

# Starter Motors and Generators

## The BRS boost recuperation system: increased power, enhanced comfort and lower fuel consumption



**BOSCH**  
Invented for life

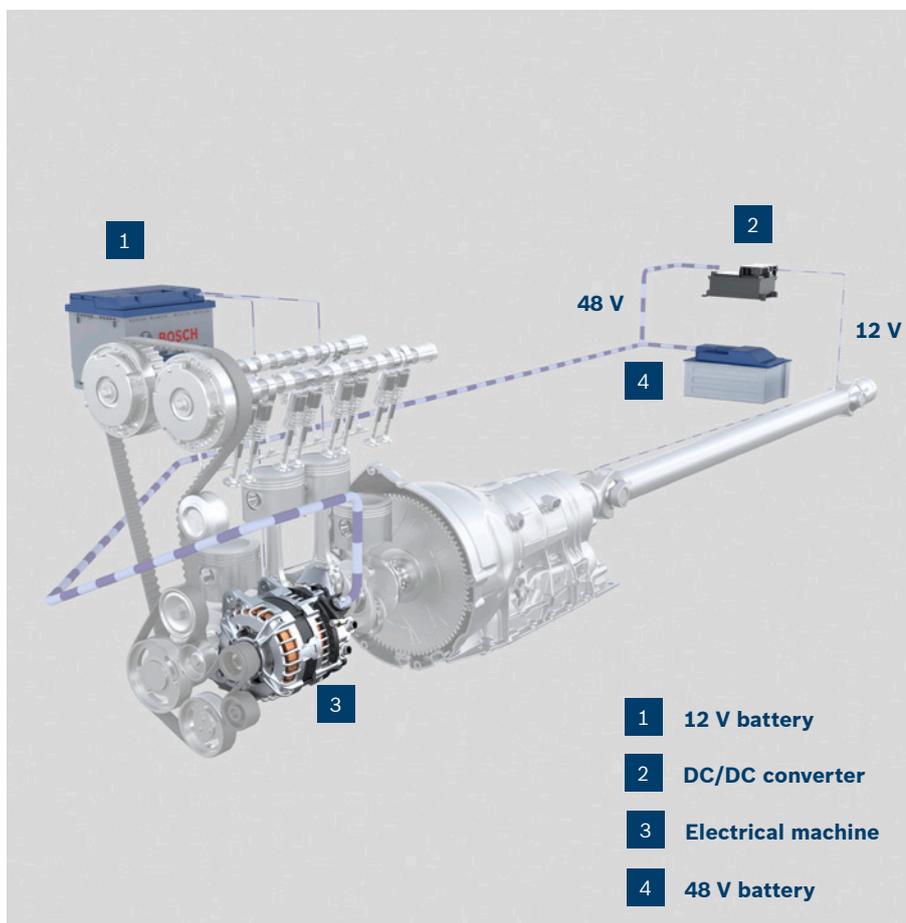


# Efficient, comfortable, economical: the boost recuperation system offers consumers and automakers unique benefits

Four-way intelligence: the BRS boost recuperation system from Bosch combines four efficient functions to create a sophisticated and innovative system. Thanks to integrated recuperation, combined with a boosting and coasting function, the BRS provides a significant evolution to conventional start-stop systems. As an entry-level electrification solution, it fills the gap between start-stop systems and full hybrids.

The heart of the BRS is the electrical machine with newly developed integrated power electronics. The BRS features a dual voltage architecture with 48 V alongside the conventional 12 V vehicle electrical system. This new system architecture enables the use of new high-power

consumers which support innovative functions and energy-saving features. The BRS's key components are the electric motor with integrated power electronics, the DC/DC converter and the high-power lithium-ion battery.



