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Robert Bosch GmbH
Postfach 10 60 50
70049 Stuttgart

Media und Public Relations
Leitung: Melita Delic
Presse-Forum:
www.bosch-presse.de

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Bosch uses software and AI to make its products smarter and make people's lives safer

CES 2025: Bosch products present in every aspect of daily life

- Tanja Rueckert: "Software and digital solutions are the cornerstones of our business."
- Boundless ambition: Bosch expects to generate sales of over 6 billion euros with software and services by the beginning of the next decade.
- Coded #LikeABosch: more than 5,000 Bosch AI experts have registered over 1,500 AI patents in just five years – unrivaled in Germany and Europe.
- Bosch Tech Compass: majority of respondents plan AI training in 2025 – Bosch has already successfully trained 65,000 associates.
- Software-defined mobility: with its mobility-specific software expertise, Bosch is the ideal partner for the world's major tech players.
- Award-winning tech: intelligent Bosch crib helps young parents care for their newborns – and wins a CES award.
- Bosch in everyday life: intelligent MEMS sensors ensure intuitive and energy-efficient operation in more than 50 % of new smartphones.
- Paul Thomas: "Major investments in the heating and chip businesses underline the strategic importance of the U.S. market."

Las Vegas, NV, USA – Software and artificial intelligence (AI) are already shaping our present. For the future, however, they will be crucial. Bosch was quick to recognize the opportunities offered by intelligent software and services, and focused on them at an early stage: AI now features in every one of the technology company's products – or was involved in their production. "Intelligent software and digital services have become cornerstones of our core business," says Tanja Rueckert, member of the board of management of Robert Bosch GmbH, at the CES 2025 electronics trade fair in Las Vegas, Nevada. And the AI and software business is continuing to gain speed: Bosch expects to achieve sales of software and services of over 6 billion euros by the beginning of the next

Robert Bosch GmbH
Postfach 10 60 50
70049 Stuttgart,
Germany

E-mail Athanassios.Kaliudis@bosch.com
Phone +49 711 811 7497

Corporate Department
Communications & Governmental Affairs
Executive Vice President: Prof. Christof Ehrhart
www.bosch-press.com

decade. The Mobility business sector will generate around two-thirds of this sales revenue.

AI is playing a particularly significant role in this development. “With over 1,500 patents in just five years, Bosch leads the way in Germany and Europe,” Rueckert says. Almost 5,000 Bosch AI specialists are now working on intelligent solutions. Bosch is offering tailored courses to consistently drive forward the training of its entire workforce in the field of AI. To date, the company’s own AI Academy has trained more than 65,000 associates. This also dovetails with the results of the latest Bosch Tech Compass, an annual survey of people’s expectations of new technologies. According to the survey, four out of five of those surveyed worldwide are planning AI-related further training this year. And two-thirds believe that schools should teach AI as an independent subject. The message is clear: AI skills are fundamental to the future of the working environment.

At CES 2025 in Las Vegas, Bosch is presenting products and solutions that are already making people’s lives safer, more efficient, and more convenient thanks to software and AI. Or to put it another way: with software and AI, Bosch is improving the everyday lives of people from all walks of life.

Mobility, the home, health – Bosch software in all life situations

Take roads, for example: Bosch has long seen itself as a company providing software for mobility. It recently programmed a new function for vehicles that allows cars to brake smoothly and without jerking. This is a boon for drivers in slow-moving traffic, as well as for passengers with motion sickness. “No one understands the requirements and needs of the automotive industry as comprehensively as Bosch,” says Paul Thomas, president of Bosch in North America, at CES 2025. “With our mobility-specific software expertise, we’re the ideal partner for the world’s major tech players.” After all, software will change not only how we use and experience cars, but how we develop them as well. In the age of software-defined mobility, Bosch programmers approach cars from a software perspective. They are developing technologies and solutions for new centralized architectures that effortlessly manage all interactions between automotive electronics and the cloud. This will be essential in the future if cars are to be able to download new functions for areas such as infotainment or driver assistance easily and conveniently over the air.

At Bosch, AI has been playing an important role in assisted and automated driving for years now. For example, the MPC3 multifunctional camera has been in volume production since 2019 and is setting new standards. This camera is able to reliably recognize objects and people as well as to distinguish between the road and the edge of the road, thereby keeping the car safely in its lane. The camera combines conventional image-processing algorithms with AI methods for a complete understanding of what it is recording. “Our AI-based multifunction camera not only makes driving more relaxed, but also makes the roads safer for all users,” Thomas says. To achieve this, Bosch is combining its profound automotive engineering knowledge and its AI expertise with a vast pool of in-house sensor data. “We’re using AI to increase the efficiency of our assistance systems,” Thomas says.

What’s more, Bosch is investigating how generative AI can be used to further improve automated driving functions. The expectation is that it will enable vehicles to assess situations and react accordingly, and in this way keep road users even safer. In the future, generative AI will train automated driving functions more quickly, thus reducing the number of test miles required to validate them. And by adding conditions such as snow to the road, generative AI will quickly be in a position to alter the context of a driving sequence recorded by cameras or radar sensors. In other words, systems can be trained for snow without having to wait until snow actually falls – the AI will do it itself.

AI to combat worries about range and new theft protection for eBikes

By merging the physical and digital worlds, software also enhances the e-bike experience. Bosch is debuting its new Battery Lock theft protection system in Las Vegas. This provides additional protection for the e-bike battery: locking it digitally by using the rider’s smartphone as a key. AI also helps allay worries about range: with the AI-based Range Control feature, e-bike riders who are about to set out on a journey can determine the battery charge level with which they would like to arrive at their destination. And in the kitchen as well, people also have their own personal preferences. The intelligent Bosch Series 8 oven will also be on show at CES 2025. It is equipped with sensors, cameras, and AI. With their help, the oven can recognize around 80 dishes and automatically set the optimum cooking method and temperature. And for many dishes, even the degree of browning can be individually selected.

Intelligent Bosch crib – a helping hand for child carers

Sensors, cameras, and AI can also give parents a helping hand when caring for newborn babies. The new, intelligent Bosch Revol crib can monitor a baby’s vital signs such as heart rate and respiratory rate. The software also signals in good time if a soft toy or blanket is covering the child’s airway or if crying is detected.

