

and complying with new emission standards, working on alternative drive systems and the successor generations of existing products. R&D expenditure at Mercedes-Benz Vans concentrated on the successor models of the Vito and the Viano. The Daimler Buses division primarily focused its development activities on new products, compliance with new emissions standards, and alternative drive systems. [↗ C.38](#) [↗ C.39](#)

### Innovation and safety

**A tradition of innovation.** Innovations have played a key role at our company ever since Carl Benz and Gottlieb Daimler invented the automobile. Today, they are more important than ever before, because the accelerated pace of technological development and the challenges posed by climate change and environmental protection policies face us with the task of reinventing the automobile. Our customers expect safe, comfortable and powerful vehicles that are simultaneously becoming ever more fuel-efficient and environmentally friendly. In order to meet these requirements, we are forging ahead with our work in the research and development units.

**On the road to emission-free mobility.** Finite oil reserves, rising energy prices, population growth – especially in urban centers – and the unabated demand for mobility require new solutions for all aspects of transport. Our aim is to offer an intelligent mix of drive systems for every need. We intend to significantly reduce the fuel consumption and pollutant emissions of our vehicles today and to eliminate them entirely in the long term. We are implementing this intelligent mix of drive systems for our cars and commercial vehicles as part of our “Road to Emission-free Driving” strategy. We have defined the following focal areas for this approach:

1. We continue to enhance our vehicles with state-of-the-art internal-combustion engines that we are optimizing to achieve significantly lower fuel consumption and emissions.
2. We are achieving further perceptible increases in efficiency through customized hybridization, i.e. the combination of combustion engines and electric motors.
3. Our electric vehicles, powered by batteries or fuel cells, are making locally emission-free driving possible. [↗ C.40](#)

During the year under review, new products and technologies enabled us to make continued rapid progress on the “Road to Emission-free Driving.” The following examples show how this is happening.

**Efficient cars and commercial vehicles with internal-combustion engines.** Much of our research and development work continues to focus on making our cars and commercial vehicles with internal combustion engines even more efficient. The especially economical BlueEFFICIENCY models are reducing the fuel consumption and CO<sub>2</sub> emissions of our Mercedes-Benz cars and vans compared with the predecessor vehicles by up to 30% for certain models. This reduction is made possible by engines with small displacements and turbochargers, as well as by lightweight engineering, aerodynamic improvements, tires with low roll resistance, demand-appropriate energy management and an automatic start-stop function. A good example of this is the A 180 CDI BlueEFFICIENCY Edition<sup>1</sup>, which we began to deliver to customers in March 2013. The car consumes only 3.6 liters of diesel per 100 kilometers and emits only 92 grams of CO<sub>2</sub> per kilometer. The new S-Class also features numerous coordinated modifications of the body, the engines and the ancillary components that substantially reduce fuel consumption. The new C-Class, which will be delivered to customers beginning in the spring of 2014, boasts impressive fuel efficiency. Thanks to intelligent lightweight engineering, the overall vehicle weighs about 100 kilograms less than its predecessor. The weight reduction significantly reduces fuel consumption to levels that are the best in this segment.

<sup>1</sup> A 180 CDI BlueEFFICIENCY Edition: fuel consumption in l/100 km urban 4,2 / extra-urban 3,2 / combined 3,6; CO<sub>2</sub> emissions in g/km combined 92.

## C.40

### Road to emission-free mobility

Optimizing our vehicles with modern conventional powertrains

Hybridization for further increase in efficiency

Locally emission-free driving with electric vehicles powered by fuel cells or batteries

Energy for the future



Clean fuels for internal combustion engines



Energy sources for locally emission-free driving

We have also reduced the fuel consumption of the most recent models of our commercial vehicles. Our new Actros, Arocs, Antos and Atego models and the all-new Freightliner Cascadia Evolution heavy-duty truck are the cleanest and most economical vehicles in their respective classes. In addition, our new buses also have outstanding fuel efficiency. [see pages 110 f](#)

