

INFORMER

The customer magazine of Knorr-Bremse Rail Division

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Knorr-Bremse at InnoTrans 2026

September 22–25 in Berlin

Inside:
InnoTrans
supplement

**Resilient systems for
Rhineland's new S-Bahn**

**Rethinking sustainability:
The value of
friction pairing**



KNORR-BREMSE

Information for Knorr-Bremse's customers and partners

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Dear Reader,

Which friction pairing is the most sustainable? There's no single, simple answer. A pairing that may be suitable for a metro train won't necessarily work for a high-speed train. One that works well in tunnels won't necessarily work as well over long distances. One thing is certain: The right answer depends on a holistic understanding of systems and applications. At Knorr-Bremse, we understand both – resulting in Sustainable Friction Pairing, our integrated approach to finding the right friction solutions (pages 24/25). We aim to make the sustainability of every friction pairing application measurable, giving both manufacturers and operators a solid basis for their decisions – based on an understanding of the underlying system, rather than just opting for an off-the-shelf product.

The same principle applies to our own organization. We have enjoyed significant growth in recent years. Our existing business activities have evolved and been supplemented by new ones. Inevitably, the structure we were using to manage all this eventually reached its limits. So we subjected it to some rigorous testing and, based on the insights gained, reshaped the whole thing (page 9), clarifying responsibilities, shortening decision-making pathways, and strengthening our local presence.

InnoTrans 2026 in Berlin will also be the first major industry event we attend in our new organizational structure. Together with my colleagues, I look forward to speaking with you in person – discussing the issues that really matter to you, and presenting you with solutions capable of delivering tangible value in response to your daily challenges.

Warm regards,



Harald Schneider,

Chairman of the Management Board
Knorr-Bremse Global Rail Holding GmbH

NYAB awarded Premier Supplier status



Trinity Rail, one of the largest manufacturers of freight cars and providers of railcar leasing services in the U.S., has awarded Knorr-Bremse subsidiary New York Air Brake (NYAB) Premier Supplier status. NYAB earned the recognition in the “Specialty Parts” category for its excellent and consistent performance throughout 2025.

Headquartered in Watertown, New York, NYAB develops and supplies leading-edge air brake control systems and components, electronically controlled braking systems, foundation brakes, train handling systems, and wayside equipment, primarily for the North American rail industry.

Celebrating NYAB's Premier Supplier status in May (from left): Mike Shin (Chief Supply Chain Officer, Trinity), Laura Gordon (Global Commodity Manager, Trinity), Ulisses Camilo (President & CEO, NYAB & Knorr Brake Company), Levi Sweazy (Regional Sales Manager, NYAB), Wade Pate (Director of Sourcing, Trinity), Jean Savage (CEO, Trinity), Joseph Han (VP Freight BU, NYAB), Jason Ball (Sr. Director OE, International & Inside Sales, NYAB), and Eric Marchetto (CFO, Trinity)

A new Service Center for Singapore



From left to right: Kai Jin Swee, Nelson Lim, Yeow Wei Pang, Yam Lim Lee, Frank Uder, Boon Cheow Yee, Alex Lai, Hai Tao Xun, Kok Hin Lim, Hwee Kiat Lee

A new node in Knorr-Bremse's international network of local facilities: The end of April saw the official opening of the company's new Service Center and office in Singapore – attended by Boon Cheow Yee, Deputy Chief Executive (Infrastructure & Development) of the country's Land Transport Authority (LTA), and Yam Lim Lee, CEO Rail at SBS Transit.

The new infrastructure will enable Knorr-Bremse to fulfill its long-term commitment to serving rail market needs in Singapore. This will radically improve turnaround times for mission-critical components such as brake controls. Singapore's local public transit network is regarded as one of the world's cleanest, most reliable systems – and is due for further expansion. By the early 2030s, the city-state's rail network is expected to cover 360 kilometers, putting eight out of ten Singaporean households no more than ten minutes away from a train station.

Localization and dialogue in India

Investing in growth: New production facility in India

Short lead times, high-speed responses, competitive pricing: To meet the expectations of customers in India's rail market, Knorr-Bremse has made yet another local investment. In May, Knorr-Bremse India Private Ltd. opened a new friction material manufacturing facility at the company's Palwal site in Haryana, focusing on brake blocks and pads for urban applications. The investment underscores Knorr-Bremse's long-term commitment to the subcontinent. The inauguration ceremony was also attended by representatives of Delhi Metro Rail Corporation (DMRC) and Alstom India, who took the opportunity to tour the new facility.



Frank Uder, Shantanu Roy, and Leonid Ovchinnikov with senior managers from DMRC and Alstom



Knorr-Bremse India Sales team

IRCE 2026: Passenger comfort, digitalization, and sustainability

In March, rail industry decision-makers, manufacturers, and technology providers from around the world gathered together once again at the International Rail Coach Expo (IRCE) in Chennai. Knorr-Bremse presented the company's latest solutions – especially those optimized for the Indian market. This year's key themes: passenger comfort, digitalization, and sustainability.

EcoVadis: Third Gold Medal in a row

The internationally renowned sustainability rating agency has awarded Knorr-Bremse a Gold Medal for the third consecutive year. The award was based on an assessment of multiple criteria under the headings Environment, Labor & Human Rights, Ethics, and Sustainable Procurement. Knorr-Bremse's score improved from 76 last year to 84 this year, placing the company among the top five percent of all companies evaluated by the rating agency. In the rail industry, a score of 84 actually ranks the company in the top two percent.

The agency's rating methodology is based on international standards such as the Global Reporting Initiative (GRI), UN Global Compact, and ISO 26000. EcoVadis analysts assess companies on the basis of submitted documentation and additional data collected from external sources.



DAC: First remote-controlled decoupling of a trainset



Train Test Laboratory in Berlin-Spandau: A trainset decoupled by remote control for the first time

EU-Rail and Knorr-Bremse have reached the next milestone on the way to series approval of the Digital Automatic Coupler (DAC). For the first time, two freight cars in a trainset were decoupled by a command issued from a third, lead vehicle.

