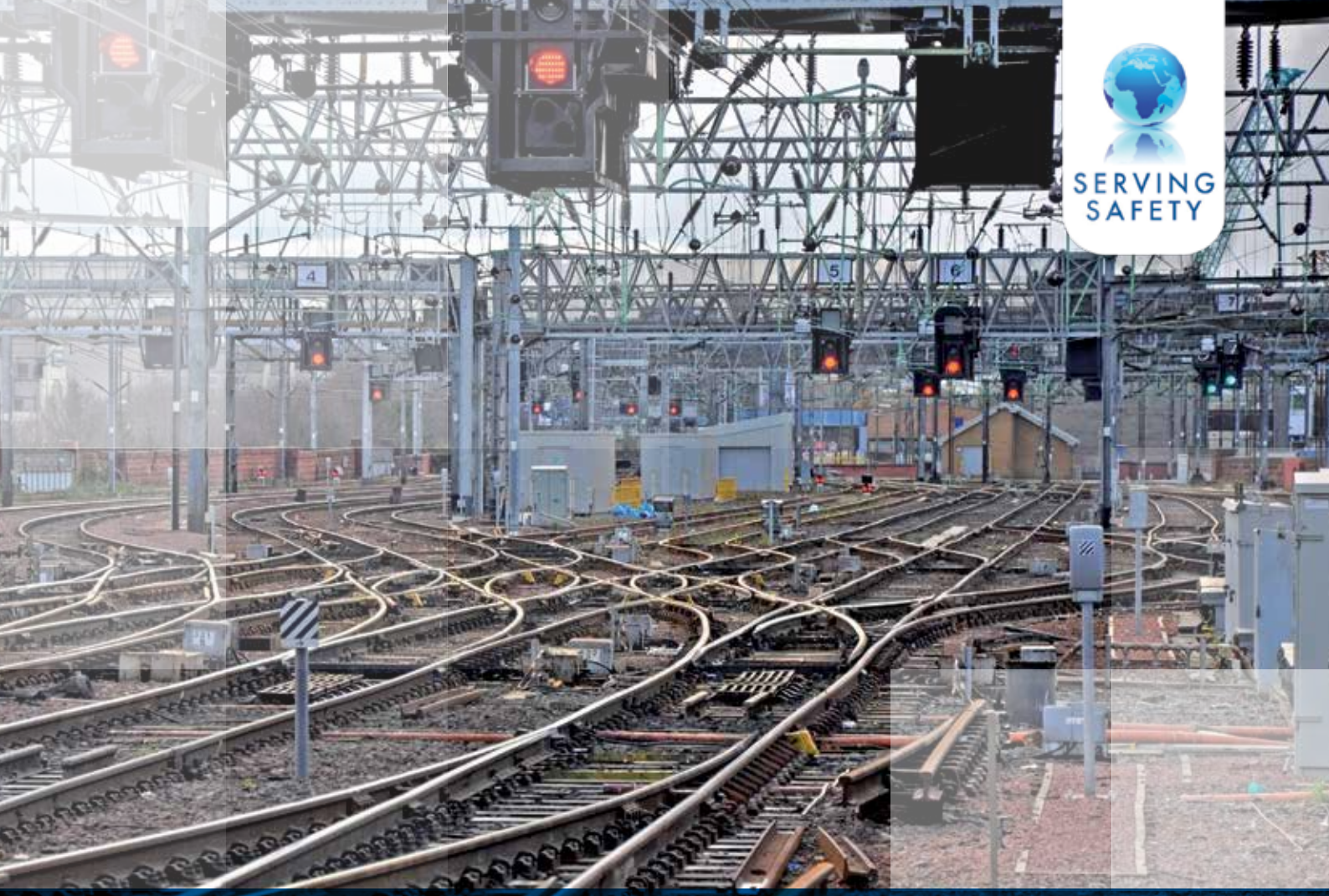


SERVING SAFETY

Mors Smitt Railway Technology

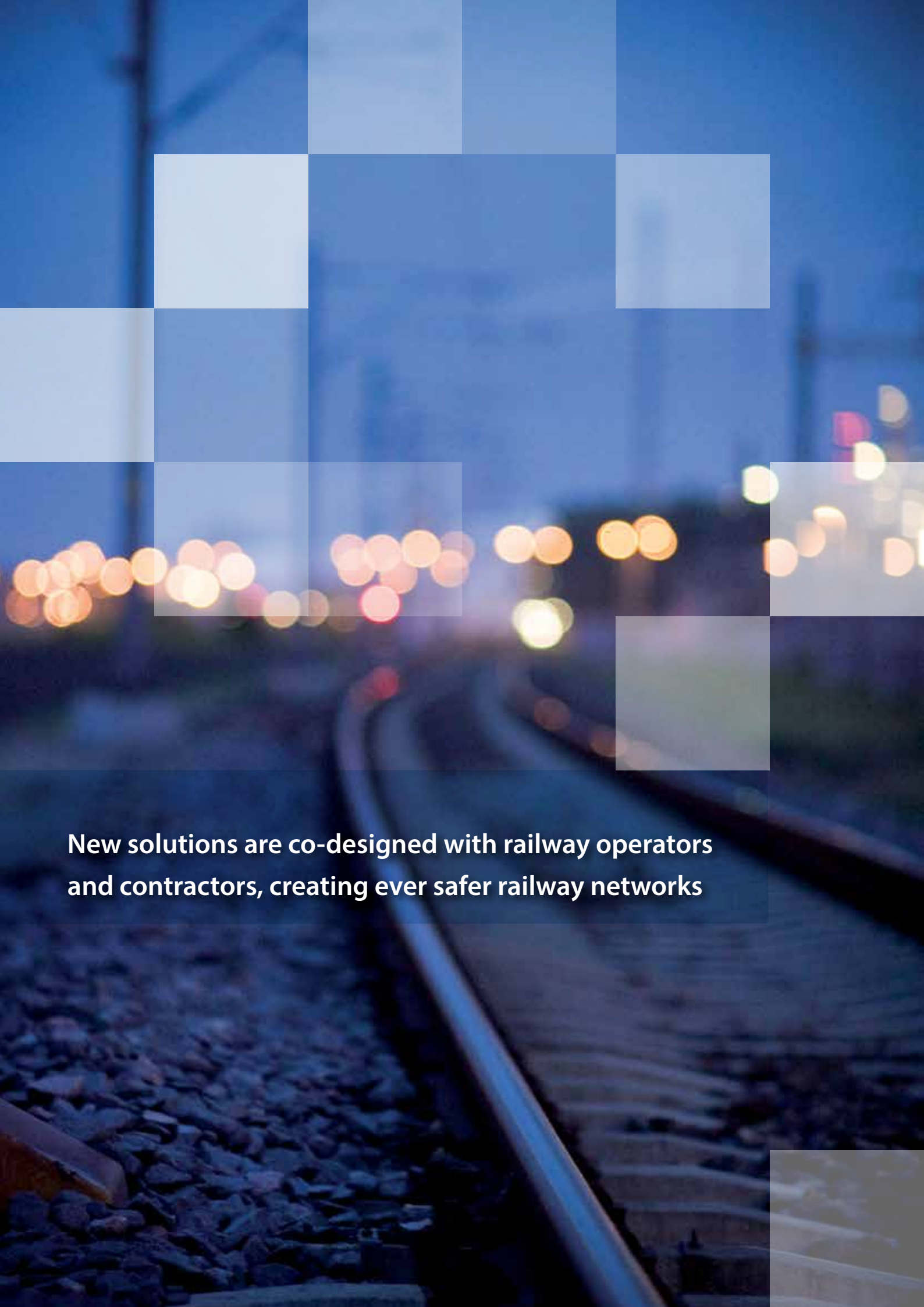
Signalling & rail infrastructure

Safety . Reliability

Mors Smitt
A Wabtec Company

Mors Smitt Railway Technology

Signalling & rail infrastructure



New solutions are co-designed with railway operators and contractors, creating ever safer railway networks

Introduction

SERVING SAFETY

Mors Smitt is a leading designer and manufacturer electro-mechanical components (e.g. relays, circuit breakers and transducers) and form, fit & function electrical control panels designed according to international railway standards.

Signalling & rail infrastructure market

The extensive knowledge build up in the rolling stock market is nowadays used in the signalling & rail infrastructure market by supplying relays and customer specific test and measuring equipment. Due to increasing performance requirements of railway lines and the need for modernisation and replacement of obsolete parts, more and more rail infrastructure managers all over the world use our economical and proven reliable relay technology for signalling and control applications.

