

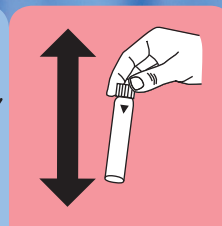
Lovibond® Water Testing

Tintometer® Group



Manual of Methods - MD6x0

Analytical procedures for analysis of water
and waste water



**K_{S4.3} T****M20****0.1 - 4 mmol/L K_{S4.3}****S:4.3****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

Remarks

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.



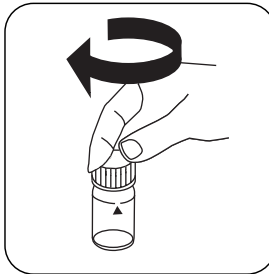
Determination of Acid capacity $K_{S4.3}$ with Tablet

Select the method on the device.

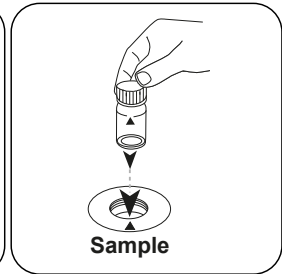
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



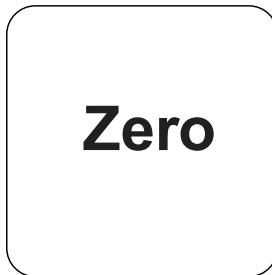
Fill 24 mm vial with **10 mL sample**.



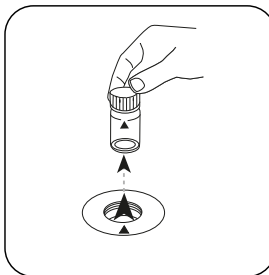
Close vial(s).



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

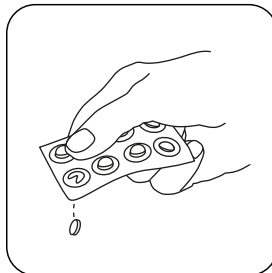


Press the **ZERO** button.

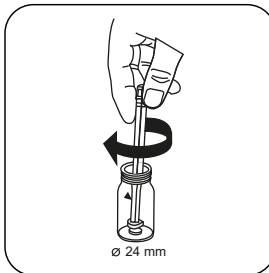


Remove the vial from the sample chamber.

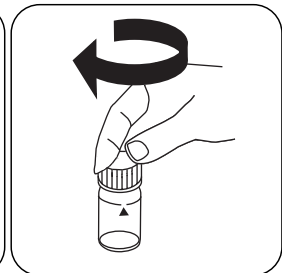
For devices that require **no ZERO measurement**, start here.



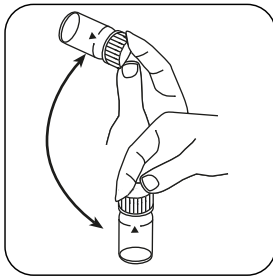
Add **ALKA-M-PHOTOMETER** tablet.



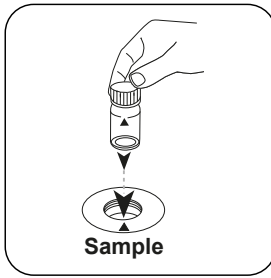
Crush tablet(s) by rotating slightly.



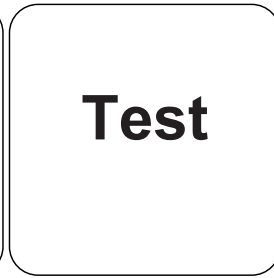
Close vial(s).



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 Acid Capacity $K_{s4.3}$ appears on the display.

EN



Chemical Method

Acid / Indicator

Appendix

Derived from

DIN 38409 - H 7-2

EN



Alkalinity-m T

M30

5 - 200 mg/L CaCO₃

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

Remarks

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.

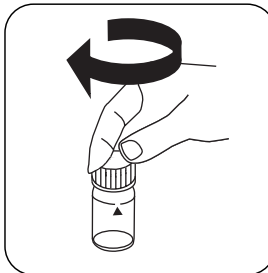
Determination of Alkalinity, total = Alkalinity-m = m-Value with Tablet

Select the method on the device.

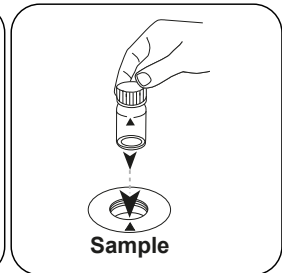
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



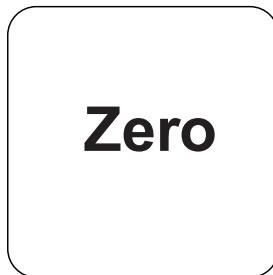
Fill 24 mm vial with **10 mL sample**.



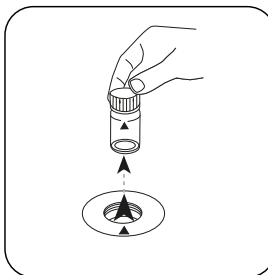
Close vial(s).



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

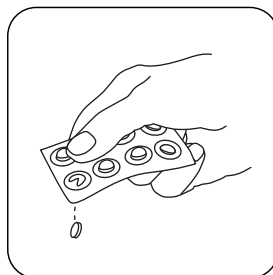


Press the **ZERO** button.

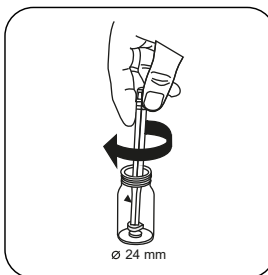


Remove the vial from the sample chamber.

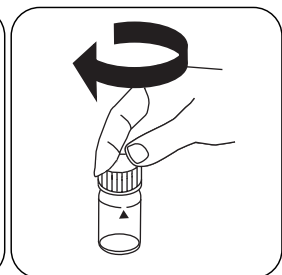
For devices that require **no ZERO measurement**, start here.



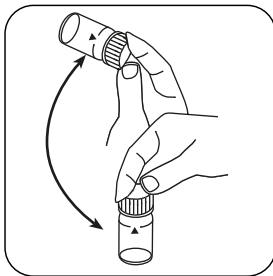
Add **ALKA-M-PHOTOMETER** tablet.



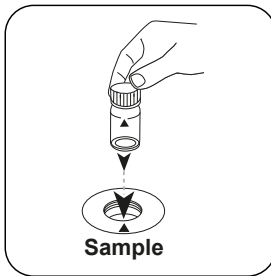
Crush tablet(s) by rotating slightly.



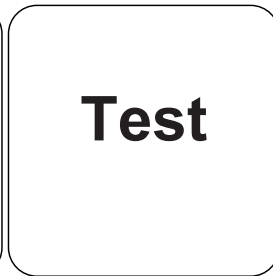
Close vial(s).



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 ₃	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K _{S4.3}	0.02

EN

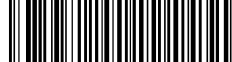
Chemical Method

Acid / Indicator

Appendix

Derived from

EN ISO 9963-1



Alkalinity-m HR T

M31

5 - 500 mg/L CaCO₃

Acid / Indicator

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Alka-M-HR Photometer	Tablet / 100	513240BT
Alka-M-HR Photometer	Tablet / 250	513241BT

Remarks

1. For verification of the result, check whether a thin yellow layer has formed on the bottom of the vial. If this is the case, mix the contents of the vial. This ensures that reaction is complete. Carry out the measurement again and reread the result.

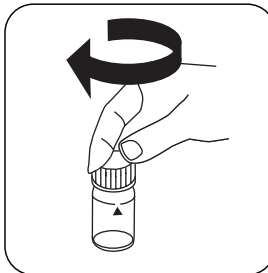
Determination of Alkalinity HR, total = Alkalinity-m HR = m-Value HR with Tablet

Select the method on the device.

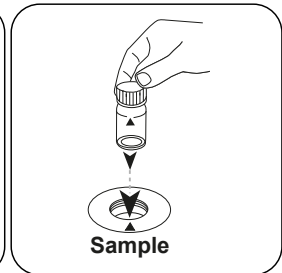
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



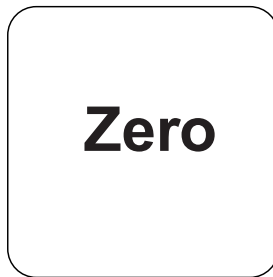
Fill 24 mm vial with **10 mL sample**.



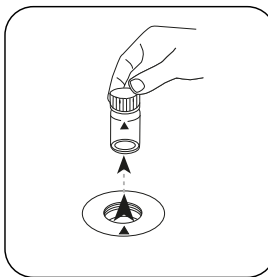
Close vial(s).



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

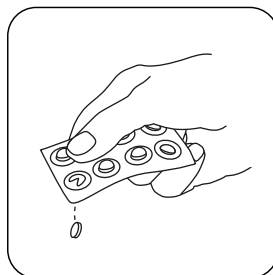


Press the **ZERO** button.

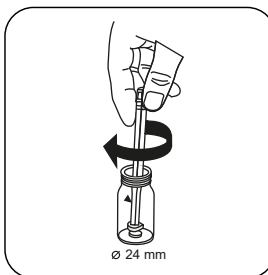


Remove the vial from the sample chamber.

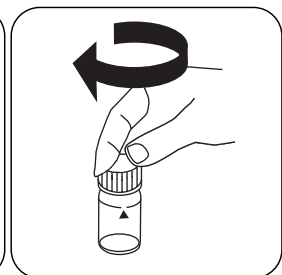
For devices that require **no ZERO measurement**, start here.



Add **ALKA-M-HR Photometer tablet**.



Crush tablet(s) by rotating slightly.



Close vial(s).



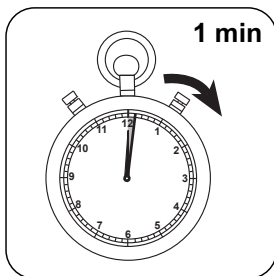
Dissolve tablet(s) by inverting.



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



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



Wait for **1 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically. The result in Alkalinity-m 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 ₃	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K _{S4.3}	0.02

EN

Chemical Method

Acid / Indicator

Appendix

Derived from

EN ISO 9963-1



Alkalinity-p T

M35

5 - 500 mg/L CaCO₃

Acid / Indicator

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Alka-P-Photometer	Tablet / 100	513230BT
Alka-P-Photometer	Tablet / 250	513231BT

Remarks

- The terms Alkalinity-p, p-Value, and Acid demand to $K_{s8.2}$ are identical.
 - For accurate results, exactly 10 ml of water sample must be used for the test.
 - This method was developed from a volumetric procedure. Due to undefined boundary conditions, deviations from the standardised method may be greater.
 - By determining Alkalinity-p and Alkalinity-m, it is possible to classify the alkalinity as Hydroxide, Carbonate and Hydrogencarbonate.
 - The following differentiation is only valid if:
 - a) no other alkalis are present and
 - b) Hydroxide and Hydrogen are not present in the sample. If condition b) is not fulfilled, please see additional information from "Deutsche Einheitsverfahren zur Wasser-, Abwasser- and Schlammuntersuchung, D8".
- If p-Alkalinity = 0:
Hydrogen carbonate = m
Carbonate = 0
Hydroxide = 0
 - If p-Alkalinity > 0 and m-Alkalinity > 2p:
Hydrogencarbonate = m - 2p
Carbonate = 2p
Hydroxide = 0
 - If p-Alkalinity > 0 and m-Alkalinity < 2p:
Hydrogen carbonate = 0
Carbonate = 2m - 2p
Hydroxide = 2p - m

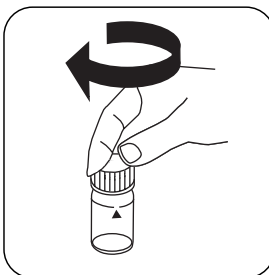
Determination of Alkalinity-p = p-Value with Tablet

Select the method on the device.

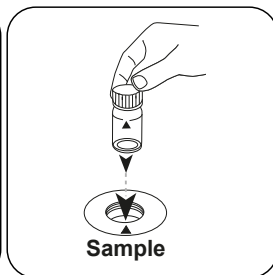
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



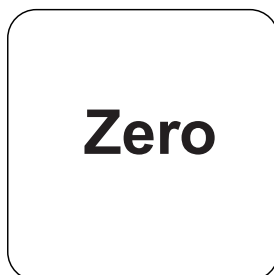
Fill 24 mm vial with **10 mL sample**.



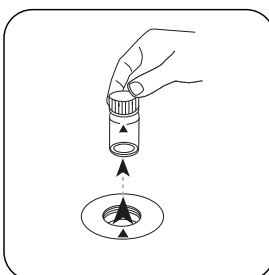
Close vial(s).



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

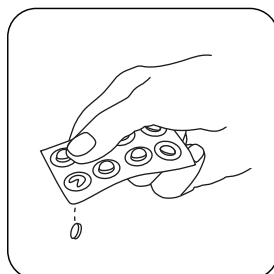


Press the **ZERO** button.

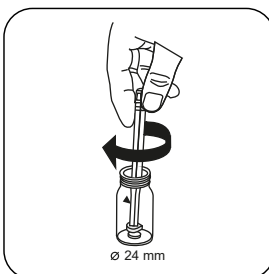


Remove the vial from the sample chamber.

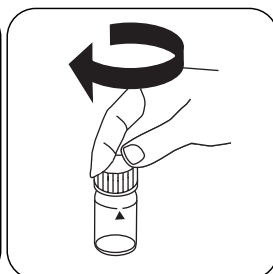
For devices that require **no ZERO measurement**, start here.



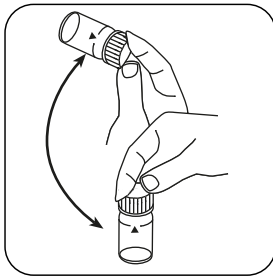
Add **ALKA-P-PHOTOMETER** tablet.



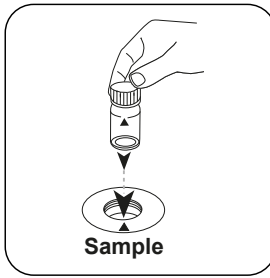
Crush tablet(s) by rotating slightly.



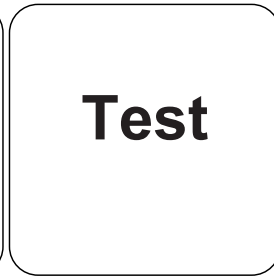
Close vial(s).



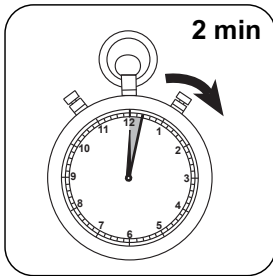
Dissolve tablet(s) by inverting.



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



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



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

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

The result in Alkalinity-p 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 ₃	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	0.058
	K _{S4.3}	0.02

EN

Chemical Method

Acid / Indicator

Appendix

Method Validation

Limit of Detection	3.34 mg/L
Limit of Quantification	10.03 mg/L
End of Measuring Range	500 mg/L
Sensitivity	167.10 mg/L / Abs
Confidence Intervall	23.21 mg/L
Standard Deviation	10.67 mg/L
Variation Coefficient	4.22 %

Derived from

DIN 38409 - H-4-2

EN ISO 9963-1



Aluminium T

M40

0.01 - 0.3 mg/L Al

AL

Eriochrom Cyanine R

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Aluminium No. 1	Tablet / 100	515460BT
Aluminium No. 1	Tablet / 250	515461BT
Aluminium No. 2	Tablet / 100	515470BT
Aluminium No. 2	Tablet / 250	515471BT
Set Aluminium No. 1/No. 2 100 Pc.#	100 each	517601BT
Set Aluminium No. 1/No. 2 250 Pc.#	250 each	517602BT

Preparation

1. To get accurate results the sample temperature must be between 20 °C and 25 °C.
2. To avoid errors caused by contamination, rinse the vial and the accessories with Hydrochloric acid (approx. 20%) before the analysis. Then rinse them with deionised water.

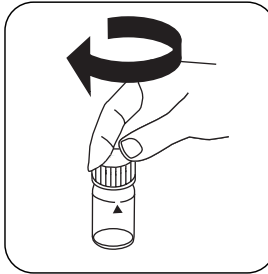
Determination of Aluminium with Tablet

Select the method on the device.

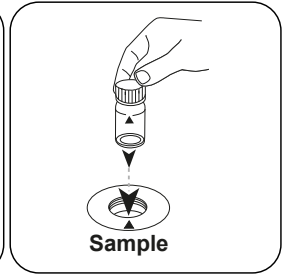
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



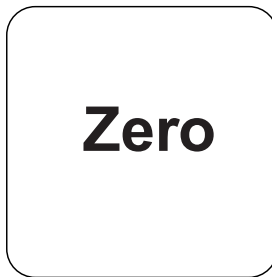
Fill 24 mm vial with **10 mL sample**.



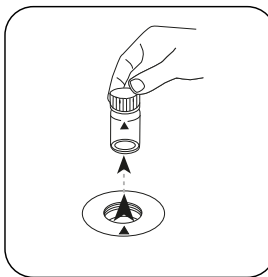
Close vial(s).



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

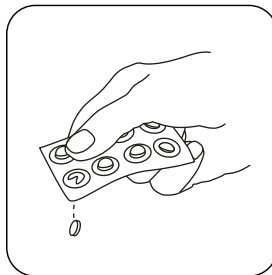


Press the **ZERO** button.

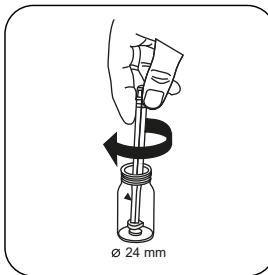


Remove the vial from the sample chamber.

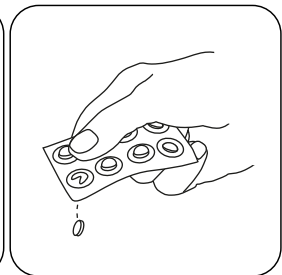
For devices that require **no ZERO measurement**, start here.



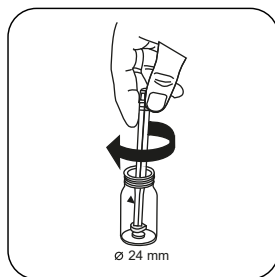
Add **ALUMINIUM No. 1 tablet**.



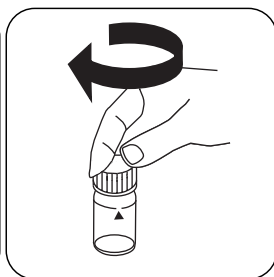
Crush tablet(s) by rotating slightly and dissolve.



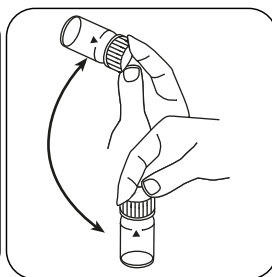
Add **ALUMINIUM No. 2 tablet**.



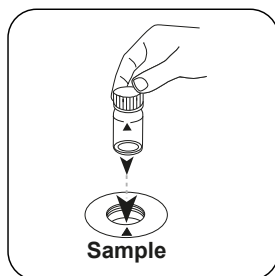
Crush tablet(s) by rotating slightly.



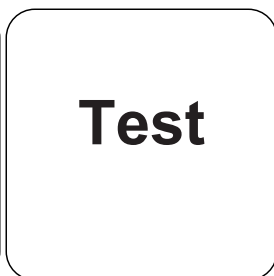
Close vial(s).



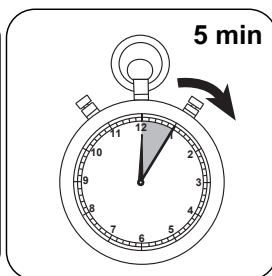
Dissolve tablet(s) by inverting.



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



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



Wait for **5 minute(s)** reaction time.

Once the reaction period is finished, the measurement takes place automatically. The result in mg/L Aluminium 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	Al	1
mg/l	Al ₂ O ₃	1.8894

EN

Chemical Method

Eriochrom Cyanine R

Appendix

Interferences

Removeable Interferences

- A low test result may be given in the presence of Fluorides and Polyphosphates. The effect of this is generally insignificant unless the water has fluoride added artificially. In this case, the following table should be used to determine the actual concentration of aluminium.
- A special tablet ingredient prevents the measurement being affected as a result of iron and manganese.

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



Method Validation

Limit of Detection	0.02 mg/L
Limit of Quantification	0.044 mg/L
End of Measuring Range	0.3 mg/L
Sensitivity	0.17 mg/L / Abs
Confidence Intervall	0.014 mg/L
Standard Deviation	0.006 mg/L
Variation Coefficient	3.71 %

Bibliography

Richter, F. Fresenius, Zeitschrift f. anal. Chemie (1943) 126: 426

According to

APHA Method 3500-AI B

* including stirring rod, 10 cm

**Aluminium PP****M50****0.01 - 0.25 mg/L Al****AL****Eriochrom Cyanine R**

EN

Material

Required material (partly optional):

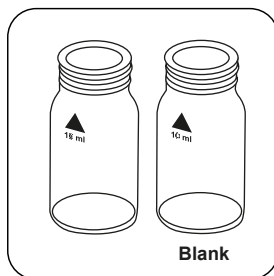
Reagents	Packaging Unit	Part Number
VARIO Aluminium Reagent, Set F20	1 Pieces	535000

Preparation

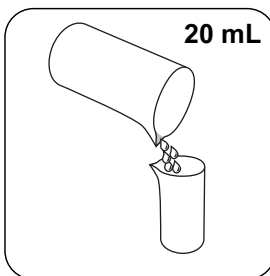
1. To get accurate results the sample temperature must be between 20 °C and 25 °C.
2. To avoid errors caused by contamination, rinse the vial and the accessories with Hydrochloric acid (approx. 20%) before the analysis. Then rinse them with deionised water.

Determination of Aluminium with Vario Powder Pack

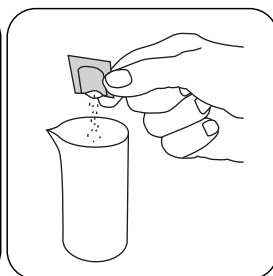
Select the method on the device.



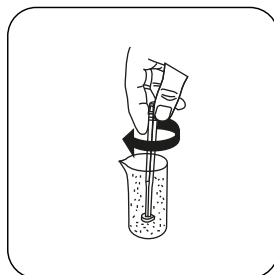
Prepare two clean 24 mm vials. Mark one as a blank.



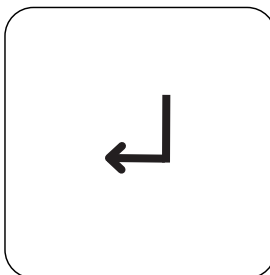
Put **20 mL sample** in 100 mL measuring beaker



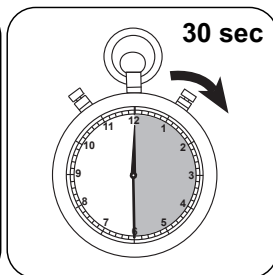
Add **Vario ALUMINIUM ECR F20 powder pack**.



Dissolve the powder by mixing.



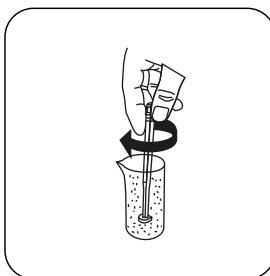
Press the **ENTER** button.



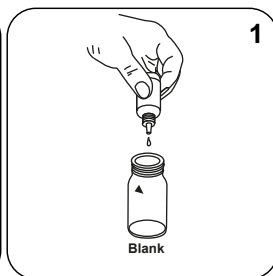
Wait for **30 second(s) reaction time**.



Add **Vario HEXAMINE F20 powder pack**.



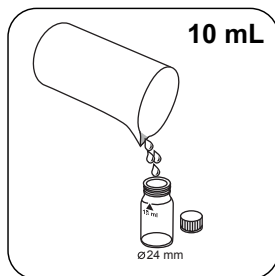
Dissolve the powder by mixing.



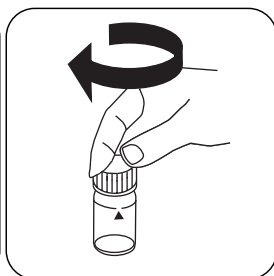
Place **1 drops Vario ALUMINIUM ECR Masking Reagent** in the blank.



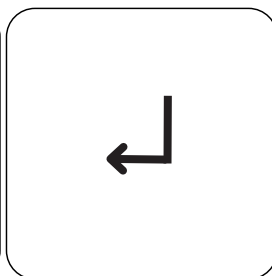
EN



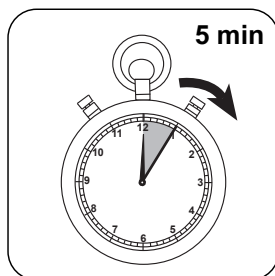
Place **10 mL pre-treated sample** in each vial.



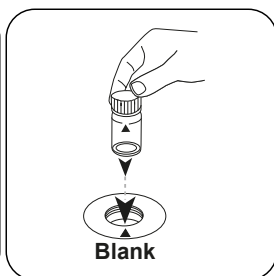
Close vial(s).



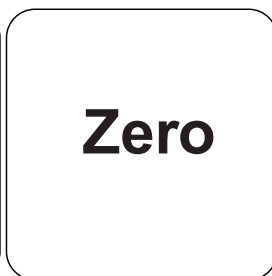
Press the **ENTER** button.



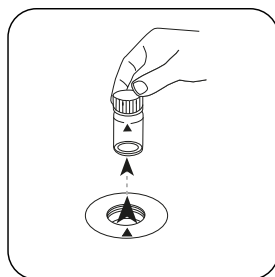
Wait for **5 minute(s) reaction time**.



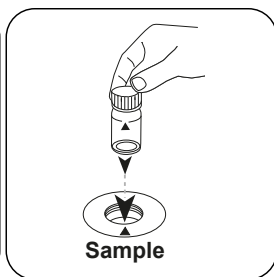
Place **blank** in the sample chamber. Pay attention to the positioning.



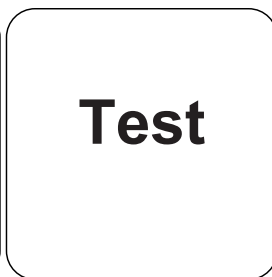
Press the **ZERO** button.



Remove the vial from the sample chamber.



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



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

The result in mg/L Aluminium 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	Al	1
mg/l	Al ₂ O ₃	1.8894

EN

Chemical Method

Eriochrom Cyanine R

Appendix

Interferences

Removeable Interferences

- A low test result may be given in the presence of Fluorides and Polyphosphates. The effect of this is generally insignificant unless the water has fluoride added artificially. In this case, the following table should be used to determine the actual concentration of aluminium.

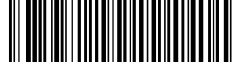
Fluoride [mg/L F]	Displayed value: Aluminium [mg/L]					
	0.05	0.10	0.15	0.20	0.25	0.30
0.2	0.05	0.11	0.16	0.21	0.27	0.32
0.4	0.06	0.11	0.17	0.23	0.28	0.34
0.6	0.06	0.12	0.18	0.24	0.30	0.37
0.8	0.06	0.13	0.20	0.26	0.32	0.40
1.0	0.07	0.13	0.21	0.28	0.36	0.45
1.5	0.09	0.20	0.29	0.37	0.48	---

Bibliography

Richter, F. Fresenius, Zeitschrift f. anal. Chemie (1943) 126: 426

According to

APHA Method 3500-Al B



Ammonia T

M60

0.02 - 1 mg/L N

A

Indophenole Blue

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Ammonia No. 1	Tablet / 100	512580BT
Ammonia No. 1	Tablet / 250	512581BT
Ammonia No. 2	Tablet / 100	512590BT
Ammonia No. 2	Tablet / 250	512591BT
Set Ammonia No. 1/No. 2 100 Pc.#	100 each	517611BT
Set Ammonia No. 1/No. 2 250 Pc.#	250 each	517612BT
Ammonia Conditioning Powder	Powder / 26 g	460170

Preparation

- Sea water samples:
Ammonia conditioning reagent is required when testing sea water or brackish water samples to prevent precipitation (settlement) of salts.
Fill the test tube with the sample to the 10 ml mark and add two level spoonful of Aluminium Conditioning Powder. Close the vials with the caps and swirl until the powder has dissolved. Then proceed as described.

Remarks

- The AMMONIA No. 1 tablet will only dissolve completely after the AMMONIA No. 2 Tablet has been added.
- The temperature of the sample is important for full colour development. At temperatures of below 20 °C the reaction period is 15 minutes.

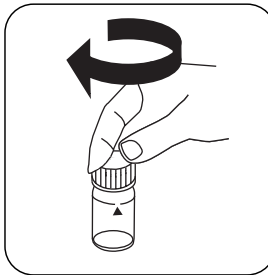
Determination of Ammonium with Tablet

Select the method on the device.

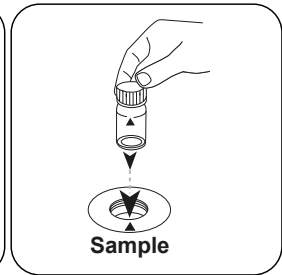
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



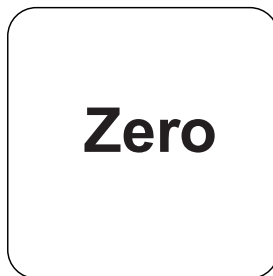
Fill 24 mm vial with **10 mL sample**.



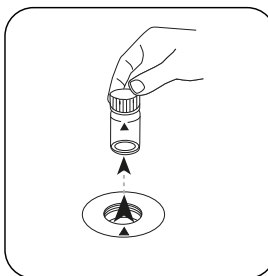
Close vial(s).



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

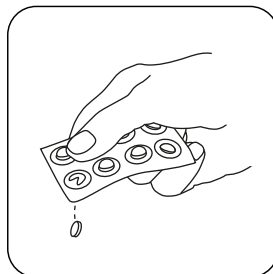


Press the **ZERO** button.

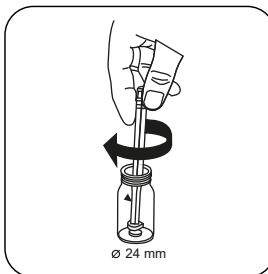


Remove the vial from the sample chamber.

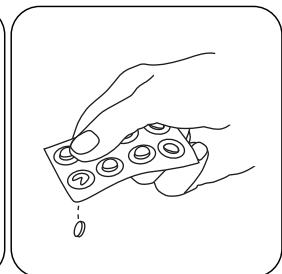
For devices that require **no ZERO measurement**, start here.



Add **AMMONIA No. 1 tablet**.



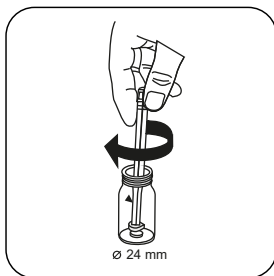
Crush tablet(s) by rotating slightly.



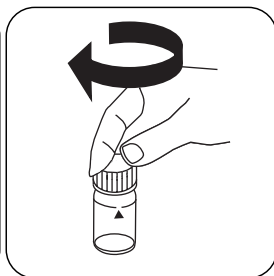
Add **AMMONIA No. 2 tablet**.



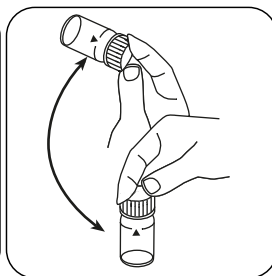
EN



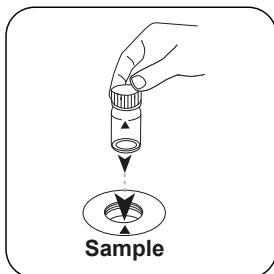
Crush tablet(s) by rotating slightly.



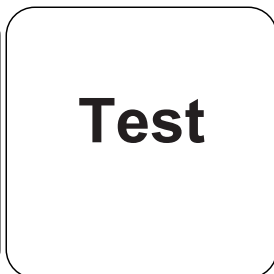
Close vial(s).



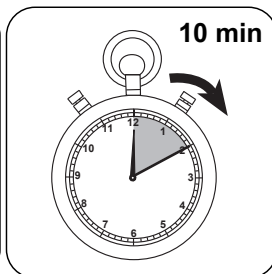
Dissolve tablet(s) by inverting.



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



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



Wait for **10 minute(s)** reaction time.

Once the reaction period is finished, the measurement takes place automatically. The result in mg/L Ammonium 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	N	1
mg/l	NH ₄	1.2878
mg/l	NH ₃	1.2158

EN

Chemical Method

Indophenole Blue

Appendix

Interferences

Persistent Interferences

- Sulphides, cyanides, rhodanide, aliphatic amine and aniline interfere in higher concentrations.

Bibliography

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989

According to

APHA Method 4500-NH₃ F

* including stirring rod, 10 cm

**Ammonia PP****M62****0.01 - 0.8 mg/L N****A****Salicylate**

EN

Material

Required material (partly optional):

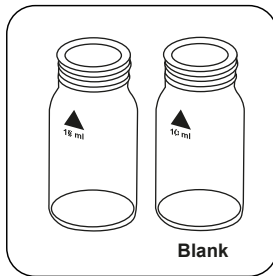
Reagents	Packaging Unit	Part Number
VARIO Ammonia Nitrogen, Set F10	1 Set	535500

Preparation

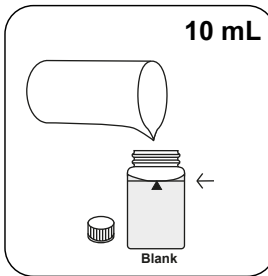
1. Extremely alkaline or acidic water samples should be adjusted with 0.5 mol/l (1N) Sulphuric acid or 1 mol/l (1 N) Sodium hydroxide to pH 7.

Determination of Ammonium with Vario Powder Pack

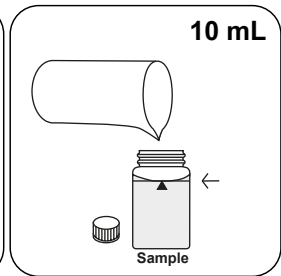
Select the method on the device.



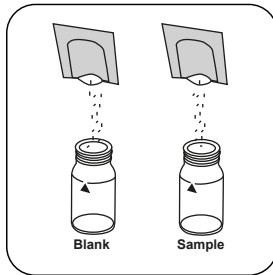
Prepare two clean 24 mm vials. Mark one as a blank.



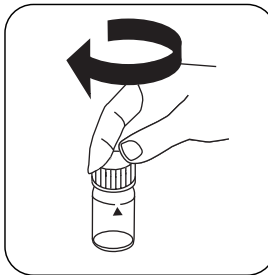
Put **10 mL deionised water** in the blank.



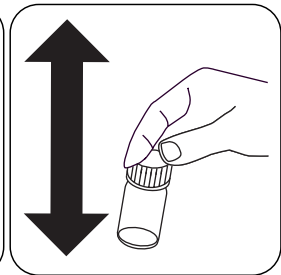
Put **10 mL sample** in the sample vial.



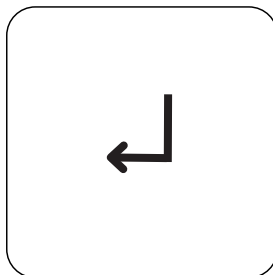
Add a **VARIO Ammonium Salicylate F10 powder pack** in each vial.



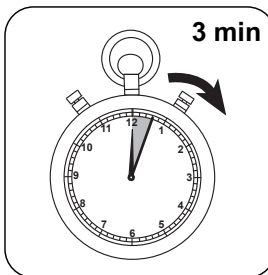
Close vial(s).



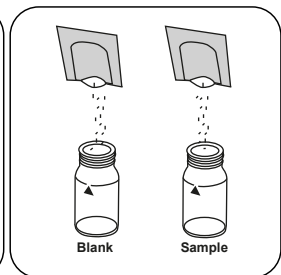
Dissolve the contents by shaking.



Press the **ENTER** button.



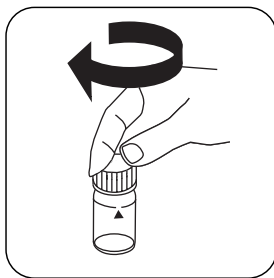
Wait for **3 minute(s) reaction time**.



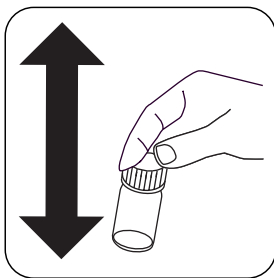
Add a **Vario Ammonium Cyanurate F10 powder pack** in each vial.



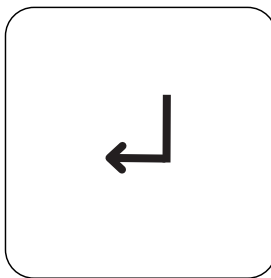
EN



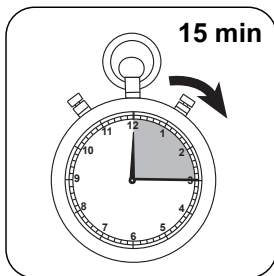
Close vial(s).



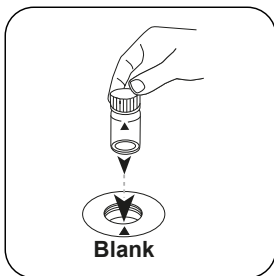
Dissolve the contents by shaking.



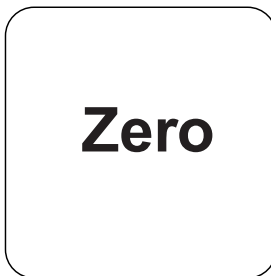
Press the **ENTER** button.



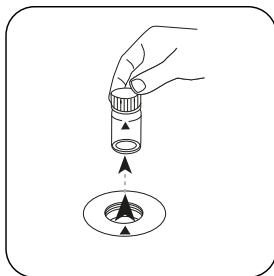
Wait for **15 minute(s) reaction time**.



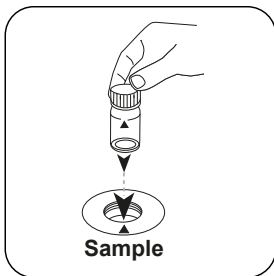
Place **blank** in the sample chamber. Pay attention to the positioning.



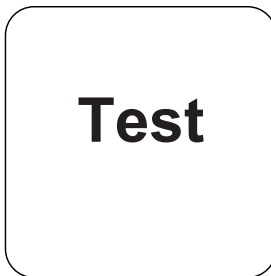
Press the **ZERO** button.



Remove the vial from the sample chamber.



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



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

The result in mg/L Ammonium 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	N	1
mg/l	NH ₄	1.288
mg/l	NH ₃	1.22

EN

Chemical Method

Salicylate

Appendix

Interferences

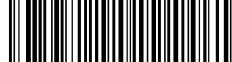
Persistent Interferences

- Sulphide intensifies the colouration.

Removeable Interferences

- Iron interferes with the test at all concentrations. Iron interference is eliminated as follows.
 - a) Determine the concentration of iron present in the sample by performing a total Iron test.
 - b) in the blank, use the same iron concentration as that determined instead of the deionised water.
- Less common interferences such as Hydrazine and Glycine will cause intensified colours in the prepared sample. Turbidity and colour will give erroneous high values. For samples where there are severe interferences, distillation will be necessary.

Interference	from / [mg/L]
Ca ²⁺	1000 (CaCO ₃)
Mg ²⁺	6000 (CaCO ₃)
NO ₃ ⁻	100
NO ₂ ⁻	12
PO ₄ ³⁻	100
SO ₄ ²⁻	300



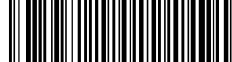
Method Validation

Limit of Detection	0.02 mg/L
Limit of Quantification	0.07 mg/L
End of Measuring Range	0.08 mg/L
Sensitivity	0.42 mg/L / Abs
Confidence Intervall	0.014 mg/L
Standard Deviation	0.006 mg/L
Variation Coefficient	1.45 %

Derived from

DIN 38406-E5-1
ISO 7150-1

EN



Chloramine (M) PP

M63

0.02 - 4.5 mg/L NH_2Cl as Cl_2

Indophenole method

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Monochloramine Set	1 Set	535800
VARIO Monochlor F Rgt - 100	Powder / 100 Pieces	531810
VARIO Free Ammonia Reagent Solution - 5 ml	5 mL	531800
Vario Rochelle Salt Solution, 30 ml ^{b)}	30 mL	530640

Remarks

- Full colour development – temperature
The reaction periods indicated in the manual refer to a sample temperature between 12 °C and 14 °C. Due to the fact that the reaction period is strongly influenced by sample temperature, you have to adjust both reaction periods according to the following table:

Sample temperature		Reaction period in X min
°C	°F	
5	41	10
7	45	9
9	47	8
10	50	8
12	54	7
14	57	7
16	61	6
18	64	5
20	68	5
23	73	2.5
25	77	2
> 25	> 77	2

- Press [Enter] key to cancel a reaction period.
- Hold the bottle vertically and squeeze slowly.
- To determine the ammonia concentration the difference between mono chloramine (T1) and the sum of mono chloramine and ammonia (T2) is calculated. If T2 exceeds the range limit the following message is displayed:

$$N[NH_2Cl] + N[NH_3] > 0.9 \text{ mg/L}$$
 In this case the sample has to be diluted and the measurement repeated.



Determination of Monochloramine, without Free Ammonia

Select the method on the device.

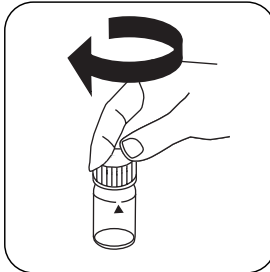
In addition, choose the test: without Ammonia

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

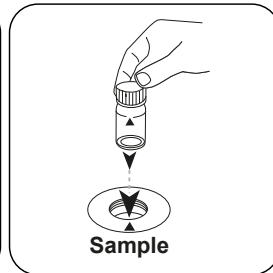
EN



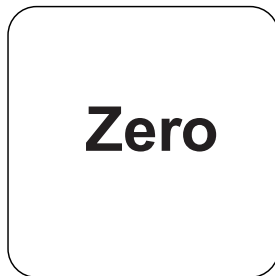
Fill 24 mm vial with **10 mL sample**.



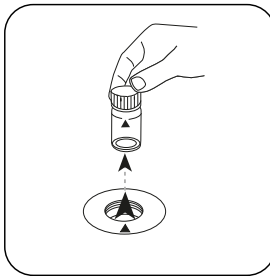
Close vial(s).



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

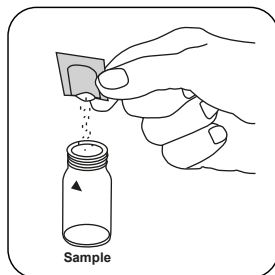


Press the **ZERO** button.

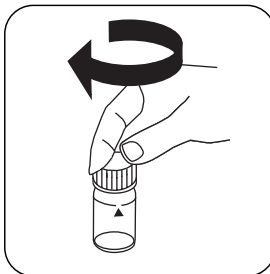


Remove the vial from the sample chamber.

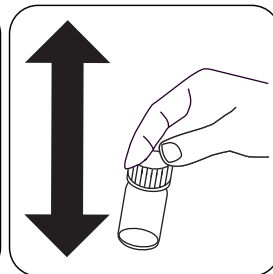
For devices that require **no ZERO measurement**, start here.



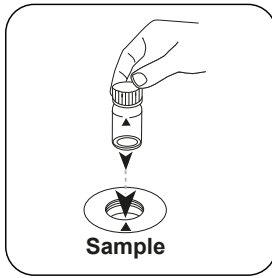
Add **Monochlor FRGT powder pack**.



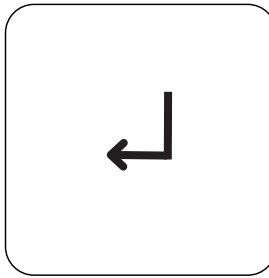
Close vial(s).



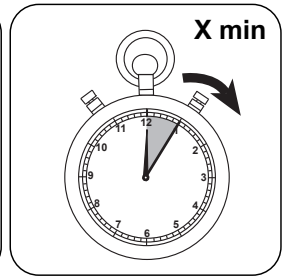
Dissolve the contents by shaking. (20 sec.)



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

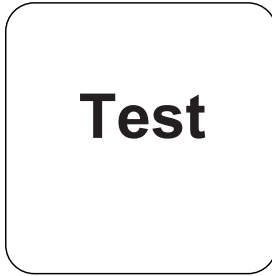


Press the **ENTER** button for countdown. (XD: start timer)



Reaction time **X minute(s)** according to table. **Wait for reaction time.**

EN



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

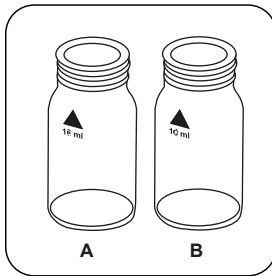
The result in mg/L Monochloramine - Chlorine Cl [NH_2Cl] appears on the display.

Determination of Monochloramine, in presence of free ammonia with powder pack

Select the method on the device.

In addition, choose the test: with Free Ammonia

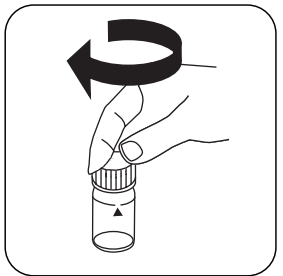
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



Prepare two clean 24 mm vials. Mark one as Ammonia and the other as Chloramine vial.



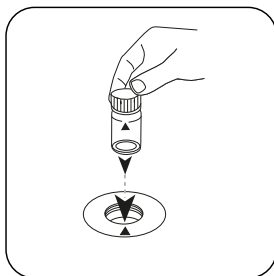
Place **10 mL sample** in each vial.



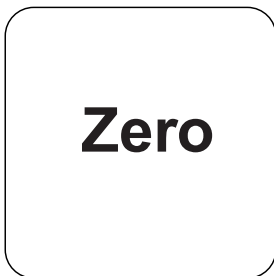
Close vial(s).



EN

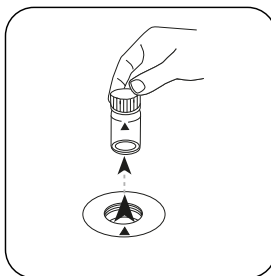


Place Ammonia vial in the sample chamber. • Pay attention to the positioning.

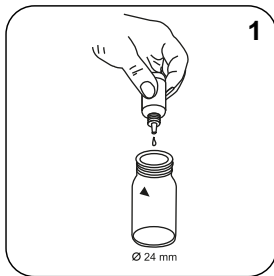


Zero

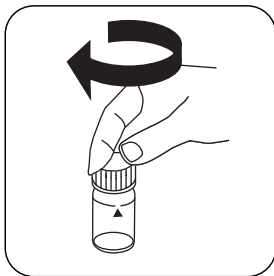
Press the **ZERO** button.



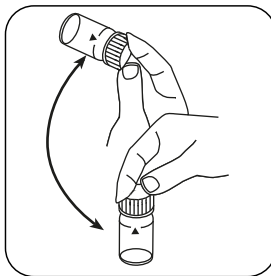
Remove the vial from the sample chamber.



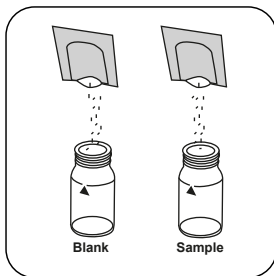
Add **1 drop Free Ammonia Reagent Solution** to the Ammonia vial.



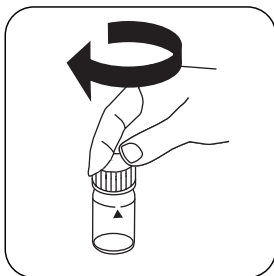
Close vial(s).



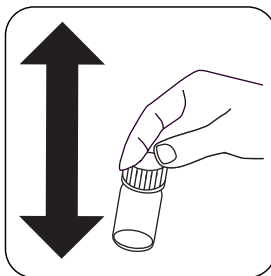
Invert several times to mix the contents (approx. 15 sec).



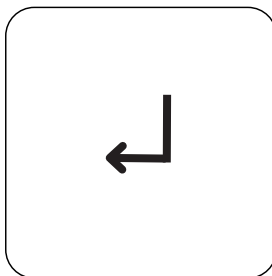
Add a **Monochlor FRGT powder pack** simultaneously in each vial.



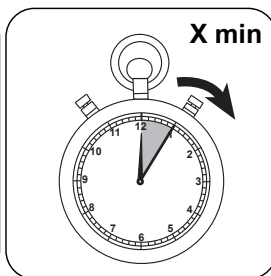
Close vial(s).



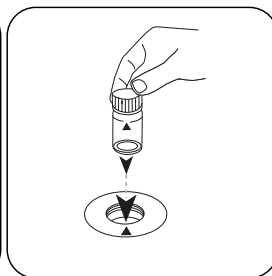
Dissolve the contents by shaking. (20 sec.)



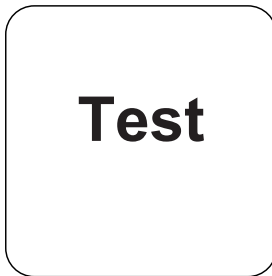
Press the **ENTER** button for countdown.
(XD: start timer)



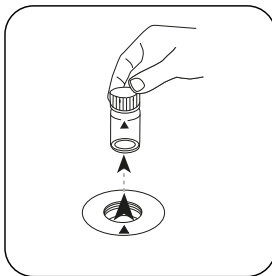
Reaction time **X minute(s)** according to table. **Wait for reaction time.**



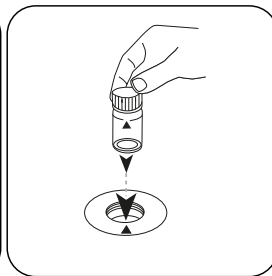
Place Chloramine **vial** in the sample chamber. • Pay attention to the positioning.



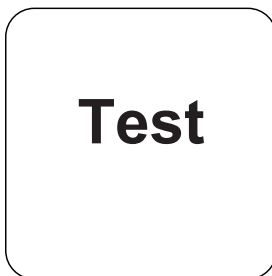
Press the **TEST** (XD: **START**) button.



Remove the vial from the sample chamber.

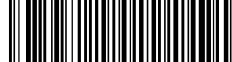


Place Ammonia **vial** in the sample chamber. • Pay attention to the positioning.



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

The result in mg/L Monochloramine - Chlorine Cl [NH_2Cl] and mg/l free Ammonia - Nitrogen N [NH_3] 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	Cl ₂	1
mg/l	NH ₂ Cl	0.72598
mg/l	N[NH ₂ Cl]	0.19754
mg/l	NH ₃	0.24019

EN

Chemical Method

Indophenole method

Interferences

Removeable Interferences

Disturbances caused by precipitation caused by magnesium hardness of more than 400 mg / l CaCO₃ can be eliminated by adding 5 drops of Rochelle salt solution.

Interference	from / [mg/L]
Alanine (N)	1
Aluminium (Al)	10
Bromide (Br)	100
Bromine (Br ₂)	15
Calcium (CaCO ₃)	1000
Chloride (Cl)	18.000
Chlorine Dioxide (ClO ₂)	5
Copper (Cu)	10
Dichloramine (Cl ₂)	10
Fluoride (F)	5
Free Chloride (Cl ₂)	10
Glycine (N)	1
Iron (II) (Fe ²⁺)	10
Iro (III) (Fe ³⁺)	10
Lead (Pb)	10
Permanganate	3
Nitrate (N)	100
Nitrite (N)	50

Interference	from / [mg/L]
Sulfide	0.5
Phosphate (PO ₄)	100
Silica (SiO ₂)	100
Sulfate (SO ₄ ²⁺)	2600
Sulfite (SO ₃ ²⁻)	50
Ozone	1
Tyrosine (N)	1
Urea (N)	10
Zinc (Zn)	5

Method Validation

Limit of Detection	0.010 mg/L
Limit of Quantification	0.03 mg/L
End of Measuring Range	4.5 mg/L
Sensitivity	1.78 mg/L / Abs
Confidence Intervall	0.044 mg/L
Standard Deviation	0.018 mg/L
Variation Coefficient	0.78 %



Chlorine (free) and Monochloramine

M64

0.02 - 4.50 mg/L Cl₂

CL2

Indophenole method

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Free Chlorine Reagent Solution - 30 ml	30 mL	531820
VARIO Monochlor F Rgt - 100	Powder / 100 Pieces	531810
Vario Rochelle Salt Solution, 30 ml ^{b)}	30 mL	530640

Remarks

- Full colour development – temperature
The reaction periods indicated in the manual refer to a sample temperature between 12 °C and 14 °C. Due to the fact that the reaction period is strongly influenced by sample temperature, you have to adjust both reaction periods according to the following table:

Sample temperature		Reaction period in X min
°C	°F	
5	41	10
7	45	9
9	47	8
10	50	8
12	54	7
14	57	7
16	61	6
18	64	5
20	68	5
23	73	2.5
25	77	2
> 25	> 77	2

- Press [Enter] key to cancel a reaction period.
- Hold the bottle vertically and squeeze slowly.
- To determine the chlorine concentration the difference between the monochloramine and the sum of monochloramine and chlorine is calculated. If one measured value exceeds the range limit the following message is displayed:
 $\text{Cl}_2[\text{NH}_2\text{Cl}] + \text{Cl}_2 > 4.5 \text{ mg/L}$
In this case the sample has to be diluted and the measurement repeated.



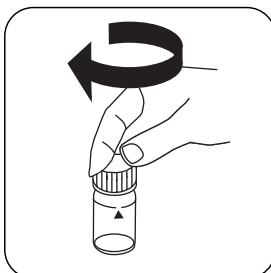
Determination of Free Chlorine in absence of Monochloramine

Select the method on the device.

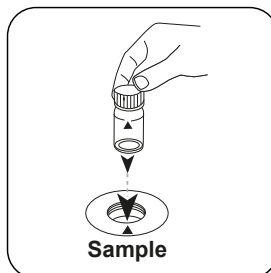
In addition, choose the test: free Chlorine in absence of Monochloramine



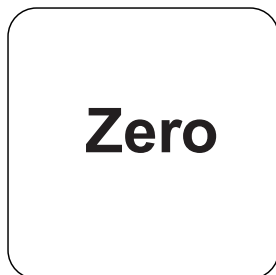
Fill 24 mm vial with **10 mL sample**.



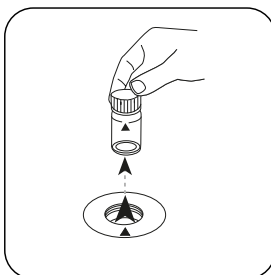
Close vial(s).



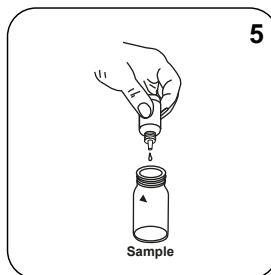
Place **sample vial** in the sample chamber. Pay attention to the positioning.



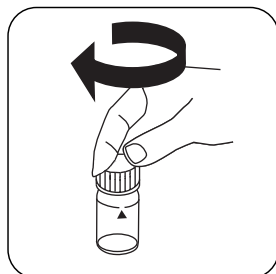
Press the **ZERO** button.



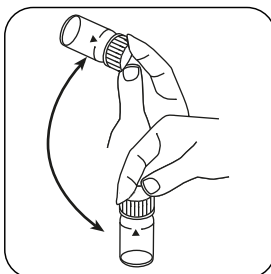
Remove the vial from the sample chamber.



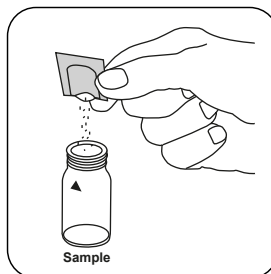
Add **5 drops Free Chlorine Reagent Solution** to the **sample vial**.



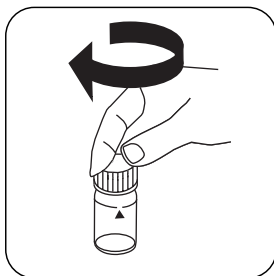
Close vial(s).



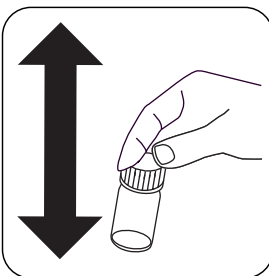
Invert several times to mix the contents (15 sec.).



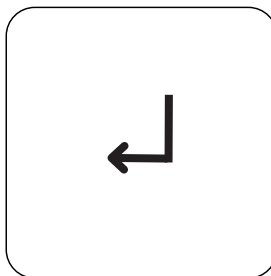
Add **Monochlor FRGT powder pack**.



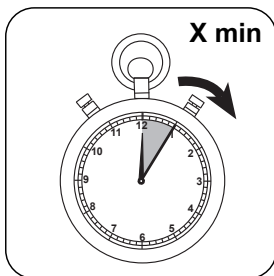
Close vial(s).



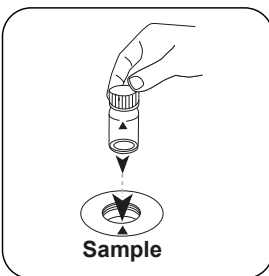
Dissolve the contents by shaking. (20 sec.)



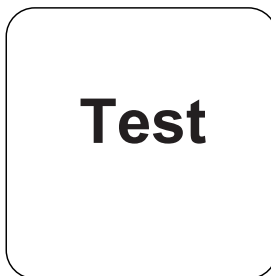
Press the **ENTER** button for countdown. (XD: start timer)



Reaction time **X minute(s)** in the according to table. **Wait for reaction time.**



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



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

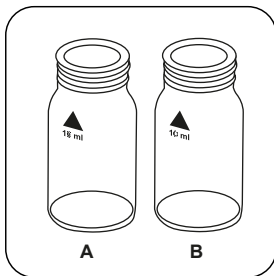
The result in mg/L free Chlorine appears on the display.

Determination of free Chlorine and Monochloramine

Select the method on the device.

In addition, choose the test: Free Chlorine

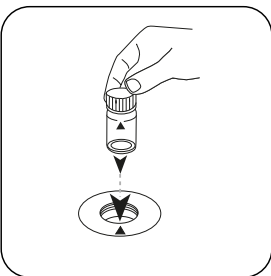
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



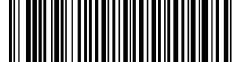
Prepare two clean 24 mm vials. Mark one as Chloramine and the other as Chlorine vial.



Place **10 mL sample** in each vial.

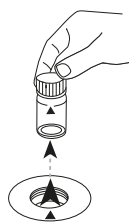


Place Chlorine vial in the sample chamber. • Pay attention to the positioning.



Zero

Press the **ZERO** button.

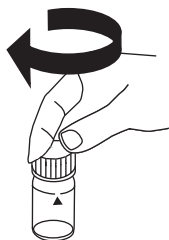


Remove the vial from the sample chamber.

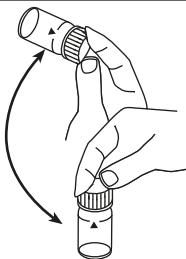


5

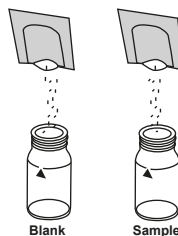
Add **5 drops Free Chlorine Reagent Solution** to the **Chlorine vial**.



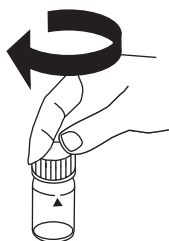
Close vial(s).



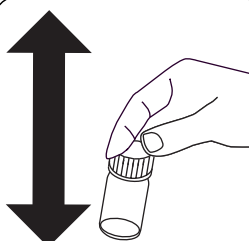
Invert several times to mix the contents (approx. 15 sec).



Add a **Monochlor FRGT powder pack** simultaneously in each vial.



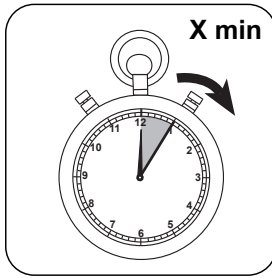
Close vial(s).



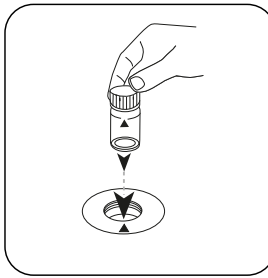
Dissolve the contents by shaking. (20 sec.)



Press the **ENTER** button for countdown. (XD: start timer)



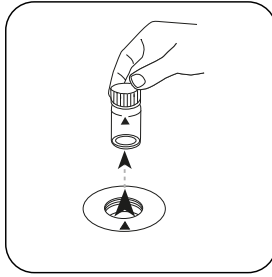
Reaction time **X minute(s)** according to table. **Wait for reaction time.**



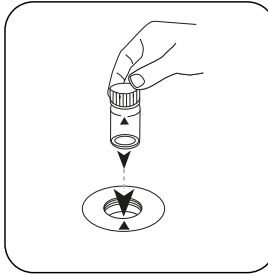
Place Chloramine vial in the sample chamber. • Pay attention to the positioning.



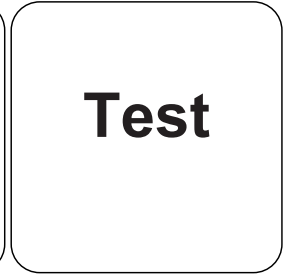
Press the **TEST** (XD: **START**) button.



Remove the vial from the sample chamber.



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



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

The result in mg/L Chlorine and mg/l Monochloramine - Chlorine Cl [NH_2Cl] 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	Cl ₂	1
mg/l	NH ₂ Cl	0.72598
mg/l	N[NH ₂ Cl]	0.19754
mg/l	NH ₃	0.24019

Chemical Method

Indophenole method

Interferences

Removeable Interferences

Disturbances caused by precipitation caused by magnesium hardness of more than 400 mg / l CaCO₃ can be eliminated by adding 5 drops of Rochelle salt solution.

Interference	from / [mg/L]
Alanine (N)	1
Aluminium (Al)	10
Bromide (Br)	100
Bromine (Br ₂)	15
Calcium (CaCO ₃)	1000
Chloride (Cl)	18.000
Chlorine Dioxide (ClO ₂)	5
Copper (Cu)	10
Dichloramine (Cl ₂)	10
Fluoride (F)	5
Glycine (N)	1
Iron (II) (Fe ²⁺)	10
Iron (III) (Fe ³⁺)	10
Lead (Pb)	10
Permanganate	3
Nitrate (N)	100
Nitrite (N)	50
Sulfide	0.5

Interference	from / [mg/L]
Phosphate (PO ₄)	100
Silica (SiO ₂)	100
Sulfate (SO ₄ ²⁺)	2600
Sulfite (SO ₃ ²⁻)	50
Ozone	1
Tyrosine (N)	1
Urea (N)	10
Zinc (Zn)	5

EN

Method Validation

Limit of Detection	0.010 mg/L
Limit of Quantification	0.03 mg/L
End of Measuring Range	4.5 mg/L
Sensitivity	1.78 mg/L / Abs
Confidence Intervall	0.044 mg/L
Standard Deviation	0.018 mg/L
Variation Coefficient	0.78 %

**Ammonia LR TT****M65****0.02 - 2.5 mg/L N****Salicylate**

EN

Material

Required material (partly optional):

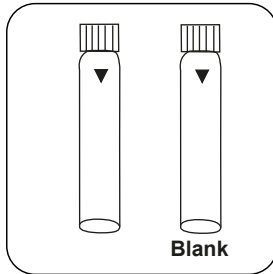
Reagents	Packaging Unit	Part Number
VARIO Am Vial Test Reagent, Set Low Range F5	1 Set	535600

Preparation

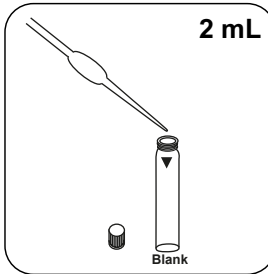
1. Strong alkaline or acidic water samples must be adjusted to approx. pH 7 before analysis (use 1 mol/l Hydrochloric acid or 1 mol/l Sodium hydroxide).

Determination of Ammonium LR with Vario Vial Test

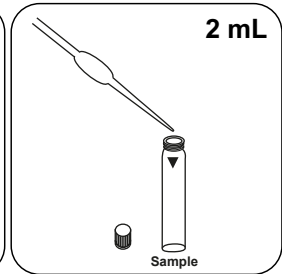
Select the method on the device.



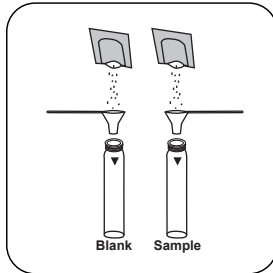
Prepare two **Ammonium Diluent Reagent LR vials**. Mark one as a blank.



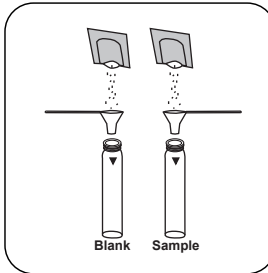
Put **2 mL deionised water** in the blank.



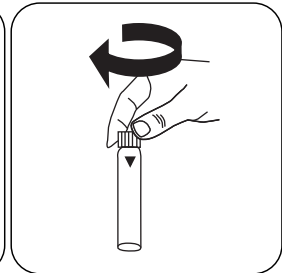
Put **2 mL sample** in the sample vial.



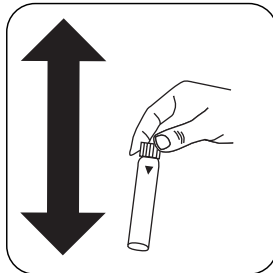
Add a **Vario AMMONIA Salicylate F5 powder pack** in each vial.



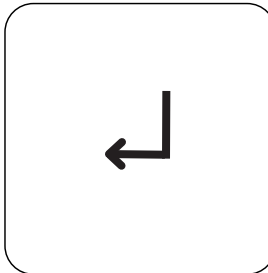
Add a **Vario AMMONIA Cyanurate F5 powder pack** in each vial.



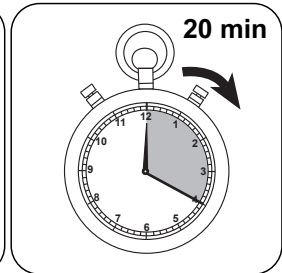
Close vial(s).



Dissolve the contents by shaking.



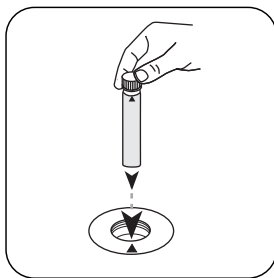
Press the **ENTER** button.



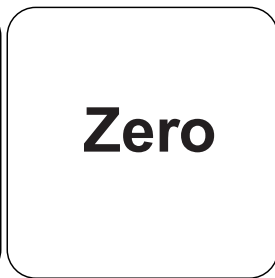
Wait for **20 minute(s) reaction time**.



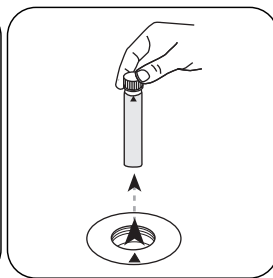
EN



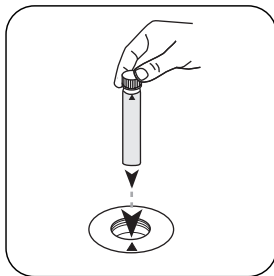
Place **blank** in the sample chamber. • Pay attention to the positioning.



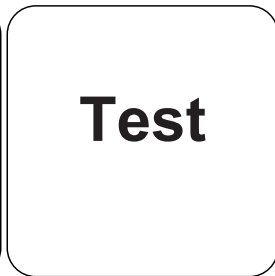
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



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

The result in mg/L Ammonium 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	N	1
mg/l	NH ₄	1.29
mg/l	NH ₃	1.22

EN

Chemical Method

Salicylate

Appendix

Interferences

Removeable Interferences

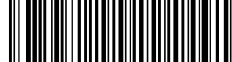
- Iron interferes with the test and can be eliminated as follows: Determine the amount of total iron present. To produce the blank, add an iron standard solution with the same concentration instead of deionised water.

Method Validation

Limit of Detection	0.01 mg/L
Limit of Quantification	0.04 mg/L
End of Measuring Range	2.5 mg/L
Sensitivity	1.49 mg/L / Abs
Confidence Intervall	0.061 mg/L
Standard Deviation	0.025 mg/L
Variation Coefficient	2.02 %

Derived from

DIN 38406-E5-1
ISO 7150-1

**Ammonia HR TT****M66****1.0 - 50 mg/L N****Salicylate**

EN

Material

Required material (partly optional):

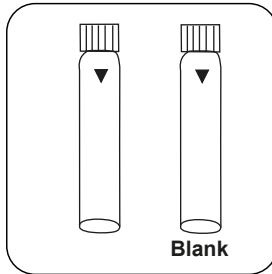
Reagents	Packaging Unit	Part Number
VARIO am Vial Test Reagent Set High Range F5	1 Set	535650

Preparation

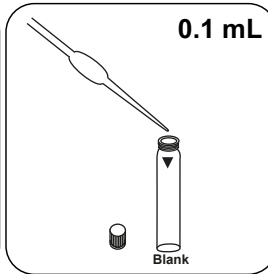
1. Strong alkaline or acidic water samples must be adjusted to approx. pH 7 before analysis (use 1 mol/l Hydrochloric acid or 1 mol/l Sodium hydroxide).

Determination of Ammonium HR with Vario Tube Test

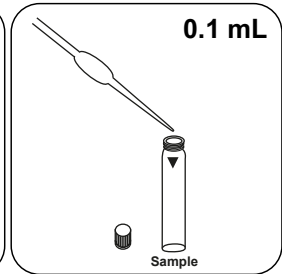
Select the method on the device.



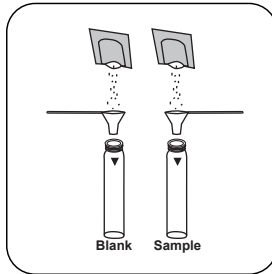
Prepare two **reaction vials**. Mark one as a blank.



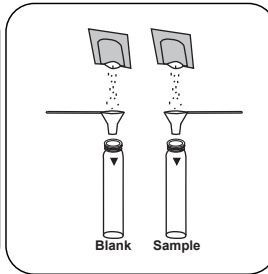
Put **0.1 mL deionised water** in the blank.



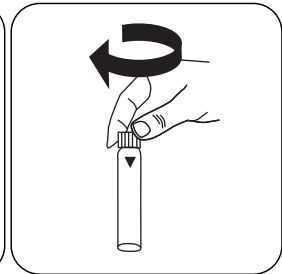
Put **0.1 mL sample** in the sample vial.



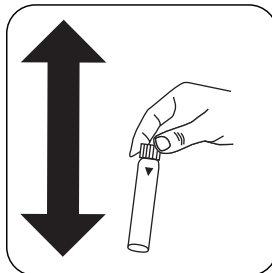
Add a **Vario AMMONIA Salicylate F5 powder pack** in each vial.



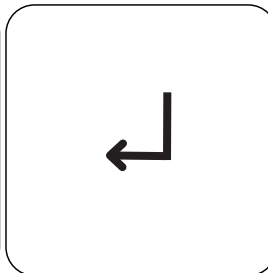
Add a **Vario AMMONIA Cyanurate F5 powder pack** in each vial.



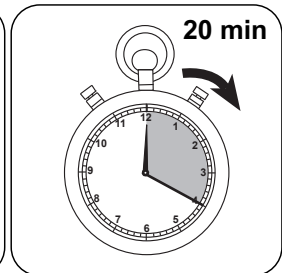
Close vial(s).



Dissolve the contents by shaking.



Press the **ENTER** button.

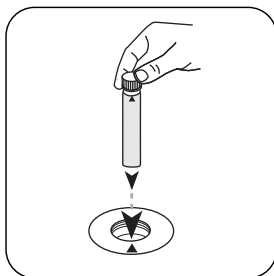


Wait for **20 minute(s) reaction time**.

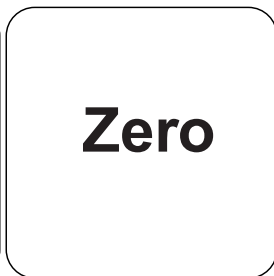
EN



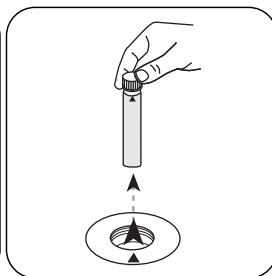
EN



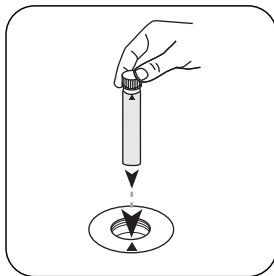
Place **blank** in the sample chamber. • Pay attention to the positioning.



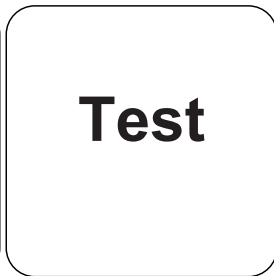
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



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

The result in mg/L Ammonium 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	N	1
mg/l	NH ₄	1.29
mg/l	NH ₃	1.22

EN

Chemical Method

Salicylate

Appendix

Interferences

Removeable Interferences

- Iron interferes with the test and can be eliminated as follows: Determine the amount of total iron present. To produce the blank, add an iron standard solution with the same concentration instead of deionised water.
- If chlorine is known to be present, the sample must be treated with sodium thiosulphate. Add one drop of 0.1 mol/l Sodium thiosulphate for each 0.3 mg/L Cl₂ in a one litre water sample.

Method Validation

Limit of Detection	0.59 mg/L
Limit of Quantification	1.78 mg/L
End of Measuring Range	50 mg/L
Sensitivity	36.82 mg/L / Abs
Confidence Intervall	3.66 mg/L
Standard Deviation	1.51 mg/L
Variation Coefficient	5.93 %

Derived from

DIN 38406-E5-1 ISO 7150-1



PHMB T

M70

2 - 60 mg/L PHMB

Buffer / Indicator

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
PHMB Photometer	Tablet / 100	516100BT
PHMB Photometer	Tablet / 250	516101BT

Remarks

1. After the end of the test, the vials must be immediately rinsed and cleaned with a brush.
2. During extended use, vials and stirring rods can become discoloured blue. This discolouration can be easily removed if the vials and stirring rod are cleaned with a lab cleaner. Rinse thoroughly with tap water and then with deionised water.
3. With this test, the result will influence the analysis of the hardness and acid capacity of the water sample. This method is adjusted using water with the following composition:
 Calcium hardness: 2 mmol/l
 Acid capacity: 2.4 mmol/l.

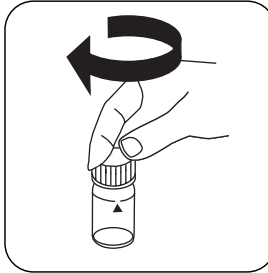
Determination of PHMB (Biguanide) with Tablet

Select the method on the device.

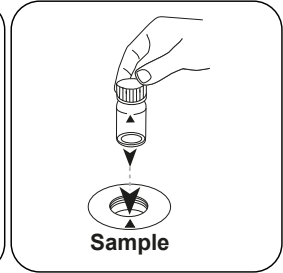
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



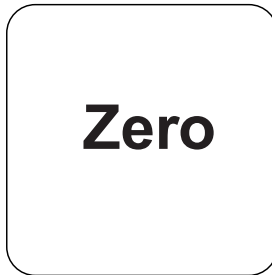
Fill 24 mm vial with **10 mL sample**.



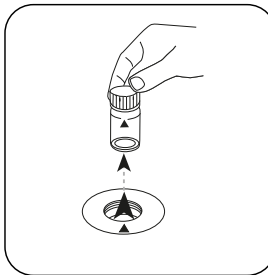
Close vial(s).



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

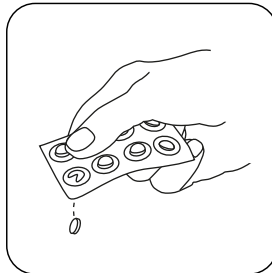


Press the **ZERO** button.

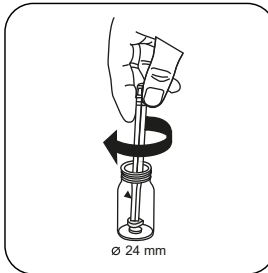


Remove the vial from the sample chamber.

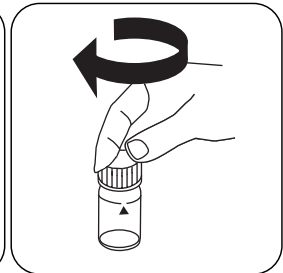
For devices that require **no ZERO measurement**, start here.



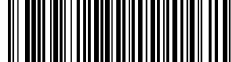
Add **PHMB PHOTOMETER** tablet.



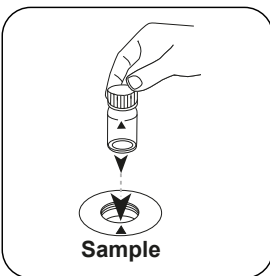
Crush tablet(s) by rotating slightly.



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 mg/L PHMB appears on the display.

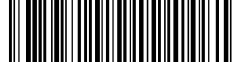
EN



Chemical Method

Buffer / Indicator

EN



Bromine T

M80

0.05 - 13 mg/L Br₂

Br

DPD

Material

EN

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. 1 High Calcium ^{e)}	Tablet / 100	515740BT
DPD No. 1 High Calcium ^{e)}	Tablet / 250	515741BT
DPD No. 1 High Calcium ^{e)}	Tablet / 500	515742BT

Preparation

1. Cleaning of vials:
As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of oxidising agents (e.g. ozone and chlorine) may show lower results. 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. When preparing the sample, Bromine outgassing, e.g. through the pipette or shaking, must be avoided. The analysis must take place immediately after taking the sample.
3. Strong alkaline or acidic water samples must be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

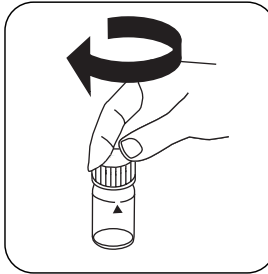
Determination of Bromine with Tablet

Select the method on the device.

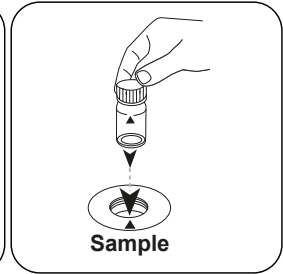
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



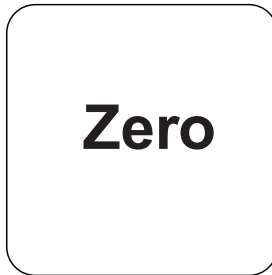
Fill 24 mm vial with **10 mL sample**.



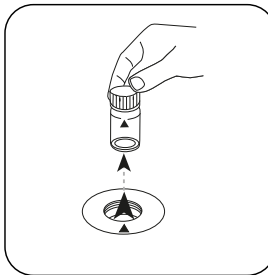
Close vial(s).



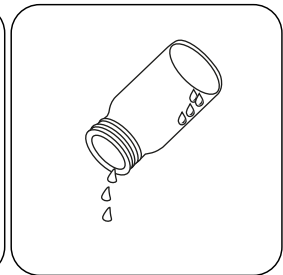
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

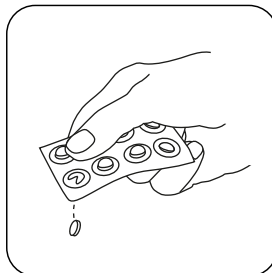


Remove the vial from the sample chamber.

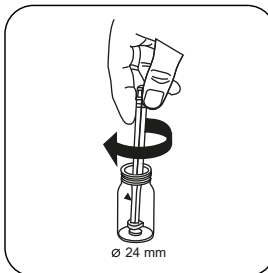


Empty vial except for a few drops.

For devices that require **no ZERO measurement**, start here.



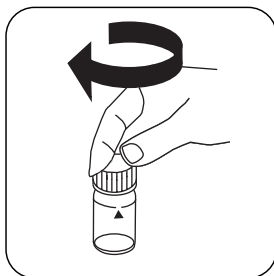
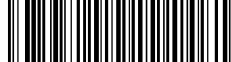
Add **DPD No. 1 tablet**.



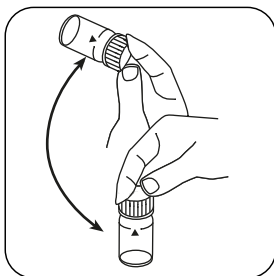
Crush tablet(s) by rotating slightly.



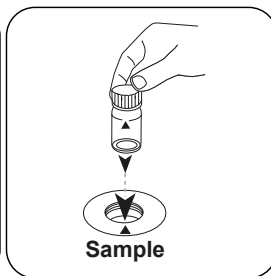
Fill up vial with **sample** to the **10 mL mark**.



Close vial(s).



Dissolve tablet(s) by inverting.



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

Test

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

The result in mg/L Bromine appears on the display.



Chemical Method

DPD

Appendix

Interferences

Persistent Interferences

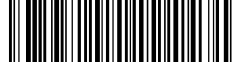
1. All oxidising agents in the samples react like bromine, which leads to higher results.
2. Concentrations above 22 mg/L Bromine can lead to results within the measuring range of up to 0 mg/L. In this case, the water sample must be diluted. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

Derived from

US EPA 330.5 (1983)
APHA Method 4500 Cl-G

^{a)} 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

EN



Bromine PP

M81

0.05 - 4.5 mg/L Br₂

DPD

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Chlorine Total DPD F10	Powder / 100 Pieces	530120

Preparation

- Cleaning of vials:
As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of oxidising agents (e.g. ozone and chlorine) may show lower results. 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.
- When preparing the sample, Bromine outgassing, e.g. through the pipette or shaking, must be avoided. The analysis must take place immediately after taking the sample.
- Strong alkaline or acidic water samples must be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

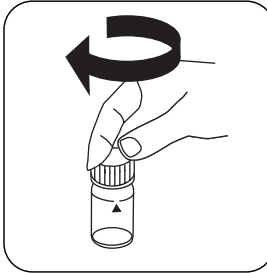
Determination of Bromine with Powder Pack

Select the method on the device.

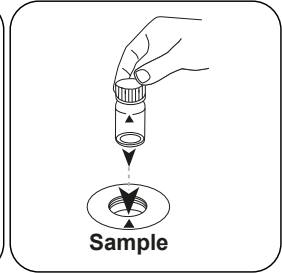
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



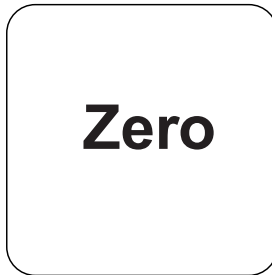
Fill 24 mm vial with **10 mL sample**.



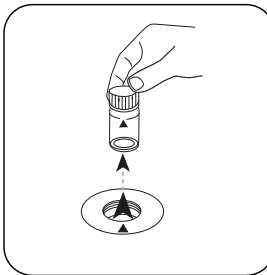
Close vial(s).



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

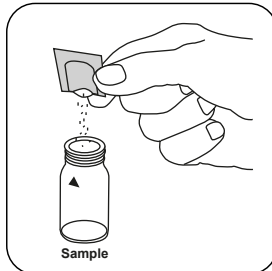


Press the **ZERO** button.

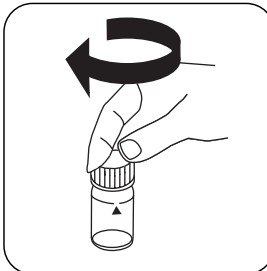


Remove the vial from the sample chamber.

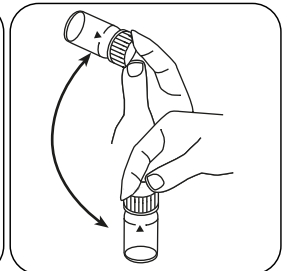
For devices that require **no ZERO measurement**, start here.



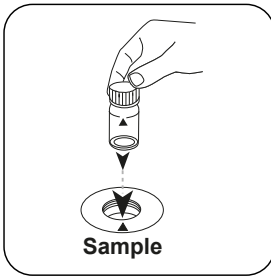
Add **Chlorine TOTAL DPD/ F10 powder pack**.



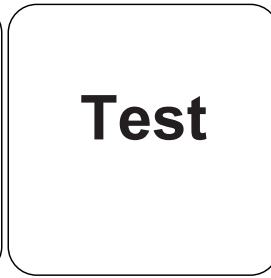
Close vial(s).



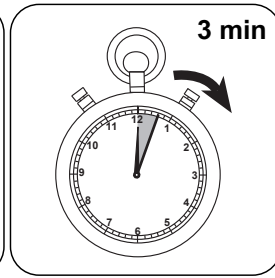
Invert several times to mix the contents (20 sec.).



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



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



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

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

The result in mg/L Bromine appears on the display.



Chemical Method

DPD

Appendix

Interferences

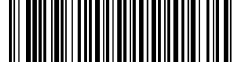
EN

Persistent Interferences

1. All oxidising agents in the samples react like bromine, which leads to higher results.
2. Concentrations above 22 mg/L Bromine can lead to results within the measuring range of up to 0 mg/L. In this case, the water sample must be diluted. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

Derived from

US EPA 330.5 (1983)
APHA Method 4500 Cl-G

**Chloride T****M90****0.5 - 25 mg/L Cl⁻****CL-1****Silver Nitrate / Turbidity****Material**

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Chloride T1	Tablet / 100	515910BT
Chloride T1	Tablet / 250	515911BT
Chloride T2	Tablet / 100	515920BT
Chloride T2	Tablet / 250	515921BT
Set Chloride T1/T 2 100 Pc.#	100 each	517741BT
Set Chloride T1/T 2 250 Pc.#	250 each	517742BT

Preparation

1. Highly alkaline water should – if necessary – be neutralised before any analysis with Nitric acid.

Remarks

1. High concentrations of electrolytes and organic compounds have different effects on the precipitation reaction.

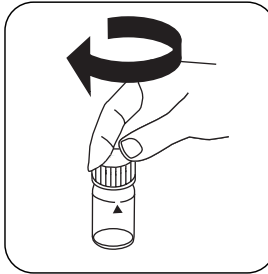
Determination of Chloride with Tablet

Select the method on the device.

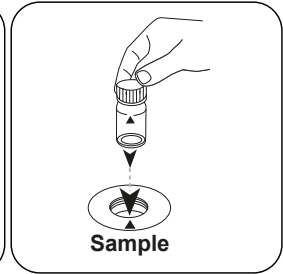
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



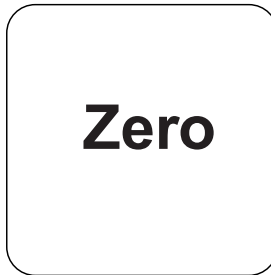
Fill 24 mm vial with **10 mL sample**.



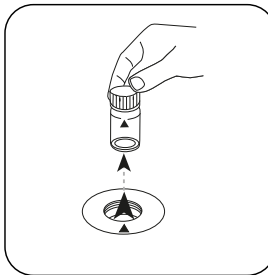
Close vial(s).



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

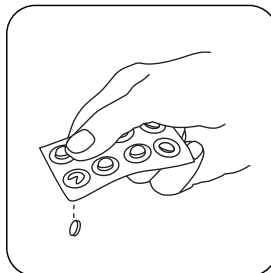


Press the **ZERO** button.

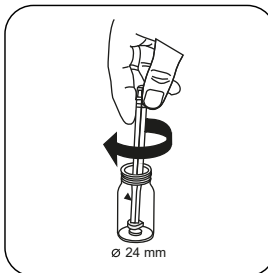


Remove the vial from the sample chamber.

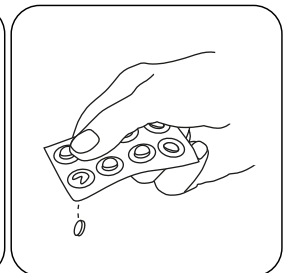
For devices that require **no ZERO measurement**, start here.



Add **CHLORIDE T1 tablet**.



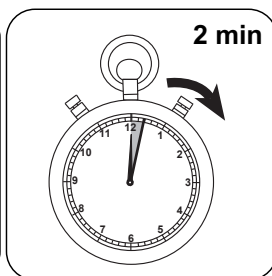
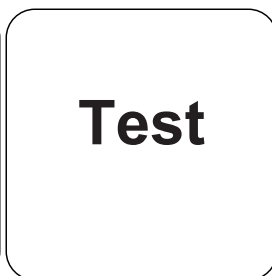
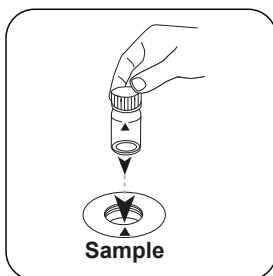
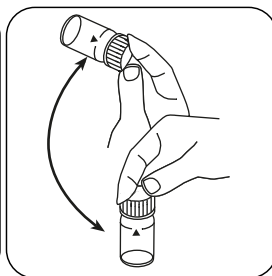
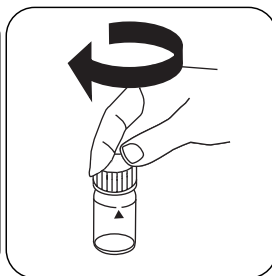
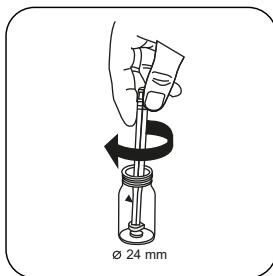
Crush tablet(s) by rotating slightly and dissolve.



Add **CHLORIDE T2 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 mg/L Chloride 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	Cl ⁻	1
mg/l	NaCl	1.65

EN

Chemical Method

Silver Nitrate / Turbidity

Appendix

Interferences

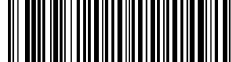
Persistent Interferences

1. Ions that also form deposits with Silver nitrate in acidic media, such as Bromides, Iodides and Thiocyanates, cause interference.
2. Individual particles are not attributable to the presence of chloride. Chloride causes a finely distributed turbidity with a milky appearance. **Disturbance through heavy shaking or stirring leads to bigger sized particles, which can cause lower readings.**
3. Cyanide, Iodine and Bromine also are determined as chloride. Chromate and dichromate interfere and should be reduced to the chromic state or removed.

Derived from

DIN 38405

* including stirring rod, 10 cm

**Chloride L (B)****M92****0.5 - 20 mg/L Cl⁻****CL-****Mercury Thiocyanate / Iron Nitrate****Material**

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Chloride Reagent Set	1 Pieces	56R018490

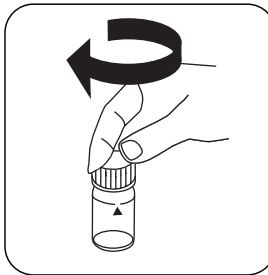
Determination of Chloride with liquid reagent

Select the method on the device.

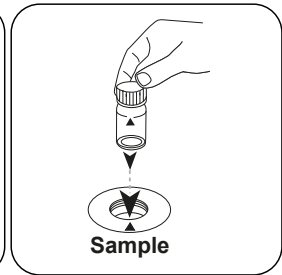
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



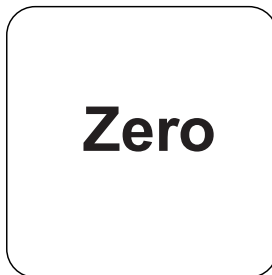
Fill 24 mm vial with **10 mL sample**.



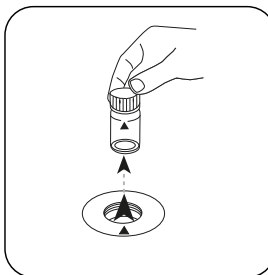
Close vial(s).



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

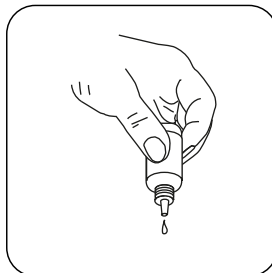


Press the **ZERO** button.

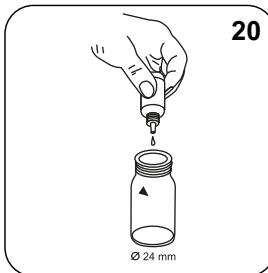


Remove the vial from the sample chamber.

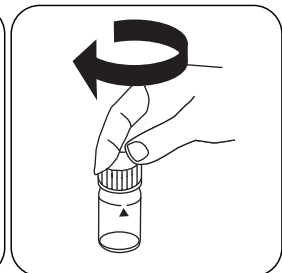
For devices that require **no ZERO measurement**, start here.



Hold cuvettes vertically and add equal drops by pressing slowly.



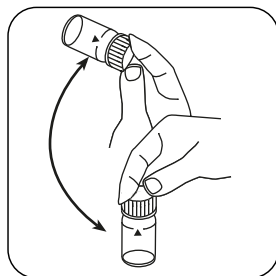
Add **20 drops KS251 (Chloride Reagent A)**.



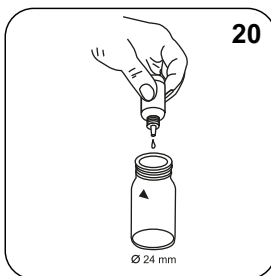
Close vial(s).



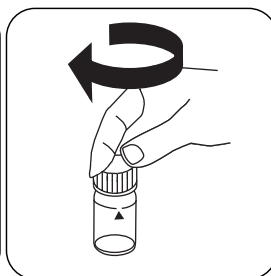
EN



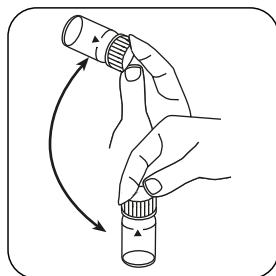
Invert several times to mix the contents.



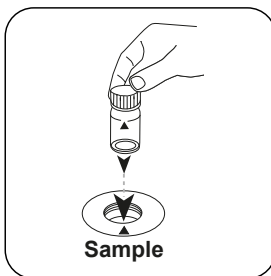
Add **20 drops** **KS253 (Chloride Reagent B)**.



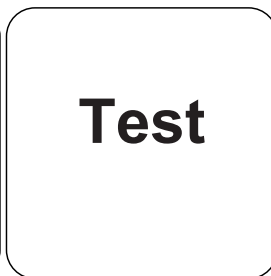
Close vial(s).



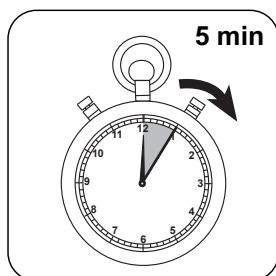
Invert several times to mix the contents.



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



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



Wait for **5 minute(s)** **reaction time**.

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

The result in mg/L Chloride 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	Cl ⁻	1
mg/l	NaCl	1.65

EN

Chemical Method

Mercury Thiocyanate / Iron Nitrate

Appendix

Interferences

Persistent Interferences

1. Reducing substances such as sulfite and thiosulfate, that can reduce iron (III) to iron (II) or mercury (II) to mercury (I) may interfere. Cyanide, Iodine and Bromide give a positive interference.

Derived from

DIN 15682-D31

DIN ISO 15923-1 D49



Chlorine T

M100

0.01 - 6.0 mg/L Cl₂ ^{a)}

CL6

DPD

Material

EN

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 ^{e)}	Tablet / 100	515740BT
DPD No. 1 High Calcium ^{e)}	Tablet / 250	515741BT
DPD No. 1 High Calcium ^{e)}	Tablet / 500	515742BT
DPD No. 3 High Calcium ^{e)}	Tablet / 100	515730BT
DPD No. 3 High Calcium ^{e)}	Tablet / 250	515731BT
DPD No. 3 High Calcium ^{e)}	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 Pieces	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).

Remarks

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.

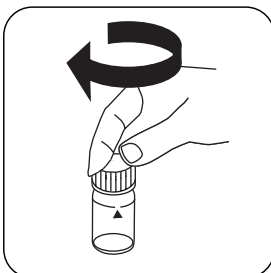
In addition, choose the test: free

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

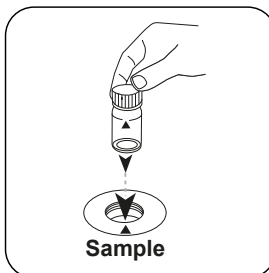
EN



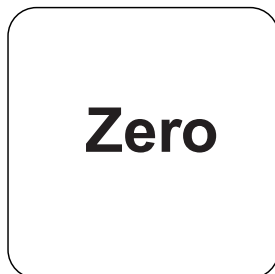
Fill 24 mm vial with **10 mL sample**.



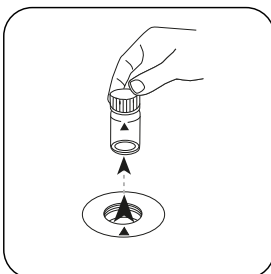
Close vial(s).



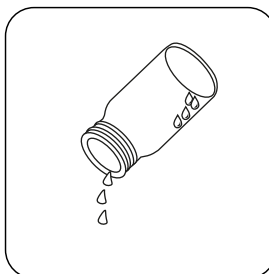
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

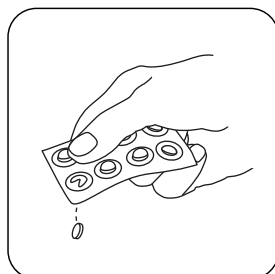


Remove the vial from the sample chamber.

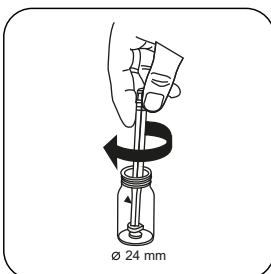


Empty vial except for a few drops.

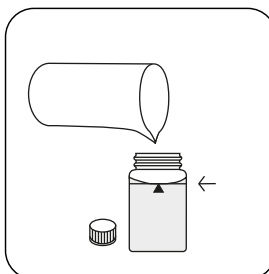
For devices that require **no ZERO measurement**, **start here**.



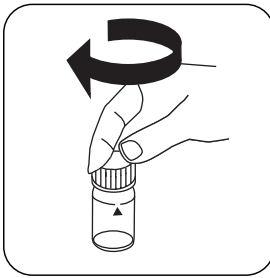
Add **DPD No. 1 tablet**.



Crush tablet(s) by rotating slightly.



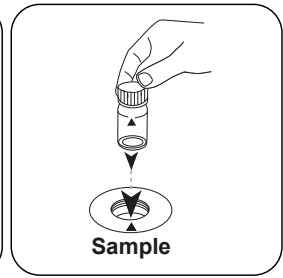
Fill up vial with **sample** to the **10 mL mark**.



Close vial(s).



Dissolve tablet(s) by inverting.



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

EN

Test

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

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

Determination of total Chlorine with tablet

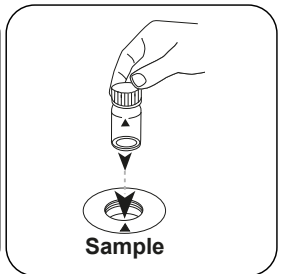
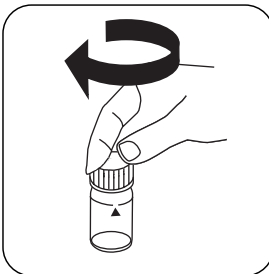
Select the method on the device.

In addition, choose the test: total

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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

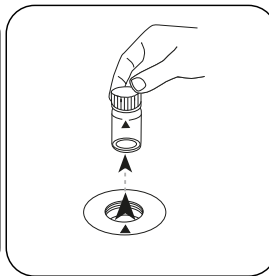


Place **sample vial** in the sample chamber. Pay attention to the positioning.

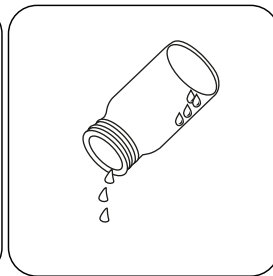


Zero

Press the **ZERO** button.

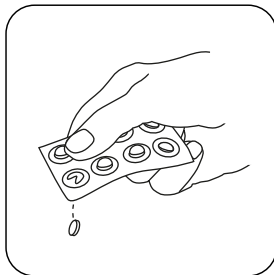


Remove the vial from the sample chamber.

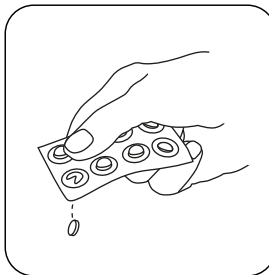


Empty vial except for a few drops.

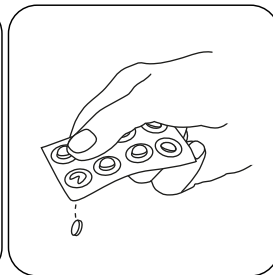
For devices that require **no ZERO measurement**, start here.



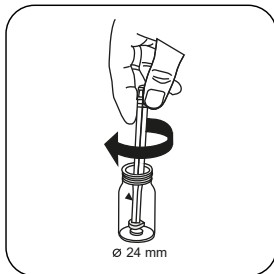
Add DPD No. 1 tablet .



Add DPD No. 3 tablet .



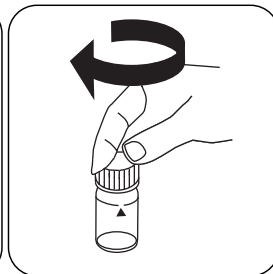
As an alternative to DPD No. 1 and No. 3 tablets, a DPD No. 4 tablet can be added.



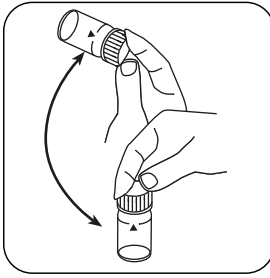
Crush tablet(s) by rotating slightly.



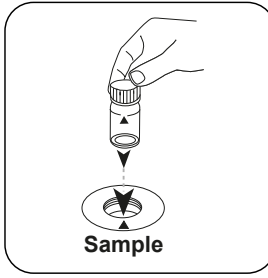
Fill up vial with **sample** to the **10 mL mark**.



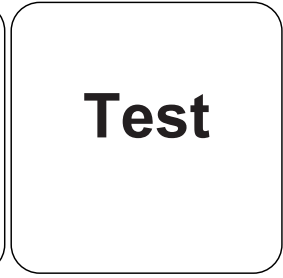
Close vial(s).



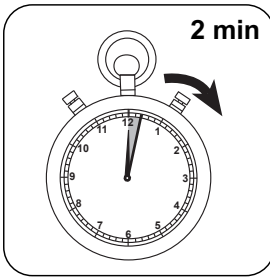
Dissolve tablet(s) by inverting.



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



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



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.

Determination of Chlorine differentiated with tablet

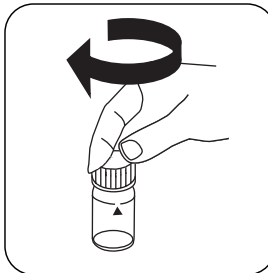
Select the method on the device.