Three vehicles were involved in the tests at the FP5 TRANS4M-R Train Test Laboratory in Berlin-Spandau, Germany, in late June, all fitted with Knorr-Bremse's FreightControl control system and FreightLink couplers. The front car simulated the trainset's locomotive, using modified control software to play the lead role. The command was transmitted to the two cars to be decoupled by the FreightControl tablet app via the train's DAC-enabled onboard network. Previously, the system had successfully conducted a train composition detection exercise.

Over the next few weeks, more vehicles will be added to the test setup, fitted with couplers and control systems from other TRANS4M-R partners. Starting in August, a Stadler Eurodual locomotive provided by Havelländische Eisenbahn (HVLE) will be fitted with FreightLink Hybrid couplers and a FreightControl DAC control system. Once the locomotive has been incorporated into the trainset, it will also be possible to evaluate the system's automated brake testing capabilities.



Nyhavn Harbor, Copenhagen, Denmark

A growing, evolving partnership

How a comprehensive service partnership gradually evolved between GoCollective and Knorr-Bremse RailServices

GoCollective is one of Denmark's multifaceted mobility providers. In the Danish capital, Copenhagen, the company operates the city's famous "Havnebusser" – electric waterbus-ferries that use fast-charging stations to recharge at each stop. Other services include city and regional buses, as well as regional trains – mainly composed of Alstom LINT 41 and Siemens Desiro rail vehicles.

With ten vehicles due for bogie and wheelset overhauls, GoCollective decided to place the order with Knorr-Bremse RailServices – for the engineers, a technically demanding but nevertheless familiar project. But that wasn't the end of it: Even as Knorr-Bremse's Aarhus service centers were working on the initial order, GoCollective started to expand the scope.

A range of services that expands to match needs

To start with, the revised scope included braking system components in the car bodies. Then it grew to include other onboard vehicle components – as well as coupler maintenance. GoCollective also added another eight trainsets to the package – quite a jump from the original ten vehicles. This was followed by a framework agreement covering repairs to damage caused by accidents – soon extended to include diesel engine maintenance. In short, what started as a component-level project quickly evolved into an integrated service partnership.

For the Danish subsidiary of Knorr-Bremse RailServices, set up in 2022, the project represents a significant milestone. Following the company's acquisition by Knorr-Bremse, this is one of its first service contracts for the overhaul and maintenance of a private operator's rail vehicles and components. Previously, most of the Danish company's business involved working on behalf of state-owned rail operator DSB.



Close collaboration between Knorr-Bremse RailServices and GoCollective: Colleagues during a visit to the Aarhus service center.

Dependable quality: Normalizing standards worldwide

The challenges: growing complexity, rising cyber risks, and increasingly stringent legal, regulatory, and standards-related requirements. To keep meeting the high expectations of customers and partners in this constantly changing environment, Knorr-Bremse has merged the Group's quality policies – previously organized by division – into a single Group-wide Quality Policy. Signed off by the Executive Board of Knorr-Bremse AG, the new policy builds on existing guidelines and aligns with Knorr-Bremse's core brand values: Reliable, Innovative, Leading.

Reliable – we are a trusted, trustworthy partner

Compliant processes, products, systems, and services are essential to minimizing safety and security risks. This is why we all follow the processes defined in the Group's management system, working to prevent failures and ensure that systems and products function safely and flawlessly over the entire product lifecycle.

Innovative – we develop future technologies

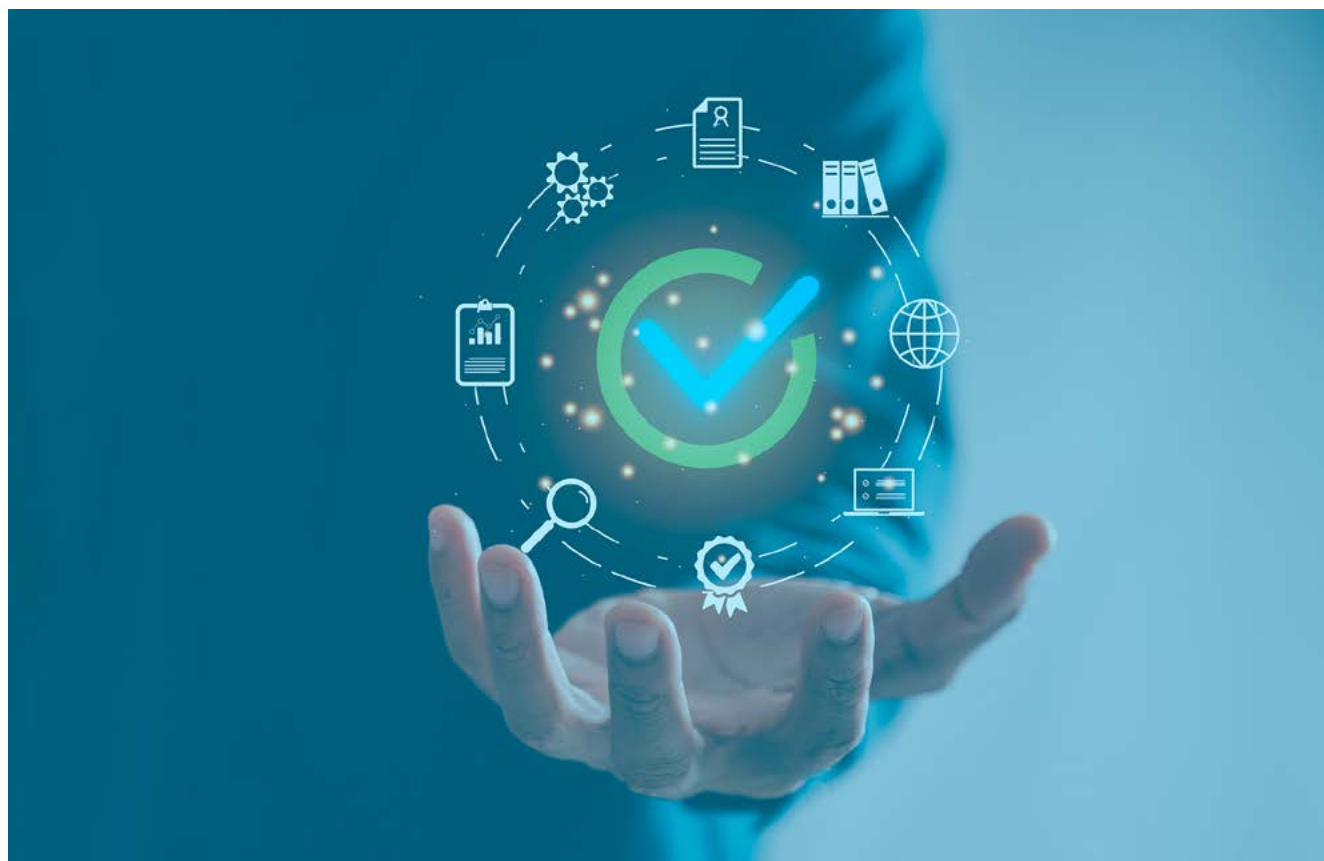
In partnership with our customers and suppliers, we constantly

