

Multi-Voltage Static Converter for Railway Coaches



Compact and lightweight auxiliary power supply

Modular system for all UIC voltages

Functional reliability up to 5 kV DC

Based on the reliable and proven MEE-NT^{LD} platform

Approved in almost all European countries

High converter overload capacity

Compact and lightweight input filters thanks to a highly dynamic input current control

Installation in two separate enclosures for easier integration

A multifaceted variety of options allows project-specific adaptability

Since 1999 SMA has been delivering multi-voltage auxiliary power supply systems for railway coaches based on the MEE-NT platform, the system to succeed the proven MEE3000 system. More than 300 vehicles have been equipped with MEE-NT^{LD} multi-voltage auxiliary power supplies since then. Vehicles with an MEE-NT^{LD} converter are approved in almost all European countries and are characterized by their high reliability.

In the winter of 2005/2006, 15 railway coaches of the legendary Venice Simplon-Orient-Express were equipped with MEE-NT^{LD} multi-voltage auxiliary power supplies. But this is only one application. The converters are also used in couchette coaches, sleepers or day coaches of e.g. German Railways (DB), Austrian Railways (ÖBB), CityNightLine and Danish State Railways (DSB). A total of more than 300 vehicles have been equipped with this system and are used in daily revenue service throughout Europe.



Figure 1: Venice Simplon-Orient-Express equipped with an MEE-NT^{LD} multi-voltage auxiliary power supply

Concept

The MEE-NT^{LD} multi-voltage auxiliary power supply features an electrically separating input converter with a standard rated power of 50 kW or 75 kW.

Each input converter consists of three power electronic converters

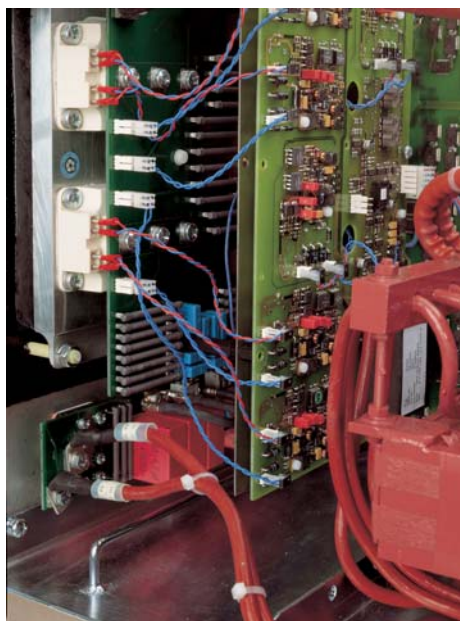


Figure 2: MEE-NT^{LD} - detail of an input converter module

with medium-frequency transformers. These converters are connected in series on the input side and in parallel on the output side. The configuration is the same over the entire input voltage range between 700 V AC and 5,000 V DC eliminating the possibility of system damages caused by misconfigurations.

Each converter features an input step-up converter allowing the active control of the input current. The input filter's size is minimized. At the same time, the converter draws a pure DC current from the train line, if operating with DC, or a sinusoidal input current in phase with the input voltage, if operating with AC.

In addition, input impedance control and distortion current suppression are implemented. This procedure complies with all requirements of European railway companies and is proven and approved in nearly all European countries.

The electrically separating input converter produces a DC link where different output converters, such as battery chargers and inverters, can be connected. It is also possible to connect the coach heating to the intermediate circuit.

Standard battery chargers are available for all usual battery systems and charging procedures of up to 12 kW as well as single- or three-phase inverters for fixed- or variable-frequency operation up to 69 kVA. All railway coach requirements for the auxiliary power supply can thus be complied with using proven standard modules.

Design

The MEE-NT^{LD} multi-voltage auxiliary power supply has been designed to comply with all requirements for refurbishments projects as well as for new rolling stock.

Usually there is only limited space available in a vehicle's underfloor area for the auxiliary power supply. The MEE-NT^{LD} was therefore conceived as a two-enclosure system to simplify integration and to ensure that the weight balance is not adversely affected.