In addition, choose the test: differentiated

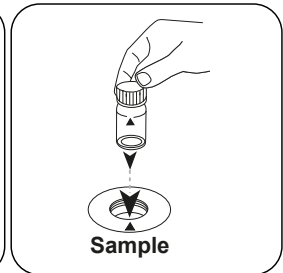
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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



Close vial(s).

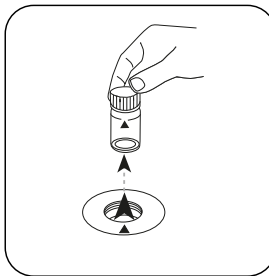


Place **sample vial** in the sample chamber. Pay attention to the positioning.

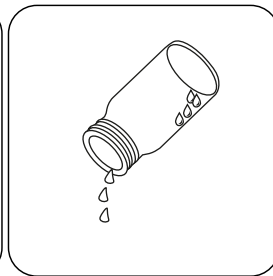


Zero

Press the **ZERO** button.

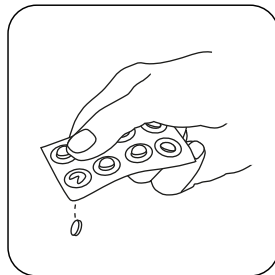


Remove the vial from the sample chamber.

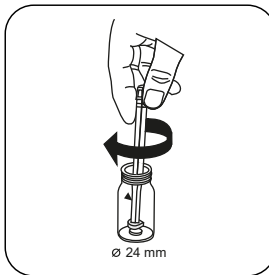


Empty vial except for a few drops.

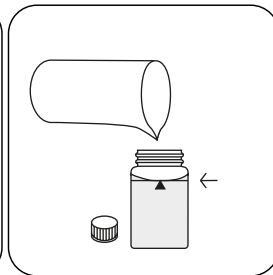
For devices that require **no ZERO measurement**, start here.



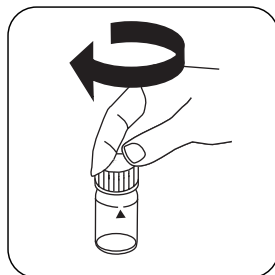
Add **DPD No. 1** tablet .



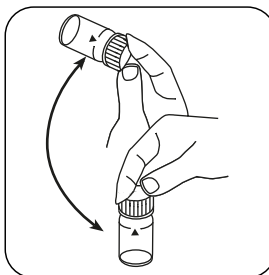
Crush tablet(s) by rotating slightly.



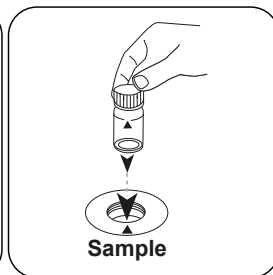
Fill up vial with **sample** to the **10 mL mark**.



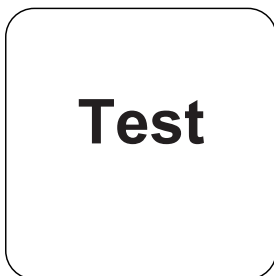
Close vial(s).



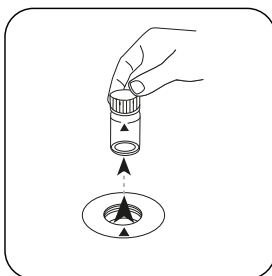
Dissolve tablet(s) by inverting.



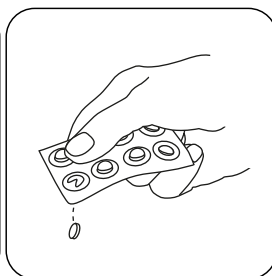
Place **sample vial** in the sample chamber. Pay attention to the positioning.



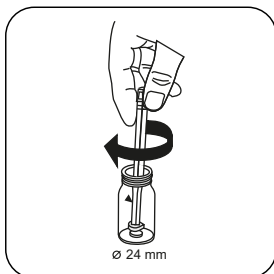
Press the **TEST** (XD:
START) button.



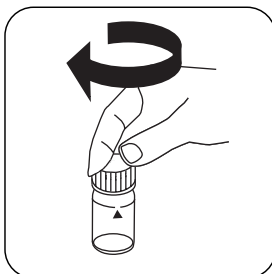
Remove the vial from the
sample chamber.



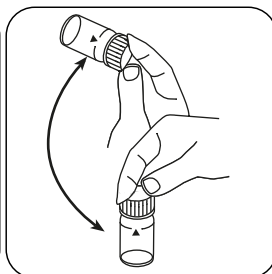
Add **DPD No. 3 tablet** .



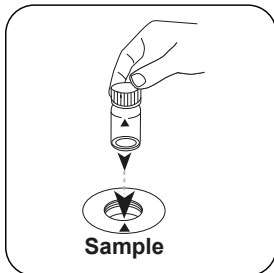
Crush tablet(s) by rotating
slightly.



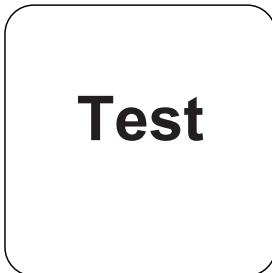
Close vial(s).



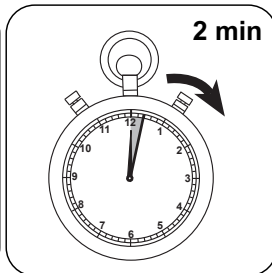
Dissolve tablet(s) by
inverting.



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



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



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

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

The result in mg/L free chlorine, mg/l combined chlorine, 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.
- 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]
CrO_4^{2-}	0.01
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



^{a)} determination of free, combined and total | ^{a)} 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 Cl₂^{a)}****CL6****DPD****Material**

EN

Required material (partly optional):

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

Available Standards

Title	Packaging Unit	Part Number
ValidCheck Chlorine 1,5 mg/l	1 Pieces	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).

Remarks

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.

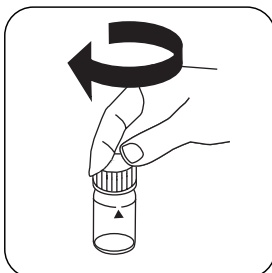
In addition, choose the test: free

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

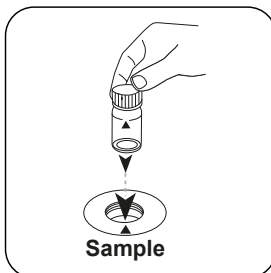
EN



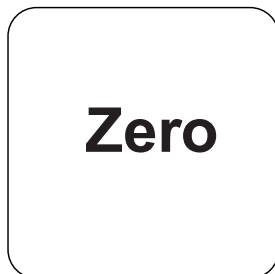
Fill 24 mm vial with **10 mL sample**.



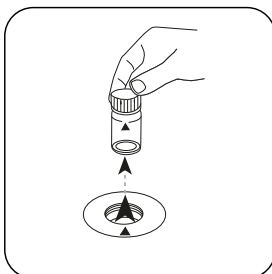
Close vial(s).



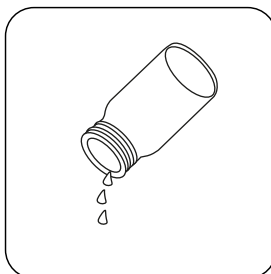
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

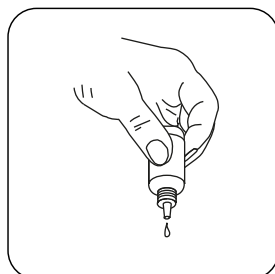


Remove the vial from the sample chamber.

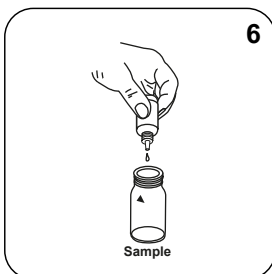


Empty vial.

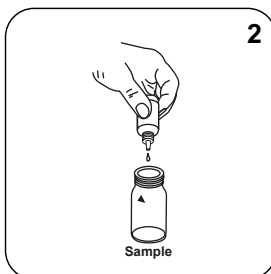
For devices that require **no ZERO measurement**, start here.



Hold cuvettes vertically and add equal drops by pressing slowly.



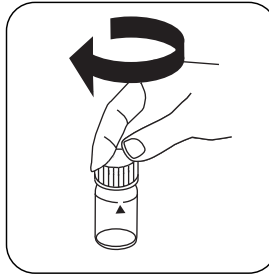
Add **6 drops DPD 1 Buffer Solution** to the **sample vial**.



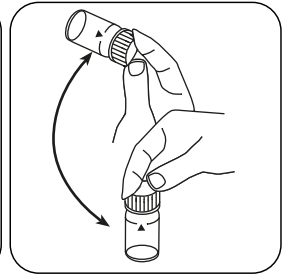
Add **2 drops DPD 1 Reagent Solution** to the **sample vial**.



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

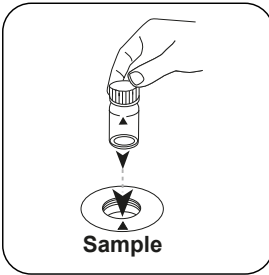


Close vial(s).

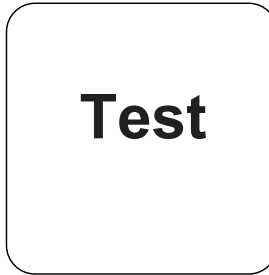


Invert several times to mix the contents.

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

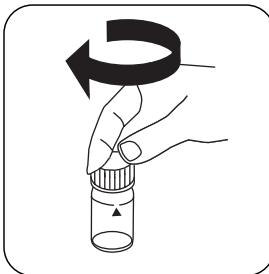
Select the method on the device.

In addition, choose the test: total

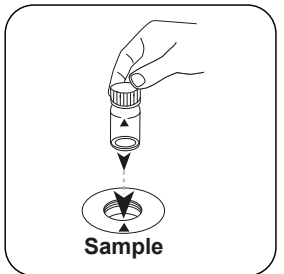
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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



Close vial(s).

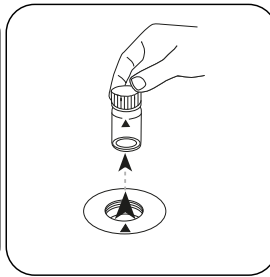


Place **sample vial** in the sample chamber. Pay attention to the positioning.

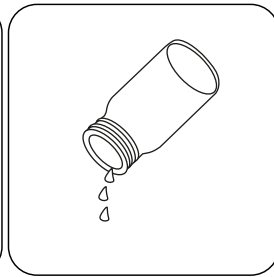


Zero

Press the **ZERO** button.

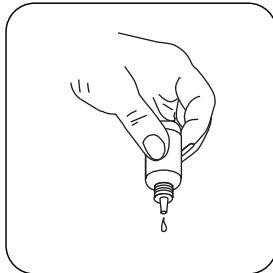


Remove the vial from the sample chamber.

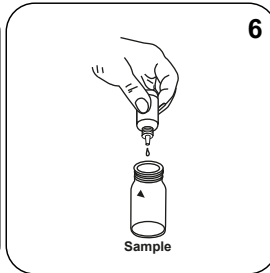


Empty vial.

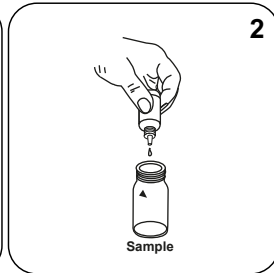
For devices that require **no ZERO measurement**, start here.



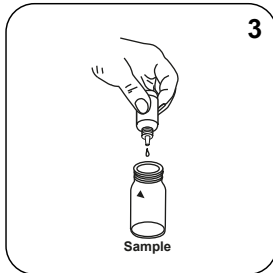
Hold cuvettes vertically and add equal drops by pressing slowly.



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



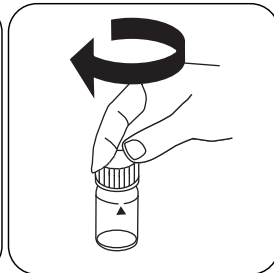
Add **2 drops DPD 1 Reagent Solution** to the **sample vial**.



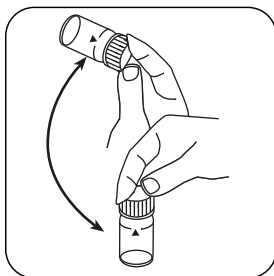
Add **3 drops DPD 3 Solution** to the **sample vial**.



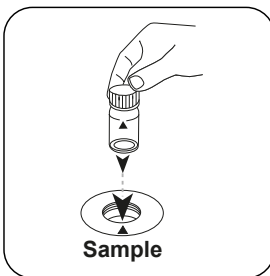
Fill up vial with **sample** to the **10 mL mark**.



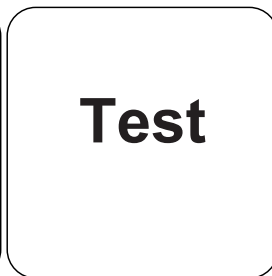
Close vial(s).



Invert several times to mix the contents.



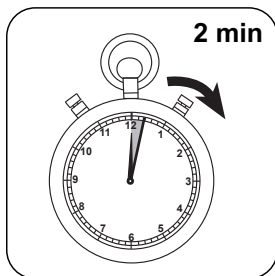
Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

Test

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.

Determination of Chlorine differentiated with liquid reagent

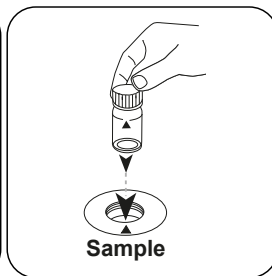
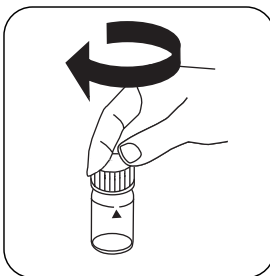
Select the method on the device.

In addition, choose the test: differentiated

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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

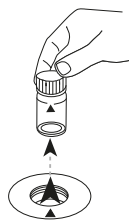


Place **sample vial** in the sample chamber. Pay attention to the positioning.

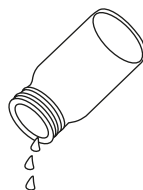


Zero

Press the **ZERO** button.

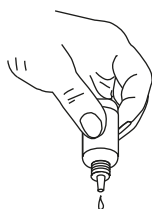


Remove the vial from the sample chamber.



Empty vial.

For devices that require **no ZERO measurement**, start here.



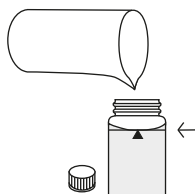
Hold cuvettes vertically and add equal drops by pressing slowly.



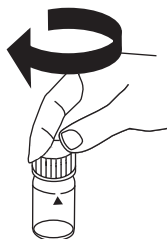
Add **6 drops DPD
1 Buffer Solution** to the sample vial.



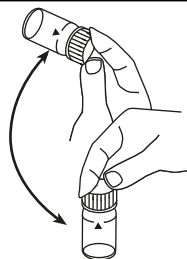
Add **2 drops DPD
1 Reagent Solution** to the sample vial.



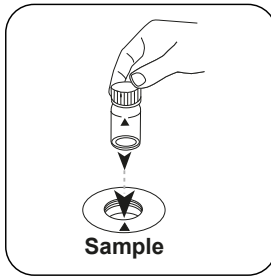
Fill up vial with **sample** to the **10 mL** mark.



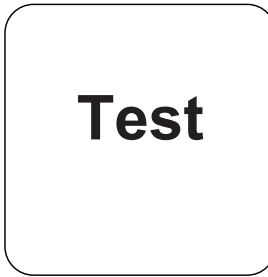
Close vial(s).



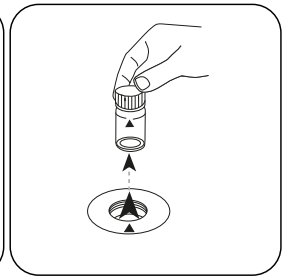
Invert several times to mix the contents.



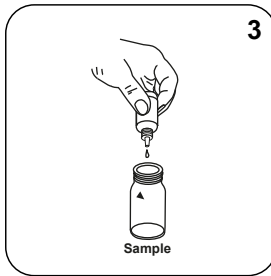
Place **sample vial** in the sample chamber. Pay attention to the positioning.



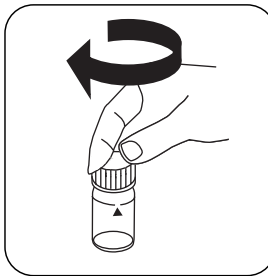
Press the **TEST (XD: START)** button.



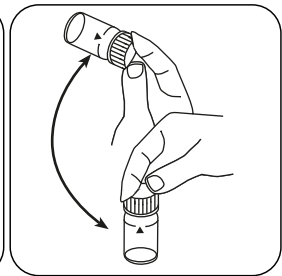
Remove the vial from the sample chamber.



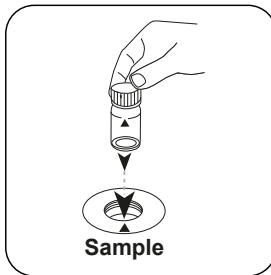
Add **3 drops DPD 3 Solution** to the **sample vial**.



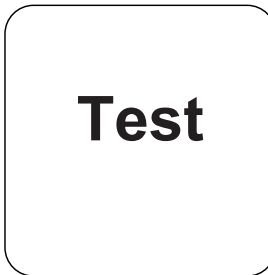
Close vial(s).



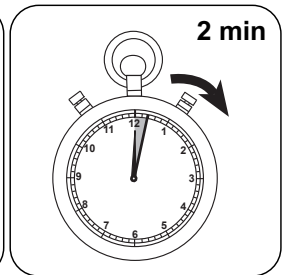
Invert several times to mix the contents.



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



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



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

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

The result in mg/L free chlorine, mg/l gebundenes Chor, 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]
CrO_4^{2-}	0,01
MnO_2	0,01

Conformity

EN ISO 7393-2

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



Chlorine HR T

M103

0.1 - 10 mg/L Cl₂^{a)}

CL10

DPD

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
DPD No. 1 HR	Tablet / 100	511500BT
DPD No. 1 HR	Tablet / 250	511501BT
DPD No. 1 HR	Tablet / 500	511502BT
DPD No. 3 HR	Tablet / 100	511590BT
DPD No. 3 HR	Tablet / 250	511591BT
DPD No. 3 HR	Tablet / 500	511592BT
Set DPD No. 1 HR/No. 3 HR 100 Pc. #	100 each	517791BT
Set DPD No. 1 HR/No. 3 HR 250 Pc. #	250 each	517792BT
DPD No. 1 High Calcium ^{e)}	Tablet / 100	515740BT
DPD No. 1 High Calcium ^{e)}	Tablet / 250	515741BT
DPD No. 1 High Calcium ^{e)}	Tablet / 500	515742BT
DPD No. 3 High Calcium ^{e)}	Tablet / 100	515730BT
DPD No. 3 High Calcium ^{e)}	Tablet / 250	515731BT
DPD No. 3 High Calcium ^{e)}	Tablet / 500	515732BT
DPD No.3 HR Evo	Tablet / 100	511920BT
DPD No. 3 HREvo	Tablet / 250	511921BT
DPD No. 3 HREvo	Tablet / 500	511922BT

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).

EN

Remarks

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 HR with tablet

Select the method on the device.

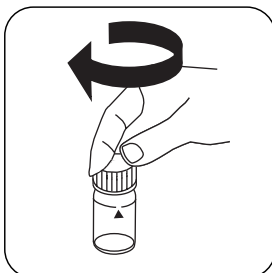
In addition, choose the test: free

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

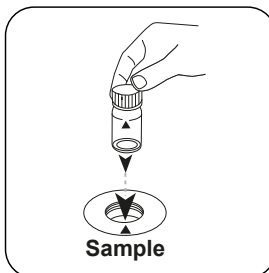
EN



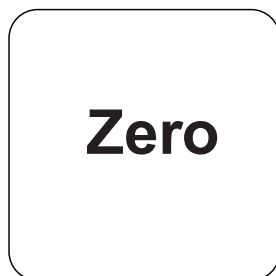
Fill 24 mm vial with **10 mL sample**.



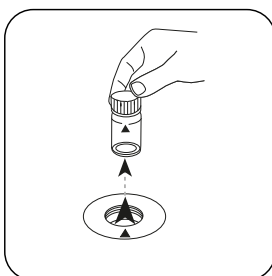
Close vial(s).



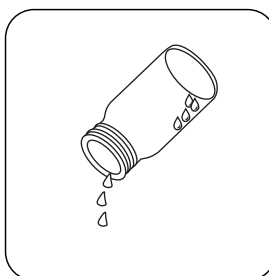
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

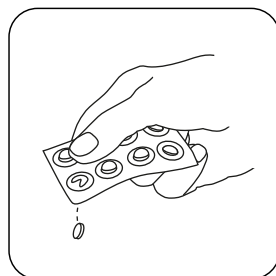


Remove the vial from the sample chamber.

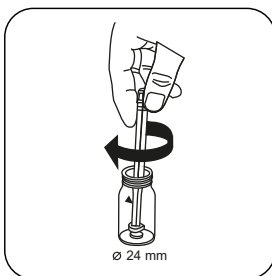


Empty vial except for a few drops.

For devices that require **no ZERO measurement**, start here.



Add **DPD No. 1 HR tablet**.



Crush tablet(s) by rotating slightly.



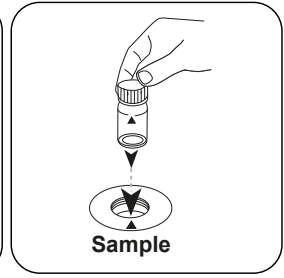
Fill up vial with **sample** to the **10 mL mark**.



Close vial(s).



Dissolve tablet(s) by inverting.



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

EN

Test

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

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

Determination of total Chlorine HR with tablet

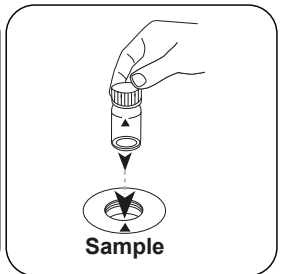
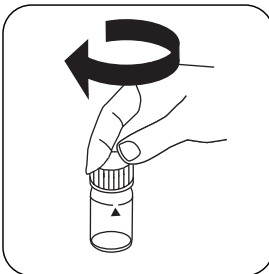
Select the method on the device.

In addition, choose the test: total

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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

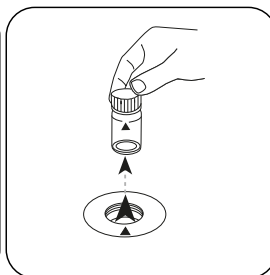


Place **sample vial** in the sample chamber. Pay attention to the positioning.

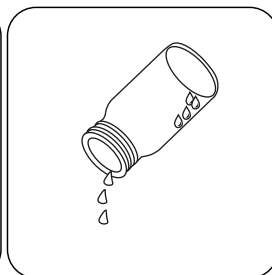


Zero

Press the **ZERO** button.

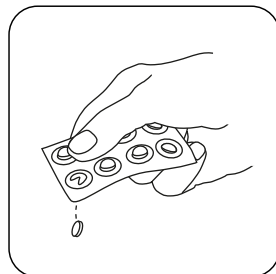


Remove the vial from the sample chamber.

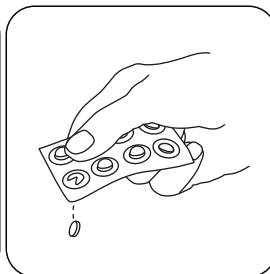


Empty vial except for a few drops.

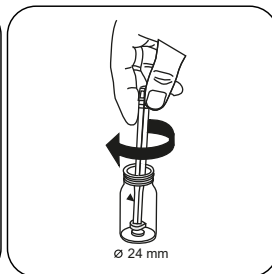
For devices that require **no ZERO measurement**, start here.



Add **DPD No. 1 HR tablet**.



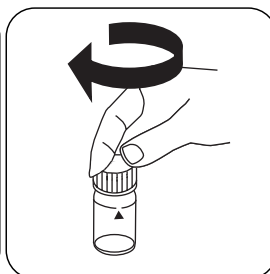
Add **DPD No. 3 HR tablet**.



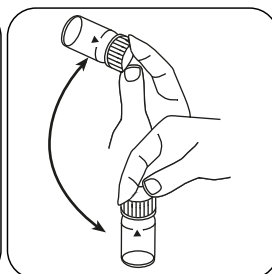
Crush tablet(s) by rotating slightly.



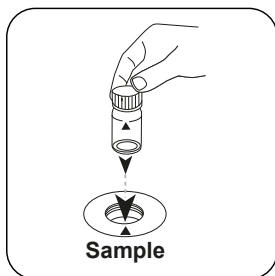
Fill up vial with **sample** to the **10 mL mark**.



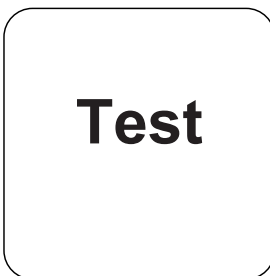
Close vial(s).



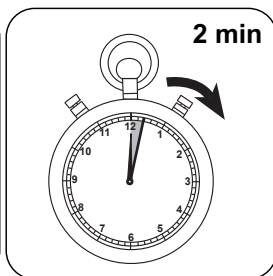
Dissolve tablet(s) by inverting.



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



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 mg/L total Chlorine appears on the display.

Determination of Chlorine HR differentiated with tablet

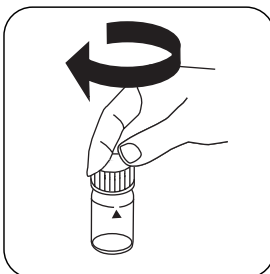
Select the method on the device.

In addition, choose the test: differentiated

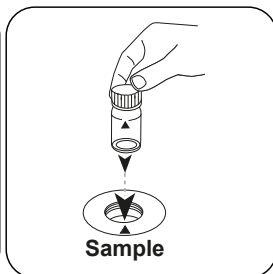
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



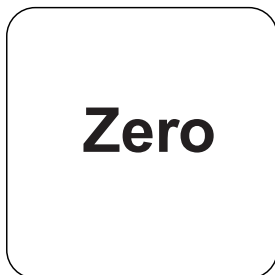
Fill 24 mm vial with **10 mL sample**.



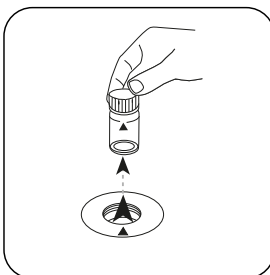
Close vial(s).



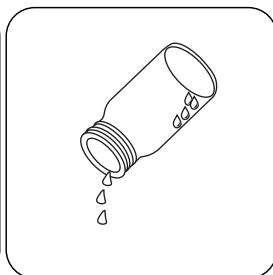
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

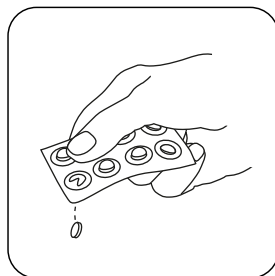


Remove the vial from the sample chamber.

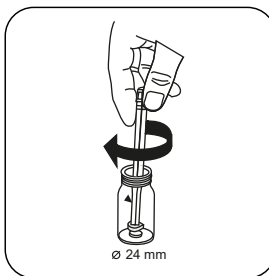


Empty vial except for a few drops.

For devices that require **no ZERO measurement**, start here.



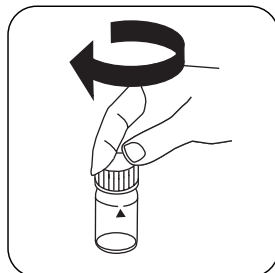
Add **DPD No. 1 HR tablet**.



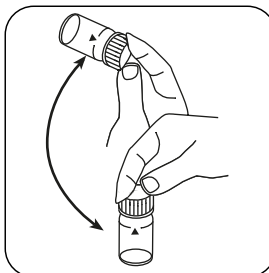
Crush tablet(s) by rotating slightly.



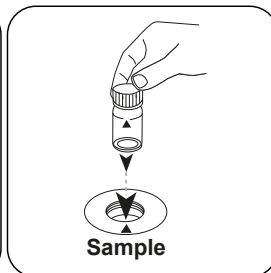
Fill up vial with **sample** to the **10 mL mark**.



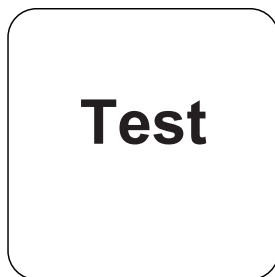
Close vial(s).



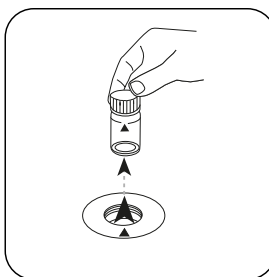
Dissolve tablet(s) by inverting.



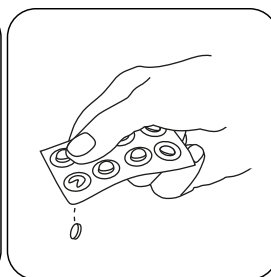
Place **sample vial** in the sample chamber. Pay attention to the positioning.



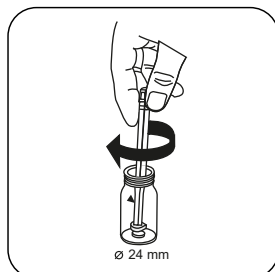
Press the **TEST (XD: START)** button.



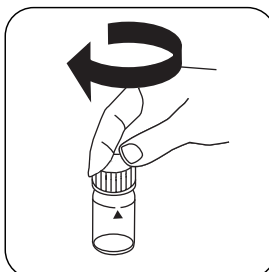
Remove the vial from the sample chamber.



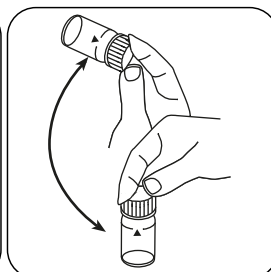
Add **DPD No. 3 HR tablet**.



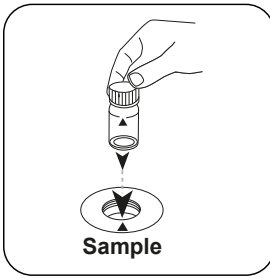
Crush tablet(s) by rotating slightly.



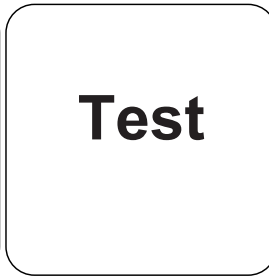
Close vial(s).



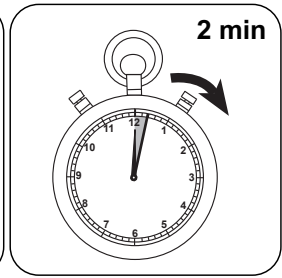
Dissolve tablet(s) by inverting.



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



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



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

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

The result in mg/L free chlorine, mg/l combined chlorine, mg/l total chlorine appears on the display.

EN



Chemical Method

DPD

Appendix

EN

Interferences

Persistent Interferences

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

Removeable Interferences

- Interference from Copper and Iron (III) are eliminated by the addition of EDTA.
- 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.

Conformity

EN ISO 7393-2

^{a)} determination of free, combined and total | ^{a)} 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 | * including stirring rod, 10 cm



Chlorine HR (KI) T

M105

5 - 200 mg/L Cl₂

CLHr

KI / Acid

Material

EN

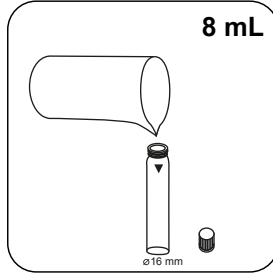
Required material (partly optional):

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

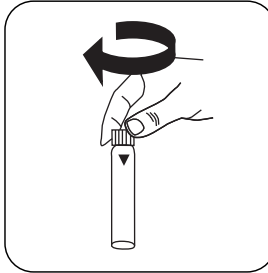
Determination of Chlorine HR (KI) with Tablet

Select the method on the device.

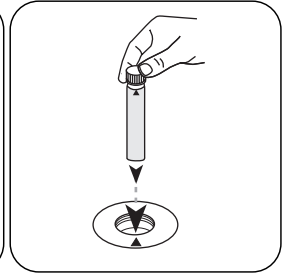
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



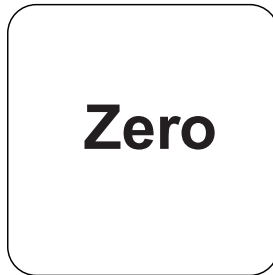
Fill 16 mm vial with **8 mL sample**.



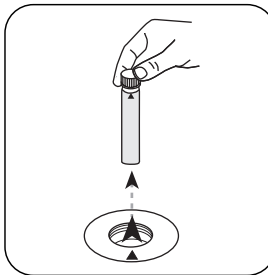
Close vial(s).



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

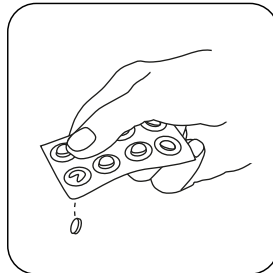


Press the **ZERO** button.

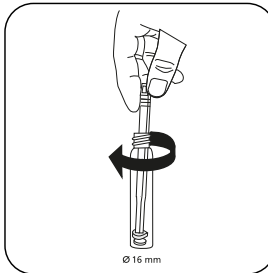


Remove **vial** from the sample chamber.

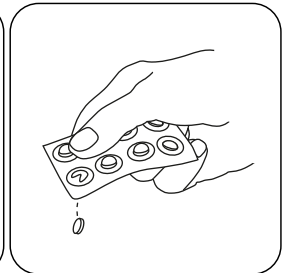
For devices that require **no ZERO measurement**, start here.



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



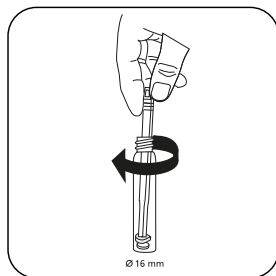
Crush tablet(s) by rotating slightly.



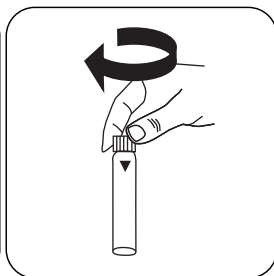
Add **ACIDIFYING GP tablet**.



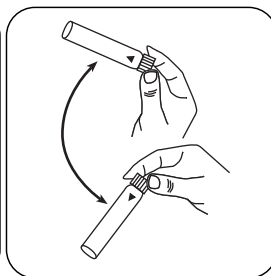
EN



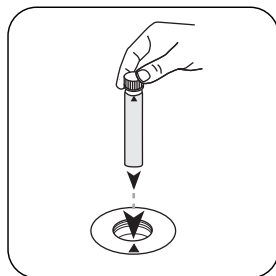
Crush tablet(s) by rotating slightly.



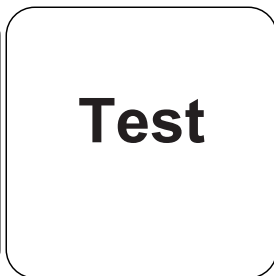
Close vial(s).



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

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

Derived from

EN ISO 7393-3

* including stirring rod, 10 cm

EN



Chlorine PP

M110

0.02 - 2 mg/L Cl₂ ^{a)}

CL2

DPD

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Chlorine Free DPD F10	Powder / 100 Pieces	530100
Chlorine Free DPD F10	Powder / 1000 Pieces	530103
Chlorine Total DPD F10	Powder / 100 Pieces	530120
Chlorine Total DPD F10	Powder / 1000 Pieces	530123

Available Standards

Title	Packaging Unit	Part Number
ValidCheck Chlorine 1,5 mg/l	1 Pieces	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).

EN



Determination of free chlorine with powder packs

Select the method on the device.

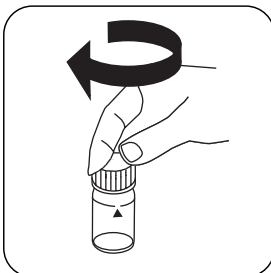
In addition, choose the test: free

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

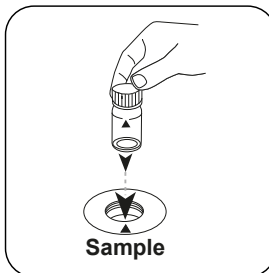
EN



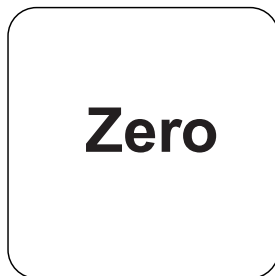
Fill 24 mm vial with **10 mL sample**.



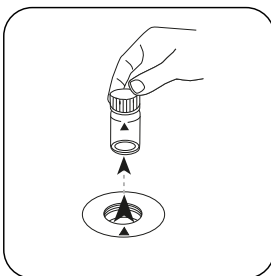
Close vial(s).



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

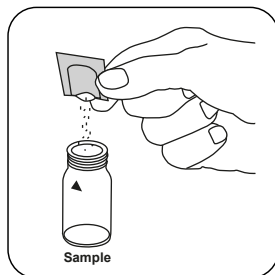


Press the **ZERO** button.

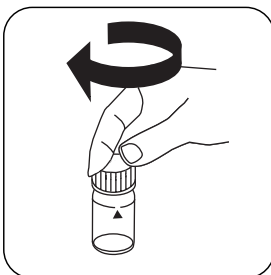


Remove the vial from the sample chamber.

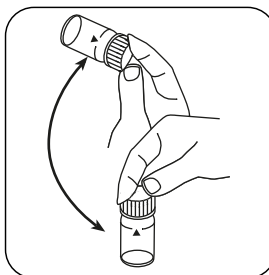
For devices that require **no ZERO measurement**, start here.



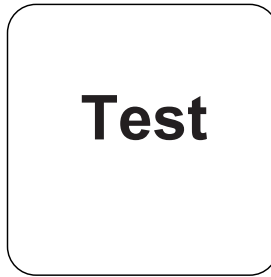
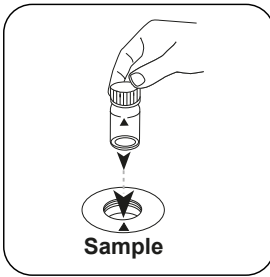
Add **Chlorine FREE-DPD/ F10 powder pack**.



Close vial(s).



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



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

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

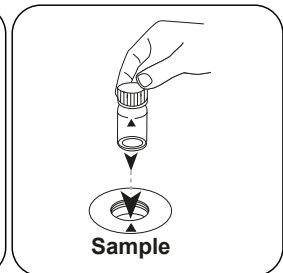
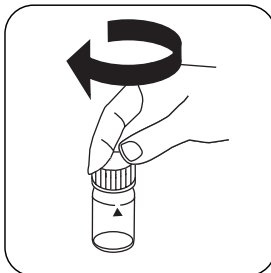
The result in mg/L free chlorine appears on the display.

Determination of totale Chlorine with powder packs

Select the method on the device.

In addition, choose the test: total

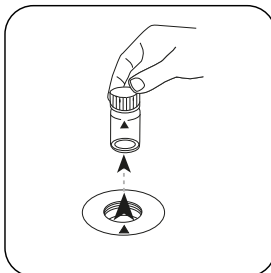
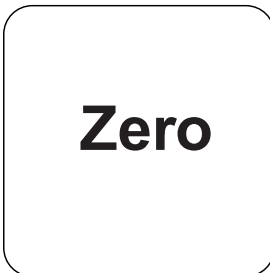
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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

Close vial(s).

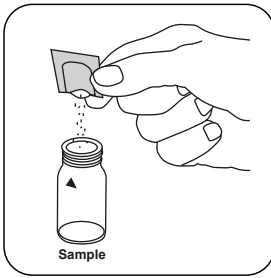
Place **sample vial** in the sample chamber. Pay attention to the positioning.



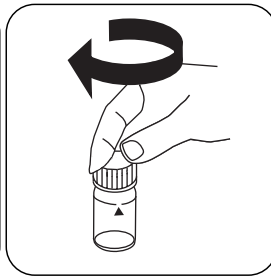
Press the **ZERO** button.

Remove the vial from the sample chamber.

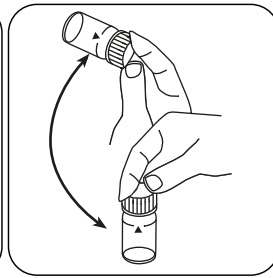
For devices that require **no ZERO measurement**, start here.



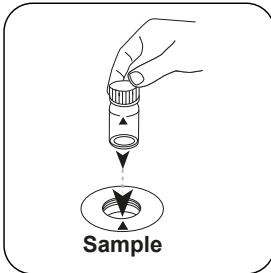
Add **Chlorine TOTAL-DPD/ F10 powder pack**.



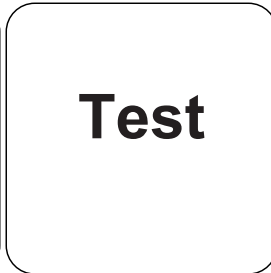
Close vial(s).



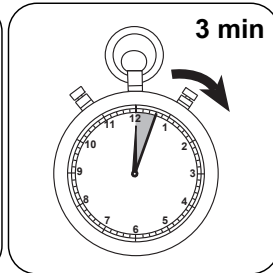
Invert several times to mix the contents (20 sec.).



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



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



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

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

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

Determination of Chlorine differentiated with powder packs

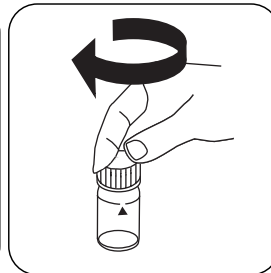
Select the method on the device.

In addition, choose the test: differentiated

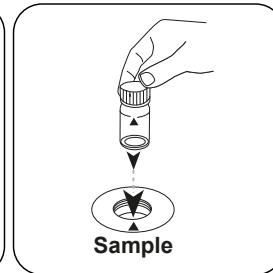
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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



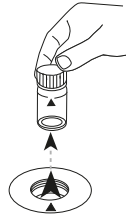
Close vial(s).



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

Zero

Press the **ZERO** button.

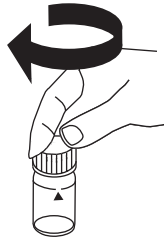


Remove the vial from the sample chamber.

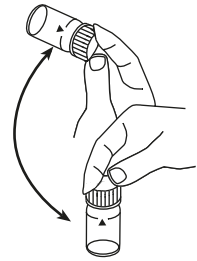
For devices that require **no ZERO measurement**, start here.



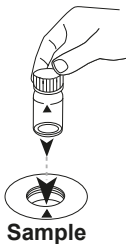
Add **Chlorine FREE-DPD/ F10 powder pack**.



Close vial(s).



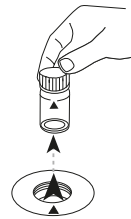
Invert several times to mix the contents (20 sec.).



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

Test

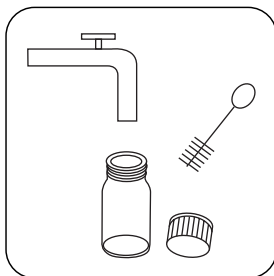
Press the **TEST** (XD: **START**) button.



Remove the vial from the sample chamber.



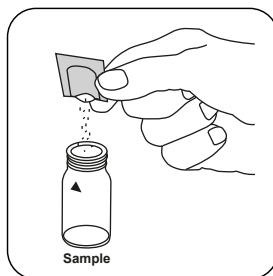
EN



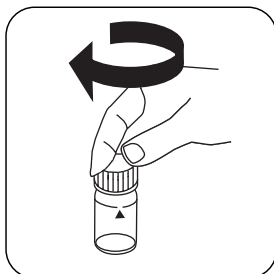
Thoroughly clean the vial and vial cap.



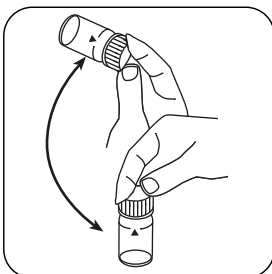
Fill 24 mm vial with **10 mL sample**.



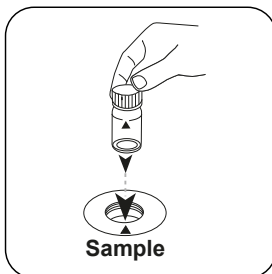
Add **TOTAL-DPD/F10 powder pack**.



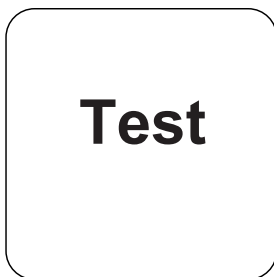
Close vial(s).



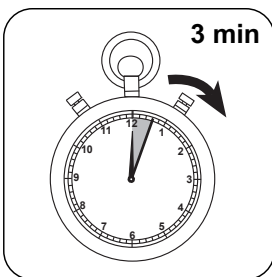
Invert several times to mix the contents (20 sec.).



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 free chlorine, mg/l combined chlorine, mg/l total chlorine appears on the display.

Chemical Method

DPD

Appendix

Interferences

Persistent Interferences

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

Removeable Interferences

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

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

Method Validation

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

Conformity

EN ISO 7393-2

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



Chlorine HR PP

M111

0.1 - 8 mg/L Cl₂ ^{a)}

CL8

DPD

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Chlorine Free DPD F10	Powder / 100 Pieces	530100
Chlorine Free DPD F10	Powder / 1000 Pieces	530103
Chlorine Total DPD F10	Powder / 100 Pieces	530120
Chlorine Total DPD F10	Powder / 1000 Pieces	530123

Sampling

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

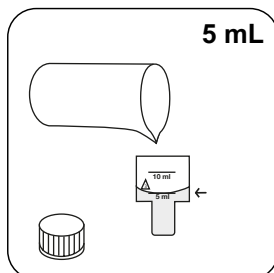
Preparation

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

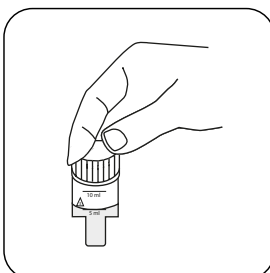
Determination of free chlorine HR with powder packs

In addition, choose the test: free

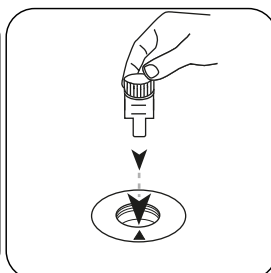
Select the method on the device.



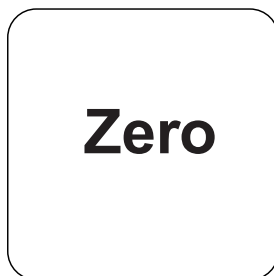
Fill 10 mm vial with **5 mL sample**.



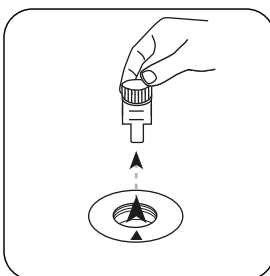
Close vial(s).



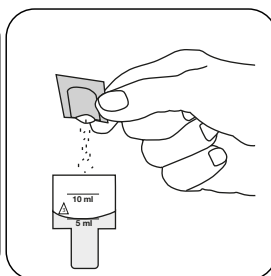
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



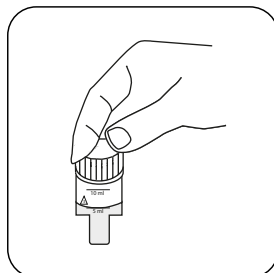
Press the **ZERO** button.



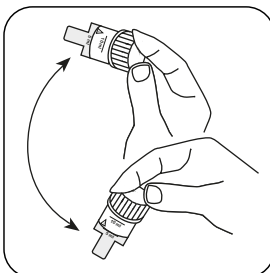
Remove **vial** from the sample chamber.



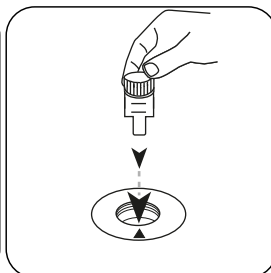
Add **two Chlorine FREE-DPD / F10 powder packs**.



Close vial(s).



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



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



Test

EN

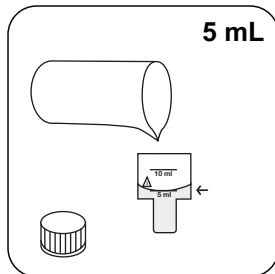
Press the **TEST** (XD:
START) button.

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

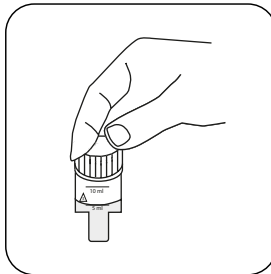
Determination of totale Chlorine HR with powder packs

In addition, choose the test: total

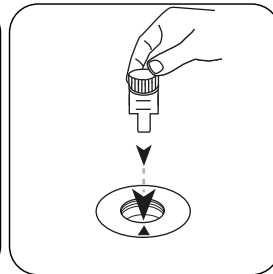
Select the method on the device.



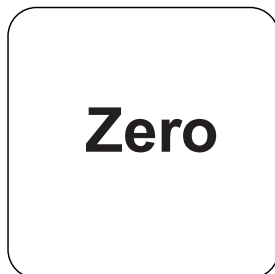
Fill 10 mm vial with **5 mL**
sample.



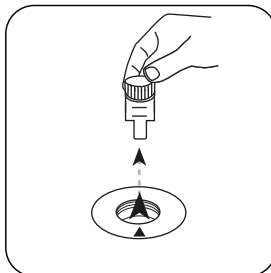
Close vial(s).



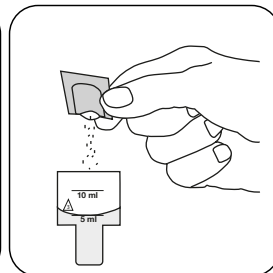
Place **sample vial** in the
sample chamber. • Pay
attention to the positioning.



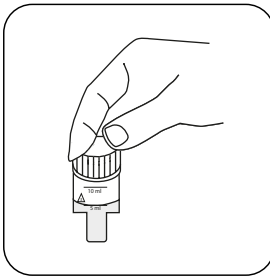
Press the **ZERO** button.



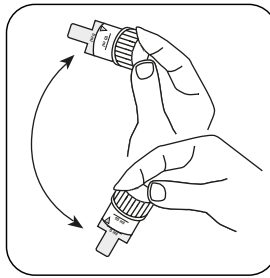
Remove **vial** from the
sample chamber.



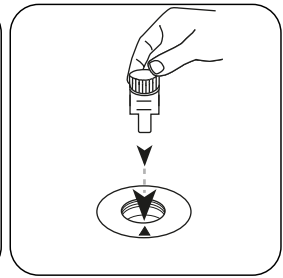
Add **two Chlorine TOTAL-
DPD / F10 powder packs** .



Close vial(s).

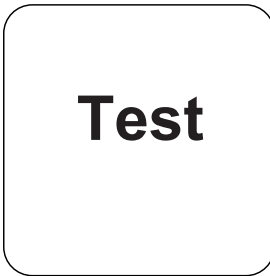


Invert several times to mix the contents (20 sec.).

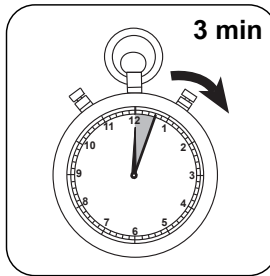


Place **sample vial** in the sample chamber. • Pay attention to the positioning.

EN



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



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

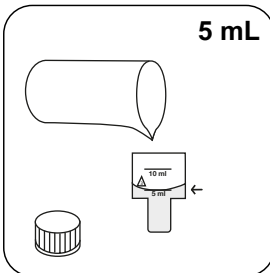
Once the reaction period is finished, the measurement takes place automatically.

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

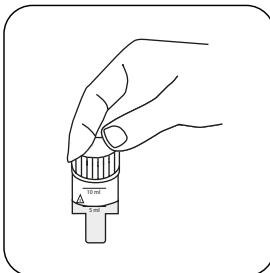
Determination of Chlorine HR differentiated with powder packs

Select the method on the device.

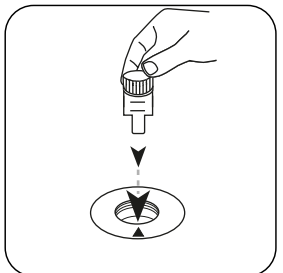
In addition, choose the test: differentiated



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



Close vial(s).

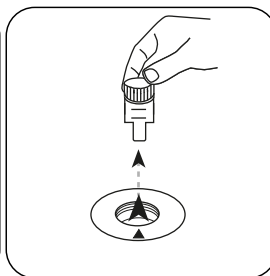


Place **sample vial** in the sample chamber. • Pay attention to the positioning.

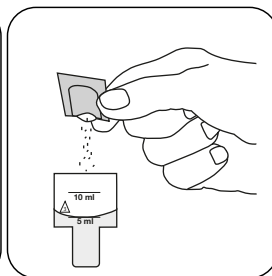


Zero

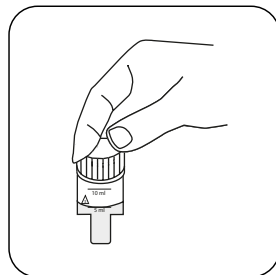
Press the **ZERO** button.



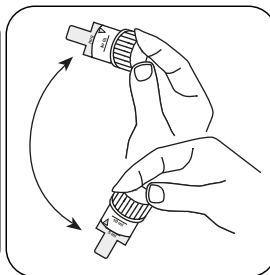
Remove **vial** from the sample chamber.



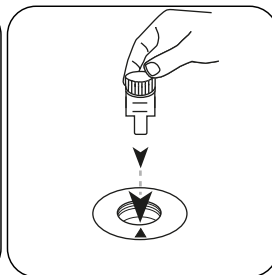
Add **two Chlorine FREE-DPD / F10 powder packs**.



Close vial(s).



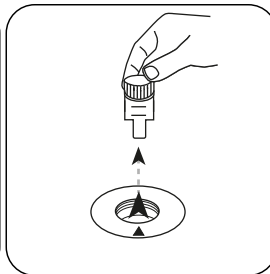
Invert several times to mix the contents (20 sec.).



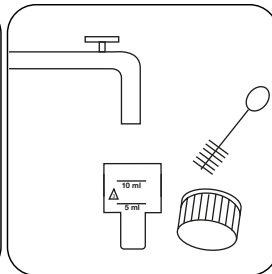
Place **sample vial** in the sample chamber. • Pay attention to the positioning.

Test

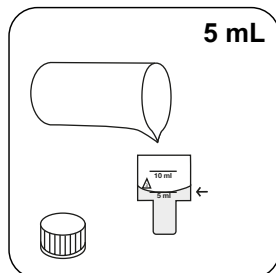
Press the **TEST (XD: START)** button.



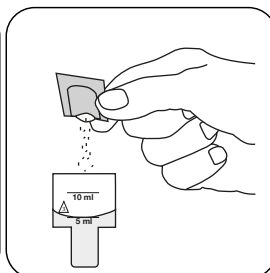
Remove **vial** from the sample chamber.



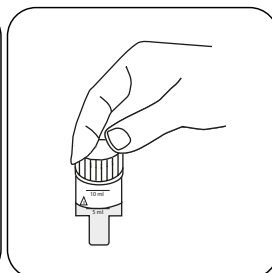
Thoroughly clean the vial and vial cap.



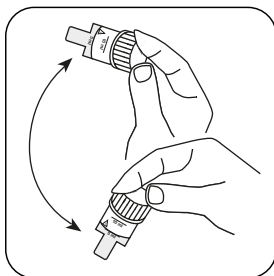
Fill 10 mm vial with **5 mL sample**.



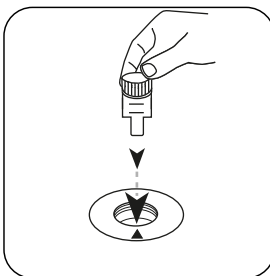
Add **two Chlorine TOTAL-DPD / F10 powder packs**.



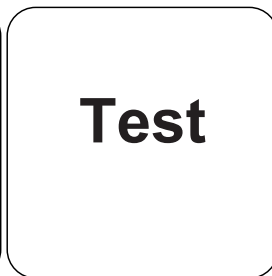
Close vial(s).



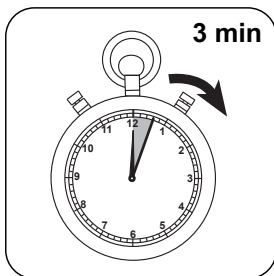
Invert several times to mix the contents (20 sec.).



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



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



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

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

The result in mg/L free chlorine, mg/l combined chlorine, mg/l total chlorine appears on the display.



Chemical Method

DPD

Appendix

EN

Interferences

Persistent Interferences

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

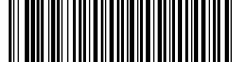
Removeable Interferences

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

Conformity

EN ISO 7393-2

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



Chlorine MR PP

M113

0.02 - 3.5 mg/L Cl₂ ^{a)}

CL2

DPD

EN

Material

Required material (partly optional):

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

Available Standards

Title	Packaging Unit	Part Number
ValidCheck Chlorine 1,5 mg/l	1 Pieces	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).

EN

Remarks

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.

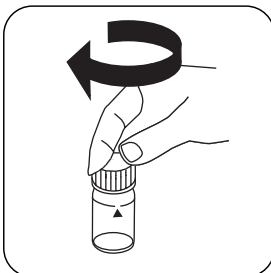
In addition, choose the test: free

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

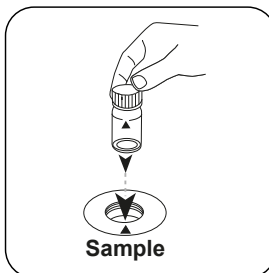
EN



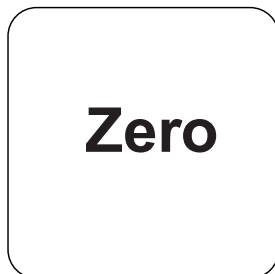
Fill 24 mm vial with **10 mL sample**.



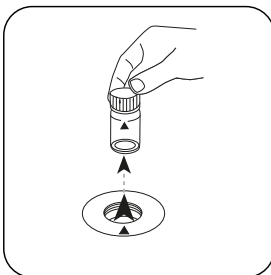
Close vial(s).



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

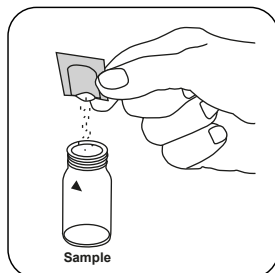


Press the **ZERO** button.

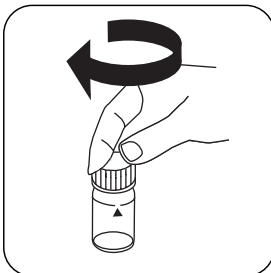


Remove the vial from the sample chamber.

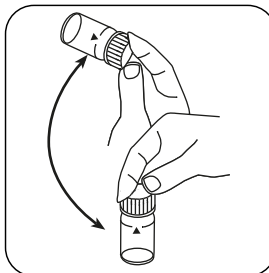
For devices that require **no ZERO measurement**, start here.



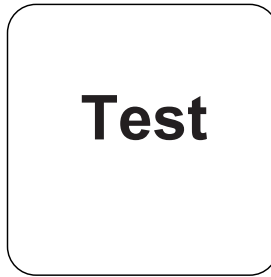
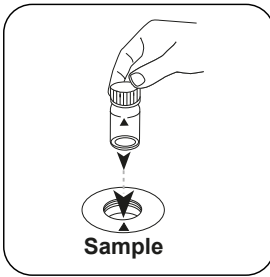
Add **VARIO Chlorine FREE-DPD/ F10 powder pack**.



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.

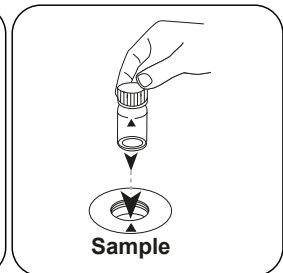
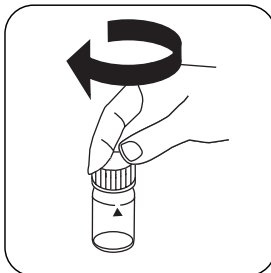
The result in mg/L free chlorine appears on the display.

Determination of Chlorine differentiated MR with powder packs

Select the method on the device.

In addition, choose the test: differentiated

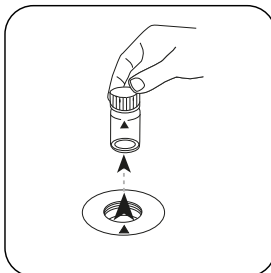
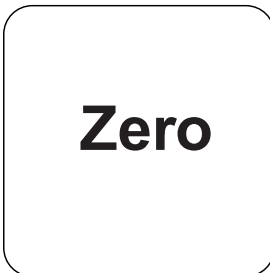
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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

Close vial(s).

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



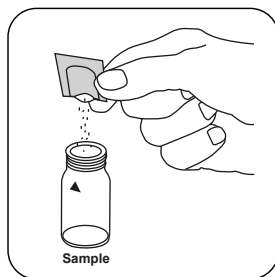
Press the **ZERO** button.

Remove the vial from the sample chamber.

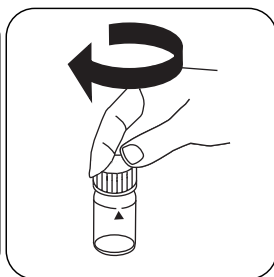
For devices that require **no ZERO measurement**, start here.



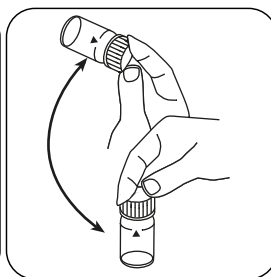
EN



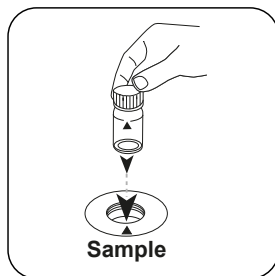
Add **VARIO Chlorine FREE-DPD/ F10 powder pack**.



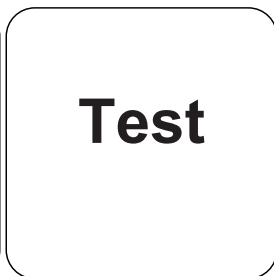
Close vial(s).



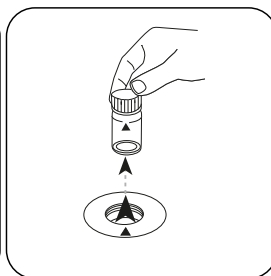
Invert several times to mix the contents (20 sec.).



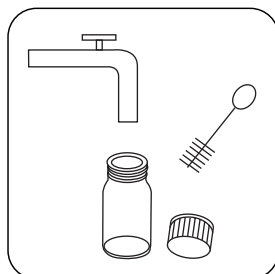
Place **sample vial** in the sample chamber. Pay attention to the positioning.



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



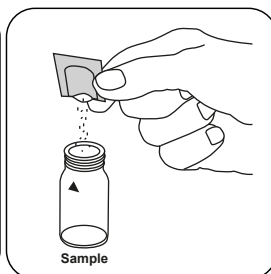
Remove the vial from the sample chamber.



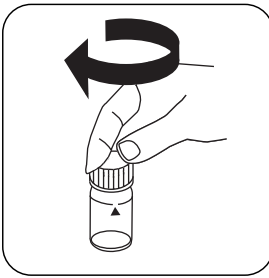
Thoroughly clean the vial and vial cap.



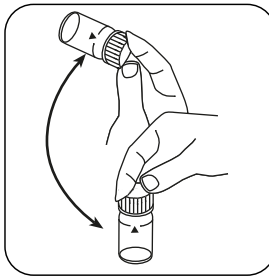
Fill 24 mm vial with **10 mL** sample.



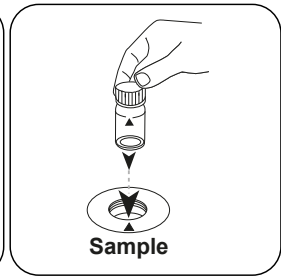
Add **Chlorine TOTAL-DPD/ F10 powder pack**.



Close vial(s).

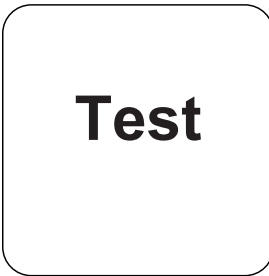


Invert several times to mix the contents (20 sec.).

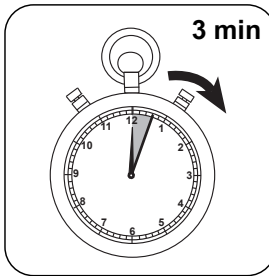


Place **sample vial** in the sample chamber. Pay attention to the positioning.

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

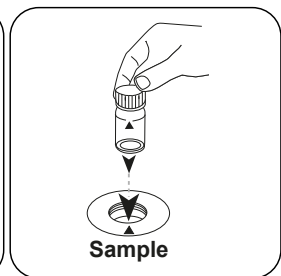
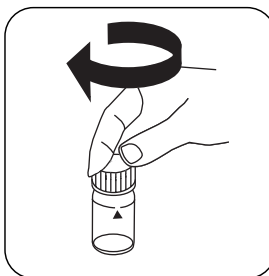
Select the method on the device.

In addition, choose the test: total

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



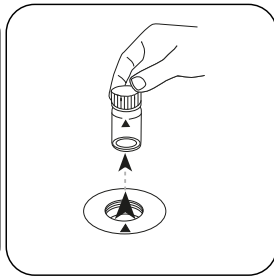
Fill 24 mm vial with **10 mL sample**. Close vial(s).



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



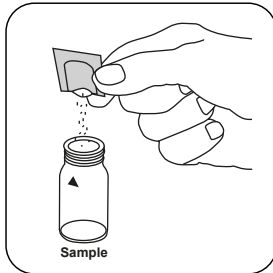
Zero



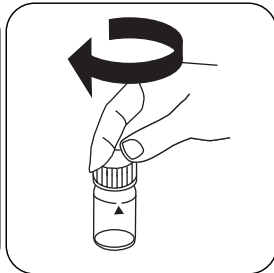
Press the **ZERO** button.

Remove the vial from the sample chamber.

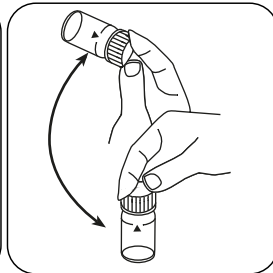
For devices that require **no ZERO measurement**, start here.



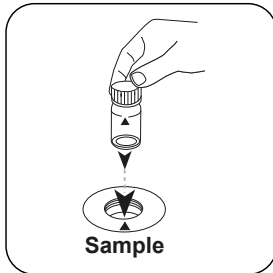
Add **VARIO Chlorine TOTAL-DPD/ F10 powder pack**.



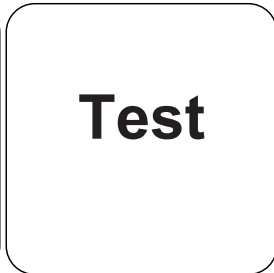
Close vial(s).



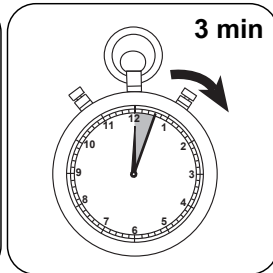
Invert several times to mix the contents (20 sec.).



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 ₄ ²⁻	0.01
MnO ₂	0.01

Method Validation

Limit of Detection	0.01 mg/L
Limit of Quantification	0.03 mg/L
End of Measuring Range	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 %

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



Chlorine dioxide T

M120

0.02 - 11 mg/L ClO₂

CLO2

DPD / Glycine

Material

EN

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
Glycine ⁹⁾	Tablet / 100	512170BT
Glycine ⁹⁾	Tablet / 250	512171BT
DPD No. 3 High Calcium ⁹⁾	Tablet / 100	515730BT
DPD No. 3 High Calcium ⁹⁾	Tablet / 250	515731BT
DPD No. 3 High Calcium ⁹⁾	Tablet / 500	515732BT
DPD No. 1 High Calcium ⁹⁾	Tablet / 100	515740BT
DPD No. 1 High Calcium ⁹⁾	Tablet / 250	515741BT
DPD No. 1 High Calcium ⁹⁾	Tablet / 500	515742BT
Set DPD No. 1/No. 3 100 Pc. #	100 each	517711BT
Set DPD No. 1/No. 3 250 Pc. #	250 each	517712BT
Set DPD No. 1/Glycine 100 Stck. #	100 each	517731BT
Set DPD No. 1/Glycine 250 Stck. #	250 each	517732BT
Set DPD No. 1/No. 3 High Calcium 100 Pc. #	100 each	517781BT
Set DPD No. 1/No. 3 High Calcium 250 Pc. #	250 each	517782BT
DPD No. 3 Evo	Tablet / 100	511420BT
DPD No. 3 Evo	Tablet / 250	511421BT
DPD No. 3 Evo	Tablet / 500	511422BT



Sampling

1. When preparing the sample, 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 dioxide. 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. Strong alkaline or acidic water samples must be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

EN

Remarks

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 Chlorine Dioxide, in absence of chlorine with tablet

Select the method on the device.

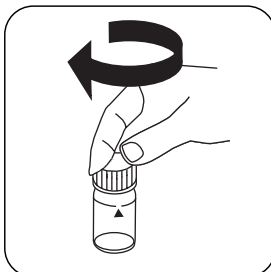
In addition, choose the test: without Chlorine

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

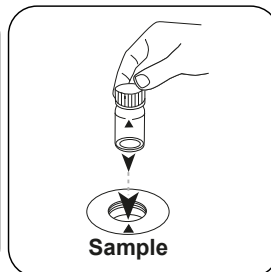
EN



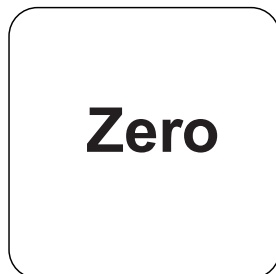
Fill 24 mm vial with **10 mL sample**.



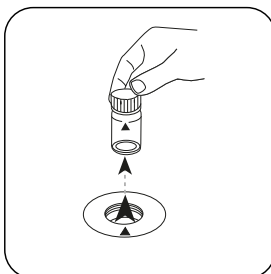
Close vial(s).



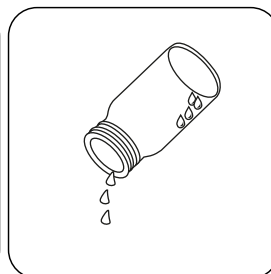
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

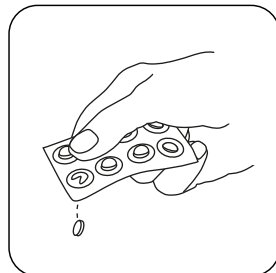


Remove the vial from the sample chamber.

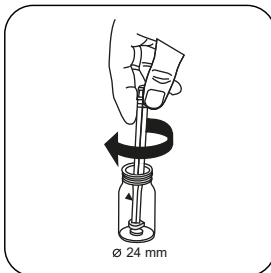


Empty vial except for a few drops.

For devices that require **no ZERO measurement**, start here.



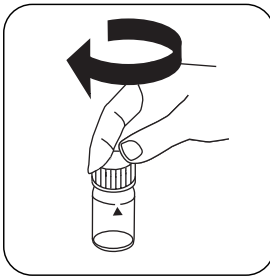
Add **DPD No.1 tablet**.



Crush tablet(s) by rotating slightly.



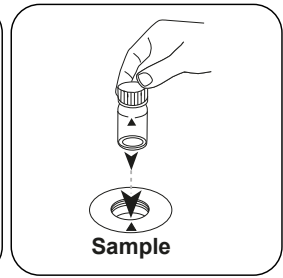
Fill up vial with **sample** to the **10 mL mark**.



Close vial(s).



Dissolve tablet(s) by inverting.



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

EN

Test

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

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

Determination of Chlorine Dioxide, in presence of chlorine with tablet

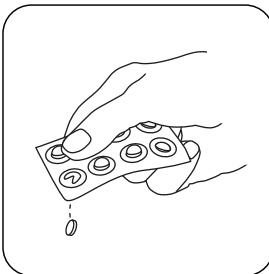
Select the method on the device.

In addition, choose the test: in presence of Chlorine

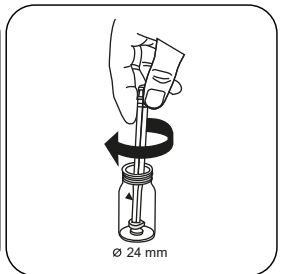
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



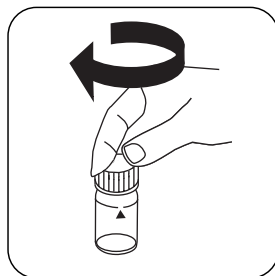
Fill 24 mm vial with **10 mL sample**.



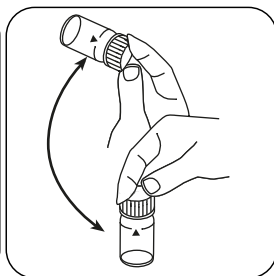
Add **GLYCINE tablet**.



Crush tablet(s) by rotating slightly.



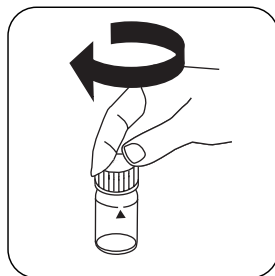
Close vial(s).



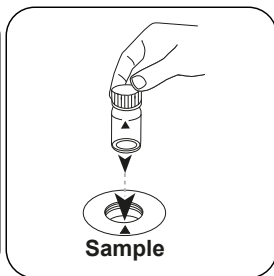
Dissolve tablet(s) by inverting.



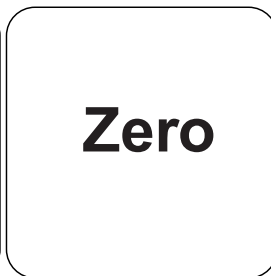
Fill a **second** vial with **10 mL sample** .



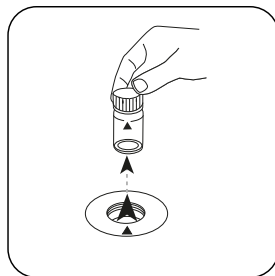
Close vial(s).



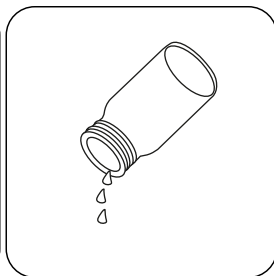
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

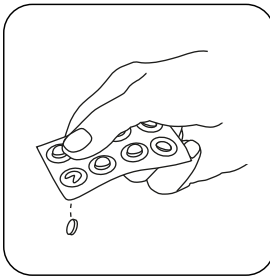


Remove the vial from the sample chamber.

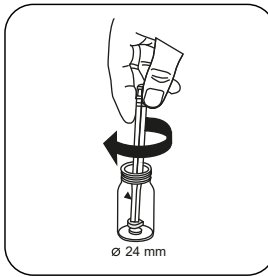


Empty vial.

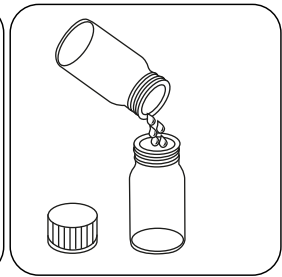
For devices that require **no ZERO measurement** , **start here**.



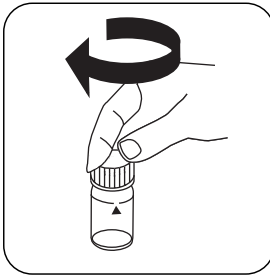
Add **DPD No. 1 tablet** .



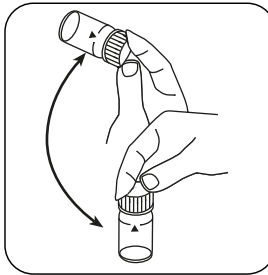
Crush tablet(s) by rotating slightly.



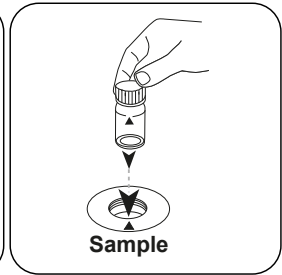
Fill prepared vial with prepared **glycine solution**.



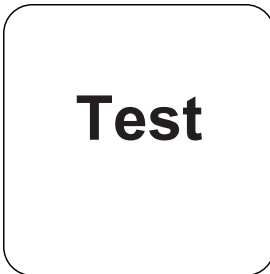
Close vial(s).



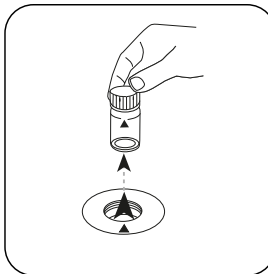
Dissolve tablet(s) by inverting.



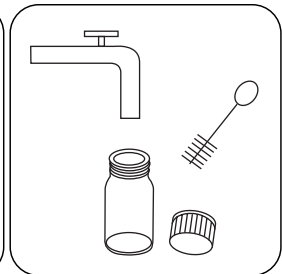
Place **sample vial** in the sample chamber. Pay attention to the positioning.



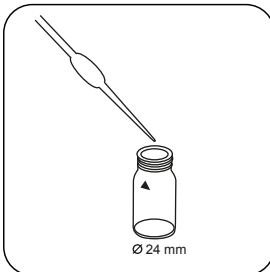
Press the **TEST** (XD: **START**) button.



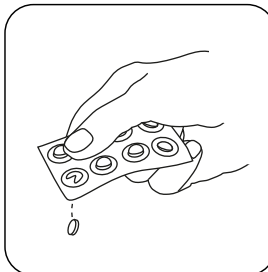
Remove the vial from the sample chamber.



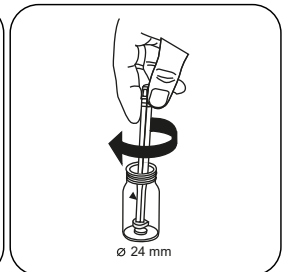
Thoroughly clean the vial and vial cap.



Fill vial with **some drops of sample**.



Add **DPD No. 1 tablet** .



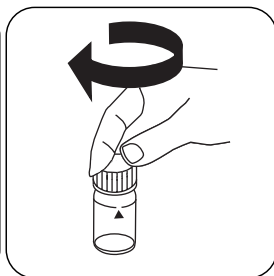
Crush tablet(s) by rotating slightly.



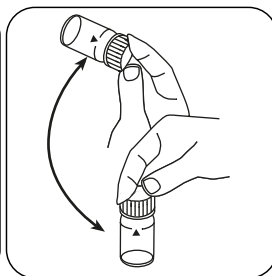
EN



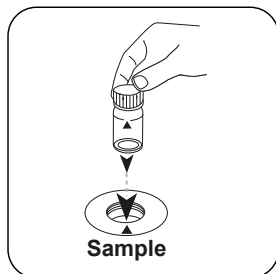
Fill up vial with **sample** to the **10 mL mark**.



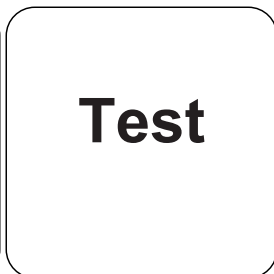
Close vial(s).



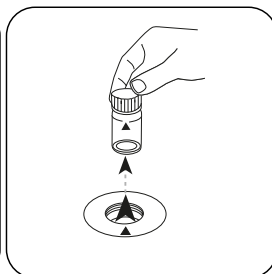
Dissolve tablet(s) by inverting.



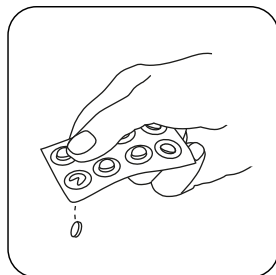
Place **sample vial** in the sample chamber. Pay attention to the positioning.



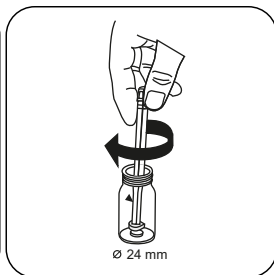
Press the **TEST (XD: START)** button.



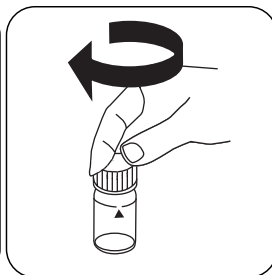
Remove the vial from the sample chamber.



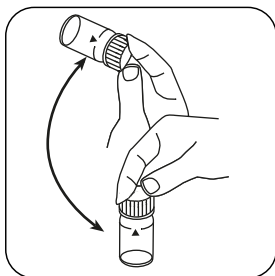
Add **DPD No.3 tablet**.



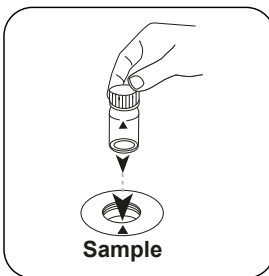
Crush tablet(s) by rotating slightly.



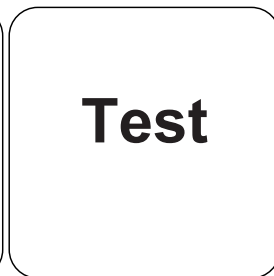
Close vial(s).



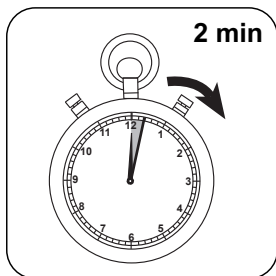
Dissolve tablet(s) by inverting.



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



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



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

Once the reaction period is finished, the measurement takes place automatically. The result in mg/L Chlorine Dioxide 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	ClO ₂	1
mg/l	Cl ₂ frei	0.525
mg/l	Cl ₂ geb.	0.525
mg/l	ges. Cl ₂	0.525

EN

Chemical Method

DPD / Glycine

Appendix

Interferences

Persistent Interferences

1. All oxidising agents in the samples lead to higher results.

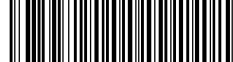
Removeable Interferences

1. Concentrations above 19 mg/L chlorine dioxide can lead to results within the measuring range of up to 0 mg/L. In this case, the water sample must be diluted with water that is free from chlorine dioxide. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again.

Derived from

DIN 38408, Section 5

⁹⁾ 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 | ⁹⁾ additionally required for determination of bromine, chlorine dioxide and ozone in the presence of chlorine | ⁶⁾ including stirring rod, 10 cm



Chlorine dioxide PP

M122

0.04 - 3.8 mg/L ClO₂

CLO2

DPD

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Chlorine Free DPD F10	Powder / 100 Pieces	530100
Chlorine Free DPD F10	Powder / 1000 Pieces	530103
Glycine ⁹	Tablet / 100	512170BT
Glycine ⁹	Tablet / 250	512171BT
VARIO Glycine Reagent 10 %, 29 ml	29 mL	532210

Sampling

1. When preparing the sample, 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 dioxide. 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. Strong alkaline or acidic water samples must be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

Determination of Chlorine Dioxide, in absence of chlorine with powder packs

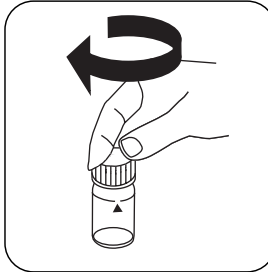
Select the method on the device.

In addition, choose the test: without Chlorine

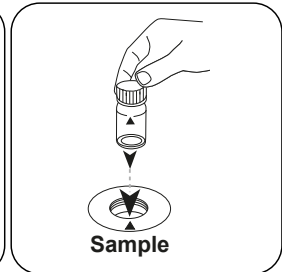
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



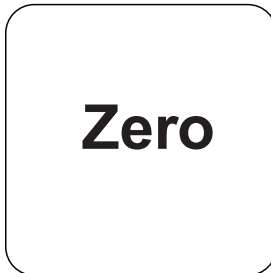
Fill 24 mm vial with **10 mL sample**.



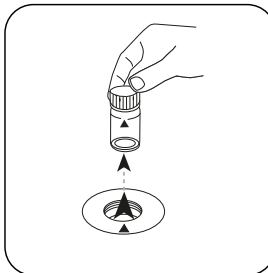
Close vial(s).



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

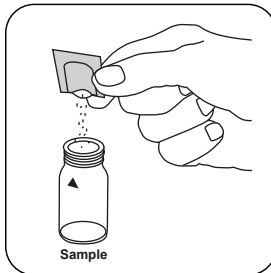


Press the **ZERO** button.

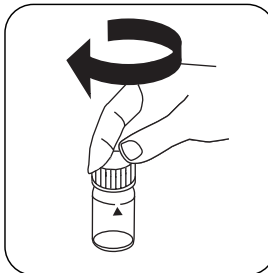


Remove the vial from the sample chamber.

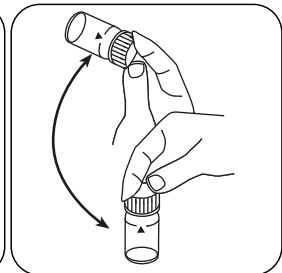
For devices that require **no ZERO measurement**, start here.



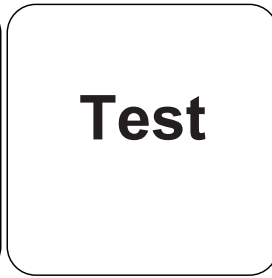
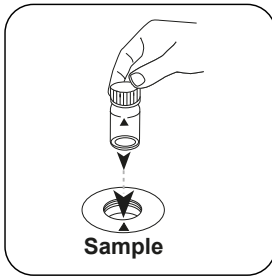
Add **Chlorine FREE-DPD / F10 powder pack**.



Close vial(s).



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



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

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

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

Determination of Chlorine Dioxide, in presence of chlorine with powder packs

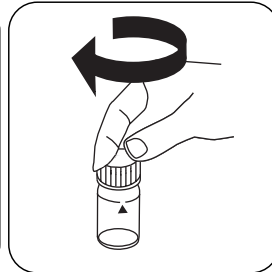
Select the method on the device.

In addition, choose the test: in presence of Chlorine

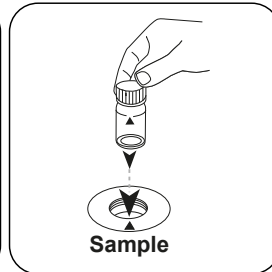
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



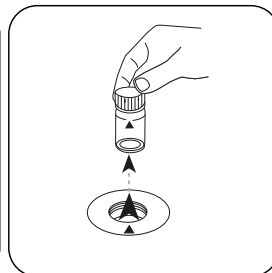
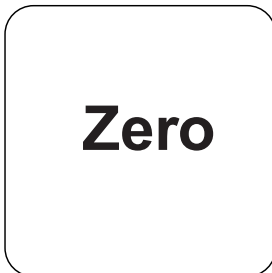
Fill 24 mm vial with **10 mL sample**.



Close vial(s).



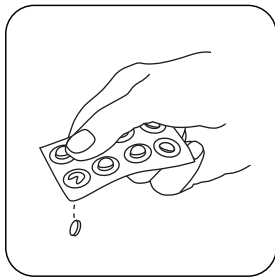
Place **sample vial** in the sample chamber. Pay attention to the positioning.



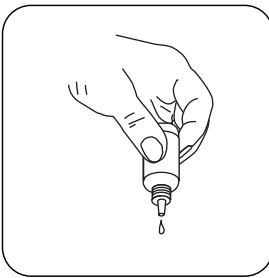
Press the **ZERO** button.

Remove the vial from the sample chamber.

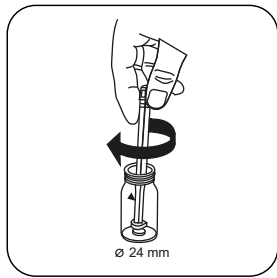
For devices that require **no ZERO measurement**, **start here**.



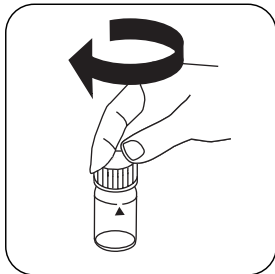
Add **GLYCINE** tablet.



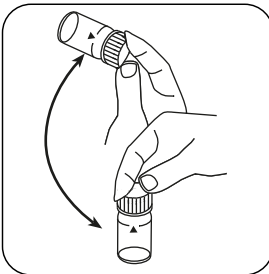
or add 4 drops GLYCINE Reagent.



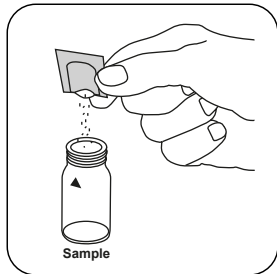
Crush tablet(s) by rotating slightly.



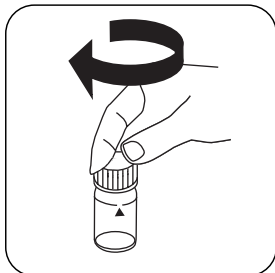
Close vial(s).



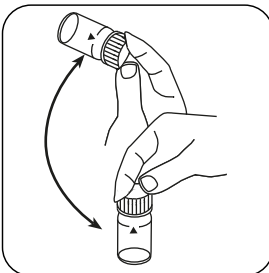
Dissolve tablet(s) by inverting.



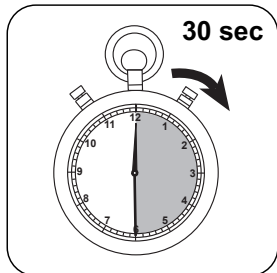
Add **Chlorine-Free-DPD/ F10** powder pack.



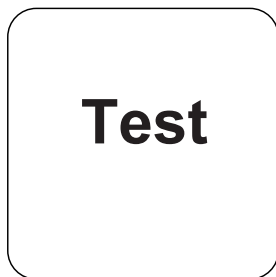
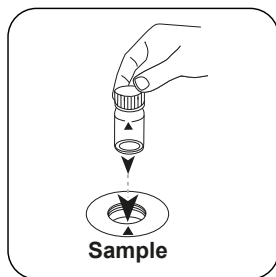
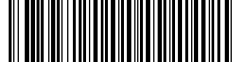
Close vial(s).



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



Wait for **30 second(s)** reaction time.



EN

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

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

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



Chemical Method

DPD

Appendix

Interferences

Persistent Interferences

1. All oxidising agents in the samples lead to higher results.

Removeable Interferences

1. Concentrations above 3.8 mg/L chlorine dioxide can lead to results within the measuring range of up to 0 mg/L. In this case, the water sample must be diluted with water that is free from chlorine dioxide. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

Derived from

DIN 38408, Section 5

⁹ additionally required for determination of bromine, chlorine dioxide and ozone in the presence of chlorine

EN



Chromium PP

M125

0.02 - 2 mg/L Cr^{b)}

Diphenylcarbazide

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Persulfat Reagent für CR	Powder / 100 Pieces	537300
Chromium Hexavalent	Powder / 100 Pieces	537310

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

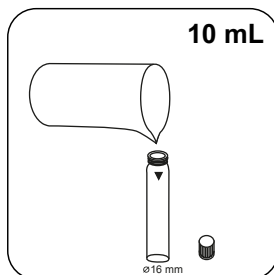
Preparation

1. The pH value of the sample should be between 3 and 9.

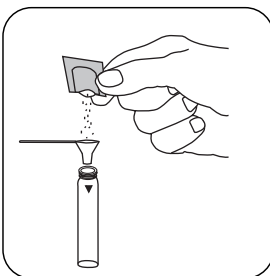
Remarks

1. Implementation of the first part determines concentration of total chromium. In the second part, the concentration of Chromium (VI) is measured. The concentration of Chromium (III) is the result of the difference.

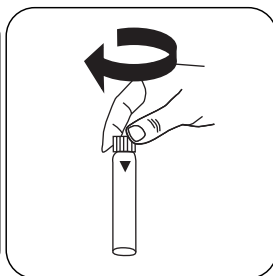
Digestion Chromium with powder packs



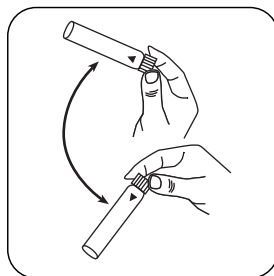
Fill 16 mm vial with **10 mL sample**.



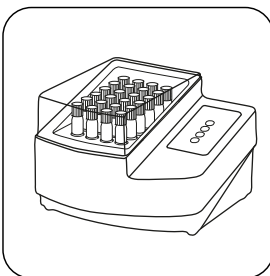
Add **PERSULFT.RGT FOR CR powder pack**.



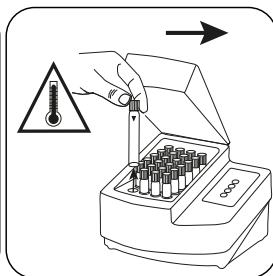
Close vial(s).



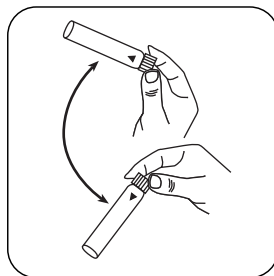
Invert several times to mix the contents.



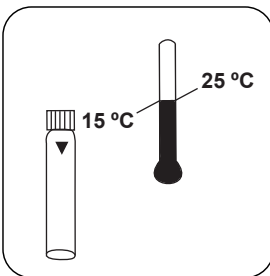
Seal the vials in the pre-heated thermoreactor for **120 minutes at 100 °C**.



Remove the vial from the thermoreactor. (**Note: vial will be hot!**)



Invert several times to mix the contents.



Allow the vial(s) to cool to room temperature.

Determination of Chromium differentiated, with powder packs

Select the method on the device.

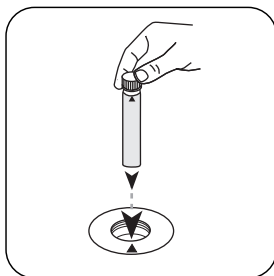
In addition, choose the test: differentiated

For testing of **Chromium, differentiated**, carry out the described **digestion**.

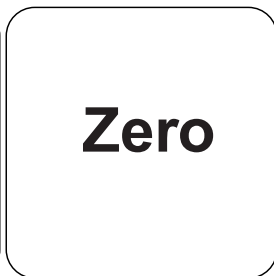
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



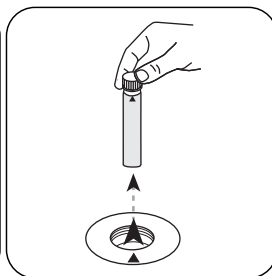
EN



Place pre-treated vial in the sample chamber. • Pay attention to the positioning.

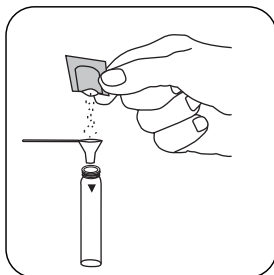


Press the **ZERO** button.

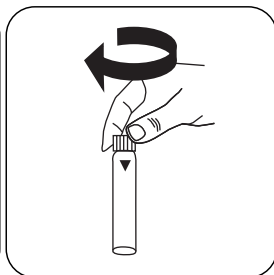


Remove **vial** from the sample chamber.

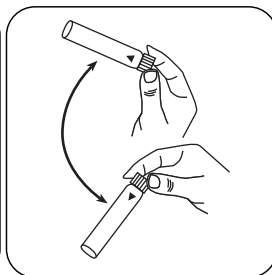
For devices that require **no ZERO measurement**, start here.



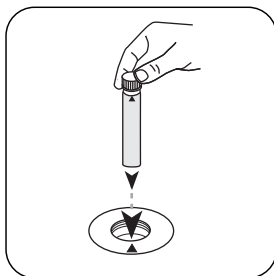
Add **CHROMIUM HEXAVALENT powder pack**.



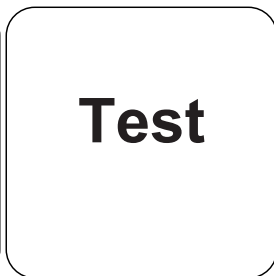
Close vial(s).



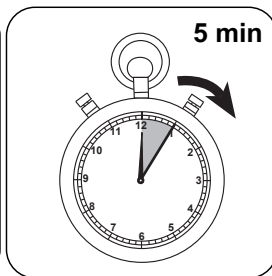
Invert several times to mix the contents.



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

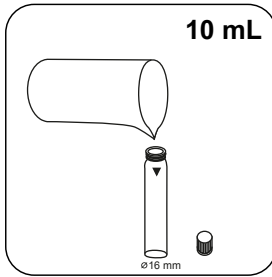


Press the **TEST (XD: START)** button.

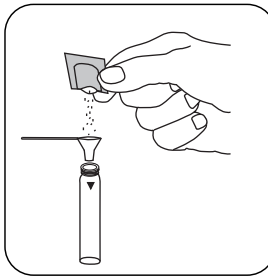


Wait for **5 minute(s) reaction time**.

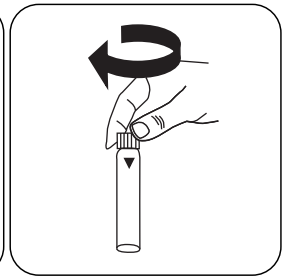
Once the reaction period is finished, the measurement takes place automatically.



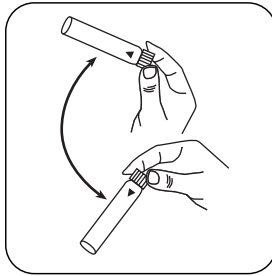
Fill a **second vial** with **10 mL sample**.



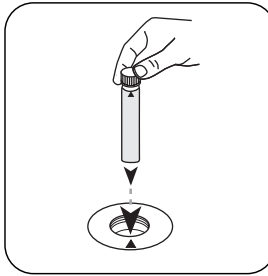
Add **CHROMIUM HEXAVALENT powder pack**.



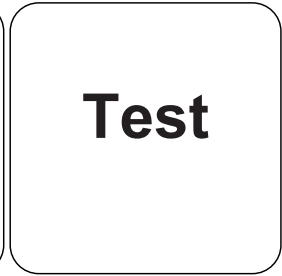
Close vial(s).



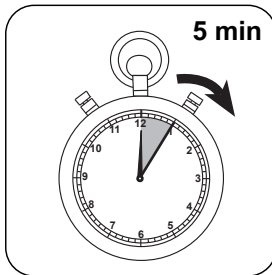
Invert several times to mix the contents.



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



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



Wait for **5 minute(s) reaction time**.

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

The result in mg/L Cr(VI); Cr(III); Cr Total Chromium appears on the display.

Determination of Chromium(VI), with powder packs

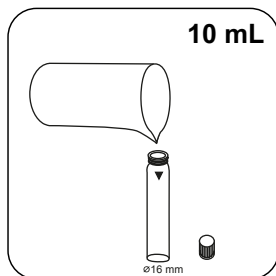
Select the method on the device.

In addition, choose the test: Cr(VI)

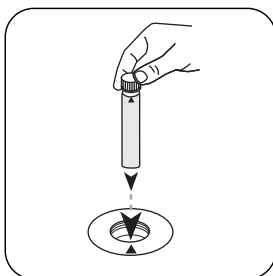
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



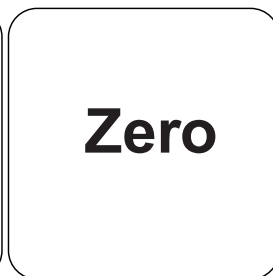
EN



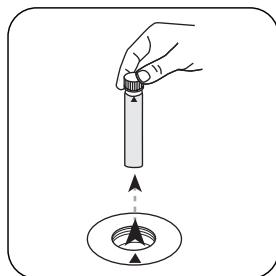
Fill 16 mm vial with **10 mL sample**.



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

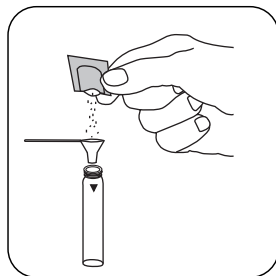


Press the **ZERO** button.

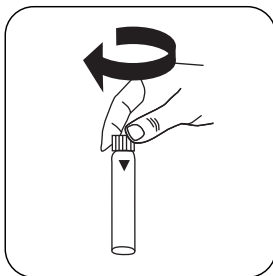


Remove **vial** from the sample chamber.

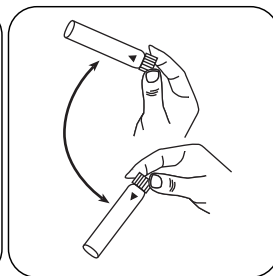
For devices that require **no ZERO measurement**, start here.



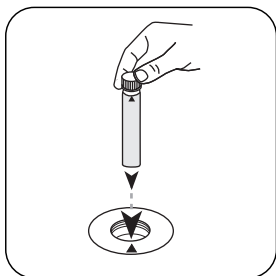
Add **CHROMIUM HEXVALENT powder pack**.



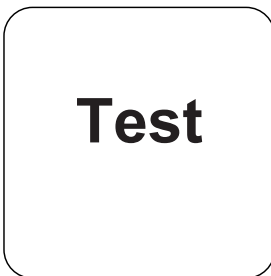
Close vial(s).



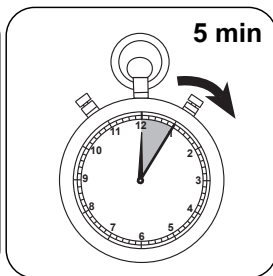
Invert several times to mix the contents.



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



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



Wait for **5 minute(s) reaction time**.

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

The result in mg/L Cr(VI) appears on the display.

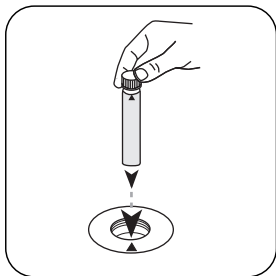
Determination of Chromium total (Cr(III) + Cr(VI)), with powder packs

Select the method on the device.

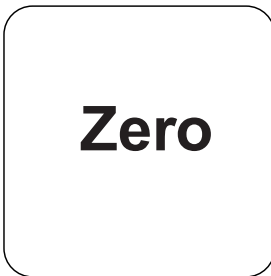
In addition, choose the test: Cr(III + VI)

For testing of **Chromium, total (Cr(III)+ Cr(VI))**, carry out the described **digestion**.

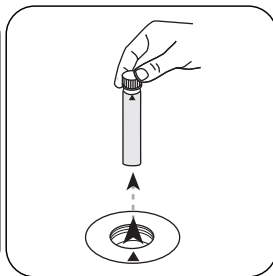
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



Place pre-treated vial in the sample chamber. • Pay attention to the positioning.



Press the **ZERO** button.

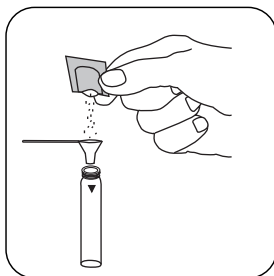


Remove **vial** from the sample chamber.

