



Light Rail Vehicles



REALIZING SYSTEM SYNERGIES

KNORR-BREMSE



AIR SUPPLY
BRAKE CONTROL
BOGIE EQUIPMENT
RAIL SERVICES
ON-BOARD



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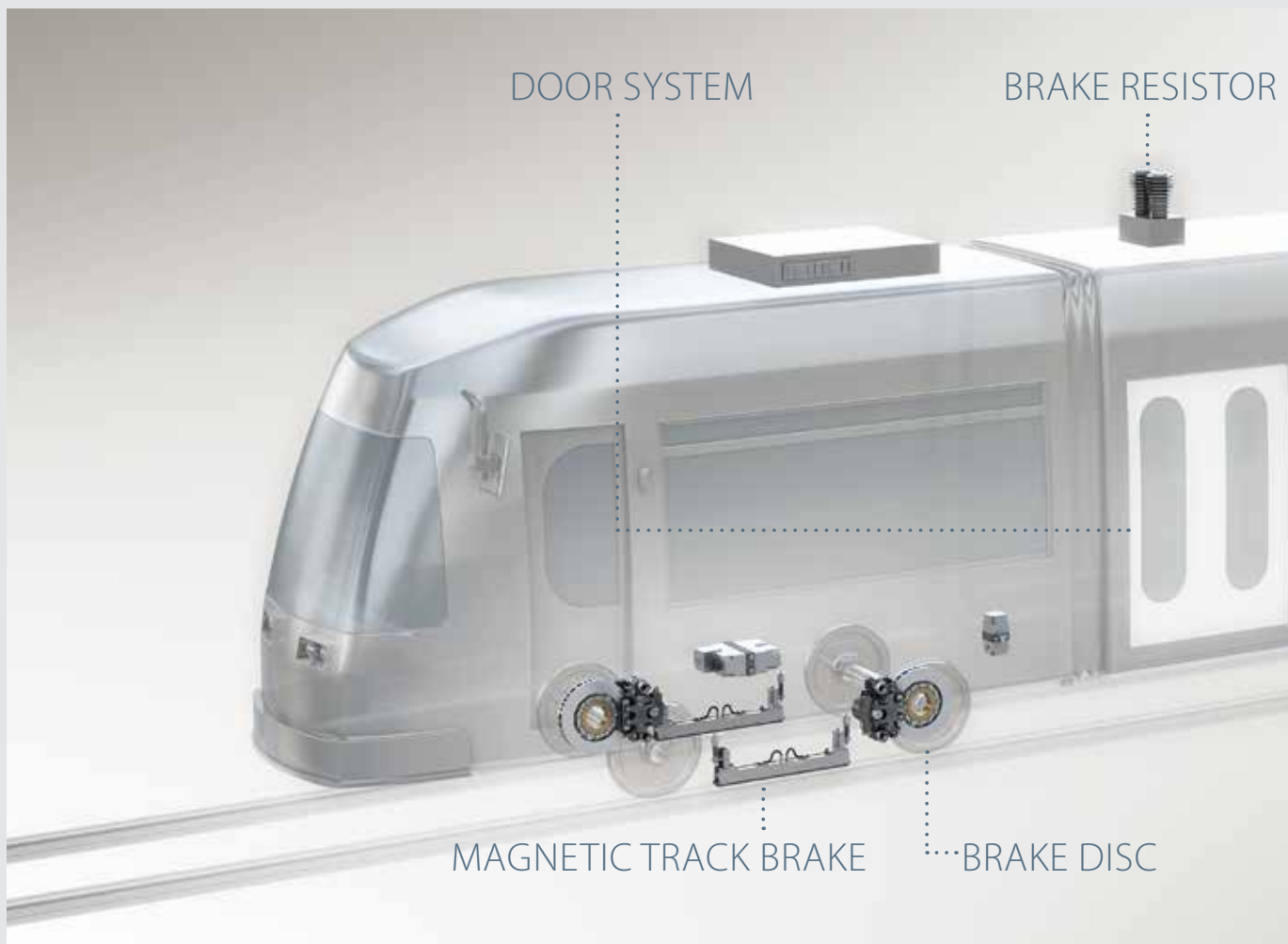
BECAUSE WE
SIMPLY FIND THE RIGHT
ANSWERS TO COMPLEX
CHALLENGES



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DELIVERING IMPRESSIVE PERFORMANCE EVEN WHEN SPACE IS AT A PREMIUM.

