

# Lovibond® Water Testing

Tintometer® Group



## Manual of Methods

MD 100 • MD 110 • MD 200

Alkalinity-m | Chlorine | Hardness | pH

**(EN) Manual of Methods**

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**(ES) Manual de Métodos**

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**(IT) Manuale dei Metodi**

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**(NL) Handboek Methoden**

Zijde 282

**(DE) Methodenhandbuch**

Seite 50

**(FR) Méthodes Manuel**

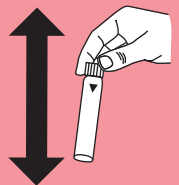
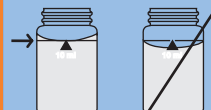
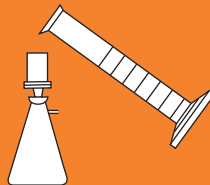
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**(PT) Métodos Manual**


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**(ZH) 方法手册**

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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

**K<sub>S4.3</sub> T**  
0.1 - 4 mmol/l K<sub>S4.3</sub>  
Acid / Indicator

**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 <sub>S4.3</sub>
SpectroDirect, XD 7000, XD 7500	ø 24 mm	615 nm	0.1 - 4 mmol/l K <sub>S4.3</sub>

**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<sub>S4.3</sub> 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

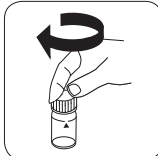
### Implementation of the provision Acid capacity $K_{S4.3}$ with Tablet

Select the method on the device

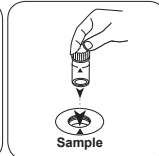
For this method, no ZERO measurements are to be carried out with the following devices: XD 7000, XD 7500



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

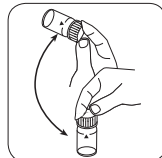


Close vial(s).

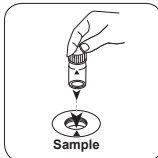


Place **sample vial** in the sample chamber. • Pay attention to the positioning.

• • •



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  $K_{S4.3}$  appears on the display.



Alkalinity-m T

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

Acid / Indicator

EN

## Material

Required material (partly optional):

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

## Notes

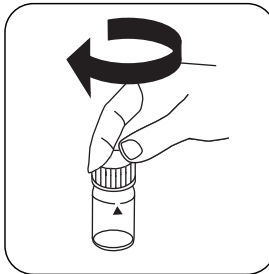
1. The terms Alkalinity-m, m-Value, total alkalinity and Acid demand to  $K_{S4.3}$  are identical.
2. For accurate results, exactly 10 ml of water sample must be used for the test.

## Determination of Alkalinity, total = Alkalinity-m = m-Value with Tablet

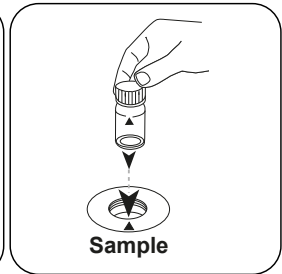
Select the method on the device.



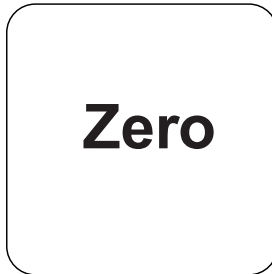
Fill 24 mm vial with **10 mL sample**.



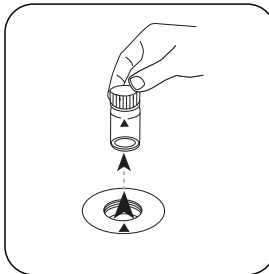
Close vial(s).



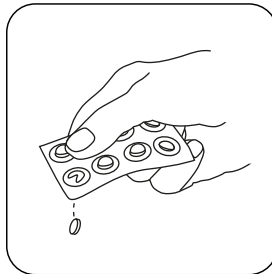
Place **sample vial** in the sample chamber. Pay attention to the positioning.



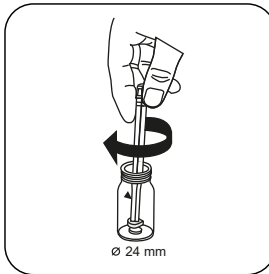
Press the **ZERO** button.



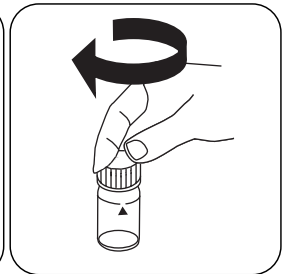
Remove the vial from the sample chamber.



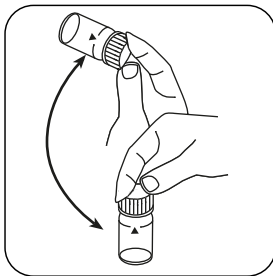
Add **ALKA-M-PHOTOMETER** tablet.



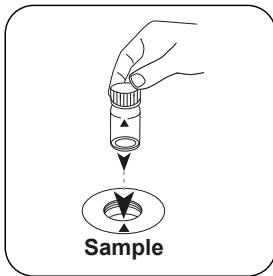
Crush tablet(s) by rotating slightly.



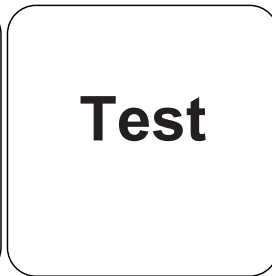
Close vial(s).



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 Alkalinity-m appears on the display.

EN

## Analyses

The following table identifies the output values can be converted into other citation forms.

Unit	Cite form	Scale Factor
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4,3</sub>	0.02

EN

## Chemical Method

Acid / Indicator

## Appendix

**Derived from**

EN ISO 9963-1





Chlorine T

M100

0.01 - 6.0 mg/L Cl<sub>2</sub> <sup>a)</sup>

CL6

DPD

## Material

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Required material (partly optional):

Reagents	Packaging Unit	Part Number
DPD No.1	Tablet / 100	511050BT
DPD No. 1	Tablet / 250	511051BT
DPD No. 1	Tablet / 500	511052BT
DPD No. 3	Tablet / 100	511080BT
DPD No. 3	Tablet / 250	511081BT
DPD No. 3	Tablet / 500	511082BT
DPD No. 1 High Calcium <sup>e)</sup>	Tablet / 100	515740BT
DPD No. 1 High Calcium <sup>e)</sup>	Tablet / 250	515741BT
DPD No. 1 High Calcium <sup>e)</sup>	Tablet / 500	515742BT
DPD No. 3 High Calcium <sup>e)</sup>	Tablet / 100	515730BT
DPD No. 3 High Calcium <sup>e)</sup>	Tablet / 250	515731BT
DPD No. 3 High Calcium <sup>e)</sup>	Tablet / 500	515732BT
DPD No. 4	Tablet / 100	511220BT
DPD No. 4	Tablet / 250	511221BT
DPD No. 4	Tablet / 500	511222BT
DPD No. 3 Evo	Tablet / 100	511420BT
DPD No. 3 Evo	Tablet / 250	511421BT
DPD No. 3 Evo	Tablet / 500	511422BT
DPD No. 4 Evo	Tablet / 100	511970BT
DPD No. 4 Evo	Tablet / 250	511971BT
DPD No. 4 Evo	Tablet / 500	511972BT

## 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).

## Notes

1. Evo tablets can be used as an alternative to the corresponding standard tablet (e.g. DPD No.3 Evo instead of DPD No.3).

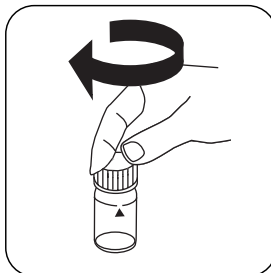


## Determination of free chlorine with tablet

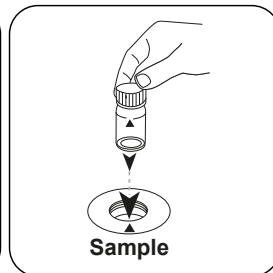
Select the method on the device.



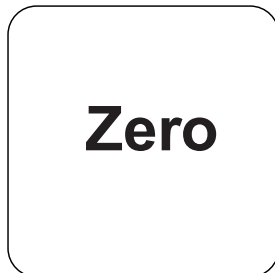
Fill 24 mm vial with **10 mL sample**.



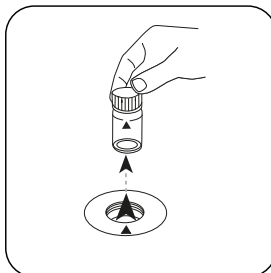
Close vial(s).



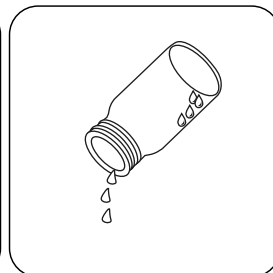
Place **sample vial** in the sample chamber. Pay attention to the positioning.



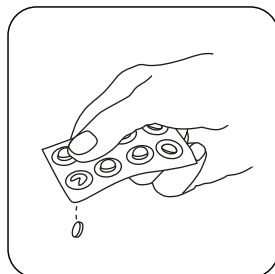
Press the **ZERO** button.



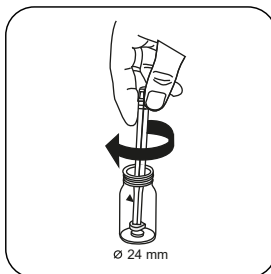
Remove the vial from the sample chamber.



Empty vial except for a few drops.



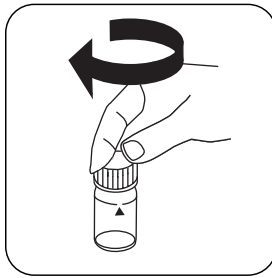
Add **DPD No. 1 tablet**.



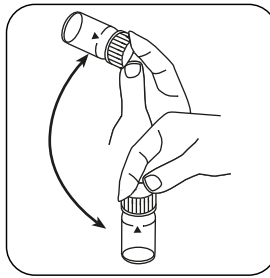
Crush tablet(s) by rotating slightly.



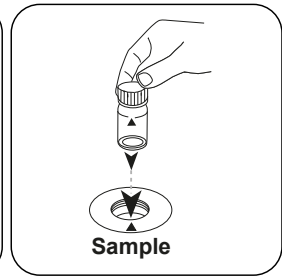
Fill up vial with **sample** to the **10 mL mark**.



Close vial(s).



Dissolve tablet(s) by inverting.



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

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## Test

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

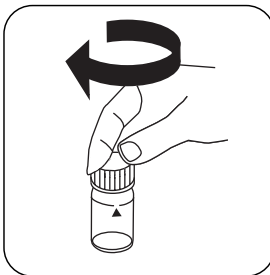
The result in mg/L free chlorine appears on the display.

### Determination of total Chlorine with tablet

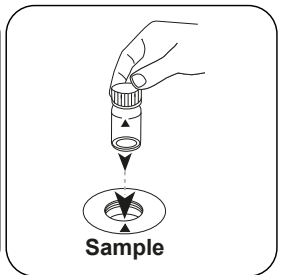
Select the method on the device.



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



Close vial(s).

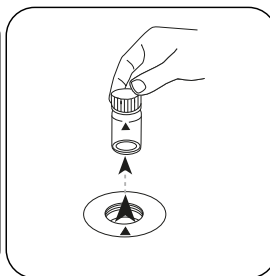


Place **sample vial** in the sample chamber. Pay attention to the positioning.

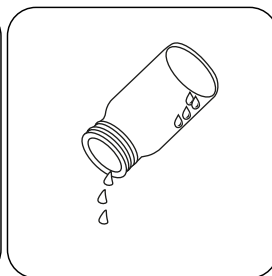


# Zero

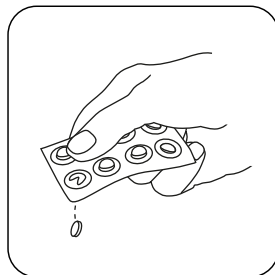
Press the **ZERO** button.



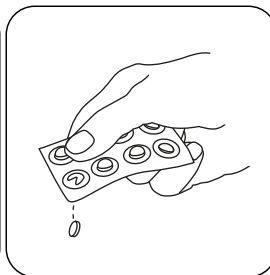
Remove the vial from the sample chamber.



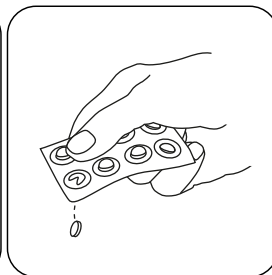
Empty vial except for a few drops.



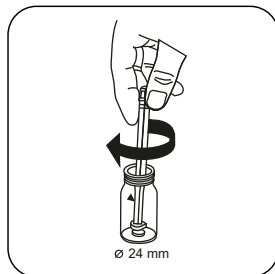
Add **DPD No. 1** tablet .



Add **DPD No. 3** tablet .



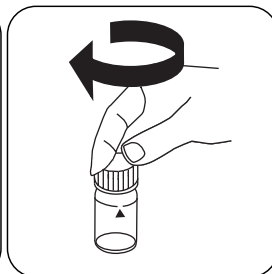
**As an alternative to DPD No. 1 and No. 3 tablets, a DPD No. 4 tablet can be added.**



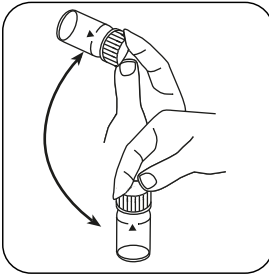
Crush tablet(s) by rotating slightly.



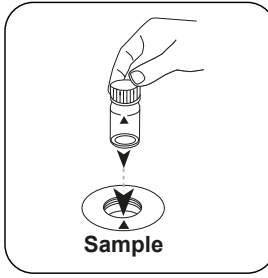
Fill up vial with **sample** to the **10 mL** mark.



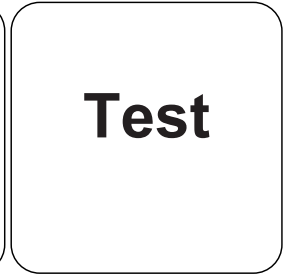
Close vial(s).



Dissolve tablet(s) by inverting.

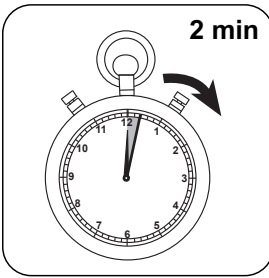


Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

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Wait for **2 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

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### 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.
- The use of reagent tablets in samples with high calcium content\* and/or high conductivity\* can lead to turbidity of the sample and therefore incorrect measurements. In this case, the alternative reagent tablet DPD No.1 High Calcium and reagent tablet DPD No.3 High Calcium should be used.  
\*it is not possible to give exact values, because the development of turbidity depends on the composition and nature of the sample.
- Concentrations above 10 mg/L chlorine, in the event of using fluid reagents, can lead to results within the measuring range of up to 0 mg/L. In the event of a high concentration of chlorine, 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]
$\text{CrO}_4^{2-}$	0.01
$\text{MnO}_2$	0.01

### Method Validation

Limit of Detection	0.02 mg/L
Limit of Quantification	0.06 mg/L
End of Measuring Range	6 mg/L
Sensitivity	2.05 mg/L / Abs
Confidence Intervall	0.04 mg/L
Standard Deviation	0.019 mg/L
Variation Coefficient	0.87 %

#### Conformity

EN ISO 7393-2



<sup>a)</sup> determination of free, combined and total | <sup>a)</sup> alternative reagent, used instead of DPD No.1/No.3 in case of turbidity in the water sample caused by high concentration of calcium and/or high conductivity



**Chlorine L****M101****0.02 - 4.0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD****Material**

EN

Required material (partly optional):

<b>Reagents</b>	<b>Packaging Unit</b>	<b>Part Number</b>
DPD 1 Buffer Solution, Blue Bottle	15 mL	471010
DPD 1 Buffer Solution	100 mL	471011
DPD 1 Buffer Solution	1 pc.	471016
DPD 1 Reagent Solution, Green Bottle	15 mL	471020
DPD 1 Reagent Solution	100 mL	471021
DPD 1 Reagent Solution	1 pc.	471026
DPD 3 Solution, Red Bottle	15 mL	471030
DPD 3 Solution	100 mL	471031
DPD 3 Solution	1 pc.	471036
DPD Reagent Set	1 pc.	471056

**Available Standards**

<b>Title</b>	<b>Packaging Unit</b>	<b>Part Number</b>
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).

## Notes

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

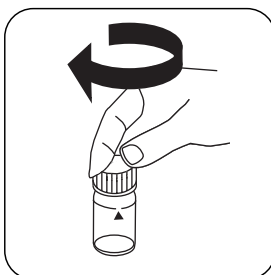


## Determination of free chlorine with liquid reagent

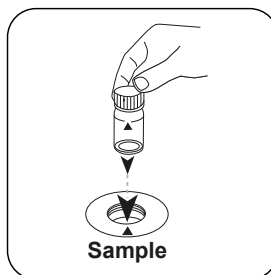
Select the method on the device.



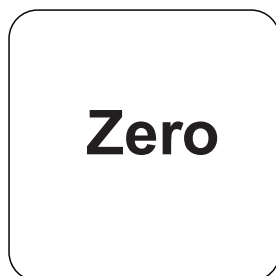
Fill 24 mm vial with **10 mL sample**.



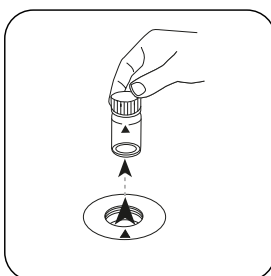
Close vial(s).



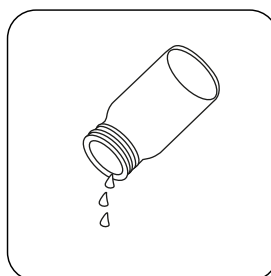
Place **sample vial** in the sample chamber. Pay attention to the positioning.



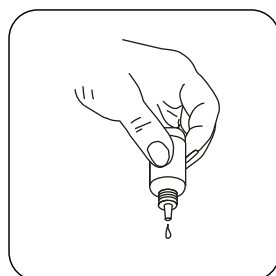
Press the **ZERO** button.



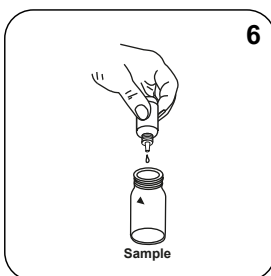
Remove the vial from the sample chamber.



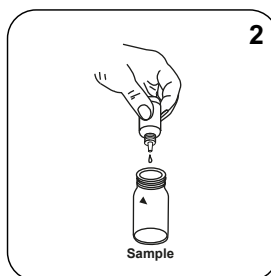
Empty vial.



Hold cuvettes vertically and add equal drops by pressing slowly.



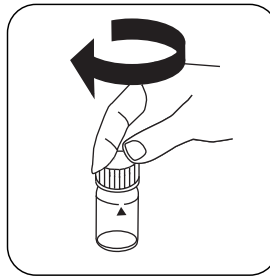
Add **6 drops DPD 1 Buffer Solution** to the **sample vial**.



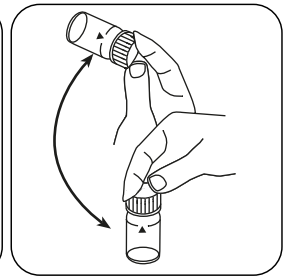
Add **2 drops DPD 1 Reagent Solution** to the **sample vial**.



Fill up vial with **sample** to the **10 mL** mark.

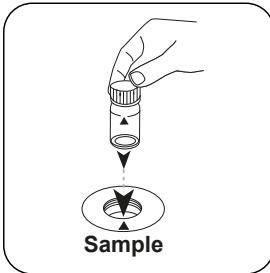


Close vial(s).

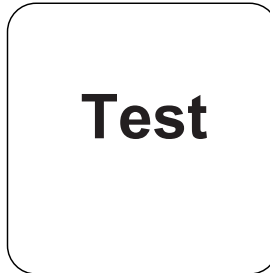


Invert several times to mix the contents.

EN



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



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

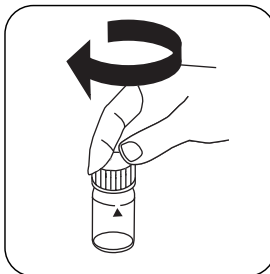
The result in mg/L free chlorine appears on the display.

### Determination of totale Chlorine with liquid reagent

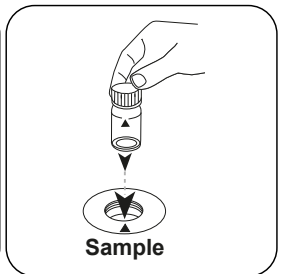
Select the method on the device.



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



Close vial(s).

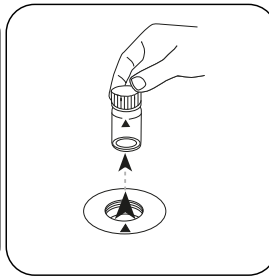


Place **sample vial** in the sample chamber. Pay attention to the positioning.

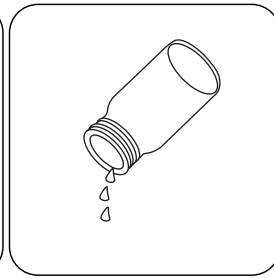


# Zero

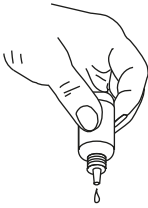
Press the **ZERO** button.



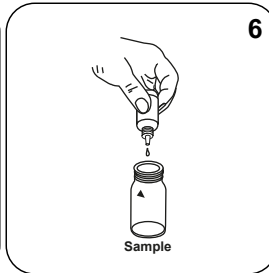
Remove the vial from the sample chamber.



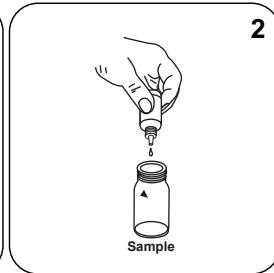
Empty vial.



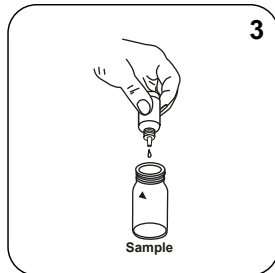
Hold cuvettes vertically and add equal drops by pressing slowly.



Add **6 drops DPD 1 Buffer Solution** to the sample vial.



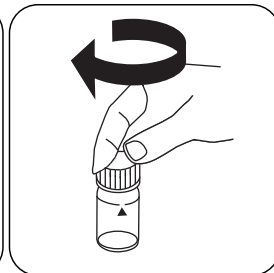
Add **2 drops DPD 1 Reagent Solution** to the sample vial.



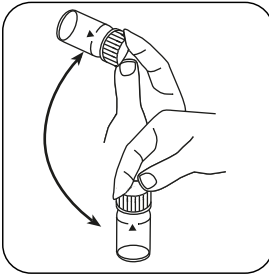
Add **3 drops DPD 3 Solution** to the sample vial.



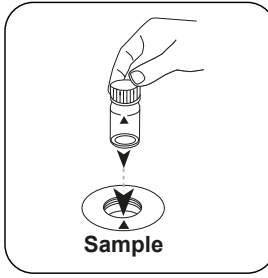
Fill up vial with **sample** to the **10 mL mark**.



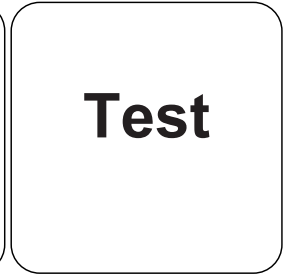
Close vial(s).



Invert several times to mix the contents.

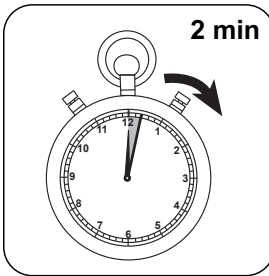


Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

EN



Wait for **2 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 4 mg/L Chlorine, in the event of using fluid reagents, 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]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

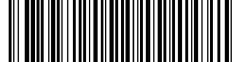
#### Conformity

EN ISO 7393-2

<sup>a)</sup> determination of free, combined and total







Chlorine HR (KI) T

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

KI / Acid

## Material

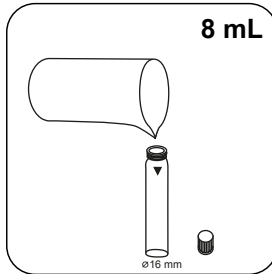
EN

Required material (partly optional):

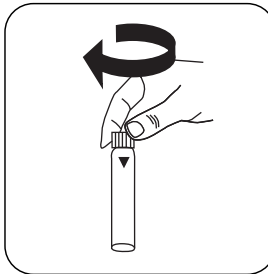
Reagents	Packaging Unit	Part Number
Chlorine HR (KI)	Tablet / 100	513000BT
Chlorine HR (KI)	Tablet / 250	513001BT
Acidifying GP	Tablet / 100	515480BT
Acidifying GP	Tablet / 250	515481BT
Set Chlorine HR (KI)/Acidifying GP 100 Pc. #	100 each	517721BT
Set Chlorine HR (KI)/Acidifying GP 250 Pc. #	250 each	517722BT
Chlorine HR (KI)	Tablet / 100	501210
Chlorine HR (KI)	Tablet / 250	501211

## Determination of Chlorine HR (KI) with Tablet

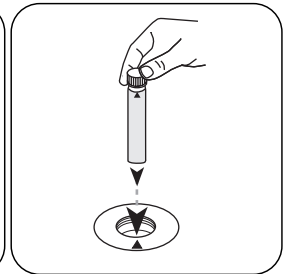
Select the method on the device.



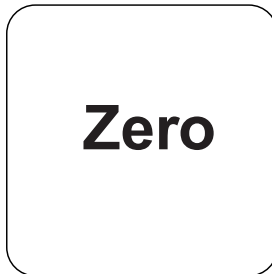
Fill 16 mm vial with **8 mL sample**.



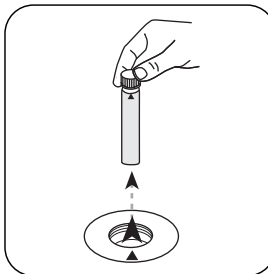
Close vial(s).



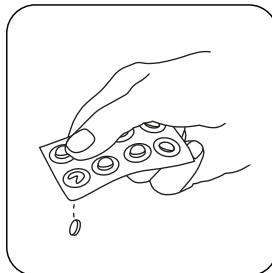
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



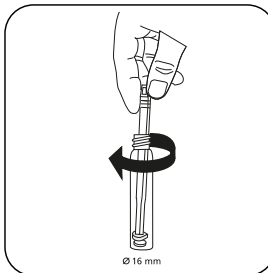
Press the **ZERO** button.



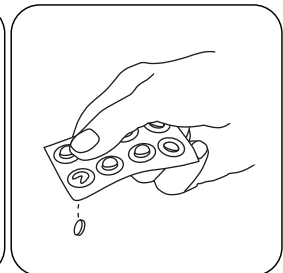
Remove **vial** from the sample chamber.



Add **Chlorine HR (KI) tablet**.



Crush tablet(s) by rotating slightly.

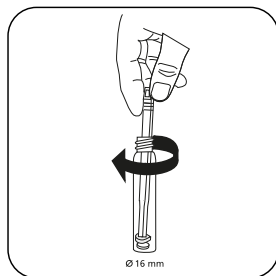


Add **ACIDIFYING GP tablet**.

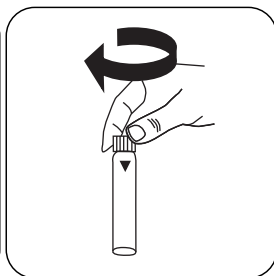
EN



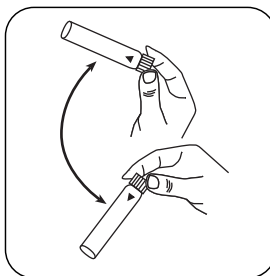
EN



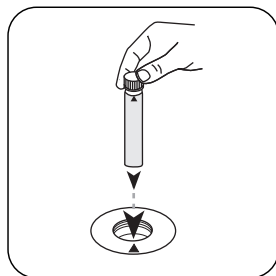
Crush tablet(s) by rotating slightly.



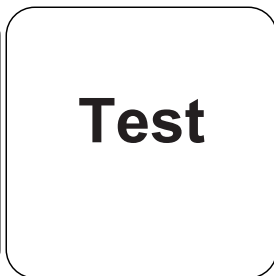
Close vial(s).



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 mg/L Chlorine appears on the display.

## Chemical Method

KI / Acid

## Appendix

### Interferences

#### Persistent Interferences

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

### Method Validation

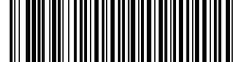
<b>Limit of Detection</b>	1.29 mg/L
<b>Limit of Quantification</b>	3.86 mg/L
<b>End of Measuring Range</b>	200 mg/L
<b>Sensitivity</b>	83.96 mg/L / Abs
<b>Confidence Intervall</b>	1.14 mg/L
<b>Standard Deviation</b>	0.45 mg/L
<b>Variation Coefficient</b>	0.45 %

#### Derived from

EN ISO 7393-3

\* including stirring rod, 10 cm

EN



Chlorine MR PP

M113

0.02 - 3.5 mg/L Cl<sub>2</sub> <sup>a)</sup>

CL2

DPD

EN

## Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Chlorine Free DPD F10	Powder / 100 pc.	530180
VARIO Chlorine Free DPD F10	Powder / 1000 pc.	530183
VARIO Chlorine Total DPD F10	Powder / 100 pc.	530190
VARIO Chlorine Total DPD F10	Powder / 1000 pc.	530193

## 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).



## Notes

1. The powder reagents used are marked in blue for easy identification. The powder for the determination of free chlorine carries a closed and a dotted line. The powder for the determination of total chlorine has two closed lines.



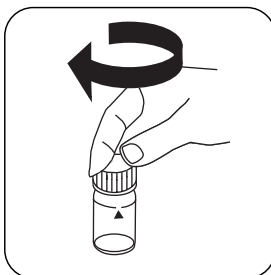
## Determination of free chlorine MR, with powder pack

Select the method on the device.

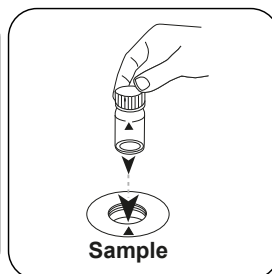
In addition, choose the test: free



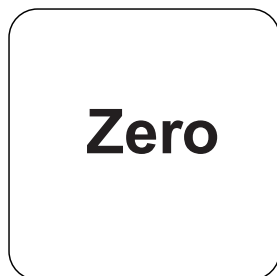
Fill 24 mm vial with **10 mL sample**.



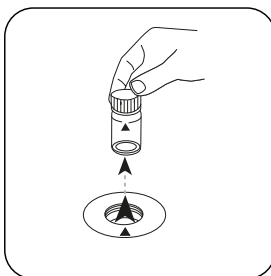
Close vial(s).



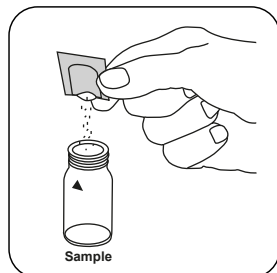
Place **sample vial** in the sample chamber. Pay attention to the positioning.



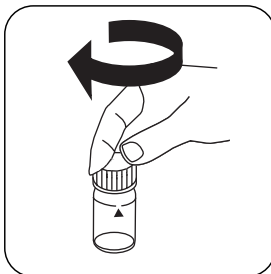
Press the **ZERO** button.



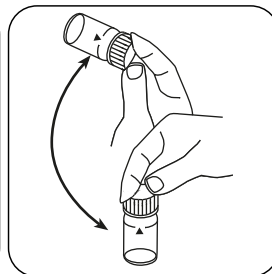
Remove the vial from the sample chamber.



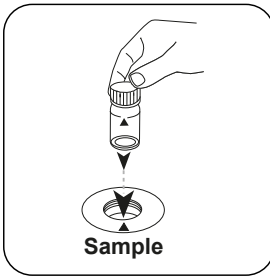
Add **VARIO Chlorine FREE-DPD/ F10 powder pack**.



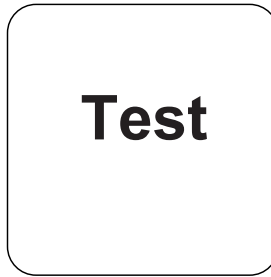
Close vial(s).



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.

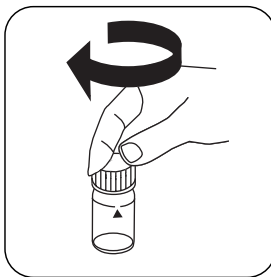
### Determination of Chlorine differentiated MR with powder packs

Select the method on the device.

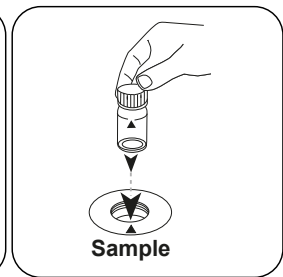
In addition, choose the test: differentiated



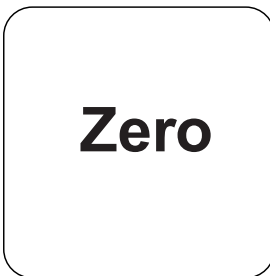
Fill 24 mm vial with **10 mL sample**.



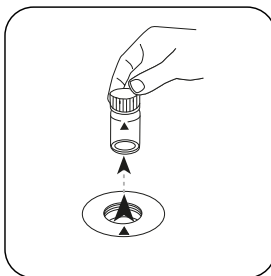
Close vial(s).



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

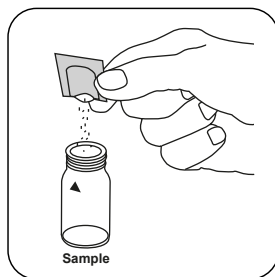


Press the **ZERO** button.

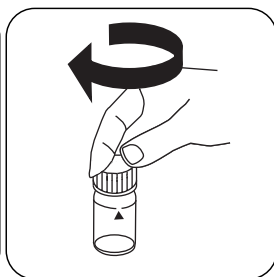


Remove the vial from the sample chamber.

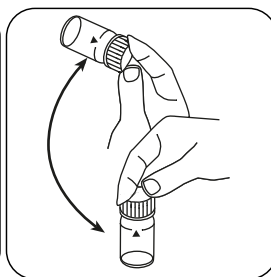




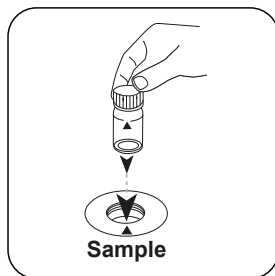
Add **VARIO Chlorine FREE-DPD/ F10 powder pack**.



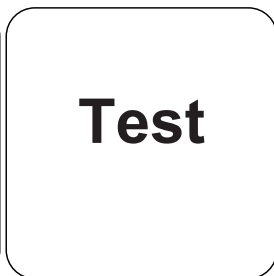
Close vial(s).



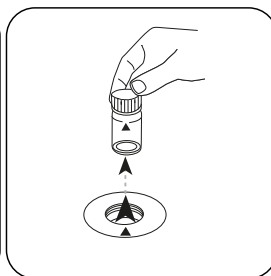
Invert several times to mix the contents (20 sec.).



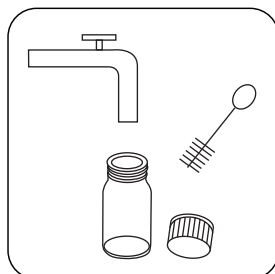
Place **sample vial** in the sample chamber. Pay attention to the positioning.



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



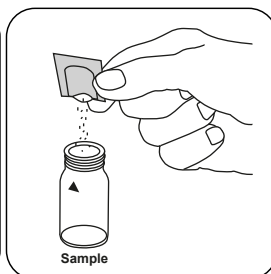
Remove the vial from the sample chamber.



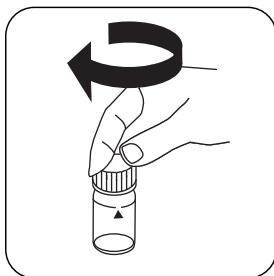
Thoroughly clean the vial and vial cap.



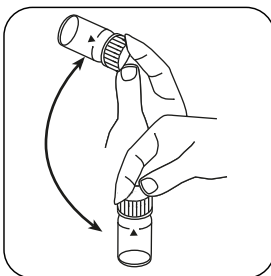
Fill 24 mm vial with **10 mL sample**.



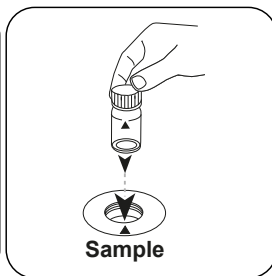
Add **Chlorine TOTAL-DPD/ F10 powder pack**.



Close vial(s).

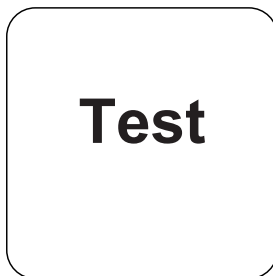


Invert several times to mix the contents (20 sec.).

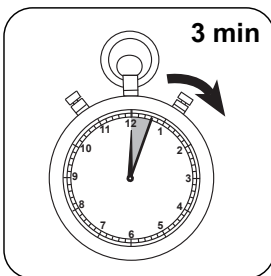


Place **sample vial** in the sample chamber. Pay attention to the positioning.

EN



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 free chlorine, combined chlorine, total chlorine appears on the display.

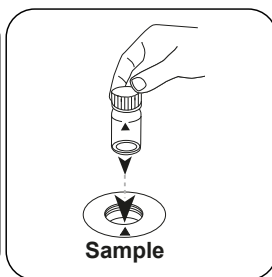
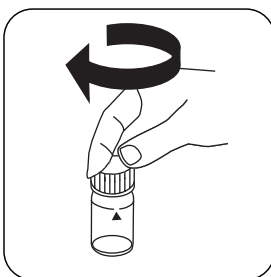
### Determination of total Chlorine MR with powder packs

Select the method on the device.

In addition, choose the test: total



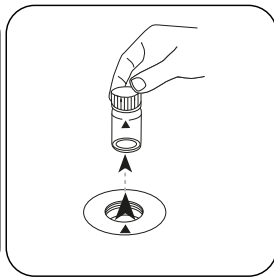
Fill 24 mm vial with **10 mL sample**. Close vial(s).



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

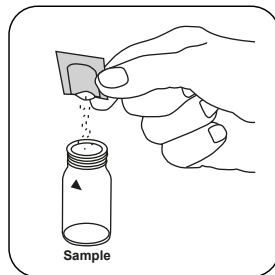


# Zero

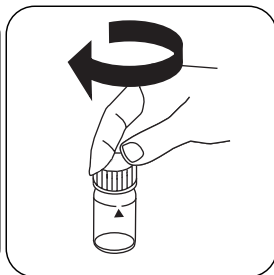


Press the **ZERO** button.

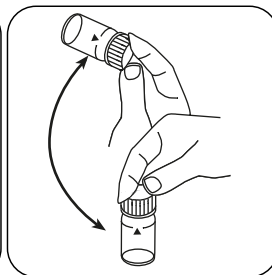
Remove the vial from the sample chamber.



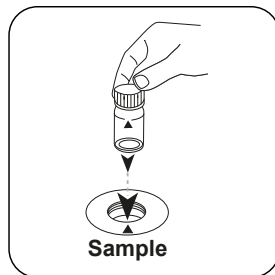
Add **VARIO Chlorine TOTAL-DPD/ F10 powder pack**.



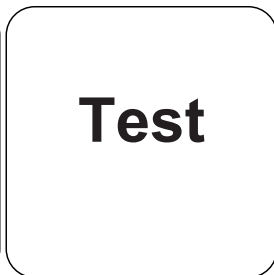
Close vial(s).



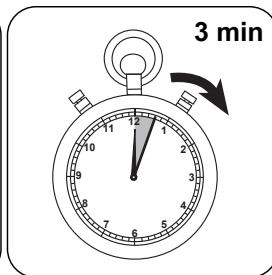
Invert several times to mix the contents (20 sec.).



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.

## Chemical Method

DPD

## Interferences

### Persistent Interferences

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

### Removeable Interferences

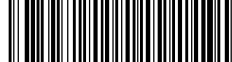
- Interference from copper and iron (III) are eliminated by the addition of EDTA.
- Concentrations above 4 mg/L chlorine, in the event of using Powder Packs, can lead to results within the measuring range of up to 0 mg/L. In this case, the sample must be diluted with chlorine-free water. 10 mL of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

Interference	from / [mg/L]
CrO <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

## Method Validation

Limit of Detection	0.01 mg/L
Limit of Quantification	0.03 mg/L
End of Measuring Range	3.5 mg/L
Sensitivity	1.7 mg/L / Abs
Confidence Intervall	0.014 mg/L
Standard Deviation	0.006 mg/L
Variation Coefficient	0.34 %

<sup>a)</sup> determination of free, combined and total



Hardness Calcium (B) T

M191

20 - 500 mg/L CaCO<sub>3</sub>

CAH

Murexide

EN

## Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Set Calcio H No. 1/No. 2 100 Pc.#	100 each	517761BT
Set Calcio H No. 1/No. 2 250 Pc.#	250 each	517762BT

## Preparation

1. Strong alkaline or acidic water samples should be adjusted between pH 4 and pH 10 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

## Notes

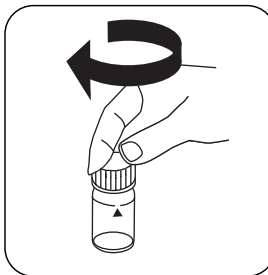
1. To optimise the readings, an optional batch-specific blind value method can be performed (see photometer description).
2. For accurate results, exactly 10 ml of water sample must be used for the test.
3. This method was developed from a volumetric procedure. Due to undefined boundary conditions, deviations from the standardised method may be greater.
4. The method works in the high measuring range with greater tolerances than in the low measuring range. When diluting samples, always measure in the first third of the range.

## Determination of Hardness Calcium 2 with Tablet

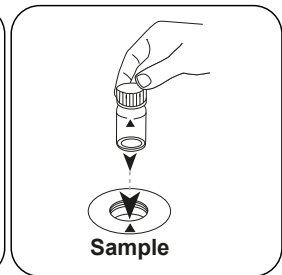
Select the method on the device.



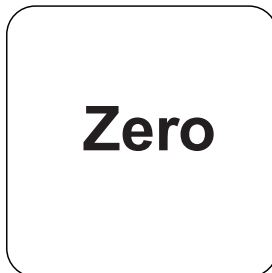
Fill 24 mm vial with **10 mL sample**.



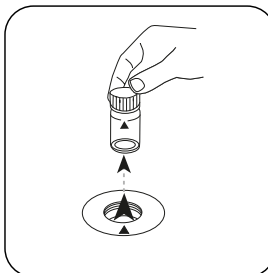
Close vial(s).



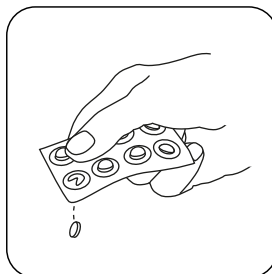
Place **sample vial** in the sample chamber. Pay attention to the positioning.



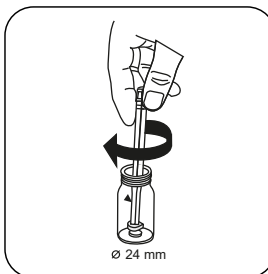
Press the **ZERO** button.



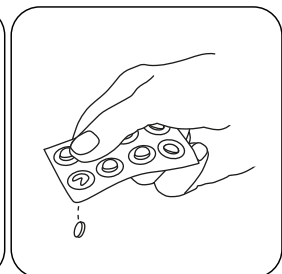
Remove the vial from the sample chamber.



Add **CALCIO H No.1 tablet**



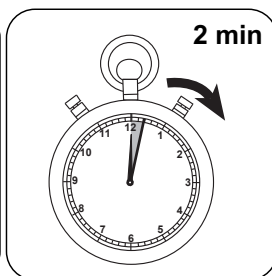
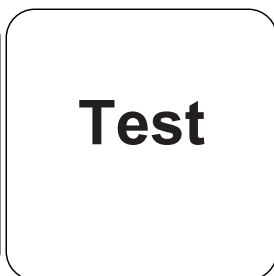
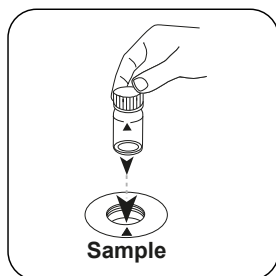
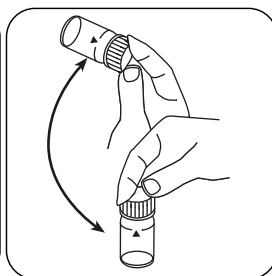
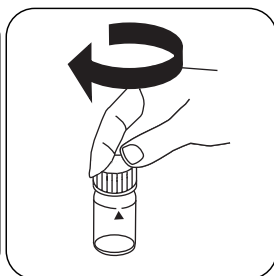
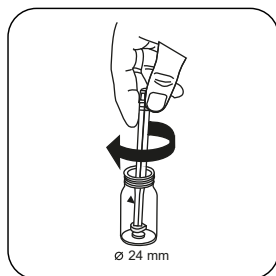
Crush tablet(s) by rotating slightly and dissolve.



Add **CALCIO H No.2 tablet**



EN



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

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

Wait for **2 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically. The result in Calcium Hardness appears on the display.

## Analyses

The following table identifies the output values can be converted into other citation forms.

Unit	Cite form	Scale Factor
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

EN

## Chemical Method

Murexide

## Appendix

### Interferences

#### Persistent Interferences

1. Silver, mercury, cadmium, cobalt and copper interfere with the test result.

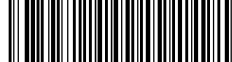
Interference	from / [mg/L]
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

### Bibliography

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

\* including stirring rod, 10 cm





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

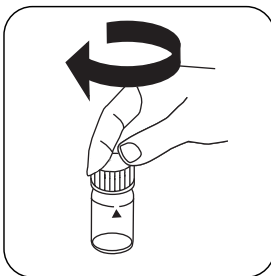
1. For photometric determination of pH values only use PHENOL RED tablets in black printed foil pack and marked with PHOTOMETER.

## Determination of pH-value with Tablet

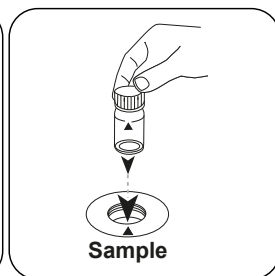
Select the method on the device.



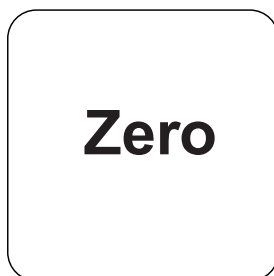
Fill 24 mm vial with **10 mL sample**.



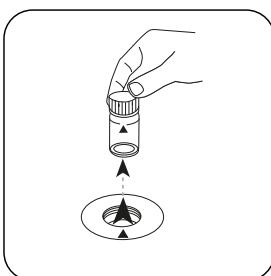
Close vial(s).



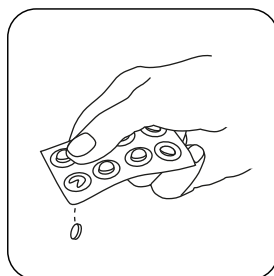
Place **sample vial** in the sample chamber. Pay attention to the positioning.



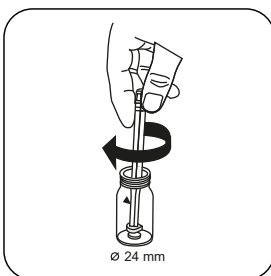
Press the **ZERO** button.



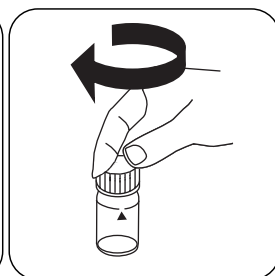
Remove the vial from the sample chamber.



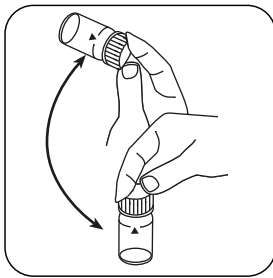
Add **PHENOL RED PHOTOMETER** tablet.



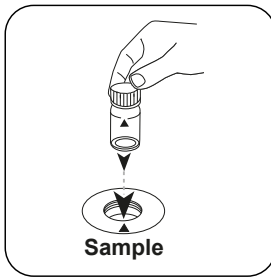
Crush tablet(s) by rotating slightly.



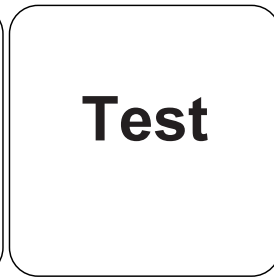
Close vial(s).



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:

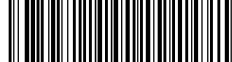
Salt content per sample in g/L	30 (seawater)	60	120	180
Correction	-0.15 <sup>1)</sup>	-0.21 <sup>2)</sup>	-0.26 <sup>2)</sup>	-0.29 <sup>2)</sup>

<sup>1)</sup> according to Kolthoff (1922)

<sup>2)</sup> 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

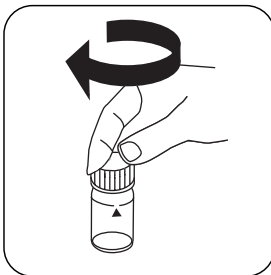
1. After use, ensure the cuvette is once again closed with the same-coloured screw caps.
2. Reagents are to be stored in the cool at +6 °C to +10 °C.

## Determination of pH-value with liquid reagent

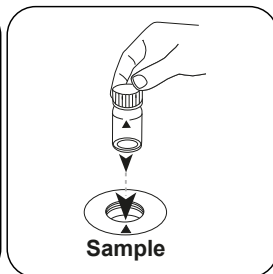
Select the method on the device.



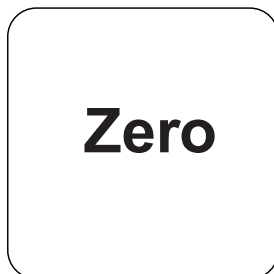
Fill 24 mm vial with **10 mL sample**.



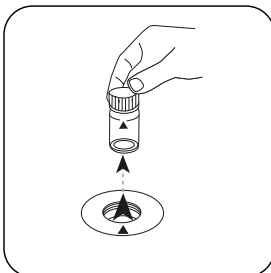
Close vial(s).



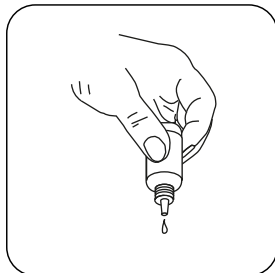
Place **sample vial** in the sample chamber. Pay attention to the positioning.



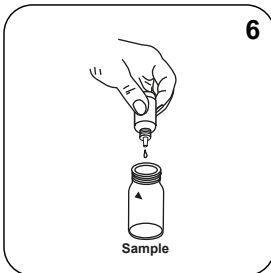
Press the **ZERO** button.



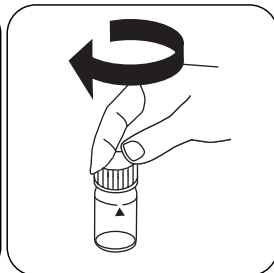
Remove the vial from the sample chamber.



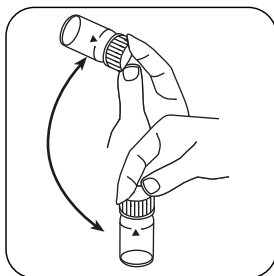
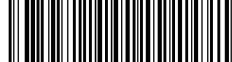
Hold cuvettes vertically and add equal drops by pressing slowly.



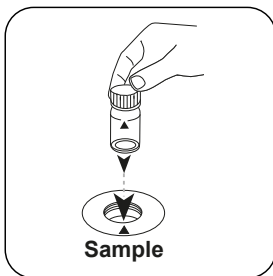
Add **6 drops PHENOL Red-Lösung** to the **sample vial**.



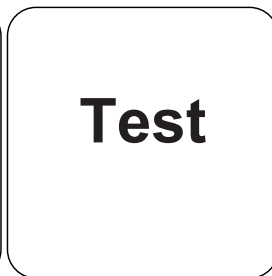
Close vial(s).



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 <sup>1)</sup>
	60 g/L	-0.21 <sup>2)</sup>
	120 g/L	-0.26 <sup>2)</sup>
	180 g/L	-0.29 <sup>2)</sup>
	<sup>1)</sup> according to Kolthoff (1922)	<sup>2)</sup> 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

Säure / Indikator

Displayanzeige im MD 100 MD 110 / MD 200

**Instrumentenspezifische Informationen**

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

Geräte	Küvette	$\lambda$	Messbereich
MD 200, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630	ø 24 mm	610 nm	0,1 - 4 mmol/l $K_{S4.3}$
SpectroDirect, XD 7000, XD 7500	ø 24 mm	615 nm	0,1 - 4 mmol/l $K_{S4.3}$

**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  $K_{S4.3}$  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

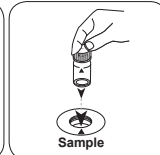
Durchführung der  
Messung**Durchführung der Bestimmung Säurekapazität  $K_{s4,3}$  mit Tablette**

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.

