



REALIZING SYSTEM SYNERGIES

KNORR-BREMSE



AIR SUPPLY
BRAKE CONTROL
BOGIE EQUIPMENT
RAIL SERVICES
ON-BOARD

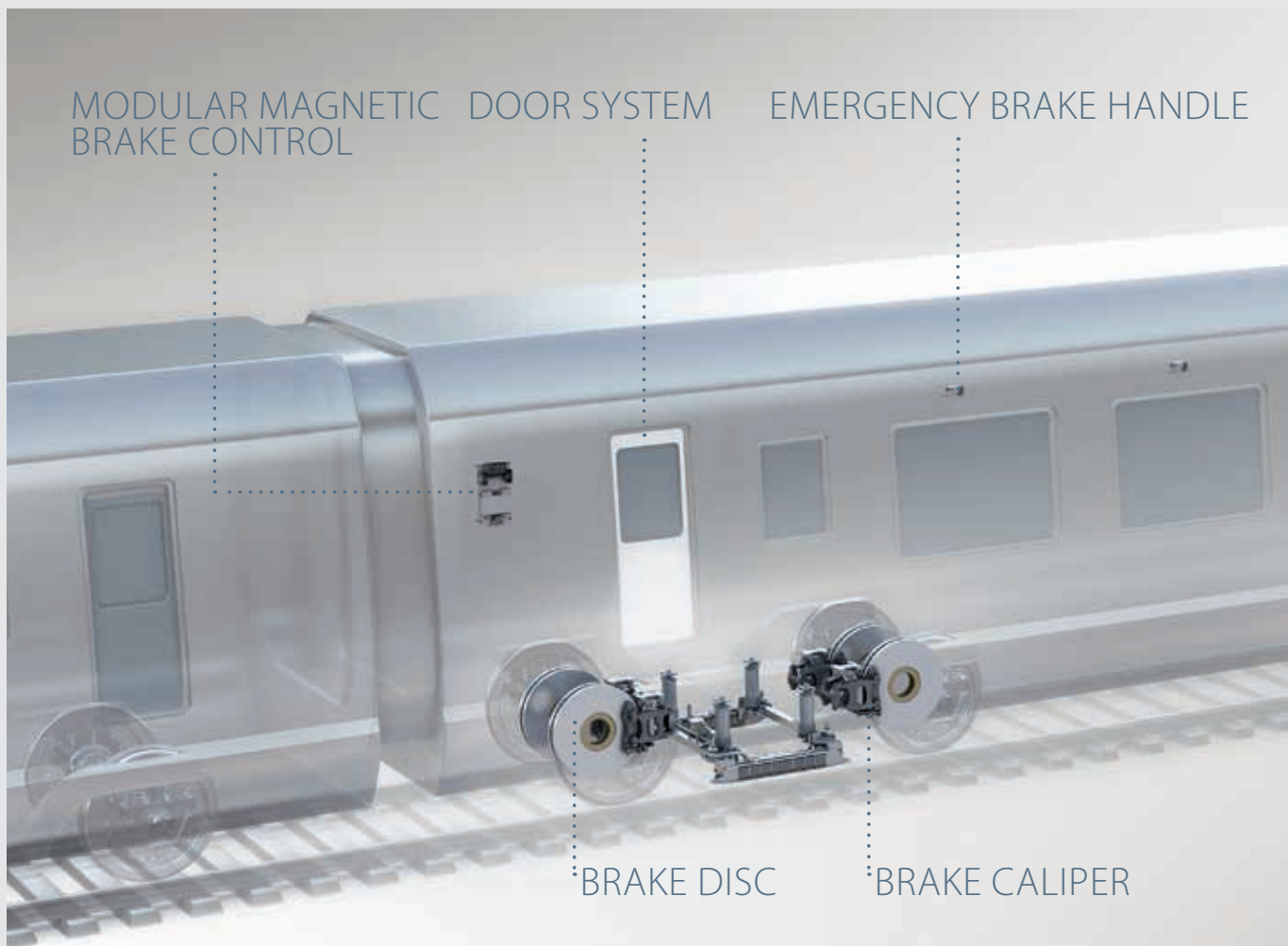


BECAUSE WE
SIMPLY FIND THE RIGHT
ANSWERS TO COMPLEX
CHALLENGES



DELIVERING A COMBINATION OF SAFETY AND COMFORT WORLDWIDE, TO UIC, AAR OR GOST STANDARDS.

