

## Operating Manual

# Cu 500 Cu 800

**Cupric Electrode Cu 500**  
**Cupric Combination Electrode Cu 800**

Distributed by:



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ADVANCED APPLIED TECHNOLOGIES

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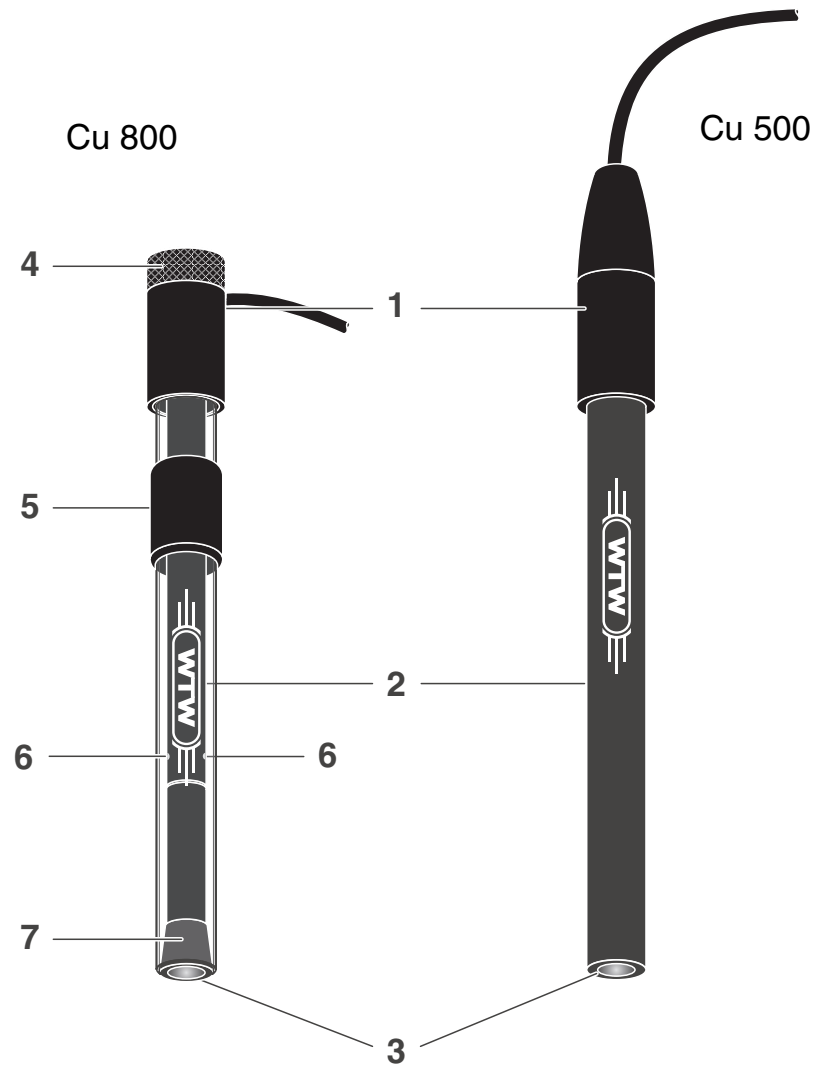
**Accuracy when  
going to press**

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## View



<b>1</b>	Connection head with connection cable
<b>2</b>	Shaft
<b>3</b>	Membrane
<b>4</b>	Knurled nut
<b>5</b>	Closing ring of the filling opening for the bridge electrolyte
<b>6</b>	Inner junctions
<b>7</b>	Ground junction

## Commissioning

### Combination electrode Cu 800

1	Remove the protection cap.
2	Pull the closing ring downward so that the filling opening for the bridge electrolyte is free.
3	Fill the bridge electrolyte ELY/BR/503 into the filling opening.
4	Shortly press the shaft of the combination electrode against the connection head to wet the ground junction with bridge electrolyte.
5	When doing so refill any spilled bridge electrolyte so that the inner junctions are covered with bridge electrolyte.
6	Rinse the combination electrode with deionized water.
7	Wipe the shaft using a clean paper towel.

### Double rod electrode Cu 500 + R 503

For measurements with the Cu 500 cupric electrode, a reference electrode is required (e.g. R 503). The two electrodes together form a double rod combination electrode.

1	Put the reference electrode into operation (see operating manual of the reference electrode)
2	Remove the protection cap of the electrode.
3	Rinse the electrode with deionized water.
4	Wipe the shaft using a clean paper towel.