Our offer comprises:

- Signalling relays
- Safety critical relays
- Protection components
- Retrofit / replacement solutions
- Maintenance & test equipment

Not just our products and services but also our production sites are focused on environmental performance improvements by certification according to the IRIS, ISO9001:2008 and ISO14001.

Safety. Reliability. Mors Smitt.

BUREAU VERITAS 1828

IRIS Certification

Signalling relays

Mors Smitt is an authority when it comes to signalling relays. We have inhouse expertise and manufacturing of various standards used in several networks:

- B-style relays (Netherlands, US)
- N.S1 relays (French standard SNCF)
- Q-style relay (British Rail Standard BR930)

Currently hunderds of relay designs are being manufactured meeting the strict requirements of railway operators. Mors Smitt can either manufacture new relays or provide a comprehensive refurbishment & repair service for existing units with re-certification.

Repair, retrofitting, maintaining, testing and re-calibration of signalling relays according to original factory specifications is part of our activity.

Mors Smitt also has extensive design capabilities enabling other relay versions & types to be developed and manufactured upon request, like special lamp proofing relays.

B-style relay

N.S1-style relay

Q-style relay

SERVING SAFETY

Our production capacity of signalling relays is flexible and responsive. Supply against low or high volumes orders is equal.

Product quality is guaranteed by using the latest technology production equipment, well trained, dedicated and experienced staff, end-of-line testcomputers assuring compliancy to specific railway standards.

'Quality and safety are the drivers of our thinking and doing'

N.S1 relays

N.S1 signalling and vital relays are a consistent, adaptable range of relays with plug-in connection, small size, modular construction, low power consumption, compliance to French and SNCF standards, conformity to UIC recommendation, Ag / Ag CdO contacts and 24 V standard voltage.

Line relay

Point operating relay

Post relay

See our brochure 'Signalling and vital relays N.S1' for more detailed information on www.morssmitt.com.

BR930 relays

BR930 relays are of modular plug-in design. Interlocking of the relay and plugboard is achieved by a pin code registration system which ensures that only those relays having the same pin code as the plugboard can be interchanged.

The contact arrangement for each relay is as specified in the relevant BR standard and up to 16 pairs of contacts can be accommodated in the same housing. Contact pairs typically consist of a domed silver tip, mating with a flat, silver/carbon tip and all contacts are in compliance with BR specifications.

See our brochure 'Signalling relays BR930' for more detailed information on www.morssmitt.com.

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GRS type B1 & B2 relay inhouse verification

Contact operation, detection and adjustment

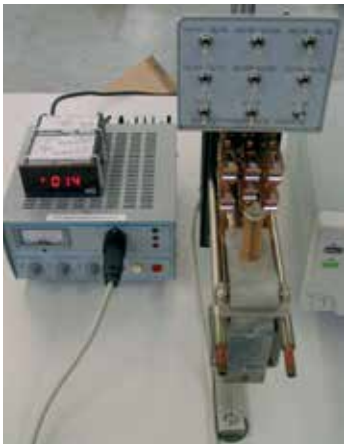
Special calibration tools have been developed to check the operation of the N/O and N/C contacts. The contact operation are visualised by LED's to be able to calibrate the contacts and guarantee proper operation of each contact.

Calibration of slow pick-up and slow release B1 relay

Calibration of B2 code transmitter

Calibration of B2 vane relay

Contact pressure measurement
The contact pressure is measured mechanically, evaluated and adjusted to guarantee the quality of the electrical connection.



Contact resistance measurement
The resistance is measured electrically, to determine the contact has to be cleaned or replaced.

Contact cleaning
Cleaning allows a better inspection of the contact and reduces the resistance.

Before After

GRS type B1 & B2 relay inhouse testing

Testing

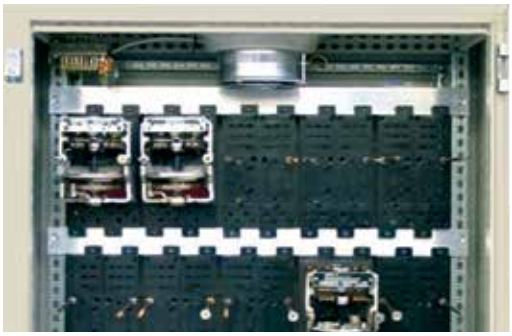
Dutch Railways has certified Mors Smitt as Red Label Expert on B1/B2 type relays.

