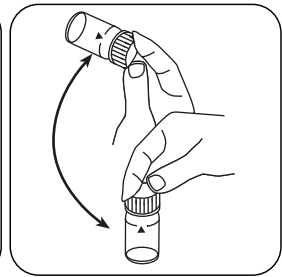
Het spoelbakje uit de meetschacht nemen.



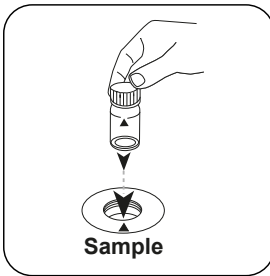
Een **Chloor TOTAL-DPD/ F10 poederpakje** toevoegen.



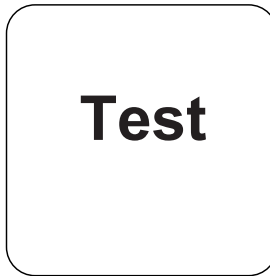
De spoelbakjes afsluiten.



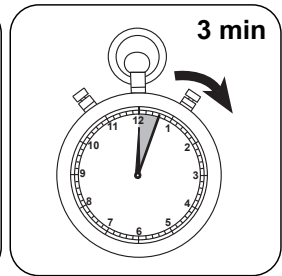
De inhoud mengen door om te draaien (20 sec.).



Het **staal spoelbakje** in de meetschacht plaatsen. Op de positionering letten.



De toets **TEST (XD: START)** indrukken.



De reactietijd van **3 minuten** afwachten.

Na afloop van de reactietijd wordt de meting automatisch uitgevoerd.

De display toont het resultaat in mg/L Totaal chloor.



Chemische methode

DPD

Aanhangsel

NL

Verstoringsen

Permanente verstoringen

- Alle oxidatiemiddelen in de monsters reageren als chloor, wat tot extra resultaten leidt.

Uit te sluiten verstoringen

- Storingen veroorzaakt door koper en ijzer(III) worden door EDTA geëlimineerd.
- Concentraties van meer dan 2 mg/L chloor, bij gebruik van Powder Packs, kunnen leiden tot resultaten binnen het meetbereik tot 0 mg/L. In dit geval moet het monster worden verdund met chloorvrij water. Voeg reagens toe aan 10 ml van het verdunde monster en herhaal de meting (plausibiliteitstest).

| Verstoringsen | verstoort vanaf |
|---------------------|-----------------|
| CrO_4^{2-} | 0,01 |
| MnO_2 | 0,01 |

Validatie van de methodes

| | |
|--------------------------------------|-----------------|
| Aantoonbaarheidsgrens | 0.01 mg/L |
| Bepaalbaarheidsgrens | 0.03 mg/L |
| Einde meetbereik | 2 mg/L |
| Gevoeligheid | 1.68 mg/L / Abs |
| Betrouwbaarheidsgrenzen | 0.033 mg/L |
| Standaardafwijking procedure | 0.014 mg/L |
| Variatiecoëfficiënt procedure | 1.34 % |

Conform

EN ISO 7393-2

^{a)} bepaling van de vrije, gebonden, totaal mogelijke



Chloor HR PP

M111

0.1 - 8 mg/L Cl₂ ^{a)}

CL8

DPD

NL

Reagentia

Benodigd materiaal (deels optioneel):

| Reagentia | Verpakkingseenheid | Bestelnr. |
|-----------------------|--------------------|-----------|
| Chloor vrij DPD F10 | Poeder / 100 St. | 530100 |
| Chloor vrij DPD F10 | Poeder / 1000 St. | 530103 |
| Chloor totaal DPD F10 | Poeder / 100 St. | 530120 |
| Chloor totaal DPD F10 | Poeder / 1000 St. | 530123 |

Bemonstering

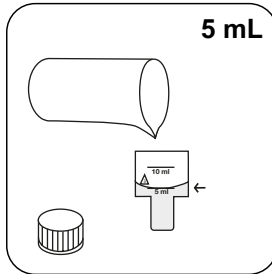
1. Tijdens de monstervoorbereiding moet worden vermeden dat het chloor wordt uitgestoten, bijvoorbeeld door pipetteren en schudden.
2. De analyse moet onmiddellijk na de bemonstering worden uitgevoerd.

Voorbereiding

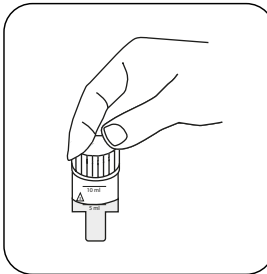
1. Het schoonmaken van de spoelbakjes:
Aangezien veel huishoudelijke reinigingsmiddelen (bijv. afwasmiddelen) minder schadelijke stoffen bevatten, kan de bepaling van chloor leiden tot minder goede resultaten. Om deze meetfout uit te sluiten, moeten de glasapparaten chloorvrij zijn. Hiertoe wordt het glaswerk gedurende één uur onder natriumhypochlorietoplossing (0,1 g/L) bewaard en vervolgens grondig gespoeld met gedeïoniseerd water.
2. Voor de individuele bepaling van vrij chloor en totaal chloor is het zinvol om een aparte set spoelbakjes te gebruiken (zie EN ISO 7393-2, paragraaf 5.3).
3. De DPD-kleurontwikkeling vindt plaats bij een pH-waarde van 6,2 tot 6,5. De reagentia bevatten daarom een buffer voor de aanpassing van de pH-waarde. Sterk alkalisch of zuur water moet echter vóór de analyse in een pH-gebied tussen 6 en 7 (met 0,5 mol/l-zwavelzuur of 1 mol/l-natriumhydroxideoplossing) worden geplaatst.

Uitvoering van de bepaling vrij chloor HR, met poederpakjes

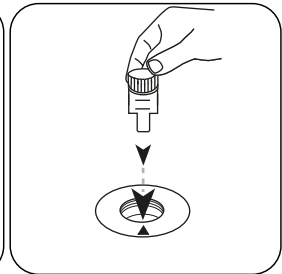
De methode in het apparaat selecteren.



Spoelbakje van 10 mm met **5 mL staal** vullen.



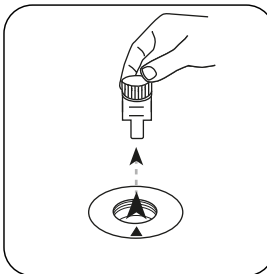
De spoelbakjes afsluiten.