One enclosure holds the complete input converter, the other contains all output modules. The electronics is integrated in modules which can be simply exchanged if required. The control electronics is installed in racks which can be easily accessed on the front side of the modules. A sophisticated diagnosis system as well as a large number of communication interfaces are available as standard equipment.

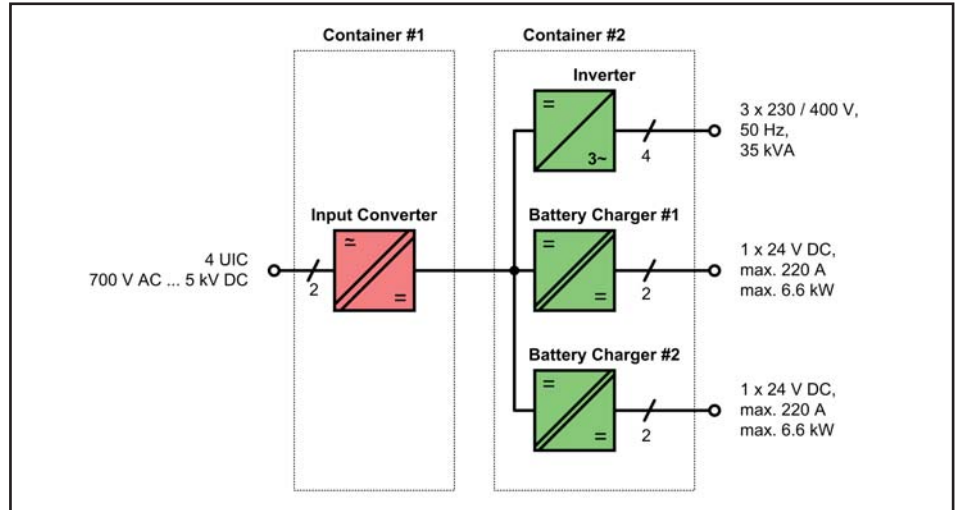


Figure 3: Block circuit diagram of an MEE-NT^{LD} used on the Venice Simplon-Orient-Express

The MEE-NT^{LD} multi-voltage auxiliary power supply is designed with a combination of natural cooling with ventilation in case of high power requirement. The fans are installed in easily removable fan covers on the backside of the enclosure and are temperature-activated when needed. This procedure,

which increases the fans' service life and allows a weight-optimized system design, has proven itself in daily revenue service over years.

In contrast to SMA's MEE-NT^{SD} auxiliary power supply systems for short-distance traffic, all inductive components of the MEE-NT^{LD} are cooled only naturally.

The MEE-NT^{LD} was designed to minimize noise emission, which makes it suitable for use in couchette coaches and sleepers. This was one of the major criteria leading to its choice for the Venice Simplon-Orient-Express.

The MEE-NT^{LD} multi-voltage auxiliary power supply is installed in welded underfloor enclosures. It is comparatively light, weighing between approx. 1,100 kg and 1,400 kg depending on rated power and equipment specifications.

The MEE-NT^{LD} can optionally be installed in switch cabinets inside the vehicle as well.



Figure 4: MEE-NT^{LD} battery charger as module

Conclusion

SMA's MEE-NT^{LD} is a sophisticated high-performance platform of multi-voltage auxiliary power supplies for long-distance traffic. Based on this innovative and trend-setting platform, it is possible to implement silent, modular, compact and lightweight power supply solutions specific to the requirements of almost any kind of railway coach. The multi-voltage auxiliary power supply MEE-NT^{LD} is proven, reliable and approved for most European countries. It is the first choice for refurbishment projects.



Figure 5: Input converter installed in underfloor enclosure with open doors

Technical Data

of MEE-NT^{LD} for Venice Simplon-Orient-Express

| | |
|-------------------------------------|-------------------------------------|
| Input voltage: | 4 UIC, 700 V AC ... 5,000 V DC |
| AC output: | 3 x 230 / 400 V, 50 Hz, 35 kVA |
| DC output 1: | 1 x 24 V DC (30 V max.), 220 A max. |
| DC output 2: | 1 x 24 V DC (30 V max.), 220 A max. |
| Dimensions of underfloor enclosure: | 2 x approx. 2,500 x 960 x 580 (mm) |
| Weight: | approx. 1,200 kg |

Other technical data is available upon request.

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