T M B – Temperature measurement in battery systems

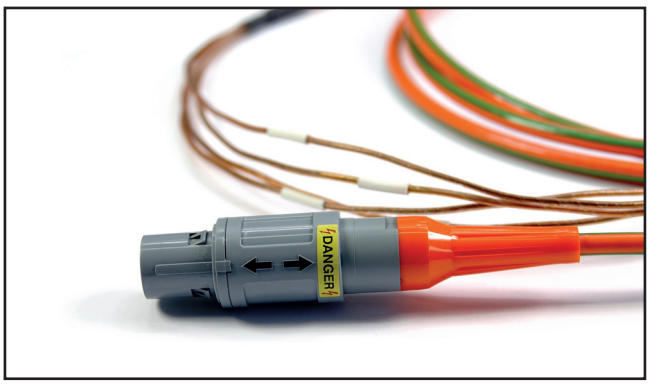
High-performance batteries in the e-mobility sector have to meet stringent requirements. Short charging times with high currents, as well as maximum capacities for large ranges when operating the vehicles are required. The provision of further components in the e-mobility sector also stretches the battery systems and other components to their limits.

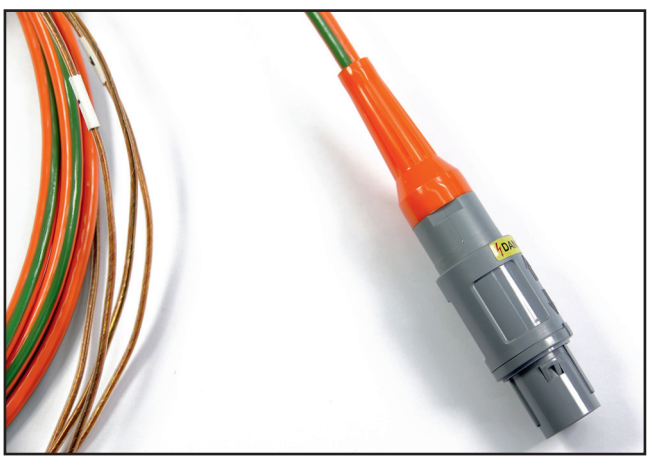
A not insignificant part of the energy provision is converted to heat, which has to be detected, monitored and regulated. Special measurement systems, which have to meet the specific safety requirements, are used in the region of development and application of modern battery systems and the associated high operating voltages.

Rössel-Messtechnik offers sensor cables which are ready for connection for measuring the temperature on high-voltage components from the e-mobility sector. Our high-voltage cables, which have been verified by the certification company, TÜV-Süd, can be directly connected to high-voltage temperature measurement modules and thus provide easy-to-use sensor technology for measurements within and outside battery components.

Each sensor cable is tested with AC and DC voltages in a high-voltage test bath by means of an established testing method. The result is recorded and documented.

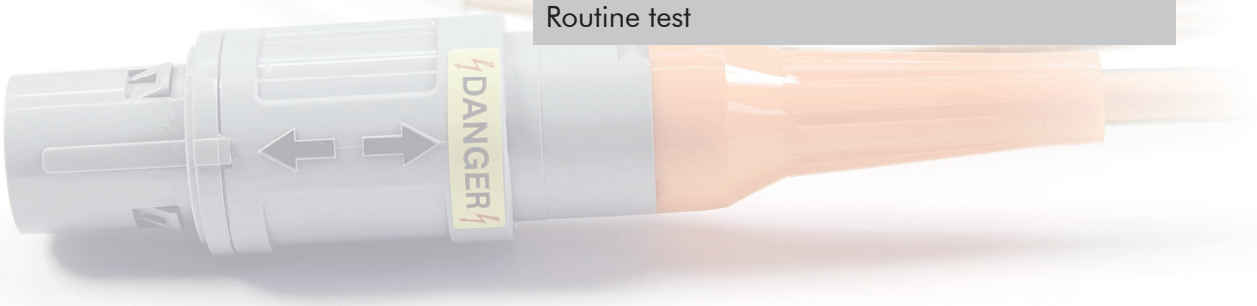
Each sensor cable is given a unique serial number so it can be traced back to the production process. Delivery is made in individually packaged and sealed PVC bags with safety instructions.

