



## Company Overview

For a better life

**Bosch Sensortec**  
sensing solutions



**BOSCH**  
Invented for life

## Our company

Bosch Sensortec is the technology leader in sensing solutions based on microelectromechanical systems (MEMS) and dedicated to the consumer electronics world. Our success in MEMS sensors and solutions is built on a remarkable team driven by passion, innovation and flexibility.

### **We are passionate**

about improving people's lifestyle and well-being through MEMS technology – again and again, every day. We understand users' needs and customers' requirements. Find out more about the applications we make possible for smartphones, tablets, wearables, AR/VR, smart homes and the IoT.

### **We create innovative sensing solutions**

that enable consumer electronic devices to sense the world around us. Discover our sensor portfolio to learn more about our MEMS products.

### **We are flexible**

in everything we do to globally support our customers. Have a look at our Bosch Sensortec Community to get answers to your questions about MEMS sensors and our diverse sensing solutions and to accelerate your projects.

### **We are a highly motivated team**

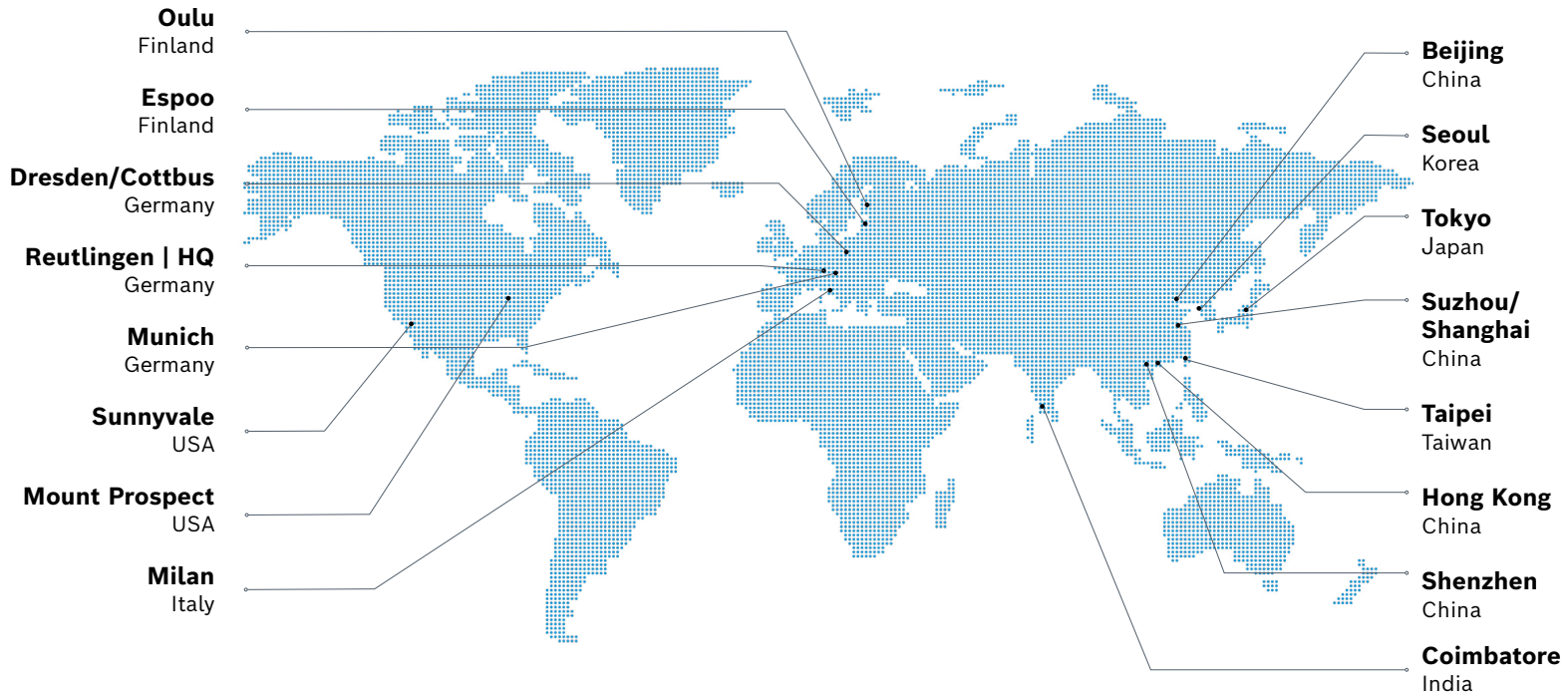
of visionaries, strategists, techies, troubleshooters and creators that forms the basis for our success in MEMS sensors and solutions. Learn more about our sensors, our working environment and careers at Bosch Sensortec.

