



# Locomotives



**REALIZING SYSTEM SYNERGIES**

**KNORR-BREMSE**



AIR SUPPLY  
BRAKE CONTROL  
BOGIE EQUIPMENT  
RAIL SERVICES  
ON-BOARD



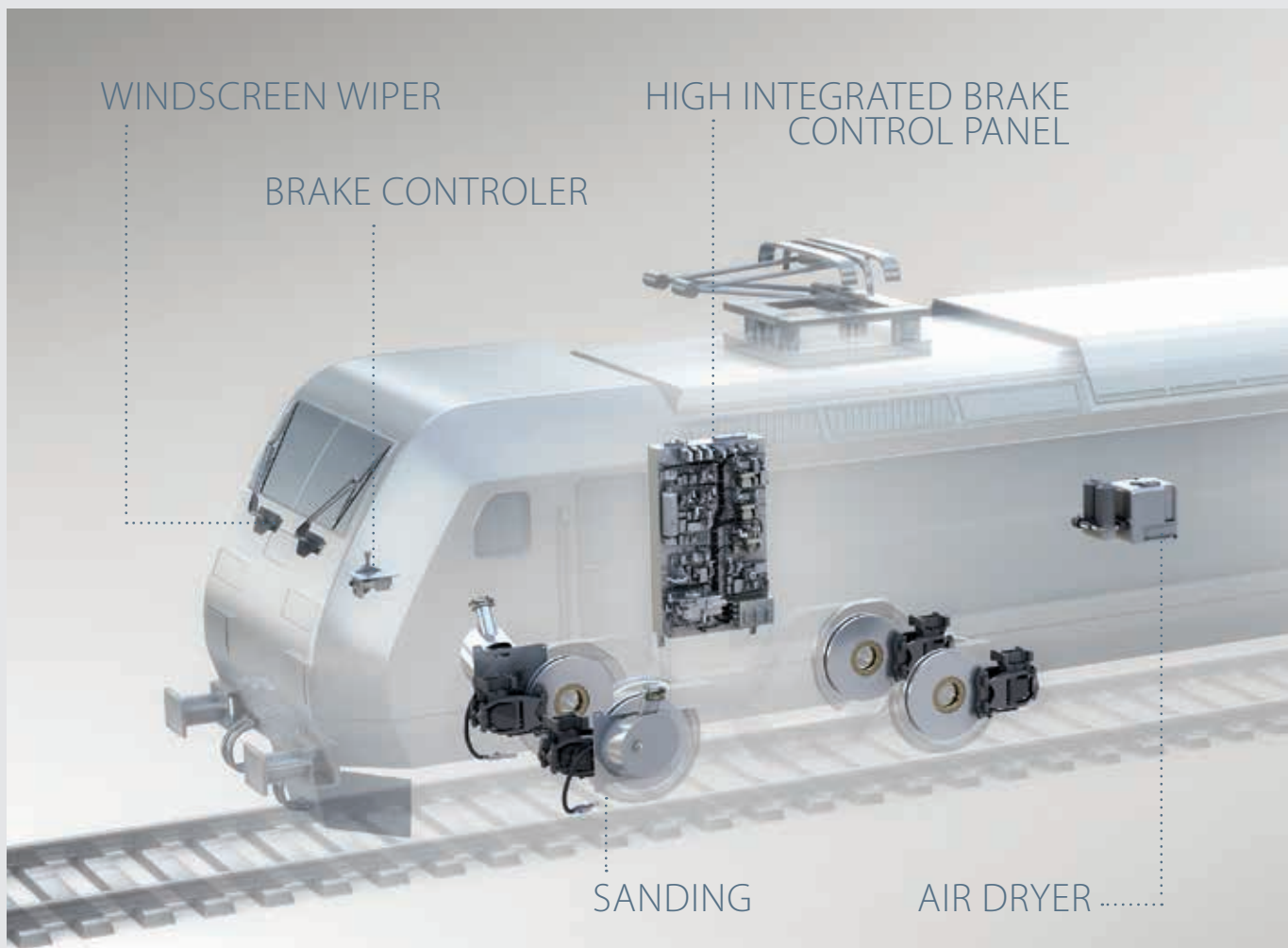
BECAUSE WE  
SIMPLY FIND THE RIGHT  
ANSWERS TO COMPLEX  
CHALLENGES



## **LOCOMOTIVE DESIGN WILL PLAY A CRUCIAL ROLE IN COPING WITH INCREASING DEMAND FOR RAIL TRANSPORTATION WORLDWIDE.**

For high-speed passenger trains and heavy freight transportation, operators need economical vehicles that have been customized to their specific needs. Manufacturers therefore produce modular vehicles that can be easily adapted to regional conditions, but at the same time are suitable for cross-border operation. This is where Knorr-Bremse can help. From a base of service-proven technologies we develop innovative solutions offering high levels of safety, reliability and economy. The systems we have developed are efficient, but they also score highly for environmental friendliness. Customers can enjoy full support from a single source; from the initial planning stage and commissioning of the train through the life cycle with support of 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.