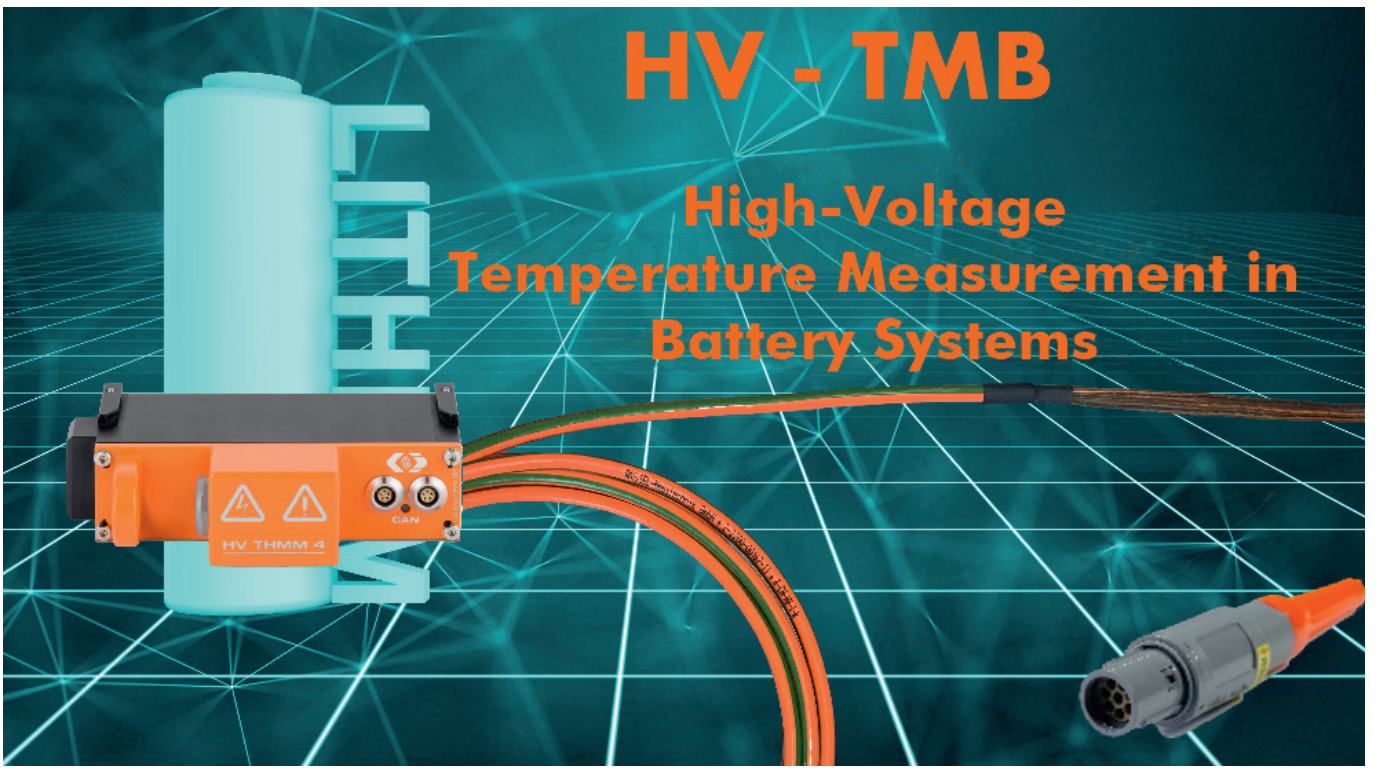




General product features

Operating temperature:	-40 to 150 °C
Dielectric strength:	3.7 kV AC and 6 kV DC
Outer sheath:	PUR
Recorded HV test	
Routine test	