**Innovation award for NANOSLIDE.** For its all-new NANOSLIDE® coating technique for cylinder walls, Daimler received the German Innovation Award for Climate and the Environment (IKU) 2013 in the category “Process Innovations for Climate Protection” in December 2013. The award is presented by the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Federation of German Industry (BDI) to honor ideas and developments that help protect the climate and the environment. NANOSLIDE technologies, such as those used in the new Mercedes-Benz six-cylinder engines and in selected AMG drive systems, optimize friction within the engine. Because NANOSLIDE enables Daimler to dispense with cast-iron cylinder liners, engine weight can be reduced by several kilograms. Both of these improvements save fuel – by around 3% in the case of six-cylinder engines, for example. In the NANOSLIDE process, an electric arc is used to melt iron-carbon alloy wires. A flow of gas is then applied to spray the melted material onto the interior cylinder wall of the lightweight aluminum crankcase. The resulting lining is then finely smoothed so that the coating is only 0.1 to 0.15 mm thick. The micropores uncovered by this process allow the surface to absorb unusually large amounts of motor oil. In addition to creating very low levels of friction, the material’s ultrafine to nanocrystalline structure makes the lining very resistant to wear and tear. As a consequence, the NANOSLIDE technique is climate-friendly as well as extremely economical.

**Innovative hybrid technology in the new S-Class.** Already in 2009, Mercedes-Benz presented the S 400 HYBRID<sup>1</sup>, the world’s first series-produced car with a hybrid drive system that uses a lithium-ion battery. We are now offering hybrid drive systems for the new S-Class series in a total of three models: the S 400 HYBRID<sup>1</sup>, the S 300 BlueTEC HYBRID<sup>2</sup> and the S 500 PLUG-IN HYBRID<sup>3</sup>. The last of these models was presented to the public at the Frankfurt Motor Show in 2013 and will be delivered to customers as of September 2014. All of these second-generation hybrid drive systems are smoothly integrated into the powertrain. Whereas the batteries of the S 400 HYBRID<sup>1</sup> and the S 300 BlueTEC HYBRID<sup>2</sup> are only recharged by the combustion engine or when the vehicle is braking or coasting, the new high-voltage lithium-ion battery in the S 500 PLUG-IN HYBRID<sup>3</sup> can also be recharged from an external source through a charging socket in the right rear bumper. With the help of a synchronous electric motor, the S-Class can travel considerable distances solely on electricity. This allows it to achieve fuel consumption that would have seemed impossible in the large-sedan segment just a few years ago. The car achieves these record values without compromising on performance, comfort or range. And thanks to the pre-air conditioning functions, occupants also enjoy a very comfortable climate-controlled interior. The second-generation S-Class hybrids have an anticipatory energy management system that improves energy efficiency. The hybrid drive’s operating strategy not only takes the current driving situation and the driver’s preferences into account, but also anticipates probable changes in the route (uphill and downhill gradients, curves and speed limits) over the next eight kilometers. The “smart

hybrid” uses the navigation data provided by COMAND Online to control the charging and discharging of the high-voltage battery. For example, it aims to use the energy contained in the battery to drive the vehicle before it reaches a downhill stretch because the energy recovery system will then be able to recharge the battery.

**The new Mercedes-Benz B-Class Electric Drive<sup>4</sup>.** At the New York International Auto Show, Mercedes-Benz unveiled the new B-Class Electric Drive<sup>4</sup>, which will be introduced in the US market in 2014 before later being launched in Europe. The electric Mercedes sets high standards amongst electric vehicles for comfort, quality and safety. For the B-Class Electric Drive, we are once again taking advantage of TESLA Motors’ expertise and incorporating the powertrain unit that company developed. The car’s quiet, locally emission-free operation is made possible by a 130 kW electric motor, which delivers its maximum torque of 340 Nm as soon as the driver steps on the gas pedal. That’s about the same as the amount of torque provided by a state-of-the-art three-liter gasoline engine. A high-performance lithium-ion battery supplies the electrical drive system with energy. The battery is located in the “energy space” of the car’s underbody, where it is safely protected and takes up little room. This smart packaging ensures that the five-seat vehicle retains the B-Class’s well-known interior spaciousness and large trunk size. To extend the car’s range, its top speed is electronically limited to 160 km/h. The vehicle has a range of about 200 kilometers, depending on the driving cycle.