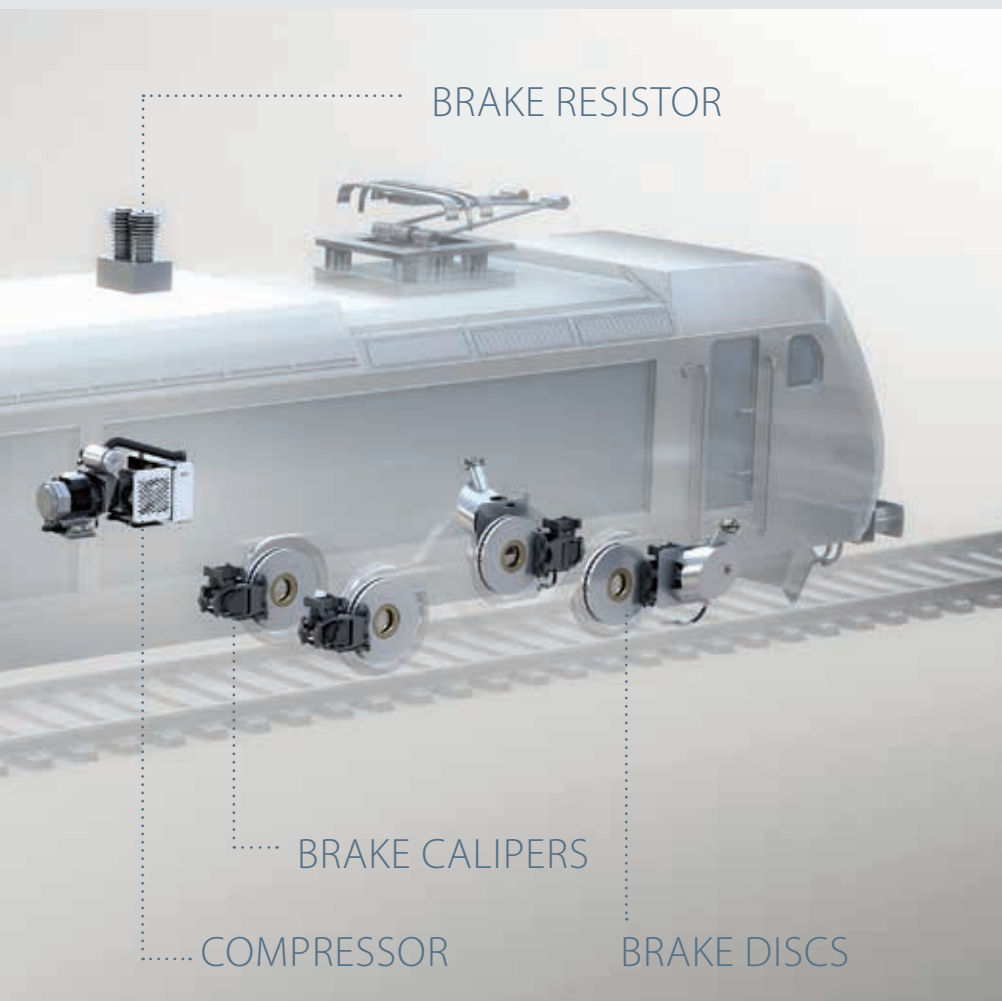




**KNORR-BREMSE EXPERTISE IN ITS FIELD HAS GONE INTO EVERY SINGLE COMPONENT AND SYSTEM.** The highest quality components operate in harmony to deliver optimum functionality, reliability and safety. Complex electronic control systems such as blending and brake management reduce wear to a minimum by ensuring 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 initial 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.