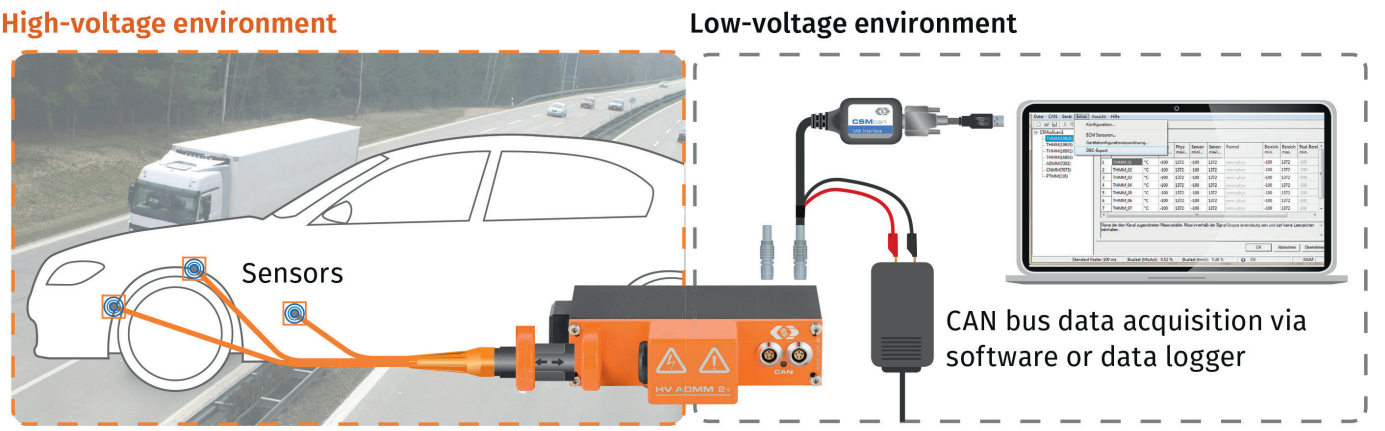




The specially developed HV cables are scoop-proof and robust. The orange-coloured outer sheath made of PUR material characterises the cables as a product for use for the high-voltage range in vehicle electrical systems. They are particularly suitable for space-saving applications with their small diameter.

As cables are frequently exposed to chafe marks on body parts, the HV cables have a blue intermediate sheath. If the blue intermediate sheath becomes visible, this indicates that the cables are no longer operationally reliable.

The special, coded and fully-insulated connection plug offers additional contact protection even if the cables are not connected to measurement modules.



Typical measurement setup in a high-voltage environment using a CSM measurement system.

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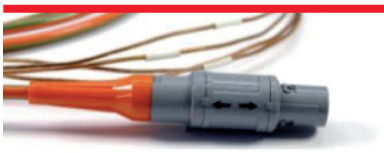


High-voltage thermocouple
type 4-CH-HV-T-K

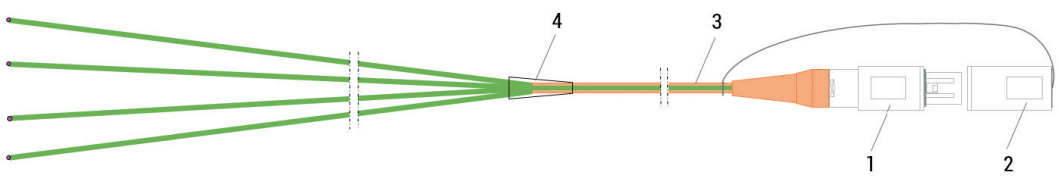
General product features

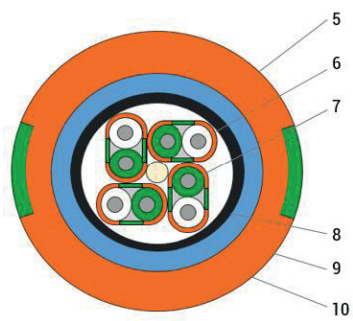
Operating temperature	-40 °C to +150 °C (3000 h)
Minimum bending radius	12 x wire diameter
Dielectric strength	3.7 kV AC and 6 kV DC
Inner sheath	FEP
Outer sheath	Polyurethane (PUR)
Version ISO	Measurement tips insulated with HST*
Version N-ISO	Measurement tips exposed 3 mm