From a base of proven technologies, Knorr-Bremse develop innovative solutions offering high levels of safety, reliability and economy. The systems we have developed are so efficient that they also deliver outstanding levels of environmental benefit. Customers enjoy full support from a single source – from the initial planning stage and commissioning right 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.



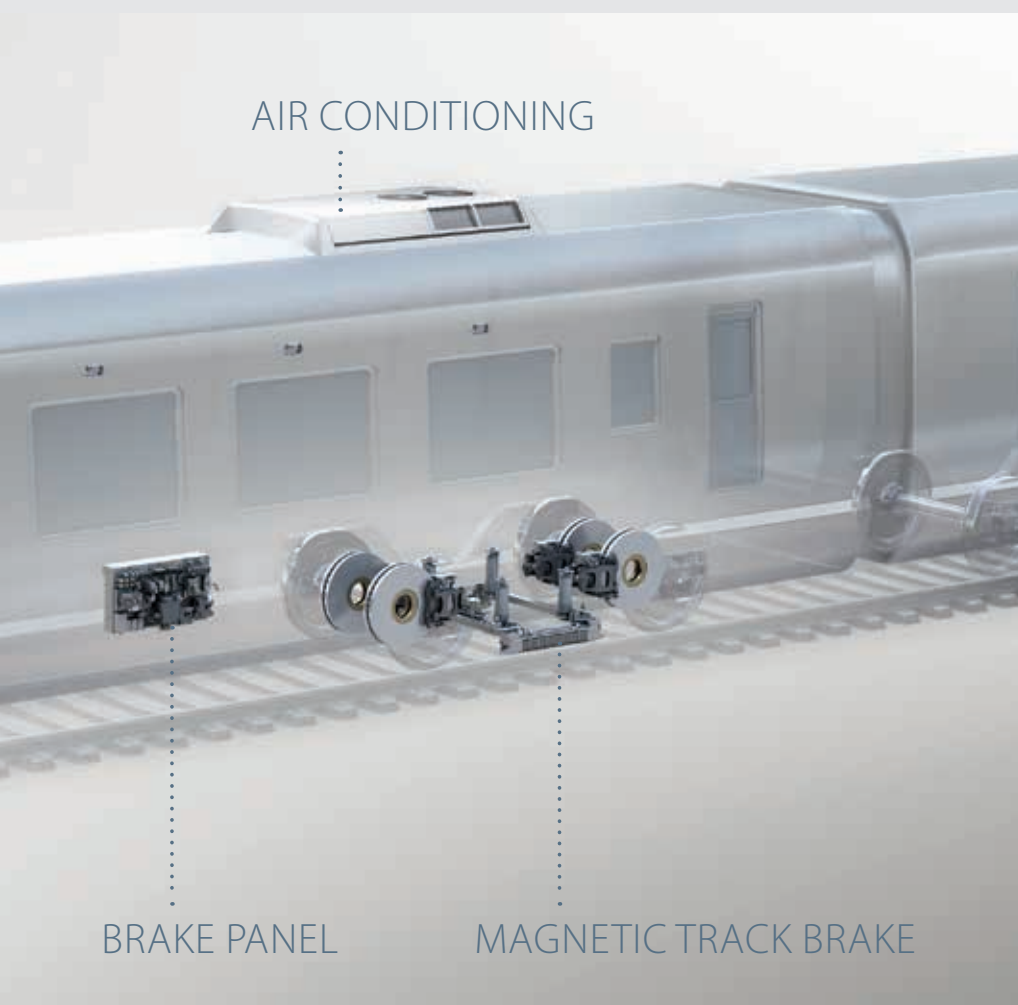
FOR DECADES, MANUFACTURERS AND OPERATORS OF PASSENGER COACHES ALL OVER THE WORLD

have been opting for Knorr-Bremse braking systems. The company uses its expertise to develop new ways of enhancing the performance and economy of tried, tested and safe technologies. High quality components operate together smoothly to guarantee optimum functionality. Every project is designed so that parameters such as pressure settings, characteristic curves and braking calculations are tailored precisely to the customer's operating requirements. Modular concepts ensure that this flexibility can be delivered with maximum economy.

