Mors Smitt Railway Technology

Protection components

Protection relays • Hall effect sensors

Mors Smitt
A Wabtec Company

SERVING SAFETY

Mors Smitt Railway Technology

Protection components

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

Railway protection

In the international railway sector the main focus of performance, reliability & priority is given to the protection of rolling stock electrical equipment and infrastructure electrical installations ensuring no compromises for the safety of passengers.

Harsh environments such as extreme operating temperature, damp heat, vibration and shocks, fire and smoke standards, critical and safe operation of power equipment, braking and electrical distribution require high quality standard electrical protection devices.

Protection relays

Mors Smitt maintenance and supply free protection relays offer stand-alone current and voltage monitoring for traction equipment as well as infrastructure. They are used for applications like voltage catenary, short circuit, overload and ground fault detection in traction power electronics or railway substations.

Hall effect sensors

Mors Smitt hall effect closed loop sensors ensure high accuracy of voltage and current measuring in traction or substations power equipments for a full protection of the power equipment against power surges, overload, ground faut detection.

Our experience

Mors Smitt offers customizable protection solutions, enhancing the safety and the performance of rail transportation. Not just our products and services but also our production sites are focused on environmental performance improvements by certifications according to the IRIS, ISO 9001:2008 and ISO 14001 standards.

The company strategy for the future is based upon further responsible development and expansion of it's high quality components, responding to tomorrow's needs in the many current sectors it serves. It is based upon putting the skills and talents of it's staff to work for company, clients and mankind. Keeping that part of the world's operation for which it plays a role, working successfully, without question and without failure.

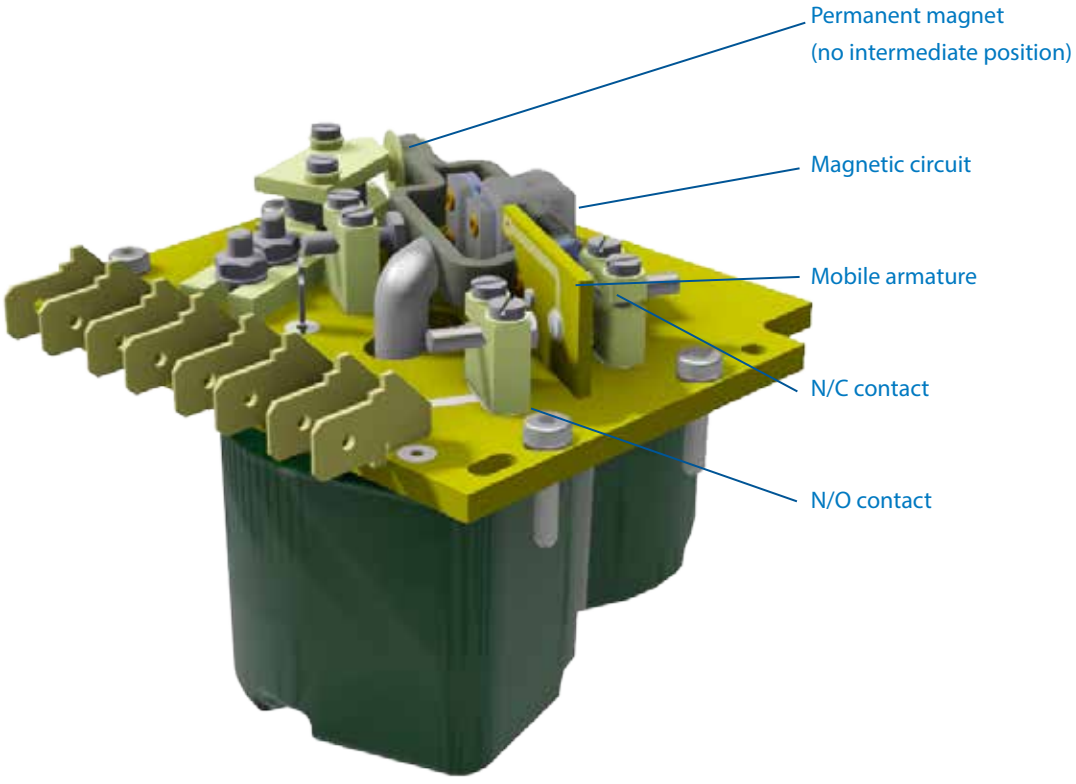
Safety functions. Reliability. Mors Smitt.