strive to improve by developing and introducing new technologies and digitalization. Every single member of our team works in close collaboration with both customers and suppliers, focused on developing solutions tailored to each customer's needs through innovation, digital optimization, and continuous improvement.

Leading – we set industry standards

In the quest for sustainable, energy-efficient mobility, we aim to become the industry benchmark for product and service quality and safety. This is why every single member of our team strives for business excellence in every aspect of our operations, and why we are all so motivated to maintain Knorr-Bremse's position as a leader.

Knorr-Bremse's certification practice reflects how seriously we take quality in the rail industry: In addition to ISO 22163 (IRIS), the rail industry quality standard, Knorr-Bremse is certified under a wide range of other standards. For customers, this means our processes and products are externally inspected and validated before they are put into service.



Closer to customers, strong in world markets

Knorr-Bremse's Rail Division is restructuring its governance framework to focus on clearer lines of responsibility and shorter decision-making pathways.



The management team in charge of the Knorr-Bremse Rail business. Front row (from left): Ulisses Camilo (President and CEO, New York Air Brake LLC & Knorr Brake Company LLC), Matthäus Englbrecht (Member of the Management Board of Knorr-Bremse Global Rail Holding GmbH, CTO), Dr. Nicolas Lange (Member of the Executive Board of Knorr-Bremse AG with responsibility for the Rail Division), Harald Schneider (Chairman of the Management Board of Knorr-Bremse Global Rail Holding GmbH). Standing (from left): Frank Uder (Member of the Board of Directors of Knorr-Bremse Asia Pacific (Holding) Ltd.), Cora Hentrich-Henne (Member of the Management Board of Knorr-Bremse Global Rail Holding GmbH), Thomas Rappl (Member of the Management Board of Knorr-Bremse Global Rail Holding GmbH, COO), Dr. Jonathan Paddison (Member of the Board of Directors of Knorr-Bremse Asia Pacific (Holding) Ltd.), Faridh Morales (Member of the Management Board of Knorr-Bremse Global Rail Holding GmbH, CFO), and Mario Beinert (Member of the Management Board of Knorr-Bremse Global Rail Holding GmbH). Not pictured: Hartmut Sievers (CPO) and Leif Lümekmann (VP Global HR Business Partner Rail)

The growth curve of Knorr-Bremse's Rail Division reflects a long history of success that has resulted in a near doubling of revenues over the past 12 years. "Growth on this scale inevitably results in complexity," explains Harald Schneider, Chairman of the Management Board. "With our new governance framework, we're taking the necessary steps to deal with it."

Going forward, Knorr-Bremse will manage its Rail business through a global matrix structure headed by the three Business Unit Executives: Harald Schneider (Chairman of the Management Board), Mario Beinert (Member of the Management Board), and Cora Hentrich-Henne (Member of the Management Board). They will bear joint, overall responsibility for strategy, financial performance, and global market share.

They will be supported by the two Market Executives for the Asia-Pacific region, Dr. Jonathan Paddison and Frank Uder, as well as Ulisses Camilo for the Americas. "They will ensure that we're closely engaged with customers outside our core European market, and actively drive forward business development in their respective regions," explains Schneider. Alongside the Chief Technology Officer (CTO), who will manage the ongoing, tightly focused development of technologies across the entire Rail portfolio, cross-departmental areas of responsibility will be taken care of by four central functions: Operational Excellence (COO), Financial Management (CFO), Purchasing (CPO), and People Strategy (VP Global HR Business Partner Rail).



Knorr-Bremse at InnoTrans 2026

Between 22 and 25 September, Berlin ExpoCenter City will be transformed into the top-ranking forum for the international rail industry. Even as InnoTrans celebrates the last three decades of innovation, the world's leading trade fair for transportation technology will be laser-focused on tomorrow's mobility landscape.

As one of the original exhibitors, Knorr-Bremse will of course be present at InnoTrans 2026. The trade fair is a key platform for showcasing the company's latest rail mobility technologies, solutions, and innovations. This year, Knorr-Bremse will present integrated systems solutions for enhancing safety, availability, efficiency, and sustainability along the entire rail mobility value chain.

The motto **Rail Mobility Visioneers** reflects Knorr-Bremse's ongoing mission: to reimagine mobility and play an active role in transforming the rail industry. As a partner specializing in innovation, Knorr-Bremse's expertise embraces vehicle technology,

infrastructure, and digitalization – supporting customers with a broad portfolio of highly integrated solutions covering the rail ecosystem as a whole.

Knorr-Bremse will showcase new products, pioneering technologies, and integrated solutions for mobility present and future in **Hall 1.2, Booth 250**. The **Embedded Electronic Solutions for Rail** space in **Hall 27, Booth 740**, will invite visitors to explore digital and smart rail systems in depth. And the latest **Digital Automatic Coupler (DAC)** will also be on display at the Europe's Rail booth (Hall 4.2, Booth 330).

DR. NICOLAS LANGE

joined Knorr-Bremse AG's Executive Board in 2023, where he took global responsibility for the Rail Division. With a doctorate in mechanical engineering, he started his career at Knorr-Bremse in 2000 as Team Lead for Technology and Development Brake Mechanics. He subsequently held several positions in development, most recently as Chairman of the Rail Division's Management Board.



An interview with Dr. Nicolas Lange

Global demand for mobility, smart infrastructure, AI as tool – the rail industry is changing at a frantic rate.

We explore Knorr-Bremse's integrated vision for the future, which embraces trains, tracks, and data.

