

Attachment af)

The description of construction of the poles (inlets) and the connection parts OPzV

1. Construction of poles of OPzV cells

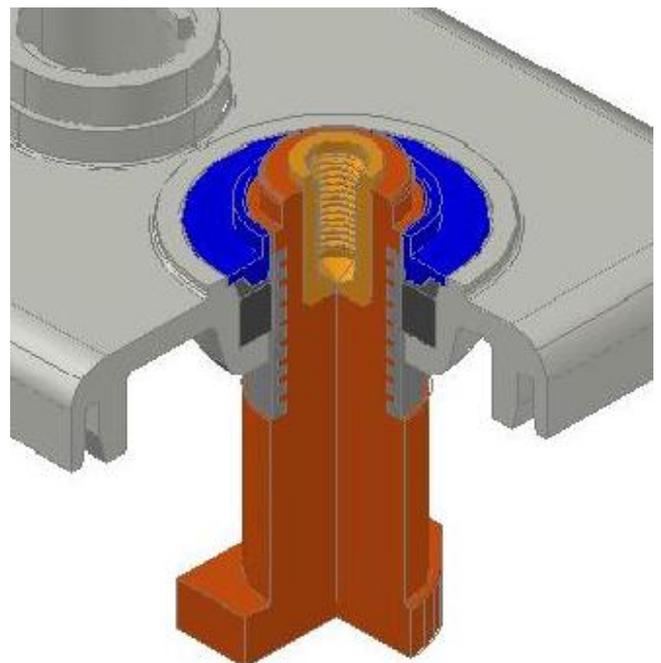
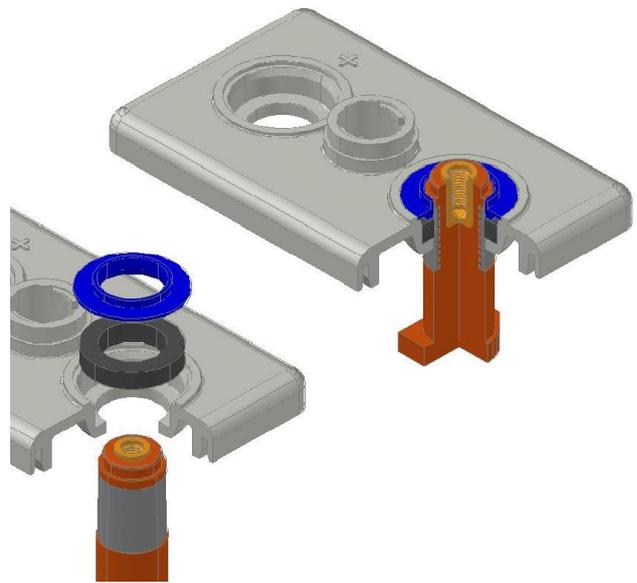
OPzV batteries are batteries with an expected service life of 18 years for OPzV cells and 15 years for OPzV blocks. In this period we get in average a corrosion layer of $30\mu\text{m}/\text{year} \times 18\text{years} = 540\mu\text{m}$ or 0,54mm on the positive grid, here around the spines of the tubular plate. As a consequence of the corrosion of the spine we get a growth of the positive plate and the positive pole. To avoid any cracking of lid and container, U-Power uses a **sliding pole** as seen on the right hand side.

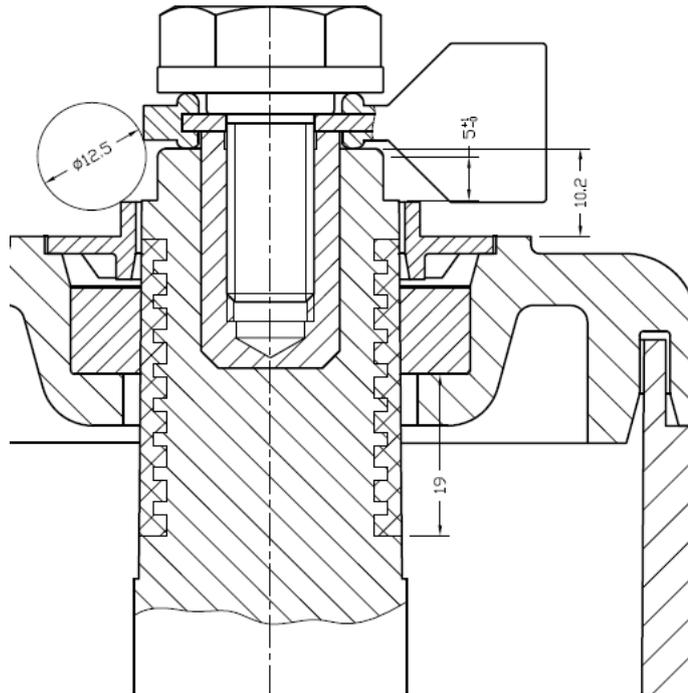
The pole is casted with a brass inlay, characterized by a M10 thread for receiving the M10 pole screw.