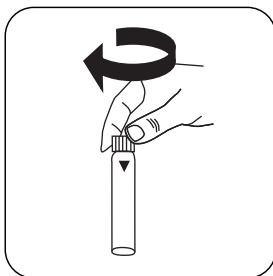
For devices that require **no ZERO measurement** , start here.



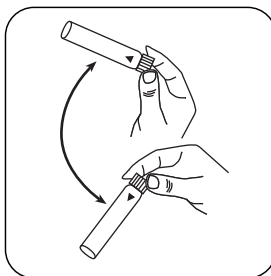
EN



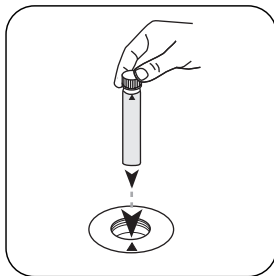
Add **CHROMIUM HEXAVALENT powder pack**.



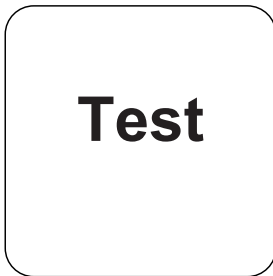
Close vial(s).



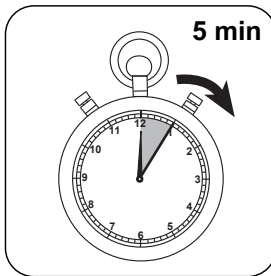
Invert several times to mix the contents.



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



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



Wait for **5 minute(s) reaction time**.

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

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



Chemical Method

Diphenylcarbazide

Appendix

Interferences

EN

Persistent Interferences

1. For information about interferences through metals and reductive or oxidizing agents, especially in strongly polluted water, see DIN 38 405 – D 24 and Standard Methods of Water and Wastewater, 20th Edition; 1998.

According to

DIN 3805 - D24

Derived from

DIN 18412
US EPA 218.6

⁹¹ Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



COD LR TT

M130

3 - 150 mg/L COD^{b)}

Lr

Dichromate / H₂SO₄

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
COD LR/25	25 Pieces	2420720
COD LR/25, mercury free	25 Pieces	2420710
COD LR/150	150 Pieces	2420725

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

Remarks

1. The blank is stable when stored in the dark.
2. Blanks and test vials must be from the same batch.
3. Do not place hot vials in the sample chamber. The most stable measured values can be determined if the vials are left standing overnight.

Removal of high Chloride concentration in COD samples

Chloride content may interfere during COD determination, if the tolerance level of the used test will be exceeded. To overcome that problem the following sample pretreatment can be used:

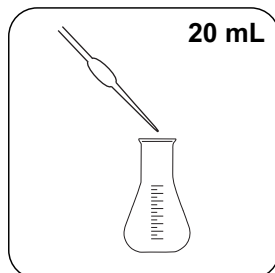
Equipment:

- 2 Erlenmeyer flasks 300 mL with NS 29/32 connection
- 2 HCl absorber according to DIN 38409
- 2 glass stoppers NS 29/32
- Pipettes for volumes of 20 and 25ml
- Magnetic stirrer and magnetic stirring rods
- Thermometer to measure 0 - 100 °C
- Ice bath

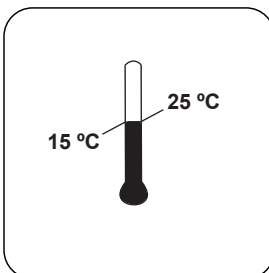
Reagents:

- 12 to 14 g of sodalime
- 50 mL H_2SO_4 (95 - 97%, 1.84 g/ml, CSB free)
- Hydrochloric acid 10 % to clean absorber from residual lime

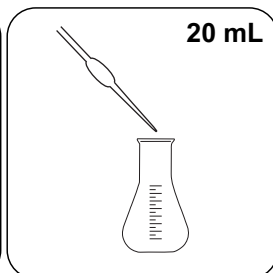
The work must be carried out under a fume hood!



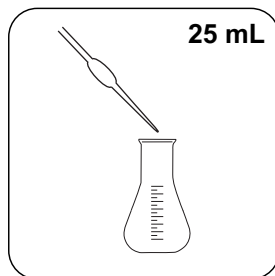
Put **20 mL homogenised sample** in the erlenmeyer flask.



Add the magnetic stirring rod, and cool in the ice bath.



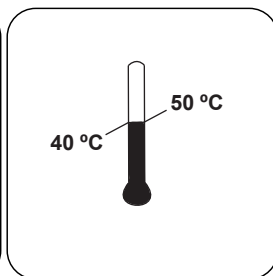
Put **20 mL deionized water** in the second erlenmeyer flask.



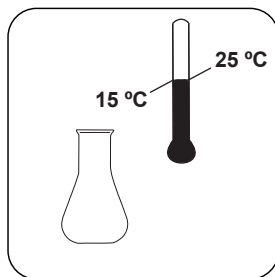
Add slowly **25 mL concentrated Sulfuric acid** each under cooling and stirring.



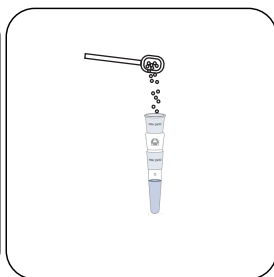
Sample will be hot!



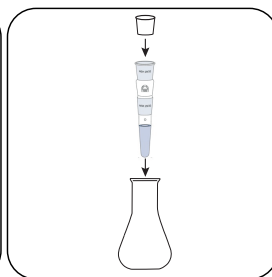
Temperature should not exceed 40 to 50 °C.



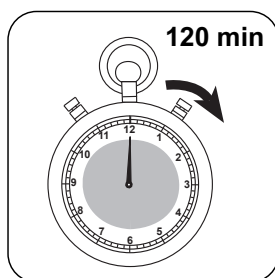
After the complete addition of the sulfuric acid, cool to room temperature in the ice bath.



Add **6 - 7 g soda lime powder** into the absorption tubes.



Close the absorption tubes with a plug and fit onto the Erlenmeyer flasks.



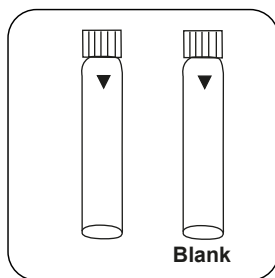
Stir at about 250 rpm for **120 minutes** at room temperature (a turbidity may be formed).

This sample is used for the analysis of COD. Due to this pretreatment procedure the original sample has been diluted by a factor of 2.05.

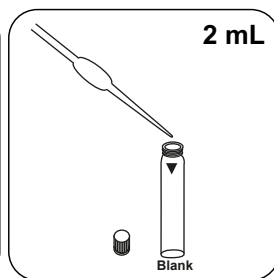
$$CSB_{\text{sample}} = CSB_{\text{display}} \times 2.05$$

Determination of COD LR with Vario Vial Test

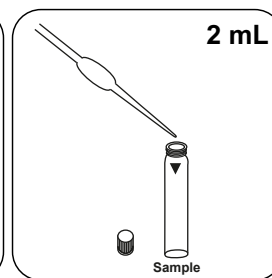
Select the method on the device.



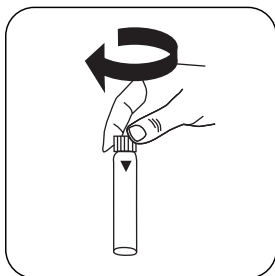
Prepare two **reaction vials**. Mark one as a blank.



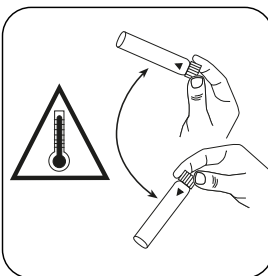
Put **2 mL deionised water** in the blank.



Put **2 mL sample** in the sample vial.

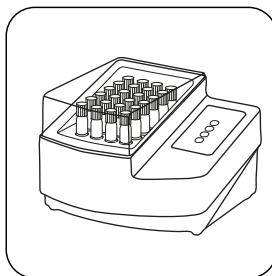


Close vial(s).

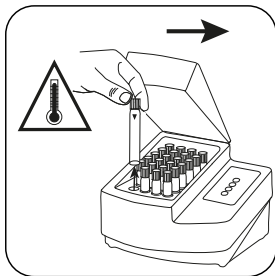


Carefully invert several times to mix the contents.

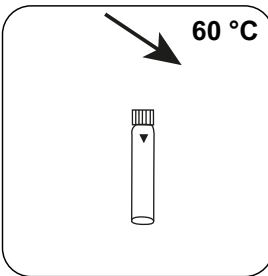
Note: Will get hot!



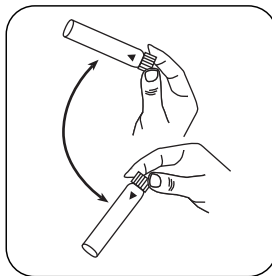
Seal the vials in the pre-heated thermoreactor for **120 minutes at 150 °C**.



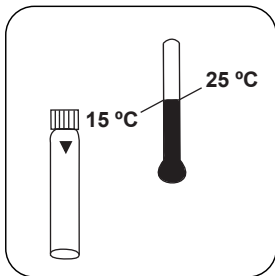
Remove the vial from the thermoreactor. (**Note: vial will be hot!**)



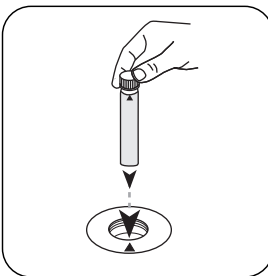
Allow vial(s) to cool to 60 °C.



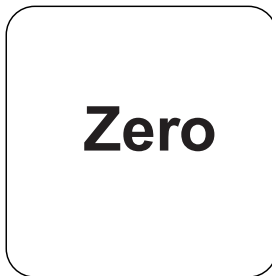
Invert several times to mix the contents.



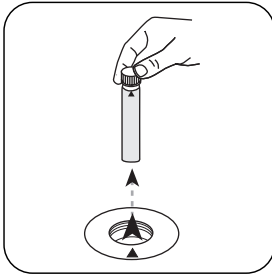
Allow the vial to cool to room temperature and then measure.



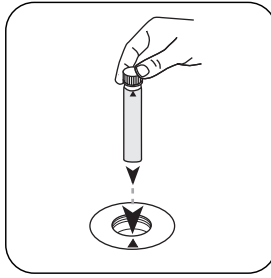
Place **blank** in the sample chamber. • Pay attention to the positioning.



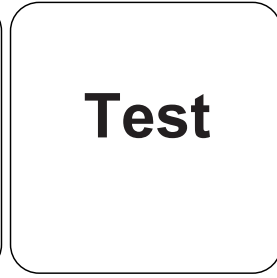
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



Test

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

The result in mg/L COD appears on the display.

EN

Chemical Method

Dichromate / H₂SO₄

Appendix

Interferences

Persistent Interferences

- In exceptional cases, contents, for which the oxidation capacity of the reagent is not sufficient, can lead to lower results.

Removeable Interferences

- Suspended solids in the vial can lead to incorrect measurements and so to avoid this, it is important to place the vials carefully in the sample chamber as the method necessitates a build-up of precipitate at the bottom of the vial.
- The outer walls of the vial must be clean and dry before the analysis is carried out. Fingerprints or water droplets on the vial lead to incorrect measurements.
- In the standard version, chloride interferes from a concentration of 1000 mg/L. In the mercury-free version, the disturbance depends on the chloride concentration and the COD. Concentrations from 100 mg/L chloride can lead to significant disturbances here.

Method Validation

Limit of Detection	3.2 mg/L
Limit of Quantification	9.7 mg/L
End of Measuring Range	150 mg/L
Sensitivity	-272 mg/L / Abs
Confidence Intervall	3.74 mg/L
Standard Deviation	1.55 mg/L
Variation Coefficient	2.02 %

Conformity

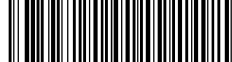
ISO 15705:2002

According to

ISO 15705:2002

DIN 38409 part 41

^{b)} Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



COD MR TT

M131

20 - 1500 mg/L COD^{b)}

Mr

Dichromate / H₂SO₄

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
COD MR/25	25 Pieces	2420721
COD MR/25, mercury free	25 Pieces	2420711
COD MR/150	150 Pieces	2420726
COD MR/150, mercury free	150 Pieces	2420716

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

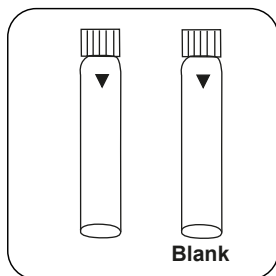
Remarks

1. The blank is stable when stored in the dark. Blanks and test vials must be from the same batch.
2. Do not place hot vials in the sample chamber. The most stable measured values can be determined if the vials are left standing overnight.
3. For samples under 100 mg/L COD it is recommended to use the tube test COD LR if a higher degree of accuracy is required.

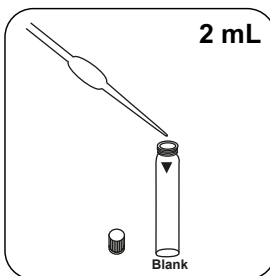


Determination of COD MR with Vario Vial Test

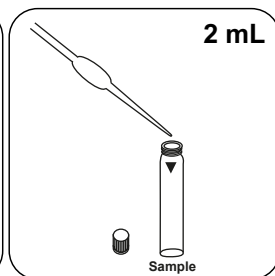
Select the method on the device.



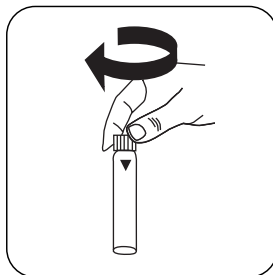
Prepare two **reaction vials**. Mark one as a blank.



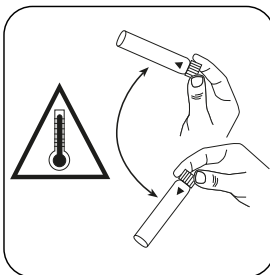
Put **2 mL deionised water** in the blank.



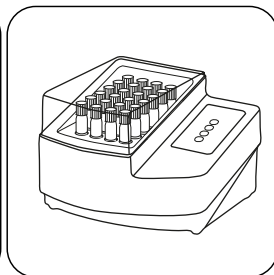
Put **2 mL sample** in the sample vial.



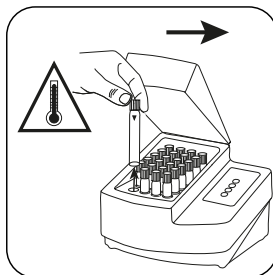
Close vial(s).



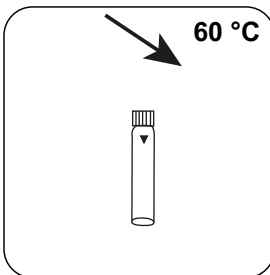
Carefully invert several times to mix the contents.
Note: Will get hot!



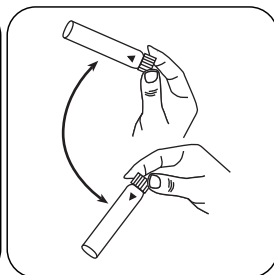
Seal the vials in the pre-heated thermoreactor for **120 minutes at 150 °C**.



Remove the vial from the thermoreactor. (**Note: vial will be hot!**)



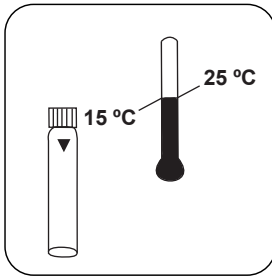
Allow vial(s) to cool to **60 °C**.



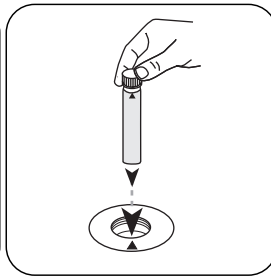
Invert several times to mix the contents.



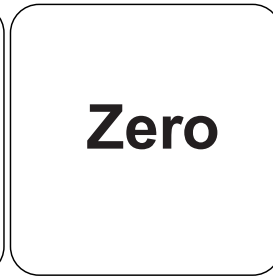
EN



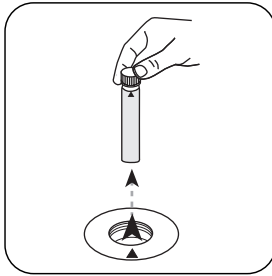
Allow the vial to cool to room temperature and then measure.



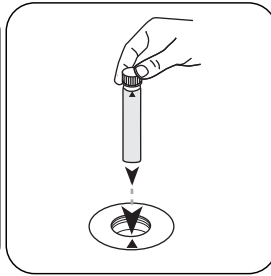
Place **blank** in the sample chamber. • Pay attention to the positioning.



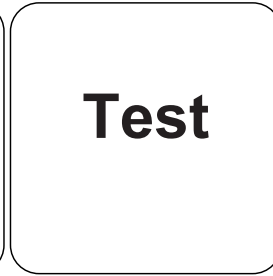
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



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

The result in mg/L COD appears on the display.

Chemical Method

Dichromate / H₂SO₄

Appendix

Interferences

Persistent Interferences

- In exceptional cases, contents, for which the oxidation capacity of the reagent is not sufficient, can lead to lower results.

Removeable Interferences

- Suspended solids in the vial can lead to incorrect measurements and so to avoid this, it is important to place the vials carefully in the sample chamber as the method necessitates a build-up of precipitate at the bottom of the vial.
- The outer walls of the vial must be clean and dry before the analysis is carried out. Fingerprints or water droplets on the vial lead to incorrect measurements.
- In the standard version, chloride interferes from a concentration of 1000 mg/L. In the mercury-free version, the disturbance depends on the chloride concentration and the COD. Concentrations from 100 mg/L chloride can lead to significant disturbances here. To remove high chloride concentrations in COD samples, see method M130 COD LR TT.

Method Validation

Limit of Detection	8.66 mg/L
Limit of Quantification	25.98 mg/L
End of Measuring Range	1500 mg/L
Sensitivity	2,141 mg/L / Abs
Confidence Intervall	18.82 mg/L
Standard Deviation	7.78 mg/L
Variation Coefficient	1.04 %

Conformity

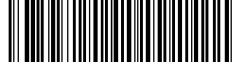
ISO 15705:2002

According to

ISO 15705:2002

DIN 38409 part 43

^{b)} Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



COD HR TT

M132

200 - 15000 mg/L COD^{b)}

Hr

Dichromate / H₂SO₄

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
COD HR/25	25 Pieces	2420722
COD HR/25, mercury free	25 Pieces	2420712
COD HR/150	150 Pieces	2420727

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

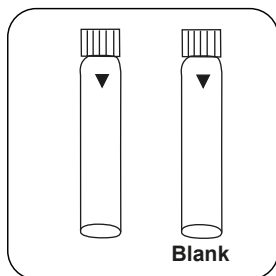
Remarks

1. The blank is stable when stored in the dark. Blanks and test vials must be from the same batch.
2. Do not place hot vials in the sample chamber. The most stable measured values can be determined if the vials are left standing overnight.
3. For samples under 1 g/L COD it is recommended to repeat the test with the test kit for COD MR or for samples under 0.1 g/L COD to use the tube test COD LR if a higher degree of accuracy is required.

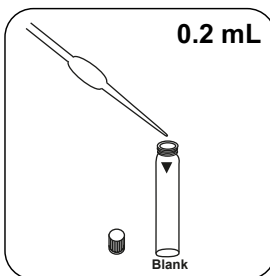


Determination of CSB HR with Vario Vial Test

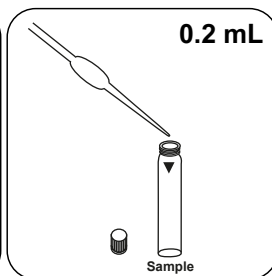
Select the method on the device.



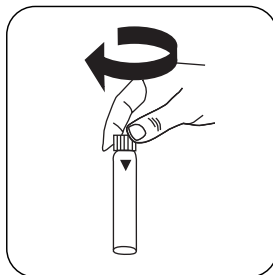
Prepare two **reaction vials**. Mark one as a blank.



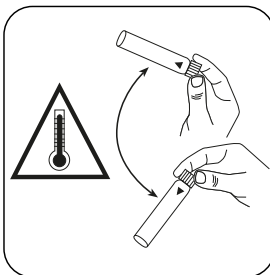
Put **0.2 mL deionised water** in the blank.



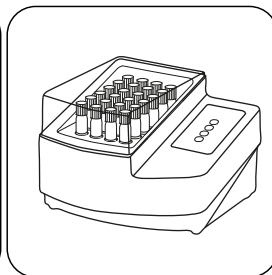
Put **0.2 mL sample** in the sample vial.



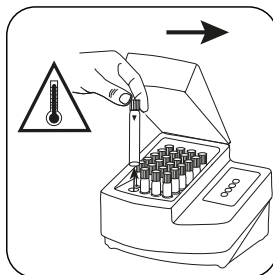
Close vial(s).



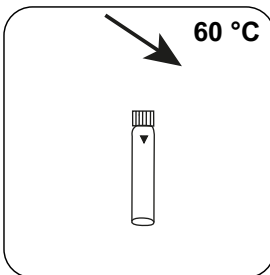
Carefully invert several times to mix the contents.
Note: Will get hot!



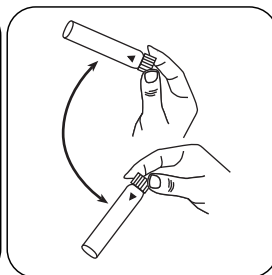
Seal the vials in the pre-heated thermoreactor for **120 minutes at 150 °C**.



Remove the vial from the thermoreactor. **(Note: vial will be hot!)**



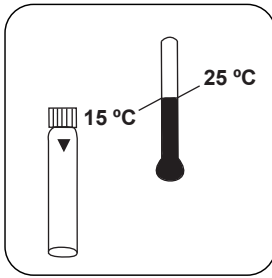
Allow vial(s) to cool to **60 °C**.



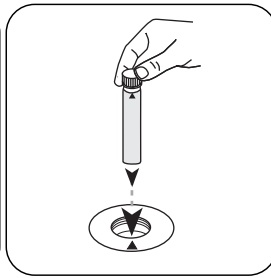
Invert several times to mix the contents.



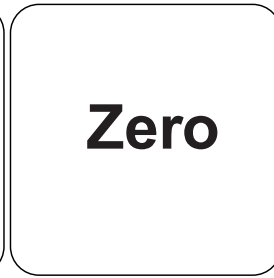
EN



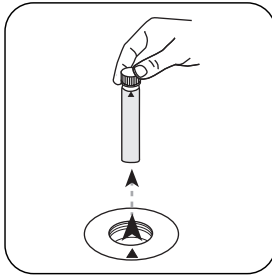
Allow the vial to cool to room temperature and then measure.



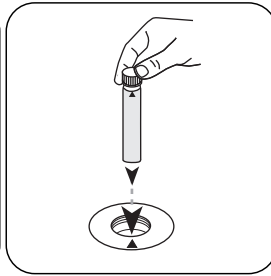
Place **blank** in the sample chamber. • Pay attention to the positioning.



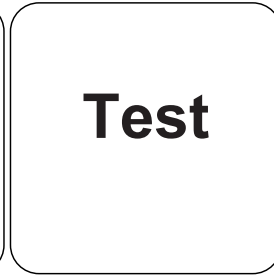
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



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

The result in mg/L COD appears on the display.

Chemical Method

Dichromate / H₂SO₄

Appendix

Interferences

Persistent Interferences

- In exceptional cases, contents, for which the oxidation capacity of the reagent is not sufficient, can lead to lower results.

Removeable Interferences

- Suspended solids in the vial can lead to incorrect measurements and so to avoid this, it is important to place the vials carefully in the sample chamber as the method necessitates a build-up of precipitate at the bottom of the vial.
- The outer walls of the vial must be clean and dry before the analysis is carried out. Fingerprints or water droplets on the vial lead to incorrect measurements.
- In the standard version, chloride interferes from a concentration of 10000 mg/L. In the mercury-free version, the disturbance depends on the chloride concentration and the COD. Concentrations from 100 mg/L chloride can lead to significant disturbances here. To remove high chloride concentrations in COD samples, see method M130 COD LR TT.

Method Validation

Limit of Detection	112.81 mg/L
Limit of Quantification	338.43 mg/L
End of Measuring Range	15 g/L
Sensitivity	21,164 mg/L / Abs
Confidence Intervall	70.48 mg/L
Standard Deviation	27.84 mg/L
Variation Coefficient	0.37 %

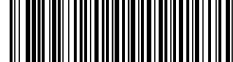
Conformity

ISO 15705:2002

According to

ISO 15705:2002

⁹⁾ Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



COD LMR TT

M133

15 - 300 mg/L COD^{b)}

LMr

Dichromate / H₂SO₄

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
COD LMR/25	25 Pieces	2423120

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

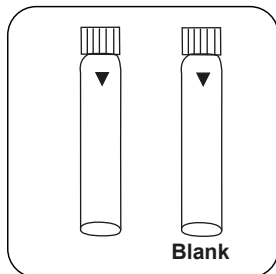
Remarks

1. The blank is stable when stored in the dark. Blanks and test vials must be from the same batch.
2. Do not place hot vials in the sample chamber. The most stable measured values can be determined if the vials are left standing overnight.

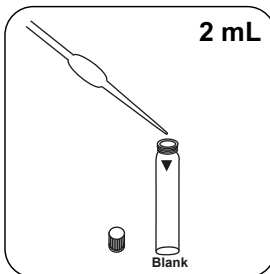


Determination of COD LMR with Vial Test

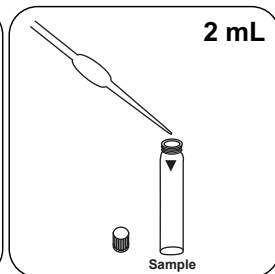
Select the method on the device.



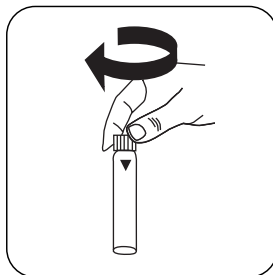
Prepare two **reaction vials**. Mark one as a blank.



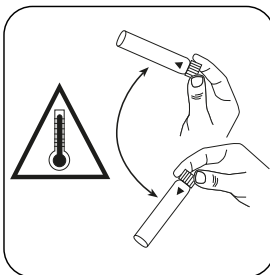
Put **2 mL deionised water** in the blank.



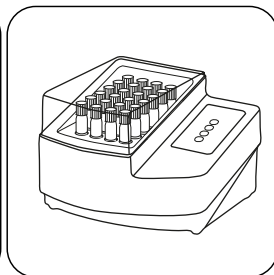
Put **2 mL sample** in the sample vial.



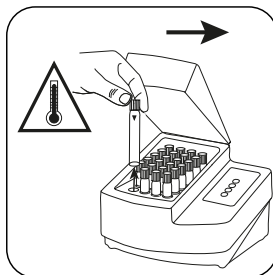
Close vial(s).



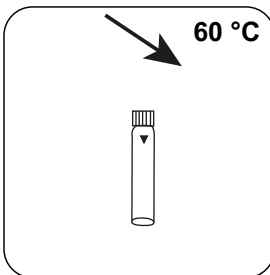
Carefully invert several times to mix the contents.
Note: Will get hot!



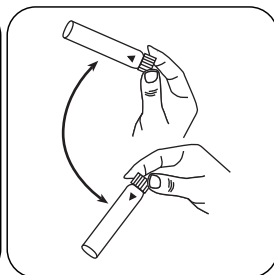
Seal the vials in the pre-heated thermoreactor for **120 minutes at 150 °C**.



Remove the vial from the thermoreactor. (**Note: vial will be hot!**)



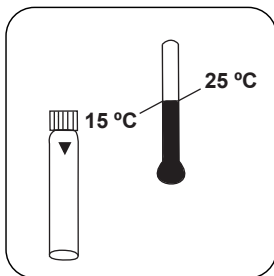
Allow vial(s) to cool to **60 °C**.



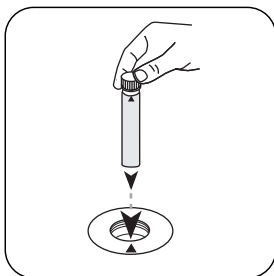
Invert several times to mix the contents.



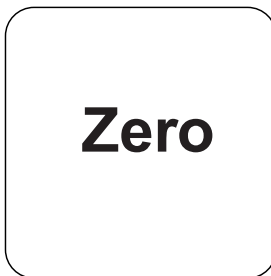
EN



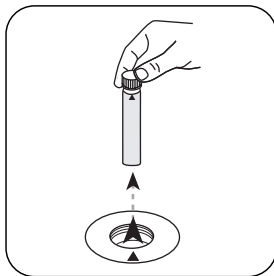
Allow the vial to cool to room temperature and then measure.



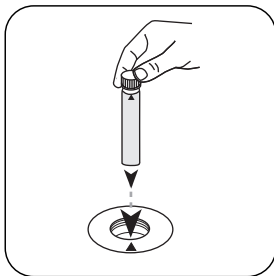
Place **blank** in the sample chamber. • Pay attention to the positioning.



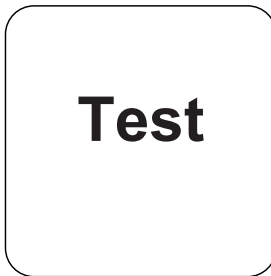
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



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

The result in mg/L COD appears on the display.

Chemical Method

Dichromate / H₂SO₄

Appendix

Interferences

Persistent Interferences

- In exceptional cases, contents, for which the oxidation capacity of the reagent is not sufficient, can lead to lower results.

Removeable Interferences

- Suspended solids in the vial can lead to incorrect measurements and so to avoid this, it is important to place the vials carefully in the sample chamber as the method necessitates a build-up of precipitate at the bottom of the vial.
- The outer walls of the vial must be clean and dry before the analysis is carried out. Fingerprints or water droplets on the vial lead to incorrect measurements.
- In the standard version, chloride interferes from a concentration of 1000 mg/L. In the mercury-free version, the disturbance depends on the chloride concentration and the COD. Concentrations from 100 mg/L chloride can lead to significant disturbances here. To remove high chloride concentrations in COD samples, see method M130 COD LR TT.

Method Validation

Limit of Detection	5.7 mg/L
Limit of Quantification	17.2 mg/L
End of Measuring Range	300 mg/L
Sensitivity	-244 mg/L / Abs
Confidence Intervall	2.56 mg/L
Standard Deviation	1.06 mg/L
Variation Coefficient	0.67 %

Conformity

ISO 15705:2002

According to

ISO 15705:2002

DIN 38409 part 41

⁹⁾ Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



Copper T

M150

0.05 - 5 mg/L Cu^{a)}

Cu

Biquinoline

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Copper No. 1	Tablet / 100	513550BT
Copper No. 1	Tablet / 250	513551BT
Copper No. 2	Tablet / 100	513560BT
Copper No. 2	Tablet / 250	513561BT
Set Copper No. 1/No. 2 100 Pc.#	100 each	517691BT
Set Copper No. 1/No. 2 250 Pc.#	250 each	517692BT

Preparation

1. Strong alkaline or acidic water samples must be adjusted to pH 4 to 6 before analysis.

Determination of Copper, free with tablet

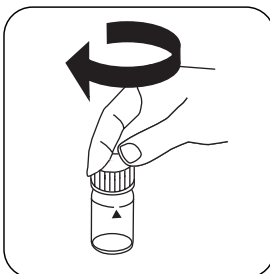
Select the method on the device.

In addition, choose the test: free

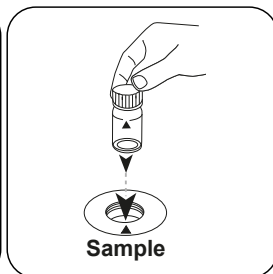
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



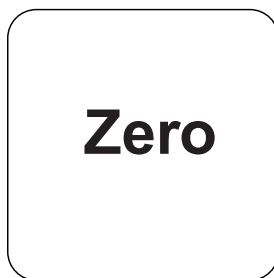
Fill 24 mm vial with **10 mL sample**.



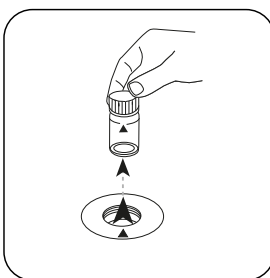
Close vial(s).



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

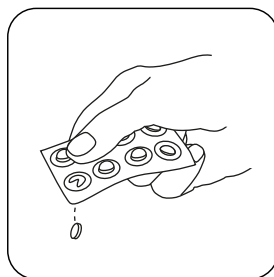


Press the **ZERO** button.

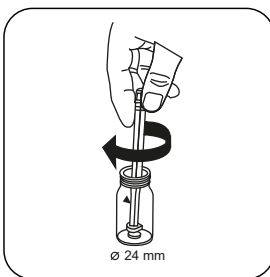


Remove the vial from the sample chamber.

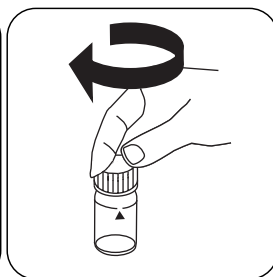
For devices that require **no ZERO measurement**, start here.



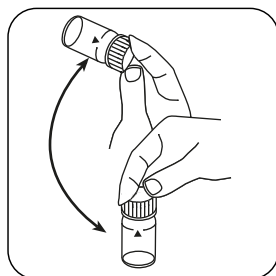
Add **COPPER No. 1 tablet**.



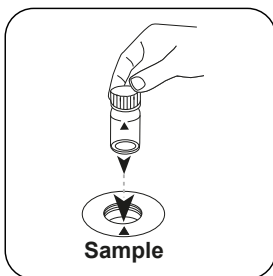
Crush tablet(s) by rotating slightly.



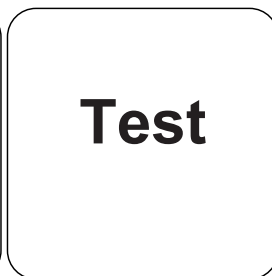
Close vial(s).



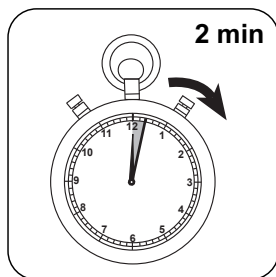
Dissolve tablet(s) by inverting.



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



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



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

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

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

Determination of Copper, total with tablet

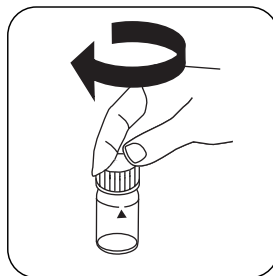
Select the method on the device.

In addition, choose the test: total

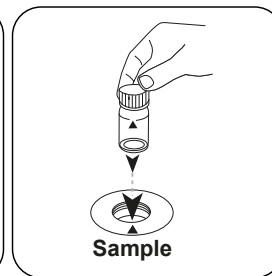
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



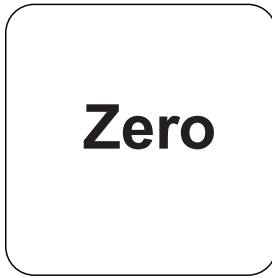
Fill 24 mm vial with **10 mL** sample.



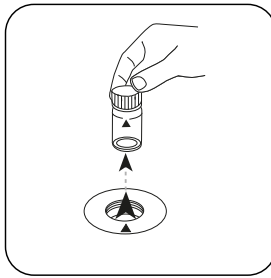
Close vial(s).



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

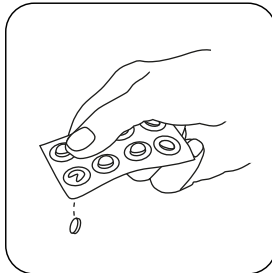


Press the **ZERO** button.

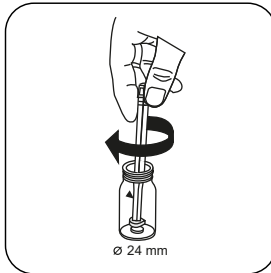


Remove the vial from the sample chamber.

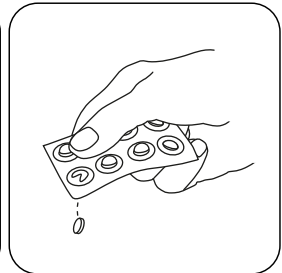
For devices that require **no ZERO measurement**, start here.



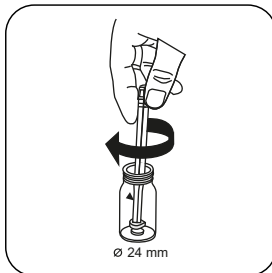
Add **COPPER No. 1 tablet**



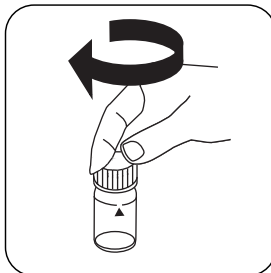
Crush tablet(s) by rotating slightly and dissolve.



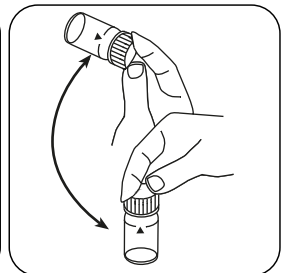
Add **COPPER No. 2 tablet**



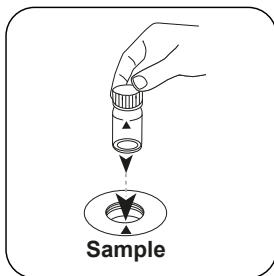
Crush tablet(s) by rotating slightly.



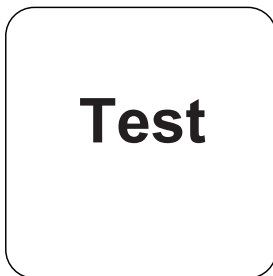
Close vial(s).



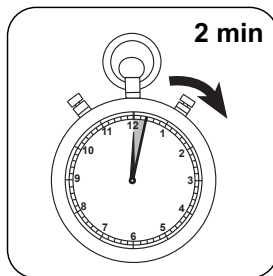
Dissolve tablet(s) by inverting.



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



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



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

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

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

Determination of Copper, differentiated determination with Tablet

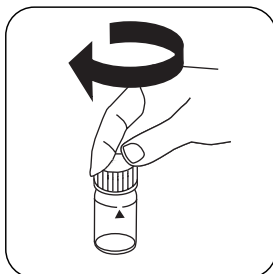
Select the method on the device.

In addition, choose the test: differentiated

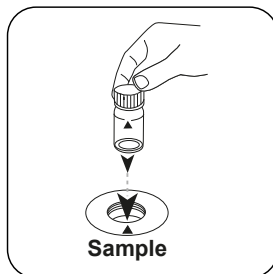
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



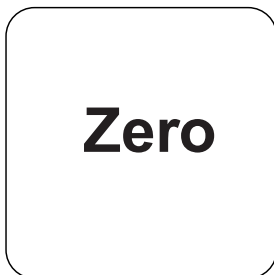
Fill 24 mm vial with **10 mL sample**.



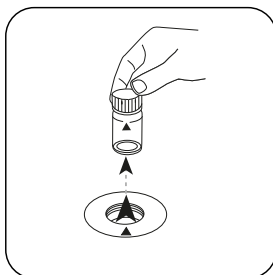
Close vial(s).



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

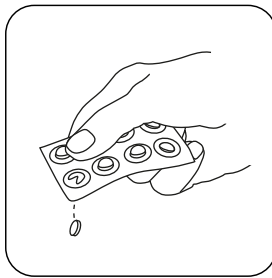


Press the **ZERO** button.

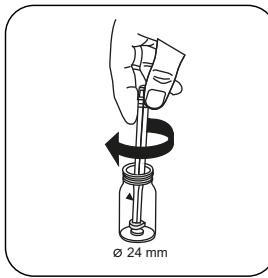


Remove the vial from the sample chamber.

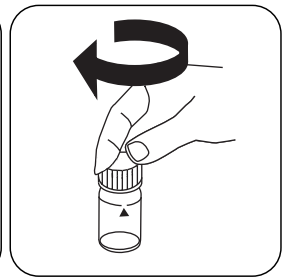
For devices that require **no ZERO measurement**, start here.



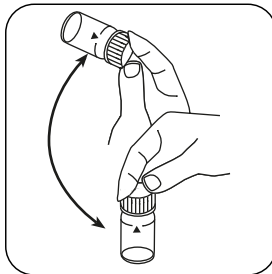
Add **COPPER No. 1 tablet**



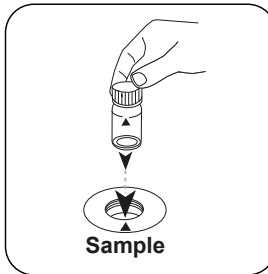
Crush tablet(s) by rotating slightly.



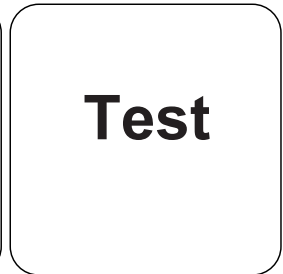
Close vial(s).



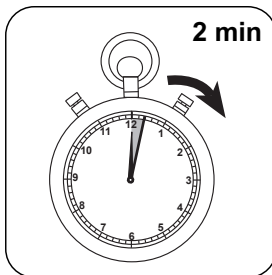
Dissolve tablet(s) by inverting.



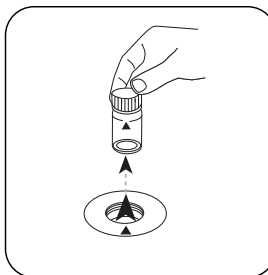
Place **sample vial** in the sample chamber. Pay attention to the positioning.



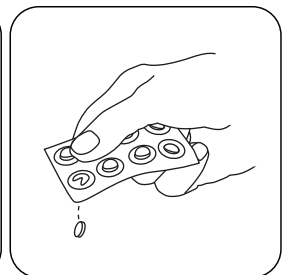
Press the **TEST** (XD: **START**) button.



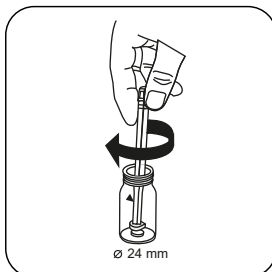
Wait for **2 minute(s) reaction time**.



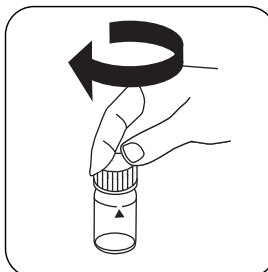
Remove the vial from the sample chamber.



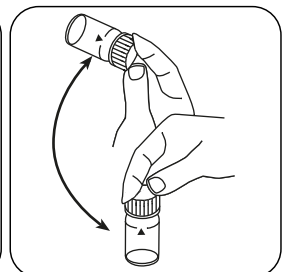
Add **COPPER No. 2 tablet**.



Crush tablet(s) by rotating slightly.

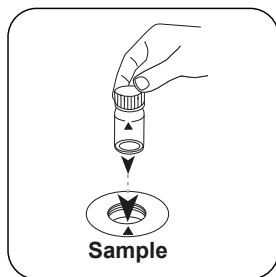


Close vial(s).

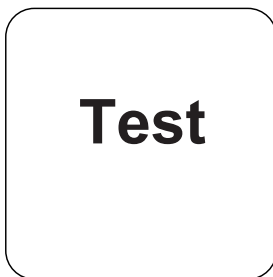


Dissolve tablet(s) by inverting.

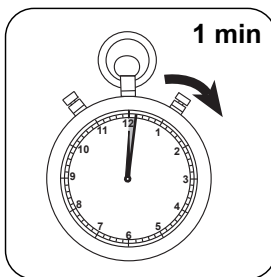
EN



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



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



Wait for **1 minute(s)** reaction time.

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

The result in mg/L free Copper; combined Copper; total Copper appears on the display.

Chemical Method

Biquinoline

Appendix

Interferences

Persistent Interferences

1. Cyanide CN^- and Silver Ag^+ interfere with the test result.

Method Validation

Limit of Detection	0.05 mg/L
Limit of Quantification	0.15 mg/L
End of Measuring Range	5 mg/L
Sensitivity	3.8 mg/L / Abs
Confidence Intervall	0.026 mg/L
Standard Deviation	0.011 mg/L
Variation Coefficient	0.42 %

Bibliography

Photometrische Analyse, Lange/Vedjerek, Verlag Chemie 1980

^{a)} determination of free, combined and total | ^{*} including stirring rod, 10 cm



Copper L

M151

0.05 - 4 mg/L Cu^{a)}

Bicinchoninate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Copper Reagent Set (free + total)	1 Pieces	56R023355
Copper No. 2	Tablet / 100	513560BT
Copper No. 2	Tablet / 250	513561BT

The following accessories are required.

Accessories	Packaging Unit	Part Number
Stirring rod and spoon	1 Pieces	56A006601

Preparation

1. Strong alkaline or acidic water samples must be adjusted to pH 4 to 6 before analysis.
2. The measuring spoon supplied with the reagents must be used for the correct dosage.

Determination of Copper, free with liquid reagent

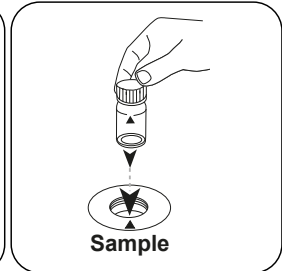
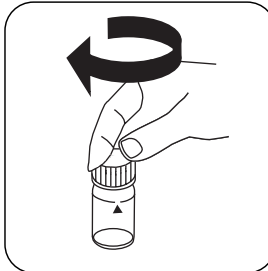
Select the method on the device.

In addition, choose the test: free

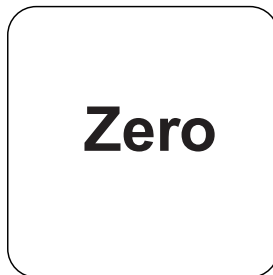
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



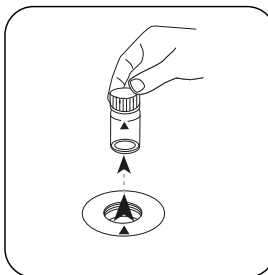
Fill 24 mm vial with **10 mL** **sample**. Close vial(s).



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

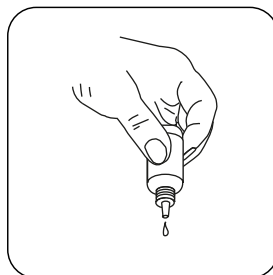


Press the **ZERO** button.

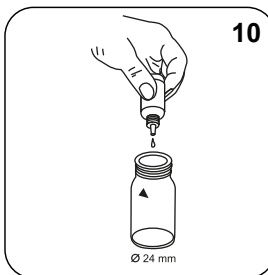


Remove the vial from the sample chamber.

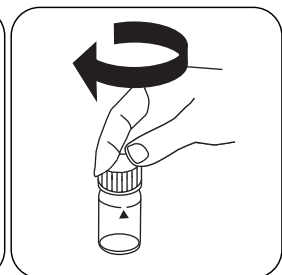
For devices that require **no ZERO measurement**, start here.



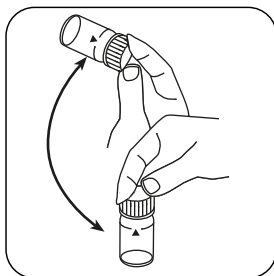
Hold cuvettes vertically and add equal drops by pressing slowly.



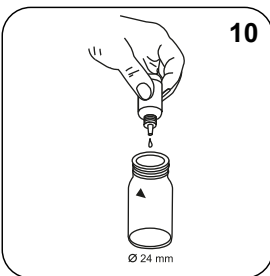
Add **10 drops** **KS240 (Coppercol Reagent 1)**.



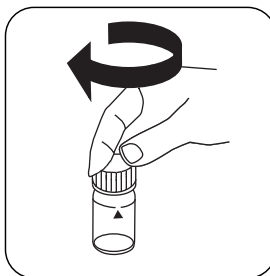
Close vial(s).



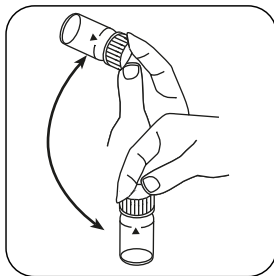
Invert several times to mix the contents.



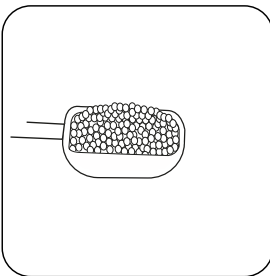
Add **10 drops** **KS241 (Coppercol Reagent 2)**.



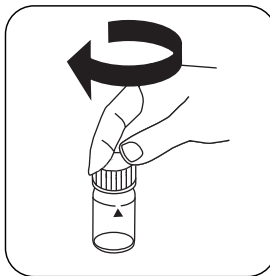
Close vial(s).



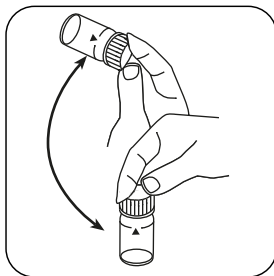
Invert several times to mix the contents.



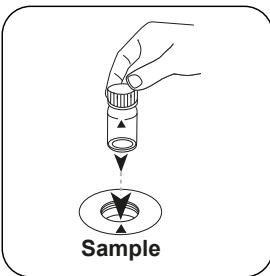
Add a **measuring scoop** **KP242 (Coppercol Reagent 3)**.



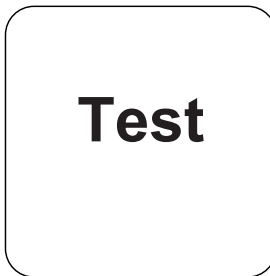
Close vial(s).



Swirl around to dissolve the powder.



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



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

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

Determination of Copper, total with liquid reagent

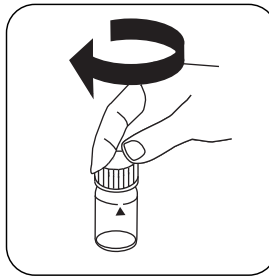
Select the method on the device.

In addition, choose the test: total

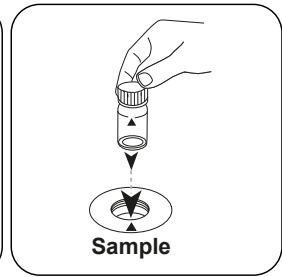
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



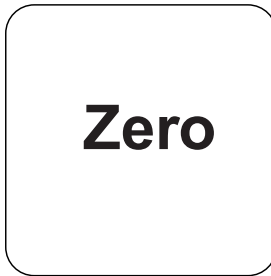
Fill 24 mm vial with **10 mL sample**.



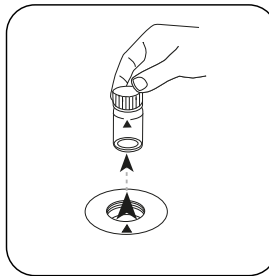
Close vial(s).



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

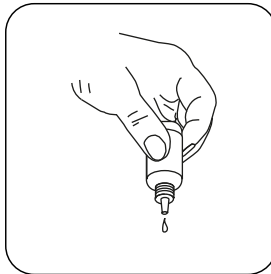


Press the **ZERO** button.

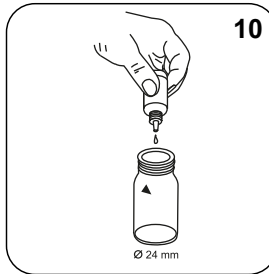


Remove the vial from the sample chamber.

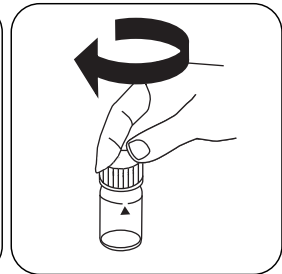
For devices that require **no ZERO measurement**, start here.



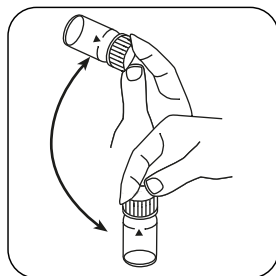
Hold cuvettes vertically and add equal drops by pressing slowly.



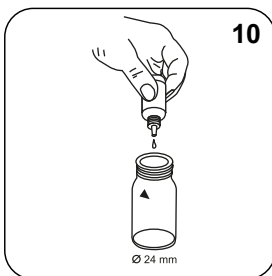
Add **10 drops KS240 (Coppercol Reagent 1)**.



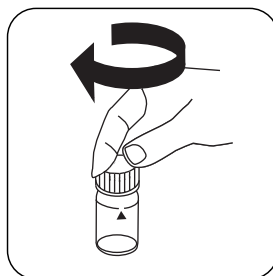
Close vial(s).



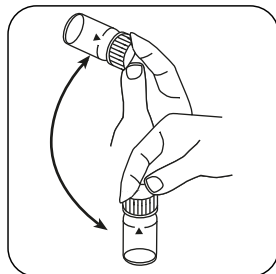
Invert several times to mix the contents.



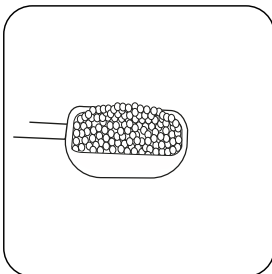
Add **10 drops**
KS241 (Coppercol
Reagent 2).



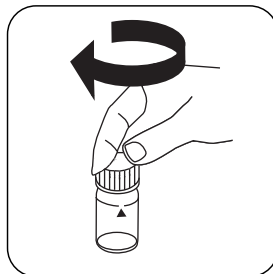
Close vial(s).



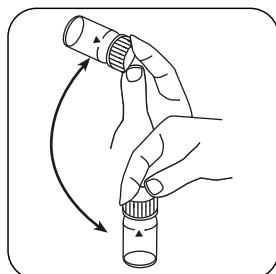
Invert several times to mix the contents.



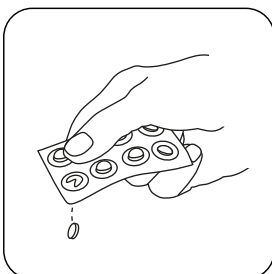
Add a **measuring scoop**
KP242 (Coppercol
Reagent 3) .



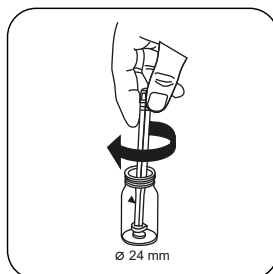
Close vial(s).



Swirl around to dissolve the powder.



Add **COPPER No.2 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.

EN

Test

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

The result in mg/L totale Copper appears on the display.

Determination of Copper, differentiated with liquid reagent

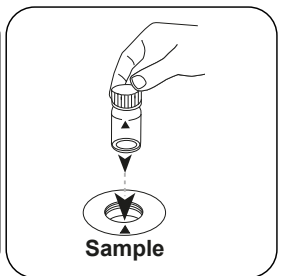
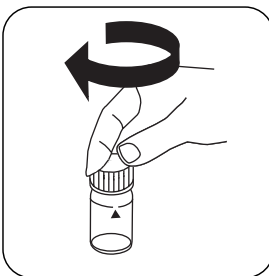
Select the method on the device.

In addition, choose the test: differentiated

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



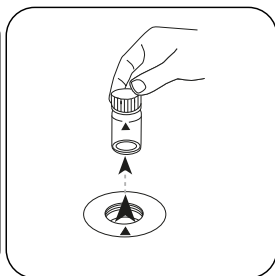
Fill 24 mm vial with **10 mL sample**. Close vial(s).



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



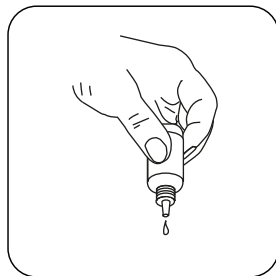
Zero



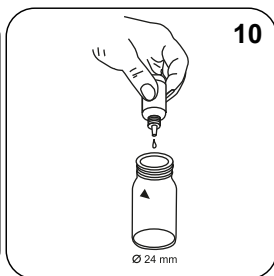
Press the **ZERO** button.

Remove the vial from the sample chamber.

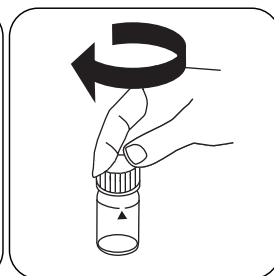
For devices that require **no ZERO measurement**, start here.



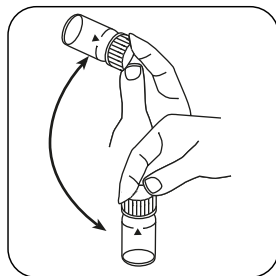
Hold cuvettes vertically and add equal drops by pressing slowly.



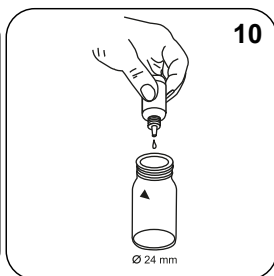
Add **10 drops** **KS240 (Coppercol Reagent 1)**.



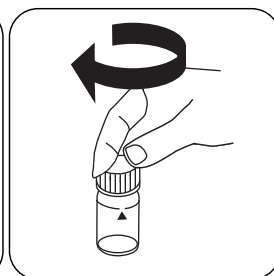
Close vial(s).



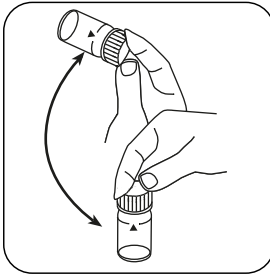
Invert several times to mix the contents.



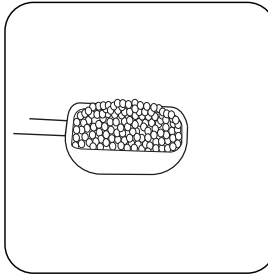
Add **10 drops** **KS241 (Coppercol Reagent 2)**.



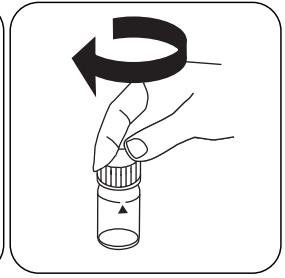
Close vial(s).



Invert several times to mix the contents.

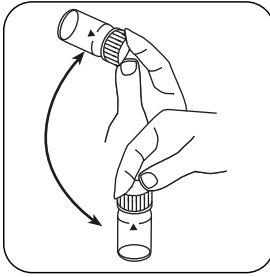


Add a measuring scoop **KP242 (Coppercol Reagent 3)**.

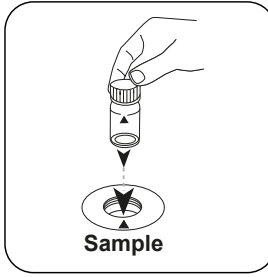


Close vial(s).

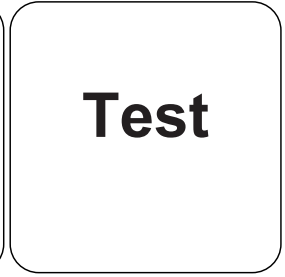
EN



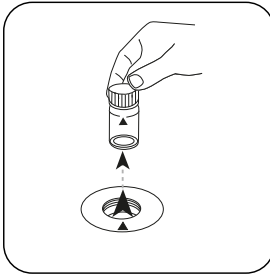
Swirl around to dissolve the powder.



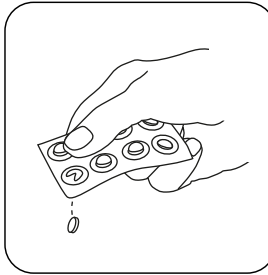
Place **sample vial** in the sample chamber. Pay attention to the positioning.



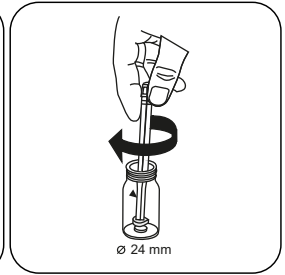
Press the **TEST (XD: START)** button.



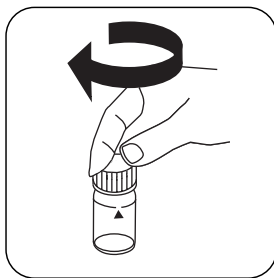
Remove the vial from the sample chamber.



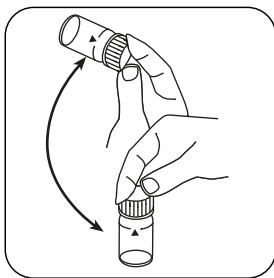
Add **COPPER No. 2 tablet**.



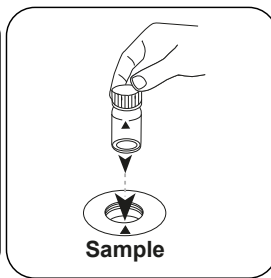
Crush tablet(s) by rotating slightly.



Close vial(s).



Dissolve tablet(s) by inverting.



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

Test

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

The result in mg/L free Copper; combined Copper; total Copper appears on the display.



Chemical Method

Bicinchoninate

Appendix

Interferences

Persistent Interferences

1. Cyanide CN^- and Silver Ag^+ interfere with the test result.

Bibliography

S. Nakano, Y. Zasshi, 82 486 - 491 (1962) [Chemical Abstracts, 58 3390e (1963)]

Derived from

APHA Method 3500Cu

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



Copper PP

M153

0.05 - 5 mg/L Cu

Cu

Bicinchoninate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO CU1 F10	Powder / 100 Pieces	530300
VARIO CU1 F10	Powder / 1000 Pieces	530303

Preparation

1. Digestion is required for the determination of total copper.
2. The pH value of the sample must be adjusted between 4 and 6 before analysis (with potassium hydroxide solution or nitric acid). Any resulting dilution must be taken into account in the result.
Note: pH values above 6 can lead to Copper precipitation.

Remarks

1. Accuracy is not affected by undissolved powder.

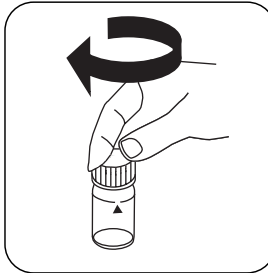
Determination of Copper, free with Vario Powder Pack

Select the method on the device.

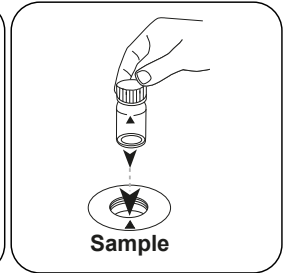
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



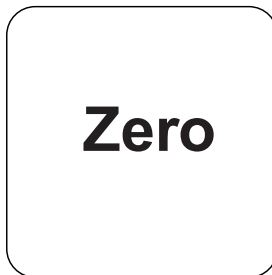
Fill 24 mm vial with **10 mL sample**.



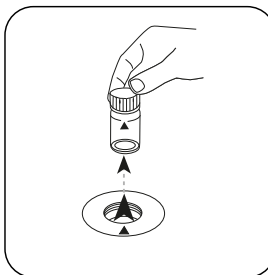
Close vial(s).



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

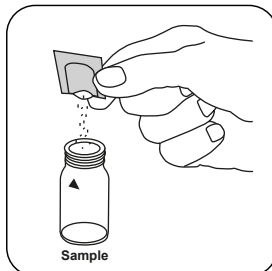


Press the **ZERO** button.

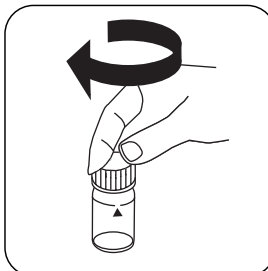


Remove the vial from the sample chamber.

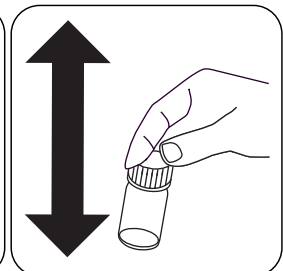
For devices that require **no ZERO measurement**, start here.



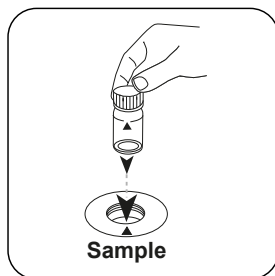
Add **Vario Cu 1 F10 powder pack**.



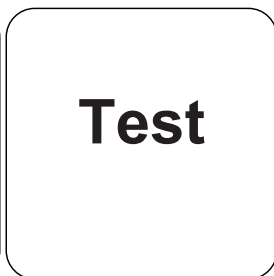
Close vial(s).



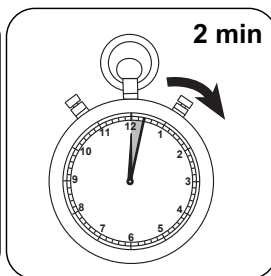
Mix the contents by shaking.



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 mg/L Copper appears on the display.

Chemical Method

Bicinchoninate

Appendix

Interferences

Persistent Interferences

Hardness, Al and Fe produce lower test results.

Removeable Interferences

1. Cyanide, CN⁻: Cyanide prevents full colour development. Cyanide interference is eliminated as follows: Add 0.2 ml Formaldehyde to 10 ml water sample and wait for a reaction time of 4 minutes. (Cyanide is masked). After this perform the test as described. Multiply the result by 1.02 to correct the sample dilution by Formaldehyde.
2. Silver, Ag⁺: If a turbidity remains and turns black, silver interference is likely. Add 10 drops of saturated Potassium chloride solution to 75 ml of water sample and filter it through a fine filter. Use 10 ml of the filtered water sample to perform test.

Method Validation

Limit of Detection	0.05 mg/L
Limit of Quantification	0.15 mg/L
End of Measuring Range	5 mg/L
Sensitivity	3.77 mg/L / Abs
Confidence Intervall	0.064 mg/L
Standard Deviation	0.027 mg/L
Variation Coefficient	1.07 %

Bibliography

S. Nakano, Y. Zasshi, 82 486 - 491 (1962) [Chemical Abstracts, 58 3390e (1963)]

Derived from

APHA Method 3500Cu

**Cyanide L****M157****0.01 - 0.5 mg/L CN⁻****Pyridine-barbituric Acid**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Cyanide Reagent Test 585 nm	1 Pieces	2418874

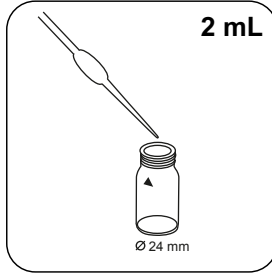
Remarks

1. Only free Cyanide and Cyanides that can be destroyed by Chlorine are determined by this test.
2. The reagents are to be stored in closed containers at a temperature of +15 °C – +25 °C.

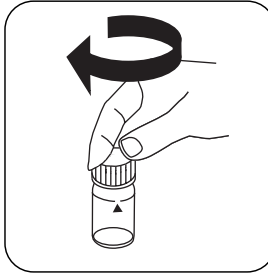
Determination of Cyanide with Reagents test

Select the method on the device.

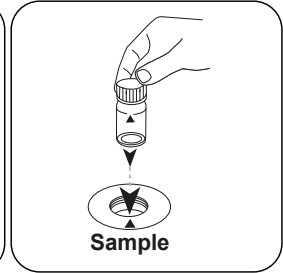
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



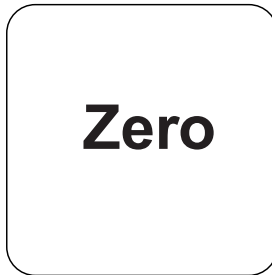
Put **2 mL sample** and **8 mL of deionised water** in the sample vessel.



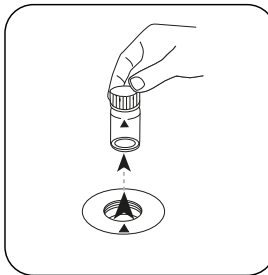
Close vial(s).



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

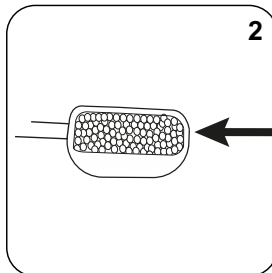


Press the **ZERO** button.

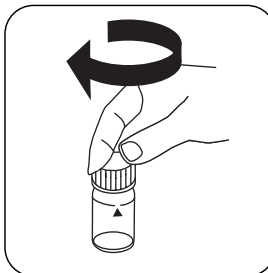


Remove the vial from the sample chamber.

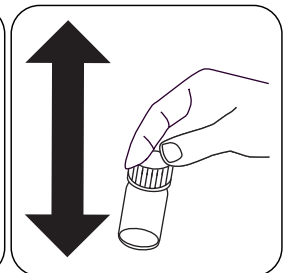
For devices that require **no ZERO measurement**, start here.



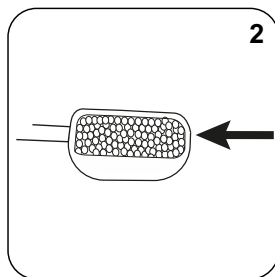
Add **2 level measuring scoop No. 4 (white) Cyanide-11**.



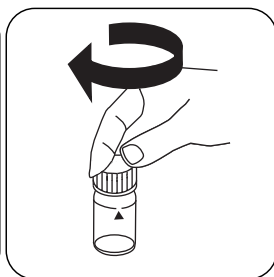
Close vial(s).



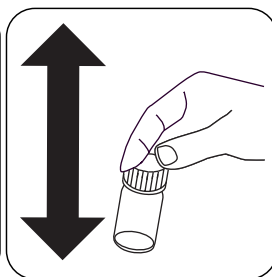
Mix the contents by shaking.



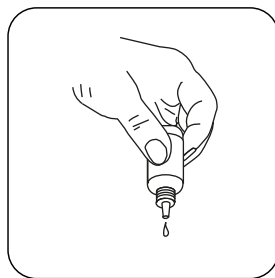
Add **2 level measuring scoop No. 4 (white) Cyanide-12**.



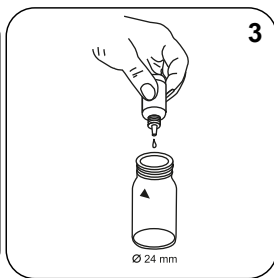
Close vial(s).



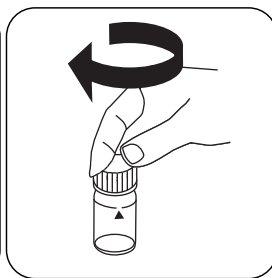
Mix the contents by shaking.



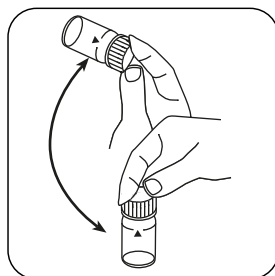
Hold cuvettes vertically and add equal drops by pressing slowly.



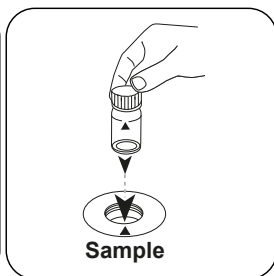
Add **3 drops Cyanide -13**.



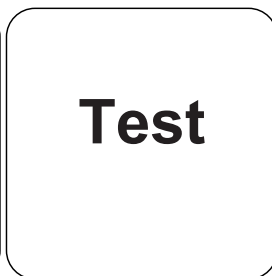
Close vial(s).



Invert several times to mix the contents.

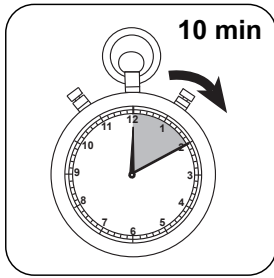


Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

Test



Wait for **10 minute(s)**
reaction time.

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

The result in mg/L Cyanide appears on the display.

EN



Chemical Method

Pyridine-barbituric Acid

Appendix

EN

Interferences

Removeable Interferences

- Thiocyanate, heavy metal complexes, sulphide, colourants or aromatic amines interfere with the test. In the presence of an interfering substance, the cyanide must be separated out by distillation before the test is carried out.

Derived from

DIN 38405-D13



CyA T

M160

10 - 160 mg/L CyA

CyA

Melamine

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
CyA-Test	Tablet / 100	511370BT
CyA-Test	Tablet / 250	511371BT
Deionised Water	250 mL	457022

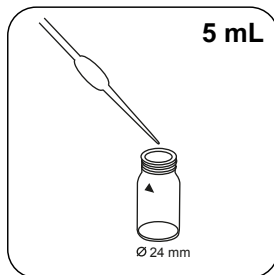
Remarks

1. Cyanuric acid causes an extremely fine distributed turbidity with a milky appearance. Individual particles are not attributable to the presence of cyanuric acid.

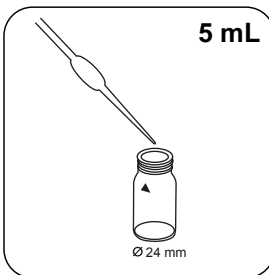
Determination of Cyanuric Acid Test with Tablet

Select the method on the device.

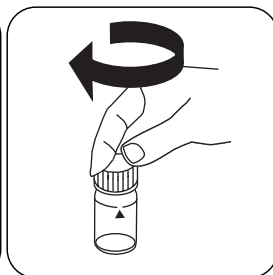
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



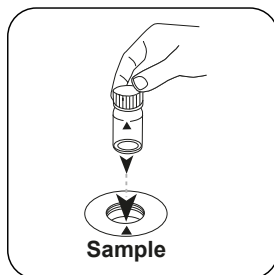
Fill 24 mm vial with **5 mL deionised water**.



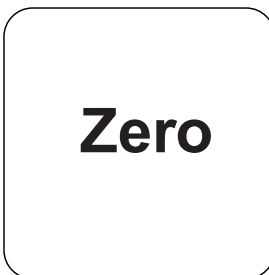
Put **5 mL sample** in the vial.



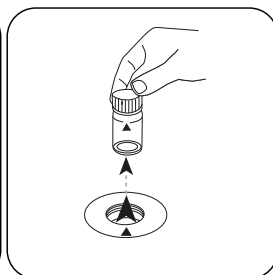
Close vial(s).



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

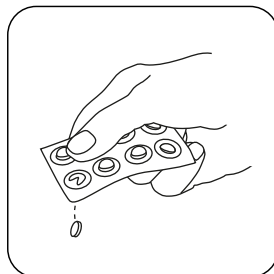


Press the **ZERO** button.

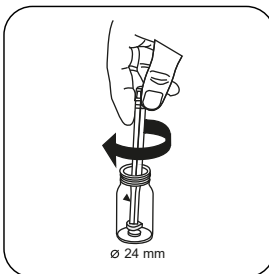


Remove the vial from the sample chamber.

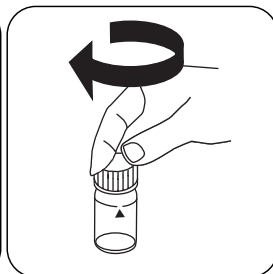
For devices that require **no ZERO measurement**, start here.



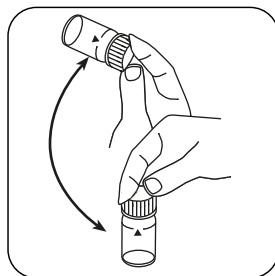
Add **CyA-Test tablet**.



Crush tablet(s) by rotating slightly.



Close vial(s).



Invert several times to mix the contents (for at least 60 s until the tablet is completely dissolved).



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



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

The result in mg/L Cyanuric Acid appears on the display.

EN



Chemical Method

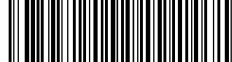
Melamine

Interferences

Persistent Interferences

1. Undissolved particles may lead to higher results. Therefore, it is important to dissolve the Tablet completely.

EN



DEHA T (L)

M165

0.02 - 0.5 mg/L DEHA

PPST

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
DEHA Reagent Solution	15 mL	461185
DEHA Reagent Solution	100 mL	461181
DEHA	Tablet / 100	513220BT
DEHA	Tablet / 250	513221BT

Preparation

1. To avoid errors caused by iron deposits, rinse the glassware with Hydrochloric acid (approx. 20%) before the analysis and then rinse with deionised water.

Remarks

1. Because the reaction depends on temperature, the temperature must be maintained at $20\text{ °C} \pm 2\text{ °C}$.
2. Keep the sample vial in the dark or in the sample chamber during colour development time. If the Reagent solution is exposed to UV-light (sunlight) it causes high measurement results.

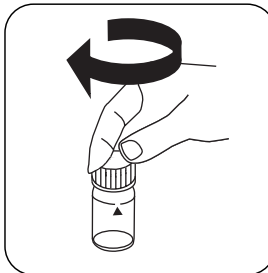
Determination of DEHA (N,N-Diethylhydroxylamine) with Tablet and Liquid Reagent

Select the method on the device.

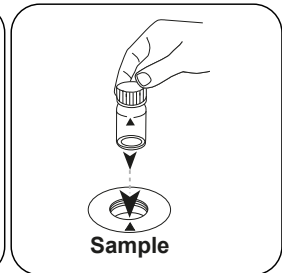
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



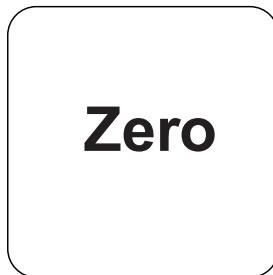
Fill 24 mm vial with **10 mL sample**.



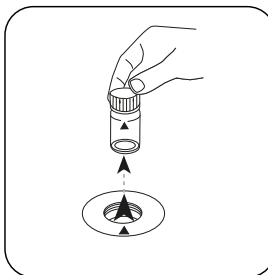
Close vial(s).



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

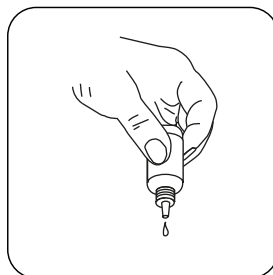


Press the **ZERO** button.

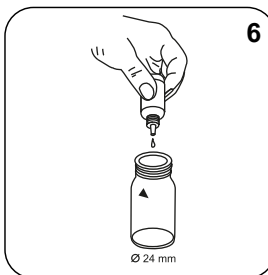


Remove the vial from the sample chamber.

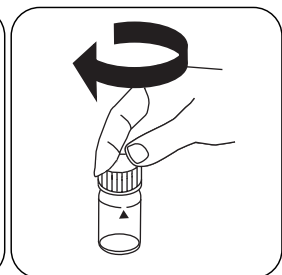
For devices that require **no ZERO measurement**, start here.



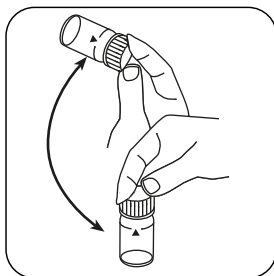
Hold cuvettes vertically and add equal drops by pressing slowly.



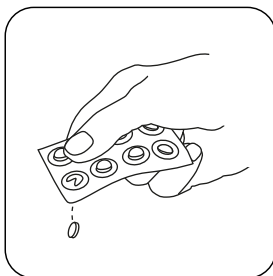
Add **6 drops DEHA Reagent Solution**.



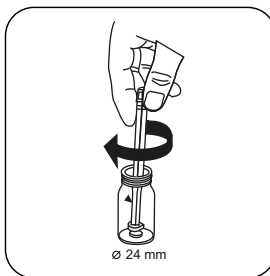
Close vial(s).



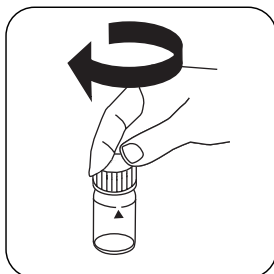
Invert several times to mix the contents.



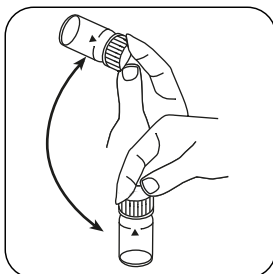
Add **DEHA tablet**.



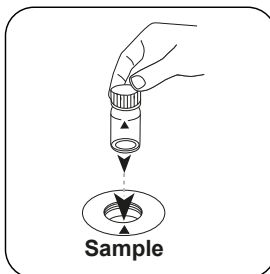
Crush tablet(s) by rotating slightly.



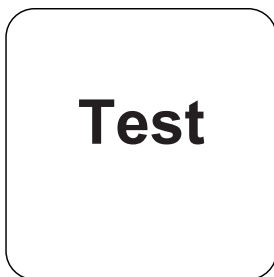
Close vial(s).



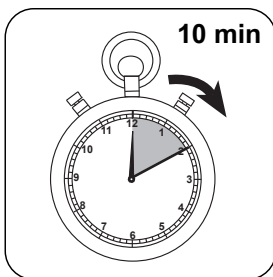
Dissolve tablet(s) by inverting.



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



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



Wait for **10 minute(s) reaction time**.

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

The result in DEHA 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	DEHA	1
µg/l	DEHA	1000
mg/l	Hydrochinon	2.63
mg/l	MEKO	4.5
mg/l	Carbohydrazid	1.31
mg/l	ISA	3.9

EN

Chemical Method

PPST

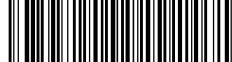
Appendix

Interferences

Removeable Interferences

1. Iron (II) interferes at all concentrations: For the determination of iron (II) concentration, the test is repeated without the addition of DEHA solution. Should the concentration be over 20 µg/L, the displayed value will be deducted from the result of the DEHA test result.
2. Substances that reduce Iron (III), interfere. Substances that complex iron strongly, may also interfere.

Interference	from / [mg/L]
Zn	50
Na ₂ B ₂ O ₇	500
Co	0,025
Cu	8
CaCO ₃	1000
Lignosulfonate	0,05
Mn	0,8
Mo	80
Ni	0,8

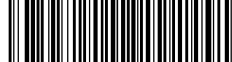


Interference	from / [mg/L]
PO_4^{3-}	10
R-PO(OH)_2	10
SO_4^{2-}	1000

Bibliography

EN

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989



DEHA PP

M167

0.02 - 0.5 mg/L DEHA

DEHA

PPST

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO DEHA Reagent Set	1 Pieces	536000

Preparation

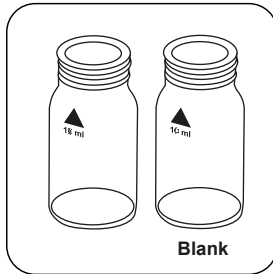
1. To avoid errors caused by iron deposits, rinse the glassware with Hydrochloric acid (approx. 20%) before the analysis and then rinse with deionised water.

Remarks

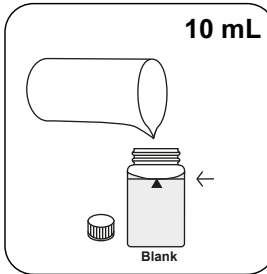
1. Because the reaction depends on temperature, the temperature must be maintained at $20\text{ °C} \pm 2\text{ °C}$.
2. Keep the sample vial in the dark or in the sample chamber during colour development time. If the Reagent solution is exposed to UV-light (sunlight) it causes high measurement results.

Determination of DEHA (N,N-Diethylhydroxylamine) with Vario Powder Pack and Fluid Reagent

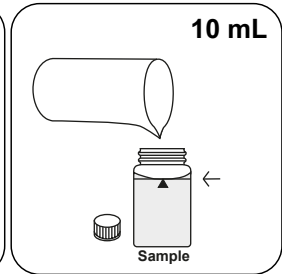
Select the method on the device.



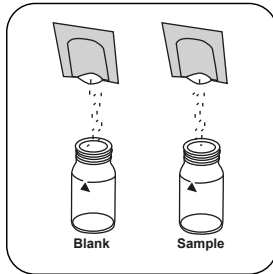
Prepare two clean 24 mm vials. Mark one as a blank.



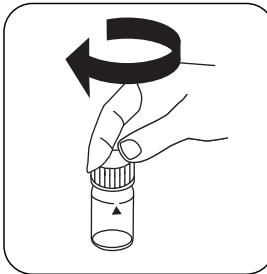
Put **10 mL deionised water** in the blank.



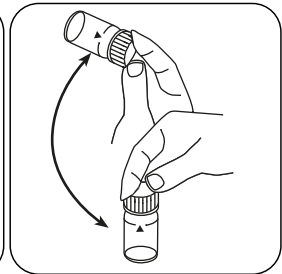
Put **10 mL sample** in the sample vial.



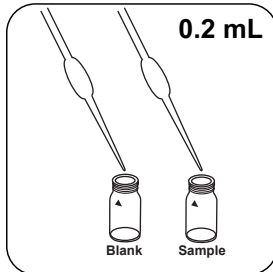
Add a **Vario OXYSCAV 1 Rgt powder pack** in each vial.



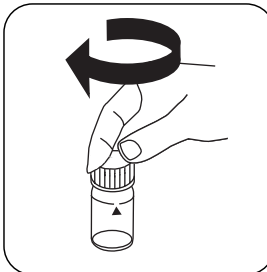
Close vial(s).



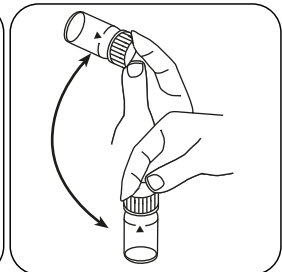
Invert several times to mix the contents.



Add **0.2 mL Vario DEHA 2 Rgt solution** to each vial.



Close vial(s).

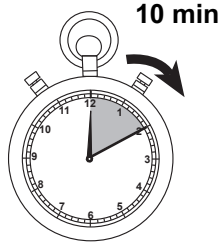


Invert several times to mix the contents.

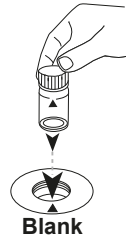
EN



Press the **ENTER** button.



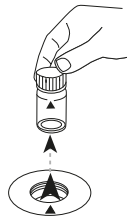
Wait for **10 minute(s) reaction time**.



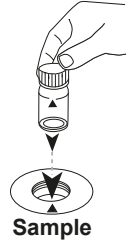
Place **blank** in the sample chamber. Pay attention to the positioning.

Zero

Press the **ZERO** button.



Remove the vial from the sample chamber.



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

Test

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

The result in DEHA 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	DEHA	1
µg/l	DEHA	1000
mg/l	Hydrochinon	2.63
mg/l	MEKO	4.5
mg/l	Carbohydrazid	1.31
mg/l	ISA	3.9

EN

Chemical Method

PPST

Appendix

Interferences

Removeable Interferences

- Interference:
Iron (II) interferes at all concentrations: For the determination of iron (II) concentration, the test is repeated without the addition of DEHA solution. Should the concentration be over 20 µg/L, the displayed value will be deducted from the result of the DEHA test result.
- Substances that reduce Iron (III), interfere. Substances that complex iron strongly, may also interfere.

Interference	from / [mg/L]
Zn	50
Na ₂ B ₄ O ₇	500
Co	0,025
Cu	8
CaCO ₃	1000
Lignosulfonate	0,05
Mn	0,8
Mo	80
Ni	0,8



Interference	from / [mg/L]
PO_4^{3-}	10
R-PO(OH)_2	10
SO_4^{2-}	1000

Bibliography

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989

EN



Fluoride L

M170

0.05 - 2 mg/L F⁻

F

SPADNS

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
SPADNS Reagent Solution 250 mL	250 mL	467481
SPADNS Reagent Solution 500 mL	500 mL	467482
Calibration Standard Fluoride	30 mL	205630

Preparation

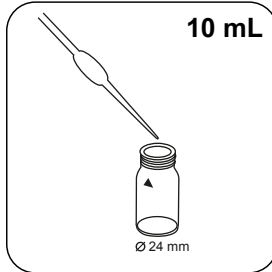
1. A user calibration (see photometer manual) must be carried out before the measurement.
2. The same batch of SPADNS reagent solution must be used for both the user calibration and test (see photometer description). The user calibration process needs to be performed for each new batch of SPADNS reagent solution (see Standard methods 20th, 1998, APHA, AWWA, WEF 4500 F D., S. 4-82).
3. For the user calibration and test, the zeroing and test must be carried out with the same vial, since the vials may have small tolerances.
4. The calibration solution and the water samples to be tested should have the same temperature (± 1 °C).
5. The test result is highly dependent on exact sample and reagent volumes. Sample and reagent volumes should always be measured using a 10 ml or 2 ml volumetric pipette (class A).
6. Seawater and waste water samples must be distilled.
7. It is better practice to use special vials with a larger volume.

Determination of Fluoride with liquid reagent

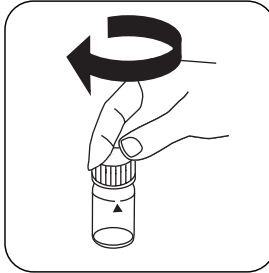
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

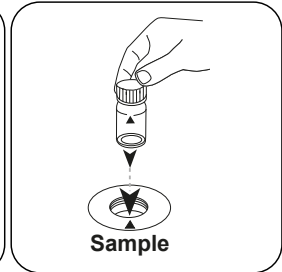
Pay attention to the notes!



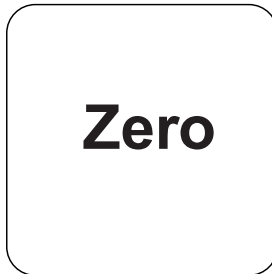
Add **exactly 10 mL sample** to the 24 mm vial.



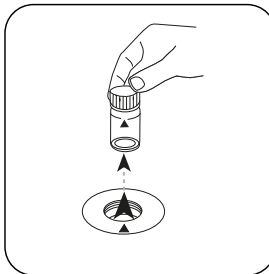
Close vial(s).



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

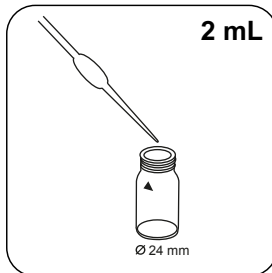


Press the **ZERO** button.

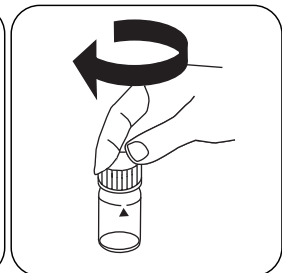
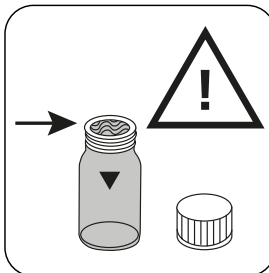


Remove the vial from the sample chamber.

For devices that require **no ZERO measurement**, start here.



Add **exactly 2 mL SPADNS reagent solution** to the 24 mm 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 mg/L Fluorid appears on the display.

EN



Chemical Method

SPADNS

Appendix

Interferences

Persistent Interferences

1. The accuracy decreases above a level of 1.2 mg/L Fluoride Although the results are sufficiently accurate for most applications, even more exact results can be achieved by a 1:1 dilution of the sample before use and by the subsequent multiplication of the result by 2.

Interference	from / [mg/L]
Cl ₂	5

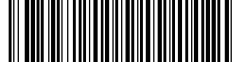
Bibliography

Standard Methods 20th, 1992, APHA, AWWA, WEF 4500 F D, S. 4-82

According to

US EPA 13A

APHA Method 4500 F D



Hardness Calcium (B) T

M190

50 - 900 mg/L CaCO₃

Murexide

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
CALCHECK	Tablet / 100	515650BT
CALCHECK	Tablet / 250	515651BT

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).
2. It is better practice to use special vials with a larger volume.

Remarks

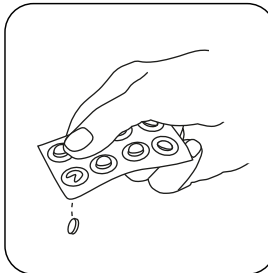
1. The method works in the high measuring range with greater tolerances than in the low measuring range. When diluting samples, always measure in the first third of the range.
2. This method was developed from a volumetric procedure for the determination of calcium. Due to undefined conditions, the deviations from the standardised method may be greater.

Determination of Hardness Calcium with Tablet

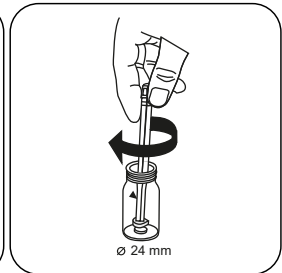
Select the method on the device.



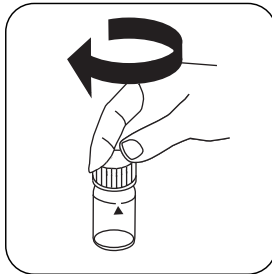
Fill 24 mm vial with **10 mL deionised water**.



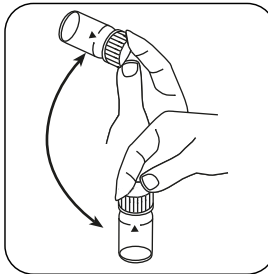
Add **CALCHECK** tablet.



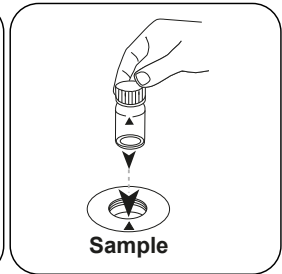
Crush tablet(s) by rotating slightly.



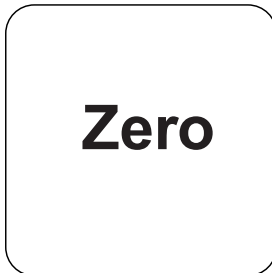
Close vial(s).



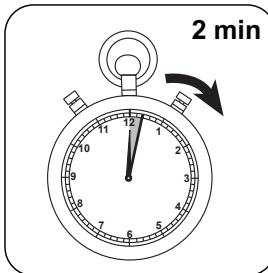
Dissolve tablet(s) by inverting.



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



Press the **ZERO** button.
XD: Sampleblank

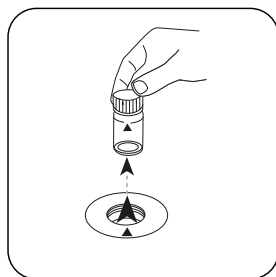


Wait for **2 minute(s) reaction time**.

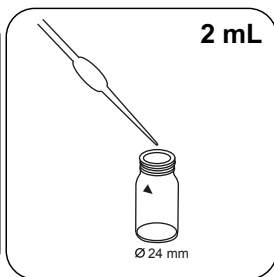
Once the reaction period is finished, the measurement takes place automatically.



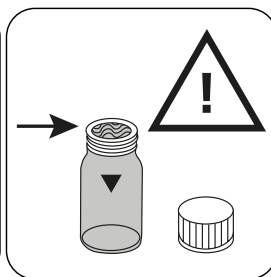
EN



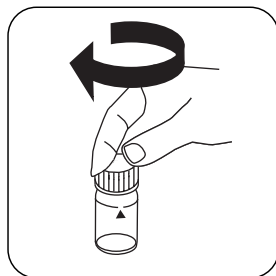
Remove the vial from the sample chamber.



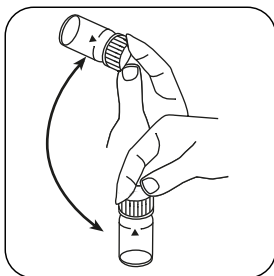
Put **2 mL sample** in the vial.



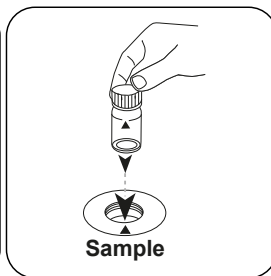
Note: Vial is filled to the top!



Close vial(s).



Invert several times to mix the contents (5x).



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

Test

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

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 ₃	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1
mg/l	Ca	0.40043

EN

Chemical Method

Murexide

Appendix

Interferences

Persistent Interferences

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

Bibliography

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980



Hardness Calcium (B) T

M191

20 - 500 mg/L CaCO₃

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).

Remarks

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.

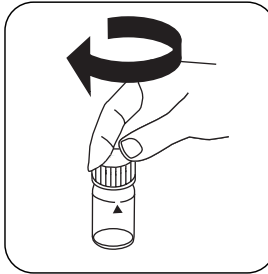
Determination of Hardness Calcium 2 with Tablet

Select the method on the device.

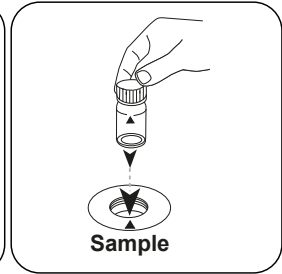
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



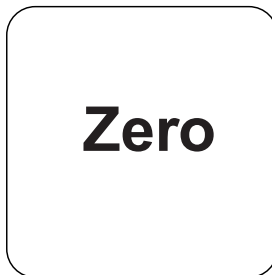
Fill 24 mm vial with **10 mL sample**.



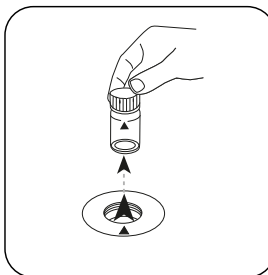
Close vial(s).



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

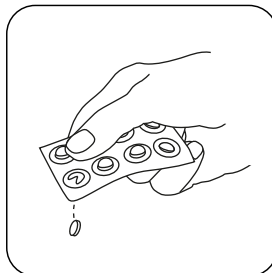


Press the **ZERO** button.

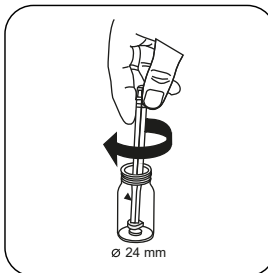


Remove the vial from the sample chamber.

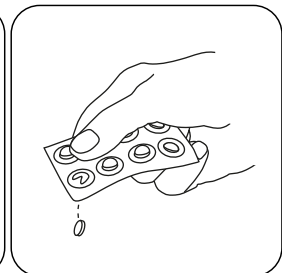
For devices that require **no ZERO measurement**, start here.



Add **CALCIO H No.1 tablet**



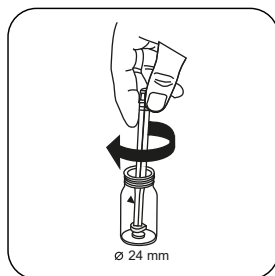
Crush tablet(s) by rotating slightly and dissolve.



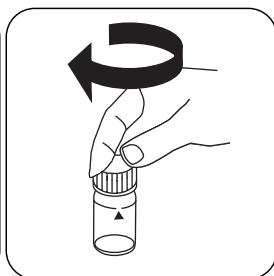
Add **CALCIO H No.2 tablet**



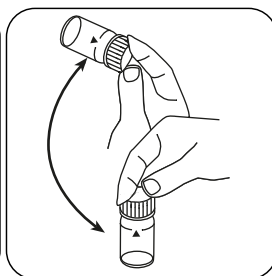
EN



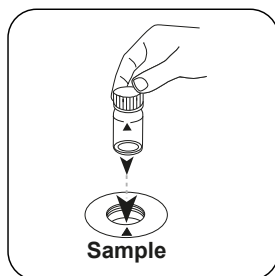
Crush tablet(s) by rotating slightly.



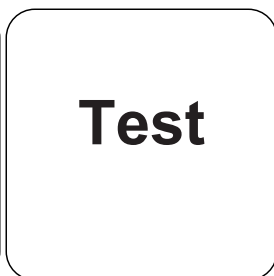
Close vial(s).



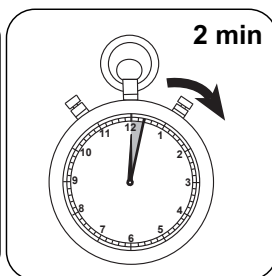
Dissolve tablet(s) by inverting.



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



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



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 ₃	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1

EN

Chemical Method

Murexide

Appendix

Interferences

Persistent Interferences

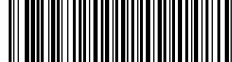
1. Silver, mercury, cadmium, cobalt and copper interfere with the test result.

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

Bibliography

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

* including stirring rod, 10 cm

**Hardness Ca and Mg MR TT****M198****10 - 360 mg/L CaCO₃****Calmagite**

EN

Material

Required material (partly optional):

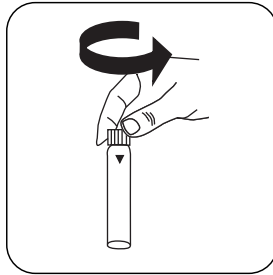
Reagents	Packaging Unit	Part Number
Hardness Ca Mg MR TT	1 Set	2423960
Ca Mg Hardness Sol 2, 15 mL	15 mL	471200
Ca Mg Hardness Sol 3 - 5 mL	5 mL	471230
Ca Mg Hardness Sol 4 - 5 mL	5 mL	471220

Remarks

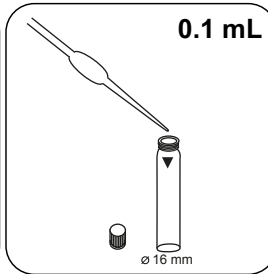
1. On the XD7x00 the method is implemented under method number M2512.

Determination of Hardness Calcium and Magnesium MR TT with liquid reagent

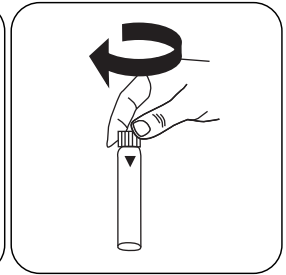
Select the method on the device.



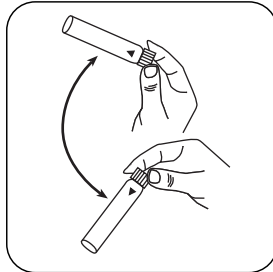
Open a **digestion vial**.



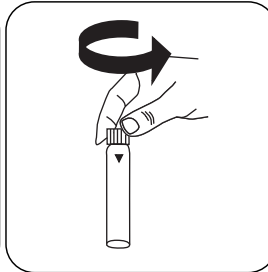
Add **0.1 mL sample**.



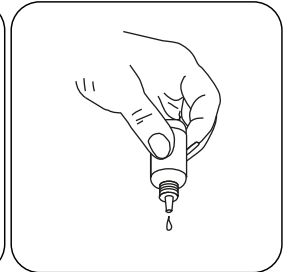
Close vial(s).



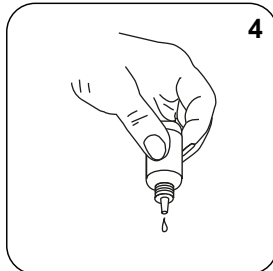
Invert several times to mix the contents (10x).



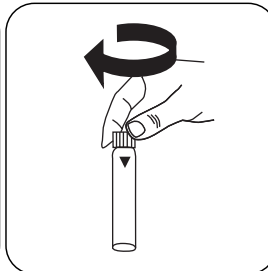
Open the sample vial.



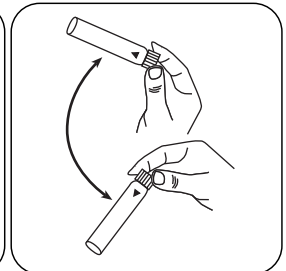
Hold cuvettes vertically and add equal drops by pressing slowly.