The first InnoTrans took place 30 years ago. When you look around the trade fair now, what's changed? And what does it tell us about the rail industry's transformation?

That's an easy one: pretty much everything – except for rails, which are still made out of steel. InnoTrans started as a modest trade show covering rail vehicle technology, so focusing on vehicles, mechanical engineering, and mechatronics. Nowadays, people come to visit the world's leading trade fair for rail mobility and find themselves in the midst of a global innovation forum! Just to take a few examples: The role of signaling and wayside technology is rapidly expanding, as are digitalization, automation, data-driven control systems, robotics and, increasingly, artificial intelligence. The entire industry is making giant strides forward. InnoTrans simply reflects how rail technologies and markets have evolved.

What global trends and demands are you seeing in the markets?

Around the world, there's growing pressure to shift more traffic to rail. Yet again, we're all being made strongly aware – right at this moment – of just how much we depend on fossil fuels. But we can't just expand rail infrastructure whenever we feel like it, especially in major towns and cities. So the key question is, how do we make better use of existing networks, managing traffic so that both people and freight flow more efficiently? On the downside, as we push infrastructure to its

limits, it inevitably becomes more sensitive to disruptions. Two factors are key to success here: reliability, and high availability. And that's precisely where smart electronics and digital solutions can make the biggest difference.

Where do you see regional differences and distinctions?

Key drivers differ enormously from one region to the next. The capacity issue is most acute in Europe and North America, either because of space constraints across existing networks or because there's an urgent need to modernize infrastructure. In Europe, this is reflected for example by, the hard work that's being done to develop and roll out the European Train Control System (ETCS). Meanwhile, India is massively expanding its physical infrastructure, building new intercity routes, rail freight corridors, and metro lines. China is where digitalization is spreading most rapidly – fail fast, move straight to the next development cycle. As a company, if you want to succeed in this environment, you need to be extremely flexible and agile in everything you do. Over the last few years, we've shown that we can be both – and now we're taking the next logical step.

“Essentially, we're the only provider taking a truly cross-cutting approach that embraces all standards, subsystems, operators, and regions.”



You're referring to Knorr-Bremse's strategic realignment?

"Rail Mobility Visioners" isn't just our slogan for InnoTrans 2026; it also reflects our vision and mindset – moving away from being a pure vehicle systems supplier to becoming a Tier 1 partner for the entire rail ecosystem. In this new role, we're taking an integrator's approach to vehicles, infrastructure, and digital applications. After all, the next wave of rail sector innovation is going to converge on precisely this area of intersection.

Just why is Knorr-Bremse able to do that?

We're uniquely positioned to take this holistic approach: Essentially, we're the only provider capable of taking a truly cross-cutting approach that embraces all standards, subsystems, operators, and regions. We're not constrained by any single vehicle type, operator, or market. Add to this our decades of rail vehicle expertise, plus the portfolio of rail network and infrastructural solutions we've been steadily building up. With electronics and software as the key development areas and intelligence enablers of the

future, we're now closing the circle. To put it all in context, it's important to note that we're not looking to compete with our customers. Vehicle manufacturers are responsible for building rail vehicles. We're the partner who – as set out in our mission – contributes critical functions, strengthens the integration of on-train and wayside components, and makes rail transportation as a whole smarter and more responsive. InnoTrans is the platform where we'll be showing all this to our customers for the first time: Essentially, we're reimagining rail as a complete system.

Which particular areas will Knorr-Bremse prioritize in the future?

Safety-critical systems are what our business is built on – and that's where we're on the verge of making further technology breakthroughs such as our new digital-electromechanical brake, which uses sustainable, energy-efficient, brake-by-wire technology to generate and transmit braking signals and braking energy. Our EM brake can be fully integrated into rail vehicles without any changes to existing train control systems. And we're already putting our digital automatic



"For many DAC functions, our portfolio also features standalone solutions for operators outside our core EU market."



coupler, FreightLink, through field trials. With support for functions like automated train composition, automatic brake testing, and automatic decoupling, FreightLink will finally haul rail freight into the digital age – after all, the way freight trains are prepared for their journeys hasn't changed much over the last 130 years. For many of these functions, our portfolio also features standalone solutions for operators outside our core EU market. We've significantly enhanced our LEADER Flow driver advisory system: It now bases its driving recommendations on detailed real-time traffic data indicating the relative positions and speeds of trains ahead, so the train can be driven as efficiently as possible. Many of these functions are also essential for future ATO operations. This is where we can draw on our extensive experience in Australia. For years, our technology has been guiding driverless heavy freight trains – often kilometers long – through the outback. In all these areas, we don't think in terms of individual products: We embrace systems thinking.

Artificial intelligence is getting everyone excited.

Where and how does Knorr-Bremse use AI?

In-house, we mainly use it to streamline our processes and make them more efficient. This is helping us to shorten development cycles and bring our technologies to market faster. With respect to the rail ecosystem, we're focused on monitoring, diagnostic, and telematic functions. So, through our Railnova subsidiary and Signaling Technology business

unit, we're already heavily involved in condition monitoring, action recommendations, and environment detection – detecting damaged or heat-distorted track, for example. The more information operators have, the better they can plan their operations. Our communication and software solutions are making interlockings, level crossings, and track switches smarter. These are all applications which can be further enhanced if we use AI as a tool for specific, clearly defined purposes. In essence, we regard AI as a constantly evolving tool, both internally and externally.

InnoTrans is coming across as more international and all-embracing than ever. What does this tell us about the global role of rail?

According to the UIC, rail currently transports seven percent of the world's passengers and eight percent of the world's freight – while producing just 1.2 percent of the world's emissions. While these figures are still comparatively low, they clearly demonstrate the rail industry's enormous potential. Fortunately, many new players in our markets also realize this. And they're driving the next wave of innovation in the form of new technologies, new business models – and often, new speeds as well. This is a “win” for our industry as a whole, even if it does intensify competition. Throughout its history, Knorr-Bremse has repeatedly set global standards. That's the mission we've set ourselves; that's the benchmark against which we'll be measuring ourselves in our new role.



