



## **VOLTAP, a powerful and reliable charging station for battery trains**

Stadtwerke Tübingen (swt) and Furrer+Frey have successfully tested VOLTAP, the first ultra-fast charging station to be developed for battery trains in real operation. During tests with a major OEM battery train in Baden-Württemberg, the VOLTAP charging station demonstrated that its innovative technical approach works precisely as designed. VOLTAP is now available as a vital building block for charging infrastructure in battery train operations worldwide. In many situations, battery trains together with VOLTAP charging infrastructure can replace diesel trains quickly and economically.

The VOLTAP fast charging station was developed by Furrer+Frey in partnership with Stadtwerke Tübingen (swt) as a simple, reliable and low-cost solution for fast charging 25 kV or 15 kV battery trains at a train station or depot.

Success was achieved by consistently pursuing the goal of simplicity and applying existing rail standards. Instead of supplying the vehicle with a plug-and-socket solution, 50 Hz mains voltage is fed in via the train's pantographs at up to 1.2 MW per pantograph. In many cases, the battery train requires no adaptation at all to allow for use of VOLTAP, since rail standards have been rigorously applied.

VOLTAP is entirely transformer based using a unique, patented technique that balances the load on the three-phase MV grid without complex and costly power electronics. Also, because it is transformer based, its useful lifetime is measured in decades instead of years. Finally, costs are reduced dramatically due to its clever combination of industrial standards and components.

VOLTAP can be used as a fast charging station at train stations to directly replace diesel trains without erecting overhead catenary, or to extend an existing electrified line onto non-electrified tracks. Another use is in sidings or workshops, where it opens up the possibility of replacing diesel locomotives in shunting and port operations.

### Technical features

- Battery train charging station using unique transformer based design
- Balanced MV grid load possible
- High economy thanks to low losses and no need for infrastructure-side frequency inverters
- Very long lifetime, low maintenance
- Small physical footprint
- Simple charging operation by stopping under the charging station and raising the pantograph
- Compatible with all 25 kV/15 kV trains
- TÜV Süd certification

### Charging station

Input medium-voltage network	10 kV to 30 kV 3 phase
Grid unbalance	0% using 2 pantographs
Charging power	up to 1.2 MVA per pantograph (15 kV) up to 2.0 MVA per pantograph (25 kV)
Remote monitoring and switching	24/7 via swt control room
Dimensions of transformer station with switchgear	8 m (L) x 3 m (W) x 3 m (H)

### Catenary system

Conductor rail	Furrer+Frey® CR4 system
Maximum charge current at standstill	80 A per pantograph
Max. conductor temperature	90 °C
Rail support spacing	7-15 m
Conductor rail cross-section	2100 mm <sup>2</sup>
Conductor rail length per charging point	30 m
Conductor rail material	aluminium alloy
Usable contact wire	EN 50149 with 100-150 mm <sup>2</sup>
Weight of conductor rail without contact wire	approx. 6.1 kg/m

### Possible applications

- Fast charging at stations or other suitable place along the route
- Sidings, workshop
- Port and shunting operations