Add **4 drops Ca Mg Hardness SOL 2 (blue bottle)**.

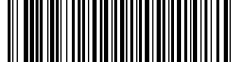


Close vial(s).

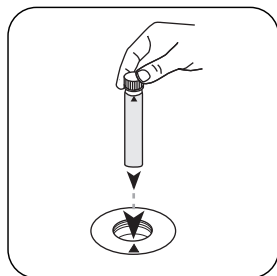


Invert several times to mix the contents (10x).

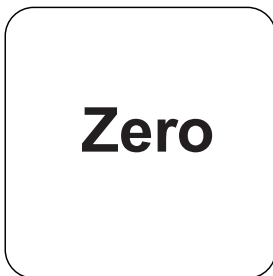
EN



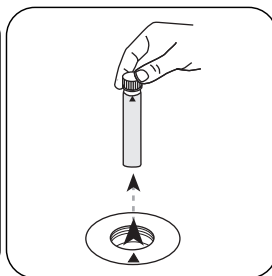
EN



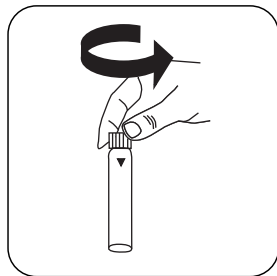
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



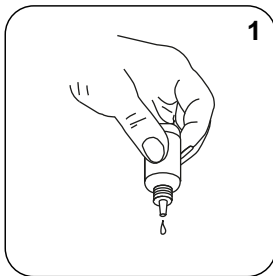
Press the **ZERO (XD: START)** button.



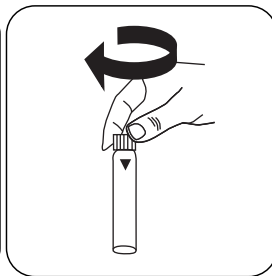
Remove **vial** from the sample chamber.



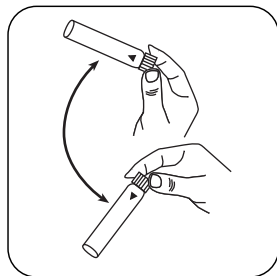
Open the **sample vial**.



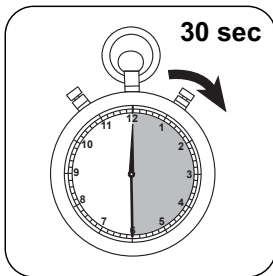
Add **1 drops Ca Mg Hardness SOL 3 (green bottle)**.



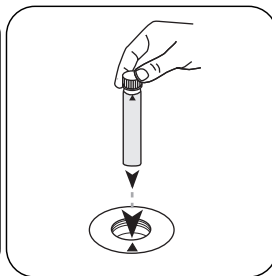
Close **vial(s)**.



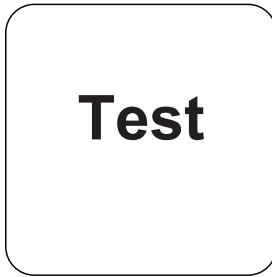
Invert several times to mix the contents (**10x**).



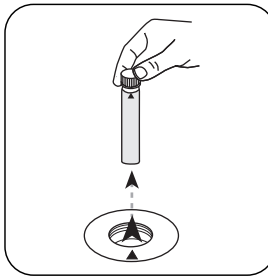
Wait for **30 second(s) reaction time**.



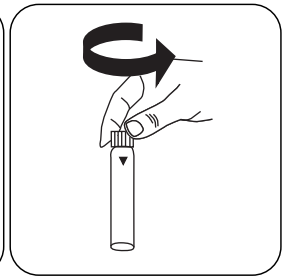
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



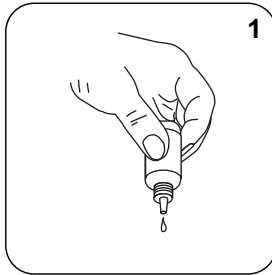
Press the **TEST** (XD:
START) button.



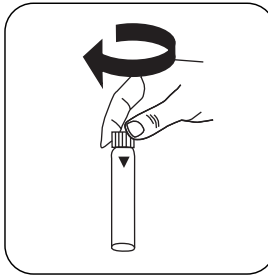
Remove **vial** from the
sample chamber.



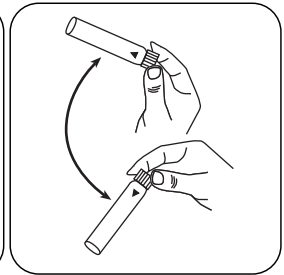
Open the sample vial.



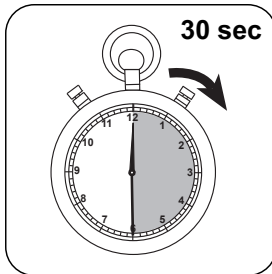
Add **1 drop** Ca Mg
Hardness **SOL 4** (white
bottle).



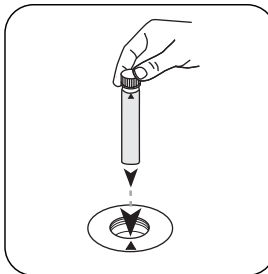
Close vial(s).



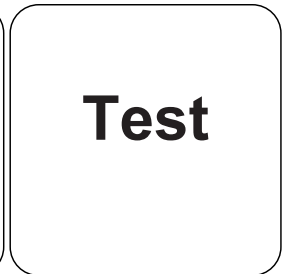
Invert several times to mix
the contents (10x).



Wait for **30 second(s)**
reaction time.



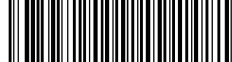
Place **sample vial** in the
sample chamber. • Pay
attention to the positioning.



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

The result in **mg/L** [Ca]-CaCO₃ and [Mg]-CaCO₃ 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 ₃	1
mg/L	Ca	0.4004
mg/L	MgCO ₃	0.8424
mg/L	Mg	0.2428
	°dH	0.0560

EN

Chemical Method

Calmagite

Interferences

Removeable Interferences

The Ca determination is disturbed by high Mg contents. For accurate Ca measurements, a dilution should be carried out.

Interference	from / [mg/L]
Al ³⁺	100
Cr ³⁺	12.5
Cr ₂ O ₇ ²⁻	12.5
Cu ²⁺	50
Fe ³⁺	150
Mn ²⁺	50
Mo ⁶⁺	110
Ni ²⁺	3
PO ₄ ³⁻	750
Zn ²⁺	10
EDTA	25



Hardness Ca and Mg L

M199

0.05 - 4 mg/L CaCO₃

Calmagite

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Ca Mg Hardness Set	1 Pieces	475100
Ca Mg Hardness Sol 1, 15 mL	15 mL	471210
Ca Mg Hardness Sol 2, 15 mL	15 mL	471200
Ca Mg Hardness Sol 3 - 5 mL	5 mL	471230
Ca Mg Hardness Sol 4 - 5 mL	5 mL	471220

Preparation

Cleaning the vials:

1. To avoid errors, rinse the vials and lids thoroughly with deionised water (demineralised water) before use.

Remarks

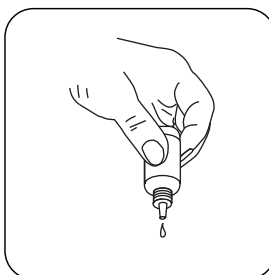
1. On the XD7x00 the method is implemented under the method number M2511.

Determination of Hardness Calcium and Magnesium with liquid reagents

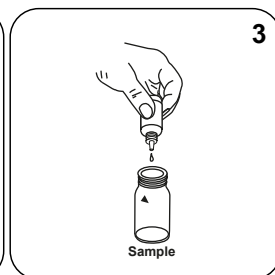
Select the method on the device.



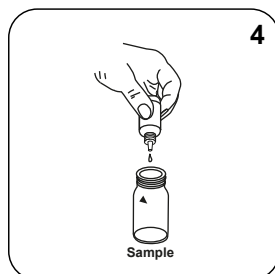
Fill 24 mm vial with **10 mL sample**.



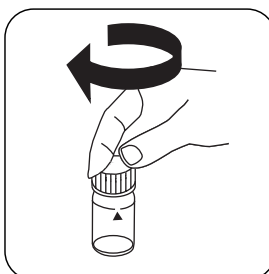
Hold cuvettes vertically and add equal drops by pressing slowly.



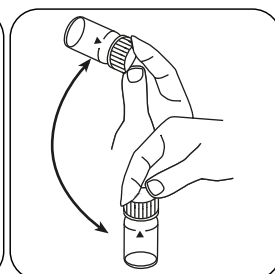
Add **3 drops Ca Mg Hardness SOL 1 (red bottle)** to the sample vial.



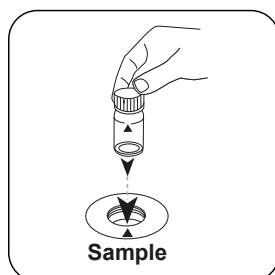
Add **4 drops Ca Mg Hardness SOL 2 (blue bottle)** to the sample vial.



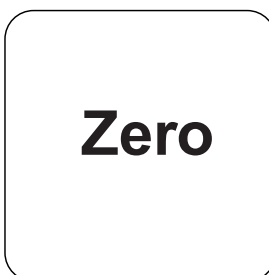
Close vial(s).



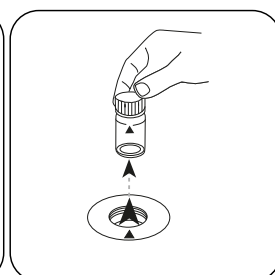
Invert several times to mix the contents (10x).



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

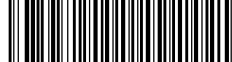


Press the **ZERO (XD: START)** button.

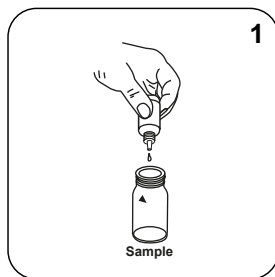


Remove the vial from the sample chamber.

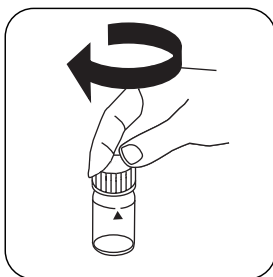
EN



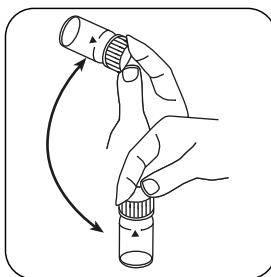
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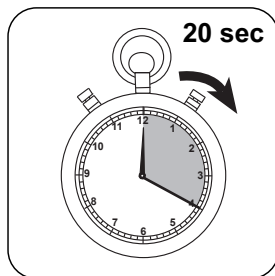
1
Add **1 drop Ca Mg Hardness SOL 3 (green bottle)** to the **sample vial**.



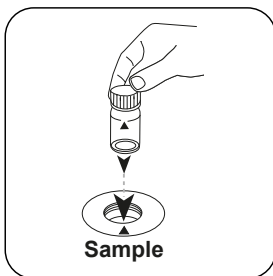
Close vial(s).



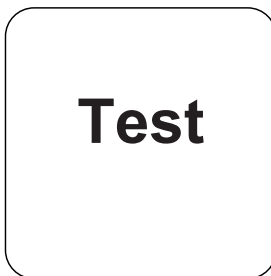
Invert several times to mix the contents.



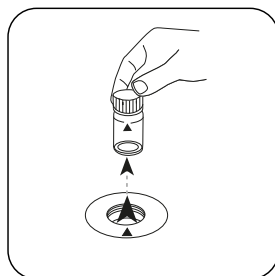
Wait for **20 second(s) reaction time**.



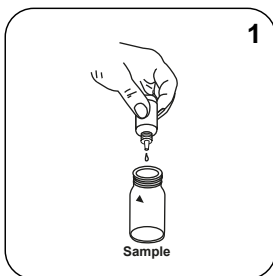
Place **sample vial** in the sample chamber. Pay attention to the positioning.



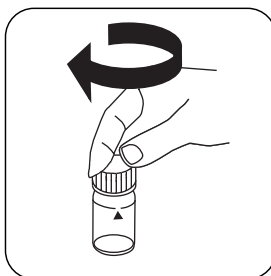
Press the **TEST (XD: START)** button.



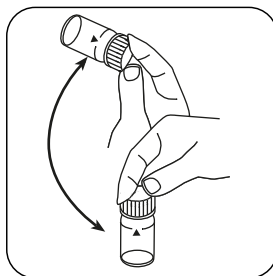
Remove the vial from the sample chamber.



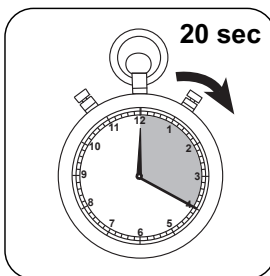
1
Add **1 drop Ca Mg Hardness SOL 4 (white bottle)** to the **sample vial**.



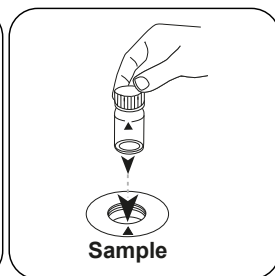
Close vial(s).



Invert several times to mix the contents.



Wait for **20 second(s) reaction time**.



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

EN

Test

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

The result in **mg/L** [Ca]-CaCO₃ and [Mg]-CaCO₃ 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 ₃	1
mg/L	Ca	0.4004
mg/L	MgCO ₃	0.8424
mg/L	Mg	0.2428
	°dH	0.0560

EN

Chemical Method

Calmagite

Interferences

Removeable Interferences

The Ca determination is disturbed by high Mg contents. For accurate Ca measurements, a dilution should be carried out.

Interference	from / [mg/L]
Cr ³⁺	0.25
Cu ²⁺	0.75
Fe ²⁺	1.4
Fe ³⁺	2.0
Mn ²⁺	0.20
Zn ²⁺	0.050



Hardness total T

M200

2 - 50 mg/L CaCO₃

tH1

Metallphthaleine

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Hardcheck P	Tablet / 100	515660BT
Hardcheck P	Tablet / 250	515661BT

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).

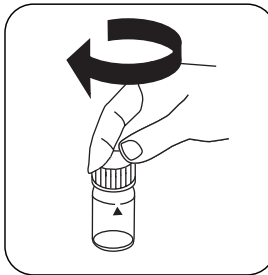
Determination of Hardness, Total with Tablet

Select the method on the device.

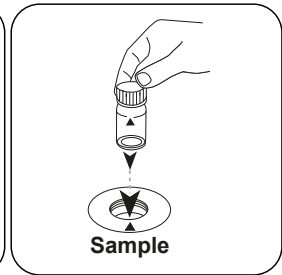
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



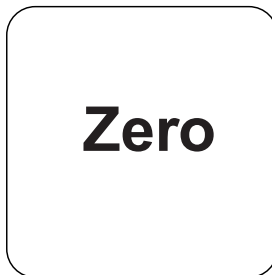
Fill 24 mm vial with **10 mL sample**.



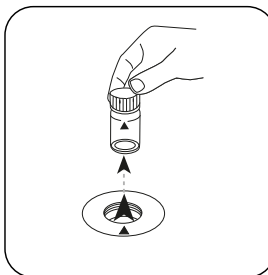
Close vial(s).



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

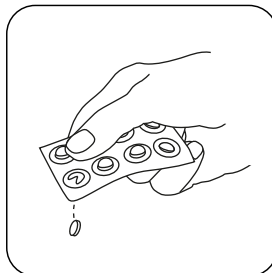


Press the **ZERO** button.

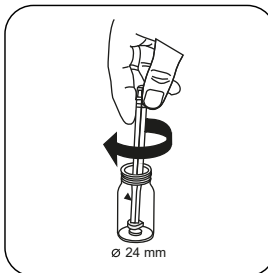


Remove the vial from the sample chamber.

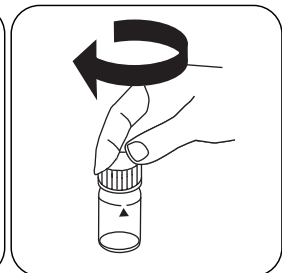
For devices that require **no ZERO measurement**, start here.



Add **HARDCHECK P tablet**.



Crush tablet(s) by rotating slightly.



Close vial(s).



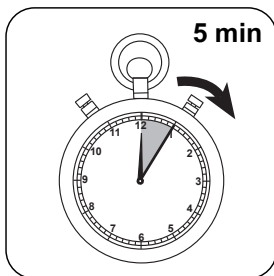
Dissolve tablet(s) by inverting.



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



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



Wait for **5 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically. The result in total 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 ₃	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1
mg/l	Ca	0.40043

EN

Chemical Method

Metallphthaleine

Appendix

Interferences

Removeable Interferences

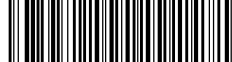
1. Interference from zinc and magnesium can be eliminated by the addition of 8-hydroxyquinoline.
2. Concentrations of strontium and barium that occur in waters and soils do not interfere.

Method Validation

Limit of Detection	0.88 mg/L
Limit of Quantification	2.64 mg/L
End of Measuring Range	50 mg/L
Sensitivity	42.5 mg/L / Abs
Confidence Intervall	2.62 mg/L
Standard Deviation	1.08 mg/L
Variation Coefficient	4.17 %

Bibliography

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989



Hardness total HR T

M201

20 - 500 mg/L CaCO₃ ¹⁾

tH2

Metallphthaleine

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Hardcheck P	Tablet / 100	515660BT
Hardcheck P	Tablet / 250	515661BT

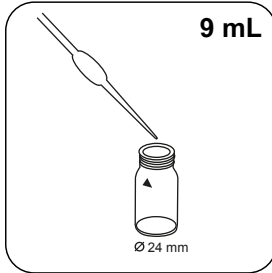
Preparation

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).

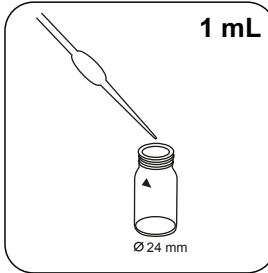
Determination of Hardness total HR with tablet

Select the method on the device.

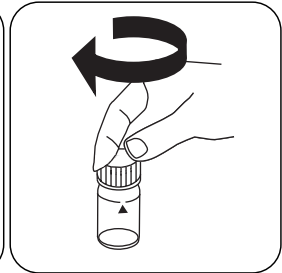
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



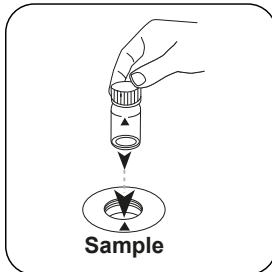
Fill 24 mm vial with **9 mL deionised water**.



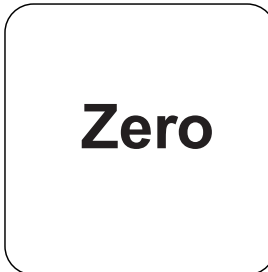
Put **1 mL sample** in the vial.



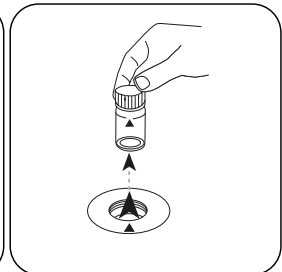
Close vial(s).



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

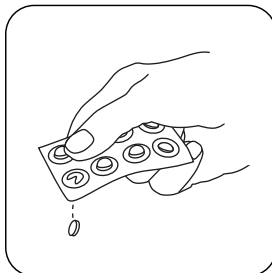


Press the **ZERO** button.

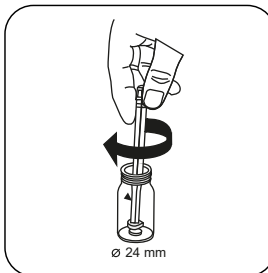


Remove the vial from the sample chamber.

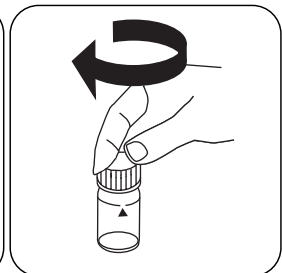
For devices that require **no ZERO measurement**, start here.



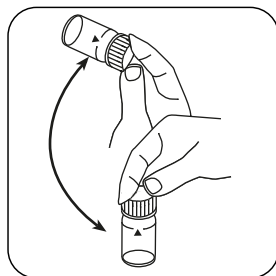
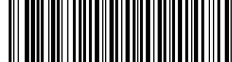
Add **HARDCHECK P** tablet.



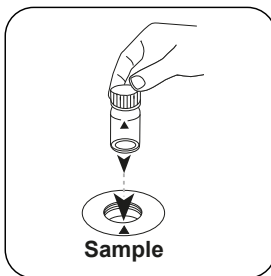
Crush tablet(s) by rotating slightly.



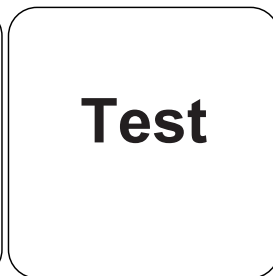
Close vial(s).



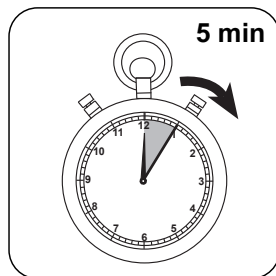
Dissolve tablet(s) by inverting.



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



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



Wait for **5 minute(s)** reaction time.

Once the reaction period is finished, the measurement takes place automatically. The result in total 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 ₃	1
	°dH	0.056
	°eH	0.07
	°fH	0.1
	°aH	1
mg/l	Ca	0.40043

EN

Chemical Method

Metallphthaleine

Appendix

Interferences

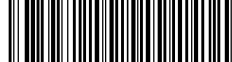
Removeable Interferences

1. Interference from zinc and magnesium can be eliminated by the addition of 8-hydroxyquinoline.
2. Concentrations of strontium and barium that occur in waters and soils do not interfere.

Bibliography

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989

³ high range by dilution



Hazen 24

M204

10 - 500 mg/L Pt

PtCo

(APHA) Platinum Cobalt Standard
Method

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
no reagent required		

Preparation

1. Sample collection, preservation and storage:
Pour the water sample into clean glass or plastic containers and analyse as soon as possible after the sample is taken. If this is not possible, fill the container right up to the top and seal tightly. Do not stir the sample and avoid lengthy contact with the air. The sample may be stored in a dark place at a temperature of 4 °C for 24 hours. Before carrying out any measurements, the water sample should be brought up to room temperature.

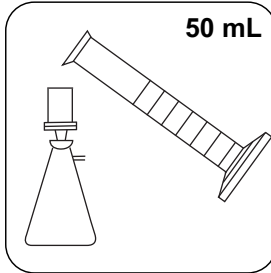
Remarks

1. This colour scale was originally developed by A. Hazen as a visual comparison scale. It is therefore necessary to ascertain whether the extinction maximum of the water sample is in the range between 420 and 470 nm, as this method is only suitable for water samples with yellowish to yellowish-brown colouration. Where applicable, a decision should be made based on visual inspection of the water sample.
2. This method is calibrated on the basis of the standards specified by "Standard Methods for the Examination of Water and Wastewater" (also see EN ISO 7887:1994). Pt-Co colour unit $\hat{=}$ 1 mg/L of platinum as chloroplatinate ion
3. Colour may be expressed as "true" or "apparent" colour. The apparent colour is defined as the colour of a solution due to dissolved substances and suspended particles in the sample. This manual describes the determination of true colour by filtration of the water sample. To determine the apparent colour, non-filtrated deionised water and sample are measured.
4. The estimated detection limit for this method is 15 mg/L Pt.

Determination of Colour, true and apparent

Select the method on the device.

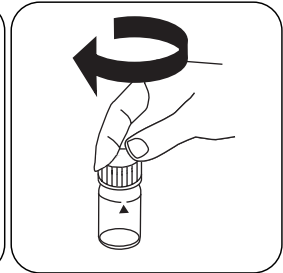
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



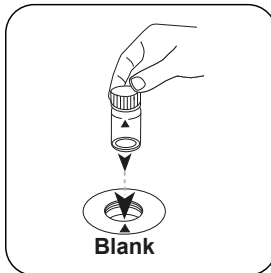
Filter approx. 50 mL sample with a pre-rinsed filter (pore size 0.45 µm).



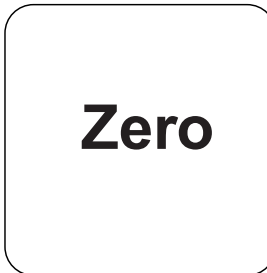
Put **10 mL deionised water** in the blank.



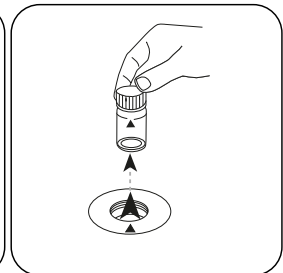
Close vial(s).



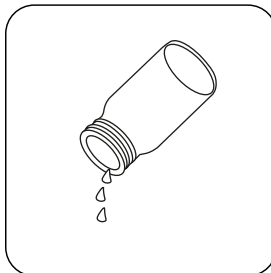
Place **blank** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.



Remove the vial from the sample chamber.

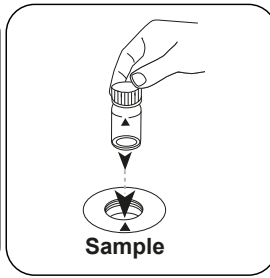


Empty vial.

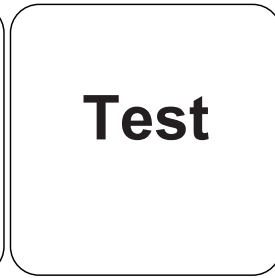
For devices that require **no ZERO measurement**, start here.



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



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



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

The result in Pt-Co units appears on the display.



Chemical Method

(APHA) Platinum Cobalt Standard Method

Appendix

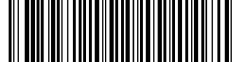
Method Validation

Limit of Detection	10.26 mg/L
Limit of Quantification	30.77 mg/L
End of Measuring Range	500 mg/L
Sensitivity	1,719.12 mg/L / Abs
Confidence Intervall	10.25 mg/L
Standard Deviation	4.24 mg/L
Variation Coefficient	1.6 %

According to

DIN 7887-C1
(WL 430, 455 nm;
Standard: 410 nm)

EN



Hydrazine P

M205

0.05 - 0.5 mg/L N₂H₄

Hydr

Dimethylaminobenzaldehyde

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Hydrazine Test Powder	Powder / 30 g	462910

The following accessories are required.

Accessories	Packaging Unit	Part Number
Measuring spoon, 1 g	1 Pieces	384930

Preparation

1. If the water sample is turbid, it must be filtered before performing the zeroing.
2. The sample's temperature should not exceed 21 °C.

Remarks

1. When using the hydrazine measuring spoon, 1 g is a level measuring spoon.
2. For removal of the reagents resulting in turbidity, ensure to use a quality membrane filter for medium deposits.
3. To check the reagent for prolonged storage and possible ageing, follow the test as described for tap water. Should the result of the value of the detection limit of 0.05 mg/L be exceeded, the reagent may only be used with restrictions (larger measured value deviations).

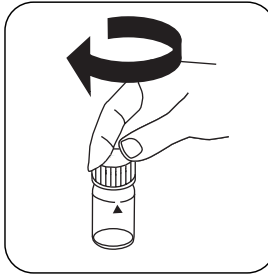
Determination of Hydrazine with Powder Reagent

Select the method on the device.

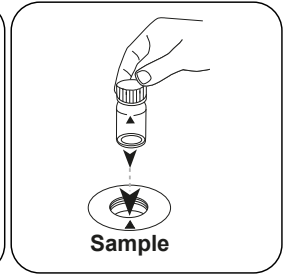
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



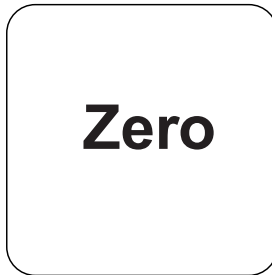
Fill 24 mm vial with **10 mL sample**.



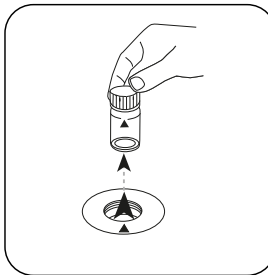
Close vial(s).



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

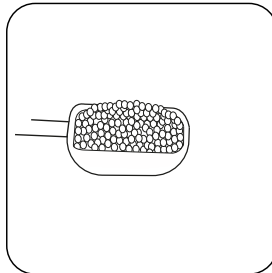


Press the **ZERO** button.

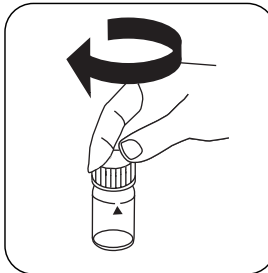


Remove the vial from the sample chamber.

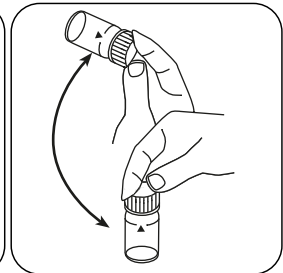
For devices that require **no ZERO measurement**, start here.



Add **1 g HYDRAZIN Test powder**.



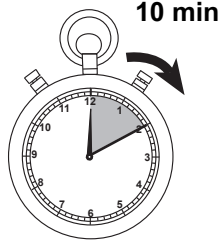
Close vial(s).



Invert several times to mix the contents.



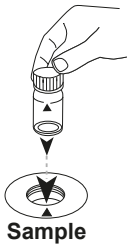
Press the **ENTER** button.



Wait for **10 minute(s)**
reaction time.



Any slight turbidity that
occurs must be removed by
filtration.



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

Test

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

The result in Hydrazine appears on the display.

Chemical Method

Dimethylaminobenzaldehyde

Appendix

Interferences

EN

Removeable Interferences

- Interferences as a result of highly coloured or turbid samples: Mix 1 part deionised water with 1 part household bleach. Add 1 drop of this mixture into a 25 ml water sample and mix. Use 10 ml prepared sample in place of deionised water in point 1.
 Note: For measuring water samples, an unprepared sample must be used.
 Principle: hydrazine is oxidised by household bleach. Colour interference will be eliminated by zeroing.

Interference	from / [mg/L]
NH_4^+	10
$\text{C}_2\text{H}_5\text{NO}$	10
VO_4^{3-}	1

Derived from

DIN 38413-P1

**Hydrazine L****M206****0.01 - 0.6 mg/L N₂H₄****Dimethylaminobenzaldehyde**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Hydra 2 Reagent	100 mL	531200

Preparation

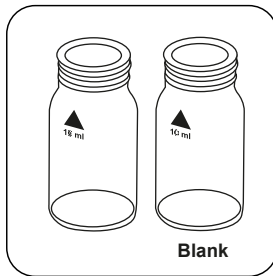
1. Samples cannot be preserved and must be analysed immediately.
2. Sample temperature should be 21 °C ± 4 °C.

Remarks

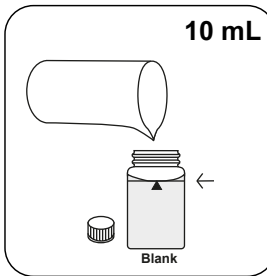
1. The blank may develop a faint yellow colour due to the reagent.
2. The unit mg/L is rounded. Measuring Range 0,01-0,6 mg/L.

Determination of Hydrazine with Vario liquid Reagent

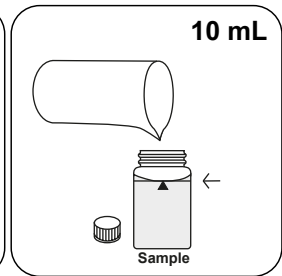
Select the method on the device.



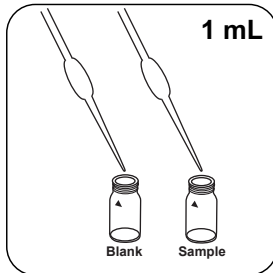
Prepare two clean 24 mL vials. Mark one as a blank.



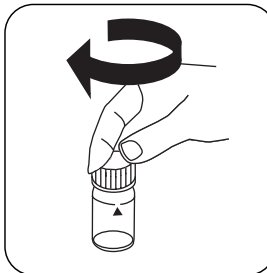
Put **10 mL deionised water** in the blank.



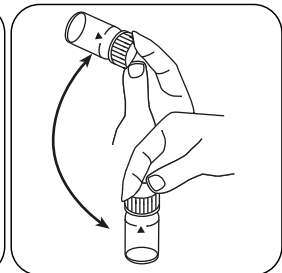
Put **10 mL sample** in the sample vial.



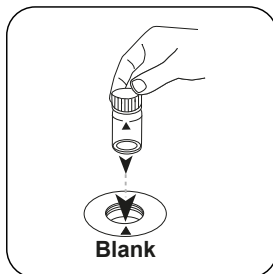
Add **1 mL Vario Hydra 2 Rgt solution** to each vial.



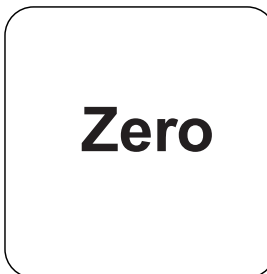
Close vial(s).



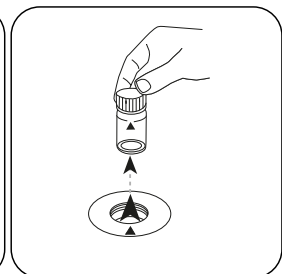
Invert several times to mix the contents.



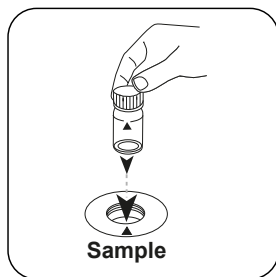
Place **blank** in the sample chamber. Pay attention to the positioning.



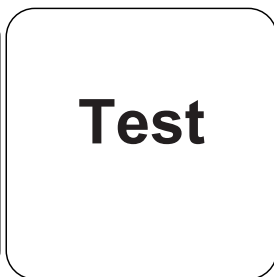
Press the **ZERO** button.



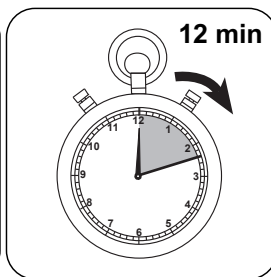
Remove the vial from the sample chamber.



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



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



Wait for **12 minute(s) reaction time**.

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

The result in Hydrazine 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	N ₂ H ₄	1
µg/l	N ₂ H ₄	1000

EN

Chemical Method

Dimethylaminobenzaldehyde

Appendix

Interferences

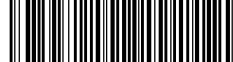
Removeable Interferences

- Interferences as a result of highly coloured or turbid samples: Mix 1 part deionised water with 1 part household bleach. Add 1 drop of this mixture into a 25 ml water sample and mix. Use 10 ml prepared sample in place of deionised water in point 1.
 Note: For measuring water samples, an unprepared sample must be used.
 Principle: hydrazine is oxidised by household bleach. Colour interference will be eliminated by zeroing.

Interference	from / [mg/L]
NH ₄ ⁺	10
Morpholin	10
VO ₄ ³⁻	1

Derived from

DIN 38413-P1



Hydrazine C

M207

0.01 - 0.7 mg/L N₂H₄ ^o

PDMAB

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Vacu-vial Hydrazine Test Kit	1 Set	380470

The following accessories are required.

Accessories	Packaging Unit	Part Number
Adapter (13 mm) MultiDirect for Vacu-vial	1 Pieces	192075
Adapter for round cuvettes 13 mm Ø	1 Pieces	19802192

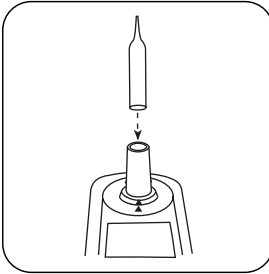
Remarks

1. This method is adapted from a product by CHEMetrics. The measuring range and wavelength used for this photometer may differ from the data specified by CHEMetrics.
2. Before performing the test, you must read through the original instructions and safety data sheet that is delivered with the test kit (MSDS are also available on the homepage of www.chemetrics.com).
3. Vacu-vials® is a registered trademark of the company CHEMetrics, Inc. / Calverton, U.S.A.

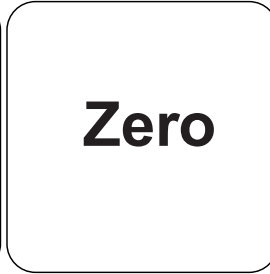


Determination of Hydrazine with Vacu-vials® K-5003

Select the method on the device.

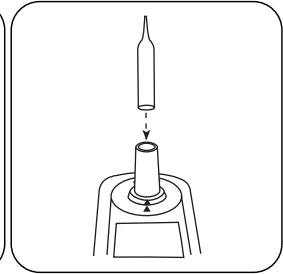


Place **Zero ampoule** in the sample chamber.

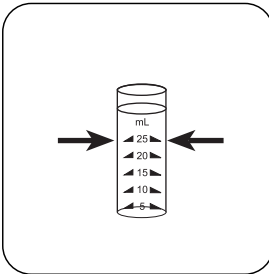


Zero

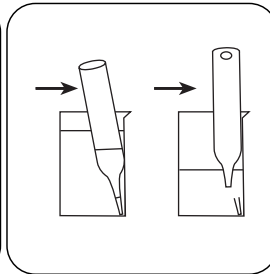
Press the **ZERO** button.



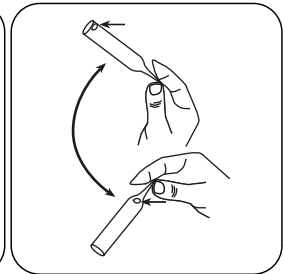
Remove zero ampoule from the sample chamber.



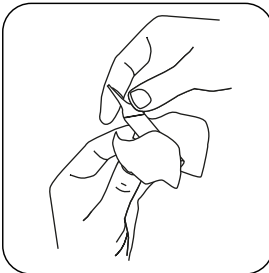
Fill the sample glass to the 25 mL mark with the sample.



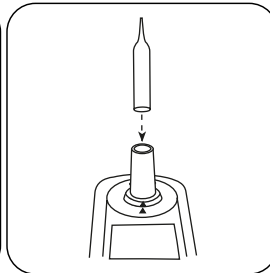
Place a Vacu-vial® ampoule in the sampling vessel. Break off the ampoule tip by applying light pressure against the vessel wall. Wait for the ampoule to fill completely.



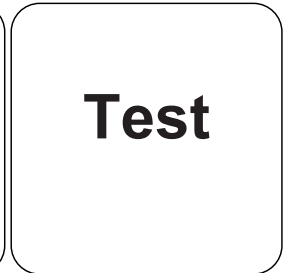
Invert the ampoule several times.



Dry the outside of the ampoule.

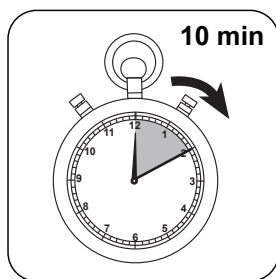
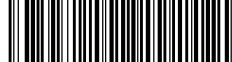


Place the ampoule in the sample chamber.



Test

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



EN

Wait for **10 minute(s)**
reaction time.

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

The result in Hydrazine 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	N ₂ H ₄	1
µg/l	N ₂ H ₄	1000

EN

Chemical Method

PDMAB

Appendix

Interferences

Removeable Interferences

- Interferences as a result of highly coloured or turbid samples: Mix 1 part deionised water with 1 part household bleach. Add 1 drop of this mixture into a 25 ml water sample and mix. Use 10 ml prepared sample in place of deionised water in point 1.
 Note: For measuring water samples, an unprepared sample must be used.
 Principle: hydrazine is oxidised by household bleach. Colour interference will be eliminated by zeroing.

Interference	from / [mg/L]
NH ₄ ⁺	10
C ₄ H ₉ NO	10
VO ₄ ³⁻	1

Method Validation

Limit of Detection	0.0087 mg/L
Limit of Quantification	0.026 mg/L
End of Measuring Range	0.7 mg/L
Sensitivity	0.67 mg/L / Abs
Confidence Intervall	0.003 mg/L
Standard Deviation	0.001 mg/L
Variation Coefficient	0.42 %



Derived from

DIN 38413-P1

^{*)} MultiDirect: Adapter is necessary for Vacu-vials® (Order code 19 20 75)

EN

H₂O₂ T

M210

0.03 - 3 mg/L H₂O₂

DPD / Catalyst

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Hydrogen Peroxide LR	Tablet / 100	512380BT
Hydrogen Peroxide LR	Tablet / 250	512381BT

Sampling

1. When preparing the sample, Hydrogen Peroxide 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. To avoid measurement errors, the glassware used should be pretreated accordingly. 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. The DPD colour development is carried out at a pH value of 6.2 to 6.5. The reagents therefore contain a buffer for the pH adjustment. Strong alkaline or acidic water samples must therefore be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

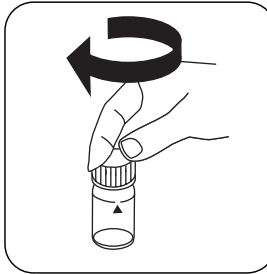
Determination of Hydrogen peroxide with Tablet

Select the method on the device.

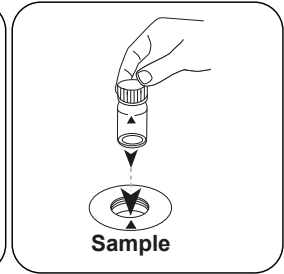
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



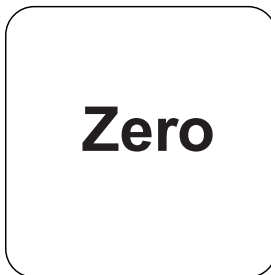
Fill 24 mm vial with **10 mL sample**.



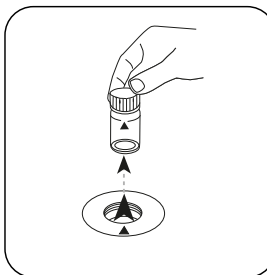
Close vial(s).



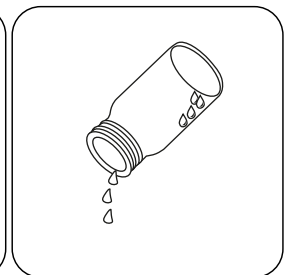
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

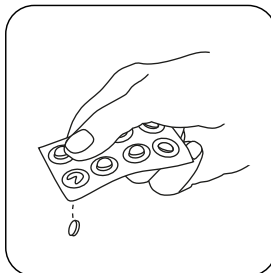


Remove the vial from the sample chamber.

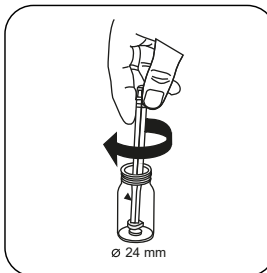


Empty vial except for a few drops.

For devices that require **no ZERO measurement**, start here.



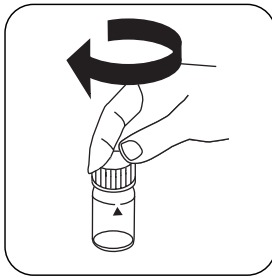
Add **HYDROGENPEROXIDE LR tablet**.



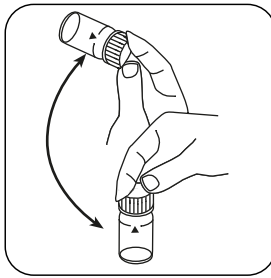
Crush tablet(s) by rotating slightly.



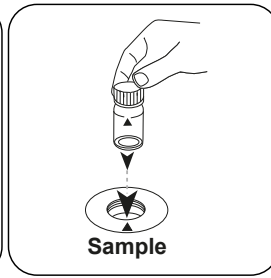
Fill up vial with **sample** to the **10 mL mark**.



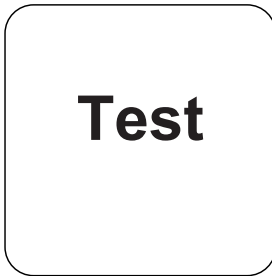
Close vial(s).



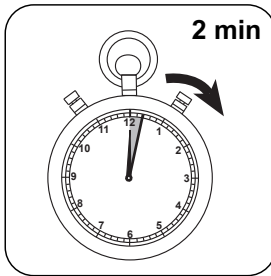
Dissolve tablet(s) by inverting.



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



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 mg/L H_2O_2 appears on the display.



Chemical Method

DPD / Catalyst

Appendix

Interferences

Persistent Interferences

1. All oxidising agents in the samples react like hydrogen peroxide, which leads to higher results.

Removeable Interferences

1. Concentrations above 5 mg/L hydrogen peroxide can lead to results within the measuring range of up to 0 mg/L. In this case, the water sample must be diluted with water that is free from hydrogen peroxide. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

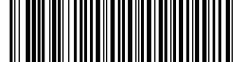
Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, Lovibond

Derived from

US EPA 330.5

APHA 4500 Cl-G



Hypochlorite T

M212

0.2 - 16 % NaOCI

Potassium Iodide

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Acidifying GP	Tablet / 100	515480BT
Acidifying GP	Tablet / 250	515481BT
Chlorine HR (KI)	Tablet / 100	513000BT
Chlorine HR (KI)	Tablet / 250	513001BT
Chlorine HR (KI)	Tablet / 100	501210
Chlorine HR (KI)	Tablet / 250	501211
Set Chlorine HR (KI)/Acidifying GP 100 Pc. #	100 each	517721BT
Set Chlorine HR (KI)/Acidifying GP 250 Pc. #	250 each	517722BT
Dilution set sodium hypochlorite	1 Pieces	414470

Remarks

1. This method provides a fast and simple test. The test can be performed on site but the result will not be as precise as a laboratory method.
2. By strictly following the test procedure, an accuracy of +/- 1 weight % can be achieved.

Determination of Sodium hypochlorite with Tablet

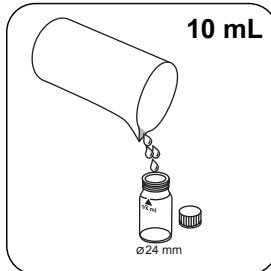
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

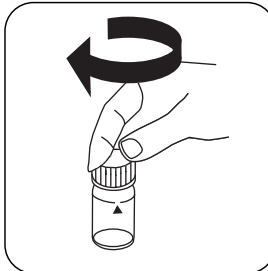
The sample is diluted x2000.

1. First rinse a 5 mL syringe with the solution to be examined and then fill to the 5 mL mark.
2. Empty the syringe into a 100-ml beaker.
3. Fill the measuring beaker up to the 100 mL mark with chlorine-free water.
4. Mix contents by stirring.
5. Fill a clean 5 mL syringe to the 1 mL mark with the diluted solution.
6. Empty the syringe into a clean 100 mL beaker.
7. Fill the measuring beaker up to the 100 mL mark with chlorine-free water.
8. Mix contents by stirring.

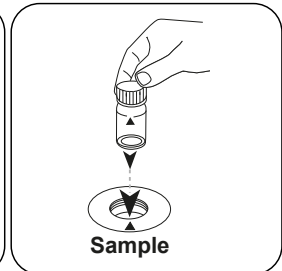
The test is performed with this solution.



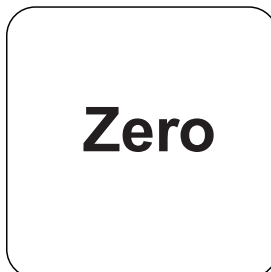
Fill 24 mm vial with **10 mL prepared sample**.



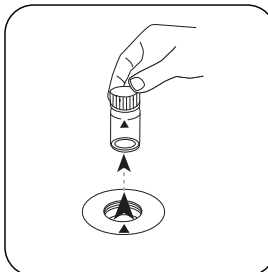
Close vial(s).



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

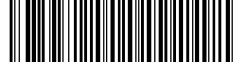


Press the **ZERO** button.

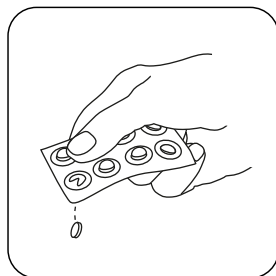


Remove the vial from the sample chamber.

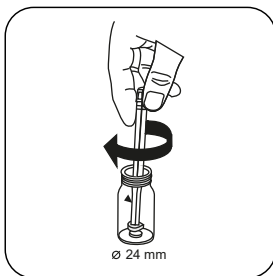
For devices that require **no ZERO measurement**, start here.



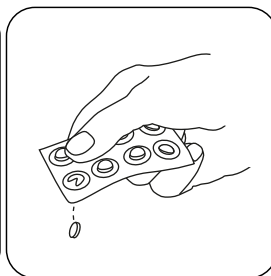
EN



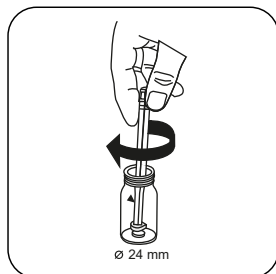
Add **CHLORINE HR (KI)** tablet.



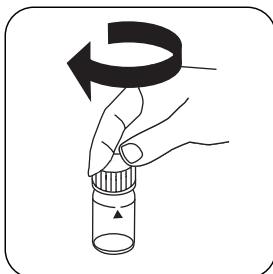
Crush tablet(s) by rotating slightly.



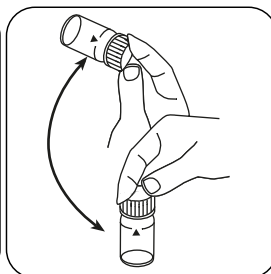
Add **ACIDIFYING GP** tablet.



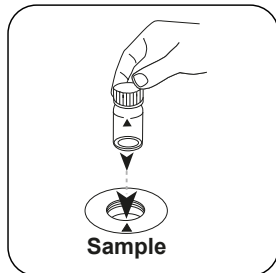
Crush tablet(s) by rotating slightly.



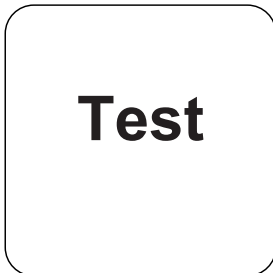
Close vial(s).



Dissolve tablet(s) by inverting.



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



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

The display will show the content of effective chlorine in % by weight (w/w %) relative to the **undiluted** sodium hypochlorite solution.



Chemical Method

Potassium Iodide

Appendix

Method Validation

Limit of Detection	0.03 %
Limit of Quantification	0.1 %
End of Measuring Range	16.8 %
Sensitivity	9.21 % / Abs
Confidence Intervall	0.12 %
Standard Deviation	0.05 %
Variation Coefficient	0.55 %

Derived from

EN ISO 7393-3

* including stirring rod, 10 cm

EN

H₂O₂ LR L

M213

1 - 50 mg/L H₂O₂

HP1

Titanium Tetrachloride / Acid

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Reagent for Hydrogen Peroxide	15 mL	424991

The following accessories are required.

Accessories	Packaging Unit	Part Number
Round cuvette 16 mm ø, set of 10	1 Set	197665

Hazard Notes

1. The reference reagent contains a 25% sulphuric acid solution. It is recommended to wear appropriate protective clothing (protective goggles/gloves).

Preparation

1. The determination is held in strong acid medium. In the case of strongly alkaline samples (pH > 10), the samples must be acidified before measurement (with a 5% sulphuric acid solution at a ratio of 1:1).

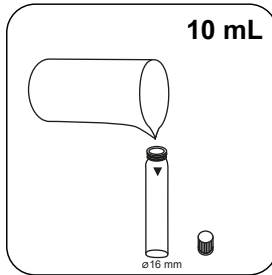
Remarks

1. The sample can be measured even 24 hours after the colour reaction.

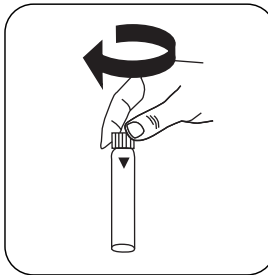
Determination of Hydrogen peroxide LR with liquid reagent

Select the method on the device.

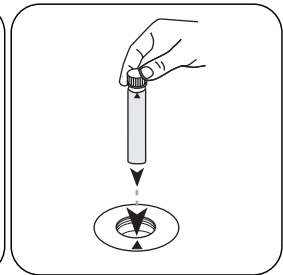
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



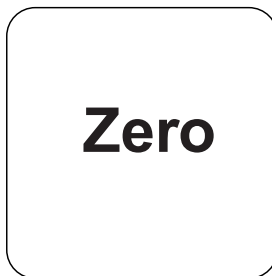
Fill 16 mm vial with **10 mL sample**.



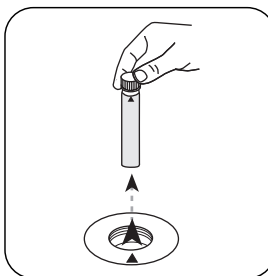
Close vial(s).



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

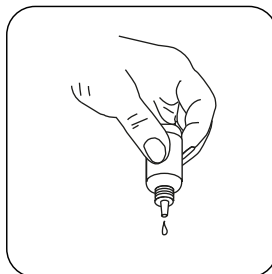


Press the **ZERO** button.

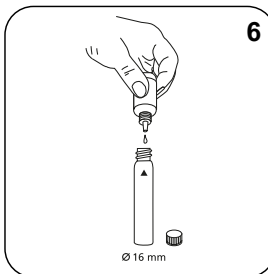


Remove **vial** from the sample chamber.

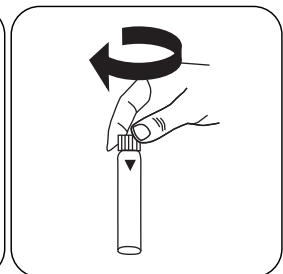
For devices that require **no ZERO measurement**, start here.



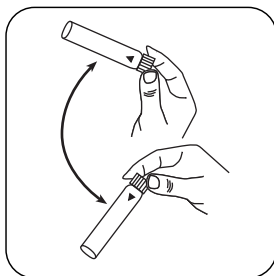
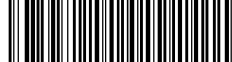
Hold cuvettes vertically and add equal drops by pressing slowly.



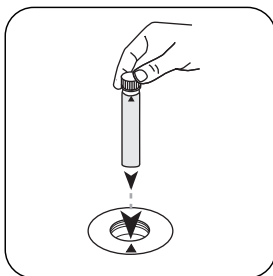
Add **6 drops H₂O₂-Reagent Solution**.



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 mg/L H₂O₂ appears on the display.

EN



Chemical Method

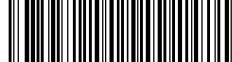
Titanium Tetrachloride / Acid

Interferences

Removeable Interferences

1. Colour interference is eliminated as follows.
 - A) Fill a clean vial with 10 ml of the water sample. Carry out zero calibration.
 - b) Measure the sample without the addition of reagents. (Result B)
 - c) Then measure the same sample with the addition of the reagents (Result A).Calculation of H_2O_2 Concentration = Result A - Result B.
2. Particles in the sample solution or turbidity distort the analysis and must be eliminated. This can be through centrifuging or simply filtering the sample solution prior to performing the measurement. Falsification of the measurement results should also be expected when working with coloured solutions.

EN

H₂O₂ HR L

M214

40 - 500 mg/L H₂O₂

HP2

Titanium Tetrachloride / Acid

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Reagent for Hydrogen Peroxide	15 mL	424991

Hazard Notes

- The reference reagent contains a 25% sulphuric acid solution. It is recommended to wear appropriate protective clothing (protective goggles/gloves).

Preparation

- The determination is held in strong acid medium. In the case of strongly alkaline samples (pH > 10), the samples must be acidified before measurement (with a 5% sulphuric acid solution at a ratio of 1:1).

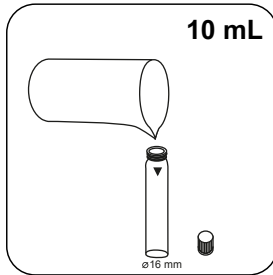
Remarks

- The sample can be measured even 24 hours after the colour reaction.

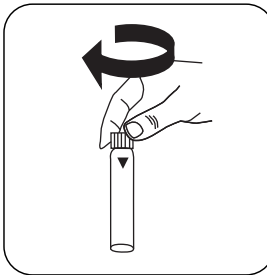
Determination of Hydrogen peroxide HR with liquid reagent

Select the method on the device.

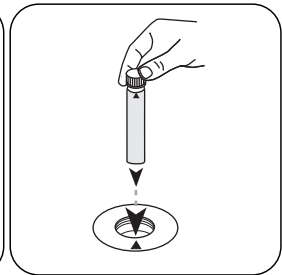
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



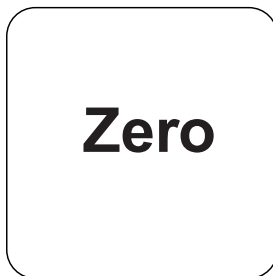
Fill 16 mm vial with **10 mL sample**.



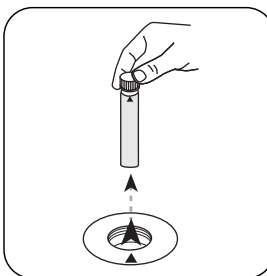
Close vial(s).



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

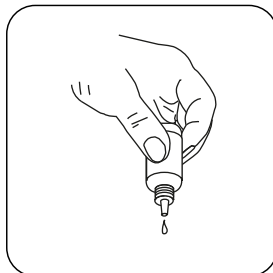


Press the **ZERO** button.

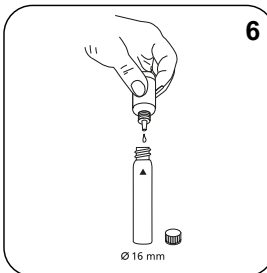


Remove **vial** from the sample chamber.

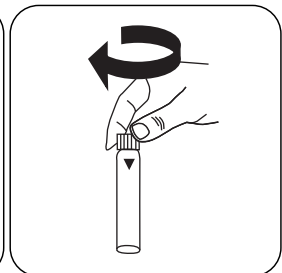
For devices that require **no ZERO measurement**, start here.



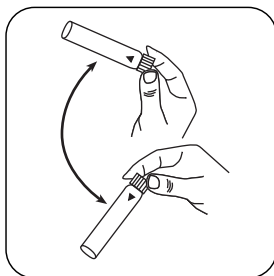
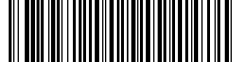
Hold cuvettes vertically and add equal drops by pressing slowly.



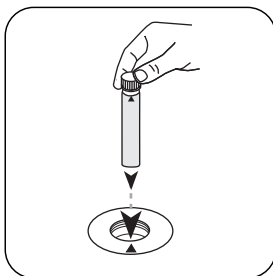
Add **6 drops H₂O₂-Reagent Solution**.



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 mg/L H₂O₂ appears on the display.

EN



Chemical Method

Titanium Tetrachloride / Acid

Interferences

Removeable Interferences

1. Colour interference is eliminated as follows.
 - A) Fill a clean vial with 10 ml of the water sample. Carry out zero calibration.
 - b) Measure the sample without the addition of reagents. (Result B)
 - c) Then measure the same sample with the addition of the reagents (Result A).Calculation of H_2O_2 Concentration = Result A - Result B.
2. Particles in the sample solution or turbidity distort the analysis and must be eliminated. This can be through centrifuging or simply filtering the sample solution prior to performing the measurement. Falsification of the measurement results should also be expected when working with coloured solutions.

EN



Iodine T

M215

0.05 - 3.6 mg/L I

DPD

EN

Material

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. 1 High Calcium ^{e)}	Tablet / 100	515740BT
DPD No. 1 High Calcium ^{e)}	Tablet / 250	515741BT
DPD No. 1 High Calcium ^{e)}	Tablet / 500	515742BT

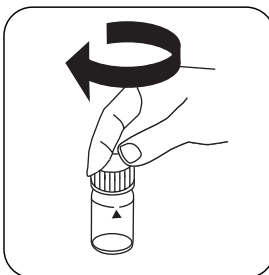
Determination of Iodine with Tablet

Select the method on the device.

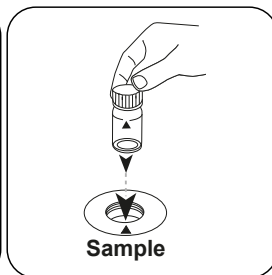
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



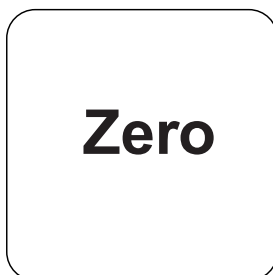
Fill 24 mm vial with **10 mL sample**.



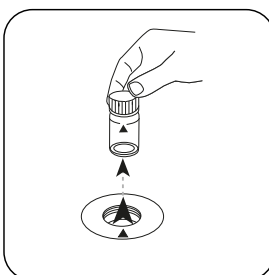
Close vial(s).



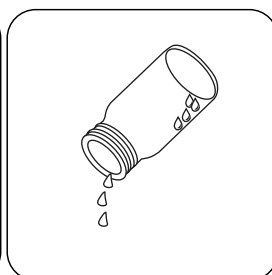
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

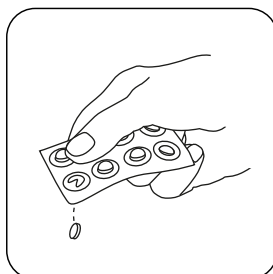


Remove the vial from the sample chamber.

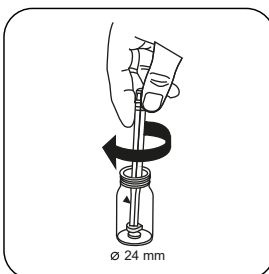


Empty vial except for a few drops.

For devices that require **no ZERO measurement**, start here.



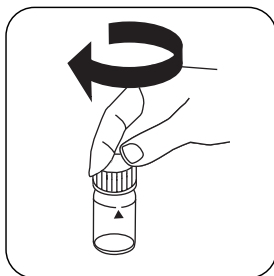
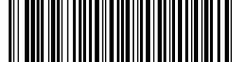
Add **DPD No. 1 tablet**.



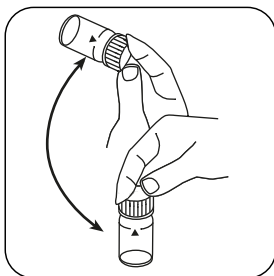
Crush tablet(s) by rotating slightly.



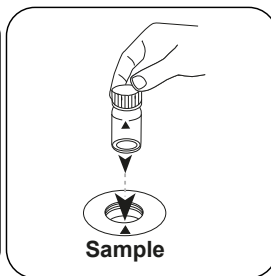
Fill up vial with **sample** to the **10 mL** mark.



Close vial(s).



Dissolve tablet(s) by inverting.



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

Test

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

The result in mg/L Iodine appears on the display.



Chemical Method

DPD

Appendix

Interferences

EN

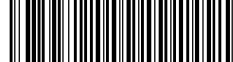
Persistent Interferences

1. All oxidising agents in the samples react like Iodine, which leads to higher results.

Derived from

EN ISO 7393-2

^{a)} 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



Iron T

M220

0.02 - 1 mg/L Fe

FE

Ferrozine / Thioglycolate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Iron II LR (Fe ²⁺)	Tablet / 100	515420BT
Iron II LR (Fe ²⁺)	Tablet / 250	515421BT
Iron LR (Fe ²⁺ und Fe ³⁺)	Tablet / 100	515370BT
Iron LR (Fe ²⁺ und Fe ³⁺)	Tablet / 250	515371BT

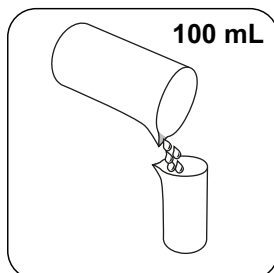
Preparation

1. Water that has been treated with organic compounds such as corrosion inhibitors, must be oxidised where necessary to break down the iron complex. 1 ml of concentrated Sulphuric acid ($\geq 95\%$) and 1 ml concentrated Nitric acid ($\geq 65\%$) is therefore added to 100 ml water sample and boiled down to approximately half the volume. After cooling down, the digestion procedure is continued.

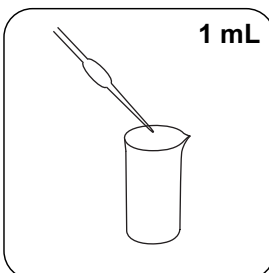
Remarks

1. This method is for the determination of total dissolved Fe²⁺ and Fe³⁺.
2. For the determination of Fe²⁺, the IRON (II) LR Tablet, instead of the IRON LR Tablet is used.

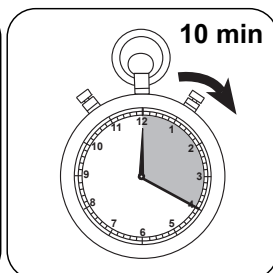
Digestion



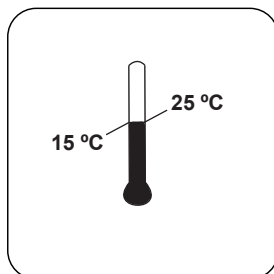
Fill a suitable sample vessel with **100 mL sample** .



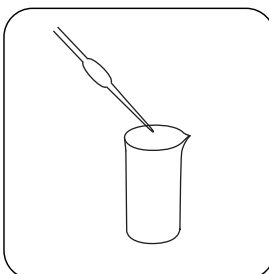
Add **1 mL concentrated sulfuric acid (≥ 95 %)** .



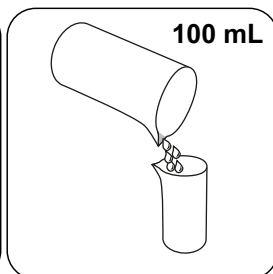
The sample is to be **heated for 10 minutes**, or for as long as it takes for everything to be completely dissolved.



Allow the sample to cool to room temperature.



Adjust **pH-value** of the sample with **ammonia solution (10-25 %)** to 3-5. .



Fill the sample with **deionised water to 100 mL** .

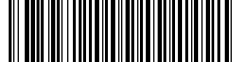
This sample is used for the analysis of total solved and dissolved Iron.

Determination of Iron (II,III), dissolved with Tablet

Select the method on the device.

For testing of **dissolved and undissolved Iron**, carry out the described **digestion**.

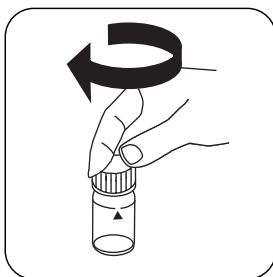
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



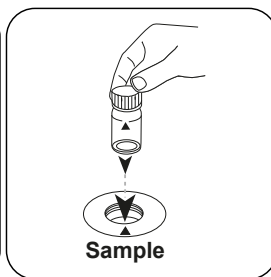
EN



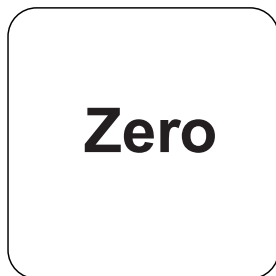
Fill 24 mm vial with **10 mL sample**.



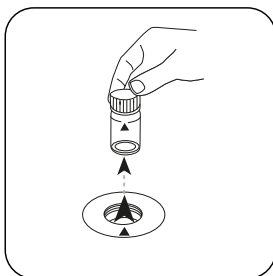
Close vial(s).



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

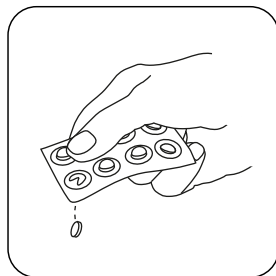


Press the **ZERO** button.

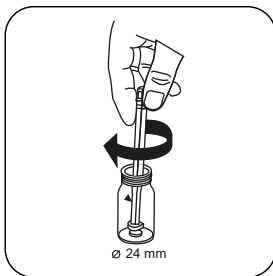


Remove the vial from the sample chamber.

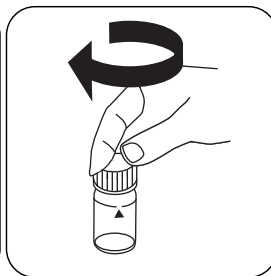
For devices that require **no ZERO measurement**, start here.



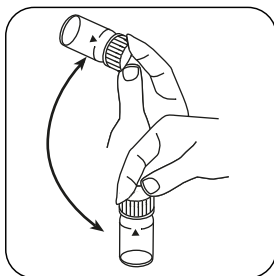
Add **IRON LR tablet**.



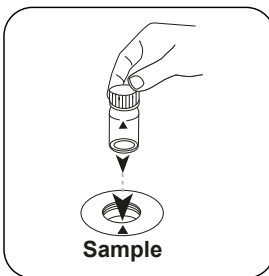
Crush tablet(s) by rotating slightly.



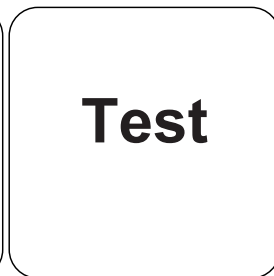
Close vial(s).



Dissolve tablet(s) by inverting.

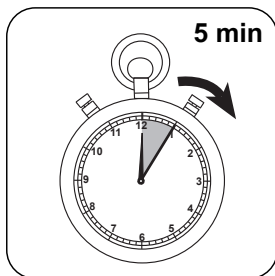


Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

EN



Wait for **5 minute(s) reaction time**.

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



Chemical Method

Ferrozine / Thioglycolate

Appendix

EN

Interferences

Removeable Interferences

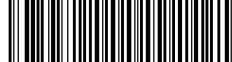
1. The presence of copper increases the test result by 10 %. At a concentration of 10 mg/L copper in the sample, the measurement result is increased by 1 mg/L iron. The interference can be eliminated by the addition of thiourea

Method Validation

Limit of Detection	0.01 mg/L
Limit of Quantification	0.016 mg/L
End of Measuring Range	1 mg/L
Sensitivity	0.92 mg/L / Abs
Confidence Intervall	0.013 mg/L
Standard Deviation	0.005 mg/L
Variation Coefficient	1.23 %

Bibliography

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980, p. 102



Iron PP

M222

0.02 - 3 mg/L Fe⁹⁾

FE1

1,10-Phenanthroline

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Ferro F10	Powder / 100 Pieces	530560
VARIO Ferro F10	Powder / 1000 Pieces	530563

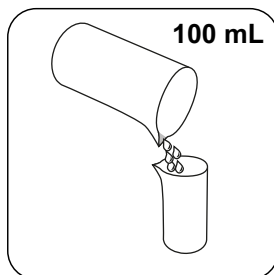
Preparation

1. Iron oxide requires mild, strong or Digesdahl digestion before the analysis (digestion process with acid).
2. Very strong alkaline or acidic water samples should be adjusted to between pH 3 and pH 5 before the analysis.
3. Water samples containing visible rust should be allowed to react for at least five minutes.
4. Water that has been treated with organic compounds such as corrosion inhibitors, must be oxidised where necessary to break down the iron complex. 1 ml of concentrated Sulphuric acid ($\geq 95\%$) and 1 ml concentrated Nitric acid ($\geq 65\%$) is therefore added to to 100 ml water sample and boiled down to approximately half the volume. After cooling down, the digestion procedure is continued.

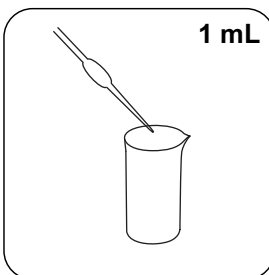
Remarks

1. This method is for the determination of all forms of dissolved iron and most forms of undissolved iron.
2. Accuracy is not affected by undissolved powder.

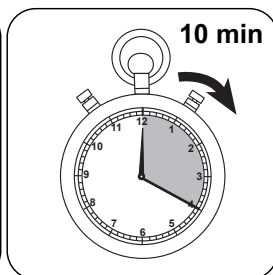
Digestion



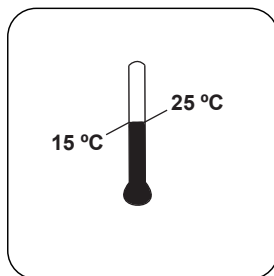
Fill a suitable sample vessel with **100 mL sample** .



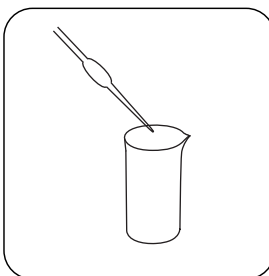
Add **1 mL concentrated sulfuric acid (≥ 95 %)** .



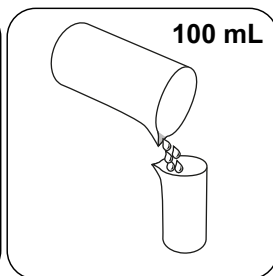
The sample is to be **heated for 10 minutes**, or for as long as it takes for everything to be completely dissolved.



Allow the sample to cool to room temperature.



Adjust **pH-value** of the sample with **ammonia solution (10-25 %)** to 3-5. .



Fill the sample with **deionised water to 100 mL**

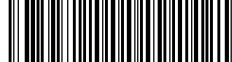
This sample is used for the analysis of total solved and dissolved Iron.

Determination of Iron (II,III), dissolved with Vario Powder Packs

Select the method on the device.

For testing of **Iron with tablet**, carry out the described **digestion**.

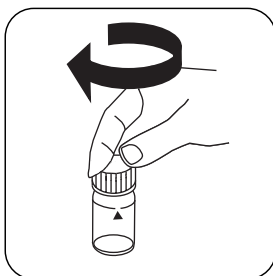
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



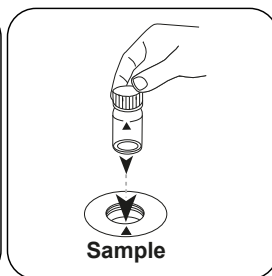
EN



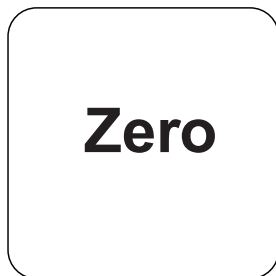
Fill 24 mm vial with **10 mL sample**.



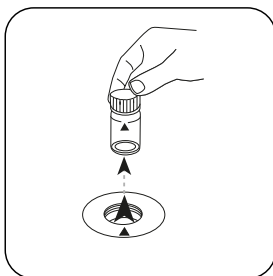
Close vial(s).



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

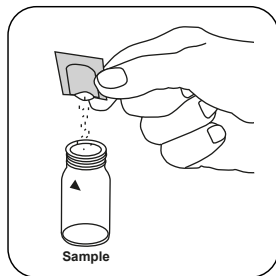


Press the **ZERO** button.

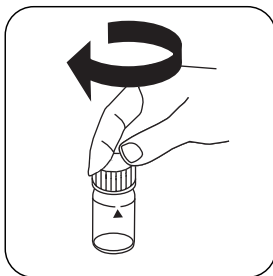


Remove the vial from the sample chamber.

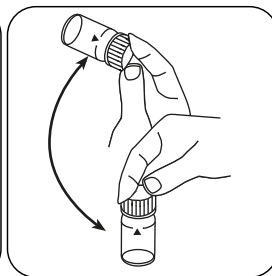
For devices that require **no ZERO measurement**, start here.



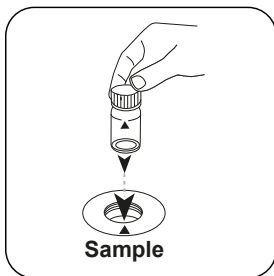
Add **Vario FERRO F10 powder pack**.



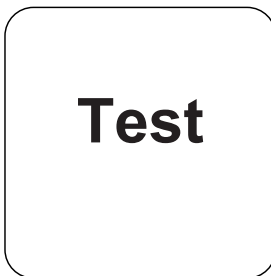
Close vial(s).



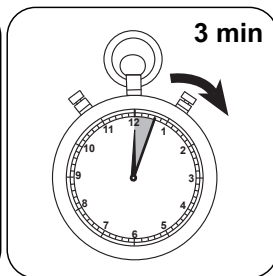
Invert several times to mix the contents.



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



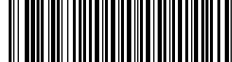
Press the **TEST** (XD: **START**) button.



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

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

The result in mg/L Iron appears on the display.



Chemical Method

1,10-Phenanthroline

Appendix

EN

Interferences

Persistent Interferences

1. Iridium interferes with the test.

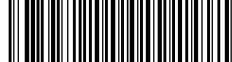
According to

DIN 38406-E1

Standard Method 3500-Fe-1997

US EPA 40 CFR 136

⁹⁾ Reagent recovers most insoluble iron oxides without digestion



Iron (TPTZ) PP

M223

0.02 - 1.8 mg/L Fe

FE2

TPTZ

EN

Material

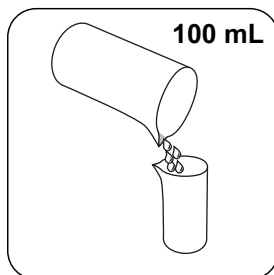
Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Iron TPTZ F10	Powder / 100 Pieces	530550

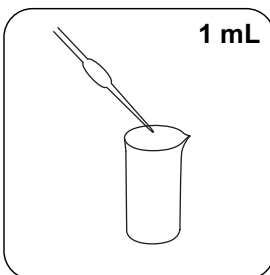
Preparation

1. Digestion is required for the determination of total Iron. The TPTZ reagent recovers most iron oxides without digestion.
2. All glassware must first be rinsed with diluted 1:1 Hydrochloric acid solution before the analysis and then rinsed with deionised water to remove iron deposits that can cause slightly high results.
3. Strong alkaline or acidic water samples should be adjusted between pH 3 and pH 8 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
4. Water that has been treated with organic compounds such as corrosion inhibitors, must be oxidised where necessary to break down the iron complex. 1 ml of concentrated Sulphuric acid ($\geq 95\%$) and 1 ml concentrated Nitric acid ($\geq 65\%$) is therefore added to 100 ml water sample and boiled down to approximately half the volume. After cooling down, the digestion procedure is continued.

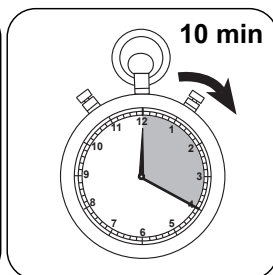
Digestion



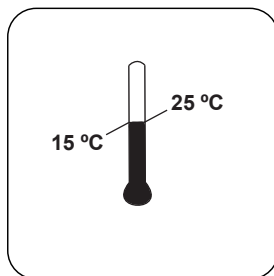
Fill a suitable sample vessel with **100 mL sample**.



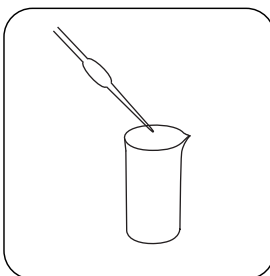
Add **1 mL concentrated sulfuric acid ($\geq 95\%$)**.



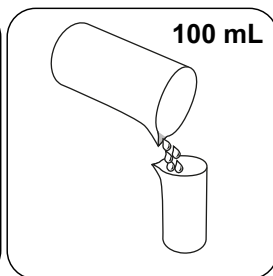
The sample is to be **heated for 10 minutes**, or for as long as it takes for everything to be completely dissolved.



Allow the sample to cool to room temperature.



Adjust **pH-value** of the sample with **ammonia solution (10-25 %)** to 3-5.



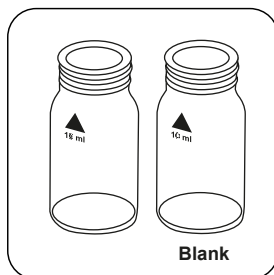
Fill the sample with **deionised water to 100 mL**.

This sample is used for the analysis of total solved and dissolved Iron.

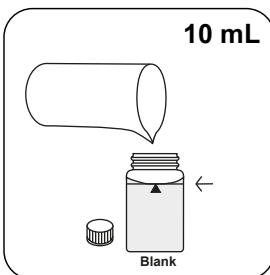
Determination of Iron, total with Vario Powder Pack

Select the method on the device.

For testing of **total Iron**, carry out the described **digestion**.



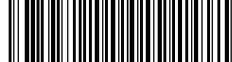
Prepare two clean 24 mm vials. Mark one as a blank.



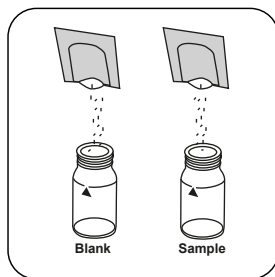
Put **10 mL deionised water** in the blank.



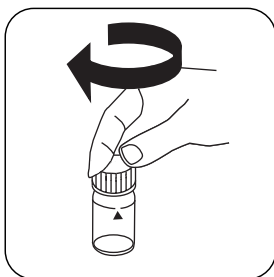
Put **10 mL sample** in the sample vial.



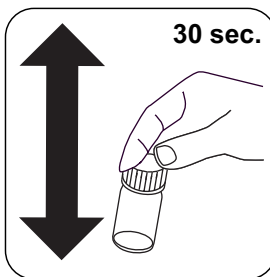
EN



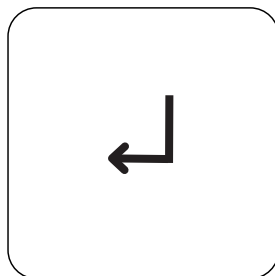
Add a **Vario IRON TPTZ F10 powder pack** in each vial.



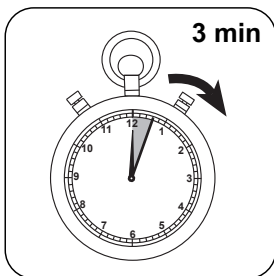
Close vial(s).



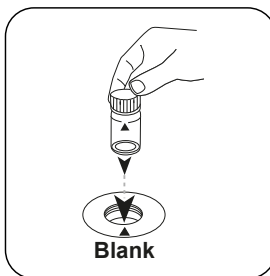
Mix the contents by shaking. (30 sec.).



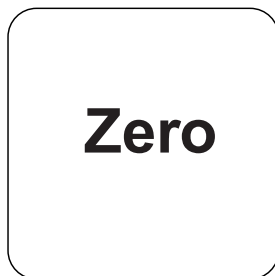
Press the **ENTER** button.



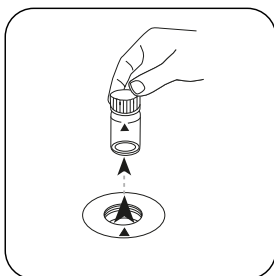
Wait for **3 minute(s) reaction time**.



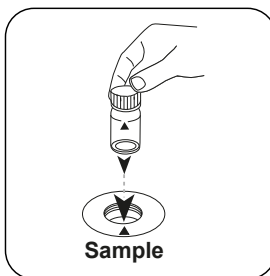
Place **blank** in the sample chamber. Pay attention to the positioning.



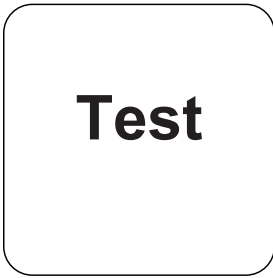
Press the **ZERO** button.



Remove the vial from the sample chamber.



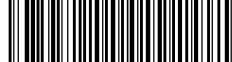
Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

The result in mg/L Iron appears on the display.

EN



Chemical Method

TPTZ

Appendix

EN

Interferences

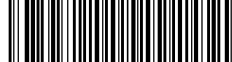
Persistent Interferences

When interferences occur, colour development is inhibited or a precipitate is formed. The values refer to a standard with an iron concentration of 0.5 mg/L.

Interference	from / [mg/L]
Ca	4
Cr ³⁺	0.25
Cr ⁴⁺	1.2
Co	0.05
Cu	0.6
CN ⁻	2.8
Mn	50
Hg	0.4
Mo	4
Ni	1
NO ₂ ⁻	0.8

Bibliography

G. Frederic Smith Chemical Co., The Iron Reagents, 3rd ed. (1980)



Iron in Mo PP (224)

M224

0.01 - 1.8 mg/L Fe

FEM

TPTZ

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Fe in MO Reagent Set	1 Set	536010

Sampling

1. Samples are to be collected in clean glass or plastic bottles. These should have been cleaned with 6 N (1:1) Hydrochloric acid and then rinsed with deionised water.
2. To preserve samples for later analysis, the pH value of the sample must be adjusted to less than 2. Approximately 2 ml per litre of concentrated Hydrochloric acid can be added to the sample. the sample is tested immediately, this addition is not necessary.
3. If determination of dissolved Iron is required, the sample must be filtered through a 0.45-micron filter or equivalent medium immediately after it has been collected and before acidification.
4. Preserved samples should be stored no longer than 6 months at room temperature.
5. The pH is to be adjusted to 3–5 by adding 5 N Sodium hydroxide solution before the analysis. A pH value of 5 must not be exceeded, since this can lead to precipitation of iron.
6. The test result needs to be corrected on the basis of the volume additions.

Preparation

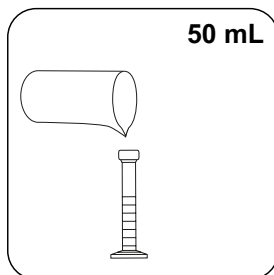
1. All glassware is to be cleaned with cleaning detergents and then rinsed with tap water. Afterwards, it should be reclaimed with Hydrochloric acid (1:1) and deionised water. These steps will remove any deposits that may cause slightly higher results.
2. If the sample contains 100 mg/L or more Molybdate (MoO_4^{2-}) then the sample reading must be taken immediately after zeroing the device.
3. For more accurate results, a reagent blank value can be determined for each new batch of reagent. Follow the procedure set out, using deionised water instead of the sample. The measured value that is obtained should be /subtracted from the readings of these results.

Remarks

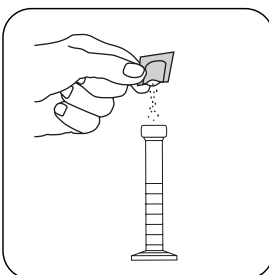
1. A blue colour develops in the presence of iron. A small amount of undissolved powder has no influence on the result.

Determination of Iron, total (Fe, Mo) in the presence of molybdate with Vario Powder Packs

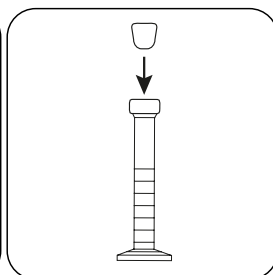
Select the method on the device.



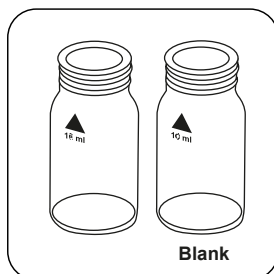
Put **50 mL sample** in 50 mL measuring cylinder.



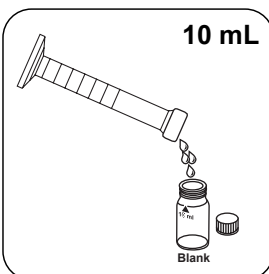
Add **Vario (Fe in Mo) Rgt 1 powder pack**.



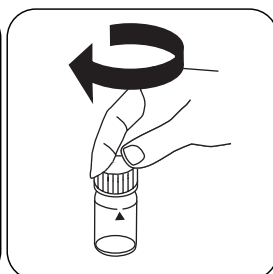
Stopper the mixing cylinder. Swirl around to dissolve the powder.



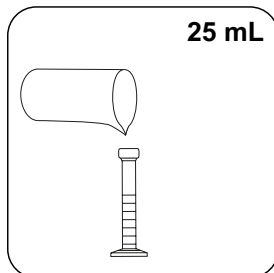
Prepare two clean 24 mm vials. Mark one as a blank.



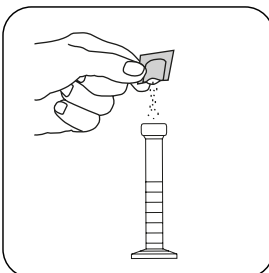
Fill blank with **10 mL prepared sample**.



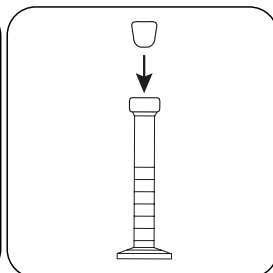
Close vial(s).



Put **25 mL prepared sample** in 25 mL measuring cylinder.



Add **Vario (Fe in Mo) Rgt 2 powder pack**.

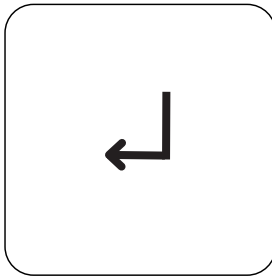


Stopper the mixing cylinder. Swirl around to dissolve the powder.

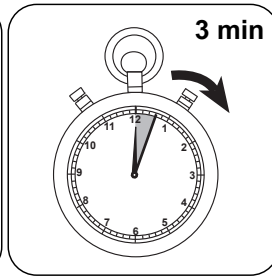
EN



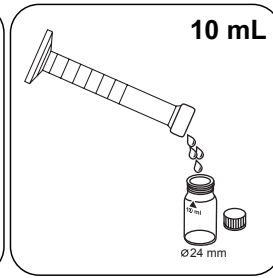
EN



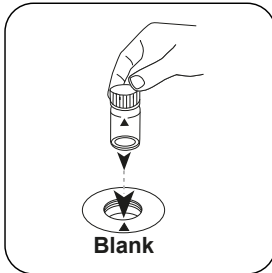
Press the **ENTER** button.



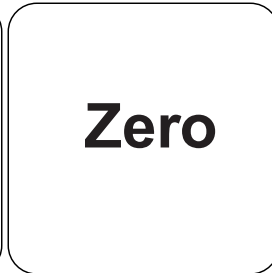
Wait for **3 minute(s)** reaction time.



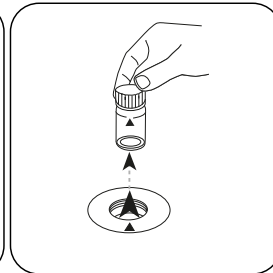
Put **10 mL sample** in the sample vial.



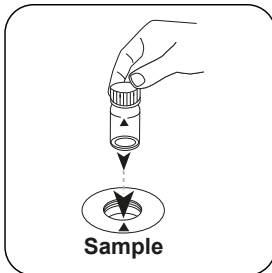
Place **blank** in the sample chamber. Pay attention to the positioning.



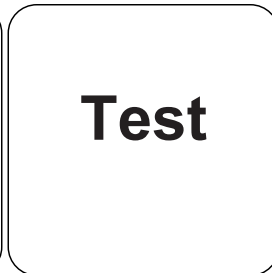
Press the **ZERO** button.



Remove the vial from the sample chamber.



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



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

The result in mg/L Fe appears on the display.



Chemical Method

TPTZ

Appendix

Interferences

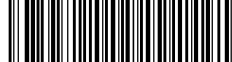
EN

Removeable Interferences

1. PH interference: A sample pH after the addition of reagent, which is less than 3 or greater than 4, may inhibit colour formation since the developed colour fades too quickly, or can result in turbidity. This means that the pH value must be adjusted to between 3 and 5 in the measuring glass before the addition of the reagent:
A suitable amount of iron-free acid or base, such as 1 N Sulphuric acid or 1 N Sodium hydroxide, can be added on a drop by drop basis.
A volume correction must be carried out if significant volumes of acid or base are added.

Bibliography

G. Frederic Smith Chemical Co., The Iron Reagents, 3rd ed. (1980)



Iron LR L (A)

M225

0.03 - 2 mg/L Fe

FE

Ferrozine / Thioglycolate

EN

Material

Required material (partly optional):

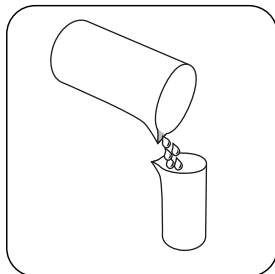
Reagents	Packaging Unit	Part Number
Acidity / Alkalinity P Indicator PA1	65 mL	56L013565
Hardness Calcium Buffer CH2	65 mL	56L014465
KP962-Ammonium Persulphate Powder	Powder / 40 g	56P096240
KS63-FE6-Thioglycolate/Molybdate HR RGT	30 mL	56L006330
Iron Reagent FE6	65 mL	56L006365
Iron Reagent FE5	65 mL	56L006165
Iron LR Reagent Set	1 Pieces	56R018990

Preparation

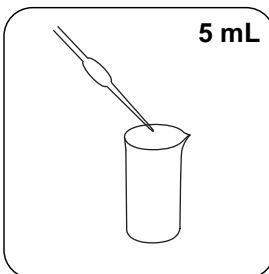
1. If there are strong complexing agents in the sample, the response time must be extended until no further colour development is seen. However, very strong iron complexes are not included in the measurement. In this event, the complexing agent must be destroyed by means of oxidation with acid/persulphate and the sample also neutralised to pH 6–9.
2. For the measurement of total iron, both suspended and dissolved, the sample must be boiled with acid/persulphate. It must be neutralised back to pH 6–9 and refilled to the original volume with deionised water.

Digestion

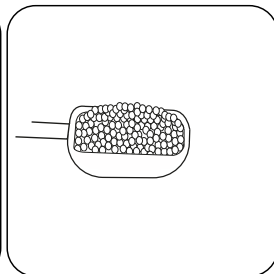
Total iron consists of suspended, soluble and complexed iron. The sample must be not filtered before measuring. To ensure homogenisation of the sample, deposited particles must be evenly distributed immediately prior to sampling by forcible shaking. A filtration of the sample is necessary for the determination of total soluble iron (including the complex iron compounds). The equipment required for the determination of total iron and reagents are not included in the standard delivery.



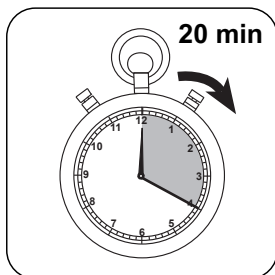
Fill a suitable digestion vessel with **50 mL homogenised sample**.



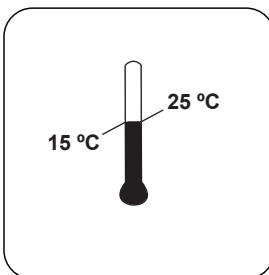
Add **5 mL 1:1 Hydrochloric acid**.



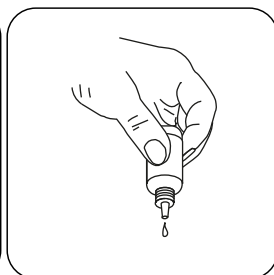
Add a measuring scoop **KP 962 (Ammonium Persulfat Powder)**.



Boil the sample for **20 minutes**. A sample volume of about 25 mL should be retained; If necessary, fill with deionised water.

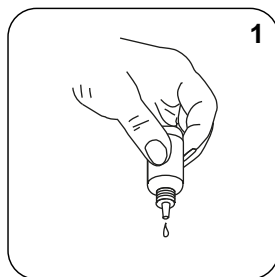
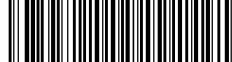


Allow the sample to cool to room temperature.

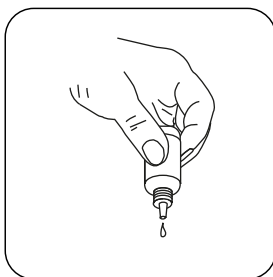


Hold cuvettes vertically and add equal drops by pressing slowly.

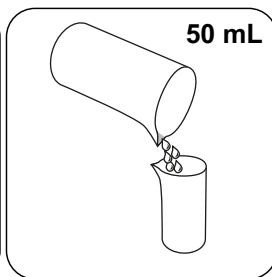
EN



Add **1 drop Acidity / Alkalinity P Indicator PA1**.



Add **Hardness Calcium Buffer CH2** drop by drop to the same sample until colouration turns from light pink to red. **(Note: make sure to swirl the vial after adding each drop!)**



Fill the sample with **deionised water to 50 mL**.

Determination of Iron, total LR (A) with liquid reagent

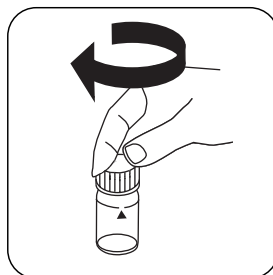
Select the method on the device.

For testing of **Iron, total LR**, carry out the described **digestion**.

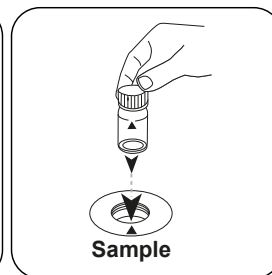
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



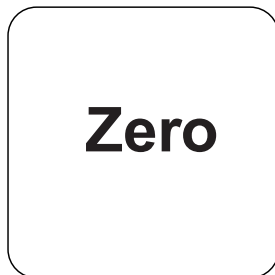
Fill 24 mm vial with **10 mL deionised water**.



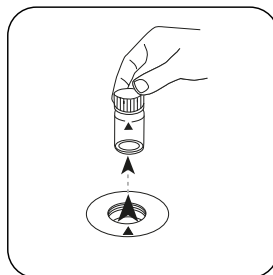
Close vial(s).



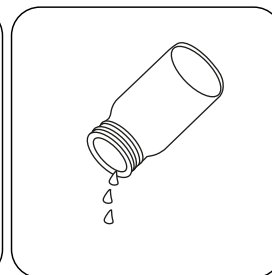
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

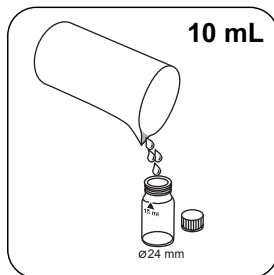


Remove the vial from the sample chamber.

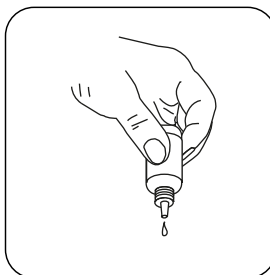


Empty vial.

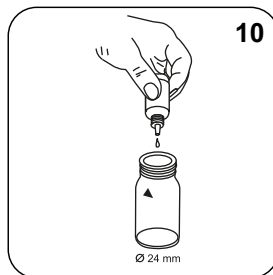
For devices that require **no ZERO measurement**, start here.



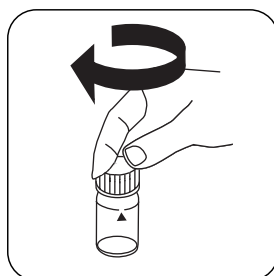
Fill 24 mm vial with **10 mL prepared sample**.



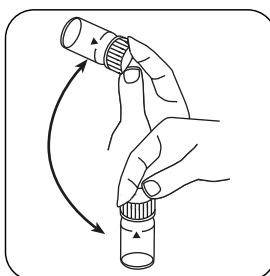
Hold cuvettes vertically and add equal drops by pressing slowly.



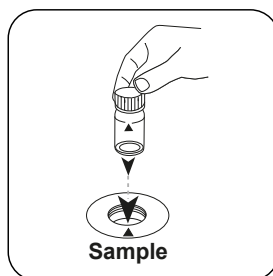
Add **10 drops Iron Reagent FE5**.



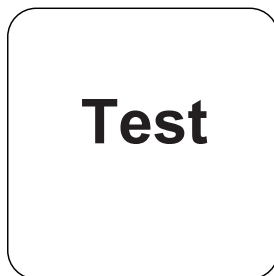
Close vial(s).



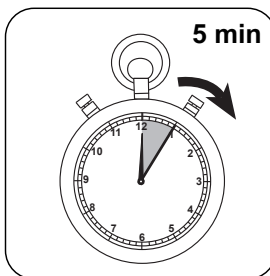
Invert several times to mix the contents.



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



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



Wait for **5 minute(s) reaction time**.

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

The result in mg/L total Iron or when using a filtrated sample, in mg/l totale soluble Iron appears on the display.

Determination of Iron LR (A) with liquid reagent

Select the method on the device.

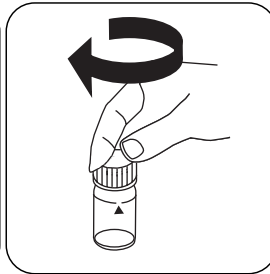
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



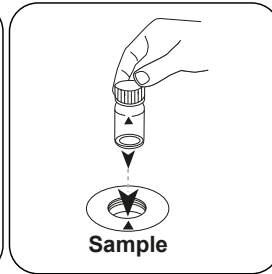
For determination of total dissolved iron the sample must be filtered prior to the test (pore size 0,45 µm). Otherwise, iron particles and suspended iron are measured.



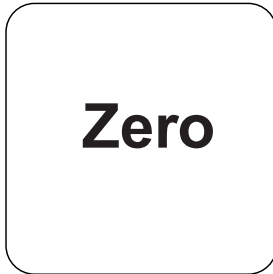
Fill 24 mm vial with **10 mL prepared sample** .



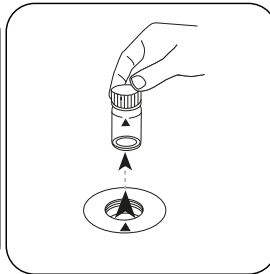
Close vial(s).



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

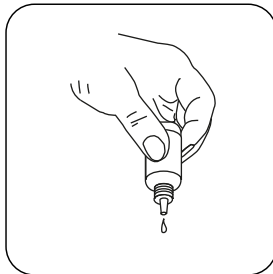


Press the **ZERO** button.

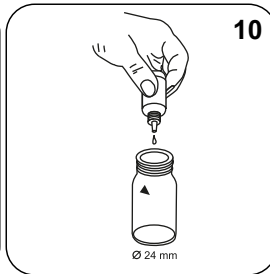


Remove the vial from the sample chamber.

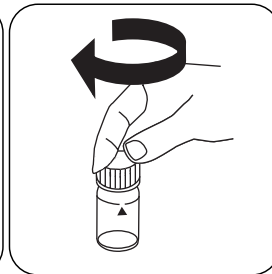
For devices that require **no ZERO measurement** , start here.



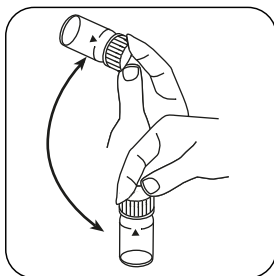
Hold cuvettes vertically and add equal drops by pressing slowly.



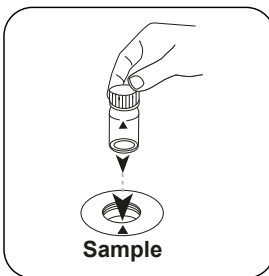
Add **10 drops Iron Reagent FE5**.



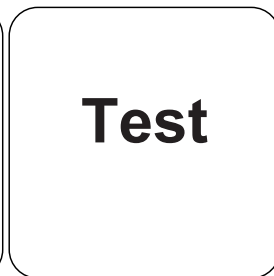
Close vial(s).



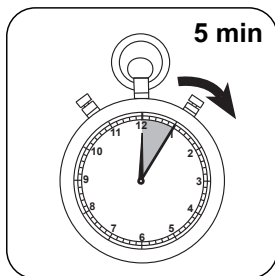
Invert several times to mix the contents.



