Monorails

REALIZING SYSTEM SYNERGIES
Because we simply find the right answers to complex challenges
WITH URBAN CONURBATIONS GROWING WORLDWIDE, PUBLIC TRANSPORT SYSTEMS ARE BECOMING INCREASINGLY IMPORTANT. Major cities are depending on attractive mass transit systems to take the pressure off overcrowded streets. Especially in Asia, Middle East and South America massive investment is currently taking place to develop the necessary infrastructure and purchase new, improved vehicles. Knorr-Bremse is a leading player in this growth market. On the basis of proven technologies, we develop innovative solutions offering top levels of safety, reliability and economy. The systems we have developed are so efficient that they also score highly in terms of environmental friendliness. 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.
Knorr-Bremse expertise in its field has gone into every single component and system. Highest quality components operate in harmony to guarantee optimum functionality, high reliability and safety. Complex electronic control systems such as blending and brake management reduce wear to a minimum by ensuring balanced operation. The system can be configured either to use the vehicle CAN-bus system or a separate CAN-bus exclusive to the braking system. For each project, customers are closely consulted at the design stage. Knorr-Bremse offers support during the homologation process as well as all the necessary on-site services through the entire product life cycle.
Brake control systems ensure efficient and safe braking all over the world. Knorr-Bremse offers both centralized and distributed systems that are compatible with all types of vehicle CAN-bus systems. Combined with the ESRA electronic platform, brake control systems such as EP Compact lite ensure optimum interaction of all braking functions. The EP2002® intelligent brake control system combines mechatronic and electronic elements in a single, extremely compact unit.

On-board systems include doors, air conditioning units, windscreen wiper and wash systems, 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 efficient and innovative products and solutions including entrance systems and platform screen systems, air conditioning units, windscreen wiper and wash systems and state-of-the-art electronic diagnostic systems.

Rail services cover a wide range of requirements throughout the entire product life cycle. Knorr-Bremse offers a 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 for performance and reliability is essential to ensure the highest standards. Test benches for all products are available worldwide, allowing for comprehensive testing of braking systems, brake control products, compressors, air dryers, tread brakes, brake calipers and many others.

Air supply systems are designed to optimize the use of space in modern monorail vehicle platforms. The trend is towards distributed systems using lightweight, compact units. Knorr-Bremse high-performance systems have been designed to meet these requirements. Intelligent compressor management means that the compressor only operates until the required quantity of air has been produced. In addition, reduced installation and maintenance times increase vehicle availability.

Bogie equipment is developed using innovative design techniques to minimize assembly and maintenance requirements. Knorr-Bremse offers a wide range of compact, lightweight bogie equipment including block brakes, low-wear brake discs and innovative high-performance brake pads. Disc brakes can be selected from rail as well as from commercial vehicle systems. For individual projects, precise calculations are made and testing is carried out on the basis of the customer’s data. New systems are subjected to extreme loads on the test bench before they are put into operation.

Knorr-Bremse has a wide range of rail services that include individual consultancy, collaborative development, homologation, commissioning, training, maintenance, repair, upgrading, and overhaul. The company also offers a reliable supply of genuine parts. Whether you choose individual services or the full package, everything is provided locally, either on-site or in one of our service centers.

The perfect combination of high-quality systems and services is the result of Knorr-Bremse’s commitment to excellence. From brake control and on-board systems to rail services and testing, Knorr-Bremse provides comprehensive solutions that meet the needs of modern monorail systems.
CUTTING-EDGE TECHNOLOGIES

**DISTRIBUTED BRAKE CONTROL | EP2002® CUBE**
Growing passenger numbers call for greater availability of trains and shorter operating intervals on monorail networks – which puts greater demands on brake reaction times. The EP2002® intelligent brake control system combines mechatronic and electronic elements in a single, extremely compact system with distributed control modules installed close to the bogie. The entire compressed air system has become even more compact with the latest development – the EP2002® Cube – which includes a wide range of additional add in a single cube-shaped unit with integrated piping.

