



#### Nanjing, China

- 30 *PRIMOVE* battery systems
- Each 5-car tram equipped with 2 modular battery systems of 49 kWh each
- 90 % CFO – charging via pantograph during acceleration and during normal dwell times at tram stops while passengers get on and off
- Start of passenger service: August 2014



#### Mannheim, Germany (pilot project)

- 2 *PRIMOVE* battery systems of 49 kWh on 5-car tram
- Charging tests via pantograph at dynamic and static mode
- Start of tests: spring 2014



#### Braunschweig, Germany

- 1 *PRIMOVE* battery system 60 on one 12-metre e-bus
- 4 *PRIMOVE* battery systems 90 on four 18-metre e-buses
- *PRIMOVE* inductive charging with 200 kW at depot, end stop and 1 intermediate bus stop
- Start of passenger service: March 2014



#### Mannheim, Germany

- 2 *PRIMOVE* battery systems 60 on two 12-metre e-buses
- *PRIMOVE* inductive charging with 200 kW at depot, end stops and 4 intermediate bus stops
- e-buses are also equipped with *PRIMOVE* propulsion 140
- Start of passenger service: June 2015



#### Berlin, Germany

- 4 *PRIMOVE* battery systems 90 on four 12-metre e-buses
- *PRIMOVE* inductive charging with 200 kW at end stops and depot
- Start of passenger service: August 2015

© 2015, Bombardier Inc. or its subsidiaries. All rights reserved. Printed in Germany/11643/GGO /10-2015/en

## TRAMS AND E-BUSES

# PRIMOVE BATTERY

Optimised for maximum performance and lifetime



Our comprehensive rail transit and e-mobility expertise lies behind our industry leading products and services.

## WHY CHOOSE PRIMOVE BATTERY SYSTEMS?

### High performance

The *PRIMOVE* battery systems have been designed to provide maximum performance using the latest Nickel Manganese Cobalt (NMC) Li-Ion cell developments. A comparatively small battery is therefore sufficient to power the vehicle and to allow full braking energy recuperation. High charging rates reduce recharging time to a minimum.

### Lifetime guarantee

By optimizing operational parameters and providing advanced liquid cooling functionality the achievable battery lifetime is extended to up to 10 years.

Optionally, a battery lifetime guarantee can be provided.

### Safety first

The *PRIMOVE* battery systems were developed and tested according to the highest automotive and rail safety standards. The multi-level safety concept covers all aspects of functional, electrical, chemical, mechanical and occupational safety considerations, making it one of the safest battery systems on the market today.

### Smaller and lighter

The compact design of the battery modules combined with an enclosure concept making use of an innovative sandwich structure results in a light and small package.

### Modular

The *PRIMOVE* battery systems follow a modular approach, allowing parallel and series connection of battery packs. This ensures the highest flexibility when fulfilling requirements of varying applications.

### Bombardier Transportation

Schöneberger Ufer 1  
10785 Berlin, Germany

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

[www.primove.com](http://www.primove.com)

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

**BOMBARDIER**  
the evolution of mobility

**primove**  
true e-mobility

**BOMBARDIER**  
the evolution of mobility

# PRIMOVE BATTERY FOR E-BUSES

At Bombardier, we are extending vehicle electrification and its benefits beyond rail. With the *PRIMOVE* high power battery systems for e-buses, planned stops are turned into charging opportunities without requiring additional vehicles, interrupting service or affecting dwell times.

The *PRIMOVE* Battery 60 and 90 are lithium-ion traction battery systems designed to minimize integration efforts on any type and size of electric bus while providing high performance, safety and lifetime. Using *PRIMOVE* inductive charging, the battery size can be kept to a minimum while allowing the e-bus to operate 7 days per week 24 hours a day.

## Battery system features

The *PRIMOVE* Battery 60 and 90 systems include all parts required for simple integration and reliable long lasting operation in all climate zones.

- One two or three 30 kWh battery packs
- One BMS master controller (installed on pack)
- One thermal conditioning unit (TCU)
- HV wiring harness set
- LV wiring harness set
- *PRIMOVE* care package

## TCU Road

Cooling capacity	kW	8
Heating capacity	W	500
Supply voltage compressor	V AC	400
Supply voltage other	V DC	24
Coolant flow rate	l/h	2000 - 3000
Max. coolant pressure	bar	1
Weight	Kg	165
Dimensions l/w/h	mm	1435/1110/360
Operating temperature <sup>1,2</sup>	°C	-30 - 45



## Application specific advantages

- Battery system capacity is chosen according to customer requirements
- Reduced cost by regularly recharging a small battery pack, rather than installing more capacity
- Long battery lifetime due to optimised operational concepts and advanced thermal conditioning solution.

Battery		60	90
Number of packs		2	3
Energy content in	kWh	60	90
Nominal battery voltage	V DC	660	660
Discharge current cont.	A DC	220	220
Discharge current 300 s	A DC	280	280
Supply voltage for control	V DC	24	24
Control bus		CAN	CAN
Liquid cooled		Water/Glycol	Water/Glycol
Weight battery	Kg	720	1080
Dimensions per pack l/w/h	mm	1680/780/246	1680/780/246



# PRIMOVE BATTERY FOR TRAMS

Trams have always operated electrically but now overhead wires are not required any more. The *PRIMOVE* battery delivers all required power for tram applications. Recharging can take place under short catenary sections in the stations or 100% catenary free using the *PRIMOVE* inductive charging technology.

The *PRIMOVE* rail battery 50 provides a power source intended for on traction bogie. Each of the two battery packs has its own power and control interfaces for separate connection to the traction converters. The *PRIMOVE* battery 50 is the smallest and lightest light railway traction battery system on the market today.

## Battery system feature

The *PRIMOVE* Battery 50 system includes all parts required for simple integration and reliable long lasting operation in all climate zones.

- Two 24.5 kWh battery units on common frame, providing separate HV interfaces
- Two BMS master controller (installed on pack)
- One thermal conditioning unit (TCU)
- HV wiring harness set
- LV wiring harness set
- Battery connection box
- *PRIMOVE* care package

## Application-specific advantages

- 100 % catenary free operation (CFO) with *PRIMOVE* inductive charging
- 90 % CFO with catenary conductive charging
- 100 % recuperation of braking energy
- No vehicle performance reductions under battery power
- Long lifetime due to optimised operational concepts, advanced cooling solution and regular recharging

## BATTERY 50

Total energy content	kWh	2 x 24,5
Nominal battery voltage	V DC	532
Discharge current cont.	A DC	2 x 120
Discharge current 300 s	A DC	2 x 162
Supply voltage for control	V DC	24
Control bus		CAN
Liquid cooled		Water/Glycol
Total battery weight	Kg	2x330
Total battery dimensions	mm	1780/440/610



## TCU Rail

Cooling capacity	kW	8
Heating capacity	W	500
Supply voltage compressor	V AC	400
Supply voltage other	V DC	24
Coolant flow rate	l/h	1600
Max. coolant pressure	bar	1
Weight	Kg	170
Dimensions l/w/h	mm	1700/430/600
Operating temperature <sup>2</sup>	°C	-30 - 45

<sup>1</sup> Battery 60 has 2 packs; battery 90 has 3 packs <sup>2</sup>Operation above 45°C up to 55 °C ambient with reduced performance