# THE PERFECT COMBINATION OF HIGH-QUALITY SYSTEMS AND SERVICES

RAIL  
VEHICLE  
SYSTEMS  
**LOCOMOTIVES**



## »AIR SUPPLY | COMBINED COMPRESSOR AND AIR TREATMENT SYSTEM

Knorr-Bremse ready-to-install air supply equipment has been designed in line with the trend towards increasingly compact, lightweight systems. Our product portfolio includes economic oil-free piston compressors, low noise screw compressors, robust simple piston compressors, and auxiliary compressors, which can serve an air flow of 80 up to 5,000 l/min. as well as air dryers and condensate collectors. The oil-free compressor is a particularly economical solution, with significant reductions in life-cycle costs.

## »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 and innovative, high-performance brake pads. Compact, low-maintenance brake calipers with sealed joints and a standardized interface reduce installation and maintenance costs.

## »BRAKE CONTROL | KNORR-BREMSE BRAKE CONTROL SYSTEMS ENSURE EFFICIENT AND SAFE BRAKING ALL OVER THE WORLD

Knorr-Bremse offers brake control solutions for locomotives worldwide,

which allow complete functional customizing for regional requirements and for all climatic and environmental conditions. As with the CCB II in AAR regions, the modular design of the MBS® brake system and the new generation of modular brake control BP and BC Compact (brake pipe and brake cylinder pressure control) offer both economical and flexible for UIC and GOST regions.

## »ON-BOARD SYSTEMS | DRIVER ASSISTANCE SYSTEMS, SANDING, WINDSCREEN WIPER AND WASH SYSTEMS AND MUCH 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 state-of-the-art driver assistance as well as electronic diagnostic systems.

## »RAILSERVICES | 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 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.

# GLOBAL COMPETENCE FOR LOCAL MARKETS

## BRAKE CONTROL



### MBS® FOR EUROPE

The modular design of the European equivalent to CCB II in America – MBS® and the new generation of brake control modules, BP Compact for brake pipe pressure control and BC Compact for brake cylinder pressure control, reduces the number of components required.



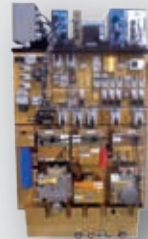
### CCB II FOR AMERICA

CCB II is the standard brake control system for the AAR market and for North America as well.



### BRAKE SYSTEM FOR CIS

Beginning with the successful market introduction of MBS® in Lithuania and BP Compact in Belarus and Kazakhstan, Knorr-Bremse is now strengthening its presence in the other countries of the former Soviet Union which operate with GOST requirements. The modular brake system is compatible with the Russian distributor valve and is capable of operating under extreme temperatures.



### CCB II FOR INDIA

For India, Knorr-Bremse is homologating the North American CCB II system. To meet the special requirements of Indian operations, experiences gained by MBS® were adapted to suit CCB II technologies.



### CCB II FOR CHINA

CCB II provides best-in-class reliability to meet Chinese railroads' demand for increased locomotive availability and serviceability. CCB II's design allows customization for specific customer requirements without any need for extensive modifications.

All Knorr-Bremse brake control systems for locomotives are characterized by their modularity. Each of the line replaceable units is capable of self diagnosis. Faults can be quickly identified and defective modules rapidly replaced. This also simplifies the brake panel layout and considerably reduces the cost of installation, commissioning, maintenance and repair, whilst at the same time improving vehicle availability. Emergency brake control remains completely functional even in the case of power failure.

# INNOVATIONS THAT REDUCE LIFE-CYCLE COSTS

RAIL  
VEHICLE  
SYSTEMS  
**LOCOMOTIVES**

*"Keeping trains running reliably and safely through their entire operational life, with systems designed to wear less and be easier and more cost-effective to maintain, is what our integrated solutions are all about."*

**FRITZ KÖNIGSBAUER**  
TEAMLEADER  
SALES LOCOMOTIVES GERMANY

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## 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.



**RAILSERVICES**  
always on track

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.



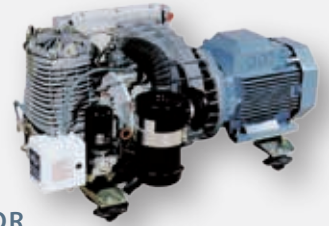
## PRODUCT RANGE

### 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



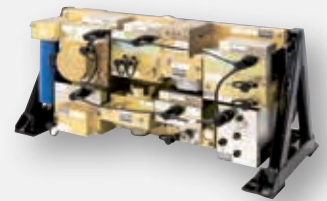
#### SCREW COMPRESSOR

- » Special design to cope with tough rail operational conditions
- » Low compressor noise level
- » Virtually pulsation-free delivery of compressed air