Rail Mobility Visioneers

Mobility

dynamic Traf

Transport Capacity

Knorr-Bremse's main booth
Hall 1.2, Booth 250

Innovation across the entire rail ecosystem

At InnoTrans 2026, Knorr-Bremse will be presenting key elements of the company's new, expanded portfolio at a single venue – On-Train and Wayside solutions, for rail vehicles and infrastructure respectively, all showcased under one roof.

KNORR-BREMSE

fic Flow



Under the banner “Rail Mobility Visioneers” the double-decker booth will invite visitors to come and explore the world of Knorr-Bremse Rail. Digital applications, interactive displays, and original product exhibits will be used to bring the company’s technologies to life.

The heart of the booth is also the point at which Knorr-Bremse’s On-Train and Wayside solution spaces will converge. Cross-sectional Solutions (X.Sectional) – including embedded electronic solutions, digital solutions, and the RailServices portfolio – will bridge both spaces, showing how data-driven insights, predictive maintenance, and smart services help to improve availability and efficiency.

The motto “Rail Mobility Visioneers” evokes Knorr-Bremse’s deep understanding of the rail ecosystem. At InnoTrans 2026, visitors will be able to experience for themselves just how technological excellence, systems expertise, and digital innovation come together to create transformative solutions.

A single platform for the rail ecosystem

On-Train Solutions

Products and solutions on and in the train

The Evolution of Braking is picking up speed! Knorr-Bremse is delighted to present a key technology for the next generation of braking solutions – the digital-electromechanical braking system (EMB), already undergoing field trials. The core brake-by-wire technology engages and releases brakes faster than ever, stabilizing braking distances, increasing line capacity, and enabling more efficient rail operations. At the same time, end-to-end digitalization makes operational processes such as brake testing substantially easier.

We are also introducing Sustainable Friction Pairing. This holistic approach assesses each friction pairing against five key criteria – carbon footprint, particulate matter emissions, material compliance, circularity (including higher recycling rates), and contribution to the vehicle's overall energy

efficiency. Our neighboring Future Rail Freight Transportation exhibit showcases Knorr-Bremse's multifaceted support for the digital freight train – in particular the wired Digital Automatic Coupler (DAC), the on-car FreightControl Sentinel system, and a wireless alternative to the DAC.

Another highlight of our On-Train Solutions is the intelligent air supply system AirSupply Smart. At InnoTrans, Knorr-Bremse is presenting the system in conjunction with our new ScrewSupply Eco screw-type compressor and DrySupply Compact air dryer. We are also showcasing ZeroStepBoarding, a near-stepless entrance system for regional and light rail applications. Just a few steps away, the focus shifts to Energy Train Management with SIFU – a compact system for energy-efficient, eco-friendly control electronics.



Wayside Solutions

Products and solutions for track and infrastructure



Interlockings, level crossings, and track switches are critical nodes in the complex of systems that govern rail safety and capacity. Knorr-Bremse supplies the technologies and

intelligence required to make rail infrastructure safer, more efficient, and more capable.

Interlocking enablement is a core aspect. Interlocking solutions control and interconnect switches and signals, while Wayside Intelligence Analytics evaluates track data in real time, providing valuable insights for operational and maintenance purposes. To support these functions, our portfolio includes electronic components for field elements and object controllers, designed to enhance the intelligence of switches and other infrastructure elements.

Level crossing and signaling solutions, including state-of-the-art LED technology, round out our Wayside portfolio – precisely where rail network availability, safety, and efficiency are most urgently required.

Cross-sectional Solutions (X.Sectional)

Digital solutions and services for the rail ecosystem

At the center of the Knorr-Bremse booth, we present our full range of digital products alongside the wealth of solutions in our On-Train and Wayside portfolios. The combined exhibit focuses in particular on the modernization, overhaul, and component repair services offered by RailServices, as well as on Railnova solutions for analyzing vehicle data and translating the results into practical recommendations for action – regardless of manufacturer.

These solutions allow operators and workshops to streamline their maintenance processes, plan their maintenance schedules more efficiently, and keep fleets reliably operational. The exhibit clearly demonstrates how data-driven insights coupled with digital services result in higher availability and greater cost efficiency across all rail operations.

Knorr-Bremse's Embedded Electronic Solutions address the full range of electronic requirements throughout the rail



ecosystem. Our main booth gives visitors a first glimpse of our solutions portfolio. Guests wishing to explore our electronics and software in more detail are invited to visit our second exhibition stand in Hall 27, Booth 740.

IN THE INNOTRANS SUPPLEMENT, YOU'LL FIND CONCISE DESCRIPTIONS OF OUR KEY PRODUCTS, SYSTEMS, AND SERVICES.

Embedded Electronics – Technology that interconnects train and track

Knorr-Bremse supports customers along the entire value chain – by supplying everything from individual plug-in cards to highly customized computing solutions supported by software, tooling, and a comprehensive range of services.

Rail Mobility **Visioneers**



While vehicle manufacturers develop new generations of digitally connected rail vehicles, operators around the world are investing in infrastructure modernization and programs for upgrading existing fleets. Knorr-Bremse's **Embedded Electronics** business unit combines the expertise of two group brands, duagon and Selectron. We will present their joint portfolio in a 360° deep dive in **Hall 27, Booth 740**.

Full-spectrum electronics from a single source

Knorr-Bremse's expanded portfolio addresses the full range of electronic requirements across the rail ecosystem – from bespoke, project-specific solutions through to modular, off-the-shelf products. We combine train communication and train control solutions with high-performance computing hardware to provide a comprehensive portfolio of reliable, safe, and scalable rail systems.

Among the highlights at our booth are two new products: our new ARIS portfolio of train control solutions and our BL74A box PC. ARIS features an end-to-end architecture that combines train control and connectivity with safety and cybersecurity, making it much easier to build and interconnect state-of-the-art vehicle systems. With integrated AI modules, the BL74A is

designed for data-intensive, smart applications ranging from virtualization and intelligent video surveillance to AI-assisted applications.

Resilience by design

Cybersecurity solutions are one of the main highlights of our exhibition presence. Knorr-Bremse is building robust foundations for safe, resilient rail systems by combining threat detection with security gateways and PKI infrastructures. Our portfolio – fully compliant with Europe's Cyber Resilience Act – helps operators and manufacturers to balance the performance of their connected systems with increasingly stringent requirements for protection and resilience in the face of cyberattacks.

