Press release
Bosch Compact

Bosch at the IAA Mobility: Safe, emissions-free, and exciting mobility – now and in the future
Bosch offers visitors an interactive, hands-on experience

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- Batteries and fuel cells: electrical powertrains make mobility more sustainable.
- Drivers and vehicles: assisted and automated driving enhance road-safety and comfort.
- On the road and at home: vehicles are connected to the internet, increasing safety and comfort.

Munich, Germany – Cars, e-bikes, motorcycles, scooters, electric race cars: Bosch is rolling out mobility solutions for all types of vehicles, and is even making smartphones and people's homes an integral part of mobility. At IAA Mobility 2021 in Munich, the supplier of technology and services will be showcasing its solutions for personalized, automated, connected, and electrified mobility. Bosch will be in exhibition hall B3 at booth C30 and in the bike area, in the Messe West parking garage, and downtown at Königsplatz and Odeonsplatz.

At the trade fair and downtown – get in, get on, try it out

Bosch show car: In the future, more and more vehicles will be electrically powered. They will increasingly be connected with other road users and their surroundings, assume more and more of the driving task themselves, and provide personalized services for their occupants. Bosch technology for automated, electrified, personalized, and connected mobility is paving the way for this future vision of mobility. The company has the systems know-how and comprehensive software and hardware expertise that this requires. For example, Bosch is developing central computers for the electronics architecture of the future. These vehicle computers are used for assisted and automated driving, controlling vehicle motion, as well as for cockpit functions and body electronics. *(Trade fair: Hall B3, booth C30)*

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Driverless parking: Bosch and nine project partners will present the future of parking in a live demonstration. In the automated valet parking system developed jointly by Bosch and Mercedes-Benz, a smartphone command directs cars automatically to their assigned parking bays without the need for driver supervision. Interplay between the intelligent parking garage infrastructure and the vehicle technology makes this possible. Sensors in the parking garage monitor the driving aisle and its surroundings while guiding the vehicle. The in-car technology converts the commands from the infrastructure into safe driving maneuvers. A joint project with the association of the German automotive industry (VDA) shows how vehicles from different manufacturers will be able to communicate with infrastructure technology from various suppliers in the future. Against this backdrop, the project partners are also working on an international standard (ISO 23374). *(Live demonstrations several times a day in the Messe West parking garage)*

An enhanced cycling experience: E-bikes are the best-selling electric vehicle in Europe. Riding an electrically assisted bike is good for people's health and the environment – as well as a lot of fun. Connected products and services enhance the cycling experience and connect e-bikers with the digital world. Bosch will be showcasing new connected-biking solutions and allowing visitors to see for themselves just how much fun power-assisted cycling can be. *(Trade fair: Hall B3, booth C30; bike area B5, Blue Lane Micromobility: Brienner Straße; open space: Königsplatz and Odeonsplatz*)

Bosch is electrifying mobility and helping mitigate global warming
Bosch wants to be a key player in climate-neutral mobility. The company has set itself the goal of making all vehicle classes ready for upcoming emissions requirements. As an innovation leader, Bosch has a broader electric driving portfolio than any other company – from e-bikes to passenger cars to heavy trucks.

Battery-electric power for two- and four-wheeled vehicles From powertrains to steering systems to brakes, Bosch's portfolio includes all the building blocks for the electrification of passenger cars. One component is the **e-axle,** which combines the power electronics, electric motor, and transmission in a single unit. And with its pre-integrated system solutions for vehicle platforms, Bosch helps automakers bring electric vehicles to market faster than before. The key is the optimized interaction of the powertrain, steering, braking, and vehicle control in the **advanced driving module**, which is combined with partner solutions to form a complete axle module for the front and rear axles. Alongside efficient powertrains, Bosch also uses **thermal management** to increase the range of electric and hybrid vehicles. Precise control of currents of hot and cold air

improves the efficiency of the battery and ensures that all components are working within their optimum temperature range. Bosch also offers drives and control units for **electric two-wheelers**. Integrated in a compact system, the two components ensure precise control of the motor, reliable riding performance, and optimum torque development.

Fuel-cell system: Mobile fuel cells offer long ranges and short refueling times. Where they really come into their own is on long-haul routes and in commercial vehicles. With green hydrogen, fuel cells enable vehicles to be operated CO_2-free. Bosch develops all the key system components to production readiness – including complete systems. For the stack, which converts hydrogen and ambient oxygen into electrical energy, the company is working with the Swedish specialist Powercell. Large-scale manufacturing of the stack is set to begin in 2022, and the launch of the complete fuel-cell system – the Bosch fuel-cell power module – is scheduled for 2023.

Services for electromobility: Bosch's **Battery in the Cloud** prolongs the life of electric car batteries. Smart software functions in the cloud continually analyze battery status and take appropriate action to prevent or slow cell aging. The tamper-proof "usage certificate" documents the condition of the battery throughout its entire service life, thus giving a better picture of the battery's residual value if the car is sold. With charging services such as **Convenience Charging**, Bosch makes it easy and straightforward for drivers of electric cars to find – and pay at – publicly accessible charging stations. In addition, the integrated recharging and navigation solution allows for a precise range forecast and route planning that includes recharging stops – and comes with the option to set personal preferences, such as charging stations next to restaurants.