High voltage insulation test

Each relay is submitted to a high voltage insulation test to check the insulation properties of the relay. Degraded coils, wiring and bases van be detected and replaced.

Pick-up and drop-away test

To inspect the calibration the pick-up (voltage and current) and drop-away values are measured. Also the resistance of the coil is determined to be within the tolerances. If not, the coil will be replaced.



Operational simulation test

An operational test of 24 hours is performed to guarantee the quality of the relay after the revision. After the test the relay is re-checked again to meet the required specification.

Safety-critical relays

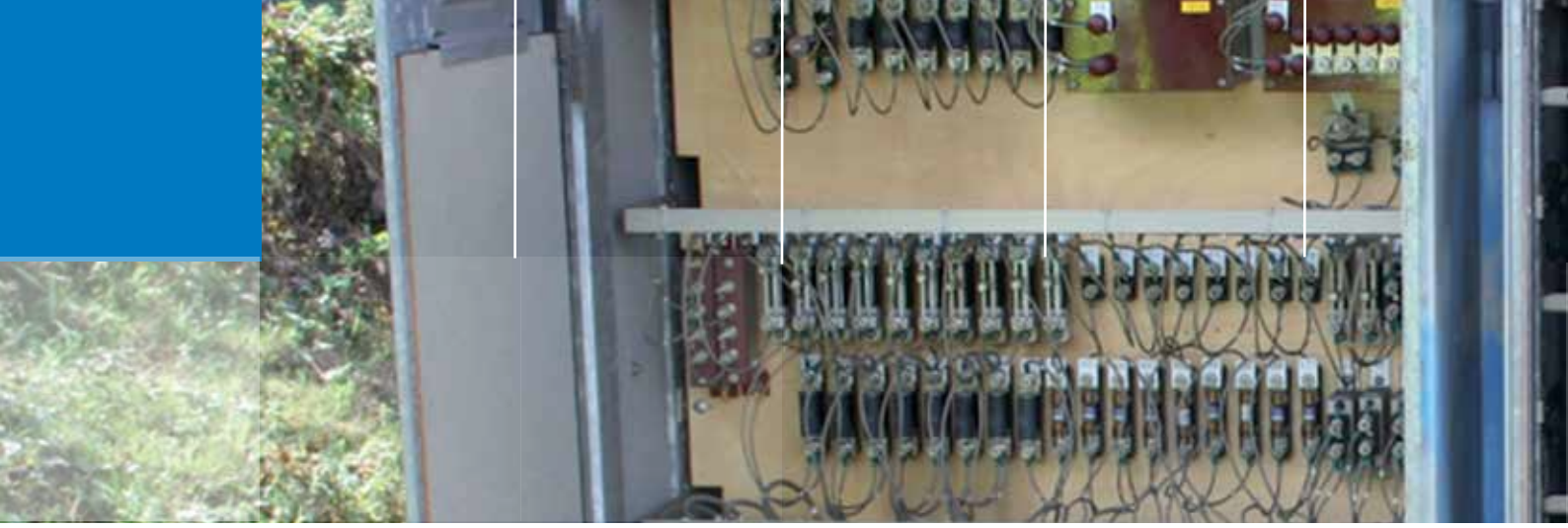
The safety-critical relay portfolio comes from safety rolling stock applications such as automatic braking units (ATB) or automatic train operating systems (ATO). There is an increasing interest to use this proven technology in trackside signalling applications because it is space saving and very economic.

There are four groups: general purpose relays, semi-vital relays, safety-critical relays and vital relays. Unique relay features such as spring enchanced gravity function in combination with 'non-weldable' double make - double break contacts and weld-no-transfer function ensures compliance with the highest safety demands.

The design criteria for rolling stock safety-critical relays are severe DC voltage switching with inductive loads (8 - 12 A at 110 - 125 VDC, L/R = 40ms), long life = 100 million operations, extremely high MTBF values, compact size, working temperature -40 °C...+80 °C and resistant to highly humid and corrosive environments.

Main advantages of safety-critical relays:

- Significant cost saving: less space needed, compact and simple installation
- No maintenance
- Compliant to all relevant international railway standards
- Long term availability & international support
- Insensitive against EMI & electrical disturbance



Retrofit and replacement solutions

Extending life expectancy by upgrading obsolete and outdated rail network installations is mandating the replacement and retrofit of obsolete components. Many authorities recognize Mors Smitt´s expertise in this field, especially for retrofit and replacement with form, fit and function compliant systems (FFF).

