Benefit from extensive start/stop system expertise:
Parts, Diagnostic and Services from Bosch
Start/stop systems by Bosch:
Future-oriented technology from one source

The demand for economical, ecological cars is increasing – and will continue to do so due to rising fuel prices and the need to reduce CO₂ emissions. Start/stop systems can make a major contribution towards cutting fuel consumption. As the driving force behind the development of efficient and ecological vehicle technologies, Bosch can supply innovative systems including the necessary replacement parts as well as Service and Diagnostic concepts. All from a single source and to top Bosch quality standards.

Start/stop systems gaining in popularity
According to current EU guidelines, beginning in 2015 a limit of 130 g/km will apply to CO₂ emissions for new cars on a manufacturer’s fleetwide average basis. CO₂ emissions should even be reduced to 95g/km by 2020. This means that new cars will always have to continue getting more and more fuel efficient. In addition to downsizing in the form of reduced capacity, fewer cylinders and optimized engine technology, start/stop systems will be employed to cut fuel consumption.

By 2017, about 90% of new vehicles will be equipped with start/stop systems in Europe. This means workshops can expect an increasing demand for the corresponding spare parts and services.
Start/stop systems with optimally matched components by Bosch make driving more and more environmentally friendly. You will save gas even during short stops after just 0.7 seconds – up to 8% overall compared to vehicles without a start/stop system. This makes me twice as happy as a driver: First of all since I’m saving money at the gas pump, and secondly since fewer damaging emissions are being released.

Boost Recuperation System (BRS) by Bosch
The boost recuperation system from Bosch combines four efficient functions to create a sophisticated holistic system. Besides the integrated recuperation, combined with the boost and coast function, the BRS provides an innovative add-on to conventional start-stop systems. As an entry-level electrification variant, it plugs the gap between start-stop systems and full hybrids. The four main functions which the driver notices directly:
• BRS charges the battery during braking thanks to recuperation
• BRS boost function helps move off and accelerate
• BRS improves driving comfort thanks to a quiet, jolt-free start-stop function
• BRS delivers a new, low-noise driving experience thanks to the coast function

The future of the start/stop system: start/stop coasting
Normal start/stop systems make fuel consumption savings and CO₂ emission reductions of up to 8% in city driving. In order to reduce fuel consumption and CO₂ emissions even further, Bosch engineers are steadily extending the periods during which the engine is switched off:
• first while the vehicle coasts to a halt
• the next step is also when the driver releases the accelerator pedal while driving.
All safety and comfort functions are operational even during these longer engine-off phases. With the start/stop coasting system, the fuel requirements can be reduced by up to 10% in comparison to conventional start/stop systems.

Start/stop technology by Bosch has by now been implemented by numerous vehicle manufacturers – in compact cars, luxury limousines and powerful sports cars:

- Audi
- Bentley
- BMW
- Citroën
- Ferrari
- Fiat
- Ford
- KIA
- Lamborghini
- Mahindra
- Mercedes-Benz
- Mini
- Nissan
- Opel
- Peugeot
- Porsche
- Renault
- Seat
- Skoda
- VW
Up to 8% fuel savings: With ecological start/stop technology by Bosch

Start/stop systems ensure that the engine cuts out automatically when the vehicle is stationary and thus stops burning fuel. The engine re-starts automatically by pressing the clutch. This can save up to 8% fuel in the urban phase of the “New European Driving Cycle”. Even greater savings are possible in dense urban traffic. This not only cuts fuel costs but also helps to preserve the environment, as vehicles fitted with a start/stop system emit less CO₂.

Always a perfect match
All start/stop system components are manufactured to high original equipment quality standards and guarantee maximum reliability and durability. They are perfectly matched with the vehicle electronics system, therefore offering excellent operation, a long service life and outstanding ride comfort. Intelligent fuel economy: start/stop system concepts from Bosch.

Coordination: Energy management (1 and 3)
The engine control unit with integrated start/stop coordinator and the battery sensor are the principal components of the energy management system. Additional items include a deep-cycle resistant battery with EFB or AGM technology and a DC/DC converter.

Direct current: DC/DC converters (2)
The voltage level in the vehicle electrical system drops briefly when operating the starter. This can impair the operation of electronic devices – in the form of interrupted radio reception or the loss of navigation function. The DC/DC converter prevents this from happening by stabilizing the electrical system when starting the engine.

Monitoring: Electronic battery sensor EBS (3)
The Electronic Battery Sensor EBS, located in the pole recess of the battery, accurately and dynamically records the operating values such as current, voltage and temperature. It uses the measured values to monitor the capability of the battery and determine the energy input and output capacity.
Especially more powerful: Start/stop starters (4)
By strengthening of the bearings, using an improved planetary gear, strengthened pinion-engaging mechanics and optimization of the commutator for longer service life, the starter has been optimized for frequent startings.