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

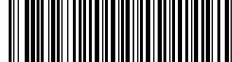


Press the **TEST** (XD: **START**) button.



Wait for **5 minute(s) reaction time**.

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



Chemical Method

Ferrozine / Thioglycolate

Appendix

EN

Interferences

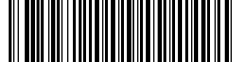
Removeable Interferences

1. If using KS61 (Ferrozine/Thioglycolate), a high concentration of molybdate will result in an intense yellow colour. In this instance, a chemical blank value is required:
 - Use two clean **24 mm vials**.
 - Mark one as blank for zeroing.
 - Fill a clean vial (24 mm) with **10 ml of the sample** (blank).
 - Add **10 drops of KS63 (Thioglycolate)** to the vial.
 - Close the vial with the cap and swirl the contents to mix them.
 - Place the blank in the sample chamber.
 - Pay attention to the positioning.
 - Press the **ZERO** button.
 - Remove the vial from the sample chamber.
 - Fill a second clean vial (24 mm) with **10 ml of the sample** (this is the sample vial).
 - Add **10 drops of KS63 (Ferrozine/Thioglycolate)** and as before, follow the procedure as described.

Interference	from / [mg/L]
Co	8
Cu	2
Oxalat	500
CN ⁻	10
NO ₂ ⁻	

Bibliography

D. F. Boltz and J. A. Howell, eds., Colorimetric Determination of Nonmetals, 2nd ed., Vol. 8, p. 304 (1978). Carpenter, J.F. "A New Field Method for Determining the Levels of Iron Contamination in Oilfield Completion Brine", SPE International Symposium (2004)



Iron LR L (B)

M226

0.03 - 2 mg/L Fe

Ferrozine / Thioglycolate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Acidity / Alkalinity P Indicator PA1	30 mL	56L013530
Acidity / Alkalinity P Indicator PA1	65 mL	56L013565
Hardness Calcium Buffer CH2	65 mL	56L014465
Calcium Hardness Buffer CH2	5 x 65 mL mL	56L014472
KP962-Ammonium Persulphate Powder	Powder / 40 g	56P096240
Iron LR 2 Reagent Set	1 Pieces	56R023490

Preparation

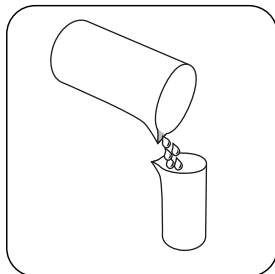
1. If there are strong complexing agents in the sample, the response time must be extended until no further colour development is seen. However, very strong iron complexes are not included in the measurement. In this event, the complexing agent must be destroyed by means of oxidation with acid/persulphate and the sample also neutralised to pH 6–9.
2. For the measurement of total iron, both suspended and dissolved, the sample must be boiled with acid/persulphate. It must be neutralised back to pH 6–9 and refilled to the original volume with deionised water.

Remarks

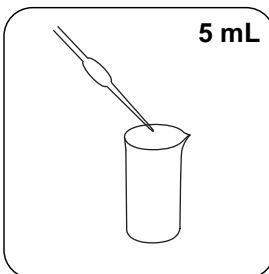
1. Do not add the reagent KS63 (Thioglycolate) if measuring Fe²⁺.

Digestion

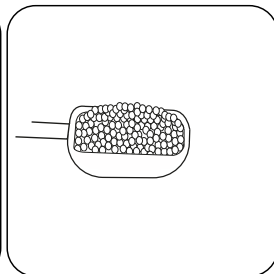
Total iron consists of suspended, soluble and complexed iron. The sample must be not filtered before measuring. To ensure homogenisation of the sample, deposited particles must be evenly distributed immediately prior to sampling by forcible shaking. A filtration of the sample is necessary for the determination of total soluble iron (including the complex iron compounds). The equipment required for the determination of total iron and reagents are not included in the standard delivery.



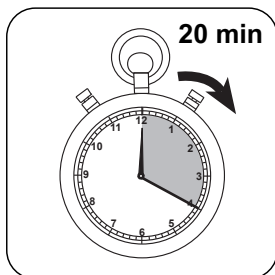
Fill a suitable digestion vessel with **50 mL homogenised sample**.



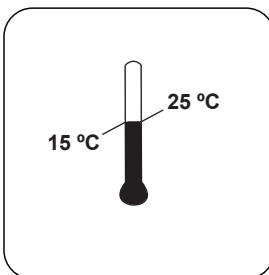
Add **5 mL 1:1 Hydrochloric acid**.



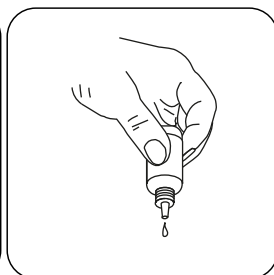
Add a measuring scoop **KP 962 (Ammonium Persulfat Powder)**.



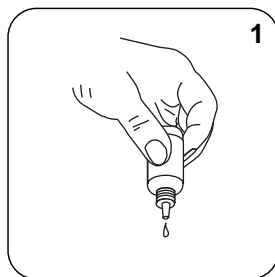
Boil the sample for **20 minutes**. A sample volume of about 25 mL should be retained; If necessary, fill with deionised water.



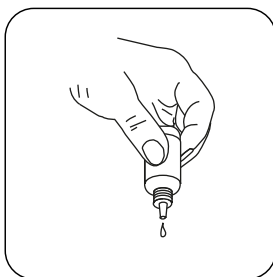
Allow the sample to cool to room temperature.



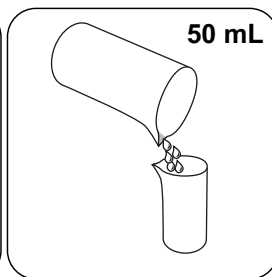
Hold cuvettes vertically and add equal drops by pressing slowly.



1
Add **1 drop Acidity / Alkalinity P Indicator PA1**.



Add **Hardness Calcium Buffer CH2** drop by drop to the same sample until colouration turns from light pink to red. (**Note: make sure to swirl the vial after adding each drop!**)



50 mL
Fill the sample with **deionised water to 50 mL**.

Determination of Iron LR (B) with Liquid Reagent

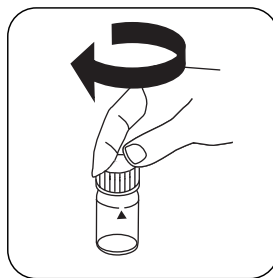
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

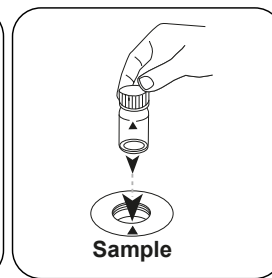
For determination of total dissolved iron with a distinction between Fe^{2+} and Fe^{3+} the sample must be filtered prior to the test (pore size 0,45 μm). Otherwise, iron particles and suspended iron are measured.



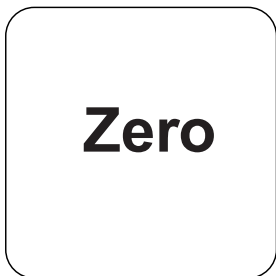
10 mL
Fill 24 mm vial with **10 mL sample**.



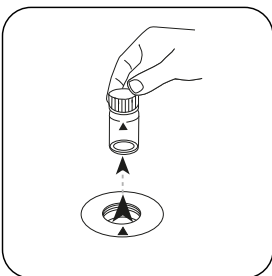
Close vial(s).



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



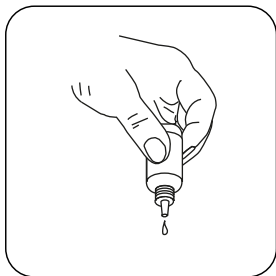
Press the **ZERO** button.



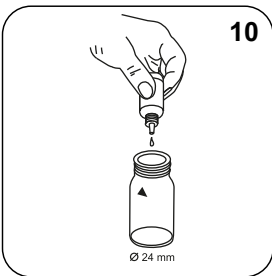
Remove the vial from the sample chamber.

EN

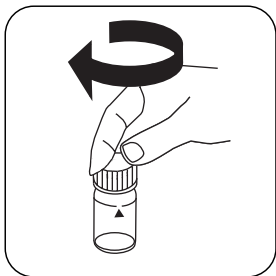
For devices that require **no ZERO measurement**, start here.



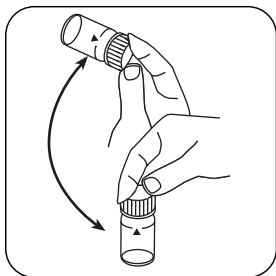
Hold cuvettes vertically and add equal drops by pressing slowly.



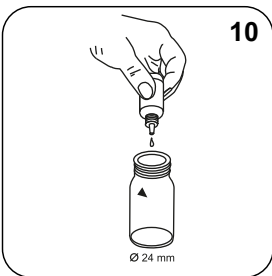
Add **10 drops KS60 (Acetate Buffer)**.



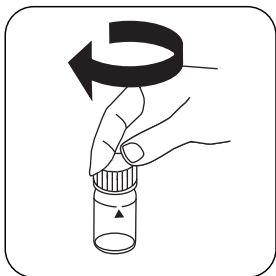
Close vial(s).



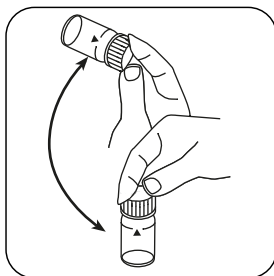
Invert several times to mix the contents.



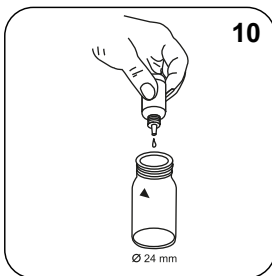
Add **10 drops Iron Reagent FE6**.



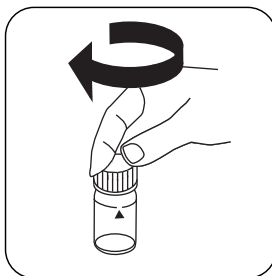
Close vial(s).



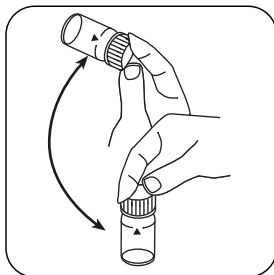
Invert several times to mix the contents.



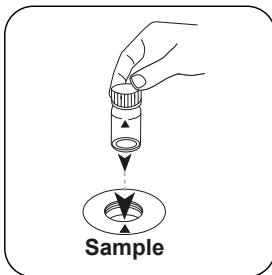
Add **10 drops**
KS65 (Ferrozine) .



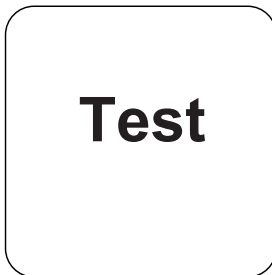
Close vial(s).



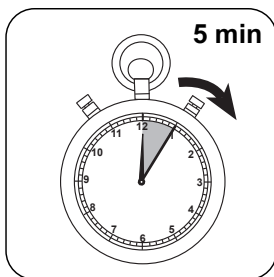
Invert several times to mix the contents.



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



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



Wait for **5 minute(s)**
reaction time.

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

The result in mg/L $\text{Fe}^{2+}/\text{Fe}^{3+}$. $\text{Fe}^{3+} = \text{Fe}^{2+}/3+ - \text{Fe}^{2+}$ appears on the display.

Determination of Iron, total LR 2 with liquid reagent

Select the method on the device.

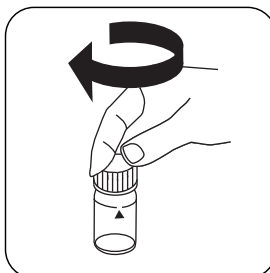
For testing of **Iron, total LR with liquid reagent**, carry out the described **digestion**.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

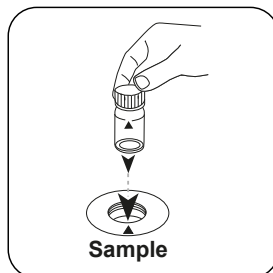
Total iron consists of suspended, soluble and complexed iron. The sample must be not filtered before measuring. To ensure homogenisation of the sample, deposited particles must be evenly distributed immediately prior to sampling by forcible shaking. A filtration of the sample is necessary for the determination of total soluble iron (including the complex iron compounds). The equipment required for the determination of total iron and reagents are not included in the standard delivery.



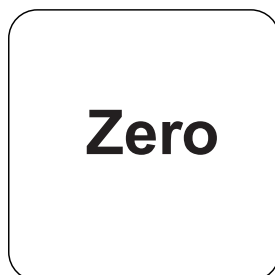
Fill 24 mm vial with **10 mL deionised water** .



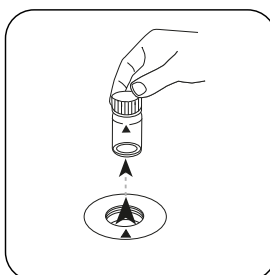
Close vial(s).



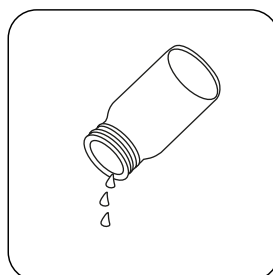
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

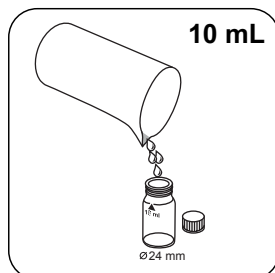


Remove the vial from the sample chamber.

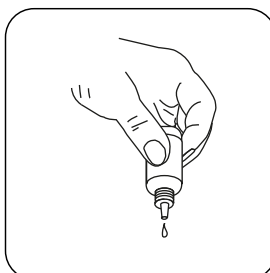


Empty vial.

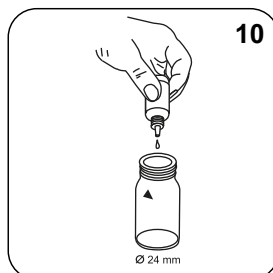
For devices that require **no ZERO measurement** , **start here**.



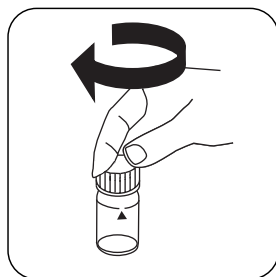
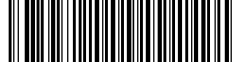
Fill 24 mm vial with **10 mL prepared sample** .



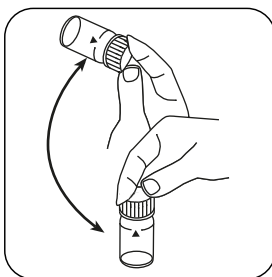
Hold cuvettes vertically and add equal drops by pressing slowly.



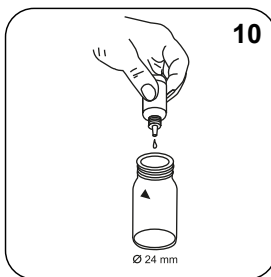
Add **10 drops KS60 (Acetate Buffer)**.



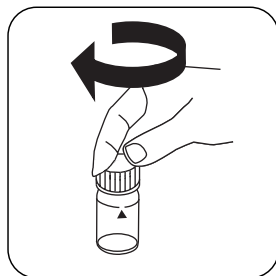
Close vial(s).



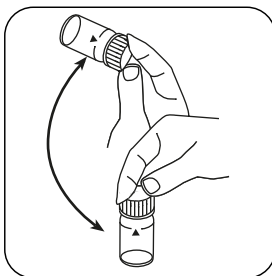
Invert several times to mix the contents.



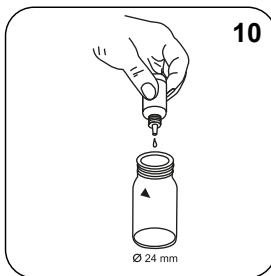
Add **10 drops Iron Reagent FE6.**



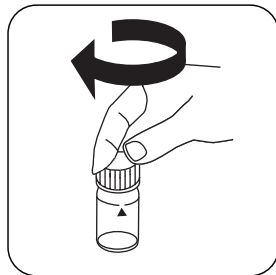
Close vial(s).



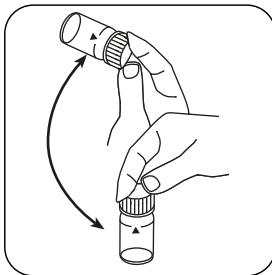
Invert several times to mix the contents.



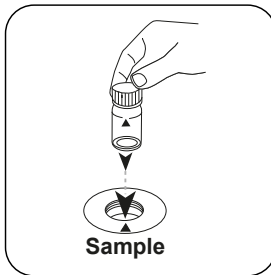
Add **10 drops KS65 (Ferrozine) .**



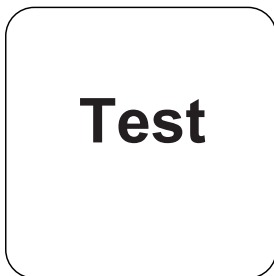
Close vial(s).



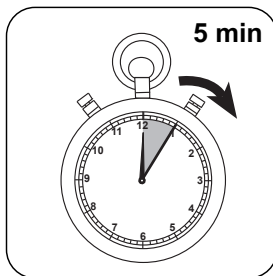
Invert several times to mix the contents.



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



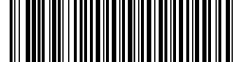
Press the **TEST** (XD:
START) button.



Wait for **5 minute(s)**
reaction time.

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

The result in mg/L total Iron or when using a filtrated sample, in mg/l totale soluble Iron appears on the display.



Chemical Method

Ferrozine / Thioglycolate

Appendix

EN

Interferences

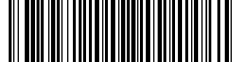
Removeable Interferences

1. If using KS63 (Ferrozine/Thioglycolate), a high concentration of molybdate will result in an intense yellow colour. In this instance, a chemical blank value is required:
 - Use two clean 24 mm vials .
 - Mark one as blank for zeroing.
 - Fill a clean vial (24 mm) with 10 ml of the sample (blank).
 - Add **10 drops of KS63 (Thioglycolate)** to the vial.
 - Close the vial with the cap and swirl the contents to mix them.
 - Place the blank in the sample chamber. Pay attention to the positioning.
 - Press the **ZERO** button.
 - Remove the vial from the sample chamber.
 - Fill a second clean vial (24 mm) with **10 ml of the sample** (this is the sample vial).
 - Add **10 drops of KS60 (Actate Buffer)** and as before, follow the procedure as described.

Interference	from / [mg/L]
Co	8
Cu	2
Oxalat	500
CN ⁻	10
NO ₂ ⁻	

Bibliography

D. F. Boltz and J. A. Howell, eds., Colorimetric Determination of Nonmetals, 2nd ed., Vol. 8, p. 304 (1978). Carpenter, J.F. "A New Field Method for Determining the Levels of Iron Contamination in Oilfield Completion Brine", SPE International Symposium (2004)



Iron HR L

M227

0.1 - 10 mg/L Fe

Thioglycolate

EN

Material

Required material (partly optional):

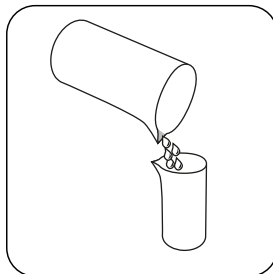
Reagents	Packaging Unit	Part Number
KP962-Ammonium Persulphate Powder	Powder / 40 g	56P096240
Acidity / Alkalinity P Indicator PA1	30 mL	56L013530
Acidity / Alkalinity P Indicator PA1	65 mL	56L013565
Hardness Calcium Buffer CH2	65 mL	56L014465
Calcium Hardness Buffer CH2	5 x 65 mL mL	56L014472
Iron HR Reagent Set	1 Pieces	56R023590

Preparation

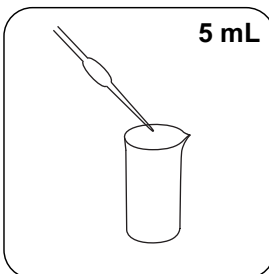
1. If there are strong complexing agents in the sample, the response time must be extended until no further colour development is seen. However, very strong iron complexes are not included in the measurement. In this event, the complexing agent must be destroyed by means of oxidation with acid/persulphate and the sample also neutralised to pH 6–9.
2. For the measurement of total iron, both suspended and dissolved, the sample must be boiled with acid/persulphate. It must be neutralised back to pH 6–9 and refilled to the original volume with deionised water.

Digestion

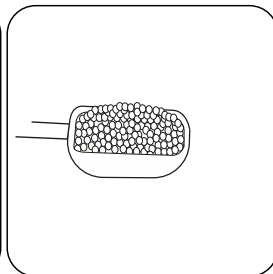
Total iron consists of suspended, soluble and complexed iron. The sample must be not filtered before measuring. To ensure homogenisation of the sample, deposited particles must be evenly distributed immediately prior to sampling by forcible shaking. A filtration of the sample is necessary for the determination of total soluble iron (including the complex iron compounds). The equipment required for the determination of total iron and reagents are not included in the standard delivery.



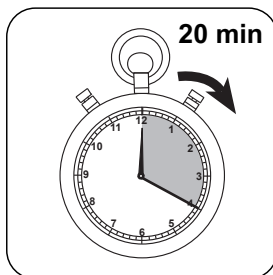
Fill a suitable digestion vessel with **50 mL homogenised sample**.



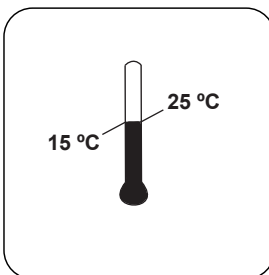
Add **5 mL 1:1 Hydrochloric acid**.



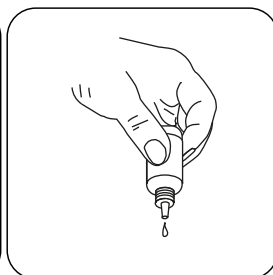
Add a measuring scoop **KP 962 (Ammonium Persulphat Powder)**.



Boil the sample for **20 minutes**. A sample volume of about 25 mL should be retained; If necessary, fill with deionised water.

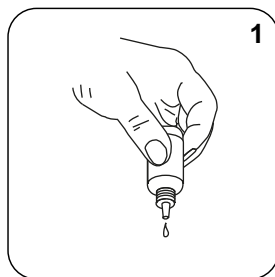
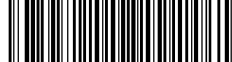


Allow the sample to cool to room temperature.

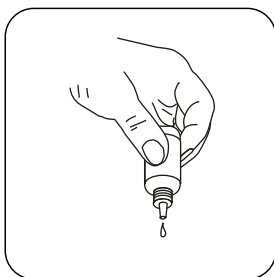


Hold cuvettes vertically and add equal drops by pressing slowly.

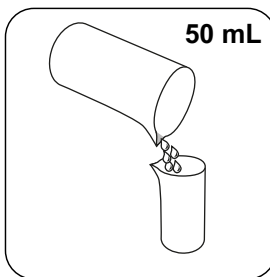
EN



Add **1 drop Acidity / Alkalinity P Indicator PA1**.



Add **Hardness Calcium Buffer CH2** drop by drop to the same sample until colouration turns from light pink to red. **(Note: make sure to swirl the vial after adding each drop!)**



Fill the sample with **deionised water to 50 mL**.

Determination of Iron, total HR with liquid reagent

Select the method on the device.

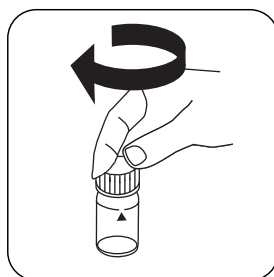
For testing of **Iron, total HR with liquid reagent**, carry out the described **digestion**.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

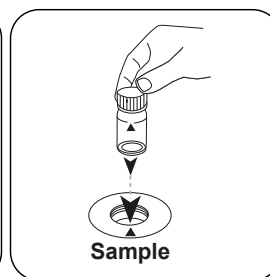
Total iron consists of suspended, soluble and complexed iron. The sample must be not filtered before measuring. To ensure homogenisation of the sample, deposited particles must be evenly distributed immediately prior to sampling by forcible shaking. A filtration of the sample is necessary for the determination of total soluble iron (including the complex iron compounds). The equipment required for the determination of total iron and reagents are not included in the standard delivery.



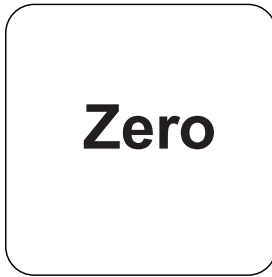
Fill 24 mm vial with **10 mL deionised water**.



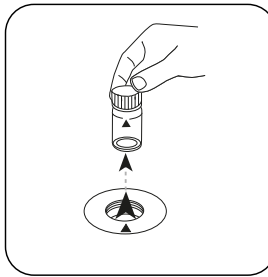
Close vial(s).



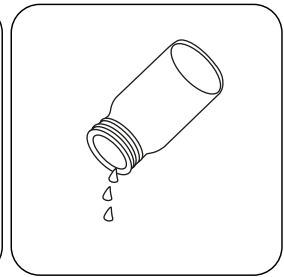
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.



Remove the vial from the sample chamber.

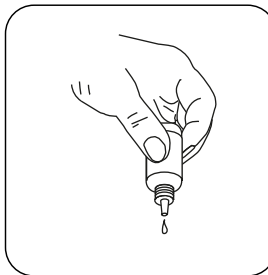


Empty vial.

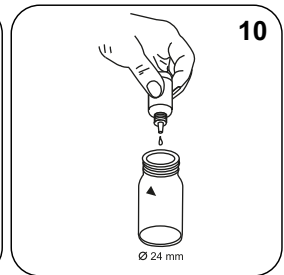
For devices that require **no ZERO measurement**, start here.



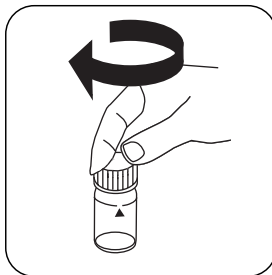
Fill 24 mm vial with **10 mL prepared sample**.



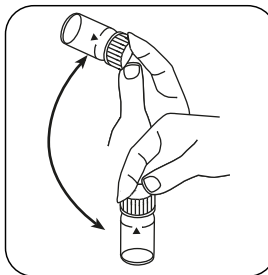
Hold cuvettes vertically and add equal drops by pressing slowly.



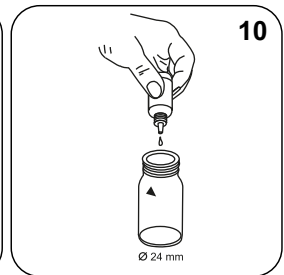
Add **10 drops Iron Reagent FE6**.



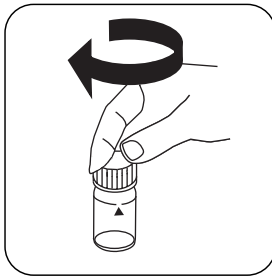
Close vial(s).



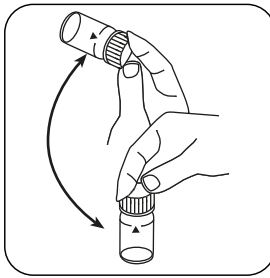
Invert several times to mix the contents.



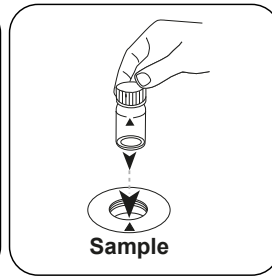
Add **10 drops Hardness Total Buffer TH2**.



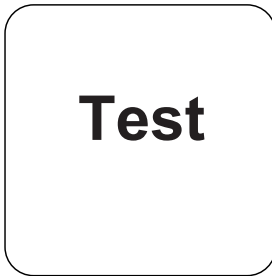
Close vial(s).



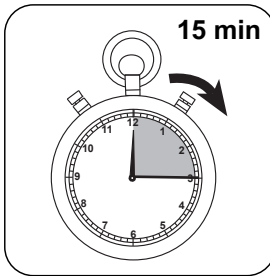
Invert several times to mix the contents.



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



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



Wait for **15 minute(s) reaction time**.

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

The result in mg/L total Iron or when using a filtrated sample, in mg/l totale soluble Iron appears on the display.

Determination of Iron HR with Liquid Reagent

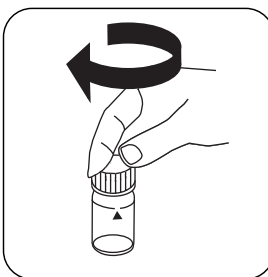
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

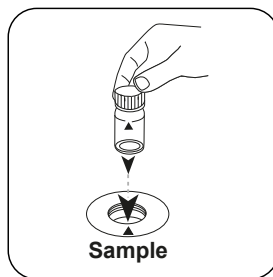
For determination of total dissolved iron with a distinction between Fe^{2+} and Fe^{3+} the sample must be filtered prior to the test (pore size 0,45 μm). Otherwise, iron particles and suspended iron are measured.



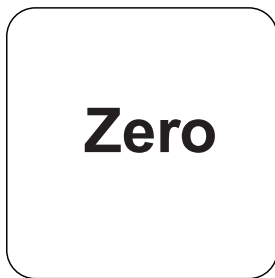
Fill 24 mm vial with **10 mL sample**.



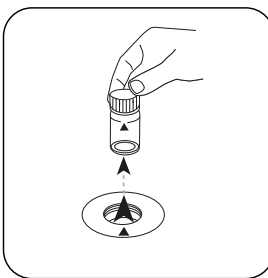
Close vial(s).



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

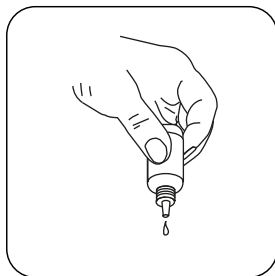


Press the **ZERO** button.

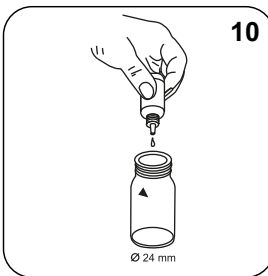


Remove the vial from the sample chamber.

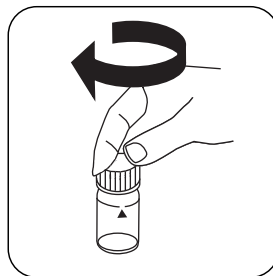
For devices that require **no ZERO measurement**, start here.



Hold cuvettes vertically and add equal drops by pressing slowly.



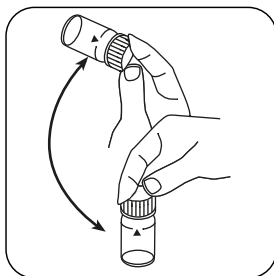
Add **10 drops Iron Reagent FE6**.



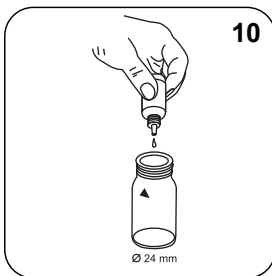
Close vial(s).



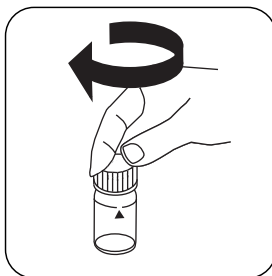
EN



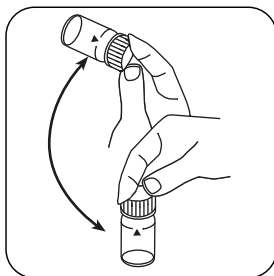
Invert several times to mix the contents.



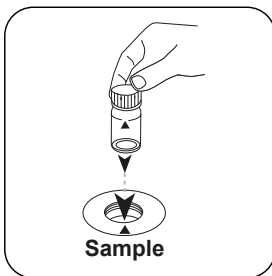
Add **10 drops Hardness Total Buffer TH2**.



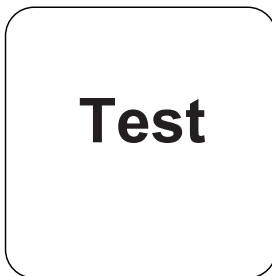
Close vial(s).



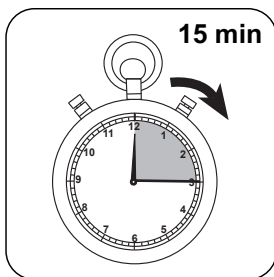
Invert several times to mix the contents.



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



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



Wait for **15 minute(s) reaction time**.

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

The result in mg/L Iron appears on the display.



Chemical Method

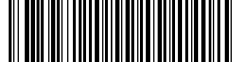
Thioglycolate

Appendix

Bibliography

E. Lyons (1927), Thioglycolic Acid As A Colour Test For Iron, J. Am. Chem. Soc., 49 (8), p.1916-1920

EN



Manganese T

M240

0.2 - 4 mg/L Mn

Mn

Formaldehyde

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Manganese LR 1	Tablet / 100	516080BT
Manganese LR 1	Tablet / 250	516081BT
Manganese LR 2	Tablet / 100	516090BT
Manganese LR 2	Tablet / 250	516091BT
Set Manganese LR 1/LR 2 100 Pc.#	100 each	517621BT
Set Manganese LR 1/LR 2 250 Pc.#	250 each	517622BT

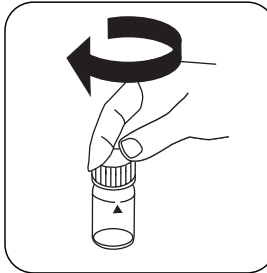
Determination of Manganese with Tablet

Select the method on the device.

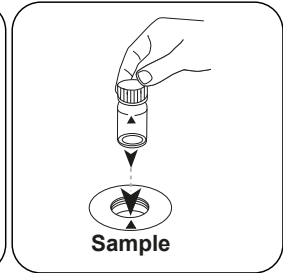
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



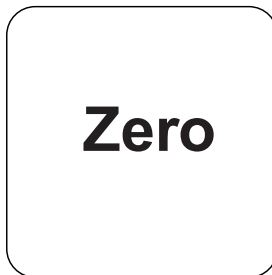
Fill 24 mm vial with **10 mL sample**.



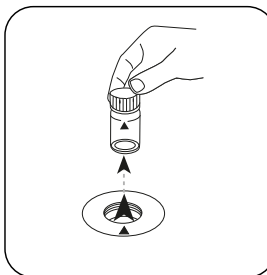
Close vial(s).



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

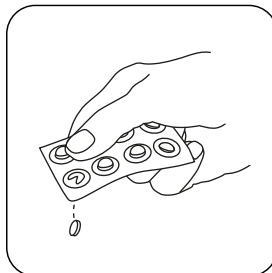


Press the **ZERO** button.

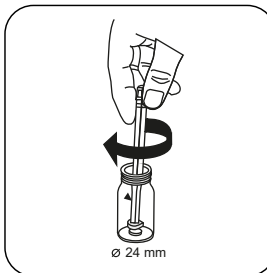


Remove the vial from the sample chamber.

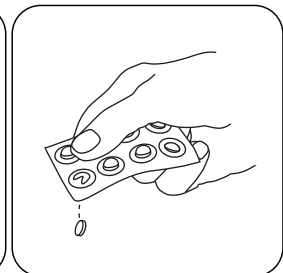
For devices that require **no ZERO measurement**, start here.



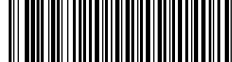
Add **MANGANESE LR 1 tablet**.



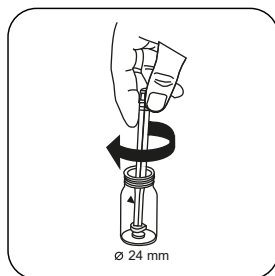
Crush tablet(s) by rotating slightly and dissolve.



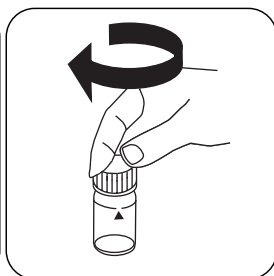
Add **MANGANESE LR 2 tablet**.



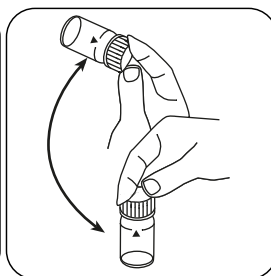
EN



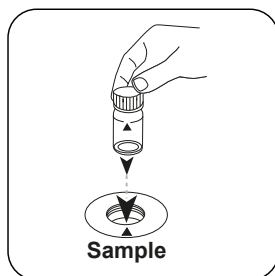
Crush tablet(s) by rotating slightly.



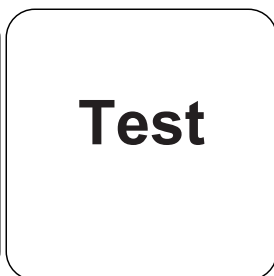
Close vial(s).



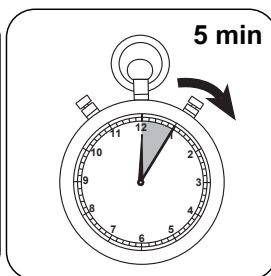
Dissolve tablet(s) by inverting.



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



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



Wait for **5 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically.
The result in mg/L Manganese 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	Mn	1
mg/l	MnO ₄	2.17
mg/l	KMnO ₄	2.88

EN

Chemical Method

Formaloxime

Appendix

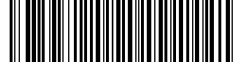
Bibliography

Gottlieb, A. & Hecht, F. Mikrochim Acta (1950) 35: 337

According to

DIN 38406-E2

* including stirring rod, 10 cm



Manganese LR PP

M242

0.01 - 0.7 mg/L Mn

Mn1

PAN

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Manganese Reagent, Set Low Range F10	1 Pieces	535090
Vario Rochelle Salt Solution, 30 ml ^{h)}	30 mL	530640

Preparation

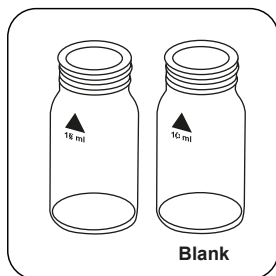
- All lab glassware must first be rinsed with diluted nitric acid and then rinsed with deionised water.
- Strongly buffered water samples or extreme pH values may exceed the buffering capacity of the reagents and pH values to be adjusted.
If samples were acidified for storing, the pH value must be adjusted between 4 and 5 with 5 mol/l (5 N) Sodium hydroxide before the test. A pH value of 5 must not be exceeded, since this can lead to precipitation of manganese.

Remarks

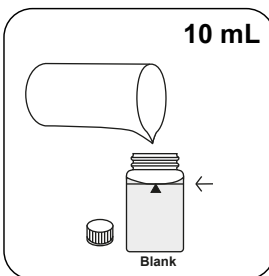
- If water samples contain more than 300 mg/L CaCO₃ hardness, then after adding the Vario Ascorbic Acid powder pack, add an additional 10 drops of Rochelle Salt Solution.
- After addition of the reagent solution "Alkaline-Cyanide" a cloudy or turbid solution may form in some water samples. Adding the PAN indicator solution should resolve the turbidity.
- If the sample contains large amounts of iron (from 5 mg/L) a reaction period of 10 minutes must be adhered to.

Determination of Manganese LR with Vario Powder Packs

Select the method on the device.



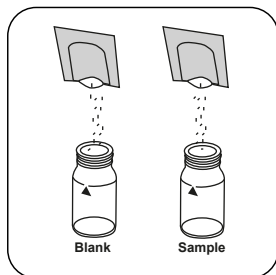
Prepare two clean 24 mm vials. Mark one as a blank.



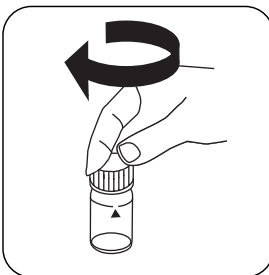
Put **10 mL deionised water** in the blank.



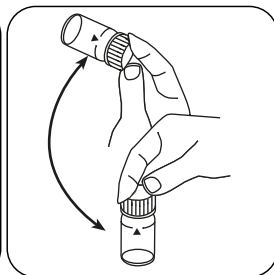
Put **10 mL sample** in the sample vial.



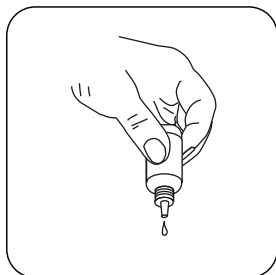
Add a **Vario Ascorbic Acid powder pack** in each vial.



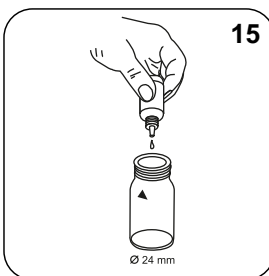
Close vial(s).



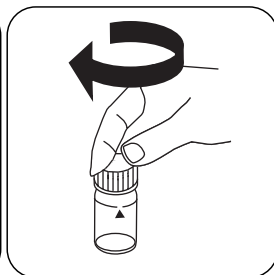
Invert several times to mix the contents.



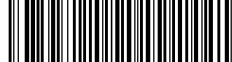
Hold cuvettes vertically and add equal drops by pressing slowly.



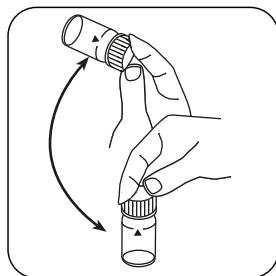
Add **15 drops Alkaline-Cyanide Reagenz**.



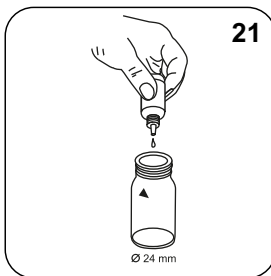
Close vial(s).



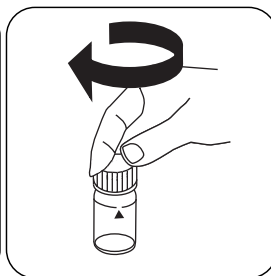
EN



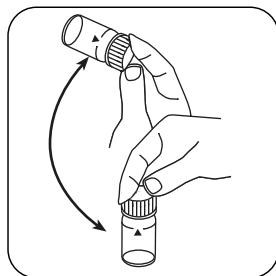
Invert several times to mix the contents.



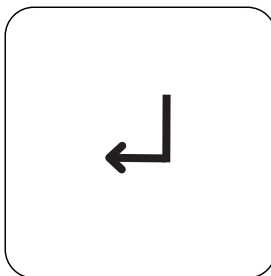
Add **21 drops PAN Indikator**.



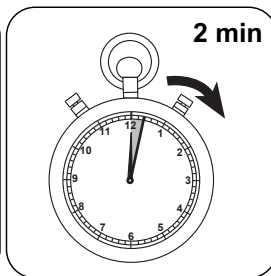
Close vial(s).



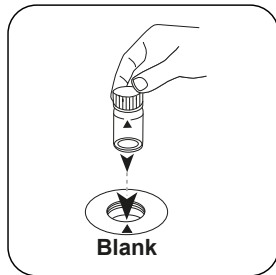
Invert several times to mix the contents.



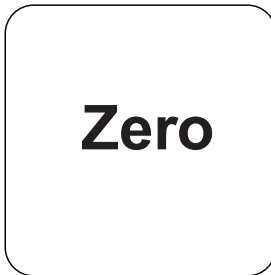
Press the **ENTER** button.



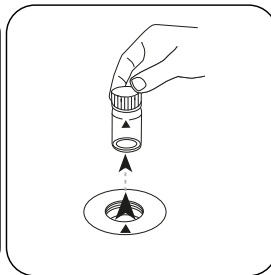
Wait for **2 minute(s) reaction time**.



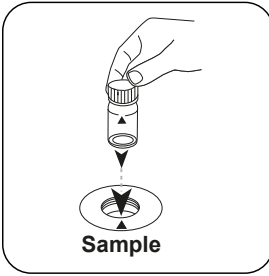
Place **blank** in the sample chamber. Pay attention to the positioning.



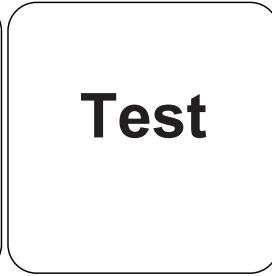
Press the **ZERO** button.



Remove the vial from the sample chamber.

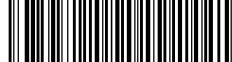


Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

The result in mg/L Manganese 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	Mn	1
mg/l	MnO ₄	2.17
mg/l	KMnO ₄	2.88

EN

Chemical Method

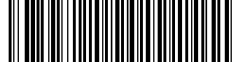
PAN

Appendix

Bibliography

Goto, K., et al., Talanta, 24, 652-3 (1977)

ⁿ⁾ additionally required for samples with hardness values above 300 mg/l CaCO₃



Manganese HR PP

M243

0.1 - 18 mg/L Mn

Mn2

Periodate Oxidation

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Manganese HR, Set High Range F10	1 Set	535100

Preparation

1. Strongly buffered water samples or extreme pH values may exceed the buffering capacity of the reagents and pH values to be adjusted.
If samples were acidified for storing, the pH value must be adjusted between 4 and 5 with 5 mol/l (5 N) Sodium hydroxide before the test. A pH value of 5 must not be exceeded, since this can lead to precipitation of manganese.

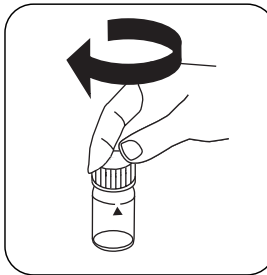
Determination of Manganese HR with Vario Powder Packs

Select the method on the device.

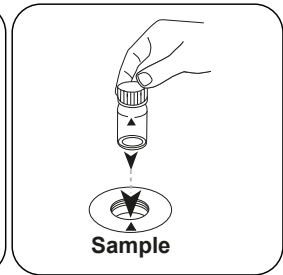
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



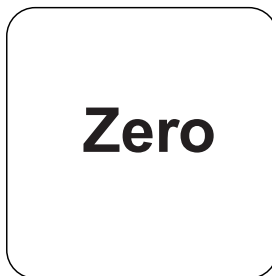
Fill 24 mm vial with **10 mL sample**.



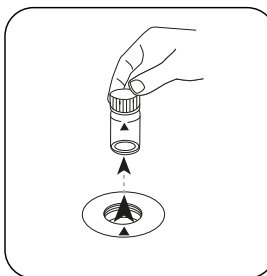
Close vial(s).



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

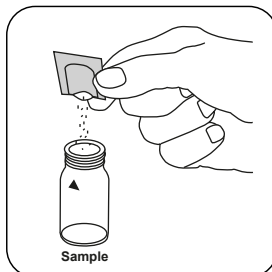


Press the **ZERO** button.

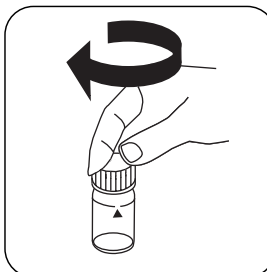


Remove the vial from the sample chamber.

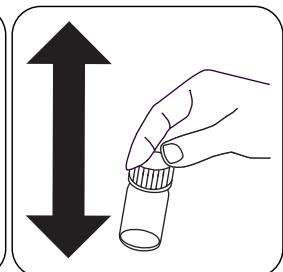
For devices that require **no ZERO measurement**, start here.



Add **Vario Manganese Citrate Buffer F10 powder pack**.



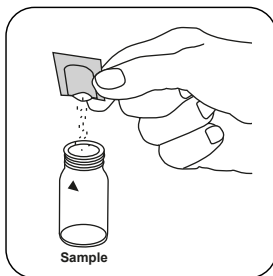
Close vial(s).



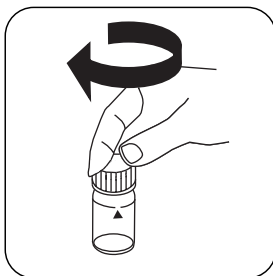
Mix the contents by shaking.



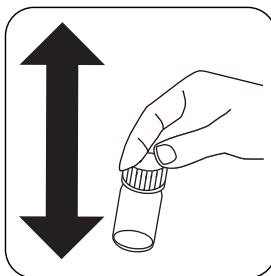
EN



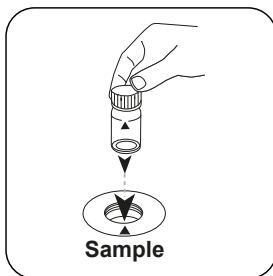
Add **Vario Sodium Periodate F10 powder pack**.



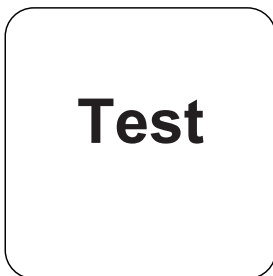
Close vial(s).



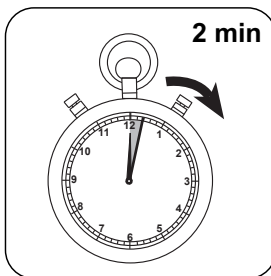
Mix the contents by shaking.



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 mg/L Manganese 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	Mn	1
mg/l	MnO ₄	2.17
mg/l	KMnO ₄	2.88

EN

Chemical Method

Periodate Oxidation

Appendix

Interferences

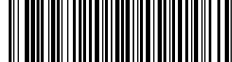
Interference	from / [mg/L]
Ca	700
Cl ⁻	70000
Fe	5
Mg	100000

Method Validation

Limit of Detection	0.16 mg/L
Limit of Quantification	0.49 mg/L
End of Measuring Range	18 mg/L
Sensitivity	13.02 mg/L / Abs
Confidence Intervall	0.28 mg/L
Standard Deviation	0.12 mg/L
Variation Coefficient	1.29 %

According to

40 CFR 136 (US EPA approved HACH)

**Manganese L****M245****0.05 - 5 mg/L Mn****Formaldehyde**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Manganese L, Reagent Pack	1 Pieces	56R024055

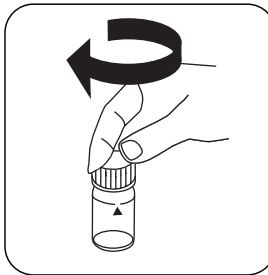
Determination of Manganese with liquid reagent

Select the method on the device.

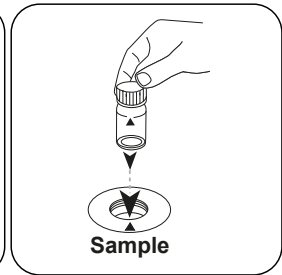
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



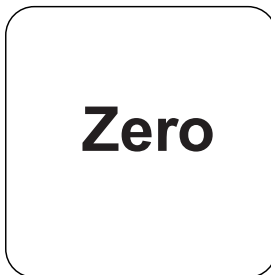
Fill 24 mm vial with **10 mL sample**.



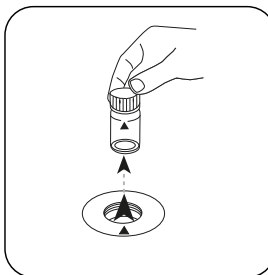
Close vial(s).



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

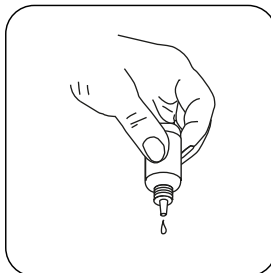


Press the **ZERO** button.

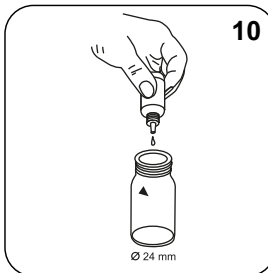


Remove the vial from the sample chamber.

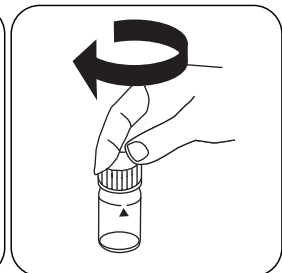
For devices that require **no ZERO measurement**, start here.



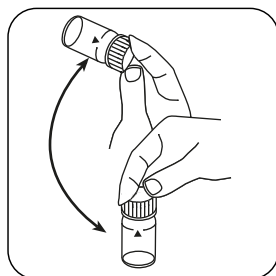
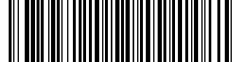
Hold cuvettes vertically and add equal drops by pressing slowly.



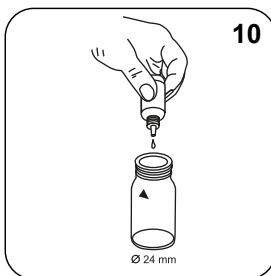
Add **10 drops KS265 (Manganese Reagent A)**.



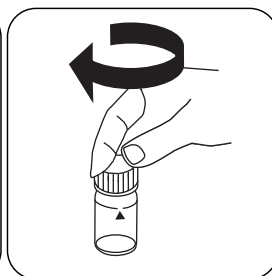
Close vial(s).



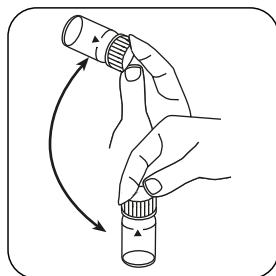
Invert several times to mix the contents.



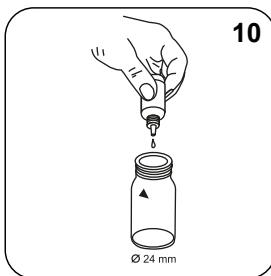
Add **10 drops** **KS266 (Manganese Reagent B)**.



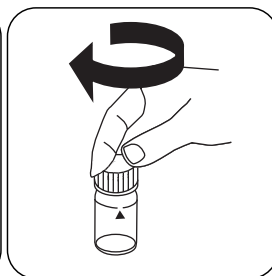
Close vial(s).



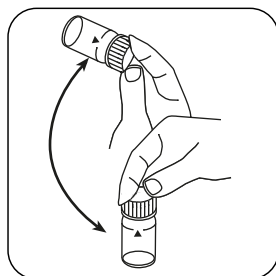
Invert several times to mix the contents.



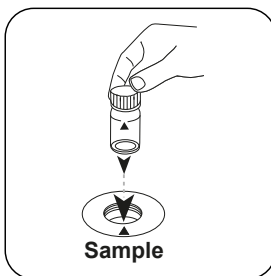
Add **10 drops** **KS304 (Manganese Reagent C)**.



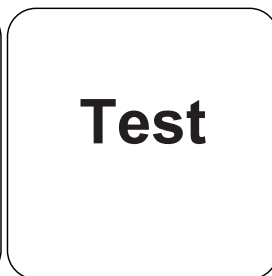
Close vial(s).



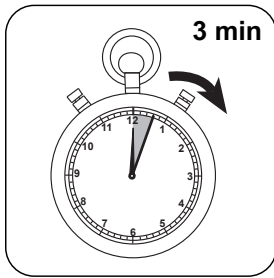
Invert several times to mix the contents.



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



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

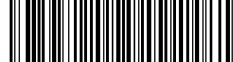


Wait for **3 minute(s)**
reaction time.

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

The result in mg/L Manganese 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	Mn	1
mg/l	MnO ₄	2.17
mg/l	KMnO ₄	2.88

EN

Chemical Method

Formaloxime

Appendix

Interferences

Interference	from / [mg/L]
Ca	500
Na	500
Ni	0,5
Fe	5
Cr	5

Method Validation

Limit of Detection	0.01 mg/L
Limit of Quantification	0.04 mg/L
End of Measuring Range	5 mg/L
Sensitivity	2.8 mg/L / Abs
Confidence Intervall	0.03 mg/L
Standard Deviation	0.01 mg/L
Variation Coefficient	0.46 %

Bibliography

Gottlieb, A. & Hecht, F. Mikrochim Acta (1950) 35: 337

According to

DIN 38406-E2



Molybdate T

M250

1 - 50 mg/L MoO₄

Mo3

Thioglycolate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Molybdate HR No. 1	Tablet / 100	513060BT
Molybdate HR No. 1	Tablet / 250	513061BT
Molybdate HR No. 2	Tablet / 100	513070BT
Molybdate HR No. 2	Tablet / 250	513071BT
Set Molybdate No. 1/No. 2 100 Pc.#	100 each	517631BT
Set Molybdate No. 1/No. 2 250 Pc.#	250 each	517632BT

Remarks

1. The tablets must be added in the correct sequence.

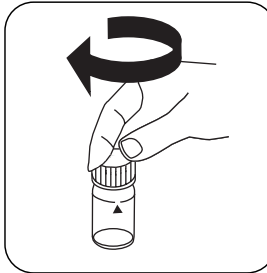
Determination of Molybdate HR with Tablet

Select the method on the device.

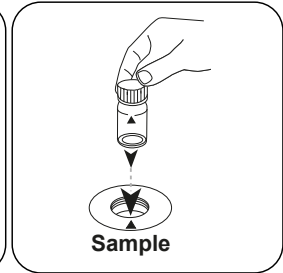
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



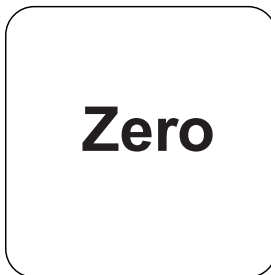
Fill 24 mm vial with **10 mL sample**.



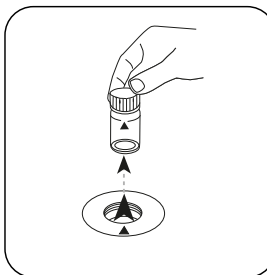
Close vial(s).



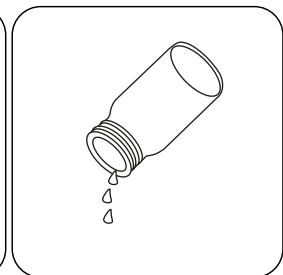
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

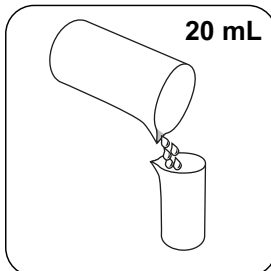


Remove the vial from the sample chamber.

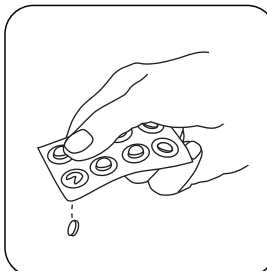


Empty vial.

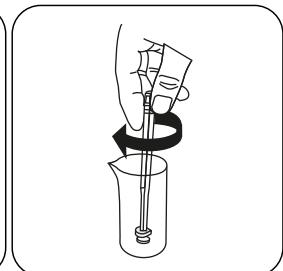
For devices that require **no ZERO measurement**, start here.



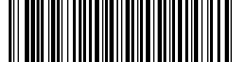
Put **20 mL sample** in 100 mL measuring beaker



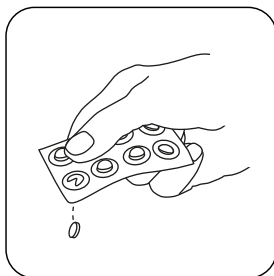
Add **MOLYBDATE HR No. 1 tablet**.



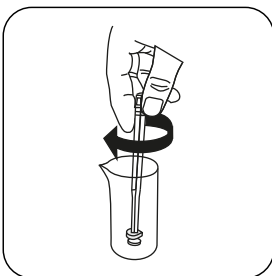
Crush tablet(s) by rotating slightly.



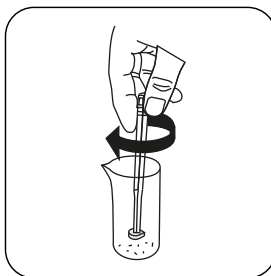
EN



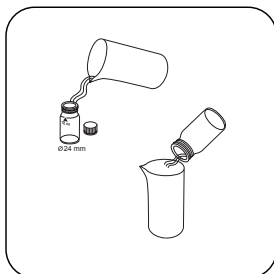
Add **MOLYBDATE HR No. 2 tablet** .



Crush tablet(s) by rotating slightly.



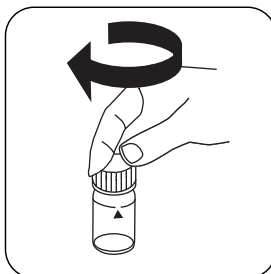
Dissolve the tablets using a clean stirring rod.



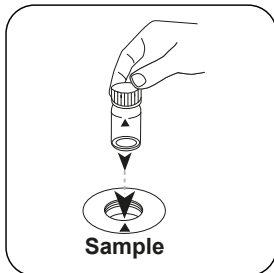
Rinse out vial with prepared sample .



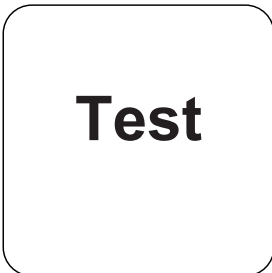
Fill up vial with **sample** to the **10 mL mark**.



Close vial(s).



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



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

The result in mg/L Molybdate/ Molybdenum 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	MoO ₄	1
mg/l	Mo	0.6
mg/l	Na ₂ MoO ₄	1.29

EN

Chemical Method

Thioglycolate

Appendix

Interferences

Removeable Interferences

1. Interference from niobium, tantalum, titanium, and zirconium are masked with citric acid.
2. Interference from vanadium(V) is masked with potassium fluoride.
3. Under test conditions (pH 3.8 – 3.9) iron does not react. Other metals at levels likely to be found in industrial water systems do not interfere at any significant level either.

Bibliography

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

* including stirring rod, 10 cm



Molybdate LR PP

M251

0.03 - 3 mg/L Mo

Mo1

Ternary Complex

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Molybdenum LR, Set F10	1 Pieces	535450

The following accessories are required.

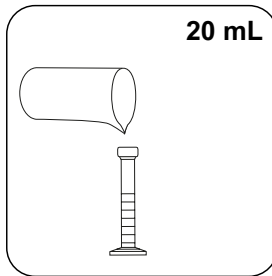
Accessories	Packaging Unit	Part Number
Mixing cylinder, 25 ml	1 Pieces	19802650

Preparation

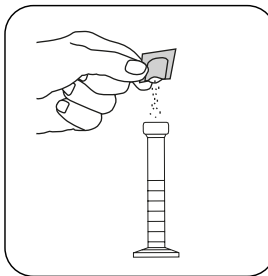
1. Strong alkaline or acidic water samples must be adjusted between pH 3 and pH 5 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. To avoid errors caused by deposits, rinse the glassware with Hydrochloric acid (approx. 20%) before the analysis and then rinse with deionised water.

Determination of Molybdate LR with Vario Powder Packs

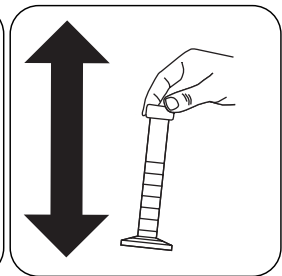
Select the method on the device.



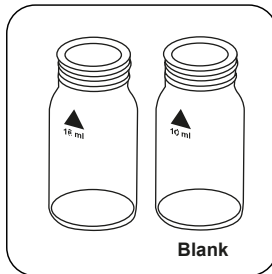
Put **20 mL sample** in 25 mL measuring cylinder.



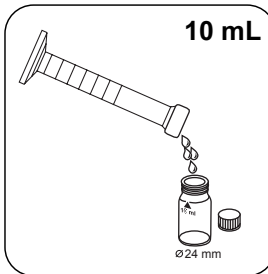
Add **Vario Molybdenum 1 LR F20 powder pack**.



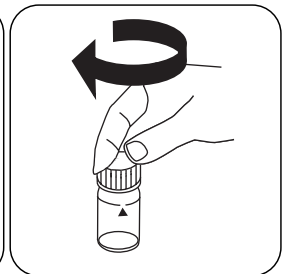
Stopper the mixing cylinder. Shake to dissolve the powder.



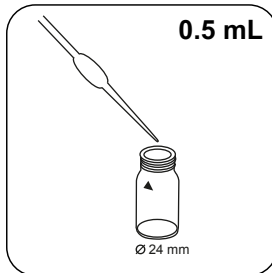
Prepare two clean 24 mm vials. Mark one as a blank.



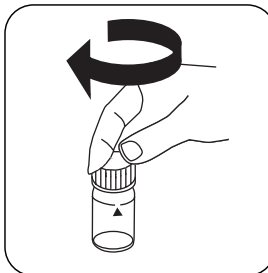
Place **10 mL sample** in each vial.



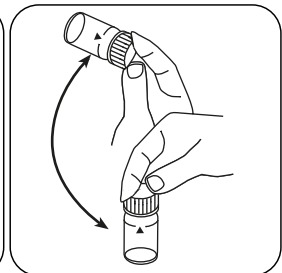
Firmly close the **blank**.



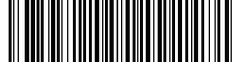
Place **0.5 mL Molybdenum 2 LR solution** in the sample cuvette.



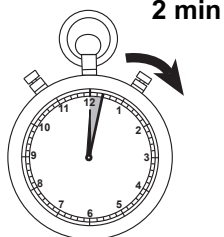
Close vial(s).



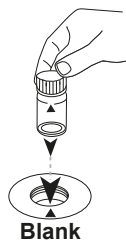
Invert several times to mix the contents.



Press the **ENTER** button.



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



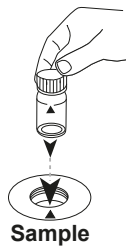
Place **blank** in the sample chamber. Pay attention to the positioning.

Zero

Press the **ZERO** button.



Remove the vial from the sample chamber.



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

Test

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

The result in mg/L Molybdate/ Molybdenum 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	MoO ₄	1
mg/l	Mo	0.6
mg/l	Na ₂ MoO ₄	1.29

EN

Chemical Method

Ternary Complex

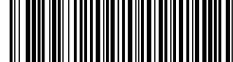
Appendix

Interferences

Interference	from / [mg/L]	Influence
Al	50	
Cr	1000	
Fe	50	
Ni	50	
NO ₂ ⁻	in all quantities	
Cu	10	Leads to higher readings with a response time of more than 5 minutes

Bibliography

Analytical Chemistry, 25(9) 1363 (1953)

**Molybdate HR PP****M252****0.3 - 40 mg/L Mo****MO2****Mercaptoacetic Acid**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Molybdenum HR, Set F10	1 Set	535300

Preparation

1. Turbid water samples should be passed through a membrane filter prior to analysis.
2. Strongly buffered samples or samples with extreme pH values should, prior to analysis, be set to a pH of about 7 with 1 mol/l nitric acid or 1 mol/l sodium hydroxide solution.

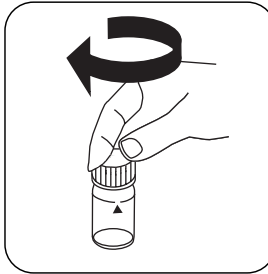
Determination of Molybdate HR with Vario Powder Packs

Select the method on the device.

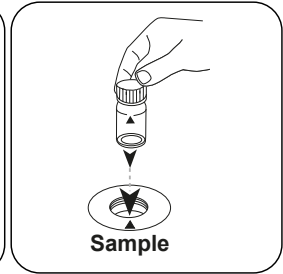
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



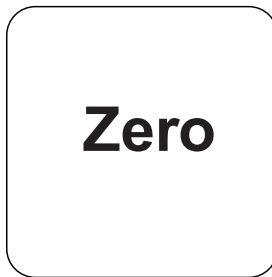
Fill 24 mm vial with **10 mL sample**.



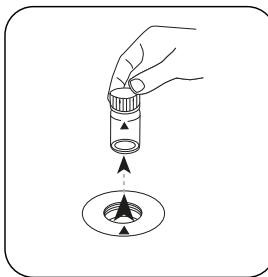
Close vial(s).



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

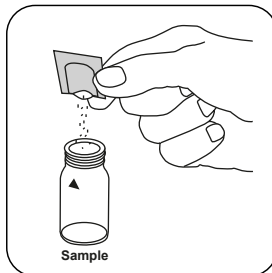


Press the **ZERO** button.

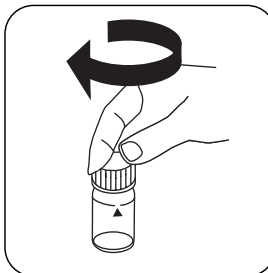


Remove the vial from the sample chamber.

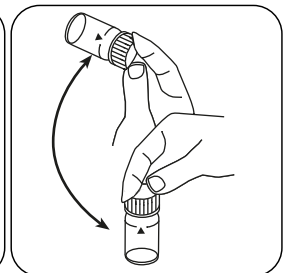
For devices that require **no ZERO measurement**, start here.



Add **Vario Molybdenum HR 1 F10 powder pack**.



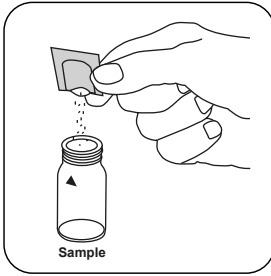
Close vial(s).



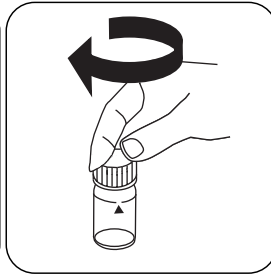
Swirl around to dissolve the powder.



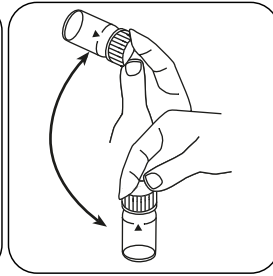
EN



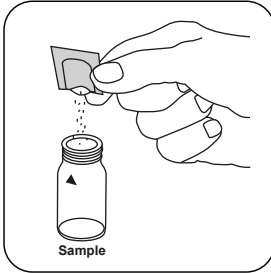
Add **Vario Molybdenum HR 2 F10 powder pack**.



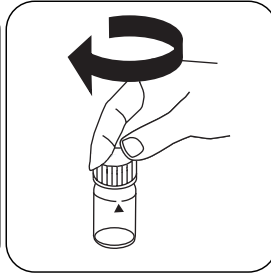
Close vial(s).



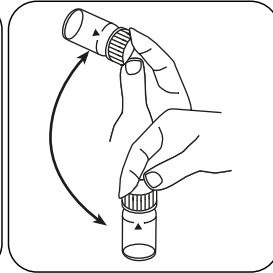
Invert several times to mix the contents.



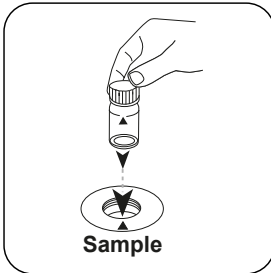
Add **Vario Molybdenum HR 3 F10 powder pack**.



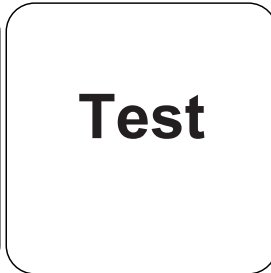
Close vial(s).



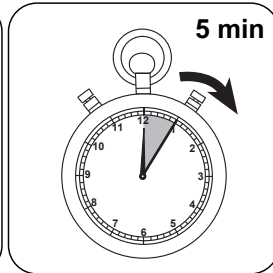
Swirl around to dissolve the powder.



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



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



Wait for **5 minute(s) reaction time**.

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

The result in mg/L Molybdate/ Molybdenum 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	MoO ₄	1
mg/l	Mo	0.6
mg/l	Na ₂ MoO ₄	1.29

EN

Chemical Method

Mercaptoacetic Acid

Appendix

Interferences

Persistent Interferences

- At concentrations of 10 mg/L Cu, more than the specified 5 minute response time leads to higher values. A rapid test performance is therefore particularly important.

Interference	from / [mg/L]
Al	50
Cr	1000
Fe	50
Ni	50
NO ₂ ⁻	in all quantities

Method Validation

Limit of Detection	0.16 mg/L
Limit of Quantification	0.47 mg/L
End of Measuring Range	40 mg/L
Sensitivity	25.04 mg/L / Abs
Confidence Intervall	0.712 mg/L
Standard Deviation	0.294 mg/L
Variation Coefficient	1.46 %



Bibliography

Analytical Chemistry, 25(9) 1363 (1953)

EN

**Molybdate HR L****M254****1 - 100 mg/L MoO₄****Mo2****Thioglycolate**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Iron Reagent FE6	65 mL	56L006365

Sampling

1. The test must take place immediately after taking the sample. Molybdate is deposited on the walls of the sample vessels, which leads to lower measurement results.

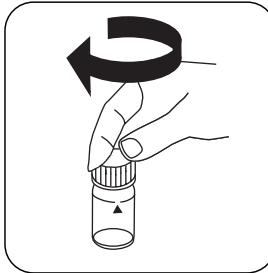
Determination of Molybdate HR with liquid reagent

Select the method on the device.

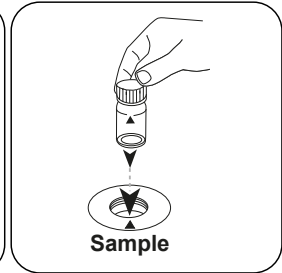
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



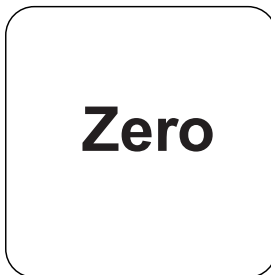
Fill 24 mm vial with **10 mL sample**.



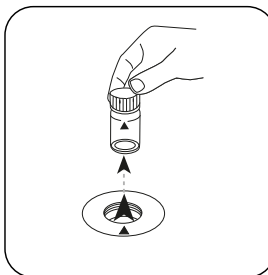
Close vial(s).



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

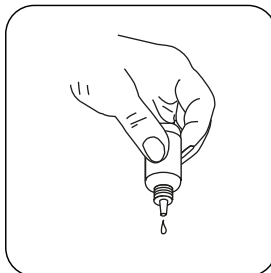


Press the **ZERO** button.

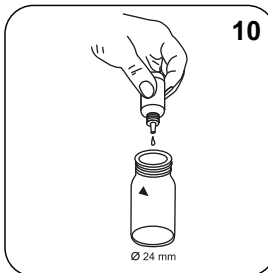


Remove the vial from the sample chamber.

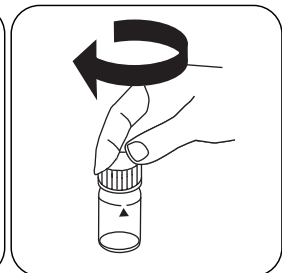
For devices that require **no ZERO measurement**, start here.



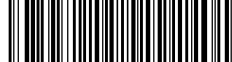
Hold cuvettes vertically and add equal drops by pressing slowly.



Add **10 drops Iron Reagent FE6**.



Close vial(s).



Invert several times to mix the contents.

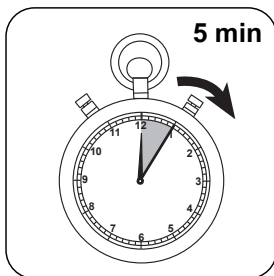


Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

EN



Wait for **5 minute(s) reaction time**.

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

The result in mg/L Molybdate/ Molybdenum 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	MoO ₄	1
mg/l	Mo	0.6
mg/l	Na ₂ MoO ₄	1.29

EN

Chemical Method

Thioglycolate

Appendix

Interferences

Removeable Interferences

1. Interference from niobium, tantalum, titanium, and zirconium are masked with citric acid.
2. Interference from vanadium(V) is masked with potassium fluoride.

Bibliography

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

**Nickel L****M256****0.2 - 7 mg/L Ni****Dimethylglyoxime**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Nickel Reagent Test	1 Pieces	2419033

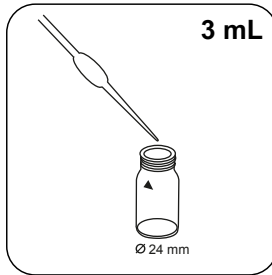
Preparation

1. The test sample and the reagents should be at room temperature when undertaking the test.
2. The pH value of the sample must be between 3 and 10.

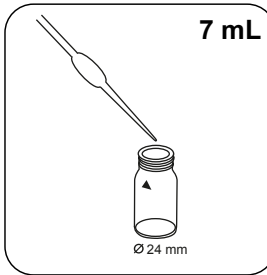
Determination of Nickel with Reagents test

Select the method on the device.

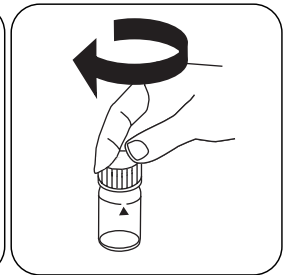
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



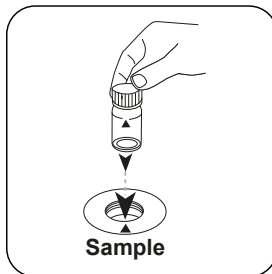
Put **3 mL sample** in the vial.



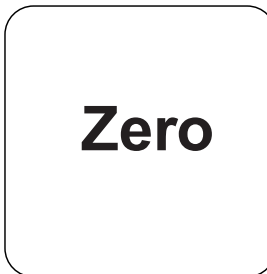
Fill 24 mm vial with **7 mL deionised water**.



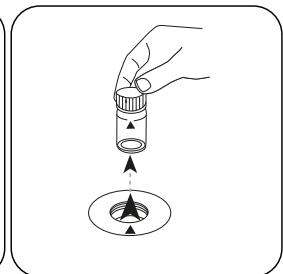
Close vial(s).



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

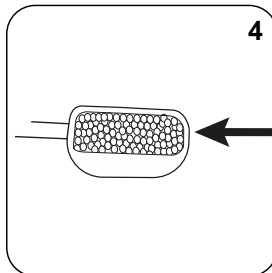


Press the **ZERO** button.

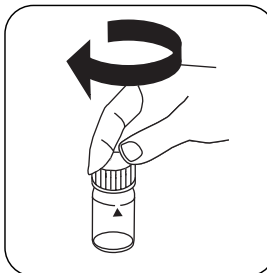


Remove the vial from the sample chamber.

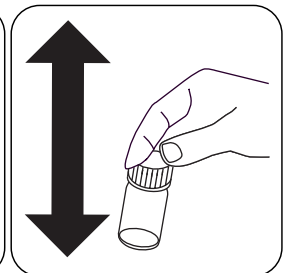
For devices that require **no ZERO measurement**, start here.



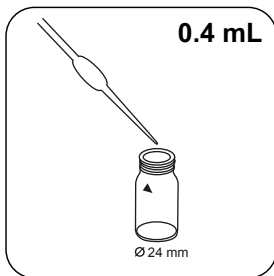
Add **4 level measuring scoop No. 8 (black) Nickel-51**.



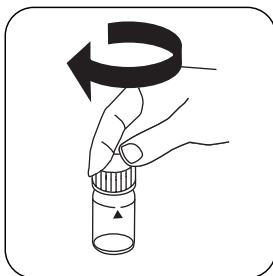
Close vial(s).



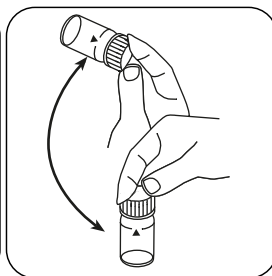
Mix the contents by shaking.



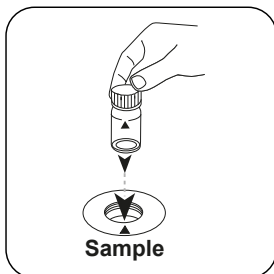
Add **0.4 mL Nickel-52**.



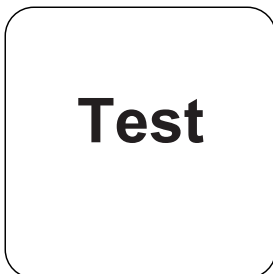
Close vial(s).



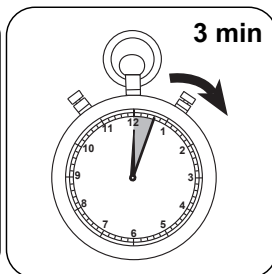
Invert several times to mix the contents.



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



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



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

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



Chemical Method

Dimethylglyoxime

Appendix

Interferences

EN

Removeable Interferences

1. If large amounts of these metals should be present, nickel must be insulated before the test determination. The insulation is performed with a solution of Dimethylglyoxim in chloroform.
Al, Co, Cu, Fe, Mn, Zn and phosphates do not pose an obstacle in biologically normal quantities. In most cases, the biological samples are first of all mineralised with a mixture of sulphuric acid and nitric acid.

Bibliography

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989

**Nitrate T****M260****0.08 - 1 mg/L N****Zinc Reduction / NED**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Nitrate Test	Tablet / 100	502810
Nitrite LR	Tablet / 100	512310BT
Nitrite LR	Tablet / 250	512311BT
Nitrate Test Pulver	Powder / 15 g	465230
Nitrate test tube	1 Pieces	366220

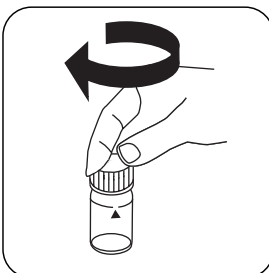
Determination of Nitrate with Tablet and Powder

Select the method on the device.

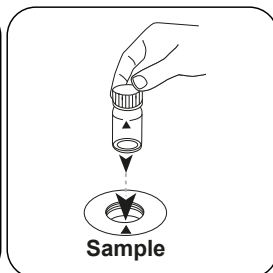
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



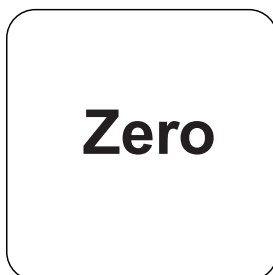
Fill 24 mm vial with **10 mL sample**.



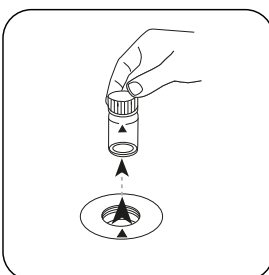
Close vial(s).



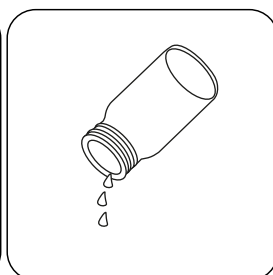
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

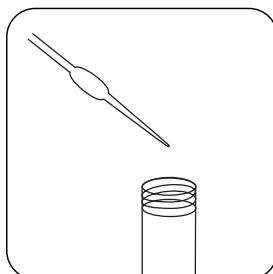


Remove the vial from the sample chamber.

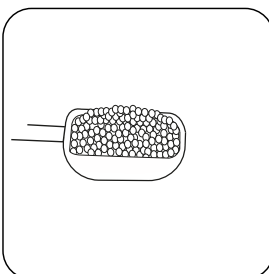


Empty vial.

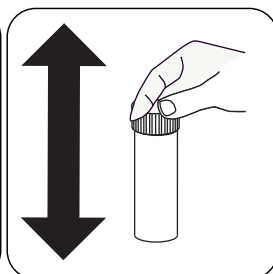
For devices that require **no ZERO measurement**, start here.



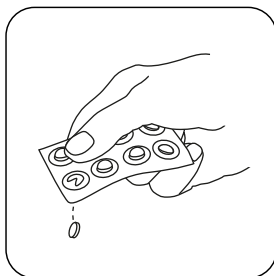
Fill a Nitratetest tube with **20 mL sample**.



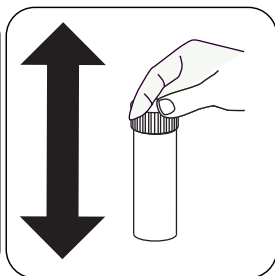
Add **one microspoon NITRATE TEST powder**.



Close the test tube with the lid and mix the contents by vigorously shaking for 1 minute.

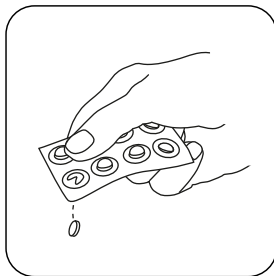


Add **NITRATE TEST tablet**.

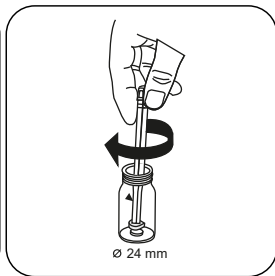


Close the test tube with the lid and mix the contents by vigorously shaking for 1 minute.

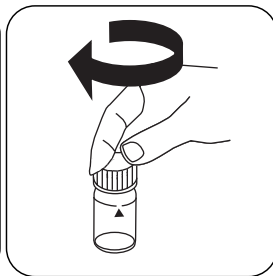
- Leave test tubes upright. Wait until the reducing agent has dropped off.
- Then turn the test tube three to four times around.
- Leave the test tube to stand for 2 minutes.
- Open the test tube and wipe the residue of the reduction with a clean cloth.
- Decant **10 mL of this sample** into a **24 mm vial** without causing a reducing agent.



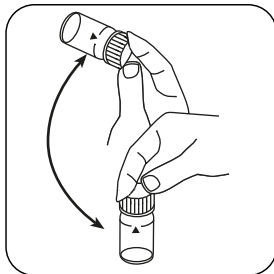
Add **NITRITE LR tablet**.



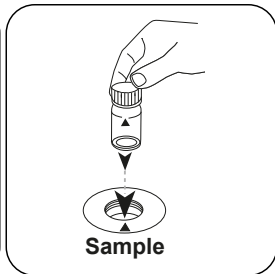
Crush tablet(s) by rotating slightly.



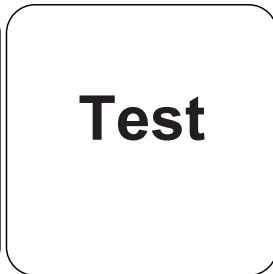
Close vial(s).



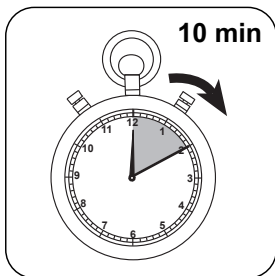
Dissolve tablet(s) by inverting.



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



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



Wait for **10 minute(s)**
reaction time.

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

The result in mg/L Nitrate 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	N	1
mg/l	NO ₃	4.4268

EN

Chemical Method

Zinc Reduction / NED

Appendix

Interferences

Persistent Interferences

1. Antimony (III), iron, lead, mercury (I), silver, Chloroplatinate, metavanadate, and bismuth create precipitation.
2. With the presence of Copper (II) there will be lower results, because it accelerates the degradation of diazonium salts.

Removeable Interferences

1. If there is nitrate in the original water sample, it will lead to high values of nitrate nitrogen. For correction, carry out a nitrite determination using method 270 in NO₂-N and subtract the result from the nitrate reading for the correct result. The result displayed does not show the actual concentration of nitrate nitrogen in the water sample being analysed.
2. Concentration of nitrate nitrogen above 1 mg/L results in an erroneous measurement after the reaction time of 10 minutes (in this instance, a colour change to apricot colour instead of the reddish pink solution). The range of the test can be extended by first diluting the water sample with deionised water. The subsequent result of the test must then be multiplied by the dilution factor.

Derived from

ASTM D 3867-09
 APHA 4500 NO₃- E-2000
 US EPA 353.3 (1983)

**Nitrate MR PP****M261****1 - 30 mg/L NO₃-N****Zinc Reduction**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Nitrate MR F10 PP	Powder / 100 Pieces	530840

Preparation

1. To avoid errors caused by contamination, rinse the vial and the accessories with Hydrochloric acid (approx. 20%) before the analysis. Then rinse them with deionised water.

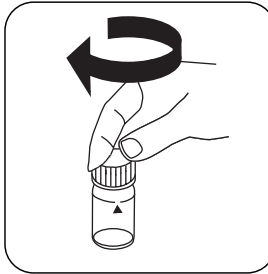
Determination of Nitrate MR with Powder Pack

Select the method on the device.

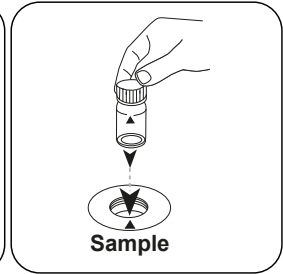
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



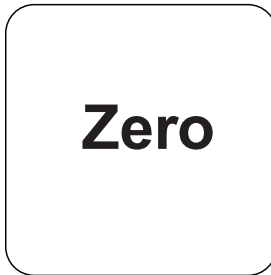
Fill 24 mm vial with **10 mL sample**.



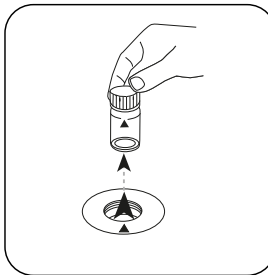
Close vial(s).



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

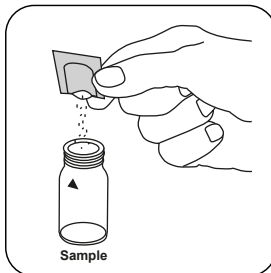


Press the **ZERO** button.

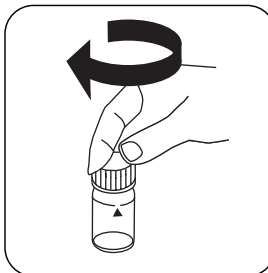


Remove the vial from the sample chamber.

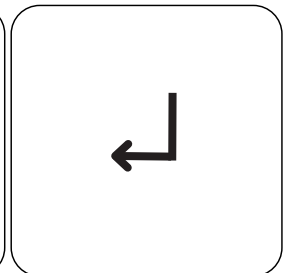
For devices that require **no ZERO measurement**, start here.



Add **Nitrate MR F10 powder pack**.



Close vial(s).



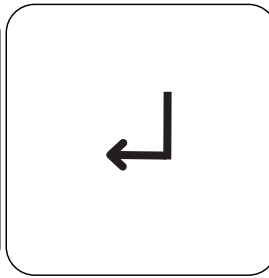
Press the **ENTER** button for countdown.
(XD: start timer)



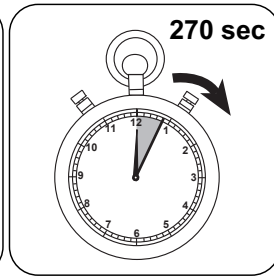
EN



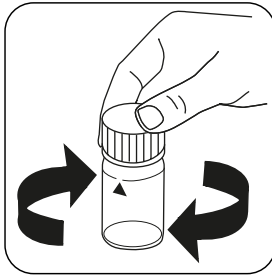
Mix the contents by shaking vigorously. (1 minute).



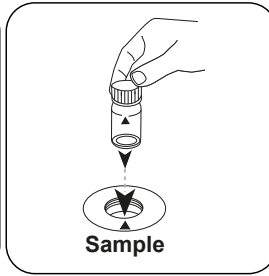
Press the **ENTER** button for countdown. (XD: start timer)



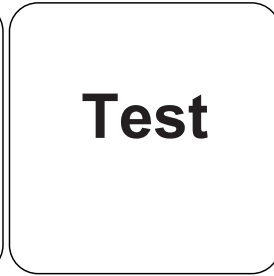
Wait for **270 second(s) reaction time.**



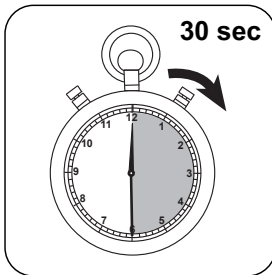
Swirl the vial once (**do not shake or invert!**).



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



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



Wait for **30 second(s) reaction time.**

The result in mg/L NO₃-N 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	N	1
mg/l	NO ₃	4.4268

EN

Chemical Method

Zinc Reduction

Interferences

Persistent Interferences

1. Nitrite interferes at any concentration.

Interference	from / [mg/L]
Fe	1
Cu	2
Ni	1
Tannin	1

Method Validation

Limit of Detection	0.5 mg/L
Limit of Quantification	1.4 mg/L
End of Measuring Range	30.0 mg/L
Sensitivity	32.0 mg/L/Abs
Confidence Intervall	0.6 mg/L
Standard Deviation	0.2 mg/L
Variation Coefficient	1.55 %

**Nitrate TT****M265****1 - 30 mg/L N****Chromotropic Acid**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Nitra X Reagent, Set	1 Set	535580

The following accessories are required.

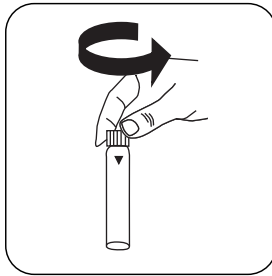
Accessories	Packaging Unit	Part Number
Plastic funnel with handle (white)	1 Pieces	471007

Remarks

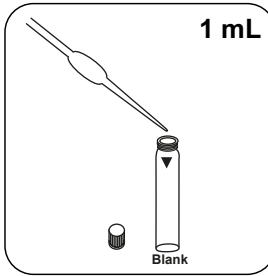
1. A small amount of solid material remains may be undissolved.

Determination of Nitrate with Vario Vial Test

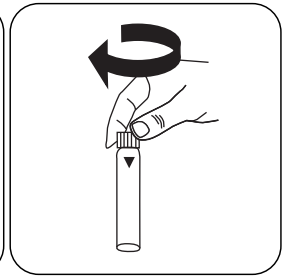
Select the method on the device.



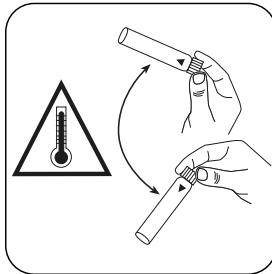
Open **digestion vial (Reagent A)**.



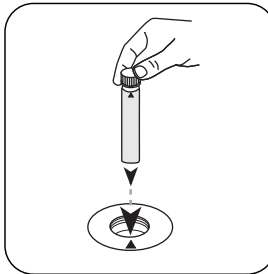
Put **1 mL sample** in the vial.



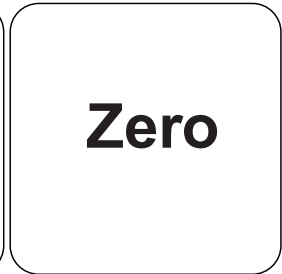
Close vial(s).



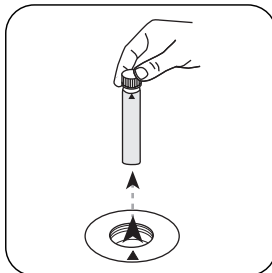
Carefully invert several times to mix the contents.
Note: Will get hot!



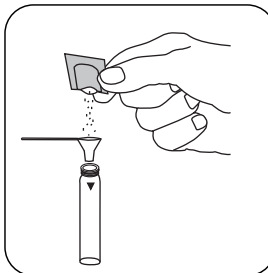
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



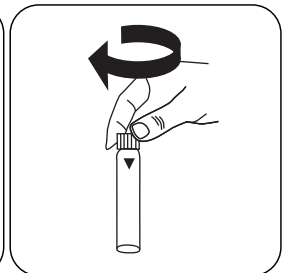
Press the **ZERO** button.



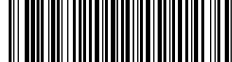
Remove **vial** from the sample chamber.



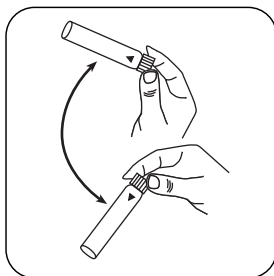
Add **Vario Nitrate Chromotropic powder pack**.



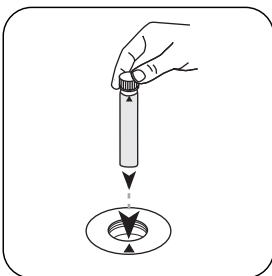
Close vial(s).



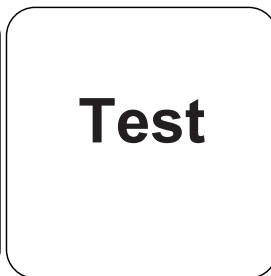
EN



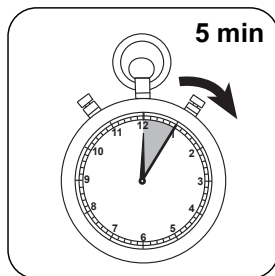
Invert several times to mix the contents (10 x).



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



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



Wait for **5 minute(s) reaction time**.

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

The result in mg/L Nitrate 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	N	1
mg/l	NO ₃	4.43

EN

Chemical Method

Chromotropic Acid

Appendix

Interferences

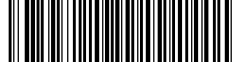
Interference	from / [mg/L]
Ba	1
Cl ⁻	1000
Cu	in all quantities
NO ₂ ⁻	12

Method Validation

Limit of Detection	0,34 mg/L
Limit of Quantification	1,02 mg/L
End of Measuring Range	30 mg/L
Sensitivity	21,3 mg/L /Abs
Confidence Intervall	0,50 mg/L
Standard Deviation	0,21 mg/L
Variation Coefficient	1,36 %

Bibliography

P. W. West, G. L. Lyles, A new method for the determination of nitrates, Analytica Chimica Acta, 23, 1960, p. 227-232

**Nitrite T****M270****0.01 - 0.5 mg/L N****N-(1-Naphthyl)-ethylenediamine**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Nitrite LR	Tablet / 100	512310BT
Nitrite LR	Tablet / 250	512311BT

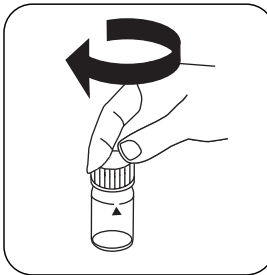
Determination of Nitrite with Tablet

Select the method on the device.

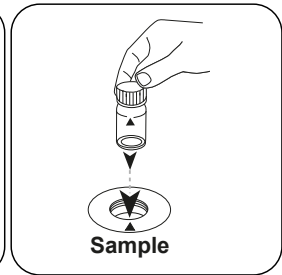
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



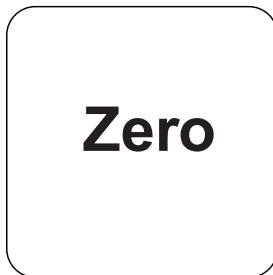
Fill 24 mm vial with **10 mL sample**.



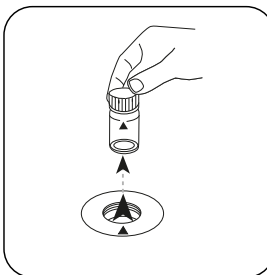
Close vial(s).



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

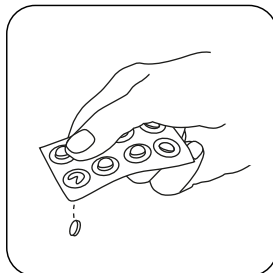


Press the **ZERO** button.

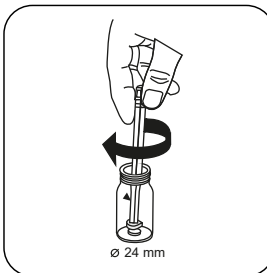


Remove the vial from the sample chamber.

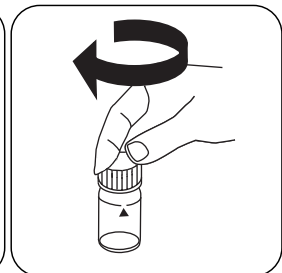
For devices that require **no ZERO measurement**, start here.



Add **NITRITE LR tablet**.



Crush tablet(s) by rotating slightly.



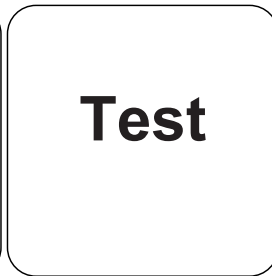
Close vial(s).



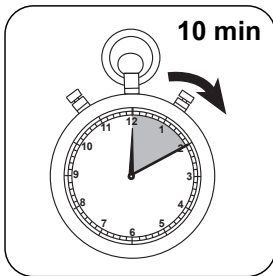
Dissolve tablet(s) by inverting.



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



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



Wait for **10 minute(s) reaction time**.

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

The result in mg/L Nitrite 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	N	1
mg/l	NO ₂	3.2846

EN

Chemical Method

N-(1-Naphthyl)-ethylendiamine

Appendix

Interferences

Persistent Interferences

1. Antimony (III), iron (III), lead, mercury (I), silver, chloroplatinate, metavanadate, and bismuth can result in interference as a result of precipitation.
2. Copper(II) ions may give a low result as they accelerate the decomposition of the diazonium salt.
3. It is unlikely in practice that these interfering ions will occur in such high concentrations that they cause significant errors.

Derived from

DIN ISO 15923-1 D49

Nitrite VHR L**M271****25 - 2500 mg/L NO₂⁻****Ferrous Sulfate Method**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Nitrite VHR L, 500 ml	500 mL	471170
Nitrite VHR L, 500 ml, Set	500 mL	471160

The following accessories are required.

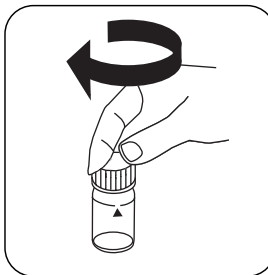
Accessories	Packaging Unit	Part Number
Pipette, 1000 µl	1 Pieces	365045
Pipette tips, 0,1-1 ml (white), 1000 pc.	1 Pieces	419073

Determination of Nitrite VHR L

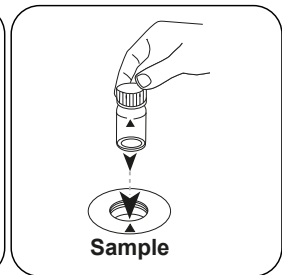
Select the method on the device.



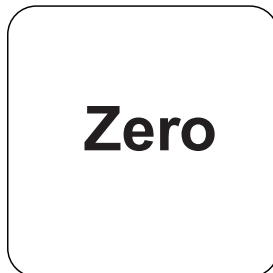
Place **10 mL Nitrite VHR L solution** in the sample cuvette.



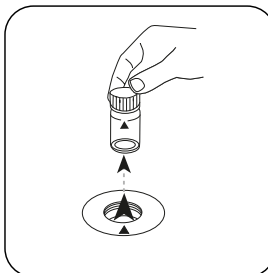
Close vial(s).



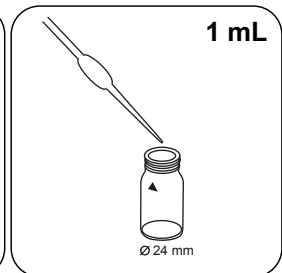
Place **sample vial** in the sample chamber. Pay attention to the positioning.



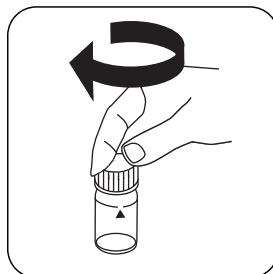
Press the **ZERO** button.



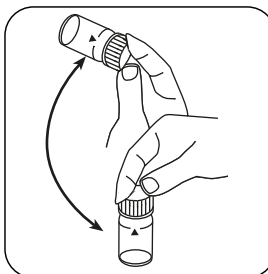
Remove the vial from the sample chamber.