And should the baby have trouble falling asleep, the crib can automatically engage a gentle rocking function. Users can decide for themselves whether the data the crib records is ultimately stored in encrypted form on Bosch servers or remains offline within their own four walls. The CTA, organizer of CES 2025, has designated the intelligent Bosch crib a CES Innovation Award Honoree.

Smart Bosch sensors have become an integral part of our daily lives

Another example of how the rapid acceleration of AI-based innovations is changing the way people use new technologies is smart sensors. These tiny components have a big impact. Microelectromechanical sensors (MEMS), packed with Bosch software and AI, can be found in all areas of our daily lives: whether smartphones, e-bikes, fitness trackers, or cars. What do they do? They can tilt displays from vertical to horizontal, count steps, and control airbags. Modern MEMS sensors even have an integrated microprocessor and run with independent software.

Without these sensors, everyday functions that we have all become accustomed to wouldn't be possible at all – functions such as "waking up" a smartphone display or activating a voice assistant with wireless headphones. Smart sensors record data such as acceleration, rotation, and temperature and use Bosch software to process it directly in the integrated microprocessor. This means their entire functionality is contained in a compact housing – Bosch produces the world's smallest sensor, which measures just 0.8 x 1.2 millimeters, making it barely larger than a grain of sand. Another advantage is that sensors with an integrated microprocessor draw noticeably less power from the battery of a smartphone or smartwatch. For the "wake-up" function, for example, the sensor system needs only its own microprocessor. Since it can do without the device's central computer, this prolongs the battery's runtime.

Bosch grows with billions of units in the sensor market

AI takes smart MEMS sensors to the next level: Bosch offers sensors with integrated self-learning AI software, for devices such as fitness trackers. The AI recognizes a variety of different movements and learns every repetitive fitness activity. If required, it can also provide users with qualitative feedback about how well they have done their exercises. The AI runs on the sensor itself; no connection to a cloud or smart device is needed. All data remains private and activities can be continuously recorded and analyzed without an internet connection.

According to the market research institute Yole Group*, this is now the fourth year in a row that Bosch is the market leader in the MEMS sector. More than one in every two new smartphones worldwide is equipped with Bosch sensors. And the potential is still huge: according to the Yole study, the annual global demand for MEMS in the automotive and consumer electronics sectors alone is expected to grow from today's 33 billion to over 40 billion units by 2029. Bosch wants to share in this growth and is planning to produce ten billion smart MEMS sensors with integrated microprocessors and independent software for consumer electronics by the end of 2030.

Billions invested in the strategically important U.S. market

CES 2025 in Las Vegas is one of the world's biggest electronics trade fairs in a strategic growth market for Bosch. The company is making targeted investments in the U.S. to further expand its global presence. Bosch recently announced plans to acquire Johnson Controls' global heating, ventilation, and air conditioning solutions business for residential and small commercial buildings – continuing its growth trajectory in the country. At a total of around 8 billion dollars (7.4 billion euros), this is the largest transaction in the company's history. In Roseville, California, Bosch is currently equipping a chip factory with modern manufacturing facilities to produce silicon carbide chips, thereby expanding its manufacturing capacity in an important sales market. These special semiconductors are a key component for electrified mobility. Over the next few years, Bosch wants to invest more than 1.9 billion dollars (some 1.8billion euros) in the Roseville location and start delivering silicon carbide chips from California in 2026. "The enormous investments in the heating and chip businesses underline the strategic importance of the U.S. market for Bosch," Thomas says.

*Source: Status of the MEMS Industry 2024, Yole Intelligence

Press photos and infographics in the Bosch Media Service at www.bosch-press.com.

Contact person for press inquiries:
Athanassios Kaliudis
Phone: +49 711 811-7497

Bosch at CES 2025:

- **PRESS CONFERENCE: Monday, Jan. 6,** from 9:00 to 9:45 a.m. PT with Dr. Tanja Rückert, member of the board of management of Robert Bosch GmbH, and Paul Thomas, president of Bosch in North America, in Ballroom Banyan ABCD, Mandalay Bay Hotel, Las Vegas, **South Convention Center, Level 3,** as well as **livestreamed** on the Bosch Media Service.
- **BOOTH: Jan. 7 – 10,** in the Central Hall, booth #16203.

- **PANELS WITH BOSCH EXPERTS:**
  "What's Next in Vehicle Tech",
  Jan. 9, 11 a.m. PT, Las Vegas Convention Center West / W219, session with Fedra Ribeiro, executive vice president sales Cross-Domain Computing Solutions at Bosch.
  "Predictive AI: Transforming Customer Service and Business",
  Jan. 9, 3 p.m. PT, Las Vegas Convention Center North / N261, session with Davie Sweis, chief digital officer at the Global Business Services at Bosch.
  "Trends in Electric Car Consumption: Who, What, Where"
  Jan. 9, 2 p.m. PT, Las Vegas Convention Center West / L2 W219, session with Sabrina Rathgeber, director Global Battery Business at Bosch.

- **WEST HALL MOBILITY STAGE:**
  "Software defined reality: Achieving consumer expectations for software-defined vehicle"
  Jan. 7, 11:20-11:50 p.m. PT, session with Thomas Irawan, president of ETAS GmbH, and Stefan Buerkle, regional president Cross-Domain Computing Solutions Americas.
  "Enabling electrification options for consumers as the market shifts"
  Jan. 8, 9:40-10:10 a.m. PT, session with Peter Tadros, regional president Power Solutions, and Kevin O'Keefe, regional president Electrified Motion at Bosch.
  "Intelligent production and automation transform battery manufacturing"
  Jan. 9, 9:40-10:10 a.m. PT, session with Sabrina Rathgeber, director Global Battery Business at Bosch.

Contact persons for press inquiries:

Bosch at CES: Irina Ananyeva, +49 152 597-53284, Tim Wieland, +1 248 410-0288, Trix Böhne +49 173 523-9774

Mobility, software: Athanassios Kaliudis, +49 152 086-51292

Artificial intelligence: Matthias Jekosch, +49 711 811-17645

Connected manufacturing: Manuela Kaiser, +49 711 811-44203

The Bosch Group is a leading global supplier of technology and services. It employs roughly 429,000 associates worldwide (as of December 31, 2023). The company generated sales of 91.6 billion euros in 2023. Its operations are divided into four business sectors: Mobility, Industrial Technology, Consumer Goods, and Energy and Building Technology. With its business activities, the company aims to use technology to help shape universal trends such as automation, electrification, digitalization, connectivity, and an orientation to sustainability. In this context, Bosch's broad diversification across regions and industries strengthens its innovativeness and robustness. Bosch uses its proven expertise in sensor technology, software, and services to offer customers cross-domain solutions from a single source. It also applies its expertise in connectivity and artificial intelligence in order to develop and manufacture user-friendly, sustainable products. With technology that is "Invented for life," Bosch wants to help improve quality of life and conserve natural resources. The Bosch Group comprises Robert Bosch GmbH and its roughly 470 subsidiary and regional companies in over 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. Bosch's innovative strength is key to the company's further development. At 136 locations across the globe, Bosch employs some 90,000 associates in research and development, of which nearly 48,000 are software engineers.