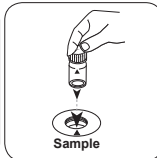
Küvette(n) verschließen.

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  $K_{s4,3}$ .



Alkalität-m T

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

Säure / Indikator

DE

## Material

Benötigtes Material (zum Teil optional):

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

## Anmerkungen

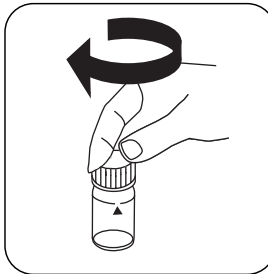
1. Die Begriffe Alkalität-m, m-Wert, Gesamtalkalität und Säurekapazität  $K_{s4,3}$  sind identisch.
2. Die exakte Einhaltung des Probevolumens von 10 ml ist für die Genauigkeit des Analyseergebnisses entscheidend.

## Durchführung der Bestimmung Alkalität, total= Alkalität-m = m-Wert mit Tablette

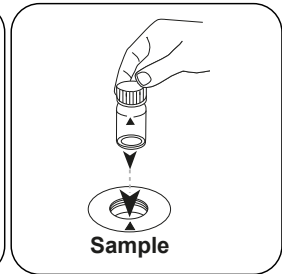
Die Methode im Gerät auswählen.



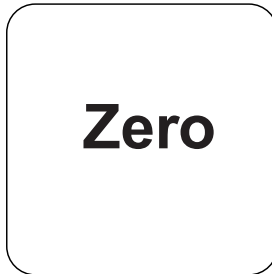
24-mm-Küvette mit **10 mL Probe** füllen.



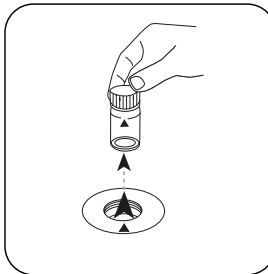
Küvette(n) verschließen.



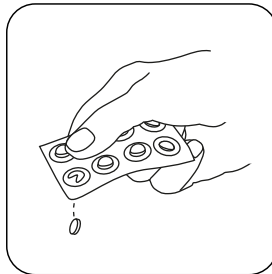
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



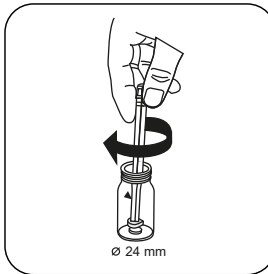
Taste **ZERO** drücken.



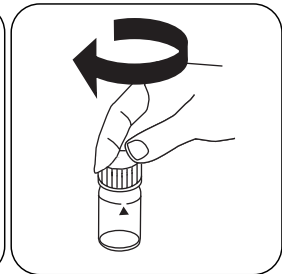
Küvette aus dem Messschacht nehmen.



Eine **ALKA-M-PHOTOMETER Tablette** zugeben.

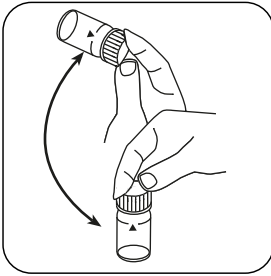


Tablette(n) unter leichter Drehung zerdrücken.

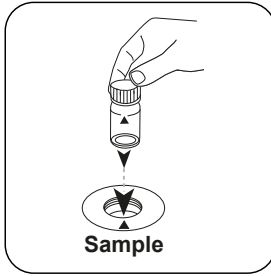


Küvette(n) verschließen.

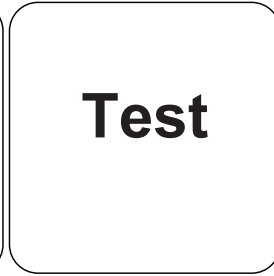
DE



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 Alkalität-m.

DE

## Auswertung

Die folgende Tabelle gibt an wie die ausgegebenen Werte in andere Zitierformen umgewandelt werden können.

Einheit	Zitierform	Umrechnungsfaktor
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4,3</sub>	0.02

DE

## Chemische Methode

Säure / Indikator

## Appendix

Abgeleitet von  
EN ISO 9963-1

**Chlor T****M100****0,01 - 6,0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD****Material**

DE

Benötigtes Material (zum Teil optional):

<b>Reagenzien</b>	<b>Form/Menge</b>	<b>Bestell-Nr.</b>
DPD No.1	Tablette / 100	511050BT
DPD No. 1	Tablette / 250	511051BT
DPD No. 1	Tablette / 500	511052BT
DPD No. 3	Tablette / 100	511080BT
DPD No. 3	Tablette / 250	511081BT
DPD No. 3	Tablette / 500	511082BT
DPD No. 1 High Calcium <sup>e)</sup>	Tablette / 100	515740BT
DPD No. 1 High Calcium <sup>e)</sup>	Tablette / 250	515741BT
DPD No. 1 High Calcium <sup>e)</sup>	Tablette / 500	515742BT
DPD No. 3 High Calcium <sup>e)</sup>	Tablette / 100	515730BT
DPD No. 3 High Calcium <sup>e)</sup>	Tablette / 250	515731BT
DPD No. 3 High Calcium <sup>e)</sup>	Tablette / 500	515732BT
DPD No. 4	Tablette / 100	511220BT
DPD No. 4	Tablette / 250	511221BT
DPD No. 4	Tablette / 500	511222BT
DPD No. 3 Evo	Tablette / 100	511420BT
DPD No. 3 Evo	Tablette / 250	511421BT
DPD No. 3 Evo	Tablette / 500	511422BT
DPD No.4 Evo	Tablette / 100	511970BT
DPD No. 4 Evo	Tablette / 250	511971BT
DPD No. 4 Evo	Tablette / 500	511972BT

**Verfügbare Standards**

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

## 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-Farbentwicklung 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).

## Anmerkungen

1. Evo-Tabletten können alternativ zu der entsprechenden Standard-Tablette verwendet werden (z.B. DPD Nr. 3 Evo anstatt DPD Nr. 3).



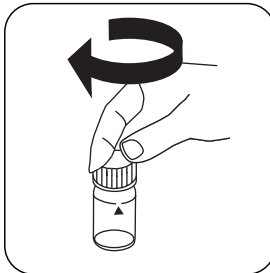


## Durchführung der Bestimmung freies Chlor mit Tablette

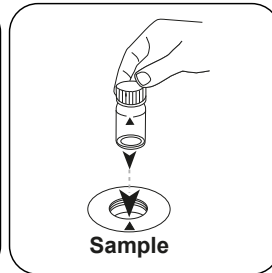
Die Methode im Gerät auswählen.



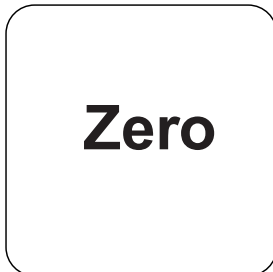
24-mm-Küvette mit **10 mL Probe** füllen.



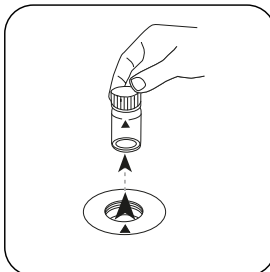
Küvette(n) verschließen.



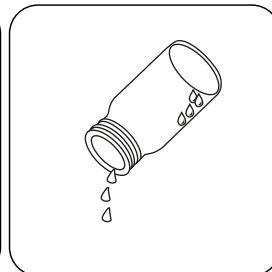
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



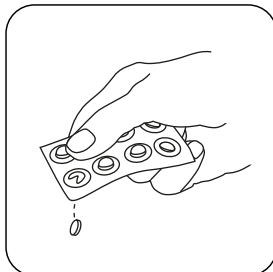
Taste **ZERO** drücken.



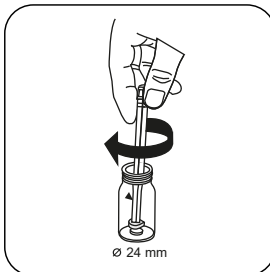
Küvette aus dem Messschacht nehmen.



Die Küvette bis auf einige Tropfen entleeren.



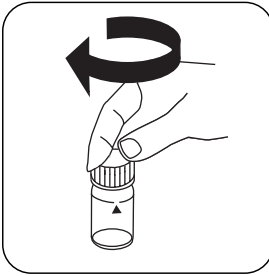
Eine **DPD No. 1 Tablette** zugeben.



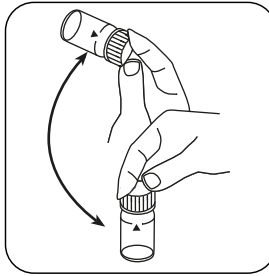
Tablette(n) unter leichter Drehung zerdrücken.



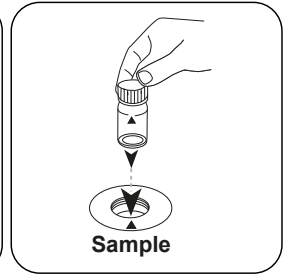
Küvette bis zur **10-mL-Marke** mit der **Probe** auffüllen.



Küvette(n) verschließen.



Tablette(n) durch Umschwenken lösen.



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

DE

# Test

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

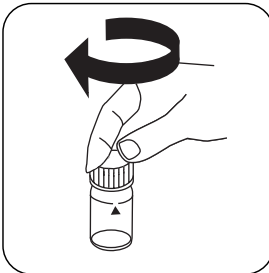
In der Anzeige erscheint das Ergebnis in mg/L freies Chlor.

## Durchführung der Bestimmung gesamt Chlor mit Tablette

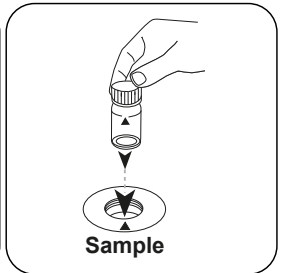
Die Methode im Gerät auswählen.



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



Küvette(n) verschließen.

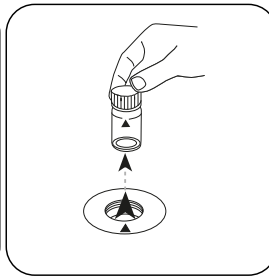


Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.

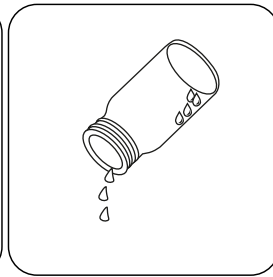


# Zero

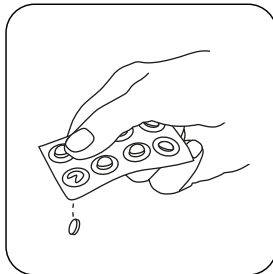
Taste **ZERO** drücken.



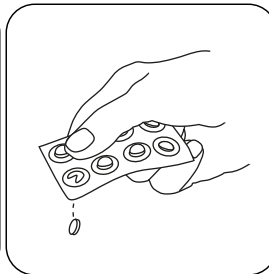
Küvette aus dem Messschacht nehmen.



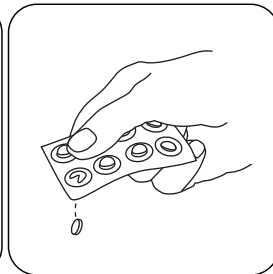
Die Küvette bis auf einige Tropfen entleeren.



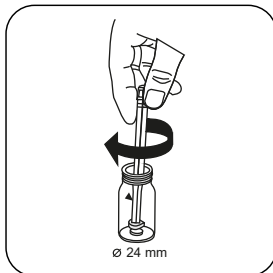
Eine **DPD No. 1** Tablette zugeben.



Eine **DPD No. 3** Tablette zugeben.



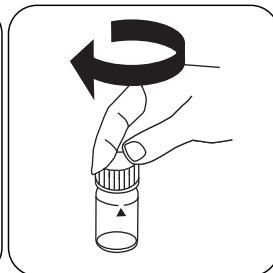
**Alternativ zur DPD Nr. 1 und Nr. 3 Tablette kann eine DPD Nr. 4 Tablette zugegeben werden.**



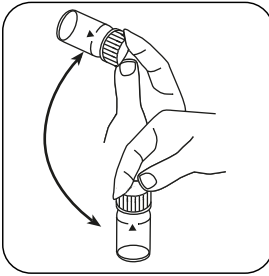
Tablette(n) unter leichter Drehung zerdrücken.



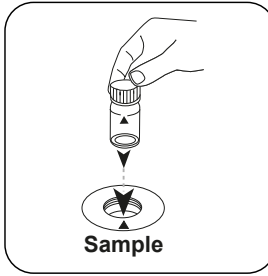
Küvette bis zur **10-mL-Marke** mit der **Probe** auffüllen.



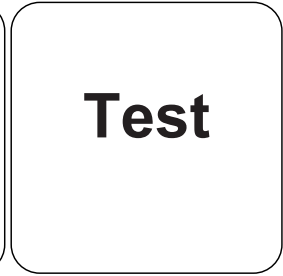
Küvette(n) verschließen.



Tablette(n) durch Umschwenken lösen.

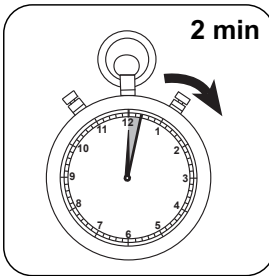


Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.



Taste **TEST (XD: START)** drücken.

DE



**2 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.
- Bei Proben mit hohem Calciumgehalt\* und/oder hoher Leitfähigkeit\* kann es bei der Verwendung der Reagenztabletten zu einer Eintrübung der Probe und damit verbundener Fehlmessung kommen. In diesem Fall sind alternativ die Reagenztablette DPD No. 1 High Calcium und die Reagenztablette DPD No. 3 High Calcium zu verwenden.  
\*exakte Werte können nicht angegeben werden, da die Entstehung einer Trübung von Art und Zusammensetzung des Probenwassers abhängt.
- Konzentrationen über 10 mg/L Chlor, bei Verwendung von Tabletten, können zu Ergebnissen innerhalb des Messbereichs bis hin zu 0 mg/L führen. Bei einer zu hohen Chlorkonzentration 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]
$\text{CrO}_4^{2-}$	0.01
$\text{MnO}_2$	0.01

## Methodenvalidierung

Nachweisgrenze	0.02 mg/L
Bestimmungsgrenze	0.06 mg/L
Messbereichsende	6 mg/L
Empfindlichkeit	2.05 mg/L / Abs
Vertrauensbereich	0.04 mg/L
Verfahrensstandardabweichung	0.019 mg/L
Verfahrensvariationskoeffizient	0.87 %

### Konform

EN ISO 7393-2



<sup>a)</sup> Bestimmung von frei, gebunden, gesamt möglich | <sup>a)</sup> Hilfsreagenz, alternativ zur DPD No. 1 / No. 3 bei Eintrübungen der Probe durch hohen Calciumionengehalt und/oder hohe Leitfähigkeit

**Chlor L****M101****0,02 - 4,0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD****Material**

DE

Benötigtes Material (zum Teil optional):

<b>Reagenzien</b>	<b>Form/Menge</b>	<b>Bestell-Nr.</b>
DPD 1 Pufferlösung, blaue Flasche	15 mL	471010
DPD 1 Pufferlösung	100 mL	471011
DPD 1 Pufferlösung im 6-er Pack	1 St.	471016
DPD 1 Reagenzlösung, grüne Flasche	15 mL	471020
DPD 1 Reagenzlösung	100 mL	471021
DPD 1 Reagenzlösung im 6-er Pack	1 St.	471026
DPD 3 Lösung, rote Flasche	15 mL	471030
DPD 3 Lösung	100 mL	471031
DPD 3 Lösung im 6-er Pack	1 St.	471036
DPD Reagenzien Set	1 St.	471056

**Verfügbare Standards**

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

**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-Farmentwicklung 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).

DE

## Anmerkungen

1. Nach Gebrauch sind die Tropfflaschen mit der jeweils gleichfarbigen Schraubkappe sofort wieder zu verschließen.
2. Den Reagenssatz bei +6 °C bis +10 °C kühl lagern.



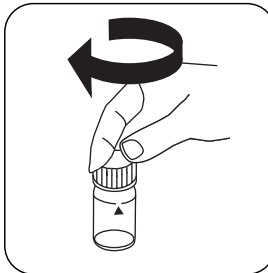


## Durchführung der Bestimmung freies Chlor mit Flüssigreagenz

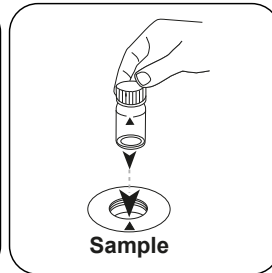
Die Methode im Gerät auswählen.



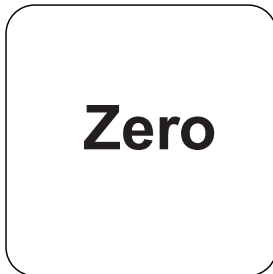
24-mm-Küvette mit **10 mL Probe** füllen.



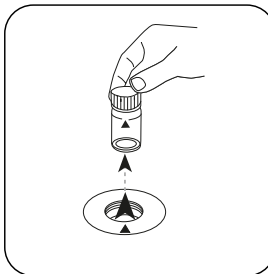
Küvette(n) verschließen.



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



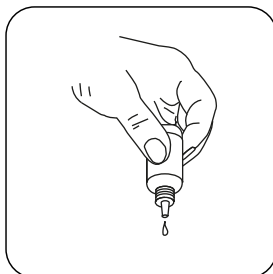
Taste **ZERO** drücken.



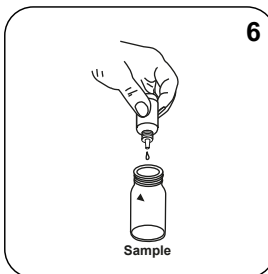
Küvette aus dem Messschacht nehmen.



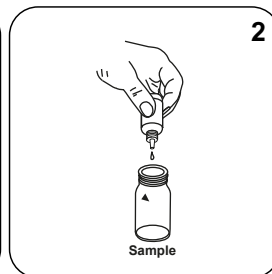
Küvette entleeren.



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



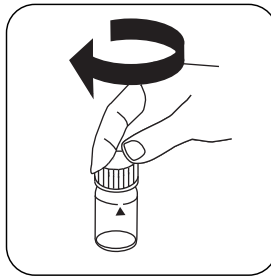
**6 Tropfen DPD 1 Puffer-Lösung** in die **Probeküvette** geben.



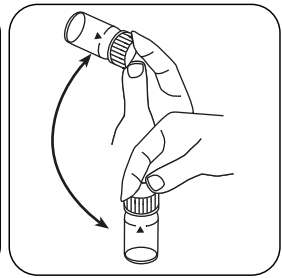
**2 Tropfen DPD 1 Reagenz-Lösung** in die **Probeküvette** geben.



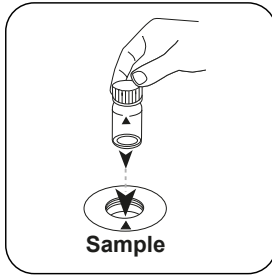
Küvette bis zur **10-mL-Mark**e mit der **Probe** auffüllen.



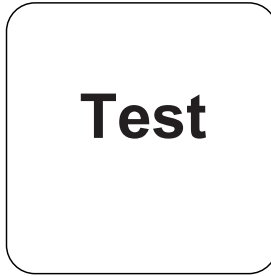
Küvette(n) verschließen.



Inhalt durch Umschwenken mischen.



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



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

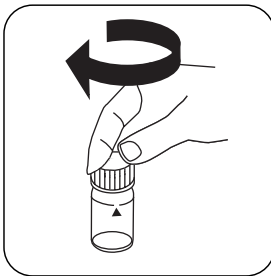
In der Anzeige erscheint das Ergebnis in mg/L freies Chlor.

### Durchführung der Bestimmung gesamtes Chlor mit Flüssigreagenz

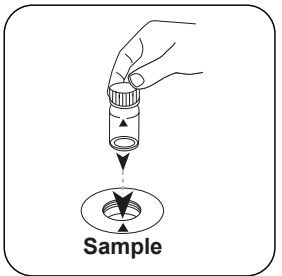
Die Methode im Gerät auswählen.



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



Küvette(n) verschließen.

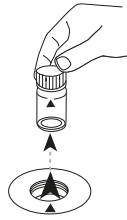


Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



# Zero

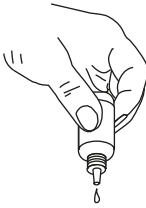
Taste **ZERO** drücken.



Küvette aus dem Messschacht nehmen.



Küvette entleeren.



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



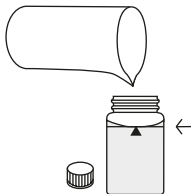
**6 Tropfen DPD**  
**1 Puffer-Lösung** in die **Probenküvette** geben.



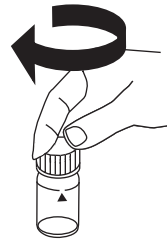
**2 Tropfen DPD**  
**1 Reagenz-Lösung** in die **Probenküvette** geben.



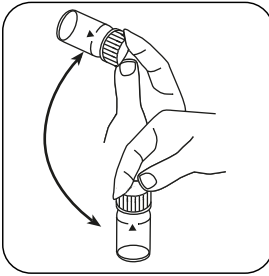
**3 Tropfen DPD 3 Lösung** in die **Probenküvette** geben.



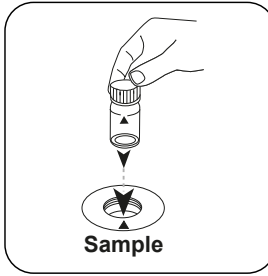
Küvette bis zur **10-mL-Marke** mit der **Probe** auffüllen.



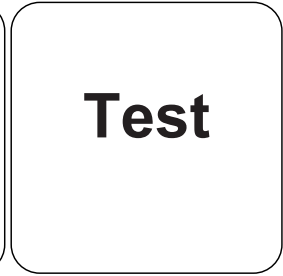
Küvette(n) verschließen.



Inhalt durch Umschwenken mischen.

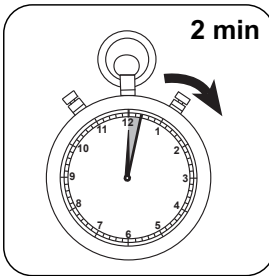


Die **Probenküvette** in den Messschacht stellen. Positionierung beachten.



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

DE



**2 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 4 mg/L Chlor, bei Verwendung von Flüssigreagenzien, 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]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

#### Konform

EN ISO 7393-2

<sup>a)</sup> Bestimmung von frei, gebunden, gesamt möglich





Chlor HR (KI) T

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

KI / Säure

## Material

DE

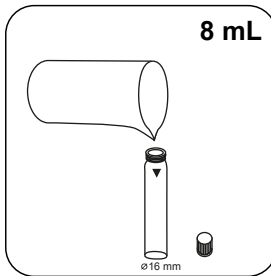
Benötigtes Material (zum Teil optional):

Reagenzien	Form/Menge	Bestell-Nr.
Chlorine HR (KI)	Tablette / 100	513000BT
Chlorine HR (KI)	Tablette / 250	513001BT
Acidifying GP	Tablette / 100	515480BT
Acidifying GP	Tablette / 250	515481BT
Set Chlorine HR (KI)/Acidifying GP#	je 100	517721BT
Set Chlorine HR (KI)/Acidifying GP#	je 250	517722BT
Chlorine HR (KI)	Tablette / 100	501210
Chlorine HR (KI)	Tablette / 250	501211

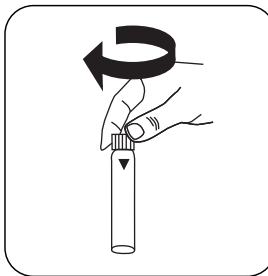


## Durchführung der Bestimmung Chlor HR (KI) mit Tablette

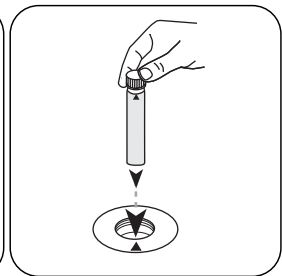
Die Methode im Gerät auswählen.



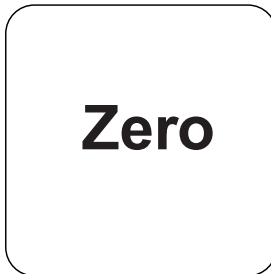
16-mm-Küvette mit **8 mL Probe** füllen.



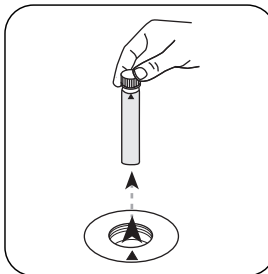
Küvette(n) verschließen.



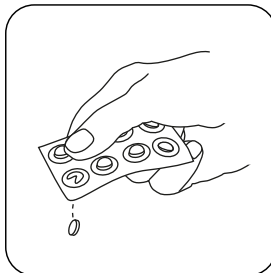
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



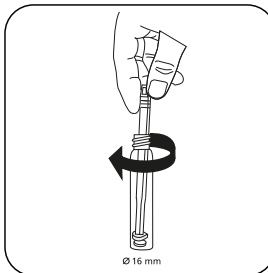
Taste **ZERO** drücken.



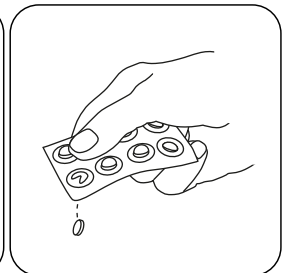
Die **Küvette** aus dem Messschacht nehmen.



Eine **Chlorine HR (KI) Tablette** zugeben.



Tablette(n) unter leichter Drehung zerdrücken.

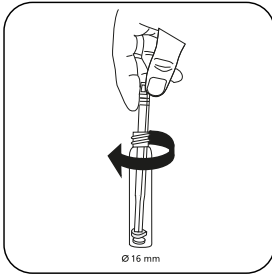


Eine **ACIDIFYING GP Tablette** zugeben.

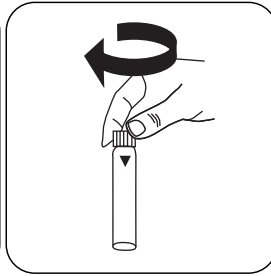




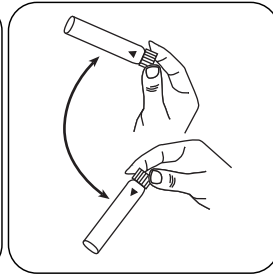
DE



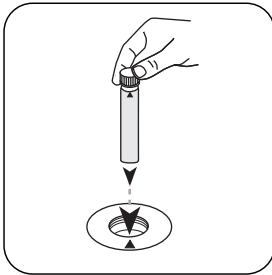
Tablette(n) unter leichter Drehung zerdrücken.



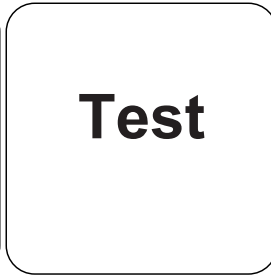
Küvette(n) verschließen.



Tablette(n) durch Umschwenken lösen.



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



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

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

## Chemische Methode

KI / Säure

## Appendix

### Störungen

#### Permanente Störungen

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

### Methodenvalidierung

<b>Nachweisgrenze</b>	1.29 mg/L
<b>Bestimmungsgrenze</b>	3.86 mg/L
<b>Messbereichsende</b>	200 mg/L
<b>Empfindlichkeit</b>	83.96 mg/L / Abs
<b>Vertrauensbereich</b>	1.14 mg/L
<b>Verfahrensstandardabweichung</b>	0.45 mg/L
<b>Verfahrensvariationskoeffizient</b>	0.45 %

#### Abgeleitet von

EN ISO 7393-3

\* inklusive Rührstab



Chlor MR PP

M113

0,02 - 3,5 mg/L Cl<sub>2</sub> <sup>a)</sup>

CL2

DPD

## Material

Folgendes Material wird für den Test benötigt.

Reagenzien	Form/Menge	Bestell-Nr.
VARIO Chlorine Free DPD F10	Pulver / 100 St.	530180
VARIO Chlorine Free DPD F10	Pulver / 1000 St.	530183
VARIO Chlorine Total DPD F10	Pulver / 100 St.	530190
VARIO Chlorine Total DPD F10	Pulver / 1000 St.	530193

## 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).



## Anmerkungen

1. Die verwendeten Pulverreagenzien tragen zur leichteren Unterscheidung eine blaue Farbmarkierung. Das Pulver zur Bestimmung von freiem Chlor trägt eine geschlossene und eine gestrichelte Linie. Das Pulver zur Bestimmung von Gesamtchlor trägt zwei geschlossene Linien.



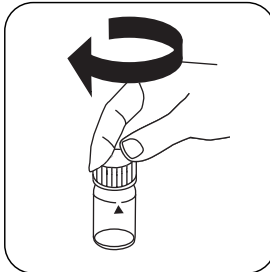
## Durchführung der Bestimmung freies Chlor MR, mit Pulverpäckchen

Die Methode im Gerät auswählen.

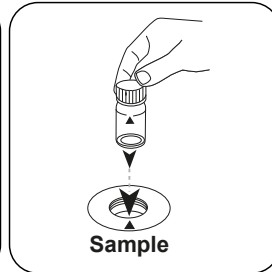
Wählen Sie zudem die Bestimmung: frei



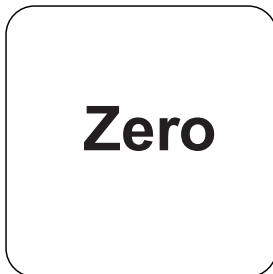
24-mm-Küvette mit **10 mL Probe** füllen.



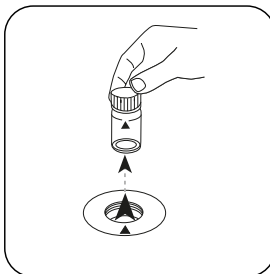
Küvette(n) verschließen.



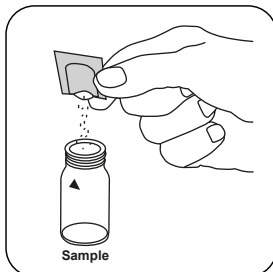
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



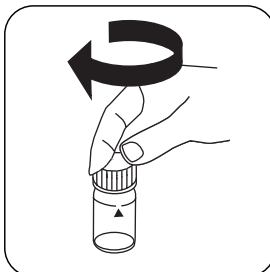
Taste **ZERO** drücken.



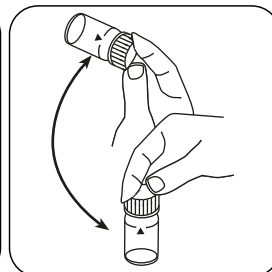
Küvette aus dem Messschacht nehmen.



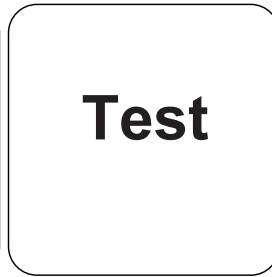
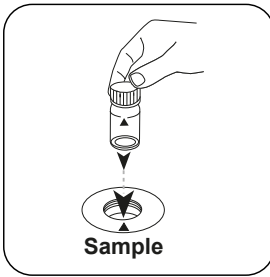
Ein **VARIO Chlorine FREE-DPD/ F10 Pulverpäckchen** zugeben.



Küvette(n) verschließen.



Inhalt durch Umschwenken mischen (20 Sek.).



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

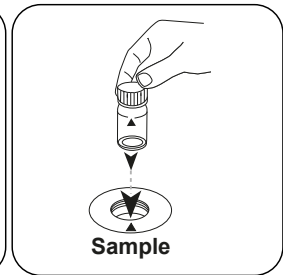
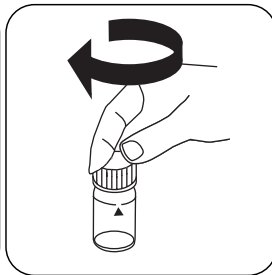
Taste **TEST** (XD: **START**) drücken.

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

### Durchführung der Bestimmung differenziertes Chlor MR mit Pulverpäckchen

Die Methode im Gerät auswählen.

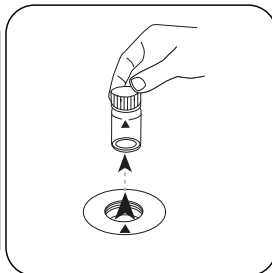
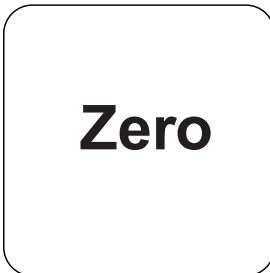
Wählen Sie zudem die Bestimmung: differenziert



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

Küvette(n) verschließen.

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

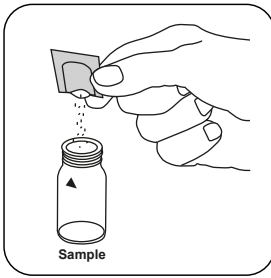


Taste **ZERO** drücken.

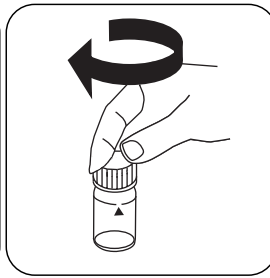
Küvette aus dem Messschacht nehmen.



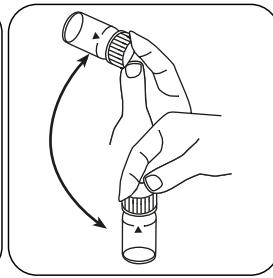
DE



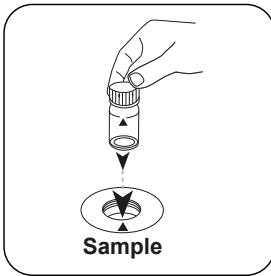
Ein **VARIO Chlorine FREE-DPD/ F10 Pulverpäckchen** zugeben.



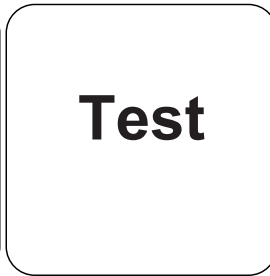
Küvette(n) verschließen.



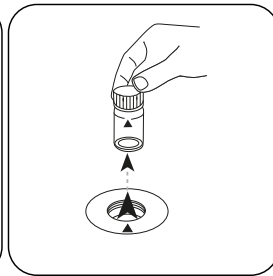
Inhalt durch Umschwenken mischen (20 Sek.).



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



Taste **TEST (XD: START)** drücken.



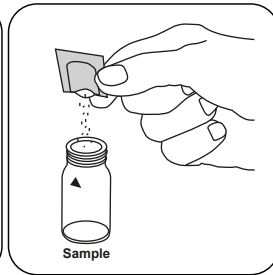
Küvette aus dem Messschacht nehmen.



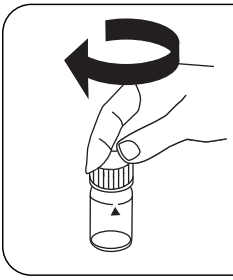
Die Küvette und den Küvettedeckel gründlich reinigen.



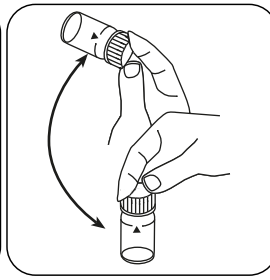
24-mm-Küvette mit **10 mL Probe** füllen.



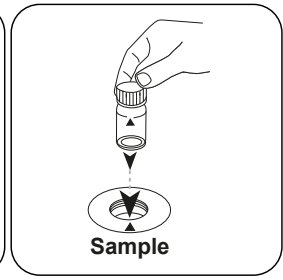
Ein **Chlorine TOTAL-DPD/ F10 Pulverpäckchen** zugeben.



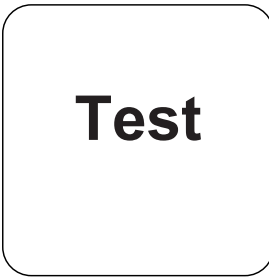
Küvette(n) verschließen.



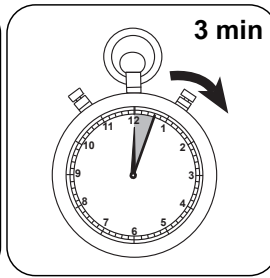
Inhalt durch Umschwenken  
mischen (20 Sek.).



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 freies Chlor, gebundenes Chlor,  
Gesamtchlor.

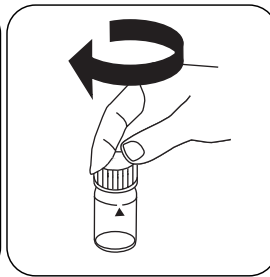
## Durchführung der Bestimmung gesamtes Chlor MR mit Pulverpäckchen

Die Methode im Gerät auswählen.

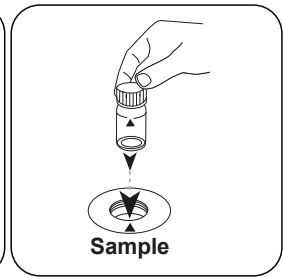
Wählen Sie zudem die Bestimmung: gesamt



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



Küvette(n) verschließen.

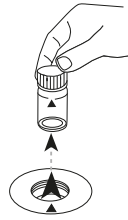


Die **Probenküvette** in  
den Messschacht stellen.  
Positionierung beachten.





# Zero

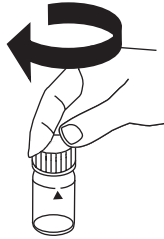


Taste **ZERO** drücken.

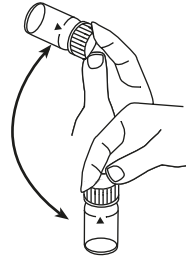
Küvette aus dem Messschacht nehmen.



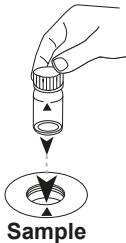
Ein **VARIO Chlorine TOTAL-DPD/ F10 Pulverpäckchen** zugeben.



Küvette(n) verschließen.



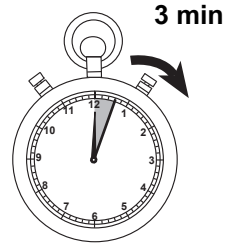
Inhalt durch Umschwenken mischen (20 Sek.).



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

# Test

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

## 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 4 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]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

## Methodenvalidierung

<b>Nachweisgrenze</b>	0.01 mg/L
<b>Bestimmungsgrenze</b>	0.03 mg/L
<b>Messbereichsende</b>	3.5 mg/L
<b>Empfindlichkeit</b>	1.7 mg/L / Abs
<b>Vertrauensbereich</b>	0.014 mg/L
<b>Verfahrensstandardabweichung</b>	0.006 mg/L
<b>Verfahrensvariationskoeffizient</b>	0.34 %

<sup>a)</sup> Bestimmung von frei, gebunden, gesamt möglich



Härte Calcium 2T

M191

20 - 500 mg/L CaCO<sub>3</sub>

CAH

Murexid

DE

## Material

Benötigtes Material (zum Teil optional):

Reagenzien	Form/Menge	Bestell-Nr.
Set Calcio H No. 1/No. 2 <sup>#</sup>	je 100	517761BT
Set Calcio H No. 1/No. 2 <sup>#</sup>	je 250	517762BT

## Vorbereitung

1. Stark alkalische oder saure Wässer sollten vor der Analyse in einen pH-Bereich zwischen 4 und 10 gebracht werden (mit 1 mol/l Salzsäure bzw. 1 mol/l Natronlauge).

## Anmerkungen

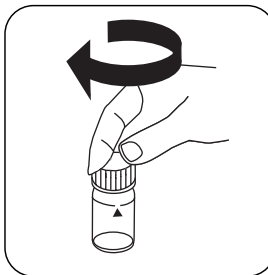
1. Zur Optimierung der Messwerte kann optional (siehe Photometeranleitung) ein batchspezifischer Methodenblindwert bzw. eine batchspezifische Anwenderjustierung durchgeführt werden.
2. Die exakte Einhaltung des Probevolumens von 10 ml ist für die Genauigkeit des Analyseergebnisses entscheidend.
3. Die vorliegende Methode wurde aus einem titrimetrischen Verfahren entwickelt. Auf Grund undefinierter Randbedingungen, kann die Abweichung zur standardisierten Methode größer sein.
4. Das Verfahren arbeitet im hohen Messbereich mit größeren Toleranzen, als im niedrigen Messbereich. Bei Probenverdünnungen immer so verdünnen, dass im unteren Drittel des Messbereichs gemessen wird.

## Durchführung der Bestimmung Härte Calcium 2 mit Tablette

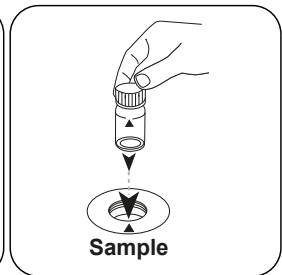
Die Methode im Gerät auswählen.



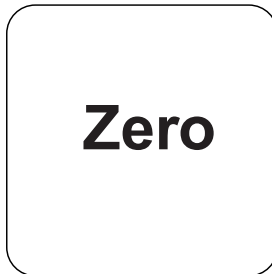
24-mm-Küvette mit **10 mL Probe** füllen.



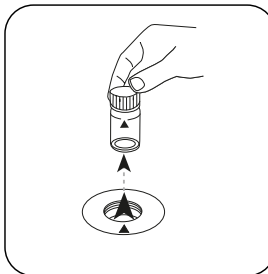
Küvette(n) verschließen.



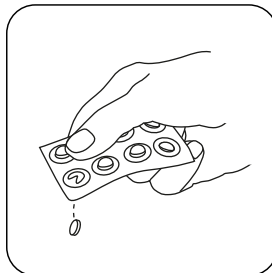
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



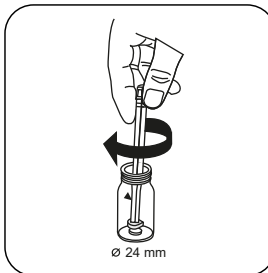
Taste **ZERO** drücken.



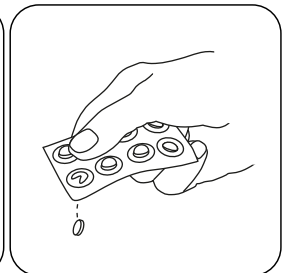
Küvette aus dem Messschacht nehmen.



Eine **CALCIO H No.1 Tablette** zugeben.



Die Tablette(n) unter leichter Drehung zerdrücken und lösen.

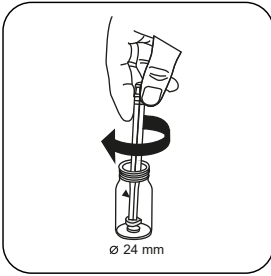


Eine **CALCIO H No.2 Tablette** zugeben.

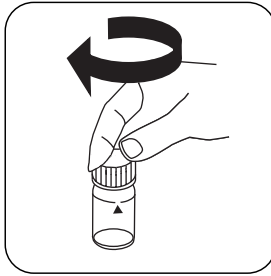
DE



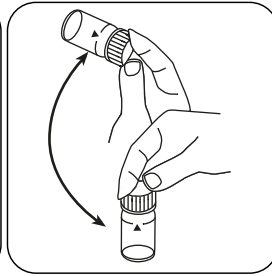
DE



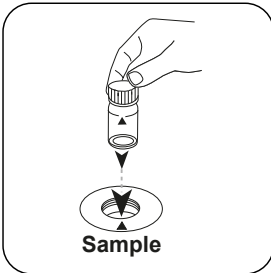
Tablette(n) unter leichter Drehung zerdrücken.



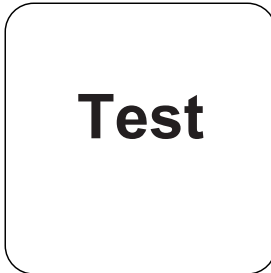
Küvette(n) verschließen.



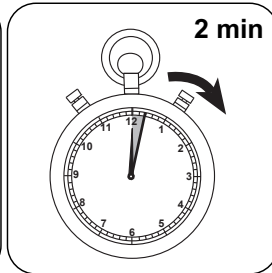
Tablette(n) durch Umschwenken lösen.



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



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



**2 Minute(n) Reaktionszeit** abwarten.

Nach Ablauf der Reaktionszeit erfolgt automatisch die Messung.

In der Anzeige erscheint das Ergebnis als Calciumhärte.

## Auswertung

Die folgende Tabelle gibt an wie die ausgegebenen Werte in andere Zitierformen umgewandelt werden können.

Einheit	Zitierform	Umrechnungsfaktor
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

DE

## Chemische Methode

Murexid

## Appendix

## Störungen

### Permanente Störungen

1. Silber, Cadmium, Cobalt, Kupfer und Quecksilber stören die Bestimmung.

Störung	Stört ab / [mg/L]
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

### Literaturverweise

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

\* inklusive Rührstab



pH-Wert T

M330

6,5 - 8,4 pH

PH

Phenolrot

## Material

DE

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

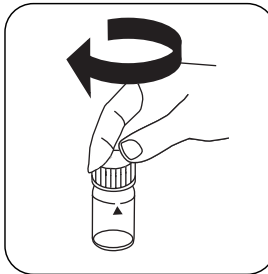
1. Für die photometrische pH-Wert Bestimmung sind nur PHENOL RED-Tabletten mit schwarzem Folienaufdruck zu verwenden, die mit dem Begriff PHOTOMETER gekennzeichnet sind.

## Durchführung der Bestimmung pH-Wert mit Tablette

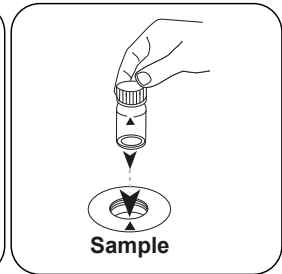
Die Methode im Gerät auswählen.



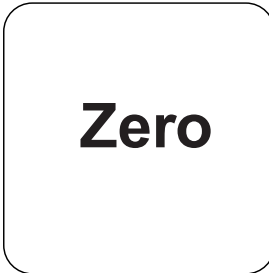
24-mm-Küvette mit **10 mL Probe** füllen.



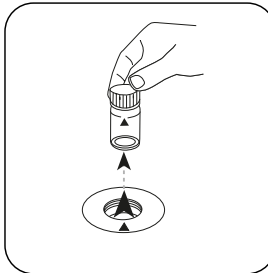
Küvette(n) verschließen.



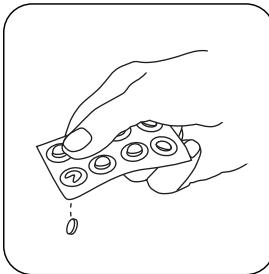
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



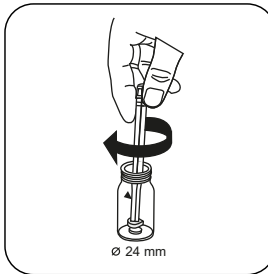
Taste **ZERO** drücken.



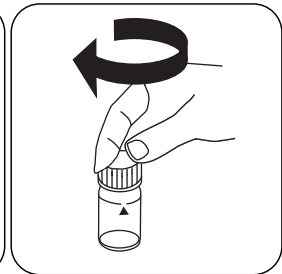
Küvette aus dem Messschacht nehmen.



Eine **PHENOL RED PHOTOMETER** Tablette zugeben.

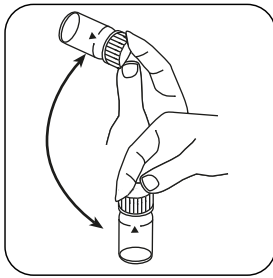


Tablette(n) unter leichter Drehung zerdrücken.

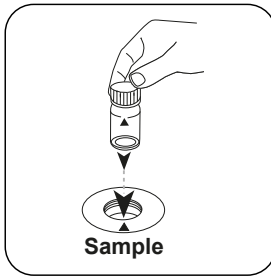


Küvette(n) verschließen.

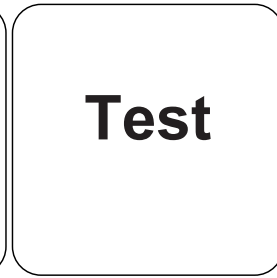




Tablette(n) durch Umschwenken lösen.



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

#### 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 <sup>1)</sup>	-0,21 <sup>2)</sup>	-0,26 <sup>2)</sup>	-0,29 <sup>2)</sup>

<sup>1)</sup> nach Kolthoff (1922)

<sup>2)</sup> 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.

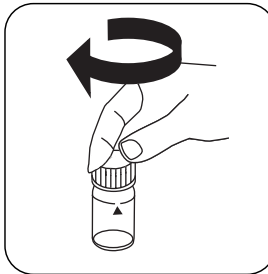


## Durchführung der Bestimmung pH-Wert mit Flüssigreagenz

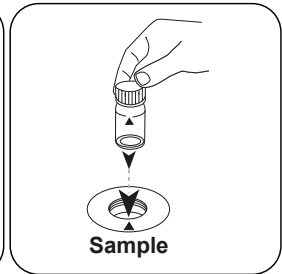
Die Methode im Gerät auswählen.



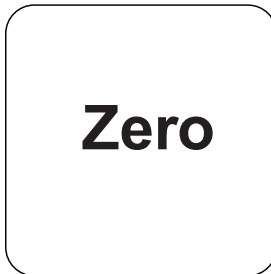
24-mm-Küvette mit **10 mL Probe** füllen.



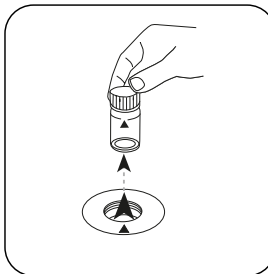
Küvette(n) verschließen.



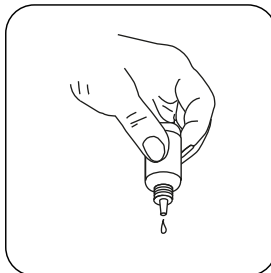
Die **Probeküvette** in den Messschacht stellen. Positionierung beachten.



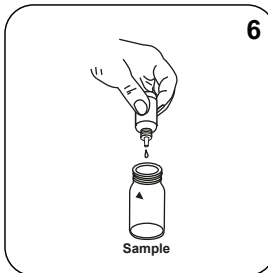
Taste **ZERO** drücken.



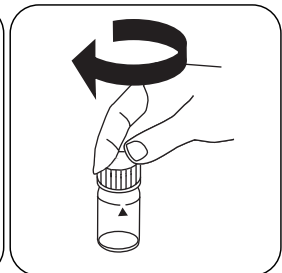
Küvette aus dem Messschacht nehmen.



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

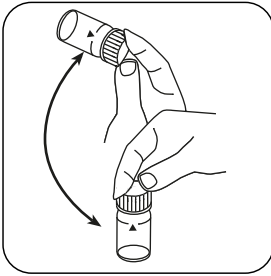


**6 Tropfen PHENOL Red-Lösung** in die **Probeküvette** geben.

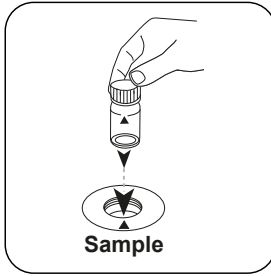


Küvette(n) verschließen.

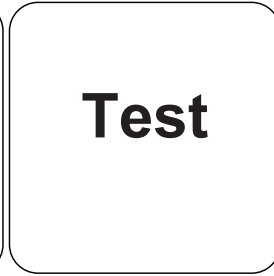
DE



Inhalt durch Umschwenken mischen.



Die **Probeküvette** 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 <sup>1)</sup>
	60 g/L	-0,21 <sup>2)</sup>
	120 g/L	-0,26 <sup>2)</sup>
	180 g/L	-0,29 <sup>2)</sup>
	<sup>1)</sup> nach Kolthoff (1922)	<sup>2)</sup> 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	$\lambda$	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 alca-M	Tabletas / 100	513210BT
Fotómetro alca-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

## Realización de la determinación

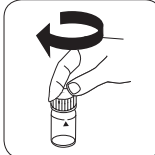
**Ejecución de la determinación Capacidad ácida  $K_{a4.3}$  con tableta**

Seleccionar el método en el aparato.

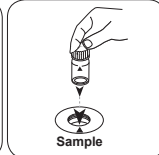
Para este método no es necesario realizar medición CERO en los aparatos siguientes: XD 7000, XD 7500



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

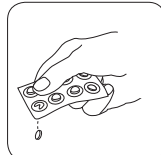


Cerrar la(s) cubeta(s).

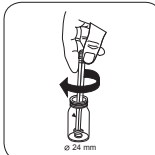


Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!

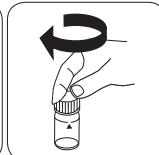
• • •



Añadir **tableta ALKA-M-PHOTOMETER**.



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



Cerrar la(s) cubeta(s).





Alcalinidad-m T

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

Ácido / Indicador

ES

## Material

Material requerido (parcialmente opcional):

Reactivos	Unidad de embalaje	No. de referencia
Fotómetro alca-M	Tabletas / 100	513210BT
Fotómetro alca-M	Tabletas / 250	513211BT

## Notas

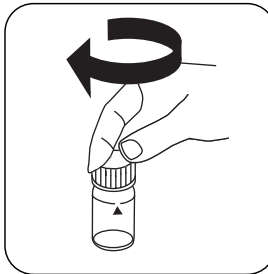
1. Las definiciones de alcalinidad-m, valor-m y capacidad ácida  $K_{s4.3}$  son idénticas.
2. Añadir un volumen de muestra de exactamente 10 ml, ya que este volumen influye de forma decisiva en la exactitud del resultado.