Electronic Repair Center

Our trade fair booth (Booth 740) also features the Electronic Repair Center, with a comprehensive range of solutions for everything from repairs to obsolescence management, from maintenance to reverse engineering. Knorr-Bremse helps customers to extend the life cycle of electronic components, protect investments, and ensure the long-term availability of existing systems.

Deep Dive:

Hall 27, Booth 740



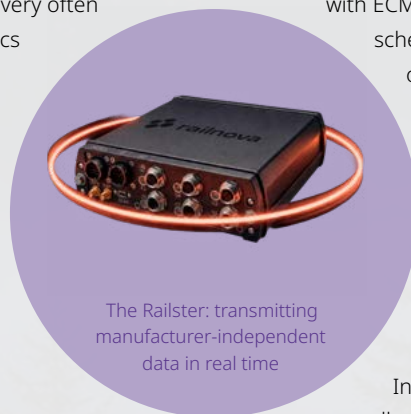
Turning data into decisions

From vehicle diagnostics to maintenance planning – Railnova closes the gap between raw data and operational decisions with manufacturer-independent products designed for use in mixed fleets.

Higher train frequencies, increasingly strained capacity, more demanding ECM initiatives – rail operators and workshops are under pressure to make their fleets (often comprising vehicles built by various manufacturers at different times) even more available and easier to schedule. This is the challenge addressed by three modular, seamlessly integrated products from Knorr-Bremse subsidiary Railnova:

Railster: Reliably capturing vehicle data

Many operators run fleets composed of vehicles from different manufacturers. As a result, they very often have no access to standardized diagnostics data – and this is the dilemma solved by **Railster**. The compact onboard device, which is manufacturer-independent and flexibly configurable, connects to rail vehicle data sources such as built-in analog and digital sensors or subcomponents' diagnostic interfaces. Without disrupting high-level systems, the device transmits diagnostic data, metrics and error codes to the cloud in real time – and is currently in use aboard some 3,500 locomotives and multiple units across Europe.



The Railster: transmitting manufacturer-independent data in real time

Railgenius: Analyzing data, identifying anomalies

But raw data alone is not very helpful unless it is fully integrated into operational and maintenance processes. This is where analytics platform **Railgenius** comes in. Using more than 2,000 algorithms, it “translates” the captured data into practical maintenance advice. And to systematically consolidate fleet-related expertise, it is also capable of converting empirical knowledge into customer-specific identification rules. In practical terms, real-time

access to error codes assists locomotive and train drivers by providing specific, targeted advice, even in situations involving complex diagnostics.

Railfleet: Coordinating maintenance planning with fleet operations

Maintenance planning is all about timing: “Too early” means unnecessary downtime, “too late” means running the risk of unscheduled breakdowns. **Railfleet** is designed to be a collaborative platform for ECM-3 fleet and maintenance managers – and is also capable of interfacing with ECM-2 and ECM-4 processes. The tool schedules and communicates maintenance orders based on mileage, time intervals, reported faults, as well as on actual condition.

Increasingly, AI agents provide additional support: By reading and automatically categorizing error reports, they provide fleet managers with a convenient, structured database. In the future, they will also use the collected information to generate specific recommendations for maintenance schedules. The positive outcome for operators and maintenance teams? Less manual work when carrying out routine tasks; an even more precise idea of vehicle condition and status – and greater freedom to concentrate on urgent, high-priority decisions, or on decisions requiring human judgement. A recent **Railfleet** reference based on day-to-day rail operations: The platform is already helping more than 9,000 users.



How systems expertise boosts sustainability

Knorr-Bremse's Sustainable Friction Pairing approach clearly shows how the right friction pairing for a rail vehicle's bogies delivers measurable, application-specific sustainability.

Squeezed together countless times during a rail vehicle's lengthy service life, two things regularly come under enormous pressure: brake pads and brake discs, or equally, brake shoes and vehicle wheels. At first glance, it's all about physics. But take another look, and it's also about direct environmental impact. Materials are consumed; fine dust is generated. Essentially, this is what determines the carbon footprint of the rail vehicle's service life. What kind of brake pad, what kind of disc is most sustainable? Experts already know there's no convenient, single answer. A solution suitable for high-speed trains competing with planes won't work for light rail vehicles running in urban tunnels. This is precisely why Knorr-Bremse keeps asking the question – because a fresh answer is needed for each customer and every new application.

The five criteria for a friction pairing

The answer to the question will be based on Knorr-Bremse's holistic understanding of friction pairings, as well as the systems in which they operate. "Sustainable Friction Pairing isn't a range of products – it's a systems-based approach," explains Anja Schuder, Product Manager Friction Technologies. The Sustainable Friction Pairing approach assesses each friction pairing against five key criteria: carbon footprint, particulate matter emissions, material compliance, circularity (including higher recycling rates), and energy savings in operation. "All five criteria depend on the real-world application involved," adds Schuder. "It's not just a question of tweaking one of the criteria – it's about finding the best overall synergy for the application, based on the customer's priorities."

