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## **Bosch presents the history of the car key**

May 2019

PI 10926 BBM Fi/af

### **First rotary switches in 1900**

Turn the key and drive away? Not in 1900. Starting a vehicle back then was a complex process comprising around ten different steps that only a well-trained chauffeur could master. Activating the ignition with a rotary switch was just one of them. So car thieves needed to be pretty determined. (press photo: #1844203)

### **The birth of the car key**

The year 1910 marked the birth of the car key in the broadest sense – and the start of a long history of preventing auto theft. The keys were used to lock the electric circuit for the ignition, but car drivers still needed to crank up the engine. (press photo: #1844204)

### **High-tech, 1920-style**

In the 1920s, people started locking their car doors, but they needed a separate key to do so. The ignition start switch also gradually became the norm. It not only locked the electric circuit, but also ignited the starter. Once the key was removed, the steering wheel could be locked. A matter of course today, but high-tech back then. (press photo: #1844205)

### **Royal car key**

Extravagance never goes out of style. A personalized gold key was manufactured for Queen Soraya of Iran for her Mercedes-Benz 300 SL. (press photo: #1844206)

### **Two become one**

Well into the 1960s, a number of cars had two different keys: one to unlock the door and another for the ignition. Then, a single key for door lock and ignition slowly became the norm. (press photo: #1844207)

### **A familiar shape emerges**

Around the 1960s, car keys gradually began to get their familiar look – retaining it into the 1980s and even beyond. (press photo: #1844197)

### **Central locking sees the light of day**

Familiar design, new functions: In the mid-1990s, central locking systems began their triumphant advance. Since then, drivers have no longer needed to walk around the vehicle locking each door separately. (press photo: #1844198)

### **Pricey artwork**

A fancy car needs a fancy key. The Berlin-based company Noblekey, a specialist manufacturer of luxury keys, is a past master of this art. Pictured here: an exotic gold key encrusted with precious and semi-precious gems. (press photo: #1844199)

### **Ever more convenient car keys**

The first wireless remote control keys made (un)locking a car even easier. One click and all the doors are open. If car drivers can't recall exactly where they parked their car, a wireless remote control helps them find it – a flash of the indicators when the doors are unlocked shows exactly where it is. (press photos: #1844200, #1844201)

### **Keyless entry systems**

Progress certainly didn't stop with the wireless remote control. Keyless locking systems, which debuted in production cars in 1999, allow car drivers not only to lock and unlock the car doors, but also to start the engine at the push of a button. No more ignition key – and no more ignition lock. (press photo: #1844202)

### **Watch out, there's a thief about**

With conventional keyless entry systems, the car key still needs to be carried in a jacket or suit pocket, for example. To open the door and start the engine, it communicates with the car using a radio signal in the low frequency (LF) or ultra-high frequency (UHF) range. In the fight against theft, the automotive industry is constantly refining existing systems. It's like a marathon. (press photo: #1844208)

### **Smartphones become car keys**

The Bosch keyless entry system for cars works with a virtual key stored on a smartphone. Sensors installed in the car recognize the owner's smartphone as securely as a fingerprint and open the vehicle only for them. Digital key management links the app and the vehicle via the cloud. (press photo: #1847983)

**Press photos:** #1844203, #1844204, #1844205, #1844206, #1844207,  
#1844197, #1844198, #1844199, #1844200, #1844201, #1844202, #1844208,  
#1847983

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*Mobility Solutions is the largest Bosch Group business sector. In 2018, its sales came to 47.6 billion euros, or 61 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 accident-free, emissions-free, and fascinating, and combines the group's expertise in the domains of 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.*

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## **Bosch survey: Three-quarters of German drivers find car keys a pain**

### Many drivers would prefer to start their cars using a smartphone

April 2019

PI10882 BBM Fi/BT

- ▶ Around 40 percent would replace their car keys with an app.
- ▶ The new “Perfectly keyless” app offers drivers both security and convenience.