We are the most  
trusted provider of  
innovative sensing  
solutions that  
improve well-being  
and lifestyle

**OUR  
VISION**



# Bosch Sensortec – A worldwide presence



## Your close partner – 16 locations across the globe

Bosch Sensortec's engineering and sales network covers 16 locations across the globe. Our global presence and the large number of international colleagues ensure a quick, local support.

Hello, how can we support you? こんにちは、何かお手伝いすることはありますか？ Guten Tag, wie können wir Sie unterstützen? 안녕하세요, 어떻게 도와 드릴까요? 您好，我们如何为您提供服务？ Buongiorno, come possiamo aiutarvi? 您好，有什麼我們可以幫忙的嗎？ नमस्कार, हम आपकी मदद कैसे कर सकते हैं?



# Innovative sensing solutions

Bosch Sensortec offers a broad portfolio of microelectromechanical systems (MEMS) based sensors and solutions that enable consumer electronic devices to sense the world around them. The product portfolio includes motion sensors such as 3-axis accelerometers, gyroscopes, magnetometers and integrated 6- and 9-axis sensors, smart sensors as well as environmental sensors for measuring barometric pressure, temperature, humidity and gases. In addition, Bosch Sensortec offers optical microsystems and a comprehensive variety of software and tools.



## Motion sensors

The Bosch Sensortec portfolio of motion sensors includes accelerometers, gyroscopes, magnetometers, inertial measurement units (IMUs) and absolute orientation sensors. Motion sensors enable various applications such as smartphones, wearables, robots, drones, and smart home and IoT.



## Environmental sensors

The category of environmental sensors includes barometric pressure sensors for drones, wearables and smartphones as well as humidity sensors measuring air pressure, ambient temperature and relative humidity for climate control for example in smart homes. In addition, Bosch Sensortec offers highly integrated four-in-one gas sensors adding gas measurement for air quality monitoring.







## Optical microsystems

The optical microsystems provide complete, ready-to-use solutions based on microoptoelectromechanical systems (MOEMS). The MOEMS solutions with Bosch Light Drive technology enable always-in-focus and hands-free smartglasses applications such as navigation, notifications and notes for life. Additionally, it facilitates virtual touchscreens on shelves and fridges.



## Acoustic microsystems

The MEMS microspeakers provide a small, energy-efficient and easily scalable solution for wireless earphones and hearables and guarantees the best sound. Thanks to the patented and exclusively licensed Nanoscopic Electrostatic Drive (NED) technology of Fraunhofer IPMS, the sound is not generated with a membrane, but inside a silicon chip. Thus, the speakers deliver sound pressure levels up to 120 dB at highest electrical efficiency.



## Smart sensors

Smart, compact and all-inclusive: Our smart sensors comprise low-power motion sensors, embedded software like sensor data fusion and a microcontroller in a single, small package, with a wide variety of interfaces to connect external devices. These smart cookies enable embedded machine learning algorithms for edge AI solutions, local data processing directly in the sensor and are ideally suited for always-on applications.



## Software and tools

Bosch Sensortec offers a wide variety of software and tools for tailored solutions. Our strong experience in signal processing and algorithm development contributed to the creation of sophisticated and application-specific software such as sensor fusion (BSX) and BSEC. By providing tools such as application boards and evaluation kits, we offer comprehensive support for developers.

# Applications & solutions

Have you ever wondered how your smartphone stabilizes your pictures? How a smartwatch understands whether you are standing still, walking or running? How a drone can stabilize its altitude? All these applications and many more are enabled by invisible sensing solutions from Bosch Sensortec that are integrated into your everyday devices. MEMS sensors endow objects with sensory perceptions and teach electronic systems how to see, feel and smell.

