Passenger Coaches

REALIZING SYSTEM SYNERGIES

KNORR-BREMSSE
They carry commuters into big cities, combine with other transport modes to open up entire regions, and link provincial train stations into the high-speed network.

Regional trains have one of the most varied roles in the entire rail sector – and the demands made on their sub-systems are similarly diverse: They have to be compact, efficient and safe, but at the same time perfectly adapted to local conditions. With its decades of experience, carefully matched systems and service concepts that ensure optimum economy over the entire life cycle, Knorr-Bremse is the partner of choice.
BRAKE SYSTEMS

More than 110 years of experience have made Knorr-Bremse the world’s leading manufacturer of rail vehicle braking systems. The company’s skills are evident not just in the individual components it manufactures but also in their perfect interaction – the key to a braking system that meets the highest standards of functionality, reliability and safety. Building on both proven and innovative technologies, Knorr-Bremse works closely with customers to develop project-specific solutions from a single source with a carefully designed combination of electronic, pneumatic, mechanical and hydraulic components. A single, direct interface ensures cost-effective and resource-efficient integration into the overall vehicle system.

CUTTING-EDGE TECHNOLOGIES

BRAKE CONTROL / WHEEL SLIDE PROTECTION SYSTEM

Wheel slide protection systems provide shorter stopping distances even in extreme weather conditions and enable dramatic reduction of maintenance costs by avoiding wheel flats. Decades of experience and ongoing technical improvement enable Knorr-Bremse to offer state-of-the-art wheel slide protection. The full system comprises sensors, valves and an electronic control.

ADDITIONAL FEATURES: HIGH PERFORMANCE MGS3

- Multi-mode switchover WSP control between low and extremely low adhesion for shorter stopping distances
- Higher pneumatic performance for shorter ventilation times
- Enozzle functionality: electronic adaption to different brake cylinder volumes for less commissioning effort

PRODUCTS FOR ALL STANDARDS

Knorr-Bremse is the partner of choice for regional train applications – with systems based on more than 110 years of development, production and practical field experience. It provides innovative, TSI-compliant solutions tailored to local requirements, all current global standards (UIC, AAR, GOST, Chinese Standard, ARA) and individual operating scenarios. And its worldwide production and service network meets even the strictest requirements for local content.

SYSTEMS SOLUTIONS – BENEFITS FOR THE CUSTOMER

The more closely braking systems are networked with other rail vehicle sub-systems, the greater the benefit for the operator, as this reduces overall complexity by avoiding redundant infrastructure. For example the braking system’s vehicle weight sensors can be used by the HVAC system to adjust output when passenger density drops.
BRAKE SYSTEMS

PRODUCT RANGE

Air Supply

OIL-FREE COMPRESSOR 2.0
- Specially optimized design to minimize noise and vibrations
- Gold starts without preheating, down to -50 °C
- No oil exchange, no disposal of used oil, no contaminated condensate to collect

SCREW COMPRESSOR
- Special design to cope with tough rail operational conditions
- Low compressor noise level
- Low vibration

INTELLIGENT AIR DRYER
- Compact, lightweight modular design
- Diagnosable with continuous monitoring of air dryer condition
- Optimized closed-loop regeneration minimizes purge air losses
- Low noise emission

INTELLIGENT AIR CONTROL – COMPLETE AIR SUPPLY UNITS
- Combines perfect air-supply- and air-treatment-related functions
- UAC, intelligent speed control of compressor
- UAC - reduce noise emission and save energy

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

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

PAKESR ALARM AND PASSENGER EMERGENCY OVERRIDE SYSTEM
- Complete set of components available

Bogie Equipment

AXLE MOUNTED BRAKE DISC
- Modular design for various friction ring materials
- Resistant against thermal cracks due to movable friction disc
- Robust design with high safety against external shock and vibration
- Split friction discs for easy replacement