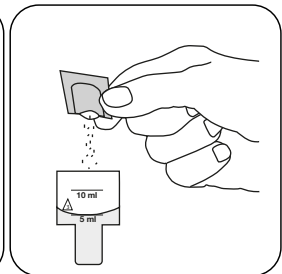
Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letteren.



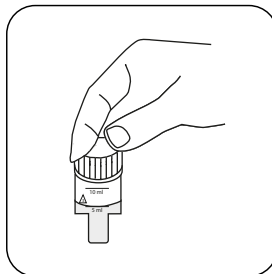
De toets **NUL** indrukken.



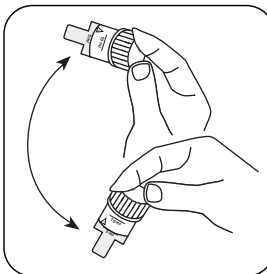
Het **spoelbakje** uit de meetschacht nemen.



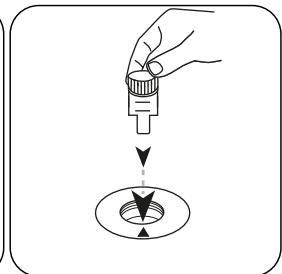
Twee Chloor FREE-DPD / F10 poederpakjes aan het staal toevoegen.



De spoelbakjes afsluiten.



De inhoud mengen door om te draaien (20 sec.).



Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letteren.



Test

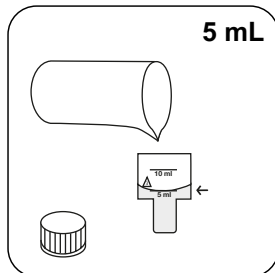
NL

De toets **TEST** (XD:
START) indrukken.

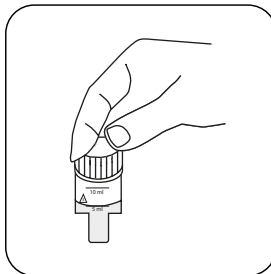
De display toont het resultaat in mg/L vrij chloor.

Uitvoering van de bepaling totaal chloor HR, met poederpakjes

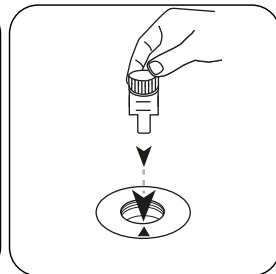
De methode in het apparaat selecteren.



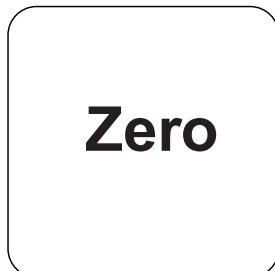
Spoelbakje van 10 mm met
5 mL staal vullen.



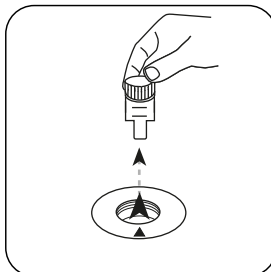
De spoelbakjes afsluiten.



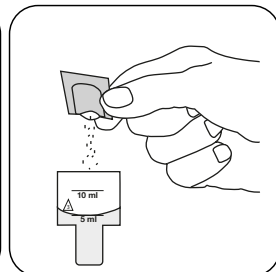
Het **staalspoelbakje** in de
meetschacht plaatsen. Op de
positionering letteren.



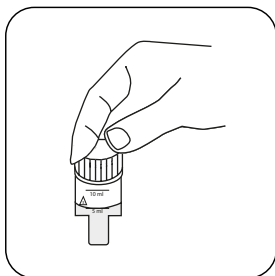
De toets **NUL** indrukken.



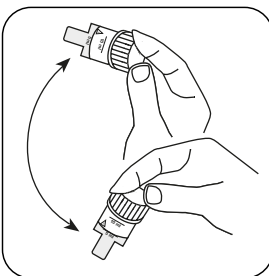
Het **spoelbakje** uit de
meetschacht nemen.



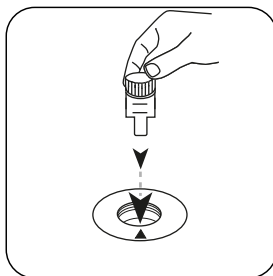
**Twee Chloor TOTAL-DPD /
F10 poederpakjes** aan het
staal toevoegen.



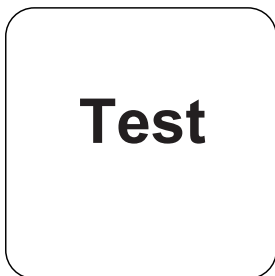
De spoelbakjes afsluiten.



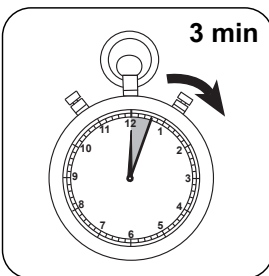
De inhoud mengen door om te draaien (20 sec.).



Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letteren.



De toets **TEST** (XD: **START**) indrukken.



De reactietijd van **3 minuten** afwachten.

Na afloop van de reactietijd wordt de meting automatisch uitgevoerd.

De display toont het resultaat in mg/L Totaal chloor.



Chemische methode

DPD

Aanhangsel

NL

Verstoringen

Permanente verstoringen

- Alle oxidatiemiddelen in de monsters reageren als chloor, wat tot extra resultaten leidt.

Uit te sluiten verstoringen

- Storingen veroorzaakt door koper en ijzer(III) worden door EDTA geëlimineerd.
- Concentraties van meer dan 8 mg/L chloor, bij gebruik van Powder Packs, kunnen leiden tot resultaten binnen het meetbereik tot 0 mg/L. In dit geval moet het monster worden verdund met chloorvrij water. Voeg reagens toe aan 10 ml van het verdunde monster en herhaal de meting (plausibiliteitstest).

Conform

EN ISO 7393-2

^{a)} bepaling van de vrije, gebonden, totaal mogelijke



pH-waarde T

M330

6.5 - 8.4 pH

PH

Fenolrood

NL

Reagentia

Benodigd materiaal (deels optioneel):

| Reagentia | Verpakkingseenheid | Bestelnr. |
|---------------------|--------------------|-----------|
| Fenolrood fotometer | Tablet / 100 | 511770BT |
| Fenolrood fotometer | Tablet / 250 | 511771BT |
| Fenolrood fotometer | Tablet / 500 | 511772BT |

Aantekeningen

1. Voor de fotometrische pH-bepaling mogen alleen PHENOL RED-tabletten met een zwarte foliedruk en de term PHOTOMETER worden gebruikt.