The company was set up in Stuttgart in 1886 by Robert Bosch (1861–1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant upfront investments in the safeguarding of its future. Ninety-four percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a charitable foundation. The remaining shares are held by Robert Bosch GmbH and by a corporation owned by the Bosch family. The majority of voting rights are held by Robert Bosch Industrietreuhand KG. It is entrusted with the task of safeguarding the company's long-term existence and in particular its financial independence – in line with the mission handed down in the will of the company's founder, Robert Bosch.

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

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Coded #LikeABosch – how we're creating software and AI-enabled solutions Invented for life

Dr. Tanja Rückert,

member of the board of management

of Robert Bosch GmbH,

and Paul Thomas,

president of Bosch in North America,

at CES®, on January 6, 2025

Check against delivery.

Robert Bosch GmbH
Postfach 10 60 50
70049 Stuttgart

Corporate Department
Communications &
Governmental Affairs
E-Mail
melissa.kronenthal@de.bosch.com
Phone: +49 711 811-45878

Executive Vice President:
Prof. Dr. Christof Ehrhart
www.bosch-press.com

Guest appearance by Danny MacAskill, Scottish trials cyclist

Danny MacAskill:
Ladies and gentlemen, please welcome to the stage Tanja Rückert and Paul Thomas!

Tanja Rückert:
Thank you, Danny. Let's have a hand for Danny MacAskill! Danny, you're truly a wizard on two wheels. And you're certainly in a great position to appreciate the opportunities digital technologies are unlocking in the world of cycling.

Paul Thomas:
Danny, tell us – when you look ahead ten or fifteen years, what digital solution has had the biggest positive impact on your career?

Danny MacAskill:
In ten or fifteen years? Well, there are a lot of technologies I'm already using today – things that help me plan my routes and collect data that let me evaluate my performance, so I can do better next time. But actually… If we're talking about that far in the future, there's something else that I think will have a bigger impact.

Tanja Rückert:
What is it?

Danny MacAskill:
An AI-based robot clone of myself that I can swap places with before doing a risky maneuver. That will save me a lot of recovery time and just a lot of generally unpleasant injuries. It'll have to look just like me, though, so nobody can tell it's a robot. You guys can do that, right?

Paul Thomas:
But Danny, what makes your routines so special is **you**! So, while AI

can help with your training and data, replacing you isn't what we think AI is about. That's actually something we'll be talking about today.

Danny MacAskill:
Well, it couldn't hurt to ask…

Tanja Rückert and Paul Thomas:
Hello everyone and welcome to CES 2025! We're so glad you could join us, either in person or virtually.

Danny and his bicycle offer us the perfect lead-in for the topic we want to talk to you about today: **how Bosch is breaking new ground in our digital business**. And our eBike business in particular is a great place to start, since it's the perfect example of how our entire company has evolved over the last few years. From a leading innovator and manufacturer in the world of hardware, we've evolved into a company that can seamlessly bridge the gap between the world of things and the world of data.

Fifteen years ago, we launched the first Bosch eBike system. The business initially brought together our expertise in traditional hardware domains such as cordless power tools and electric motors. We entered the market with a single drive unit, battery, and LED display. Fast forward to today: we're one of the leading makers of eBike drive systems globally. But what's more, we're a **leading provider of smart, connected solutions** that are transforming the way consumers approach mobility and experience cycling.

The **ever-increasing digital expertise** of Bosch eBike Systems is on display here at CES. For example, we're debuting a new and unique solution called **Battery Lock**, which enables you to digitally deactivate your battery when it's not in use, simply using your smartphone or Kiox display. Let's face it, batteries are one of the most valuable and easily-resold components on an eBike. But once a battery has been disabled,

it's basically useless to anyone else. Which means less risk of theft and more peace of mind for you. And it’s extremely convenient – to unlock your bike again, you don’t even need to take your phone out of your pocket, since the battery recognizes you via Bluetooth.

We’re also presenting a solution called **Range Control**. This feature of our eBike Flow app helps cyclists plan their routes with the help of AI. If you’re an e-biker, you know that a big worry is whether you’ll run out of motor support before you reach your destination. Well, with Range Control, you know in advance **exactly how far your battery will take you.** It even lets you decide how much charge you want left when you get where you’re going. The algorithm does this by taking things like your system weight, installed components, route elevation, and individual riding behavior into account. On this basis, it dynamically adapts motor support to maximize battery efficiency during your ride. And best of all, the more you use it, the more accurate it gets, as it continues to learn your riding style. At least when you’re on two wheels with the Bosch smart system, range anxiety will be a thing of the past!

What the eBike example illustrates is how software and digital solutions have become an integral part of our business at all levels – and that our heavy investments in this area are bearing fruit. By the beginning of the next decade, we aim to generate sales of over **6 billion euros** with software and services. Of course, a lot of this will feature AI: after all, we employ some **5,000 AI experts**, and we’ve filed **more than 1,500 AI-related patents in the last five years.** This makes us the European leader for AI patents, by the way. You may not remember, but at CES 2020, we announced that by 2025, **every product and solution** in our portfolio would either contain AI or be developed or manufactured with its help. Not only have we achieved this goal, we did so two years earlier than planned.

But our **digital transformation and the success** we’re seeing with software and AI is only part of the story. The other part is what we’re

hinting at with our CES tagline this year, “Coded #LikeABosch.” Code, of course, is the foundation of all digital solutions, and today we want to throw back the curtain and show you how that foundation is built. Not the literal lines of code, of course, but something far more fundamental. In a nutshell, “Coded #LikeABosch” **describes the approach we take in all our digital activities** – an approach that is above all guided by our “Invented for life” ethos. Let’s look at its **four key aspects**.