## Ejecución de la determinación Alcalinidad, total= alcalinidad-m = valor-m con tableta

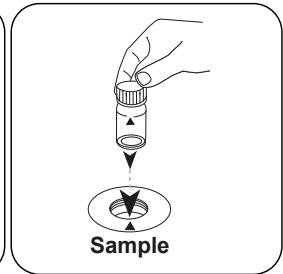
Seleccionar el método en el aparato.



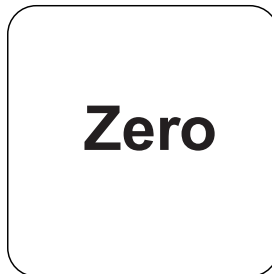
Llenar la cubeta de 24 mm con **10 mL de muestra** .



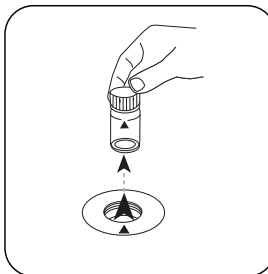
Cerrar la(s) cubeta(s).



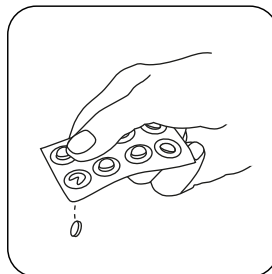
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



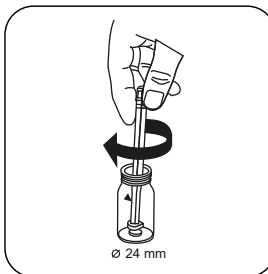
Pulsar la tecla **ZERO**.



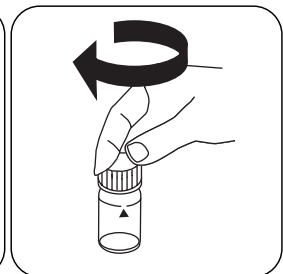
Extraer la cubeta del compartimiento de medición.



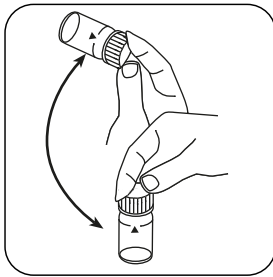
Añadir tableta **ALKA-M-PHOTOMETER**.



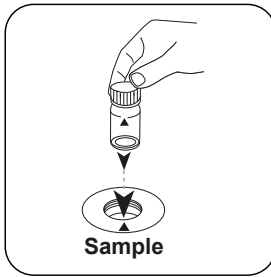
Triturar la(s) tableta(s) girando ligeramente.



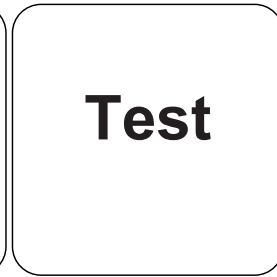
Cerrar la(s) cubeta(s).



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 Alcalinidad-m.

ES

## Evaluación

La siguiente tabla muestra cómo los valores de salida se pueden convertir a otros formularios de citas.

Unidad	Conversión	Factor de conversión
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4.3</sub>	0.02

ES

## Método químico

Ácido / Indicador

## Apéndice

**Derivado de**

EN ISO 9963-1

**Cloro T****M100****0.01 - 6.0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD****Material**

ES

Material requerido (parcialmente opcional):

<b>Reactivos</b>	<b>Unidad de embalaje</b>	<b>No. de referencia</b>
DPD n°1	Tabletas / 100	511050BT
DPD n° 1	Tabletas / 250	511051BT
DPD n° 1	Tabletas / 500	511052BT
DPD n° 3	Tabletas / 100	511080BT
DPD n° 3	Tabletas / 250	511081BT
DPD n° 3	Tabletas / 500	511082BT
DPD n° 1 High Calcium <sup>e)</sup>	Tabletas / 100	515740BT
DPD n° 1 High Calcium <sup>e)</sup>	Tabletas / 250	515741BT
DPD n° 1 High Calcium <sup>e)</sup>	Tabletas / 500	515742BT
DPD n° 3 High Calcium <sup>e)</sup>	Tabletas / 100	515730BT
DPD n° 3 High Calcium <sup>e)</sup>	Tabletas / 250	515731BT
DPD n° 3 High Calcium <sup>e)</sup>	Tabletas / 500	515732BT
DPD n° 4	Tabletas / 100	511220BT
DPD n° 4	Tabletas / 250	511221BT
DPD n° 4	Tabletas / 500	511222BT
DPD n° 3 Evo	Tabletas / 100	511420BT
DPD n° 3 Evo	Tabletas / 250	511421BT
DPD n° 3 Evo	Tabletas / 500	511422BT
DPD n°4 Evo	Tabletas / 100	511970BT
DPD n° 4 Evo	Tabletas / 250	511971BT
DPD n° 4 Evo	Tabletas / 500	511972BT

**Standards disponibles**

<b>Título</b>	<b>Unidad de embalaje</b>	<b>No. de referencia</b>
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).

## Notas

1. Las tabletas Evo pueden utilizarse como alternativa a la tableta estándar correspondiente (por ejemplo, DPD nº 3 Evo en lugar de DPD nº 3).

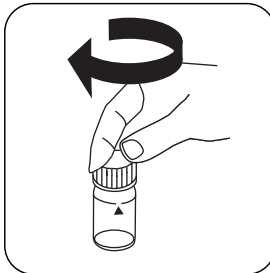


## Ejecución de la determinación Cloro libre con tableta

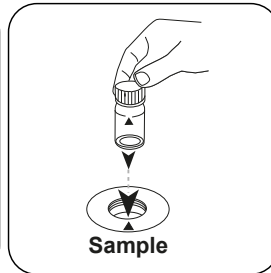
Seleccionar el método en el aparato.



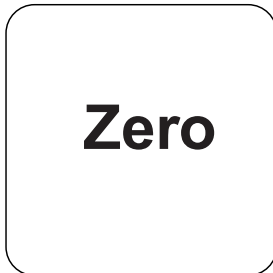
Llenar la cubeta de 24 mm con **10 mL de muestra** .



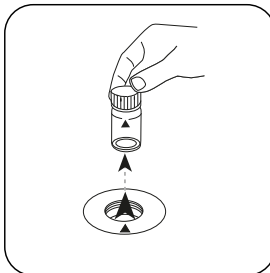
Cerrar la(s) cubeta(s).



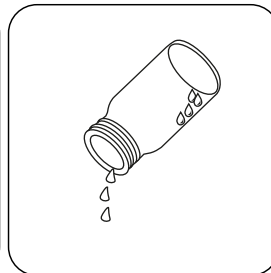
Poner la **cubeta de muestra** en el compartimento de medición. ¡Debe tenerse en cuenta el posicionamiento!



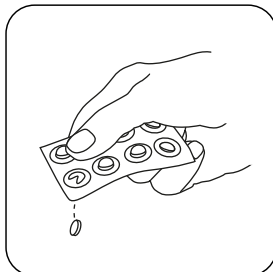
Pulsar la tecla **ZERO**.



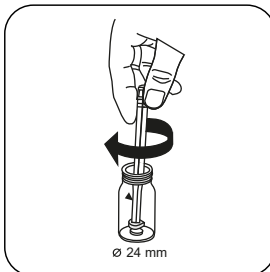
Extraer la cubeta del compartimento de medición.



Vaciar la cubeta excepto algunas gotas.



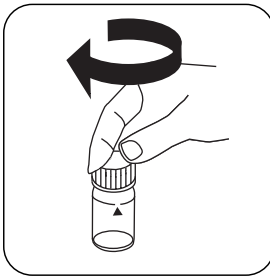
Añadir **tableta DPD No. 1**.



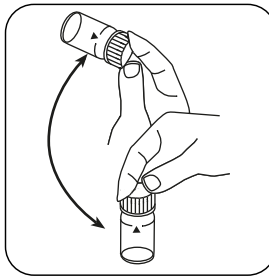
Triturar la(s) tableta(s) girando ligeramente.



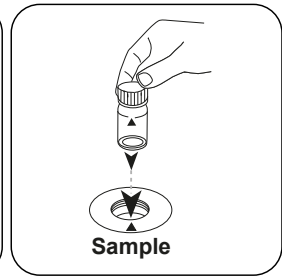
Llenar la cubeta con la **muestra hasta la marca de 10 mL** .



Cerrar la(s) cubeta(s).



Disolver la(s) tableta(s) girando.



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

ES

## Test

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

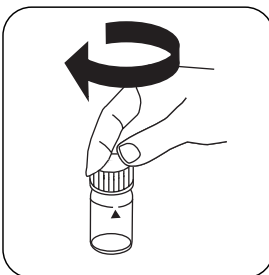
A continuación se visualizará el resultado en mg/L Cloro libre.

### Ejecución de la determinación Cloro total con tableta

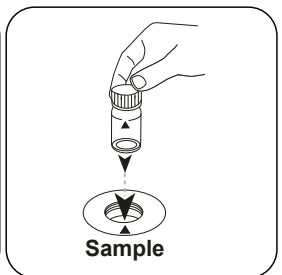
Seleccionar el método en el aparato.



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



Cerrar la(s) cubeta(s).



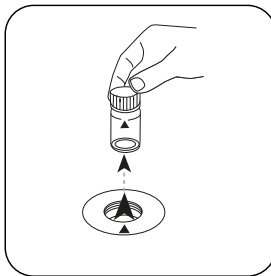
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



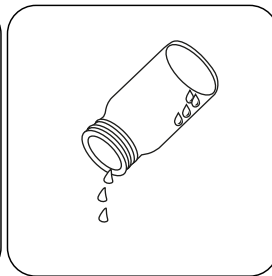


# Zero

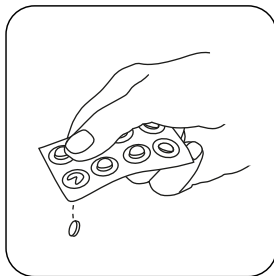
Pulsar la tecla **ZERO**.



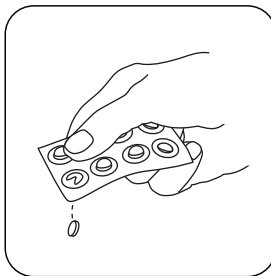
Extraer la cubeta del compartimiento de medición.



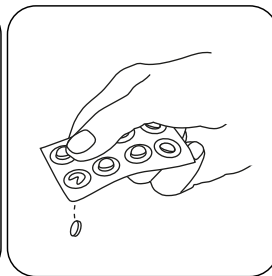
Vaciar la cubeta excepto algunas gotas.



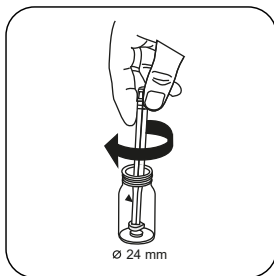
Añadir **tableta DPD No. 1**.



Añadir **tableta DPD No. 3**.



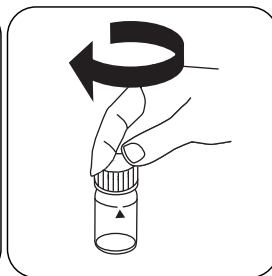
**Alternativa a la tableta DPD No 1 y No 3, se puede agregar una tableta DPD No. 4.**



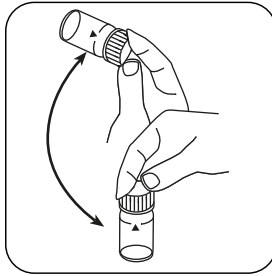
Triturar la(s) tableta(s) girando ligeramente.



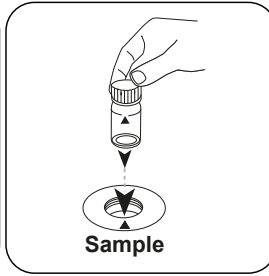
Llenar la cubeta con la **muestra hasta la marca de 10 mL**.



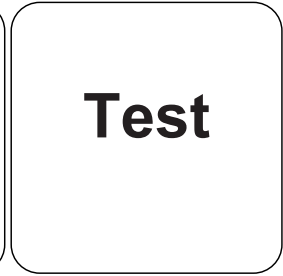
Cerrar la(s) cubeta(s).



Disolver la(s) tableta(s) girando.

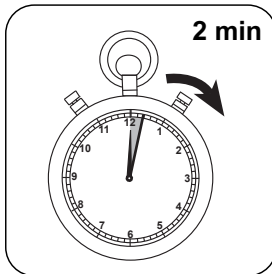


Poner la  **cubeta de muestra**  en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



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

ES



Esperar  **2 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.
- En las muestras con una elevada concentración de iones de calcio\* y/o alta conductividad\*, se puede producir un enturbiamiento de la muestra con el uso de las tabletas de reactivo, alterando el resultado. En este caso, utilizar alternativamente la tableta reactiva DPD n° 1 High Calcium y la tableta reactiva DPD n° 3 High Calcium. \*no se pueden dar valores exactos, ya que la aparición de enturbiamiento dependerá del tipo y composición de la muestra.
- Las concentraciones de cloro mayores a 10 mg/L, cuando se usan tabletas pueden conducir a resultados de dentro del campo de medición hasta 0 mg/L. Con una concentración de cloro alta, 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 <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

### Validación del método

Límite de detección	0.02 mg/L
Límite de determinación	0.06 mg/L
Límite del rango de medición	6 mg/L
Sensibilidad	2.05 mg/L / Abs
Intervalo de confianza	0.04 mg/L
Desviación estándar	0.019 mg/L
Coefficiente de variación	0.87 %

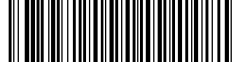
#### Conforme a

EN ISO 7393-2



<sup>a)</sup> Posible determinación de libre, combinado, total | <sup>a)</sup> Reactivo auxiliar, alternativo a DPD No.1/3 en enturbiamientos de la prueba debido a concentraciones elevadas de calcio y/o elevada conductividad

ES

**Cloro L****M101****0.02 - 4.0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD**

ES

**Material**

Material requerido (parcialmente opcional):

<b>Reactivos</b>	<b>Unidad de embalaje</b>	<b>No. de referencia</b>
Solución de tampón DPD 1, frasco azul	15 mL	471010
Solución de tampón DPD 1	100 mL	471011
Solución de tampón DPD 1 en pack de 6	1 Cantidad	471016
Solución reactiva DPD 1, frasco verde	15 mL	471020
Solución de reactivo DPD 1	100 mL	471021
Solución reactiva DPD 1 en pack de 6	1 Cantidad	471026
Solución DPD 3, frasco rojo	15 mL	471030
Solución DPD 3	100 mL	471031
Solución DPD 3 en pack de 6	1 Cantidad	471036
Juego de reactivos para DPD	1 Cantidad	471056

**Standards disponibles**

<b>Título</b>	<b>Unidad de embalaje</b>	<b>No. de referencia</b>
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).

## Notas

1. Después de usarlas, las botellas cuentagotas deben cerrarse de nuevo inmediatamente con la tapa roscada del mismo color, respectivamente.
2. Guardar el set reactivo a una temperatura entre +6 °C y +10 °C.

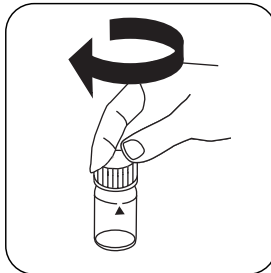


## Ejecución de la determinación Cloro libre con reactivos líquidos

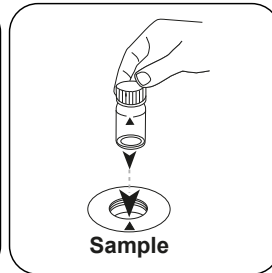
Seleccionar el método en el aparato.



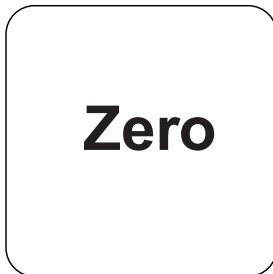
10 mL  
Llenar la cubeta de 24 mm con **10 mL de muestra**.



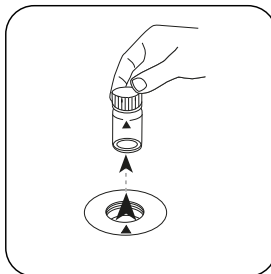
Cerrar la(s) cubeta(s).



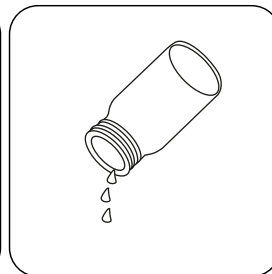
Poner la **cubeta de muestra** en el compartimento de medición. ¡Debe tenerse en cuenta el posicionamiento!



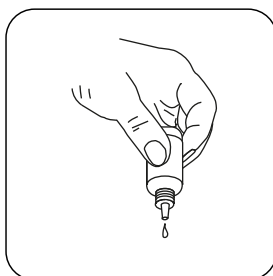
Pulsar la tecla **ZERO**.



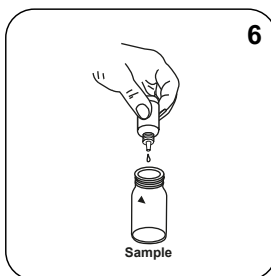
Extraer la cubeta del compartimento de medición.



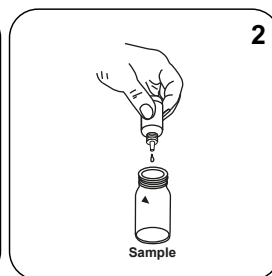
Vaciar la cubeta.



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



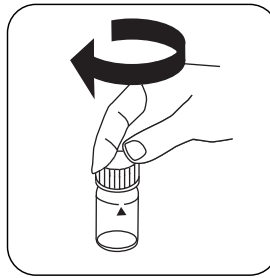
Añadir **6 gotas de DPD 1 Buffer Solution** en la cubeta con la muestra.



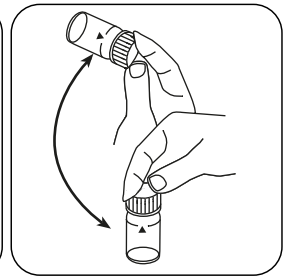
Añadir **2 gotas de DPD 1 Reagent Solution** en la cubeta con la muestra.



Llenar la cubeta con la **muestra** hasta la **marca de 10 mL** .

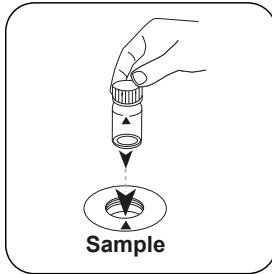


Cerrar la(s) cubeta(s).

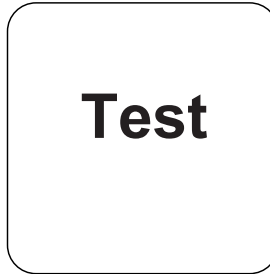


Mezclar el contenido girando.

ES



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



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

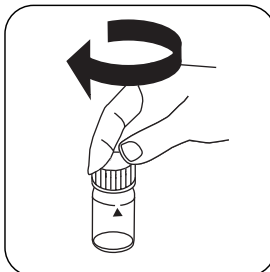
A continuación se visualizará el resultado en mg/L Cloro libre.

### Ejecución de la determinación Cloro total con reactivos líquidos

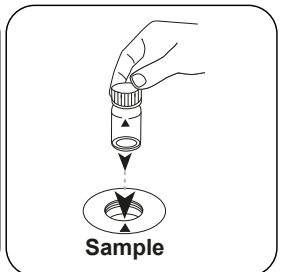
Seleccionar el método en el aparato.



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



Cerrar la(s) cubeta(s).



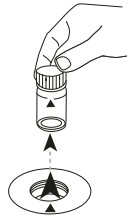
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!





# Zero

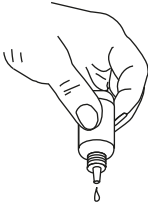
Pulsar la tecla **ZERO**.



Extraer la cubeta del compartimiento de medición.



Vaciar la cubeta.



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



**6**

Añadir **6 gotas de DPD 1 Buffer Solution** en la cubeta con la muestra.



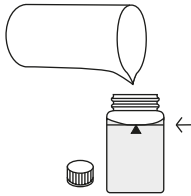
**2**

Añadir **2 gotas de DPD 1 Reagent Solution** en la cubeta con la muestra.

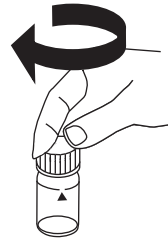


**3**

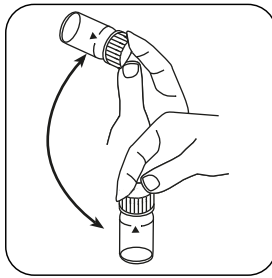
Añadir **3 gotas de DPD 3 Solution** en la cubeta con la muestra.



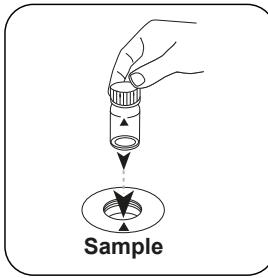
Llenar la cubeta con la **muestra hasta la marca de 10 mL**.



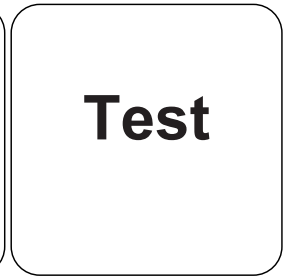
Cerrar la(s) cubeta(s).



Mezclar el contenido girando.

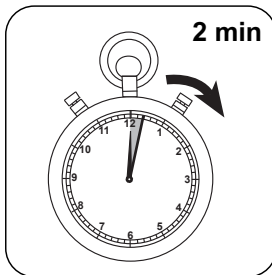


Poner la  **cubeta de muestra**  en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



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

ES



Esperar  **2 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 4 mg/L, cuando se usan reactivos líquidos 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]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

#### Conforme a

EN ISO 7393-2

<sup>a)</sup> Posible determinación de libre, combinado, total





Cloro HR (KI) T

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

KI / ácido

## Material

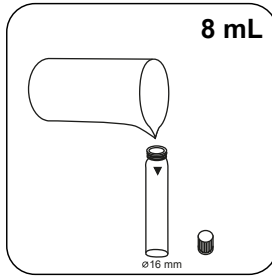
ES

Material requerido (parcialmente opcional):

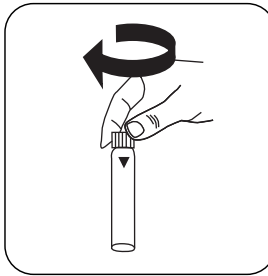
Reactivos	Unidad de embalaje	No. de referencia
Cloro HR (KI)	Tabletas / 100	513000BT
Cloro HR (KI)	Tabletas / 250	513001BT
Acidificante GP	Tabletas / 100	515480BT
Acidificante GP	Tabletas / 250	515481BT
Juego cloro HR (KI)/acidificante GP <sup>#</sup>	100 cada	517721BT
Juego cloro HR (KI)/acidificante GP <sup>#</sup>	250 cada	517722BT
Cloro HR (KI)	Tabletas / 100	501210
Cloro HR (KI)	Tabletas / 250	501211

## Ejecución de la determinación Cloro HR (KI) con tableta

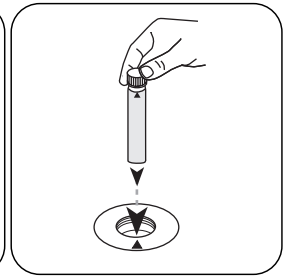
Seleccionar el método en el aparato.



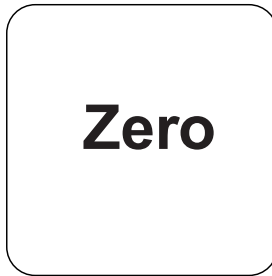
Llenar la cubeta de 16 mm con **8 mL de muestra**.



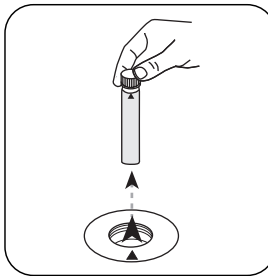
Cerrar la(s) cubeta(s).



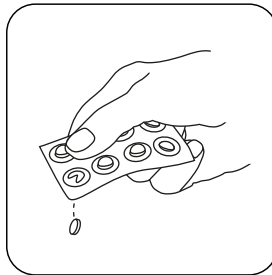
Poner la **cubeta de muestra** en el compartimento de medición. ¡Debe tenerse en cuenta el posicionamiento!



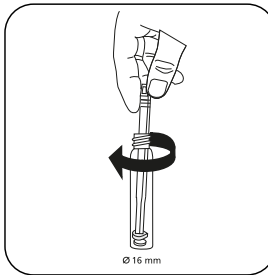
Pulsar la tecla **ZERO**.



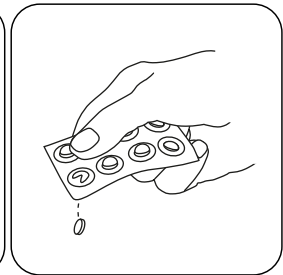
Extraer la **cubeta** del compartimento de medición.



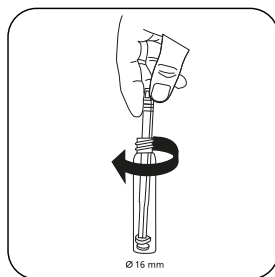
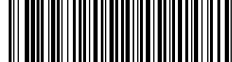
Añadir tableta **Chlorine HR (KI)**.



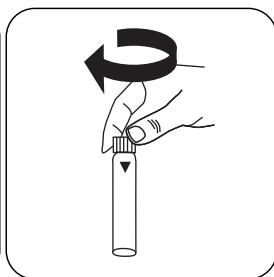
Triturar la(s) tableta(s) girando ligeramente.



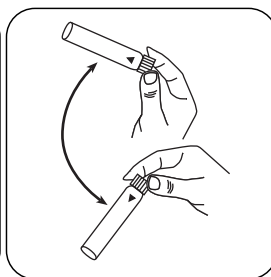
Añadir tableta **ACIDIFYING GP**.



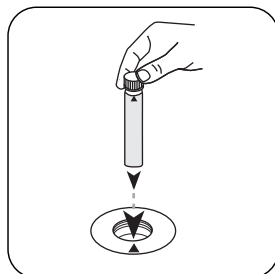
Triturar la(s) tableta(s) girando ligeramente.



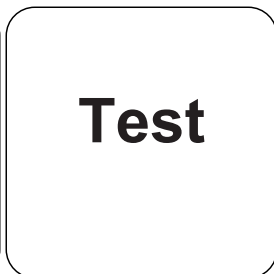
Cerrar la(s) cubeta(s).



Disolver la(s) tableta(s) girando.



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.

## Método químico

KI / ácido

## Apéndice

### Interferencia

ES

#### Interferencias persistentes

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

### Validación del método

<b>Límite de detección</b>	1.29 mg/L
<b>Límite de determinación</b>	3.86 mg/L
<b>Límite del rango de medición</b>	200 mg/L
<b>Sensibilidad</b>	83.96 mg/L / Abs
<b>Intervalo de confianza</b>	1.14 mg/L
<b>Desviación estándar</b>	0.45 mg/L
<b>Coefficiente de variación</b>	0.45 %

#### Derivado de

EN ISO 7393-3



**Cloro MR PP****M113****0.02 - 3.5 mg/L Cl<sub>2</sub><sup>a)</sup>****CL2****DPD**

ES

**Material**

Material requerido (parcialmente opcional):

<b>Reactivos</b>	<b>Unidad de embalaje</b>	<b>No. de referencia</b>
Cloro libre DPD F10 VARIO	Polvos / 100 Cantidad	530180
Cloro libre DPD F10 VARIO	Polvos / 1000 Cantidad	530183
Cloro total DPD F10 VARIO	Polvos / 100 Cantidad	530190
Cloro total DPD F10 VARIO	Polvos / 1000 Cantidad	530193

**Standards disponibles**

<b>Título</b>	<b>Unidad de embalaje</b>	<b>No. de referencia</b>
ValidCheck cloro 1,5 mg/l	1 Cantidad	48105510

**Muestreo**

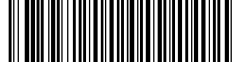
1. Evitar durante la preparación de la muestra la desgasificación de cloro, p. ej., al pipetar o agitar.
2. La determinación se ha de realizar inmediatamente después de la toma de la muestra.

## 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).

## Notas

1. Los reactivos en polvo utilizados están marcados en azul para facilitar su identificación. El polvo para la determinación del cloro libre lleva una línea cerrada y punteada. El polvo para la determinación del cloro total tiene dos líneas cerradas.



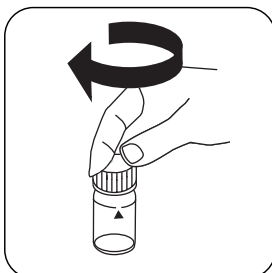
## Ejecución de la determinación cloro libre MR con reactivo Powder Pack

Seleccionar el método en el aparato.

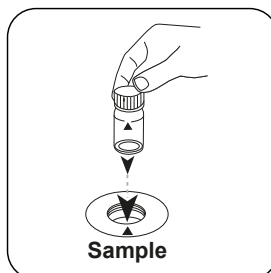
Seleccione además la determinación: libre



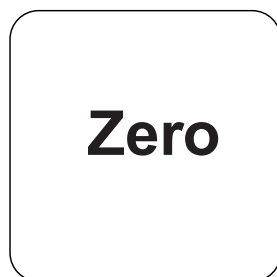
10 mL  
Llenar la cubeta de 24 mm con **10 mL de muestra** .



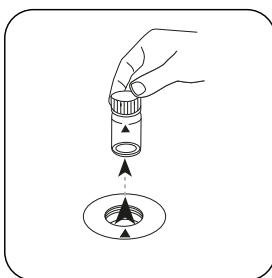
Cerrar la(s) cubeta(s).



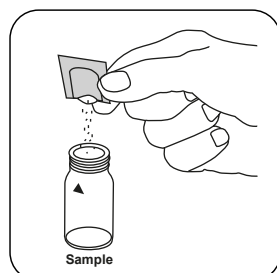
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



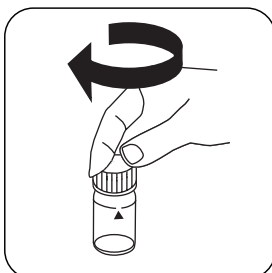
Pulsar la tecla **ZERO**.



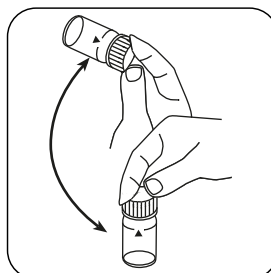
Extraer la cubeta del compartimiento de medición.



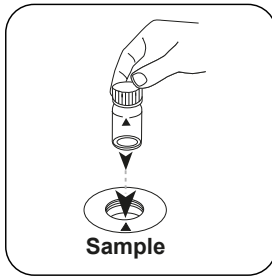
Añadir un **sobre de polvos VARIO Chlorine FREE-DPD/ F10** .



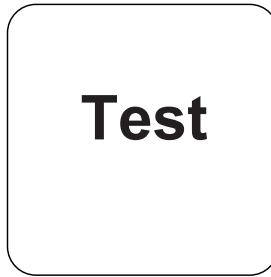
Cerrar la(s) cubeta(s).



Mezclar el contenido girando (20 sec.).



Poner la **cupeta 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.

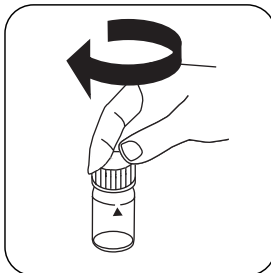
### Ejecución de la determinación cloro diferenciado MR con reactivo Powder Pack

Seleccionar el método en el aparato.

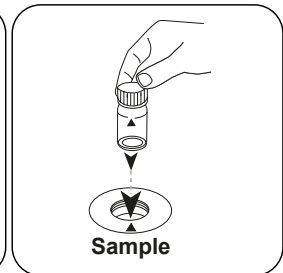
Seleccione además la determinación: diferenciado



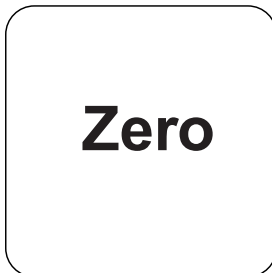
Llenar la cupeta de 24 mm con **10 mL de muestra**.



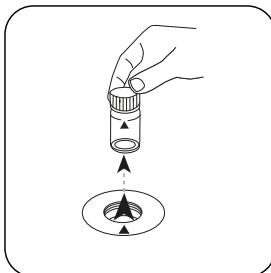
Cerrar la(s) cupeta(s).



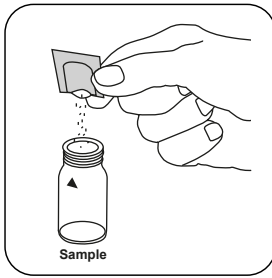
Poner la **cupeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



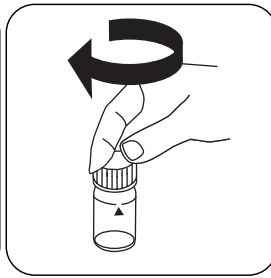
Pulsar la tecla **ZERO**.



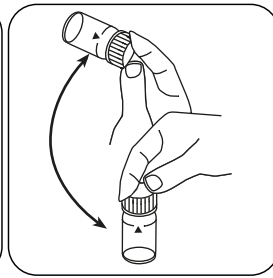
Extraer la cupeta del compartimiento de medición.



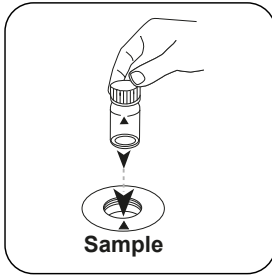
Añadir un **sobre de polvos VARIO Chlorine FREE-DPD/ F10** .



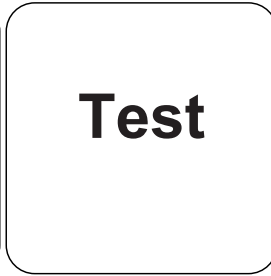
Cerrar la(s) cubeta(s).



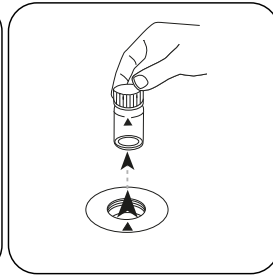
Mezclar el contenido girando (20 sec.).



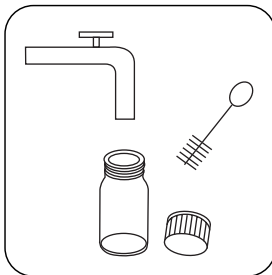
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



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



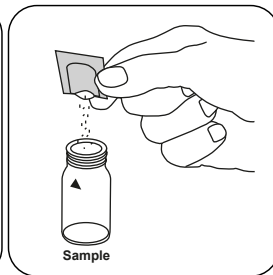
Extraer la cubeta del compartimiento de medición.



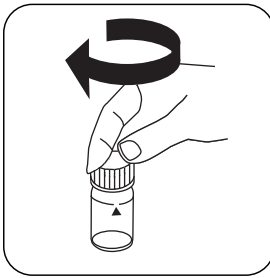
Limpiar a fondo la cubeta y la tapa.



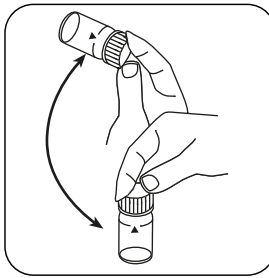
Llenar la cubeta de 24 mm con **10 mL de muestra** .



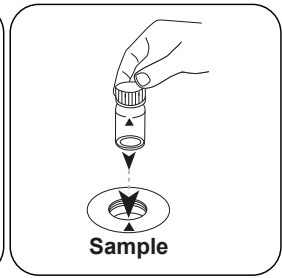
Añadir un **sobre de polvos Chlorine TOTAL-DPD/ F10** .



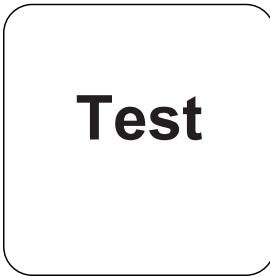
Cerrar la(s) cubeta(s).



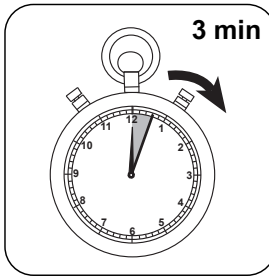
Mezclar el contenido girando (20 sec.).



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 libre, cloro ligado, cloro total.

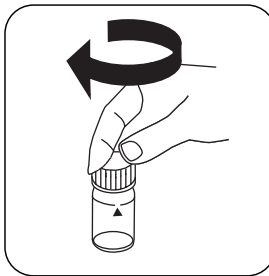
### Ejecución de la determinación cloro total MR con reactivo Powder Pack

Seleccionar el método en el aparato.

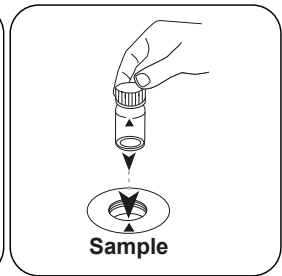
Seleccione además la determinación: total



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



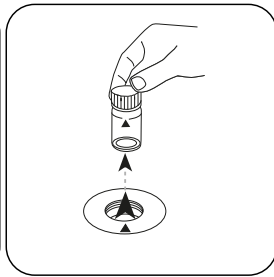
Cerrar la(s) cubeta(s).



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

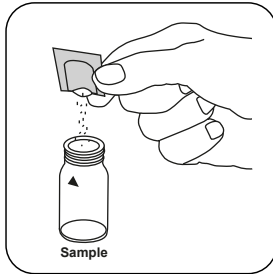


# Zero

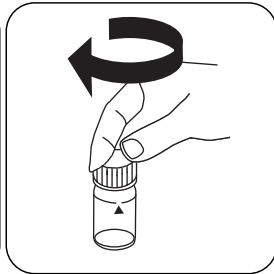


Pulsar la tecla **ZERO**.

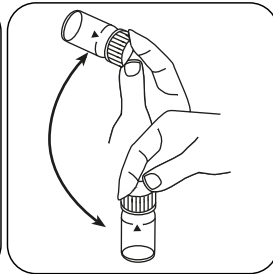
Extraer la cubeta del compartimiento de medición.



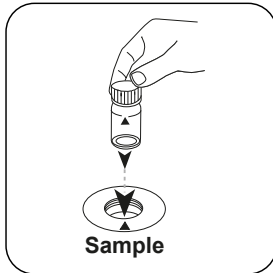
Añadir un **sobre de polvos VARIO Chlorine TOTAL-DPD/ F10**.



Cerrar la(s) cubeta(s).



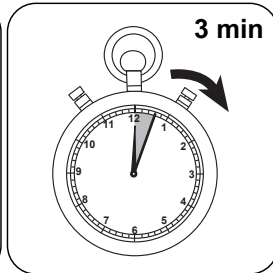
Mezclar el contenido girando (20 sec.).



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

# Test

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

## 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 4 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).

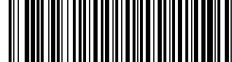
Interferencia	de / [mg/L]
CrO <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

## Validación del método

Límite de detección	0.01 mg/L
Límite de determinación	0.03 mg/L
Límite del rango de medición	3.5 mg/L
Sensibilidad	1.7 mg/L / Abs
Intervalo de confianza	0.014 mg/L
Desviación estándar	0.006 mg/L
Coficiente de variación	0.34 %

<sup>a)</sup> Posible determinación de libre, combinado, total



**Dureza calcio 2T****M191****20 - 500 mg/L CaCO<sub>3</sub>****CAH****Murexid**

ES

**Material**

Material requerido (parcialmente opcional):

<b>Reactivos</b>	<b>Unidad de embalaje</b>	<b>No. de referencia</b>
Juego calcio H n° 1/n° 2 <sup>#</sup>	100 cada	517761BT
Juego calcio H n° 1/n° 2 <sup>#</sup>	250 cada	517762BT

**Preparación**

1. Las muestras acuosas muy ácidas o muy básicas se deberán neutralizar a un valor de pH entre 4 y 10 antes de realizar el análisis (con 1 mol/l de ácido clorhídrico o 1 mol/l de hidróxido sódico).

**Notas**

1. Para optimizar los valores de medición, puede determinarse opcionalmente un ensayo en blanco de método específico para el lote (véase la descripción del fotómetro).
2. Añadir un volumen de muestra de exactamente 10 ml, ya que este volumen influye de forma decisiva en la exactitud del resultado.
3. Este método en cuestión se ha desarrollado a partir de un método de titración. Debido a circunstancias secundarias no definidas, la desviación respecto al método estándar puede ser aún mayor.
4. El procedimiento trabaja en el rango de medición alto con mayores tolerancias que en el bajo. Con diluciones de la muestra, diluir siempre de modo que se mida en el tercio inferior del rango de medición.

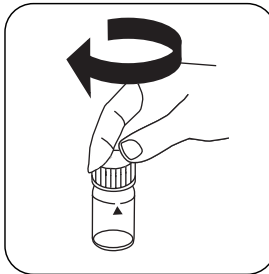


## Ejecución de la determinación Dureza calcio 2 con tableta

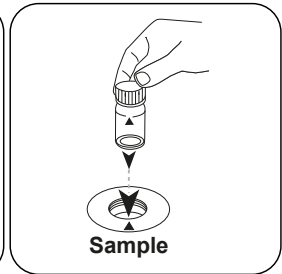
Seleccionar el método en el aparato.



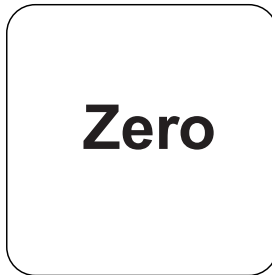
Llenar la cubeta de 24 mm con **10 mL de muestra** .



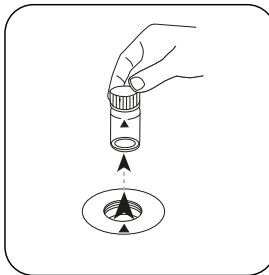
Cerrar la(s) cubeta(s).



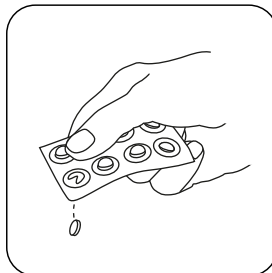
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



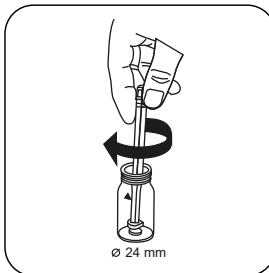
Pulsar la tecla **ZERO**.



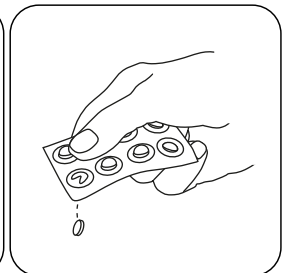
Extraer la cubeta del compartimiento de medición.



Añadir tableta **CALCIO H No.1**.



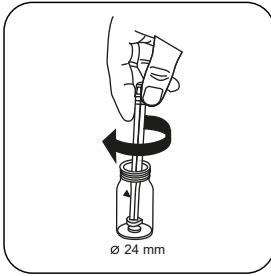
Triturar la(s) tableta(s) girando ligeramente y disolver.



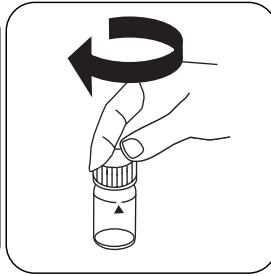
Añadir tableta **CALCIO H No.2**.



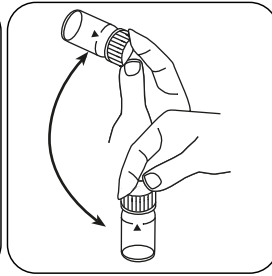
ES



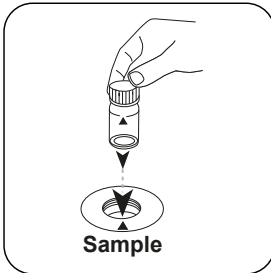
Triturar la(s) tableta(s) girando ligeramente.



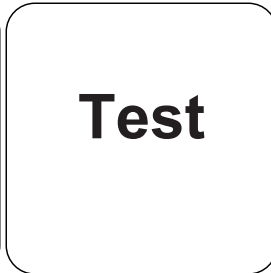
Cerrar la(s) cubeta(s).



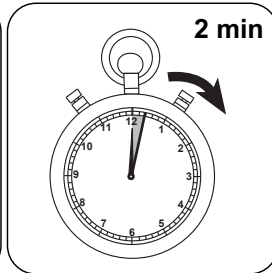
Disolver la(s) tableta(s) girando.



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



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



Esperar **2 minutos como periodo de reacción**.

Finalizado el periodo de reacción se realizará la determinación automáticamente.

A continuación se visualizará el resultado como Dureza calcio.

## Evaluación

La siguiente tabla muestra cómo los valores de salida se pueden convertir a otros formularios de citas.

Unidad	Conversión	Factor de conversión
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

ES

## Método químico

Murexid

## Apéndice

### Interferencia

#### Interferencias persistentes

1. La plata, el cadmio, el cobalto, el cobre y el mercurio perturban la determinación.

Interferencia	de / [mg/L]
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

### Bibliografía

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980



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

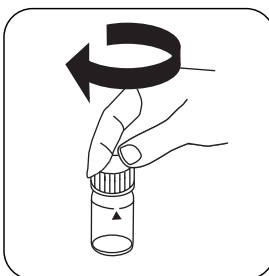
1. Para la determinación fotométrica del valor de pH solo deben usarse tabletas PHENOL RED selladas en una lámina negra con la palabra adicional PHOTOMETER.

## Ejecución de la determinación Valor de pH con tableta

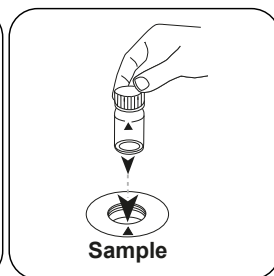
Seleccionar el método en el aparato.



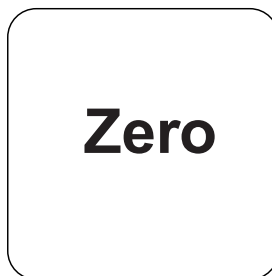
Llenar la cubeta de 24 mm con **10 mL de muestra** .



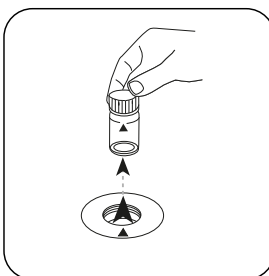
Cerrar la(s) cubeta(s).



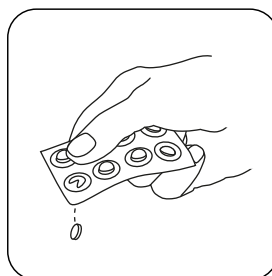
Poner la **cubeta de muestra** en el compartimento de medición. ¡Debe tenerse en cuenta el posicionamiento!



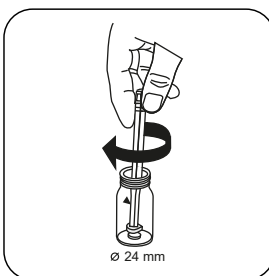
Pulsar la tecla **ZERO**.



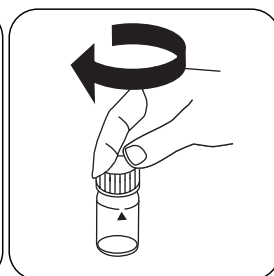
Extraer la cubeta del compartimento de medición.



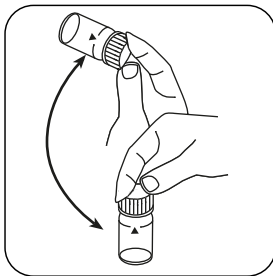
Añadir tableta **PHENOL RED PHOTOMETER**.



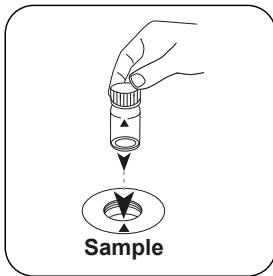
Triturar la(s) tableta(s) girando ligeramente.



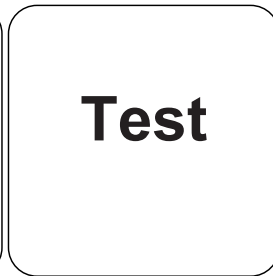
Cerrar la(s) cubeta(s).



Disolver la(s) tableta(s) girando.



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 como valor de pH.

ES

## 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 <sup>1)</sup>	-0,21 <sup>2)</sup>	-0,26 <sup>2)</sup>	-0,29 <sup>2)</sup>

<sup>1)</sup>según Kolthoff (1922)

<sup>2)</sup>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

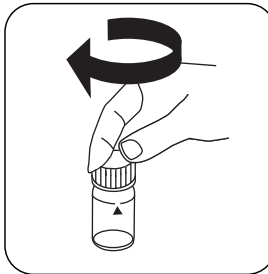
1. Después de usarla, la botella cuentagotas debe cerrarse de nuevo inmediatamente con la tapa roscada del mismo color.
2. Guardar el reactivo a una temperatura entre +6 °C y +10 °C.

## Ejecución de la determinación Valor de pH con reactivos líquidos

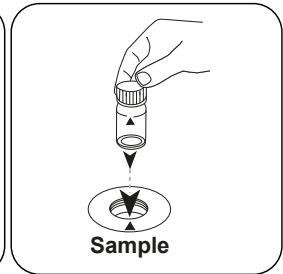
Seleccionar el método en el aparato.



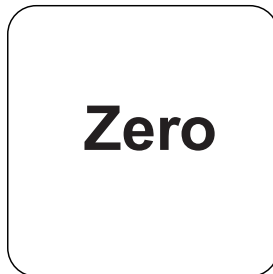
Llenar la cubeta de 24 mm con **10 mL de muestra**.



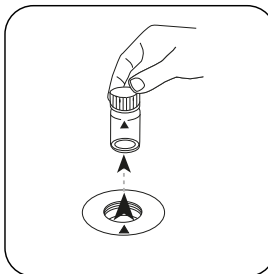
Cerrar la(s) cubeta(s).



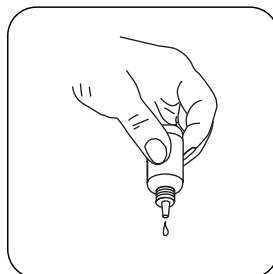
Poner la **cubeta de muestra** en el compartimiento de medición. ¡Debe tenerse en cuenta el posicionamiento!



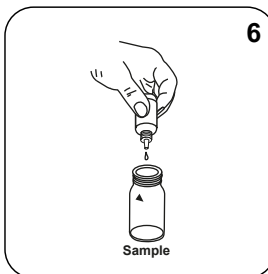
Pulsar la tecla **ZERO**.



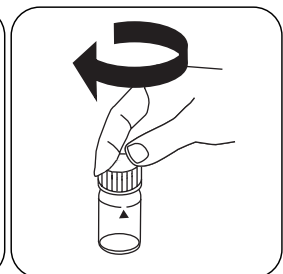
Extraer la cubeta del compartimiento de medición.



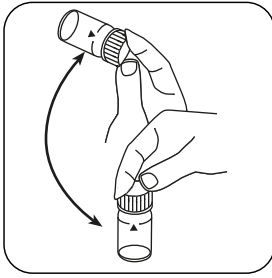
Mantener la botella cuentagotas vertical y añadir gotas del mismo tamaño presionando lentamente.



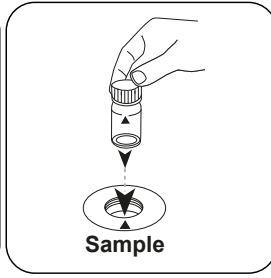
Añadir **6 gotas de PHENOL Red-Lösung** en la cubeta con la muestra.



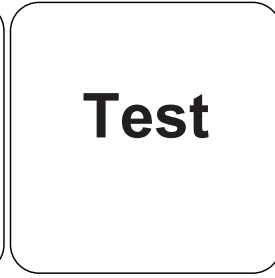
Cerrar la(s) cubeta(s).



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 <sup>1)</sup>
	60 g/L	-0,21 <sup>2)</sup>
	120 g/L	-0,26 <sup>2)</sup>
	180 g/L	-0,29 <sup>2)</sup>
	<sup>1)</sup> según Kolthoff (1922)	<sup>2)</sup> 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	$\lambda$	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

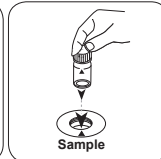
**Réalisation de la quantification Capacité acide  $K_{s4.3}$  avec pastille**

Sélectionnez la méthode sur l'appareil.

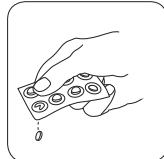
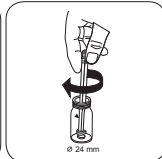
Cette méthode ne nécessite aucune mesure du zéro sur les appareils suivants : XD 7000, XD 7500

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

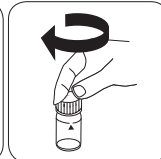
Fermez la(les) cuvette(s).

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).