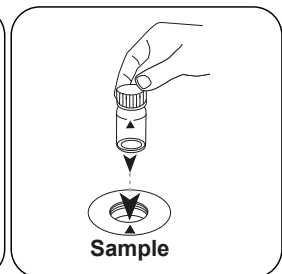
Add **1 mL sample**.



Close vial(s).



Invert several times to mix the contents (1-2 times).



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

EN



Test

EN

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

The result in mg/L Nitrite appears on the display.

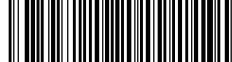
Chemical Method

Ferrous Sulfate Method

Method Validation

Limit of Detection	8.77 mg/L
Limit of Quantification	26.31 mg/L
End of Measuring Range	2500 mg/L
Sensitivity	1235.02 mg/L / Abs
Confidence Intervall	13.11 mg/L
Standard Deviation	5.42 mg/L
Variation Coefficient	0.43 %

EN

**Nitrite PP****M272****0.01 - 0.3 mg/L N****Diazotation**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Nitri 3 F10	Powder / 100 Pieces	530980

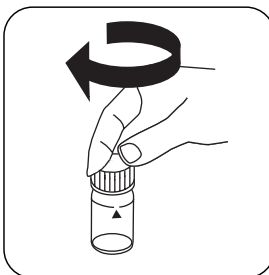
Determination of Nitrite with Vario Powder Pack

Select the method on the device.

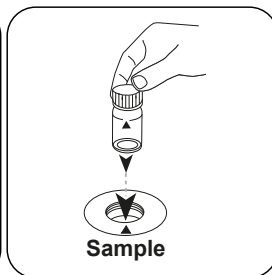
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



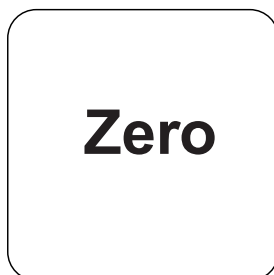
Fill 24 mm vial with **10 mL sample**.



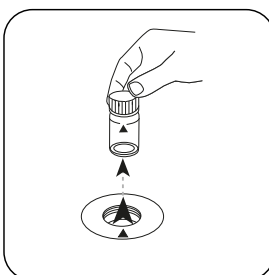
Close vial(s).



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

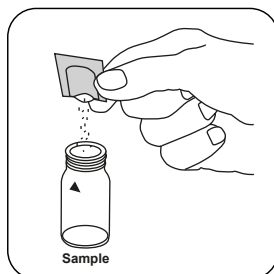


Press the **ZERO** button.

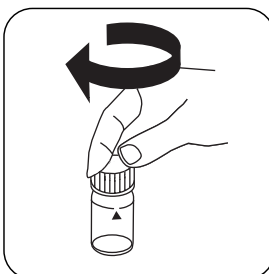


Remove the vial from the sample chamber.

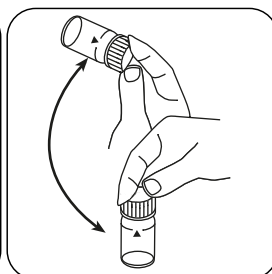
For devices that require **no ZERO measurement**, start here.



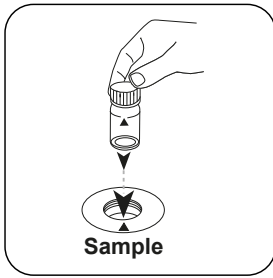
Add **Vario Nitri 3 F10 powder pack**.



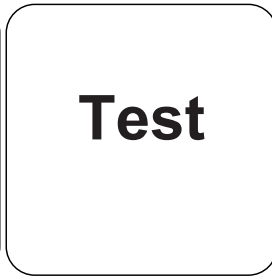
Close vial(s).



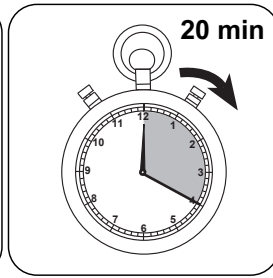
Invert several times to mix the contents.



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



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



Wait for **20 minute(s) reaction time**.

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

The result in mg/L Nitrite 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	N	1
mg/l	NO ₂	3.2846

EN

Chemical Method

Diazotation

Appendix

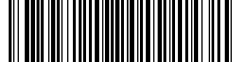
Interferences

Persistent Interferences

1. Strong oxidising and reducing agents interfere at all concentrations.
2. Copper and Iron (II) ions may cause lower test results.
3. The following ions can produce interferences through precipitation: Antimony, Iron (III), Lead, Gold, Mercury, Silver, Chloroplatinate, Metavanadate and Bismuth.
4. At very high concentrations of nitrate (<100 mg/L N) a small amount of nitrite is always detected. This seems to be caused by a minor reduction of nitrate to nitrite, which occurs either spontaneously or over the course of the test.

Derived from

USGS I-4540-85

**Nitrite HR PP****M273****2 - 250 mg/L NO₂⁻****Ferrous Sulfate Method**

EN

Material

Required material (partly optional):

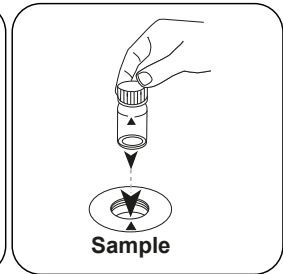
Reagents	Packaging Unit	Part Number
VARIO Nitri NT-2 F10	Powder / 100 Pieces	530280

Determination of Nitrite HR with Powder Pack

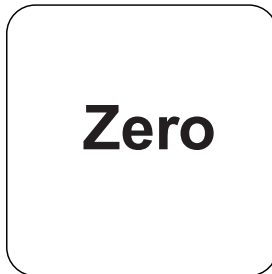
Select the method on the device.



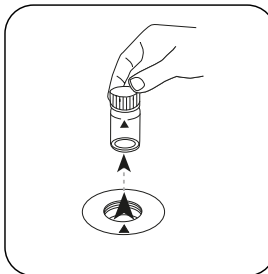
Fill 24 mm vial with **10 mL sample**. Close vial(s).



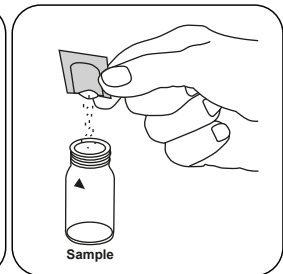
Place **sample vial** in the sample chamber. Pay attention to the positioning.



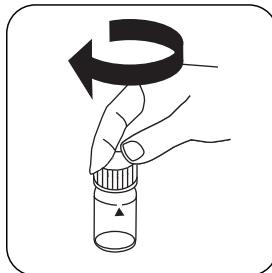
Press the **ZERO** button.



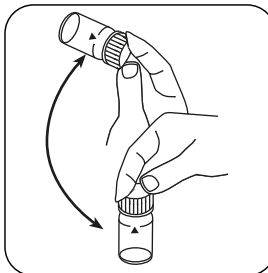
Remove the vial from the sample chamber.



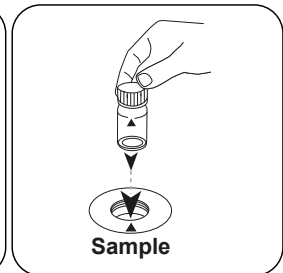
Add **VARIO NITRI NT-2 F10 powder pack**.



Close vial(s).

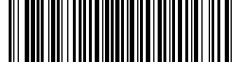


Invert several times to mix the contents (20 sec.).

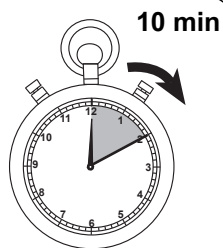


Place **sample vial** in the sample chamber. Pay attention to the positioning.

EN



Test



EN

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

Wait for **10 minute(s)**
reaction time.

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

The result in mg/L NO_2^- 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	N	1
mg/l	NO ₂	3.2846

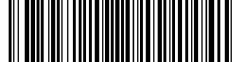
EN

Chemical Method

Ferrous Sulfate Method

Method Validation

Limit of Detection	1 mg/L
Limit of Quantification	3 mg/L
End of Measuring Range	250 mg/L
Sensitivity	145 mg/L / Abs
Confidence Intervall	4.7 mg/L
Standard Deviation	2.0 mg/L
Variation Coefficient	1.55%



Nitrite LR TT

M275

0.03 - 0.6 mg/L N

Sulfanilic / Naphthylamine

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Nitrite LR / 25	1 Pieces	2423420
Nitrite / 25	1 Pieces	2419018

The following accessories are required.

Accessories	Packaging Unit	Part Number
Measuring spoon no. 8, black	1 Pieces	424513

Preparation

1. The test sample and the reagents should be at room temperature when undertaking the test.

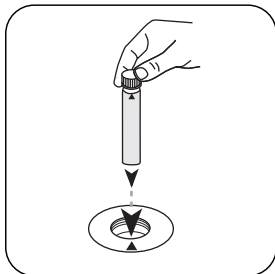
Remarks

1. The reagents are to be stored in closed containers at a temperature of +4 °C – +8 °C.

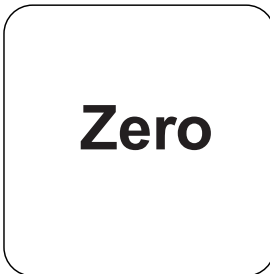
Determination of Nitrite LR with Vial Test

Select the method on the device.

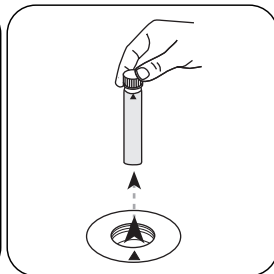
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



Place the supplied Zero vial (red sticker) in the sample chamber. • Pay attention to the positioning.

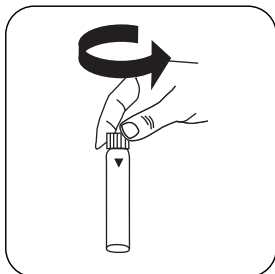


Press the **ZERO** button.

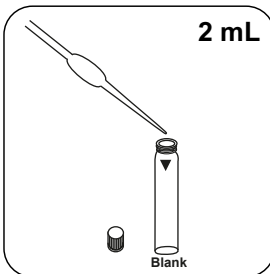


Remove **vial** from the sample chamber.

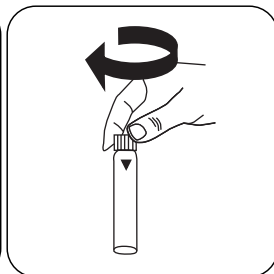
For devices that require **no ZERO measurement**, start here.



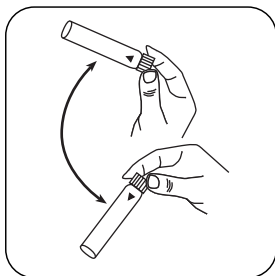
Open **digestion vial**.



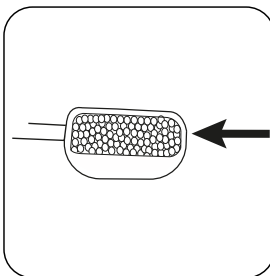
Put **2 mL sample** in the vial.



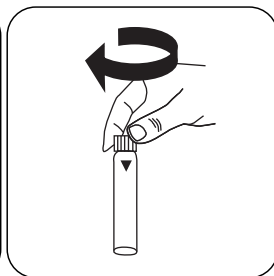
Close vial(s).



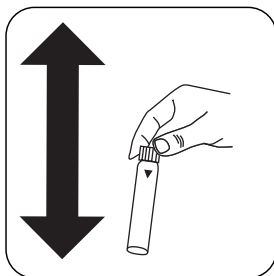
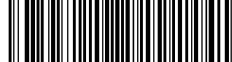
Invert several times to mix the contents.



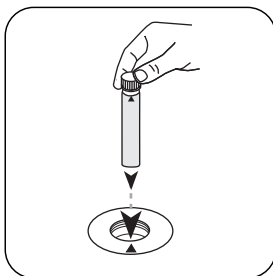
Add a **level measuring scoop No. 8 (black) Nitrite-101**.



Close vial(s).



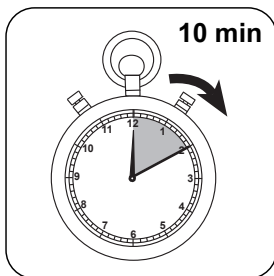
Dissolve the contents by shaking.



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



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



Wait for **10 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically.
The result in mg/L Nitrite 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	N	1
mg/l	NO ₂	3.2846

EN

Chemical Method

Sulfanilic / Naphthylamine

Appendix

Interferences

Interference	from / [mg/L]
Fe ³⁺	5
Fe ²⁺	10
Cu ²⁺	100
Cr ³⁺	100
Al ³⁺	1000
Cd ²⁺	1000
total hardness	178,6 mmol/l (1000 °dH)
CrO ₄ ²⁻	0,5
p-PO ₄	2
S ²⁻	10
SO ₃ ²⁻	10
NO ₃ ⁻	25
HCO ₃ ⁻	35,8 mmol/l (100 °dH)
Hg ²⁺	250
Mn ²⁺	1000
NH ₄ ⁺	1000
Ni ²⁺	1000
Pb ²⁺	1000
Zn ²⁺	1000
Cl ⁻	1000



Interference	from / [mg/L]
CN ⁻	250
EDTA	250
o-PO ₄ ³⁻	1000
SO ₄ ²⁻	1000

EN

Method Validation

Limit of Detection	0.01 mg/L
Limit of Quantification	0.04 mg/L
End of Measuring Range	0.6 mg/L
Sensitivity	2.03 mg/L / Abs
Confidence Intervall	0.014 mg/L
Standard Deviation	0.006 mg/L
Variation Coefficient	1.79 %

Derived from

DIN EN 26777

ISO 6777



Nitrite HR TT

M276

0.3 - 3 mg/L N

Sulfanilic / Naphthylamine

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Nitrite HR / 25	1 Pieces	2423470
Nitrite / 25	1 Pieces	2419018

The following accessories are required.

Accessories	Packaging Unit	Part Number
Measuring spoon no. 8, black	1 Pieces	424513

Preparation

1. The test sample and the reagents should be at room temperature when undertaking the test.

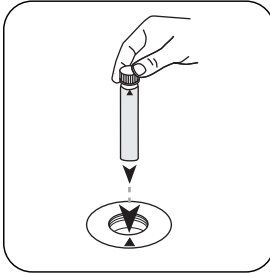
Remarks

1. The reagents are to be stored in closed containers at a temperature of +4 °C – +8 °C.

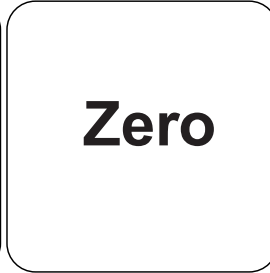
Determination of Nitrite HR with Vial Test

Select the method on the device.

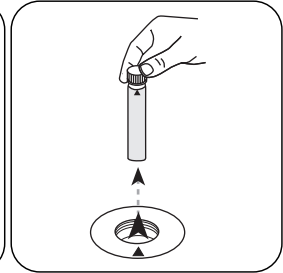
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



Place the supplied Zero vial (red sticker) in the sample chamber. • Pay attention to the positioning.



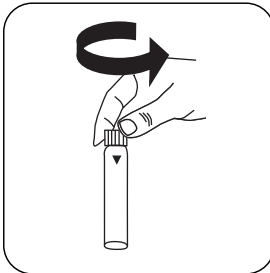
Press the **ZERO** button.



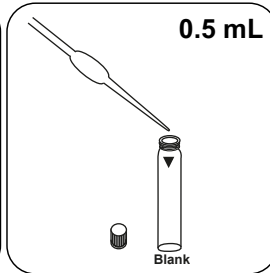
Remove **vial** from the sample chamber.

EN

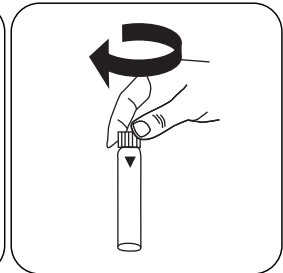
For devices that require **no ZERO measurement**, start here.



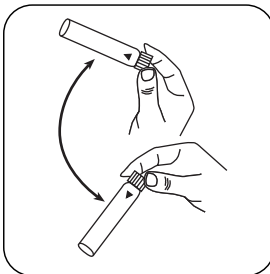
Open **digestion vial**.



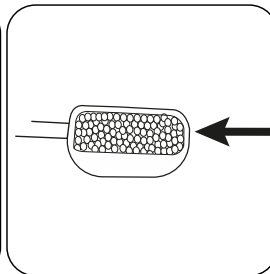
Put **0.5 mL sample** in the vial.



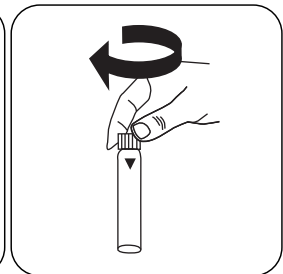
Close vial(s).



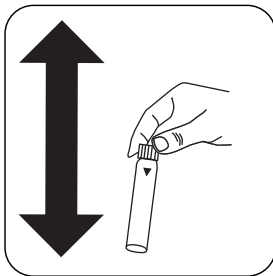
Invert several times to mix the contents.



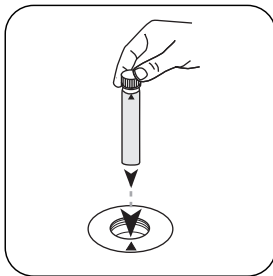
Add a **level measuring scoop No. 8 (black) Nitrite-101**.



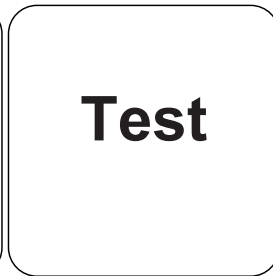
Close vial(s).



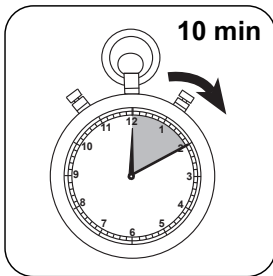
Dissolve the contents by shaking.



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



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



Wait for **10 minute(s) reaction time**.

Once the reaction period is finished, the measurement takes place automatically.
The result in mg/L Nitrite 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	N	1
mg/l	NO ₂	3.2846

EN

Chemical Method

Sulfanilic / Naphthylamine

Appendix

Interferences

Interference	from / [mg/L]
Fe ³⁺	20
Fe ²⁺	50
Cu ²⁺	500
Cr ³⁺	500
Al ³⁺	1000
Cd ²⁺	1000
total hardness	178,6 mmol/l (1000 °dH)
CrO ₄ ²⁻	0,5
p-PO ₄	10
S ²⁻	50
SO ₃ ²⁻	50
NO ₃ ⁻	100
HCO ₃ ⁻	143,2 mmol/l (400 °dH)
Hg ²⁺	1000
Mn ²⁺	1000
NH ₄ ⁺	1000
Ni ²⁺	1000
Pb ²⁺	1000
Zn ²⁺	1000
Cl ⁻	1000



Interference	from / [mg/L]
CN ⁻	1000
EDTA	1000
o-PO ₄ ³⁻	1000
SO ₄ ²⁻	1000

EN

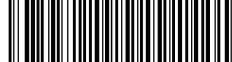
Method Validation

Limit of Detection	0.05 mg/L
Limit of Quantification	0.15 mg/L
End of Measuring Range	3 mg/L
Sensitivity	8.54 mg/L / Abs
Confidence Intervall	0.61 mg/L
Standard Deviation	0.25 mg/L
Variation Coefficient	15.16 %

Derived from

DIN EN 26777

ISO 6777



TN LR TT

M280

0.5 - 25 mg/L N^{b)}

Persulphate Digestion

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Total Nitrogen LR, Set	1 Set	535550

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

Preparation

1. Large quantities of nitrogen free, organic compounds that are included in some water samples may reduce the effectiveness of the digestion by reacting with the Persulphate reagent. Samples which are well known to contain large quantities of organic compounds must be diluted and digestion and measurement must be repeated for checking the effectiveness of the digestion.

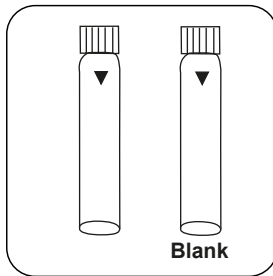
Remarks

1. Persulphate reagent may not get on the vial threads. To remove spattered or spilt Persulphate reagent, thoroughly wipe the vial threads with a clean cloth.
2. Volumes for samples and blank should always be metered by using suitable 2 ml pipettes (class A).
3. One blank is sufficient for each set of samples.
4. The reagents TN hydroxide LR, TN persulphates RGT. and TN reagent B may not completely dissolve.
5. The blank (stored in the dark) can be used for 7 days, if the measured samples were prepared with the same batch of reagent.

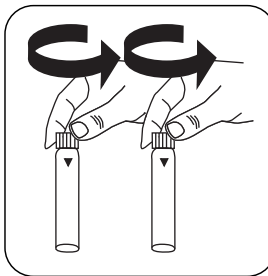


Determination of Nitrogen, total LR with Vial Test

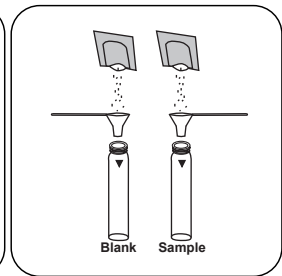
Select the method on the device.



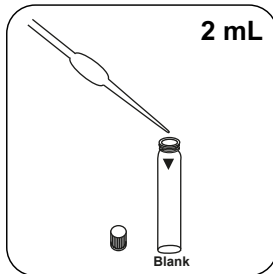
Prepare two **digestion vials TN Hydroxide LR**.
Mark one as a blank.



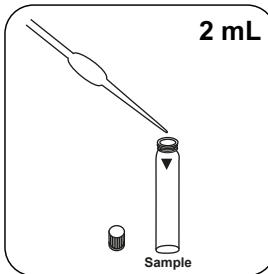
Open the vial.



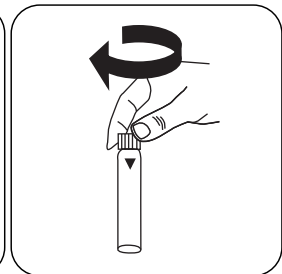
Add a **Vario TN Persulfate Rgt. powder pack** in each vial.



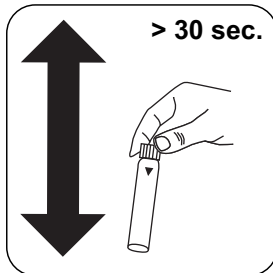
Put **2 mL deionised water** in the blank.



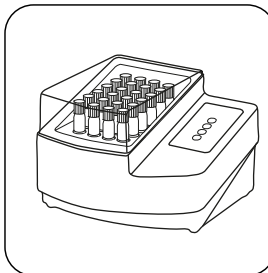
Put **2 mL sample** in the sample vial.



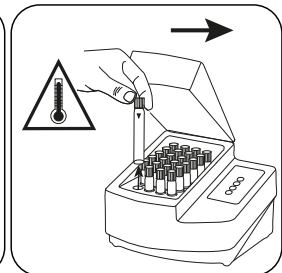
Close vial(s).



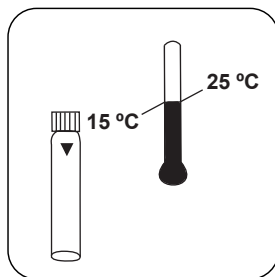
Mix the contents by shaking vigorously. (> 30 sec.).



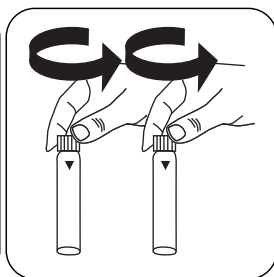
Seal the vials in the pre-heated thermoreactor for **30 minutes at 100 °C**.



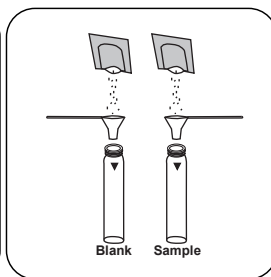
Remove the vial from the thermoreactor. (**Note: vial will be hot!**)



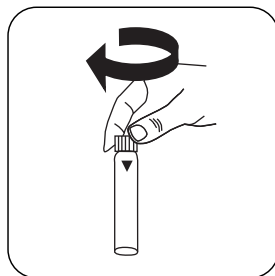
Allow the sample to cool to room temperature.



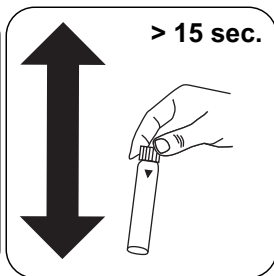
Open the vial.



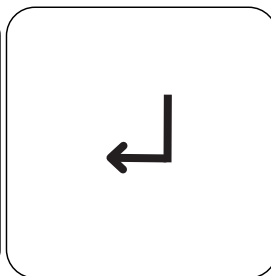
Add a **Vario TN Reagent A powder pack** in each vial.



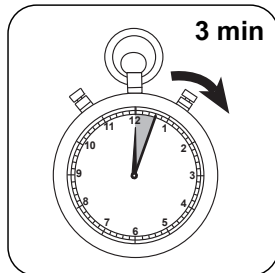
Close vial(s).



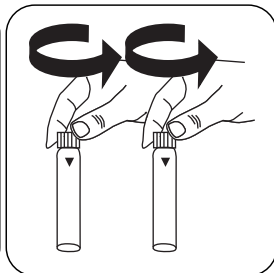
Mix the contents by shaking. (> 15 sec.).



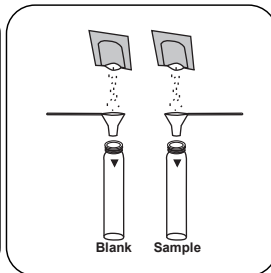
Press the **ENTER** button.



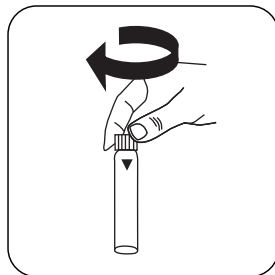
Wait for **3 minute(s) reaction time**.



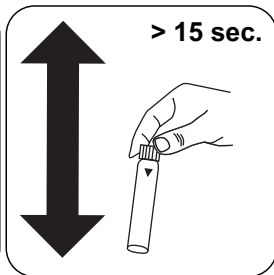
Open the vial.



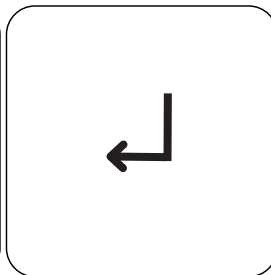
Add a **Vario TN Reagent B powder pack** in each vial.



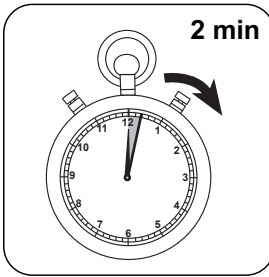
Close vial(s).



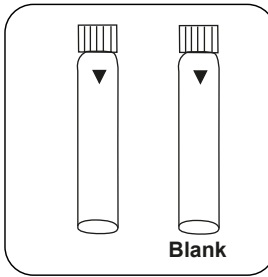
Mix the contents by shaking. (> 15 sec.).



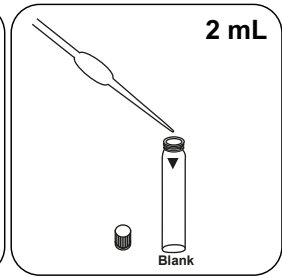
Press the **ENTER** button.



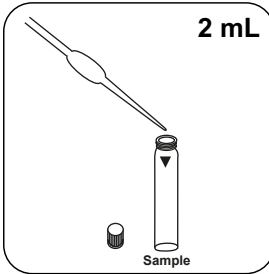
Wait for **2 minute(s)** reaction time.



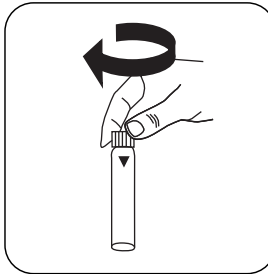
Prepare two **TN Acid LR/HR (Reagent C)** vials. Mark one as a blank.



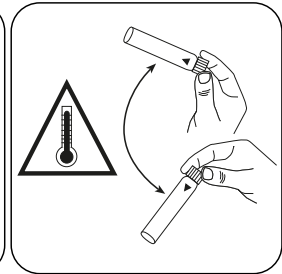
Place **2 mL** of digested, pre-prepared zero sample in the blank.



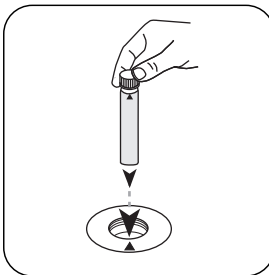
Fill sample vial with **2 mL** prepared, digested sample.



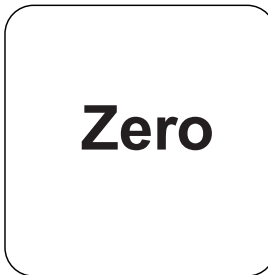
Close vial(s).



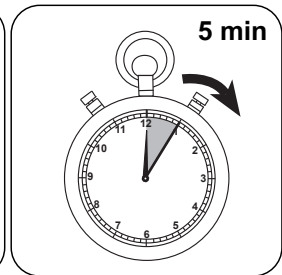
Invert several times to mix the contents (10 x). **Note: Will get hot!**



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

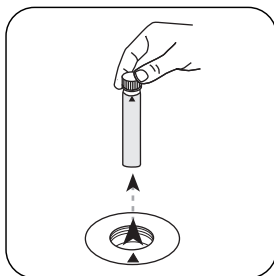


Press the **ZERO** button.

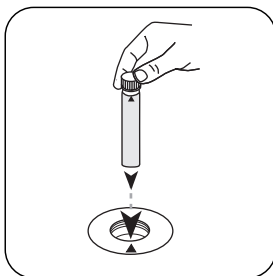


Wait for **5 minute(s)** reaction time.

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



Remove **vial** from the sample chamber.



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



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

The result in mg/L Nitrogen 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	N	1
mg/l	NH ₄	1.288
mg/l	NH ₃	1.22

EN

Chemical Method

Persulphate Digestion

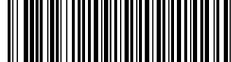
Appendix

Interferences

Interference	from / [mg/L]
Cr ⁶⁺	5
Fe ²⁺	50
Sn ²⁺	50
Ca ²⁺	100
Co ²⁺	100
Cu ²⁺	100
Fe ³⁺	100
Ni ²⁺	100
Pb ²⁺	100
Zn ²⁺	100
Cd ²⁺	200
K ⁺	500
Cl ⁻	500

Bibliography

1. M. Hosomi, R. Sudo, Simultaneous determination of total nitrogen and total phosphorus in freshwater samples using persulphate digestion, *Int. J. of Env. Stud.* (1986), 27 (3-4), p. 267-275
2. ISO 23697-2, Water quality — Determination of total bound nitrogen (ST-TNb) in water using small-scale sealed tubes — Part 2: Chromotropic acid colour reaction



^{b)} Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)

EN



TN HR TT

M281

5 - 150 mg/L N^{b)}

Persulphate Digestion

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Total Nitrogen HR, Set	1 Set	535560

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

Preparation

1. Large quantities of nitrogen free, organic compounds that are included in some water samples may reduce the effectiveness of the digestion by reacting with the Persulphate reagent. Samples which are well known to contain large quantities of organic compounds must be diluted and digestion and measurement must be repeated for checking the effectiveness of the digestion.

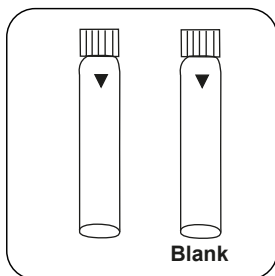
Remarks

1. Persulphate reagent may not get on the vial threads. To remove spattered or spilt Persulphate reagent, thoroughly wipe the vial threads with a clean cloth.
2. Volumes for samples and blank should always be metered by using suitable pipettes (class A).
3. One blank is sufficient for each set of samples.
4. The reagents TN hydroxide LR, TN persulphates RGT. and TN reagent B may not completely dissolve.
5. The blank (stored in the dark) can be used for 7 days, if the measured samples were prepared with the same batch of reagent.

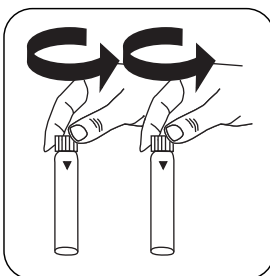


Determination of Nitrogen, total HR with Vial Test

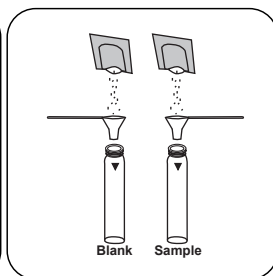
Select the method on the device.



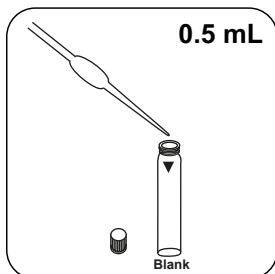
Prepare two **digestion vials TN Hydroxide HR**.
Mark one as a blank.



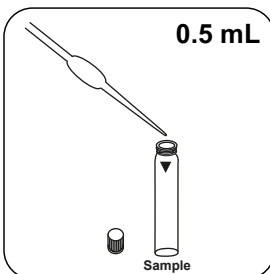
Open the vial.



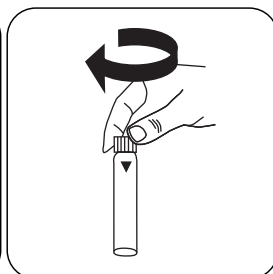
Add a **Vario TN Persulfate Rgt. powder pack** in each vial.



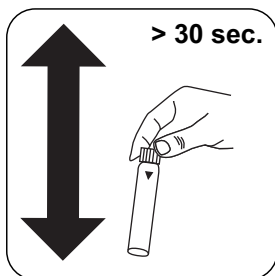
Put **0.5 mL deionised water** in the blank.



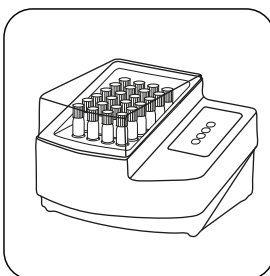
Put **0.5 mL sample** in the sample vial.



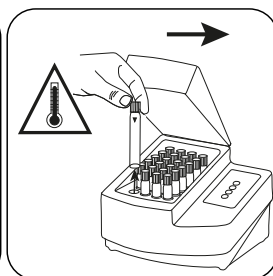
Close vial(s).



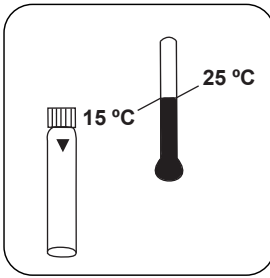
Mix the contents by shaking vigorously. (> 30 sec.).



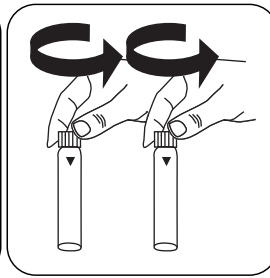
Seal the vials in the pre-heated thermoreactor for **30 minutes at 100 °C**.



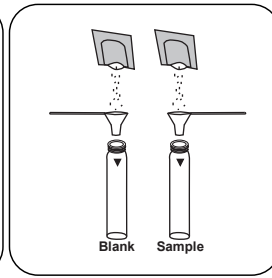
Remove the vial from the thermoreactor. (**Note: vial will be hot!**)



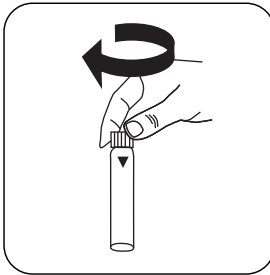
Allow the sample to cool to room temperature.



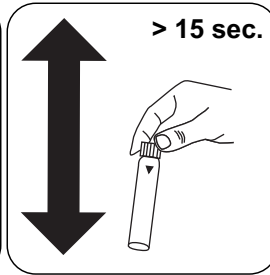
Open the vial.



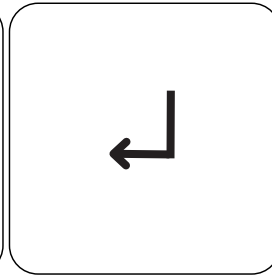
Add a **Vario TN Reagent A powder pack** in each vial.



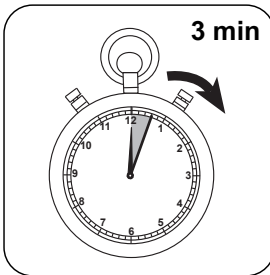
Close vial(s).



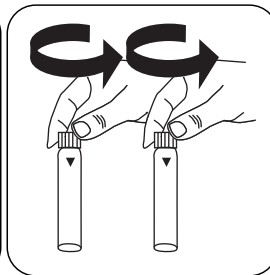
Mix the contents by shaking. (> 15 sec.).



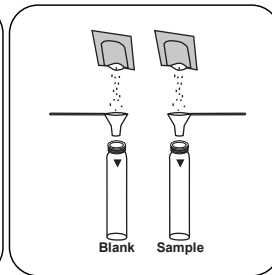
Press the **ENTER** button.



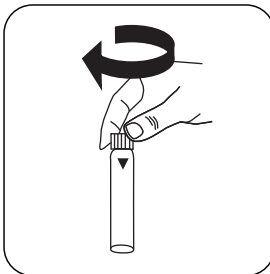
Wait for **3 minute(s) reaction time**.



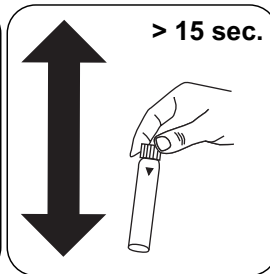
Open the vial.



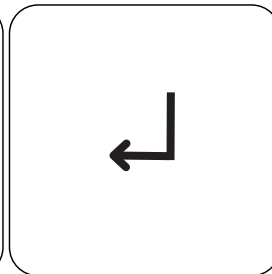
Add a **Vario TN Reagent B powder pack** in each vial.



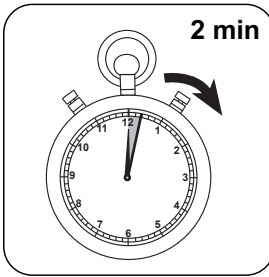
Close vial(s).



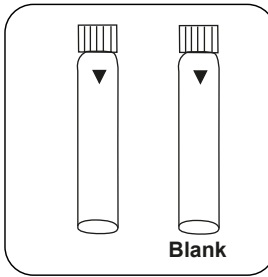
Mix the contents by shaking. (> 15 sec.).



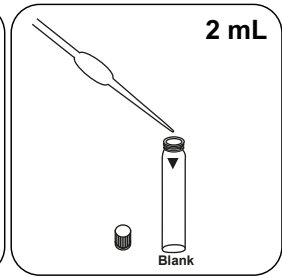
Press the **ENTER** button.



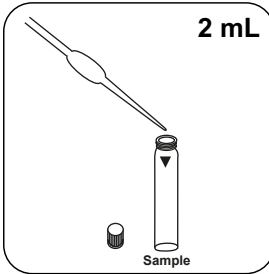
Wait for **2 minute(s)** reaction time.



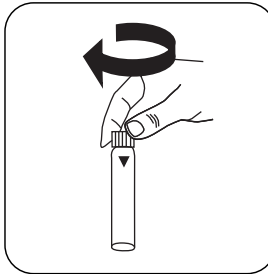
Prepare two **TN Acid LR/HR (Reagent C)** vials. Mark one as a blank.



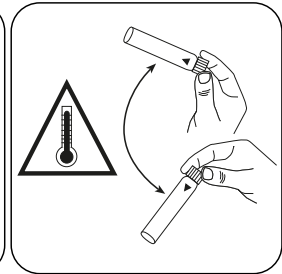
Place **2 mL** of digested, pre-prepared zero sample in the blank.



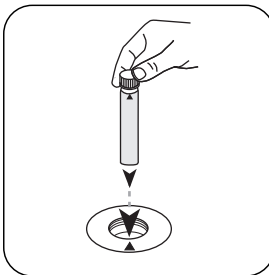
Fill sample vial with **2 mL** prepared, digested sample.



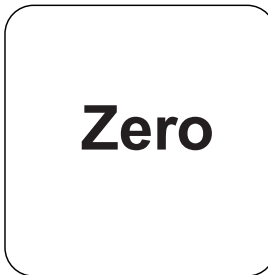
Close vial(s).



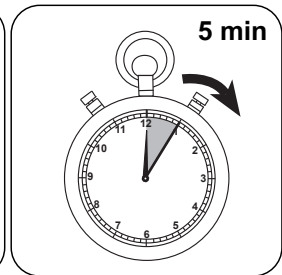
Invert several times to mix the contents (10 x). **Note: Will get hot!**



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

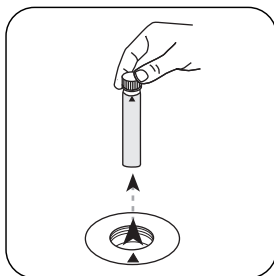
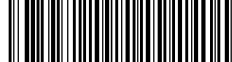


Press the **ZERO** button.

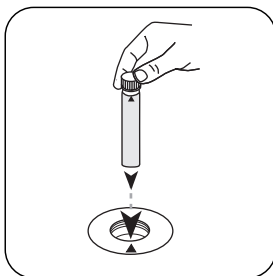


Wait for **5 minute(s)** reaction time.

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



Remove **vial** from the sample chamber.



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



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

The result in mg/L Nitrogen appears on the display.

EN

Chemical Method

Persulphate Digestion

Appendix

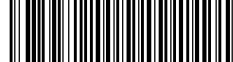
Interferences

Interference	from / [mg/L]
Cr ⁶⁺	5
Fe ²⁺	50
Sn ²⁺	50
Ca ²⁺	100
Co ²⁺	100
Cu ²⁺	100
Fe ³⁺	100
Ni ²⁺	100
Pb ²⁺	100
Zn ²⁺	100
Cd ²⁺	200
K ⁺	500
Cl ⁻	500

Bibliography

1. M. Hosomi, R. Sudo, Simultaneous determination of total nitrogen and total phosphorus in freshwater samples using persulphate digestion, *Int. J. of Env. Stud.* (1986), 27 (3-4), p. 267-275
2. ISO 23697-2, Water quality — Determination of total bound nitrogen (ST-TNb) in water using small-scale sealed tubes — Part 2: Chromotropic acid colour reaction

³⁾ Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



Oxygen active T

M290

0.1 - 10 mg/L O₂

DPD

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
DPD No. 4	Tablet / 100	511220BT
DPD No. 4	Tablet / 250	511221BT
DPD No. 4	Tablet / 500	511222BT

Preparation

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

Remarks

1. Active Oxygen is a synonym for a common disinfectant (based on "Oxygen") in treating swimming pools.

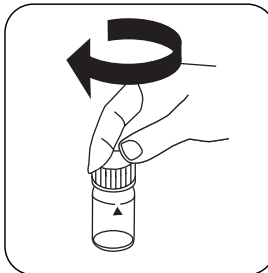
Determination of Oxygen, active with Tablet

Select the method on the device.

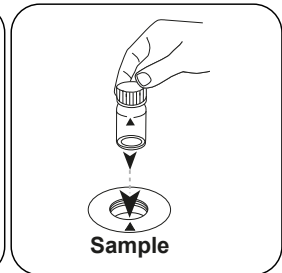
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



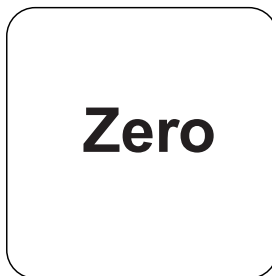
Fill 24 mm vial with **10 mL sample**.



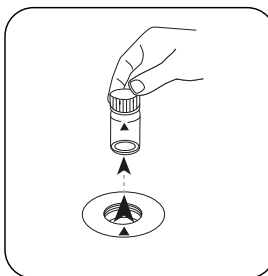
Close vial(s).



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

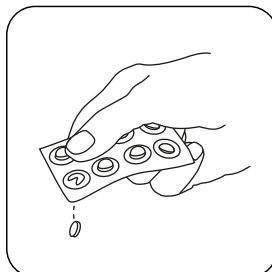


Press the **ZERO** button.

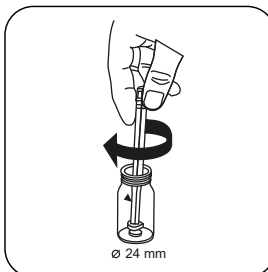


Remove the vial from the sample chamber.

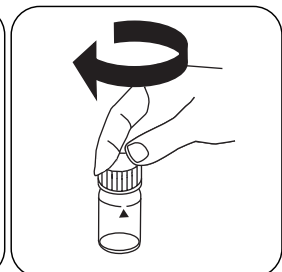
For devices that require **no ZERO measurement**, start here.



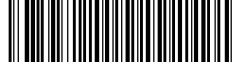
Add **DPD No. 4 tablet**.



Crush tablet(s) by rotating slightly.



Close vial(s).



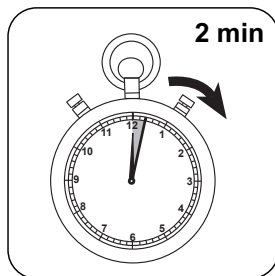
Dissolve tablet(s) by inverting.



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



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



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

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



Chemical Method

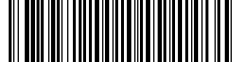
DPD

Interferences

Persistent Interferences

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

EN



Oxygen dissolved C

M292

10 - 800 µg/L O₂ ^{c)}O₂

Rhodazine D TM

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Vacu-vial Oxygen Test Kit	1 Set	380450

The following accessories are required.

Accessories	Packaging Unit	Part Number
Adapter for round cuvettes 13 mm Ø	1 Pieces	19802192
Adapter (13 mm) MultiDirect for Vacu-vial	1 Pieces	192075

Preparation

1. Before performing the test, you must read through the original instructions and safety advice that is delivered with the test kit (MSDS are available on the homepage of www.chemetrics.com).

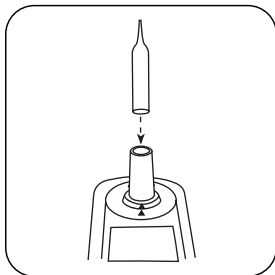
Remarks

1. This method is adapted from a product by CHEMetrics. The measuring range and wavelength used for this photometer may differ from the data specified by CHEMetrics.
2. Keep Vacu-Vials® in the dark at room temperature.
4. Vacu-vials® is a registered trademark of the company CHEMetrics, Inc. / Calverton, U.S.A.

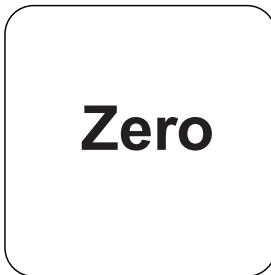


Determination of Oxygen, dissolved with Vacu Vials® K-7553

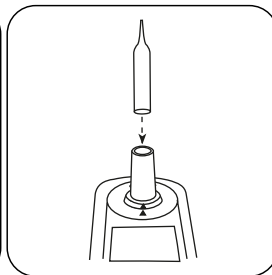
Select the method on the device.



Place **Zero ampoule** in the sample chamber.

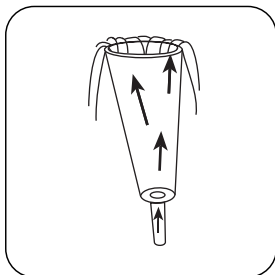


Press the **ZERO** button.

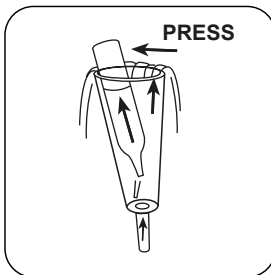


Remove zero ampoule from the sample chamber.

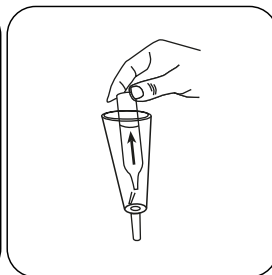
EN



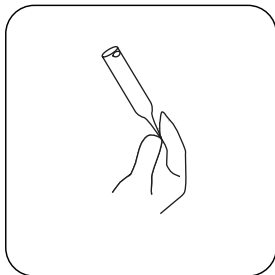
Run test water through the sampling vessel for several minutes from bottom to top to remove air bubbles.



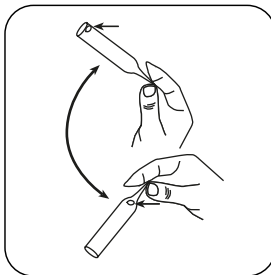
Place a Vacu-vial® ampoule in the sampling vessel. Break off the ampoule tip by applying light pressure against the vessel wall. Wait for the ampoule to fill completely.



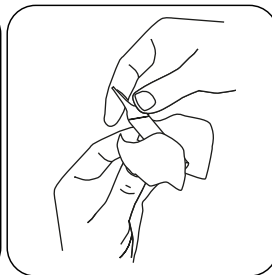
Then quickly remove the ampoule from the sampling vessel with the tip down.



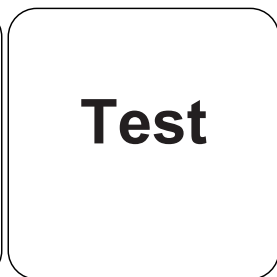
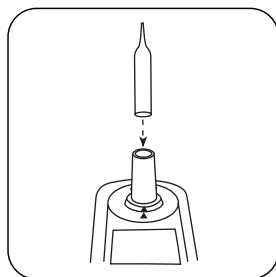
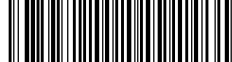
Close the opening with one finger, to avoid contact with the air.



Invert the ampoule several times.



Dry the outside of the ampoule.



EN

Place the ampoule in the sample chamber.

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

The result in mg/L Oxygen appears on the display.



Chemical Method

Rhodazine D TM

Appendix

Derived from

ASTM D 5543-15

EN

^o MultiDirect: Adapter is necessary for Vacu-vials® (Order code 19 20 75)



Ozone T

M300

0.02 - 2 mg/L O₃O₃

DPD / Glycine

Material

EN

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 ^{e)}	Tablet / 100	515740BT
DPD No. 1 High Calcium ^{e)}	Tablet / 250	515741BT
DPD No. 1 High Calcium ^{e)}	Tablet / 500	515742BT
DPD No. 3 High Calcium ^{e)}	Tablet / 100	515730BT
DPD No. 3 High Calcium ^{e)}	Tablet / 250	515731BT
DPD No. 3 High Calcium ^{e)}	Tablet / 500	515732BT
Glycine ^{f)}	Tablet / 100	512170BT
Glycine ^{f)}	Tablet / 250	512171BT
Set DPD No. 1/No. 3 100 Pc. #	100 each	517711BT
Set DPD No. 1/No. 3 250 Pc. #	250 each	517712BT
Set DPD No. 1/No. 3 High Calcium 100 Pc. #	100 each	517781BT
Set DPD No. 1/No. 3 High Calcium 250 Pc. #	250 each	517782BT
Set DPD No. 1/Glycine 100 Stck. #	100 each	517731BT
Set DPD No. 1/Glycine 250 Stck. #	250 each	517732BT



Preparation

1. Cleaning of vials:
As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of oxidising agents (e.g. ozone and chlorine) may show lower results. 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. When preparing the sample, Ozone outgassing, e.g. through the pipette or shaking, must be avoided. The analysis must take place immediately after taking the sample.
3. Strong alkaline or acidic water samples must be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).



Determination of Ozone, in presence of Chlorine with tablet

Select the method on the device.

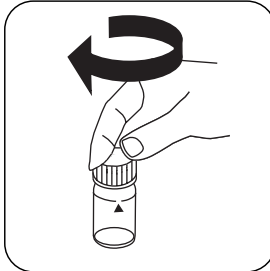
In addition, choose the test: in presence of Chlorine

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

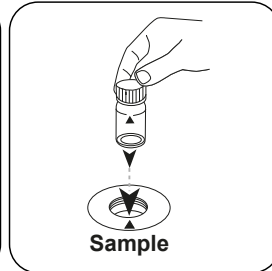
EN



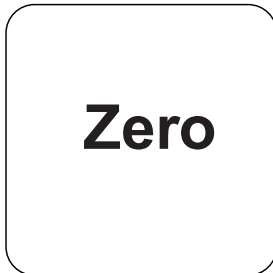
Fill 24 mm vial with **10 mL sample**.



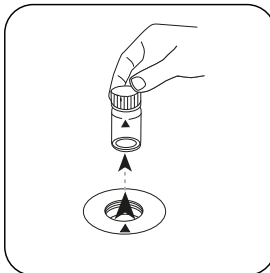
Close vial(s).



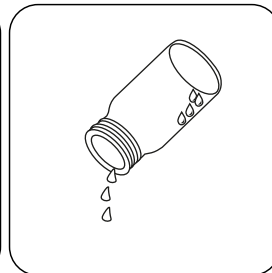
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

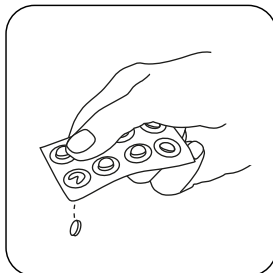


Remove the vial from the sample chamber.

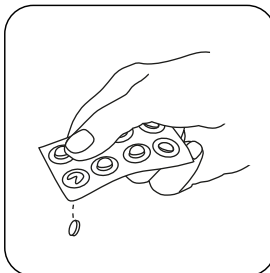


Empty vial except for a few drops.

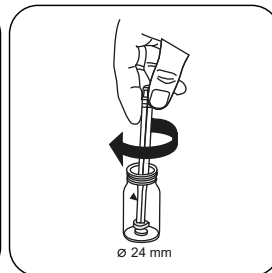
For devices that require **no ZERO measurement**, **start here**.



Add **DPD No. 1 tablet**.



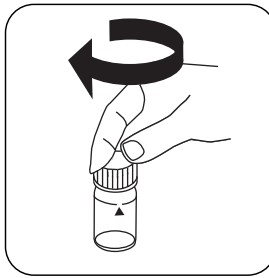
Add **DPD No. 3 tablet**.



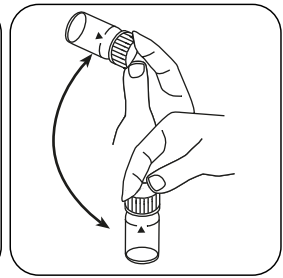
Crush tablet(s) by rotating slightly.



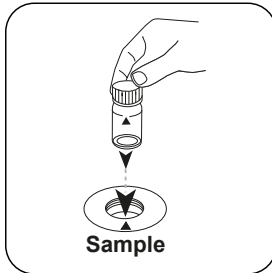
Fill up vial with **sample** to the **10 mL mark**.



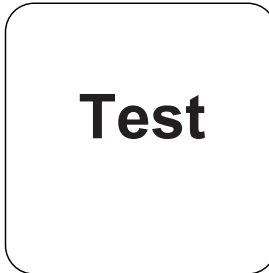
Close vial(s).



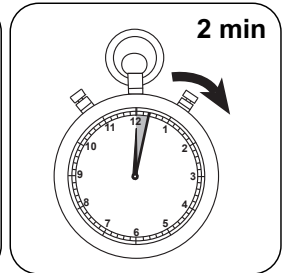
Dissolve tablet(s) by inverting.



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

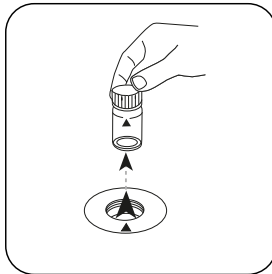


Press the **TEST (XD: START)** button.

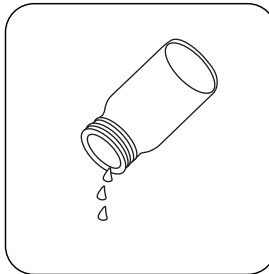


Wait for **2 minute(s) reaction time**.

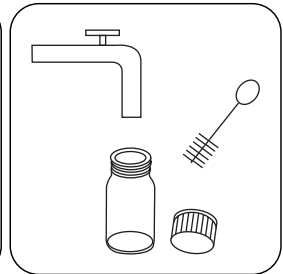
Once the reaction period is finished, the measurement takes place automatically.



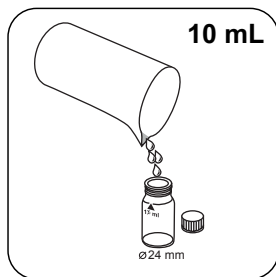
Remove the vial from the sample chamber.



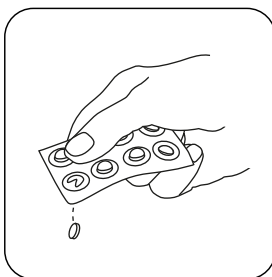
Empty vial.



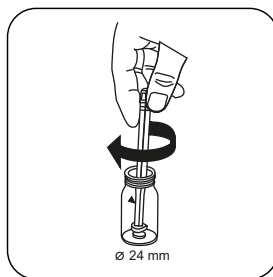
Thoroughly clean the vial and vial cap.



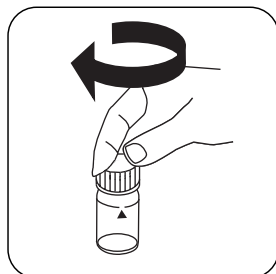
Fill a **second** vial with **10 mL** sample .



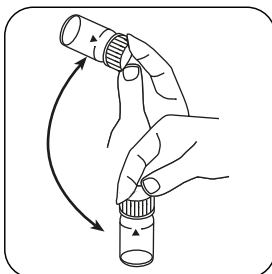
Add **GLYCINE** tablet.



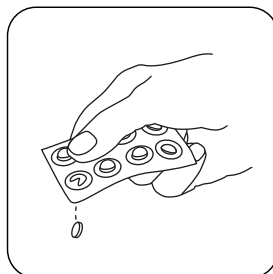
Crush tablet(s) by rotating slightly.



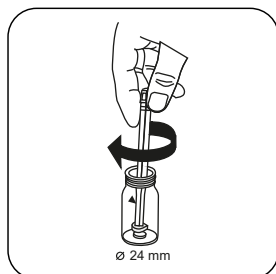
Close vial(s).



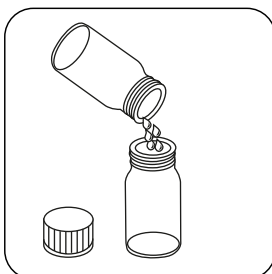
Dissolve tablet(s) by inverting.



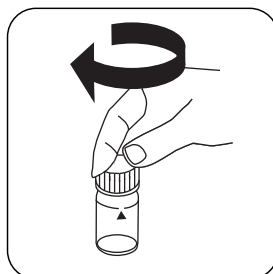
Add **one DPD No. 1** tablet and **one DPD No. 3** tablet straight from the foil into the first cleaned cuvette



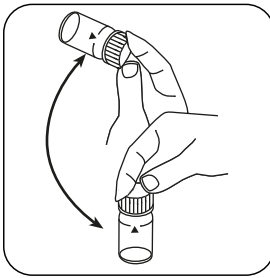
Crush tablet(s) by rotating slightly.



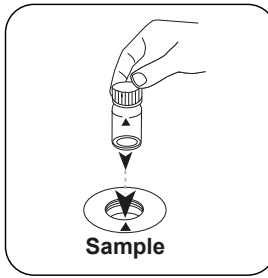
Fill prepared vial with prepared **glycine solution**.



Close vial(s).



Dissolve tablet(s) by inverting.

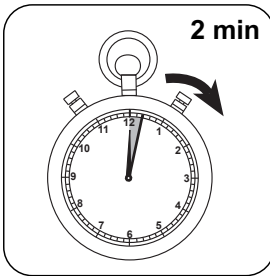


Place **sample vial** in the sample chamber. Pay attention to the positioning.

Test

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 Ozone; mg/l total chlorine appears on the display.

Determination of Ozone, in absence of chlorine with tablet

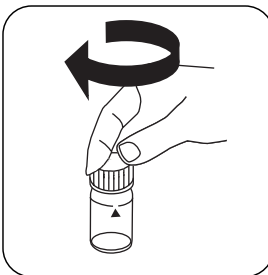
Select the method on the device.

In addition, choose the test: without Chlorine

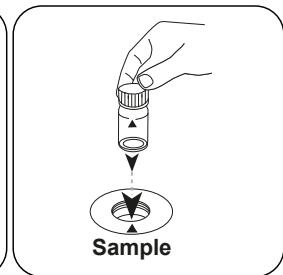
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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



Close vial(s).



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



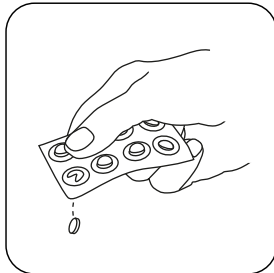
Zero

Press the **ZERO** button.

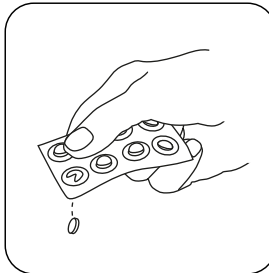
Remove the vial from the sample chamber.

Empty vial except for a few drops.

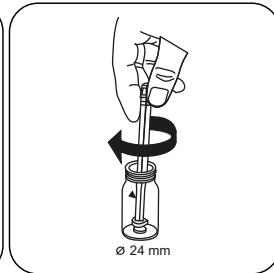
For devices that require **no ZERO measurement**, start here.



Add **DPD No. 1** tablet .



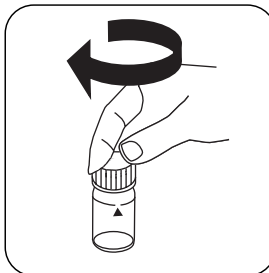
Add **DPD No. 3** tablet .



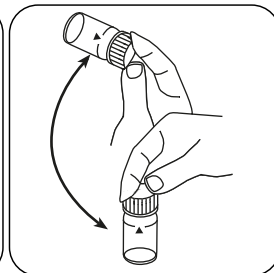
Crush tablet(s) by rotating slightly.



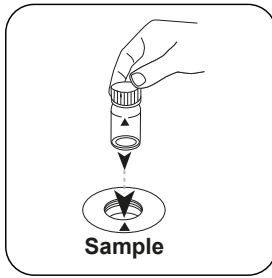
Fill up vial with **sample** to the **10 mL** mark.



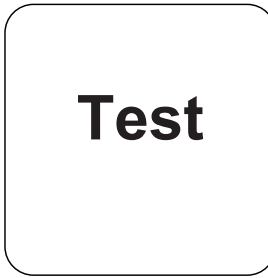
Close vial(s).



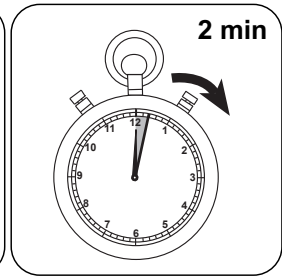
Dissolve tablet(s) by inverting.



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



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 mg/L Ozone 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	O ₃	1
mg/l	Cl ₂	1.4771

EN

Chemical Method

DPD / Glycine

Appendix

Interferences

Persistent Interferences

1. All oxidising agents in the samples react like chlorine, which leads to higher results.
2. Concentrations above 6 mg/L Ozone can lead to results within the measuring range of up to 0 mg/L. In this case, the water sample must be diluted. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, Lovibond

Derived from

DIN 38408-3:2011-04

^{a)} 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 | ^{b)} additionally required for determination of bromine, chlorine dioxide and ozone in the presence of chlorine | * including stirring rod, 10 cm



Ozone PP

M301

0.015 - 1.2 mg/L O₃

DPD / Glycine

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Chlorine Total DPD F10	Powder / 100 Pieces	530120
Chlorine Total DPD F10	Powder / 1000 Pieces	530123
Glycine ⁹	Tablet / 100	512170BT
Glycine ⁹	Tablet / 250	512171BT

Preparation

1. Cleaning of vials:
As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of oxidising agents (e.g. ozone and chlorine) may show lower results. 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. When preparing the sample, Ozone outgassing, e.g. through the pipette or shaking, must be avoided. The analysis must take place immediately after taking the sample.
3. Strong alkaline or acidic water samples must be adjusted between pH 6 and pH 7 before the analysis (use 0.5 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

Determination of Ozone, in presence of chlorine with powder packs

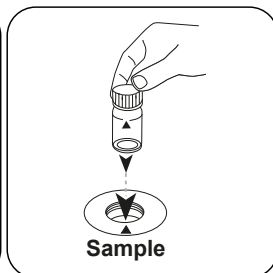
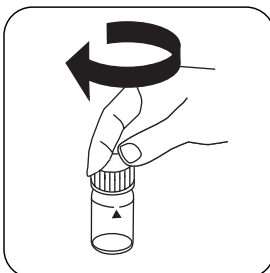
Select the method on the device.

In addition, choose the test: in presence of Chlorine

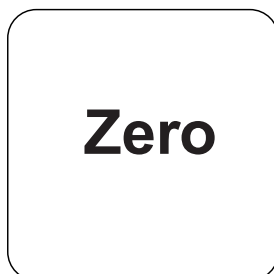
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



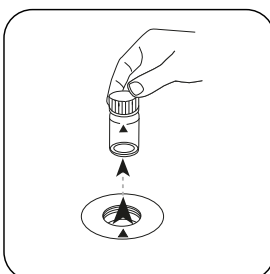
Fill 24 mm vial with **10 mL sample**. Close vial(s).



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

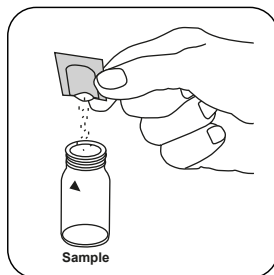


Press the **ZERO** button.

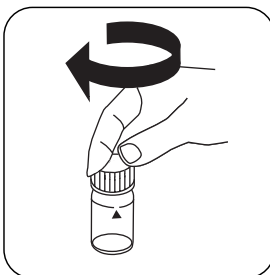


Remove the vial from the sample chamber.

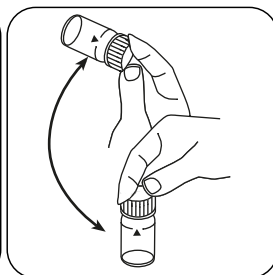
For devices that require **no ZERO measurement**, start here.



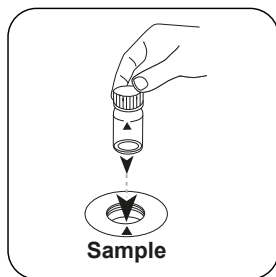
Add **Chlorine TOTAL-DPD/F 10 powder pack**.



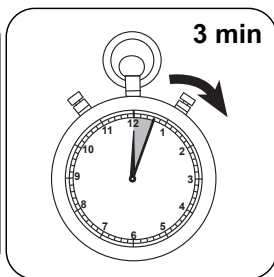
Close vial(s).



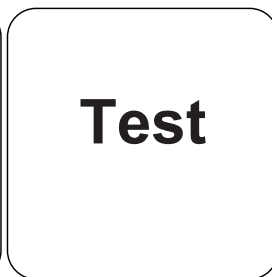
Invert several times to mix the contents (20 sec.).



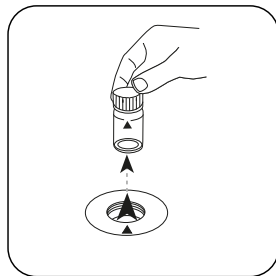
Place **sample vial** in the sample chamber. Pay attention to the positioning.



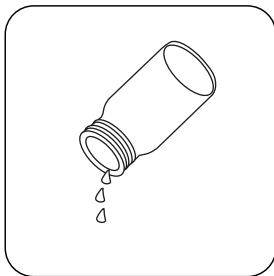
Wait for **3 minute(s) reaction time**.



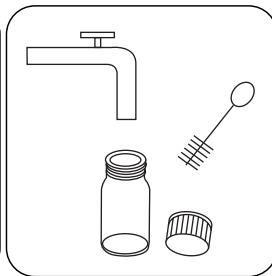
Press the **TEST (XD: START)** button.



Remove the vial from the sample chamber.



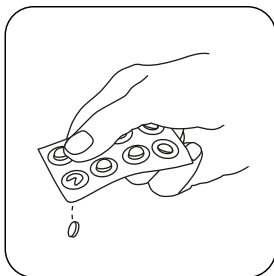
Empty vial.



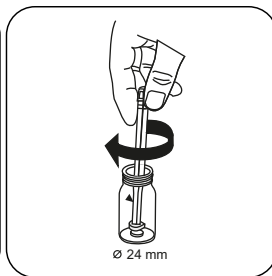
Thoroughly clean the vial and vial cap.



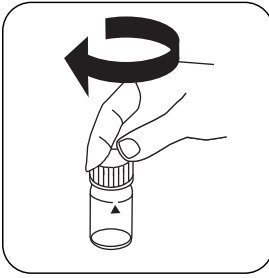
Fill 24 mm vial with **10 mL sample**.



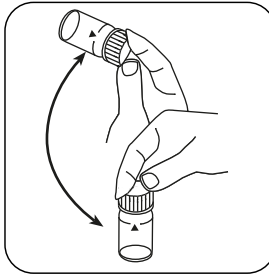
Add **GLYCINE tablet**.



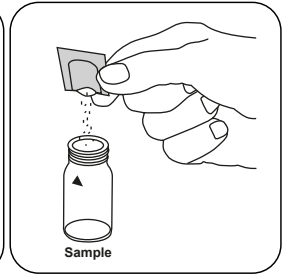
Crush tablet(s) by rotating slightly.



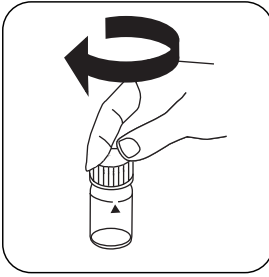
Close vial(s).



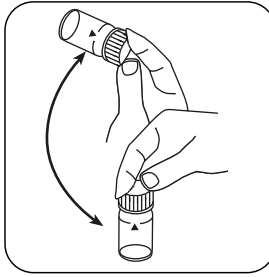
Dissolve tablet(s) by inverting.



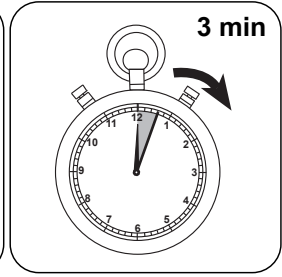
Add **Chlorine TOTAL-DPD/F 10 powder pack**.



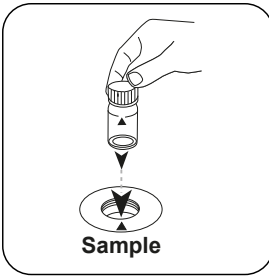
Close vial(s).



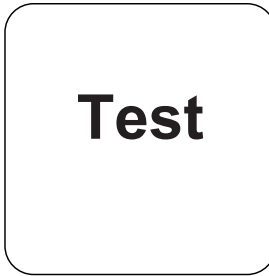
Invert several times to mix the contents (20 sec.).



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



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



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

The result in mg/L Ozone, mg/l total chlorine appears on the display.

Determination of Ozone, in absence of chlorine with powder packs

Select the method on the device.

In addition, choose the test: without Chlorine

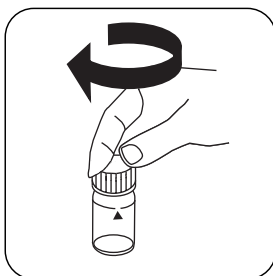
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



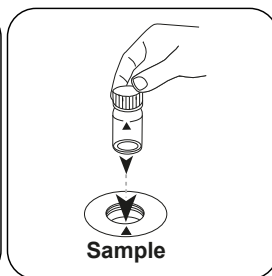
EN



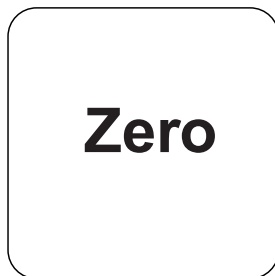
Fill 24 mm vial with **10 mL sample**.



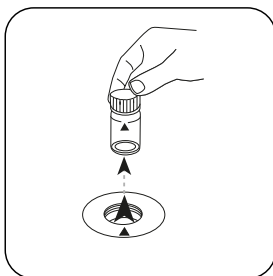
Close vial(s).



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

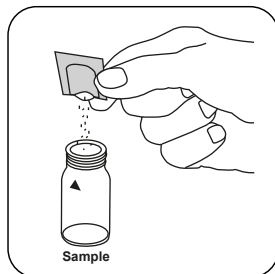


Press the **ZERO** button.

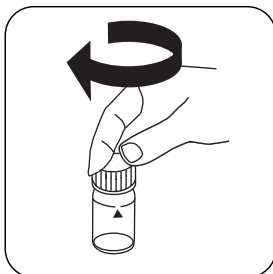


Remove the vial from the sample chamber.

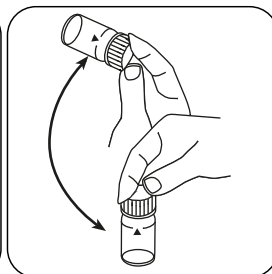
For devices that require **no ZERO measurement**, start here.



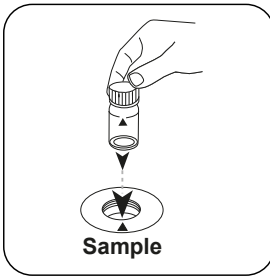
Add **Chlorine TOTAL-DPD/F 10 powder pack**.



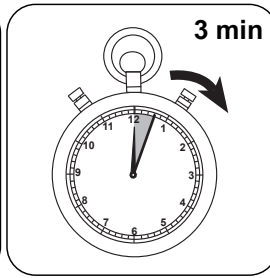
Close vial(s).



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



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



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



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

The result in mg/L Ozone 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	O ₃	1
mg/l	Cl ₂	1.4771

EN

Chemical Method

DPD / Glycine

Interferences

Persistent Interferences

1. All oxidising agents in the samples react like chlorine, which leads to higher results.
2. Concentrations above 6 mg/L Ozone can lead to results within the measuring range of up to 0 mg/L. In this case, the water sample must be diluted. 10 ml of the diluted sample should be mixed with the reagent and the measurement taken again (plausibility test).

Method Validation

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

⁹ additionally required for determination of bromine, chlorine dioxide and ozone in the presence of chlorine



Phenol T

M315

0.1 - 5 mg/L C₆H₅OH

4-Aminoantipyrine

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Phenole No. 1	Tablet / 100	515950BT
Phenole No. 2	Tablet / 100	515960BT

Preparation

1. The aqueous sample solution should have a pH value between 3 and 11.

Remarks

1. This method determines ortho- and metha-substituted phenols but not all para-substituted phenols (see: "Standard Methods of Examination of Water and Wastewater, 22nd Edition, 5-46ff.")

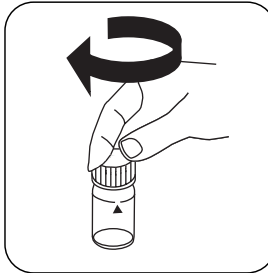
Determination of Phenol with Tablet

Select the method on the device.

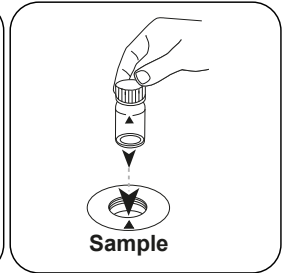
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



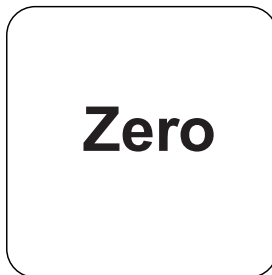
Fill 24 mm vial with **10 mL sample**.



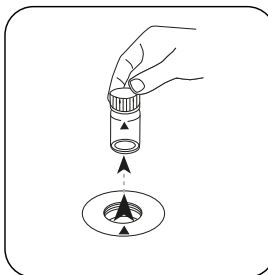
Close vial(s).



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

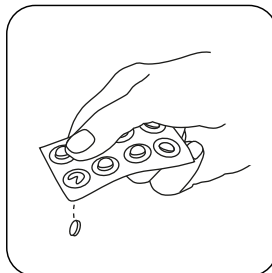


Press the **ZERO** button.

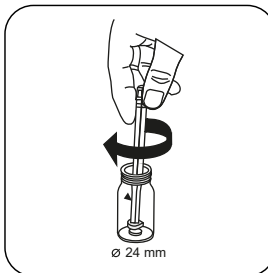


Remove the vial from the sample chamber.

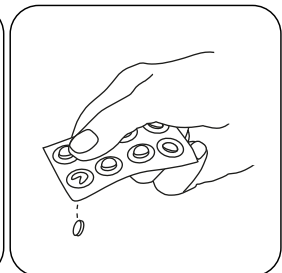
For devices that require **no ZERO measurement**, start here.



Add **PHENOLE No. 1 tablet**.



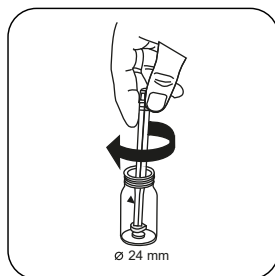
Crush tablet(s) by rotating slightly and dissolve.



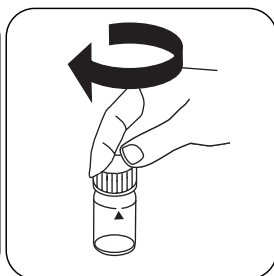
Add **PHENOLE No. 2 tablet**.



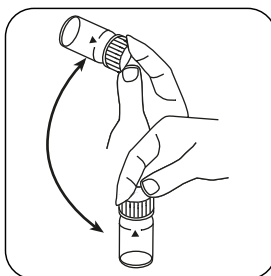
EN



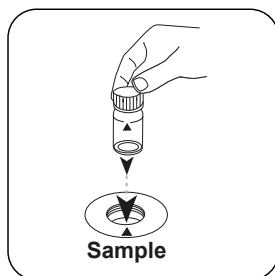
Crush tablet(s) by rotating slightly.



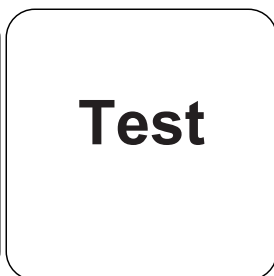
Close vial(s).



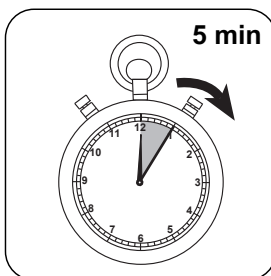
Dissolve tablet(s) by inverting.



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



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



Wait for **5 minute(s) reaction time**.

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

Chemical Method

4-Aminoantipyrine

Appendix

Interferences

EN

Removeable Interferences

1. In case of known or suspected interferences (e.g. phenol-decomposing bacteria, oxidizing agents, reducing agents, sulfur compounds and suspended solids) the sample should be pre-treated accordingly, see "Standard Methods for Examination of Water and Wastewater, 22nd Edition, 5-46 ff".

Method Validation

Limit of Detection	0.03 mg/L
Limit of Quantification	0.09 mg/L
End of Measuring Range	5 mg/L
Sensitivity	3.21 mg/L / Abs
Confidence Intervall	0.024 mg/L
Standard Deviation	0.01 mg/L
Variation Coefficient	0.39 %

According to

Standard Method 5530
US EPA Method 420.1



Phosphonate PP

M316

0.02 - 125 mg/L PO₄

Persulfate UV Oxidation Method

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Phosphonate Set	1 Set	535220

The following accessories are required.

Accessories	Packaging Unit	Part Number
UV Pen Lamp, 254 nm	1 Pieces	400740
UV protection glasses, orange	1 Pieces	400755

Preparation

1. All glassware must first be rinsed with diluted Hydrochloric acid (1:1) and then rinsed with deionised water. Do not use detergents with phosphates.

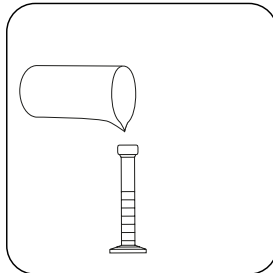
Remarks

1. During UV digestion Phosphonates are converted to ortho-Phosphates. This step is normally completed in 10 minutes. Organic highly-loaded samples or a weak UV lamp can cause incomplete phosphate conversion to take place.
2. UV lamp available on request.
3. For handling of the UV lamp see manufacturer's manual. Do not touch the surface of the UV lamp. Fingerprints will erode the glass. Wipe the UV lamp with a soft and clean cloth between measurements.
4. The reagent Vario Phosphate Rgt. F10 is not completely dissolved.
5. The given reaction time of 2 minutes refers to a sample temperature of more than 15 °C. At a sample temperature lower than 15 °C, a reaction time of 4 minutes is required.

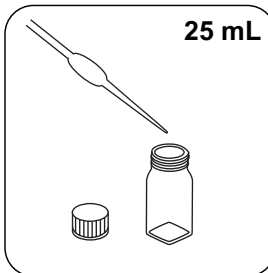
Digestion

Select the appropriate volume of sample according to the following table:

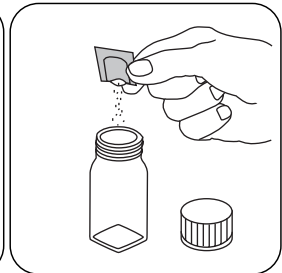
Expected measuring range (mg/L Phosphonate)	Sample volume in mL	Factor
0 - 2.5	50	0.1
0 - 5.0	25	0.2
0 - 12.5	10	0.5
0 - 25	5	1.0
0 - 125	1	5.0



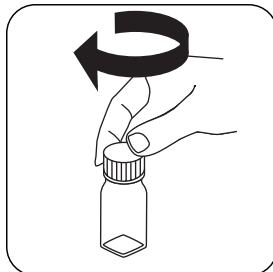
With the selected sample volume fill a 50 mL measuring cylinder. If necessary, fill up with demineralised water to 50 mL and mix.



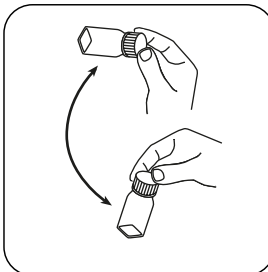
Fill one of the digestion vials with **25 mL of prepared sample**.



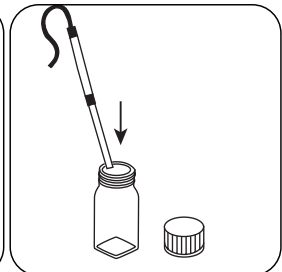
Add **Vario Potassium Persulfate F10 powder pack**.



Close digestion vial



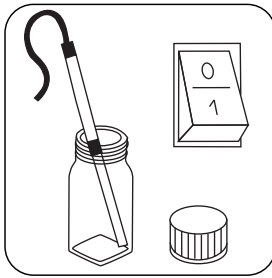
Swirl around to dissolve the powder.



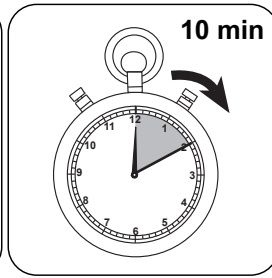
Keep the UV lamp in the sample. **Note: wear UV safety goggles!**



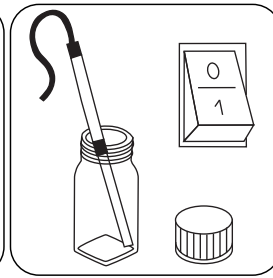
EN



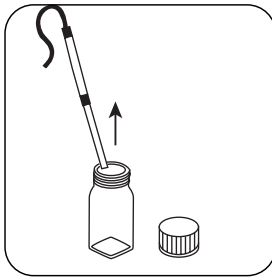
Turn on the UV lamp.



Wait for **10 minute(s)** reaction time.



The UV lamp is switched off when the countdown is finished.

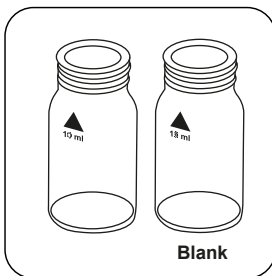


Remove the UV lamp from the sample.

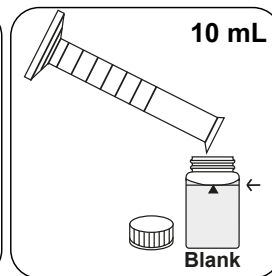
Determination of Phosphonate Persulphate-UV oxidation method with Vario Powder Packs

Select the method on the device.

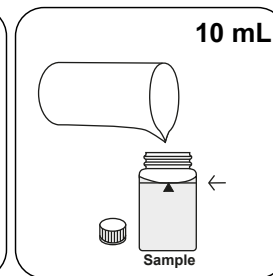
For testing of **Phosphonate with powder packs**, carry out the described **digestion**.



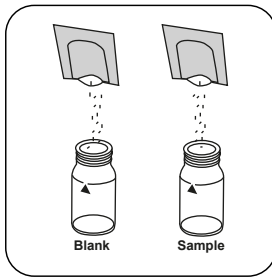
Prepare two clean 24 mL vials. Mark one as a blank.



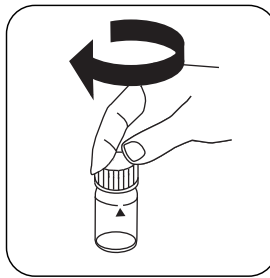
Fill blank with **10 mL** prepared, **not digested** sample.



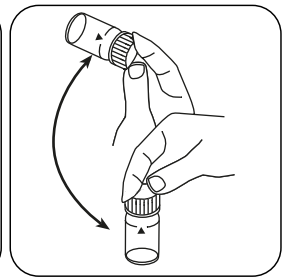
Fill sample vial with **10 mL** prepared, **digested** sample.



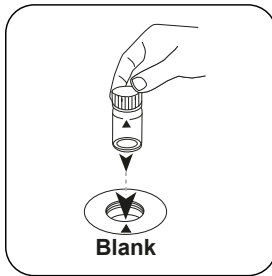
Add a **Vario Phosphate Rgt. F10 powder pack** in each vial.



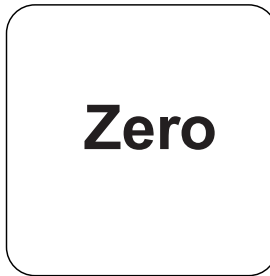
Close vial(s).



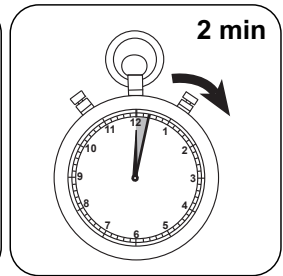
Invert several times to mix the contents (30 sec.).



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

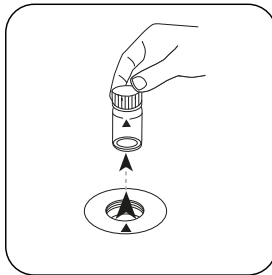


Press the **ZERO** button.

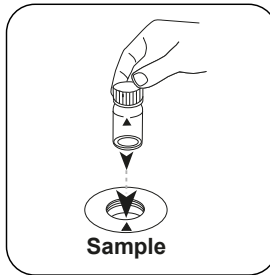


Wait for **2 minute(s) reaction time**.

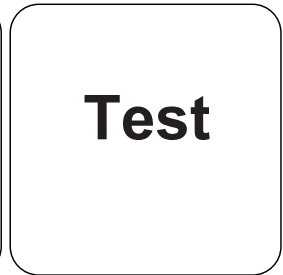
Once the reaction period is finished, the measurement takes place automatically.



Remove the vial from the sample chamber.



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



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

The result in mg/L PO_4^{3-} 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	PBTC	2.84
mg/l	NTP	1.05
mg/l	HEDPA	1.085
mg/l	EDTMPA	1.148
mg/l	HMDTMPA	1.295
mg/l	DETPMPA	1.207

EN

Chemical Method

Persulfate UV Oxidation Method

Appendix

Interferences

Interference	from / [mg/L]	Influence
Aluminium (from 100 mg/l)	1000	
Arsenic	in all concentrations	Positive interference of similar magnitude
Benzotriazoles	10	
HCO ₃ ⁻	1000	
Br	100	
Ca	5000	
CDTA	100	
Cl ⁻	5000	
CrO ₄ ²⁻	100	
Cu	100	
CN ⁻	100	
Diethanoldithiocarbamate	50	
EDTA	100	
Fe	200	
NO ₃ ⁻	200	
NTA	250	

Interference	from / [mg/L]	Influence
PO ₄ ³⁻	15	
Phosphites, organic phosphorus compounds	Large quantities	Meta- and polyphosphates do not interfere
SiO ₂	500	
Si(OH) ₄	100	
SO ₄ ²⁻	2000	
S ²⁻	in all quantities	
SO ₃ ²⁻	100	
Thiourea (from 10 mg / l)	10	
Heavily buffered sample or samples with extreme pH values		May exceed the buffer capacity of the reagents

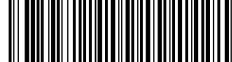
EN

Bibliography

Blystone, P., Larson, P., A Rapid Method for Analysis of Phosphate Compounds, International Water Conference, Pittsburgh, PA. (Oct 26-28, 1981)

According to

Standard Method 4500-P I



Phosphate LR T

M320

0.02 - 1.3 mg/L P

PO4

Phosphomolybdenum Blue

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Phosphate No. 1 LR	Tablet / 100	513040BT
Phosphate No. 2 LR	Tablet / 100	513050BT
Phosphate No. 2 LR	Tablet / 250	513051BT
Set Phosphate No. 1 LR/No. 2 LR 100 Pc. #	100 each	517651BT

Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Ortho-Phosphate ions react with the reagent to form an intense blue colour. Phosphate, which is found in organic and condensed, inorganic (meta-, pyro- and polyphosphate) forms, must therefore be converted into ortho-phosphate ions prior to analysis. The pretreatment of the sample with acid and heat creates the conditions for the hydrolysis of the condensed, inorganic forms. Organically bound phosphate can be converted into ortho-phosphate ions by heating with acid and Persulphate.
The amount of organically bound phosphate can be calculated:
mg/L organic Phosphate = mg/L Phosphate, total - mg/L Phosphate, can be hydrolysed in acid.

Remarks

1. Only ortho-phosphate ions react.
2. The tablets must be added in the correct sequence.



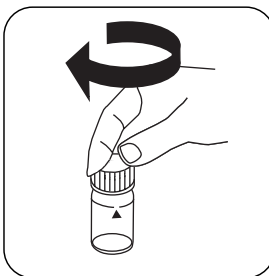
Determination of Phosphate, ortho LR with Tablet

Select the method on the device.

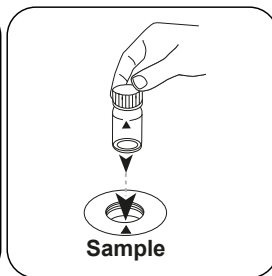
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



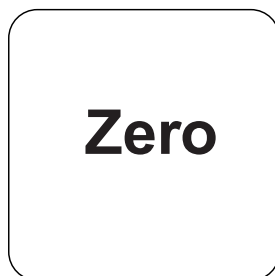
Fill 24 mm vial with **10 mL sample**.



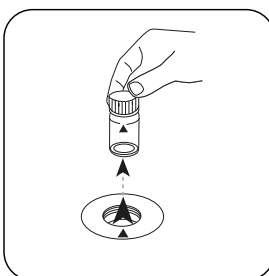
Close vial(s).



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

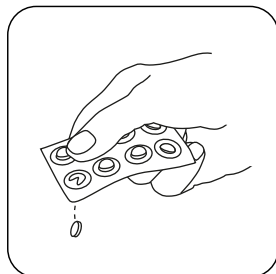


Press the **ZERO** button.

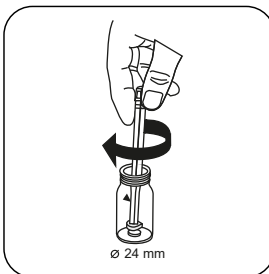


Remove the vial from the sample chamber.

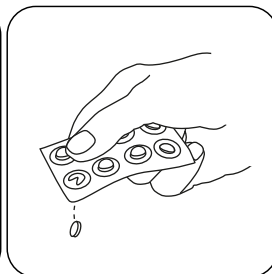
For devices that require **no ZERO measurement**, start here.



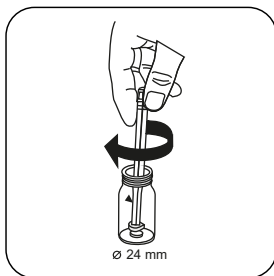
Add **PHOSPHATE No. 1 LR tablet**.



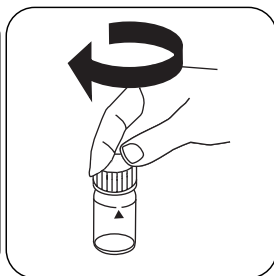
Crush tablet(s) by rotating slightly.



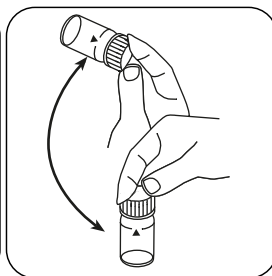
Add **PHOSPHATE No. 2 LR tablet**.



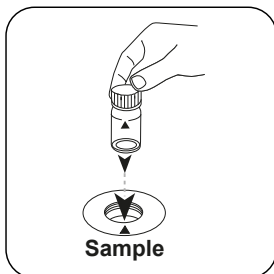
Crush tablet(s) by rotating slightly.



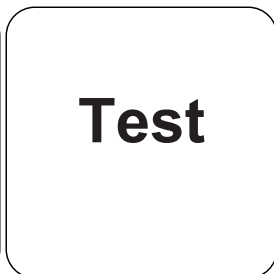
Close vial(s).



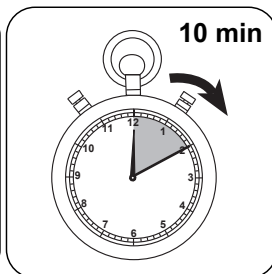
Dissolve tablet(s) by inverting.



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



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



Wait for **10 minute(s)** reaction time.

Once the reaction period is finished, the measurement takes place automatically. The result in mg/L ortho-Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066177
mg/l	P ₂ O ₅	2.29137

EN

Chemical Method

Phosphomolybdenum Blue

Appendix

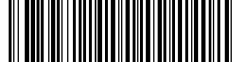
Interferences

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
H ₂ S	in all quantities
SiO ₂	50
S ²⁻	in all quantities
Zn	80
V(V)	large quantities
W(VI)	large quantities

According to

DIN ISO 15923-1 D49
Standard Method 4500-P E
US EPA 365.2

* including stirring rod, 10 cm



Phosphate HR T

M321

0.33 - 26 mg/L P

Vanadomolybdate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Set Phosphate No. 1 HR/No. 2 HR 100 Pc. #	100 each	517661BT
Phosphate HR P1	Tablet / 100	515810BT
Phosphate HR P2	Tablet / 100	515820BT

Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Ortho-Phosphate ions react with the reagent to form an intense yellow colour. Phosphate, which is found in organic and condensed, inorganic (meta-, pyro- and polyphosphate) forms, must therefore be converted into ortho-phosphate ions prior to analysis. The pretreatment of the sample with acid and heat creates the conditions for the hydrolysis of the condensed, inorganic forms. Organically bound phosphate can be converted into ortho-phosphate ions by heating with acid and Persulphate.

The amount of organically bound phosphate can be calculated:

mg/L organic Phosphate = mg/L Phosphate, total - mg/L Phosphate, can be hydrolysed in acid.

Remarks

1. Only ortho-phosphate ions react.
2. For samples under 5 mg/L PO₄ it is recommended to analyse the water sample using Method 320 "Phosphate ortho LR with Tablet".



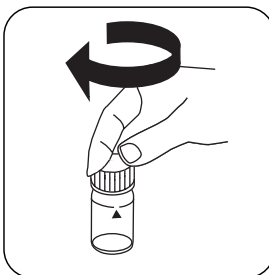
Determination of Phosphate, ortho HR with Tablet

Select the method on the device.

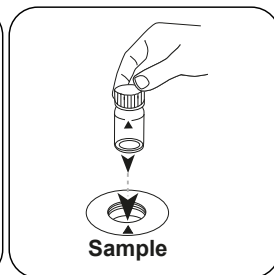
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



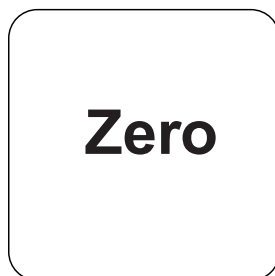
Fill 24 mm vial with **10 mL sample**.



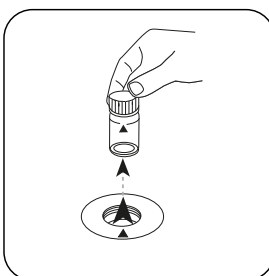
Close vial(s).



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

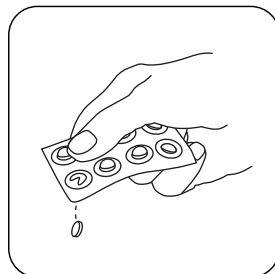


Press the **ZERO** button.

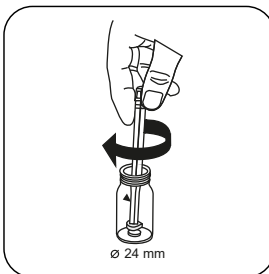


Remove the vial from the sample chamber.

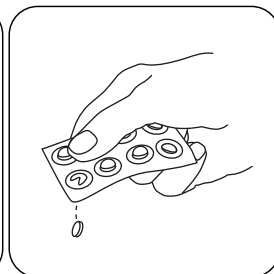
For devices that require **no ZERO measurement**, start here.



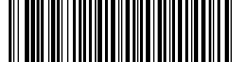
Add **PHOSPHATE HR P1 tablet**.



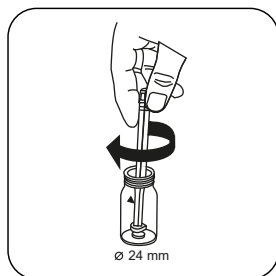
Crush tablet(s) by rotating slightly.



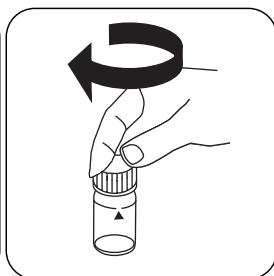
Add **PHOSPHATE HR P2 tablet**.



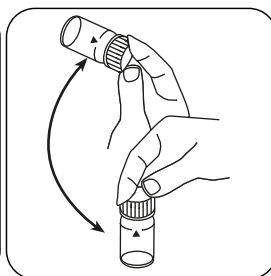
EN



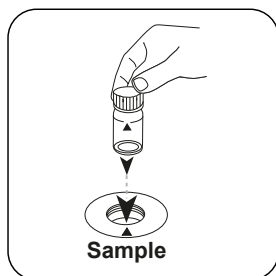
Crush tablet(s) by rotating slightly.



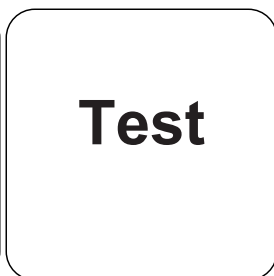
Close vial(s).



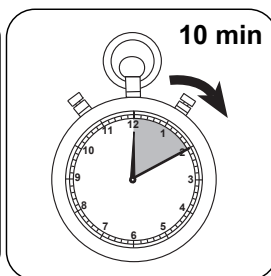
Dissolve tablet(s) by inverting.



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



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



Wait for **10 minute(s)** reaction time.

Once the reaction period is finished, the measurement takes place automatically. The result in mg/L ortho-Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066177
mg/l	P ₂ O ₅	2.29137

EN

Chemical Method

Vanadomolybdate

Appendix

Interferences

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
H ₂ S	in all quantities
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

Standard Method 4500-P E

* including stirring rod, 10 cm



Phosphate HR TT

M322

1 - 20 mg/L P

Vanadomolybdate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Phosphate-ortho/24	24 Pieces	2420701

Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Ortho-Phosphate ions react with the reagent to form an intense yellow colour. Phosphate, which is found in organic and condensed, inorganic (meta-, pyro- and polyphosphate) forms, must therefore be converted into ortho-phosphate ions prior to analysis. The pretreatment of the sample with acid and heat creates the conditions for the hydrolysis of the condensed, inorganic forms. Organically bound phosphate can be converted into ortho-phosphate ions by heating with acid and Persulphate.
The amount of organically bound phosphate can be calculated:

$$\text{mg/L organic Phosphate} = \text{mg/L Phosphate, total} - \text{mg/L Phosphate, can be hydrolysed in acid.}$$

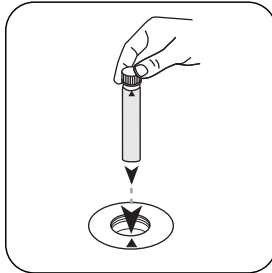
Remarks

1. Only ortho-phosphate ions react.

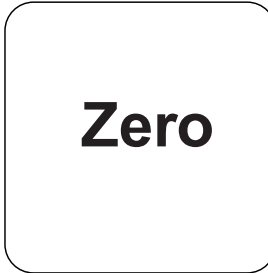
Determination of Phosphate, ortho with Vial Test

Select the method on the device.

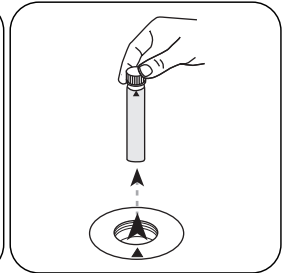
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



Place the supplied Zero vial (red sticker) in the sample chamber. • Pay attention to the positioning.

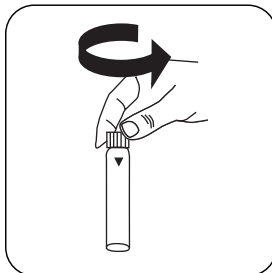


Press the **ZERO** button.

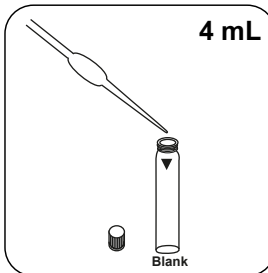


Remove **vial** from the sample chamber.

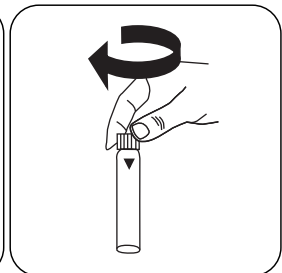
For devices that require **no ZERO measurement**, start here.



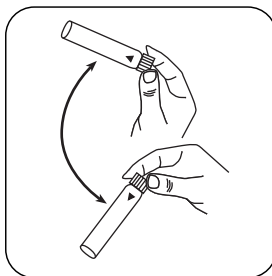
Open a **digestion vial**.