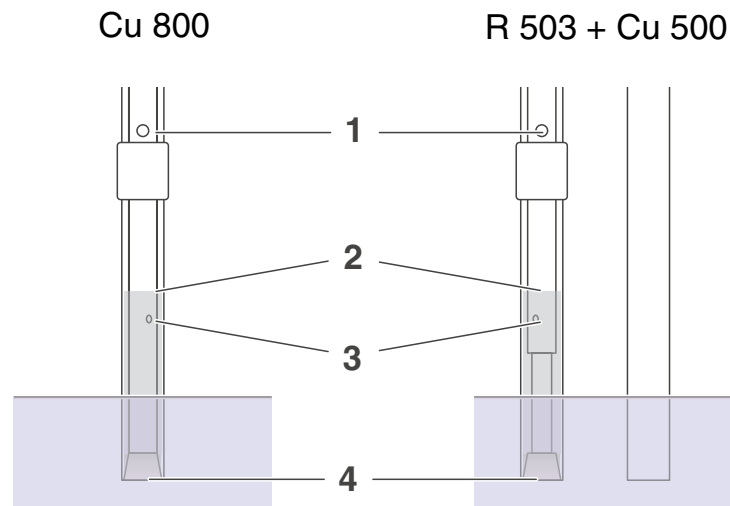
## Conditioning, calibration, measurement



### Note

We recommend to exclusively use the cupric electrodes to determine the end point for titration procedures.

### General information



When operating the electrode ensure that

- the filling opening (1) for the bridge electrolyte is open
- the inner junctions (3) are covered with bridge electrolyte
- no air bubbles are in the bridge electrolyte
- the depth of immersion is within the optimum range:

Minimum depth of immersion	The ground junction (4) must be covered
Maximum depth of immersion	Approx. 1 cm below the fluid level (2) of the bridge electrolyte

### Before measuring

- 1 Before use, condition the combination electrode or electrodes respectively for approx. 2 hours in 1000 mg/l standard solution.

- |   |  |
|---|--|
| 2 | Remove any air bubbles in the bridge electrolyte by slightly knocking against the shaft. |
| 3 | Calibrate according to the operating manual of the meter and the analysis specification. |

**Note**

In the case of an erroneous calibration immediately after commissioning, polish the membrane surface (see MAINTENANCE).

## Sample preparation

Add 2 % ISA/FK solution.

This sample conditioning solution creates optimum conditions for measuring. It provides a constant ionic strength and similar diffusion potentials at the reference electrode in standard solution and test sample.



### Note

If you would like to have more detailed information concerning sample preparation and measuring procedures, WTW provides a large number of application reports for various applications.

## Response times

The response time depends on the concentration range. It is

- several seconds at high concentrations,
- several minutes near the detection limit.

The measured value is stable if the value does not change by more than 0.1 mV within 30 seconds.

## Interferences

- Complexes with acetate, citrate, ammonia, amino acids, EDTA etc.
- Mercury and silver ions poison the membrane.
- The membrane is light sensitive concerning the potential setting.
- Interfering ions: no disturbances with the following conditions:

$(\text{Cu}^{2+}) \times (\text{Cl}^-)^2$	$(\text{Cu}^{2+}) \times (\text{Br}^-)^2$	$(\text{Fe}^{3+})$
$< 1.6 \times 10^{-6} \text{ mol}^3/\text{l}^3$	$< 1.3 \times 10^{-12} \text{ mol}^3/\text{l}^3$	$< 0.1 (\text{Cu}^{2+})$

## Aging

Please note that every (combination) electrode undergoes a natural aging process. The response time increases and the slope decreases with the age of the (combination) electrode. The following factors shorten the lifetime considerably:

- Incorrect storage
- Special measuring media (e.g. organic solutions, solutions that contain mercury or silver, frequent measuring with high concentrations of interfering ions)
- High temperatures
- High changes in temperature

The warranty does not cover damage caused by measuring conditions and mechanical damage.



## Maintenance

- Combination electrodes:  
Refill any used up bridge electrolyte.
- In the case of increased response times of the (combination) electrode perform the following activities:
  - Polish the membrane surface using an SF/K polishing strip (see RECOMMENDED ACCESSORIES). To do so, moisten a polishing strip with deionized water, and with circular movements polish the membrane surface for approx. 30 seconds.
  - Subsequently place the (combination) electrode into diluted standard solution for approx. 5 minutes.
- Clean the inside of the combination electrode.  
To do so, open the combination electrode:

1	Unscrew the knurled nut from the connection head.
2	Put the connection cable into a vertical position.
3	Unscrew the connection head.
4	Push the connection head and pressure spring over the connection cable.
5	Remove the protection cap.
6	Push the combination electrode through the shaft.



### Caution

**Never pull the connection cable of the (combination) electrode.**

**The cable might be damaged.**

## Storage

### Between two measurements

Put the combination electrode into diluted standard solution.

### Overnight to one week

**Cu 500:** Put the combination electrode into diluted standard solution.

**Cu 800:** Put the combination electrode into diluted aqueous standard solution with the filling opening open. To avoid a contamination of the bridge electrolyte with standard solution, the level of the bridge electrolyte must be clearly above the level of the standard solution.

