

Copper VLR PP**M152****2 - 210 µg/L Cu****Porphyrine Indicator****Instrument specific information**

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

| Instrument Type | Cuvette | λ | Measuring Range |
|---------------------------------|----------------|----------|------------------------|
| MD 600, MultiDirect | ø 24 mm | 430 nm | 2 - 210 µg/L Cu |
| SpectroDirect, XD 7000, XD 7500 | ø 24 mm | 425 nm | 2 - 210 µg/L Cu |

Material

Required material (partly optional):

| Reagents | Packaging Unit | Part Number |
|-----------------------|-----------------------|--------------------|
| VARIO Copper, Set F10 | 1 Set | 535140 |

Application List

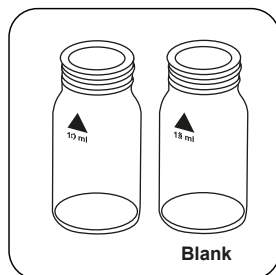
- Waste Water Treatment

Notes

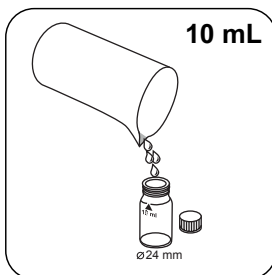
1. For most accurate results, a reagent blank measurement should be performed.
2. The pH of the sample has to be adapted by addition of sodium hydroxide solution or salpetric acid to a range 2-6 before starting the measurement.

Determination of Copper VLR with powder packs

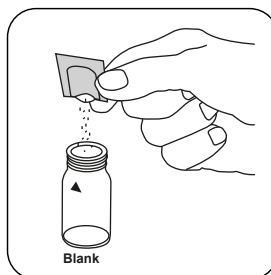
Select the method on the device.



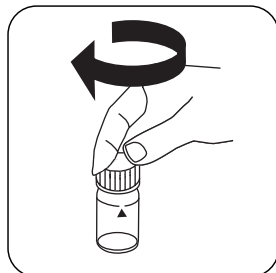
Prepare two clean 24 mm vials. Mark one as a blank.



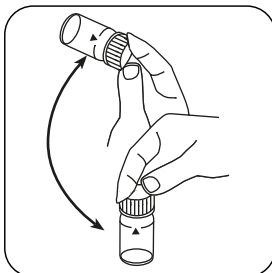
Place **10 mL sample** in each vial.



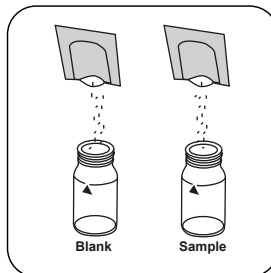
Add a **CU3 Masking F10 powder pack** to the blank.



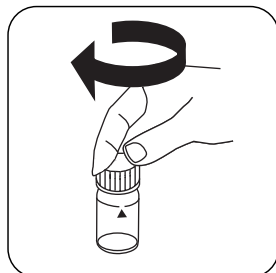
Close vial(s).



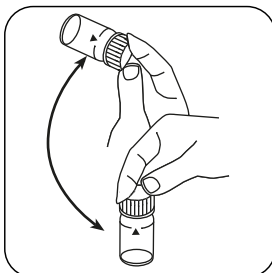
Swirl around to dissolve the powder.



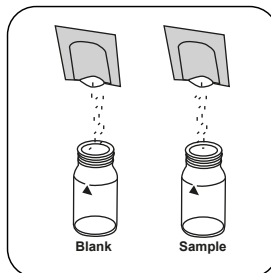
Add a **CU1 Porphyrin F10 powder pack** in each vial.



Close vial(s).



Swirl around to dissolve the powder.



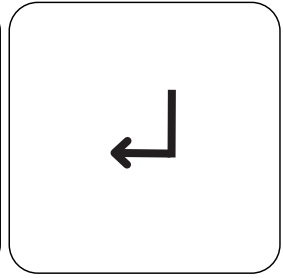
Add a **CU2 Porphyrin F10 powder pack** in each vial.



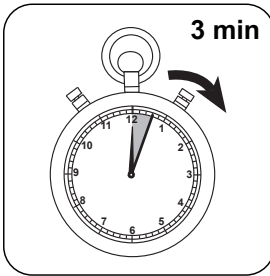
Close vial(s).



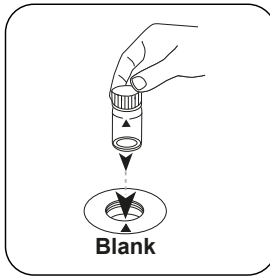
Swirl around to dissolve the powder.



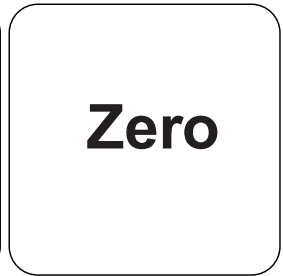
Press the **ENTER** button.



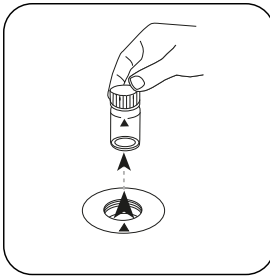
Wait for **3 minute(s) reaction time**.



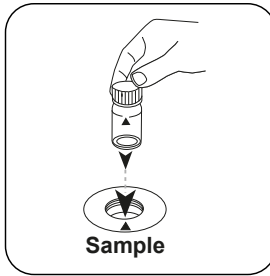
Place **blank** in the sample chamber. Pay attention to the positioning.



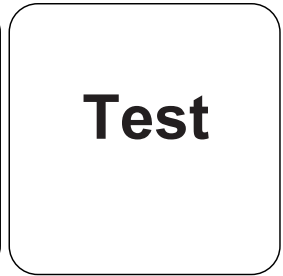
Press the **ZERO** button.



Remove the vial from the sample chamber.



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



Press the **TEST** button.

The result in **µg/L** Copper appears on the display.

Chemical Method

Porphyrine Indicator

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 | $1.6957 \cdot 10^{+0}$ | $1.6957 \cdot 10^{+0}$ |
| b | $1.5650 \cdot 10^{+2}$ | $3.3647 \cdot 10^{+2}$ |
| c | | |
| d | | |
| e | | |
| f | | |

Interferences

Persistent Interferences

1. Complexing substances can interfere in any concentration.

| Interference | from / [mg/L] |
|------------------|---------------|
| Al ³⁺ | 60 |
| Cd ²⁺ | 10 |
| Ca ²⁺ | 15000 |
| Cl ⁻ | 90000 |
| Cr ⁶⁺ | 110 |
| Co ²⁺ | 100 |
| F ⁻ | 30000 |
| Pb ²⁺ | 3 |
| Mg ²⁺ | 10000 |
| Mn | 140 |
| Mo | 11 |
| Ni ²⁺ | 60 |
| K ⁺ | 60000 |
| Na ⁺ | 90000 |
| Zn ²⁺ | 9 |
| Fe | 6 |
| Hg | 3 |

Method Validation

| | |
|--------------------------------|--------------|
| Limit of Detection | 2.6 µg/L |
| Limit of Quantification | 7.9 µg/L |
| End of Measuring Range | 210 µg/L |
| Sensitivity | 156 µg/L/Abs |
| Confidence Intervall | 5.5 µg/L |
| Standard Deviation | 2.3 µg/L |
| Variation Coefficient | 2.2 % |