

### **Ten years of developing tram assistance systems at Bosch Engineering**

#### **Greater safety in city rail transportation**

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- ▶ Successful transfer of proven automotive technology to the track
- ▶ Automatic braking function already increasing the level of safety in city rail transportation today
- ▶ Reduction in tram accidents by up to 40% after installation of collision warning system

Abstatt – Inattentive traffic participants who suddenly walk or drive in front of the tram present a high risk of accidents, especially in the dense, chaotic traffic of today's city centers. "To minimize the risk of collisions in city rail transportation and to reduce stress for the drivers, we started a development project for driver assistance systems more than ten years ago which are designed especially for trams," explains Heiko Mangold, head of the rail technology business field at Bosch Engineering. Since 2017, Bosch Engineering's tram forward collision warning system (TFCW) has been used in passenger operations. Once an object is perceived in the detection area, the system warns the driver visually and/or acoustically of the obstacle and even brakes the tram automatically until it stops if the driver fails to react to the warning or does so too late. After the installation of the system in a German city, for example, the number of tram accidents declined by more than 40%, although the number of trams in operation increased. Currently, around 1.200 TFCW-systems are installed in trams in Europe, Australia, and North America.

#### **Bringing automotive technology onto the track**

Bosch's wide-ranging expertise from the automotive sector forms the foundation for the assistance systems in city rail transportation. This applies to both the proven hardware, such as sensors and electronic control units, used by the millions in the passenger car and commercial vehicle sector and to the software and development methods. Components are chosen from the modular system and then tailored to the specific requirements of tram operation and the individual topographical and urban planning specifics for the region in which they are used.

“By transferring the technology from the street to the track, we are able to develop assistance functions for city rail transportation with a high technical standard and degree of maturity,” says Mangold. For example, the basic functions of the system have been optimized in the past years to better detect pedestrians in situations with poor visibility and provide additional safety when moving through tunnels.

For future expansions of the system, other assistance functions known from the passenger car segment will be adapted for use in rail traffic. Tram drivers will then be supported to a greater extent in their daily range of responsibilities and the risk of an accident will be minimized even more.

**Press photos:** #XXXXXX

**Further information:**

<https://www.bosch-engineering.com/stories/stories-detailpages/t-storypage-5.html>

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#### **About Bosch Engineering GmbH**

*Bosch Engineering GmbH is a wholly owned subsidiary of Robert Bosch GmbH and is head-quartered in Abstatt, Germany. As a systems development partner to the automotive industry since 1999, the company with its more than 3,000 associates offers development services for powertrains, safety and convenience systems, and electrical and electronic systems – from the original concept to series production. Specialized in electronics and software, it draws on Bosch’s proven large-scale series production technology to develop tailored solutions for a wide variety of applications in passenger cars, commercial vehicles, off-highway and recreational vehicles, and in rail applications, ships, and industry. Bosch Engineering GmbH also coordinates all the Bosch Group’s motorsports activities. Additional information can be accessed at [www.bosch-engineering.com](http://www.bosch-engineering.com).*

*Mobility Solutions is the largest Bosch Group business sector. It generated sales of 45.3 billion euros in 2021, and thus contributed 58 percent of total sales from operations. This makes the Bosch Group one of the leading automotive suppliers. The Mobility Solutions business sector pursues a vision of mobility that is safe, sustainable, and exciting, and combines the group’s expertise in the domains of personalization, automation, electrification, and connectivity. For its customers, the outcome is integrated mobility solutions. The business sector’s main areas of activity are injection technology and powertrain peripherals for internal-combustion engines, diverse solutions for powertrain electrification, vehicle safety systems, driver-assistance and automated functions, technology for user-friendly infotainment as well as vehicle-to-vehicle and vehicle-to-infrastructure communication, repair-shop concepts, and technology and services for the automotive aftermarket. Bosch is synonymous with important automotive innovations, such as electronic engine management, the ESP anti-skid system, and common-rail diesel technology.*

*The Bosch Group is a leading global supplier of technology and services. It employs roughly 402,600 associates worldwide (as of December 31, 2021). The company generated sales of 78.7 billion euros in 2021. Its operations are divided into four business sectors: Mobility Solutions,*

*Industrial Technology, Consumer Goods, and Energy and Building Technology.*

*As a leading IoT provider, Bosch offers innovative solutions for smart homes, Industry 4.0, and connected mobility. Bosch is pursuing a vision of mobility that is sustainable, safe, and exciting. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to facilitate connected living with products and solutions that either contain artificial intelligence (AI) or have been developed or manufactured with its help. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiary and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. With its more than 400 locations worldwide, the Bosch Group has been carbon neutral since the first quarter of 2020. The basis for the company's future growth is its innovative strength. At 128 locations across the globe, Bosch employs some 76,100 associates in research and development, of which more than 38,000 are software engineers.*

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