Alcalinité-m T

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

Acide / Indicateur

FR

## Matériel

Matériel requis (partiellement optionnel):

Réactifs	Pack contenant	Code
Photomètre Alca-M	Pastilles / 100	513210BT
Photomètre Alca-M	Pastilles / 250	513211BT

## Indication

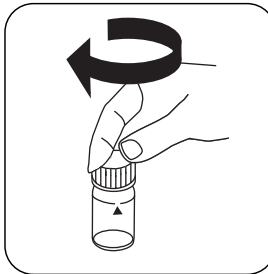
1. Les termes Alcalinité-m, Valeur m, Alcalinité totale et Capacité acide  $K_{s4,3}$  sont identiques.
2. L'observation exacte du volume d'échantillon de 10 ml est décisive pour l'exactitude du résultat de l'analyse.

## Réalisation de la quantification Alcalinité, total= Alcalinité-m = valeur-m avec pastille

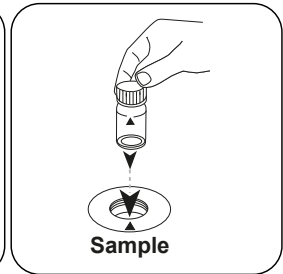
Sélectionnez la méthode sur l'appareil.



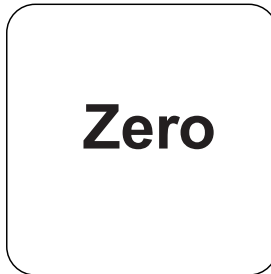
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



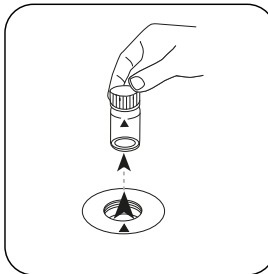
Fermez la(les) cuvette(s).



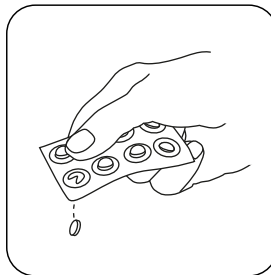
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



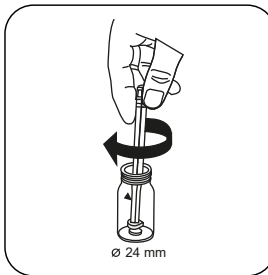
Appuyez sur la touche **ZERO**.



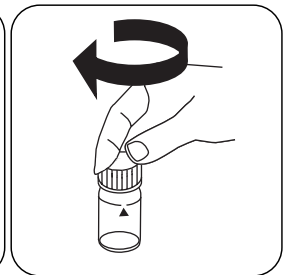
Retirez la cuvette de la chambre de mesure.



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



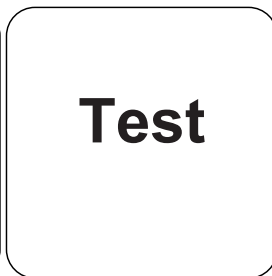
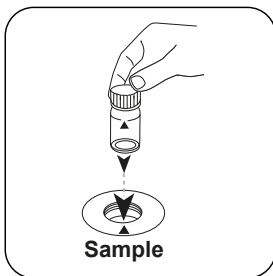
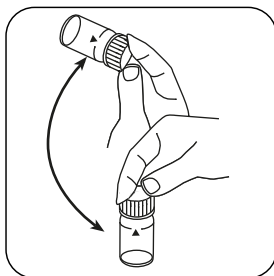
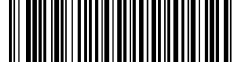
Écrasez la(les) pastille(s) en la(les) tournant un peu.



Fermez la(les) cuvette(s).

FR





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 alcalinité-m.

## Analyses

Le tableau suivant identifie les valeurs de sortie qui peuvent être converties en d'autres formes de citation.

Unité	Formes de citation	Facteur de conversion
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4,3</sub>	0.02

FR

## Méthode chimique

Acide / Indicateur

## Appendice

### Dérivé de

EN ISO 9963-1



Chlore T

M100

0.01 - 6.0 mg/L Cl<sub>2</sub> <sup>a)</sup>

CL6

DPD

## Matériel

FR

Matériel requis (partiellement optionnel):

Réactifs	Pack contenant	Code
DPD N° 1	Pastilles / 100	511050BT
DPD N° 1	Pastilles / 250	511051BT
DPD N° 1	Pastilles / 500	511052BT
DPD N° 3	Pastilles / 100	511080BT
DPD N° 3	Pastilles / 250	511081BT
DPD N° 3	Pastilles / 500	511082BT
DPD N° 1 High Calcium <sup>e)</sup>	Pastilles / 100	515740BT
DPD N° 1 High Calcium <sup>e)</sup>	Pastilles / 250	515741BT
DPD N° 1 High Calcium <sup>e)</sup>	Pastilles / 500	515742BT
DPD N° 3 High Calcium <sup>e)</sup>	Pastilles / 100	515730BT
DPD N° 3 High Calcium <sup>e)</sup>	Pastilles / 250	515731BT
DPD N° 3 High Calcium <sup>e)</sup>	Pastilles / 500	515732BT
DPD N° 4	Pastilles / 100	511220BT
DPD N° 4	Pastilles / 250	511221BT
DPD N° 4	Pastilles / 500	511222BT
DPD N° 3 Evo	Pastilles / 100	511420BT
DPD N° 3 Evo	Pastilles / 250	511421BT
DPD N° 3 Evo	Pastilles / 500	511422BT
DPD N° 4 Evo	Pastilles / 100	511970BT
DPD N° 4 Evo	Pastilles / 250	511971BT
DPD N° 4 Evo	Pastilles / 500	511972BT

## 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).

## Indication

1. Les pastilles Evo peuvent être utilisées en remplacement de la pastille standard correspondante (par exemple, DPD n° 3 Evo au lieu de DPD n° 3).

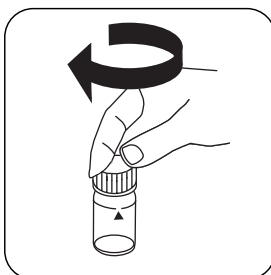


## Réalisation de la quantification Chlore libre avec pastilles

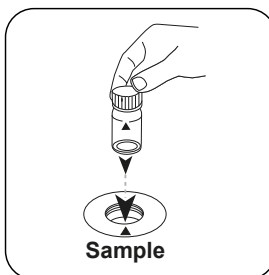
Sélectionnez la méthode sur l'appareil.



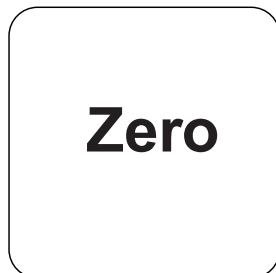
Remplissez une cuvette de 24 mm de **10 mL d'échantillon**.



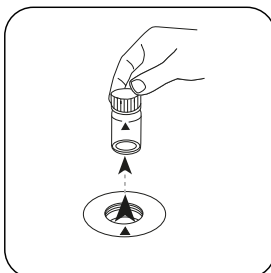
Fermez la(les) cuvette(s).



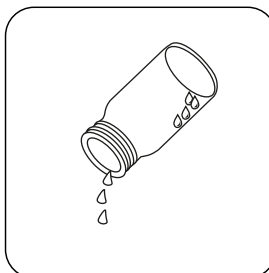
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



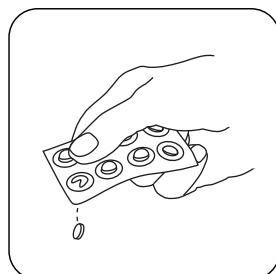
Appuyez sur la touche **ZERO**.



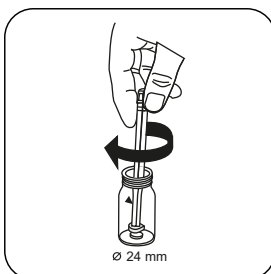
Retirez la cuvette de la chambre de mesure.



Videz pratiquement la cuvette en y laissant quelques gouttes.



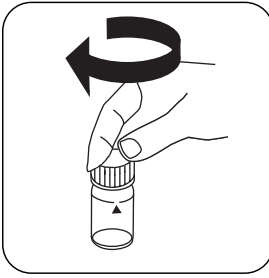
Ajoutez une **pastille de DPD No. 1**.



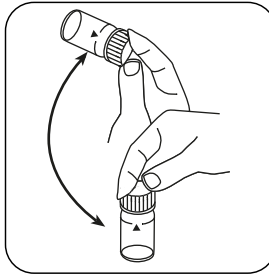
Écrasez la(les) pastille(s) en la(les) tournant un peu.



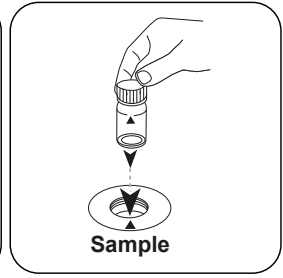
Remplissez la cuvette jusqu'au **repère de 10 mL** en y versant l'**échantillon**.



Fermez la(les) cuvette(s).



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.

FR

## Test

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

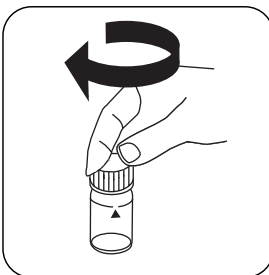
Le résultat s'affiche à l'écran en mg/L chlore libre.

### Réalisation de la quantification Chlore total avec pastilles

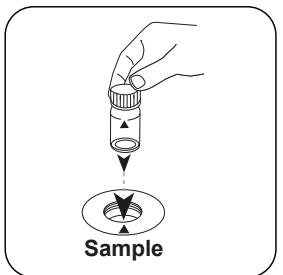
Sélectionnez la méthode sur l'appareil.



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



Fermez la(les) cuvette(s).

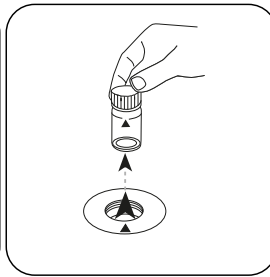


Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

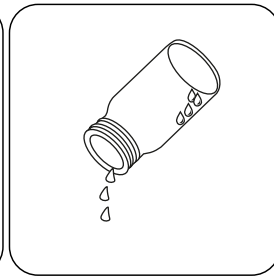


# Zero

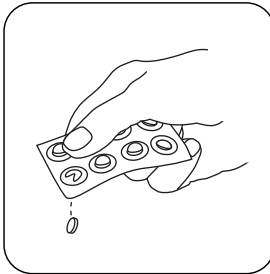
Appuyez sur la touche **ZERO**.



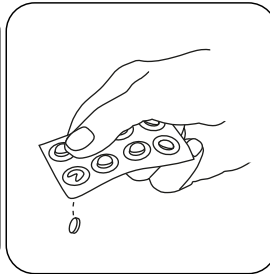
Retirez la cuvette de la chambre de mesure.



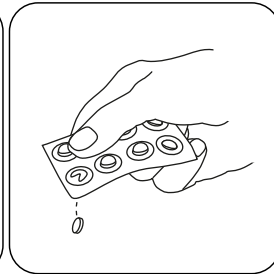
Videz pratiquement la cuvette en y laissant quelques gouttes.



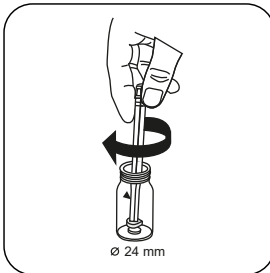
Ajoutez une **pastille de DPD No. 1**.



Ajoutez une **pastille de DPD No. 3**.



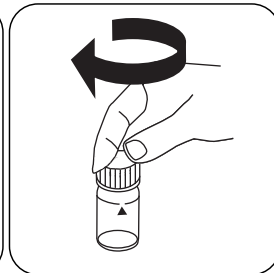
En alternative aux comprimés DPD n° 1 et n° 3, un comprimé DPD n° 4 peut être ajouté.



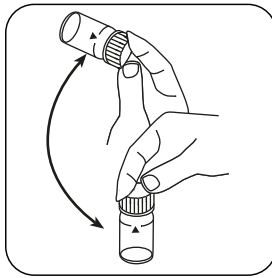
Écrasez la(les) pastille(s) en la(les) tournant un peu.



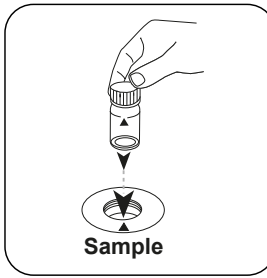
Remplissez la cuvette jusqu'au **repère de 10 mL** en y versant l'**échantillon**.



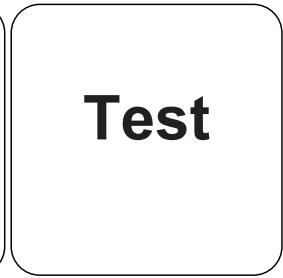
Fermez la(les) cuvette(s).



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

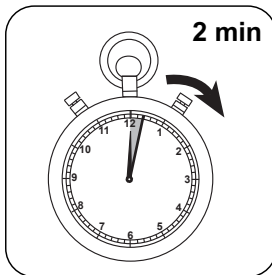


Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



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

FR



Attendez la fin du **temps de réaction de 2 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.
- Dans le cas des échantillons à haute concentration en calcium\* et/ou conductibilité élevée\*, l'utilisation des pastilles de réactif peut causer des turbidités et donc fausser les résultats. Utilisez alors la pastille de réactif DPD N° 1 High Calcium et la pastille de réactif DPD N° 3 High Calcium.  
\*Nous ne pouvons fournir de valeurs exactes, l'apparition d'une turbidité dépendant du type et de la composition de l'eau d'échantillonnage.
- Les concentrations de chlore supérieures à 10 mg/L peuvent donner des résultats dans la plage de mesure allant jusqu'à 0 mg/L en utilisant des pastilles. En cas de concentration trop élevée de chlore, 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]
$\text{CrO}_4^{2-}$	0.01
$\text{MnO}_2$	0.01

### Méthode Validation

Limite de détection	0.02 mg/L
Limite de détermination	0.06 mg/L
Fin de la gamme de mesure	6 mg/L
Sensibilité	2.05 mg/L / Abs
Intervalle de confiance	0.04 mg/L
Déviatoin standard	0.019 mg/L
Coefficient de variation	0.87 %

#### Conformité

EN ISO 7393-2



<sup>a</sup>Détermination du libre, combiné et total | <sup>a</sup>autre réactif, utilisé à la place de DPD No.1/3 en cas de turbidité dans l'échantillon d'eau due à une concentration élevée de calcium et/ou une conductivité élevée

**Chlore L****M101****0.02 - 4.0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD****Matériel**

FR

Matériel requis (partiellement optionnel):

Réactifs	Pack contenant	Code
DPD 1 solution tampon, flacon bleu	15 mL	471010
DPD 1 solution tampon	100 mL	471011
Solution tampon DPD 1 dans un lot de 6	1 Pièces	471016
DPD 1 solution de réactif, flacon vert	15 mL	471020
DPD 1 solution de réactif	100 mL	471021
Solution de réactif DPD 1 dans un lot de 6	1 Pièces	471026
DPD 3 solution, flacon rouge	15 mL	471030
DPD 3 solution	100 mL	471031
Solution DPD 3 dans un lot de 6	1 Pièces	471036
Kit de réactifs DPD	1 Pièces	471056

**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).

## Indication

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

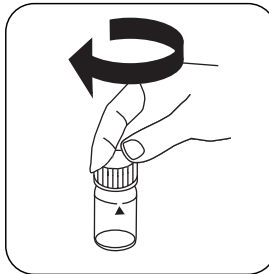


## Réalisation de la quantification Chlore libre avec réactifs liquides

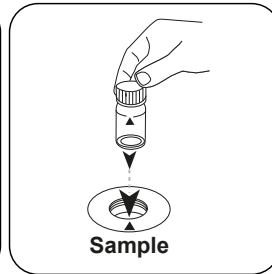
Sélectionnez la méthode sur l'appareil.



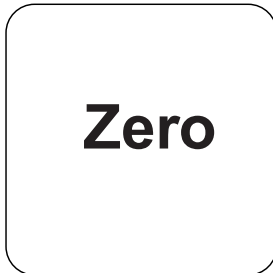
Remplissez une cuvette de 24 mm de **10 mL d'échantillon**.



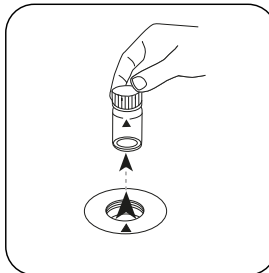
Fermez la(les) cuvette(s).



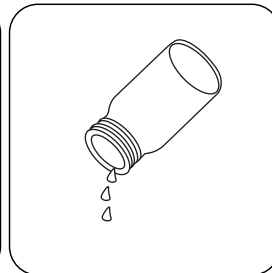
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



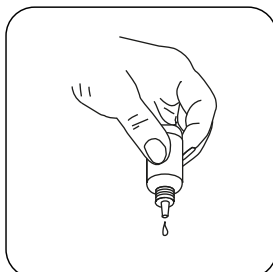
Appuyez sur la touche **ZERO**.



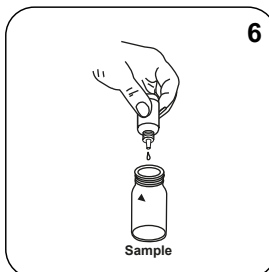
Retirez la cuvette de la chambre de mesure.



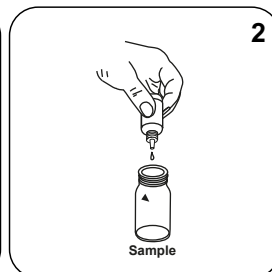
Videz la cuvette.



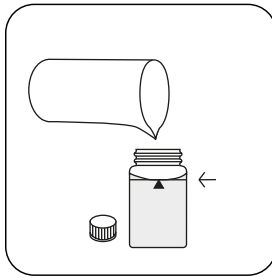
Tenez les flacons compte-goutte à la verticale et ajoutez des gouttes uniformes en appuyant lentement.



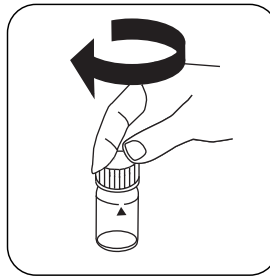
Ajoutez **6 gouttes de DPD 1 Buffer Solution** dans la cuvette réservée à l'échantillon.



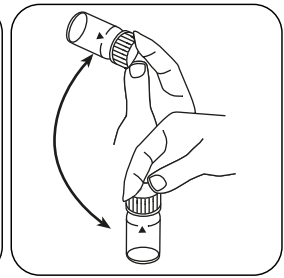
Ajoutez **2 gouttes de DPD 1 Reagent Solution** dans la cuvette réservée à l'échantillon.



Remplissez la cuvette jusqu'au repère de 10 mL en y versant l'échantillon.

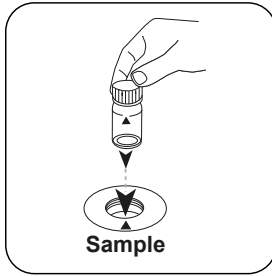


Fermez la(les) cuvette(s).

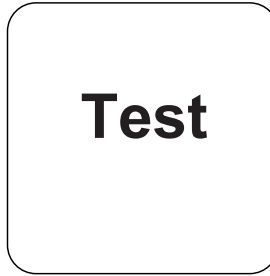


Mélangez le contenu en mettant le tube plusieurs fois à l'envers puis à l'endroit.

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



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

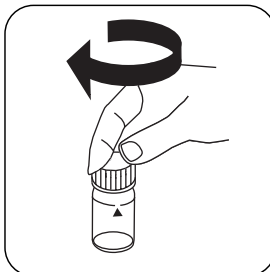
Le résultat s'affiche à l'écran en mg/L chlore libre.

## Réalisation de la quantification Chlore total avec réactifs liquides

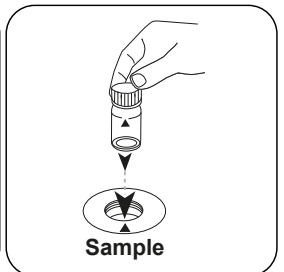
Sélectionnez la méthode sur l'appareil.



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



Fermez la(les) cuvette(s).

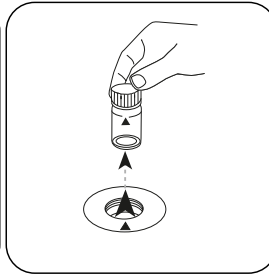


Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

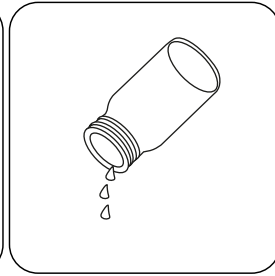


# Zero

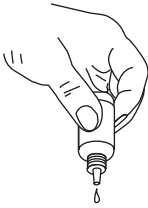
Appuyez sur la touche **ZERO**.



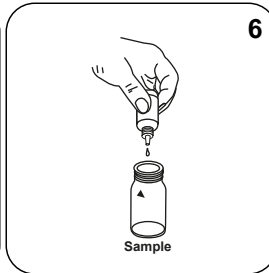
Retirez la cuvette de la chambre de mesure.



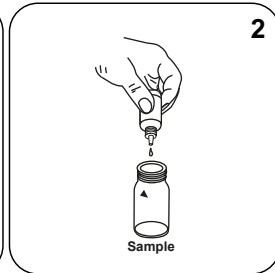
Videz la cuvette.



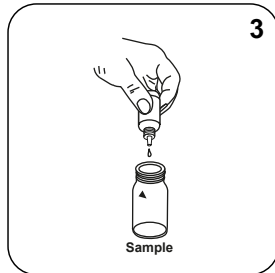
Tenez les flacons compte-goutte à la verticale et ajoutez des gouttes uniformes en appuyant lentement.



Ajoutez **6 gouttes de DPD 1 Buffer Solution** dans la cuvette réservée à l'échantillon.



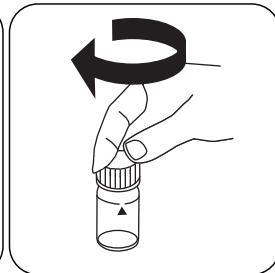
Ajoutez **2 gouttes de DPD 1 Reagent Solution** dans la cuvette réservée à l'échantillon.



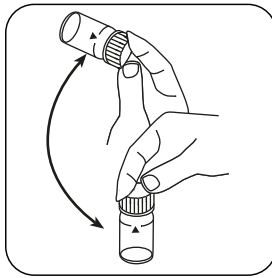
Ajoutez **3 gouttes de DPD 3 Solution** dans la cuvette réservée à l'échantillon.



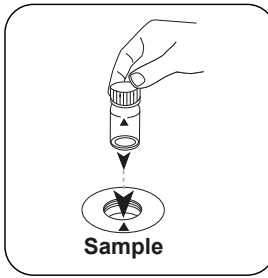
Remplissez la cuvette jusqu'au **repère de 10 mL** en y versant l'**échantillon**.



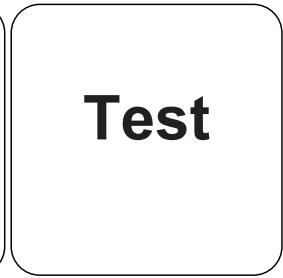
Fermez la(les) cuvette(s).



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

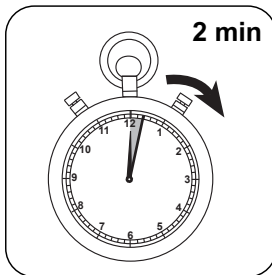


Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



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

FR



Attendez la fin du **temps de réaction de 2 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

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### 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 4 mg/L peuvent donner des résultats dans la plage de mesure allant jusqu'à 0 mg/L en utilisant des réactifs liquides. 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]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

#### Conformité

EN ISO 7393-2

<sup>a)</sup>Détermination du libre, combiné et total





Chlore HR (KI) T

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

KI / Acide

## Matériel

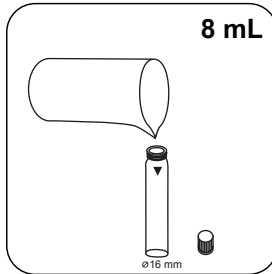
FR

Matériel requis (partiellement optionnel):

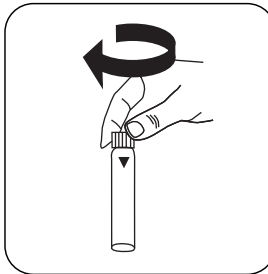
Réactifs	Pack contenant	Code
Chlore HR (KI)	Pastilles / 100	513000BT
Chlore HR (KI)	Pastilles / 250	513001BT
Acidifiants PT	Pastilles / 100	515480BT
Acidifiants PT	Pastilles / 250	515481BT
Kit chlore HR (KI)/acidifiant GP#	100 chacun	517721BT
Kit chlore HR (KI)/acidifiant GP#	250 chacun	517722BT
Chlore HR (KI)	Pastilles / 100	501210
Chlore HR (KI)	Pastilles / 250	501211

## Réalisation de la quantification Chlore HR (KI) avec pastille

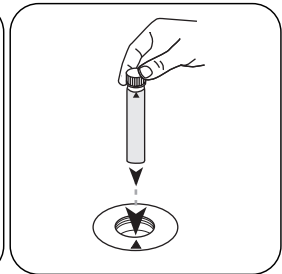
Sélectionnez la méthode sur l'appareil.



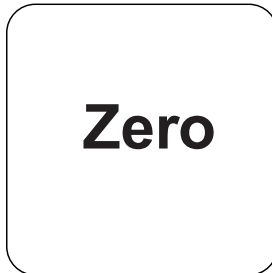
Remplissez une cuvette de 16 mm de **8 mL** d'échantillon.



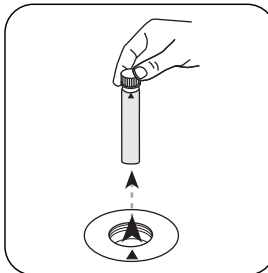
Fermez la(les) cuvette(s).



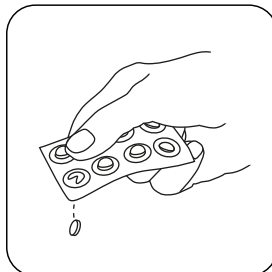
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



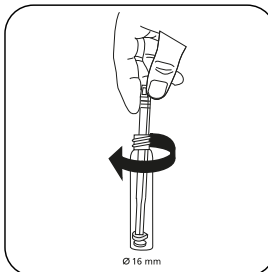
Appuyez sur la touche **ZERO**.



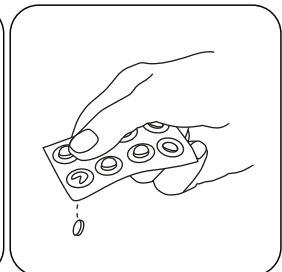
Retirez la **cuvette** de la chambre de mesure.



Ajoutez une **pastille de Chlorine HR (KI)**.



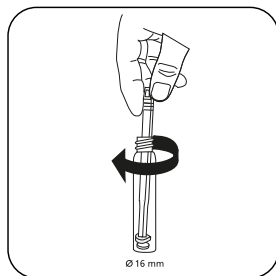
Écrasez la(les) pastille(s) en la(les) tournant un peu.



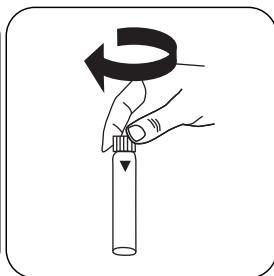
Ajoutez une **pastille de ACIDIFYING GP**.



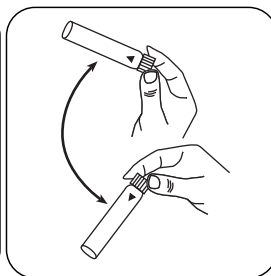
FR



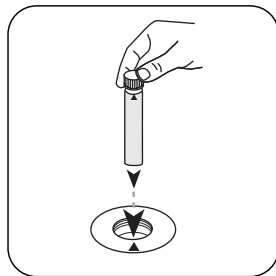
Écrasez la(les) pastille(s)  
en la(les) tournant un peu.



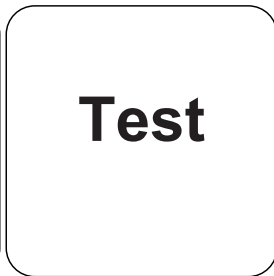
Fermez la(les) cuvette(s).



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 mg/L chlore.

## Méthode chimique

KI / Acide

## Appendice

### Interférences

#### Interférences persistantes

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

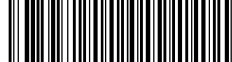
### Méthode Validation

<b>Limite de détection</b>	1.29 mg/L
<b>Limite de détermination</b>	3.86 mg/L
<b>Fin de la gamme de mesure</b>	200 mg/L
<b>Sensibilité</b>	83.96 mg/L / Abs
<b>Intervalle de confiance</b>	1.14 mg/L
<b>Déviatiion standard</b>	0.45 mg/L
<b>Coefficient de variation</b>	0.45 %

#### Dérivé de

EN ISO 7393-3

<sup>ii</sup>\* agitateur inclus

**Chlore MR PP****M113****0.02 - 3.5 mg/L Cl<sub>2</sub><sup>a)</sup>****CL2****DPD**

FR

**Matériel**

Matériel requis (partiellement optionnel):

Réactifs	Pack contenant	Code
VARIO Chlore libre DPD F10	Poudre / 100 Pièces	530180
VARIO Chlore libre DPD F10	Poudre / 1000 Pièces	530183
VARIO Chlore total DPD F10	Poudre / 100 Pièces	530190
VARIO Chlore total DPD F10	Poudre / 1000 Pièces	530193

**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).

## Indication

1. Les réactifs en poudre utilisés sont marqués en bleu pour faciliter l'identification. La poudre pour le dosage du chlore libre porte une ligne fermée et une ligne en pointillés. La poudre pour la détermination du chlore total a deux lignes fermées.





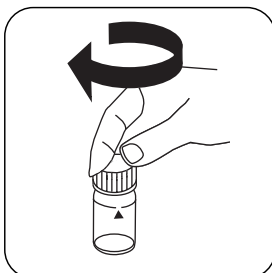
## Réalisation de la quantification Chlore MR libre avec réactifs en sachet de poudre (PP)

Sélectionnez la méthode sur l'appareil.

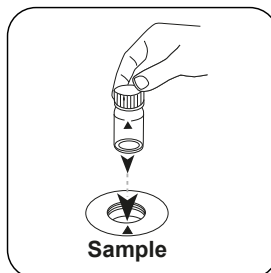
Sélectionnez également la quantification : libre



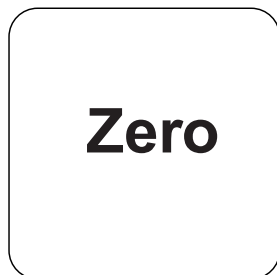
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



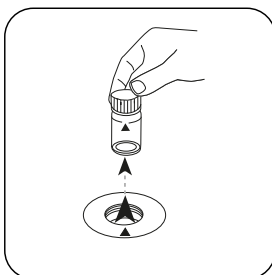
Fermez la(les) cuvette(s).



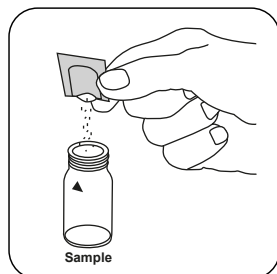
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



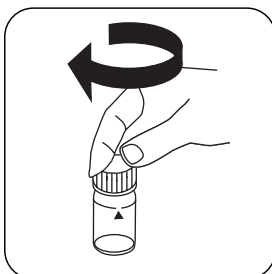
Appuyez sur la touche **ZERO**.



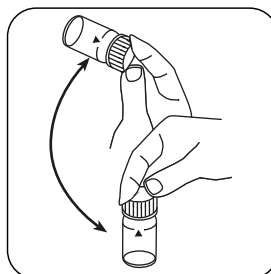
Retirez la cuvette de la chambre de mesure.



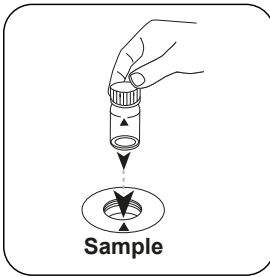
Ajoutez un **sachet de poudre VARIO Chlorine FREE-DPD/ F10**.



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.

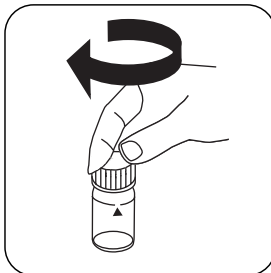
## Réalisation de la quantification Chlore MR détermination différenciée avec réactifs en sachet de poudre (PP)

Sélectionnez la méthode sur l'appareil.

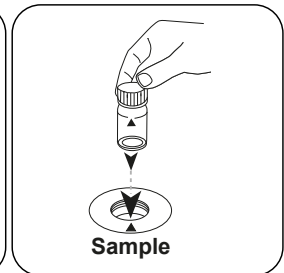
Sélectionnez également la quantification : différenciée



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

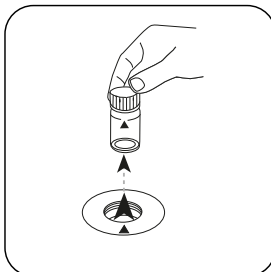


Fermez la(les) cuvette(s).



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

# Zero

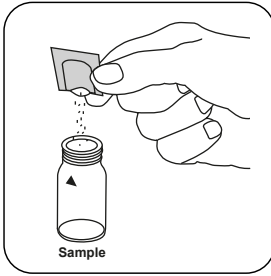


Appuyez sur la touche **ZERO**.

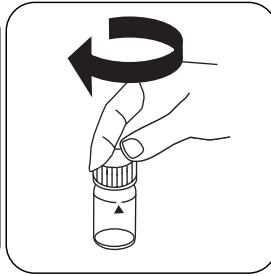
Retirez la cuvette de la chambre de mesure.



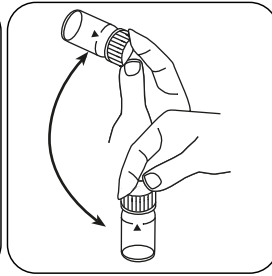
FR



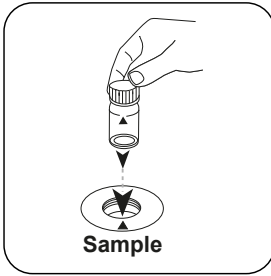
Ajoutez un **sachet de poudre VARIO Chlorine FREE-DPD/ F10**.



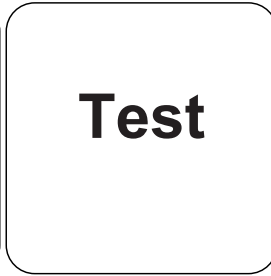
Fermez la(les) cuvette(s).



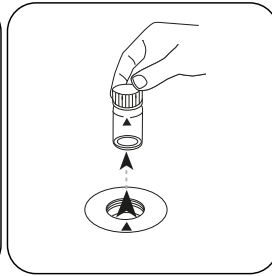
Retourner plusieurs fois pour mélanger le contenu (20 sec.) .



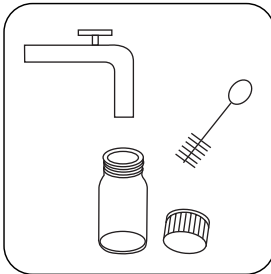
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



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



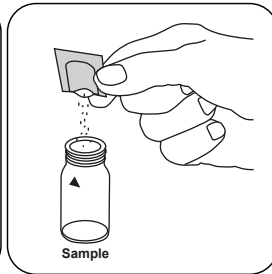
Retirez la cuvette de la chambre de mesure.



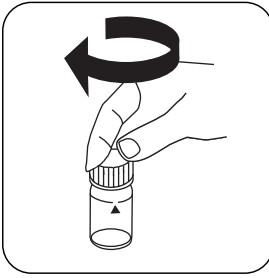
Nettoyez à fond la cuvette et le couvercle de la cuvette.



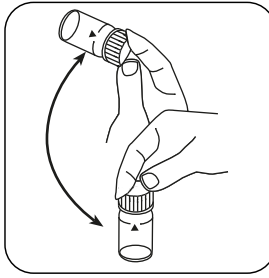
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



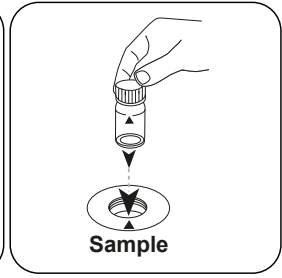
Ajoutez un **sachet de poudre Chlorine TOTAL-DPD/ F10**.



Fermez la(les) cuvette(s).

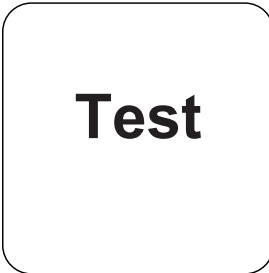


Retourner plusieurs fois pour mélanger le contenu (20 sec.) .

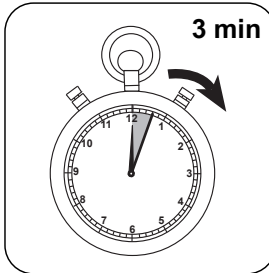


Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.

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 libre, chlore combiné, chlore total.

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

Sélectionnez la méthode sur l'appareil.

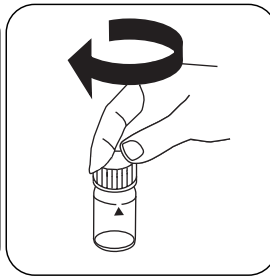
Sélectionnez également la quantification : total



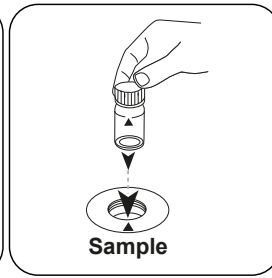
FR



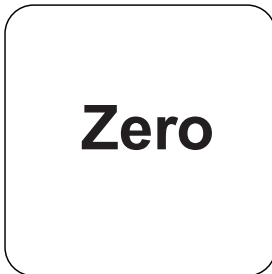
Remplissez une cuvette de 24 mm de **10 mL d'échantillon**.



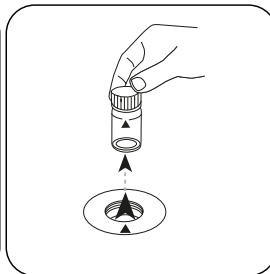
Fermez la(les) cuvette(s).



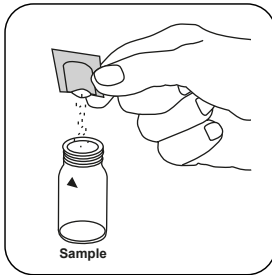
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



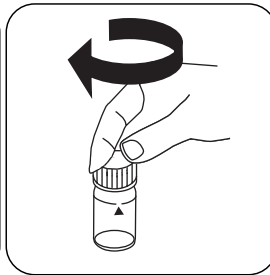
Appuyez sur la touche **ZERO**.



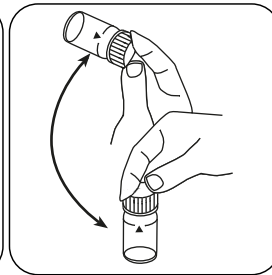
Retirez la cuvette de la chambre de mesure.



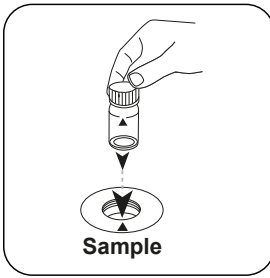
Ajoutez un **sachet de poudre VARIO Chlorine TOTAL-DPD/ F10**.



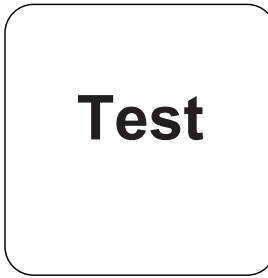
Fermez la(les) cuvette(s).



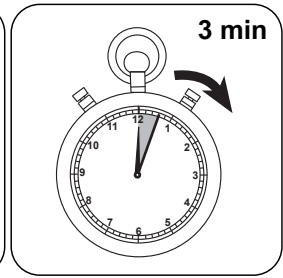
Retourner plusieurs fois pour mélanger le contenu (20 sec.) .



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



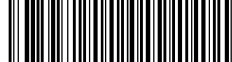
Appuyez sur la touche **TEST** (XD: **START**).



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

## 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 4 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 <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

## Méthode Validation

Limite de détection	0.01 mg/L
Limite de détermination	0.03 mg/L
Fin de la gamme de mesure	3.5 mg/L
Sensibilité	1.7 mg/L / Abs
Intervalle de confiance	0.014 mg/L
Déviation standard	0.006 mg/L
Coefficient de variation	0.34 %

<sup>a)</sup>Détermination du libre, combiné et total





**Dureté calcique 2T****M191****20 - 500 mg/L CaCO<sub>3</sub>****CAH****Murexide**

FR

**Matériel**

Matériel requis (partiellement optionnel):

Réactifs	Pack contenant	Code
Kit Calcio H N° 1/N° 2*	100 chacun	517761BT
Kit Calcio H N° 1/N° 2*	250 chacun	517762BT

**Préparation**

1. Avant l'analyse, les eaux fortement alcalines ou acides devraient être ajustées sur un pH compris entre 4 et 10 (avec 1 mol/l d'acide chlorhydrique ou 1 mol/l de soude caustique).

**Indication**

1. Pour optimiser les valeurs mesurées, il est possible de quantifier une valeur à blanc de la méthode par lot en utilisant (voir la description du photomètre).
2. L'observation exacte du volume d'échantillon de 10 ml est décisive pour l'exactitude du résultat de l'analyse.
3. Cette méthode a été mise au point à partir d'une procédure titrimétrique. Pour des raisons secondaires non définies, l'écart par rapport à la méthode normalisée peut être supérieur.
4. La procédure est réalisée dans la partie haute de la plage de mesure avec des tolérances supérieures à celles de la plage de mesure inférieure. Lors des dilutions de l'échantillon, diluez toujours de manière à mesurer dans le tiers inférieur de la plage de mesure.

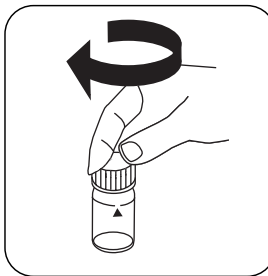


## Réalisation de la quantification Duréte calcique 2 avec pastille

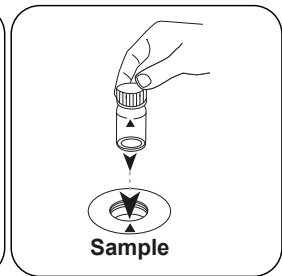
Sélectionnez la méthode sur l'appareil.



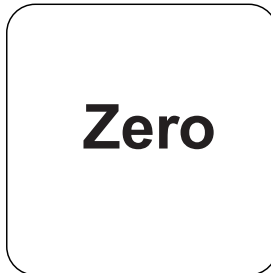
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



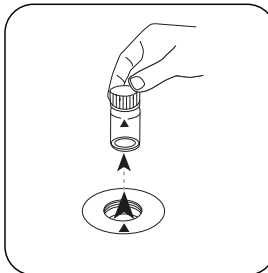
Fermez la(les) cuvette(s).



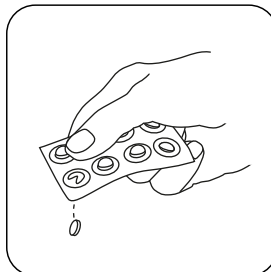
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



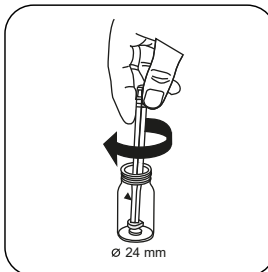
Appuyez sur la touche **ZERO**.



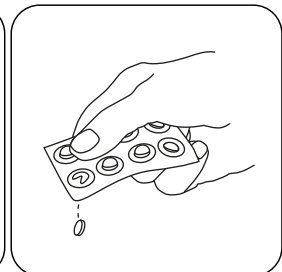
Retirez la cuvette de la chambre de mesure.



Ajoutez une **pastille de CALCIO H No.1**.



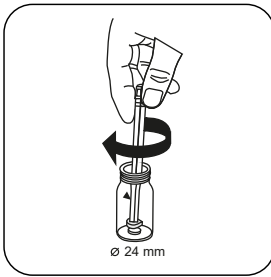
Écrasez et dissolvez la(les) pastille(s) en la(les) tournant un peu.



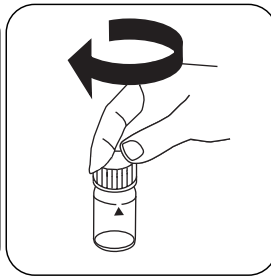
Ajoutez une **pastille de CALCIO H No.2**.



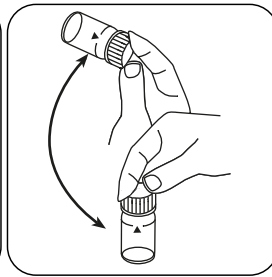
FR



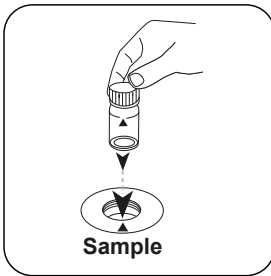
Écrasez la(les) pastille(s)  
en la(les) tournant un peu.



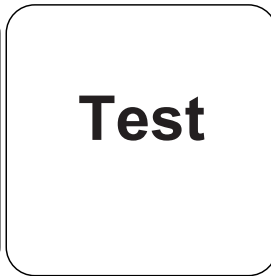
Fermez la(les) cuvette(s).



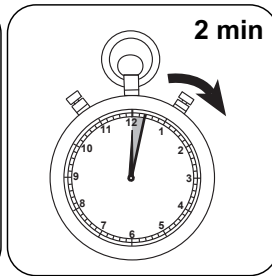
Dissolvez la(les) pastille(s)  
en mettant le tube plusieurs  
fois à l'envers.



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



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



Attendez la fin du **temps de**  
**réaction de 2 minute(s)** .

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

Le résultat s'affiche à l'écran en Dureté calcique.

## Analyses

Le tableau suivant identifie les valeurs de sortie qui peuvent être converties en d'autres formes de citation.

Unité	Formes de citation	Facteur de conversion
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

FR

## Méthode chimique

Murexide

## Appendice

### Interférences

#### Interférences persistantes

1. L'argent, le cadmium, le cobalt, le cuivre et le mercure perturbent la quantification.

Interférences	de / [mg/L]
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

### Bibliographie

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

<sup>ii</sup># agitateur inclus



Valeur du pH T

M330

6.5 - 8.4 pH

PH

Rouge de phénol

FR

## Matériel

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

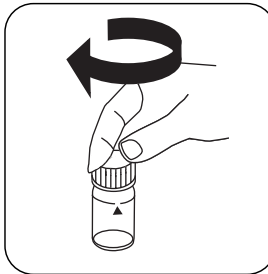
1. Pour la quantification photométrique du pH, n'utilisez que des pastilles PHENOL RED avec étiquette noire, sur lesquelles le terme PHOTOMER est apposé.

## Réalisation de la quantification Valeur du pH avec pastille

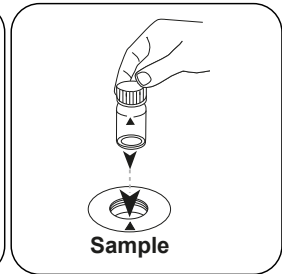
Sélectionnez la méthode sur l'appareil.



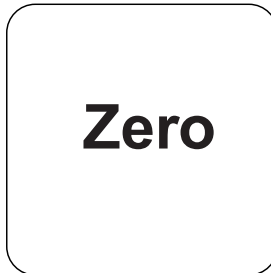
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



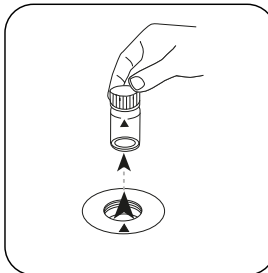
Fermez la(les) cuvette(s).



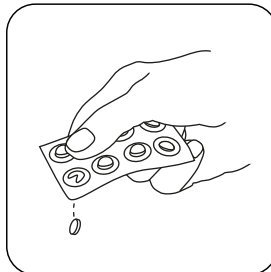
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



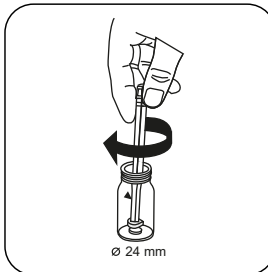
Appuyez sur la touche **ZERO**.



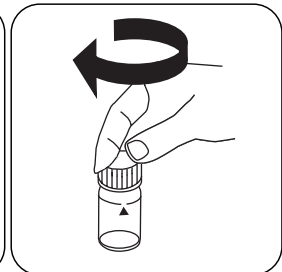
Retirez la cuvette de la chambre de mesure.



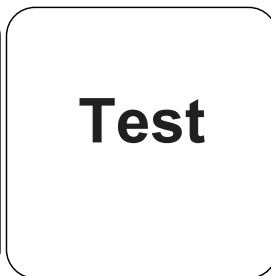
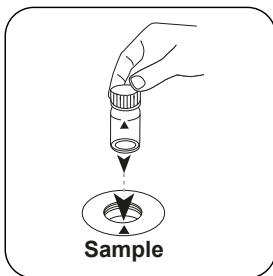
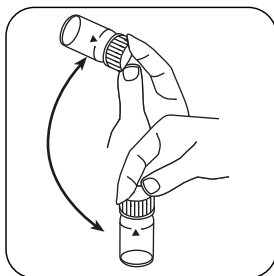
Ajoutez une **pastille de PHENOL RED PHOTOMETER**.



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  $\text{CaCO}_3$ .

#### 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 <sup>1)</sup>	-0,21 <sup>2)</sup>	-0,26 <sup>2)</sup>	-0,29 <sup>2)</sup>

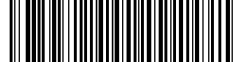
<sup>1)</sup> selon Kolthoff (1922)

<sup>2)</sup> 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

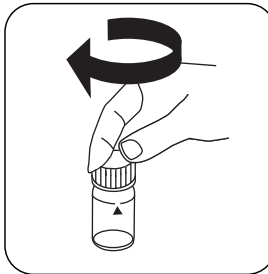
- Après emploi, refermez immédiatement le flacon compte-goutte en utilisant le capot de même couleur.
- Conservez le réactif à une température de +6 °C à +10 °C.

## Réalisation de la quantification Valeur du pH avec réactif liquide

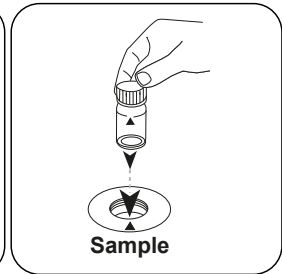
Sélectionnez la méthode sur l'appareil.



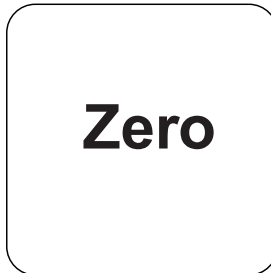
Remplissez une cuvette de 24 mm de **10 mL** d'échantillon.



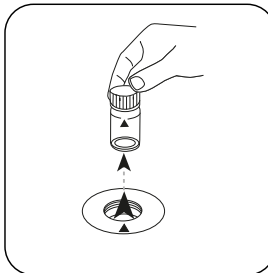
Fermez la(les) cuvette(s).



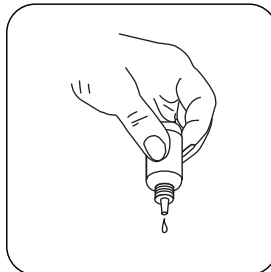
Placez la **cuvette réservée à l'échantillon** dans la chambre de mesure. Attention à la positionner correctement.



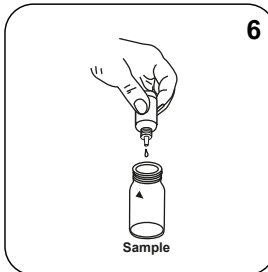
Appuyez sur la touche **ZERO**.



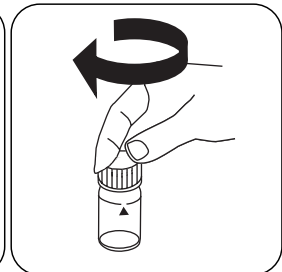
Retirez la cuvette de la chambre de mesure.



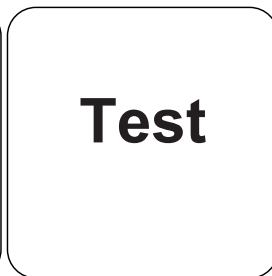
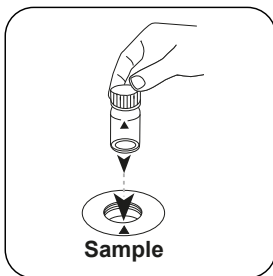
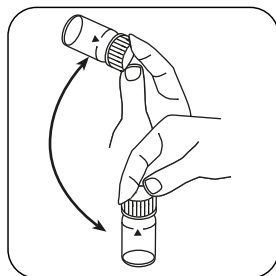
Tenez les flacons compte-goutte à la verticale et ajoutez des gouttes uniformes en appuyant lentement.



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



Fermez la(les) cuvette(s).



FR

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.