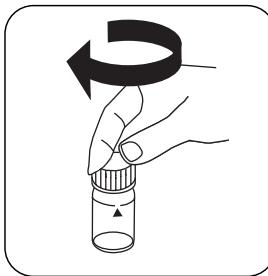


Uitvoering van de bepaling pH-waarde met tablet

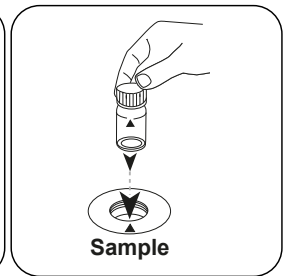
De methode in het apparaat selecteren.



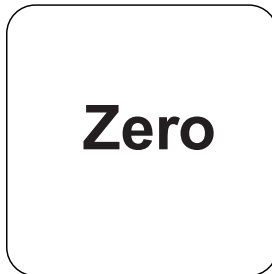
Spoelbakje van 24 mm met 10 mL staal vullen.



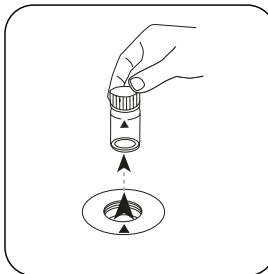
De spoelbakjes afsluiten.



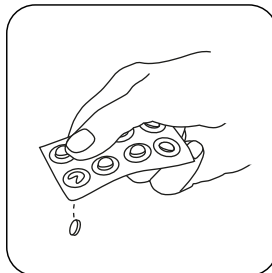
Het **staal**spoelbakje in de meetschacht plaatsen. Op de positionering letteren.



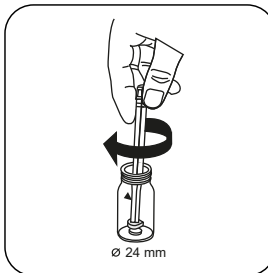
De toets **NUL** indrukken.



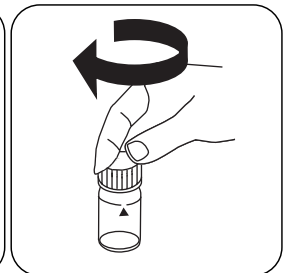
Het spoelbakje uit de meetschacht nemen.



Een **FENOLROOD FOTOMETER** tablet toevoegen.



De tabletten onder lichte rotatie verpletteren.



De spoelbakjes afsluiten.



Tabletten oplossen door om te draaien



Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



De toets **TEST** (XD: **START**) indrukken.

De display toont het resultaat als pH-waarde.

Chemische methode

Fenolrood

Aanhangsel

Verstoringsen

NL

Permanente verstoringen

1. Watermonsters met een lage carbonaathardheid* kunnen leiden tot onjuiste pH-waarden.

* $_{\text{K}84,3} < 0,7 \text{ mmol/l} \triangleq \text{Totale alkaliteit} < 35 \text{ mg/L CaCO}_3$.

Uit te sluiten verstoringen

1. pH-waarden onder 6,5 en boven 8,4 kunnen leiden tot resultaten binnen het meetbereik. Een plausibiliteitstest (pH-meter) wordt aanbevolen.
2. Zoutgebrek:
Voor zoutgehalten tot 2 g/L kan geen significante zoutfout worden verwacht als gevolg van het zoutgehalte van het reagenstablet. Indien het zoutgehalte hoger is, worden de gemeten waarden als volgt gecorrigeerd:

| zoutgehalte van het monster (in g/L) | 30 (zeewater) | 60 | 120 | 180 |
|--------------------------------------|---------------------|---------------------|---------------------|---------------------|
| Correctie | -0,15 ¹⁾ | -0,21 ²⁾ | -0,26 ²⁾ | -0,29 ²⁾ |

¹⁾ na Kolthoff (1922)

²⁾ na Parson en Douglas (1926)

Literatuurverwijzing

Colorimetric Chemical Analytical Methods, 9th Edition, London



pH-waarde L

M331

6.5 - 8.4 pH

PH

Fenolrood

NL

Reagentia

Benodigd materiaal (deels optioneel):

| Reagentia | Verpakkingseenheid | Bestelnr. |
|---|--------------------|-----------|
| Fenolrood oplossing | 15 mL | 471040 |
| Fenolrood oplossing | 100 mL | 471041 |
| Fenolrood oplossing in verpakking van 6 stuks | 1 St. | 471046 |

Vorbereiding

- Door de verschillende druppelgroottes kan het meetresultaat grotere afwijkingen vertonen dan bij gebruik van tabletten.
Bij gebruik van een pipet (0,18 ml komt overeen met 6 druppels) kan deze afwijking worden geminimaliseerd.

Aantekeningen

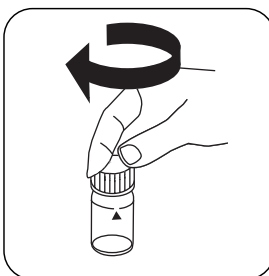
- Na gebruik moet de druppelfles meteen onmiddellijk worden gesloten met de schroefdop van dezelfde kleur.
- Bewaar het reagens bij +6 °C tot +10 °C op een koele plaats.

Uitvoering van de bepaling pH-waarde met vloeibaar reagens

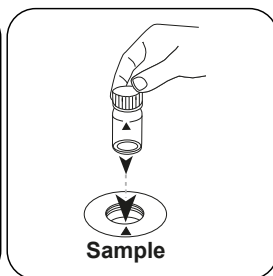
De methode in het apparaat selecteren.



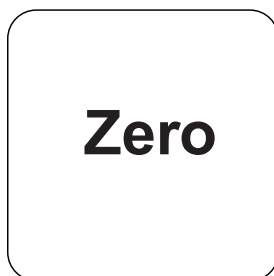
Spoelbakje van 24 mm met **10 mL staal** vullen.



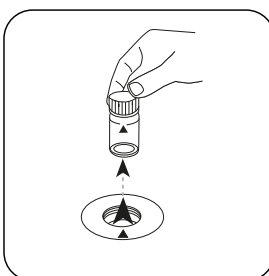
De spoelbakjes afsluiten.



