

E-BUS

PRIMOVE PROPULSION

Reliable turnkey propulsion solution for e-mobility



.....
We are one of the world's leading providers of propulsion and control equipment for trains. With the *BOMBARDIER PRIMOVE* propulsion and controls portfolio, we are extending this know-how and experience into the e-mobility market.
.....

WHY CHOOSE PRIMOVE PROPULSION?

Configurable architecture

Different routes and climate conditions require respective power supplies. To meet individual needs, *PRIMOVE* propulsion offers a modular architecture.

Platform independent

PRIMOVE propulsion can be applied to all typical e-bus

platforms independent of central drive or axle drive setups, regardless of vehicle size and type.

Easy integration

All power converters for traction and auxiliaries for an e-bus are integrated into one single *PRIMOVE* Power Equipment Box (PEB) for greater flexibility when it comes to vehicle installation and commissioning.

Designed for reliability

Comprehensive validation of the IGBT propulsion systems with in-house testing facilities ensures high reliability for excellent fleet availability.

Remote diagnosis

Remote diagnosis via mobile radio and/or WLAN ensures early notification of any event and operational data to optimize maintenance and minimize overall repair and standstill time.

THE TECHNOLOGY BEHIND

One turnkey propulsion and drives solution for electric buses

Power Equipment Box

- Inverter for 1 or 2 motors
- Auxiliary supply 24 V DC
- Auxiliary supply 400 V AC
- Propulsion control unit
- Power distribution unit



Motor Solution

- Wheel hub motors (e.g. ZF axle), 2 x 85 kW
- Central motors 140 / 240 kW

System Integration

- Commissioning
- Homologation



Services

- Spares, repair, overhaul
- LCC contracts
- TCO calculations
- Remote diagnostics, CBM
- Route profile optimization
- Consulting, training

The *PRIMOVE* propulsion 140 and *PRIMOVE* propulsion 200 systems complete the *PRIMOVE* e-mobility portfolio with proven Bombardier propulsion technology.

From traction and auxiliary converter modules to individual complete HV system solutions, our competitive *PRIMOVE* propulsion system provides manufacturers and operators with a reliable turnkey solution that boosts the overall performance and efficiency of electric buses.

PRIMOVE propulsion system architecture

The *PRIMOVE* propulsion system is based on the proven design and concepts of our rail products. Transferring this architecture to the e-bus application resulted in a highly integrated product with minimum interfaces to the vehicle manufacturer (OEM) without compromising on flexibility, allowing the usage on all vehicle platforms. This is possible thanks to the integration of the major inverter components including control and supply into one central power equipment box (PEB).

Due to our knowledge in vehicle cabling and component integration, as well as vehicle homologation we can ideally support our customers, especially concerning high voltage systems.

The *PRIMOVE* propulsion system is fully configurable, offering a wide scope of opportunities to adapt to every vehicle. It offers a choice between two motor converter module ratings and the auxiliary inverter solution allows for flexible configuration and adjustments according to the desired solution. The platforms available include 12-metre, 18-metre and 24-metre e-buses for both, fully electric and hybrid solutions as well as trolley buses.

The *PRIMOVE* propulsion system has been extensively tested in our own high power testing facilities. A hardware in the loop test environment allows for software pre-testing of the major control algorithms and architectures before rolling them out to the customer, resulting in decreased development time and cost, as well as development errors within customer projects.

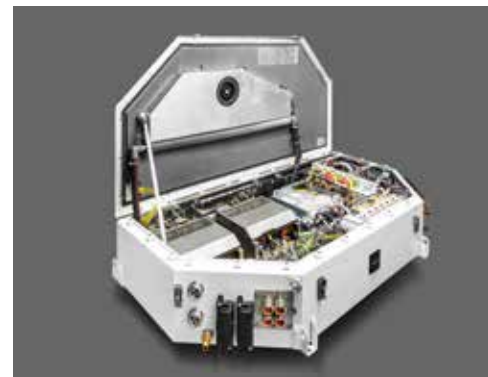
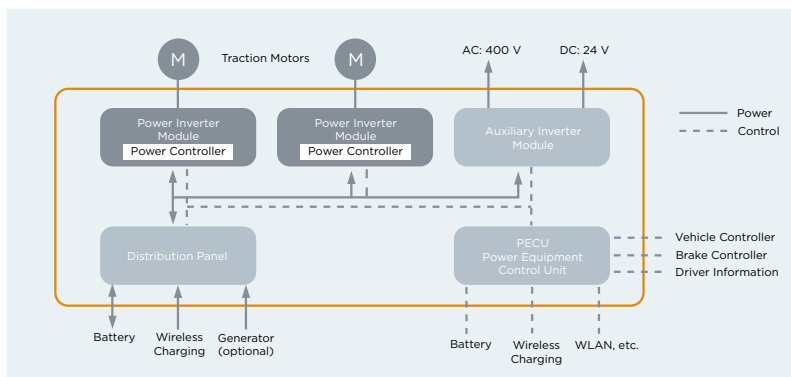
In addition, with our powerful traction battery portfolio and our catenary front end (CFE) inverter we are able to provide a complete battery trolley system with increased power density compared to a conventional trolley system. This enables us and the OEM to minimize variation efforts between e-bus and trolley bus platforms.