*HST=heat shrink tube

Other versions can be delivered on request

Schematic illustration





1 Lemo 8-pin connector
2 Cap
3 High-voltage cable 4-CH-HV-T-K
4 HST black
5 Outer sheath Ø 6.1 mm
6 Thermocouples type K 2 x 0.2 mm
7 FEP wire 1.1 x 1.9 mm
8 FEP insulation thickness 0.4 mm
9 Individually insulated green(+), white(-)
10 HV-TC marking

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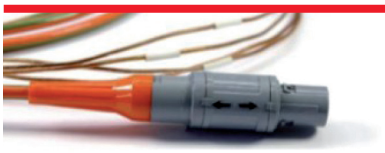


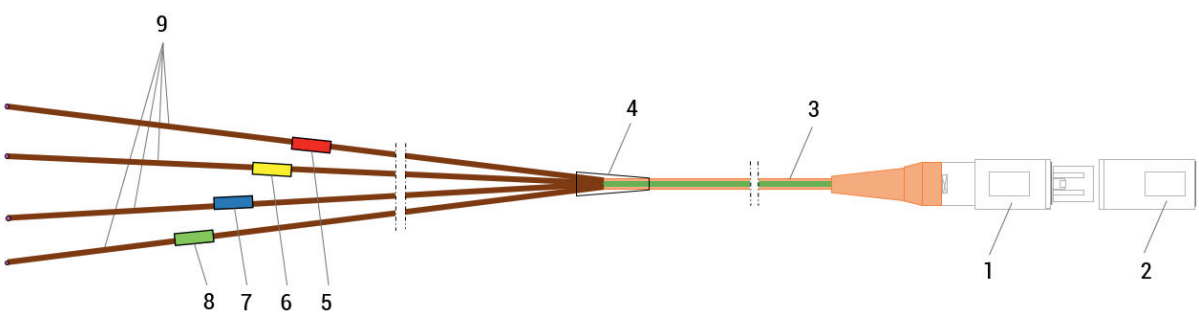
High-voltage thermocouple
type 4-CH-HV-KN-K

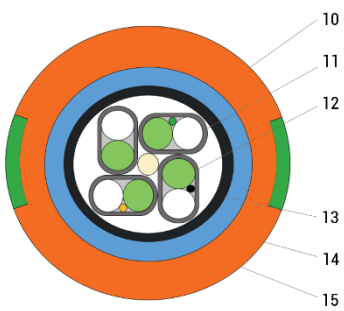
General product features

Operating temperature	-40 °C to +150 °C (3000 h)
Minimum bending radius	12 x wire diameter
Dielectric strength	3.7 kV AC and 6 kV DC
Inner sheath	FEP
Outer sheath	Polyurethane (PUR)
Version ISO	Measurement tips insulated with HST
Version N-ISO	Measurement tips exposed 3 mm

Other versions can be delivered on request

Schematic illustration





1 Lemo 8-pin connector
2 Cap
3 High-voltage cable 4-CH-HV-KN-K
4 HST black
5 HST red
6 HST yellow
7 HST blue
8 HST green
9 HST transparent
10 Outer sheath Ø 4.5 mm
11 Thermocouples type K 2 x 0.2 mm
12 Kapton wire 0.7 x 1.1 mm
13 FEP insulation thickness 0.4 mm
14 3 x coloured fibre
15 HV-TC marking

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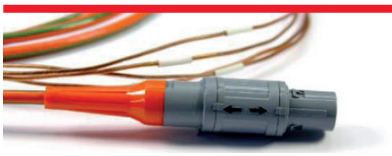