Trams and light rail systems are increasingly in demand in cities around the world. Especially in mid-sized cities that wish to avoid the expense of creating a new metro systems, trams and light rail systems are being seen as an environmentally friendly alternative. The range in this vehicle sector is particularly varied but the Knorr-Bremse approach to a consistent platform strategy means that we can offer customers a wide choice of solutions at affordable prices. Our hydraulic systems offer high levels of performance in confined space envelopes and are especially suitable for low-floor vehicles that have only limited space available whilst our pneumatic systems offer the perfect solution for high-floor vehicles. Whether hydraulic or pneumatic systems are required, proven Knorr-Bremse technology provides a solid base from which we can offer customers the right solution for their specific application. Customers can also enjoy the full support of Knorr-Bremse from the initial planning and commissioning stages through the life cycle with support from our RailServices team. Operator and customer audits worldwide regularly single out the consistent quality of our products and services for praise and this is confirmed by our International Railway Industry Standard (IRIS) certification.

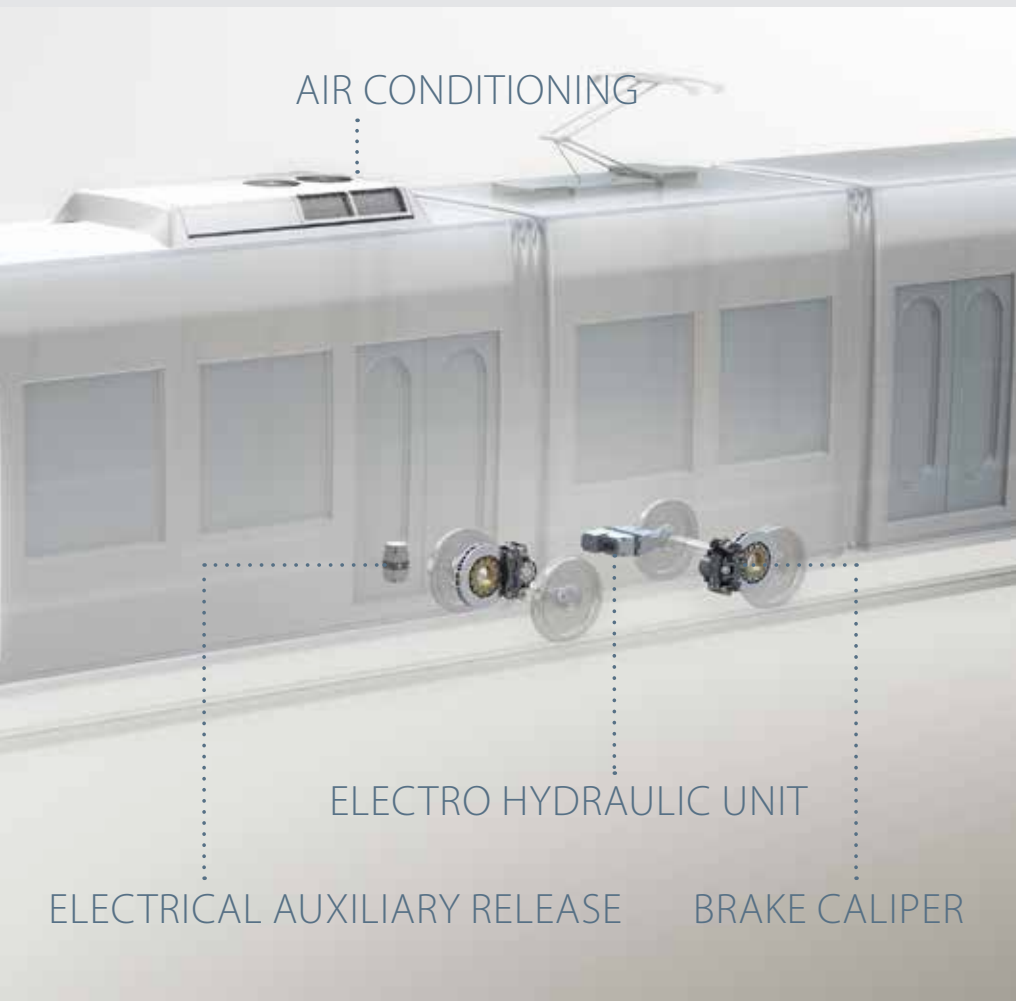


THE PERFECT COMBINATION OF HIGH-QUALITY SYSTEMS AND SERVICES.