**Sustainability isn't a feature.
It's a system decision.**



Where mindset meets brake discs

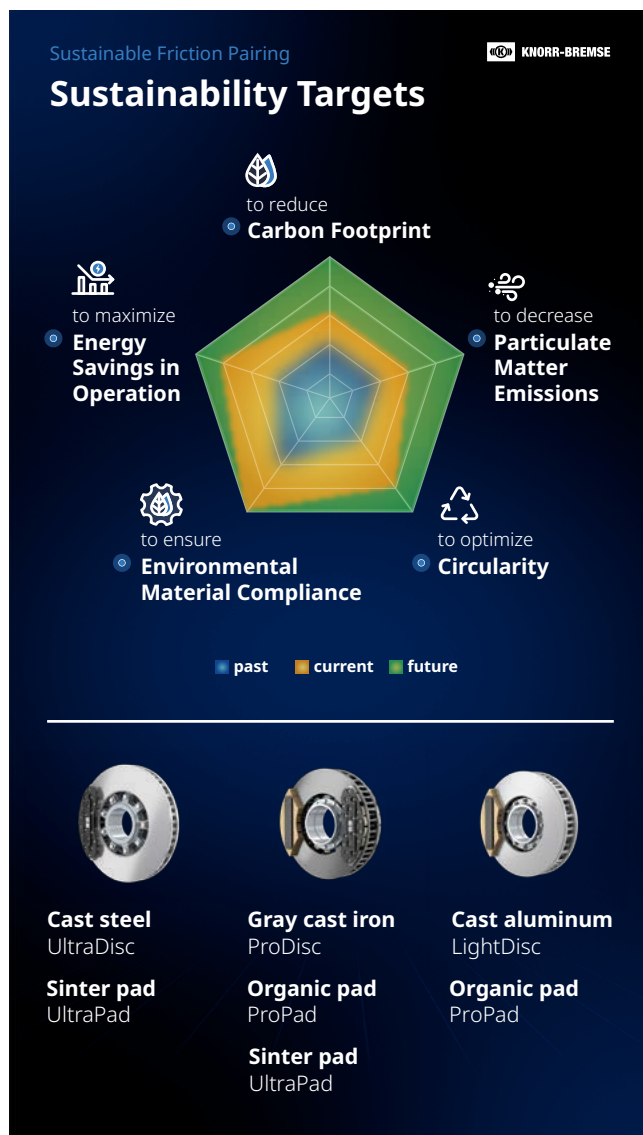
The product manager goes on to clarify the approach using a real-world example. “Brake discs slow the vehicle down, but after each stop, it has to accelerate back up to speed.” So which is more (cost-)efficient for a specific application – a lightweight aluminum disc, or a heavier gray cast-iron disc? Or would it make more sense to optimize the design of the gray cast-iron disc?

Maybe the latter, because Knorr-Bremse understands every last detail of rib design: “With the right know-how, precise optimization can reduce air resistance and minimize ventilation losses.” This kind of optimization is based on decades of accumulated data, analyzed and validated in simulations and test rigs, taking every possible consideration into account. The same principle applies to circularity: Knorr-Bremse already recycles more than 80 percent of steel scrap by feeding it back into the production of cast steel brake discs.



“Sustainable Friction Pairing isn’t a range of products – it’s a systems-based approach.”

Anja Schuder, Product Manager Friction Technologies



Just how complex these considerations are is highlighted by one of the market’s current disputes. Many people believe that sintered brake pads are the best way to cut down particulate matter emissions from rail traffic. “On the one hand, this is a relatively logical idea that’s clearly justified in certain applications,” explains expert Schuder.

On the other hand, it’s worth taking a closer look – because the true relevance of particulate emissions generated by friction pairings depends on the application. In the case of state-of-the-art vehicles with plenty of electrodynamic braking capacity, the amount of particulate pollution is negligible. And in vehicles that still use mechanical braking systems, thermal behavior can be optimized by choosing the right friction pairing: “Homogeneous temperature distribution with no hot spots reduces wear – hence also particulate matter emissions,” clarifies Schuder.

Going beyond regulatory requirements

Knorr-Bremse’s new internal standards already impose requirements that go beyond current regulatory obligations. The product portfolio excludes, for example, heavy metals and substances on the EU’s REACH* Candidate List. And because the measurement of particulate matter emissions is not just a question of quantity, but also of methodology, Knorr-Bremse is a member of the ISO/TC 269 working group engaged in drawing up the relevant standards: The company’s experts are actively working on practical measurement methods for the rail industry as a whole.

* REACH stands for Registration, Evaluation, Authorisation and Restriction of Chemicals, and refers to the key EU chemicals regulation (EC) 1907/2006.



Double the power for Rhineland's new S-Bahn

Two regional associations – go.Rheinland and Verkehrsverbund Rhein-Ruhr (VRR) – have joined forces to modernize their mobility services. They have commissioned Alstom to develop a totally new multiple-unit train for the Rhineland S-Bahn fleet. It will feature multiple innovative Knorr-Bremse systems for enhancing safety, comfort, and efficiency.

As the authority responsible for local passenger rail transit, go.Rheinland serves the Cologne–Bonn–Aachen area, whereas VRR (the Rhine-Ruhr Transportation Association) covers the Ruhr area. With the aim of providing seamless mobility services across one of Germany's most densely populated regions, the neighboring associations invited manufacturers to tender for innovative rail vehicles destined for the Rhineland's suburban rail services (S-Bahn), in a pan-European procurement process. As a result, Alstom was awarded the contract for one of Germany's largest suburban rail projects: up to 90 walk-through nine-car and eleven-car trains ranging from 150 to 170 meters in length. The project will raise the S-Bahn service to a whole new level.

Folding seats provide extra standing room during rush hour

The latest generation of S-Bahn trains is based on Alstom's new Adessia Stream™ platform – and delivers exactly what passengers need. "We commissioned a completely redesigned rail vehicle tailored to our region's specific needs and unique requirements," explains Sven Kleine, authorized signatory and Technical

Operations Manager at go.Rheinland. On average, passengers spend around 25 minutes on the S-Bahn – ranging from short trips into the city to longer journeys into the surrounding countryside, which may take up to an hour. This poses certain challenges when outfitting the trains: More seats are needed for longer journeys, more standing room and passenger capacity for commuter travel.

Alstom is solving this dilemma by creating a flexibly adaptable vehicle based on an ingenious modular design. As well as fixed seats installed facing each other, the vehicles include modules with seats that can be swiveled or retracted as needed. In the multipurpose module, folding seats provide additional standing room. There are also storage areas for strollers and bicycles, a Bluetooth-based digital audio system for hearing-impaired passengers, and – in a first for German high-floor commuter trains – a combined restroom-washroom unit in each end car. The first vehicles should be ready for field trials in summer 2029. The entire order is scheduled for delivery by the end of 2032.



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For the first time, Knorr-Bremse is supplying Alstom with automatic front couplers

Alstom will rely on Knorr-Bremse's expertise for braking systems and – for the very first time – coupling systems. Knorr-Bremse's AutoLink automatic front (center-buffer) couplers combined with adapter couplers from the RescueLink family will guarantee fast, safe coupling in both normal and emergency operation.