Stuttgart – Seventy-six percent of Germans found their car keys a pain at one time or another. That is the result of a representative survey conducted by PULS, a market research institute, on behalf of Bosch\*. Especially drivers below the age of 40, and those who drive a lot, have had negative experiences with conventional car keys. It starts with simple logistics: they don't know where to put their keys (45 percent of respondents), e.g., when at the swimming pool, they misplace them and take ages to find them again (44 percent), while some have even lost them altogether (38 percent). Some used to view car keys with wireless remote controls and automaker's logo as a status symbol; now only 6 percent of those surveyed do. It comes as no surprise, then, that around 40 percent of respondents could already imagine replacing them with a smartphone app. “The advantages of a digital car key are obvious – it is convenient, secure, and available any time and anywhere”, says Harald Kröger, president of the Bosch Automotive Electronics division. Bosch is developing the Perfectly keyless app to enable drivers to automatically unlock and start their vehicles without using a key or reaching for their smartphone. Sensors integrated in the vehicle recognize the owner's smartphone and unlock the vehicle door for that person only; the level of security offered is comparable to fingerprint technology. It is no problem to deactivate the system if the smartphone is lost. The app can also be used to allow access by other drivers for a limited period of time.

### **From smartphone to car key**

Nowadays, most people don't go anywhere without a smartphone. The majority of those surveyed use their phones to take photos and shoot videos (74 percent), to surf the web (70 percent), and to write e-mails (55 percent). Forty-six percent of men, 32 percent of women, and every second SUV driver were excited by the prospect of having a digital car-locking app on their smartphones. People who drive between 15,001 and 20,000 km/year (49 percent) or more than 20,000 km/year (51 percent) are especially open to such a system. Even more than one in two users of contemporary keyless entry systems (54 percent) could imagine replacing them with an app. After all, with the keyless entry systems currently in use, drivers still have to carry the key in their jacket or pants pocket, or in a handbag – so it can still be forgotten or misplaced. “In recent years, a large number of everyday applications and devices have been transformed into smartphone apps. Ten years ago, it was perfectly normal to have a separate camera and cell phone, but now that has changed. It's time for the smartphone to replace our car keys,” says Kröger. The survey respondents, too, see multiple advantages in a digital car key: 30 percent like that they can deactivate the system online if they happen to lose their smartphone. Twenty-eight percent like the idea of using a smartphone to lock or unlock their car remotely. But the convenience factor is a big plus: 40 percent always have their smartphone with them anyway and 38 percent think it good that, with a smartphone app, they would never have to worry again about losing their car keys.

### **Protecting radio and keyless locking systems against theft**

The majority of German drivers currently lock and unlock their cars using systems whose codes can be easily intercepted and manipulated. The majority (almost two-thirds) have wireless remote controls for their cars. Sixteen percent have keyless locking systems, i.e., the doors unlock automatically when the driver approaches the vehicle. Although 87 percent of respondents consider wireless remote controls to be secure and 78 percent think the same of keyless locking systems, one in every five has had their car stolen or hacked, or knows someone who has. Instead of transferring data using LF and UHF technology, the Bosch system utilizes the smartphone as a virtual key and Bluetooth as the transmission technology. That means the signal cannot be intercepted. “If you lock and unlock your car with a smartphone app, you are using a future-proof technology and benefiting not only from considerably enhanced security, but also greater ease of operation,” says Kröger.

\*On behalf of Bosch, the market research institute PULS surveyed 1,046 German drivers between the ages of 18 and 69 in the period January 11–18, 2019.