Information managers: Sensors (5, 6 and 7)
The sensors provide the control system with up-to-date information to help optimize the starting process. Whilst the neutral position sensor indicates whether a gear is engaged, the wheel speed sensor measures whether the vehicle has actually come to a standstill. The crankshaft sensor accordingly signals the engine activity.

Reliable power source: Alternator (8)
Even in the low speed range and immediately after starting, the highly efficient alternators from Bosch generate a surplus of energy to supply the vehicle electrical system. In conjunction with the powerful battery they increase the availability of the start/stop function.
Start/stop systems demand a lot from the battery. The Bosch batteries S5 A and S4 E provide a reliable supply of power for the frequent starting and stopping operations. Sufficient power is always available even for high-demand electrical equipment such as the air conditioner or auxiliary heating system.

**New heavy load cycles**

The introduction of start/stop systems dramatically altered the load profile for vehicle batteries. If there is no start/stop system fitted to the vehicle, the principal task of the battery is to provide power for starting the engine, which is then re-charged by the alternator. Consequently the demands in terms of deep cycle resistance and discharge level are not particularly great. Conventional batteries do nothing to save fuel or reduce CO₂ emissions. In contrast, the battery in vehicles with start/stop systems has to supply power for frequent starting as well as powering the on-board electrical equipment during the stop phase without any assistance from the engine and alternator. This demands a greater deep cycle resistance and discharge level and helps to cut fuel consumption and CO₂ emissions.

**Drivers convinced of Bosch batteries**

Readers of "auto motor und sport" magazine voted Bosch the best brand for the category of "batteries".

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**Battery load diagram for conventional vehicle**

Characteristic: single start operation followed by subsequent recharging.
Regenerative braking (recuperation)
Regenerative braking involves a further task for the battery: It has to act as a buffer store for the electrical energy generated on braking. This energy is then made available when required to increase engine power and save fuel by enabling the alternator to be periodically de-activated (passive boost).

Advantages of the Bosch S5 A battery with AGM technology
- Longer service life and up to 4 times higher deep-cycle resistance compared to conventional starter batteries
- Constant power even for short trips, stop-and-go traffic or high consumption in stationary mode
- Excellent charge acceptance and starting power with several electrical devices
- Suitable for start/stop systems with regenerative braking
- Absolutely maintenance-free and leak proof
- First class quality from Bosch

Advantages of the Bosch S4 E battery with EFB technology
- Longer service life and doubled deep-cycle resistance compared to conventional starter batteries
- Reliable starting even under extreme temperatures and with several electrical consumers
- Excellent charge acceptance and short distance stability
- Absolutely maintenance-free and leak proof
- First class quality from Bosch

S4 E with EFB technology:
For start/stop systems and many electrical devices running
With EFB technology (Enhanced Flooded Battery) the positive plate is coated with “polyester scrim”. This provides additional retention of the active material at the plate. The cycle resistance increases when compared to conventional batteries and the battery remains operational even under strong vibrations.

Battery load diagram for start/stop and recuperation
Characteristics: Many starting operations, high load on the battery, additional power drawing by passive boost

Battery load diagram for start/stop
Characteristics: Many starting operations, resulting in a higher load on the battery
Start/stop reliability: Bosch starters, alternators, control units and sensors

In the development of starters, alternators, control units and sensors for start/stop systems, Bosch can draw on the wealth of system expertise and exceptional innovative skills which have made them one of the world’s leading suppliers of vehicle electrical and electronic systems. Not only do vehicle manufacturers enjoy the benefits of top quality start/stop system components from Bosch, they are for the workshop as well: Bosch quality for professionals.

**Powerful many times over: Starters**
Starters for start/stop systems are designed for many more starting operations than conventional starters. They feature reinforced bearings, an enhanced planetary gear unit, a heavy-duty meshing mechanism and an optimized commutator. This special design ensures that the starter motor is able to deal with the particular requirements of a start/stop system over the entire course of the vehicle service life.

**Higher degree of efficiency: Alternators**
The outstanding performance even at low engine speeds makes high efficient alternators from Bosch ideal for use in start/stop systems. They start supplying the vehicle electrical system with power immediately after starting the engine and allow rapid charging of the battery. Combined with the powerful battery they thus ensure a high level of start/stop function. Equipped with high efficiency diodes (HED) or synchronous active rectifier (SAR), they achieve an efficiency of up to 76% or 80%. This reduces the mechanical force needed to drive the alternator in order to generate energy for the electrical consumers in the vehicle. This aids in fuel savings and CO₂ reduction in comparison to conventional alternators.

**Optimum engine management: Control units**
In contrast to conventional engine control units, control units for start/stop systems are provided with additional interfaces for the starter as well as for the battery, crankshaft, wheel speed and neutral position sensors.
Special software analyzes the data supplied by the sensors to coordinate the start/stop function. If the control unit detects that the vehicle is stationary, it automatically issues a command to shut off the engine.