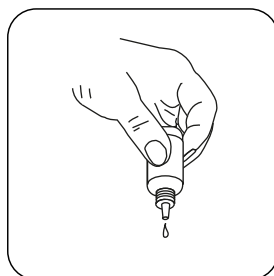
Het **staal spoelbakje** in de meetschacht plaatsen. Op de positionering letten.



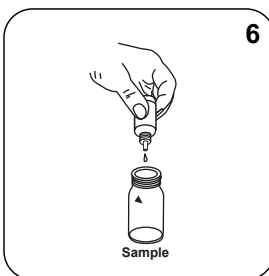
De toets **NUL** indrukken.



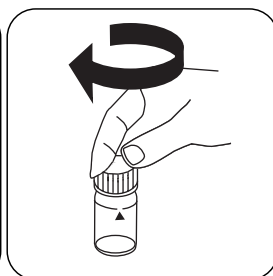
Het spoelbakje uit de meetschacht nemen.



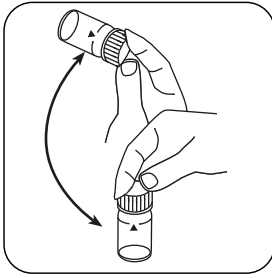
De druppelflessen verticaal houden en even grote druppels toevoegen door langzaam te drukken.



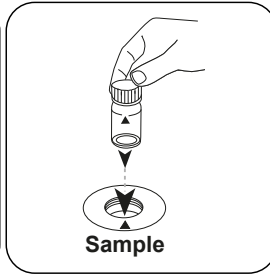
6 druppels FENOLROOD-oplossing in het staal spoelbakje doen.



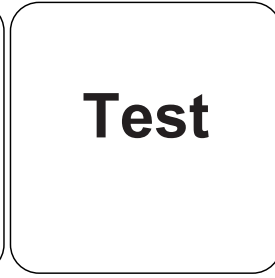
De spoelbakjes afsluiten.



De inhoud mengen door om te draaien.



Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



De toets **TEST** (XD: **START**) indrukken.

De display toont het resultaat als pH-waarde.

Chemische methode

Fenolrood

Aanhangsel

Verstoringen

NL

Uit te sluiten verstoringen


1. Zoutgebrek: correctie van de gemeten waarde (gemiddelde waarden) voor monsters met een zoutgehalte van:

| 2. | Zoutgehalte van het monster | Correctie |
|----|----------------------------------|---|
| | 30 g/L (zeewater) | -0,15 ¹⁾ |
| | 60 g/L | -0,21 ²⁾ |
| | 120 g/L | -0,26 ²⁾ |
| | 180 g/L | -0,29 ²⁾ |
| | ¹⁾ na Kolthoff (1922) | ²⁾ na Parson en Douglas (1926) |

3. Bij het testen van gechloreerd water kan het aanwezige chloorgehalte de kleurreactie van het vloeibare reagens beïnvloeden. Dit wordt voorkomen door een klein kristal natriumthiosulfaat ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$) aan de monsteroplossing toe te voegen voordat de PHENOL RED-oplossing wordt toegevoegd.

Literatuurverwijzing

Colorimetric Chemical Analytical Methods, 9th Edition, London

KS4.3 T / 20


方法名称

方法号

用于方法检测的条形码

测量范围

$K_{S4.3} T$
0.1 - 4 mmol/l $K_{S4.3}$

酸性 / 指示剂

20

屏幕显示: MD 100 / MD 110 / MD 200

化学方法

儀器的具體信息

測試可以在以下設備上執行。此外還指出了所需的比色杯和光度計的吸收範圍。

| 儀器類型 | 比色皿 | λ | 測量範圍 |
|---|---------------------|-----------|---------------------------|
| MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630 | \varnothing 24 mm | 610 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |
| SpectroDirect, XD 7000, XD 7500 | \varnothing 24 mm | 615 nm | 0.1 - 4 mmol/l $K_{S4.3}$ |

材料

所需材料 (部分可選) :

| 標題 | 包裝單位 | 貨號 |
|-------------------|----------|----------|
| Alka-M-Photometer | 片劑 / 100 | 513210BT |
| Alka-M-Photometer | 片劑 / 250 | 513211BT |

應用列表

- 污水處理
- 飲用水處理
- 原水處理

備註

1. 術語總度-m、m-值、總碱度和酸容量 $K_{S4.3}$ 是相同的。
2. 準確地遵守 10 ml 的樣本體積對分析結果的準確度至關重要。

語言代碼ISO 639-1

修訂狀態

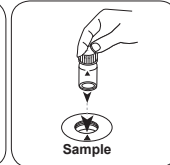
CN 方法手冊 01/20

开始测量

进行测定 $K_{s4.3}$ 片剂酸容量

选择设备中的方法。

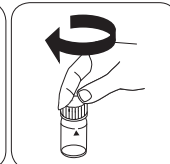
对于这种方法，在以下设备上不能进行 ZERO 测量：XD 7000, XD 7500

用 10 ml 样本填充 24 mm 比色杯。
色杯。将样本比色杯放入测量轴
中。注意定位。

• • •

加入 ALKA-M-PHOTOME-
TER 片剂。

用轻微的扭转压碎片剂。



密封比色杯。

CN 方法手册 01/20

ZH



PP 氯

M110

0.02 - 2 mg/L Cl₂^{a)}

CL2

DPD

材料

所需材料 (部分可選) :

ZH

| 试剂 | 包装单位 | 货号 |
|-------------|-------------|--------|
| 游离氯 DPD F10 | 粉剂 / 100 片 | 530100 |
| 游离氯 DPD F10 | 粉剂 / 1000 片 | 530103 |
| 氯总量 DPD F10 | 粉剂 / 100 片 | 530120 |
| 氯总量 DPD F10 | 粉剂 / 1000 片 | 530123 |

現有標準

| 标题 | 包装单位 | 货号 |
|-----------------------|------|----------|
| ValidCheck 氯 1.5 mg/l | 1 片 | 48105510 |

取样

1. 在样本制备中, 通过移液和摇动来避免氯的排气。
2. 取样后必须立即进行分析。

准备

1. 清洗比色杯 :
由于许多家用清洁剂 (例如洗碗用洗涤剂) 含有还原剂, 所以测定的氯结果可能会不足。为了排除这种测量误差, 玻璃器皿应无氯。为此, 将玻璃器皿在次氯酸钠溶液 (0.1 g/L) 下存放 1 小时, 然后用去离子水 (软化水) 彻底冲洗。
2. 对于游离氯和总氯的单独测定, 使用一套相应单独的比色杯是有意义的 (参见 EN ISO 7393-2, 第 5.3 段)。
3. DPD 显色发生在 pH 值在 6.2 至 6.5 时。因此该试剂含有用于调节 pH 值的缓冲液。但在分析前 (用 0.5 mol/l 硫酸或 1 mol/l 氢氧化钠溶液) 必须将强碱性或酸性水的 pH 范围调节到 6 和 7 之间。