Next a labyrinth is machined in the lead shaft of the pole. This part is covered with a primer prior to the injection-mould to form a plastic jacket.

The seal between the lid and the plastic jacket is made by a strong rubber ring, which allows a sliding during growth of the pole.

A pole ring in the colors blue for the negative and red for the positive pole covers the black ring and makes the polarity-finding easier.





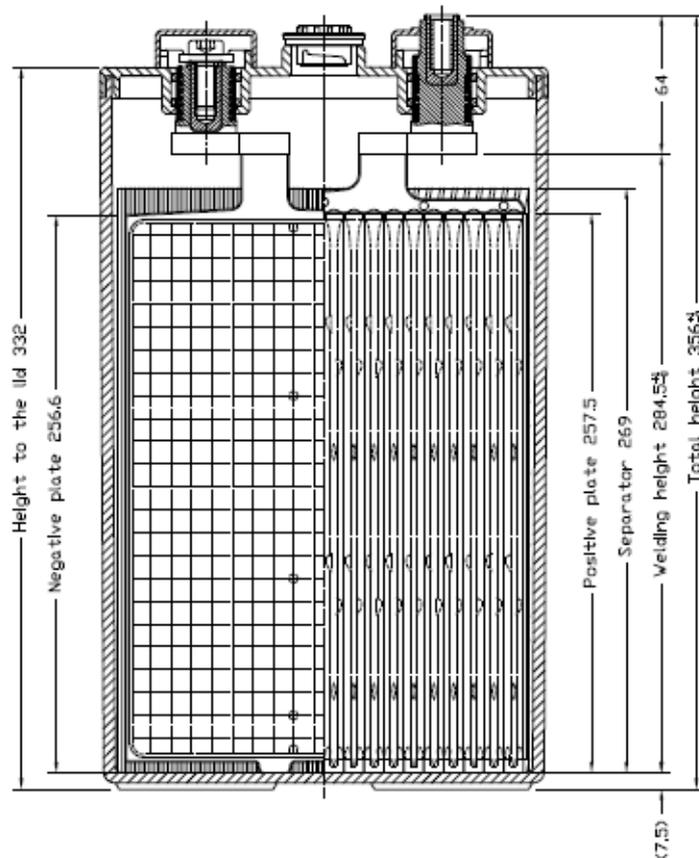
We can see in the drawing above that the pole bushing design allows a growth of 19mm, before the lead surface touches the lower edge of the black rubber ring. According to our experience the rubber ring stays in place as the pole is moving upwards.

Outside of the cell we provide a 5mm ring of the pole with free access of measuring the contact resistance of the connectors, the impedance value of the cell and f.e. with a crocodile-clamp the cell voltage during a capacity test. The dimension of the pole bushing parts and the connector are chosen in a way that we get a contact protection IP 25 according to DIN 40050: The design is safe against touching with fingers and against water from all directions.

The cable connector is pressed onto the pole by a plastic-headed screw assembled with a high torque of 22Nm, providing a good contact and sealing the contact surface with rubber lips from above and below.

The plastic-headed screw has on top a lead ball, to measure the cell voltage. Cable connectors can be provided from 35mm² to 180mm² copper cross section. For telecom applications we deliver normally cable connectors with 50 to 70mm² cross section. As option we can deliver flat copper connectors having also the lips by injected Thermo-Plastic-Polymer (TPP).

2. Construction of poles of OPzV blocks



By using the same sliding pole for the end poles and the inner poles we get the same sliding characteristic for all poles. The connection is 100% acid and gas tight, so that we can use copper connectors between the cells without risk.

Sunlight uses not the inter-partition-wall welding of lugs instead of poles and connectors. This design is typical for automotive batteries with a service life of 5 years. It is not growth-tolerant and can lead to cracks of the container and short-circuits between positive plates and negative pole straps.

We see that the all poles have also the design as used for OPzV cells: Brass inlay with M10 thread, plastic jacket around the pole and rubber ring between the cover groove and the jacketed pole. Also access to the lead pole is provided. The standard inter-block connectors are cable connectors in 35 or 50mm².