



# EP2002<sup>®</sup> Distributed Brake Control



## APPLICATIONS

Light Rail Vehicles | Metros | Monorails | Regional and Commuter  
Trains

**KNORR-BREMSE**



# EP2002® DISTRIBUTED BRAKE CONTROL



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**EP2002® IS AN INTELLIGENT DISTRIBUTED BRAKE CONTROL (DBC) SYSTEM**, delivering per bogie or axle control in a unique package. Smaller, lighter and easier to install and commission than conventional systems, EP2002® has set new standards in advanced brake control.

In use around the world, EP2002® employs advanced mechatronic technology to maximize brake performance across the entire train. EP2002® self-compensates in real time to address variable car operating conditions such as passenger loading and wheel spin and slide.

## **THE BENEFITS OF EP2002® FOR TRAIN BUILDERS (AGAINST CONVENTIONAL SYSTEMS)**

- Low cost
- Faster installation
- Faster commissioning
- Lighter
- Smaller
- Integrated system
- Optimized braking performance

## **THE BENEFITS OF EP2002® FOR TRAIN OPERATORS**

- Reduced operational costs
- In-service availability is maximized
- Optimized braking performance
- Wheel Slide Protection (WSP) virtually eliminates wheel damage
- Specially developed EP2002® Brakes Consultant software provides system status information
- Improved under-car access
- Overhaul periodicity of 9 years

## EP2002® DISTRIBUTED BRAKE CONTROL

### EP2002® TECHNICAL AND QUALITY FEATURES

- Intelligent, per bogie braking
- Modular EP2002® valve is configurable to suit most Train Management system protocols
- Fully integrated system
- WSP (Wheel Slide Protection)
- Operational temperatures from -40 °C to +55 °C
- Complies with latest EN safety and software standards
- EP2002® manufacturing facility is TÜV certified
- EP2002® product engineering is TÜV certified for functional safety

### EP2002® FEATURES

	SMART	GATEWAY	RIO
Service Brake Control	S	S	S
Emergency Brake Control	S	S	S
Two step emergency brake for high speed application	O	O	O
Wheel Slide Protection	S	S	S
Digital I/O (8 digital input and 4 relay outputs)		S	S
Analogue Interface (PWM, 4-20mA)		O	O
TMS Interface (MVB ESD, MVB EMD, RS485)		O	
Line replaceable	S	S	S

S = Standard  
O = Optional



### **EP2002® SMART VALVE**

Contains all of the mechatronics (mechanical and electronic elements) to deliver Service Brake, Emergency Brake and WSP control on an individual bogie.



### **EP2002® GATEWAY VALVE**

Delivers all of the functions of the Smart valve and in addition provides both the interface of the EP2002® system with the Train Management System and also the management of the whole train braking effort, including the Dynamic Brake.