进行测定 余氯 粉剂法

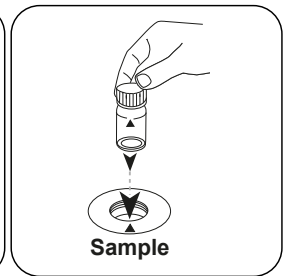
选择设备中的方法。



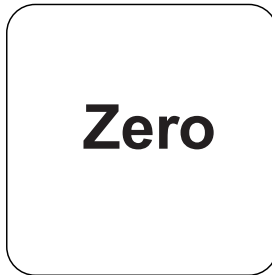
用 **10 mL** 样本填充 24 mm 比色杯。



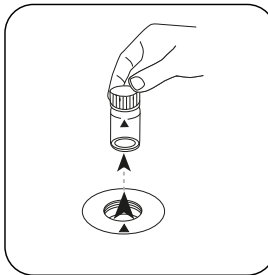
密封比色杯。



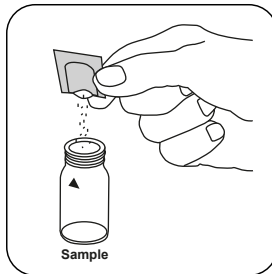
将样本比色杯放入测量轴中。注意定位。



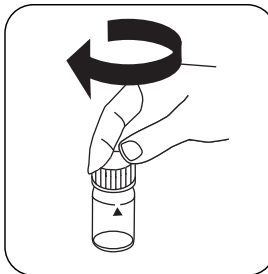
按下 **ZERO** 按钮。



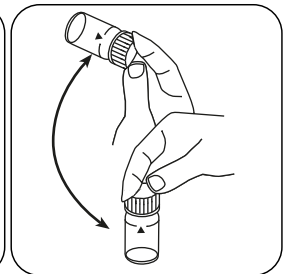
从测量轴上取下比色杯。



加入 **Chlorine FREE-DPD/ F10** 粉包。



密封比色杯。

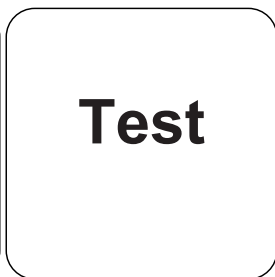
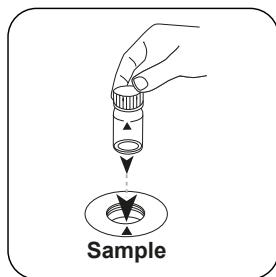


通过旋转混合内容物 (20 sec.)。

ZH



ZH



将**样本**比色杯放入测量轴中。注意定位。

按下 **TEST (XD: START)** 按钮。

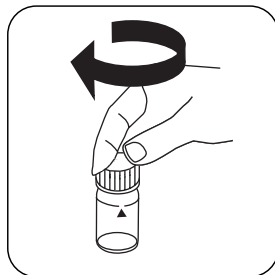
结果在显示屏上显示为 mg / l 余氯。

进行测定 总氯 粉剂法

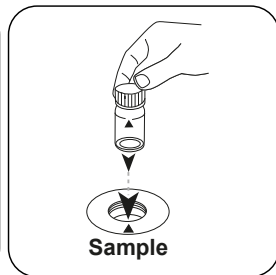
选择设备中的方法。



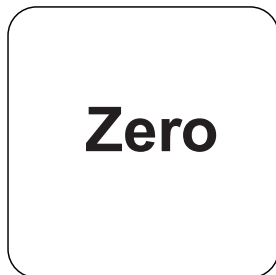
用 **10 mL** 样本填充 24 mm 比色杯。



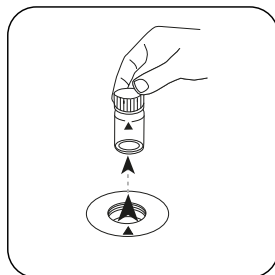
密封比色杯。



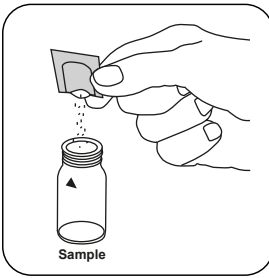
将**样本**比色杯放入测量轴中。注意定位。



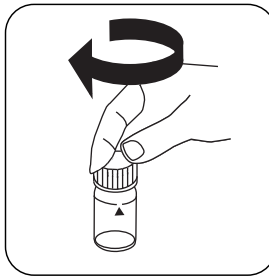
按下 **ZERO** 按钮。



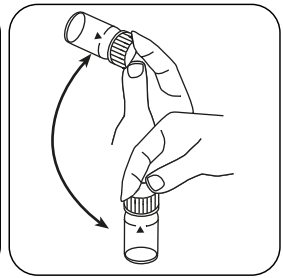
从测量轴上取下比色杯。



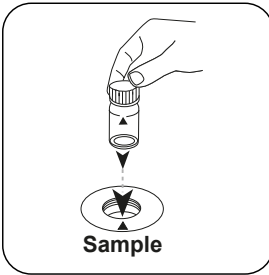
加入 **Chlorine TOTAL-DPD/ F10** 粉包。



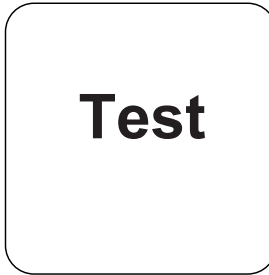
密封比色杯。



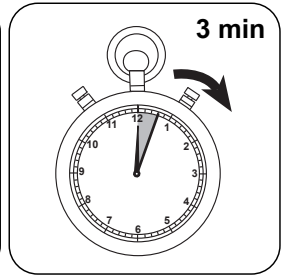
通过旋转混合内容物
(20 sec.)。



将样本比色杯放入测量轴中。注意定位。



按下 **TEST (XD: START)** 按钮。



等待 **3 分钟** 反应时间。

反应时间结束后，自动进行测量。

结果在显示屏上显示为 **mg / l 总氯**。



化学方法

DPD

附录

ZH

干扰说明

持续干扰

- 存在于样本中的所有氧化剂都像氯一样反应，导致多重结果。

可消除干扰

- 铜和铁 (III) 的干扰必须通过 EDTA 消除。
- 在使用粉包时，高于 2 mg/L 氯的浓度可导致测量范围内的结果高达 0 mg/L。在这种情况下应用无氯水稀释样本。将 10 ml 稀释的样本与试剂混合并重复测量 (可信度测试)。

| 干扰 | 限 / [mg/l] |
|---------------------|------------|
| CrO_4^{2-} | 0,01 |
| MnO_2 | 0,01 |