## Smartphones & tablets



## Drones



## AR & VR



## Gaming & toys



## Wearables & hearables



## Robots



## Smart home

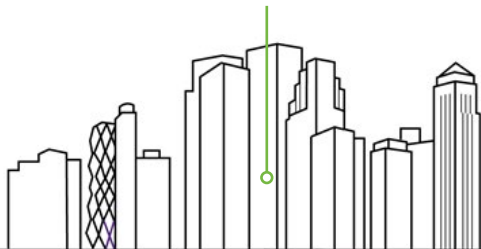




# We improve your everyday life...

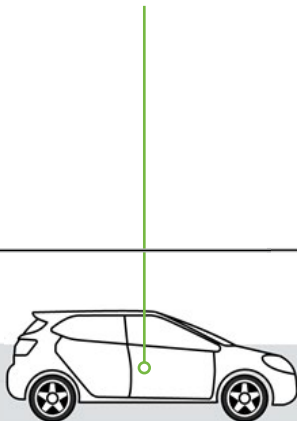
## ... in your city

Indoor/outdoor navigation



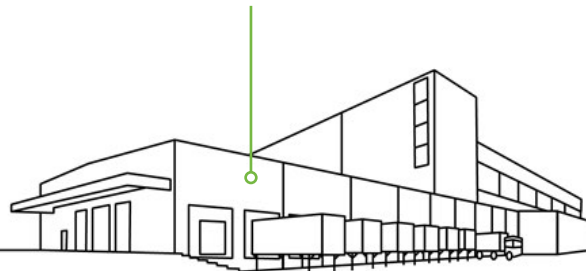
## ... at your vehicle

Air quality monitoring



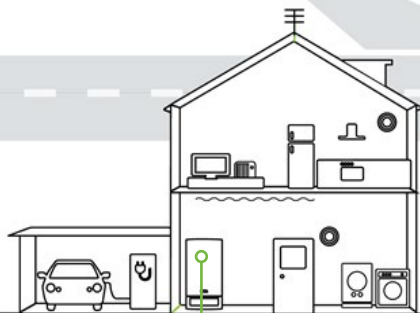
## ... at your workplace

Asset tracking



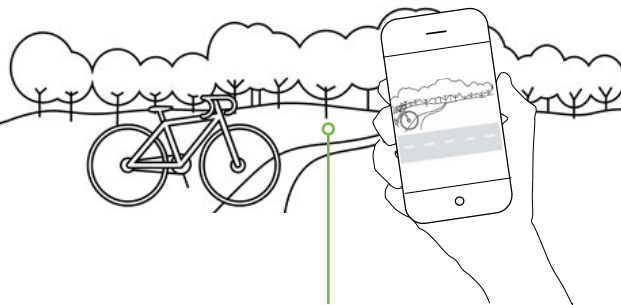
## ... at your home

Climate control



## ... during your free time

Activity tracking, image stabilization



Bosch Sensortec is a leading provider of sensing solutions for smartphones and mobile applications.



# Smartphones & tablets

Did you know that you most likely have a Bosch MEMS sensor in your pocket? These tiny helpers for example stabilize images, rotate your screen or count your steps.

## Sensor requirements



Ultra-low  
power  
consumption



High  
sensor  
accuracy



Flexible, broad  
feature spectrum  
with embedded intelligence

Bosch Sensortec is offering a broad range of ultra-low power sensors specifically designed for smartphones and tablets, with intelligent power management features such as motion and no-motion, interrupts, wake-up functions and low-power step counter. Thanks to low latency, minimal group delays, and high-precision time stamps our precise sensor data and algorithms substantially improve photo and video quality for end users, e.g. in optical and electronic image stabilization (OIS/EIS) applications. In addition, our sensors include a broad range of features such as full Android compliance, indoor SLAM and support for sensor synchronization as well as motionless Component Retrimming (CRT) feature for built-in gyroscope self-calibration.

Bosch MEMS sensors turn wearable and  
hearable devices into your daily companions.



## Wearables & hearables

Smartwatches, wristbands and hearables: These are just a few examples of devices for wearables. All of them are enhanced by Bosch MEMS sensors – whether supporting your fitness through activity recognition or helping you orient yourself through navigation and position tracking.