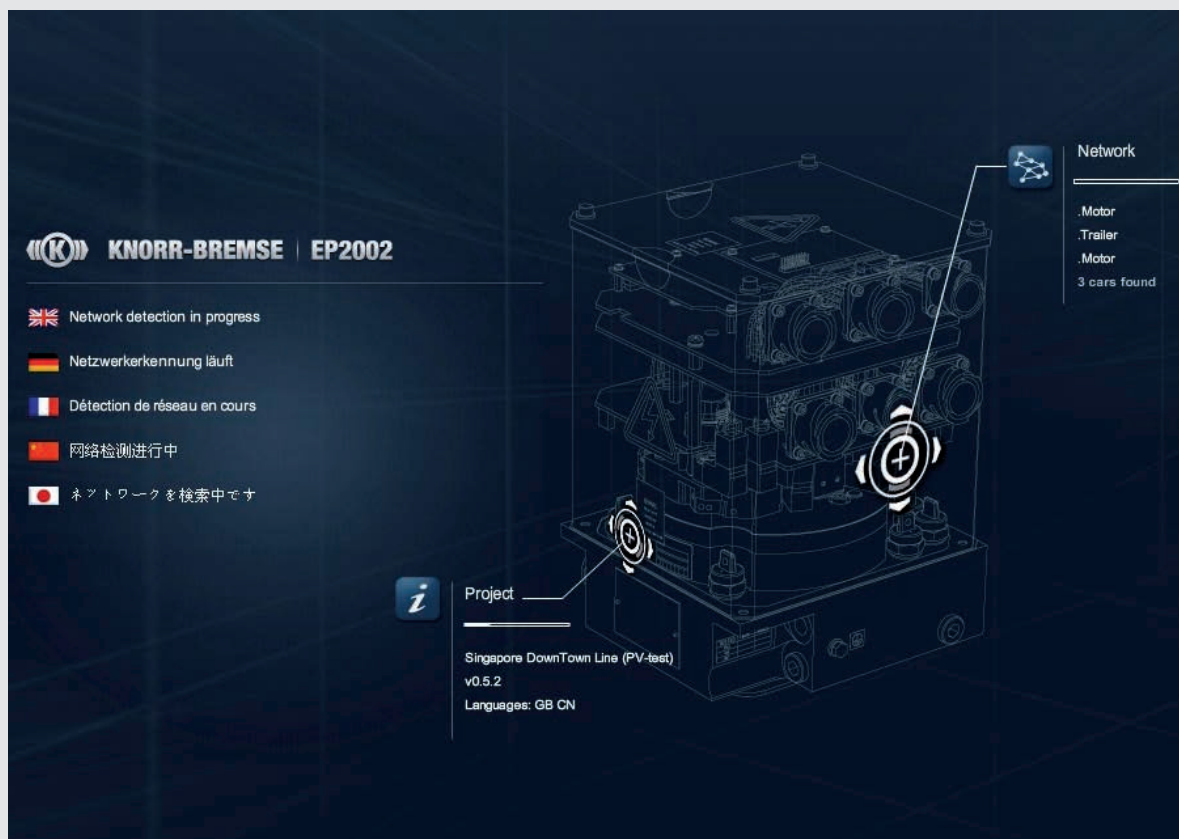


### **EP2002® RIO VALVE**

Delivers all of the functions of the EP2002® Smart valve but with additional interfaces to wired train lines (analogue and digital).

The network of communication required between the EP2002® Gateway and EP2002® Smart valve is provided by a dedicated Brake-bus. Each EP2002® Smart valve provides service brake control in accordance with demands, distributed by the EP2002® Gateway valve.

## EP2002® DISTRIBUTED BRAKE CONTROL



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## EP2002® BRAKES CONSULTANT SOFTWARE. COMPATIBLE INTEGRATED DIAGNOSTIC SOFTWARE.

Knorr-Bremse EP2002® Brakes Consultant is a Compatible Integrated Diagnostic Software product package which uses clear on-screen graphics. The package contains software developed specifically to facilitate the interrogation of the EP2002® systems and allows integration maintenance procedure diagnosis to take place trackside.

The EP2002® Brakes Consultant is sold as a complete package and contains the bespoke software, PC interface adaptor and leads needed to install the software “tool” and use it straight “out of the box.”

The software is easy to install and use and allows an “inside view” into how each EP2002® valve is performing.



EP2002® was developed in response to the increasing demands being made on urban mass transit systems – including driverless operation.

### LOWER COST, HIGHER PERFORMANCE

EP2002® combines mechanical and electronic elements into a single compact unit. Compared to conventional technology the same high safety standards are maintained, but it is more economical to operate, requires less space, is lighter and its decentralized layout improves system performance.

### CERTIFICATION DURING DEVELOPMENT

During the five-year development process, regular safety audits and reviews were carried out on all the hardware and software involved, with the main focus on detailed safety analysis and extensive reliability testing. The system was repeatedly subjected to comprehensive testing at extreme temperatures and exposed to strong vibration and other stresses. The result is an extremely robust system with reduced life-cycle costs. The number of components has been significantly reduced and the maintenance and overhaul concept adapted to the needs of operators. Decentralized installation, close to the bogie, means reduced piping requirements and improved pneumatic performance, with shorter brake reaction times.





## EP2002® IMPLEMENTS THE FOLLOWING SAFETY DESIGN PRINCIPLES:

- Network of connected EP2002® units forms a system based on an inherent fail-safety and redundancy
- Comparison of the brake calculation results of different EP2002® units
- Independence of software functions between brake management and brake control
- "Watch-dog" for all micro-processors
- Protection against over-voltage and under-voltage
- Memory management unit for protection of WSP memory area
- Self-tests executed at start-up of the system
- Running tests to monitor all safety functions
- Comparison of speed signals between smart valves to detect faulty tachometers
- Safety critical data sent via the CAN-bus protected by a safety protocol to EN50159-1

## 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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