方法验证

| | |
|------|-----------------|
| 检出限 | 0.01 mg/L |
| 测定下限 | 0.03 mg/L |
| 测量上限 | 2 mg/L |
| 灵敏度 | 1.68 mg/L / Abs |
| 置信范围 | 0.033 mg/L |
| 标准偏差 | 0.014 mg/L |
| 变异系数 | 1.34 % |

一致性

EN ISO 7393-2

^{a)} 测定余氯，总氯和结合氯



HR PP 氯

M111

0.1 - 8 mg/L Cl₂^{a)}

CL8

DPD

材料

所需材料 (部分可选) :

ZH

| 试剂 | 包装单位 | 货号 |
|-------------|-------------|--------|
| 游离氯 DPD F10 | 粉剂 / 100 片 | 530100 |
| 游离氯 DPD F10 | 粉剂 / 1000 片 | 530103 |
| 氯总量 DPD F10 | 粉剂 / 100 片 | 530120 |
| 氯总量 DPD F10 | 粉剂 / 1000 片 | 530123 |

取样

1. 在样本制备中，通过移液和摇动来避免氯的排气。
2. 取样后必须立即进行分析。

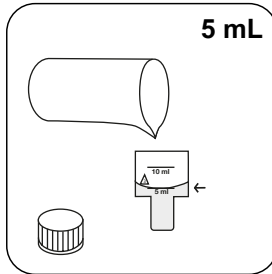
准备

1. 清洗比色杯：

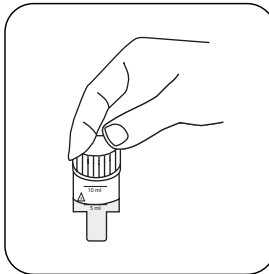
由于许多家用清洁剂（例如洗碗用洗涤剂）含有还原剂，所以测定的氯结果可能会不足。为了排除这种测量误差，玻璃器皿应无氯。为此，将玻璃器皿在次氯酸钠溶液（0.1 g/L）下存放 1 小时，然后用去离子水（软化水）彻底冲洗。
2. 对于游离氯和总氯的单独测定，使用一套相应单独的比色杯是有意义的（参见 EN ISO 7393-2，第 5.3 段）。
3. DPD 显色发生在 pH 值在 6.2 至 6.5 时。因此该试剂含有用于调节 pH 值的缓冲液。但在分析前（用 0.5 mol/l 硫酸或 1 mol/l 氢氧化钠溶液）必须将强碱性或酸性水的 pH 范围调节到 6 和 7 之间。

进行测定 余氯HR 粉剂法

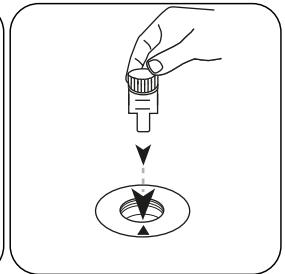
选择设备中的方法。



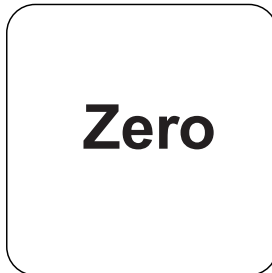
用 5 mL 样本填充 10 mm 比色杯。



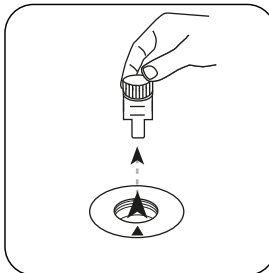
密封比色杯。



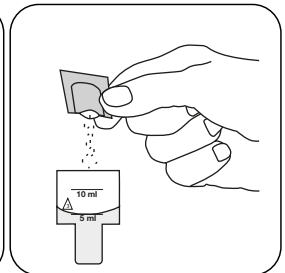
将样本比色杯放入测量轴中。注意定位。



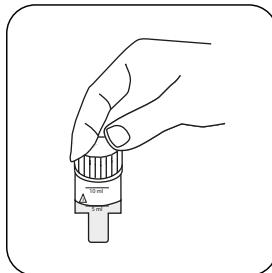
按下 **ZERO** 按钮。



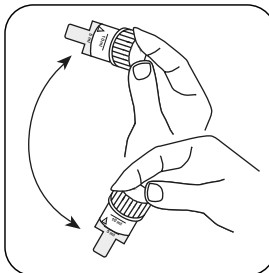
从测量轴上取下比色杯。



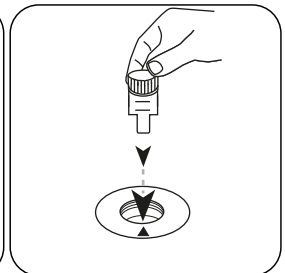
将两个 **Chlorine FREE-DPD / F10** 粉包 加入到样本中。