COMPACT BRAKE CALIPER UNIT
- One interface to bogie
- Highly modular design
- Optimized design regarding weight, assembly and costs
- Reduced maintenance and long overhaul period

MAGNETIC TRACK BRAKE
- Additional, independent braking system
- Robust and proven design
- High braking performance even under poor track conditions

Friction Technologies

PADS OPTIPAD / FLEXPAD
- High friction stability at high temperatures and wet and dirty track at brake disc
- High mechanical resistance
- Optimized for high energy applications

PADS PROPAD
- Large product portfolio covering the specific demands of each application
- Noise optimized designs to avoid squeaking
- Standardized UIC designs and 15% increased lifetime KRS designs

BLOCKS PROBLOCK
- 50% lower noise UIC certified block
- Thermal stability
- Low wear levels, 3 times longer lifetime compared to GO blocks

TRACK BRAKE CONTROL – iRCB
- Next-generation control for track brakes
- Supports condition-based maintenance
- Enhanced function monitoring
- Modular system
BRAKE SYSTEMS

PRODUCT RANGE

SANDING SYSTEMS
- Continuous innovation
- Suitable for manual or automatic sand filling
- Lighter weight and smaller installation space
- Drying, heating and loosening of the grit

WIPER SYSTEMS
- Expertise with all vehicle types
- Extensive investigations and tests to guarantee durable products
- Long-term product support with spare parts delivery of 30 years

DIAGNOSTICS/iCOM
- iCOM transfers the mobile device philosophy to the railway industry
  - Driver advisory system (iCOM Assist)
  - Energy metering (iCOM Meter)
  - Energy management (iCOM Energy Saver)
  - Service tool (iCOM Service)

Auxiliaries

BRAKE SYSTEMS

WIPER SYSTEMS

KNORR-BREMSE

DIFFI

SANDING SYSTEMS

PASSENGER COACHES

RAIL VEHICLE SYSTEMS

SBB CFF FFS
ENTRANCE SYSTEMS

Increasing requirements in meeting train schedules and higher comfort expectations of passengers are some of the new challenges the manufacturers of entrance systems are faced with. Notwithstanding this, safety, reliability and availability of entrance systems remain the key priorities. At the same time improvements for ease of use by persons with reduced mobility are requested.

As the global leader in entrance systems for passenger coaches and for pressure-sealed entrance systems for high-speed trains, we cover the complete range of market requirements with our sliding plug doors E3 and DET from 600 to 1,600 mm entrance width. The offering is complemented by a variety of door leaf types and access devices such as sliding or folding step systems. Further development is not only driven by technical and functional excellence but also by long-term economic considerations. Our products are characterized by a particularly low-maintenance and easy-to-install design featuring the lowest life-cycle costs.

IFE is globally known as a reliable partner for the supply of entrance systems. The range of offered services, however, goes far beyond this area and furthermore includes installation, commissioning as well as maintenance over the whole product life of our door systems, including spare parts management.

CUTTING-EDGE TECHNOLOGIES

ENTRANCE SYSTEM E3H-RIC
The E3H-RIC convinces with its rugged design, which enables it to be combined even with wide and heavy door leaves. Its ability to be installed within the door frame opening and its compact dimensions allow for its use in all types of vehicles and available spaces. There is a purely mechanical activation of the optional folding step.

ADVANTAGES
- Entrance widths up to 1,400 mm
- Robust telescopic guiding system
- Lubrication-free spindle drive
- One single motor for door, step and lock
- Easy to install

SYSTEMS SOLUTIONS – BENEFITS FOR THE CUSTOMER
The more closely entrance systems are networked with other rail vehicle sub-systems, the greater the benefit for the vehicle builder, as a well-designed solution can enable data from adjoining systems to be used. For example sub-systems can ‘share’ information on the train’s speed to ensure that the doors only open once the train has come to a complete standstill in a station.