Voltage and current protection relays

Principle

With over 20 years experience in measurement for railway equipment, Mors Smitt has designed and manufactured detection and protection relays for railway onboard and trackside applications of currents, voltages and differential currents monitoring. PRA (current protection relays) and PRV (voltage protection relays) require no auxiliary power supply and provide commonly 1N/O +1N/C output relay contact.

Mors Smitt protection relays operate on an electromechanical magnetic circuit principle. Primary current or voltage create in the magnetic circuit a flux. A permanent magnet creates an opposite flux maintaining the contacts in rest position. As soon as the primary magnetic circuit flux is higher than the permanent magnet flux, the relay contacts trip. Adjustment of the position of the permanent magnet allows adjustment of the pick up value from 30% to 125 % of nominal value and adjustable drop out from 40% to 85% of pick-up value. Time delay can also be provided as an option. The mobile armature pivots without friction providing reliable operation and the permanent magnet ensures fast switching without intermediate position.



Relay non energized

Advantages

- This technology allows all current or voltage waveforms: direct, alternating and impulse currents or voltages
- No auxiliary supply needed, stand alone unit required for safety application
- High galvanic isolation up to 12 kV
- High reliability and robustness, no friction of mobile armature, maintenance free device.
- Extreme high speed response
- Strong ability to withstand high overloads due to its magnetic circuit materials
- Adaptable to specific customer applications
- Operating temperature -50 °C...+85°C

Applications

- Voltage: minimum, maximum, interval monitoring, differential voltage.
- Current: minimum, maximum, differential monitoring.

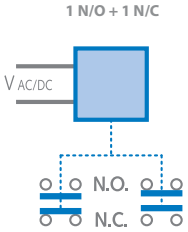
Traction main converters, auxiliary converters (lighting, air conditioning), battery chargers, power electronics, railway substations.

Product range

PRV - Voltage protection relays

100 V

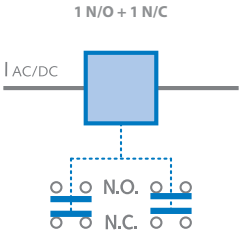
3000 VAC/DC



PRA - Current protection relays

20 mA

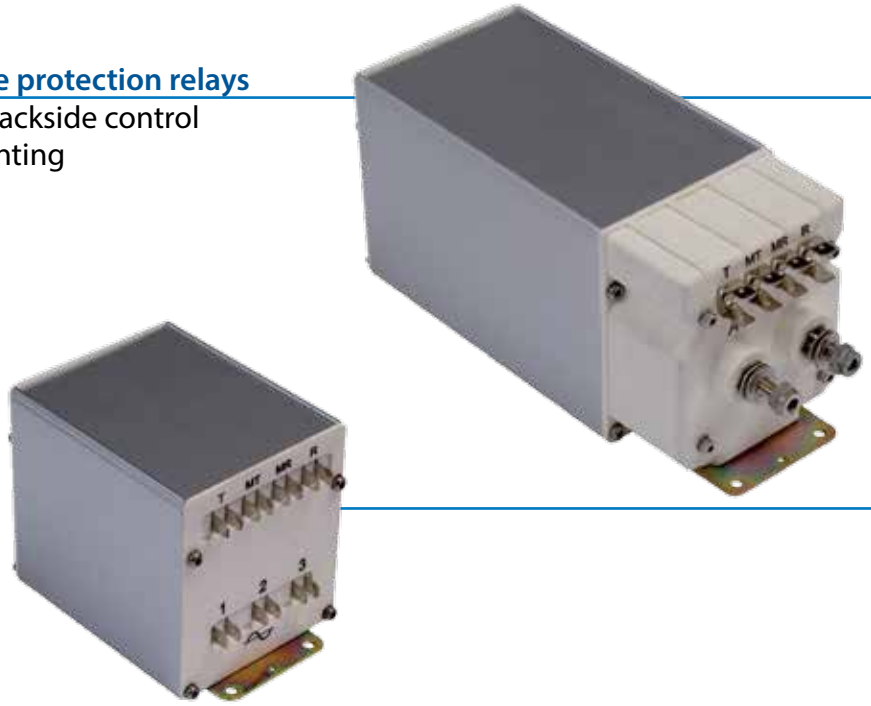
18000 AAC/DC



Product range

PRV - Voltage protection relays

Onboard & trackside control
cabinet mounting



PRA - Current protection relays

Onboard & trackside control
cabinet mounting

Functions

The relays provide under, over, interval, differential voltage and current monitoring for the following applications:

