

## Qualmega KPL Ni-Cd Batteries

### Installation and Operating Instructions

#### Safety measures:

- Wear safety goggles and protective clothing when working with batteries.
- No smoking. No open flame or sparks in the vicinity of the battery.
- Potential lethal voltages. It should only be operated by trained personnel.
- Avoid short circuits. Use insulated tools only. Remove watches, rings, bracelets, and other metal items before working on the battery.
- If any battery emission contacts the skin, wash immediately and thoroughly with water.
- Use special caution when connecting or adjusting battery cables. If a battery cable contacts an unintended surface, arcing, fire, or a possible explosion can occur.
- Do not tip the battery.

#### Accessories supplied with the battery:

- Vent plugs
- Inter-cell connecting straps and covers.
- Extra nuts and washers.
- Electrolyte filling tools (optional).
- Inter-cell cables (optional).
- Nickel-plated cable lugs (optional).

#### 1. Receiving and Installation

- 1.1. All cells must be inspected for transportation damage upon arrival.
- 1.2. Replace the transport plugs with supplied standard vent plugs. Keep the transport plugs for future use. **The battery should never be charged with the transport plugs installed.**
- 1.3. Mount the cells to the designated location. Verify the cell polarity for positive-to-negative connections throughout the battery.
- 1.4. Secure the cells.
- 1.5. Ensure that the contact surfaces of terminal posts, terminal nuts, and inter-cell connecting straps are clean.
- 1.6. Connect the cells together. **Recommended torque for tightening the connections:**
  - M10 18±2 N.m (12~15 lb.ft)**
  - M16 30±3 N.m (20~24 lb.ft)**
  - M20 50±5 N.m (33~40 lb.ft)**
- 1.7. Measure the battery voltage to ensure that individual cells are connected correctly. The total voltage value should be approximately equal to the number of cells times the measured voltage of one cell. If the measurement is less, check the individual cell's



polarities again.

- 1.8. Snap the supplied connector covers onto the connecting straps.
- 1.9. Connect the battery to the charger.

#### 2. Commissioning

- 2.1. **If a battery is delivered at discharged state, a commissioning charge is necessary prior to putting the battery into service.**
- 2.2. The initial charge may cause a significant amount of hydrogen and oxygen to be generated. Verify the ventilation is sufficient.
- 2.3. The following methods of commissioning charge are recommended:
  - Constant current charge at 0.1 C<sub>5</sub> A (e.g. 10 A for a 100 Ah battery) for 16 hours, or
  - Constant current charge at 0.2 C<sub>5</sub> A (e.g. 20 A for a 100 Ah battery) for 8 hours.
- 2.4. If the charging voltage is higher than the charger's voltage limit, the battery should be split to allow the cells to be charged up.
- 2.5. During the commissioning charging, high cell voltages up to 1.9 V may occur. If the charging voltage exceeds the system voltage limit, perform the commissioning charge off-line from the dc system.
- 2.6. After a rest period of at least 2 hours, top up the electrolyte with distilled or de-ionized water to the maximum mark.
- 2.7. Clean the cells with a clean, wet cloth.

#### 3. Charging in service

- 3.1. During normal operation, Qualmega KPL batteries may be charged by the following methods:
    - Dual rate charging:
      - **Boost charge: 1.67±0.03 V/cell** for a maximum of 20~24 hours with 0.1~0.2 C<sub>5</sub> A maximum current limit, then
      - **Float charge: 1.44~1.49 V/cell** with 0.1~0.2 C<sub>5</sub> A maximum current limit.
- The boost charge should be reapplied manually or automatically after a deep discharge.

- Single rate charging:
  - **Float charge:  $1.48 \pm 0.04$  V/cell** with 0.1~0.2 C<sub>5</sub> A maximum current limit
- 3.2. If the temperature is outside the range of  $20 \pm 10^{\circ}\text{C}$  ( $68 \pm 18^{\circ}\text{F}$ ), it is recommended to adjust the charging voltage to compensate the temperature change. The recommended adjustment is:  $-3$  mV/ $^{\circ}\text{C}$ / cell ( $-1.7$  mV/ $^{\circ}\text{F}$ / cell).
- 4. Electrolyte**
  - 4.1. Qualmega Ni-Cd batteries are filled with potassium hydroxide (KOH) solution and an additive of lithium hydroxide (LiOH).
  - 4.2. Visually check electrolyte levels regularly. If the electrolyte levels of the battery are below the mid-point between the min. and max. marks, top-up to the max. mark with distilled or de-ionized water. **Top-up only when the battery is at the fully charged state.**
  - 4.3. If there is evidence that electrolyte has been ejected from vents or that there is excessive water loss, this could indicate a charger or system malfunction. Action should be taken to rectify this.
- 5. General maintenance**
  - 5.1. It is important to keep the batteries, racks, trays, and insulating covers dry and clean to avoid leakage current and corrosion.
  - 5.2. Use damp cloth to clean the battery. Do not use solvents of any kind. Use water only.
  - 5.3. Check float charging voltage and current often. **High water loss is usually caused by high floating voltage.**
  - 5.4. Check electrolyte level often as in section 4.2.
  - 5.5. Check every year to make sure that all the connections are tight.
  - 5.6. It is recommended that for every 6 ~ 12 months (depending on the operation condition), measure the voltage of each cell during float charge.
  - 5.7. If the voltage of an individual cell in a floating battery is found to be 30mV below the average cell voltage, apply a high-rate charge.
  - 5.8. Do not use or store Ni-Cd batteries in the same room with lead-acid batteries.
- 6. Storage**
  - 6.1. To take the battery out of service:
    - Discharge at 0.1 C A to an end of discharge voltage of 1.0 V/cell
    - Replace the standard vent plugs with the transport plugs.
    - Clean the cells
    - Store the batteries on open shelves in a clean, dry, cool and well ventilated room where the temperature is not more than  $25^{\circ}\text{C}$ .
  - 6.2. Before putting the batteries back to service, **replace the transport plugs with the standard vent plugs.** Perform the Commissioning steps again as described in sections 2.2 to 2.7.