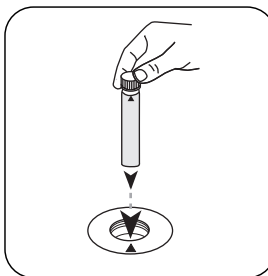
Put **4 mL sample** in the vial.



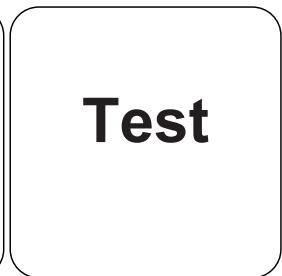
Close vial(s).



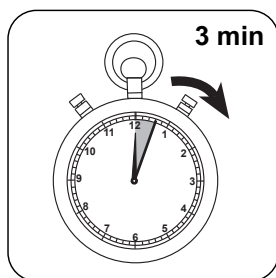
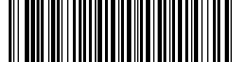
Invert several times to mix the contents.



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



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



EN

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

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

The result in mg/L ortho-Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066177
mg/l	P ₂ O ₅	2.29137

EN

Chemical Method

Vanadomolybdate

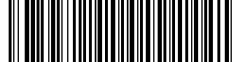
Appendix

Interferences

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
H ₂ S	in all quantities
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

Standard Method 4500-P E



Phosphate PP

M323

0.02 - 0.8 mg/L P

PO4

Phosphomolybdenum Blue

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Phosphate RGT F10 mL	Powder / 100 Pieces	531550

Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Ortho-Phosphate ions react with the reagent to form an intense blue colour. Phosphate, which is found in organic and condensed, inorganic (meta-, pyro- and polyphosphate) forms, must therefore be converted into ortho-phosphate ions prior to analysis. The pretreatment of the sample with acid and heat creates the conditions for the hydrolysis of the condensed, inorganic forms. Organically bound phosphate can be converted into ortho-phosphate ions by heating with acid and Persulphate.

The amount of organically bound phosphate can be calculated:

mg/L organic Phosphate = mg/L Phosphate, total - mg/L Phosphate, can be hydrolysed in acid.

Remarks

1. The reagent Vario Phosphate Rgt. F10 is not completely dissolved.

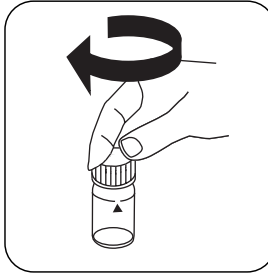
Determination of Phosphate, ortho with Vario Powder Packs

Select the method on the device.

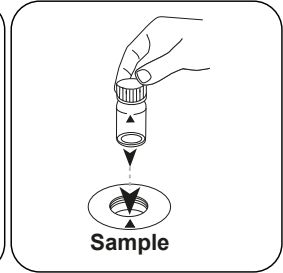
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



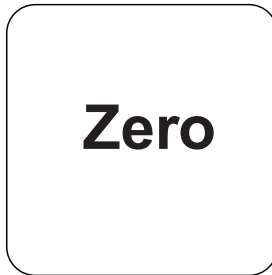
Fill 24 mm vial with **10 mL sample**.



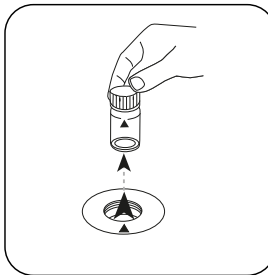
Close vial(s).



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

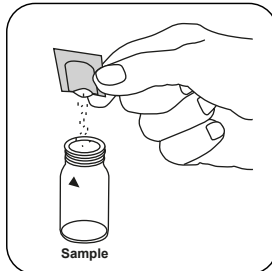


Press the **ZERO** button.

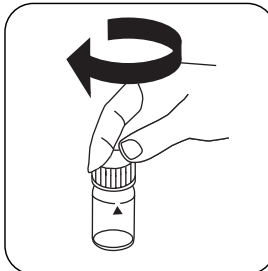


Remove the vial from the sample chamber.

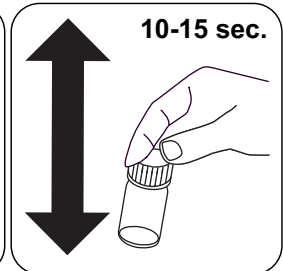
For devices that require **no ZERO measurement**, start here.



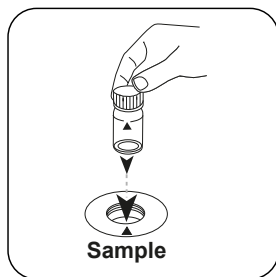
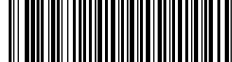
Add **Vario Phosphate Rgt. F10 powder pack**.



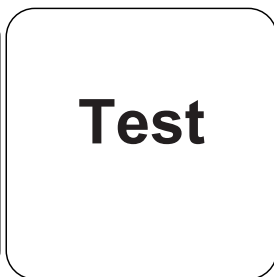
Close vial(s).



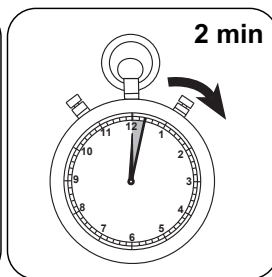
Mix the contents by shaking. (10-15 sec.).



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 mg/L ortho-Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066177
mg/l	P ₂ O ₅	2.29137

EN

Chemical Method

Phosphomolybdenum Blue

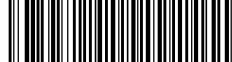
Appendix

Interferences

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
H ₂ S	in all quantities
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

DIN ISO 15923-1 D49
Standard Method 4500-P E
US EPA 365.2



Phosphate TT

M324

0.02 - 1.63 mg/L P

Phosphomolybdenum Blue

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Phosphate-Ortho, Set	1 Set	535200

Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Ortho-Phosphate ions react with the reagent to form an intense blue colour. Phosphate, which is found in organic and condensed, inorganic (meta-, pyro- and polyphosphate) forms, must therefore be converted into ortho-phosphate ions prior to analysis. The pretreatment of the sample with acid and heat creates the conditions for the hydrolysis of the condensed, inorganic forms. Organically bound phosphate can be converted into ortho-phosphate ions by heating with acid and Persulphate.
The amount of organically bound phosphate can be calculated:
mg/L organic Phosphate = mg/L Phosphate, total - mg/L Phosphate, can be hydrolysed in acid.

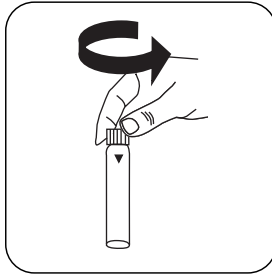
Remarks

1. The reagent does not dissolve completely.

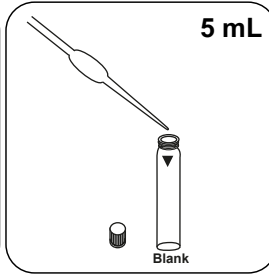
Determination of Phosphate, ortho with Vario Vial Test

Select the method on the device.

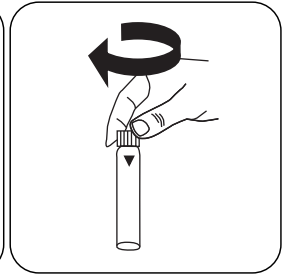
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



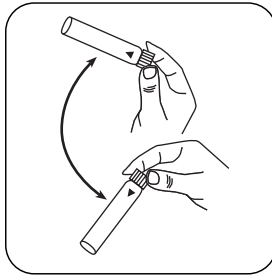
Open **digestion vial Phosphate Dilution** .



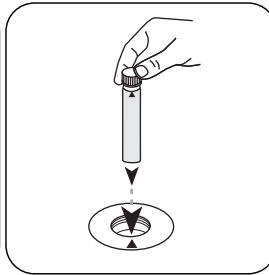
Put **5 mL sample** in the vial.



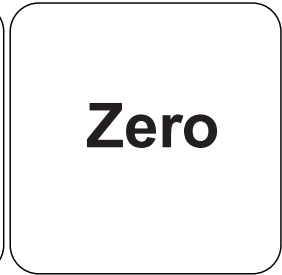
Close vial(s).



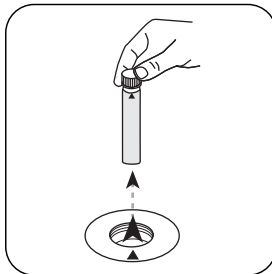
Invert several times to mix the contents.



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



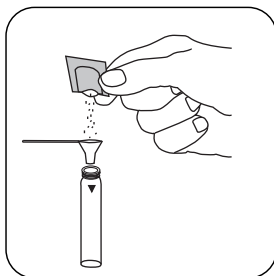
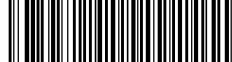
Press the **ZERO** button.



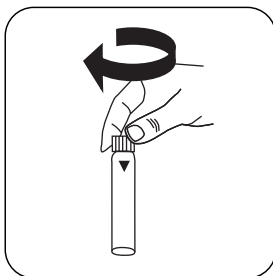
Remove **vial** from the sample chamber.

For devices that require **no ZERO measurement** , start here.

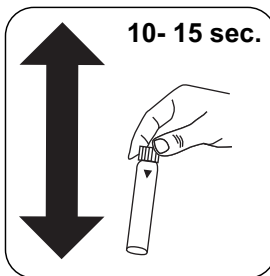
EN



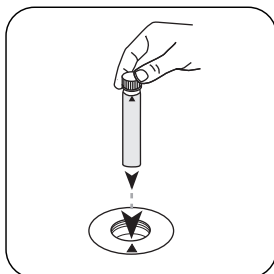
Add **Vario Phosphate Rgt. F10 powder pack**.



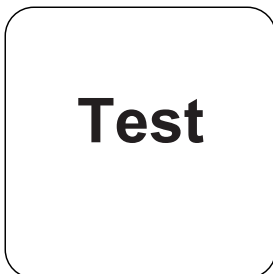
Close vial(s).



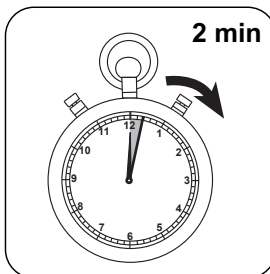
Mix the contents by shaking. (10- 15 sec.).



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 mg/L ortho-Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066177
mg/l	P ₂ O ₅	2.29137

EN

Chemical Method

Phosphomolybdenum Blue

Appendix

Interferences

Persistent Interferences

- Large amounts of unresolved solids can cause non-reproducible measurement results.

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
H ₂ S	in all quantities
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

DIN ISO 15923-1 D49
Standard Method 4500-P E



Phosphate h. TT

M325

0.02 - 1.6 mg/L P^{b)}

Phosphomolybdenum Blue

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Phosphate, acid hydrolyzable, Total Set	1 Set	535250

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

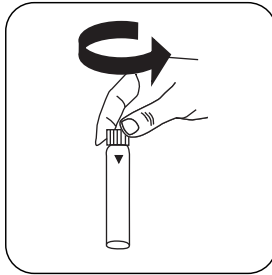
Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Ortho-Phosphate ions react with the reagent to form an intense blue colour. Phosphate, which is found in organic and condensed, inorganic (meta-, pyro- and polyphosphate) forms, must therefore be converted into ortho-phosphate ions prior to analysis. The pretreatment of the sample with acid and heat creates the conditions for the hydrolysis of the condensed, inorganic forms. Organically bound phosphate can be converted into ortho-phosphate ions by heating with acid and Persulphate.
The amount of organically bound phosphate can be calculated:
mg/L organic Phosphate = mg/L Phosphate, total - mg/L Phosphate, can be hydrolysed in acid.

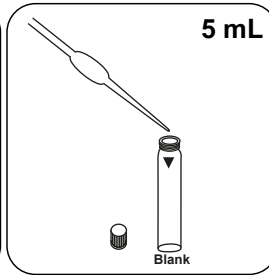
Remarks

1. The reagent Vario Phosphat Rgt. F 10 need to be shaken directly after addition like described in the following procedure. If significant time elapsed before shaking precision can be decreased. After 10 to 15 sec. of shaking some parts of the reagent stay undissolved.

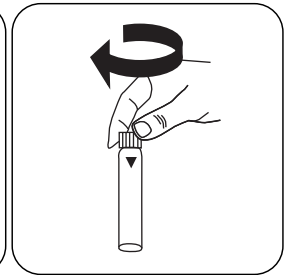
Digestion



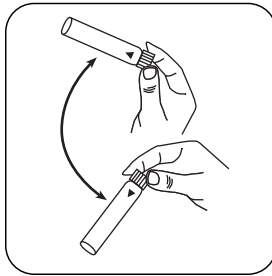
Open a digestion vial **PO₄-P Acid Reagent**.



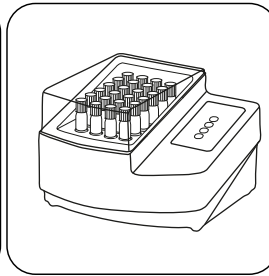
Put **5 mL sample** in the vial.



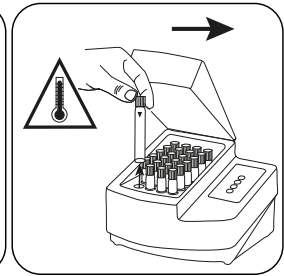
Close vial(s).



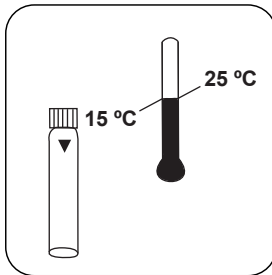
Invert several times to mix the contents.



Seal the vials in the pre-heated thermoreactor for **30 minutes at 100 °C**.



Remove the vial from the thermoreactor. (**Note: vial will be hot!**)



Allow the sample to cool to room temperature.

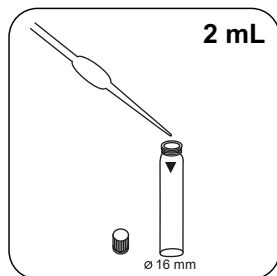
Determination of Phosphate, can be hydrolysed in acid, with Vario Vial Test

Select the method on the device.

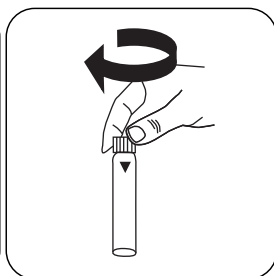
For testing of **Phosphate, acid hydrolyzable, with Vario tube tests**, carry out the described **digestion**.



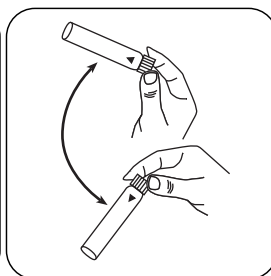
EN



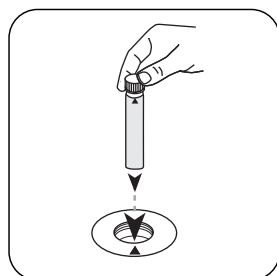
Add **2 mL 1,00 N Sodium Hydroxide solution** to the digested sample.



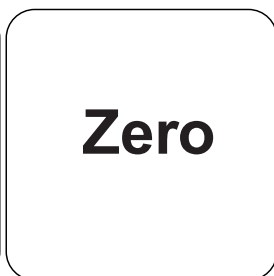
Close vial(s).



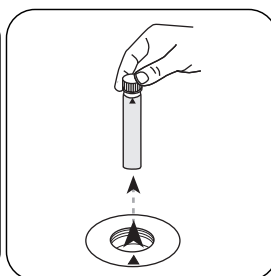
Invert several times to mix the contents.



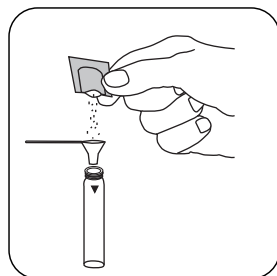
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



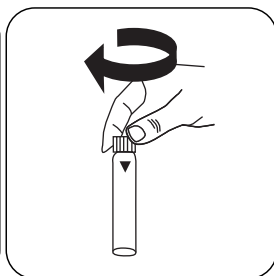
Press the **ZERO** button.



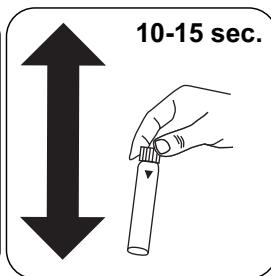
Remove **vial** from the sample chamber.



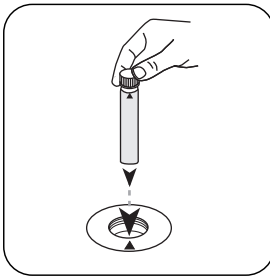
Add **Vario Phosphate Rgt. F10 powder pack**.



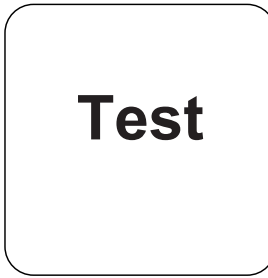
Close vial(s).



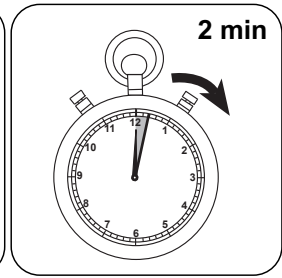
Mix the contents by shaking. (10-15 sec.).



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 mg/L acid hydrolyzable Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.0661
mg/l	P ₂ O ₅	2.2913

EN

Chemical Method

Phosphomolybdenum Blue

Appendix

Interferences

Persistent Interferences

- Large amounts of unresolved solids can cause non-reproducible measurement results.

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
H ₂ S	in all quantities
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

ISO 6878-1-1986,
DIN 38405 D11-4
Standard Method 4500-P E
US EPA 365.2



⁴⁾ Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



Phosphate t. TT

M326

0.02 - 1.1 mg/L P^{b)}

Phosphomolybdenum Blue

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Phosphate, Total Set	1 Set	535210

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940

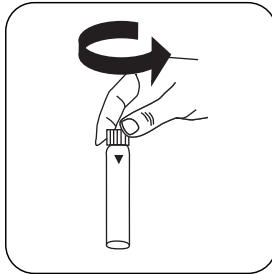
Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Ortho-Phosphate ions react with the reagent to form an intense blue colour. Phosphate, which is found in organic and condensed, inorganic (meta-, pyro- and polyphosphate) forms, must therefore be converted into ortho-phosphate ions prior to analysis. The pretreatment of the sample with acid and heat creates the conditions for the hydrolysis of the condensed, inorganic forms. Organically bound phosphate can be converted into ortho-phosphate ions by heating with acid and Persulphate.
The amount of organically bound phosphate can be calculated:
mg/L organic Phosphate = mg/L Phosphate, total - mg/L Phosphate, can be hydrolysed in acid.

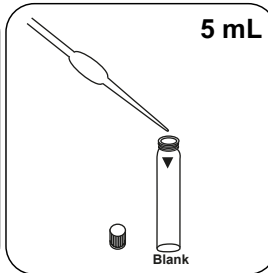
Remarks

1. The reagent Vario Phosphat Rgt. F 10 need to be shaken directly after addition like described in the following procedure. If significant time elapsed before shaking precision can be decreased. After 10 to 15 sec. of shaking some parts of the reagent stay undissolved.

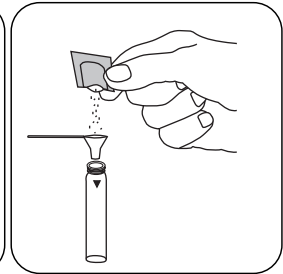
Digestion



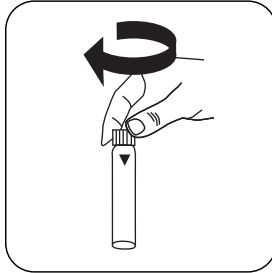
Open a digestion vial **PO₄-P Acid Reagent**.



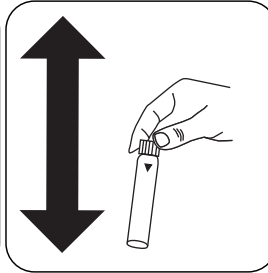
Put **5 mL sample** in the vial.



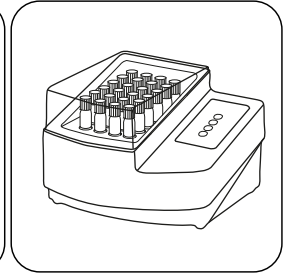
Add **Vario Potassium Persulfate F10 powder pack**.



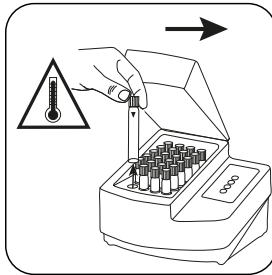
Close vial(s).



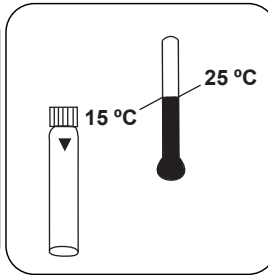
Mix the contents by shaking.



Seal the vials in the pre-heated thermoreactor for **30 minutes at 100 °C**.



Remove the vial from the thermoreactor. (**Note: vial will be hot!**)

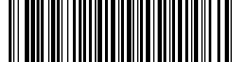


Allow the sample to cool to room temperature.

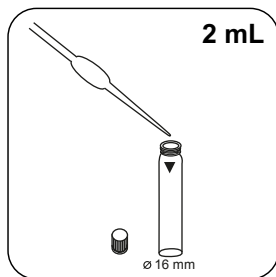
Determination of Phosphate, total with Vario Vial Test

Select the method on the device.

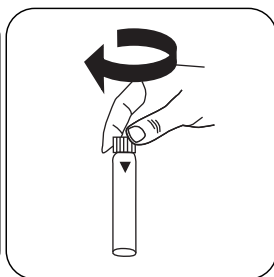
For testing of **Phosphate, total with Vario Vial Test**, carry out the described digestion.



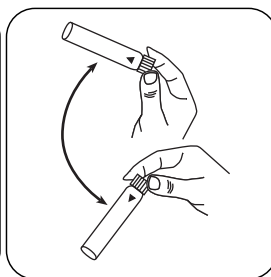
EN



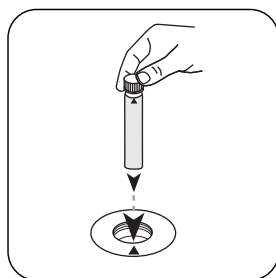
Add **2 mL 1,54 N Sodium Hydroxide Solution** to the digested sample.



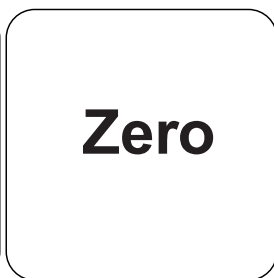
Close vial(s).



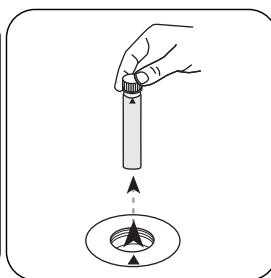
Invert several times to mix the contents.



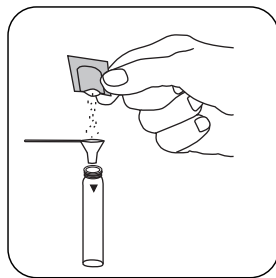
Place **sample vial** in the sample chamber. • Pay attention to the positioning.



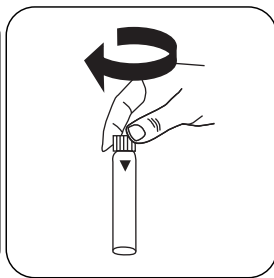
Press the **ZERO** button.



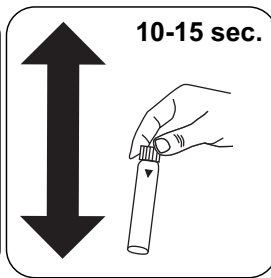
Remove **vial** from the sample chamber.



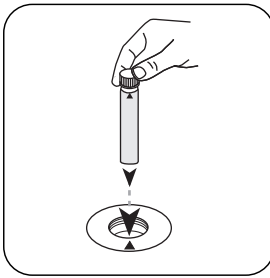
Add **Vario Phosphate Rgt. F10 powder pack**.



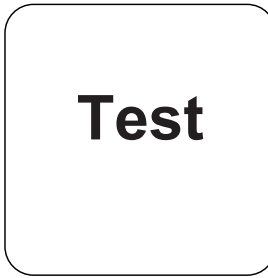
Close vial(s).



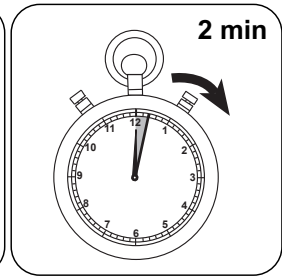
Mix the contents by shaking. (10-15 sec.).



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



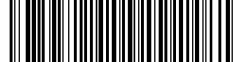
Press the **TEST** (XD: **START**) button.



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

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

The result in mg/L total Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.0661
mg/l	P ₂ O ₅	2.2913

EN

Chemical Method

Phosphomolybdenum Blue

Appendix

Interferences

Persistent Interferences

- Large amounts of unresolved solids can cause non-reproducible measurement results.

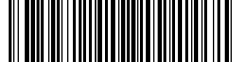
Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
H ₂ S	in all quantities
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

ISO 6878-1-1986,
DIN 38405 D11-4
Standard Method 4500-P E
US EPA 365.2



⁴⁾ Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)



Phosphate HR C

M327

1.6 - 13 mg/L P^e)

Vanadomolybdate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Vacu-vial Phosphate Test Kit	1 Set	380460

The following accessories are required.

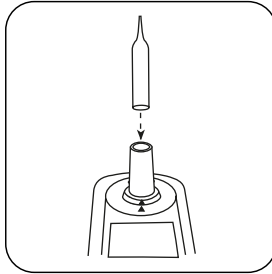
Accessories	Packaging Unit	Part Number
Adapter for round cuvettes 13 mm Ø	1 Pieces	19802192
Adapter (13 mm) MultiDirect for Vacu-vial	1 Pieces	192075

Remarks

1. This method is adapted from a product by CHEMetrics. The measuring range and wavelength used for this photometer may differ from the data specified by CHEMetrics.
2. Before performing the test, you must read through the original instructions and safety data sheet that is delivered with the test kit (MSDS are also available on the homepage of www.chemetrics.com).
3. Vacu-vials® is a registered trademark of the company CHEMetrics, Inc. / Calverton, U.S.A.
4. Only ortho-phosphate ions react.

Determination of Phosphate HR, ortho with Vacu Vials® K-8503

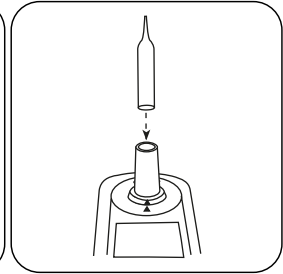
Select the method on the device.



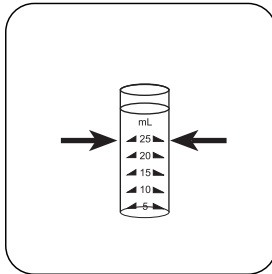
Place **Zero ampoule** in the sample chamber.

Zero

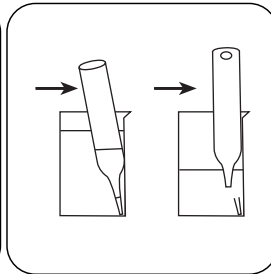
Press the **ZERO** button.



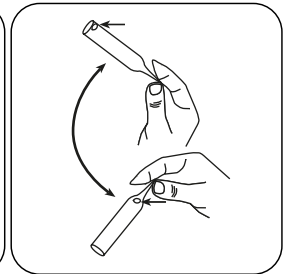
Remove zero ampoule from the sample chamber.



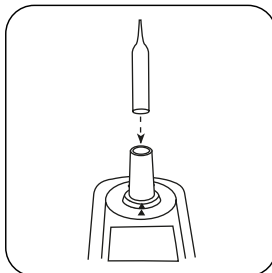
Fill the sample glass to the 25 mL mark with the sample.



Place a Vacu-vial® ampoule in the sampling vessel. Break off the ampoule tip by applying light pressure against the vessel wall. Wait for the ampoule to fill completely.



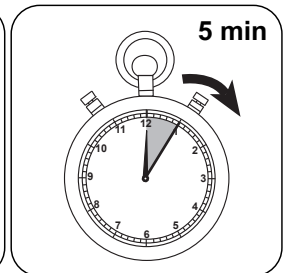
Invert the ampoule several times, allowing the bubble to move from one end to the other. Dry the outside.



Place the ampoule in the sample chamber.

Test

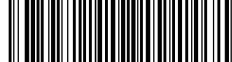
Press the **TEST (XD: START)** button.



Wait for **5 minute(s) reaction time**.

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

The result in mg/L ortho-Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066
mg/l	P ₂ O ₅	2.3

EN

Chemical Method

Vanadomolybdate

Appendix

Interferences

Persistent Interferences

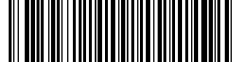
- Sulphide, thiosulphate, and Thiocyanide produce lower test results.

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

Standard Method 4500-P E

^o MultiDirect: Adapter is necessary for Vacu-vials[®] (Order code 19 20 75)



Phosphate LR C

M328

0.02 - 1.6 mg/L P^o)

Stannous Chloride

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Vacu-vial Phosphate Test Kit	1 Set	380480

The following accessories are required.

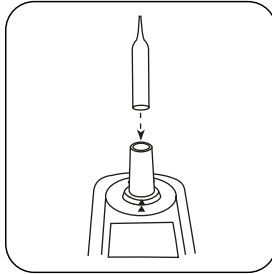
Accessories	Packaging Unit	Part Number
Adapter for round cuvettes 13 mm Ø	1 Pieces	19802192
Adapter (13 mm) MultiDirect for Vacu-vial	1 Pieces	192075

Remarks

1. This method is adapted from a product by CHEMetrics. The measuring range and wavelength used for this photometer may differ from the data specified by CHEMetrics.
2. Before performing the test, you must read through the original instructions and safety data sheet that is delivered with the test kit (MSDS are also available on the homepage of www.chemetrics.com).
3. Vacu-vials® is a registered trademark of the company CHEMetrics, Inc. / Calverton, U.S.A.
4. Only ortho-phosphate ions react.

Determination of Phosphate LR, ortho with Vacu Vials® K-8513

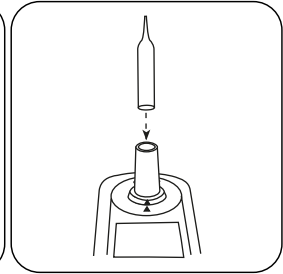
Select the method on the device.



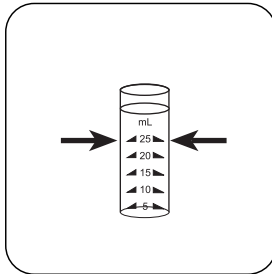
Place **Zero ampoule** in the sample chamber.

Zero

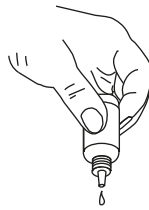
Press the **ZERO** button.



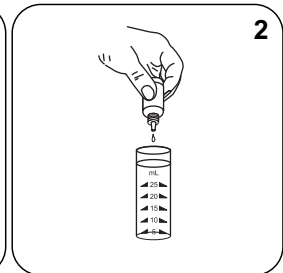
Remove zero ampoule from the sample chamber.



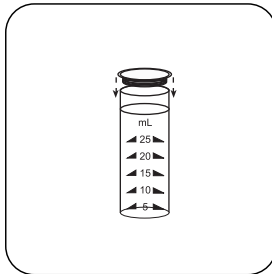
Fill the sample glass to the 25 mL mark with the sample.



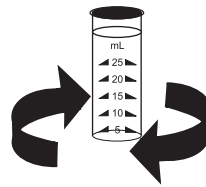
Hold cuvettes vertically and add equal drops by pressing slowly.



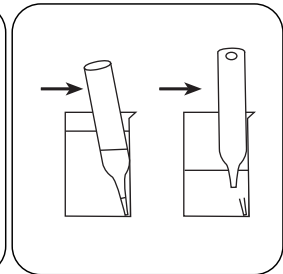
Add **2 drops A-8500-Activator Solution**.



Close the sample glass with the lid.



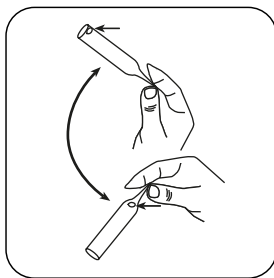
Invert several times to mix the contents.



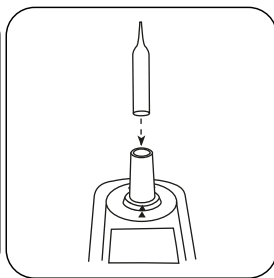
Place a Vacu-vial® ampoule in the sampling vessel. Break off the ampoule tip by applying light pressure against the vessel wall. Wait for the ampoule to fill completely.

EN

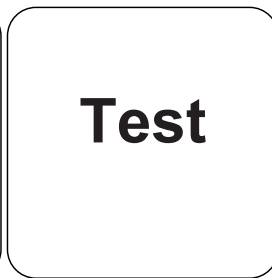
2



Invert the ampoule several times, allowing the bubble to move from one end to the other. Dry the outside.

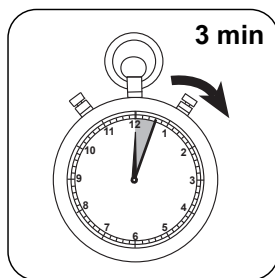


Place the ampoule in the sample chamber.



Test

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 ortho-Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066
mg/l	P ₂ O ₅	2.3

EN

Chemical Method

Stannous Chloride

Appendix

Interferences

Persistent Interferences

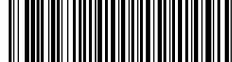
- Sulphide, thiosulphate, and Thiocyanide produce lower test results.

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

Standard Method 4500-P D

^o MultiDirect: Adapter is necessary for Vacu-vials® (Order code 19 20 75)



pH-value LR T

M329

5.2 - 6.8 pH

Bromocresolpurple

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Bromocresol Purple Photometer	Tablet / 100	515700BT
Bromocresol Purple Photometer	Tablet / 250	515701BT

Remarks

1. For photometric determination of pH values only use BROMCRESOL PURPLE tablets in black printed foil pack and marked with PHOTOMETER.
2. The accuracy of the colorimetric determination of pH values depends on various boundary conditions (buffer capacity of the sample, salt contents etc.).

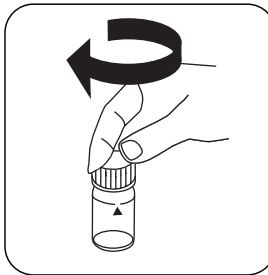
Determination of pH value LR with Tablet

Select the method on the device.

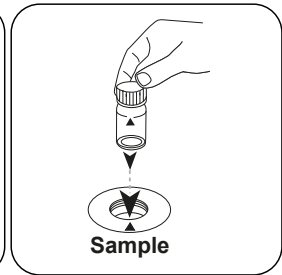
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



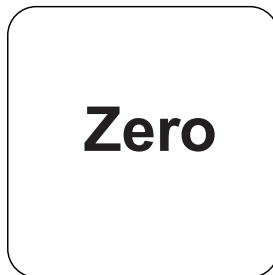
Fill 24 mm vial with **10 mL sample**.



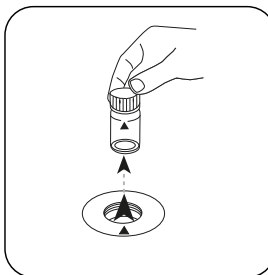
Close vial(s).



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

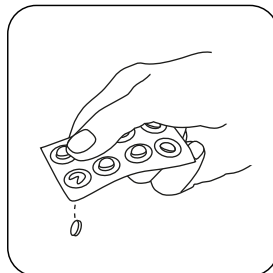


Press the **ZERO** button.

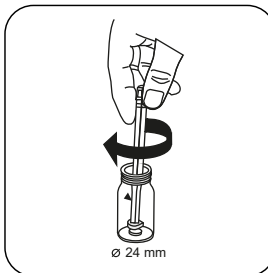


Remove the vial from the sample chamber.

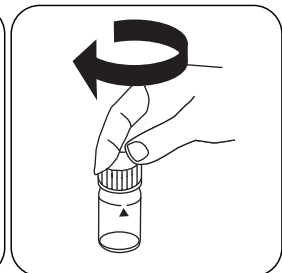
For devices that require **no ZERO measurement**, start here.



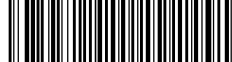
Add **BROMCRESOLPURPLE PHOTOMETER** tablet.



Crush tablet(s) by rotating slightly.



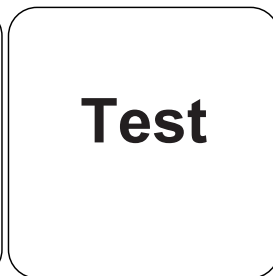
Close vial(s).



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.

EN

Chemical Method

Bromocresolpurple

Appendix

Interferences

Persistent Interferences

- pH values below 5.2 and above 6.8 can produce results inside the measuring range. A plausibility test (pH-meter) is recommended.

Removeable Interferences

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

Indicator	Salt content per sample		
Bromocresolpurple	1 molar -0.26	2 molar -0.33	3 molar -0.31

The values of Parson and Douglas (1926) are based on the use of Clark and Lubs buffers. 1 Mol NaCl = 58.4 g/L = 5.8 %

Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, London



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

Remarks

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

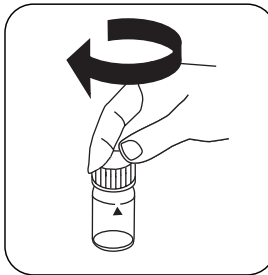
Determination of pH-value with Tablet

Select the method on the device.

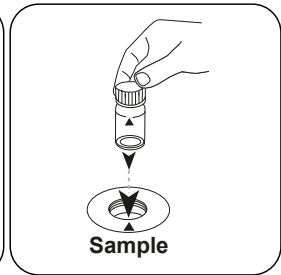
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



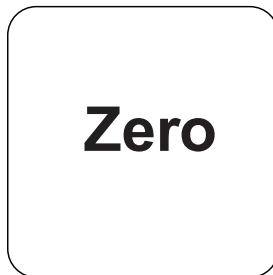
Fill 24 mm vial with **10 mL sample**.



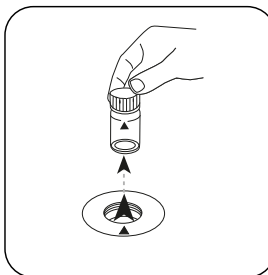
Close vial(s).



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

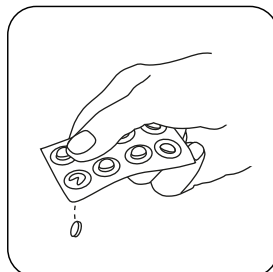


Press the **ZERO** button.

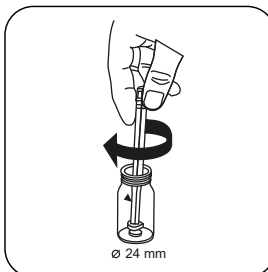


Remove the vial from the sample chamber.

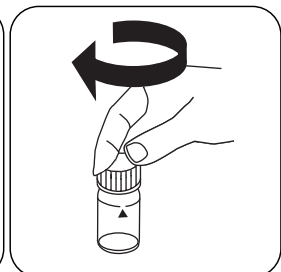
For devices that require **no ZERO measurement**, start here.



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.

EN

Chemical Method

Phenol Red

Appendix

Interferences

EN

Persistent Interferences

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

Removeable Interferences

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

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

¹⁾ according to Kolthoff (1922)

²⁾ according to Parson and Douglas (1926)

Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, London



pH value L

M331

6.5 - 8.4 pH

PH

Phenol Red

EN

Material

Required material (partly optional):

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

Preparation

- 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).

Remarks

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



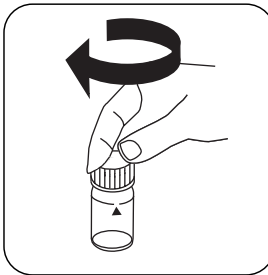
Determination of pH-value with liquid reagent

Select the method on the device.

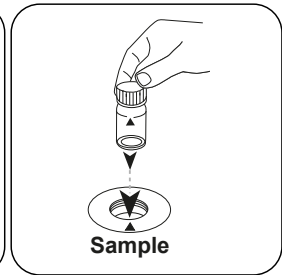
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



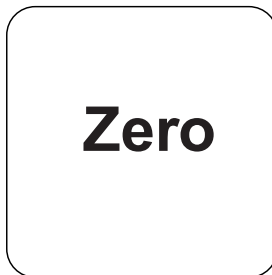
Fill 24 mm vial with **10 mL sample**.



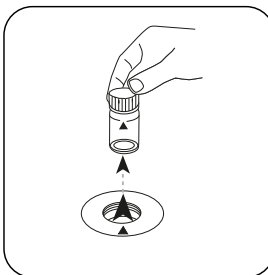
Close vial(s).



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

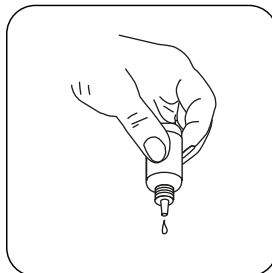


Press the **ZERO** button.

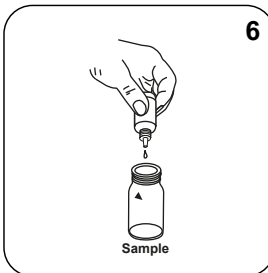


Remove the vial from the sample chamber.

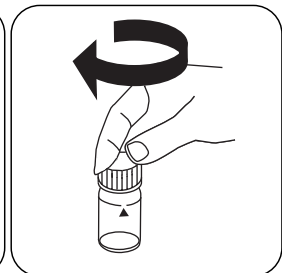
For devices that require **no ZERO measurement**, start here.



Hold cuvettes vertically and add equal drops by pressing slowly.



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



Close vial(s).



Invert several times to mix the contents.



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



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

The result in pH value appears on the display.

EN

Chemical Method

Phenol Red

Appendix

Interferences

EN

Removeable Interferences

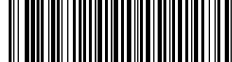
1. Salt error Correction of test results (average values) for samples with salt contents of:

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

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

Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, London

**pH-value HR T****M332****8.0 - 9.6 pH****Thymol Blue**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Thymol Blue Photometer	Tablet / 100	515710BT
Thymol Blue Photometer	Tablet / 250	515711BT

Remarks

1. For photometric determination of pH values only use THYMOLBLUE tablets in black printed foil pack and marked with PHOTOMETER.
2. The accuracy of the colorimetric determination of pH values depends on various boundary conditions (buffer capacity of the sample, salt contents etc.).



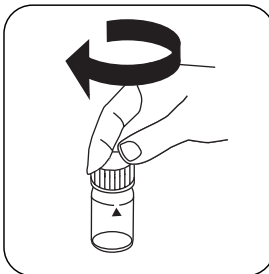
Determination of pH-value with Tablet

Select the method on the device.

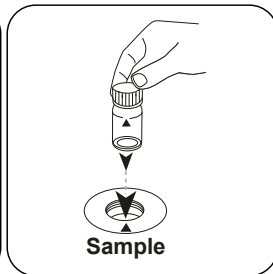
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



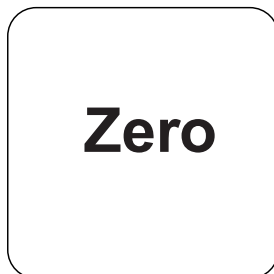
Fill 24 mm vial with **10 mL sample**.



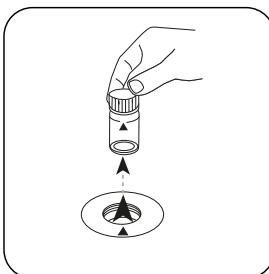
Close vial(s).



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

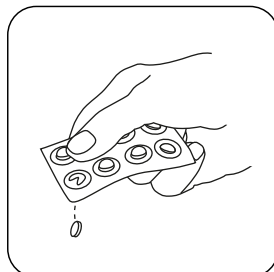


Press the **ZERO** button.

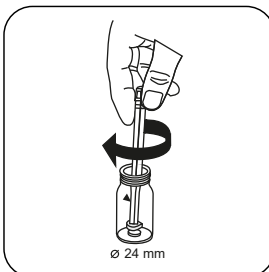


Remove the vial from the sample chamber.

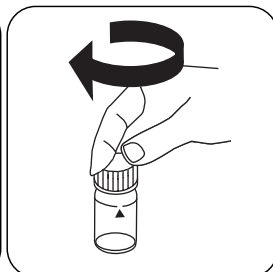
For devices that require **no ZERO measurement**, start here.



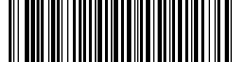
Add **THYMOLBLUE PHOTOMETER** tablet.



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.

EN

Chemical Method

Thymol Blue

Appendix

Interferences

Persistent Interferences

1. pH values below 8.0 and above 9.6 can produce results inside the measuring range. A plausibility test (pH-meter) is recommended.

Removeable Interferences

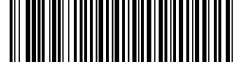
Salt error Correction of test results (average values) for samples with salt contents of:

Indicator	Salt content per sample		
Thymolblue	1 molar -0.22	2 molars -0.29	3 molars -0.34

The values of Parson and Douglas (1926) are based on the use of Clark and Lubs buffers. 1 Mol NaCl = 58.4 g/L = 5.8 %

Bibliography

Colorimetric Chemical Analytical Methods, 9th Edition, London



Phosphate LR L

M334

0.1 - 10 mg/L PO₄

Phosphomolybic Acid / Ascorbic Acid

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
KS278-Sulphuric Acid 50 % V/V	65 mL	56L027865
Acidity / Alkalinity P Indicator PA1	65 mL	56L013565
Hardness Calcium Buffer CH2	65 mL	56L014465
KP962-Ammonium Persulphate Powder	Powder / 40 g	56P096240
Phosphate LR Reagent Pack	1 Pieces	56R023765

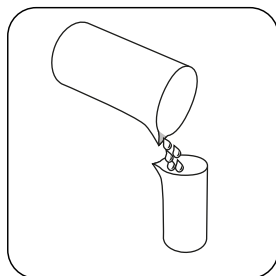
Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Prior digestion is required for the analysis of Polyphosphate and total phosphate.

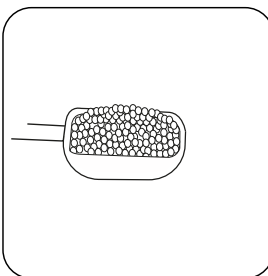
Remarks

1. The measuring spoon supplied with the reagents must be used for the correct dosage.
2. The long scoop is for KP962. The short scoop is for KP119.

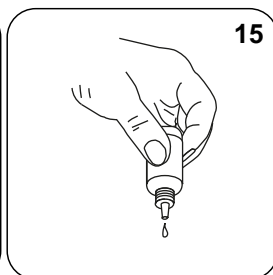
Digestion total Phosphate LR with liquid reagents



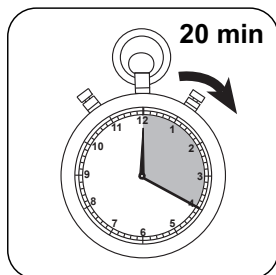
Fill a suitable digestion vessel with **50 mL homogenised sample**.



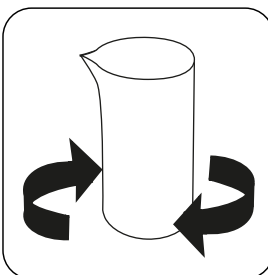
Add a **measuring scoop KP962 (Ammonium Persulfate Powder)**.



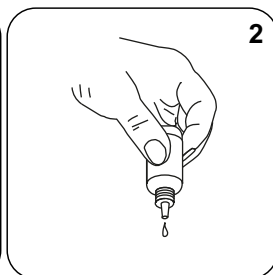
Add **15 drops KS278 (50% sulfuric acid)**.



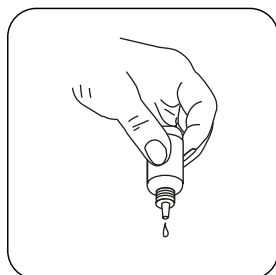
Boil the sample for **20 minutes**. A sample volume of about 25 mL should be retained; If necessary, fill with deionised water.



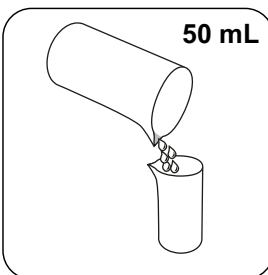
Invert the vial and allow to cool to room temperature.



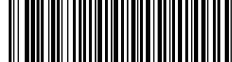
Add **2 drops Acidity / Alkalinity P Indicator PA1**.



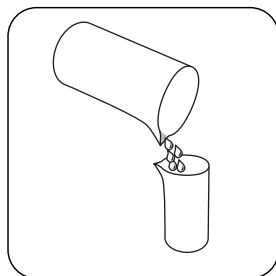
Add **Hardness Calcium Buffer CH2** drop by drop to the same sample until colouration turns from light pink to red. (**Note: make sure to swirl the vial after adding each drop!**)



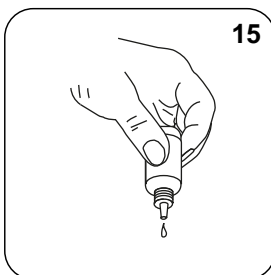
Fill the sample with **deionised water to 50 mL**.



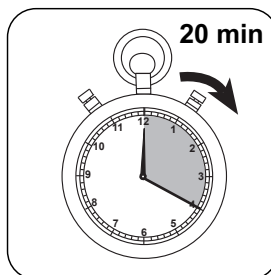
Digestion Polyphosphate LR with liquid reagents



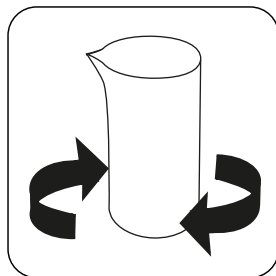
Fill a suitable digestion vessel with **50 mL homogenised sample**.



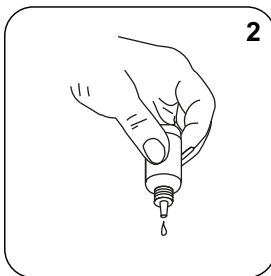
Add **15 drops KS278 (50% sulfuric acid)**.



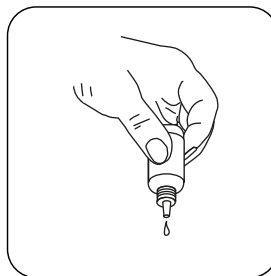
Boil the sample for **20 minutes**. A sample volume of about 25 mL should be retained; if necessary, fill with deionised water.



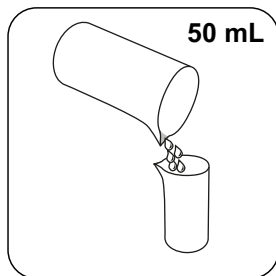
Invert the vial and allow to cool to room temperature.



Add **2 drops Acidity / Alkalinity P Indicator PA1**.



Add **Hardness Calcium Buffer CH2** drop by drop to the same sample until colouration turns from light pink to red. (**Note: make sure to swirl the vial after adding each drop!**)

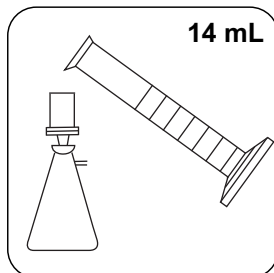


Fill the sample with **deionised water to 50 mL**.

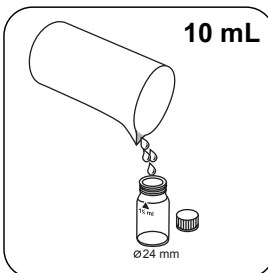
Determination of Phosphate LR with liquid reagent

Select the method on the device.

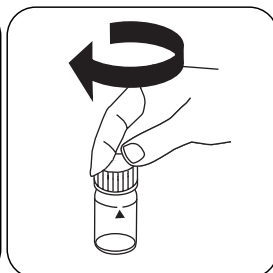
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



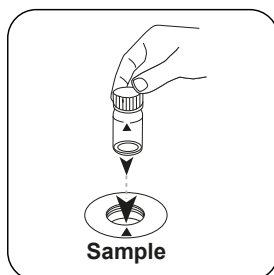
Filter approx. 14 mL sample with a pre-rinsed filter (pore size 0.45 µm).



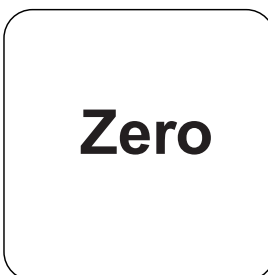
Fill 24 mm vial with **10 mL prepared sample**.



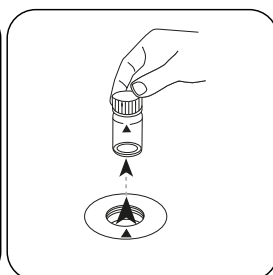
Close vial(s).



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

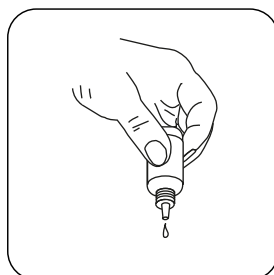


Press the **ZERO** button.

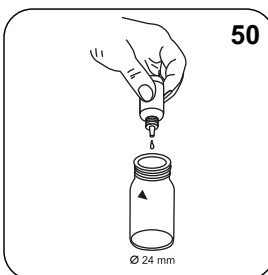


Remove the vial from the sample chamber.

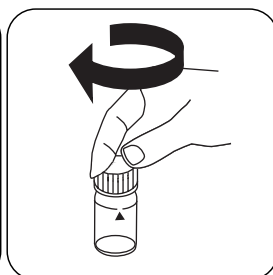
For devices that require **no ZERO measurement**, start here.



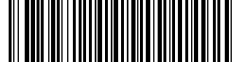
Hold cuvettes vertically and add equal drops by pressing slowly.



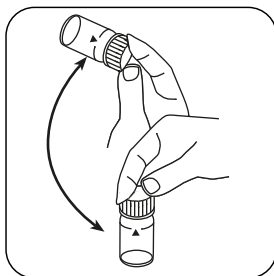
Add **50 drops KS80 (CRP)**.



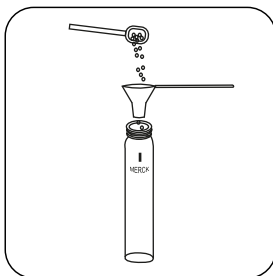
Close vial(s).



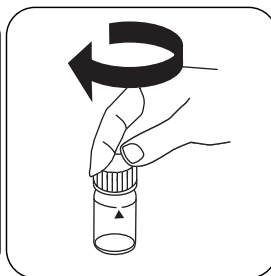
EN



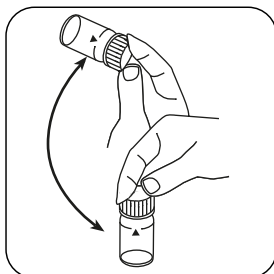
Invert several times to mix the contents.



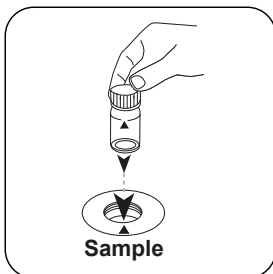
Add a **measuring scoop KP119 (Ascorbic Acid)**.



Close vial(s).



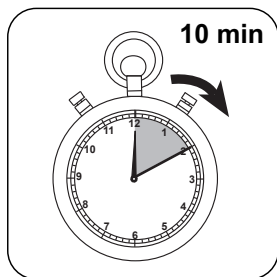
Swirl around to dissolve the powder.



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



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



Wait for **10 minute(s)**
reaction time.

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

The result in mg/L Phosphate appears on the display.

Determination of Polyphosphate LR with liquid reagents

Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

For testing of **Polyphosphate LR with liquid reagents**, carry out the described **digestion**.

This test determines the content of inorganic total phosphate. The Polyphosphate content arises from the difference between inorganic and ortho phosphate.

The test for Polyphosphate LR with liquid reagents runs just as the test under Method 334, Phosphate LR with liquid reagents.

The result in mg/L anorganic Total Phosphate (ortho-Phosphate and Polyphosphate) appears on the display.

Determination of total Phosphate LR with liquid reagent

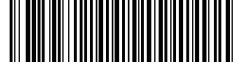
Select the method on the device.

For testing of **total Phosphate LR with liquid reagents**, carry out the described **digestion**.

This test determines all compounds of phosphorus present in the sample, including ortho-phosphate, polyphosphate, and organic phosphorus compounds.

The test for total Phosphate LR with liquid reagents runs just as the test under Method 334, Phosphate LR with liquid reagents.

The result in mg/L total Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066177
mg/l	P ₂ O ₅	2.29137

EN

Chemical Method

Phosphomolybic Acid / Ascorbic Acid

Appendix

Interferences

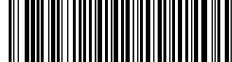
Persistent Interferences

- Large amounts of unresolved substances can cause non-reproducible measurement results.

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

DIN ISO 15923-1 D49
Standard Method 4500-P E
US EPA 365.2



Phosphate HR L

M335

5 - 80 mg/L PO₄PO₄

Vanadomolybdate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
KS278-Sulphuric Acid 50 % V/V	65 mL	56L027865
Acidity / Alkalinity P Indicator PA1	65 mL	56L013565
Hardness Calcium Buffer CH2	65 mL	56L014465
KP962-Ammonium Persulphate Powder	Powder / 40 g	56P096240
Phosphate HR, Ortho Reagent Set	1 Pieces	56R019090

The following accessories are required.

Accessories	Packaging Unit	Part Number
Stirring rod and spoon	1 Pieces	56A006601

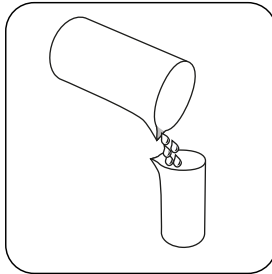
Preparation

1. Strongly buffered samples or samples with extreme pH values should be adjusted to between pH 6 and pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).
2. Prior digestion is required for the analysis of Polyphosphate and total phosphate.

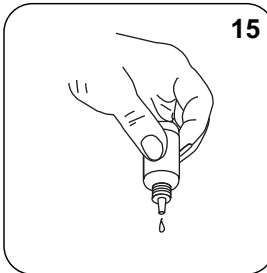
Remarks

1. Reagents and accessories available on request.

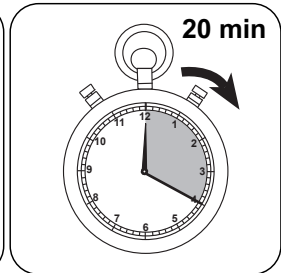
Digestion Polyphosphate HR with liquid reagents



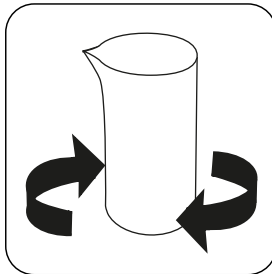
Fill a suitable digestion vessel with **50 mL homogenised sample**.



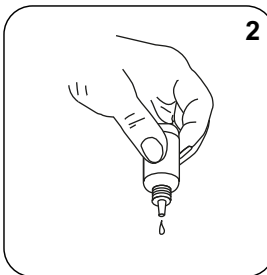
Add **15 drops KS278 (50% sulfuric acid)**.



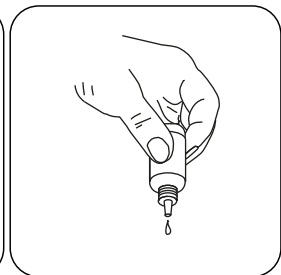
Boil the sample for **20 minutes**. A sample volume of about 25 mL should be retained; If necessary, fill with deionised water.



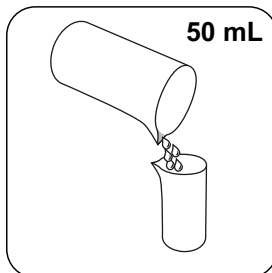
Invert the vial and allow to cool to room temperature.



Add **2 drops Acidity / Alkalinity P Indicator PA1**.

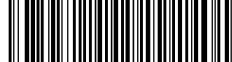


Add **Hardness Calcium Buffer CH2** drop by drop to the same sample until colouration turns from light pink to red. **(Note: make sure to swirl the vial after adding each drop!)**

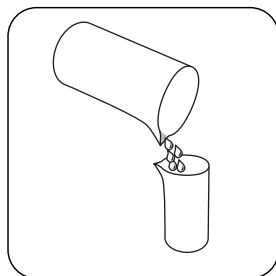


Fill the sample with **deionised water to 50 mL**.

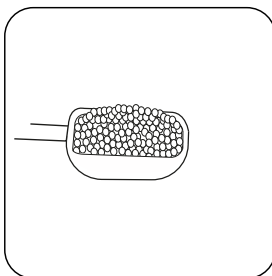
EN



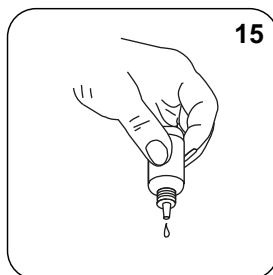
Digestion total Phosphate HR with with liquid reagents



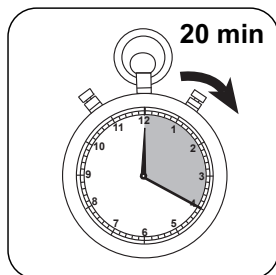
Fill a suitable digestion vessel with **50 mL** homogenised sample.



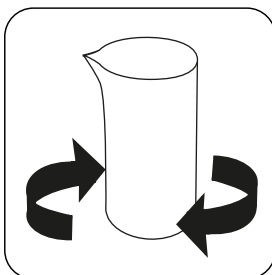
Add a measuring scoop **KP962 (Ammonium Persulfate Powder)** .



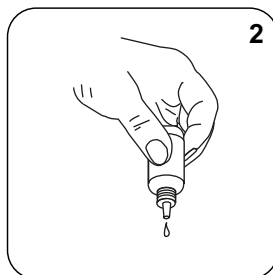
Add **15 drops KS278 (50% sulfuric acid)**.



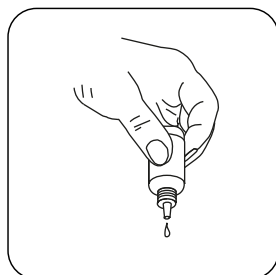
Boil the sample for **20 minutes** . A sample volume of about 25 mL should be retained; If necessary, fill with deionised water.



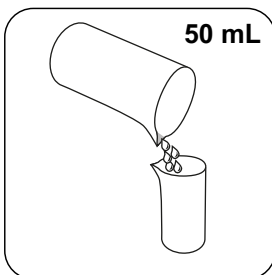
Invert the vial and allow to cool to room temperature.



Add **2 drops Acidity / Alkalinity P Indicator PA1**.



Add **Hardness Calcium Buffer CH2** drop by drop to the same sample until colouration turns from light pink to red. **(Note: make sure to swirl the vial after adding each drop!)**

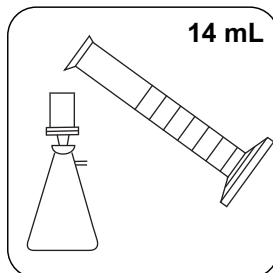


Fill the sample with **deionised water to 50 mL** .

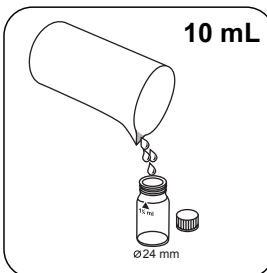
Determination of Phosphate HR with fluid reagent

Select the method on the device.

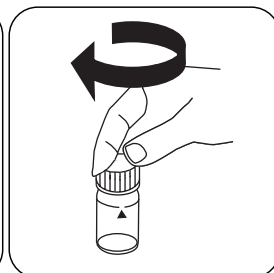
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



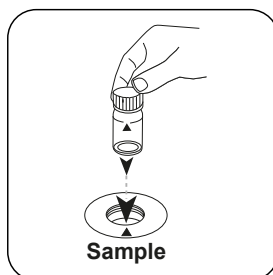
Filter approx. 14 mL sample with a pre-rinsed filter (pore size 0.45 µm).



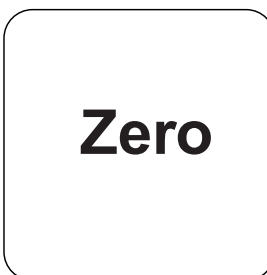
Fill 24 mm vial with **10 mL prepared sample**.



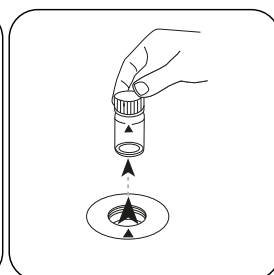
Close vial(s).



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

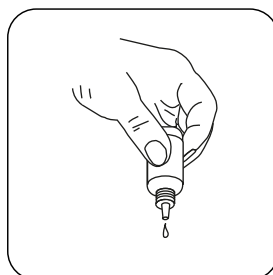


Press the **ZERO** button.

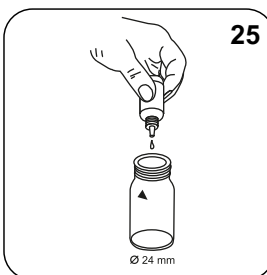


Remove the vial from the sample chamber.

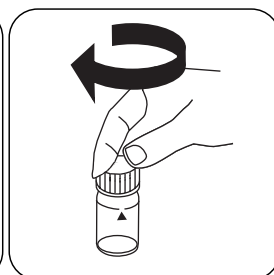
For devices that require **no ZERO measurement**, start here.



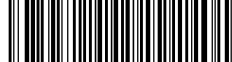
Hold cuvettes vertically and add equal drops by pressing slowly.



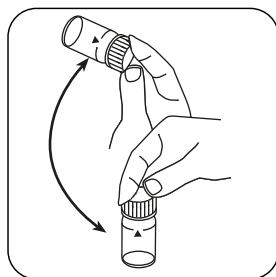
Add **25 drops KS228 (Ammonium Molybdate)**.



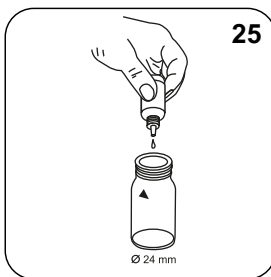
Close vial(s).



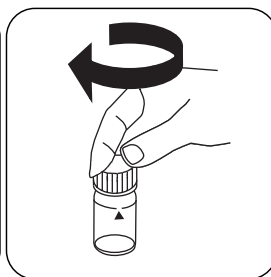
EN



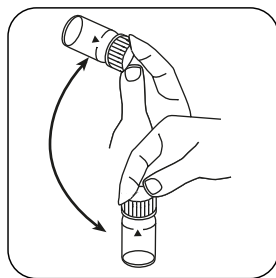
Invert several times to mix the contents.



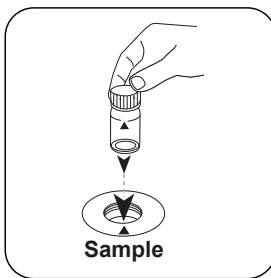
Add **25 drops KS229 (Ammonium Metavanadate)**.



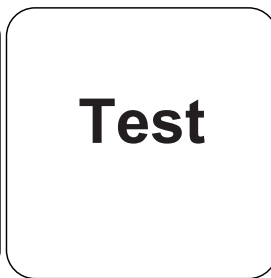
Close vial(s).



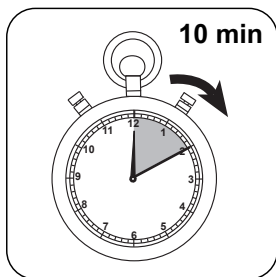
Invert several times to mix the contents.



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



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



Wait for **10 minute(s)**
reaction time.

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

The result in mg/L Phosphate appears on the display.

Determination of Polyphosphate with liquid reagents

Select the method on the device.

For testing of **Polyphosphate HR with liquid reagents**, carry out the described **digestion**.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

This test determines the content of inorganic total phosphate. The Polyphosphate content arises from the difference between inorganic and ortho phosphate.

The test for total Phosphate LR with liquid reagents runs just as the test under Method 335, Phosphate HR with liquid reagents.

The result in mg/L anorganic Total Phosphate (ortho-Phosphate and Polyphosphate) appears on the display.

Determination of total Phosphate with liquid reagents

Select the method on the device.

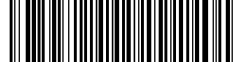
For testing of **total Phosphate HR with liquid reagents**, carry out the described **digestion**.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

This test determines all compounds of phosphorus present in the sample, including ortho-phosphate, polyphosphate, and organic phosphorus compounds.

The test for total Phosphate HR with liquid reagent runs just as the test under Method 335, Phosphate HR with liquid reagent.

The result in mg/L total Phosphate 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	P	1
mg/l	PO ₄ ³⁻	3.066177
mg/l	P ₂ O ₅	2.29137

EN

Chemical Method

Vanadomolybdate

Appendix

Interferences

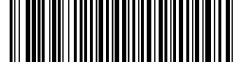
Persistent Interferences

- Large amounts of unresolved substances can cause non-reproducible measurement results.

Interference	from / [mg/L]
Al	200
AsO ₄ ³⁻	in all quantities
Cr	100
Cu	10
Fe	100
Ni	300
SiO ₂	50
Si(OH) ₄	10
S ²⁻	in all quantities
Zn	80

According to

Standard Method 4500-P E



Polyacrylate L

M338

1 - 30 mg/L Polyacryl

POLY

Turbidity

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Cartouche C18	1 Pieces	56A020101
KS173-P2-2,4 Dinitrophenol Indicator	65 mL	56L017365
QAC Buffer QA2	65 mL	56L018365
Polyacrylate L Reagent Set	1 Pieces	56R019165
KS336-Propan-2-ol, 65 mL	65 mL	56L033665

Preparation

• Preparing the cartridge:

1. Remove the plunger from a suitable syringe. Attach the C18 cartridge to the syringe cylinder.
2. Add 5 ml of KS336 (propane-2-ol) to the syringe cylinder.
3. Using the plunger, press the solvent by drop through the cartridge.
4. Remove the solvent that has passed through.
5. Remove the plunger again. Fill the syringe cylinder with 20 ml of deionised water.
6. With the help of the plunger, press the contents through the cartridge drop by drop.
7. Discard the deionised water that has flowed through.
8. The cartridge is now ready for use.

Remarks

1. If little or no turbidity is present at correct dose concentrations, the sample will need a pre-concentration step in order to detect this level of polyacrylate/polymer.
2. Anomalous results occur when interferences are present as part of the sample components or from sample contaminants. In this case, the interference will need to be eliminated.
3. This test has been calibrated using polyacrylic acid 2'100 sodium salt in the range 1-30 mg/L. Other polyacrylates/polymers will give differing responses and therefore the test range will vary.

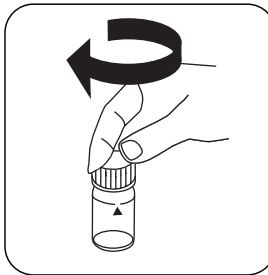
Determination of Polyacrylate with liquid reagent

Select the method on the device.

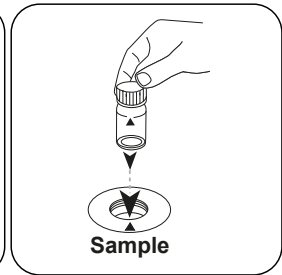
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



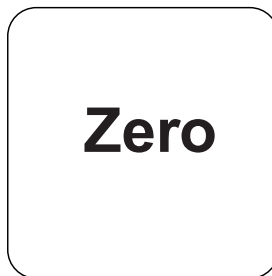
Fill 24 mm vial with **10 mL sample**.



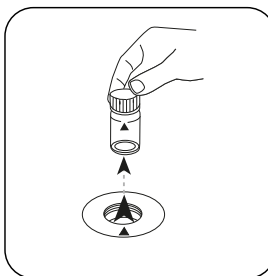
Close vial(s).



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

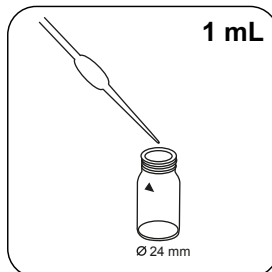


Press the **ZERO** button.

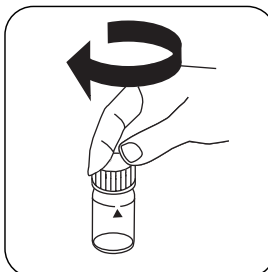


Remove the vial from the sample chamber.

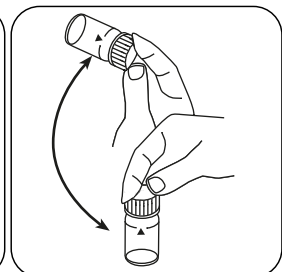
For devices that require **no ZERO measurement**, start here.



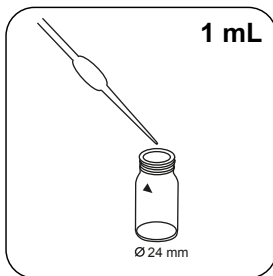
Place **1 mL (25 drops) Polyacrylate Buffer A1 solution** in the sample cuvette.



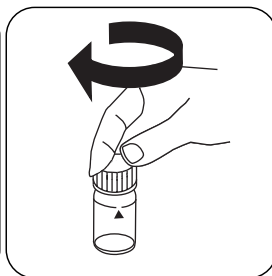
Close vial(s).



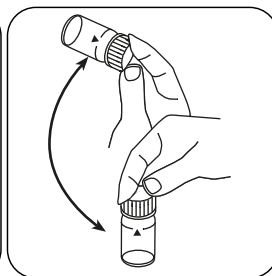
Invert several times to mix the contents.



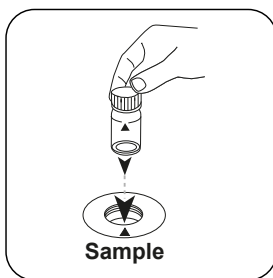
Place **1 mL (25 drops)** Polyacrylate Precipitant A2 solution in the sample cuvette.



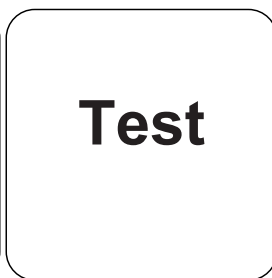
Close vial(s).



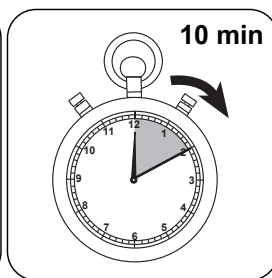
Invert several times to mix the contents.



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



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



Wait for **10 minute(s)** reaction time.

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

The result in mg/L Polyacryl acid 2100 sodium salt appears on the display.



Chemical Method

Turbidity

Appendix

Bibliography

W.B. Crummett, R.A. Hummel (1963), The Determination of Polyacrylamides in Water, American Water Works Association, 55 (2), pp. 209-219

EN

**Potassium T****M340****0.7 - 16 mg/L K****Tetraphenylborat Turbidity**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Potassium-T	Tablet / 100	515670BT
Potassium-T	Tablet / 250	515671BT

Remarks

1. Potassium causes a finely distributed turbidity with a milky appearance. Individual particles are not attributable to the presence of Potassium.

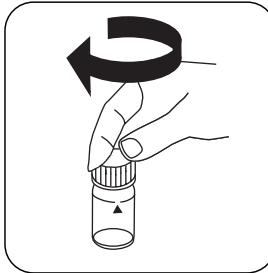
Determination of Potassium with Tablet

Select the method on the device.

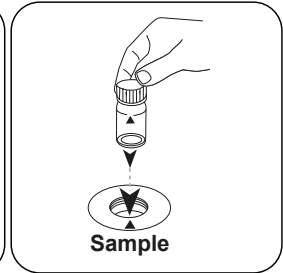
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



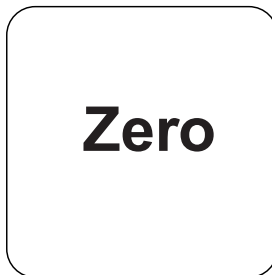
Fill 24 mm vial with **10 mL sample**.



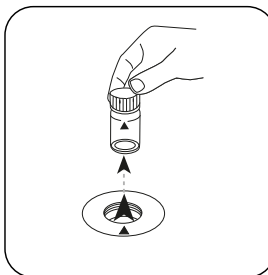
Close vial(s).



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

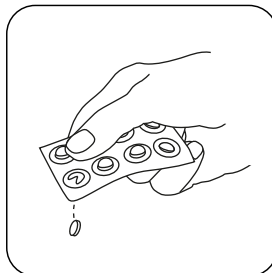


Press the **ZERO** button.

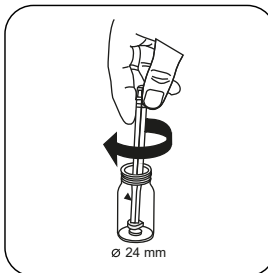


Remove the vial from the sample chamber.

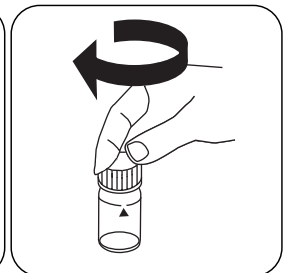
For devices that require **no ZERO measurement**, start here.



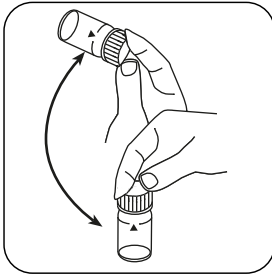
Add **POTASSIUM T** tablet.



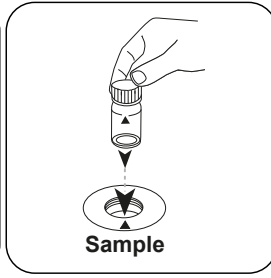
Crush tablet(s) by rotating slightly.



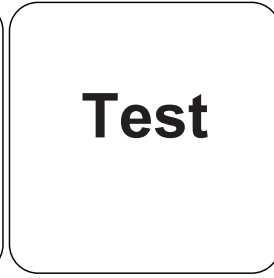
Close vial(s).



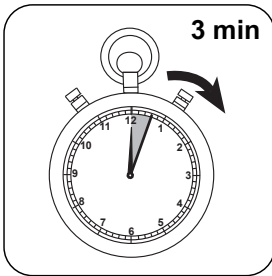
Dissolve tablet(s) by inverting.



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



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



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

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



Chemical Method

Tetraphenylborat Turbidity

Appendix

Method Validation

Limit of Detection	0.04 mg/L
Limit of Quantification	0.13 mg/L
End of Measuring Range	16 mg/L
Sensitivity	6.11 mg/L / Abs
Confidence Intervall	0.54 mg/L
Standard Deviation	0.24 mg/L
Variation Coefficient	2.89 %

Bibliography

R.T. Pflaum, L.C. Howick (1956), Spectrophotometric Determination of Potassium with Tetraphenylborate, *Anal. Chem.*, 28 (10), pp. 1542-1544

EN



Silicate T

M350

0.05 - 4 mg/L SiO₂

Si

Silicomolybdenum Blue

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Silica No. 1	Tablet / 100	513130BT
Silica No. 1	Tablet / 250	513131BT
Silica No. 2	Tablet / 100	513140BT
Silica No. 2	Tablet / 250	513141BT
Silica PR	Tablet / 100	513150BT
Silica PR	Tablet / 250	513151BT
Set Silica No. 1/No. 2 100 Pc.#	100 each	517671BT
Set Silica No. 1/No. 2 250 Pc.#	250 each	517672BT

Remarks

1. The tablets must be added in the correct sequence.

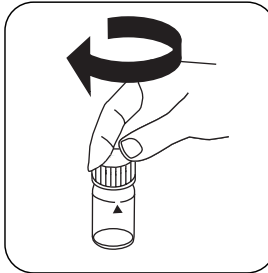
Determination of Silicon Dioxide with Tablet

Select the method on the device.

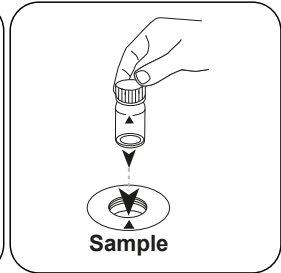
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



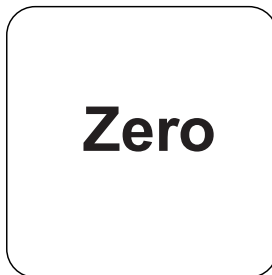
Fill 24 mm vial with **10 mL sample**.



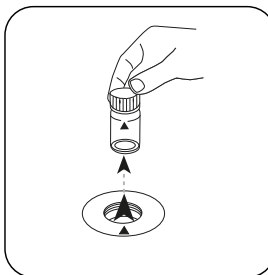
Close vial(s).



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

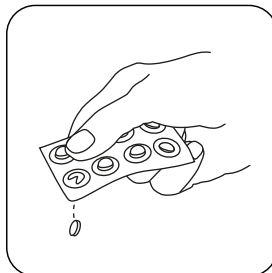


Press the **ZERO** button.

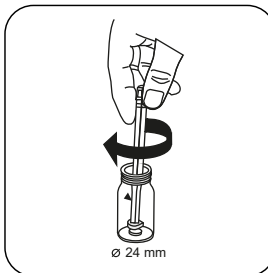


Remove the vial from the sample chamber.

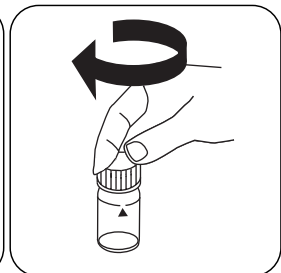
For devices that require **no ZERO measurement**, start here.



Add **SILICA No. 1 tablet**.



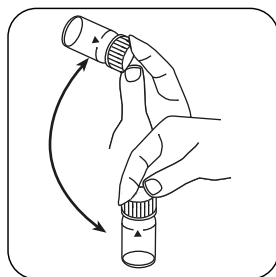
Crush tablet(s) by rotating slightly.



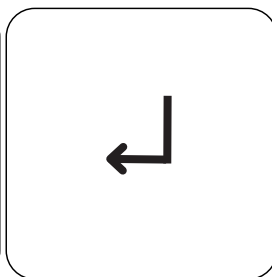
Close vial(s).



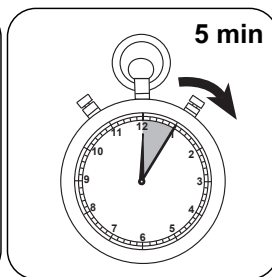
EN



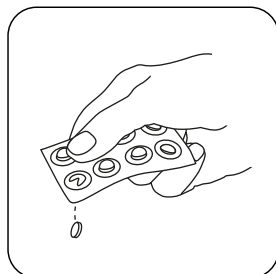
Dissolve tablet(s) by inverting.



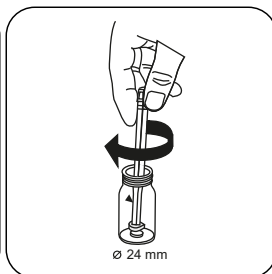
Press the **ENTER** button.



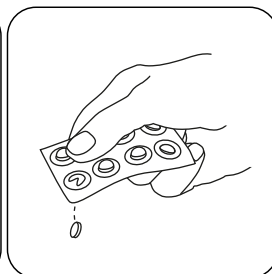
Wait for **5 minute(s)** reaction time.



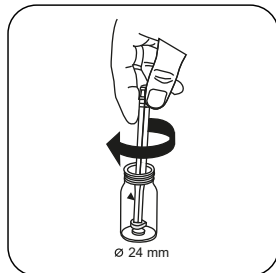
Add **SILICA PR** tablet.



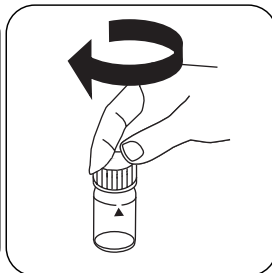
Crush tablet(s) by rotating slightly.



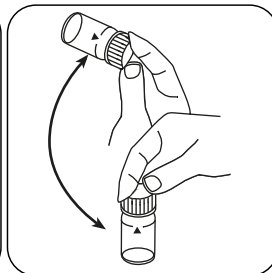
Add **SILICA No. 2** tablet .



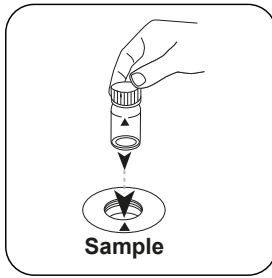
Crush tablet(s) by rotating slightly.



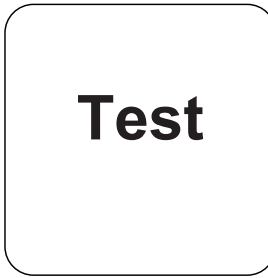
Close vial(s).



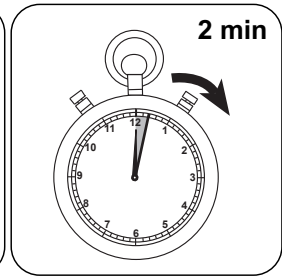
Dissolve tablet(s) by inverting.



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



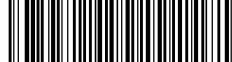
Press the **TEST** (XD: **START**) button.



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

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

The result in mg/L Silica 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	SiO ₂	1
mg/l	Si	0.47

EN

Chemical Method

Silicomolybdenum Blue

Appendix

Interferences

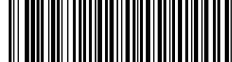
Removeable Interferences

- Phosphate does not interfere under the reaction conditions.

Derived from

Standard Method 4500-SiO₂ C

* including stirring rod, 10 cm



Silicate LR PP

M351

0.1 - 1.6 mg/L SiO₂

SiLr

Heteropolyblue

EN

Material

Required material (partly optional):

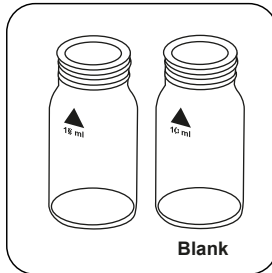
Reagents	Packaging Unit	Part Number
VARIO Silica LR, Set F10	1 Set	535690

Remarks

1. The given reaction time of 4 minutes refers to a sample temperature of 20 °C. At a sample temperature of 30 °C, a reaction time is 4 minutes and at 10 °C, a reaction time of 8 minutes.

Determination of Silicon dioxide LR with Vario Powder Packs and liquid reagent

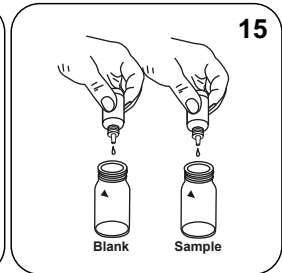
Select the method on the device.



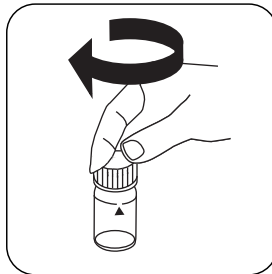
Prepare two clean 24 mm vials. Mark one as a blank.



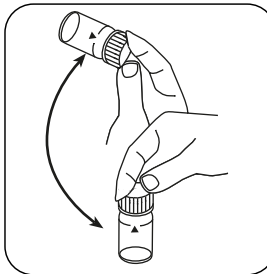
Place **10 mL sample** in each vial.



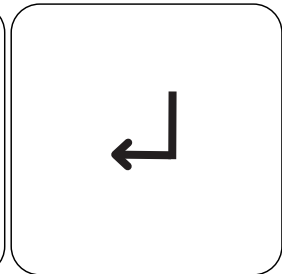
Add **15 drops Vario Molybdate 3 Reagenz-solution** to each vial.



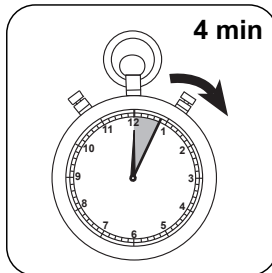
Close vial(s).



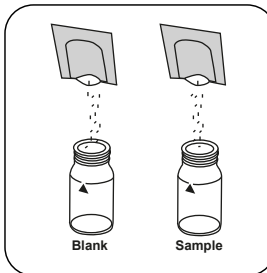
Invert several times to mix the contents.



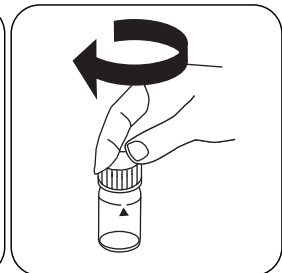
Press the **ENTER** button.



Wait for **4 minute(s) reaction time**.



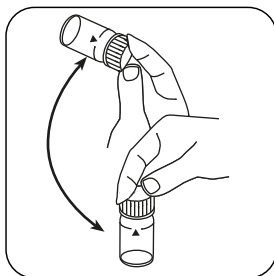
Add a **Vario Silica Citric Acid F10 powder pack** in each vial.



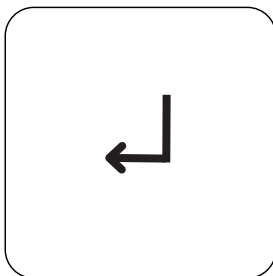
Close vial(s).



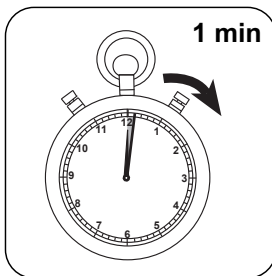
EN



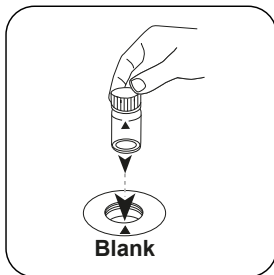
Swirl around to dissolve the powder.



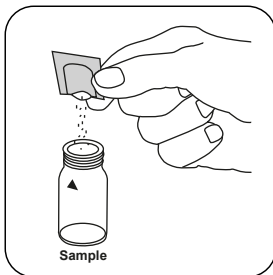
Press the **ENTER** button.



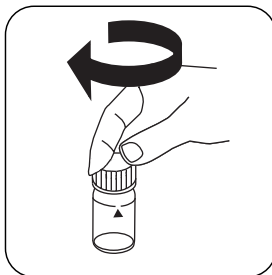
Wait for **1 minute(s) reaction time**.



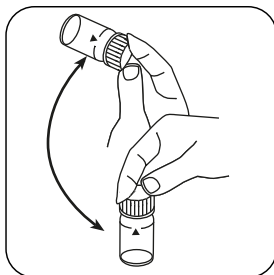
Place **blank** in the sample chamber. Pay attention to the positioning.



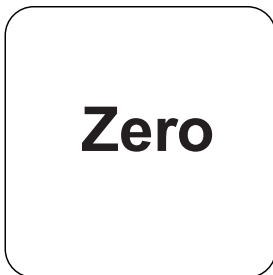
Add a **Vario Silica Amino Acid F10 powder pack** to the sample vial.



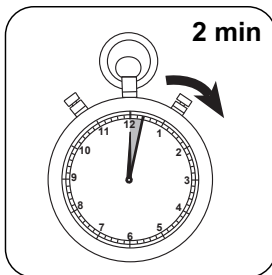
Close vial(s).



Swirl around to dissolve the powder.

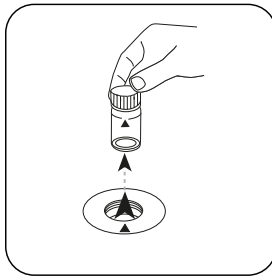


Press the **ZERO** button.



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

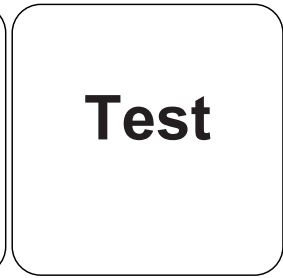
Once the reaction period is finished, the measurement takes place automatically.



Remove the vial from the sample chamber.



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



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

The result in mg/L Silica 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	SiO ₂	1
mg/l	Si	0.47

EN

Chemical Method

Heteropolyblue

Appendix

Interferences

Removeable Interferences

1. Close the vials with the cap immediately after adding the Vario Molybdate 3 reagent solution, otherwise low readings may result.
2. Occasionally water samples contain forms of silica which reacts very slowly with Molybdate. The nature of these forms is not known. A pre-treatment with Sodium hydrogencarbonate and then with Sulphuric Acid will make these forms reactive to Molybdate (pre-treatment is given in "Standard Methods for the Examination of Water and Wastewater" under "Silica Digestion with Sodium Bicarbonate").

Interference	from / [mg/L]
Fe	large quantities
PO ₄ ³⁻	50
S ²⁻	in all quantities

Method Validation

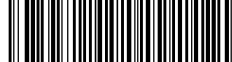
Limit of Detection	0.01 mg/L
Limit of Quantification	0.03 mg/L
End of Measuring Range	1.6 mg/L
Sensitivity	1.35 mg/L / Abs
Confidence Intervall	0.01 mg/L
Standard Deviation	0.004 mg/L
Variation Coefficient	0.46 %



Derived from

Standard Method 4500-SiO₂ D

EN



Silicate HR PP

M352

1 - 90 mg/L SiO₂

SiHr

Silicomolybdate

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Silica HR Reagent, Set F10	1 Set	535700

Preparation

- The temperature of the sample should be between 15 °C and 25 °C.

Remarks

- The method measures in the flank of the absorption curve of the resulting coloration. For filter photometers, the accuracy of the method can therefore be improved, if necessary, by user adjustment using a silicate standard (approx. 70 mg/L SiO₂).

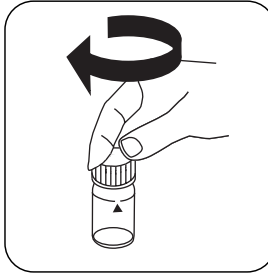
Determination of Silicate dioxide HR with Vario Powder Packs

Select the method on the device.

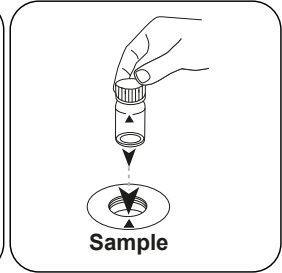
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



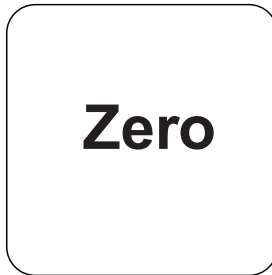
Fill 24 mm vial with **10 mL sample**.



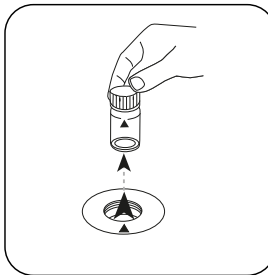
Close vial(s).



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

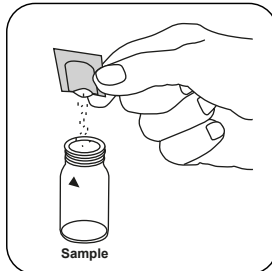


Press the **ZERO** button.

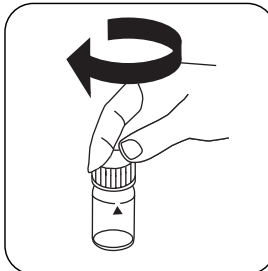


Remove the vial from the sample chamber.

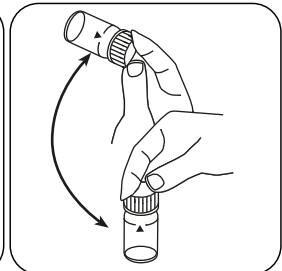
For devices that require **no ZERO measurement**, start here.



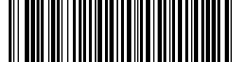
Add **Vario Silica HR Molybdate F10 powder pack**.



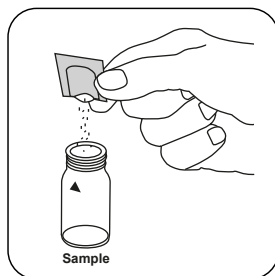
Close vial(s).



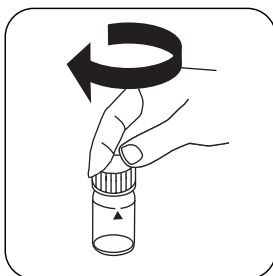
Swirl around to dissolve the powder.



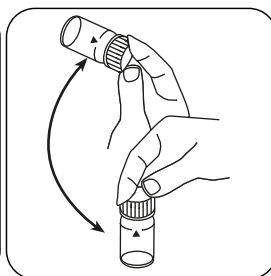
EN



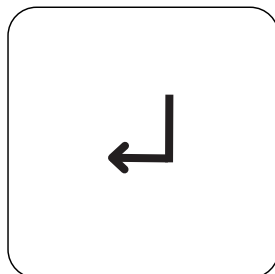
Add **Vario Silica HR Acid Rgt. F10 powder pack.**



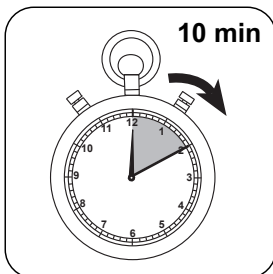
Close vial(s).



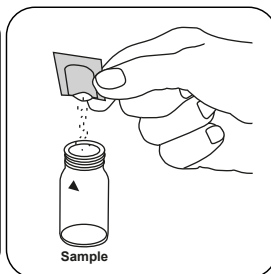
Invert several times to mix the contents.



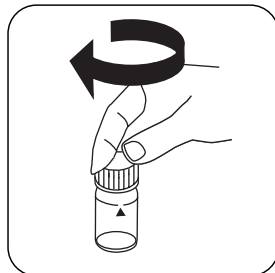
Press the **ENTER** button.



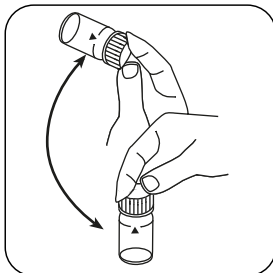
Wait for **10 minute(s)** reaction time.



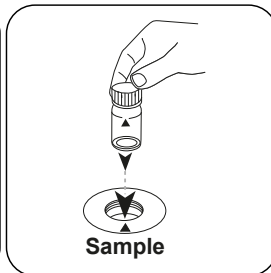
Add **Vario Silica Citric Acid F10 powder pack.**



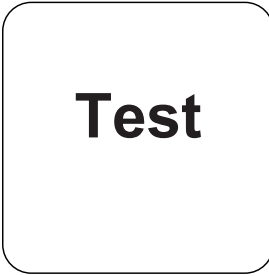
Close vial(s).



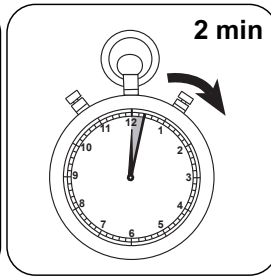
Swirl around to dissolve the powder.



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



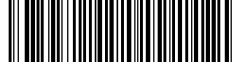
Press the **TEST** (XD:
START) button.



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

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

The result in mg/L Silica 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	SiO ₂	1
mg/l	Si	0.47

EN

Chemical Method

Silicomolybdate

Appendix

Interferences

Removeable Interferences

- Occasionally water samples contain forms of silica which reacts very slowly with Molybdate. The nature of these forms is not known. A pre-treatment with Sodium hydrogencarbonate and then with Sulphuric Acid will make these forms reactive to Molybdate (pre-treatment is given in "Standard Methods for the Examination of Water and Wastewater" under "Silica Digestion with Sodium Bicarbonate").
- If silicon dioxide or phosphate are present, a yellow colour develops. The yellow colour caused by phosphate is eliminated by the addition of silica citric acid F10 powder packets.

Interference	from / [mg/L]	Influence
Fe	large quantities	
PO ₄ ³⁻	50	
PO ₄ ³⁻	60	The disturbance is about -2 %
PO ₄ ³⁻	75	The disturbance is about -11 %
S ²⁻	in all quantities	

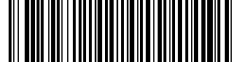


Method Validation

Limit of Detection	0.38 mg/L
Limit of Quantification	1.14 mg/L
End of Measuring Range	100 mg/L
Sensitivity	120 mg/L / Abs
Confidence Intervall	1.69 mg/L
Standard Deviation	0.70 mg/L
Variation Coefficient	1.38 %

Derived from

Standard Method 4500-SiO₂ C

**Silicate L****M353****0.1 - 8 mg/L SiO₂****Heteropolyblue**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Silica LR L	1 Pieces	56R023856
KS104-Silica Reagent 1	65 mL	56L010465
KS105-Silica Reagent 2	65 mL	56L010565
KP106-Silica Reagent 3	10 g	56P010610

Preparation

1. The measuring spoon supplied with the reagents must be used for the correct dosage.
2. To get accurate results the sample temperature must be between 20 °C and 30 °C.

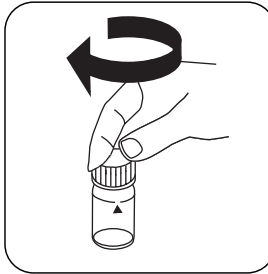
Determination of Silicon dioxide with liquid reagent

Select the method on the device.

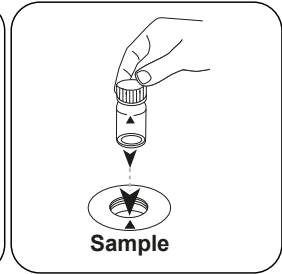
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



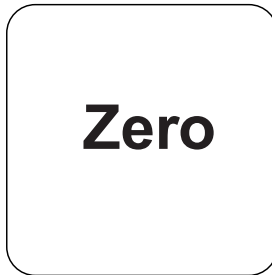
Fill 24 mm vial with **10 mL sample**.



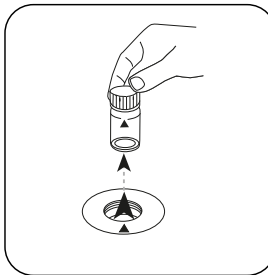
Close vial(s).



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

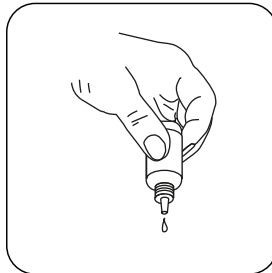


Press the **ZERO** button.

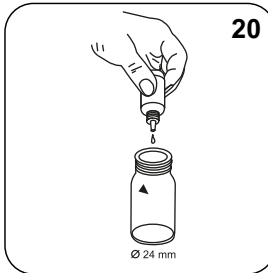


Remove the vial from the sample chamber.

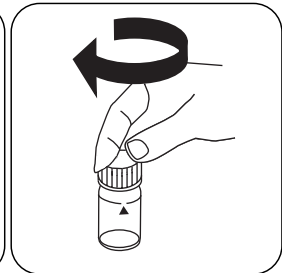
For devices that require **no ZERO measurement**, start here.



Hold cuvettes vertically and add equal drops by pressing slowly.