POWER EQUIPMENT BOX

.....
The heart of the *PRIMOVE* propulsion system is the power equipment box, which contains all relevant components to drive and supply an e-bus.
.....

Main features

- Power equipment control unit
- Generation of tractive effort
- Supervision of safety relevant functions
- Coordination of AUX loads and energy management
- Communication interface with external control devices (HMI, EBS, ...)
- One or two motor converters with different ratings
 - Two different power ratings selectable
- Two to three different auxiliary converters
- High voltage distribution panel towards traction battery and charging
- Low voltage distribution
- AC 400V and 24 DC (including main battery charging)



PRIMOVE motor converters

PRIMOVE offers reliable high performance motor converter modules based on long-term rail development know how and widespread field experience from several thousand rail vehicles in daily operation.

By applying this long-term experience to the requirements of the application of electric buses we can offer powerful and reliable products applicable to most bus platforms and electric motors on the market.

Auxiliary converter modules

Offering flexible configurations of AUX converters makes the *PRIMOVE* propulsion system even more modular. Our equipment delivers up to three different configurations of 400V AC controls, enabling the application of either constant 50Hz or frequency control.

To allow high flexibility for different AC load components, *PRIMOVE* supports a wide range of selective outputs from two to nine selective AC outputs. In addition, adjustable power ratings of auxiliary modules between 40 kVA and 60 kVA at 400 V AC and 10 kW to 15 kW at 24V DC are available.

PRIMOVE PROPULSION EQUIPMENT FOR E-BUSES

Easy and flexible system integration

PRIMOVE is the one-stop shop for propulsion equipment: design, selection and integration of complete bus HV systems, perfectly adapted to the individual customer requirements.

- Existing interface towards *PRIMOVE* inductive charging, as well as conductive platforms
- Interface towards *PRIMOVE* high power battery established, others also applicable

- Available ECE R85 certificate for central motor drive as well as for axle drive (AVE 130)
- Implementation of brake resistor and control to fulfil ECE R100
- HV System compliant with ECE R13
- Pantograph for trolley bus applications
- Catenary front end to combine e-bus propulsion and trolley bus application
- Heating device and control

Technical data in standard configuration

	Propulsion 140-2	Propulsion 200-1	Propulsion 200-2
Dimensions (mm)	375 x 1810 x 900	375 x 1810 x 900	375 x 1810 x 900
Weight	175 kg	160 kg	200 kg
Nominal DC-link voltage	660 Volt	660 Volt	660 Volt
Traction Power	2 x 140 kW	1 x 200 kW	2 x 200 kW
Heating power supply	1 x 30 kW	1 x 30 kW	2 x 30 kW
Auxiliary Power 400V , AC, 50Hz	2 x 20kVA	2 x 20kVA	3 x 20kVA
Auxiliary Power, 24V, DC	10kW (400A)	10 kW (400A)	15 kW (600A)

PRIMOVE propulsion reference project



Mannheim, Germany

- Commercial operation of two fully electric busses for everyday passenger services, even on demanding bus routes
- PRIMOVE propulsion system 140-2 for two 12 meter e-buses
- Integration of ZF AVE 130 Axle
- Within 3 month operation, >20 tkm operation with >95% reliability
- Start of passenger service: June 2015

Bombardier Transportation

Schöneberger Ufer 1
10785 Berlin, Germany

Tel + 49 30 986 07 0
Fax + 49 30 986 07 2000

www.primove.com

BOMBARDIER and *PRIMOVE* are trademarks of Bombardier Inc. or its subsidiaries.

BOMBARDIER
the evolution of mobility