**Press photos:** #1847983, #1847984, #1847985, #1847986, #1847987,  
#1847988, #1847989, #1847990, #1847991

**Photo gallery about the history of car keys:** #1844197, #1844198, #1844199,  
#1844200, #1844201, #1844202, #1844203, #1844204, #1844205, #1844206,  
#1844207, #1844208

**Further information:**

Press release: [Bosch system is the “key” to preventing digital car theft](#)

Press release: [No more lost keys](#)

Perfectly keyless at [Bosch Mobility Solutions](#)

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## **Bosch system is the “key” to preventing digital car theft**

December 2018  
PI10834 BBM Fi/af

### Perfectly Keyless is as secure as a fingerprint

- ▶ Bosch division president Harald Kröger: “Our Perfectly Keyless system revolutionizes keyless entry systems.”
- ▶ With Perfectly Keyless, there is no more trade-off between convenience and safety in keyless entry systems.
- ▶ Using data transmission with a built-in digital security lock, the owner’s smartphone is accurately identified.
- ▶ Secure digital key management for car-sharing fleets, cars, and commercial vehicles.

Reutlingen, Germany – It takes less than five seconds for a hacker to compromise a standard keyless vehicle entry system. Among experts, this is known as a relay station attack. A Bosch key app is going to change all that. “Our Perfectly Keyless system revolutionizes keyless entry systems. It is the ‘key’ to preventing digital car theft,” says Harald Kröger, president of the Bosch Automotive Electronics division. The special thing about the solution is that the Bosch technology works with a virtual key stored in the smartphone. Sensors installed in the car recognize the owner’s smartphone as securely as a fingerprint and open the vehicle only for them. Digital key management links the app and the vehicle via the cloud. With Perfectly Keyless, Bosch is thus doing something that no other keyless entry system has done before, namely offering both convenience and security. The new smartphone-based key can be used in cars, entire car-sharing fleets, and commercial vehicles. Bosch believes this system with its built-in security lock has huge market potential worldwide.

### **Bosch revolutionizes keyless entry**

With conventional keyless entry systems, the car key still needs to be carried in a jacket or suit pocket, for example. To open the door and start the engine, it communicates with the car using a radio signal in the low frequency (LF) or ultra

high frequency (UHF) range. In the race against thieves, the automotive industry is constantly refining existing systems. It's like a marathon. "Now, with Perfectly Keyless, Bosch is launching into a sprint in the development of digital vehicle entry systems. Our motto is revolution, not evolution," Kröger says. Instead of transmitting data via low or high frequency radio technology, the Bosch system uses the smartphone as virtual key and Bluetooth as the transmission technology. This means that the car key can stay at home. And thanks to its decades of experience in semiconductors, Bosch is in a position to make this connection as secure as a fingerprint. Every smartphone contains tiny microchips to manage communication via Bluetooth, and these play a key role in the Bosch solution. Together with sensors installed in the vehicle and a special control unit, they form a system that opens the door only for the smartphone containing the virtual key that fits in the Perfectly Keyless system's digital lock. The system blocks signals from other smartphones or from electronic devices that manipulate the radio transmission. In this way, Perfectly Keyless protects against unauthorized access.

### **A keyless journey**

Virtual vehicle keys on smartphones have long been a feature of car-sharing fleets. These vehicles don't move until their operator authorizes entry via the cloud; only then can a user unlock the vehicle, start it, and lock it again using an app. This conversation between the phone and the vehicle uses near-field communication (NFC), a wireless protocol for sharing data over distances of a few centimeters. For this to work, users must take out their smartphone before each journey and hold it up to a marked area on the vehicle. Only then can the system recognize the user and unlock the doors. With Bosch Perfectly Keyless, the smartphone can also stay in its pocket. This means greater ease of use for drivers, and carsharing users benefit from the added convenience. The Bosch solution also works in trucks and for entire fleets of commercial vehicles. That means no more manual administration of vehicle keys, physical handover, or hassle when a key is lost or stolen. If the smartphone is lost or stolen, and the Perfectly Keyless app with it, the digital key can be simply deactivated online, thus blocking access to the vehicle.