## Sensor requirements



Ultra-low  
power  
consumption



Easy to  
integrate



Small size and  
high  
level of integra-  
tion

Wearables such as smartwatches, hearables or wristbands are typically significantly smaller than smartphones and have thus even less space available for batteries. Hence, ultra-low power sensing solutions are required, that however do not compromise on accuracy in order to offer accurate data to users. Therefore, new power saving and yet high-precision concepts are needed. In order to meet these requirements, Bosch Sensortec provides a broad portfolio of small-sized, highly integrated and low-power sensing solutions with a broad range of integrated features. Another important aspect for manufacturers is the simple integration of the sensor. Bosch Sensortec offers documentation, sample code and enables a simple PCB soldering, to ensure a smooth process of integrating the sensor into the end device.



Drones open up new horizons for aerial photography.





# Drones

The number of drones buzzing in the sky is increasing. They make impressive aerial photos and videos, support agriculture, and many more. Our sensor and software solutions stabilize the drone's altitude, enable orientation and flight control as well as gimbals for pin-sharp photos!

## Sensor requirements



High  
sensor  
accuracy



Easy to  
integrate



Flexible and  
broad  
feature spectrum

Bosch Sensortec motion and barometric pressure sensors ensure solid reliability and high performance for drones through highly accurate measurement – without falsification through vibration or temperature, for example from a built-in motor. This ensures an optimal user experience even in challenging environments such as windy situations. Bosch MEMS sensors are easy to integrate into drones and offer a broad feature spectrum, for example an auto level mode for maintaining the drone's horizontal orientation or an orbit mode for circling around a specific point. All these features rely on high-performance motion and barometric pressure sensors that allow accurate location, height and GPS tracking for optimized flights.

You can save 40 hours a year of your valuable time by using a robotic vacuum cleaner.



# Robots

Did you know that you can save about 40 hours a year if you use a robotic vacuum cleaner? Our sensors and software enable the robot to navigate effortlessly around objects, detect the boundaries of a designated area and dynamically plan a cleaning path by mapping out rooms.

## Sensor requirements



High  
sensor  
accuracy



Easy to  
integrate



Flexible and  
broad  
feature spectrum

Robots such as robotic vacuum cleaners strongly depend on high sensor accuracy for reliable and efficient operation. The sensing solutions from Bosch Sensortec offer excellent stability to large temperature changes and superior vibration robustness and suppression, coming for example from rough terrain and built-in motors. Additionally, Bosch MEMS sensors are easy to integrate into the final robot device. Motion sensors and software from Bosch Sensortec enable different cleaning modes such as boundary and obstacle detection as well as dynamic path planning. Environmental sensors such as gas sensors detect volatile organic compounds (VOCs) and support clean indoor air quality.

AR and VR devices demand robust, precise, responsive and extremely sensitive sensors.



## Augmented reality & virtual reality

Augmented reality (AR) and virtual reality (VR) are becoming increasingly popular trends in gaming, learning, navigation and maintenance. Our sensing solutions improve the AR and VR experience by enabling real-time motion detection, head movement tracking and many more applications.

### Sensor requirements



High  
sensor  
accuracy



Flexible and  
broad  
feature spectrum



Small size and  
high level  
of integration

An immersive and authentic AR and VR experience is based on high sensor accuracy and precise data processing, which eliminate image drifts and deliver a true real-life experience – even in high-fluctuation temperature environments. Bosch Sensortec has developed sensing solutions specifically suited for AR and VR applications. The small-sized MEMS sensor packages are filled with features and provide ultra-precise instantaneous detection of head movements, which reduce time lag to an almost imperceptible minimum. For example, Bosch Sensortec's inertial measurement units (IMUs) combine an extremely low-drift gyroscope with a low-noise accelerometer to significantly reduce the unpleasant motion sickness effect.

Smart home applications require ultra-low power and easy to integrate sensing solutions.





## Smart home

Imagine you get up on a cold winter day and the bathroom in your smart home is already heated. After a hot shower, ventilation is automatically started to improve the air quality. Our sensing solutions are the tiny, invisible helpers that enable these smart home and other IoT applications.