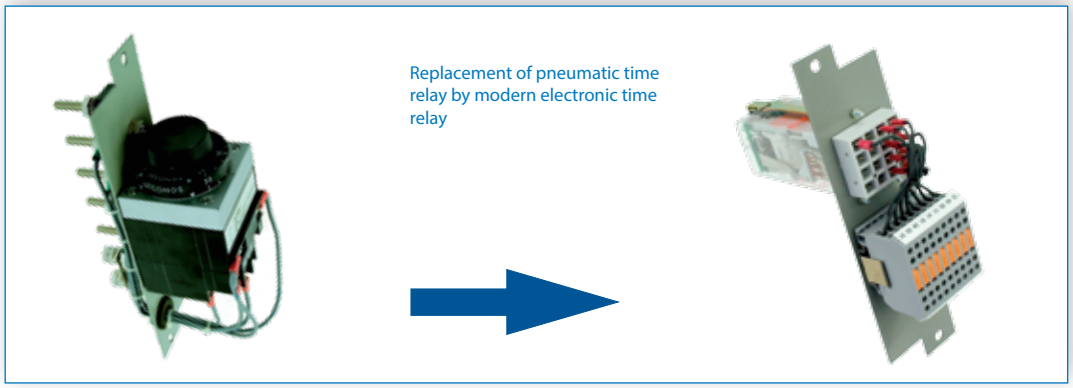
This is an area of increasing significance:

- Inhouse design and prototyping of new solutions
- Customer specific type testing and validation
- On site implementation and commissioning
- After sales support

Mors Smitt delivers perfect and competitive on time solutions for any challenge of space limitations and technical requirements.

Some examples of our replacement solutions are:

MS-TBBU-R



MS-TBBU-W

Replacement of pneumatic time relay by modern electronic time relay

ePOR

Replacing voltage monitoring relay, monitors voltage in signalling installations

MS-DU166

Solution for interface relay between industrial electronics and B relay installation

(back)

Protection components

No compromises on performance in electrical safety of installations and quality are allowed. Mors Smitt offers a wide range of protection components for specific customer applications with high insulation, high accuracy, no auxiliary supply needed and maintenance free.

High voltage and current protection relays

Designed to measure and protect high voltage & high current circuits e.g. catenary voltage detection, overload, third rail voltage, ground fault detection.

Hall effect sensors

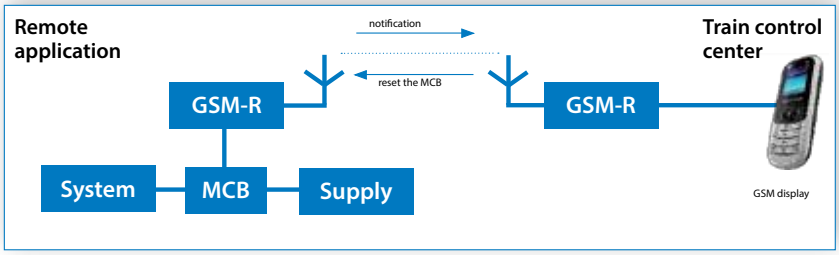
A new range of sensors based on closed loop hall effect technology, for measuring and monitoring of e.g. secondary transformer overload or shortcircuit detection, DC link from ground fault and overload, motor overload.

Hydraulic magnetic circuit breakers

A wide range of standard, ground fault and remote operated circuit breakers is available.

Advantage of remote applications:

- Effective and economic
- Remote failure indication
- Saving time
- No unnecessa-