- Catenary voltage detection
- Overload, second side transformer short-circuit detection
- Battery load shedding and charging current monitoring
- 3 Phase motor pump and fan protection against phase loss, unbalance
- Current monitoring in magnetic brake
- Ground fault detection in the traction power equipment

High galvanic insulation

PRA and PRV relays withstand high overloads due to a very magnetic circuit materials and offer a high galvanic insulation up to 12 kV.

Stand-alone

Protection relays are self powered from measuring circuit and do not require any auxiliary supply ensuring protection continuity required for safety application.

High reliability

Their technology is electromechanical, based on magnetic field tripping without friction of mobile armature. They offer extreme high speed response and withstand extreme temperatures -50 °C...+85 °C. 1 N/C + 1N/O output contacts are weld no transfer with rating a mechanical life of 100 million of operations.

Maintenance free

Current and voltage protection relays are chassis or copper busbar mounted, in any positions. They do not required any specific maintenance.

Overview

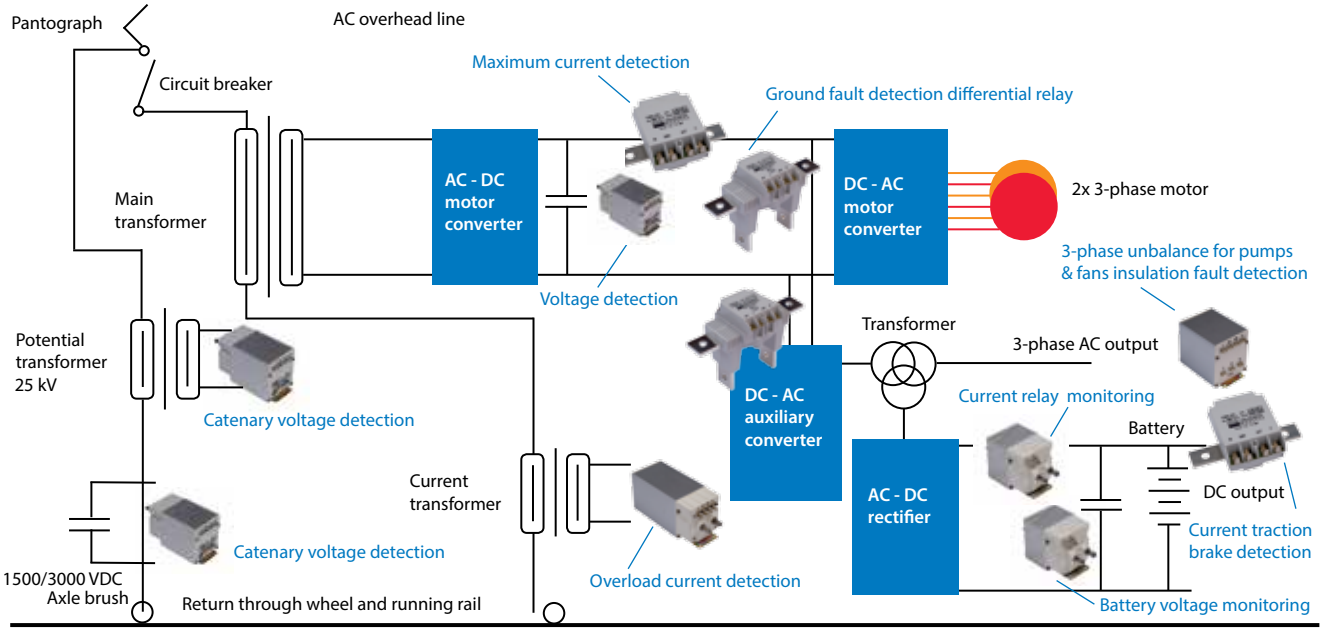
Common technical characteristics

	 PRV	 PRA	 PRA (differential)
Voltage measuring	100 V - 3000 VAC/DC		
Current measuring		1 A - 6 kAAC/DC	1 A - 6 kAAC/DC
Typical output[1]	1 N/O + 1 N/C	1 N/O + 1 N/C	1 N/O + 1 N/C
Accuracy	5%	5%	5%
Dielectric strength	up to12 kV	up to12 kV	up to12 kV
Operating temperature	-50 °C...+85 °C	-50 °C...+85 °C	-50 °C...+85 °C
Connection terminals[2]	Faston, M5	Busbar, Faston, M6	Busbar, Faston, M6
Monitoring functions	Min. voltage Max. voltage Interval voltage Differential voltage	Min. current Max. current	Differential current