## Sensor requirements



Ultra-low  
power  
consumption



Easy to  
integrate



High  
sensor  
accuracy

Many smart home applications are unthinkable without MEMS sensors and corresponding software. One key requirement for manufacturers is the ease of integration of sensing solutions into the final smart home automation system. Ultra-low power consumption is also crucial for battery-powered home automation devices. Bosch Sensortec sensors enable intelligent power management features such as automatic wake-up and sleep mode extending the battery replacement interval for the user. Finally, a high sensor accuracy is critical – for example, to ensure reliable intrusion detection. Bosch Sensortec offers a broad portfolio of innovative sensing solutions to improve smart home users' lifestyle and well-being.

Smart sensing solutions open up a world of opportunities for a richer entertainment experience.



## Gaming & toys

Sensor-enabled gaming consoles and toys are common devices in many people's everyday lives. Motion control, orientation, balancing or gesture recognition – our sensing solutions open up a world of opportunities for a richer entertainment experience!

## Sensor requirements



High  
sensor  
accuracy



Easy to  
integrate



Flexible and  
broad  
feature spectrum

Intelligent game controllers and toys increasingly use MEMS sensors to ensure a flawless game experience. One key requirement for manufacturers is the ease of integration into devices. Having a flexible and broad feature spectrum with embedded intelligence can further improve the user experience of gaming applications. Bosch Sensortec integrates many features directly in the sensors and offers corresponding software for enabling new use cases and features. Bosch MEMS sensors offer low latency and accurate data measurement, translating into real-time movement and precise navigation.

## Bosch – pioneer of MEMS technology

They are smaller than the head of a pin but have changed our world and impact our future way of life: sensing solutions based on microelectromechanical systems – or in short, MEMS. In 1995, the start of large-scale production at Bosch was laid as the foundation for this modern technology. Bosch is a pioneer and the world's leading supplier of MEMS sensors in the automotive and consumer electronics industry.

- Start of MEMS production in 1995



- MEMS sensors have been used in consumer electronics since 2006



- MEMS sensors are the key technology for the Internet of Things



- Bosch has manufactured more than 15 billion MEMS sensors since 1995

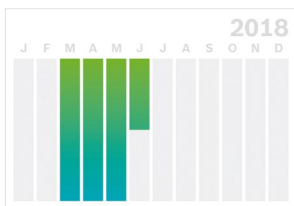
15  
billion

- 100% in-house from MEMS design to manufacturing



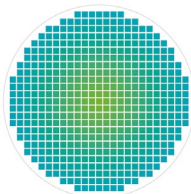
# Three facts about MEMS sensors

## Fact 1



Thin round discs of silicon – known as wafers – are manufactured in a complex production process lasting up to 14 weeks. Bosch turns each wafer into thousands of microchips, which are the MEMS sensor elements.

## Fact 2



Up to 50,000 microchips fit on one 200-millimeter wafer. A MEMS sensor comprises one chip and one evaluation circuit – an ASIC – in a single housing.

## Fact 3



Wafer production is carried out under cleanroom class 1 condition. That means a cubic foot (approx. 28 to 30 liters) of air may contain at most a single 0.5 microgram particle of dust; that's the equivalent of a cherry stone in a body of water the size of Lake Constance (or 360 million bathtubs).