#### **A unique spectrum of electrically powered vehicles.**

Because our spectrum of battery or fuel-cell powered locally emission-free vehicles ranges from cars and vans to light trucks and buses, the models we offer in this area can meet almost any road mobility requirement. In June 2012, we began to produce the new smart fortwo electric drive<sup>5</sup>, which is now available in 14 markets worldwide, including China and the United States. With a market share of around 30%, the smart fortwo electric drive<sup>5</sup> is the leader in Germany’s electric car segment. More than 1,200 e-smarts are being used around the clock as part of our innovative car2go mobility service. The technology is proving its worth every day in various large cities around the globe. The Mercedes-Benz B-Class F-CELL<sup>6</sup> and the Mercedes-Benz Citaro FuelCELL Hybrid city bus are the world’s most extensively tested fuel-cell vehicles. The Mercedes-Benz A-Class E-CELL<sup>7</sup> has been on the road since the fall of 2010. In the van segment, we have been delivering panel-van and crewbus versions of the Mercedes-Benz Vito E-CELL<sup>8</sup> to customers since mid-2010. We also offer FUSO Canter E-CELL and Freightliner Custom Chassis MT E-Cell light trucks. Customers began to receive the Mercedes-Benz SLS AMG Coupe Electric Drive<sup>9</sup> in mid-2013. This model is geared toward technology-focused super-sports car fans with a passion for state-of-the-art engineering and futuristic high-tech solutions. In China, we will launch the first electric vehicle built by the DENZA brand in 2014. We jointly developed, and now produce, this innovative model with our partner BYD.

**Our “road to accident-free driving.”** Vehicle safety is one of our core areas of expertise and a key component of our product strategy. For over 60 years, our engineers have been ahead of their time in the development of new safety technologies. Our vision of accident-free driving continues to motivate us to make mobility as safe as possible for all road users.

#### Autonomous driving with the S 500 INTELLIGENT DRIVE.

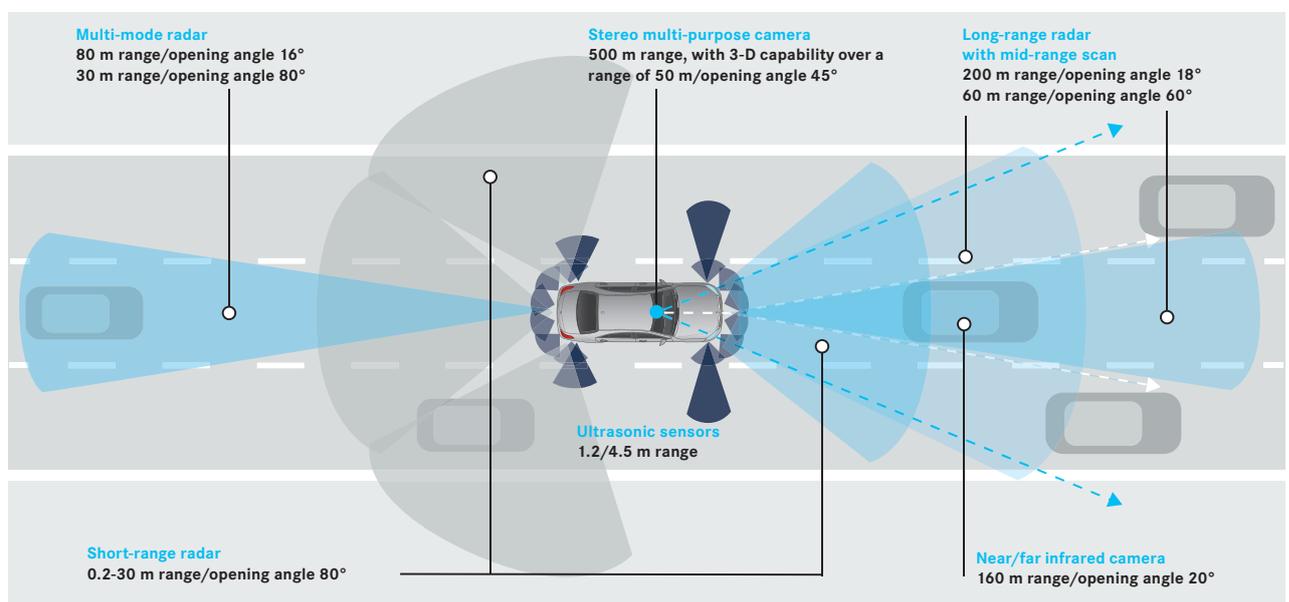
The S 500 INTELLIGENT DRIVE is a milestone on the road to accident-free driving. In August 2013, Mercedes-Benz became the world’s first automaker to prove that autonomous driving is also possible in cities and on highways and country roads. The vehicle covered the same route taken by Bertha Benz 125 years ago, when she became the first person to complete such a long trip in an automobile. In the dense traffic of the 21st century, the innovative Mercedes-Benz S-Class research vehicle faced the difficult challenge of driving autonomously in highly complex situations – with traffic lights, roundabouts, pedestrians, cyclists and streetcars. The unusual aspect of this pioneering achievement is that it was accomplished not with extremely expensive special technology, but instead with the help of technology that is close to the series-production stage. This technology is similar to systems that are already available for the new E-Class and S-Class. Beginning in 2014, they will also be available in the new C-Class.