Knorr-Bremse expertise means that the complete braking systems offers a combination of maximum functionality, reliability and safety. High-quality elements operate in perfect harmony: low-maintenance brake caliper units allow high performance even in a restricted space, brake discs whose thermal characteristics are precisely tailored to operating conditions, hydraulic units that incorporate all functions in a small space, electromagnetic track brakes which fits to the given bogie and infrastructure and electronic control and interface modules for the hydraulic system. Every system is designed specifically for the requirements of the particular project. Knorr-Bremse also offers support during the homologation process as well as all the necessary on-site services through the entire product life cycle.

THE PERFECT COMBINATION OF HIGH-QUALITY SYSTEMS AND SERVICES

RAIL VEHICLE SYSTEMS
LIGHT RAIL VEHICLES



»ON-BOARD SYSTEMS | DOORS, AIR CONDITIONING UNITS AND MORE
It is not just Knorr-Bremse braking systems that ensure greater safety and comfort in rail vehicles. Our on-board product portfolio covers a wide range of innovative products and solutions that includes entrance systems, platform screen systems and air conditioning units. We also produce state-of-the-art electronic diagnostic systems and passenger information systems.

»BRAKE CONTROL | NOT JUST FOR HYDRAULIC SYSTEMS
Intelligent systems such as ESRA are equally capable of controlling both hydraulic and pneumatic systems. Knorr-Bremse also has a range of electronic control and interface modules especially designed for hydraulic systems. The HCM hydraulic control module transfers the signals to the braking system.

»RAILSERVICES | A PARTNER FOR ALL REQUIREMENTS THROUGHOUT THE ENTIRE PRODUCT LIFE CYCLE
Knorr-Bremse offers a wide range of rail services, ranging from individual consultancy and collaborative product development to homologation, commissioning, training, maintenance, repair, upgrading and overhaul of all components – as well as a reliable supply of OEM parts. Whether you opt for individual services or the full package, everything is provided locally, either on-site or in one of our network of service centers.

»ON-BOARD SYSTEMS | TAILOR-MADE SANDING SYSTEMS
Knorr-Bremse has invested considerable amounts into designing the most suitable sanding systems for Light Rail Vehicles under differing environmental operating conditions all over the globe. Increasing demand for dosing precision and reduction in sand consumption combined with higher system availability and function monitoring has resulted in the development of tailored system functionalities based on a modular system.

»HYDRAULICS | HIGH PERFORMANCE WITHIN A SMALL SPACE
Knorr-Bremse has a large portfolio of hydraulic components and systems for low-floor trams, ranging from conventional parking brakes to combined active / passive braking systems for trams and people-movers. Our suspension and leveling systems facilitate disabled access and enhance passenger comfort.

»BOGIE EQUIPMENT | INNOVATIVE DESIGN MINIMIZES ASSEMBLY AND MAINTENANCE REQUIREMENTS
Knorr-Bremse offers a wide range of compact, lightweight bogie equipment including low-wear brake discs (with a diameter from 260 mm upwards) brake caliper units, pneumatic brakes for high-floor street cars and electromagnetic track brakes.

CUTTING-EDGE TECHNOLOGIES



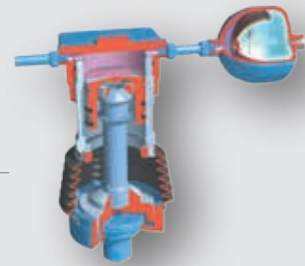
BOGIE EQUIPMENT | BRAKE CALIPER UNITS FOR ALL TYPES OF INSTALLATION

Knorr-Bremse brake caliper units are ideally suited for tram platforms, especially the low-floor segment, where installation space is at a premium. These high-performance modules can be installed even in the most confined spaces and operate with low maintenance requirements. The universally installable basic units can be easily modified to take special interfaces.



HYDRAULICS | ELECTRO-HYDRAULIC SUPPLY AND CONTROL UNITS

The energy consumption and performance characteristics of Knorr-Bremse electro-hydraulic supply and control units, also available with brushless electrical motors, make them ideally suited for rail vehicle applications. Products available range from simple braking systems to ones for operating hydro-pneumatic suspension and / or levelling systems which cover a wide variety of functional requirements.