## 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 <sup>1)</sup>
	60 g/L	-0,21 <sup>2)</sup>
	120 g/L	-0,26 <sup>2)</sup>
	180 g/L	-0,29 <sup>2)</sup>
	<sup>1)</sup> selon Kolthoff (1922)	<sup>2)</sup> 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	$\lambda$	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.

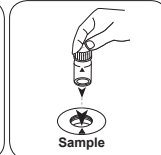
Con i seguenti dispositivi, per questo metodo non è necessario eseguire una misurazione ZERO: XD 7000, XD 7500



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

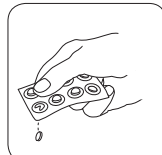


Chiudere la/e cuvetta/e.

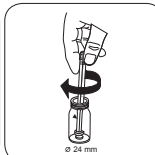


Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.

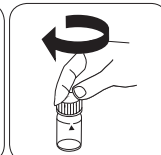
• • •



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



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



Chiudere la/e cuvetta/e.



Alcalinità M T

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

Acido/indicatore

IT

## Materiale

Materiale richiesto (in parte facoltativo):

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

## Note

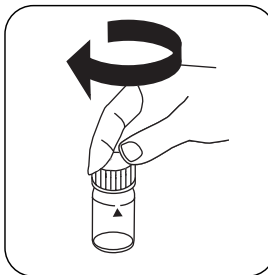
1. I termini alcalinità M, valore M, alcalinità totale e capacità acida  $K_{S4,3}$  sono equivalenti.
2. Per l'accuratezza del risultato dell'analisi è fondamentale che il volume del campione misuri esattamente 10 ml.

## Esecuzione della rilevazione Alcalinità, totale = alcalinità M = valore M con pastiglia

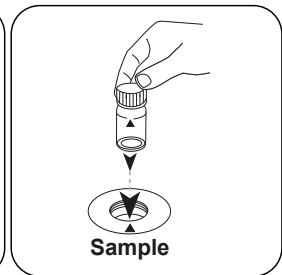
Selezionare il metodo nel dispositivo.



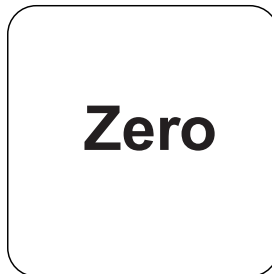
Riempire una cuvetta da 24 mm con **10 mL di campione**.



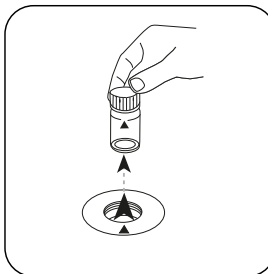
Chiudere la/e cuvetta/e.



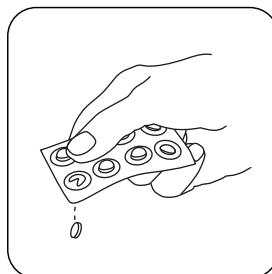
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



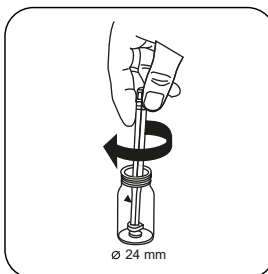
Premere il tasto **ZERO**.



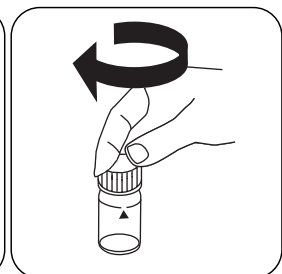
Prelevare la cuvetta dal vano di misurazione.



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

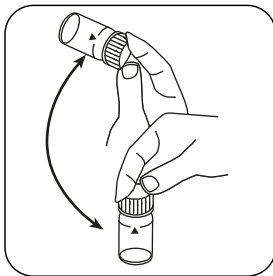


Frantumare la/e pastiglia/e con una leggera rotazione.

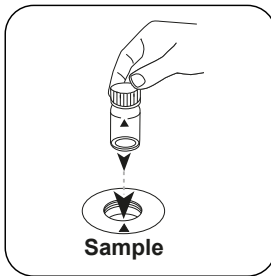


Chiudere la/e cuvetta/e.

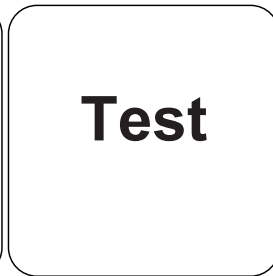




Far sciogliere la/e  
pastiglia/e agitando.



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 alcalinità-m.

## Valutazione

La seguente tabella identifica i valori di output che possono essere convertiti in altre forme di citazione.

Unità di misura	Forma di citazione	Fattore di conversione
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4.3</sub>	0.02

IT

## Metodo chimico

Acido/indicatore

## Appendice

**Derivato di**

EN ISO 9963-1

**Cloro T****M100****0.01 - 6.0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD**

IT

**Materiale**

Materiale richiesto (in parte facoltativo):

<b>Reagenti</b>	<b>Unità di imballaggio</b>	<b>N. ordine</b>
DPD No.1	Pastiglia / 100	511050BT
DPD No. 1	Pastiglia / 250	511051BT
DPD No. 1	Pastiglia / 500	511052BT
DPD No. 3	Pastiglia / 100	511080BT
DPD No. 3	Pastiglia / 250	511081BT
DPD No. 3	Pastiglia / 500	511082BT
DPD No. 1 Alto Calcio <sup>e)</sup>	Pastiglia / 100	515740BT
DPD No. 1 Alto Calcio <sup>e)</sup>	Pastiglia / 250	515741BT
DPD No. 1 Alto Calcio <sup>e)</sup>	Pastiglia / 500	515742BT
DPD No. 3 High Calcium <sup>e)</sup>	Pastiglia / 100	515730BT
DPD No. 3 High Calcium <sup>e)</sup>	Pastiglia / 250	515731BT
DPD No. 3 High Calcium <sup>e)</sup>	Pastiglia / 500	515732BT
DPD No. 4	Pastiglia / 100	511220BT
DPD No. 4	Pastiglia / 250	511221BT
DPD No. 4	Pastiglia / 500	511222BT
DPD No. 3 Evo	Pastiglia / 100	511420BT
DPD No. 3 Evo	Pastiglia / 250	511421BT
DPD No. 3 Evo	Pastiglia / 500	511422BT
DPD No.4 Evo	Pastiglia / 100	511970BT
DPD No. 4 Evo	Pastiglia / 250	511971BT
DPD No. 4 Evo	Pastiglia / 500	511972BT

**Standards disponibles**

<b>Titolo</b>	<b>Unità di imballaggio</b>	<b>N. ordine</b>
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 detergenti 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).

## Note

1. Le compresse Evo possono essere utilizzate come alternativa alla corrispondente compressa standard (ad esempio DPD No. 3 Evo invece di DPD No. 3).



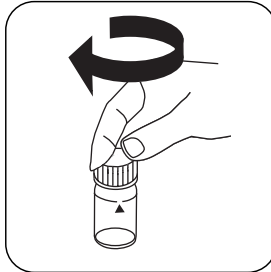
## Esecuzione della rilevazione Cloro, libero con compressa

Selezionare il metodo nel dispositivo.

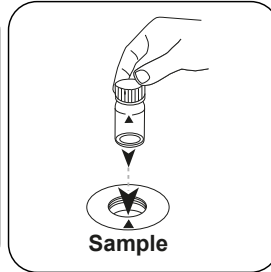
IT



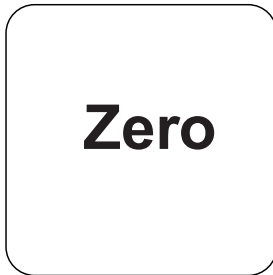
Riempire una cuvetta da 24 mm con **10 mL di campione**.



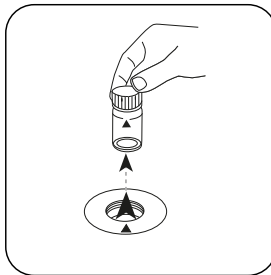
Chiudere la/e cuvetta/e.



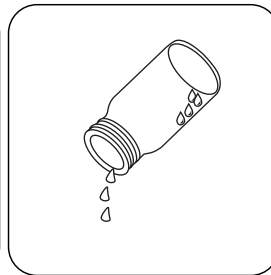
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



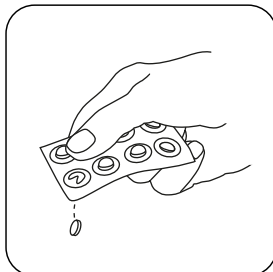
Premere il tasto **ZERO**.



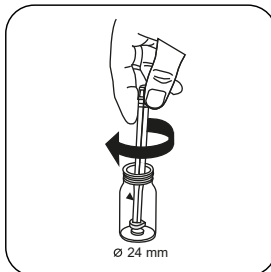
Prelevare la cuvetta dal vano di misurazione.



Svuotare la cuvetta finché non rimangono alcune gocce.



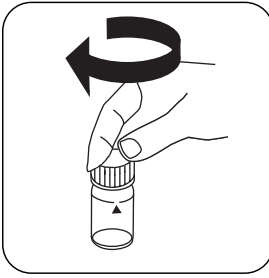
Aggiungere **una pastiglia DPD No. 1**.



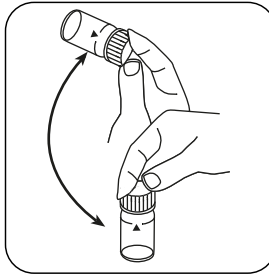
Frantumare la/e pastiglia/e con una leggera rotazione.



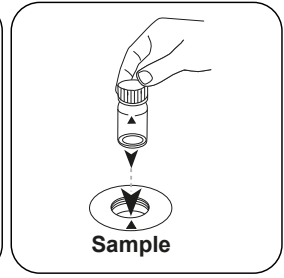
Immettere il **campione** nella cuvetta fino a raggiungere la **tacca dei 10 mL**.



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.

IT

## Test

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

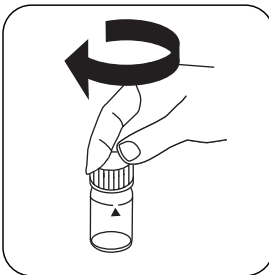
Sul display compare il risultato in mg/L di Cloro libero.

### Esecuzione della rilevazione Cloro, totale con compressa

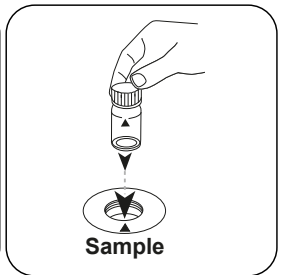
Selezionare il metodo nel dispositivo.



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



Chiudere la/e cuvetta/e.

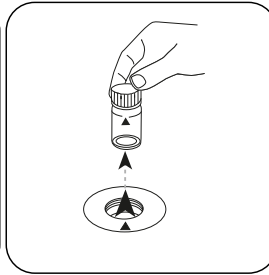


Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.

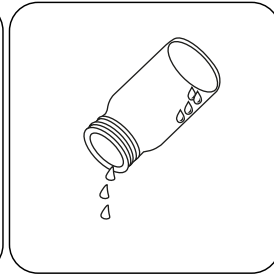


# Zero

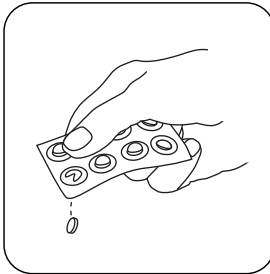
IT Premere il tasto **ZERO**.



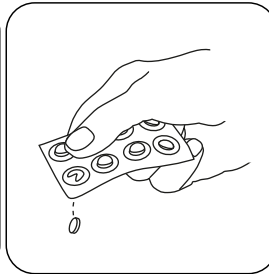
Prelevare la cuvetta dal vano di misurazione.



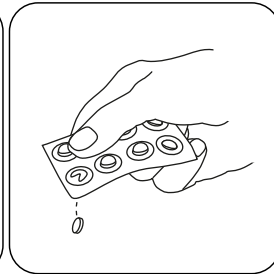
Svuotare la cuvetta finché non rimangono alcune gocce.



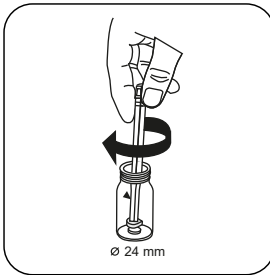
Aggiungere **una pastiglia DPD No. 1**.



Aggiungere **una pastiglia DPD No. 3**.



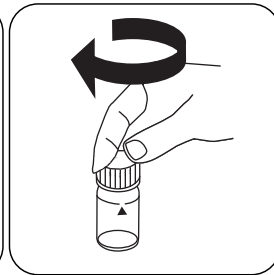
In alternativa al **DPD No. 1** e **No. 3** tablet, un **DPD No. 4** tablet può essere aggiunto.



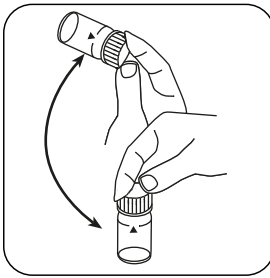
Frantumare la/e pastiglia/e con una leggera rotazione.



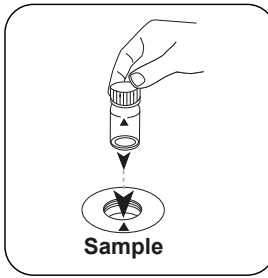
Immettere il **campione** nella cuvetta fino a raggiungere la **tacca dei 10 mL**.



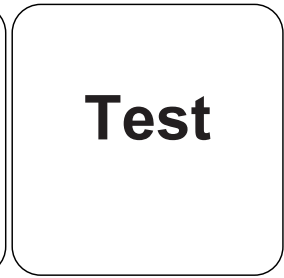
Chiudere la/e cuvetta/e.



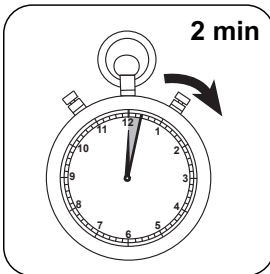
Far sciogliere la/e pastiglia/e agitando.



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



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



Attendere un **tempo di reazione di 2 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.
- In caso di campioni con un elevato tenore di calcio\* e/o un'elevata conducibilità\*, utilizzando le pastiglie di reagenti potrebbe verificarsi un intorbidimento del campione con conseguenti errori di misurazione. In questo caso si possono utilizzare in alternativa la pastiglia di reagente DPD No. 1 High Calcium e la pastiglia di reagente DPD No. 3 High Calcium.  
\*Non è possibile indicare i valori esatti in quanto l'intorbidimento dipende dal tipo e dalla composizione dell'acqua campione.
- Se si utilizzano pastiglie, le concentrazioni di cloro maggiori di 10 mg/L possono dare risultati entro il range di misura fino a 0 mg/L. Se la concentrazione di cloro è troppo elevata, 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 <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

### Validazione metodo

Limite di rilevabilità	0.02 mg/L
Limite di quantificazione	0.06 mg/L
Estremità campo di misura	6 mg/L
Sensibilità	2.05 mg/L / Abs
Intervallo di confidenza	0.04 mg/L
Deviazione standard della procedura	0.019 mg/L
Coefficiente di variazione della procedura	0.87 %



**Conforme**

EN ISO 7393-2

\*Determinazione di libero, vincolato, totale possibile | \*Reagente ausiliario, in alternativa a DPD n. 1 / no 3 in caso di torbidità del campione a causa di alto contenuto di ioni di calcio e / o alta conduttività

IT

**Cloro L****M101****0.02 - 4.0 mg/L Cl<sub>2</sub> <sup>a)</sup>****CL6****DPD**

IT

**Materiale**

Materiale richiesto (in parte facoltativo):

<b>Reagenti</b>	<b>Unità di imballaggio</b>	<b>N. ordine</b>
DPD 1 soluzione tampone, bottiglia blu	15 mL	471010
Soluzione tampone DPD 1	100 mL	471011
DPD 1 Soluzione tampone in confezione da 6	1 pz.	471016
DPD 1 soluzione reagente, bottiglia verde	15 mL	471020
Soluzione reagente DPD 1	100 mL	471021
DPD 1 Soluzione reagente in confezione da 6	1 pz.	471026
DPD 3 soluzione, bottiglia rossa	15 mL	471030
Soluzione DPD 3	100 mL	471031
DPD 3 Soluzione in confezione da 6	1 pz.	471036
Set di reagenti DPD	1 pz.	471056

**Standards disponibles**

<b>Titolo</b>	<b>Unità di imballaggio</b>	<b>N. ordine</b>
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).

## Note

1. Dopo l'uso bisogna richiudere immediatamente le bottiglie contagocce con i rispettivi tappi dello stesso colore.
2. Conservare al fresco il kit di reagenti a una temperatura compresa tra +6 °C e +10 °C.

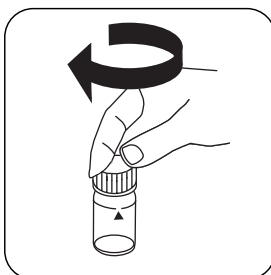


## Esecuzione della rilevazione Cloro, libero con reagente liquido

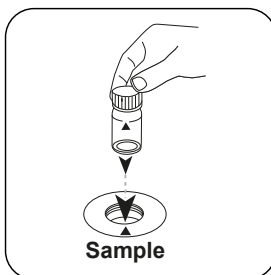
Selezionare il metodo nel dispositivo.



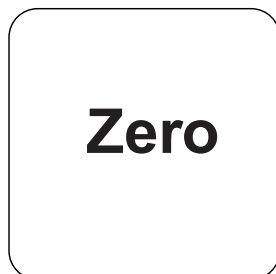
Riempire una cuvetta da 24 mm con **10 mL di campione**.



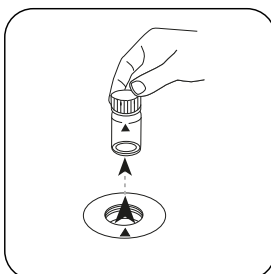
Chiudere la/e cuvetta/e.



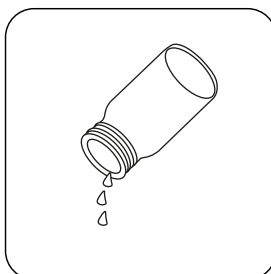
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



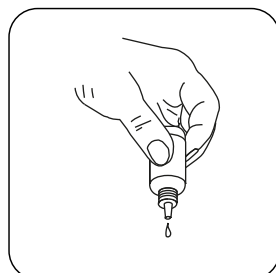
Premere il tasto **ZERO**.



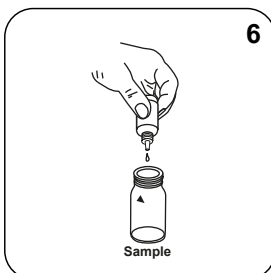
Prelevare la cuvetta dal vano di misurazione.



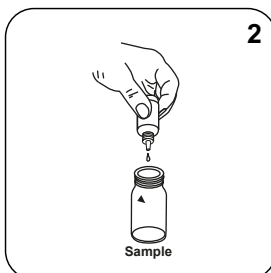
Svuotare la cuvetta.



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



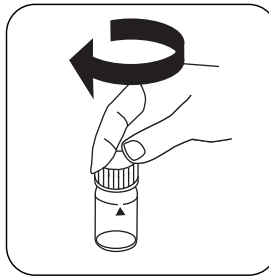
Introdurre **6 gocce di DPD 1 Buffer Solution** nella cuvetta del campione.



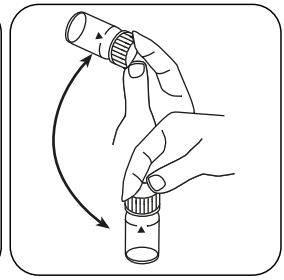
Introdurre **2 gocce di DPD 1 Reagent Solution** nella cuvetta del campione.



Immettere il **campione** nella cuvetta fino a raggiungere la **tacca dei 10 mL**.

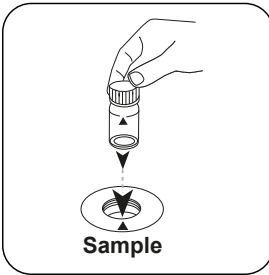


Chiudere la/e cuvetta/e.

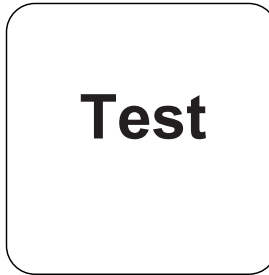


Miscelare il contenuto capovolgendo.

IT



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



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

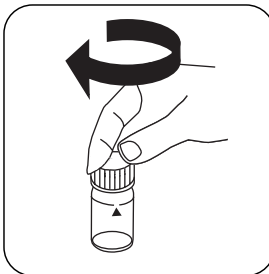
Sul display compare il risultato in mg/L di Cloro libero.

### Esecuzione della rilevazione Cloro, totale con reagente liquido

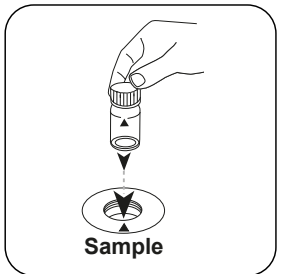
Selezionare il metodo nel dispositivo.



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



Chiudere la/e cuvetta/e.

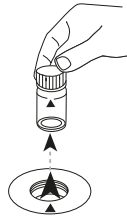


Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



# Zero

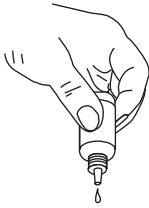
Premere il tasto **ZERO**.



Prelevare la cuvetta dal vano di misurazione.



Svuotare la cuvetta.



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



**6**

Introdurre **6 gocce di DPD 1 Buffer Solution** nella cuvetta del campione.



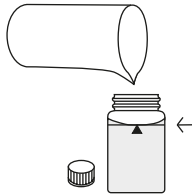
**2**

Introdurre **2 gocce di DPD 1 Reagent Solution** nella cuvetta del campione.

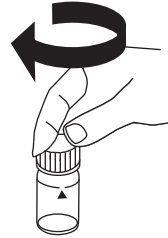


**3**

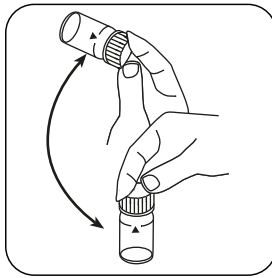
Introdurre **3 gocce di DPD 3 Solution** nella cuvetta del campione.



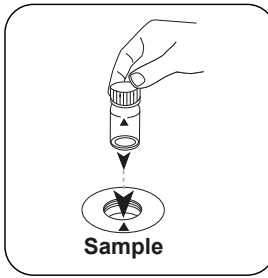
Immettere il **campione** nella cuvetta fino a raggiungere la **tacca dei 10 mL**.



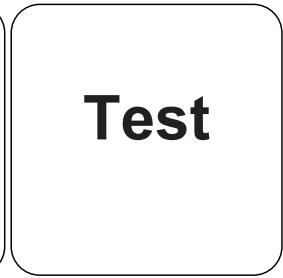
Chiudere la/e cuvetta/e.



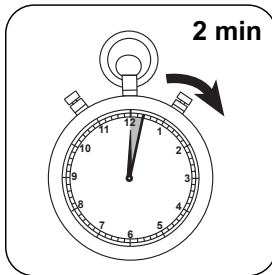
Miscelare il contenuto capovolgendo.



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



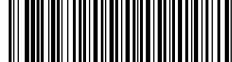
Premere il tasto **TEST** (XD: **START**).



Attendere un **tempo di reazione di 2 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 reagenti liquidi, le concentrazioni di cloro maggiori di 4 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]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

#### Conforme

EN ISO 7393-2

<sup>a)</sup>Determinazione di libero, vincolato, totale possibile





Cloro HR (KI) T

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

KI/acido

IT

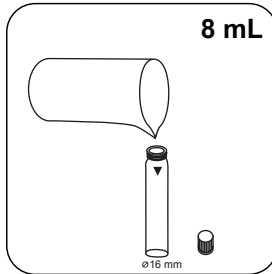
## Materiale

Materiale richiesto (in parte facoltativo):

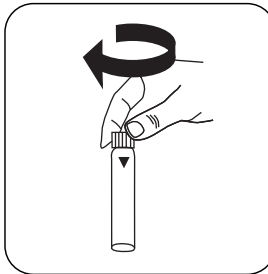
Reagenti	Unità di imballaggio	N. ordine
Cloro HR (KI)	Pastiglia / 100	513000BT
Cloro HR (KI)	Pastiglia / 250	513001BT
Acidificante GP	Pastiglia / 100	515480BT
Acidificante GP	Pastiglia / 250	515481BT
Set Cloro HR (KI)/Acidificante GP <sup>#</sup>	ciascuna 100	517721BT
Set Cloro HR (KI)/Acidificante GP <sup>#</sup>	ciascuna 250	517722BT
Cloro HR (KI)	Pastiglia / 100	501210
Cloro HR (KI)	Pastiglia / 250	501211

## Esecuzione della rilevazione Cloro HR (KI) con pastiglia

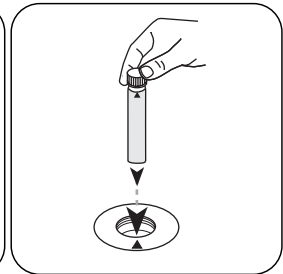
Selezionare il metodo nel dispositivo.



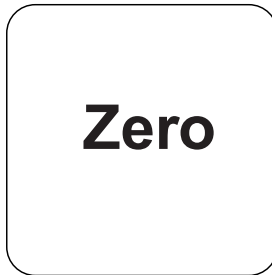
Riempire una cuvetta da 16 mm con **8 mL di campione**.



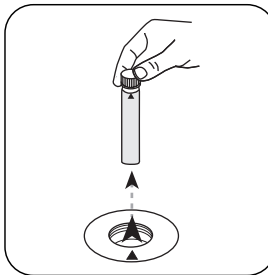
Chiudere la/e cuvetta/e.



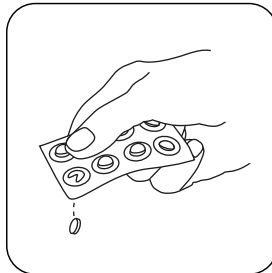
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



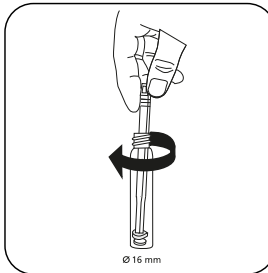
Premere il tasto **ZERO**.



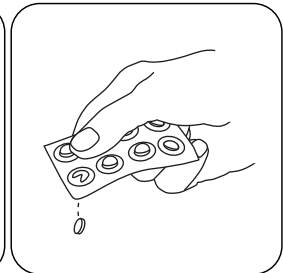
Prelevare la **cuvetta** dal vano di misurazione.



Aggiungere una **pastiglia Chlorine HR (KI)**.



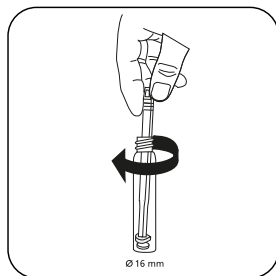
Frantumare la/e pastiglia/e con una leggera rotazione.



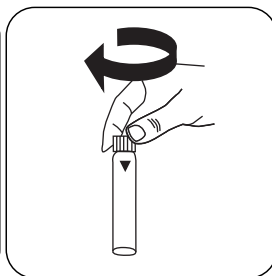
Aggiungere una **pastiglia ACIDIFYING GP**.



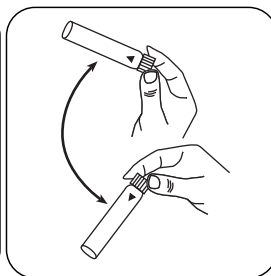
IT



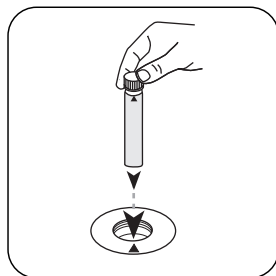
Frantumare la/e pastiglia/e con una leggera rotazione.



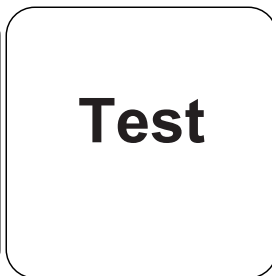
Chiudere la/e cuvetta/e.



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 in mg/L di Cloro.

## Metodo chimico

KI/acido

## Appendice

### Interferenze

#### Interferenze permanenti

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

### Validazione metodo

<b>Limite di rilevabilità</b>	1.29 mg/L
<b>Limite di quantificazione</b>	3.86 mg/L
<b>Estremità campo di misura</b>	200 mg/L
<b>Sensibilità</b>	83.96 mg/L / Abs
<b>Intervallo di confidenza</b>	1.14 mg/L
<b>Deviazione standard della procedura</b>	0.45 mg/L
<b>Coefficiente di variazione della procedura</b>	0.45 %

#### Derivato di

EN ISO 7393-3

<sup>#</sup>Bacchetta compresa



Cloro MR PP

M113

0.02 - 3.5 mg/L Cl<sub>2</sub> <sup>a)</sup>

CL2

DPD

IT

## Materiale

Materiale richiesto (in parte facoltativo):

Reagenti	Unità di imballaggio	N. ordine
VARIO Cloro libero DPD F10	Polvere / 100 pz.	530180
VARIO Cloro libero DPD F10	Polvere / 1000 pz.	530183
VARIO Cloro totale DPD F10	Polvere / 100 pz.	530190
VARIO Cloro totale DPD F10	Polvere / 1000 pz.	530193

## 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).

## Note

1. I reagenti in polvere utilizzati sono contrassegnati in blu per una facile identificazione. La polvere per la determinazione del cloro libero porta una linea chiusa e una linea tratteggiata. La polvere per la determinazione del cloro totale ha due linee chiuse.





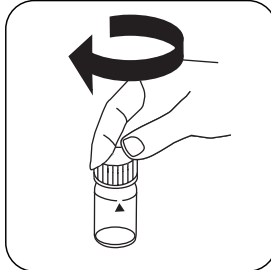
## Esecuzione della rilevazione cloro libero MR con confezioni in polvere

Selezionare il metodo nel dispositivo.

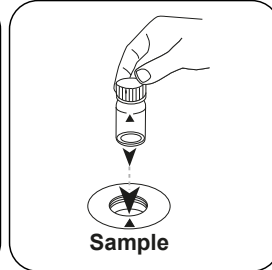
Selezionare inoltre la determinazione: libero



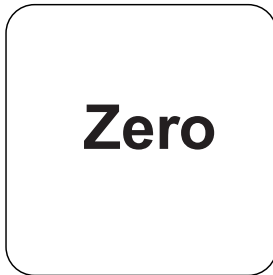
Riempire una cuvetta da 24 mm con **10 mL di campione**.



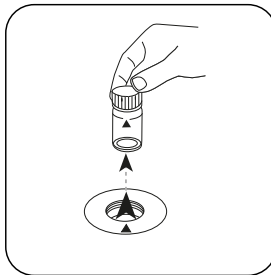
Chiudere la/e cuvetta/e.



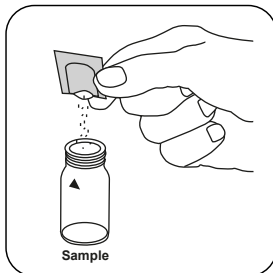
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



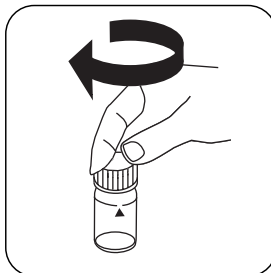
Premere il tasto **ZERO**.



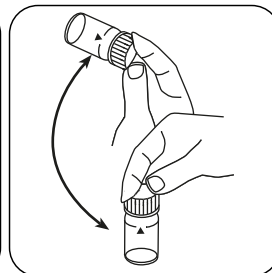
Prelevare la cuvetta dal vano di misurazione.



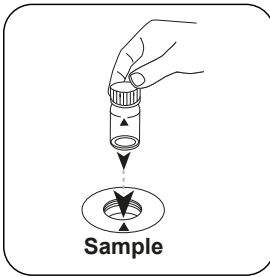
Aggiungere **una bustina di polvere VARIO Chlorine FREE-DPD/ F10**.



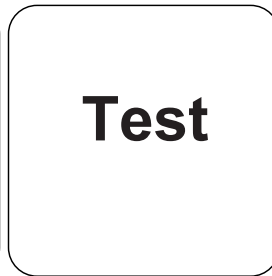
Chiudere la/e cuvetta/e.



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.

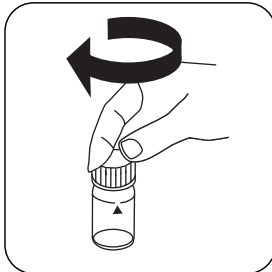
### Esecuzione della rilevazione Chlorine differentiated MR with powder packs

Selezionare il metodo nel dispositivo.

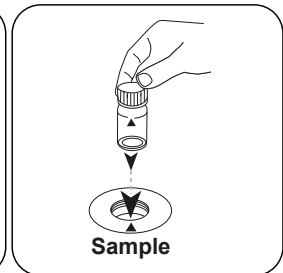
Selezionare inoltre la determinazione: differenziato



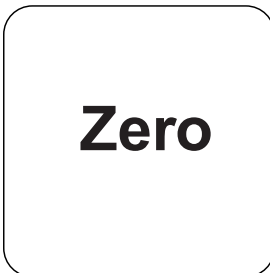
Riempire una cuvetta da 24 mm con **10 mL di campione**.



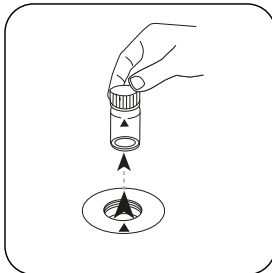
Chiudere la/e cuvetta/e.



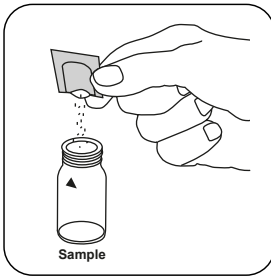
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



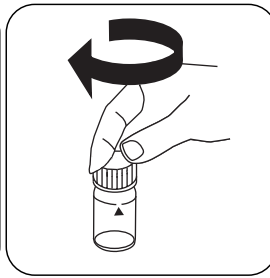
Premere il tasto **ZERO**.



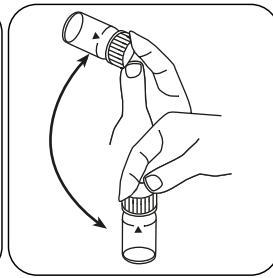
Prelevare la cuvetta dal vano di misurazione.



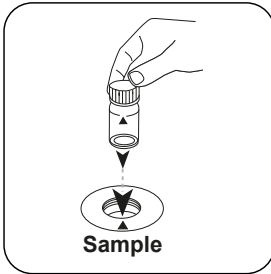
Aggiungere **una bustina di polvere VARIO Chlorine FREE-DPD/ F10**.



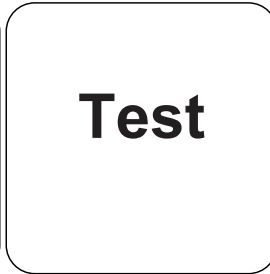
Chiudere la/e cuvetta/e.



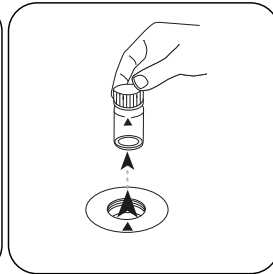
Miscelare il contenuto capovolgendo (20 sec.).



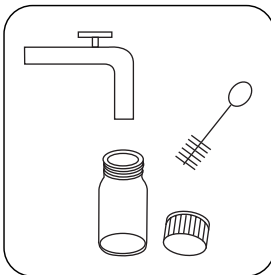
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



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



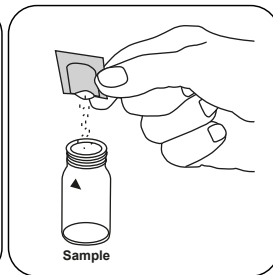
Prelevare la cuvetta dal vano di misurazione.



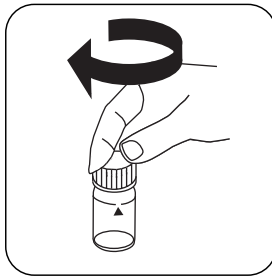
Pulire a fondo la cuvetta e il coperchio della cuvetta.



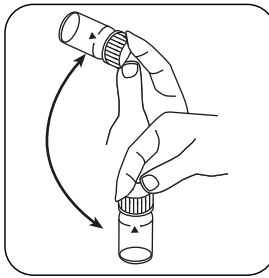
Riempire una cuvetta da 24 mm con **10 mL di campione**.



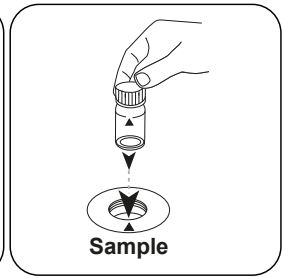
Aggiungere **una bustina di polvere Chlorine TOTAL-DPD/ F10**.



Chiudere la/e cuvetta/e.

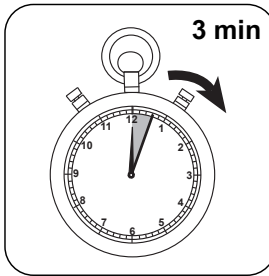
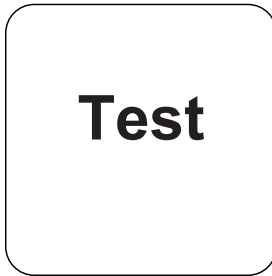


Miscelare il contenuto capovolgendo (20 sec.).



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

IT



Premere il tasto **TEST** (XD: **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 libero, mg/l cloro combinato, mg/l cloro totale.

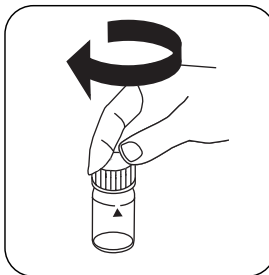
### Esecuzione della rilevazione cloro totale MR con confezioni in polvere

Selezionare il metodo nel dispositivo.

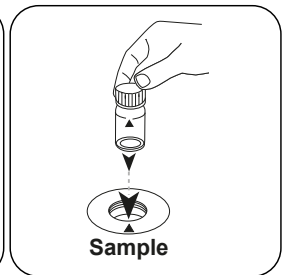
Selezionare inoltre la determinazione: totale



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



Chiudere la/e cuvetta/e.

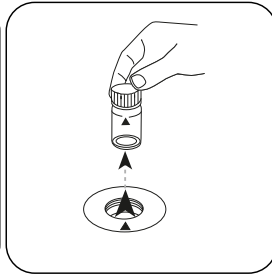


Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.

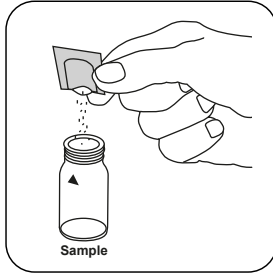


# Zero

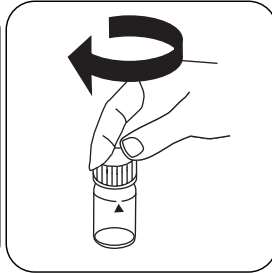
Premere il tasto **ZERO**.



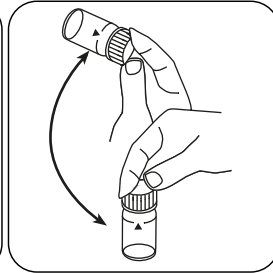
Prelevare la cuvetta dal vano di misurazione.



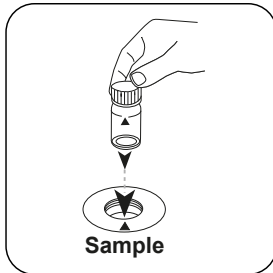
Aggiungere **una bustina di polvere VARIO Chlorine TOTAL-DPD/ F10**.



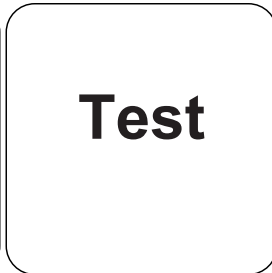
Chiudere la/e cuvetta/e.



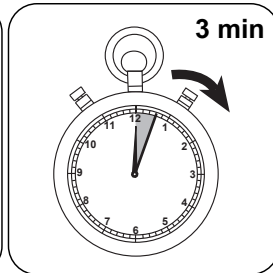
Miscelare il contenuto capovolgendo (20 sec.).



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

## Interferenze

### Interferenze permanenti

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

### Interferenze escludibili

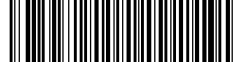
- Le interferenze da parte di rame e ferro(III) devono essere eliminate con EDTA.
- Se si utilizzano Powder Packs, le concentrazioni di cloro maggiori di 4 mg/L possono dare risultati entro il range di misura fino a 0 mg/L. In questo caso il campione deve essere diluito con acqua priva di cloro. 10 mL del campione diluito vengono addizionati con il reagente e la misurazione viene ripetuta (test di plausibilità).

Interferenze	da / [mg/L]
$\text{CrO}_4^{2-}$	0.01
$\text{MnO}_2$	0.01

## Validazione metodo

Limite di rilevabilità	0.01 mg/L
Limite di quantificazione	0.03 mg/L
Estremità campo di misura	3.5 mg/L
Sensibilità	1.7 mg/L / Abs
Intervallo di confidenza	0.014 mg/L
Deviazione standard della procedura	0.006 mg/L
Coefficiente di variazione della procedura	0.34 %

<sup>a</sup>Determinazione di libero, vincolato, totale possibile



Durezza calcio 2T

M191

20 - 500 mg/L CaCO<sub>3</sub>

CAH

Murexide

IT

## Materiale

Materiale richiesto (in parte facoltativo):

Reagenti	Unità di imballaggio	N. ordine
Set Calcio H No. 1/no. 2 <sup>#</sup>	ciascuna 100	517761BT
Set Calcio H No. 1/no. 2 <sup>#</sup>	ciascuna 250	517762BT

## Preparazione

1. Le acque fortemente alcaline o acide dovrebbero essere portate prima dell'analisi entro un range di pH compreso tra 4 e 10 (con 1 mol/l di acido cloridrico o 1 mol/l di liscivia).

## Note

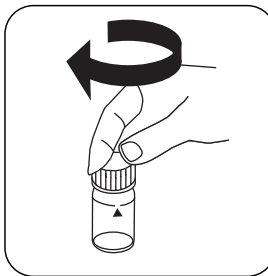
1. Per ottimizzare i valori di misura è possibile determinare, in via opzionale, un valore cieco del metodo, specifico per lotto (vedere la descrizione del fotometro).
2. Per l'accuratezza del risultato dell'analisi è fondamentale che il volume del campione misuri esattamente 10 ml.
3. Il presente metodo è stato sviluppato sulla base di una procedura titrimetrica. A causa di condizioni collaterali indefinite, la divergenza rispetto al metodo standard può essere maggiore.
4. Nel range di misura elevato la procedura presenta tolleranze maggiori che non nel range di misura basso. Per la diluizione del campione diluire sempre in modo tale che la misurazione avvenga nel terzo inferiore del range di misura.

## Esecuzione della rilevazione Durezza calcio 2 con pastiglia

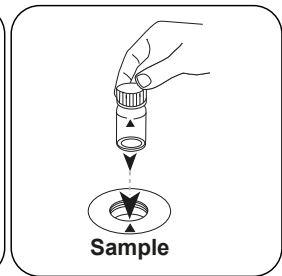
Selezionare il metodo nel dispositivo.



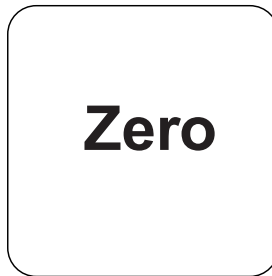
Riempire una cuvetta da 24 mm con **10 mL di campione**.



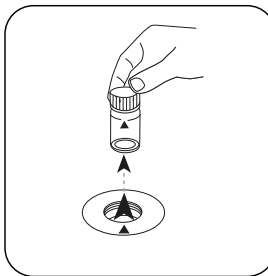
Chiudere la/e cuvetta/e.



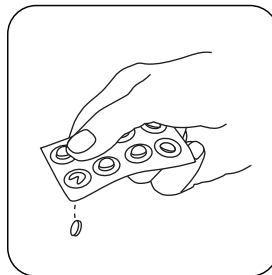
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



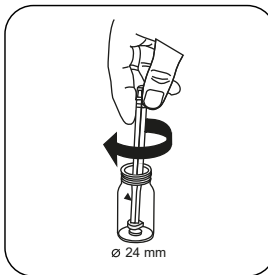
Premere il tasto **ZERO**.



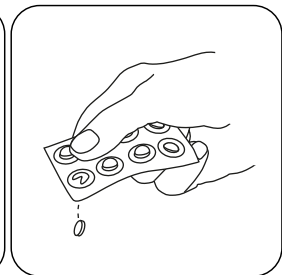
Prelevare la cuvetta dal vano di misurazione.



Aggiungere una **pastiglia CALCIO H No.1**.



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

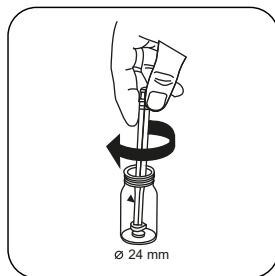


Aggiungere una **pastiglia CALCIO H No.2**.

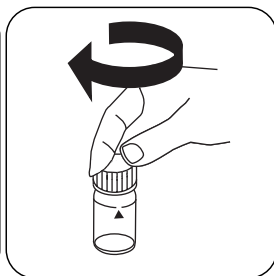




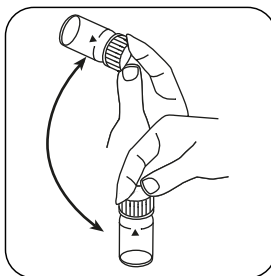
IT



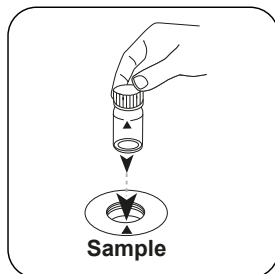
Frantumare la/e pastiglia/e con una leggera rotazione.



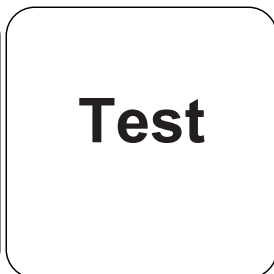
Chiudere la/e cuvetta/e.



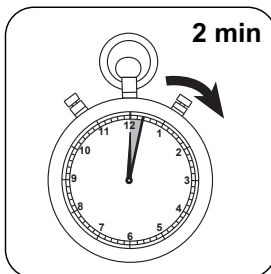
Far sciogliere la/e pastiglia/e agitando.



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



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



Attendere un **tempo di reazione di 2 minuto/i**.

Allo scadere del tempo di reazione viene effettuata automaticamente la misurazione. Sul display compare il risultato come Durezza calcio.

## Valutazione

La seguente tabella identifica i valori di output che possono essere convertiti in altre forme di citazione.

Unità di misura	Forma di citazione	Fattore di conversione
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

IT

## Metodo chimico

Murexide

## Appendice

### Interferenze

#### Interferenze permanenti

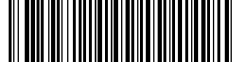
1. Argento, cadmio, cobalto, rame e mercurio interferiscono con la rilevazione.

Interferenze	da / [mg/L]
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

#### Riferimenti bibliografici

Photometrische Analyse, Lange/Vjedelek, Verlag Chemie 1980

<sup>ii</sup>\*Bacchetta compresa



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

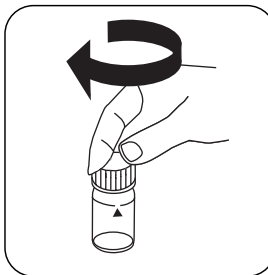
1. Per la rilevazione fotometrica del valore di pH si devono utilizzare soltanto pastiglie PHENOL RED con etichetta nera contrassegnate con il termine PHOTOMETER.

## Esecuzione della rilevazione Valore pH con pastiglia

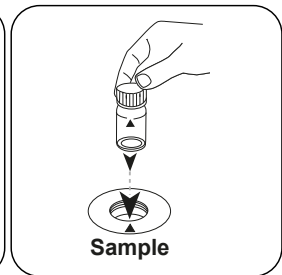
Selezionare il metodo nel dispositivo.



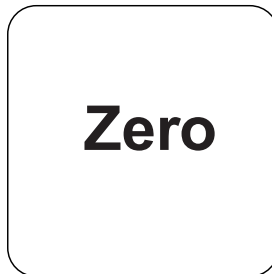
Riempire una cuvetta da 24 mm con **10 mL di campione**.



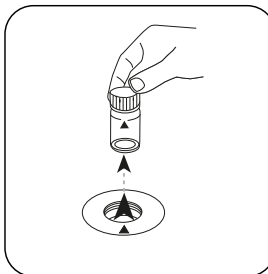
Chiudere la/e cuvetta/e.



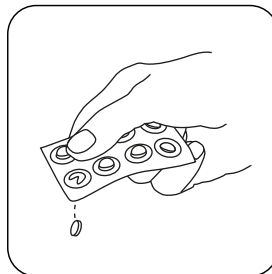
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



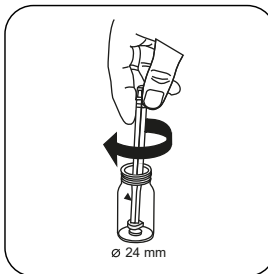
Premere il tasto **ZERO**.



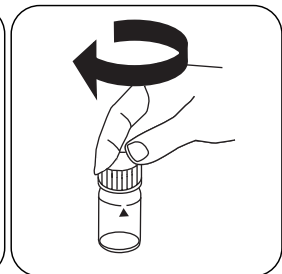
Prelevare la cuvetta dal vano di misurazione.



Aggiungere una pastiglia **PHENOL RED PHOTOMETER**.



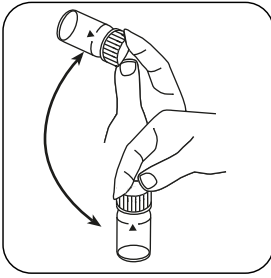
Frantumare la/e pastiglia/e con una leggera rotazione.



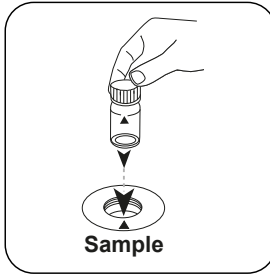
Chiudere la/e cuvetta/e.



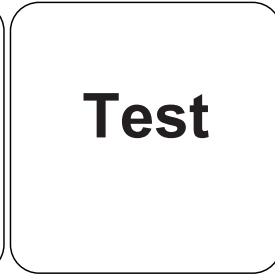
IT



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:

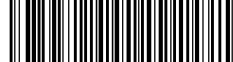
Salinità del campione in g/L	30 (acqua di mare)	60	120	180
Correzione	-0,15 <sup>1)</sup>	-0,21 <sup>2)</sup>	-0,26 <sup>2)</sup>	-0,29 <sup>2)</sup>

<sup>1)</sup> secondo Kolthoff (1922)

<sup>2)</sup> 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

- 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

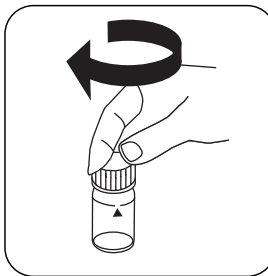
- Dopo l'uso bisogna richiudere immediatamente la boccetta contagocce con il relativo tappo dello stesso colore.
- Conservare al fresco il reagente a una temperatura compresa tra +6 °C e +10 °C.

## Esecuzione della rilevazione Valore pH con reagente liquido

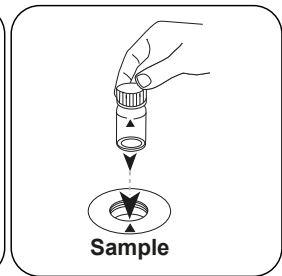
Selezionare il metodo nel dispositivo.



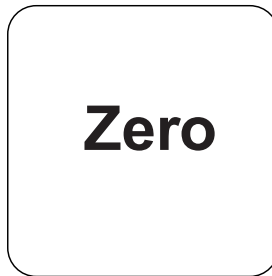
Riempire una cuvetta da 24 mm con **10 mL di campione**.



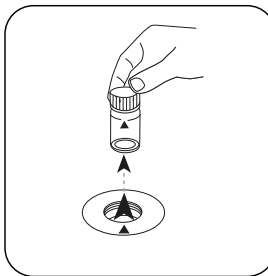
Chiudere la/e cuvetta/e.



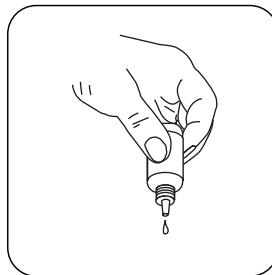
Posizionare la **cuvetta del campione** nel vano di misurazione. Fare attenzione al posizionamento.



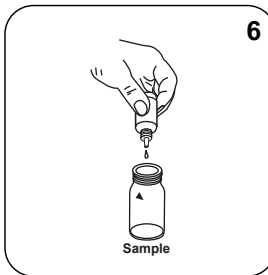
Premere il tasto **ZERO**.