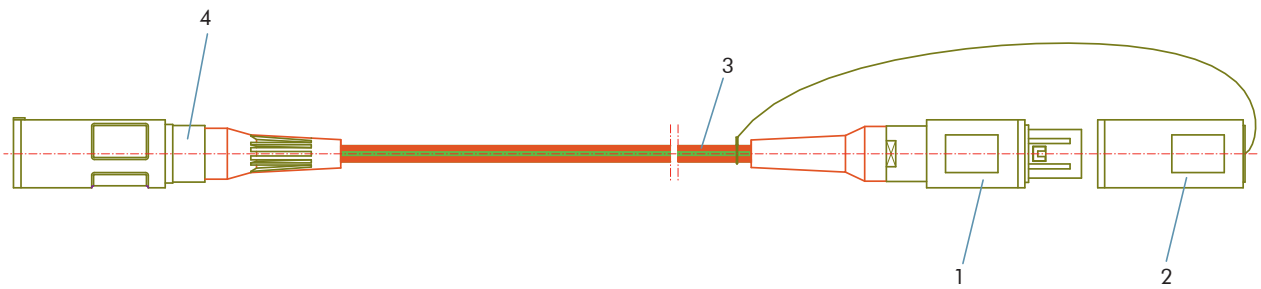
High-voltage thermo adapter
adapter type 4-CH-HV-KN-K

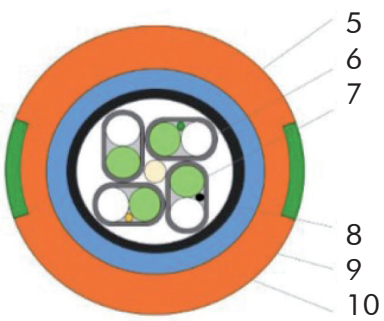
General product features

Operating temperature	-40 °C to +150 °C (3000 h)
Minimum bending radius	12 x wire diameter
Dielectric strength	3.7 kV AC and 6 kV DC
Inner sheath	FEP
Outer sheath	Polyurethane (PUR)

Other versions can be delivered on request

Schematic illustration





1 Lemo 8-pin connector
2 Cap
3 High-voltage cable 4-CH-HV-KN-K
4 Lemo coupling 8-pin
5 Outer sheath Ø 4.5 mm
6 Thermocouples type K 2 x 0.2 mm
7 Kapton wire 0.7 x 1.1 mm
8 FEP insulation thickness 0.4 mm
9 3 x coloured fibre
10 HV-TC marking

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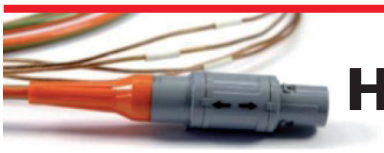


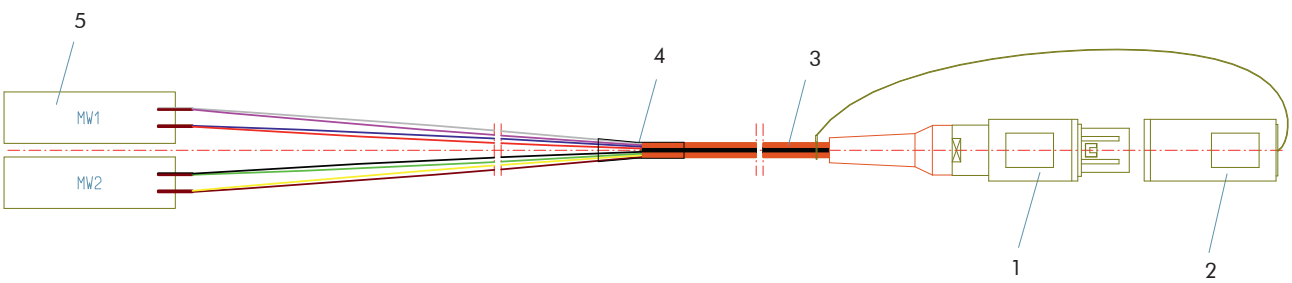
High-voltage resistance thermometer
type 2-CH-HV-T-PT