HYDRO-PNEUMATIC | SUSPENSION AND HYDRAULIC LEVELING SYSTEMS

Knorr-Bremse hydropneumatic levelling and suspension systems contribute to excellent ride comfort. Vertical and lateral suspension characteristics can be designed to the car specific requirements. The installation space of the levelling cylinders correspond to the geometry of steel springs to allow the integration into existing bogie design. The hydraulic pressure supply and control can easily be added to the hydraulic brake system.

KNOW-HOW TO OPTIMIZE LIFE-CYCLE COSTS

RAIL
VEHICLE
SYSTEMS
LIGHT RAIL VEHICLES



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INTERDISCIPLINARY TEAMS ANALYZING PRODUCT CONDITIONS AND EVALUATING POTENTIALS FOR TECHNICAL UPGRADES. Customized service packages ensure that all Knorr-Bremse systems function smoothly for up to 30 years - anywhere in the world. The secret is our combination of OEM expertise and a highly efficient service infrastructure.

PRODUCT RANGE

AIR SUPPLY



ELECTRONIC BRAKE CONTROL UNIT

- » Modular and flexible design with standard board configuration
- » Functionality for wheel slide protection and load correction integrated
- » Ethernet connection possible



HYDRAULIC CONTROL MODULE

- » Simplified diagnostics and functionality including step control
- » Simplified hardware interface including LED visual status display
- » Software installation, diagnostic and maintenance via a standardised interface

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BRAKE CONTROL



AUXILIARY RELEASE UNIT

- » Electrical activation of release pressure
- » Various installation options
- » Small and compact design



HYDRAULIC UNIT HGA

- » For pressure or spring actuated brake calipers
- » For stopping / holding brakes and brakes with wheel slide protection
- » Option for security brake

BOGIE EQUIPMENT



HYDRAULIC BRAKE CALIPER

- » Robust design
- » Automatic slack adjustment mechanism
- » Hydraulic and mechanical auxiliary release



AXLE-MOUNTED BRAKE DISC

- » Standardized interface and mounting on wheel
- » Resistant against thermal cracks due to movable friction disc
- » Robust design with high protection against external shock and vibration



SANDING SYSTEMS

- » Modular design delivers a wide range of systems
- » Optimal performance with low weight and installation space
- » Low life-cycle costs



WINDSCREEN WIPER AND WASH SYSTEMS

- » High system availability
- » Plug and play system
- » Low life-cycle costs



HYDRAULIC UNIT HGK

- » DC-, brushless DC- or AC motor
- » Smallest dimension: 100 mm
- » Installation options: horizontal or vertical



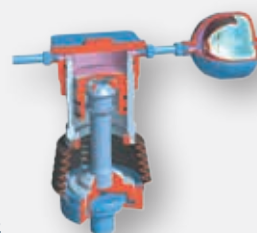
HYDRAULIC UNIT HGF

- » For pressure or spring actuated brake calipers
- » Option for security brake
- » Integrated hydraulic levelling control



