Chlorine (free) and Monochloramine M64

0.02 - 4.50 mg/L Cl_2 CL2

Indophenole method

Instrument specific information

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

Instrument Type	Cuvette	λ	Measuring Range
MD50, MD 600, MD 610, MD 640, PM 620, PM 630	ø 24 mm	660 nm	0.02 - 4.50 mg/L Cl_2
XD 7000, XD 7500	ø 24 mm	655 nm	0.02 - 4.50 mg/L Cl_2

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 pc.	531810
Vario Rochelle Salt Solution, 30 ml [h)]	30 mL	530640

Application List

- Disinfection Control
- Drinking Water Treatment
- Pool Water Control
- Food and Beverage
- Others

Notes

1. 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

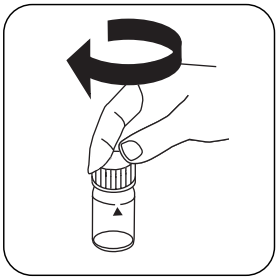
2. Press [Enter] key to to cancel a reaction period.
3. Hold the bottle vertically and squeeze slowly.
4. To determine the chlorine concentration the difference between the monochloramine and the sum of monochloramine and chlorine is calculated. If one measured value exceeds the range limit the following message is displayed:
   $Cl_2[NH_2Cl] + Cl_2 > 4.5$ mg/L
   In this case the sample has to be diluted and the measurement repeated.

Determination of Free Chlorine in absence of Monochloramine

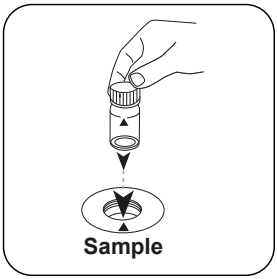
Select the method on the device.

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

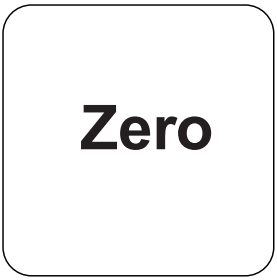
Fill 24 mm vial with **10 mL sample**.



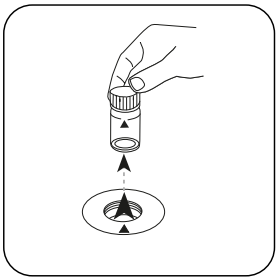
Close vial(s).



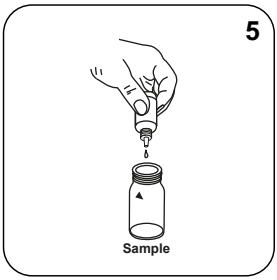
Place **sample vial** in the sample chamber. Pay attention to the positioning.



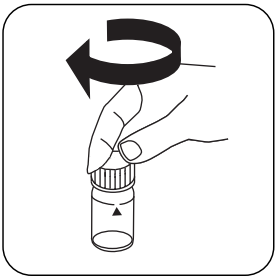
Press the **ZERO** button.



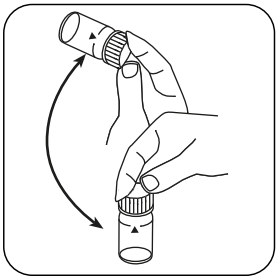
Remove the vial from the sample chamber.



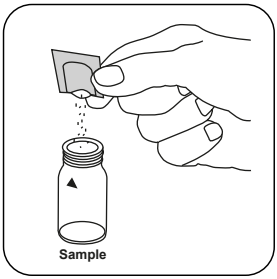
Add **5 drops Free Chlorine Reagent Solution** to the **sample vial**.



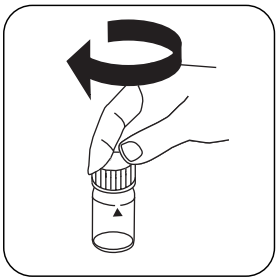
Close vial(s).



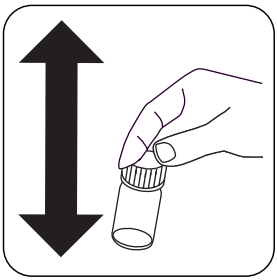
Invert several times to mix the contents (15 sec.).



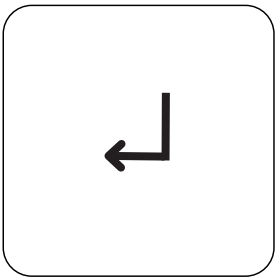
Add **Monochlor FRGT powder pack**.



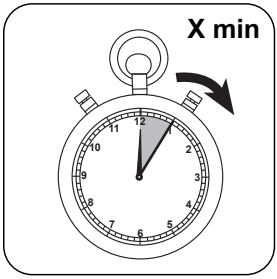
Close vial(s).



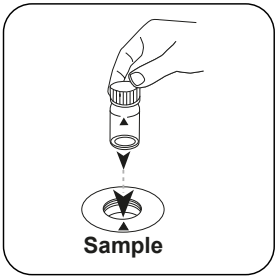
Dissolve the contents by shaking. (20 sec.)



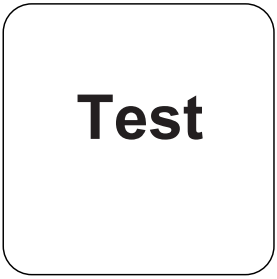
Press the **ENTER** button for countdown.
(XD: start timer)



Reaction time **X minute(s)** 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.

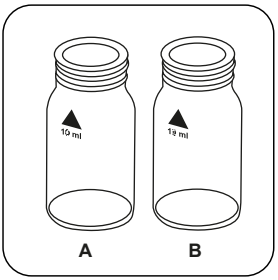
The result in mg/L free Chlorine appears on the display.

