

BORDLINE® CC750 MS (1 kV_{DC} and 11 kV_{AC}/16.7 Hz) Propulsion and auxiliary converter for dual-voltage multiple unit trains

The Compact Converter BORDLINE® CC750 MS converts the power from the 1 kV_{DC} or 11 kV_{AC} overhead line into propulsion power for the traction motors and auxiliary power for onboard consumers (AC, DC, and battery).

Characteristics

- Single axle control for maximum adhesion exploitation
- Dual-voltage system
- Compact and light design
- High integration (auxiliary converter, battery charger)
- High power density (without second harmonic filter)
- Powerful control platform
- Ice-breaking function
- Cooling on demand

System overview

BORDLINE® CC750 MS is a traction converter for dual-voltage railcars and supplies the propulsion power for the traction motors. Either the traction converter operates directly under the DC overhead line of 1 kV_{DC} or the traction converter is connected with a transformer to the AC overhead line of 11 kV_{AC}.

BORDLINE® CC750 MS converts the incoming power via the DC-link voltage in frequency variable output power for the traction motors and onboard supply. Each power head is fitted with two propulsion converters (converter part 1 and converter part 2) and fed by a common transformer in AC operation and accordingly fed by an own DC choke for DC operation. Both traction converters work independently to reach a maximum redundancy under both voltage systems. Both traction converters are identical, apart from the auxiliary converter and battery charger configuration.

The traction converter consists of:

- System switch contactor and precharge unit
- Two line converter
- DC-link circuit
- Voltage limiter unit/braking chopper
- Two independent propulsion converters
- Auxiliary converter (sine filter 50 Hz)
- Battery charger (only converter part 1)
- Auxiliary inverter (only converter part 2)
- Control system



BORDLINE® CC750 MS for dual-voltage multiple unit trains

Propulsion converter

The compact and robust BORDLINE® CC750 MS is based on low-voltage IGBT technology. With a high switching frequency of 1 kHz and 2 kHz, BORDLINE® CC750 MS generates sinusoidal-like output voltage, which dramatically reduces the losses, the audible noise and the mechanical stress on the traction motor. Each BORDLINE® CC750 MS can control one or two motors in parallel independently.

Auxiliary converter

The auxiliary converter generates directly from the DC-link circuit voltage a current limited 3-phase-voltage. A sine filter smoothes this pulse width modulated voltage to provide a sinusoidal voltage waveform at the output terminals of the auxiliary converter. Converter part 1 and 2 work independent of each other in case of failure, and complete the well-engineered redundancy concept.

Battery charger

The battery charger is integrated and connected with the DC-link.

Auxiliary inverter with variable frequency

Converter part 2 is identical to part 1 but has instead of the battery charger a second auxiliary inverter (variable frequency).

«Ice breaking» function

Under DC operation, the line converter operates as a step-up converter in the event of an iced overhead line. The vehicle control unit releases this function as soon as input current falls below a minimum value. A voltage as high as possible (maximum overhead line voltage) is built above the ice coating between the overhead line and the pantograph. Therefore the ice coating is penetrated electrically and flowing creepage current is melting the ice.

Powerful control platform

ABB traction converters are built on the AC 800PEC control platform, one of the most powerful modular controllers for high-speed performance on the market. This control platform is also used in a wide range of industrial applications. The AC 800PEC software is implemented on three performance levels, thus providing an excellent range of control and communication functionality, in cycle times that extend from the sub-microsecond to the millisecond level. Compared to most other commercially available traction control systems, the modular application software in the AC 800PEC reduces train commissioning time significantly.

Cooling system

The Compact Converter BORDLINE® CC750 MS is efficiently cooled using service water without the need for a heat exchanger. The internal fan ensures forced-air circulation inside of the power parts and dissipates the heat via an internal air-to-water heat exchanger connected to the main cooling circuit. An additional, external ventilation of the power parts can therefore be omitted. The Compact Converters are integrated in the vehicle cooling concept.

Mechanical design

The propulsion and auxiliary converter are housed in an IP65 rated, solid and vibration resistant housing. BORDLINE® CC750 MS is designed for under-floor mounting. The modular design allows easy access for maintenance and servicing. Power parts can be easily exchanged by one person.

Application example

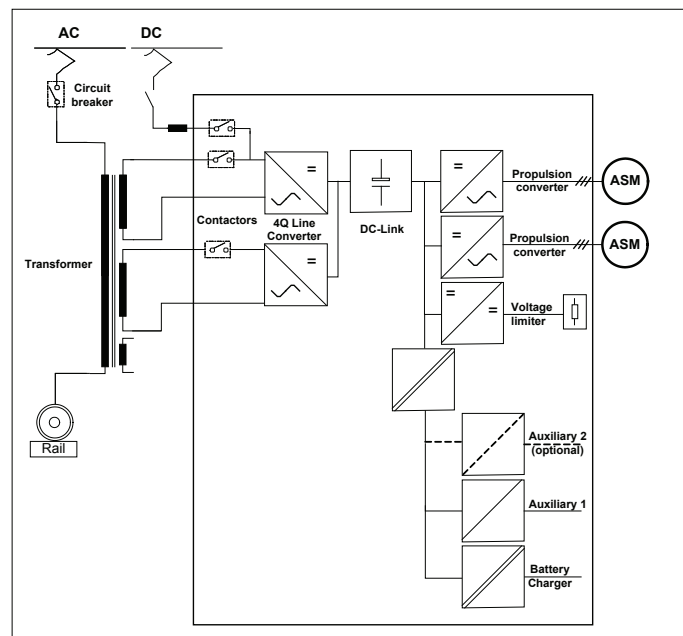
For example, the BORDLINE® CC750 MS is used in the new powerful «ALLEGRA» dual-voltage multiple unit trains by Stadler Rail operating on the famous Bernina line of Rhaetian Railway (RhB). The line climbs up the Bernina pass via gradients up to 70 ‰ making it one of Europe's steepest adhesion railways. The line runs up to 2253 meters above sea level. The multiple unit trains consist of two power heads with two transformers, four Compact Converters BORDLINE® CC750 MS, and eight traction motors.



Dual-voltage multiple unit train by Stadler Rail for RhB

Diagnostics and service

The service-friendly modular design with highly standardized components ensures high reliability, excellent spare parts availability, and optimized life-cycle costs. The Compact Converter is delivered with BORDLINE®-View, a diagnostic tool that visualizes signals, various parameters and the state of the traction system. It consists of an advanced self-diagnosis function, which provides advice and instructions for service and repair. BORDLINE®-View is easy to use and runs on a standard PC.



Block diagram BORDLINE® CC750 MS

Technical data	BORDLINE® CC750 MS
AC voltage input	850 V / 16.7 Hz
Propulsion output	2 x (0 - 930 V) 2 x 350 kW
DC voltage input	1 - 1.4 kV _{DC}
Propulsion output	2 x (0 - 670 V) 2 x 300 kW
Auxiliary converter 1	70 kVA, 50 Hz
Auxiliary inverter 2 (optional)	15 kVA V/f
Battery charger (optional)	8 kW, 36 V _{DC}
Mounting position	under-floor
Dimensionen (L x W x H)	2000 x 2110 x 590 mm
Weight	1120 kg

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