### **Additional information:**

ADAC tests keyless entry systems for cars and motorcycles (German only):

<https://www.adac.de/infotestrat/technik-und-zubehoer/fahrerassistenzsysteme/keyless/default.aspx>

**Press photos:** #1713212, #1807399, #1807400, #1807402, #1807403, #1807404

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**Bosch at CES 2019**

- **Monday, January 7, 2019, from 9:00 to 9:45 a.m.** local time, in the Mandalay Bay Hotel, **South Convention Center, Level 2**, Ballrooms B, C, and D
- **BOOTH: Tuesday to Friday, January 8–11, 2019**, in the Central Hall, booth #14020
- **FOLLOW** the Bosch CES 2019 highlights on Twitter: **#BoschCES**

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## **This Bosch app makes car keys a thing of the past** Safe and stress-free key management by smartphone

August 2018

PI10715 BBM Fi/BT

- ▶ Digital, not analog: with Perfectly Keyless, Bosch puts car keys onto smartphones.
- ▶ World first: the first keyless access system for trucks.
- ▶ For fleet operators: they can now flexibly manage which drivers have vehicle access and when.
- ▶ No more hunting for keys: a digital key is always where it is needed.

Stuttgart, Germany – The key of the future is digital, and offers more features than its analog predecessors: impossible to lose or steal, there is never a need to search for it. That is because it is stored securely and specifically for each user in a smartphone app. “Our Perfectly Keyless app is making conventional vehicle keys a thing of the past. Bosch is taking the car key into the digital realm and making it available anywhere, anytime,” says Harald Kröger, president of the Bosch Automotive Electronics division. With Perfectly Keyless, the smartphone replaces the analog vehicle key. This concept can offer owners of private vehicles increased convenience, but where it really shines is in vehicle fleets with multiple drivers. No more key handovers: fleet managers and logistics providers simply use the app to give drivers access to the vehicles. “Bosch’s digital vehicle key gives fleets a boost towards greater connectivity,” Kröger says. The company believes there is a huge market for its solution, which is making its world debut at the IAA Commercial Vehicles in Hannover: potential customers include some 15,000 logistics providers in Germany alone. Most of them manage at least a dozen vehicles and drivers.

### **A keyless journey**

Row upon row of hundreds of keys hanging on large boards – logistics providers still often use this method to organize the keys to their fleet vehicles. A missing key triggers a massive search operation. But every minute counts, especially with commercial vehicles. After all, if a truck isn’t moving, it’s not making any money. At the core of the new system is an app that dispatchers and truck drivers both have on their phones. This makes it possible to grant vehicle access with just a

few clicks. In the future, the Bosch solution will also allow logistics providers to completely integrate digital key management into their dispatch and scheduling systems. As soon as dispatch has assigned drivers and trucks to a route, the system automatically generates digital keys for the vehicles and sends them to the drivers' smartphones. If the route scheduling changes, the software adjusts the keys accordingly. "Thanks to Bosch's fully digital key management, logistics providers enjoy both security and flexibility in their planning. This is the only way the logistics of the future will be able to function efficiently," Kröger says.

### **Secure key management with app and cloud**

Bosch digital key management connects trucks and the smartphone app via the cloud. Dispatchers or fleet managers use the app to assign a truck to a driver for a particular route. Perfectly Keyless generates a personal, secure digital key and sends it via the cloud to the truck and to the driver's smartphone. As the driver approaches the assigned truck, the sensors installed in the truck detect the smartphone via a wireless connection. The vehicle doors will open only if the key on the phone "fits" the digital lock in the vehicle. These sensors can also tell when the driver is in the driver's seat, and the engine starts up as soon as the driver presses the start-stop button. When the driver gets out of the car at the end of the journey, the system detects this and automatically locks the doors.

### **Battery dead? No problem!**

But what happens if the smartphone's battery dies, or the device has gone missing? In the future, the vehicle key in the smartphone will work even if the phone battery is dead. In that case, the phone and truck will communicate using near-field communication (NFC), a wireless protocol for sharing data over short distances. Bosch plans to make it the "double hull" of its solution. If the smartphone is lost or stolen, and the app with it, the digital key can be simply deactivated online, thus blocking access to the vehicle. It cannot be opened and started until the fleet manager uses the app to provide another driver or a new phone with access to the truck.