First and foremost, “Coded #LikeABosch” reflects our focus on identifying what people need and want – especially when it comes to things like safety, convenience, and efficiency. On that basis, we create digital solutions that bring them **real benefits** – not just novelty. As a longstanding tech leader, we’ve always **pursued innovations that improve people’s lives**. Bosch was behind the magneto ignition that helped democratize the automobile, and we developed the groundbreaking vehicle safety systems such as airbag control units, ABS, and ESP that have saved countless lives around the world.

Now, we’re **doing the same with our digital innovations**. Our software alerts road users to the danger of wrong-way drivers. It enables intelligent cameras that “see” smoke and fire before they get out of control, or that detect a ball crossing your car’s path and warn you that a child may follow. It forms the basis of energy-saving building management platforms, cutting-edge digital healthcare solutions, and safe, efficient manufacturing operations. And in the mobility realm, of course, it’s helping pave the way toward the **software-defined vehicles of the future** – and in the process unlocking many new benefits for their users.

At our booth this year, one of the most impressive showcases is a racecar. It’s not just any racecar, though – it’s a cutting-edge **Le Mans Daytona hybrid vehicle** – also known as LMDh. It’s the first hybrid-powered prototype racecar approved to compete in both NASCAR’s

IMSA series as well as the ACO's FIA World Endurance Championship. These are cars you'll see racing at endurance classics such as Le Mans, Daytona, and Sebring. And they're very special for two reasons: one, because the LMDh was the first entirely new car to receive global approval from both organizations, and two, because it has a Bosch hybrid system at its core. If you're a motorsport fan, you'll have to check it out! Among the high-tech digital features you'll find is our new cloud-based telemetry platform **RaceConnect**. This module allows us to extract maximum value from the stream of data being produced by vehicles on the track by converting it into actionable insights for the series, manufacturers, teams, and fans, and all in real time.

But it's actually another component of the system we want to spend a few minutes talking about – namely, the braking system. Not for the reasons you might think, though. We have an inspiring story to share about how this brake system has enabled one particular driver to continue doing what he loves best in the face of incredible adversity.

To help tell this story, we have a very special guest here today. But before we welcome him on stage, let's take a look at the challenges he faces and the Bosch technology that's helping him overcome them…

Guest appearance by Robert Wickens, motorsport racing driver
Paul Thomas:
Robert, thank you so much for joining us here at CES! That's a pretty incredible journey. You returned to racing in 2022, and this past year you debuted the Bosch hand control system for braking. Can you tell us a little more about the system and what it has enabled for you?

Robert Wickens:
Thanks, Paul! It's a pleasure to be here. When I first returned to racing after my accident, I used a system that was based on physical linkages that went down to the actual brake pedal and pressed it. It worked, but

it wasn't ideal. Then Bosch approached me with a solution that took the electric brake system they supply for the LMDh class. That system is based on **cutting-edge brake-by-wire technology**, using software to intelligently balance the braking torque from the electric motor generator unit and the traditional hydraulic brakes. The Bosch motorsport team figured out how to integrate this hardware with parts of my existing system, and more importantly to **adapt and tailor the software** for use with hand controls. The result is like night and day in terms of feel and responsiveness. The added technology **allows me to brake faster and with more consistency** than with my previous system, and it also features advanced diagnostics for safety. In short, this system has given me the ability to control my vehicle in the same way that other drivers do.

Paul Thomas:
So, with Bosch technology you're now able to drive with world-class speed and accuracy?

Robert Wickens:
Exactly.

Tanja Rückert:
And what does that mean for you and your career?

Robert Wickens:
Honestly, it's a game-changer for me. I can race like I used to again. And that basically means I can continue to do what I love professionally, which is compete – and at the highest level. I also love that because of its software architecture the **system is transportable**; I have been driving a Hyundai Elantra N TCR, but in the future I can take it with me into any number of other cars. But more than that, I'm glad that no matter what else I achieve in my career, together with Bosch I'll be able to leave behind a **legacy for the next generation of racing drivers with disabilities**. Not only by showing them that a

disability is absolutely compatible with this career, but by helping to develop and refine the actual technology that will help them pursue their dreams.

Paul Thomas:
Can you give us any idea of what the future holds for you?

Robert Wickens:
Well I do have some exciting news! To start in 2025, I'm making my debut in IMSA's WeatherTech SportsCar Championship with the No. 36 DXDT Corvette Z06 GT3.R, which is a step up in power and competition I'm looking forward to. Beyond that, my collaboration with Bosch allows for endless opportunities and continuing to push the boundaries of this system. So I know this is only the beginning of our story together.

Tanja Rückert and Paul Thomas:
Congratulations, Robert, and thank you so much for joining us today. You have such an incredible, inspiring story, and we're honored to have been able to play a part in it!

That's a really great example of what we mean with technology "Invented for life" and real benefits. It also shows why we are so **committed to driving forward the move to software-defined vehicles** – because of the potential they offer for greater safety, efficiency, and accessibility. And not just in the racing segment! After all, Bosch has software expertise derived from our extensive knowledge of the entire mobility ecosystem. That's what sets us apart from other companies – we're active on all levels and in all domains of the software-defined vehicle, which makes us the go-to partners.

Speaking of partners, let's move on to the **second aspect** of our approach. As a matter of principle when it comes to our digital activities, we pursue a **collaborative**, **hardware-agnostic, open-**

platform strategy. This is because on a fundamental level, we believe that in this sphere, **more can be achieved by opening up than by narrowing down**.

That's why we engage in collaborations with other companies such as **VW and its subsidiary Cariad**, with whom we're working on bringing automated driving functions to cars in all price segments. It's why we're focusing on hardware-agnostic software such as our groundbreaking **Vehicle Motion Management**, which you can see demonstrated at our booth. And it's why we're proponents of open and cross-brand platforms in nearly all our areas of business, such as our award-winning industrial automation toolkit **CtrlX Automation**. This system runs on an open-source Linux operating system and functions kind of like an app store for high-tech factory applications. It already counts more than 100 global partners that are actively contributing to its further development.

Or take the example of **our smart-home business**. Over the past few years, we've not only continued to develop intelligent, connected solutions that make our lives easier and more convenient, we've been working to make them cross-compatible with other companies' products and platforms. After all, doesn't it also increase ease and convenience to be able to choose freely among different brands and still have everything work together seamlessly?

