SMA provides converters based on the MEE-NTSD platform of auxiliary power supplies for the climate control of passenger compartment and driver's cab. The converters are integrated into the air conditioning units.

Two ET420 prototype DB AG commuter trains for greater Stuttgart, Germany, were refurbished and tested in the DB AG's workshop in Krefeld, Germany, in 2005.
Modernizing already-existing railway vehicles is always a challenge. The integration of significant electrical and mechanical upgrades not considered in the original design requires clever and detailed solutions.

SMA’s modular auxiliary power supply, MEE-NTSD, is an innovative platform providing a solution for the most challenging tasks, as was the modernization of DB AG EMU’s of the type ET 420, for example. In the summer of 2005, two prototype EMU’s were refurbished in the DB Krefeld workshop. They belonged to the two last series delivered to the DB between 1989 and 1997. In addition to new seats or a public address system, for example, an air conditioning system for the driver’s cabs and the passenger compartment was retrofitted. In particular, the power supply for these upgrade systems proved to be a great challenge. The existing onboard power supply could not provide the extra power needed for the additional consumers. An additional source had to be installed in the air conditioning on the roof because the underfloor space of the vehicle was already full. As the roof of the ET420 was not designed for added loads, all new components had to be as lightweight as possible.

The ET420 is electrically designed for operation at 15 kV AC 16.7 Hz. The existing onboard power supplies as well as the drives are supplied via separated windings of a traction transformer. However, the winding provided for the existing onboard supply was not suitable, in terms of its power, for the added load of the air conditioning. The traction winding, on the other hand, has sufficient power reserve. The additional power supply for the air conditioning system was therefore designed to be connected to the traction winding. This traction concept sees two
windings per motorized car. Each traction winding is assigned a thyristor chopper as traction converter. The DC output of the traction converters is connected in series and supplies all traction motors simultaneously. This solution, of course, has substantial consequences for the additional power supply. On the one hand, it must have an electric separation in order to avoid improper stress of the insulation of all consumers within the air conditioning unit. In order to minimize the transformer load, on the other hand, a current which is as sinusoidal as possible has to be drawn from the traction winding. The additional auxiliary power supply must be able to cope with the voltage distortion at the transformer caused by the thyristor traction converter and its emission of electromagnetic interferences.

MEE-NTSD as System Solution

Due to these very high requirements SMA’s MEE-NTSD was selected as the auxiliary power supply system. It consists of an electrically separating input converter designed as a soft-switching power unit with active input current control and electric separation by a medium-frequency transformer. This input converter equipped with active input current control (PFC) guarantees a sinusoidal input current in phase with the distorted input voltage. It provides a DC link where all fixed- and variable-frequency 3-phase inverters for different loads within the air conditioning system are connected. DC outputs can of course be realized with the MEE-NTSD auxiliary power supply platform.

The MEE-NTSD power supply is optimized for the lowest system weight. The modules can be directly integrated into the air conditioning units. Each air conditioning unit is therefore equipped with its own power supply.

In addition to its mechanical modularity, the MEE-NTSD-based auxilia-
Input voltages

- e.g. 1 x 370 V AC from traction transformer or optionally 600 / 750 V DC from catenary or 3rd rail available with and without electric separation

AC output 1

- e.g. fixed-frequency 3 x 400 V AC, 50 Hz

AC output 2 (option)

- e.g. variable-frequency up to 3 x 560 V AC, 70 Hz
- other AC outputs are possible

DC output (option)

- e.g. 24 V DC, other voltages are possible

Dimensions

- as required by the vehicle