Determination of free Chlorine and Monochloramine

Select the method on the device.

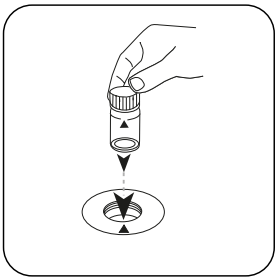
In addition, choose the test: Free Chlorine

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

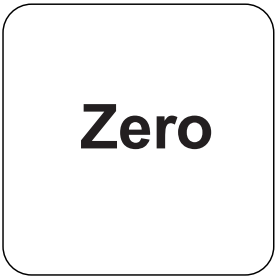


Prepare two clean 24 mm vials. Mark one as Chloramine and the other as Chlorine vial.

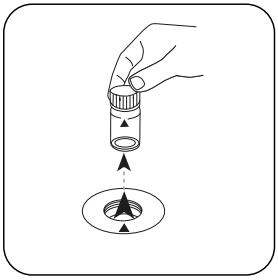
Place **10 mL sample** in each vial.



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

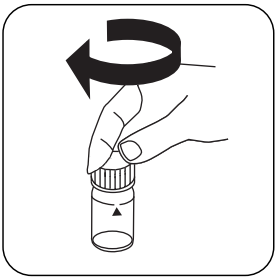


Press the **ZERO** button.

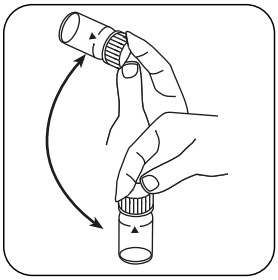


Remove the vial from the sample chamber.

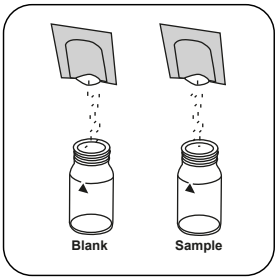
Add **5 drops Free Chlorine Reagent Solution** to the **Chlorine vial**.



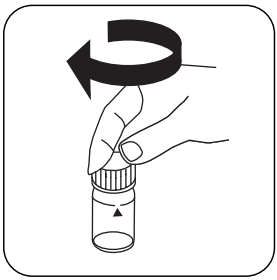
Close vial(s).



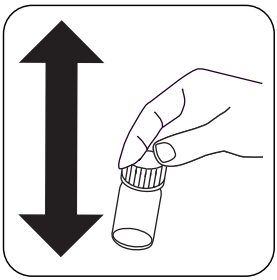
Invert several times to mix the contents (approx. 15 sec).



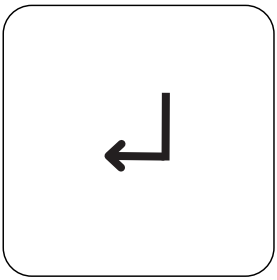
Add **a Monochlor FRGT powder pack** simultaneously in each vial.



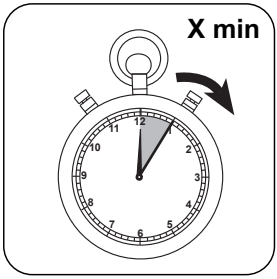
Close vial(s).



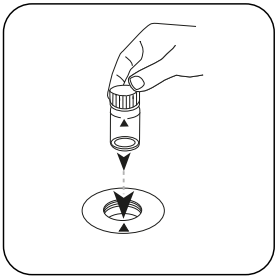
Dissolve the contents by shaking. (20 sec.)



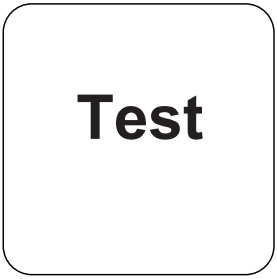
Press the **ENTER** button for countdown.
(XD: start timer)



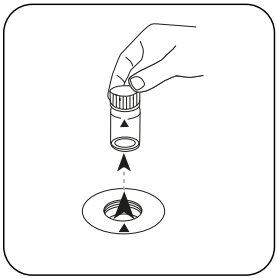
Reaction time **X minute(s)** according to table. **Wait for reaction time**.



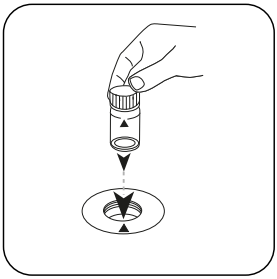
Place Chloramine **vial** in the sample chamber. • Pay attention to the positioning.



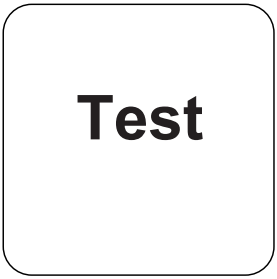
Press the **TEST** (XD: **START**)button.



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.

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_2Cl	0.72598
mg/l	$N[NH_2Cl]$	0.19754
mg/l	NH_3	0.24019

Chemical Method

Indophenole method

Calibration function for 3rd-party photometers

Conc. = $a + b \cdot Abs + c \cdot Abs^2 + d \cdot Abs^3 + e \cdot Abs^4 + f \cdot Abs^5$

	ø 24 mm	□ 10 mm
a	$-5{,}8124 \cdot 10^{-2}$	$-5{,}8124 \cdot 10^{-2}$
b	$1.80357 \cdot 10^{0}$	$3.87768 \cdot 10^{0}$
c	-	-
d	-	-
e	-	-
f	-	-

Interferences

Removeable Interferences

Disturbances caused by precipitation caused by magnesium hardness of more than 400 mg / l $CaCO_3$ 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

Interference	from / [mg/L]
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
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 %