At our booth, we're showcasing a range of new Bosch **smart-home products** that are now **compatible with the Matter open standard**. Matter is a freely available connectivity standard for smart home and IoT devices. Stop by our booth to check out our smart wall plug, door and window contact, radiator thermostat, air purifier, and air conditioning unit. We're also showcasing the newly launched **Bosch 100 series French Door Bottom Mount refrigerator**, which will be compatible with Alexa through Matter in 2025. Bosch is excited to be working with Amazon to move the Matter-enabled home appliance

space forward. And this launch reinforces our leadership position as the first company globally to have brought a Matter-enabled home appliance to market.

All these flexible, modular solutions can help to make your home more comfortable, energy-efficient, and secure. And looking ahead, in addition to managing our home appliances with our long-standing Home Connect app, users may be able to control all Matter-enabled devices across a smart home through partner systems or hubs, such as those from Amazon, Google, and Apple.

So more choice and more convenience – by taking a collaborative approach, we can serve customer needs even better.

This brings me to **aspect number three:** in our digital activities, we prioritize the **building of trust** in new technologies. This is something we've been talking about for a long time, but it's more relevant than ever today. At Bosch, we recognized at an early stage that without trust, many digital technologies are never going to achieve widespread acceptance and adoption. This is why an essential part of our digital strategy has been to put the focus on **users of our technology**, and to ensure that people's concerns are addressed above all.

Nowhere is this more important than in the realm of AI. This is why we've made it a priority to develop AI in a way that is safe, secure, robust, and explainable. Several years ago, we developed our **AI code of ethics**, which guides all our development activities in this domain. We're also strong proponents of a standardized, easy to understand **AI Label**, which puts the core idea of the **European AI Act** into practice and will provide transparency to consumers. We believe these are important tools for convincing people to trust our digital technologies like they've long trusted our analog ones. And they will also help ensure that people remain the focal point of the development and application of AI technologies.

For us, this people-centric approach means a focus on identifying applications where AI can be used to assist people and make their lives easier, safer, and simply better. One of the innovations we're showcasing at CES **encapsulates this approach perfectly**. It's our new **Revol multi-modal AI infant care solution**, and it was a CES Innovation Award Honoree in both the "smart home" and "artificial intelligence" categories. All you parents out there know how much time, energy, and uncertainty are involved in caring for a little one. This is where technology can help pick up the slack. The Revol is a smart crib that helps keep an eye on your baby, thanks to sensors, camera, and AI. How exactly? By monitoring your baby's heart and respiratory rate. The software also signals in good time if a soft toy or blanket is covering the child's airway or if crying is detected. And should your little one have trouble falling asleep, the crib can automatically engage a gentle rocking function.

What this solution doesn't do is replace the human element. Caretaking still comes from **parental involvement and expertise,** as you remain the decision maker. You're just offered a helping hand to keep your baby safe and healthy, so that your time together is characterized by more enjoyment and less worry. This is exactly where AI is incredibly useful, and it's why we're focusing on applications like this to build trust in the technology. Dealing **responsibly and transparently with user data** is also part of this. With the Revol, all data transmitted is encrypted end-to-end and stored on Bosch-administered servers, while all data at rest is secured locally with individual data encryption keys. But we also give you the final say whether it's transmitted at all – the Revol has an offline mode, which keeps all data within your four walls, if that's what you prefer.

The way the Revol harnesses digital technologies to aid and assist parents offers the perfect bridge to the **fourth and final aspect of our approach.** Namely, we aim to use these technologies to complement

and **support human** intelligence and abilities, **not to replace them** – especially when it comes to AI. Here, I want to talk about AI – and specifically GenAI – in a little more depth, since it's without a doubt **one of the most transformative technological developments** of recent decades.

While the advent of artificial intelligence was already a milestone in itself, the leap to generative AI represents nothing short of a **technological revolution** – on par with the invention of the computer or internet. **GenAI** has thrown open the doors to everyone – you no longer need to be an AI expert to harness this technology's power and potential. At Bosch we're currently seeing how GenAI is acting as a catalyst for the rapid uptake of AI technology throughout our organization. As a result, **GenAI has made topics like AI upskilling and AI governance** so much more important.

How are we using it? Well, in our **internal processes**, Bosch is using GenAI **in a wide variety of applications** with the aim of streamlining our work and serving our customers better. We've recently rolled out tools that for example support our associates in generating texts, videos, and software code.

But GenAI is also helping us unlock new possibilities in our **solutions for customers**, too. In collaboration with the German company Aleph Alpha, we've launched an **AI-based service which responds to vehicle breakdown calls** with the help of natural language processing. With the **multilingual elevator emergency call service,** we've established another AI-based service which connects a person trapped in a stalled elevator with our service expert. An AI-based voice bot translates the interaction in real time, and GenAI enhances the support. In both cases, it means people in trouble get someone on the other end of the line instantly who can help them in multiple languages.

We've also put GenAI into our **Series 8 smart oven**, which you can experience here at CES. Thanks to sensors, a camera, and a mini foundation model installed in each appliance, this oven learns to automatically identify dishes and choose the perfect time and temperature for each. All you need to do is assemble the ingredients, and the oven does the rest. Here again, the more you use it, the better it gets as it builds on its own experience and learns your preferences.

That's the beauty of AI, and why I get so excited about the possibilities it offers. But in all honesty, I also find it frustrating that there's clearly still a **lack of a balanced perspective** on AI in wider society. On one hand, there is a lot of fear and misunderstanding, and this is leading to hesitancy or even outright rejection of AI. On the other hand, its strongest proponents often downplay legitimate concerns and are over-confident about what AI can do. As is so often the case, the reality is somewhere in the middle. If used wisely and responsibly, **AI is a valuable tool that works together with and complements human intelligence**. It can be an assistant, a companion for life and work. But it cannot – and should not – operate independently of people or be designed to replace them. This is why the **development of AI skills** is so crucial.

This fits with our findings in the latest **Bosch Tech Compass**, the survey we conduct each year to gauge global attitudes to technology. In our most recent survey, we asked people about their opinions on a range of AI-related topics. Interestingly, a widespread belief in the importance of **building AI-related skills** was reflected in the results. For instance, **82 percent of global respondents are planning to educate themselves** on matters related to AI. In line with this, **63 percent** also believe AI should be taught as a **standalone subject** in school, which means people think such skills are increasingly fundamental and should be acquired early. In contrast, employers are at an early stage in recognizing the importance of AI skills – **only**

about a quarter of respondents report that they have received any **on-the-job AI training**.