PRODUCT RANGE

DET-H DOOR DRIVE (HYBRID SYSTEM): ELECTRIC DRIVE, PNEUMATIC LOCKING DEVICE
- Entrance widths up to 1,600 mm
- Robust telescopic guiding system
- Lubrication-free spindle drive
- One single motor for door, step and lock
- Easy to install

DET-E DOOR DRIVE (ALL-ELECTRIC SYSTEM): ELECTRIC DRIVE AND LOCKING SYSTEM
- Entrance widths up to 1,600 mm
- Robust telescopic guiding system
- Lubrication-free spindle drive
- Highest safety level

E3H-RIC DOOR DRIVE
- Entrance widths up to 1,400 mm
- Robust telescopic guiding system
- Lubrication-free spindle drive
- One single motor for door, step and lock
- Easy to install

E3D DOOR DRIVE
- Entrance widths up to 1,600 mm
- Robust telescopic guiding system
- One single motor for door and lock
- Four active locks

X4 SLIDING STEP
- Reduced installation height of 50 mm
- Jamming-free 3-point guiding system with integrated weight detection
- Weight to tension of the vehicle
- Maintenance- and adjustment-free locking module
- Rugged design, not affected by dirt, corrosion or by ice and snow

FOLDING STEP
- Low installation measures
- Easy construction
- Robust against dirt and corrosion
- Direct connection to the door drive

SWIVELING STEP
- Extends to a fixed distance due to its kinematics
- Various kinematic solutions can be adapted to the specific needs of a project
- Proven for decades
- Optionally with weight detection
HEATING, VENTILATION AND AIR CONDITIONING

Passengers expect the rail sector to steadily improve levels of comfort. Noise and vibration are increasingly regarded as sources of irritation, and a properly air-conditioned interior is taken for granted. Merak HVAC systems ensure the right level of comfort for all passengers, whether they are commuters on urban metro trains operating in tropical conditions, or long-distance travelers in the arctic winter.

Project-specific application of service-proven technologies means that systems can be flexibly configured for all rail vehicle types and operating environments, and always deliver the right performance with low weight, noise, and energy consumption. Available as roof-mounted, floor-level, or under-floor units, for driver’s cabs or passenger cars, for newly-built vehicles or modernizations, Merak HVAC systems are in operation in all parts of the world – with local teams ensuring seamless service, every day.

PRODUCT RANGE

VERTICALLY INSTALLED HVAC UNIT
- Stainless steel frame
- Capable of operating at extreme ambient temperatures of -40 to +40 °C
- Adjustable load management by optimizing the balance of fresh air based on external conditions, passenger load and CO₂
- Compliant with GOST requirements
- Air sterilization by ultraviolet germicidal irradiation

ROOF-MOUNTED HVAC UNIT
- Stainless steel frame
- Designed for performance in high ambient temperatures of up to 45 °C
- Compact fresh air intake design to avoid water entering
- Redundant electrical control system
- Fault visualization management in display unit
HVAC SYSTEMS

PRODUCT RANGE

UNDER-FRAME MOUNTED HVAC UNIT
- Stainless steel frame
- Designed according to BS6853
- Adjustable load management by optimizing the balance of fresh air based on external conditions, passenger load and CO2
- Specific design following GRM 2100 structural shock FEM calculation
- Air distribution and comfort design & CO2 at coach level

ROOF-MOUNTED HVAC UNIT FOR DOUBLE DECK TRAINS
- Roof-integrated system with 2 independent circuits
- 3 independent supply air outlets and integrated exhaust
- Adjustable cross-section according to requested gauge
- Adjustable load management by optimizing the balance of fresh air based on external conditions, passenger load and CO2
- Excellent energy efficiency with stepless adjustable airflow for evaporator and exhaust motors as well as exhaust energy recovery system

SYSTEMS SOLUTIONS – BENEFITS FOR THE CUSTOMER
The more closely an HVAC system is networked with other rail vehicle sub-systems, the greater the benefit for the vehicle builder, as this enables it to respond intelligently to the other systems’ current operating status. For example the HVAC unit can be immediately shut down if a fire sprinkler is triggered, instead of continuing to blow air into the interior of the train.
With growing comfort and safety requirements in modern rail vehicles, the power demand by various on-board consumers is constantly increasing. The on-board power supply system is thus assuming an increasingly important role. Knorr-Bremse PowerTech stands for more than 100 years of extensive hands-on expertise in power conversion, ensuring effective power supply and efficient energy distribution in all types of rail vehicles.