**Anticipatory active chassis.** The new Stereo Multi Purpose Camera (SMPC), or “stereo camera” for short, provides vehicle occupants with even more safety and comfort. The system’s two “eyes” enable it to monitor in 3D an area extending approximately 50 meters in front of the vehicle. The system can also see as far as 500 meters ahead. The information is analyzed with the help of sophisticated algorithms. Within a wide area, the system can thus detect and spatially localize oncoming vehicles as well as vehicles that are driving ahead or coming from the side. It can also recognize and localize pedestrians and various types of traffic signs and road markings. The new camera supplies data to a variety of systems for further processing. One of them is the one-of-a-kind ROAD SURFACE SCAN system, which was first introduced in the new S-Class and turns the ABC feature into MAGIC BODY CONTROL. ROAD SURFACE SCAN recognizes and measures the road surface ahead, while ACTIVE BODY CONTROL, which is an enhanced active suspension system, uses this information to largely offset body movements caused by the road. The chassis is adjusted to each situation within a fraction of a second, enabling body movement to be substantially reduced. This results in an unprecedented level of ride comfort. ↗ C.41

- 1 S 400 HYBRID: fuel consumption in l/100 km urban 7.4 – 6.6 / extra-urban 6.5 – 6.1 / combined 6.8 – 6.3; CO<sub>2</sub> emissions in g/km combined 159 – 147.
- 2 S 300 BlueTEC HYBRID: fuel consumption in l/100 km urban 4.8 – 4.7 / extra-urban 4.6 – 4.3 / combined 4.7 – 4.4; CO<sub>2</sub> emissions in g/km combined 124 – 115.
- 3 S 500 PLUG-IN HYBRID: market launch in second half of 2014.
- 4 B-Class Electric Drive: market launch at first in the USA in Q2 2014.
- 5 smart fortwo electric drive: electricity consumption in kWh/100 km 15.1; CO<sub>2</sub> emissions in g/km 0.0.
- 6 B-Class F-CELL: H<sub>2</sub> consumption in kg/100 km 0.97; CO<sub>2</sub> emissions in g/km 0.0.
- 7 A-Class E-CELL: electricity consumption in kWh/100 km 17.5; CO<sub>2</sub> emissions in g/km 0.0.
- 8 Vito E-CELL: electricity consumption in kWh/100 km 25.2; CO<sub>2</sub> emissions in g/km 0.0.
- 9 SLS AMG Coupe Electric Drive: electricity consumption in kWh/100 km 26.8; CO<sub>2</sub> emissions in g/km 0.0.