New charging cable: At the IAA Mobility, Bosch is presenting a flexible charging cable with integrated control and safety technology for the first time. It also does without the usual in-cable control box when charging at a 230-volt power socket. This means, the flexible smart charging cable weighs less than three kilograms. On average, this is a good 40 percent less than conventional charging cables with a control box. Because it comes with adapters for Type 2 and household plugs, drivers who want to be free to choose whether to recharge from a power socket at home or from a charging station on the road no longer need a second cable.

High-speed electromobility: For everyday life and for the racetrack – Bosch is committed to becoming the leading supplier of electrified powertrain solutions, both in electromobility for production vehicles and in electrified motorsports. The company has entered into a long-term technology and development partnership

with the DRAGON/PENSKE AUTOSPORT Formula E Team. And those who want to experience driving the racing series courses virtually and compete with others for the best time can do just that in two simulators. (*Open space: Königsplatz*)

Using electricity intelligently: Bosch's intelligent energy manager makes it possible for homeowners to reduce CO_2 emissions and save energy costs. Serving as an interface between a Bosch heat pump and a photovoltaic system, it optimizes the use of home-generated solar energy and distributes it intelligently throughout the building. Alongside heating and hot water, it will also be possible to integrate electric cars into the Bosch energy management system in the future. Compatible wallboxes can then be deployed to recharge vehicles using as much home-generated electricity as possible.

Bosch is automating driving and making roads safer

Less stress, smoother traffic flows, greater safety – vehicles that assume more driving tasks themselves are a key building block for tomorrow's mobility. An automated vehicle must be able to do everything a human driver can: perceive its surroundings, make decisions, and accelerate, brake, and steer. Step by step, Bosch is laying the technical foundations for automated driving. With its driver assistance systems, it is already paving the way for all levels of automation.

Surround sensing for all traffic situations: Sensor technology forms the basis for assisted and increasingly automated driving. To drive safely, the vehicle must be able to reliably recognize objects, people, and other road users. Bosch's **multi-purpose camera** combines traditional image-processing algorithms with artificial intelligence (AI) methods. Using AI, the camera understands and interprets what it sees, ensuring reliable object recognition and good surround sensing. In addition to camera, radar, and ultrasonic sensors, Bosch is also developing a long-range lidar, for which it employs various sensor principles. The more complex the driving task, the more important their interaction.

Localization technology for exact positioning: Automated vehicles need to know exactly where they are at all times. Bosch offers a comprehensive package of hardware, software, and services that allows automated vehicles to precisely determine their own location. The **VMPS (vehicle motion and position sensor)** uses satellite navigation signals to identify the exact position, augmented by data from a correction service and information from the steering-angle and wheel-speed sensors. The **Bosch road signature** cloud-based map service uses data from radar and video sensors as well as vehicle motion data to create additional layers for high-resolution maps. Volkswagen Golf 8 vehicles are currently collecting this information on Europe's roads.

Redundant braking and steering systems for safe and energy-saving driving maneuvers: Better safe than sorry – this holds especially true for safety-relevant functions in automated driving. Thanks to multiple redundancy, Bosch's **electric steering system** offers additional safety. In the rare event of a malfunction, the system is still capable of retaining 50 percent of its electric steering functionality. Bosch has also integrated a redundant architecture into the design of its **braking systems**: should either the iBooster (the electromechanical brake booster) or the ESP electronic stability program fail, the other component can brake the vehicle. A second braking unit serves as a backup for the integrated power brake system, which combines brake boosting technology and ESP functionality. This is an especially important requirement in automated vehicles. In addition, Bosch's regenerative braking systems help save CO_2: in a very smooth process, which is unnoticeable for the driver, they make it possible to switch between generator and friction braking, thus enabling braking energy to be converted back into electrical energy and fed back into the battery every time the vehicle is braked.

Services for automated driving: Bosch's **predictive road-condition services** raise the alert in the event of potential hazards long before critical situations develop. They provide real-time information about road conditions and risks such as aquaplaning, ice, and snow. This enables automated vehicles to correctly anticipate road conditions, adapt their driving behavior to the conditions, choose a different route, or even ask the driver to take control.

Bosch connects vehicles with each other and with their surroundings: Vehicles that warn each other of danger, keep a protective eye on their occupants, and communicate with the smart home – Bosch connects systems, components, and services inside and outside the vehicle, making mobility more efficient, safer, and more relaxed. Users, vehicles, and surroundings are seamlessly connected, making driving more enjoyable and providing a personalized mobility experience.

Smart car meets smart home: Bosch is turning cars into the command centers for smart homes: using Mercedes-Benz's MBUX infotainment system, Bosch Smart Home applications can be controlled by voice command from the vehicle. In addition to shutters and heating thermostats, the system can also be used to control light switches and smart adapters, and to check the status of motion detectors and door/window contacts. Using voice commands allows the driver to stay focused on the road.