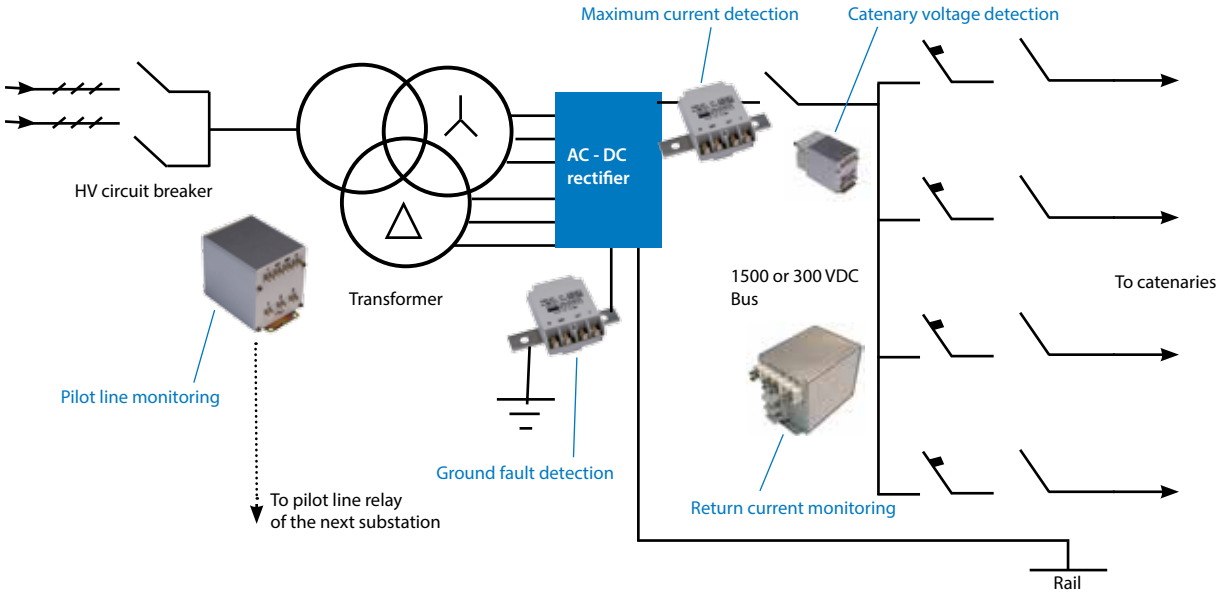
[1] other outputs on request

[2] more terminals on request

Example:
Onboard schematic of Mors Smitt protection relays in a self propelled car



Example:
Trackside schematic of Mors Smitt protection relays in a catenary distribution post



Closed loop voltage and current sensors

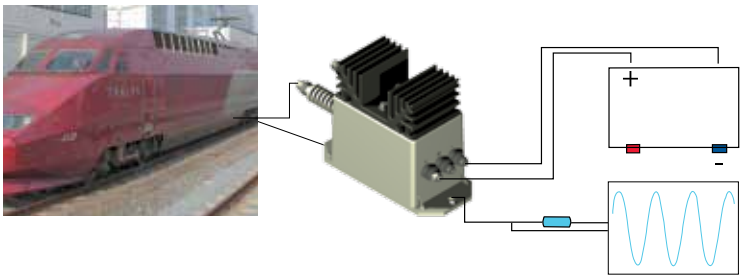
Principle

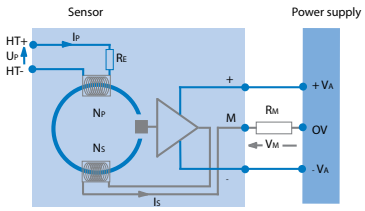
With over 20 years experience in measurement for railway equipment, Mors Smitt has developed a new range of sensors based on closed loop hall effect technology. They allow for the measurement of all current waveforms, with high galvanic insulation between the primary and secondary circuits.