## C.41

### All-round visibility in the S-Class

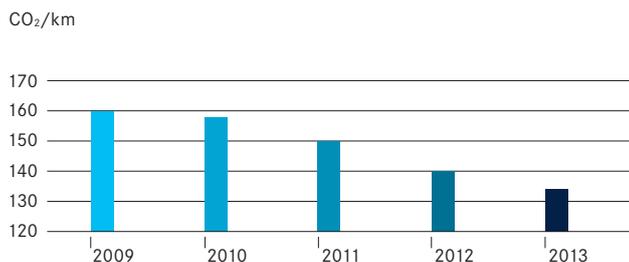


## Five new assistance systems in the Mercedes-Benz

**Sprinter.** One of the main activities during the development of the new Sprinter was the creation of a whole series of new assistance systems, including world firsts for the van segment. Among the systems premiered are Crosswind Assist, COLLISION PREVENTION ASSIST, Blind Spot Assist, Highbeam Assist and Lane Keeping Assist. The many new assistance systems underscore Mercedes-Benz Vans' role as a safety technology pioneer and a driving force for innovation. Crosswind Assist is a milestone in safety technology. Within the limits of what is physically possible, the system almost completely offsets the effects that gusts of wind have on the vehicle. It greatly reduces driver stress, as motorists no longer have to steer as much against sudden gusts of wind. Crosswind Assist uses the standard-fitted ESP<sup>®</sup> sensors to determine the force exerted by crosswinds and gusts on the vehicle. To counteract this force, the assistance system brakes specific wheels on the windward side of the van. This causes the vehicle to steer in the direction of the wind and prevents it from drifting, which would have dangerous consequences.

## C.42

### Average CO<sub>2</sub> emissions of the new car fleet of Mercedes-Benz Cars in the EU



## Environmental protection

### A comprehensive approach to environmental protection.

Daimler is strongly committed to improving the environment and the quality of life in the geographic locations and social settings in which we operate. Protecting the environment is a primary corporate objective of the Daimler Group. Environmental protection is not separate from other objectives at Daimler; instead, it is an integral component of a corporate strategy aimed at long-term value creation. For Daimler, a focus on the highest possible product quality includes compliance with stringent environmental standards and the sparing use of vital natural resources. Our measures for manufacturing environmentally friendly products therefore take the entire product lifecycle into account – from design, production and product use all the way to recycling and disposal. The environmental and energy-related guidelines approved by the Board of Management define the environmental and energy-related policy of the Daimler Group. This expresses our commitment to integrated environmental protection that begins with the underlying factors that have an impact on the environment, assesses the environmental effects of production processes and products in advance, and takes these findings into account in corporate decision-making.

**€2.9 billion for environmental protection.** In 2013, we continued to energetically pursue the goal of conserving resources and reducing all relevant emissions. We have kept a close eye on the effects of all our processes, ranging from vehicle development and production to recycling and environmentally friendly disposal. We increased our expenditure for environmental protection by 4% to €2.9 billion in 2013.

**Further reduction of CO<sub>2</sub> emissions from cars.** Mercedes-Benz made intensive efforts early on to reduce the fuel consumption of its vehicles while enhancing their performance – and thus increasing driving enjoyment and safety margins. With a fleet average of 134 g/km (2012: 140 g/km), we once again significantly reduced the average CO<sub>2</sub> emissions of the cars we sell in the European Union in 2013. More than 50 Mercedes-Benz models emit less than 120 g CO<sub>2</sub>/km, and over 100 models bear the energy efficiency label A+ or A. [↗ C.42](#)

One example of these models is the E 220 BlueTEC BlueEFFICIENCY Edition<sup>1</sup>. With emissions of 114 grams of CO<sub>2</sub> per kilometer, it is not only the most efficient vehicle in its segment but also conforms to the Euro 6 emissions standards. Consequently, it is ranked in the best efficiency class: A+. The E 300 BlueTEC Hybrid<sup>2</sup> emits even less CO<sub>2</sub>. This car combines a 150-kW four-cylinder diesel engine with a 20-kW electric motor and consumes only 4.1 liters/100 km on average (NEDC combined). That corresponds to CO<sub>2</sub> emissions of 107 grams per kilometer.

1 E 220 BlueTEC BlueEFFICIENCY Edition: fuel consumption in l/100 km urban 5,6 – 5,4 / extra-urban 4,1 – 3,7 / combined 4,6 – 4,4; CO<sub>2</sub> emissions in g/km combined 122 – 114.

2 E 300 BlueTEC HYBRID: fuel consumption in l/100 km urban 4,2 – 4,2 / extra-urban 4,2 – 4,1 / combined 4,2 – 4,1; CO<sub>2</sub> emissions in g/km combined 110 – 107.