Guardian angel for all areas of life: In the shape of **Help Connect**, Bosch has developed a digitally connected emergency call system for motorcycles and other vehicles. A smart crash algorithm added to the acceleration sensors in the Bosch MSC motorcycle stability control system allows accidents to be detected. A smartphone app transmits information about the accident scene and the rider to a service center, and from there to the emergency services. If the motorcycle has no permanently installed accident detection system, the sensor data from the smartphone can be used to initiate the emergency response. Bosch Help Connect can also provide assistance at home, in the gym, or when out cycling.

Indoor monitoring for better occupant protection: Bosch has developed a system comprising cameras and AI that can increase the safety of vehicle occupants. The interior monitoring system detects driver drowsiness and distraction, or if occupants are in an unsafe seating position. It warns inattentive drivers, recommends a break if they are getting tired, and can reduce vehicle speed – depending on the automaker's wishes and legal requirements. The system also enhances convenience by automatically adjusting the seat, mirrors, and steering wheel height in line with individual preferences – as well as enabling gesture control of the infotainment system.

Wrong-way driver alert: Bosch's cloud-based **wrong-way driver warning** system warns both the wrong-way driver and all road users at risk of the impending danger within seconds – much faster than traffic news on the radio. In early 2021, ŠKODA became the first automaker worldwide to opt for Bosch's digital guardian angel. The lifesaving warning is flashed up directly on the display in the vehicle cockpit. As an app solution for smartphones, this service already has 2.5 million active users in 20 European countries.

Smartphones as car keys: With **Perfectly Keyless**, sensors in the car recognize the owner's smartphone as securely as a fingerprint and open the vehicle only at their request. The cell phone thus displaces the conventional car key. Thanks to ultra-wideband technology, the system also offers other practical everyday advantages: it is even easier to maneuver the car into tight parking spaces by remote control or to open the trunk remotely so that package handlers can deposit deliveries in it. For large parking lots where it is difficult to locate vehicles, Perfectly Keyless helps find the way to the car and illuminates the path by switching on the headlights, providing extra safety in the dark.

Press photographs: #9231c1b5, #3271234, #c2772624, #3294800, #92eb12b7, #2068019, #ebeb4b0e, #1709802, #3285530, #ee16ca1d, #2898156, #83e39dc4, #1847983, #f4f5e097, #718e84c2

EXPERIENCE BOSCH AT THE IAA MOBILITY 2021 in Munich: Rethinking mobility and making it as safe, emissions-free, and fascinating as possible – this is the goal Bosch has set itself. On a technological level, the supplier of technology and services wants to achieve these aims through personalization, automation, connectivity, and electrification. At this year's IAA Mobility, Bosch is presenting its full range of two-wheeler and four-wheeler mobility solutions for a climate-neutral future. In addition to the summit at the Munich trade fair center, Bosch will also be downtown at Königsplatz and Odeonsplatz.

BOSCH PRESS CONFERENCE: Monday, September 6, 2021, from 10:45 to 11:00 CEST: with Dr. Volkmar Denner, chairman of the board of management of Robert Bosch GmbH and Dr. Stefan Hartung, chairman of the Mobility Solutions business sector, at the Bosch summit booth C30 in Hall B3 and via livestream on the Bosch Media Service.

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Mobility Solutions is the largest Bosch Group business sector. In 2020, its sales came to 42.1 billion euros, or 59 percent of total group sales. This makes the Bosch Group one of the leading automotive suppliers. The Mobility Solutions business sector pursues a vision of mobility that is safe, sustainable, and exciting, and combines the group's expertise in the domains of personalization, automation, electrification, and connectivity. For its customers, the outcome is integrated mobility solutions. The business sector's main areas of activity are injection technology and powertrain peripherals for internal-combustion engines, diverse solutions for powertrain electrification, vehicle safety systems, driver-assistance and automated functions, technology for user-friendly infotainment as well as vehicle-to-vehicle and vehicle-to-infrastructure communication, repair-shop concepts, and technology and services for the automotive aftermarket. Bosch is synonymous with important automotive innovations, such as electronic engine management, the ESP anti-skid system, and common-rail diesel technology.

The Bosch Group is a leading global supplier of technology and services. It employs roughly 395,000 associates worldwide (as of December 31, 2020). The company generated sales of 71.5 billion euros in 2020. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT provider, Bosch offers innovative solutions for smart homes, Industry 4.0, and connected mobility. Bosch is pursuing a vision of mobility that is sustainable, safe, and exciting. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to facilitate connected living with products and solutions that either contain artificial intelligence (AI) or have been developed or manufactured with its help. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiary and regional companies

in some 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. With its more than 400 locations worldwide, the Bosch Group has been carbon neutral since the first quarter of 2020. The basis for the company's future growth is its innovative strength. At 129 locations across the globe, Bosch employs some 73,000 associates in research and development, of which nearly 34,000 are software engineers.

Additional information is available online at www.bosch.com, www.iot.bosch.com, www.bosch-press.com, www.twitter.com/BoschPresse.