### BRAKE CONTROL

#### MODULAR BRAKE SYSTEM

- » For UIC and GOST market
- » High availability through in-built back-up
- » Reduced overhaul time by automatic self-diagnostics
- » Functionalities combined into line replaceable units
- » Optimized maintenance



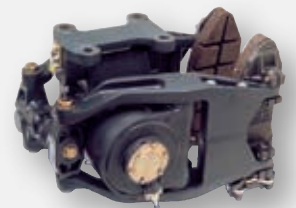
#### CCB II

- » Modular design
- » For AAR market

### BOGIE EQUIPMENT

#### WHEEL-MOUNTED BRAKE DISC

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



#### COMPACT BRAKE CALIPER

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

### AUXILIARIES

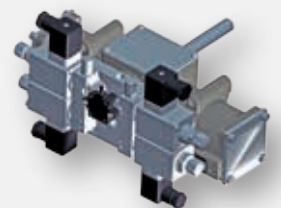
#### SANDING SYSTEMS

- » Pure pneumatic sand dosing principle, no abrasion
- » Separation of sand dosing and sand conveying function
- » Highest accuracy
- » Integrated heating and drying function optionally

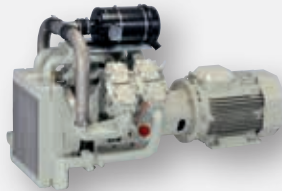


#### WINDSCREEN WIPER AND WASH SYSTEMS

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







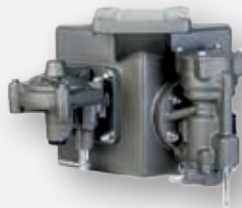
### PISTON COMPRESSOR

- » Rugged construction and long life performance
- » Self-supporting, flange-mounted motor compressor set



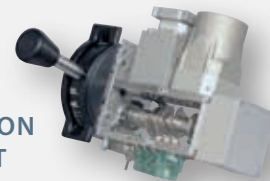
### AIR DRYER

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



### DISTRIBUTOR VALVES

- » KE for UIC
- » KAB60 for GOST



### MODULAR MOTION CONTROLLER KIT

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



### TREAD-BRAKE UNIT

- » Fixation modular design
- » Flexible mounting
- » High output forces



### CONDITIONING UNIT

- » Wheel surface conditioning to improve friction
- » Flexible mounting in bogie
- » Robust and service-proven design



### LEADER DRIVER ADVISORY SYSTEM

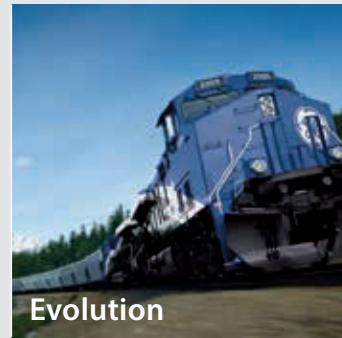
- » Saves traction energy
- » Increases punctuality
- » Reduces wear of the brake system
- » Improves driver skills
- » Increases customer satisfaction



### CIRCUIT BREAKERS AND ENERGY METERS

- » High level of electronic safety
- » High level of integration
- » Low weight and size
- » High accuracy
- » Smoke emission free
- » Maintenance-free

## GLOBAL APPLICATIONS



Evolution



HXD3



Amtrak Cities  
Sprinter



WAG-9



Euro 4000



TRAXX  
P160 DE ME

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

# TECHNOLOGY INTO THE FUTURE

RAIL  
VEHICLE  
SYSTEMS  
**LOCOMOTIVES**



**FEW AREAS HAVE AS MANY DIFFERENT REGULATIONS AS CROSS-BORDER RAIL TRANSPORTATION.** As a manufacturer of innovative systems with more than 100 years experience, Knorr-Bremse has the necessary expertise to address this challenge. Constant improvements to processes and high levels of research and development investment guarantee the high quality of our products in all conditions, including those of extreme heat and cold. Wherever it is to the customer's advantage, Knorr-Bremse further standardizes its products. When wear is unavoidable, we reduce it to a minimum. The use of easily accessible, cost-optimized modules can further improve vehicle availability. Knorr-Bremse can support all its products and systems throughout their entire life cycle.



## Knorr-Bremse Systeme für Schienenfahrzeuge GmbH

Moosacher Straße 80  
80809 Munich  
Germany  
Tel: +49 89 3547-0  
Fax: +49 89 3547-2767

WWW.KNORR-BREMSE.COM



Knorr-Bremse Group

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