MAGNETIC TRACK BRAKE

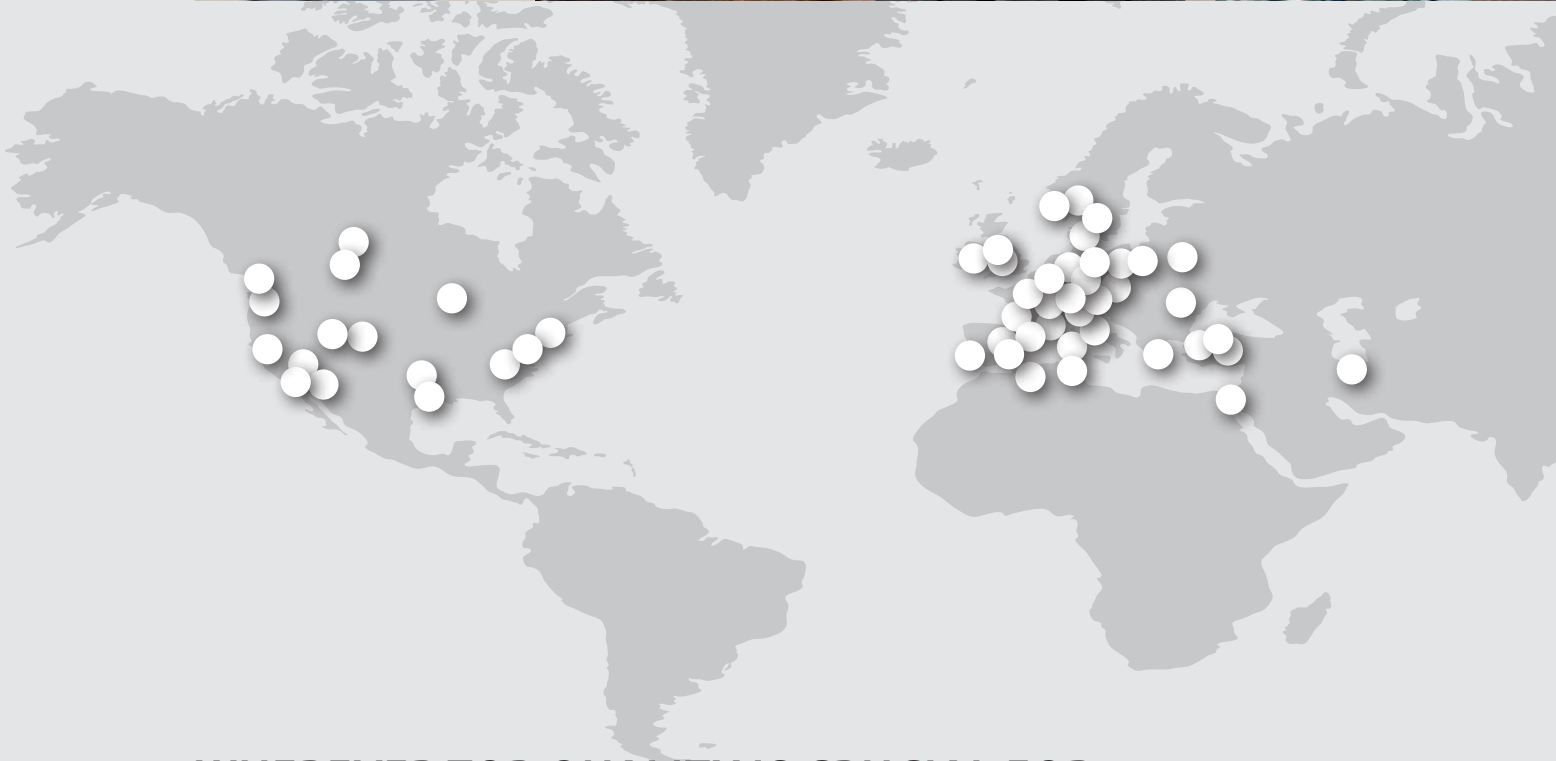
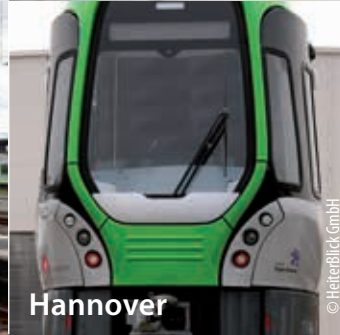
- » Modular standardized solutions
- » Robust and proven design
- » Wear-optimized pole shoes available



SUSPENSION LEG

- » Part of hydro-pneumatic suspension and levelling system
- » Vertical and lateral suspension functionality
- » Installation space corresponding to steel springs

GLOBAL APPLICATIONS



WHEREVER TOP QUALITY IS CRUCIAL FOR COMPETITIVENESS, KNORR-BREMSE RAIL VEHICLE SYSTEMS OFFER CUTTING-EDGE TECHNOLOGY

TECHNOLOGY INTO THE FUTURE

RAIL
VEHICLE
SYSTEMS
LIGHT RAIL VEHICLES



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TRAMS, LIGHT RAIL AND MONORAIL SYSTEMS ARE FIRMLY ESTABLISHED AS AN ENVIRONMENTALLY FRIENDLY SOLUTION TO THE URBAN TRANSPORT CHALLENGE.

For years, vehicle design has been undergoing further development in close collaboration with Knorr-Bremse. For the restricted installation space available in the low-floor segment we produce compact units with continually improving performance. We offer to adapt every system to the specific operating conditions involved, thereby minimizing wear and achieving top levels of economy and vehicle availability. As a manufacturer of braking systems with more than 100 years experience, Knorr-Bremse has the necessary expertise to achieve this. High levels of research and development investment ensure that our systems remain cutting-edge world-wide. With RailServices Knorr-Bremse offers a high-quality portfolio of maintenance and aftermarket services ranging from original spare parts via maintenance agreements right down to responsibility for complete systems during the entire life cycle. Customers also benefit from a comprehensive network of service centers for all braking and on-board systems.

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