**HYDRAULICS | ELECTROHYDRAULIC SUPPLY AND CONTROL UNITS**
The energy consumption and performance characteristics of Knorr-Bremse electro hydraulic supply and control units 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. Brushless electrical motors are available. A wide variety of functional requirements is covered by different units.

**AIR SUPPLY | OIL-FREE COMPRESSOR**
Knorr-Bremse was the first company in the rail vehicle industry to develop a compressor that operates without any oil. Lubricating oil is negated by a special coating, and the unit is cooled by air taken in via the crankcase. This innovative product is a winner in both environmental and economic terms. The expense of oil changes, oil separation and condensate disposal are avoided and energy consumption, weight and installation space are significantly reduced.

**BOGIE EQUIPMENT | Disc Brake SN7**
The SN series of pneumatic disc brake is the logical development of the SB series. It is designed as a sliding caliper brake and can be used with a membrane or a combined service brake cylinder or in combination as a service brake and parking brake system are used.
INNOVATIONS THAT REDUCE LIFE-CYCLE COSTS

“With the advent of monorails as mass transit systems, a whole new market is opening up worldwide. The characteristic feature of monorails is that they have rubber tires (commercial vehicle sector) and run on rails (rail vehicle sector). We have the necessary expertise to achieve the perfect combination of pneumatic and hydraulic systems from the rail vehicle sector with components from the commercial vehicle sector.”

ANNA ROMASZKIEWICZ
MANAGER PROJECT ENGINEERING
MONORAIL

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 electro-dynamic 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)
- Almost maintenance-free, very low life-cycle costs

SCREW COMPRESSOR
- Special design, for tough railway operation conditions
- Low compressor noise level
- Low vibration, delivery of compressed air

EP2002® CUBE
- Distributed control
- Compact design

EP COMPACT LITE
- Central control
- Compact design
- Modular and suitable to various customer requirements
- Optional electronics underfloor

BRAKE CONTROL

BRAKE CALIPER SN7
- Light, compact design
- Even brake pad wear
- Circa 20 million used worldwide
- Ability to sense brake pad wear
- Economical in-service

SPLINED DISC
- SD7 modular design
- Reduced thermal stress cracking
- Robust design protected against external shock and vibration

BOGIE EQUIPMENT

WINDSCREEN WIPER AND WASH SYSTEMS
- Plug and play system
- Lifetime of at least 1,000 operating hours
- Low life-cycle costs

AUXILIARIES
**CAPSULED UNITS**
- Compact, light, reliable
- Developed especially for very low noise level
- All components to be maintained can be accessed through a maintenance port

**AIR DRYER**
- Dual-chamber regeneration dryer
- Lightweight aluminum design
- Integrated pre-filtration elements

**HGE/HGK**
- Lightweight
- Very compact - minimum height 100 mm
- Several types for various installations available
- 3-phase AC-drive and DC-drive available
- Option for security brake functionality available

**MODULAR MOTION CONTROLLER KIT**
- Brake, traction and master controller
- Compatible with UIC standard
- Small, flexible installation space
- Robust design, proven application

**COMPACT BRAKE CALIPER**
- Only one interface to bogie
- Highly modular design
- Optimized design regarding weight, assembly, and costs
- Reduced maintenance

**HYDRAULIC BRAKE CALIPER**
- Ideally suited for confined installation space
- Low maintenance required
- Can be easily modified to take special interfaces
- Can be used as a spring actuator brake or active brake
WHEREVER TOP QUALITY IS CRUCIAL FOR COMPETITIVENESS, KNORR-BREMSE RAIL VEHICLE SYSTEMS OFFER CUTTING-EDGE TECHNOLOGY
TECHNOLOGY INTO THE FUTURE

Technology can deliver solutions as traffic levels in the world’s cities continue to rise. To avoid gridlock, the proportion of passengers using rail transport has to be increased by developing efficient monorail systems which are attractive to use. What is required are compact, lightweight technologies offering greater economy. We design every system to the specific operating conditions involved, thereby minimizing wear and tear and achieving high 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. With RailServices Knorr-Bremse offers a high-quality portfolio of maintenance and aftermarket services ranging from original parts and maintenance agreements through 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.