Fill in fresh bridge electrolyte for measurement.

### For more than a week

Remove the bridge electrolyte and rinse the combination electrode with deionized water, dab it dry using a clean paper towel and put on the protection cap. Store the combination electrode in a dry place.



### Note

Store the reference electrode according to the instructions in its operating manual.

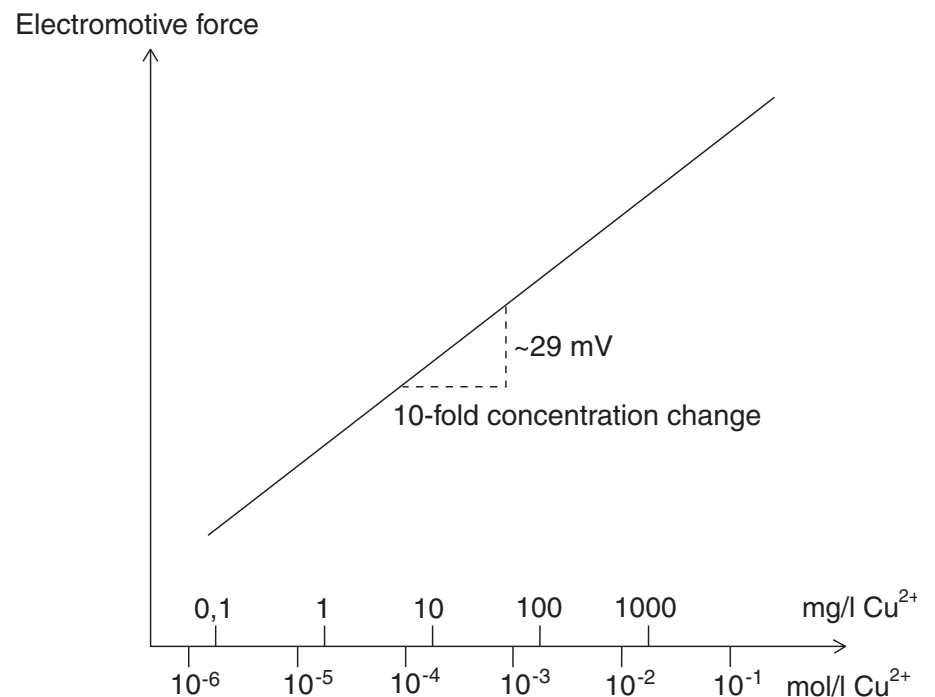
## Recommended accessories

Description	Model	Order no.
Reference electrode for cupric electrode Cu 500	R 503/P* R 503/D**	106570 106571
Standard solution for Cu <sup>2+</sup> measurement	ES/Cu	120190
Bridge electrolyte	ELY/BR/503	106575
ISA sample conditioning solution	ISA/FK	140110
Polishing strips (24 pieces)	S/FK	180130

\* Pin plug

\*\* Banana plug

## Calibration line of a cupric combination electrode



## What to do if ...

	Cause	Remedy
<b>Measured value unstable</b>	– Inner junctions not sufficiently wetted with bridge electrolyte (Cu 800)	– Fill up bridge electrolyte until the inner junctions are covered with bridge electrolyte
	– Inner junctions encrusted (Cu 800)	– Leave the bridge electrolyte to react on the inner junctions for some hours until the crusts have dissolved.
	– Ground junction contaminated (Cu 800)	– Rinse ground junction with bridge electrolyte
	– Cable broken	– Exchange (combination) electrode
<b>Slope too low</b>	– Membrane surface contaminated	– Polish the membrane surface with polishing strip S/FK (see MAINTENANCE)
	– Conditioning time too short	– Extend conditioning time
	– Standard solutions too old	– Use new standard solutions
	– Inner junctions encrusted (Cu 800)	– Leave the bridge electrolyte to react on the inner junctions for some hours until the crusts have dissolved.
	– (Combination) Electrode defective	– Exchange (combination) electrode

## Technical data

<b>Measuring range</b>	6 x 10 <sup>-4</sup> ... 6,350 mg/l Cu <sup>2+</sup> (10 <sup>-8</sup> ... 0.1 mol/l Cu <sup>2+</sup> )
<b>Reproducibility</b>	± 4 %
<b>pH range</b>	2 ... 6 (see INTERFERENCES)
<b>Temperature range</b>	0 ... 80 °C / up to 100 °C for a short time
<b>Membrane resistance</b>	< 1 MΩ
<b>Length</b>	Cu 500: 170 mm (including 50 mm connection head) Cu 800: 153 mm (including 33 mm connection head)
<b>Diameter</b>	Shaft: 12 mm Connection head: 16 mm
<b>Cable length</b>	1 m
<b>Plug</b>	DIN plug or BNC plug, depending on design.





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