At Bosch, we take the issue of AI skills very seriously. So far, we have launched a number of **initiatives to upskill our workforce**. Among these is a dedicated learning portal called our **AI Academy**, which is open to everyone at the company. It offers a broad portfolio of both virtual and in-person training opportunities for associates at all levels of expertise. So far more than **65,000 associates** have completed training related to AI and GenAI.

One area in which we're actively demonstrating how we can put these new skills to use – and more generally how AI can be used to **complement rather than replace human expertise** – is the manufacturing sphere. Bosch is widely considered a **pioneer of what's being called Industrial AI,** which involves harnessing the technology to optimize and streamline manufacturing operations, in the process helping to make it more safe, efficient, and precise.

So that's what "Coded #LikeABosch" means in a nutshell: digital solutions that are designed to assist, support, and benefit people. And they're an increasingly fundamental part of our portfolio – and thus our growth efforts – in all our global markets.

That of course includes the United States, and one digital innovation we're pleased to be rolling out more widely is our **wrong-way driver warning.** The Bosch cloud-based system tracks vehicles as they approach highway entrance or exit ramps. Using anonymized data, the system can tell if a vehicle is moving in the permitted direction of travel. If it is moving the wrong way, a warning is issued to the driver. A warning can also be sent to other drivers, alerting them that an approaching vehicle is travelling the wrong direction. According to the U.S. Federal Highway Administration, there were more than 700 fatalities in 2022 from wrong-way driving – up almost 60 percent over a

five-year period. Here is an example where digital services can provide real value to help reduce these incidents.

That's why we're very excited to announce here at CES that we are **working together with SiriusXM Connect** to potentially bring Bosch wrong-way driver alerts into the new SiriusXM Connect mobile safety app. This would mean that millions of new consumers would have access to this technology to help alert them of wrong-way driving incidents.

We're also actively working to bring this technology to more vehicles and smartphones via collaborations; we hope to have more to announce soon.

In other areas of business as well, the **United States** continues to be a major strategic focal point for our growth efforts, and we're continuing our program of **heavy investment** here. A few months ago, we announced the biggest single transaction in our company's history, our planned $8 billion acquisition of the residential and light commercial HVAC business from Johnson Controls and Hitachi. That's expected to close sometime this year.

We're also contributing to the build-up of semiconductor manufacturing in the United States. We're continuing to work toward the planned launch of silicon carbide chip production at our Roseville, California, facility in 2026. As was announced just last month, the project has received proposed support from the CHIPS and Science Act, which is helping enable us to transform the Roseville site into a world-class semiconductor manufacturing operation.

And that's not all. We're planning multiple new product launches in our power tools and home appliances categories tailored to the U.S. market.

There's a lot of exciting stuff happening at Bosch in the U.S. right now! And beginning shortly, people here are going to be hearing a lot more from us. They'll also be seeing us in places they've never seen us before. One place in particular might be quite surprising…

We're proud to announce here at CES that for the first time in our company's history, Bosch will be advertising at the "Big Game" on February 9!

Stay tuned for more information in the coming weeks and make sure to keep an eye out for Bosch during the game!

As we look toward the future, we see how digital technologies are opening up a **vast new landscape of possibilities**. In particular, **AI** and **GenAI** have the potential to help enable greater comfort, efficiency, cost savings, and sustainability in nearly every domain – if the right approach is taken.

We believe such an approach should put the focus on people. Especially when it comes to AI, we believe the four aspects we just outlined are essential to fostering a balanced and realistic view. They're also the key to ensuring that this technology is put to work doing what it does best – namely **supporting, assisting, and enhancing** our own efforts.

At Bosch, we long ago traded in our membership in the hardware-only club and are continuously breaking new ground in the digital sphere. But in a data-driven world, our essential motivation hasn't changed. As ever, we remain committed to **leveraging technology to make people's lives better** – in line with our "Invented for life" ethos. Stop by our booth this week and see for yourself what beneficial digital technology "Coded #LikeABosch" looks like.

Thank you!

Press release
Bosch Sensortec

AI-enabled sensors deliver life-changing use cases
Coded #LikeABosch – how we're creating software and AI sensing solutions

January 6, 2025
PI11907

- Intelligent software and edge AI deliver powerful, integrated sensor solutions.
- Accurate, real-time and personalized data provided to users.
- Feature-rich, compact and power-saving sensors for consumer devices.
- Bosch at CES: booth 16203.

Las Vegas, NV - Sensor technology is transforming our lives: tracking our fitness, making our gadgets easy to use, and monitoring air quality, to mention just a few examples. To provide all these sophisticated functions to consumers, Bosch Sensortec's sensors are evolving to be smarter – by integrating MEMS technology with embedded microcontrollers, software, and AI runs inside the sensor itself.

At CES®, Bosch Sensortec is showcasing its latest AI-enabled sensors, and highlighting how software adds value not only to the sensor but to the entire system.

Stefan Finkbeiner, CEO at Bosch Sensortec, said: "Bosch's innovative cutting-edge sensor solutions are making an impact in diverse areas such as consumer health, smart homes and smart cities. AI and intelligent software are the key enabling technologies that make this possible."

Vision 2030: Bosch aims for more than 10 billion intelligent sensors
According to market research and strategy consulting company Yole Group, Bosch is the market leader for MEMS for the fourth year in a row. In 2024 alone, Bosch Sensortec surpassed the milestone of delivering over 1 billion MEMS sensors featuring integrated microcontrollers and software. From 2027 onwards, 90 % of the products will include these integrated features. By 2030, the company aims to achieve a remarkable total of more than 10 billion MEMS sensors sold with this advanced integration.

Robert Bosch GmbH
Postfach 10 60 50
D-70049 Stuttgart,
Germany

E-mail constantin.schmauder@bosch-sensortec.com
Phone +49 172 7257198
X @BoschMEMS

Corporate Department
Communications & Governmental Affairs
Senior Vice President: Prof. Christof Ehrhart
www.bosch-press.com

AI on the edge

With AI running on the edge (meaning directly in the sensor), there's no need for constant cloud connectivity. This ensures data remains private, dramatically reduces latency, and cuts power consumption, all while delivering accurate real-time feedback to users.

State-of-the-art software solutions add value not only to the sensor but to the entire system, enabling new applications and forming the basis for AI inside the sensor itself.