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'AutoLink' automatic front coupler (left) and 'CubeControl' (right)

CubeControl will regulate and manage the various braking system functions, while AirSupply Smart sets new standards for quiet, efficient, and reliable air supply, with Boost mode for unlocking additional downsizing potential and Silent mode for reducing sound output by an impressive 75 percent – ideal for noise-sensitive environments. One of the key components is the latest generation of air dryers, DrySupply Compact, which occupies 20 percent less space than the previous model. Integrated condition monitoring will help to reliably identify maintenance needs.

WheelAct Compact (RZTS) brake calipers on the motor bogies and AxleAct Compact (WZK) calipers on the unpowered bogies will deliver reliable, consistent deceleration. MagnetAct Flex magnetic track brakes with cast pole shoes and a SandGrip (SDM) sanding system built into the vehicle's sandboxes are the final ingredients in the braking system package.

One train, multiple networks: Europe's latest generation of intercity train

Siemens Mobility has designed the new Vectouro as a standardized passenger car platform for flexible international use across Europe. As an established Siemens partner, Knorr-Bremse is supplying the braking and entrance systems, as well as key modules for the sanitary units.



Last November, the European Commission set out an action plan for cross-border passenger rail services: By 2040, key European rail hubs should be connected at speeds of at least 200 km/h. At the same time, many long-distance rail fleets in Europe are reaching the end of their economically viable lifespans – thus political vision has coincided with real-world procurement needs. Purchasing managers are looking for vehicles that can be rapidly adapted to different operational requirements and deployed in multiple countries.

Flexibility as a system philosophy

The new Vectouro passenger car platform – in parallel with the Vectron locomotive platform – represents Siemens Mobility's response to this need: a standardized passenger car platform designed for flexible, cross-border deployment in Europe, that will allow operators to gradually build up their fleets and adapt them to transit capacity as required. Designed to achieve a

top speed of 230 km/h, the platform supports conventional locomotive operation, push-pull operation and sandwich operation, and can be combined in trainsets of up to 14 cars in a double traction setup. Depending on demand and requirements, multiple combinations are possible, including first-class, economy, and dining cars, as well as control cars. So far, the Vectouro has been certified for use in seven countries: Germany, Austria, Czechia, Slovakia, Hungary, Poland, and Denmark – each with its own national systems and certification requirements.

Ensuring reliable supply, minimizing certification risks

Knorr-Bremse is equipping the platform with braking and entrance systems, as well as sanitary unit modules. The first braking systems to be ordered were based on a proven design used in a previous passenger car project, ensuring a swift market launch and reducing the certification overhead. Several product optimizations are planned for future orders, including

a redesigned brake panel incorporating the very latest KEF distributor valves and KRF relay valves.

As for entrance systems, Siemens Mobility has opted for the DET pressure-tight sliding plug door system, combined with a folding step as a boarding aid. For nearly 20 years, this successful design has proven its reliability in long-distance services such as the high-speed Railjet operated by Austrian Federal Railways (ÖBB). Once fitted with robust sanitary systems, the railcars will be ready for use.

The underlying framework agreement was signed in December 2025. Thanks to the modular design and close logistical integration with Knorr-Bremse, Siemens Mobility is able to respond quickly and flexibly to market demand.





Operating flawlessly over 140,000 kilometers, AirSupply Smart impresses in Tokyo

AirSupply Smart has shown what it can do when it really counts – in daily operation on Tokyo Metro's passenger service. The high-frequency service is exceptionally demanding, with short dwell times, frequently changing loads, and hugely fluctuating compressed-air requirements.



The results of the field trial speak for themselves: Operator Tokyo Metro Co., Ltd gave AirSupply Smart's performance a very positive rating and formally approved the system for operational use – an important milestone for future projects in Japan. Philipp Verheyen, Product Manager for AirSupply Smart, summarizes the outcome: "Tokyo Metro's operations are extremely demanding, and AirSupply Smart provided impressive proof that it is capable of delivering the highest levels of performance and reliability even in very challenging conditions."

The Knorr-Bremse Sakado Service Center, located close to the capital, played a key role in the project's success. Its engineers



A Hibiya Line Series 13000 train.

supported the project on-site from the very beginning, training Tokyo Metro staff in data retrieval procedures, carrying out incoming inspections of AirSupply Smart units, and performing regular disassembly inspections throughout the trial period at the operator's site.

Seamless integration with vehicle design

Vehicle integration was another area where AirSupply Smart excelled. Seamlessly integrated into the existing system, the unit's efficient communication with the vehicle ensured that exchanges of signals, feedback and diagnostic data did not disrupt higher-level control logic. At the same time, the unit's pneumatic and electrical interfaces were optimized to ensure that the solution perfectly matched the vehicle design. For operators and vehicle manufacturers, AirSupply Smart guarantees high-level system compatibility, problem-free integration, and efficient operation in existing fleet environments.

Soft Start reduces peak loads in the onboard power supply

One of the key factors behind the success of this project was the Soft Start function built into AirSupply Smart. Soft Start ensures that the compressor starts up very smoothly, significantly reducing peak currents in the onboard power supply. "We use the inverter with voltage-frequency characteristic curve control for a smooth compressor start-up," explains Verheyen. "This helps to substantially reduce power-on currents."

The practical relevance of this benefit is illustrated by the design of Tokyo Metro's 13000 Series vehicles. Here, compressed air is usually generated by four smaller compressors, which the vehicle control system powers up in a staggered sequence to avoid peak loads. AirSupply Smart uses the more powerful PistonSupply Eco VV180-T compressor, but the Soft Start function limits the amplitude of the power-on current to match the nominal current, so it is even lower than it would be if the system still used smaller compressors starting at staggered intervals. This has major advantages for the vehicle's power supply – and creates additional technical headroom for vehicle designers.

A strong reference for the Japanese marketplace

Throughout the field trial, the integrated data logger continuously recorded important operating data such as load profiles, switching cycles, and thermal conditions. Thanks to this comprehensive information, tracking of the system's real-world operating behavior was completely transparent, demonstrating the potential of Knorr-Bremse's integrated Condition Monitoring approach in everyday operation.

Tokyo Metro's approval of the system provides Knorr-Bremse with vital proof of AirSupply Smart's suitability for the Japanese market. Not only will this allow Knorr-Bremse to take part in future Tokyo Metro tenders – it also provides a strong reference for future projects, whether in Japan or in other international applications.

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