

Tips & Technology

For Bosch business partners

Current topics for successful workshops No. 12/2014

Electric / Electronics



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Invented for life

Service for Hybrid Vehicles

A growing need for mobility, finite fossil resources and greater environmental impact call for new mobility and drive concepts. In addition, legislators worldwide are tightening up emissions directives and raising environment-related taxes. Depending on the system variant, hybrid and electric vehicles emit between 25 and 100 % less CO₂ than those equipped solely with internal combustion engines.

Moreover, electromobility is an investment in the future. Bosch invests 400 million EUR every year – for example, to extend the range of established electric cars to at least 300 km. Hybrid technology is already suitable for mass-produced vehicles. By the end of 2014, Bosch will have realized around 30 production projects on drive system electrification. Bosch is predicting that the year 2020 will see global sales of 6.5 million strong-hybrids, 3 million plug-in hybrids and 2.5 million e-vehicles (Basis: total of 113 million vehicles sold in 2020).

The different drive systems

Full Hybrid (HEV)

With full hybrid vehicles, the combustion engine is complemented by an electric motor. The vehicle is driven by an internal combustion engine. Over short distances, however, full hybrids are able to run on electric power alone. For this operating mode, the gasoline- or diesel-powered internal combustion engine generates the required electricity. In this way, the battery is charged independently of the power grid.

Plug-in Hybrid (PHEV)

Plug-in hybrids can run emission-free up to 50 km with the electric drive. The internal combustion engine starts up when the battery charge is no longer adequate. The battery can be recharged directly from a socket.

Electric Vehicle with Range Extender (EVRex)

Electric vehicles with a range extender have a small internal combustion engine that recharges the battery as the charge level decreases. In contrast to a plug-in hybrid, electric vehicles with a range extender are always powered strictly electrically. This ensures the mobility of electric vehicles - even if there is no charging station within range.

Electric vehicle: Farewell to fuel (EV)

The pure electric drive system requires no fossil fuel. Technically, the step from hybrid to electric vehicle is not a major one: but to achieve broad acceptance, the costs must fall and enough charging stations must be available. Bosch is working hard on refining the lithium-ion battery and on creating an infrastructure for electromobility.



Left: Parallel full hybrid with electric motor – between internal combustion engine and transmission – integrated into the drive train
 Right: Electric vehicle with electric drive for the front axle

Product/vehicle type	HEV ¹	PHEV ²	EV ³	EV ⁴
E-machine (motor/alternator) 1	•	•	•	•
Inverter 2	•	•	•	•
High-voltage battery 3	•	•	•	•
Regenerative braking system 4	•	•	•	•
Charger	–	•	•	•
Emission reduction	•	•	•	•
No emission	–	–	–	•
Runs without fossil fuels	–	–	–	•

¹Hybrid Electric Vehicle, ²Plug-In-Hybrid Electric Vehicle, ³Electric Vehicle with Range Extender, ⁴Electric Vehicle

Service on hybrid vehicles

Due to their reduced consumption and CO₂ emissions, hybrid vehicles are on everyone's lips. In the meantime, they have become part of the street scene and are increasingly among customer vehicles in the workshops. The usual workshop work can also continue to be carried out. However, the new drive technology and the high-voltage components present mechanics with new challenges in terms of their knowledge and capabilities. This makes diagnosing the interaction between the internal combustion engine and electric motor, with as yet unknown driving conditions, more complex. Furthermore, working safely with high electric voltages of up to 800 V requires special knowledge. The expertise that Bosch can offer here gives vehicle workshops the chance to establish themselves as a specialist.

Bosch offers its entire experience in the production and development of hybrid components:

- Special diagnostics systems for high-voltage systems: FSA 050 hybrid tester: Stand-alone or in conjunction with the FSA 500 or the FSA 7 Series

- ESI[tronic] 2.0 expanded by the diagnostics software for hybrid and electric vehicles
- Remote diagnostics: Modern Hotline support over the Internet
- Special training on high-voltage technology
- Targeted assistance over the Technical Hotline for questions about hybrid vehicles

Would you have known: Questions and answers about working on hybrid vehicles

What are the benefits of parallel hybrid systems?

Powerful acceleration, high efficiency, easier application to existing vehicles with different engine types.

When is it necessary to check HV cables?

Regularly in accordance with the manufacturer's specifications, after accident repairs, after a system fault in the HV system.

How is the HV battery cooling controlled?

The BMS (battery management) regulates battery temperature control.

Of what should the mechanic be aware when replacing the control unit?

The new control unit must be coded.

How large is the voltage range of the traction machine?

150 V- 600 V .

How many cells does the HV battery have?

Depending on the output and system, between 80 – 200 cells.

How are the cells of the HV battery connected together?

Depending on the battery system, parallel and series connections are present. For the most part, the cells are connected in series.

What is the function of the resolver?

The resolver detects the angular position, the speed of rotation and the direction of rotation of the rotor in the electric drive motor.

Name the first 3 safety rules!

Disconnect power, secure against reconnection, check that no voltage is present.

What does an HV-intrinsically safe vehicle mean?

This means that technical measures on the vehicle provide complete protection for employees against electric arcing and contact with components of the HV system.

Would you like to know more about service on hybrid vehicles?

Then attend our special training sessions:

The "High-voltage technician (HVT)" course is designed specifically for automobile mechanics, electricians and mechatronic technicians, body and vehicle assembly mechanics, mechanics who repair vehicle bodies and automobile service technicians. The successful completion of this introductory course entitles the participant to work on hybrid and electric vehicles.

Advanced training courses for specific vehicle brands are also offered:

- GOVECS: e-scooter training

- Hybrid and electric vehicles: Alternative drive technologies
- High-voltage experts (HVE)
- Hybrid and HV technology for Honda and Toyota
- Hybrid and HV technology for Peugeot/Citroen and Mitsubishi

Course booking at: www.automotive-campus.com