Always-on and ready to go

Always-on technology is essential in consumer electronics, enabling continuous access to features without the need to activate the device and wake up the main processor. This significantly extends battery life, and creates a more intuitive and effortless experience for users, especially in smartphones and hearables.

This is achieved with intelligent sensors combined with smart software, enabling quick access to voice assistants, health monitoring, and more, empowered by MEMS sensors with integrated microcontrollers. Examples of always-on use cases include voice activity detection and keyword triggering to activate voice assistants in hearables, fall detection in smartwatches for faster emergency assistance, and automatic orientation sensing in smartphones to adjust modes and enter sleep mode when inactive.

Smart Connected Sensors (SCS): the personal AI feedback coach

Can you imagine having unlimited access to a professional fitness trainer, with feedback at any time? This is the future of exercising – made possible by the Smart Connected Sensors platform from Bosch Sensortec.

The platform gives users qualitative feedback on the movement execution, as well as measuring movements and repetitions. Specifically designed for full-body motion tracking, the SCS platform provides a fully integrated hardware and software solution (based on the BHI380, a programmable IMU-based sensor system with AI) that dramatically cuts development costs and time to market.

A sound move for software-enabled voice control

Wireless headsets have transformed how we listen to music, podcasts and audiobooks, providing free, unhindered movement – as well as new features enabled by sensors, such as activity recognition and indoor navigation. But shifting to voice control can cause problems, when the system is triggered unintentionally because it reacts to ambient noise.

To fix this issue, Bosch Sensortec has come up with a software-based innovation: a new type of acceleration sensor, the BMA550, detects sound through bone vibrations. Intelligent algorithms then ensure voice control activates only when the wearer of the headset is actually speaking.

Take a breath: air quality sensing

Poor indoor air quality is a problem: the concentration of PM2.5 particulates from domestic cooking can reach levels 100 times higher than acceptable limits. Localized, actionable data from Bosch's particulate matter sensor for PM2.5 and PM1 enables effective responses to poor air quality. A software update coming soon will activate PM10 measurement in addition.

Almost the entire global population (99 %) breathes air that exceeds WHO air quality limits, and threatens their health. Bosch’s BMV080 sensor uses software and intelligent algorithms, in a tiny, fanless design which is more than 450 times smaller than any comparable device on the market.

Open platform and strong collaboration

Bosch can’t do all this alone and offers a framework that supports customers in creating movement classification algorithms specific for their own application. These models can then run on a smart motion sensor, such as the BHI360.

For example, Bosch Sensortec and Doublepoint have partnered to develop a powerful microgesture control solution for smartwatches, using the BHI360. This enables always-available, reliable control, such as allowing users to adjust light brightness with an intuitive pinch gesture.

Doublepoint's advanced algorithms are seamlessly integrated into Bosch’s compact, low-power IMUs via a new software tool. Compared to camera-based solutions, this IMU-based approach enables obstruction-free gesture detection, offering greater reliability and efficiency.

“This collaboration exemplifies Bosch Sensortec's commitment to innovation in the IoT and wearable markets, empowering manufacturers to bring advanced, user-friendly products to market more quickly,” said Lucas Ginzinger, Vice President Marketing and Business Strategy at Bosch Sensortec.

Website:

https://www.bosch-sensortec.com/

Press photos and infocharts are available on the Bosch Media Service at www.bosch-press.com.

Contact persons for press inquiries:

Constantin Schmauder
phone: +49 172 7257198

Christoph Veeser
phone: +49 173 5948776

Bosch at CES 2025:

- **PRESS CONFERENCE: Monday, Jan. 6,** from 9:00 to 9:45 a.m. PT with Dr. Tanja Rückert, member of the board of management of Robert Bosch GmbH, and Paul Thomas, president of Bosch in North America, in Ballroom Banyan ABCD, Mandalay Bay Hotel, Las Vegas, **South Convention Center, Level 3,** as well as **livestreamed** on the Bosch Media Service.
- **BOOTH: Jan. 7 – 10,** in the Central Hall, booth #16203.

Bosch Sensortec GmbH, a fully owned subsidiary of Robert Bosch GmbH, develops and markets a wide portfolio of microelectromechanical systems (MEMS) sensors and solutions tailored for smartphones, tablets, wearables and hearables, AR/VR devices, drones, robots, smart home and IoT (Internet of Things) applications. The product portfolio includes 3-axis accelerometers, gyroscopes and magnetometers, integrated 6- and 9-axis sensors, smart sensors, barometric pressure sensors, humidity sensors, gas sensors, optical microsystems and comprehensive software. Since its foundation in 2005, Bosch Sensortec has emerged as the MEMS technology leader in the markets it addresses. Bosch has been both a pioneer and one of the leading providers in the MEMS sensor segment since 1995 and has, to date, sold more than 23 billion MEMS sensors.

For more information, please visit www.bosch-sensortec.com, twitter.com/boschMEMS, community.bosch-sensortec.com, linkedin.com/company/bosch-sensortec/, youtube.com/user/BoschSensortec

The Bosch Group is a leading global supplier of technology and services. It employs roughly 429,000 associates worldwide (as of December 31, 2023). The company generated sales of 91.6 billion euros in 2023. Its operations are divided into four business sectors: Mobility, Industrial Technology, Consumer Goods, and Energy and Building Technology. With its business activities, the company aims to use technology to help shape universal trends such as automation, electrification, digitalization, connectivity, and an orientation to sustainability. In this context, Bosch's broad diversification across regions and industries strengthens its innovativeness and robustness. Bosch uses its proven expertise in sensor technology, software, and services to offer customers cross-domain solutions from a single source. It also applies its expertise in connectivity and artificial intelligence in order to develop and manufacture user-friendly, sustainable products. With technology that is "Invented for life," Bosch wants to help improve quality of life and conserve natural resources. The Bosch Group comprises Robert Bosch GmbH and its roughly 470 subsidiary and regional companies in over 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. Bosch's innovative strength is key to the company's further development. At 136 locations across the globe, Bosch employs some 90,000 associates in research and development, of which nearly 48,000 are software engineers.

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

Press release
Bosch eBike Systems

January 5, 2025

CES 2025: Bosch eBike Systems presents digital theft protection for eBike batteries

New function Battery Lock function makes the battery useless for thieves

- With Battery Lock eBike batteries can be digitally locked.
- eBike Flow app and Kiox 300 and Kiox 500 displays serve as keys.
- Battery Lock and other digital security solutions from Bosch complement the mechanical lock.