THE PERFECT COMBINATION OF HIGH-QUALITY SYSTEMS AND SERVICES

PASSENGER COACHES

RAIL
VEHICLE
SYSTEMS



AIR CONDITIONING

BRAKE PANEL

MAGNETIC TRACK BRAKE

»BOGIE EQUIPMENT | INNOVATIVE DESIGN MINIMIZES ASSEMBLY AND MAINTENANCE REQUIREMENTS

Knorr-Bremse offers a wide range of compact, lightweight bogie equipment including axle- and wheel-mounted disc brakes, low-wear brake discs and brake pads. Knorr-Bremse electromagnetic track brakes are not only considerably lighter and more compact than conventional articulated electromagnet, the use of sintered metal pole shoes also means they operate without building up any deposits, thus improving braking performance.

»BRAKE CONTROL | EVERYTHING REQUIRED FOR PRECISELY COORDINATED BRAKING

Knorr-Bremse offers a wide range of integrated systems and components to ensure proper co-ordination of braking throughout the entire train: rapid brake accelerators, electro-pneumatic brake control systems, emergency brake override systems, driver cab equipment, brake diagnostic systems and many more.

»HVAC SYSTEMS | AIR CONDITIONING COMFORT

Knorr-Bremse subsidiary, Merak, designs and manufactures heating, ventilation and air conditioning (HVAC) systems for all types of railway vehicles. With systems running on all continents, under all kinds of climatic conditions, Merak offers innovative solutions to meet each customer's needs.

»AUTOMATIC DOOR SYSTEMS | SAFETY, RELIABILITY AND COST EFFECTIVENESS THROUGH QUALITY AND CONTINUOUS DEVELOPMENT

Knorr-Bremse subsidiary, IFE produces a wide range of external train doors, internal doors, control units, microprocessor controls, access ramps, movable steps, gap bridges and detection systems. A modular system enables IFE to respond to changing customer requirements, and a customer-oriented service center offers expert advice, including a growing range of replacement and maintenance options.

»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 genuine parts. Whether you opt for individual services or the full package, everything is provided locally, either on-site or in one of our service centers.

»TESTING | TEST BENCHES FOR ALL PRODUCTS – WORLDWIDE

Knorr-Bremse can supply test benches for all of the company's products and systems. The test equipment can be customized and the necessary tools can be provided to exactly suit the customer's specific test requirements. Hundreds of Knorr-Bremse test benches and test installations are in successful operational service with customers worldwide. Examples of the type of testing covered include: train brake systems, brake control products, compressors, air dryers, tread brakes, brake calipers and there are many more available.

CUTTING-EDGE TECHNOLOGIES



DISC BRAKES | OPTIMUM COOLING WITH MINIMAL FRICTION LOSS

Knorr-Bremse high-performance disc brakes are capable of absorbing huge amounts of energy. The discs are ventilated by rods designed in such a way as to offer maximum cooling without adversely affecting braking. There are a number of different materials available, including aluminum for reducing weight and systems are designed to help reduce life-cycle costs.



ELECTROMAGNETIC TRACK BRAKE | MORE COMPACT, LIGHTER AND LESS MAINTENANCE

Knorr-Bremse offers the latest electromagnetic track brakes, ideally suited to modern mainline passenger coaches with limited bogie space. Sintered materials are increasingly being used for the pole shoes as these can develop the same braking force as steel but avoid any build-up of deposits.



BRAKE PANELS | OFFERING ECONOMY WITH A SIMPLER LAYOUT

Knorr-Bremse brake panels offer proven and tested components in a compact configuration. The modular design of braking systems also simplifies the panel layout considerably. By integrating electronic and mechanical components, the dimensions have now been significantly reduced. The resulting reduction in piping and cabling contributes to lowering costs significantly.

ELECTRONIC EQUIPMENT | WHEEL SLIDE PROTECTION, PASSENGER ALARM SIGNAL

The use of the Knorr-Bremse electronic wheel slide protection system means that flats resulting from wheel lock are now a thing of the past. It is available as a stand-alone unit but can also be networked via interfaces to the CAN-bus system.

The optional passenger emergency override system (following UIC standards 541-5 and 541-6) enables the driver to react appropriately to a request from a passenger alarm signal. A customized real-time monitoring of the brake system can be implemented as well.



COMORAN® | CONDITION MONITORING FOR RAILWAY APPLICATIONS

Knorr-Bremse has developed a monitoring and diagnostic system for powered and unpowered bogies and their components. Integrated into the braking system, Comoran® identifies critical and safety-relevant conditions such as damage to wheelset bearings, hot axle boxes, unstable running or derailment. The system also provides comprehensive data that enables condition-based maintenance work to be carried out economically.