密封比色杯。



通过旋转混合内容物 (20 sec.) 。



将样本比色杯放入测量轴中。注意定位。

ZH



Test

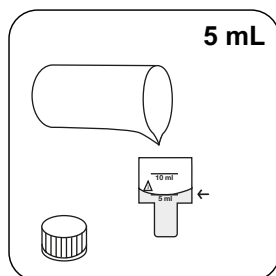
ZH

按下 **TEST (XD: START)** 按钮。

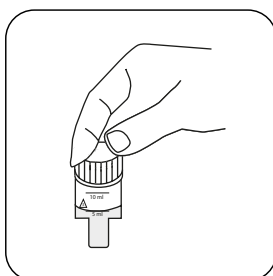
结果在显示屏上显示为 mg / l 余氯。

进行测定 总氯HR 粉剂法

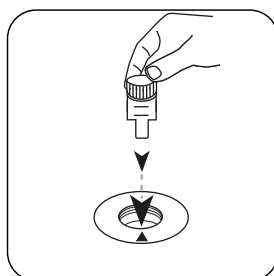
选择设备中的方法。



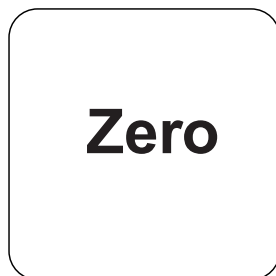
用 **5 mL** 样本填充 10 mm 比色杯。



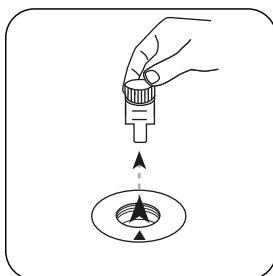
密封比色杯。



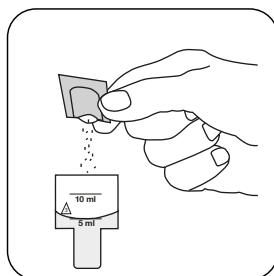
将样本比色杯放入测量轴中。注意定位。



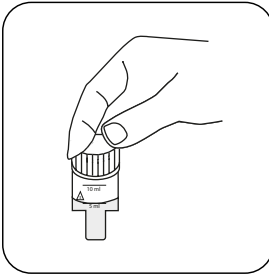
按下 **ZERO** 按钮。



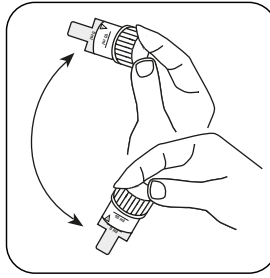
从测量轴上取下比色杯。



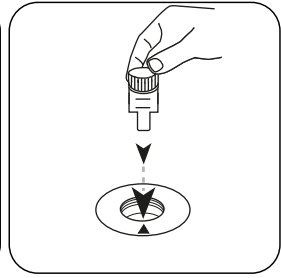
将两个 **Chlorine TOTAL-DPD / F10** 粉包 加入到样本中。



密封比色杯。

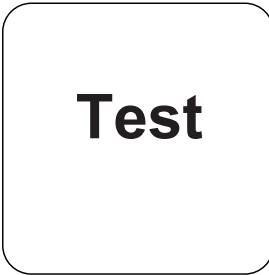


通过旋转混合内容物
(20 sec.)。

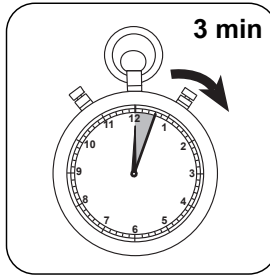


将样本比色杯放入测量轴中。
注意定位。

ZH



按下 **TEST** (XD: **START**) 按 等待 3 分钟反应时间。
钮。



反应时间结束后，自动进行测量。

结果在显示屏上显示为 mg / l 总氯。



化学方法

DPD

附录

ZH

干扰说明

持续干扰

- 存在于样本中的所有氧化剂都像氯一样反应，导致多重结果。

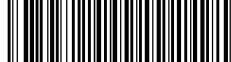
可消除干扰

- 铜和铁 (III) 的干扰必须通过 EDTA 消除。
- 在使用粉包时，高于 8 mg/L 氯的浓度可导致测量范围内的结果高达 0 mg/L。在这种情况下应用无氯水稀释样本。将 10 ml 稀释的样本与试剂混合并重复测量 (可信度测试) 。

一致性

EN ISO 7393-2

^{a)} 测定余氯，总氯和结合氯



T pH 值

M330

6.5 - 8.4 pH

PH

苯酚红

材料

所需材料 (部分可選) :

ZH

| 试剂 | 包装单位 | 货号 |
|-------|----------|----------|
| 酚红光度计 | 片剂 / 100 | 511770BT |
| 酚红光度计 | 片剂 / 250 | 511771BT |
| 酚红光度计 | 片剂 / 500 | 511772BT |

备注

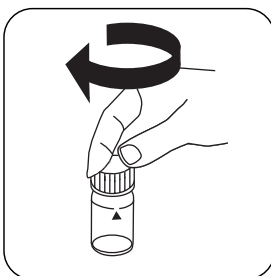
1. 对于光度 pH 值测定，只应使用标有 PHOTOMETER 的带有黑色烫印的 PHENOL RED 片剂。