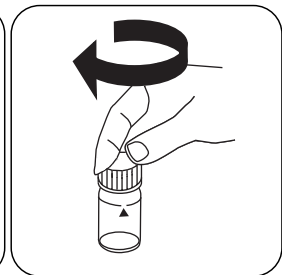
Prelevare la cuvetta dal vano di misurazione.



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

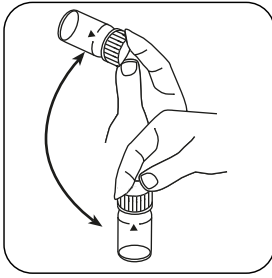


Introdurre **6 gocce di PHENOL Red-Lösung** nella cuvetta del campione.

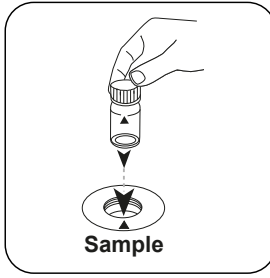


Chiudere la/e cuvetta/e.

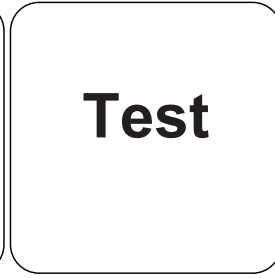




Miscelare il contenuto capovolgendo.



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 <sup>1)</sup>
	60 g/L	-0,21 <sup>2)</sup>
	120 g/L	-0,26 <sup>2)</sup>
	180 g/L	-0,29 <sup>2)</sup>
	<sup>1)</sup> secondo Kolthoff (1922)	<sup>2)</sup> 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 deteção 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

**Método Químico**

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

**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	$\lambda$	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

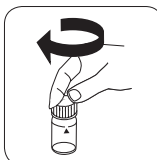
### Realização da determinação Capacidade de acidez $K_{s4.3}$ com pastilha

Escolher o método no equipamento.

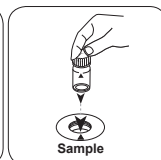
Para este método não tem de ser efetuada uma medição ZERO nos seguintes equipamentos: XD 7000, XD 7500



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

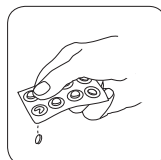


Fechar a(s) célula(s).

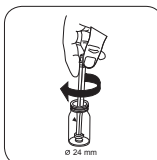


Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.

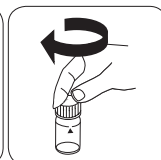
• • •



Pastilha ALKA-M-PHOTO-METER.



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



Fechar a(s) célula(s).

PT Métodos Manual 01/20

PT



Alcalinidade-m T

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

Ácido / Indicador

PT

## Material

Material necessário (parcialmente opcional):

Reagentes	Unidade de Embalagem	Código do Produto
Alca-M-fotómetro	Pastilhas / 100	513210BT
Alca-M-fotómetro	Pastilhas / 250	513211BT

## Notas

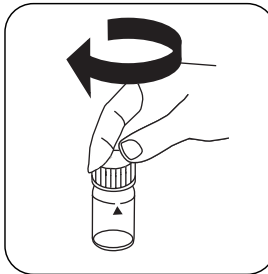
- Os termos alcalinidade-m, m-valor, alcalinidade total e capacidade de acidez  $K_{s4,3}$  são idênticos.
- O cumprimento exato do volume da amostra de 10 ml é decisivo para a precisão do resultado de análise.

## Realização da determinação Alcalinidade, total= alcalinidade-m= m-valor com pastilha

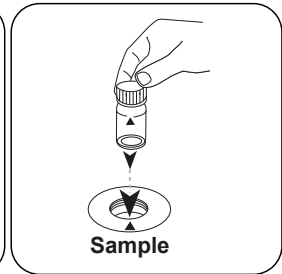
Escolher o método no equipamento.



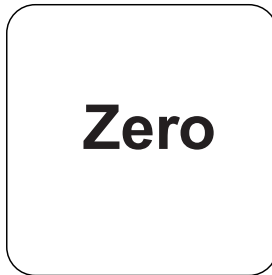
Encher a célula de 24 mm com **10 mL de amostra**.



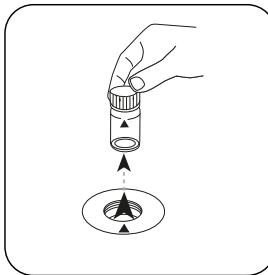
Fechar a(s) célula(s).



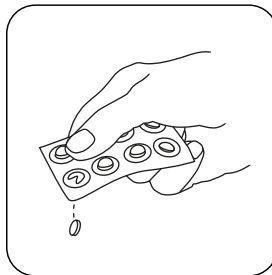
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



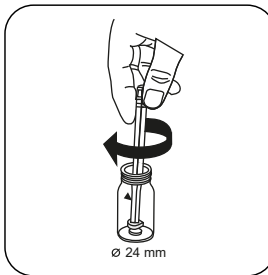
Premir a tecla **ZERO**.



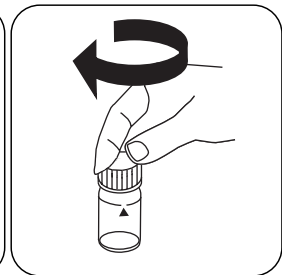
Retirar a célula do compartimento de medição.



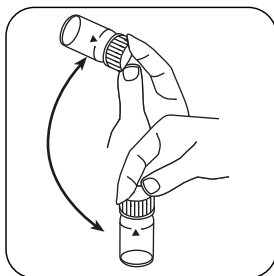
**Pastilha ALKA-M-PHOTOMETER.**



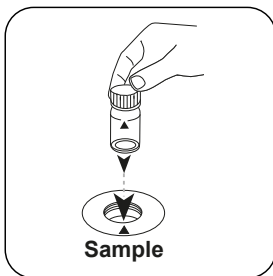
Esmagar a(s) pastilha(s) rodando ligeiramente.



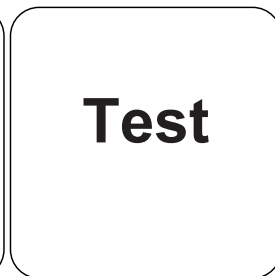
Fechar a(s) célula(s).



Dissolver a(s) pastilha(s) girando.



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



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

No visor aparece o resultado como Alcalinidade-m.

PT

## Análises

A tabela a seguir identifica os valores de saída que podem ser convertidos em outras formas de citação.

Unidade	Forma de citação	Fator de conversão
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4,3</sub>	0.02

PT

## Método Químico

Ácido / Indicador

## Apêndice

**Derivado de**

EN ISO 9963-1



**Cloro T****M100****0.01 - 6.0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD**

PT

**Material**

Material necessário (parcialmente opcional):

<b>Reagentes</b>	<b>Unidade de Embalagem</b>	<b>Código do Produto</b>
DPD Nº. 1	Pastilhas / 100	511050BT
DPD Nº. 1	Pastilhas / 250	511051BT
DPD Nº. 1	Pastilhas / 500	511052BT
DPD Nº. 3	Pastilhas / 100	511080BT
DPD Nº. 3	Pastilhas / 250	511081BT
DPD Nº. 3	Pastilhas / 500	511082BT
DPD Nº. 1 Alto Cálcio <sup>e)</sup>	Pastilhas / 100	515740BT
DPD Nº. 1 Alto Cálcio <sup>e)</sup>	Pastilhas / 250	515741BT
DPD Nº. 1 Alto Cálcio <sup>e)</sup>	Pastilhas / 500	515742BT
DPD Nº. 3 Alto Cálcio <sup>e)</sup>	Pastilhas / 100	515730BT
DPD Nº. 3 Alto Cálcio <sup>e)</sup>	Pastilhas / 250	515731BT
DPD Nº. 3 Alto Cálcio <sup>e)</sup>	Pastilhas / 500	515732BT
DPD Nº. 4	Pastilhas / 100	511220BT
DPD Nº. 4	Pastilhas / 250	511221BT
DPD Nº. 4	Pastilhas / 500	511222BT
DPD Nº. 3 Evo	Pastilhas / 100	511420BT
DPD Nº. 3 Evo	Pastilhas / 250	511421BT
DPD Nº. 3 Evo	Pastilhas / 500	511422BT
DPD Nº. 4 Evo	Pastilhas / 100	511970BT
DPD Nº. 4 Evo	Pastilhas / 250	511971BT
DPD Nº. 4 Evo	Pastilhas / 500	511972BT

**Padrões disponíveis**

<b>Título</b>	<b>Unidade de Embalagem</b>	<b>Código do Produto</b>
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).

## Notas

1. Os pastilhas Evo podem ser utilizadas como alternativa à pastilha padrão correspondente (por exemplo, DPD N° 3 Evo em vez da DPD N° 3).

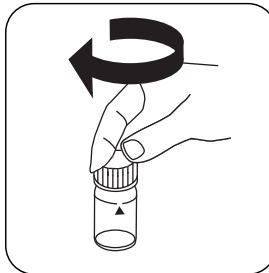


## Realização da determinação Cloro livre com pastilha

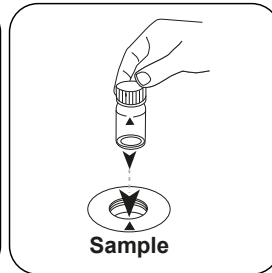
Escolher o método no equipamento.



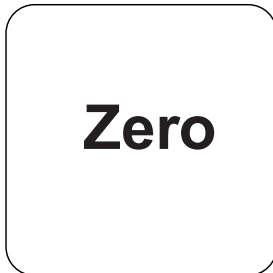
Encher a célula de 24 mm com **10 mL de amostra**.



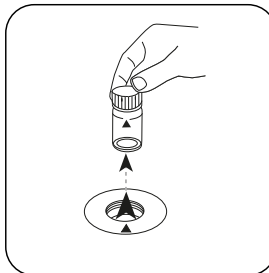
Fechar a(s) célula(s).



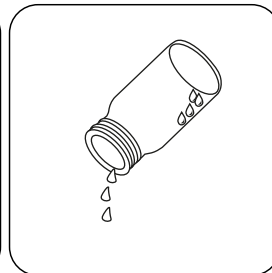
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



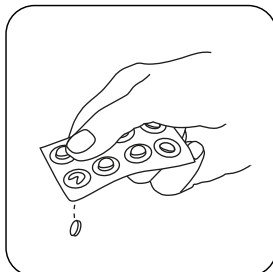
Premir a tecla **ZERO**.



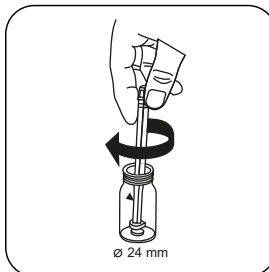
Retirar a célula do compartimento de medição.



Esvaziar a célula até ficarem apenas algumas gotas.



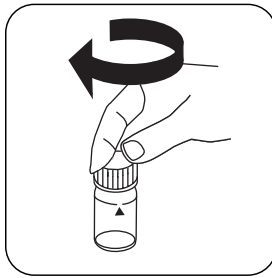
**Pastilha DPD No. 1.**



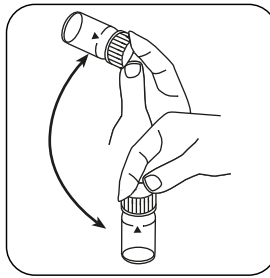
Esmagar a(s) pastilha(s) rodando ligeiramente.



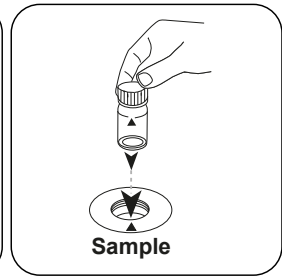
Encher a célula até à **marca de 10 mL** com a amostra.



Fechar a(s) célula(s).



Dissolver a(s) pastilha(s) girando.



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

PT

## Test

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

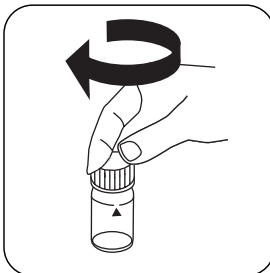
No visor aparece o resultado em mg/L Cloro livre.

### Realização da determinação Cloro total com pastilha

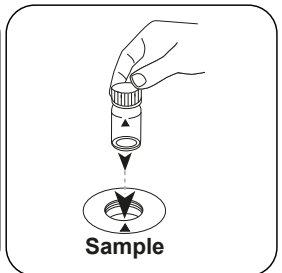
Escolher o método no equipamento.



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



Fechar a(s) célula(s).

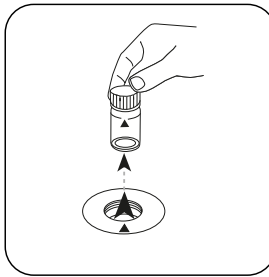


Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.

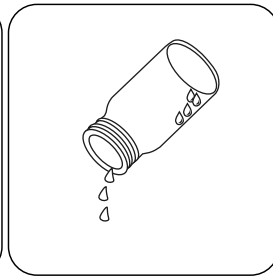


# Zero

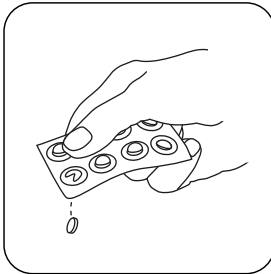
PT  
 Premir a tecla **ZERO**.



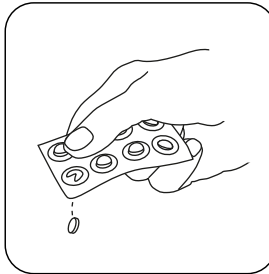
Retirar a célula do compartimento de medição.



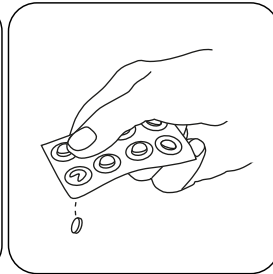
Esvaziar a célula até ficarem apenas algumas gotas.



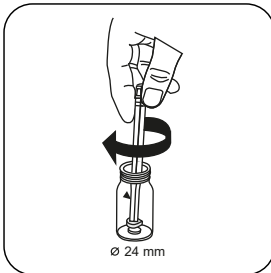
**Pastilha DPD No. 1.**



**Pastilha DPD No. 3.**



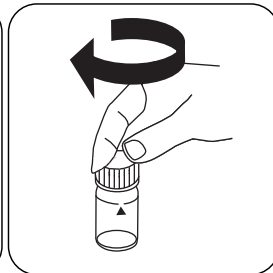
**Como alternativa aos comprimidos DPD No. 1 e No. 3, pode ser adicionado 1 comprimido DPD No. 4.**



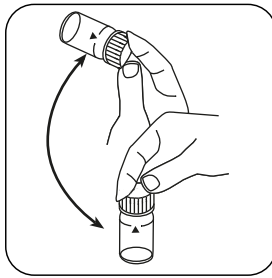
Esmagar a(s) pastilha(s) rodando ligeiramente.



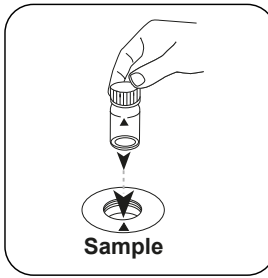
Encher a célula até à **marca de 10 mL** com a amostra .



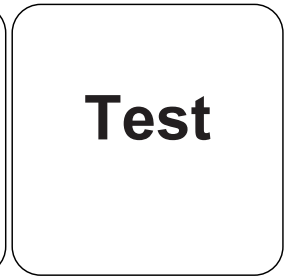
Fechar a(s) célula(s).



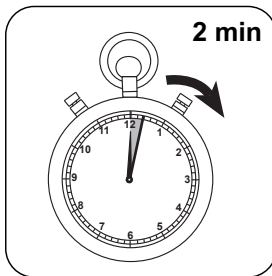
Dissolver a(s) pastilha(s) girando.



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



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



Aguardar **2 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.
- Nas amostras com elevado teor de cálcio\* e/ou elevada condutividade\* pode ocorrer, se forem usadas as pastilhas de reagente, uma turvação da amostra e, por conseguinte, a medição pode ficar errada. Neste caso, deve usar em alternativa a pastilha de reagente DPD No. 1 High Calcium e a pastilha de reagente DPD No. 3 High Calcium.  
\*não podem ser indicados valores exatos, uma vez que a formação de uma turvação depende do tipo e da composição da água da amostra.
- Concentrações de cloro superiores a 10 mg/L, se forem usadas pastilhas, podem causar resultados dentro da área de medição até 0 mg/L. No caso de uma concentração demasiado alta de cloro, 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]
$\text{CrO}_4^{2-}$	0.01
$\text{MnO}_2$	0.01

### Validação de método

Limite de Detecção	0.02 mg/L
Limite de Determinação	0.06 mg/L
Fim da Faixa de Medição	6 mg/L
Sensibilidade	2.05 mg/L / Abs
Faixa de Confiança	0.04 mg/L
Desvio Padrão	0.019 mg/L
Coefficiente de Variação	0.87 %

#### Conformidade

EN ISO 7393-2



<sup>a</sup>Determinação do possível livre, vinculado, total | <sup>a</sup>Reagente auxiliar, alternativamente ao DPD no. 1 / não 3 quando a amostra é nublada devido ao alto teor de íons de cálcio e / ou alta condutividade



**Cloro L****M101****0.02 - 4.0 mg/L Cl<sub>2</sub><sup>a)</sup>****CL6****DPD**

PT

**Material**

Material necessário (parcialmente opcional):

<b>Reagentes</b>	<b>Unidade de Embalagem</b>	<b>Código do Produto</b>
DPD 1 solução tampão, frasco azul	15 mL	471010
Solução tampão DPD 1	100 mL	471011
DPD 1 solução tampão em embalagem de 6	1 pc.	471016
Solução de reagente DPD 1, frasco verde	15 mL	471020
Solução de reagente DPD 1	100 mL	471021
Solução de reagente DPD 1 numa embalagem de 6 unidades	1 pc.	471026
DPD 3 Solução, frasco vermelho	15 mL	471030
Solução DPD 3	100 mL	471031
Solução DPD 3 numa embalagem de 6 unidades	1 pc.	471036
Kit de reagentes DPD	1 pc.	471056

**Padrões disponíveis**

<b>Título</b>	<b>Unidade de Embalagem</b>	<b>Código do Produto</b>
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).

## Notas

1. Depois de usados, os frascos conta-gotas devem ser novamente fechados com a respetiva tampa de enroscar à cor.
2. Guardar o conjunto de reagentes em local fresco entre +6 °C e +10 °C.

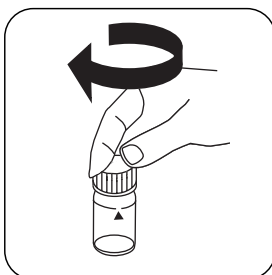


## Realização da determinação Cloro livre com reagente líquido

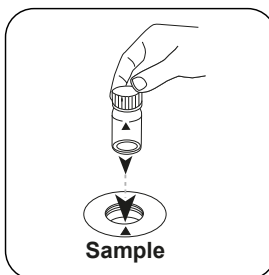
Escolher o método no equipamento.



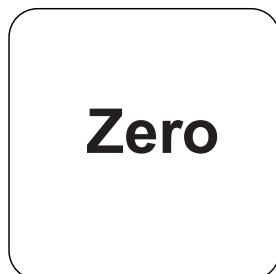
Encher a célula de 24 mm com **10 mL de amostra**.



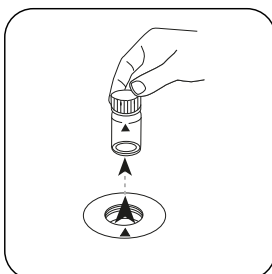
Fechar a(s) célula(s).



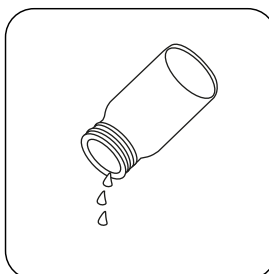
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



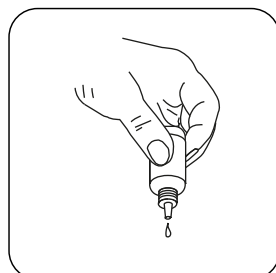
Premir a tecla **ZERO**.



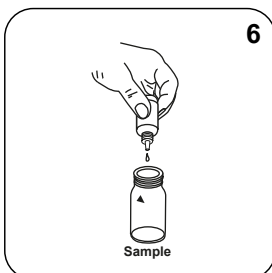
Retirar a célula do compartimento de medição.



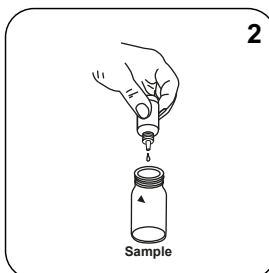
Esvaziar a célula.



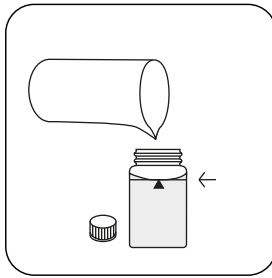
Manter os frascos conta gotas na vertical e pressionar lentamente para adicionar gotas de igual dimensão.



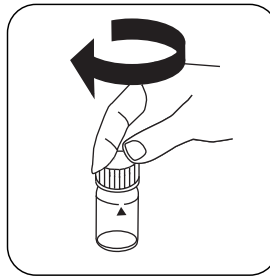
Adicionar **6 gotas DPD 1 Buffer Solution** à célula de amostra.



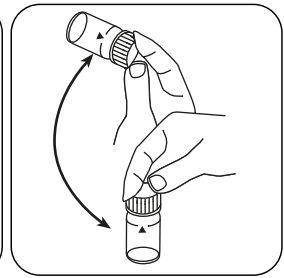
Adicionar **2 gotas DPD 1 Reagent Solution** à célula de amostra.



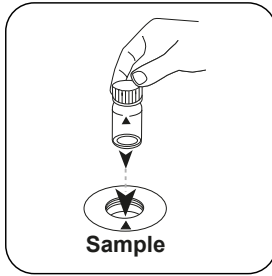
Encher a célula até à **marca de 10 mL** com a amostra .



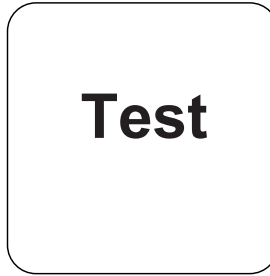
Fechar a(s) célula(s).



Misturar o conteúdo girando.



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



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

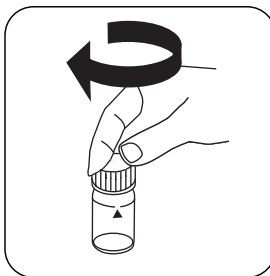
No visor aparece o resultado em mg/L Cloro livre.

### Realização da determinação Cloro total com reagente líquido

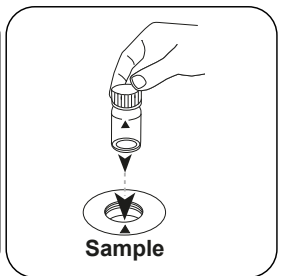
Escolher o método no equipamento.



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



Fechar a(s) célula(s).



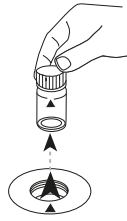
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



# Zero

PT

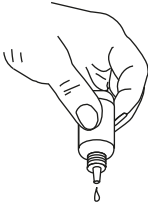
Premir a tecla **ZERO**.



Retirar a célula do compartimento de medição.



Esvaziar a célula.



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



6

Adicionar **6 gotas DPD 1 Buffer Solution** à célula de amostra.



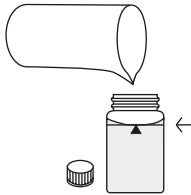
2

Adicionar **2 gotas DPD 1 Reagent Solution** à célula de amostra.



3

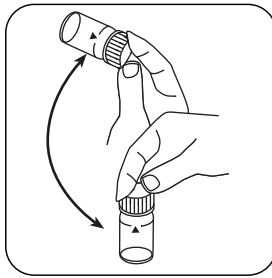
Adicionar **3 gotas DPD 3 Solution** à célula de amostra.



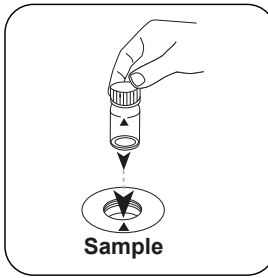
Encher a célula até à **marca de 10 mL** com a amostra .



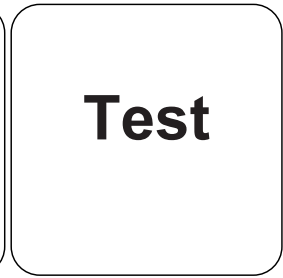
Fechar a(s) célula(s).



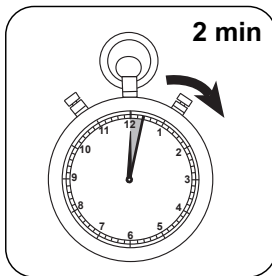
Misturar o conteúdo girando.



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



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



Aguardar **2 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 4 mg/L, se forem usados reagentes líquidos, 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]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

#### Conformidade

EN ISO 7393-2

<sup>a)</sup>Determinação do possível livre, vinculado, total







Cloro HR (KI) T

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

KI / Ácido

## Material

PT

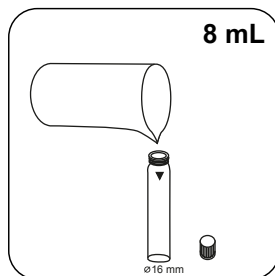
Material necessário (parcialmente opcional):

Reagentes	Unidade de Embalagem	Código do Produto
Cloro HR (KI)	Pastilhas / 100	513000BT
Cloro HR (KI)	Pastilhas / 250	513001BT
Acidificante GP	Pastilhas / 100	515480BT
Acidificante GP	Pastilhas / 250	515481BT
Definir Cloro HR (KI)/Acidificar GP#	cada 100	517721BT
Definir Cloro HR (KI)/Acidificar GP#	cada 250	517722BT
Cloro HR (KI)	Pastilhas / 100	501210
Cloro HR (KI)	Pastilhas / 250	501211

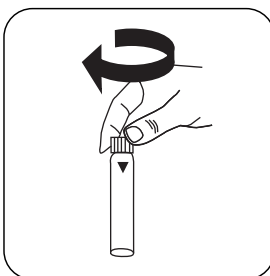


## Realização da determinação Cloro HR (KI) com pastilha

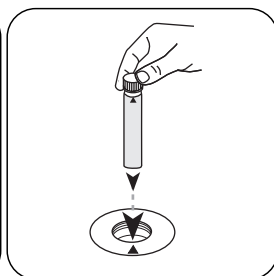
Escolher o método no equipamento.



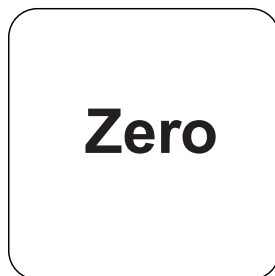
Encher a célula de 16 mm com **8 mL de amostra**.



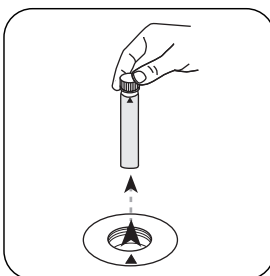
Fechar a(s) célula(s).



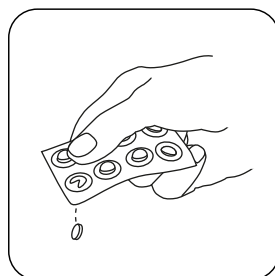
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



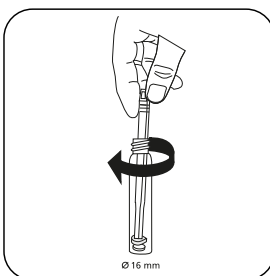
Premir a tecla **ZERO**.



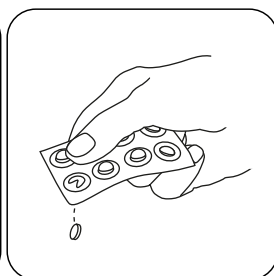
Retirar a **célula** do compartimento de medição.



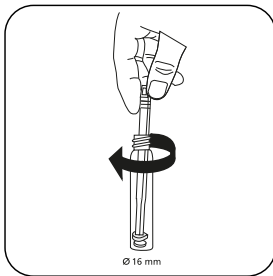
**Pastilha Chlorine HR (KI).**



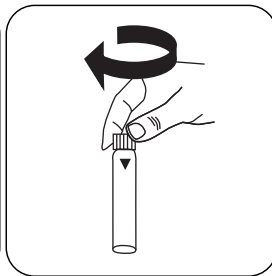
Esmagar a(s) pastilha(s) rodando ligeiramente.



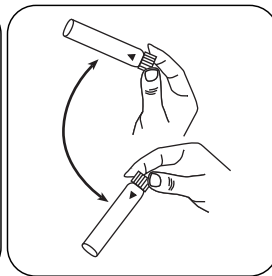
**Pastilha ACIDIFYING GP.**



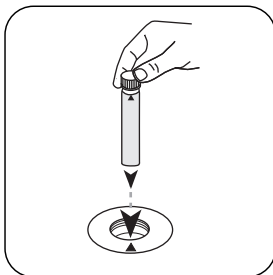
Esmagar a(s) pastilha(s) rodando ligeiramente.



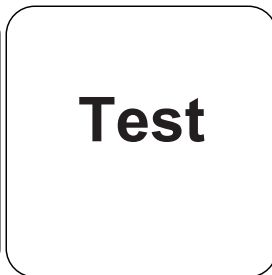
Fechar a(s) célula(s).



Dissolver a(s) pastilha(s) girando.



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



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

No visor aparece o resultado em mg/L Cloro.

## Método Químico

KI / Ácido

## Apêndice

### Texto de Interferências

#### Interferências Persistentes

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

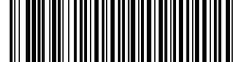
### Validação de método

<b>Limite de Detecção</b>	1.29 mg/L
<b>Limite de Determinação</b>	3.86 mg/L
<b>Fim da Faixa de Medição</b>	200 mg/L
<b>Sensibilidade</b>	83.96 mg/L / Abs
<b>Faixa de Confiança</b>	1.14 mg/L
<b>Desvio Padrão</b>	0.45 mg/L
<b>Coefficiente de Variação</b>	0.45 %

#### Derivado de

EN ISO 7393-3

\*incluindo vareta de agitação



Cloro MR PP

M113

0.02 - 3.5 mg/L Cl<sub>2</sub> <sup>a)</sup>

CL2

DPD

PT

## Material

Material necessário (parcialmente opcional):

Reagentes	Unidade de Embalagem	Código do Produto
DPD F10 sem cloro VARIO	Pó / 100 pc.	530180
DPD F10 sem cloro VARIO	Pó / 1000 pc.	530183
VARIO Cloro Total DPD F10	Pó / 100 pc.	530190
VARIO Cloro Total DPD F10	Pó / 1000 pc.	530193

## 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 devem 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).



## Notas

1. Os reagentes em pó utilizados são marcados a azul para facilitar a sua identificação. O pó para a determinação do cloro livre transporta uma linha fechada e uma linha pontilhada. O pó para a determinação do cloro total tem duas linhas fechadas.



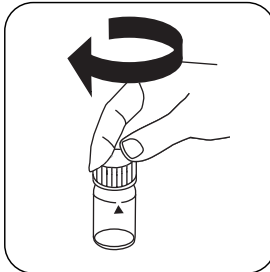
## Realização da determinação Cloro MR livre com pacotes de pó

Escolher o método no equipamento.

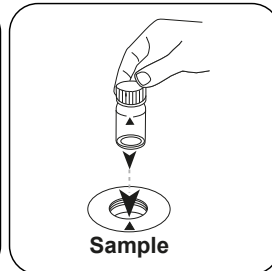
Escolha ainda a determinação: livre



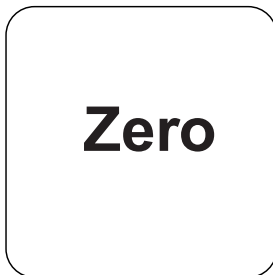
Encher a célula de 24 mm com **10 mL de amostra**.



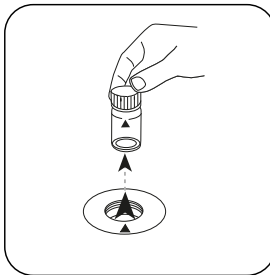
Fechar a(s) célula(s).



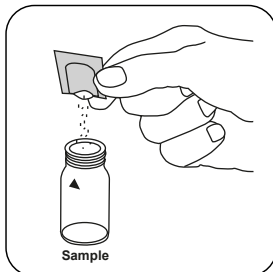
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



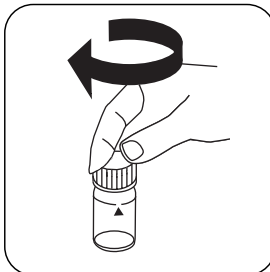
Premir a tecla **ZERO**.



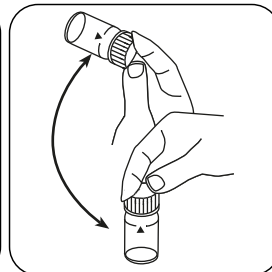
Retirar a célula do compartimento de medição.



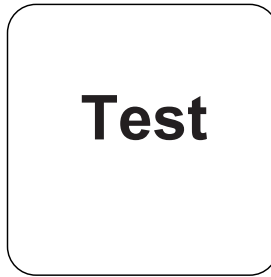
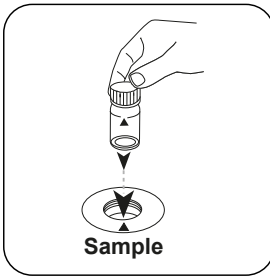
Adicionar um **pacote de pó VARIO Chlorine FREE-DPD/ F10**.



Fechar a(s) célula(s).



Misturar o conteúdo girando (20 sec.).



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

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

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

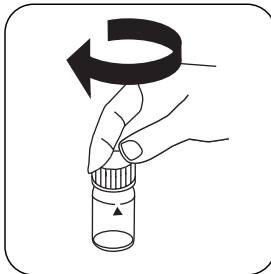
### Realização da determinação Cloro MR diferenciado com pacotes de pó

Escolher o método no equipamento.

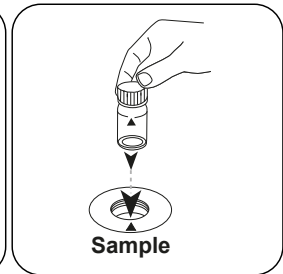
Escolha ainda a determinação: diferenciado



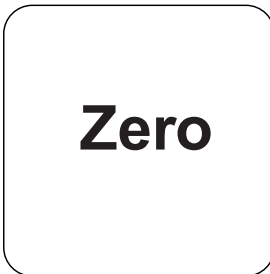
Encher a célula de 24 mm com **10 mL de amostra**.



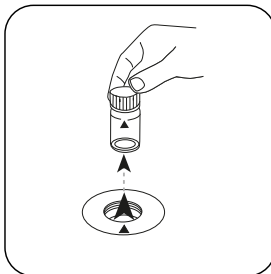
Fechar a(s) célula(s).



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

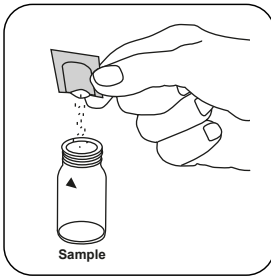


Premir a tecla **ZERO**.

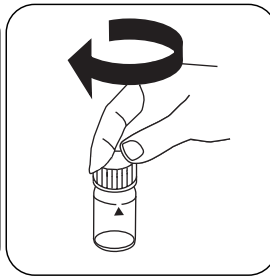


Retirar a célula do compartimento de medição.

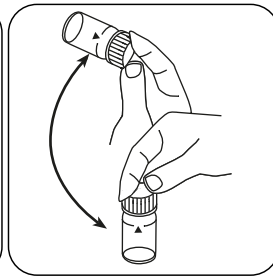




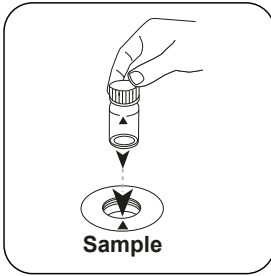
Adicionar um **pacote de pó VARIO Chlorine FREE-DPD/ F10** .



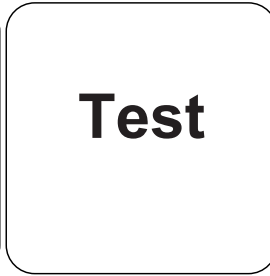
Fechar a(s) célula(s).



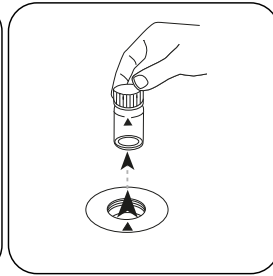
Misturar o conteúdo girando (20 sec.).



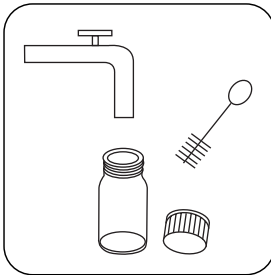
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



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



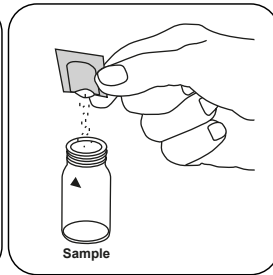
Retirar a célula do compartimento de medição.



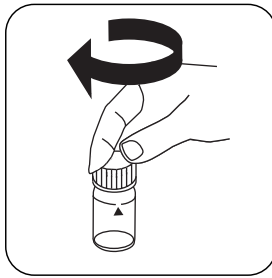
Limpar bem a célula e a tampa da mesma.



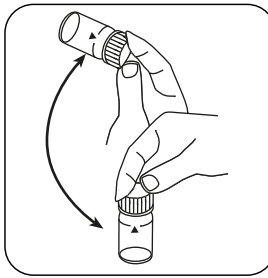
Encher a célula de 24 mm com **10 mL de amostra** .



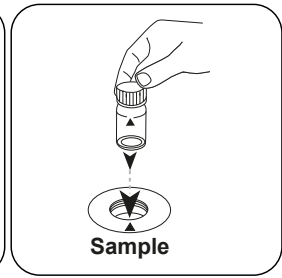
Adicionar um **pacote de pó Chlorine TOTAL-DPD/ F10** .



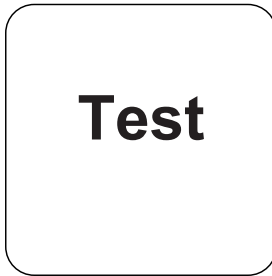
Fechar a(s) célula(s).



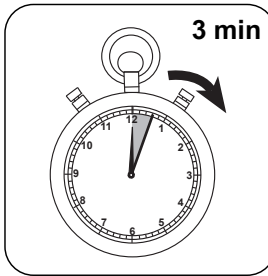
Misturar o conteúdo girando (20 sec.).



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 livre, mg/l Cloro combinado, mg/l Cloro total.

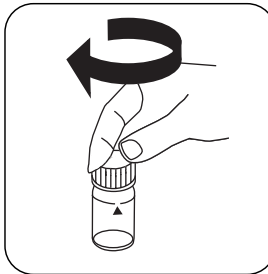
### Realização da determinação Cloro MR total com pacotes de pó

Escolher o método no equipamento.

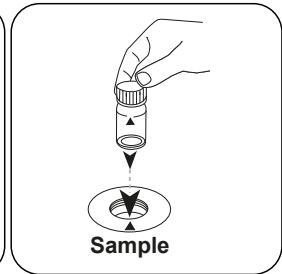
Escolha ainda a determinação: total



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



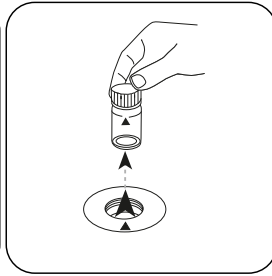
Fechar a(s) célula(s).



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



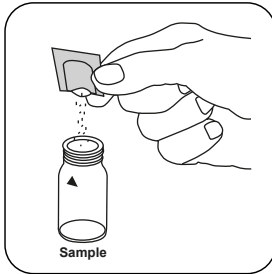
# Zero



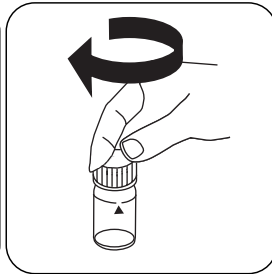
PT

Premir a tecla **ZERO**.

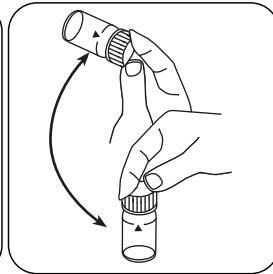
Retirar a célula do compartimento de medição.



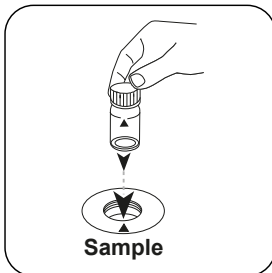
Adicionar um **pacote de pó VARIO Chlorine TOTAL-DPD/ F10**.



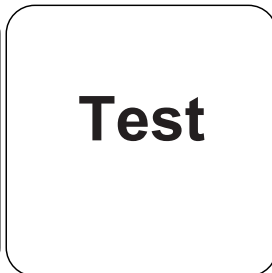
Fechar a(s) célula(s).



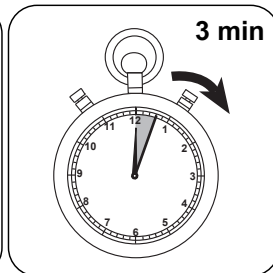
Misturar o conteúdo girando (20 sec.).



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

## 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 4 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 <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

## Validação de método

Limite de Detecção	0.01 mg/L
Limite de Determinação	0.03 mg/L
Fim da Faixa de Medição	3.5 mg/L
Sensibilidade	1.7 mg/L / Abs
Faixa de Confiança	0.014 mg/L
Desvio Padrão	0.006 mg/L
Coefficiente de Variação	0.34 %

<sup>a</sup>Determinação do possível livre, vinculado, total



Dureza do cálcio 2T

M191

20 - 500 mg/L CaCO<sub>3</sub>

CAH

Murexide

PT

## Material

Material necessário (parcialmente opcional):

Reagentes	Unidade de Embalagem	Código do Produto
Definir Cálcio H Não. 1/Não. 2 <sup>a</sup>	cada 100	517761BT
Definir Cálcio H Não. 1/Não. 2 <sup>a</sup>	cada 250	517762BT

## Preparação

1. As águas fortemente alcalinas ou ácidas deviam, antes da análise, ser ajustadas para um valor pH entre 4 e 10 (com 1 mol/l de ácido sulfúrico ou 1 mol/l soda cáustica).

## Notas

1. Para otimizar os valores de medição pode-se determinar opcionalmente um valor em branco do método específico do lote (veja a descrição do fotómetro).
2. O comprimento exato do volume da amostra de 10 ml é decisivo para a precisão do resultado de análise.
3. O presente método foi desenvolvido a partir de um processo titrimétrico. Devido às condições básicas indefinidas, a diferença para com o método padronizado pode ser maior.
4. O processo trabalha na área de medição alta com tolerâncias mais altas do que na área de medição baixa. Nas diluições de amostras deve diluir sempre de modo a medir na terça parte inferior da área de medição.

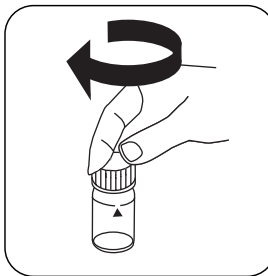


## Realização da determinação Dureza do cálcio 2 com pastilha

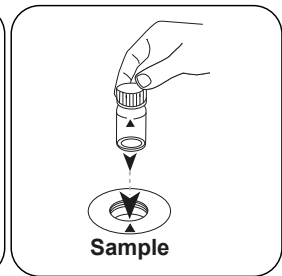
Escolher o método no equipamento.



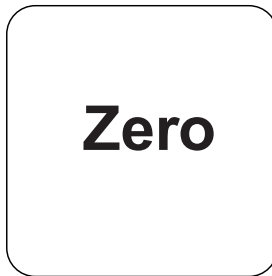
Encher a célula de 24 mm com **10 mL de amostra**.



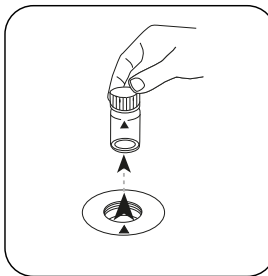
Fechar a(s) célula(s).



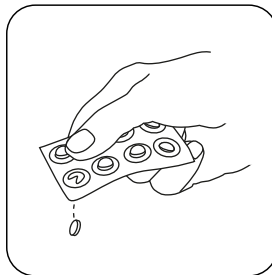
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



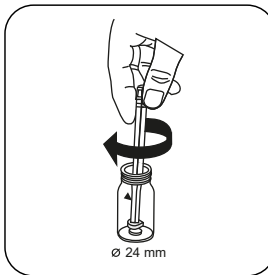
Premir a tecla **ZERO**.



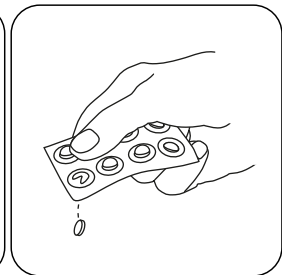
Retirar a célula do compartimento de medição.



**Pastilha CALCIO H No.1.**



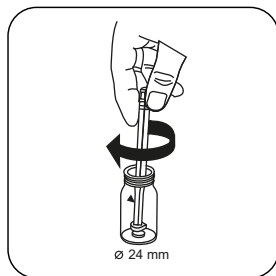
Esmagar a(s) pastilha(s) rodando ligeiramente e dissolver.



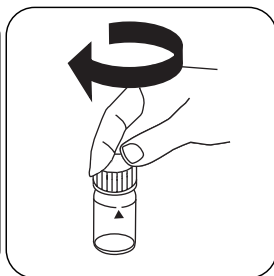
**Pastilha CALCIO H No.2.**



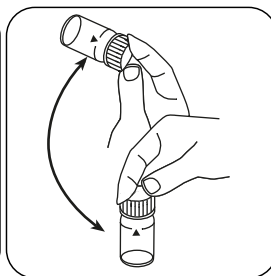
PT



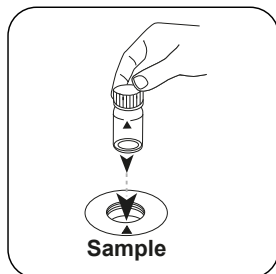
Esmagar a(s) pastilha(s) rodando ligeiramente.



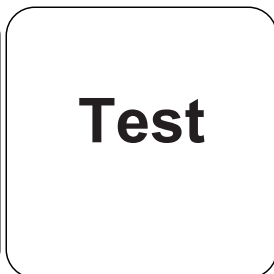
Fechar a(s) célula(s).



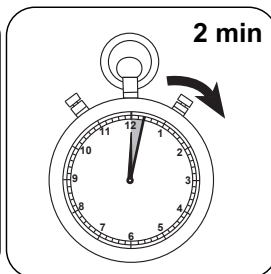
Dissolver a(s) pastilha(s) girando.



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



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



Aguardar **2 minuto(s) de tempo de reação**.

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

No visor aparece o resultado como Dureza do cálcio.

## Análises

A tabela a seguir identifica os valores de saída que podem ser convertidos em outras formas de citação.

Unidade	Forma de citação	Fator de conversão
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

PT

## Método Químico

Murexide

## Apêndice

### Texto de Interferências

#### Interferências Persistentes

1. Prata, cádmio, cobalto, cobre e mercúrio interferem a determinação.

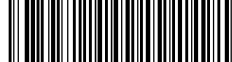
Interferências	a partir de / [mg/L]
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

#### Bibliografia

Análise fotométrica, Lange/ Vjedelek, Verlag Chemie 1980

\*incluindo vareta de agitação





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
Fotómetro Fenol Vermelho	Pastilhas / 100	511770BT
Fotómetro Fenol Vermelho	Pastilhas / 250	511771BT
Fotómetro Fenol Vermelho	Pastilhas / 500	511772BT

## Notas

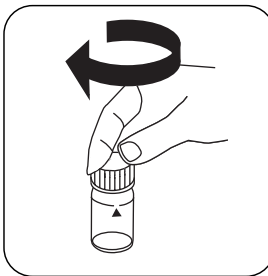
1. Para a determinação fotométrica do valor pH deve usar somente pastilhas PHENOL RED com impressão de película preta, que estão identificadas com o termo PHOTOMETER.

## Realização da determinação Valor pH com pastilha

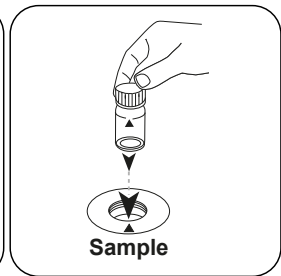
Escolher o método no equipamento.



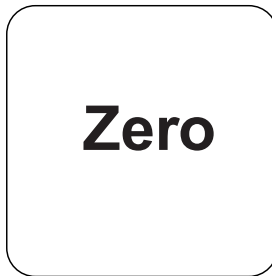
Encher a célula de 24 mm com **10 mL de amostra**.



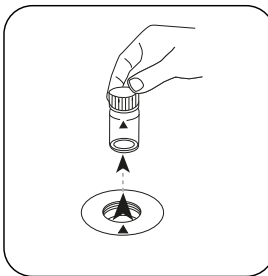
Fechar a(s) célula(s).



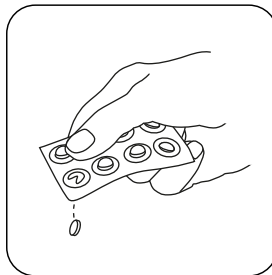
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



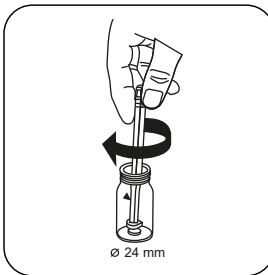
Premir a tecla **ZERO**.



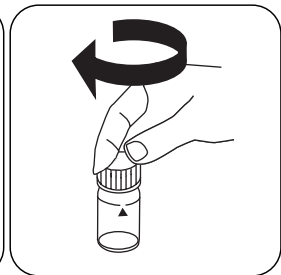
Retirar a célula do compartimento de medição.



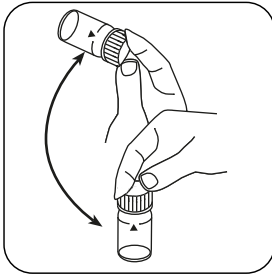
**Pastilha PHENOL RED PHOTOMETER.**



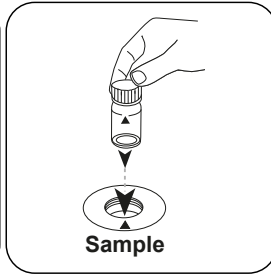
Esmagar a(s) pastilha(s) rodando ligeiramente.



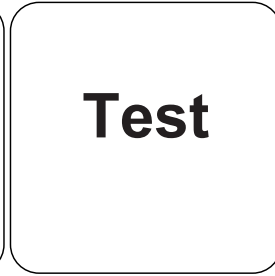
Fechar a(s) célula(s).



Dissolver a(s) pastilha(s) girando.



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



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

No visor aparece o resultado como valor pH.

PT

## 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 <sup>1)</sup>	-0,21 <sup>2)</sup>	-0,26 <sup>2)</sup>	-0,29 <sup>2)</sup>

<sup>1)</sup> segundo Kolthoff (1922)

<sup>2)</sup> 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

## Material

PT

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.

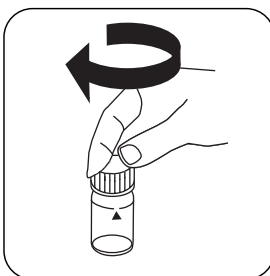


## Realização da determinação Valor pH com reagente líquido

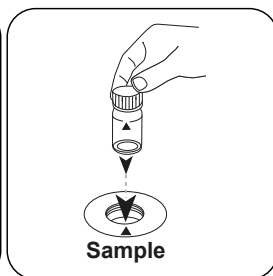
Escolher o método no equipamento.



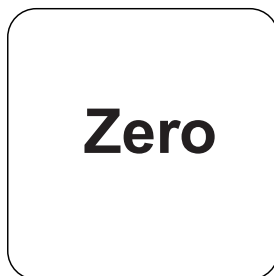
Encher a célula de 24 mm com **10 mL de amostra**.



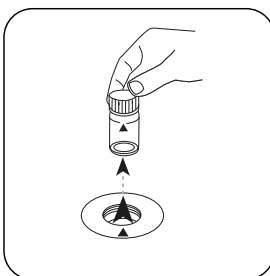
Fechar a(s) célula(s).



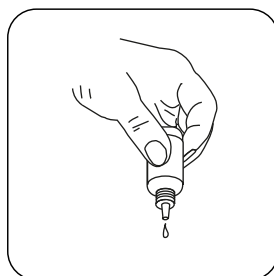
Colocar a **célula de amostra** no compartimento de medição. Observar o posicionamento.



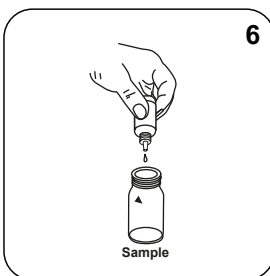
Premir a tecla **ZERO**.



