



Copper PP

M153

0.05 - 5 mg/L Cu

Cu

Bicinchoninate

## 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	$\lambda$	Measuring Range
MD 100, MD 600, MD 610, MD 640, MultiDirect, PM 620, PM 630, SpectroDirect, XD 7000, XD 7500	ø 24 mm	560 nm	0.05 - 5 mg/L Cu

## Material

Required material (partly optional):

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

## Application List

- Cooling Water
- Boiler Water
- Waste Water Treatment
- Pool Water Control
- Drinking Water Treatment
- Galvanization

## 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.



## Notes

1. Accuracy is not affected by undissolved powder.



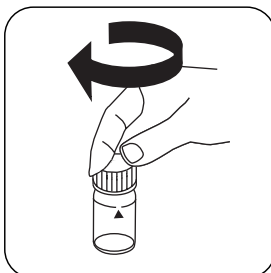
## Determination of Copper, free with Vario Powder Pack

Select the method on the device.

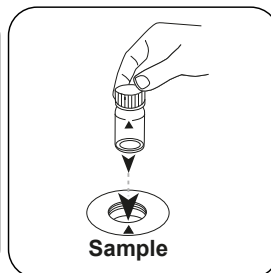
For this method, a ZERO measurement does not have to be carried out every time on the following devices: XD 7000, XD 7500



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



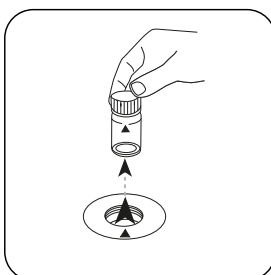
Close vial(s).



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

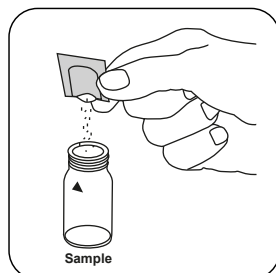


Press the **ZERO** button.

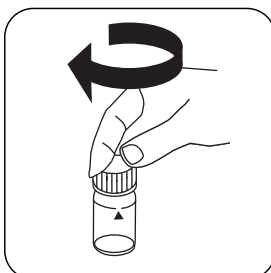


Remove the vial from the sample chamber.

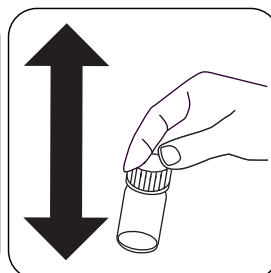
For devices that require **no ZERO measurement**, start here.



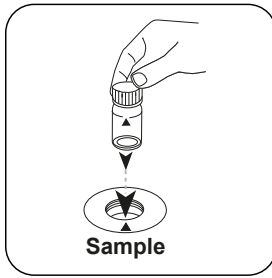
Add **Vario Cu 1 F10 powder pack**.



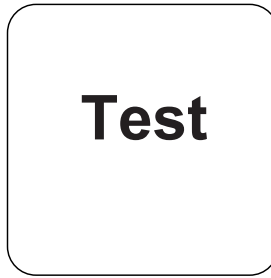
Close vial(s).



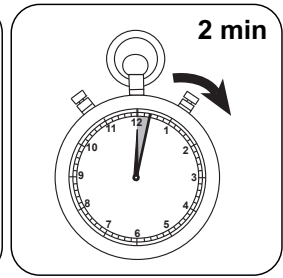
Mix the contents by shaking.



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

### Calibration function for 3rd-party photometers

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

	∅ 24 mm	□ 10 mm
a	$-6.44214 \cdot 10^{-2}$	$-7.44232 \cdot 10^{-2}$
b	$3.7903 \cdot 10^{+0}$	$8.16011 \cdot 10^{+0}$
c		
d		
e		
f		

## Interferences

### Persistent Interferences

Hardness, Al and Fe produce lower test results.

### Removeable Interferences

1. Cyanide, CN<sup>-</sup>: 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<sup>+</sup>: 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

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

## Bibliography

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

## Derived from

APHA Method 3500Cu