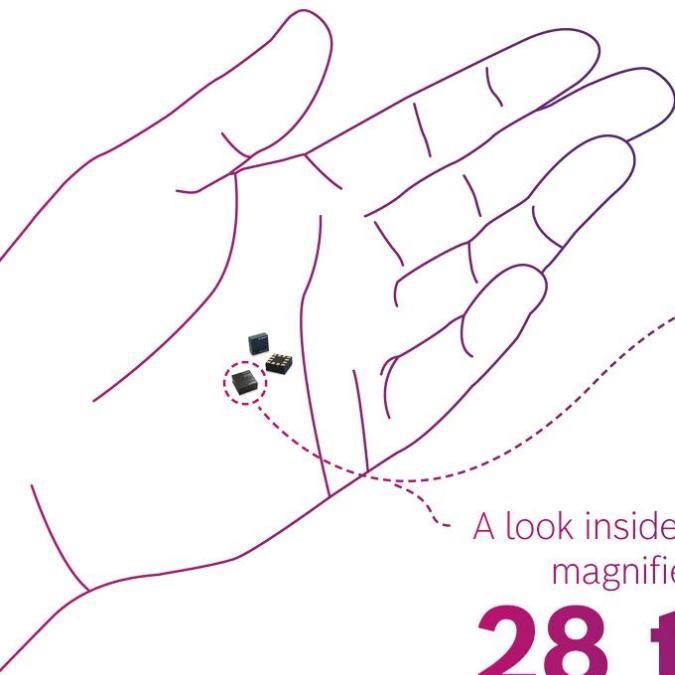
**“Among the ten biggest MEMS companies, Bosch has become a real titan. It is today the only MEMS company that is taking full manufacturing, engineering and commercial advantages of its positioning in dual markets, automotive and consumer.”**

Jean-Christophe Eloy, President & CEO, Yole Développement



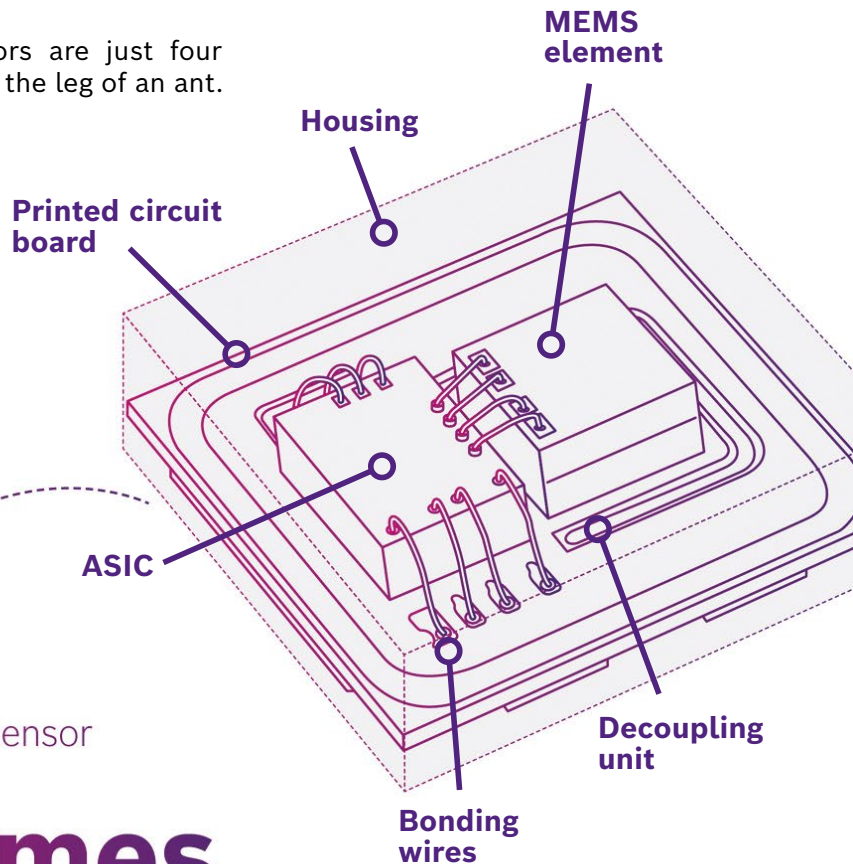
# What's inside a MEMS sensor?

Some components of the smallest MEMS sensors are just four microns in size – more than ten times smaller than the leg of an ant.



A look inside a sensor  
magnified

# 28 times



# Community to foster and accelerate innovative IoT applications

Bosch Sensortec offers an ideation community to customers, partners, developers and makers to learn about sensing solutions and to accelerate the development of innovative IoT applications. The Bosch Sensortec Community provides useful information, best practice advice and allows developers to share their experience with others.



## **MEMS sensors forum**

The forum is intended for developers, customers, partners and makers using Bosch Sensortec's sensing solutions. Ask your questions, share your ideas, and exchange with experts.



## **Knowledge base**

The knowledge base is intended for developers, customers, partners and makers using Bosch Sensortec's sensing solutions.



