

Press Release

Munich, September 19, 2018

Knorr-Bremse and Continental announce a partnership for highly automated driving in commercial vehicles

- **Partnership to develop turnkey system solutions for highly automated driving**
- **Current focus – automated convoy driving (platooning), demonstrator with three trucks in early 2019**
- **Knorr-Bremse supplies redundant actuator systems for brakes and steering and is responsible for the overall system integration**
- **Continental supplies the sensors, environment model, central processing unit, connectivity and human-machine interaction**
- **Architecture and functions to be developed jointly and optimally aligned to one other in the total system**

Munich, September 19, 2018 – Knorr-Bremse and Continental have entered into a partnership to develop a complete system solution for highly automated driving (HAD) in commercial vehicles. This means that in the future the partners will be able to offer HAD solutions for truck series production of any size.

The cooperation includes all functions for driver assistance and highly automated driving. The system consists of environment recognition, driving planning and decision-making, as well as the control of the actuator systems in the vehicle (such as steering and brakes) and human-machine interaction. The cooperation between the world market leader for brake systems and leading supplier of subsystems for rail and commercial vehicles and the Hanover-based technology company will initially involve automated convoy driving (platooning). Later development work will deal with automated driving on the freeway (“Highway Pilot”). In addition to system solutions, both companies will continue to offer their respective functionalities, components and subsystems individually on request and can thus react very flexibly to customer requirements. Knorr-Bremse will offer the complete system to commercial vehicle manufacturers in Europe, North America and Asia. From the beginning of 2019, the joint platooning demonstrator, a convoy of three coupled trucks from different manufacturers, will demonstrate its capabilities to selected customers.

The know-how and portfolio of the two companies complement each other in the best possible way

Dr. Peter Laier, Member of the Executive Board of Knorr-Bremse AG and responsible for the Commercial Vehicle Systems Division, adds: “With this partnership, Knorr-Bremse and Continental are creating the first-ever total system for highly automated driving in the commercial vehicle sector. The components of our jointly developed and pre-validated systems are very well matched to one another and considerably reduce the effort and complexity of integration on the part of the manufacturers. In the future, Knorr-Bremse will provide customers with these turnkey solutions for automated driving from a single source.”

Frank Jourdan, Member of the Executive Board of Continental and Head of the Chassis & Safety Division, explains: “At the moment, the public is more aware of the use of automated driving in cars. However, we see great potential in making the intensively competitive freight transport sector significantly more efficient and, above all, safer. Continental and Knorr-Bremse are two specialist companies which are at the forefront of their respective market segments and which complement each other perfectly with their portfolios. Continental brings

many years of experience in assisted and automated driving and an extensive product portfolio for driver assistance sensors and system architecture – for both passenger cars and commercial vehicles. In Knorr-Bremse, we have a partner with the expertise of a proven commercial vehicle specialist company which has in-depth knowledge of safety-critical systems.”

Individual class becomes HAD system competence

At the level of environment recognition, Continental supplies the various radar and lidar sensors, cameras and connectivity technologies for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2X) communication. Continental also provides the intelligence that uses the acquired data to create a model of the respective environment. The model is a main prerequisite for automated driving, because it enables the truck to orient itself in its environment: it recognizes objects, defines lanes, complies with valid rules and uses connectivity to contribute additional information that lies outside the range of vision of the sensors. The Hanover-based technology company is also responsible for human-machine interaction, which enables communication between the driver and the truck.

Tested and pre-validated components

At the driving planning and decision making level, Continental supplies the basic functions used in the passenger car market, including the high-performance control unit for automated driving functions. The driving dynamics of commercial vehicles are considerably more complex than those of passenger cars, due to the wide variety of different vehicle types. Knorr-Bremse's Truck Motion Controller based on the new brake system control (GSBC) brings this know-how to the new partnership. In addition, Knorr-Bremse has in-depth knowledge of the factors that have a great influence on driving characteristics: the tractor/trailer combination, vehicle length, the number of axles, combinations of one or more units, load distribution, the height of the center of gravity, torsionally soft frames, etc. Knorr-Bremse also has expertise on all the relevant components at the actuation level, i.e. the conversion of the driving decision into actual control processes in the vehicle. These include above all the steering and the braking system, but also the control of individual components in the powertrain.

Highly automated driving with intelligent redundancy concept

In addition to the development of automation functions, the intelligent redundancy concept is also decisive for the success of highly automated driving. If the automatic system takes over control, it must be designed to prevent the vehicle getting out of control, even if the electronic subsystems fail – and the simple doubling of critical components is not economically viable. The redundancy concept for steering developed by Knorr-Bremse demonstrates how the failure of an active steering system can be offset without installing duplicates of the relevant components. Only when the total system – including the redundant structure – operates as intended can the driver concern himself with other tasks while on the road. This best-in-class performance is combined with cost efficiency.

Contribution to greater safety and efficiency

With their cooperation in highly automated driving, both companies are also making a significant contribution to much more efficient driving, through platooning, for example, which can save up to 15 percent fuel and reduce vehicle emissions accordingly. The automation of individual driving functions such as lane changes, driving on the construction site and emergency braking will ensure that commercial vehicles are safer in the future.

Platooning demonstrator to be presented in early 2019

At the IAA, the partners Knorr-Bremse and Continental will present a film demonstrating platooning, giving visitors a realistic impression of the new automated functions in actual driving practice. The joint platooning demonstrator is expected to showcase its capabilities to se-

lected customers at the beginning of 2019. Depending on the vehicle manufacturer, the partners regard a period of 3-4 years as being realistic before platooning convoys will be seen on selected roads in series operation. The legal framework conditions, such as the minimum distance between vehicles, will play an important role here. However, looking into the future, it is clear that both companies are pursuing a development path towards a completely autonomous unit.

Caption 1: Knorr-Bremse and Continental are jointly pursuing the development path towards highly automated commercial vehicles. The partnership will initially focus on automated convoy driving (platooning). | © Knorr-Bremse/Continental

Caption 2: The cooperation of Knorr-Bremse and Continental includes all functions for driver assistance and highly automated driving. | © Knorr-Bremse/Continental

Knorr-Bremse is the global market leader for braking systems and a leading supplier of other safety-critical rail and commercial vehicle systems. Knorr-Bremse's products make a decisive contribution to greater safety and energy efficiency on rail tracks and roads around the world. For more than 110 years the company has been the industry innovator, driving innovation in mobility and transportation technologies with an edge in connected system solutions. Knorr-Bremse is one of Germany's most successful industrial companies and profits from the key global megatrends: urbanization, eco-efficiency, digitization and automated driving.

Approximately 29,000 employees (per June 30, 2018) at over 100 sites in more than 30 countries use their competence and motivation to satisfy customers worldwide with products and services. Localization is a central focus of Knorr-Bremse's strategy. Knorr-Bremse delivers braking, entrance, control and auxiliary power supply systems, HVAC and driver assistance systems for rail vehicles, as well as braking, steering, powertrain and transmission control solutions, and driver assistance systems for commercial vehicles. In 2017, Knorr-Bremse's two divisions together generated revenues of EUR 6.2 billion (IFRS). A comprehensive aftermarket & services business with high entry barriers gives these revenues increasingly cyclically independent stability. The company benefits from strong, entrepreneurial and experienced management. Technical excellence, reliability, passion and responsibility are deeply embedded in its corporate culture.

Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. Founded in 1871, the technology company offers safe, efficient, intelligent and affordable solutions for vehicles, machines, traffic and transport. In 2017, Continental generated sales of €44 billion and currently employs more than 243,000 people in 60 countries.

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