Stuttgart/Reutlingen – Anyone who decides to buy an eBike wants to protect it against theft in the best possible way. To make things more difficult for thieves, Bosch eBike Systems is now extending its digital theft protection to batteries. At CES 2025 in Las Vegas, Bosch will present the **Battery Lock**: a unique function that ensures that the eBike battery can no longer be used if it is stolen, making it worthless to thieves. The new solution complements the digital theft protection portfolio in the smart system centred around "eBike Lock" and "eBike Alarm".

Gregor Dasbach, Head of Digital Business at Bosch eBike Systems: "The battery is one of the most valuable eBike components. With Battery Lock, eBike riders get a smart security function that helps them to protect their eBike even better against theft and to park it more carefree. The expansion of our digital theft protection portfolio brings us a big step closer to our vision of ensuring that no eBike with a Bosch system is stolen in the future."

Battery Lock provides additional digital protection for the eBike battery

Removable batteries such as PowerTube and PowerPack are mechanically secured by a lock. Battery Lock complements this protection on a digital level: as soon as Battery Lock is activated in the eBike Flow app, the battery locks automatically when the eBike is switched off. If a locked battery is inserted into another eBike with the smart system, it automatically deactivates its motor support and renders the entire eBike unusable for the thief. This also makes reselling the battery pointless, which reduces the risk of theft.

Robert Bosch GmbH
Postfach 10 60 50
D-70049 Stuttgart,
Germany

E-Mail Tamara.Winograd@bosch.com
Phone +49 7121 35-394 64

Corporate Department
Communications & Governmental Affairs
Executive Vice President: Prof. Christof Ehrhart
www.bosch-press.com

Full flexibility: Compatible with all batteries or battery combinations in the smart system

Several digital keys can be used simultaneously for Battery Lock: the smartphone with the eBike Flow app and Kiox 300 or Kiox 500. These digital keys are flexibly managed with the eBike Flow app and Battery Lock can also be switched off if you want to share the battery with friends or family, for example. Battery Lock is also compatible with all batteries or battery combinations in the smart system and also works with DualBatteries and the PowerMore 250 Range Extender.

Optimum additional theft protection

With the new Battery Lock function, Bosch eBike Systems is expanding its existing portfolio of digital security solutions and offering eBike riders even more protection against theft. With the **eBike Lock** function, which is already available, the smartphone and the Kiox 300 and Kiox 500 displays serve as a digital key to activate motor support. **eBike Alarm** informs users about the location of their eBike and sounds the alarm in the event of suspicious activity. If the eBike is stolen, they receive a push notification on their smartphone and location tracking starts. In the event of theft, the **theft report** summarises all the important data about the eBike and the crime so that it can be passed on to the police, including a live tracking link. The **eBike pass** serves as a digital vehicle registration document that shows eBike riders all the important information about their eBike at a glance.

Available from summer 2025

Battery Lock can be installed over-the-air as usual on any Bosch eBike with the smart system via the eBike Flow app and will be available from summer 2025 as part of the Flow+ subscription.

Press photos and infocharts are available on the Bosch Media Service at www.bosch-press.com.

Bosch at CES 2025:

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- **PANELS WITH BOSCH EXPERTS:**
  “What’s Next in Vehicle Tech”,
  Jan. 9, 11 a.m. PT, Las Vegas Convention Center West / W219, session with Fedra Ribeiro, executive vice president sales Cross-Domain Computing Solutions at Bosch.
  “Predictive AI: Transforming Customer Service and Business”,
  Jan. 9, 3 p.m. PT, Las Vegas Convention Center North / N261, session with Davie Sweis, chief digital officer at the Global Business Services at Bosch.
  “Trends in Electric Car Consumption: Who, What, Where”
  Jan. 9, 2 p.m. PT, Las Vegas Convention Center West / L2 W219, session with Sabrina Rathgeber, director Global Battery Business at Bosch.

- **WEST HALL MOBILITY STAGE:**
  “Software defined reality: Achieving consumer expectations for software-defined vehicles”
  Jan 7, 11:20 a.m. PT, session with Thomas Irawan, president of ETAS GmbH, and Stefan Buerkle, regional president Cross-Domain Computing Solutions Americas.
  “Enabling electrification options for consumers as the market shifts”
  Jan. 8, 9:40 a.m. PT, session with Peter Tadros, regional president Power Solutions, and Kevin O’Keefe, regional president Electrified Motion at Bosch.
  “Intelligent production and automation transform battery manufacturing”
  Jan. 9, 9:40 a.m. PT, session with Sabrina Rathgeber, director Global Battery Business at Bosch.

Contact persons for press inquiries:
Bosch at CES: Irina Ananyeva, +49 152 597-53284, Tim Wieland, +1 248 410-0288, Trix Böhne, +49 173 523-9774
Mobility, software: Athanassios Kaliudis, +49 152 086-51292
Artificial intelligence: Matthias Jekosch, +49 711 811-17645
Connected manufacturing: Manuela Kaiser, +49 711 811-44203
Bosch eBike Systems: Tamara Winograd, +49 7121 35-394 64, Tamara.Winograd@de.bosch.com

Bosch eBike Systems *is shaping the future of eBike mobility with innovative products and digital services ranging from highly efficient drive systems and the first series-ready ABS for eBikes to connected biking solutions. On daily routes through the city, on enjoyable tours through the countryside or for sporty adventures in the mountains: Bosch eBike Systems offers eBikers the right drive system (drive unit, battery, display and app) for every requirement and every area of use, which ensures a unique riding experience. Today, more than 100 of the world's leading bicycle brands trust in the perfectly coordinated, modular product portfolio. As an independent business unit within the Bosch Group, Bosch eBike Systems also uses the group's technology and manufacturing know-how. For healthy, safe and sustainable mobility that is fun.*

For more information please visit www.bosch-ebike.com

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The company was set up in Stuttgart in 1886 by Robert Bosch (1861–1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant upfront investments in the safeguarding of its future. Ninety-four percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a charitable foundation. The remaining shares are held by Robert Bosch GmbH and by a corporation owned by the Bosch family. The majority of voting rights are held by Robert Bosch Industrietreuhand KG, an industrial trust. The entrepreneurial ownership functions are carried out by the trust.

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