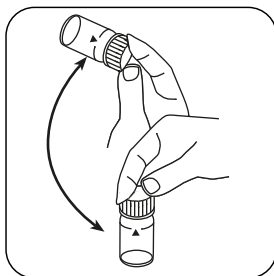
Add **20 drops KS104 (Silica Reagent 1)**.



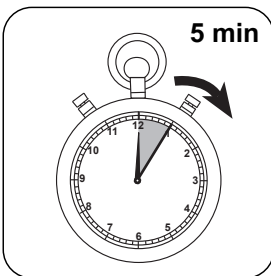
Close vial(s).



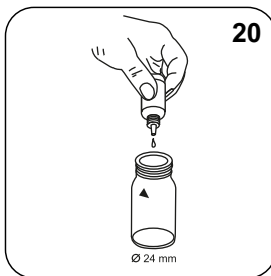
EN



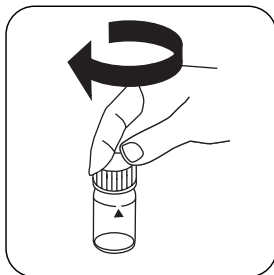
Invert several times to mix the contents.



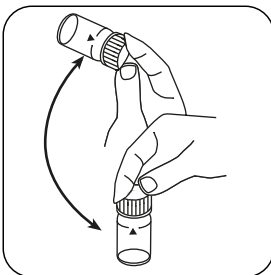
Wait for **5 minute(s)** reaction time.



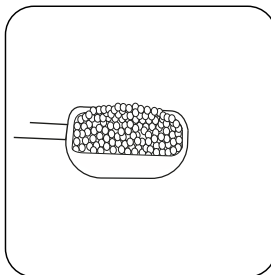
Add **20 drops** **KS105 (Silica Reagent 2)**.



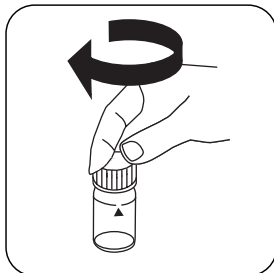
Close vial(s).



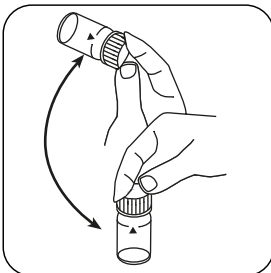
Invert several times to mix the contents.



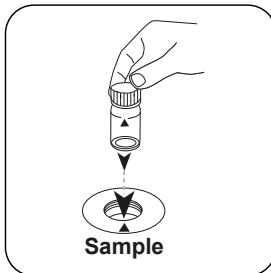
Add a **measuring scoop** **KP106 (Silica Reagent 3)**.



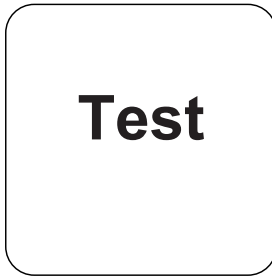
Close vial(s).



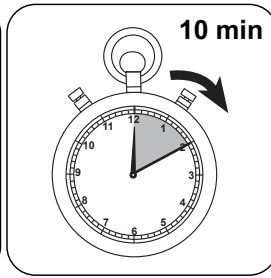
Swirl around to dissolve the powder.



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



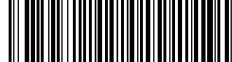
Press the **TEST** (XD:
START) button.



Wait for **10 minute(s)**
reaction time.

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

The result in mg/L Silica 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	SiO ₂	1
mg/l	Si	0.47

EN

Chemical Method

Heteropolyblue

Appendix

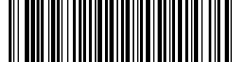
Interferences

Persistent Interferences

- At a temperature below 20 °C no complete reaction occurs, thus reducing findings are to be expected.

Derived from

Standard Method 4500-SiO₂ D

**Sulphate T****M355****5 - 100 mg/L SO₄²⁻****Bariumsulphate Turbidity**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Sulfate Turbidity	Tablet / 100	515450BT
Sulfate Turbidity	Tablet / 250	515451BT

Remarks

1. Sulphate causes a finely distributed turbidity with a milky appearance.

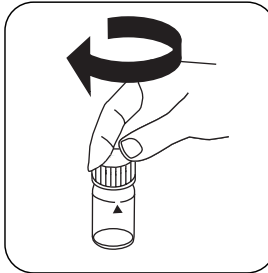
Determination of Sulphate with Tablet

Select the method on the device.

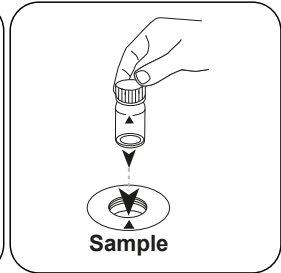
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



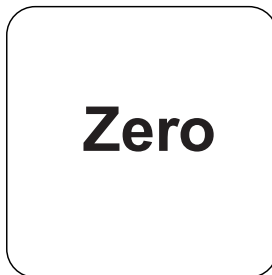
Fill 24 mm vial with **10 mL sample**.



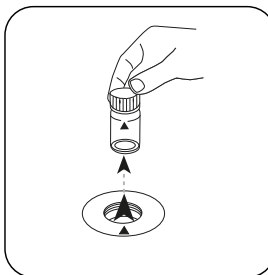
Close vial(s).



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

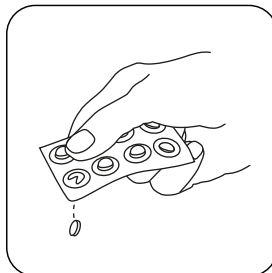


Press the **ZERO** button.

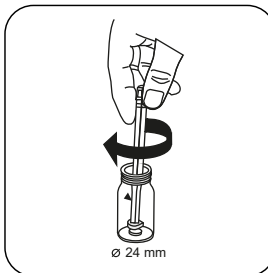


Remove the vial from the sample chamber.

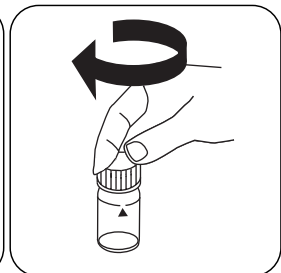
For devices that require **no ZERO measurement**, start here.



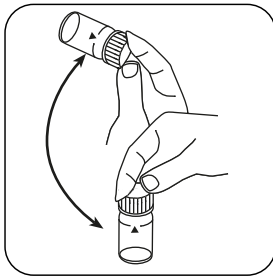
Add **SULFATE T tablet**.



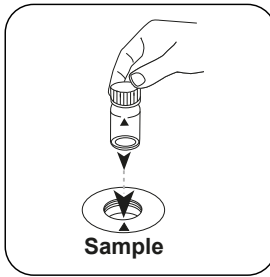
Crush tablet(s) by rotating slightly.



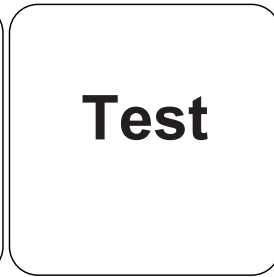
Close vial(s).



Dissolve tablet(s) by inverting.

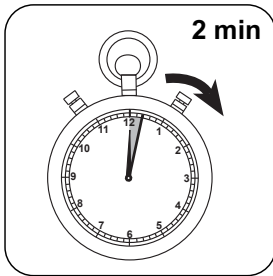


Place **sample vial** in the sample chamber. Pay attention to the positioning.



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

EN



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

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



Chemical Method

Bariumsulphate Turbidity

Appendix

Derived from

DIN ISO 15923-1 D49

EN



Sulphate PP

M360

5 - 100 mg/L SO_4^{2-}

SO4

Bariumsulphate Turbidity

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Sulfa 4 F10	Powder / 100 Pieces	532160

Remarks

1. Sulphate causes a finely distributed turbidity.

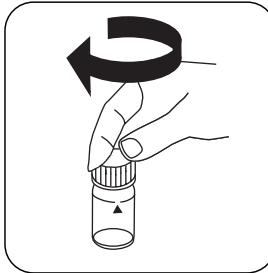
Determination of Sulphate with Vario Powder Pack

Select the method on the device.

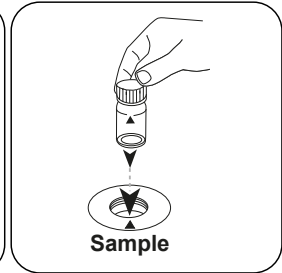
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



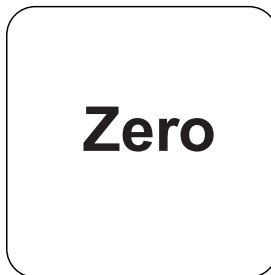
Fill 24 mm vial with **10 mL sample**.



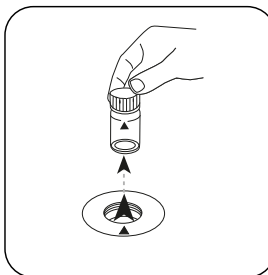
Close vial(s).



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

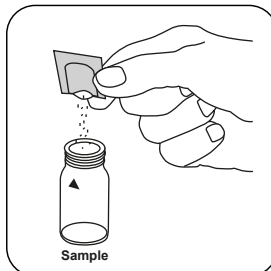


Press the **ZERO** button.

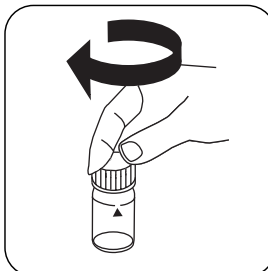


Remove the vial from the sample chamber.

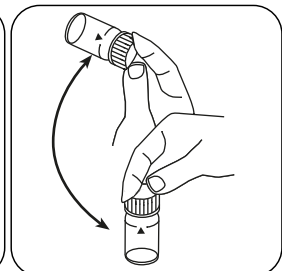
For devices that require **no ZERO measurement**, start here.



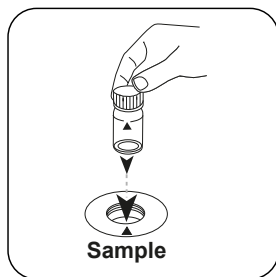
Add **Vario Sulpha 4/ F10 powder pack**.



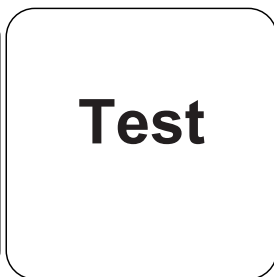
Close vial(s).



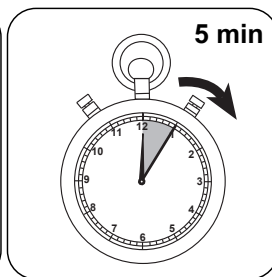
Invert several times to mix the contents.



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



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



Wait for **5 minute(s) reaction time**.

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

The result in mg/L Sulphate appears on the display.



Chemical Method

Bariumsulphate Turbidity

Appendix

According to

Standard Method 4500-SO42- E
US EPA 375.4

Derived from

DIN ISO 15923-1 D49

EN



Sulphate HR PP

M361

50 - 1000

Bariumsulphate Turbidity

Material

EN

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Sulfa 4 F10	Powder / 100 Pieces	532160
Deionised Water	250 mL	457022

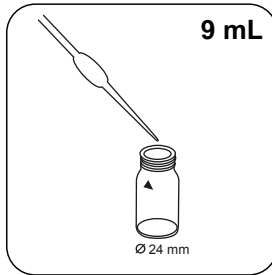
The following accessories are required.

Accessories	Packaging Unit	Part Number
Round cuvette 24 mm \varnothing , set of 5	1 Set	197629
Automatic pipette, 1-5 ml	1 Pieces	419076
Pipette tips, 1-5 ml (white) 100 pc.	1 Pieces	419066

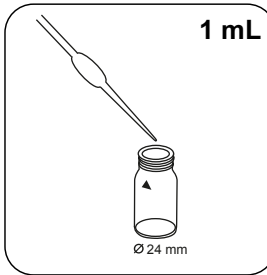
Determination of Sulphate HR with powder packs

Select the method on the device.

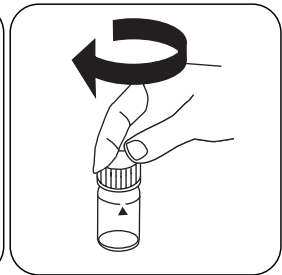
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



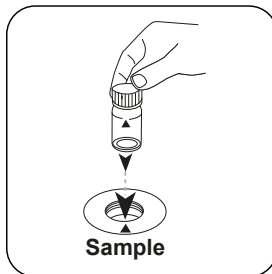
Fill 24 mm vial with **9 mL deionised water**.



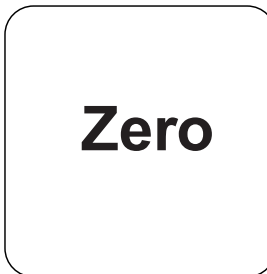
Put **1 mL sample** in the vial.



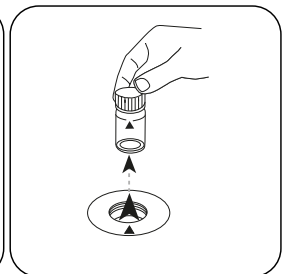
Close vial(s).



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

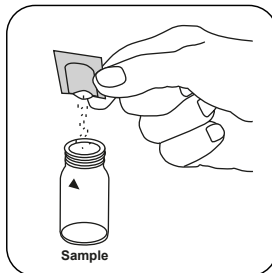


Press the **ZERO** button.

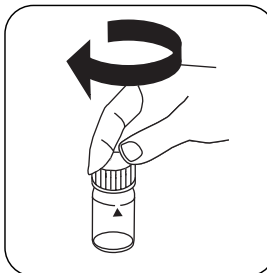


Remove the vial from the sample chamber.

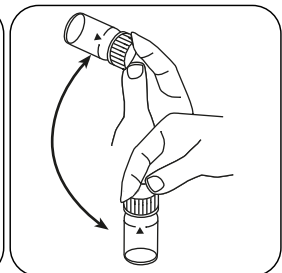
For devices that require **no ZERO measurement**, start here.



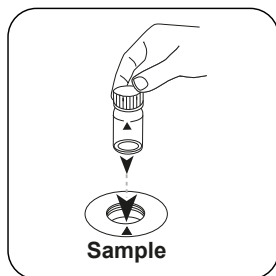
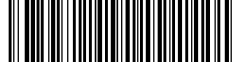
Add **Vario Sulpha 4/ F10 powder pack**.



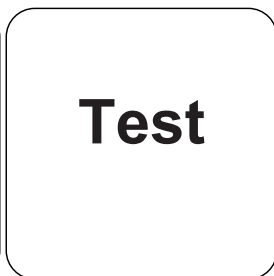
Close vial(s).



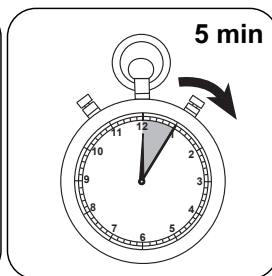
Invert several times to mix the contents.



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



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



Wait for **5 minute(s)** reaction time.

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

The result in mg/L Sulphate appears on the display.



Chemical Method

Bariumsulphate Turbidity

Method Validation

Limit of Detection	2.91 mg/L
Limit of Quantification	8.74 mg/L
End of Measuring Range	1,000 mg/L
Sensitivity	516 mg/L / Abs
Confidence Intervall	56.16 mg/L
Standard Deviation	23.22 mg/L
Variation Coefficient	4.42 %

EN



Sulphide T

M365

0.04 - 0.5 mg/L S²⁻

DPD / Catalyst

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Sulfide No. 1	Tablet / 100	502930
Sulfide No. 2	Tablet / 100	502940

Sampling

1. To avoid loss of sulphide, the sample shall be taken carefully under minimal exposure to air. Also, the test must be performed immediately after sampling.

Remarks

1. The tablets must be added in the correct sequence.

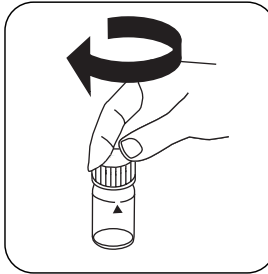
Determination of Sulphide with Tablet

Select the method on the device.

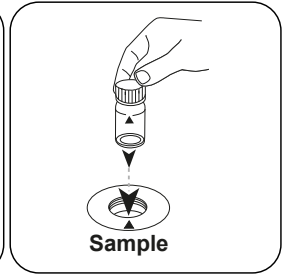
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



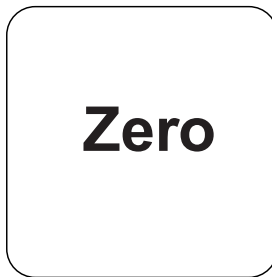
Fill 24 mm vial with **10 mL sample**.



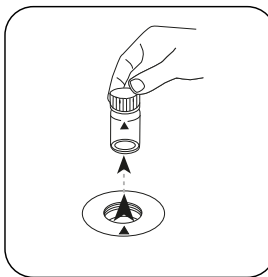
Close vial(s).



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

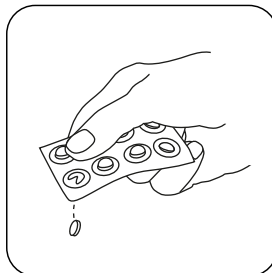


Press the **ZERO** button.

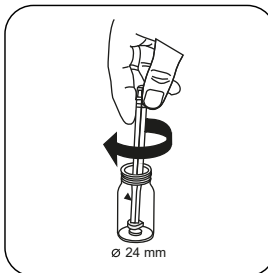


Remove the vial from the sample chamber.

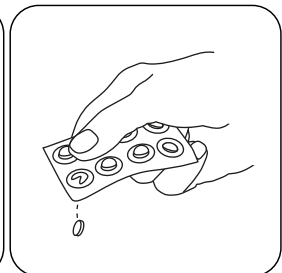
For devices that require **no ZERO measurement**, start here.



Add **SULFIDE No. 1 tablet**



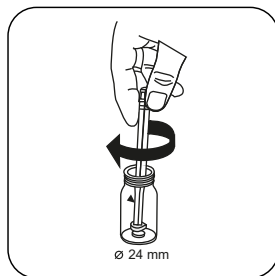
Crush tablet(s) by rotating slightly.



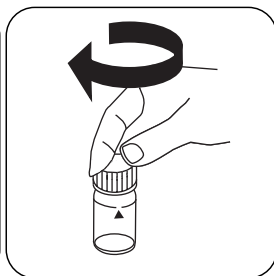
Add **SULFIDE No. 2 tablet**



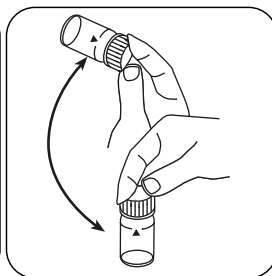
EN



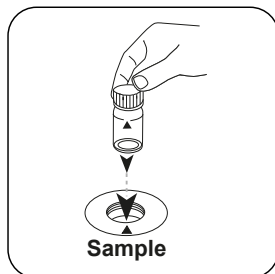
Crush tablet(s) by rotating slightly.



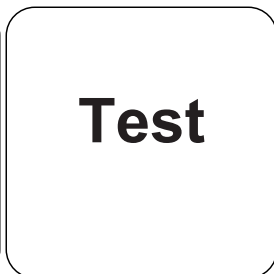
Close vial(s).



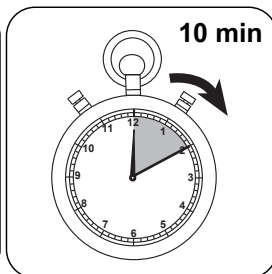
Dissolve tablet(s) by inverting.



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



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



Wait for **10 minute(s)** reaction time.

Once the reaction period is finished, the measurement takes place automatically. The result in mg/L Sulphide 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	S ²⁻	1
mg/l	H ₂ S	1.0629

EN

Chemical Method

DPD / Catalyst

Appendix

Interferences

Removeable Interferences

- Chlorine and other oxidising agents that react with DPD, do not interfere with the test
- The recommended analysis temperature is 20 ° C. Deviations from the temperature can lead to excess or may show lower results.

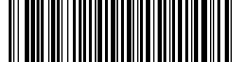
Bibliography

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989

Photometrische Analyse, Lange/ Vjedelek, Verlag Chemie 1980

Derived from

DIN 38405-D26/27

**Sulphide L****M366****8 - 1400 µg/L S²⁻****Methylene Blue**

EN

Material

Required material (partly optional):

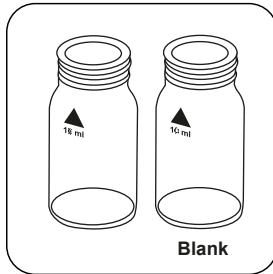
Reagents	Packaging Unit	Part Number
VARIO Sulphide Reagent Set	1 Pieces	535170
VARIO Sulphide Reagent 1	100 mL	531310
VARIO Sulphide Reagent 2	100 mL	531320

Sampling

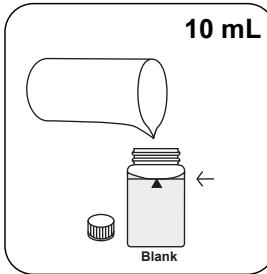
1. During sampling, exposure to air must be minimised to avoid losses.
2. The analysis must be carried out immediately after sampling.

Determination of Sulphide with VARIO liquid reagent

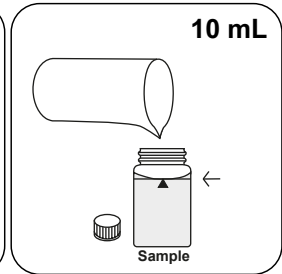
Select the method on the device.



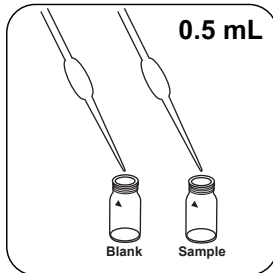
Prepare two clean 24 mm vials. Mark one as a blank.



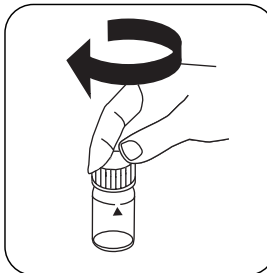
Put **10 mL deionised water** in the blank.



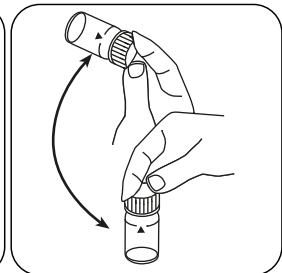
Put **10 mL sample** in the sample vial.



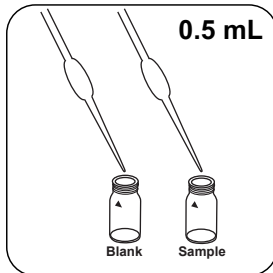
Add **0.5 mL VARIO Sulphide 1 solution** to each vial.



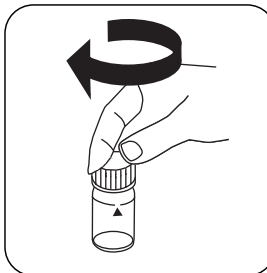
Close vial(s).



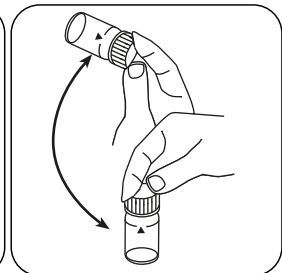
Invert several times to mix the contents.



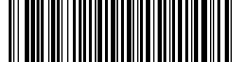
Add **0.5 mL VARIO Sulphide 2 solution** to each vial.



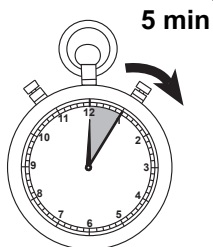
Close vial(s).



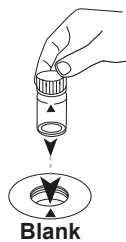
Invert several times to mix the contents.



Press the **ENTER** button.



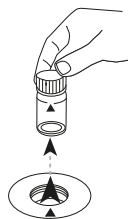
Wait for **5 minute(s)** reaction time.



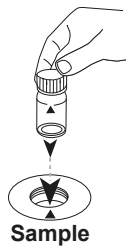
Place **blank** in the sample chamber. Pay attention to the positioning.

Zero

Press the **ZERO** button.



Remove the vial from the sample chamber.



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

Test

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

The result in **µg/L** Sulphide appears on the display.

Analyses

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

Unit	Cite form	Scale Factor
µg/l	S ²⁻	1
µg/l	H ₂ S	1.0629

EN

Chemical Method

Methylene Blue

Appendix

Interferences

Persistent Interferences

1. Strongly reducing substances can interfere with colour development.

Interference	from / [mg/L]
Ba	20

Method Validation

Limit of Detection	8 µg/L
Limit of Quantification	24 µg/L
End of Measuring Range	1400 µg/L
Sensitivity	609 µg/L/Abs
Confidence Intervall	40 µg/L
Standard Deviation	18 µg/L
Variation Coefficient	2.7%

Derived from

Standard Method 4500-S²⁻-D

**Sulphite T****M370****0.1 - 5 mg/L SO₃****DTNB**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Sulfite LR	Tablet / 100	518020BT

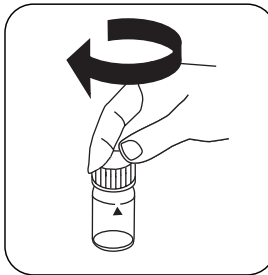
Determination of Sulphite with Tablet

Select the method on the device.

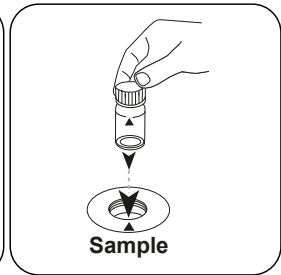
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



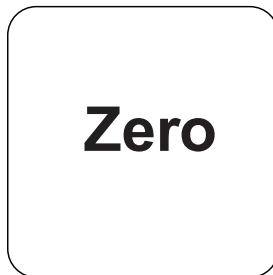
Fill 24 mm vial with **10 mL sample**.



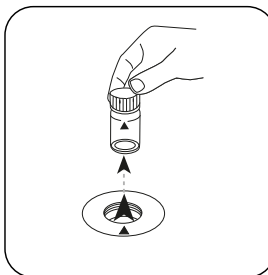
Close vial(s).



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

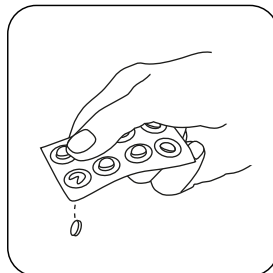


Press the **ZERO** button.

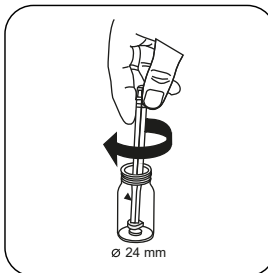


Remove the vial from the sample chamber.

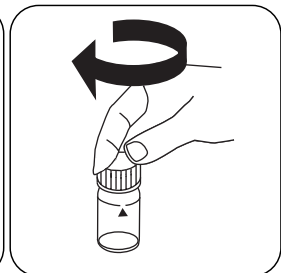
For devices that require **no ZERO measurement**, start here.



Add **SULFITE LR tablet**.



Crush tablet(s) by rotating slightly.



Close vial(s).



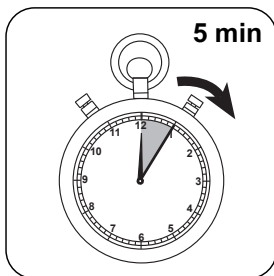
Dissolve tablet(s) by inverting.



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



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



Wait for **5 minute(s) reaction time**.

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

The result in mg/L Sulphite 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	SO ₃ ²⁻	1
mg/l	Na ₂ SO ₃	1.5743

EN

Chemical Method

DTNB

Appendix

Method Validation

Limit of Detection	0.04 mg/L
Limit of Quantification	0.118 mg/L
End of Measuring Range	6.0 mg/L
Sensitivity	2.815 mg/L / Abs
Confidence Intervall	0.081 mg/L
Standard Deviation	0.033 mg/L
Variation Coefficient	1.41 %

Bibliography

R.E. Humphrey, M.H. Ward, W. Hinze, Spectrophotometric determination of sulphite with 4,4'-dithio-dipyridine and 5,5'-dithiobis(2-nitrobenzoic acid), Anal. Chem., 1970, 42 (7), pp 698–702



Surfactants M. (anion.) TT

M376

0.05 - 2 mg/L SDSA

Methylene Blue

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Surfactants (anionic) Spectroquant 1.02552.0001 tube test ⁴⁾	25 Pieces	420763

Preparation

1. Because the reaction depends on temperature, the temperature must be maintained at 10-20 °C (for the reaction vial and the water sample).
2. Invert the vial prior to the measurement. Should the lower phase be turbid, warm the cell briefly with the hand.

Remarks

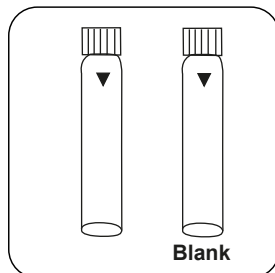
1. This method is adapted from MERCK.
2. Spectroquant® is a registered trademark of the company MERCK KGaA.
3. Appropriate safety precautions and good laboratory technique should be used during the whole procedure.
4. Before performing the test, you must read through the original instructions and safety advice that is delivered with the test kit (MSDS are available on the homepage of www.merckmillipore.com).
5. Sample volume should always be metered by using a 5ml volumetric pipette (class A).
6. The reagents are to be stored in closed containers at a temperature of +15 °C – +25 °C.
7. MBAS = **M**ethylene**b**lue**a**ctive **S**ubstances, calculated as sodium 1-dodecanesulfonate

Determination of Anionic surfactants with MERCK Spectroquant® Cell Test, No. 1.14697.0001

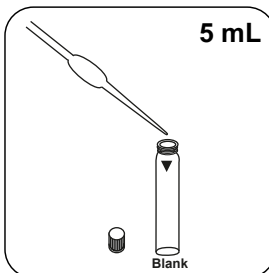
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

Skip steps with Blank.



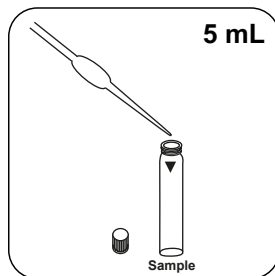
Prepare two **reaction vials**. Mark one as a blank.



Put **5 mL deionised water** in the blank.



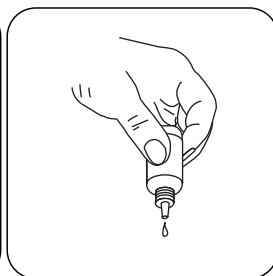
Do not mix the contents



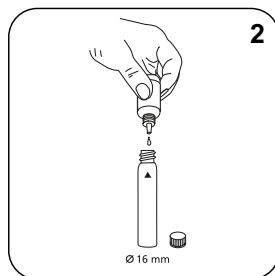
Put **5 mL sample** in the sample vial.



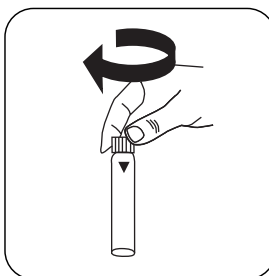
Do not mix the contents



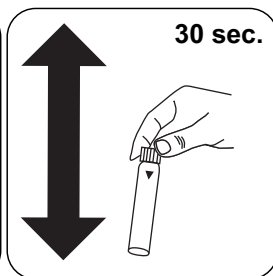
Hold cuvettes vertically and add equal drops by pressing slowly.



Add **2 drops Reagenz T-1 K solution** to each vial.

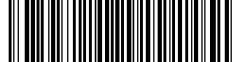


Close vial(s).

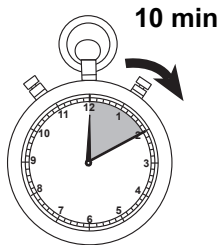


Mix the contents by shaking. (30 sec.).

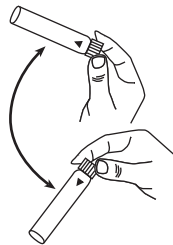
EN



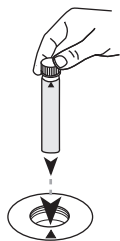
Press the **ENTER** button.



Wait for **10 minute(s)** reaction time.



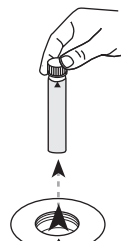
Invert **zero cuvette**.



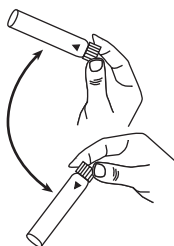
Place **blank** in the sample chamber. • Pay attention to the positioning.

Zero

Press the **ZERO** button.



Remove **vial** from the sample chamber.



Invert the **sample vial**.



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

Test

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

The result in mg/L MBAS 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	SDBS	1.28
mg/l	SDS	1.06
mg/l	SDOSSA	1.63

EN

Chemical Method

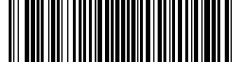
Methylene Blue

Appendix

According to

DIN EN 903:1994

^o Spectroquant® is a Merck KGaA Trademark



Surfactants M. (not ionic) TT

M377

0.1 - 7.5 mg/L Triton X-100

TBPE

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Surfactants (non ionic) Spectroquant 1.01787.0001 tube test ⁴⁾	25 Pieces	420764

Preparation

1. Before performing the test read the original test instructions (delivered with the test) and the MSDS (available at www.merckmillipore.com).
2. Appropriate safety precautions and good lab technique should be used during the whole procedure.
3. Because reaction depends on temperature, sample and tube temperature must be between 20 and 25 °C.
4. The test sample should have a pH value between 3 and 9.

Remarks

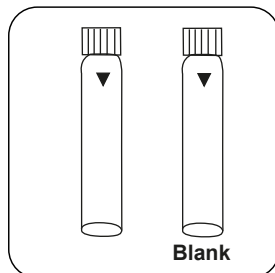
1. This method is adapted from MERCK.
2. Spektroquant® is a registered trade mark of the company MERCK KGaA.
3. Sample volume should always be metered by using volumetric pipette (class A).
4. Triton® is a registered trade mark of the company DOW Chemical Company.

Determination of Non-ionic surfactants with MERCK Spectroquant® Cell Test, No. 1.01787.0001

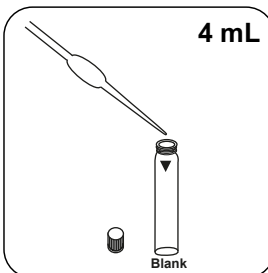
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

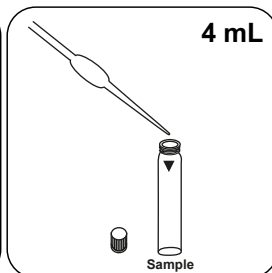
Skip steps with Blank.



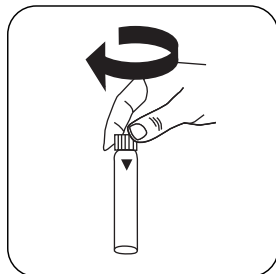
Prepare two **reaction vials**. Mark one as a blank.



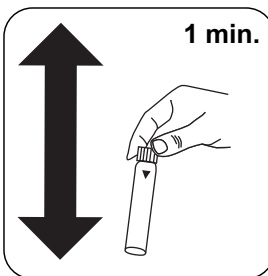
Put **4 mL deionized water** in the blank.



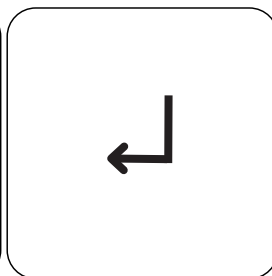
Put **4 mL sample** in the sample vial.



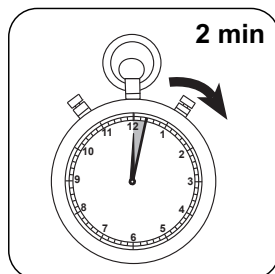
Close vial(s).



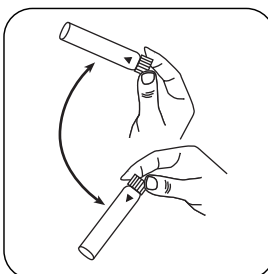
Mix the contents by shaking vigorously. (1 min.).



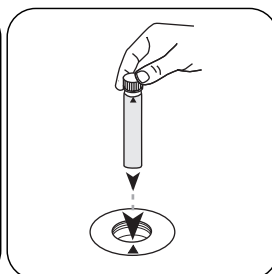
Press the **ENTER** button.



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

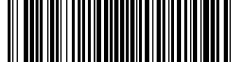


Invert **zero cuvette**.



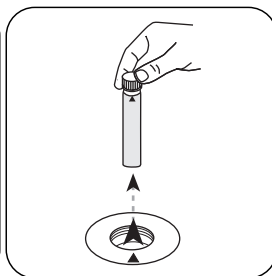
Place **blank** in the sample chamber. • Pay attention to the positioning.

EN

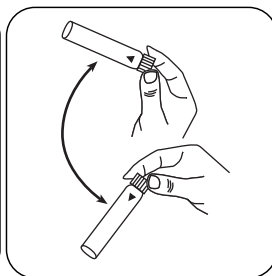


Zero

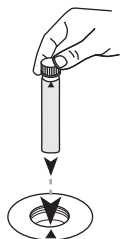
Press the **ZERO** button.



Remove **vial** from the sample chamber.



Invert the **sample vial** .



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

Test

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

The result in mg/L Triton X-100 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	NP10	1.1

Chemical Method

TBPE

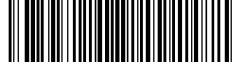
Appendix

According to

DIN EN 903:1994

^o Spectroquant[®] is a Merck KGaA Trademark

EN



Surfactants M. (cation.) TT

M378

0.05 - 1.5 mg/L CTAB

Disulphine Blue

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Surfactants (cationic) Spectroquant 1.01764.0001 tube test ⁴⁾	25 Pieces	420765

Preparation

1. Before performing the test read the original test instructions (delivered with the test) and the MSDS (available at www.merckmillipore.com).
2. Appropriate safety precautions and good lab technique should be used during the whole procedure.
3. Because reaction depends on temperature, sample and tube temperature must be between 20 and 25 °C.
4. The test sample should have a pH value between 3 and 8.

Remarks

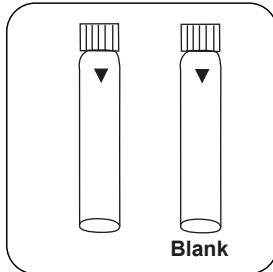
1. This method is adapted from MERCK.
2. Spektroquant® is a registered trade mark of the company MERCK KGaA.
3. Sample volume should always be metered by using volumetric pipette (class A).
4. Triton® is a registered trade mark of the company DOW Chemical Company.
5. CTAB = calculated as N-cetyl-N,N,N-trimethylammonium bromide.
6. Should the lower phase be turbid, warm the cell briefly with the hand.

Determination of Cationic surfactants with MERCK Spectroquant® Cell Test, No. 1.01764.0001

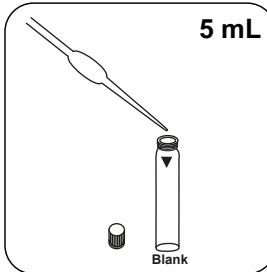
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

Skip steps with Blank.



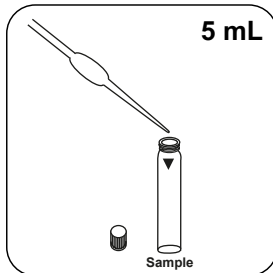
Prepare two **reaction vials**. Mark one as a blank.



Put **5 mL deionised water** in the blank.



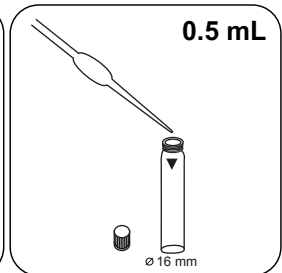
Do not mix the contents



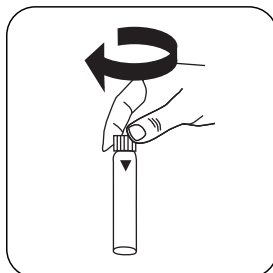
Put **5 mL sample** in the sample vial.



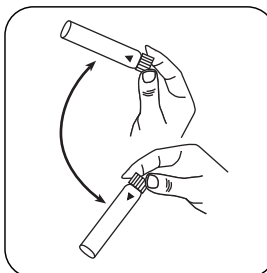
Do not mix the contents



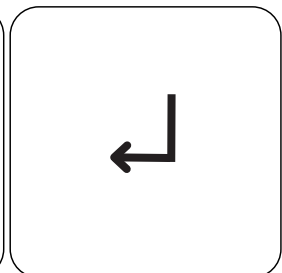
Add **0.5 mL Reagenz T-1 K**



Close vial(s).

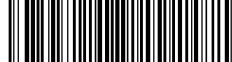


Invert several times to mix the contents (30 sec.).

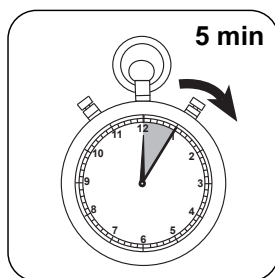


Press the **ENTER** button.

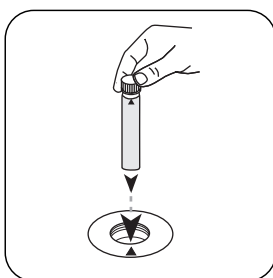
EN



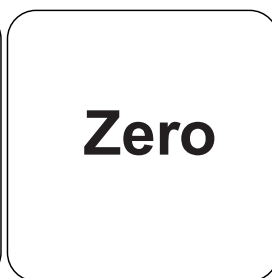
EN



Wait for **5 minute(s)** reaction time.

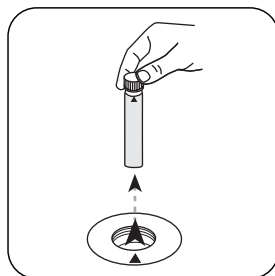


Place **blank** in the sample chamber. • Pay attention to the positioning.

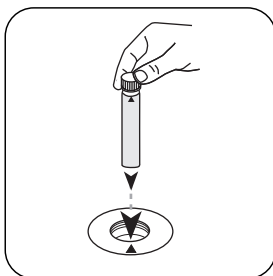


Zero

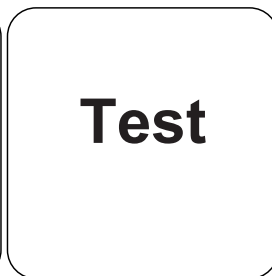
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



Test

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

The result in mg/L CTAB appears on the display.



Chemical Method

Disulphine Blue

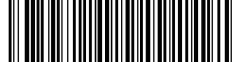
Appendix

According to

DIN EN 903:1994

^o Spectroquant® is a Merck KGaA Trademark

EN



TOC LR M. TT

M380

5 - 80 mg/L TOC^{b)}H₂SO₄ / Persulphate / Indicator

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
TOC Spectroquant 1.14878.0001 tube test ^{d)}	25 Pieces	420761

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940
Screw caps TOC	1 Set	420757

Preparation

1. Before performing the test, you must read through the original instructions and safety advice that is delivered with the test kit (MSDS are available on the homepage of www.merckmillipore.com).

Remarks

1. This method is adapted from MERCK.
2. Spectroquant[®] is a registered trademark of the company MERCK KGaA.
3. Appropriate safety precautions and good laboratory technique should be used during the whole procedure.
4. Sample volume should always be metered by using a volumetric pipette (class A).
5. TOC = Total Organic Carbon
6. Aluminium caps can be reused (see Merck).
7. Due to the greater height of the cuvettes, the lid of the measuring chamber cannot be completely closed on XD devices. This does not affect the measurement.



Determination of TOC LR with MERCK Spectroquant® Cell Test, No. 1.14878.0001

Select the method on the device.

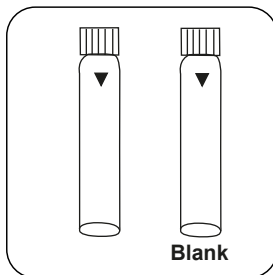
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

Skip steps with Blank.

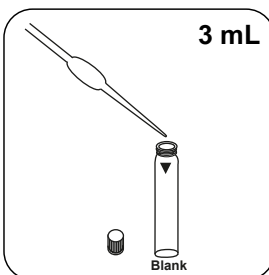
• Use two clean suitable glass vessels. • Mark one glass vessel for zeroing.

1. Put **25 mL deionised water** in the zero sample.
2. Put **25 mL sample** in the sample vessel.
3. Add **3 drops of reagent TOC-1K** and mix.
4. The pH value of the sample should be under 2.5. If necessary, add sulphuric acid.
5. Stir for **10 minutes** at a medium speed. (Magnetic stirrer, stirring stick)

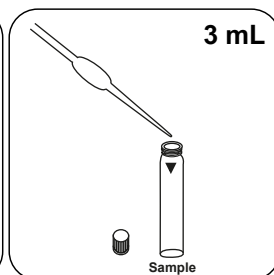
EN



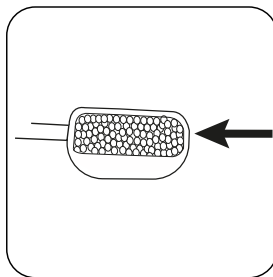
Prepare two **reaction vials**. Mark one as a blank.



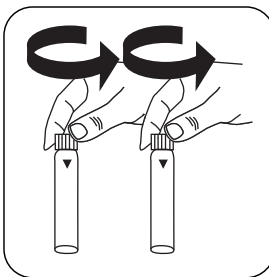
Place **3 mL of prepared zero sample** in the blank.



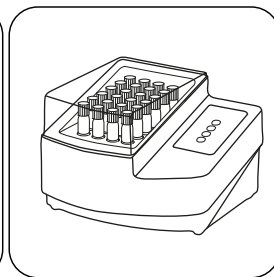
Put **3 mL sample** in the sample vial.



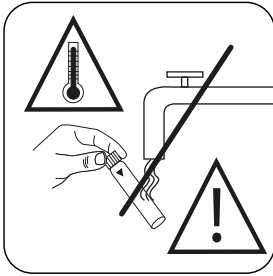
Add exactly **one level microscoop TOC-2K**.



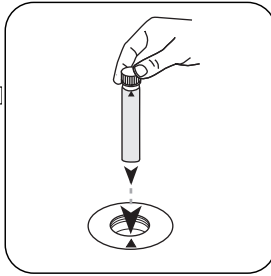
Close the vial(s) **immediately** with the aluminium caps



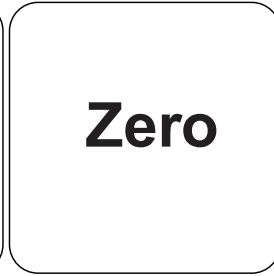
Warm vial for **120 minutes at 120 °C** in a pre-heated thermoreactor **in inverted position**.



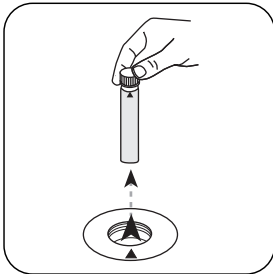
Allow vial to stand inverted for 1 hour and to cool. **Do not cool it with water!** After cooling down, rotate it and measure in the photometer **within 10 min**.



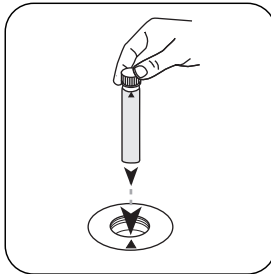
Place **blank** in the sample chamber. • Pay attention to the positioning.



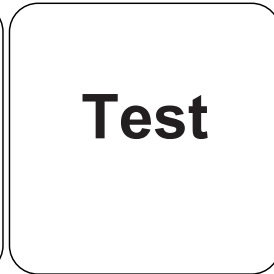
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



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

The result in mg/L TOC appears on the display.



Chemical Method

H₂SO₄ / Persulphate / Indicator

Appendix

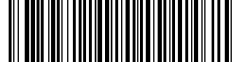
Derived from

EN 1484:1997

Standard Method 5310 C

EN

^{*)} Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C) | ^{*)} Spectroquant® is a Merck KGaA Trademark



TOC HR M. TT

M381

50 - 800 mg/L TOC^{b)}H₂SO₄ / Persulphate / Indicator

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
TOC Spectroquant 1.14879.0001 tube test ^{d)}	25 Pieces	420756

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 Pieces	2418940
Screw caps TOC	1 Set	420757

Preparation

1. Before performing the test, you must read through the original instructions and safety advice that is delivered with the test kit (MSDS are available on the homepage of www.merckmillipore.com).

Remarks

1. This method is adapted from MERCK.
2. Spectroquant[®] is a registered trademark of the company MERCK KGaA.
3. Appropriate safety precautions and good laboratory technique should be used during the whole procedure.
4. Sample volume should always be metered by using a volumetric pipette (class A).
5. TOC = Total Organic Carbon.
6. Aluminium caps can be reused (see Merck).
7. Due to the greater height of the cuvettes, the lid of the measuring chamber cannot be completely closed on XD devices. This does not affect the measurement.

Determination of TOC HR with MERCK Spectroquant® Cell Test, No. 1.14879.0001

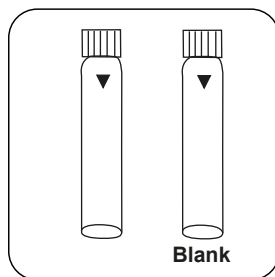
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

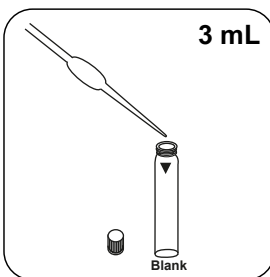
Skip steps with Blank.

• Use two clean suitable glass vessels. • Mark one glass vessel for zeroing.

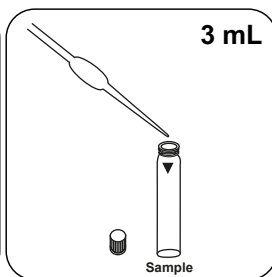
1. Put **10 mL deionised water** in the zero sample.
2. Put **1 mL sample and 9 mL deionised water** in the sample vessel and mix.
3. Add **2 drops of reagent TOC-1K** and mix.
4. The pH value of the sample should be under 2.5. If necessary, add sulphuric acid.
5. Stir for **10 minutes** at a medium speed. (Magnetic stirrer, stirring stick)



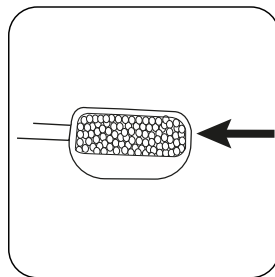
Prepare two **reaction vials**. Mark one as a blank.



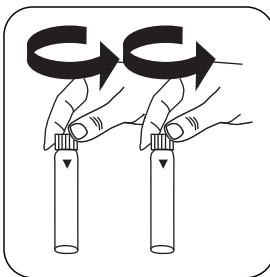
Place **3 mL of prepared zero sample** in the blank.



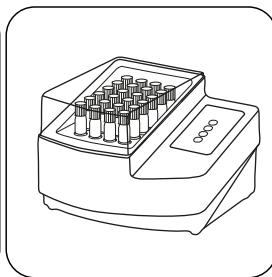
Place **3 mL of prepared sample** in the sample vial.



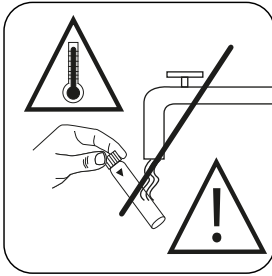
Add exactly **one level microspoon TOC-2K**.



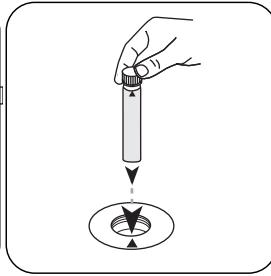
Close the vial(s) **immediately** with the aluminium caps



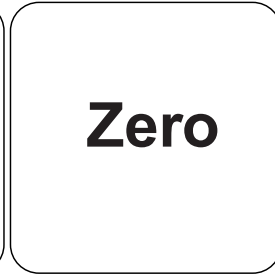
Warm vial for **120 minutes at 120 °C** in a pre-heated thermoreactor **in inverted position**.



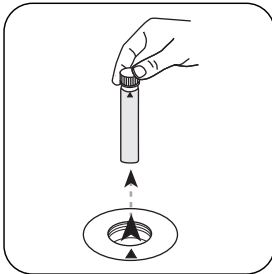
Allow vial to stand inverted for 1 hour and to cool. **Do not cool it with water!** After cooling down, rotate it and measure in the photometer **within 10 min**.



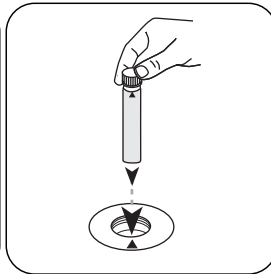
Place **blank** in the sample chamber. • Pay attention to the positioning.



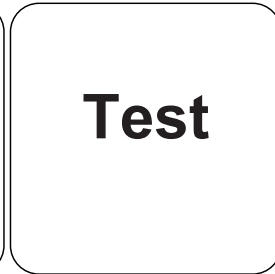
Press the **ZERO** button.



Remove **vial** from the sample chamber.



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



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

The result in mg/L TOC appears on the display.

Chemical Method

H₂SO₄ / Persulphate / Indicator

Appendix

Interferences

Interference	from / [mg/L]
Ca	1000
Mg	1000
NH ₄ -N	1000
TIC (total inorganic carbon)	250
NaCl	25
NaNO ₃	100
Na ₂ SO ₄	100

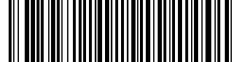
Derived from

EN 1484:1997

Standard Method 5310 C

⁸⁾ Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C) | ⁹⁾ Spectroquant® is a Merck KGaA Trademark

EN



Suspended solids 24

M384

10 - 750 mg/L TSS

SuS

Turbidity / Attenuated Radiation Method

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
no reagent required		

Sampling

1. Measure the water sample as soon as possible after sampling. It is possible to store the sample at 4 °C for 7 days in plastic or glass containers. The measurement should be at the same temperature as the sample. Temperature differences between measurement and sampling can change the result of the measurement.

Remarks

1. The photometric determination of Suspended Solids is based on a gravimetric method. In a laboratory this is usually done by evaporation of the filter residue of a filtrated water sample in a furnace at 103 °C – 105 °C and weighing of the dried residue.
2. When higher accuracy is required perform a gravimetric determination of a water sample. The result can be used to calibrate the photometer with the same water sample.
3. The estimated detection limit is 20 mg/L TSS.

Determination of Total suspended solids

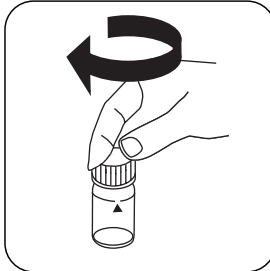
Select the method on the device.

For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500

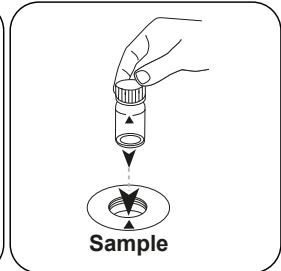
Homogenize mL of the water sample in a blender on high speed for minutes



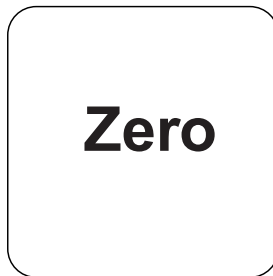
Fill 24 mm vial with **10 mL deionised water** .



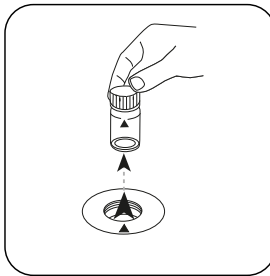
Close vial(s).



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

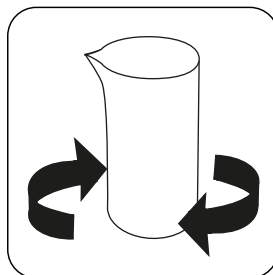


Press the **ZERO** button.

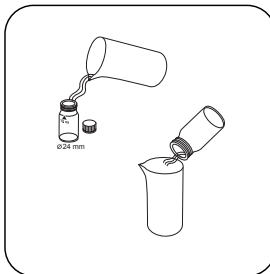


Remove the vial from the sample chamber.

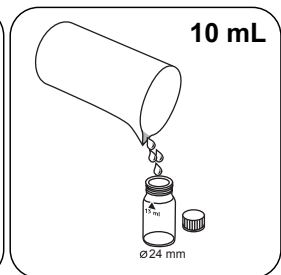
For devices that require **no ZERO measurement** , start here.



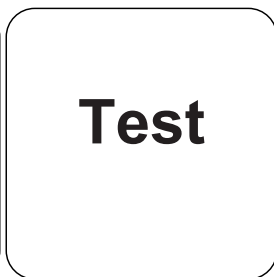
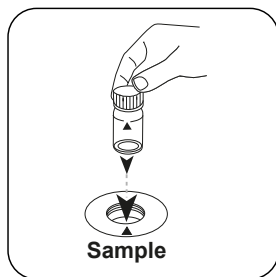
Mix homogenised water sample thoroughly.



Pre-rinse vial with water sample.



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



EN

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

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

The result in mg/L TSS (Total Suspended Solids) appears on the display.

Chemical Method

Turbidity / Attenuated Radiation Method

Appendix

Interferences

Persistent Interferences

- Colour interferes if light is absorbed at 660 nm.

Removeable Interferences

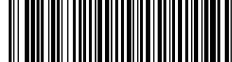
- Air bubbles interfere and can be removed by swirling the vial gently.

Method Validation

Limit of Detection	10 mg/L
Limit of Quantification	30 mg/L
End of Measuring Range	750 mg/L
Sensitivity	550 mg/L / Abs
Confidence Intervall	4.24 mg/L
Standard Deviation	1.79 mg/L
Variation Coefficient	0.47 %

Derived from

EN 872:2005



Turbidity 24

M386

10 - 1000 FAU

Attenuated Radiation Method

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
no reagent required		

Sampling

1. Measure the water sample as soon as possible after sampling. It is possible to store the sample at 4 °C for 48 hours in plastic or glass containers. The measurement should take place at the same temperature as the sample, as temperature differences between measurement and sample collection can effect the turbidity of the sample.

Remarks

1. This test uses an attenuated radiation method for the reading of Formazin Attenuation Units (FAU). The results can not be used for documenting purposes, but may be used for routine measurements because the attenuated radiation method is different from the Nephelometric method.
2. The estimated detection limit is 20 FAU.

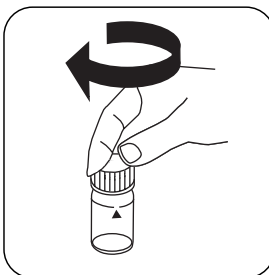
Determination of Turbidity

Select the method on the device.

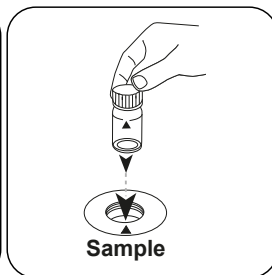
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



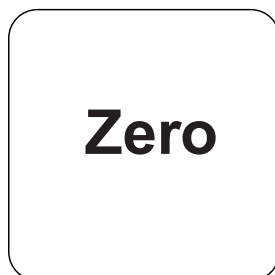
Fill 24 mm vial with **10 mL deionised water**.



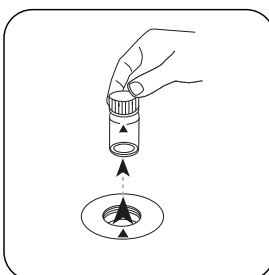
Close vial(s).



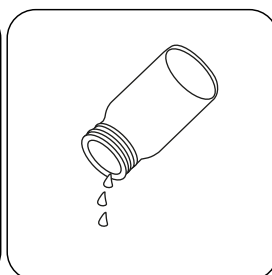
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

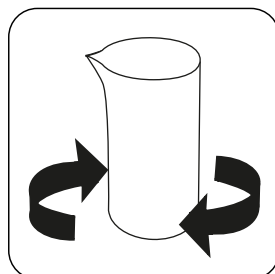


Remove the vial from the sample chamber.

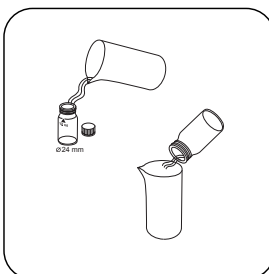


Empty vial.

For devices that require **no ZERO measurement**, start here.



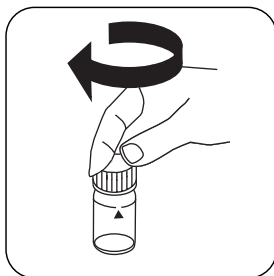
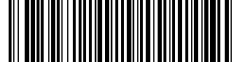
Mix water sample thoroughly.



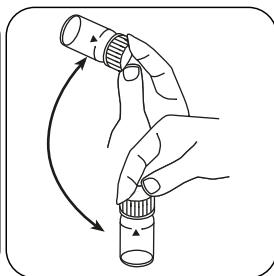
Pre-rinse vial with water sample.



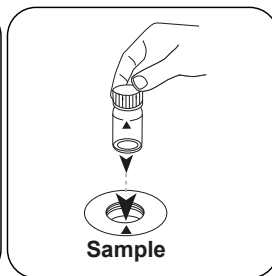
Fill 24 mm vial with **10 mL sample**.



Close vial(s).



Invert several times to mix the contents.



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

Test

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

The result in FAU appears on the display.

Chemical Method

Attenuated Radiation Method

Appendix

Interferences

Removeable Interferences

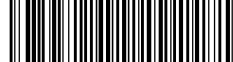
- Air bubbles interfere with turbidity measurements. These can be removed using an ultrasonic bath.
- Colour interferes if light is absorbed at 530 nm.
For strong coloured water samples a filtrated portion of the sample can be used for zeroing instead of the deionised water.

Method Validation

Limit of Detection	1.59 FAU
Limit of Quantification	4.76 FAU
End of Measuring Range	1000 FAU
Sensitivity	642 FAU / Abs
Confidence Intervall	4.27 FAU
Standard Deviation	1.85 FAU
Variation Coefficient	0.37 %

Bibliography

FWPCA Methods for Chemical Analysis of Water and Wastes, 275 (1969)



Triazole PP

M388

1 - 16 mg/L Benzotriazole or
Tolyltriazole

tri

Catalyzed UV Digestion

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
VARIO Triazole Rgt Powder Pack F25	Powder / 100 Pieces	532200
Vario Rochelle Salt Solution, 30 ml ^{h)}	30 mL	530640

The following accessories are required.

Accessories	Packaging Unit	Part Number
UV Pen Lamp, 254 nm	1 Pieces	400740
UV protection glasses, orange	1 Pieces	400755

Hazard Notes

While the UV lamp is in operation, UV safety goggles must be worn.

Sampling

1. Measure the water sample as soon as possible after sampling.

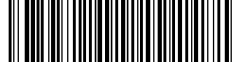
Preparation

1. To get accurate results the sample temperature must be between 20 °C and 25 °C.
2. Nitrites or borax-containing water must be adjusted between pH 4 and pH 6 before the analysis (with 1N Sulphuric acid).
3. If the sample contains more than 500 mg/L CaCO₃ hardness, 10 drops of Rochelle Salt Solution are to be added.



Remarks

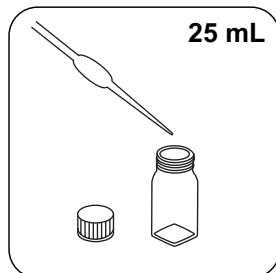
1. Triazole Reagent Powder Packs and UV maps available on request.
2. For handling of the UV lamp see manufacturer's manual. Do not touch the surface of the UV lamp. Fingerprints will erode the glass. Wipe the UV lamp with a soft and clean cloth between measurements.
3. The test does not distinguish between Tolyltriazole and Benzotriazole.



Determination of Benzotriazole / Tolytriazole with Vario Powder Packs

Select the method on the device.

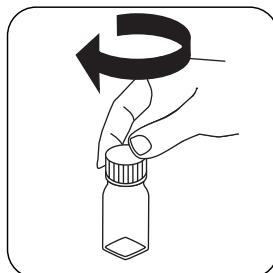
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



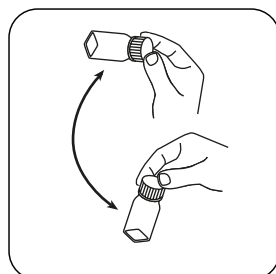
Fill the digestion vial with **25 mL** sample.



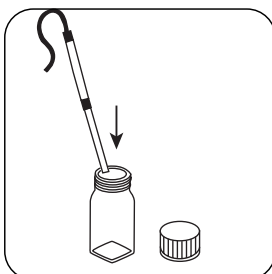
Add **powder pack**.



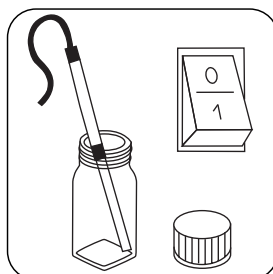
Close digestion vial.



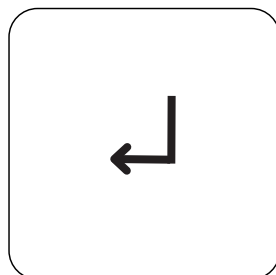
Swirl around to dissolve the powder.



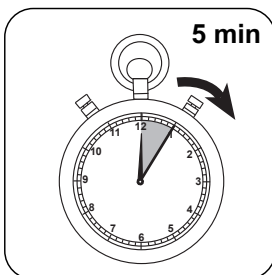
Keep the UV lamp in the sample. **Note: wear UV safety goggles!**



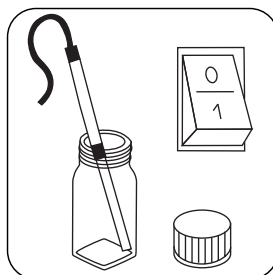
Turn on the UV lamp.



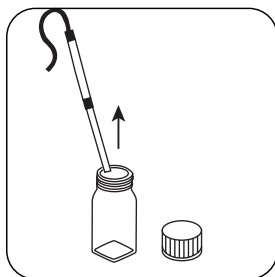
Press the **ENTER** button.



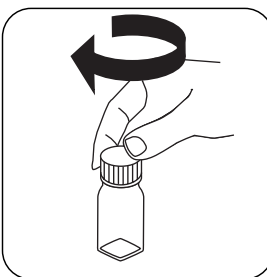
Wait for **5 minute(s)** reaction time.



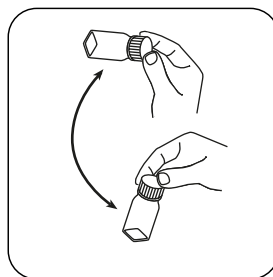
The UV lamp is switched off when the countdown is finished.



Remove the UV lamp from the sample.



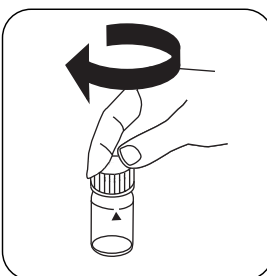
Close digestion vial.



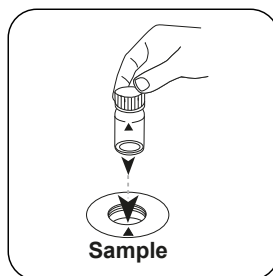
Invert several times to mix the contents.



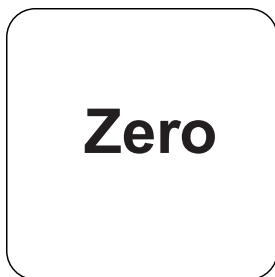
Fill 24 mm vial with **10 mL deionised water** .



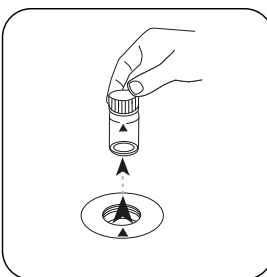
Close vial(s).



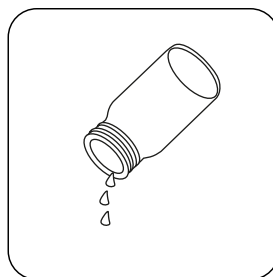
Place **sample vial** in the sample chamber. Pay attention to the positioning.



Press the **ZERO** button.

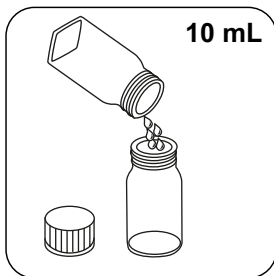


Remove the vial from the sample chamber.

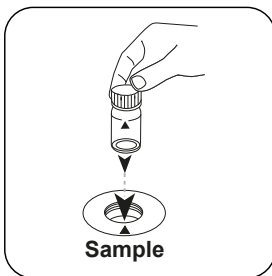


Empty vial.

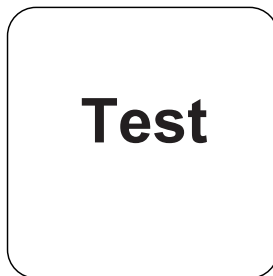
For devices that require **no ZERO measurement** , start here.



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



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



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

The result in mg/L Benzotriazole or Tolyltriazole (Switch between citation forms by pressing up-/down arrow.) 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	Benzotriazole	1
mg/l	Tolyltriazole	1.1177

EN

Chemical Method

Catalyzed UV Digestion

Appendix

Interferences

Persistent Interferences

- Should the photolysis be carried out for more or less than 5 minutes, this may lead to showing lower results.

Bibliography

Harp, D., Proceedings 45th International Water Conference, 299 (October 22-24, 1984)

^{*)} additionally required for samples with hardness values above 300 mg/l CaCO₃

Tannin L**M389****0.5 - 20 mg/L Tannin**

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
KS539 - Tannin Reagent 1	30 mL	56L053930
Tannin Reagent 2	30 mL	56L746530

Sampling

1. If samples are turbid, filter before testing using GF/C filter papers.
2. For tannin concentrations higher than 20 mg/L the sample may be suitably diluted with distilled water prior to analysis. The result must then be multiplied by the dilution factor.

Remarks

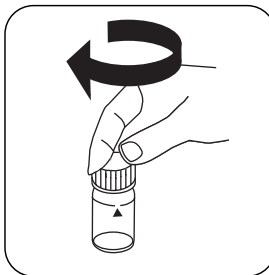
1. This test is very sensitive to the reaction period time. The sample must be read as close as possible to 5 minutes, starting from the addition of Tannin Reagent 2 being added to the pressing of the TEST key. Incorrect results will be displayed if this is not strictly followed.

Determination of Tannin with liquid reagents

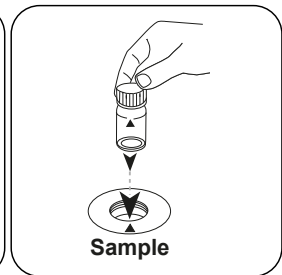
Select the method on the device.



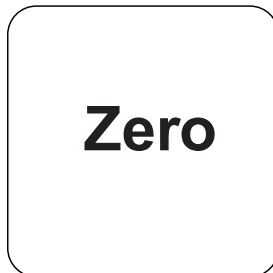
Fill 24 mm vial with **10 mL sample**.



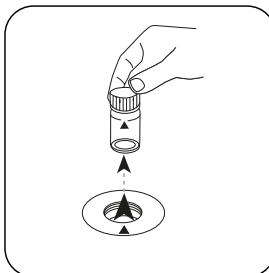
Close vial(s).



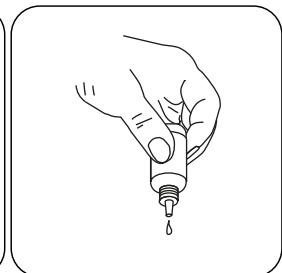
Place **sample vial** in the sample chamber. Pay attention to the positioning.



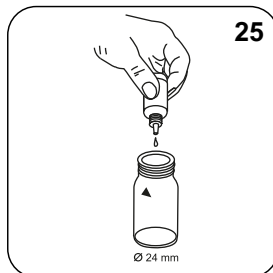
Press the **ZERO** button.



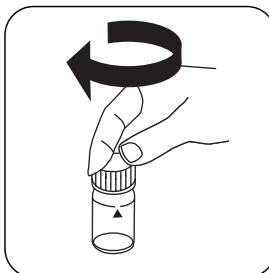
Remove the vial from the sample chamber.



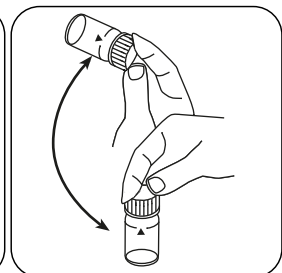
Hold cuvettes vertically and add equal drops by pressing slowly.



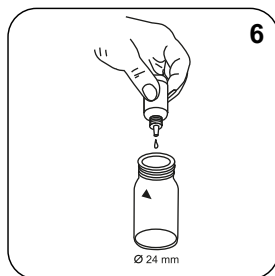
Add **25 drops Tannin Reagent 1**.



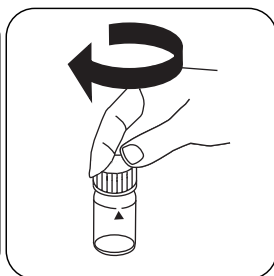
Close vial(s).



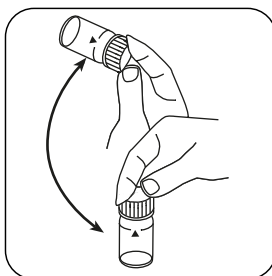
Invert several times to mix the contents.



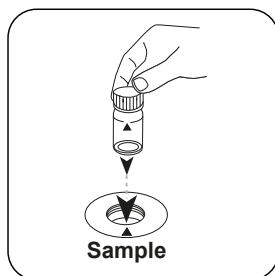
Add **6 drops Tannin Reagent 2**.



Close vial(s).



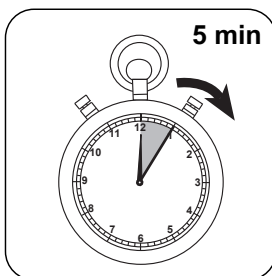
Invert several times to mix the contents.



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



Press the **TEST** button.



Wait for **5 minute(s) reaction time**.

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

Appendix

Method Validation

Limit of Detection	0.13 mg/L
Limit of Quantification	0.26 mg/L
End of Measuring Range	20 mg/L
Sensitivity	7.72 mg/L / Abs
Confidence Intervall	0.93 mg/L
Standard Deviation	0.38 mg/L
Variation Coefficient	0.65 %

Derived from

5550 B Standard Method

EN



Urea T

M390

0.1 - 2.5 mg/L Urea

Ur1

Indophenol / Urease

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
UREA Reagent 1	15 mL	459300
UREA Reagent 2	10 mL	459400
Ammonia No. 1	Tablet / 100	512580BT
Ammonia No. 1	Tablet / 250	512581BT
Ammonia No. 2	Tablet / 100	512590BT
Ammonia No. 2	Tablet / 250	512591BT
Set Ammonia No. 1/No. 2 100 Pc.#	100 each	517611BT
Set Ammonia No. 1/No. 2 250 Pc.#	250 each	517612BT
Ammonia Conditioning Powder	Powder / 26 g	460170
Urea Pretreat (compensates for the interference of free Chlorine up to 2 mg/l)	Tablet / 100	516110BT
UREA Reagent Set	1 Set	517800BT

Preparation

1. The temperature of the sample should be between 20 °C and 30 °C.
2. The analysis must take place within one hour after taking the sample at the latest.
3. With the analysis of sea water samples, before the addition of Ammonia No. 1 Tablet, two scoops of ammonium conditioning powder must be added to the sample and dissolved by swirling.

Remarks

1. The AMMONIA No. 1 tablet will only dissolve completely after the AMMONIA No. 2 Tablet has been added.
2. Ammonium and chloramines are accounted for in the urea determination.

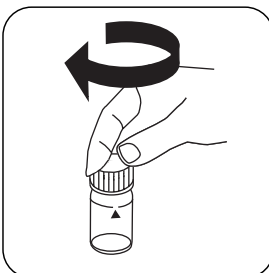
Determination of Urea with Tablet and Liquid Reagent

Select the method on the device.

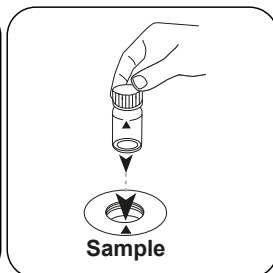
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



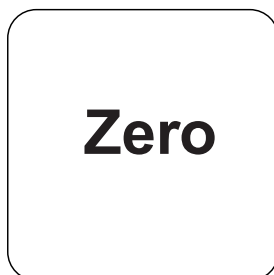
Fill 24 mm vial with **10 mL sample**.



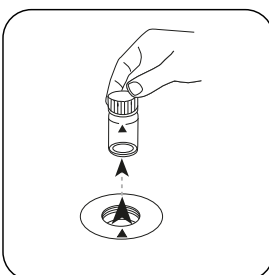
Close vial(s).



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

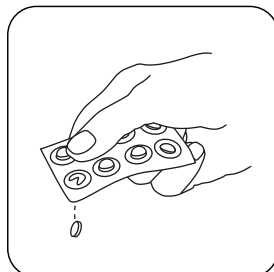


Press the **ZERO** button.

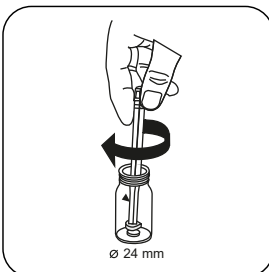


Remove the vial from the sample chamber.

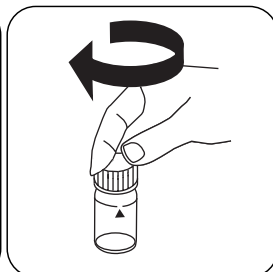
For devices that require **no ZERO measurement**, start here.



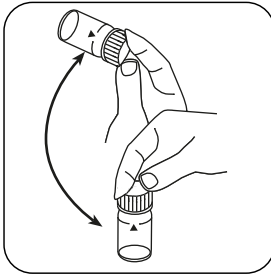
If free chlorine (HOCl) is present, add a **UREA PRETREAT** tablet.



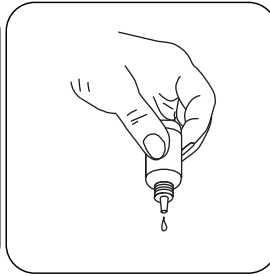
Crush tablet(s) by rotating slightly.



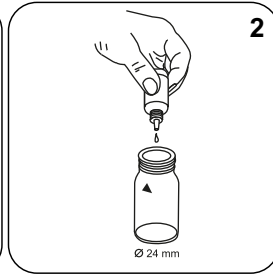
Close vial(s).



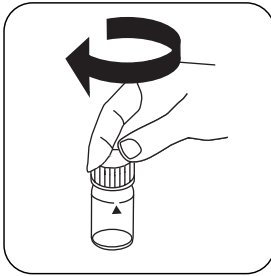
Dissolve tablet(s) by inverting.



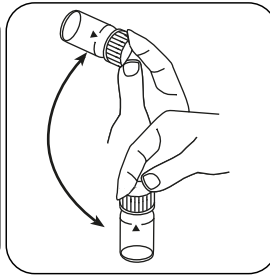
Hold cuvettes vertically and add equal drops by pressing slowly.



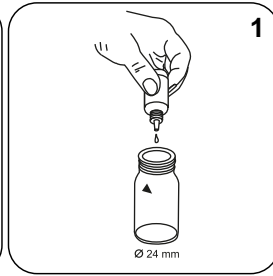
Add **2 drops Urea Reagent 1.**



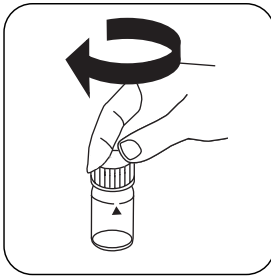
Close vial(s).



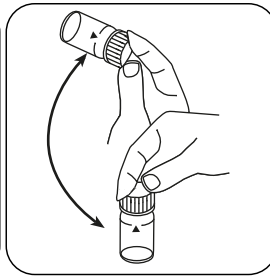
Invert several times to mix the contents.



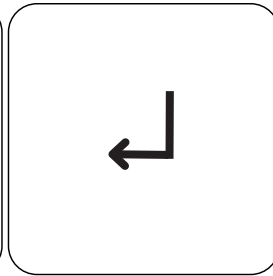
Add **1 drops Urea Reagent 2.**



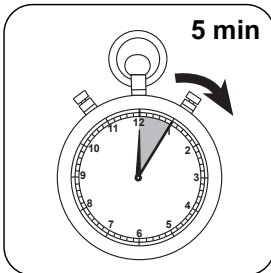
Close vial(s).



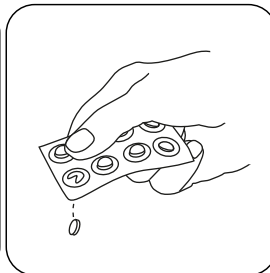
Invert several times to mix the contents.



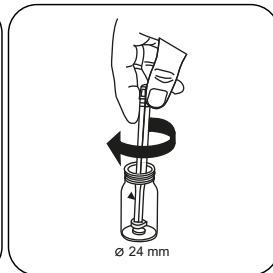
Press the **ENTER** button.



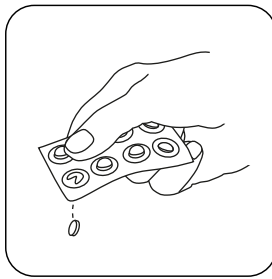
Wait for **5 minute(s) reaction time.**



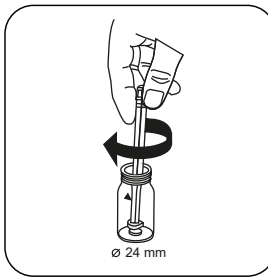
Add **AMMONIA No.1 tablet**.



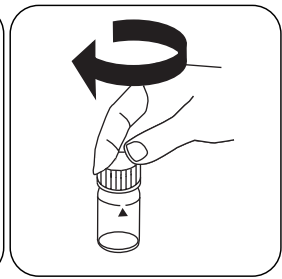
Crush tablet(s) by rotating slightly.



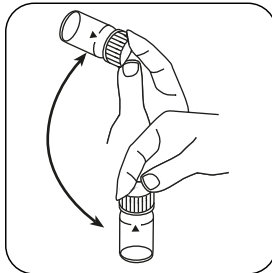
Add **AMMONIA No.2** tablet .



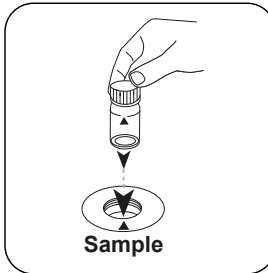
Crush tablet(s) by rotating slightly.



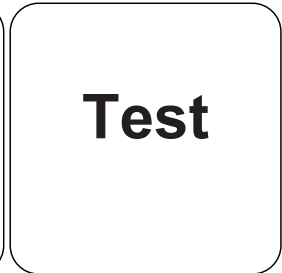
Close vial(s).



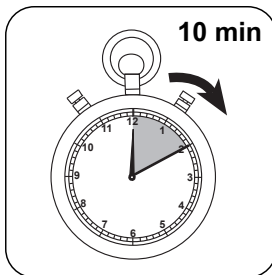
Dissolve tablet(s) by inverting.



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



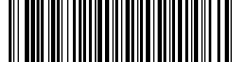
Press the **TEST (XD: START)**button.



Wait for **10 minute(s) reaction time**.

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

Test



Chemical Method

Indophenol / Urease

Appendix

EN

Interferences

Persistent Interferences

- Concentrations above 2 mg/L urea can lead to results within the measuring range. In this case, the water sample must be diluted with water that is free from urea and the measurement must be repeated (plausibility test).

Removeable Interferences

- A UREA PRETREAT Tablet eliminates the interference of free chlorine up to 2 mg/L (two tablets up to 4 mg/L, 3 tablets up to 6 mg/L).

Interference	from / [mg/L]
Cl ₂	2

Bibliography

R.J. Creno, R.E. Wenk, P. Bohling, Automated Micromasurement of Urea Using Urease and the Berthelot Reaction, American Journal of Clinical Pathology (1970), 54 (6), p. 828-832

* including stirring rod, 10 cm



Zinc T

M400

0.02 - 1 mg/L Zn

Zincon

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Copperr/Zinc LR	Tablet / 100	512620BT
Copperr/Zinc LR	Tablet / 250	512621BT
EDTA in presence of copper	Tablet / 100	512390BT
EDTA in presence of copper	Tablet / 250	512391BT
Dechlor in presence of chlorine	Tablet / 100	512350BT

Preparation

1. In the case of high levels of residual chlorine, perform the analysis with a dechlorinated water sample. To dechlorinate the sample, add a DECHLOR tablet to a 24mm vial with the water sample. Then add the Copper/Zinc LR tablet (point 2) and continue with the test procedure as described.
2. Strong alkaline or acidic water samples should be adjusted between to about pH 7 before the analysis (use 1 mol/l Sulphuric acid or 1 mol/l Sodium hydroxide).

Remarks

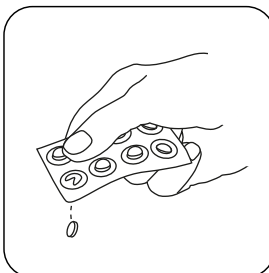
1. When using the copper/zinc LR tablets, the Zincon indicator reacts with both the zinc and the copper. Therefore, the specified measuring range may possibly refer to the total concentration of both ions.
2. The addition of an EDTA tablet during the second step of the analysis ensures that any copper presence is not measured.

Determination of Zinc with Tablet

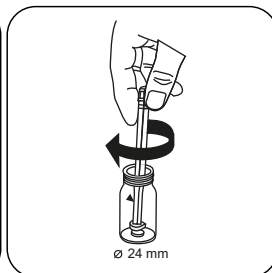
Select the method on the device.



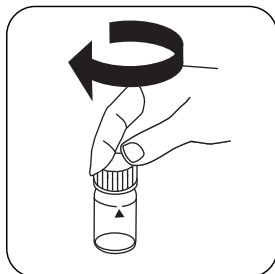
Fill 24 mm vial with **10 mL sample**.



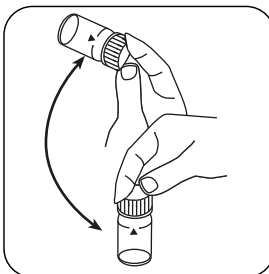
Add **COPPER/ ZINK LR tablet**.



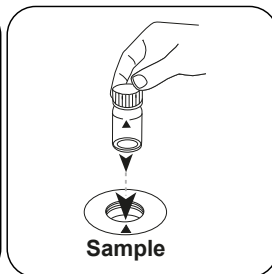
Crush tablet(s) by rotating slightly.



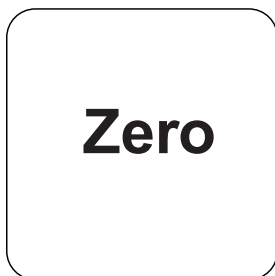
Close vial(s).



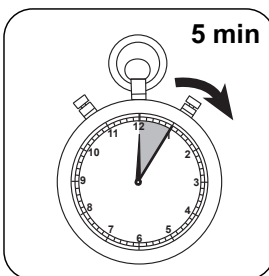
Dissolve tablet(s) by inverting.



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



Press the **ZERO** button.

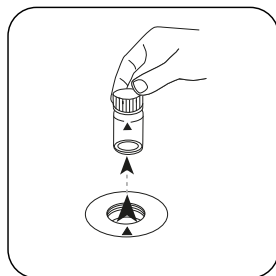


Wait for **5 minute(s) reaction time**.

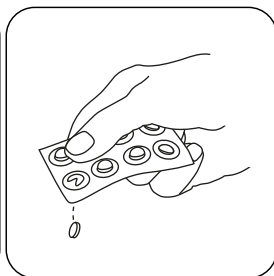
Once the reaction period is finished, the measurement takes place automatically.



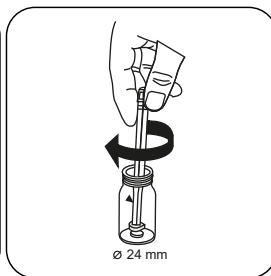
EN



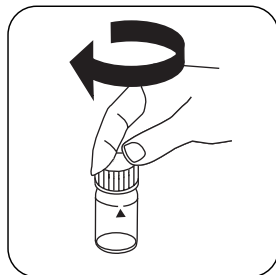
Remove the vial from the sample chamber.



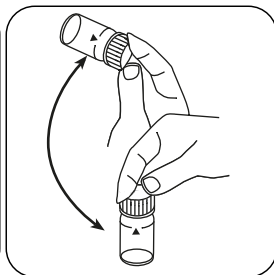
Add **EDTA** tablet.



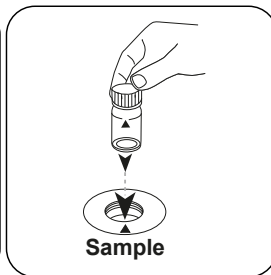
Crush tablet(s) by rotating slightly.



Close vial(s).



Dissolve tablet(s) by inverting.



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

Test

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

The result in mg/L Zinc appears on the display.



Chemical Method

Zincon

Appendix

Interferences

Persistent Interferences

Copper, cobalt, nickel, aluminium, iron, cadmium, manganese interfere with the determination.

Removeable Interferences

- If there is a presence of interfering metals, pre-isolation of zinc is recommended by means of an ion exchanger, precipitation of the metals with ammonia, pre-extraction of the zinc from hydrochloric acid medium using methyldiethylamine or triisooctylamine solution in methyl isobutyl ketone, etc..
- Concentrations above 1 mg/L can lead to results within the measuring range. A plausibility test (dilution of the sample) is recommended.

Derived from

Hach Method 8009 US EPA approved for Wastewater

EN



Zinc L

M405

0.1 - 2.5 mg/L Zn

Zn

Zincon / EDTA

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
KS 89 - Cationic Suppressor	65 mL	56L008965
Zinc LR Reagent Set	1 Pieces	56R023965
Zinc Buffer Z1B	65 mL	56L024365
Zinc Indicator Z4P	Powder / 20 g	56P024420

Remarks

1. The measuring spoon supplied with the reagents must be used for the correct dosage.
2. This test is suitable for the determination of free soluble zinc. Zinc, which is bound to strong complexifying agents, is not measured.



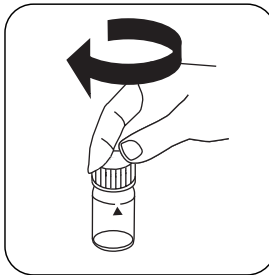
Determination of Zinc with liquid reagent and powder

Select the method on the device.

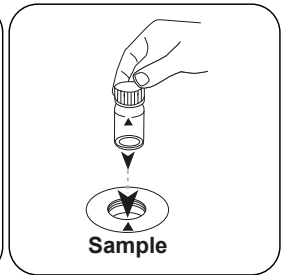
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



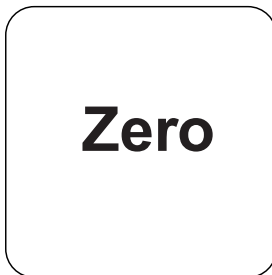
Fill 24 mm vial with **10 mL sample**.



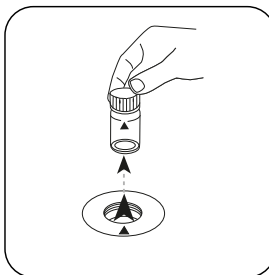
Close vial(s).



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

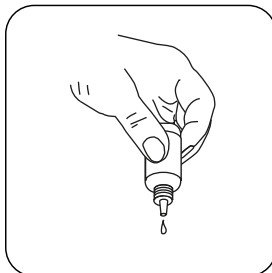


Press the **ZERO** button.

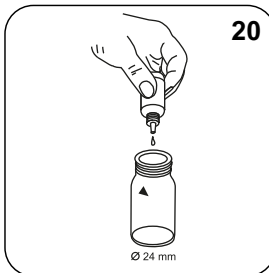


Remove the vial from the sample chamber.

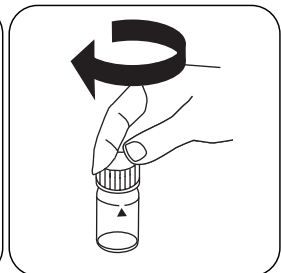
For devices that require **no ZERO measurement**, start here.



Hold cuvettes vertically and add equal drops by pressing slowly.



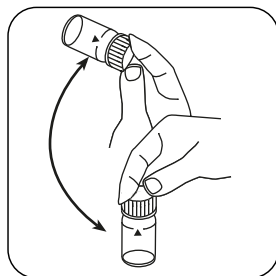
Add **20 drops Zinc Buffer Z1B**.



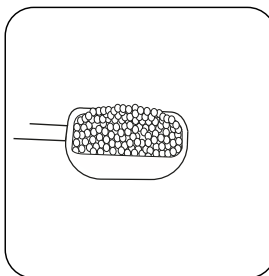
Close vial(s).



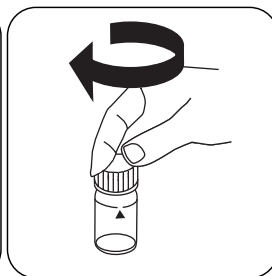
EN



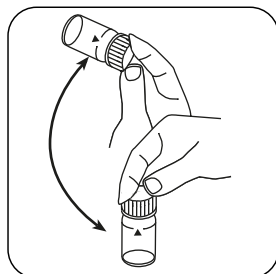
Invert several times to mix the contents.



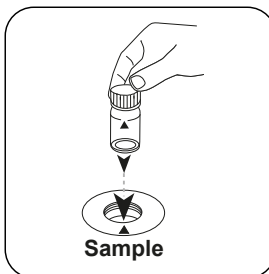
Add a **measuring scoop** **Zinc Indicator Z4P**.



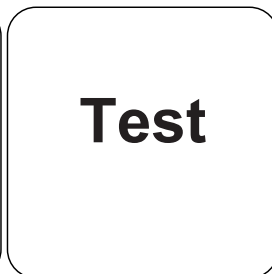
Close vial(s).



Swirl around to dissolve the powder.



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



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

The result in mg/L Zinc appears on the display.

Test



Chemical Method

Zincon / EDTA

Appendix

Interferences

EN

Removeable Interferences

- Cationics such as quaternary ammonium compounds will cause the colour to change from rose red to purple, depending upon the level of copper present. In this event add drops of KS89 (cationic suppressor) one at a time, until it turns orange/blue. Note: After adding each drop, swirl the vial.

Bibliography

Photometrische Analyseverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989

S.M. Khopkar, Basic Concepts of Analytical Chemistry (2004), New Age International Ltd. Publishers, New Dheli, p. 75



PTSA

M500

10 - 1000 ppb

Fluorescence

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
PTSA calibration set (0, 200, 1000 ppb)	1 Pieces	461245
PTSA standard addition solution, 1000 ppb	1 Pieces	461210

Preparation

1. Calibrate the instrument if verification result is not 200 ± 20 ppb.
2. The below mentioned calibration set should be used to calibrate the instrument.
3. Before use, clean the vials and the accessories.
4. The outside of the vial must be clean and dry before starting the analysis. Clean the outside of the vial with a towel. Fingerprints or other marks will be removed.
5. The photometer is already factory calibrated, or the instrument was calibrated by the user. It is recommended to verify calibration accuracy by a 200 ppb Standard measurement:
 - when in doubt about last calibration or accuracy of results
 - once a month

The verification measurement shall be done like a sample measurement and the result of 200 ppb standard shall be at 200 ± 20 ppb.

Remarks

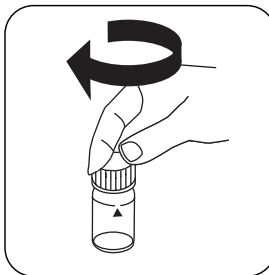
1. Use only vials with black lids for PTSA measurements.
2. Large temperature differences between the instrument and the environment can lead to errors. For best results, perform tests with sample temperatures between 20 °C (68 °F) and 25 °C (77 °F).
3. Vials and caps should be cleaned thoroughly **after each analysis** to prevent interferences.
4. To ensure maximum accuracy of test results, always use the reagent system supplied by the instrument manufacturer.
5. Do not pour used standards back into the bottle.
6. Spiking procedure possible (see Instruction Manual Photometer).

Determination of PTSA

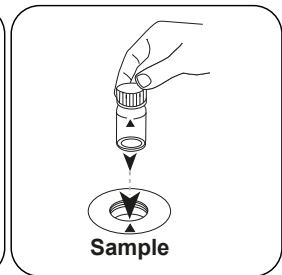
Select the method on the device.



Fill PTSA mm vial with
10 mL sample.



Close vial(s).



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

Test

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

The result in ppb PTSA appears on the display.

EN



Chemical Method

Fluorescence

EN



PTSA

M501

10 - 400 ppb

Fluorescence

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
PTSA standard addition solution, 1000 ppb	1 Pieces	461210

Preparation

1. Before use, clean the vials and the accessories.
2. The outside of the vial must be clean and dry before starting the analysis. Clean the outside of the vials with a towel. Fingerprints or other marks will be removed.
3. The photometre is already factory calibrated, or the instrument was calibrated by the user. It is recommended to verify calibration accuracy by a Standard measurement:
 - when in doubt about last calibration or accuracy of results
 - once a month

The verification measurement shall be done like a sample measurement.

Remarks

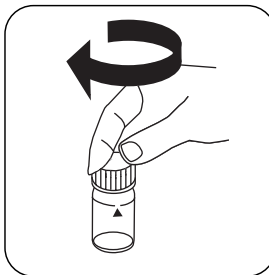
1. Use only vials with black lids for PTSA measurements.
2. Large temperature differences between the instrument and the environment can lead to errors. For best results, perform tests with sample temperatures between 20 °C (68 °F) and 25 °C (77 °F).
3. Vials and caps should be cleaned thoroughly **after each analysis** to prevent interferences.
4. To ensure maximum accuracy of test results, always use the reagent system supplied by the instrument manufacturer.
5. Do not pour used standards back into the bottle.
6. Spiking procedure possible (see Instruction Manual Photometer).

Determination of PTSA

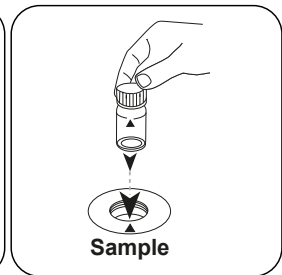
Select the method on the device.



Fill PTSA mm vial with
10 mL sample.



Close vial(s).

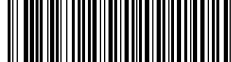


Place **sample vial** in the
sample chamber. Pay
attention to the positioning.

Test

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

The result in ppb PTSA appears on the display.



Chemical Method

Fluorescence

EN



Fluorescein

M510

10 - 400 ppb

Fluorescence

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Fluoresceine calibration set (0, 75, 400 ppb)	1 Pieces	461240
Fluoresceine standard addition solution, 400 ppb	1 Pieces	461230

Preparation

1. Calibrate the instrument if verification result is not 75 ± 8 ppb.
2. The Fluorescein Calibration Set should be used to calibrate the instrument.
3. Before use, clean the vials and the accessories.
4. The outside of the vial must be clean and dry before starting the analysis. Clean the outside of the vials with a towel. Fingerprints or other marks will be removed.
5. The photometer is already factory calibrated, or the instrument was calibrated by the user. It is recommended to verify calibration accuracy by a 75 ppb Standard measurement:
 - when in doubt about last calibration or accuracy of results
 - once a month

The verification measurement shall be done like a sample measurement and the result of a 75 ppb standard shall be 75 ± 8 ppb.

Remarks

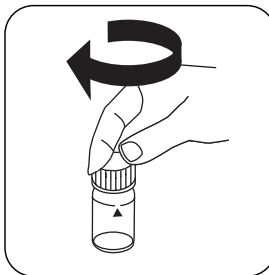
1. Use only vials with black lids for Fluorescein measurements.
2. Large temperature differences between the instrument and the environment can lead to errors. For best results, perform tests with sample temperatures between 20 °C (68 °F) and 25 °C (77 °F).
3. Vials and caps should be cleaned thoroughly after each analysis to prevent interferences.
4. To ensure maximum accuracy of test results, always use the reagent systems supplied by the instrument manufacturer.
5. Do not pour used standards back into the bottle.
6. Implementation of a spiking procedure possible (see manual).

Determination of Fluorescein

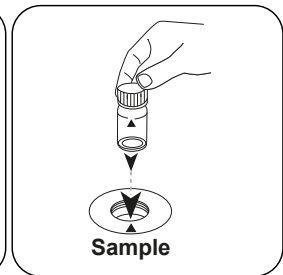
Select the method on the device.



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



Close vial(s).



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

Test

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

The result in ppb Fluorescein appears on the display.

EN



Chemical Method

Fluorescence

EN


Fluorescein 2P
M511
10 - 300 ppb
Fluorescence

EN

Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
Fluoresceine standard addition solution, 400 ppb	1 Pieces	461230

Preparation

1. Before use, clean the vials and the accessories.
2. The outside of the vial must be clean and dry before starting the analysis. Clean the outside of the vials with a towel. Fingerprints or other marks will be removed.
3. The photometer is already factory calibrated, or the instrument was calibrated by the user. It is recommended to verify calibration accuracy by a Standard measurement:
 - when in doubt about last calibration or accuracy of results
 - once a month

The verification measurement shall be done like a sample measurement.

Remarks

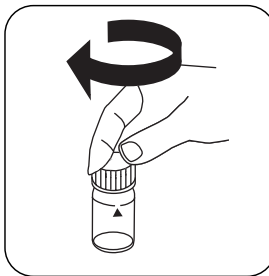
1. Use only vials with black lids for Fluorescein measurements.
2. Large temperature differences between the instrument and the environment can lead to errors. For best results, perform tests with sample temperatures between 20 °C (68 °F) and 25 °C (77 °F).
3. Vials and caps should be cleaned thoroughly after each analysis to prevent interferences.
4. To ensure maximum accuracy of test results, always use the reagent systems supplied by the instrument manufacturer.
5. Do not pour used standards back into the bottle.
6. Implementation of a spiking procedure possible (see manual).

Determination of Fluorescein

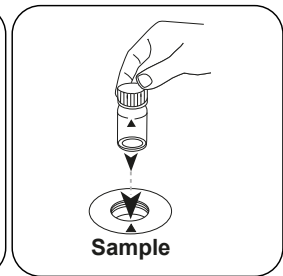
Select the method on the device.



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



Close vial(s).



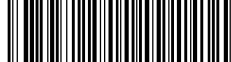
Place **sample vial** in the sample chamber. Pay attention to the positioning.

Test

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

The result in ppb Fluorescein appears on the display.

EN



Chemical Method

Fluorescence

EN

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