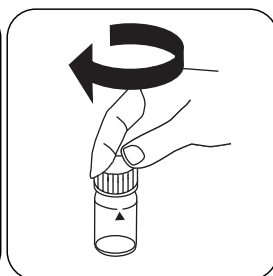
Retirar a célula do compartimento de medição.



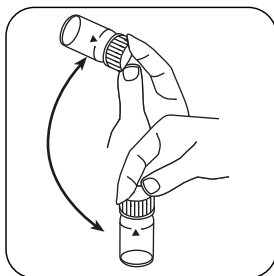
Manter os frascos conta gotas na vertical e pressionar lentamente para adicionar gotas de igual dimensão.



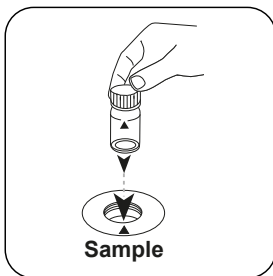
Adicionar **6 gotas PHENOL Red-Lösung** à célula de amostra.



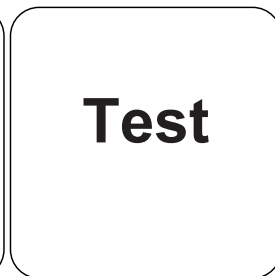
Fechar a(s) célula(s).



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.

PT

## 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 <sup>1)</sup>
	60 g/L	-0,21 <sup>2)</sup>
	120 g/L	-0,26 <sup>2)</sup>
	180 g/L	-0,29 <sup>2)</sup>
	<sup>1)</sup> segundo Kolthoff (1922)	<sup>2)</sup> 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	$\lambda$	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<sub>S<sub>4.3</sub></sub> 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**

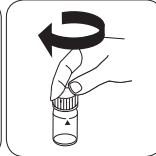
**Uitvoering van de bepaling Zuurcapaciteit  $K_{s4,3}$  met tablet**

De methode in het apparaat selecteren.

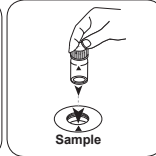
Voor deze methode moet bij de volgende apparaten geen nulmeting worden uitgevoerd:  
XD 7000, XD 7500



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

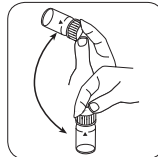


De spoelbakjes afsluiten.

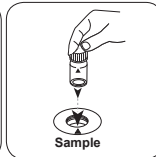


Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.

• • •



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  $K_{s4,3}$ .



Alkaliteit-m T

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

Zuur / Indicator

NL

## Reagentia

Benodigd materiaal (deels optioneel):

Reagentia	Verpakkingseenheid	Bestelnr.
Alka-M-fotometer	Tablet / 100	513210BT
Alka-M-fotometer	Tablet / 250	513211BT

## Aantekeningen

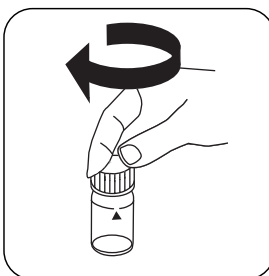
1. De termen alkaliteit-m, m-waarde, totale alkaliteit en zuurcapaciteit<sub>KS4.3</sub> zijn identiek.
2. De exacte naleving van het monstervolume van 10 ml is bepalend voor de nauwkeurigheid van het analyseresultaat.

## Uitvoering van de bepaling Alkaliteit, totaal= alkaliteit-m= m-waarde met tablet

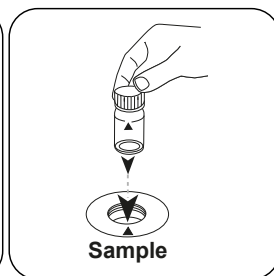
De methode in het apparaat selecteren.



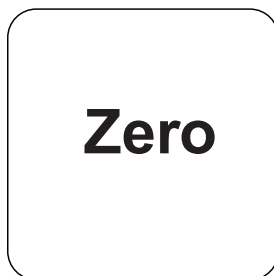
Spoelbakje van 24 mm met 10 mL staal vullen.



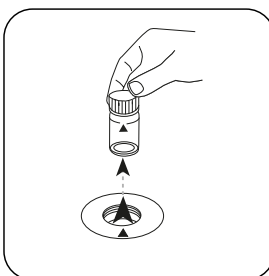
De spoelbakjes afsluiten.



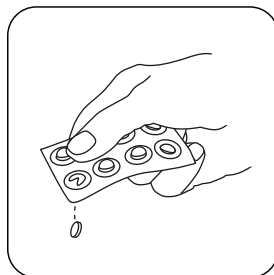
Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



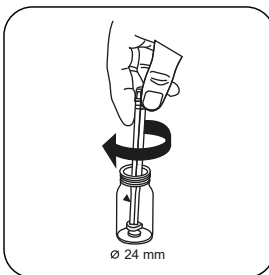
De toets **NUL** indrukken.



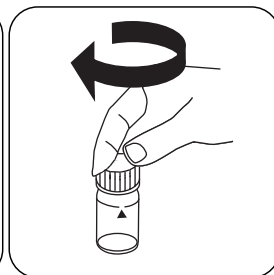
Het spoelbakje uit de meetschacht nemen.



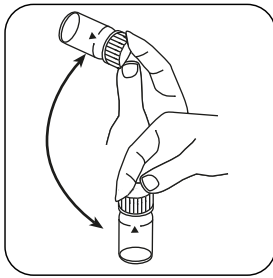
Een **ALKA-M-FOTOMETER** tablet toevoegen.



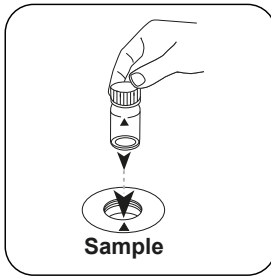
De tabletten onder lichte rotatie verpletteren.



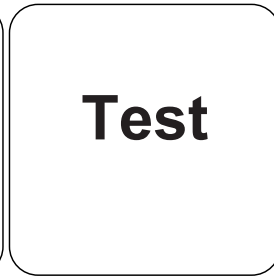
De spoelbakjes afsluiten.



Tabletten oplossen door om te draaien



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



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

De display toont het resultaat als Alkaliteit-m.

NL

## Evaluatie

De volgende tabel geeft aan dat de uitvoerwaarden kunnen worden geconverteerd naar andere citatievormen.

Eenheid	Dagvaardingsformulier	Omrekeningsfactor
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4,3</sub>	0.02

NL

## Chemische methode

Zuur / Indicator

## Aanhangsel

Afgeleid van

EN ISO 9963-1

**Chloor T****M100****0.01 - 6.0 mg/L Cl<sub>2</sub> <sup>a)</sup>****CL6****DPD**

NL

**Reagentia**

Benodigd materiaal (deels optioneel):

<b>Reagentia</b>	<b>Verpakkingseenheid</b>	<b>Bestelnr.</b>
DPD Nr. 1	Tablet / 100	511050BT
DPD Nr. 1	Tablet / 250	511051BT
DPD Nr. 1	Tablet / 500	511052BT
DPD Nr. 3	Tablet / 100	511080BT
DPD Nr. 3	Tablet / 250	511081BT
DPD Nr. 3	Tablet / 500	511082BT
DPD Nr. 1 hoog calcium <sup>e)</sup>	Tablet / 100	515740BT
DPD Nr. 1 hoog calcium <sup>e)</sup>	Tablet / 250	515741BT
DPD Nr. 1 hoog calcium <sup>e)</sup>	Tablet / 500	515742BT
DPD Nr. 3 hoog calcium <sup>e)</sup>	Tablet / 100	515730BT
DPD Nr. 3 hoog calcium <sup>e)</sup>	Tablet / 250	515731BT
DPD Nr. 3 hoog calcium <sup>e)</sup>	Tablet / 500	515732BT
DPD Nr. 4	Tablet / 100	511220BT
DPD Nr. 4	Tablet / 250	511221BT
DPD Nr. 4	Tablet / 500	511222BT
DPD No. 3 Evo	Tablet / 100	511420BT
DPD No. 3 Evo	Tablet / 250	511421BT
DPD No. 3 Evo	Tablet / 500	511422BT
DPD Nr.4 Evo	Tablet / 100	511970BT
DPD Nr. 4 Evo	Tablet / 250	511971BT
DPD Nr. 4 Evo	Tablet / 500	511972BT

**Beschikbare standaarden**

<b>Omschrijving</b>	<b>Verpakkingseenheid</b>	<b>Bestelnr.</b>
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.

## Vorbereiding

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 meefout 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.

## Aantekeningen

1. Evo-tabletten kunnen worden gebruikt als alternatief voor de overeenkomstige standaardtabletten (bv. DPD nr. 3 Evo in plaats van DPD nr. 3).



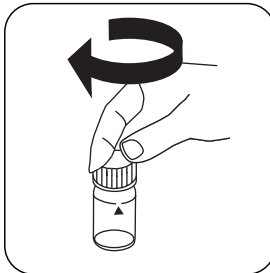


## Uitvoering van de bepaling vrij chloor met tablet

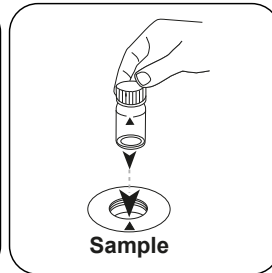
De methode in het apparaat selecteren.



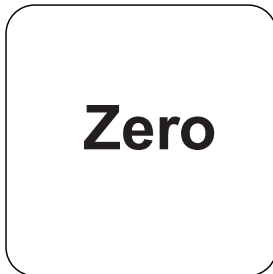
Spoelbakje van 24 mm met **10 mL staal** vullen.



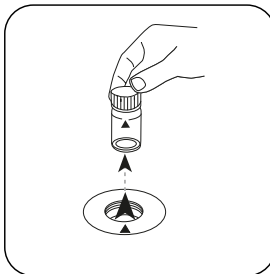
De spoelbakjes afsluiten.



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



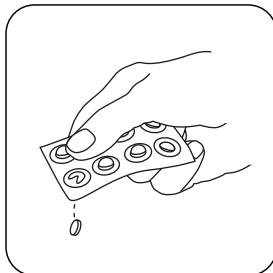
De toets **NUL** indrukken.



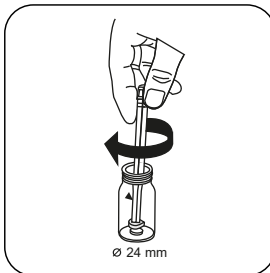
Het spoelbakje uit de meetschacht nemen.



Het spoelbakje tot op enkele druppels ledigen.



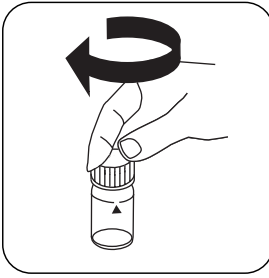
Een **DPD Nr. 1 tablet** toevoegen.



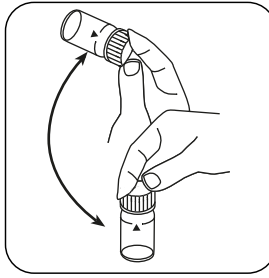
De tabletten onder lichte rotatie verpletteren.



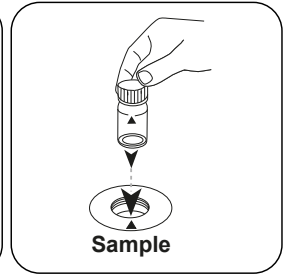
Het spoelbakje tot aan de **markering van 10 mL** met het **staal** vullen.



De spoelbakjes afsluiten.



Tabletten oplossen door om te draaien



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

NL

## Test

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

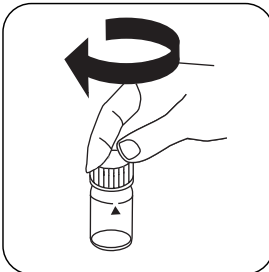
De display toont het resultaat in mg/L vrij chloor.

### Uitvoering van de bepaling totaal chloor met tablet

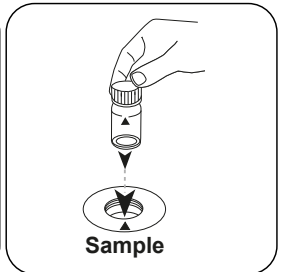
De methode in het apparaat selecteren.



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



De spoelbakjes afsluiten.



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

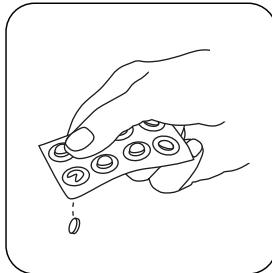


# Zero

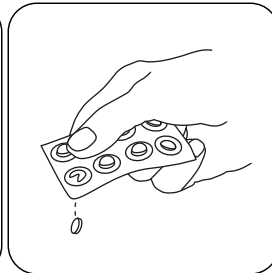
De toets **NUL** indrukken.

Het spoelbakje uit de meetschacht nemen.

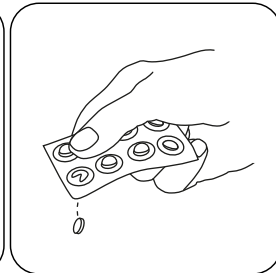
Het spoelbakje tot op enkele druppels ledigen.



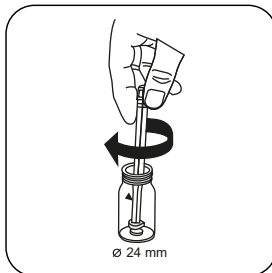
Een DPD Nr. 1 tablet toevoegen.



Een DPD Nr. 3 tablet toevoegen.



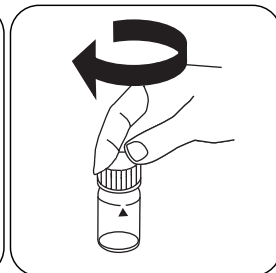
Als alternatief voor DPD nr. 1 en nr. 3 tabletten kan 1 DPD nr. 4 tablet worden toegevoegd.



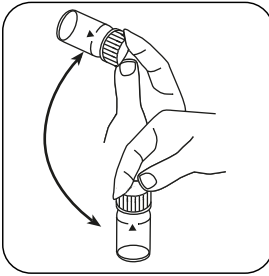
De tabletten onder lichte rotatie verpletteren.



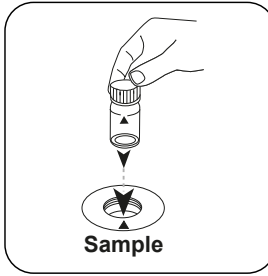
Het spoelbakje tot aan de **markering van 10 mL** met het **staal** vullen.



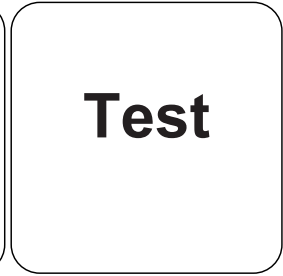
De spoelbakjes afsluiten.



Tabletten oplossen door om te draaien

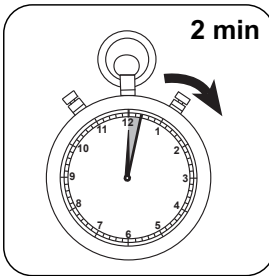


Het **staalspoelbakje** in de meetschacht plaats. Op de positionering letten.



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

NL



De reactietijd van **2 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.
- Bij monsters met een hoog calciumgehalte\* en/of een hoge geleidbaarheid\* kan het gebruik van reagenstabletten leiden tot vertroebeling van het monster en de daarmee samenhangende onjuiste meting. In dit geval zijn de reagenstabletten DPD-nr. 1 High Calcium en het reagenstablet DPD-nr. 3 High Calcium te gebruiken.  
\*exacte waarden kunnen niet worden gegeven omdat de troebelheidsvorming afhankelijk is van de aard en samenstelling van het monsterwater.
- Concentraties van meer dan 10 mg/L chloor, bij gebruik van tabletten, kunnen leiden tot resultaten binnen het meetbereik tot 0 mg/L. Als de chloorconcentratie te hoog is, moet het monster worden verdund met chloorvrij water. Voeg reagens toe aan 10 mL van het verdunde monster en herhaal de meting (plausibiliteitstest).

Verstoringen	verstoort vanaf
CrO <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

## Validatie van de methodes

<b>Aantoonbaarheidsgrens</b>	0.02 mg/L
<b>Bepaalbaarheidsgrens</b>	0.06 mg/L
<b>Einde meetbereik</b>	6 mg/L
<b>Gevoeligheid</b>	2.05 mg/L / Abs
<b>Betrouwbaarheidsgrenzen</b>	0.04 mg/L
<b>Standaardafwijking procedure</b>	0.019 mg/L
<b>Variatiecoëfficiënt procedure</b>	0.87 %

### Conform

EN ISO 7393-2



<sup>a)</sup> bepaling van de vrije, gebonden, totaal mogelijke | <sup>a)</sup> hulpreagens, alternatief voor DPD-nr. 1 / nr. 3 in geval van troebelheid van het monster als gevolg van een hoog calciumionengehalte en/of een hoge geleidbaarheid



Chloor L

M101

0.02 - 4.0 mg/L Cl<sub>2</sub><sup>a)</sup>

CL6

DPD

NL

## Reagentia

Benodigd materiaal (deels optioneel):

Reagentia	Verpakkingseenheid	Bestelnr.
DPD 1 bufferoplossing, blauw flesje	15 mL	471010
DPD 1-bufferoplossing	100 mL	471011
DPD 1 bufferoplossing in verpakking van 6 stuks	1 St.	471016
DPD 1 reagensoplossing, groen flesje	15 mL	471020
DPD 1-reagensoplossing	100 mL	471021
DPD 1 reagensoplossing in verpakking van 6 stuks	1 St.	471026
DPD 3 oplossing, rood flesje	15 mL	471030
DPD 3 oplossing	100 mL	471031
DPD 3 oplossing in verpakking van 6 stuks	1 St.	471036
DPD reagentia set	1 St.	471056

## 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.

## Vorbereiding

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.

## Aantekeningen

1. Na gebruik moeten de druppelflacons onmiddellijk worden gesloten met de schroefdop van dezelfde kleur.
2. Bewaar het reagens ingesteld op +6 °C tot +10 °C op een koele plaats.



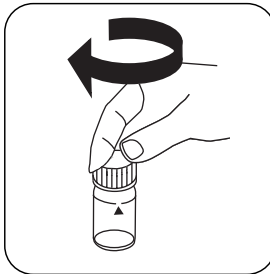


## Uitvoering van de bepaling vrij chloor met vloeibaar reagens

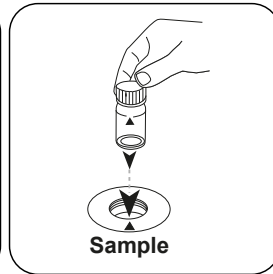
De methode in het apparaat selecteren.



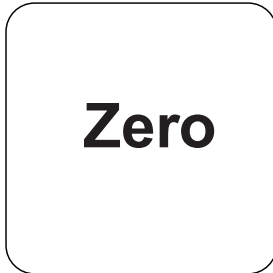
Spoelbakje van 24 mm met **10 mL staal** vullen.



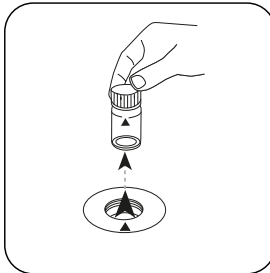
De spoelbakjes afsluiten.



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



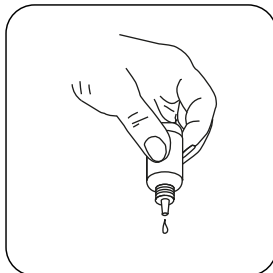
De toets **NUL** indrukken.



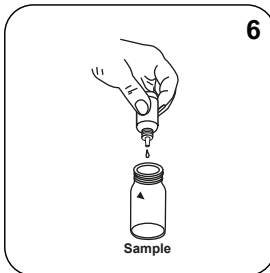
Het spoelbakje uit de meetschacht nemen.



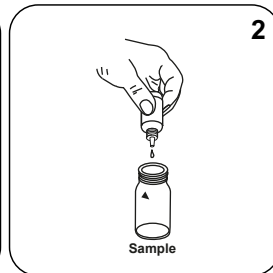
Het spoelbakje ledigen.



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



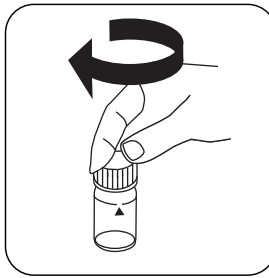
**6 druppels DPD**  
**1 bufferoplossing** in het staalspoelbakje doen.



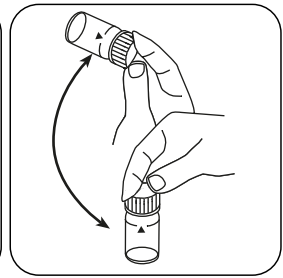
**2 druppels DPD**  
**1 reagensoplossing** in het staalspoelbakje doen.



Het spoelbakje tot aan de **markering van 10 mL** met het **staal** vullen.

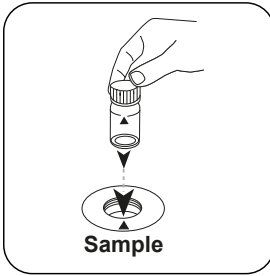


De spoelbakjes afsluiten.

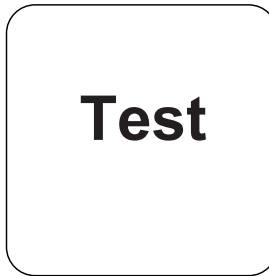


De inhoud mengen door om te draaien.

NL



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



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

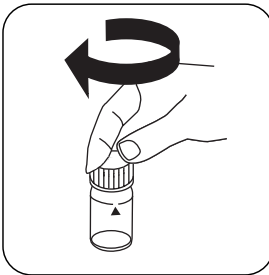
De display toont het resultaat in mg/L vrij chloor.

### **Uitvoering van de bepaling totaal chloor met vloeibaar reagens**

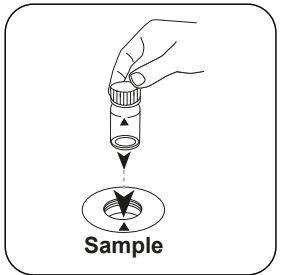
De methode in het apparaat selecteren.



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



De spoelbakjes afsluiten.

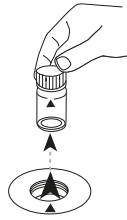


Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letteren.



# Zero

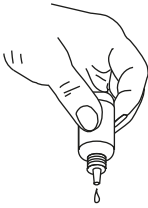
De toets **NUL** indrukken.



Het spoelbakje uit de meetschacht nemen.



Het spoelbakje ledigen.



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



**6**

**6 druppels DPD  
1 bufferoplossing** in het staal spoelbakje doen.



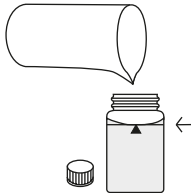
**2**

**2 druppels DPD  
1 reagensoplossing** in het staal spoelbakje doen.

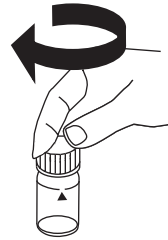


**3**

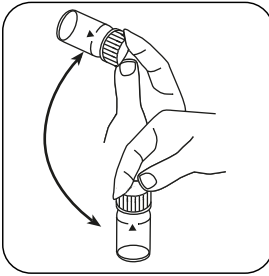
**3 druppels DPD  
3 oplossing** in het staal spoelbakje doen.



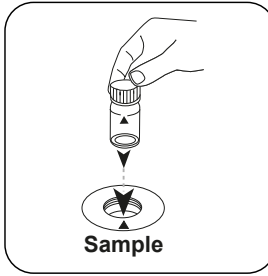
Het spoelbakje tot aan de **markering van 10 mL** met het **staal** vullen.



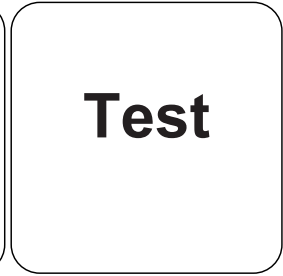
De spoelbakjes afsluiten.



De inhoud mengen door om te draaien.

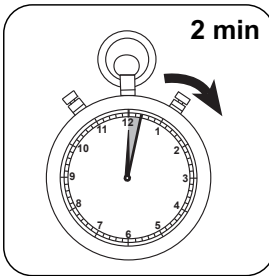


Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



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

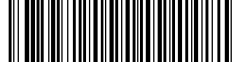
NL



De reactietijd van **2 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 4 mg/L chloor, bij gebruik van vloeibare reagentia, 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
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

### Conform

EN ISO 7393-2

<sup>a)</sup> bepaling van de vrije, gebonden, totaal mogelijke





Chloor HR (KI) T

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

Al / Zuur

NL

## Reagentia

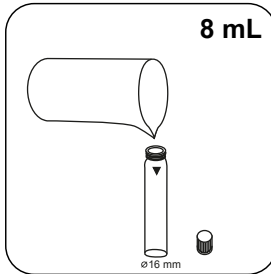
Benodigd materiaal (deels optioneel):

Reagentia	Verpakkingseenheid	Bestelnr.
Chloor HR (KI)	Tablet / 100	513000BT
Chloor HR (KI)	Tablet / 250	513001BT
Acidifying GP	Tablet / 100	515480BT
Acidifying GP	Tablet / 250	515481BT
Set chloor HR (KI)/Acidifying GP#	per 100	517721BT
Set chloor HR (KI)/Acidifying GP#	per 250	517722BT
Chloor HR (KI)	Tablet / 100	501210
Chloor HR (KI)	Tablet / 250	501211

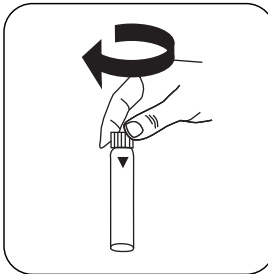


## Uitvoering van de bepaling Chloor HR (KI) met tablet

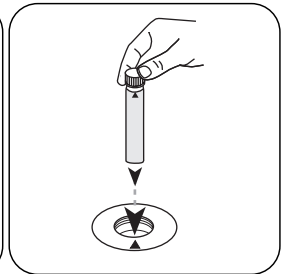
De methode in het apparaat selecteren.



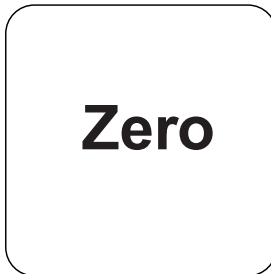
Spoelbakje van 16 mm met **8 mL** staal vullen.



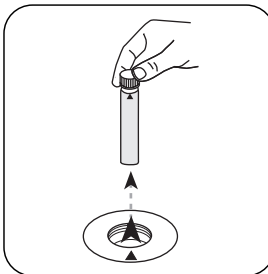
De spoelbakjes afsluiten.



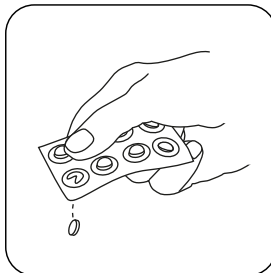
Het **staal**spoelbakje in de meetschacht plaatsen. Op de positionering letteren.



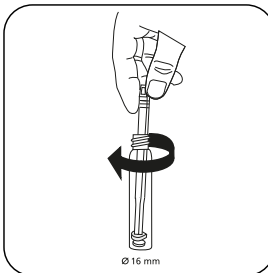
De toets **NUL** indrukken.



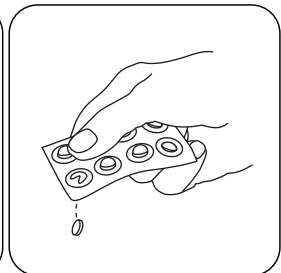
Het **spoelbakje** uit de meetschacht nemen.



Een **Chloor HR (KI) tablet** toevoegen.

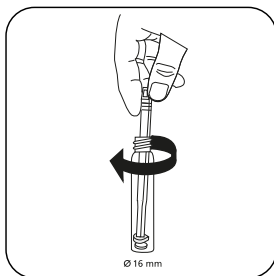
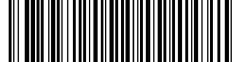


De tabletten onder lichte rotatie verpletteren.

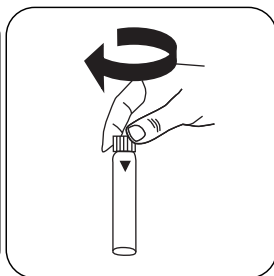


Een **ACIDIFYING GP tablet** toevoegen.

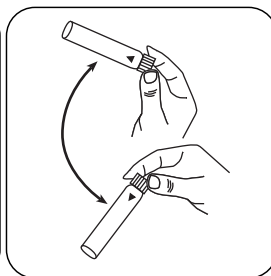




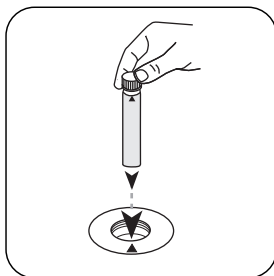
De tabletten onder lichte rotatie verpletteren.



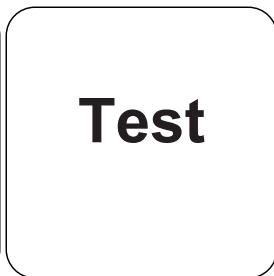
De spoelbakjes afsluiten.



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 in mg/L Chloor.

## Chemische methode

Al / Zuur

## Aanhangsel

## Verstoringsen

### Permanente verstoringen

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

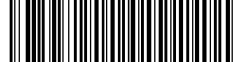
## Validatie van de methodes

<b>Aantoonbaarheidsgrens</b>	1.29 mg/L
<b>Bepaalbaarheidsgrens</b>	3.86 mg/L
<b>Einde meetbereik</b>	200 mg/L
<b>Gevoeligheid</b>	83.96 mg/L / Abs
<b>Betrouwbaarheidsgrenzen</b>	1.14 mg/L
<b>Standaardafwijking procedure</b>	0.45 mg/L
<b>Variatiecoëfficiënt procedure</b>	0.45 %

### Afgeleid van

EN ISO 7393-3

\* met inbegrip van de mengstaaf



Chloor MR PP

M113

0.02 - 3.5 mg/L Cl<sub>2</sub><sup>a)</sup>

CL2

DPD

NL

## Reagentia

Benodigd materiaal (deels optioneel):

Reagentia	Verpakkingseenheid	Bestelnr.
VARIO Chloor vrij DPD F10	Poeder / 100 St.	530180
VARIO Chloor totaal DPD F10	Poeder / 100 St.	530190
VARIO Chloor vrij DPD F10	Poeder / 1000 St.	530183
VARIO Chloor totaal DPD F10	Poeder / 1000 St.	530193

## 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 geplatst.



## Aantekeningen

1. De gebruikte poederreagentia zijn voorzien van een blauwe kleurmarkering om de differentiatie te vergemakkelijken. Het poeder voor de bepaling van vrij chloor heeft een gesloten en gestippelde lijn. Het poeder voor de bepaling van het totaal aan chloor bevat twee gesloten lijnen.



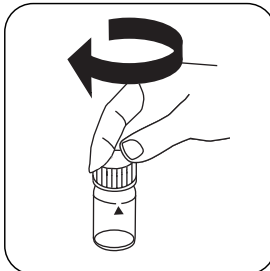
## Uitvoering van de bepaling vrij chloor MR, met poederpakjes

De methode in het apparaat selecteren.

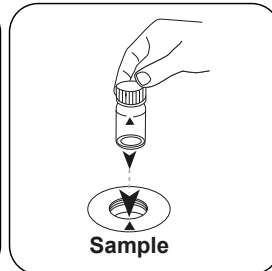
Selecteer bovendien de bepaling: vrij



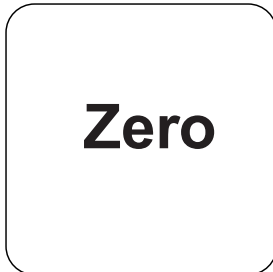
Spoelbakje van 24 mm met **10 mL staal** vullen.



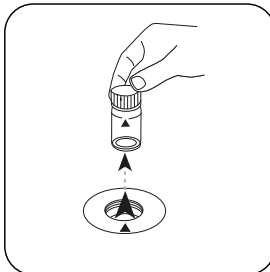
De spoelbakjes afsluiten.



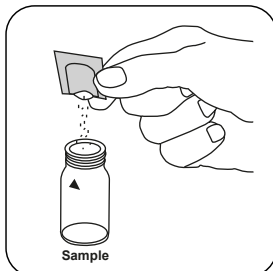
Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



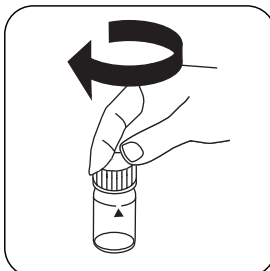
De toets **NUL** indrukken.



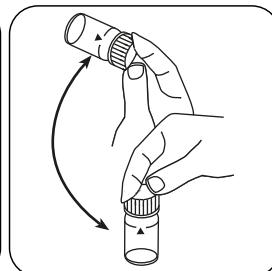
Het spoelbakje uit de meetschacht nemen.



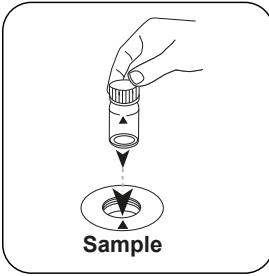
Een **VARIO Chloor FREE-DPD/ F10 poederpakje** toevoegen.



De spoelbakjes afsluiten.



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



# Test

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

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

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

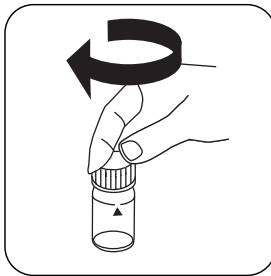
## Uitvoering van de bepaling gedifferentieerd chloor MR met poederpakjes

De methode in het apparaat selecteren.

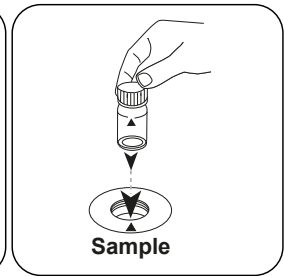
Selecteer bovendien de bepaling: gedifferentieerd



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



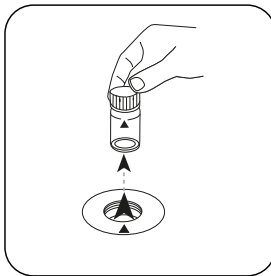
De spoelbakjes afsluiten.



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

# Zero

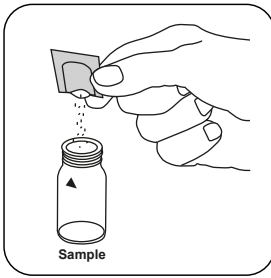
De toets **NUL** indrukken.



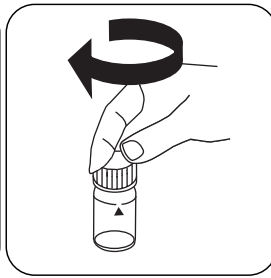
Het spoelbakje uit de meetschacht nemen.



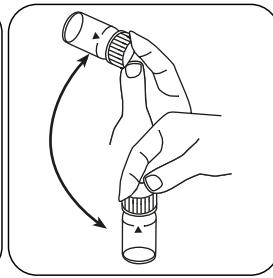
NL



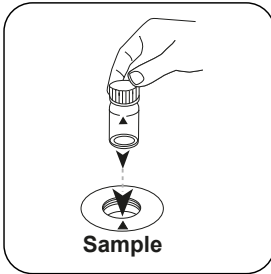
Een **VARIO Chloor FREE-DPD/ F10 poederpakje** toevoegen.



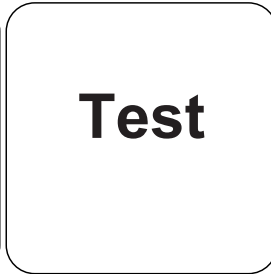
De spoelbakjes afsluiten.



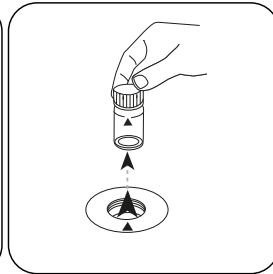
De inhoud mengen door om te draaien (20 sec.).



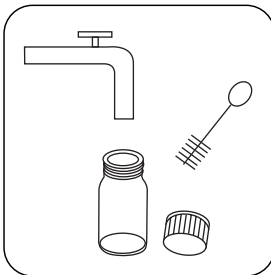
Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



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



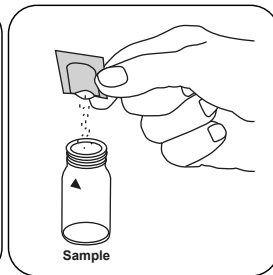
Het spoelbakje uit de meetschacht nemen.



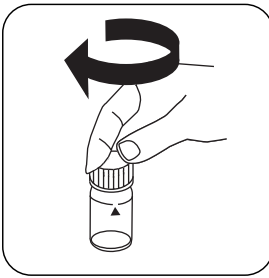
Het spoelbakje en het deksel van het spoelbakje grondig reinigen.



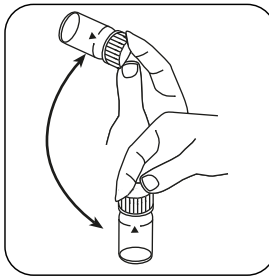
Spoelbakje van 24 mm met **10 mL** staal vullen.



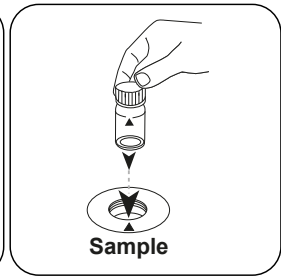
Een **Chloor TOTAL-DPD/ F10 poederpakje** toevoegen.



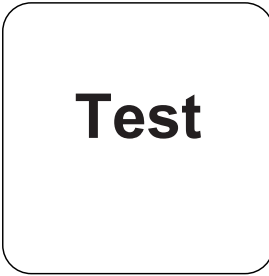
De spoelbakjes afsluiten.



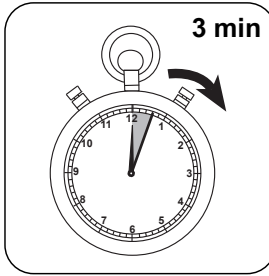
De inhoud mengen door om te draaien (20 sec.).



Het **staalspoelbakje** 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 vrij chloor, gebonden chloor, totaal chloor.

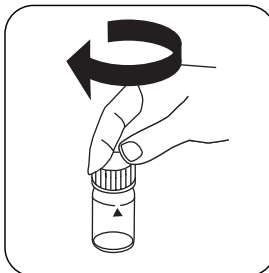
### **Uitvoering van de bepaling totaal chloor MR met poederpakjes**

De methode in het apparaat selecteren.

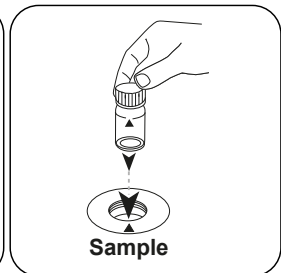
Selecteer bovendien de bepaling: totaal



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



De spoelbakjes afsluiten.



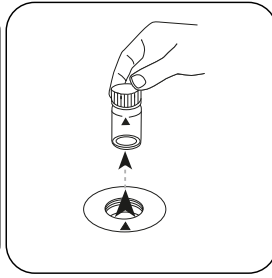
Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letten.



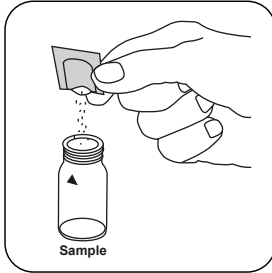


# Zero

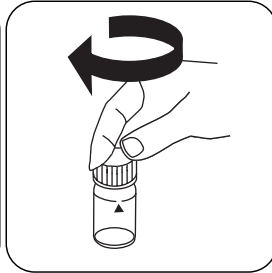
De toets **NUL** indrukken.



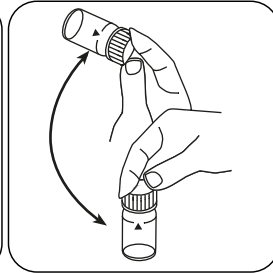
Het spoelbakje uit de meetschacht nemen.



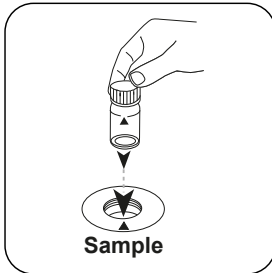
Een **VARIO Chloor TOTAL-DPD/F10 poederpakje** toevoegen.



De spoelbakjes afsluiten.



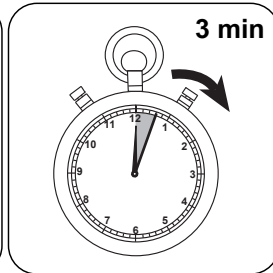
De inhoud mengen door om te draaien (20 sec.).



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

# Test

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

## Verstoringen

### Permanente verstoringen

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

### Uit te sluiten verstoringen

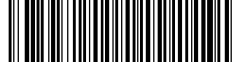
- Storingen veroorzaakt door koper en ijzer(III) worden door EDTA geëlimineerd.
- Concentraties van meer dan 4 mg/L chloor, bij gebruik van Powder Packs, kunnen leiden tot resultaten binnen het meetbereik tot 0 mg/L. In dit geval moet het monster worden verdund met chloorvrij water. Voeg reagens toe aan 10 mL van het verdunde monster en herhaal de meting (plausibiliteitstest).

Verstoringen	verstoort vanaf
$\text{CrO}_4^{2-}$	0.01
$\text{MnO}_2$	0.01

## Validatie van de methodes

Aantoonbaarheidsgrens	0.01 mg/L
Bepaalbaarheidsgrens	0.03 mg/L
Einde meetbereik	3.5 mg/L
Gevoeligheid	1.7 mg/L / Abs
Betrouwbaarheidsgrenzen	0.014 mg/L
Standaardafwijking procedure	0.006 mg/L
Variatiecoëfficiënt procedure	0.34 %

<sup>a)</sup> bepaling van de vrije, gebonden, totaal mogelijke



Hardheid Calcium 2T

M191

20 - 500 mg/L CaCO<sub>3</sub>

CAH

Oppervlakteactieve stof

NL

## Reagentia

Benodigd materiaal (deels optioneel):

Reagentia	Verpakkingseenheid	Bestelnr.
Set calcio H nr. 1/Nr. 2 <sup>#</sup>	per 100	517761BT
Set calcio H nr. 1/Nr. 2 <sup>#</sup>	per 250	517762BT

## Vorbereiding

1. Sterk alkalisch of zuur water moet vóór de analyse in een pH-gebied tussen 4 en 10 (met 1 mol/l-zoutzuur of 1 mol/l-natriumhydroxideoplossing) worden geplaatst.

## Aantekeningen

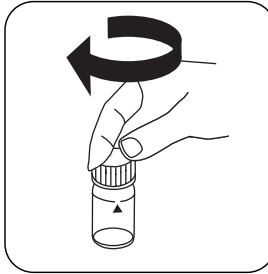
1. Om de meetwaarden te optimaliseren, kan optioneel een batchspecifieke blancowaarde worden bepaald (zie handleiding van de fotometer).
2. De exacte naleving van het monstervolume van 10 ml is bepalend voor de nauwkeurigheid van het analyseresultaat.
3. De huidige methode is ontwikkeld vanuit een titrimetrische procedure. Als gevolg van ongedefinieerde randvoorwaarden kan de afwijking van de gestandaardiseerde methode groter zijn.
4. De methode werkt in het hoge meetbereik met grotere toleranties dan in het lage meetbereik. Voor monsterverdunningen, verdun altijd zodanig dat de meting zich in het onderste derde van het meetbereik bevindt.

## Uitvoering van de bepaling Hardheid calcium 2 met tablet

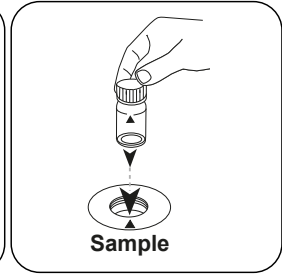
De methode in het apparaat selecteren.



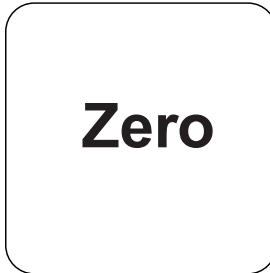
Spoelbakje van 24 mm met **10 mL staal** vullen.



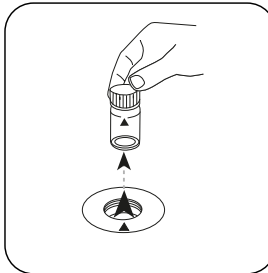
De spoelbakjes afsluiten.



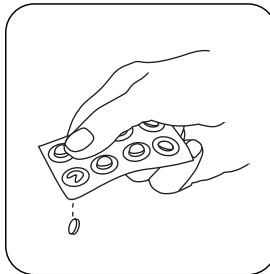
Het **staal spoelbakje** in de meetschacht plaatsen. Op de positionering letten.



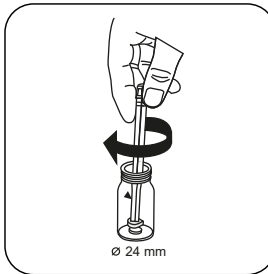
De toets **NUL** indrukken.



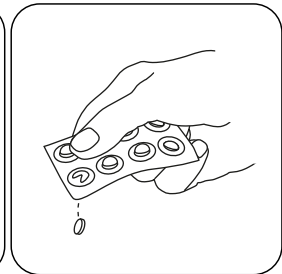
Het spoelbakje uit de meetschacht nemen.



Een **CALCIO H Nr.1 tablet** toevoegen.



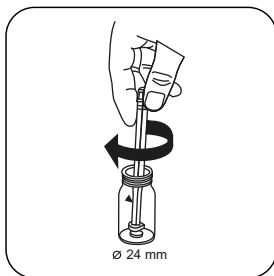
De tabletten onder lichte rotatie verpletteren en oplossen.



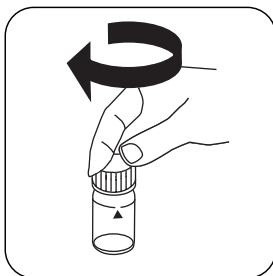
Een **CALCIO H Nr.2 tablet** toevoegen.



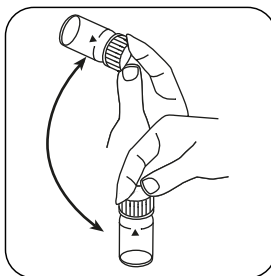
NL



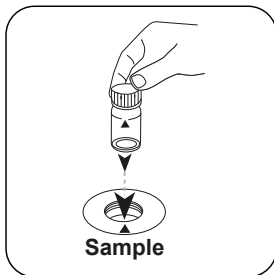
De tabletten onder lichte rotatie verpletteren.



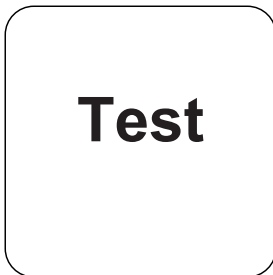
De spoelbakjes afsluiten.



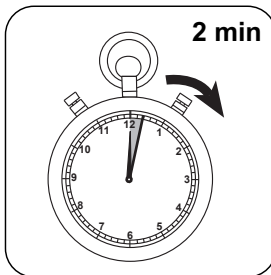
Tabletten oplossen door om te draaien



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



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



De reactietijd van **2 minuten** afwachten.

Na afloop van de reactietijd wordt de meting automatisch uitgevoerd.

De display toont het resultaat als Calciumhardheid.

## Evaluatie

De volgende tabel geeft aan dat de uitvoerwaarden kunnen worden geconverteerd naar andere citatievormen.

Eenheid	Dagvaardingsformulier	Omrekeningsfactor
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

NL

## Chemische methode

Oppervlakreactieve stof

## Aanhangsel

## Verstoringen

### Permanente verstoringen

1. Zilver, cadmium, kobalt, koper en kwik interfereren met de bepaling.

Verstoringen	verstoort vanaf
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

### Literatuurverwijzing

Fotometrische analyse, Lange/ Vjedelek, Chemie-uitgeverij 1980

\* met inbegrip van de mengstaaf



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.

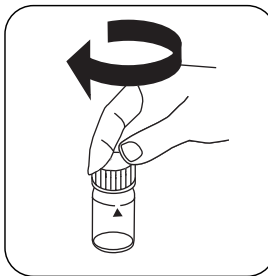


## Uitvoering van de bepaling pH-waarde met tablet

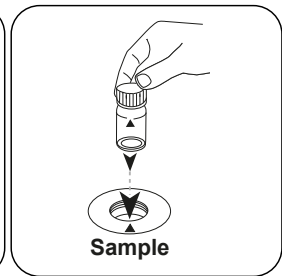
De methode in het apparaat selecteren.



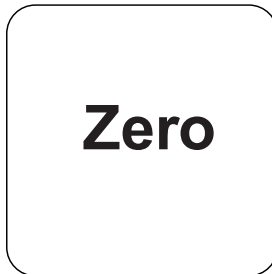
Spoelbakje van 24 mm met 10 mL staal vullen.



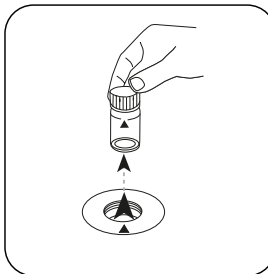
De spoelbakjes afsluiten.



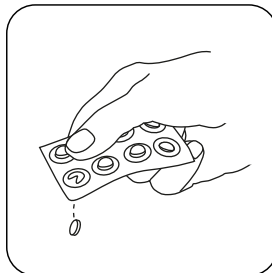
Het **staalspoelbakje** in de meetschacht plaatsen. Op de positionering letteren.



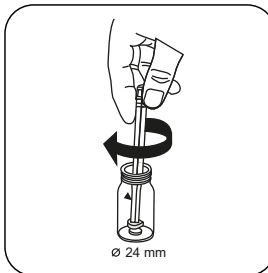
De toets **NUL** indrukken.



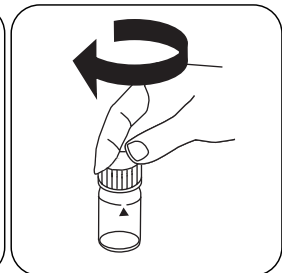
Het spoelbakje uit de meetschacht nemen.



Een **FENOLROOD FOTOMETER** tablet toevoegen.

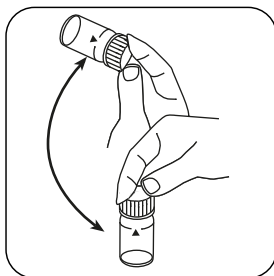
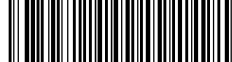


De tabletten onder lichte rotatie verpletteren.

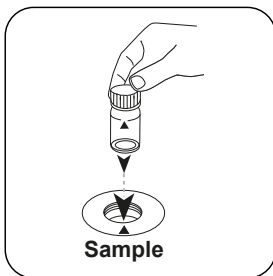


De spoelbakjes afsluiten.

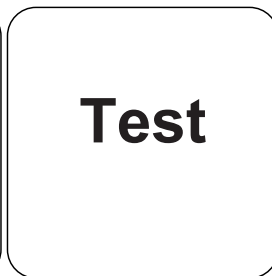




Tabletten oplossen door om te draaien



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



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

De display toont het resultaat als pH-waarde.

NL

## Chemische methode

Fenolrood

## Aanhangsel

### Verstoringsen

NL

#### Permanente verstoringen

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

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

#### 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:

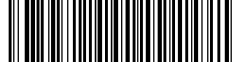
zoutgehalte van het monster (in g/L)	30 (zeewater)	60	120	180
Correctie	-0,15 <sup>1)</sup>	-0,21 <sup>2)</sup>	-0,26 <sup>2)</sup>	-0,29 <sup>2)</sup>

<sup>1)</sup> na Kolthoff (1922)

<sup>2)</sup> 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

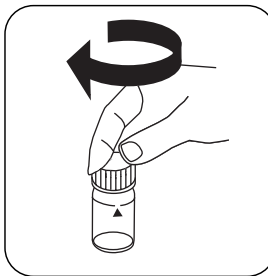
- Na gebruik moet de druppelfles meteen onmiddellijk worden gesloten met de schroefdop van dezelfde kleur.
- Bewaar het reagens bij +6 °C tot +10 °C op een koele plaats.

## Uitvoering van de bepaling pH-waarde met vloeibaar reagens

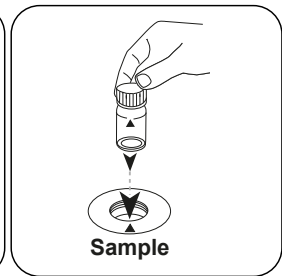
De methode in het apparaat selecteren.



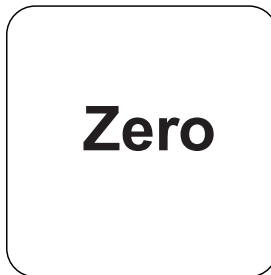
Spoelbakje van 24 mm met **10 mL staal** vullen.