**Press photos:** #1452339, #1452340, #1452341, #1452342

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## **BOSCH AT THE IAA COMMERCIAL VEHICLES 2018**

- **Press conference: Wednesday, September 19, 2018**, from 1:20 p.m. to 1:40 p.m., with [Dr. Rolf Bulander, chairman of the Mobility Solutions business sector](#), and [Dr. Markus Heyn, Member of the Board of Management, Robert Bosch GmbH](#), at the Bosch booth A01 in Hall 16.

- **Follow the Bosch IAA 2018** highlights on [www.bosch-iaa.com](http://www.bosch-iaa.com) or on Twitter: [#BoschIAA](https://twitter.com/BoschIAA)
- **Panels with Bosch experts at the New Mobility World Forum, pavilion 11, section D:**
  - **Wednesday, September 26, 10:00 a.m. – 11:00 a.m.:** Presentation “The enhancement of automated driving (and AI)” with Johannes-Jörg Rüger, head of the Commercial Vehicle and Off-Road unit
  - **Thursday, September 27, 11:15 a.m. – 12:15 p.m.:** Panel discussion “Aftermarket – more than just repair and maintenance”
  - **Thursday, September 27, 2:30 p.m. – 3:30 p.m.:** Presentation and discussion “Masters of digitalization: digitizing businesses and mobility ecosystems” with Dr. Rainer Kallenbach, president of the Connected Mobility Solutions division

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## No more lost keys

### Bosch's Perfectly Keyless turns the smartphone into a car key

August 2017

PI 9785 BBM Fi/af

- ▶ Use a smartphone to unlock the car, ignite the engine, and lock the car again
- ▶ Digital key can be passed on to other users
- ▶ Personalized vehicle settings for each driver
- ▶ Digital key management for vehicle fleets and vehicle-sharing providers

Stuttgart, Germany – It's a scene most of us will be familiar with: in the mad morning rush, the car key is nowhere to be found. And anyone who has ever had both hands full with shopping bags will have wished that an "open sesame" was all it took to open their car door. By turning the smartphone into a car key, Bosch will be putting an end to this irksome hunt for the key. "Perfectly Keyless, our digital vehicle access system, means that drivers will be able to do without traditional car keys. It's a great example of stress-free connected mobility," says Harald Kröger, president of the Bosch Automotive Electronics division. As drivers approach their vehicles, their smartphones are identified by the on-board sensors. "Once this identification has happened, the vehicle is unlocked without any need for a physical key. Similarly, no key is needed to start the engine or to lock the car again at the end of a journey," Kröger says. Vehicle owners can also use an app to give other drivers permission to use their vehicles. In a secure process that is protected against unauthorized access, an additional virtual key will then be sent via the cloud to other smartphones. This will allow the providers of car-sharing services and the operators of vehicle fleets to manage access and keys flexibly.

#### A stress-free, keyless journey

Perfectly Keyless is a digital car key. To use it, drivers download an app onto their smartphones, and connect their cars to the app. Once they have done this, the smartphone generates a one-off security key that fits their respective vehicle's digital lock. Perfectly Keyless uses a wireless connection to the on-board sensors to measure how far away the smartphone is, and to identify the security

key. Once the distance between driver and vehicle is less than two meters, the car door is unlocked. Hunting for the car key is no longer necessary. As soon as the vehicle has been unlocked, any predetermined individual settings, such as those for the rear-view mirror and seat position, are activated. And if Perfectly Keyless detects that the smartphone is in the vehicle, a touch of the start-stop button is enough to start the engine. When the driver gets out of the car at the end of the journey, the system continues to keep a virtual eye on the smartphone. Once driver and phone have moved more than two meters away from the car, it is automatically locked securely. The system sends an acknowledgment to the driver's smartphone.