INNOVATIONS THAT REDUCE LIFE-CYCLE COSTS

PASSENGER COACHES RAIL
VEHICLE
SYSTEMS

"Passengers want to be as relaxed as possible when they reach their destination. Our systems help make trains both safe and comfortable."

OLAF METZNER

BRAKE SPECIALIST
KNORR-BREMSE RAIL VEHICLE SYSTEMS

REDUCING UNNECESSARY WEAR AND MAINTENANCE IS A GOOD WAY OF REDUCING LIFE-CYCLE COSTS.

More than any other manufacturer, Knorr-Bremse has succeeded in finely coordinating the complex interplay of different braking systems. Brake components that are prone to wear are only used when the wear-free electrodynamic braking cannot cope on its own. Even then, patented brake pads have proven longevity against conventional materials. Brake pads and discs require replacement less frequently and their design enables them to be serviced rapidly. The brake calipers themselves are low maintenance. These examples demonstrate that if all the relevant factors are included in the calculation, the bottom line is savings for the customer.



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



OIL-FREE COMPRESSOR

- » Oil-free air (environmentally friendly, no downstream contamination)
- » Less complex system / fewer interfaces (no oil filter, no condensate collector)
- » Virtually maintenance-free, very low life-cycle costs



AIR DRYER

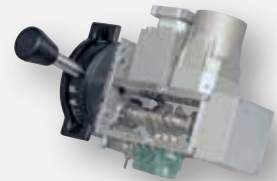
- » Dual-chamber regeneration dryer
- » Lightweight aluminum design
- » Integrated pre-filtration elements

BRAKE CONTROL



BRAKE PANEL

- » Intelligent combination of pneumatic and electronic control
- » Tailored to various customer requirements
- » Optimized packaging, clear interface



MODULAR MOTION CONTROLLER KIT

- » Brake, traction and master controller
- » Compatible with UIC standard
- » Small, flexible installation space
- » Robust design, proven application

BOGIE EQUIPMENT



WHEEL- AND AXLE-MOUNTED BRAKE DISC

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



COMPACT BRAKE CALIPER

- » Only one interface to bogie
- » Highly modular design
- » Optimized design regarding weight, assembly and costs
- » Reduced maintenance

**WINDSCREEN WIPER
AND WASH SYSTEMS**

- » Maximum lifetime of the electric driving units
- » Optimized availability via optional emergency unit
- » Maximum flexibility of functionalities (e.g., middle parking position, ect.)

**SANDING**

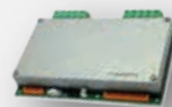
- » Modular design delivers a wide range of systems
- » Optimal performance with low weight and installation space
- » Low life-cycle costs

**PASSENGER ALARM AND PASSENGER
EMERGENCY OVERRIDE SYSTEM**

- » Compatible to UIC Standards UIC 541-5 and UIC 541-6
- » Complete set of components available

**MODULAR MAGNETIC TRACK BRAKE
CONTROL**

- » Permanent detection of cable break
- » Monitoring of the differential and minimum current
- » Various options for installation

**FRICTION MATERIAL**

- » Organic brake pads up to 200 km/h
- » Compatible with UIC standard
- » Robust design, proven application

**MAGNETIC TRACK BRAKE**

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

GLOBAL APPLICATIONS



DD-Coaches VR



LHB-Coaches India



SBB Inova



CDPTR



Marschbahn



TVZ

source: Wikipedia, Jollyroger

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

TECHNOLOGY INTO THE FUTURE

PASSENGER COACHES RAIL
VEHICLE
SYSTEMS



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THE FUTURE IS HERE! FOR THE FIRST TIME, TRAINSETS OF UP TO 15 PASSENGER CARS CAN BE EQUIPPED WITH MENU-DRIVEN BRAKE TESTING AND DIAGNOSTIC FUNCTIONS as in the case of the new Dosto 2010 double-deck trains manufactured for DB Region by Bombardier Transportation. Every coach, whether it is a control or a center car, comes with a central brake panel which includes load-controlled braking as well as an MGS2 micro-electronic wheel flat protection system. These systems combined with an MVB interface module, processes the braking signal for monitoring and diagnostic purposes. The data is then transmitted to the brake control unit in the powered control car via the vehicle CAN-bus, enabling diagnosis of the entire braking system – for example for user-controlled brake testing – across the entire trainset.

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