With our comprehensive engineering competence and a proven track record of more than 30,000 converters in operation worldwide, we supply cutting-edge power converter solutions, distinguished by their compact design as well as high reliability and efficiency. Based on standardized modules, combined with a large range of optional product features, we closely work together with our customers to develop auxiliary power supply and distribution systems, tailored to their specific needs. Added to this, we ensure close proximity to our customers and maximum uptime of our systems through a broad portfolio of custom-fit service solutions and the integration into the global Knorr-Bremse service network.

SYSTEMS SOLUTIONS – BENEFITS FOR THE CUSTOMER

The more closely power supply systems are networked with other rail vehicle sub-systems, the greater the benefit for the vehicle operator. For example a smart air supply unit could adjust compressor performance when the train enters a station, thereby reducing noise emissions.
Resistors enable safe, controlled braking to take place, contactors connect and disconnect circuits under load, and disconnectors change the configuration of the traction circuit when the catenary voltage changes. High-voltage metering transducers provide reliable data for the vehicle logic, drive control and many other measuring devices. Systems like these are often invisible to the outside world but are essential for the proper functioning of a modern vehicle. And however diverse their tasks, such control components have one thing in common: There can be no compromises in terms of safety. Microelettrica Scientifica’s cutting-edge solutions have met this requirement for more than 50 years, and today the company is a global market leader in electrical and electromechanical control components for rail applications.

CUTTING-EDGE TECHNOLOGIES

**LTSS CONTACTOR FOR CONTROL OF HEATING RESISTORS**
- Solid-state contactor
- Maintenance-free
- Virtually unlimited lifetime, even in demanding application with high switching frequency
- Compact design

**SYSTEMS SOLUTIONS – BENEFITS FOR THE CUSTOMER**
The more closely power supply systems are networked with other rail vehicle sub-systems, the greater the benefit for the vehicle operator. For example a smart air supply unit could adjust compressor performance when the train enters a station, thereby reducing noise emissions.

PRODUCT RANGE

**BATTERY SWITCH**
- 2 poles
- 2 stable positions, for saving energy when closed
- Suitable for low voltages, but high currents
- Compact design

**HEATING CONTACTORS**
- Up to 4 kV voltage rating
- Conceived for high switching frequency
Modern rail vehicles are highly complex systems incorporating braking, door and HVAC systems, as well as traction, lighting and power supply components. They also carry a wide range of display units for vehicle diagnostics, passenger information and safety alerts. The train control management system (TCMS) links all these functions into a single, intelligent system that offers maximum precision, safety and reliability. This is where Selectron Systems AG comes in – the market leader in rail vehicle control technology and automation. Selectron’s comprehensive product portfolio includes freely programmable control units, central and distributed remote I/O systems and train setup components. At the heart of the systems is an EN 50155-compliant family of control systems.

**SYSTEMS SOLUTIONS – BENEFITS FOR THE CUSTOMER**

The more closely a rail vehicle’s sub-systems are networked with each other, the greater the benefit for the vehicle builder and operator. For example, cross-system diagnostics can make individual service tools superfluous. Cutting-edge control technology from Selectron Systems AG provides the perfect basis for this.