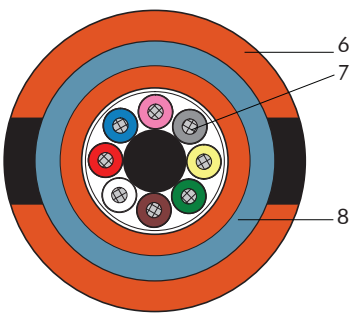
General product features

Operating temperature of wire	-40 °C to +150 °C (3000 h)
Operating temperature of sensor	-50 °C to +200 °C
Minimum bending radius	12 x wire diameter
Dielectric strength	3.7 kV AC and 6 kV DC
Inner sheath	FEP
Outer sheath	Polyurethane (PUR)
Resistor dimensions	15 x 50 x 0,3 mm

Other versions can be delivered on request

Schematic illustration





1 Lemo 8-pin connector
2 Cap
3 High-voltage cable 4-CH-HV-T-PT
4 HST black
5 Flat measuring resistor Pt100
6 Outer sheath Ø 5 mm
7 Copper wire
8 Coloured FEP marking insulation

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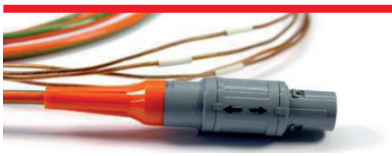


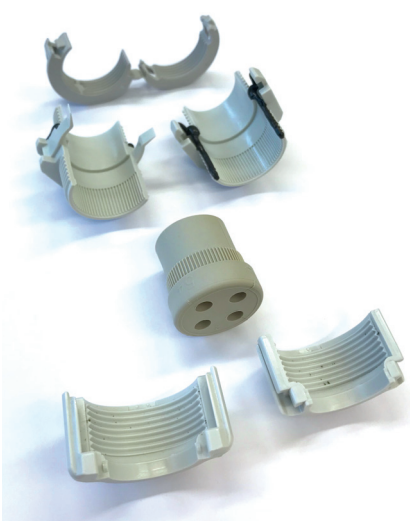
Multi-split screw connection
type TMB Multi SV

General product features

Temperature resistance	-40 °C to +135 °C
Protection type	IP 67 according to EN 60529
Material	PC, PA, TPE-V
Special features	Easy retrofitting
	integrated tension relief
	separable

Other versions can be delivered on request

Image



4-component divided through screw connection system

Can be used effortlessly even with pre-installed wiring

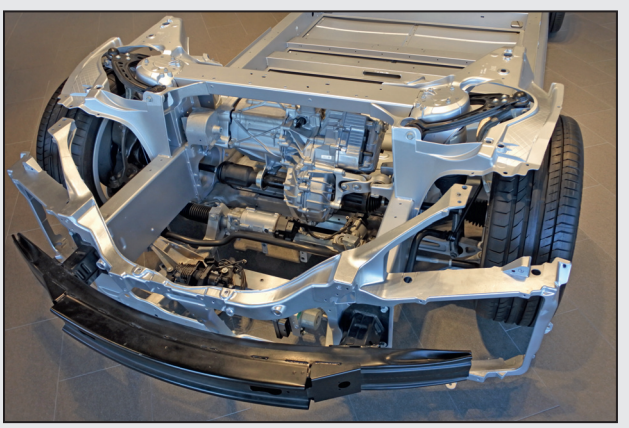
Cable passages can be plugged with bolts

Additionally with expanding pliers for simplified insertion of the cables

The drive train of e-vehicles is designed completely differently compared to vehicles with internal combustion engines. Battery systems and electric motors are main components here, but components such as power electronics, alternator, cooler and possibly transmission also play a decisive role.

Only lithium ion batteries are currently installed in e-vehicles. They are impressive on account of their long life cycle and a large energy density. Thousands of lithium ion cells are concentrated in a battery block.

The electric motor as drive element plays a central role, although the term ‘electric motor’ is not quite correct, as the drive element can also be used as a generator and is also used accordingly in the recuperation.



The power electronics control the change in voltage in driving mode and charging mode. In this case, the electronics convert the electrical energy into the voltage level and waveform necessary for each consumer. A key feature is the high-voltage vehicle electrical system via which all components are connected to one another.

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