**Constant voltage level: DC/DC converter**
The DC/DC converter stabilizes the vehicle electronic system and prevents problems with, or the failure of electronic equipment, such as the radio or navigation system on starting.

**Accurate measurement results: Sensors**
A network of different vehicle sensors provides the control unit with the latest status data to achieve optimum control of the start/stop function.

- The **neutral gear sensor** indicates whether a gear is engaged.
- The **wheel speed sensor** detects the direction of wheel rotation and whether the wheel is at a standstill.
- The **intelligent crankshaft sensor** signals the engine activity.
- The **brake booster differential pressure sensor** monitors the pressure in the brake booster during the stop phase in order to start the engine when the pressure drops. This protects the brake booster.
- The **electronic battery sensor (EBS)** monitors the battery power status.
Efficiency in the workshop: Service and diagnosis of start/stop systems

Service, repair and diagnosis work on start/stop systems means plenty of new business potential for workshops. As a system manufacturer offering in-depth expertise, Bosch can provide optimum assistance to help make the most of this opportunity – by being able to supply not only ideal technical concepts to original equipment standards, but also first rate training, replacement parts and diagnostic technology.

Comprehensive checking: Diagnostic technology for start/stop systems
Start/stop system diagnosis and servicing involves highly specialized work which can best be performed with top class diagnostic technology available from Bosch.

Diagnostics KTS: This well-established diagnostic tester can be used to reset the battery data and enter technical data such as the serial number and capacity of the new battery. The associated Bosch ES[tronic] diagnostic software covers all the relevant vehicles with start/stop system and also provides technical information such as service and repair instructions, system information and replacement part catalogs.
Courses offered by the Bosch Service Training Center on start/stop system technology and the associated engine management, transmission control, air conditioning and safety/convenience systems provide all the information required for expert handling of new technology.

**Overview of training contents:**
- Operating principle of the start/stop system
- Interlinking with other vehicle systems
- Component diagnosis and repair
- Battery replacement with diagnostic tester

**An overview of the current training offerings can be found under**
www.werkstattportal.bosch.de
www.werkstattportal.bosch.at
www.werkstattportal.bosch.ch
www.automotive-campus.com

The specialists from the Bosch technical Hotline can also be relied on to help workshop personnel with any queries and problems.

- **Battery service BAT:** The status of start/stop batteries featuring AGM technology can be checked using the battery tester BAT 131. The Bosch chargers BAT 415, 430 and 490 are available for charging start/stop batteries.

- **Vehicle system analysis FSA:** FSA, the ultra-modern vehicle system analyzer from Bosch, permits checking of the proper operation of the relevant start/stop system sensors. With the aid of FSA 500 or FSA 740 for example it is also possible to test the charging system in the vehicle.
A job for true professionals: Perfect battery replacement with start/stop systems

With the aid of ESI[tronic], the Bosch KTS provides users with a step-by-step guide for the entire battery replacement process. Selection of the right vehicle model is essential for this.

Battery replacement with start/stop systems present workshops with a new challenge, as professional replacement and setting of the right type of battery is essential for correct operation of the start/stop system. Innovative diagnostic technology from Bosch guarantees quick and reliable battery replacement, ensuring that customers can continue to enjoy all the benefits offered by the start/stop system in their vehicles.
Tip: Does a start/stop system in a vehicle make the use of a diagnostic tester essential when replacing the battery?

Configuration and programming are not always required for all vehicle models on battery replacement. The fault code memory of the battery management system (BMS) or engine control unit as well as of other systems must however always be read out, as certain faults may be caused by the failure or discharge of the battery (resetting of indicator lamps). These fault codes can then be erased with Bosch diagnostic equipment.

Battery replacement is a job for experts

Batteries in vehicles with start/stop systems should always be replaced at a workshop. Only professional replacement of the right type of battery can ensure proper operation of the start/stop system and attain the desired reductions in fuel consumption and CO₂ emissions. With many vehicles, battery replacement requires the use of a suitable diagnostic tester, e.g. from the Bosch KTS series, for battery adaption within the vehicle and programming of technical data such as capacity, make and serial number.

Points to watch when replacing batteries in vehicles with start/stop systems:
- Only ever replace AGM with AGM
- EFB can be replaced with EFB or AGM
- Conventional lead-acid batteries cannot be used

Selection of the battery capacity provides the battery management system with all the relevant data and registers the new battery.
Program overview: Bosch start/stop starters*

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* Edition April 2014 – Program continuously being expanded
Tailored for all systems:
Bosch batteries

S5 A batteries with AGM technology

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What drives you, drives us.

Technology from Bosch is used in practically every vehicle in the world. For us, the focus is on people and helping them to stay mobile.

We have been dedicated to people for more than 125 years with our pioneering spirit, research, production and expertise.

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▶ state-of-the-art solutions for efficient vehicle repairs
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▶ fast, reliable delivery service
▶ expert customer care via our hotline
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▶ specific sales and marketing support
▶ plus many other services

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