The hall effect probe placed in the air gap of the magnetic circuit provide a voltage proportional to this flux. The electronic circuit amplify the signal from the primary current Ip or voltage Up flowing across the sensor and generates a current into the secondary Is.

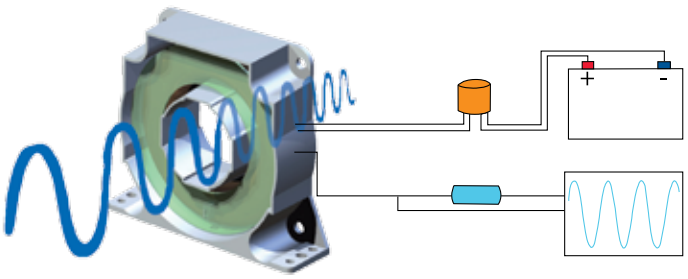
The secondary output current Is is exactly proportional to the primary current and can be passed through a measuring resistance Rm. The measuring voltage Vm at the terminals of this resistance is therefore proportional to the primary current Ip.

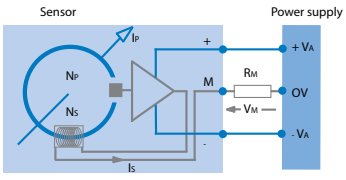
Voltage sensor





Current sensor





Advantages

- This technology allows all current or voltage waveforms: direct, alternating and impulse currents or voltages
- Accuracy from 1% of up to 0.5% over a large frequency range (from direct to more than 100 kHz)
- High galvanic isolation up to 10 kV
- Excellent linearity across a wide operating temperature of -50 °C...+85 °C
- High reliability and overload capacities

Applications

- Voltage measuring: catenary, secondary transformer and power electronics sufficient voltage monitoring for traction, track side voltage monitoring.
- Current measuring: secondary transformer, DC link power electronics overload monitoring and short circuit detection for traction and railway substations.
- Traction main converters, auxiliary converters (lighting, air conditioning), battery chargers, power electronics, railway substations.

Product range

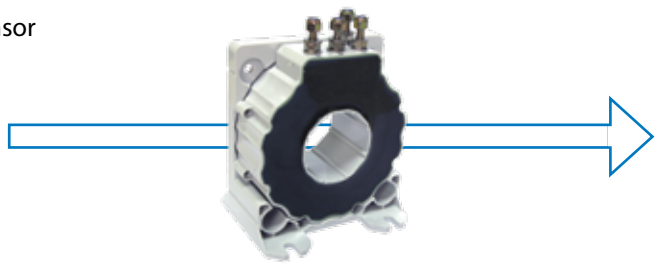
Voltage sensor

100 V

5000 VAC/DC

Current sensor

50 A



2000 AAC/DC

Product range

MSV Electronic voltage sensors

MSV100 - up to 950 VAC/DC
MSV200 - up to 5000 VAC/DC

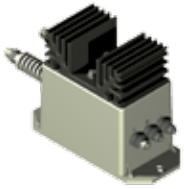
MSA Hall effect current sensors

MSA100 - up to 100 A
MSA200 - up to 200 A
MSA300 - up to 300 A
MSA500 - up to 500 A
MSA1000 - up to 1000 A
MSA2000 - up to 2000 A

MSA2010 Eliptic current sensor

Up to 2000 A, accepts 10 x 1000 mm busbar direct for easy mounting and installation, cost saving.

