

DC Substations

with compact construction method (kGUW)



DC Substations

Rapidly available, ready to use, Pre-tested and easy to set up

Immediately ready for use

Direct current substations with a compact construction method for supplying energy for local rail transport are prepared at the manufacturer's factory to be ready for connection. They can be made of concrete in accordance with EN 62271-202 with fault arc classification IAC-AB, 20 kA, 1 s, which opens up a wide variety of installation options and makes installation in public spaces no problem.

Compact substations are the ideal solution for applications in which electrical traction energy must be made available for railway operation quickly and without lengthy construction work. Another application for these container substations is as a substitute for existing substations during conversion or modernisation work.

The building envelope of a compact substation can optionally be made of concrete, coated steel or glass-fibre-reinforced plastic (GRP). The slightly lower costs and the durability of the concrete construction are clear benefits. Versions made of steel or GRP are to be preferred for reasons of mass where only temporary installation is planned or if multiple changes of location are expected.

Equipped ready for operation

The compact substation contains all the systems required for operation. These include:

- Medium-voltage switchgear
- Rectifier transformer
- Rectifier and DC switchgear
- Substation control and remote control coupling
- Low-voltage system with auxiliary power system and emergency supply
- Internal earthing system
- Lighting and heaters

Pre-tested

The compact substations are extensively tested in the manufacturer's factory. All the connections between the installed systems are fully set up and tested. Connections to and from the outside are prepared for quick assembly and signals are checked up to the transfer terminal block. This reduces the assembly and commissioning time on site to a minimum.

Assembling the systems in the factory ensures the highest quality during installation. The usual construction site difficulties such as dirt, tricky access conditions, weather and environmental conditions have no effect. Any necessary adaption work can already be carried out at the factory with machines of the highest precision.



Fully equipped kGUW ready for transport

Easy to set up, optimal network design

Due to their construction method, the compact substations have low space requirements. For a substation with a higher output, multiple units can be combined. However, in a railway energy supply that is optimally decentralised from an energy point of view, the intended main purpose generally involves more, but smaller, rectifier substations. The requirements for high availability are achieved by means of redundancy in the network, i.e. adjacent rectifier substations. This makes it possible to dispense with redundant systems such as a second transformer/rectifier unit and a double busbar system with bypass switchgear inside the rectifier substations.

Depending on the building design, in addition to ground-level installation, it is also possible to have installations on a slope, or partially or completely recessed into the ground. An elevated version is also appropriate in flood-prone areas. The prerequisite for this is a load-bearing substrate with or without a substructure. Thanks to a raised false floor in the switchgear room, power cables can be installed easily and hassle-free.

The design ensures high sound insulation values and allows easy installation even in residential areas. The requirements of the TA Lärm regulations are fulfilled. The requirements of the 26th BImSchV ordinance for electric and magnetic fields are also complied with.

Short assembly and commissioning time

Thanks to pre-installed and pre-tested power and control cables between the systems, the assembly and commissioning time after setting up or relocating the container is reduced to a minimum. Once the external power cables and control lines are connected, the container substation can go into operation within a few hours.

Characteristics of compact substations Building

Steel construction

- Welded hollow steel profile base frame with welded-in steel structural panel as outer wall; alternatively bolted hollow steel profile base frame; seamlessly galvanised, outer wall made of aluminum or galvanised steel structural panel
- Painted in RAL colours or veneered
- Raised false floor
- Pressure release flaps
- Dimensions: ISO standard dimensions or special sizes up to 12 m in length and 4 m in width.
- Integrated shading or integrated air conditioning possible.

Concrete construction

- Factory-assembled concrete cell
- Seamless machining of the base bodies from a single casting with a removable roof
- Facades with plaster in RAL colours or facing with wood, clinker, slate and natural stone possible
- Corrosion-free doors, ventilation and pressure release openings made of anodised aluminium
- Protection against impact and vandalism
- Resistant to the weather, additional thermal insulation is also possible
- Non-sensitive to condensation
- Waterproof even in the ground
- Raised false floor
- Dimensions for example 9.1 m x 3.4 m x 3.3 m (L x W x H)



KGUW positioned in a terminal loop at the final installation site with short cable paths

Medium-voltage switchgear assembly

- Rated voltage up to 24 kV
- Standard switchgear assembly in air-insulated or (if preferred) gas-insulated design

Transformers

- Oil, cast resin or dry transformers
- Installed in separate transformer room

Rectifier

- TracFeed® TRx rectifier for easy accessibility and maintenance
- Natural air cooling in a six- or twelve-pulse version
- Performance and load class in accordance with the requirements

DC switchgear assembly

- TracFeed® TDx DC switchgear
- Rated voltage DC 750 V or DC 1,500 V
- Circuit breaker panels in switchgear truck technology
- Panel width 500 mm or 800 mm.
- Protection and control units TracFeed® DCP 3.

Auxiliary power system

- Systems for buffered power supply to the compact substation

Control/monitoring

- Control and monitoring by means of a central unit and decentralised automation units in the DC switchgear (DCP 3) and in the MS switchgear
- Remote control coupling

Example design

Compact substation for Dresdner Verkehrsbetrieb AG (as of 2022) System data

- External dimensions: 9.1 m x 3.4 m x 3.3 m (L x W x H)
- 20 kV medium-voltage switchgear with four panels (K-K-Ü-M)
- 1 MVA oil rectifier transformer with low no-load losses
- TracFeed® GR2/A evo rectifier for 1,900 A; six-pulse with feed-in disconnecter
- TracFeed® TDA 750 V DC switchgear, two line feeder panels with bypass busbar, cable outlet isolators and protection and control unit
- Negative return feeder panel with cable outlet isolators and frame fault protection
- Central control unit



Concrete version of the KGUW being lifted by crane off the transporter



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