In addition to the four main functions, which the driver notices directly, the BRS offers further benefits for automakers:

- ▶ Reduction of average fleet fuel consumption and associated CO<sub>2</sub> emissions
- ▶ Cost-effective entry-level hybrid solution
- ▶ Easy to integrate into existing and future vehicles – supports cross platform usage
- ▶ Compatible with all transmissions and engine types
- ▶ Introduction of 48 V high-power consumers for new comfort and safety functions
- ▶ Effective acceleration support for small downsized engines through the electric motor
- ▶ No high-voltage protection needed as voltage is <60 V

# Enjoy driving and save fuel: the boost recuperation system's operating modes

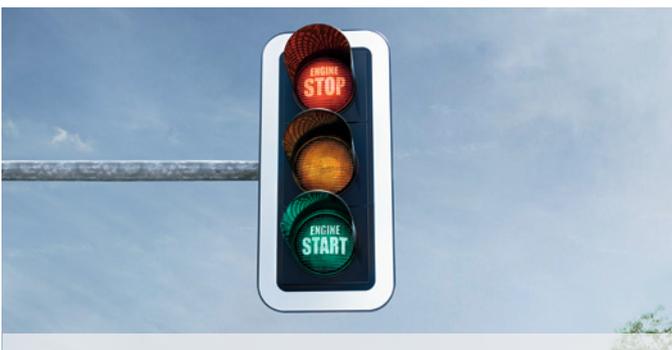
## BRS charges the battery during braking thanks to recuperation

The BRS utilizes the vehicle's momentum to store a large portion of the brake energy in the lithium-ion battery. The central component of the BRS, the electrical machine, is responsible for this energy recuperation and transmission to the 48 V vehicle electrical system. Just with the conversion of kinetic energy into electrical energy fuel consumption is reduced by up to 7%.



## The BRS boost function helps acceleration

The electrical machine of the BRS provides additional torque, which means increased comfort and facilitates more dynamic acceleration, for instance when merging into traffic. The energy for the additional boost is provided by the 48 V battery.



## BRS improves driving comfort thanks to a quiet, smooth start-stop function

The scope of the BRS also includes the efficient start-stop system. When the internal combustion engine is switched off, both batteries power all the lighting, safety and comfort functions. As soon as the driver wants to pull away after the automatic engine stop, the electrical machine quickly and smoothly restarts the engine.



## BRS delivers a new, low-noise driving experience thanks to the coasting function

If neither the accelerator nor the brake pedal is depressed while coasting or driving downhill, the BRS automatically switches off the internal combustion engine. The dual-voltage supply system powers all the relevant consumers while the vehicle coasts in zero-emission, noiseless, low-resistance mode, driven solely by its momentum. As such, the BRS conveys an entirely new driving experience and protects the environment.

# Fully interconnected: the new vehicle electrical system architecture

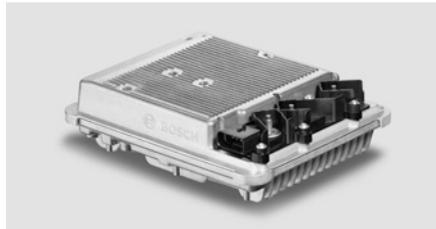


## The boost recuperation machine – the heart of the BRS

The electrical machine looks like a conventional generator and is integrated in exactly the same way into the vehicle. However, it is much more than a conventional “generator”: it brings together the four functions of the BRS in an innovative high-tech package.

### Technical data

- ▶ Air-cooled claw pole motor with integrated power electronics and fan
- ▶ High efficiency up to 88%
- ▶ Torque at engine start: max. 56 Nm (approx. 160 Nm on the crankshaft)
- ▶ Electrical output during recuperation: max. 11.5 kW at 48 V
- ▶ Mechanical output in boost mode: max. 9.7 kW at 48 V
- ▶ Weight: ~ 8.5 kg
- ▶ Dimensions [Ø x L]: 148 x 169 mm



## DC/DC converter – highly efficient conversion

The PCU power conversion unit is a bidirectional 48/12 V DC/DC converter. The PCU is based on a patented converter concept and provides a highly efficient, reliable link between the new 48 V vehicle electrical subsystem and the conventional 12 V vehicle electrical system. The PCU's main task is to provide the 12 V vehicle electrical system with electrical power, which is generated and stored on the 48 V side. Thanks to its compact, sealed design, the PCU can be installed in various locations, including the engine compartment.

### Technical data

- ▶ Bidirectional multiphase buck-boost converter
- ▶ High efficiency ( $\geq 96\%$ )
- ▶ Nominal voltage: 48/12 V
- ▶ Rated output: continuous up to 3 kW at nominal voltage
- ▶ Weight: 2.7 kg
- ▶ Dimensions: 220 x 183 x 75 mm

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