**CUTTING-EDGE TECHNOLOGIES**

**SMARTIO**

The smart remote I/O system ("Smartio") simplifies the complexity of the wiring in the body of the vehicle, in the cabinet, and in the driver’s desk allowing a lean design, savings on installation and service time, and is extremely space-saving and easy to install. It can be flexibly expanded for all applications and is, therefore, a “just enough” solution.

The new CPU3xx Smartio® controller family (SIL0/SIL2) has been added to the established Smartio® I/O system.

**PRODUCT RANGE**

**ROUTER/SWITCH**

The new switches and routers provide flexible network architectures and meet the TCN standard IEC 61375. Configuration of individual devices within the network is carried out across the trains from one data access point. Application development, commissioning, and service are simplified.

**MAS 94X**

The new vehicle control unit family CPU 94x revolutionizes the control architecture of modern rolling stock. For the first time, it allows several autonomous user-programmable controllers (PLCs) to be bundled virtually in a single control unit. They have been developed to meet high safety (SIL0 to SIL4) and cybersecurity standards and thus provide optimum protection for people and equipment.

**HMI**

The HMI portfolio includes display sizes from 8.4” up to 12.1”. The units are available as both SIL0 and SIL2 versions. The high processing power allows, among other things, multichannel video streaming over Ethernet; the display is particularly bright. The simple and intuitive graphical programming interface reduces development and commissioning time.

**CONNECTED SYSTEMS**

Modern rail vehicles are highly complex systems incorporating braking, door and HVAC systems as well as traction, lighting and power supply components. They also carry a wide range of display units for vehicle diagnostics, passenger information and safety alerts. The train control management system (TCMS) links all these functions into a single, intelligent system that offers maximum precision, safety and reliability. This is where Selectron Systems AG comes in – the market leader in rail vehicle control technology and automation. Selectron’s comprehensive product portfolio includes freely programmable control units, central and distributed remote I/O systems and train setup components. At the heart of the systems is an EN 50155-compliant family of control systems.
A reliable service partner – over the entire life cycle. All train operators are unique – and their servicing requirements for braking and on-board systems are also highly specific. But they have one thing in common: They depend on their vehicles remaining operational at all times and in all places. The mission of our RailServices brand is to ensure that this happens – for all Knorr-Bremse sub-systems and over the vehicle’s entire life cycle.

The extended RailServices portfolio includes comprehensive service and support for all our products and systems, including vehicle maintenance:

- **SERVICE CENTER** – ALWAYS CLOSE TO THE CUSTOMER
  Excellent service calls for rapid reaction times. With 30 service centers on all continents, our RailServices specialists are close at hand when local customers need them. The first European Rail Services sites already fulfill the requirements of European Regulation (EU) no. 445/2011 for freight wagons.

- **MODERNIZATION** – CUSTOMER-SPECIFIC SOLUTIONS BREATHE NEW LIFE INTO EXISTING VEHICLES
  RailServices provides innovative component upgrades and systems modernization for existing fleets. We offer attractive system solutions worldwide for rail vehicles of all ages. Modernization is delivered by RailServices specialists with expertise and above all, passion. It is our ongoing commitment to your operational needs and to continued product innovation that makes modernization projects a realistic and affordable option for our customers.

- **iCOM DIGITAL PLATFORM 4.0 – DIGITALIZATION ON BOARD**
  Knorr-Bremse provides a digital, innovative platform for the railway industry 4.0. User-friendly applications on a single platform using one on-board computer unit and a back office. This is the flexible expandable Knorr-Bremse solution for the railroad 4.0. This retrofittable system extends rail vehicle diagnostics to cover not just specific systems but whole vehicles. By introducing tablets, smartphones and apps to the railroad sector, it offers unique access to data on the condition of the entire vehicle fleet. Sophisticated measurement and analysis processes combine with automatic diagnostics to enable iCOM to predict maintenance requirements in advance – allowing operators to take measures pro-actively. This powerful and flexible system already supports additional applications such as driver advisory systems and energy metering as well as third-party products due to the open architecture.