**Bosch**: Bringing you the workshop of the future

For over 125 years, Bosch innovations have been keeping vehicles on the road and getting people to and from their destinations while improving safety and peace of mind along the way.

Bosch Automotive Aftermarket offers workshops and retailers a comprehensive portfolio of products that is unmatched worldwide:

- Efficient diagnostics
- Innovative workshop equipment
- Quick, reliable delivery
- The world’s most comprehensive range of spare parts – including both new and remanufactured
- Workshop concepts to meet every requirement
- Comprehensive training
- Targeted sales and marketing support
- A competent service hotline
- 24-hour online workshop services
- Affordable leasing services for workshop equipment and software

From parts to scheduling, organization and results, our solutions are combined with additional services to ensure your needs will be perfectly met, helping you to maximize your potential.

Your address for genuine Bosch quality:

For more information:
www.bosch.com
Start / stop systems from Bosch:
Tomorrow’s technology from a single supplier

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
With effect from 2012, the average fleet CO₂ emissions of a manufacturers new vehicles is 130 g/km in line with EU directives. Over the next few years this value will be applied to an increasingly larger portion of each manufacturer’s new vehicle fleet. This means that new vehicles will have to become increasingly economical with regards to CO₂ emissions. 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. Experts forecast that 90 % of new vehicles will be fitted with start/stop systems by the year 2017. This means workshops can expect an increasing demand for the corresponding replacement parts and Service work such as the replacement of batteries in start/stop systems.

Comprehensive system expertise
As one of the world’s leading manufacturers of motor vehicle systems and diagnostic equipment, Bosch can draw on a wealth of system expertise. More than 30 years of working on the development of hybrid technologies provide Bosch with a firm foundation of expert knowledge in the fields of battery, electric drive and brake management, brake energy recuperation, engine management and transmission control as a basis for start/stop systems. Bosch can offer a lot more than just innovative technical concepts. The overall start/stop system package also includes the appropriate training as well as specialized diagnostic technology to enable workshops to provide ideal and efficient Service work.

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.
Up to 8% fuel saving: With ecological start/stop technology from 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.

Start/stop system: Design
Bosch launched the series production of start/stop systems in 2007. At the heart of the system is the specially developed start/stop starter, which is interlinked with the engine control unit. In addition to control software and a battery sensor, the overall system also includes a crankshaft sensor and the corresponding sensor system at the pedals. Frequent start/stop operations are made possible by a highly efficient alternator together with a deep-cycle resistant battery. When the engine is switched off, the battery supplies power for the electrical equipment such as air conditioner, power windows, luggage compartment lid lock and engine cooling etc.

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.

DC voltage: DC/DC converter (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) found in the battery post recess, 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.

Heavy-duty design: Start/stop starter (4)
Thanks to reinforced bearings and an enhanced gear unit, the starter is ideally designed for frequent starting operations.

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 innovative Efficiency Line 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.
**Full power:**
Bosch batteries for start / stop systems

- **Constant energy peak:** S6 AGM technology – guaranteed supply
  Special micro-glass fibre mats tightly packed between the lead plates of the AGM battery bind the electrolyte together. The high contact pressure minimizes the loss of active material with an extremely low internal resistance. The rapid reaction between the electrolyte and the plate material allows a greater quantity of energy to be supplied in demanding situations.

- **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.

- **Braking energy recovery (recuperation)**
  Braking energy recovery 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 deactivated (passive boost).

- **S5 EFB technology**
  By virtue of its extremely high power density, the Bosch S5 EFB (Enhanced Flooded Battery) is an ideal match for the demands of modern start/stop systems. It has a distinctly longer service life than conventional starter batteries with twice the deep cycle resistance. Reliable starting is guaranteed even at extreme temperatures. It is leak and spill proof up to an angle of 55°, 100 % maintenance-free and manufactured to original equipment standard.

- **S6 AGM technology**
  AGM (Absorbent Glass Mat) technology is the leading technology on the market. Dynamic rechargeability and up to 4 times more discharging/charging cycles than conventional starter batteries mean that S6 AGM technology is equipped to deal with the most challenging demands. It is an essential feature of start/stop systems with braking energy recovery. Operation is maintained even with a very low charge and constant power is also provided on short journeys, in stop-and-start traffic and with high consumption when stationary. It is completely maintenance-free, can be installed in any position, is leak and spill-proof and satisfies the original equipment standard recommended by vehicle manufacturers.

- **Load diagram – battery in conventional vehicle**
  Characteristic: A start operation followed by recharging

- **Load diagram – battery for start/stop system**
  Characteristic: Large number of start operations, resulting in higher load on the battery

- **Load diagram – battery for start/stop system/recuperation**
  Characteristic: Many start operations, high load on the battery, additional power called upon by passive boost

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Bosch batteries are the motorists’ favourites: Readers of the magazine “auto motor und sport” voted for Bosch as the best brand in the “Battery” category: Autobild: Good price/performance ratio, top quality and service life, No. 10/2012
**Start / stop reliability:** 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.

**Versatile performance: 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.

**Top performance: Efficiency Line alternators**
The outstanding performance even at low engine speeds makes Efficiency Line alternators from Bosch ideal for use in start/stop systems. Efficiency Line alternators 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 availability. The enhanced electrical design and the optimized materials make it possible to achieve a far higher level of efficiency than conventional alternators. Alternators additionally featuring high-efficiency diode technology (HED) achieve a degree of efficiency of up to 77% – which in itself is sufficient to save fuel and reduce CO₂ emissions by up to 2% as compared 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 new Efficiency Line alternators really live up to their name, being considerably more efficient than alternators used to date – and quieter as well thanks to noise optimization.**

**The neutral position sensor indicates whether a gear is engaged.**
**The wheel speed sensor detects the direction of wheel rotation and standstill of the wheel.**
**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 for engine starting in the event of a drop in pressure. Servo action is thus ensured.**
**The electronic battery sensor (EBS) monitors the battery power status.**
Efficiency in the workshop: Service and diagnosis for 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.

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.

Training topics at a glance:
- Operating principle of the start/stop system
- Interlinking with other vehicle systems
- Component diagnosis and repair
- Battery replacement with diagnostic tester

A list of all training sessions currently available can be found under www.bosch.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.

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 ESI[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.

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.

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**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.

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

**Question:** 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 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.

**Selection of battery management system in repair menu**

**Selection of “Battery replacement” function**

**Input of battery serial number taken from the battery removed**

**Picking out “Selection/adaption” function in battery management diagnosis dialog box**

**Selection of “Battery data” option to access battery selection**

**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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**S6 batteries with AGM technology**

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**S6 batteries with EFB technology**

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S6 batteries without EFB technology are not suitable for start/stop applications.