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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.

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## **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!