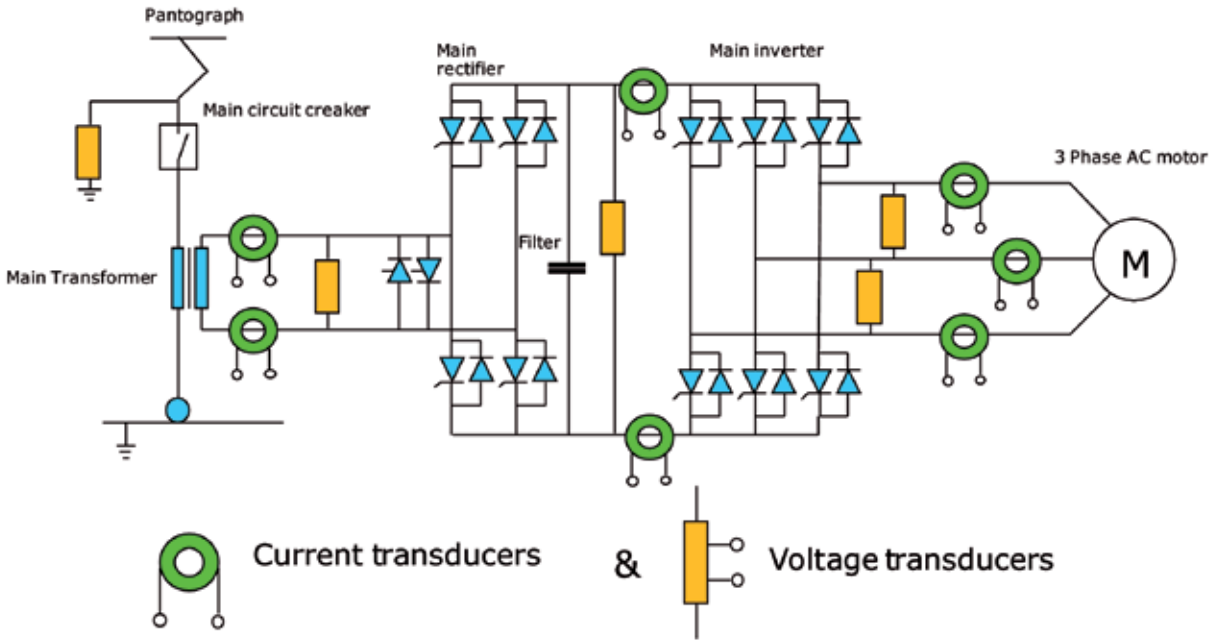
Common technical characteristics

	 MSV	 MSA
Standard rating V	1000 / 2000 / 3000 / 4000 / 5000 V	
Standard rating A		100 / 200 / 300 / 500 / 1000 / 2000 A
Typical output[1]	50mA	50 to 500 mA
Auxiliary supply	± 15...24 VDC	± 15...24V DC
Accuracy	0.7	0.5
Dielectric strength	up to 10 kV	up to 12 kV
Operating temperature range	-50 °C ... +85 °C	-50 °C ... +85 °C
Terminals[2]	M5	M5

[1] other outputs on request
[2] other terminals on request

Applications

Application example



Measuring and monitoring of:

- Secondary transformer overload of shortcircuit detection
- DC link form ground fault and overload
- Motor overload
- Traction current

Measuring of:

- Catenary voltage
- Secondary transformer for sufficient traction power
- DC link volrage to protect power electronics

Measuring and monitoring of:

- Phase loss or unbalanced to protect 3 phase motors

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SALES OFFICES

FRANCE
Mors Smitt France SAS
Tour Rosny 2, Avenue du Genéral de Gaulle,
F - 93118 Rosny-sous-Bois Cedex, France
T +33 (0) 1 4812 1440
F +33 (0) 1 4855 9001
E sales.msf@wabtec.com

HONG KONG
Mors Smitt Asia Ltd.
29/F., Fun Tower, 35 Hung To Road
Kwun Tong, Kowloon, Hong Kong SAR
T +852 2343 5555
F +852 2343 6555
E sales.msa@wabtec.com

THE NETHERLANDS
Mors Smitt B.V.
Vrieslantlaan 6
3526 AA Utrecht, The Netherlands
T +31 (0)30 288 1311
F +31 (0)30 289 8816
E sales.msbv@wabtec.com

UNITED KINGDOM
Mors Smitt UK Ltd.
Graycar Business Park
Barton under Needwood, Burton on Trent
Staffordshire, DE13 8 EN, United Kingdom
T +44 (0)1283 722 650
F +44 (0)1283 722 651
E sales.msuk@wabtec.com

USA
Mors Smitt Technologies Inc.
1010 Johnson Drive
Buffalo Grove, IL 60089-6918, USA
T +1 847 777 6497
F +1 847 520 2222
E salesmst@wabtec.com

Your local contact:

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www.morssmitt.com

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