

ATO-CTL-136 Portable Copper Sulfate Reference Electrode

User Manual

I. Applications and Features

Model CTL 136 Portable Copper Sulfate Reference Electrode is designed for field site use. It is mainly applied to measure the native potential and cathodic protection potential of underground metal structures and pipelines, as well as to detect stray currents in soil. It can also measure the potential of cable metal sheaths and steel reinforcements embedded in concrete. Additionally, it serves as a reference electrode for potential control in impressed current cathodic protection systems. This electrode is suitable for use in clay rich soils, various types of soils, and fresh water environments.

II. Structure and Performance

1. The cavity is made of transparent plexiglass, which facilitates observation of the saturation state of the internal copper sulfate solution.
2. The electrode provides stable potential. Under standard conditions, its potential relative to the calomel electrode is 70 ± 3 mV, consistent with the theoretical value.
3. The electrode resists polarization. For field site operation, the potential difference between identical electrodes is less than ± 5 mV. Its operating temperature range is $0 \sim 45$ °C.
4. Long service life. The upper and lower end caps are thread connected to the cavity for convenient solution refilling. One filling enables service life of more than one year. Multiple refills are permitted as long as the cavity remains intact for long term operation.
5. The electrode structure is firm, the connection is corrosion-resistant, the leakage rate of the microporous membrane is appropriate, and there is no visible liquid flow.

III. Operating Procedures

1. Unscrew either end cap of the reference electrode. Pour purified water or distilled water until the liquid level is 2 cm above the copper sulfate crystals. Screw the cap back on and shake several times to fully dissolve most copper sulfate crystals while retaining some undissolved crystals inside.
2. Immerse the lower ceramic plug of the reference electrode in clean water for approximately 5 minutes for first time use.
3. Insert the lower end (ceramic plug) of the reference electrode into moist soil near the measured metal structure. Set the multimeter to the 2 V range. Connect the lead wire supplied with the reference electrode to the top nut; connect the other end of the lead to the black terminal of the multimeter.
4. Connect the red probe of the multimeter to the metal structure body or the test wire inside the test post, then read and record the measured data.

IV. Maintenance and Care

1. When the electrode rod inside the reference electrode turns black, polish the rod with fine abrasive cloth until the metallic color of pure copper is exposed.
2. For long term storage, fit the protective sleeve over the bottom ceramic plug of the reference electrode. Shake the electrode several times before reuse.