### **Individual key management**

Car owners can use Perfectly Keyless to make their cars available to others, such as family members and friends. Instead of handing over the key personally, parents can simply use the app to grant their children access to the family car. The system generates a further individual security key, and sends it via the cloud to the smartphone. So that each user's settings can be personalized, each key is unique. The Perfectly Keyless system also works for entire vehicle fleets. Users can be granted and blocked access digitally, subject to geographical and time limits if so desired. This allows fleet operators such as car hire companies, providers of car-sharing services, and businesses in general to manage their vehicle keys digitally, using an app and the cloud.

### **Additional questions and answers**

#### **For Perfectly Keyless to work, what hardware does my car need to have?**

Automakers will have to install proximity sensors and a control unit as fixed features in their vehicles. These sensors measure how far away the driver's smartphone is from the car. They also register what direction the driver is approaching from. The control unit administers the digital security key and ensures that smartphone, cloud, and vehicle systems communicate smoothly.

#### **What if a user loses their smartphone?**

If the smartphone is lost, and the app with it, the digital key can be deactivated online. This blocks access to the vehicle, both for authorized persons and third parties. A new smartphone can be connected with the vehicle at any time, and a new unique security key generated. In the interim period, the conventional vehicle key will work as usual.

#### **How does Perfectly Keyless differ from the keyless entry systems already in the market?**

Today's keyless entry systems still feature a physical key fitted with a chip, which drivers still have with them in their pocket or handbag. The first app-based digital access systems are now being used by sharing services to cut out the complicated task of keeping track of car keys. To get in or to drive off, users request access by smartphone before each journey. With Perfectly Keyless, simply having a smartphone in one's pocket is enough. The vehicle access system automatically unlocks the vehicle as soon as the driver and smartphone come close. There is no need for a key, chipcard, or swipe of the smartphone touchscreen.

### **Which mobile operating systems does Perfectly Keyless work with?**

The systems supports devices using any of the common operating systems.

**Press photos:** #1152553 #1156699 #1156701

### **Further information:**

Video about Perfectly Keyless on [YouTube](#).

Additional details about Perfectly Keyless at [www.bosch-mobility-solutions.com](http://www.bosch-mobility-solutions.com).

[The Bosch innovations on show at the IAA 2017](#)

### **Contact person for press inquiries**

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**EXPERIENCE BOSCH AT THE IAA 2017** in Frankfurt: Bosch believes the mobility of the future will be accident-free, stress-free, and emissions-free. On a technological level, Bosch wants to achieve the objectives of zero accidents, zero emissions, and zero stress through automation, electrification, and connectivity. At the IAA 2017, Bosch will be presenting its latest solutions in each of these three spheres – solutions that make driving safer and more efficient, and turn cars into a third living environment.

**BOSCH PRESS CONFERENCE:** From 13:15 to 13:40 local time on Tuesday, September 12, 2017, with [Dr. Volkmar Denner, chairman of the board of management of Robert Bosch GmbH](#) and [Dr. Rolf Bulander, chairman of the Mobility Solutions business sector](#), at the Bosch booth A03 in Hall 8.

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*Mobility Solutions is the largest Bosch Group business sector. In 2016, its sales came to 43.9 billion euros, or 60 percent of total group sales. This makes the Bosch Group one of the leading automotive suppliers. The Mobility Solutions business sector combines the group's expertise in three mobility domains – automation, electrification, and connectivity – and offers its customers integrated mobility solutions. Its 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 390,000 associates worldwide (as of December 31, 2016). The company generated sales of 73.1 billion euros in 2016. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT company, Bosch offers innovative solutions for smart homes, smart cities, connected mobility, and connected manufacturing. 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 deliver innovations for a connected life. 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 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing and sales network covers nearly every country in the world. The basis for the company's future growth is its innovative strength. At 120 locations across the globe, Bosch employs some 59,000 associates in research and development.*

*Additional information is available online at [www.bosch.com](http://www.bosch.com), [www.iot.bosch.com](http://www.iot.bosch.com), [www.bosch-press.com](http://www.bosch-press.com), [www.twitter.com/BoschPresse](https://twitter.com/BoschPresse).*