进行测定 pH 值片剂

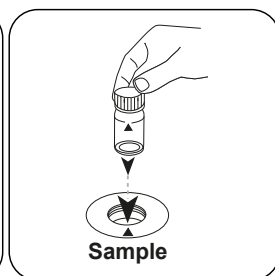
选择设备中的方法。



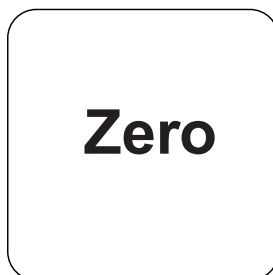
用 **10 mL** 样本填充 24 mm 比色杯。



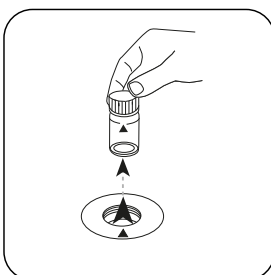
密封比色杯。



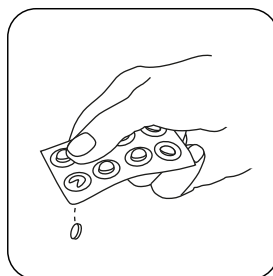
将样本比色杯放入测量轴中。注意定位。



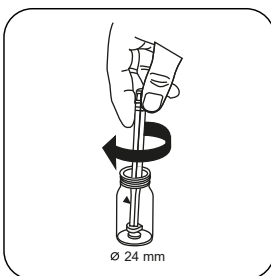
按下 **ZERO** 按钮。



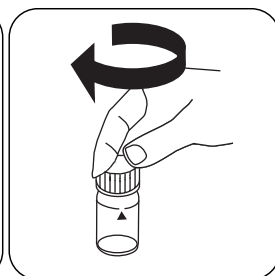
从测量轴上取下比色杯。



加入 **PHENOL RED PHOTOMETER** 片剂。

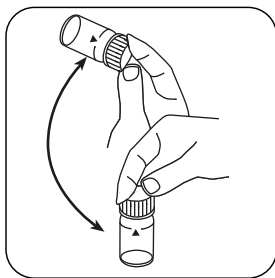


用轻微的扭转压碎片剂。

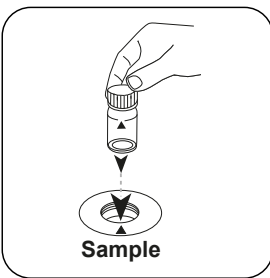


密封比色杯。

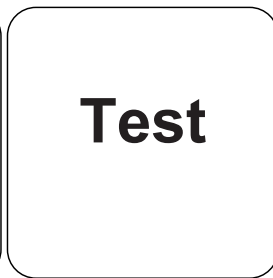
ZH



通过旋转溶解试剂。



将样本比色杯放入测量轴中。注意定位。



按下 **TEST (XD: START)** 按钮。

结果在显示屏上显示为 pH 值。

ZH

化学方法

苯酚红

附录

干扰说明

持续干扰

1. 碳酸盐硬度*低的水样可能会得出错误的 pH 值。
* $K_{S_{4,3}} < 0,7 \text{ mmol/l} \triangleq \text{总碱度} < 35 \text{ mg/L CaCO}_3$.

可消除干扰

1. pH 值低于 6.5 和高于 8.4 可导致测量范围内的结果。建议使用可信度测试 (pH 计)。
2. 盐误差：
对于盐含量高达 2 g/L，试剂片的盐含量不会引起明显的盐误差。对于较高的盐含量，测量值应进行如下校正：

| 样本的盐 含量以 g/ L 为单位 | 30 (海 水) | 60 | 120 | 180 |
|-------------------------|---------------------|---------------------|---------------------|---------------------|
| 校正 | -0,15 ¹⁾ | -0,21 ²⁾ | -0,26 ²⁾ | -0,29 ²⁾ |

¹⁾ 根据 Kolthoff (1922)

²⁾ 根据 Parson 和 Douglas (1926)

参考文献

Colorimetric Chemical Analytical Methods, 9th Edition, London



L pH 值

M331

6.5 - 8.4 pH

PH

苯酚红

材料

所需材料 (部分可选) :

ZH

| 试剂 | 包装单位 | 货号 |
|-----------|--------|--------|
| 酚红溶液 | 15 mL | 471040 |
| 酚红溶液 | 100 mL | 471041 |
| 酚红溶液 6 件装 | 1 片 | 471046 |

准备

1. 由于液滴大小不同, 测量结果可能会比使用片剂时有更大的偏差。使用移液管 (0.18 ml 相当于 6 滴) 时这种偏差可以最小化。

备注

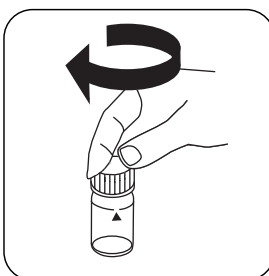
1. 使用后滴瓶必须立即用相同颜色的瓶盖重新密封。
2. 将试剂冷藏在 +6 °C 至 +10 °C。

进行测定 pH 值液剂

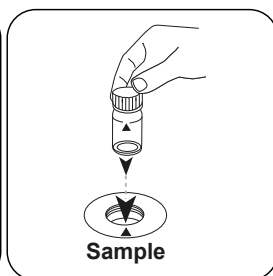
选择设备中的方法。



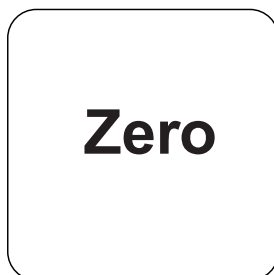
用 **10 mL** 样本填充 24 mm 比色杯。



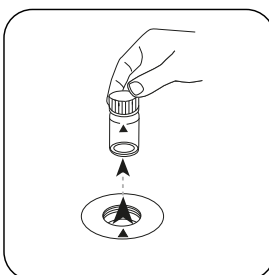
密封比色杯。



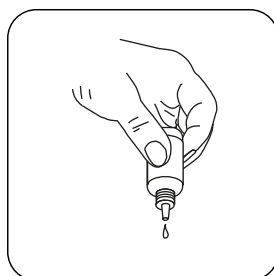
将样本比色杯放入测量轴中。注意定位。



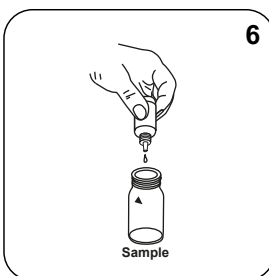
按下 **ZERO** 按钮。



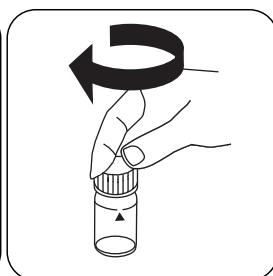
从测量轴上取下比色杯。



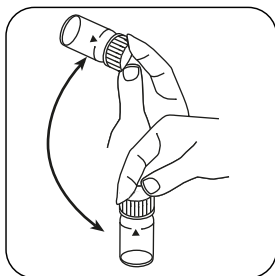
垂直握住滴瓶，慢慢加入相同大小的滴剂。



将 **6 滴 PHENOL Red-Lösung** 添加到样本比色杯中。



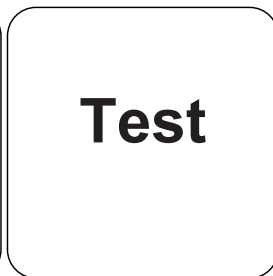
密封比色杯。



通过旋转混合内容物。



将样本比色杯放入测量轴中。注意定位。



按下 **TEST (XD: START)** 按钮。

结果在显示屏上显示为 pH 值。

化学方法

苯酚红

附录

干扰说明

可消除干扰

1. 盐误差：通过盐含量校正样本的测量值（平均值）：

| 样本盐含量 | 校正 |
|-------------|---------------------|
| 30 g/L (海水) | -0,15 ¹⁾ |
| 60 g/L | -0,21 ²⁾ |
| 120 g/L | -0,26 ²⁾ |
| 180 g/L | -0,29 ²⁾ |

¹⁾根据 Kolthoff (1922)

²⁾根据 Parson 和 Douglas (1926)

3. 分析氯化水时存在的残余氯含量会影响液体试剂的显色反应。在添加 PHENOL RED 溶液之前，向样本溶液中加入一小块硫代硫酸钠晶体 ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$) 来防止这种情况。

参考文献

Colorimetric Chemical Analytical Methods, 9th Edition, London

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