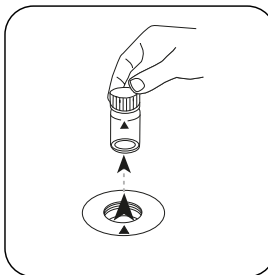
De spoelbakjes afsluiten.



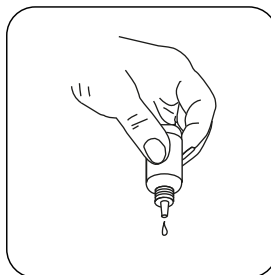
Het **staal spoelbakje** in de meetschacht plaatsen. Op de positionering letten.



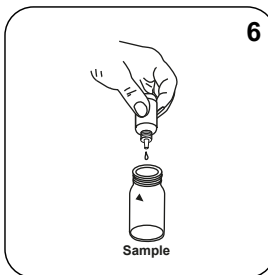
De toets **NUL** indrukken.



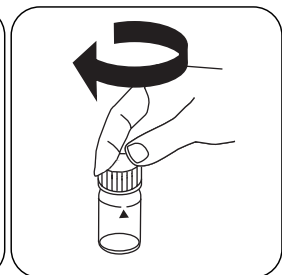
Het spoelbakje uit de meetschacht nemen.



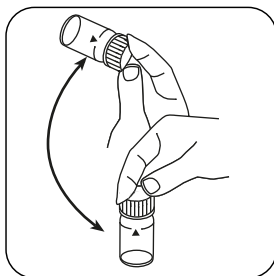
De druppelflessen verticaal houden en even grote druppels toevoegen door langzaam te drukken.



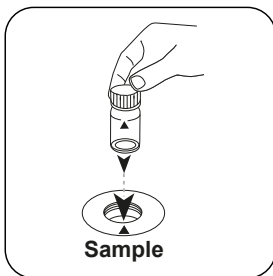
**6 druppels FENOLROOD-oplossing** in het staal spoelbakje doen.



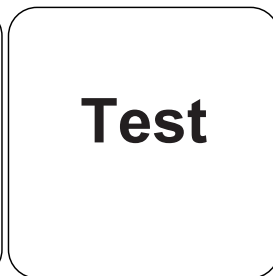
De spoelbakjes afsluiten.



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.

NL

## Chemische methode

Fenolrood

## Aanhangsel

### Verstoringsen

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 <sup>1)</sup>
	60 g/L	-0,21 <sup>2)</sup>
	120 g/L	-0,26 <sup>2)</sup>
	180 g/L	-0,29 <sup>2)</sup>
	<sup>1)</sup> na Kolthoff (1922)	<sup>2)</sup> 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

酸性 / 指示剂

化学方法

**仪器的具體信息**

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	$\lambda$	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

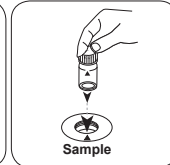
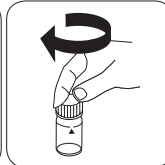
CN 方法手冊 01/20

开始测量

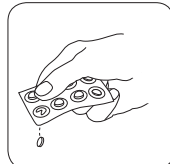
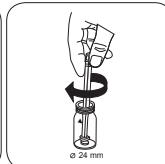
进行测定  $K_{s4.3}$  片剂酸容量

选择设备中的方法。

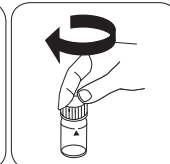
对于这种方法，在以下设备上不能进行 ZERO 测量：XD 7000, XD 7500

用 10 ml 样本填充 24 mm 比密封比色杯。  
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





T 碱度-m

M30

5 - 200 mg/L CaCO<sub>3</sub>

tA

酸性 / 指示剂

材料

所需材料 ( 部分可选 ) :

ZH

试剂	包装单位	货号
碱度 M 光度计	片剂 / 100	513210BT
碱度 M 光度计	片剂 / 250	513211BT

### 备注

1. 术语碱度-m、m-值、总碱度和酸容量  $K_{S4.3}$  是相同的。
2. 准确地遵守 10 ml 的样本体积对分析结果的准确度至关重要。

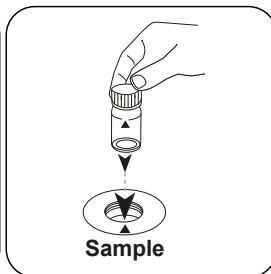
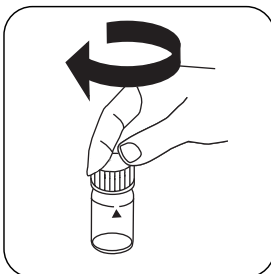


### 进行测定 总碱度 = 碱度 M = 片剂的 m-值

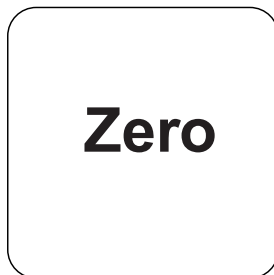
选择设备中的方法。



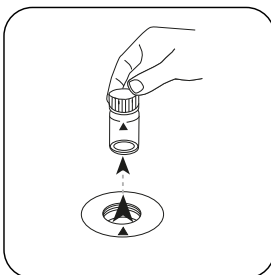
用 10 mL 样本填充 24 mm 比色杯。  
密封比色杯。



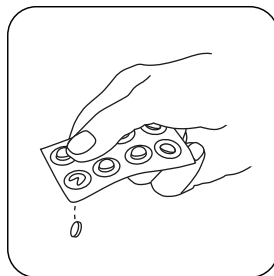
将样本比色杯放入测量轴中。注意定位。



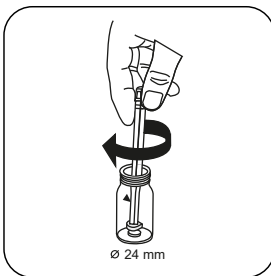
按下 ZERO 按钮。



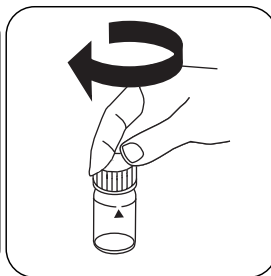
从测量轴上取下比色杯。



加入 ALKA-M-PHOTOMETER 片剂。

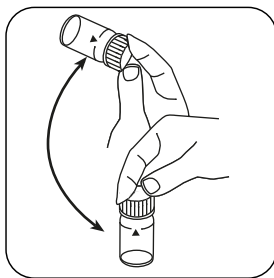


用轻微的扭转压碎片剂。

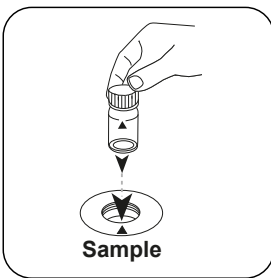


密封比色杯。

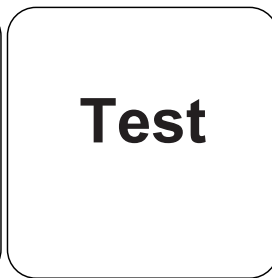
ZH



通过旋转溶解片剂。



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 碱度-m。

ZH

## 分析

下表中输出数据也可转换为其他格式表示.

单位	参考表格	因素
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K <sub>S4.3</sub>	0.02

ZH

## 化学方法

酸性 / 指示剂

## 附录

源于

EN ISO 9963-1



T 氯

M100

0.01 - 6.0 mg/L Cl<sub>2</sub><sup>a)</sup>

CL6

DPD

材料

所需材料 ( 部分可選 ) :

ZH

试剂	包装单位	货号
DPD No.1	片剂 / 100	511050BT
DPD No.1	片剂 / 250	511051BT
DPD No.1	片剂 / 500	511052BT
DPD No.3	片剂 / 100	511080BT
DPD No.3	片剂 / 250	511081BT
DPD No.3	片剂 / 500	511082BT
DPD No.1 高钙 <sup>e)</sup>	片剂 / 100	515740BT
DPD No.1 高钙 <sup>e)</sup>	片剂 / 250	515741BT
DPD No.1 高钙 <sup>e)</sup>	片剂 / 500	515742BT
DPD No.3 高钙 <sup>e)</sup>	片剂 / 100	515730BT
DPD No.3 高钙 <sup>e)</sup>	片剂 / 250	515731BT
DPD No.3 高钙 <sup>e)</sup>	片剂 / 500	515732BT
DPD No.4	片剂 / 100	511220BT
DPD No.4	片剂 / 250	511221BT
DPD No.4	片剂 / 500	511222BT
DPD No.3 Evo	片剂 / 100	511420BT
DPD No.3 Evo	片剂 / 250	511421BT
DPD No.3 Evo	片剂 / 500	511422BT
DPD No.4 Evo	片剂 / 100	511970BT
DPD No.4 Evo	片剂 / 250	511971BT
DPD No.4 Evo	片剂 / 500	511972BT

## 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。

## 备注

1. Evo 片剂可以作为相应标准片剂的替代品（如 DPD No.3 Evo 代替 DPD No.3）。



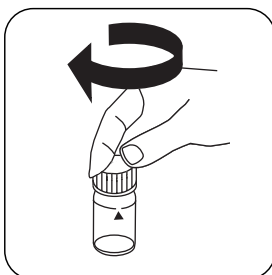
## 进行测定 余氯 片剂法

选择设备中的方法。

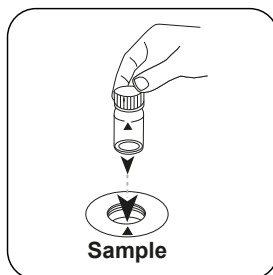
ZH



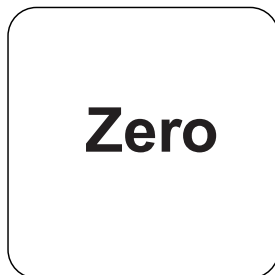
用 **10 mL** 样本填充 24 mm 比色杯。



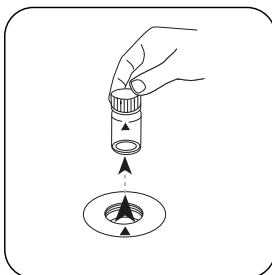
密封比色杯。



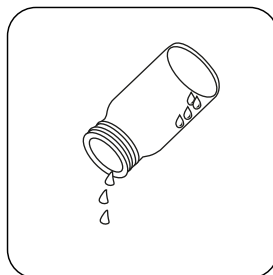
将样本比色杯放入测量轴中。  
注意定位。



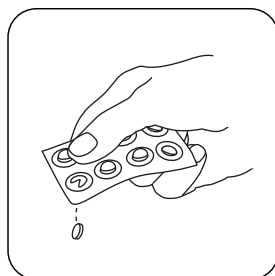
按下 **ZERO** 按钮。



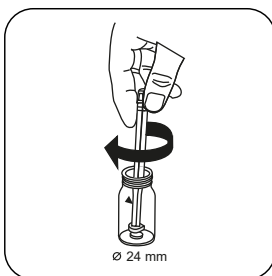
从测量轴上取下比色杯。



将比色杯倒空。



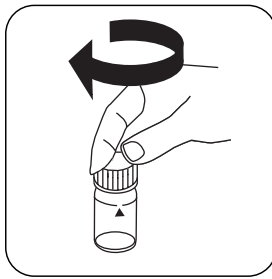
加入 **DPD No. 1** 片剂。



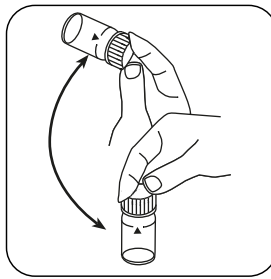
用轻微的扭转压碎片剂。



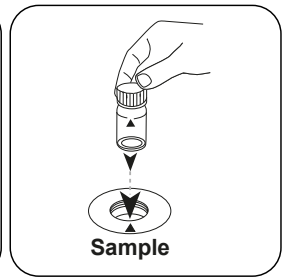
用样本将比色杯填充至 **10 mL** 刻度处。



密封比色杯。



通过旋转溶解片剂。

将样本比色杯放入测量轴中。  
注意定位。

ZH

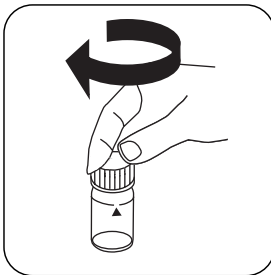
# Test

按下 **TEST (XD: START)** 按钮。

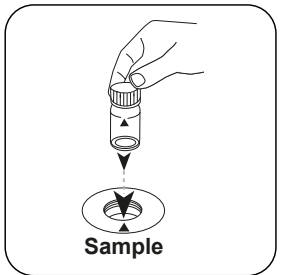
结果在显示屏上显示为 mg / l 余氯。

## 进行测定 总氯 片剂法

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。



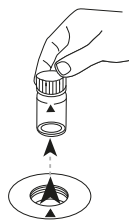
将样本比色杯放入测量轴中。注意定位。



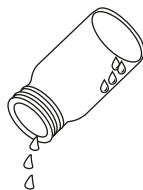


# Zero

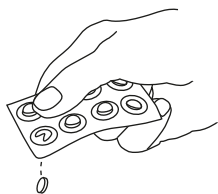
按下 **ZERO** 按钮。



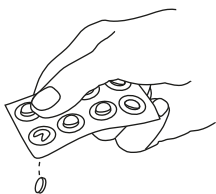
从测量轴上取下比色杯。



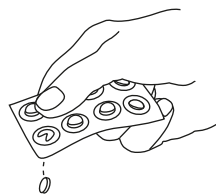
将比色杯倒空。



加入 **DPD No. 1** 片剂。



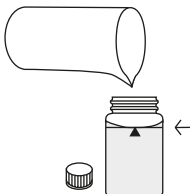
加入 **DPD No. 3** 片剂。



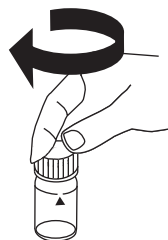
作为 DPD 1号和3号片剂的替代品，可以添加1个DPD 4号片剂。



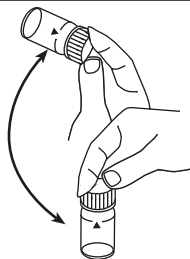
用轻微的扭转压碎片剂。



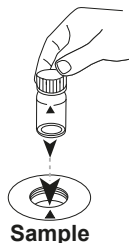
用样本将比色杯填充至 **10 mL** 刻度处。



密封比色杯。



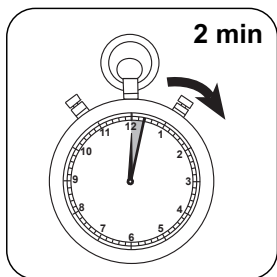
通过旋转溶解片剂。



将样本比色杯放入测量轴中。注意定位。

# Test

按下 **TEST (XD: START)** 按钮。



等待 **2 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。
- 对于高钙含量\*和/或高电导率\*的样本，使用试剂片可能会导致样本浑浊和相关的测量误差。在这种情况下，可选用试剂片 DPD 编号1 高钙和试剂片 DPD 编号3 高钙。  
\*不能给出精确值，因为浑浊的形成取决于样本水的类型和组成。
- 在使用片剂时，高于 10 mg/L 氯的浓度可导致测量范围内的结果高达 0 mg/L。氯浓度过高时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 ( 可置信度测试 ) 。

干扰	限 / [mg/l]
CrO <sub>4</sub> <sup>2-</sup>	0.01
MnO <sub>2</sub>	0.01

### 方法验证

检出限	0.02 mg/L
测定下限	0.06 mg/L
测量上限	6 mg/L
灵敏度	2.05 mg/L / Abs
置信范围	0.04 mg/L
标准偏差	0.019 mg/L
变异系数	0.87 %

#### 一致性

EN ISO 7393-2

\* 测定余氯，总氯和结合氯 | \* 替代试剂，取代 DPD No. 1/No. 3 试剂，用于由高浓度钙离子和/或高电导率引起的浑浊水样分析





L 氯

M101

0.02 - 4.0 mg/L Cl<sub>2</sub><sup>a)</sup>

CL6

DPD

材料

所需材料 (部分可选) :

ZH

试剂	包装单位	货号
DPD 1 缓冲溶液, 蓝瓶	15 mL	471010
DPD 1 缓冲溶液	100 mL	471011
DPD 1 缓冲溶液, 6 件装	1 片	471016
DPD 1 试剂溶液, 绿瓶	15 mL	471020
DPD 1 试剂溶液	100 mL	471021
DPD 1 试剂溶液, 6 件装	1 片	471026
DPD 3 溶液, 红瓶	15 mL	471030
DPD 3 溶液	100 mL	471031
DPD 3 溶液, 6 件装	1 片	471036
DPD 试剂套件	1 片	471056

## 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。



## 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. 将试剂盒冷藏在 +6 °C 至 +10 °C。



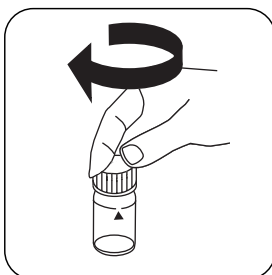
## 进行测定 余氯 水剂法

选择设备中的方法。

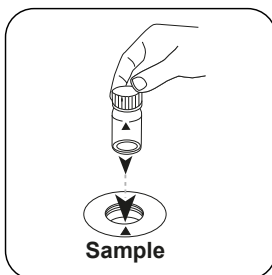
ZH



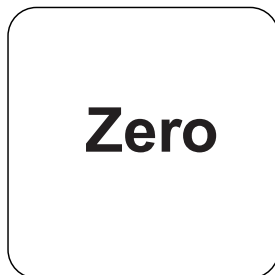
用 **10 mL** 样本填充 24 mm 比色杯。



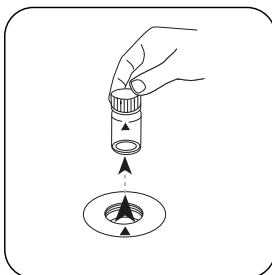
密封比色杯。



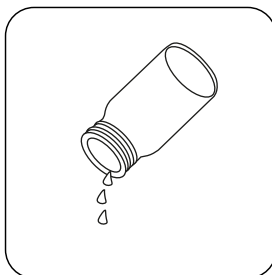
将样本比色杯放入测量轴中。  
注意定位。



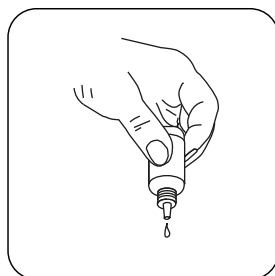
按下 **ZERO** 按钮。



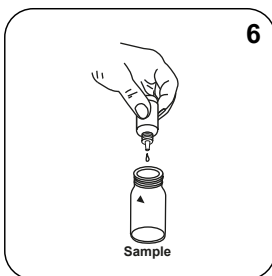
从测量轴上取下比色杯。



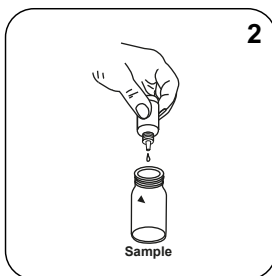
倒空比色杯。



垂直握住滴瓶，慢慢加入相同大小的滴剂。



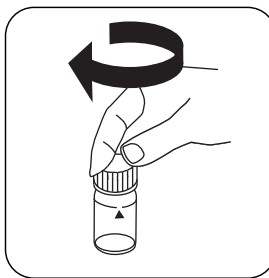
将 **6 滴 DPD 1 Buffer Solution** 添加到样本比色杯中。



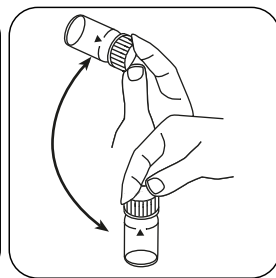
将 **2 滴 DPD 1 Reagent Solution** 添加到样本比色杯中。



用样本将比色杯填充至  
10 mL 刻度处。

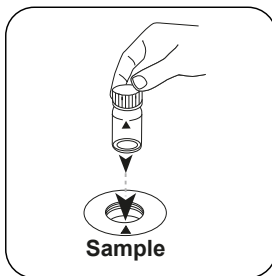


密封比色杯。

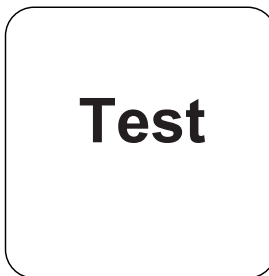


通过旋转混合内容物。

ZH



将样本比色杯放入测量轴  
中。注意定位。



按下 **TEST (XD: START)** 按钮。

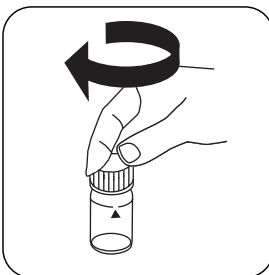
结果在显示屏上显示为 mg / l 余氯。

### 进行测定 总氯 水剂法

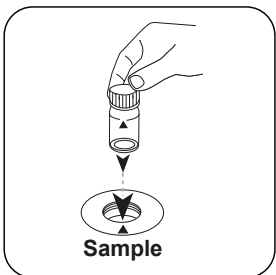
选择设备中的方法。



用 10 mL 样本填充 24 mm  
比色杯。



密封比色杯。



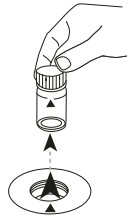
将样本比色杯放入测量轴  
中。注意定位。





# Zero

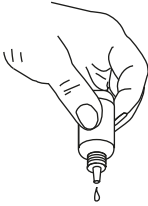
按下 **ZERO** 按钮。



从测量轴上取下比色杯。



倒空比色杯。



垂直握住滴瓶，慢慢加入相同大小的滴剂。



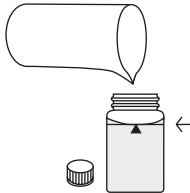
将 **6 滴 DPD 1 Buffer Solution** 添加到样本比色杯中。



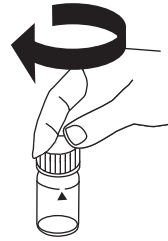
将 **2 滴 DPD 1 Reagent Solution** 添加到样本比色杯中。



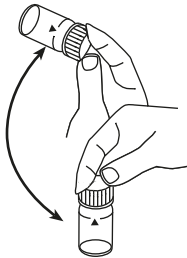
将 **3 滴 DPD 3 Solution** 添加到样本比色杯中。



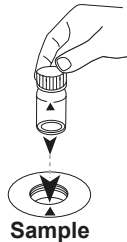
用样本将比色杯填充至 **10 mL 刻度处**。



密封比色杯。



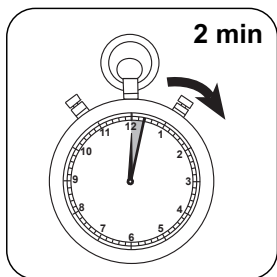
通过旋转混合内容物。



将样本比色杯放入测量轴中。注意定位。

# Test

按下 **TEST (XD: START)** 按钮。



等待 2 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

## 附錄

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。
- 在使用液剂时，高于 4 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 )。

干擾	從/ [mg/l]
$\text{CrO}_4^{2-}$	0,01
$\text{MnO}_2$	0,01

#### 一致性

EN ISO 7393-2

<sup>a)</sup> 测定余氯，总氯和结合氯





HR (KI) T 氯

M105

5 - 200 mg/L Cl<sub>2</sub>

CLHr

碘化钾 / 酸法

材料

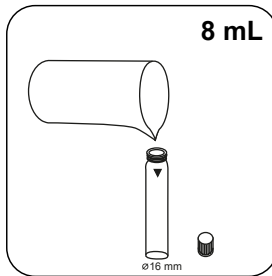
所需材料 ( 部分可選 ) :

ZH

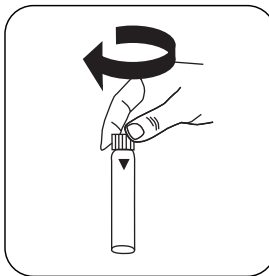
试剂	包装单位	货号
氯 HR (KI)	片剂 / 100	513000BT
氯 HR (KI)	片剂 / 250	513001BT
酸化 GP	片剂 / 100	515480BT
酸化 GP	片剂 / 250	515481BT
套件氯 HR (KI)/酸化 GP#	各100次	517721BT
套件氯 HR (KI)/酸化 GP#	各250次	517722BT
氯 HR (KI)	片剂 / 100	501210
氯 HR (KI)	片剂 / 250	501211

## 进行测定 HR (KI) 氯片剂

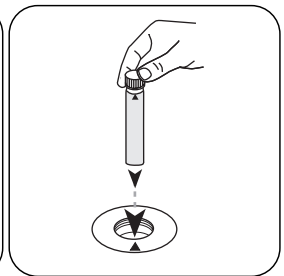
选择设备中的方法。



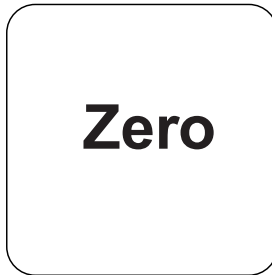
用 8 mL 样本填充 16 mm 比色杯。



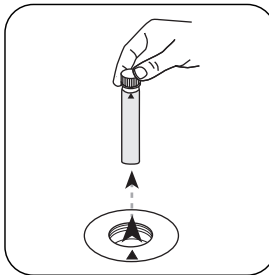
密封比色杯。



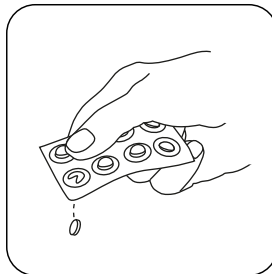
将样本比色杯放入测量轴中。注意定位。



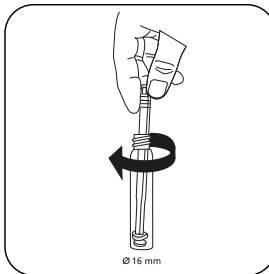
按下 ZERO 按钮。



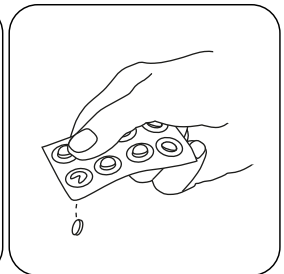
从测量轴上取下比色杯。



加入 Chlorine HR (KI) 片剂。



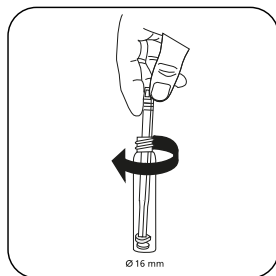
用轻微的扭转压碎片剂。



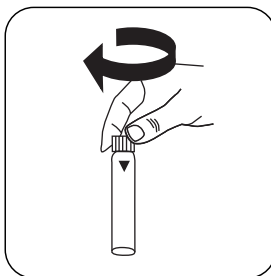
加入 ACIDIFYING GP 片剂。



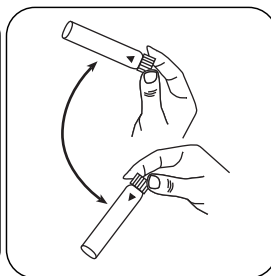
ZH



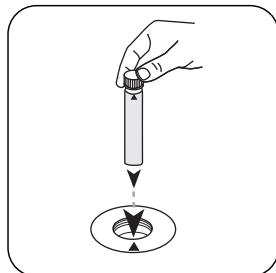
用轻微的扭转压碎片剂。



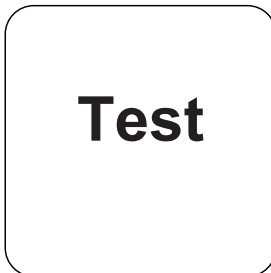
密封比色杯。



通过旋转溶解片剂。



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 mg / l 氯。

## 化学方法

碘化钾 / 酸法

## 附錄

### 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。

### 方法验证

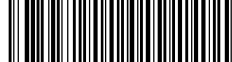
检出限	1.29 mg/L
测定下限	3.86 mg/L
测量上限	200 mg/L
灵敏度	83.96 mg/L / Abs
置信范围	1.14 mg/L
标准偏差	0.45 mg/L
变异系数	0.45 %

#### 源于

EN ISO 7393-3

\*i含搅拌棒, 10cm





PP MR 氯

M113

0.02 - 3.5 mg/L Cl<sub>2</sub><sup>a)</sup>

CL2

DPD

材料

所需材料 (部分可選) :

ZH

试剂	包装单位	货号
VARIO 游离氯 DPD F10	粉剂 / 100 片	530180
VARIO 游离氯 DPD F10	粉剂 / 1000 片	530183
VARIO 氯总量 DPD F10	粉剂 / 100 片	530190
VARIO 氯总量 DPD F10	粉剂 / 1000 片	530193

## 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。

## 备注

1. 使用的粉末试剂用蓝色标示, 便于识别 测定游离氯的粉末带有封闭线和虚线。用于测定总氯的粉末有两条封闭线。

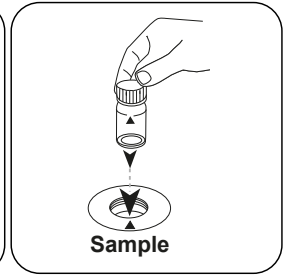
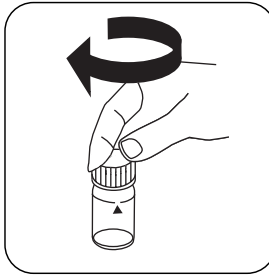
## 进行测定 余氯MR 粉剂法

选择设备中的方法。

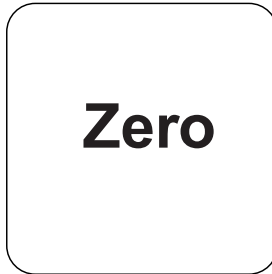
另外选择测定：余氯



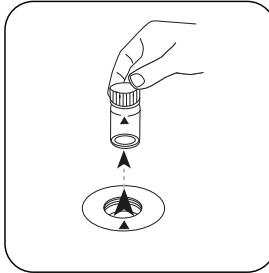
用 10 mL 样本填充 24 mm 比色杯。  
密封比色杯。



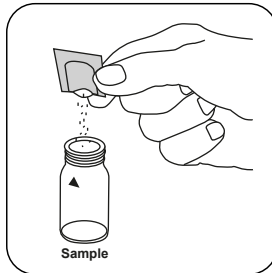
将样本比色杯放入测量轴中。注意定位。



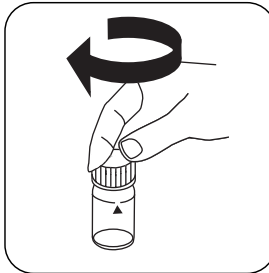
按下 ZERO 按钮。



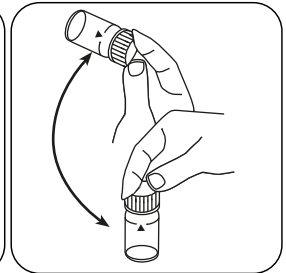
从测量轴上取下比色杯。



加入 VARIO Chlorine  
FREE-DPD/ F10 粉包。



密封比色杯。

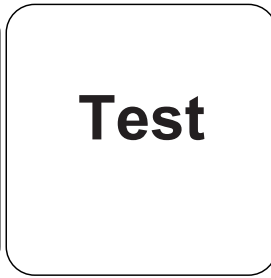
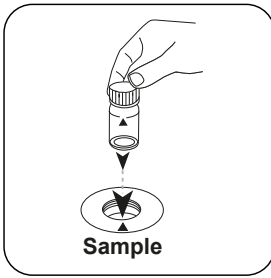


通过旋转混合内容物  
( 20 sec. )。

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。

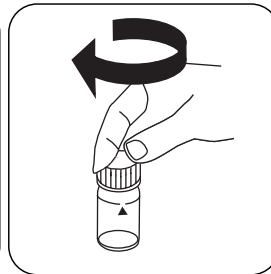
### 进行测定 结合氯MR 粉剂法

选择设备中的方法。

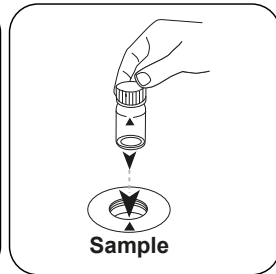
另外选择测定：结合氯



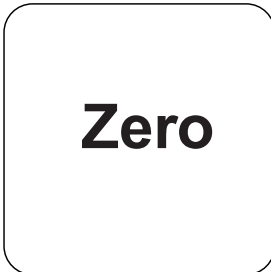
用 **10 mL** 样本填充 24 mm 比色杯。



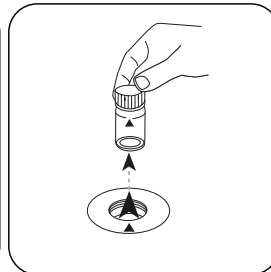
密封比色杯。



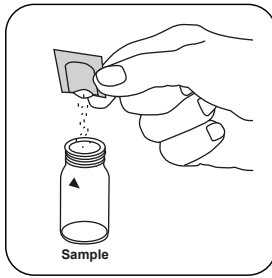
将样本比色杯放入测量轴中。注意定位。



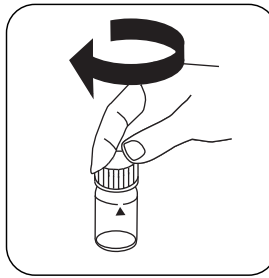
按下 **ZERO** 按钮。



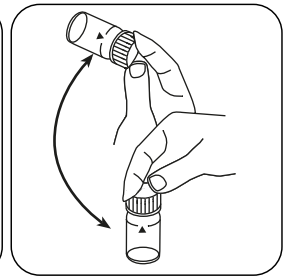
从测量轴上取下比色杯。



加入 **VARIO Chlorine FREE-DPD/ F10** 粉包。

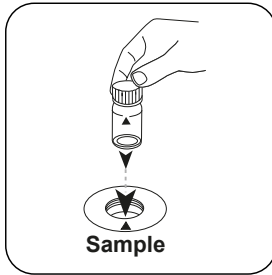


密封比色杯。

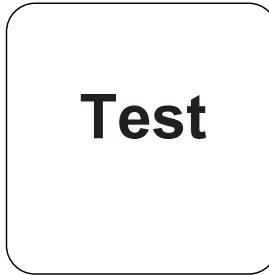


通过旋转混合内容物  
( 20 sec. )。

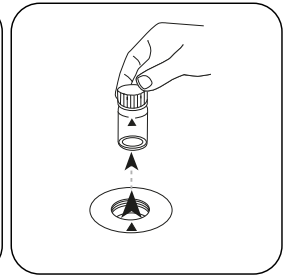
ZH



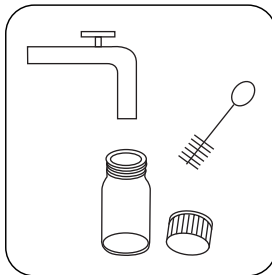
将样本比色杯放入测量轴中。注意定位。



按下 **TEST (XD: START)** 按钮。



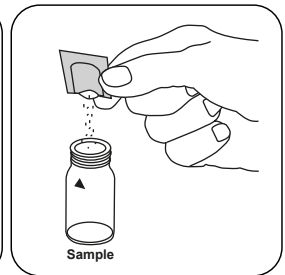
从测量轴上取下比色杯。



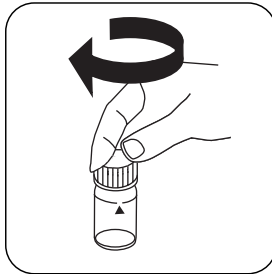
彻底清洗比色杯和比色杯杯盖。



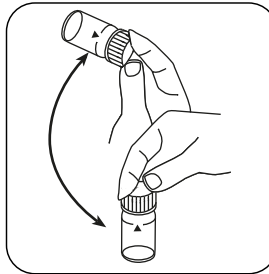
用 **10 mL** 样本填充 24 mm 比色杯。



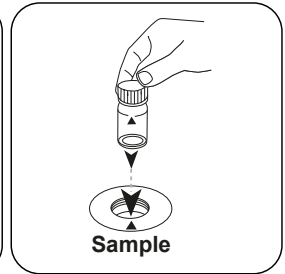
加入 **Chlorine TOTAL-DPD/ F10** 粉包。



密封比色杯。



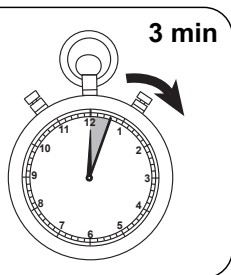
通过旋转混合内容物  
( 20 sec. )。



将样本比色杯放入测量轴中。注意定位。



# Test



ZH

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 余氯, mg/l 结合 氯, mg/l 总氯。

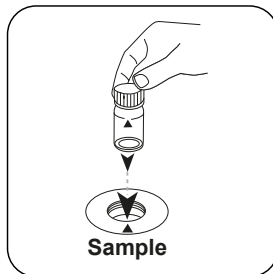
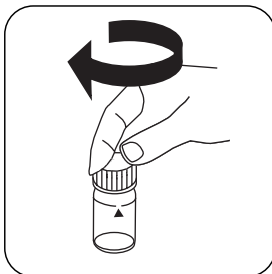
## 进行测定 总氯MR 粉剂法

选择设备中的方法。

另外选择测定：总氯

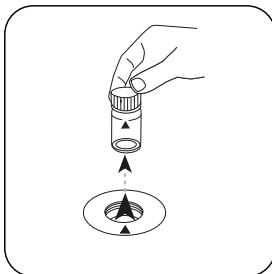


用 **10 mL** 样本填充 24 mm 密封比色杯。



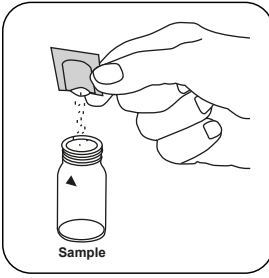
将样本比色杯放入测量轴中。  
注意定位。

# Zero

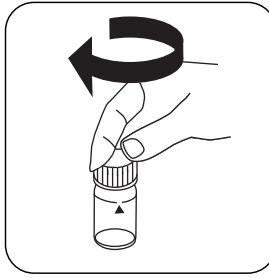


按下 **ZERO** 按钮。

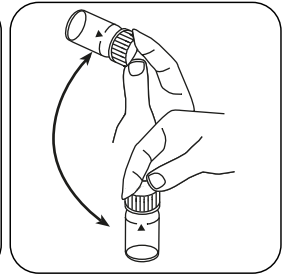
从测量轴上取下比色杯。



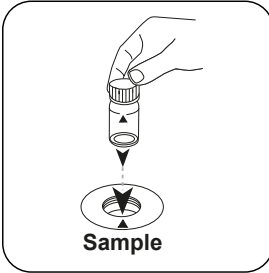
加入 **VARIO Chlorine TOTAL-DPD/ F10** 粉包。



密封比色杯。



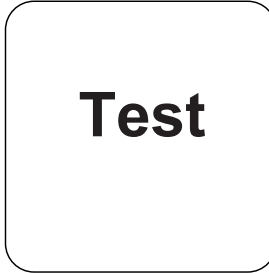
通过旋转混合内容物  
( 20 sec. )。



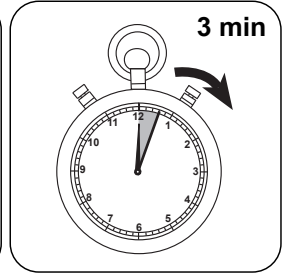
将样本比色杯放入测量轴中。注意定位。

反应时间结束后，自动进行测量。

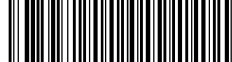
结果在显示屏上显示为 mg / l 总氯。



按下 **TEST (XD: START)** 按钮。



等待 **3 分钟** 反应时间。



## 化学方法

DPD

## 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 4 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	徼 / [mg/l]
$\text{CrO}_4^{2-}$	0.01
$\text{MnO}_2$	0.01

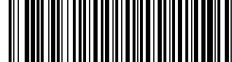
## 方法验证

检出限	0.01 mg/L
测定下限	0.03 mg/L
测量上限	3.5 mg/L
灵敏度	1.7 mg/L / Abs
置信范围	0.014 mg/L
标准偏差	0.006 mg/L
变异系数	0.34 %

<sup>\*)</sup> 测定余氯，总氯和结合氯







2T 钙硬度

M191

20 - 500 mg/L CaCO<sub>3</sub>

CAH

紫脲酸铵

材料

所需材料 ( 部分可选 ) :

ZH

试剂	包装单位	货号
套件 Calcio H No.1/No.2#	各100次	517761BT
套件 Calcio H No.1/No.2#	各250次	517762BT

## 准备

1. 在分析前 ( 用 1 mol/l 盐酸或 1 mol/l 氢氧化钠溶液 ) 应将强碱性或酸性水的 pH 范围调节到 4 和 10 之间。

## 备注

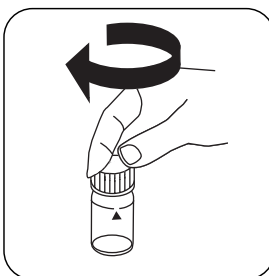
1. 为了优化测量值, 可选用于测定批次特定的方法空白值 ( 参阅光度计说明)。
2. 准确地遵守 10 ml 的样本体积对分析结果的准确度至关重要。
3. 本方法从滴定法发展而来。由于未定义的边界条件, 与标准化方法的偏差可能更大。
4. 该方法在较高的测量范围内的公差大于在较低的测量范围内。稀释样本, 使其在测量范围的下三分之一处进行测量。

## 进行测定 2 钙硬度，片剂

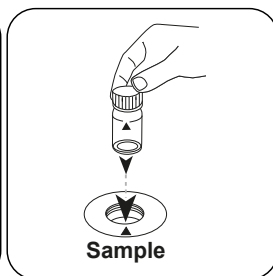
选择设备中的方法。



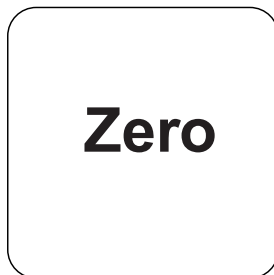
用 10 mL 样本填充 24 mm 比色杯。



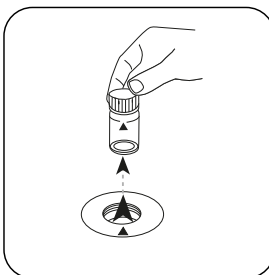
密封比色杯。



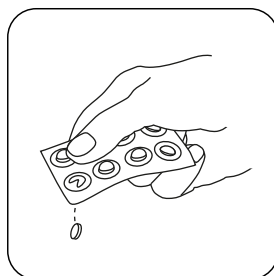
将样本比色杯放入测量轴中。注意定位。



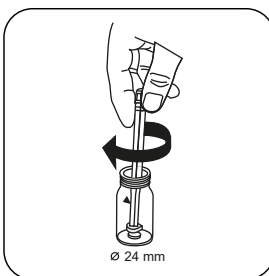
按下 **ZERO** 按钮。



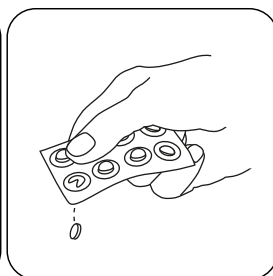
从测量轴上取下比色杯。



加入 **CALCIO H No.1** 片剂。



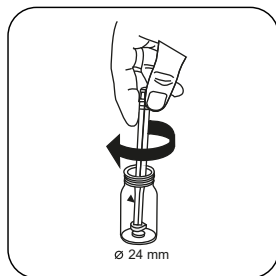
用轻微的扭转压碎片剂并溶解。



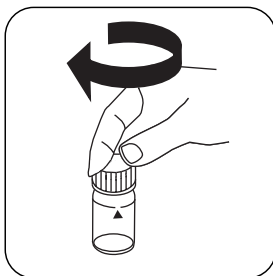
加入 **CALCIO H No.2** 片剂。



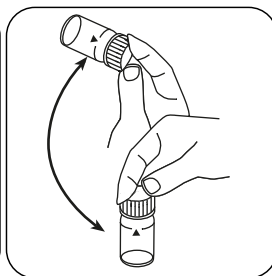
ZH



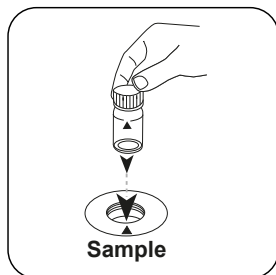
用轻微的扭转压碎片剂。



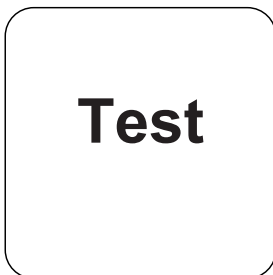
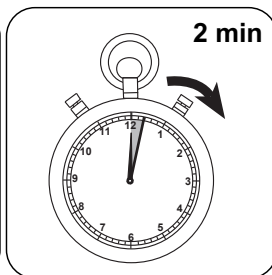
密封比色杯。



通过旋转溶解片剂。



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 **2 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 钙硬度。

## 分析

下表中输出数据也可转换为其他格式表示.

单位	参考表格	因素
mg/l	CaCO <sub>3</sub>	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

ZH

## 化学方法

紫脲酸铵

## 附录

### 干扰说明

#### 持续干扰

1. 银、镉、钴、铜和汞干扰测定。

干扰	徛 / [mg/l]
Mg <sup>2+</sup>	200 (CaCO <sub>3</sub> )
Fe	10
Zn <sup>2+</sup>	5

#### 参考文献

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

\* i含搅拌棒, 10cm



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

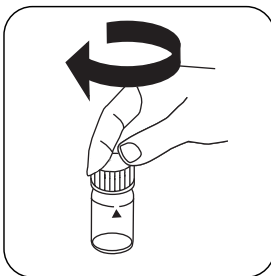
1. 对于光度 pH 值测定，只应使用标有 PHOTOMETER 的带有黑色烫印的 PHENOL RED 片剂。

## 进行测定 pH 值片剂

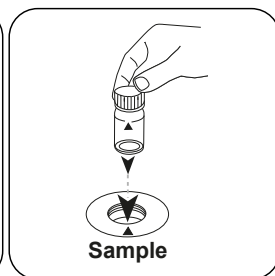
选择设备中的方法。



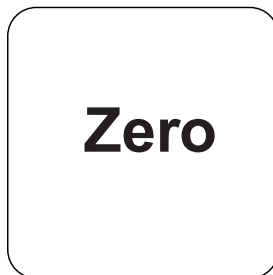
用 **10 mL** 样本填充 24 mm 比色杯。



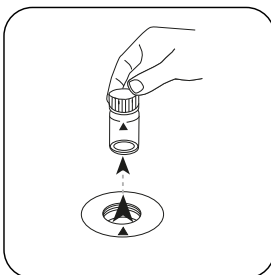
密封比色杯。



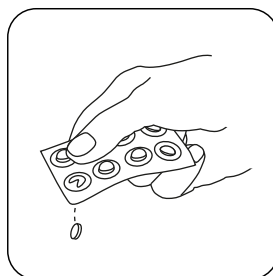
将样本比色杯放入测量轴中。注意定位。



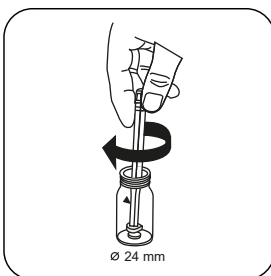
按下 **ZERO** 按钮。



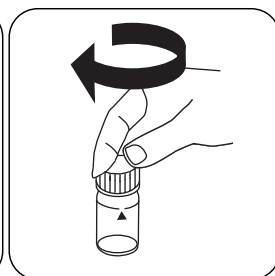
从测量轴上取下比色杯。



加入 **PHENOL RED PHOTOMETER** 片剂。

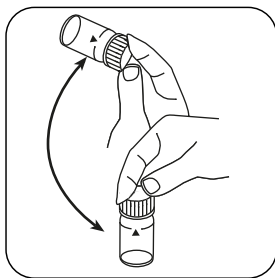


用轻微的扭转压碎片剂。

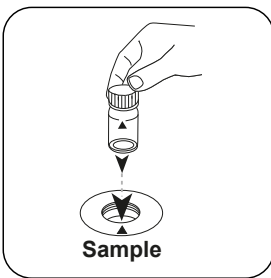


密封比色杯。

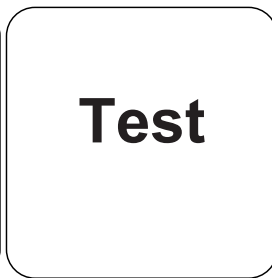
ZH



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。

# Test

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 <sup>1)</sup>	-0,21 <sup>2)</sup>	-0,26 <sup>2)</sup>	-0,29 <sup>2)</sup>

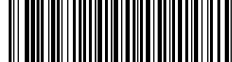
<sup>1)</sup> 根据 Kolthoff (1922)

<sup>2)</sup> 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

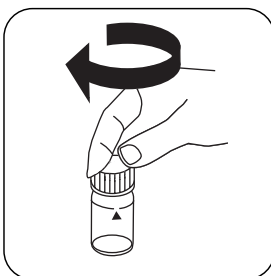
1. 使用后滴瓶必须立即用相同颜色的瓶盖重新密封。
2. 将试剂冷藏在 +6 °C 至 +10 °C。

## 进行测定 pH 值液剂

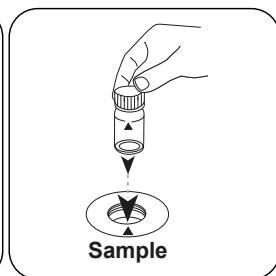
选择设备中的方法。



用 **10 mL** 样本填充 24 mm 比色杯。



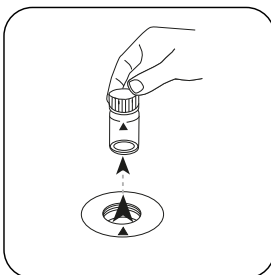
密封比色杯。



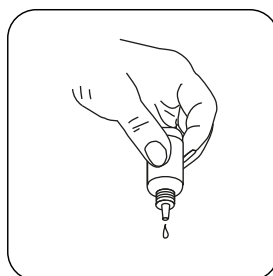
将样本比色杯放入测量轴中。注意定位。



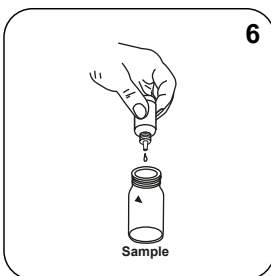
按下 **ZERO** 按钮。



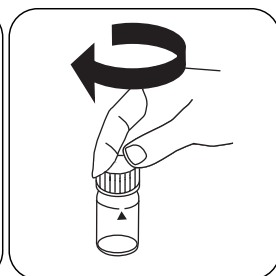
从测量轴上取下比色杯。



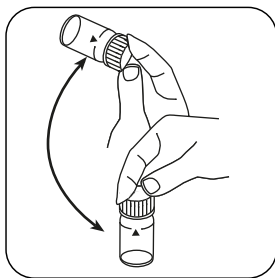
垂直握住滴瓶，慢慢加入相同大小的滴剂。



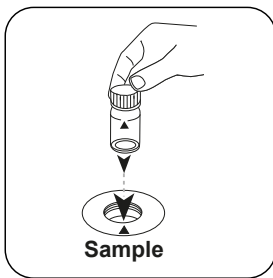
将 **6 滴 PHENOL Red-Lösung** 添加到样本比色杯中。



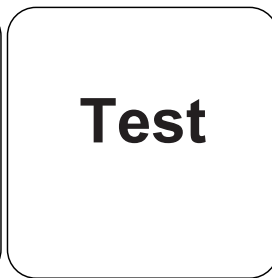
密封比色杯。



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 <sup>1)</sup>
60 g/L	-0,21 <sup>2)</sup>
120 g/L	-0,26 <sup>2)</sup>
180 g/L	-0,29 <sup>2)</sup>

<sup>1)</sup>根据 Kolthoff (1922)

<sup>2)</sup>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











**Tintometer GmbH**

Lovibond® Water Testing  
Schleefstraße 8-12  
44287 Dortmund  
Tel.: +49 (0)231/94510-0  
sales@lovibond.com  
www.lovibond.com  
Germany

**Tintometer South East Asia**

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

**Tintometer India Pvt. Ltd.**

Door No: 7-2-C-14, 2<sup>nd</sup>, 3<sup>rd</sup> & 4<sup>th</sup> Floor  
Sanathnagar Industrial Estate,  
Hyderabad, 500018  
Telangana  
Tel: +91 (0) 40 23883300  
Toll Free: 1 800 599 3891/ 3892  
indiaoffice@lovibond.in  
www.lovibondwater.in  
India

**The Tintometer Limited**

Lovibond House  
Sun Rise Way  
Amesbury, SP4 7GR  
Tel.: +44 (0)1980 664800  
Fax: +44 (0)1980 625412  
sales@lovibond.uk  
www.lovibond.com  
UK

**Tintometer Brazil**

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

**Tintometer Spain**

Postbox: 24047  
08080 Barcelona  
Tel.: +34 661 606 770  
sales@tintometer.es  
www.lovibond.com  
Spain

**Tintometer China**

9F, SOHO II C.  
No.9 Guanghualu,  
Chaoyang District,  
Beijing, 100020  
Customer Care China Tel.: 4009021628  
Tel.: +86 10 85251111 Ext. 330  
Fax: +86 10 85251001  
chinaoffice@tintometer.com  
www.lovibond.com  
China

**Tintometer Inc.**

6456 Parkland Drive  
Sarasota, FL 34243  
Tel: 941.756.6410  
Fax: 941.727.9654  
sales@lovibond.us  
www.lovibond.us  
USA



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