## **Questions and answers**

Find answers to frequently asked questions.



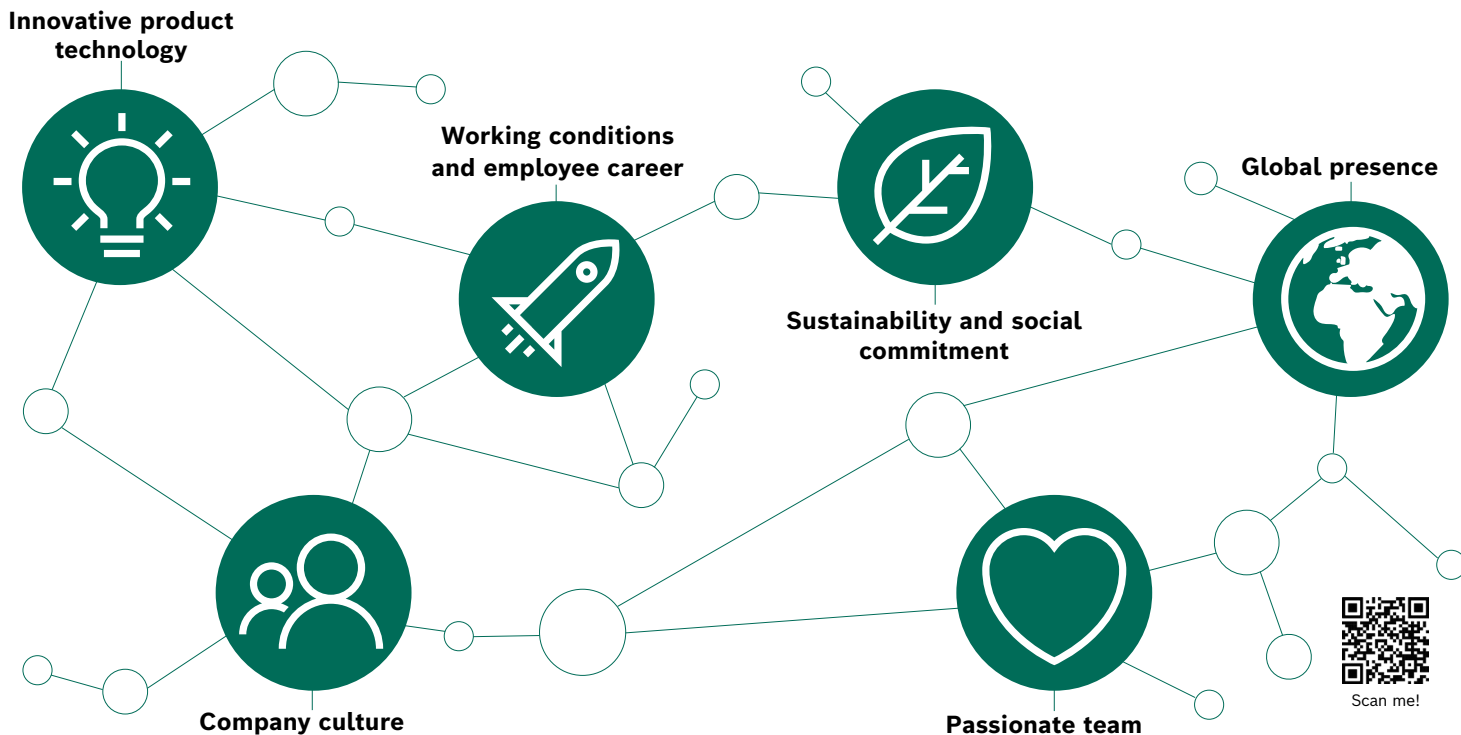
Scan me!

# Bosch Sensortec Community



# Six good reasons to join Bosch Sensortec

There is more than one good reason to work for us. We not only have innovative product technology and an employee-oriented corporate culture. Moreover, Bosch Sensortec provides attractive working conditions and first-class career opportunities. At our global locations, passionate teams of visionaries, strategists and technicians share our commitment to sustainability and social engagement. That's just right for you? Welcome to the Bosch Sensortec team!





## LET'S GET IN TOUCH

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Bosch Sensortec  
Community

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