Maintenance & test equipment

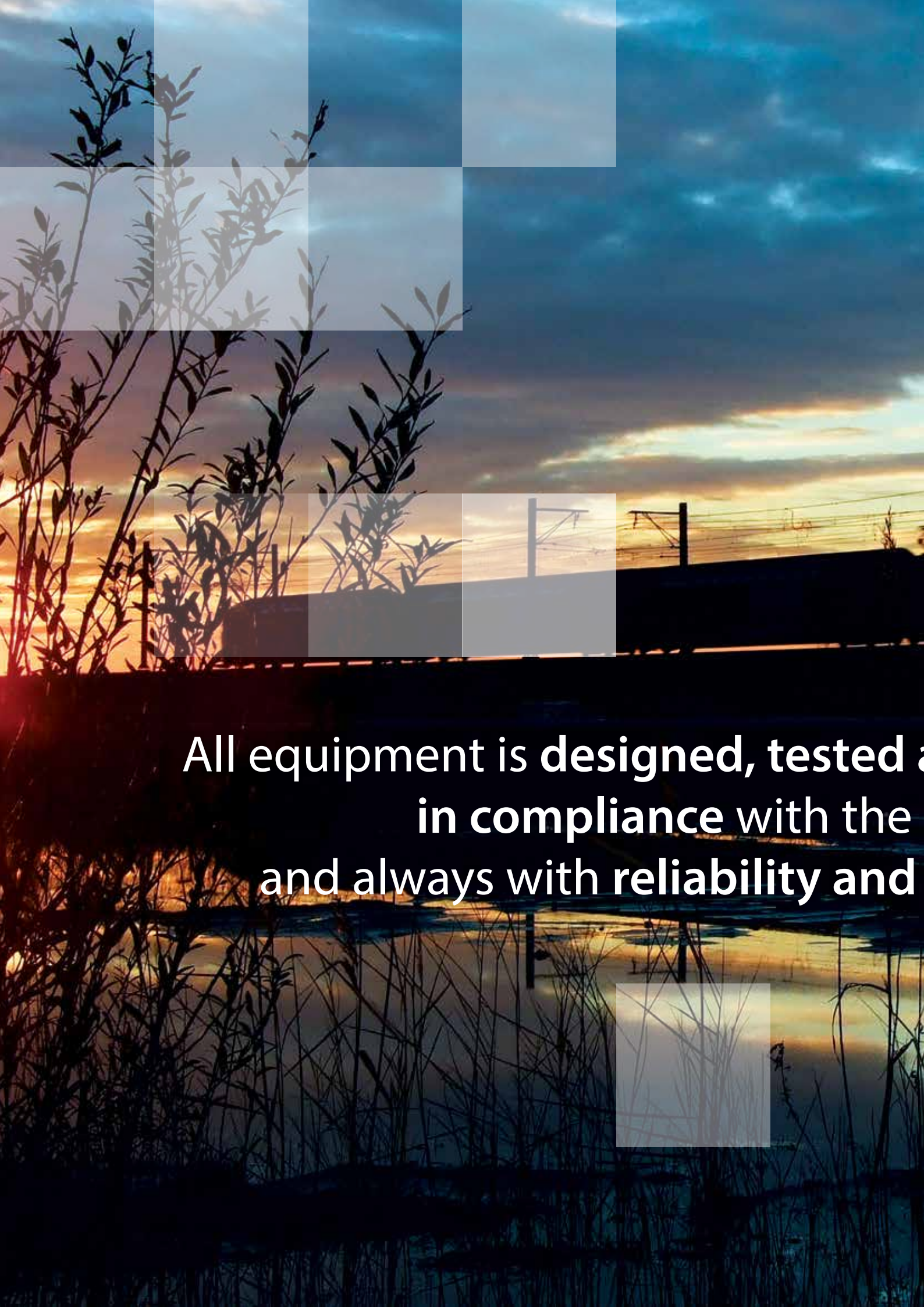
Mors Smitt has extensive experience with electrical test and measuring equipment in different markets. Over the years many customer specific railway solutions have been introduced. From specification to drawing, from design to manufacturing, Mors Smitt masters all elements of the development process.

Safety testers

- Selfdetecting shuntbar (ZKL II) - Ensures the safe blocking of track sections to protect railroad workers
- B2 Vane torque meter - Adjusts the current in a track section of a railway line in order to achieve a correct detection of trains in that section
- Selective voltage tester - Measures the voltage and current of a specific frequency
- Rail insulation test - Checks the insulation resistance between two different track sections

Calibration of safety testers

Test equipment for safety functions has to fulfill their specifications under all circumstances. According railway regulations yearly calibration is essential to guarantee faultless functionality. Mors Smitt has the experience and capability to offer various calibration services for your test equipment.



All equipment is **designed, tested a**
in compliance with the
and always with **reliability and**


SERVING
SAFETY
and manufactured
strictest international standards
safety in the front of our mind

SERVING SAFETY

Mors Smitt Railway Technology

Signalling & rail infrastructure

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