The companies SAB BRÖCKSKES GmbH & Co. KG / CSM GmbH - Computer-Systeme-Messtechnik

Safe temperature measurement on HV components

Application example

Safe and efficient measurements in high-voltage environments

HV TH Measurement Modules

PRODUCT RANGE

- 4-channel HV temperature sensor FEP cable
- 4-channel HV temperature sensor PI cable
- HV thermo extension
- 1-channel HV temperature sensor
- HV analogue sensor cable item no. L3801-9192 / item no. L3801-9196
- HV PT100: 2, 4, 6 and 8 channels in 4-wire circuit reduced outer diameter and flat PT100 chip resistances for a comfortable installation
- 2-channel HV PT extension
- High voltage measuring cable IEPE with MicroCom-plug
- High voltage measuring cable HV measuring cable with increased contact protection
- High voltage measuring cable 1-channel with Redel-plug
- High voltage measuring cable 1-channel with laboratory plug
- Test adapter and accessories
- Accessories for HV sensors
- Besilen® - silicone cable B 110 C Besilen® insulated shielded copper rope
- Besilen® - silicone cable B 107 Besilen® insulated copper rope
- Application for high voltage measuring cables
SAB Bröckskes

FOUNDED IN 1947
by Peter Bröckskes sen.
an independent, middle sized company

CEO
Peter Bröckskes and Sabine Bröckskes-Wetten

PLANT/LOCATION
in Viersen (lower Rhine) 110,000m² company site
manufacturing from copper conductor to
outer sheath, thermocouples, resistance thermometers, cable harnessing,
own VDE approved burning chamber and laboratory

STAFF
approx. 420 in Viersen, 500 worldwide

TURNOVER
approx. 95 million € worldwide

PRODUCTS
■ special cables
■ measurement
■ cable harnessing

CERTIFICATES AND APPROVALS
quality management system acc. to ISO 9001:2015
for all production fields, environmental management
system acc. to ISO 14001:2015, occupational health
and safety management acc. to NLF/LO-OSH 2001
and OHSAS 18001:2007, energy management system
acc. to DIN EN ISO 50001:2011

CSM GmbH

FOUNDED IN 1983
by Iris Koch and Dr. Winfried Koch
as a privately held technology company

CEO
Iris Koch
Dr. Winfried Koch

PLANT/LOCATION
CSM Computer-Systeme-Messtechnik GmbH
Filderstadt near Stuttgart

STAFF
approx. 100 employees worldwide

PRODUCT PORTFOLIO
■ CAN- and EtherCAT®-based
  measurement technology, high-voltage-safe
  measurement modules for use in vehicles,
on machinery and in test benches
■ E-Mobility Measurement System
  from Vector and CSM for testing
  high-voltage batteries, inverters, converters,
motors and high-voltage electrical systems
■ Data loggers for mobile,
  fail-safe data acquisition of measurement data

CERTIFICATES AND APPROVALS
certified acc. to DIN EN ISO 9001 since 2002, certified
acc. to DIN EN ISO 14001 since 2004, own test
laboratory for EMC tests, laboratory for calibrations with
DAkkS approval (D-K-15214-01-00)
The measurement system is especially designed for safe temperature measurement on HV components and is excellently suited for mobile and stationary use in the field of electric mobility: electric and hybrid vehicles.

- Tested safety from measuring point to data logging
- ✔ temperature measurement on HV components
- ✔ suitable for mobile and stationary use in the field of e-mobility
- ✔ it can be used in close proximity to the measuring point
- ✔ type test of the complete system by an accredited laboratory

Digatron test bench for electric vehicle batteries
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

APPLICATION EXAMPLE

- CAN bus data logger
- CAN Interface
- battery block
- HV sensor cable 4 x thermocouple
- HV THMM 4
- notebook with DAQ SW
- CAN-Bus
Measurement systems from CSM provide safety from HV damage in the entire measurement chain - from the sensor to data acquisition software, and the user. As with our other CAN and EtherCAT® modules, they ensure fast installation as well as precise and reliable measurement results over the entire operating temperature range.

Overview HV Measurement Modules

- HV Breakout Modules
- HV DTemp Measurement System
- E-Mobility Measurement System
- HV AD ECAT Measurement Modules
- HV STG Measurement Modules
- HV TH Measurement Modules
- HV PT Measurement Modules
- HV IEPE Measurement Modules
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

HV TH MEASUREMENT MODULES

Safe temperature measurement with K-type thermocouples

Safe temperature measurements with thermocouples on high-voltage components: the high-voltage-safe temperature measurement modules are specifically designed for the reliable acquisition of temperatures in electric and hybrid vehicles.

These measurement modules are equipped with NiCr-Ni-temperature inputs (Type K) for easy and reliable temperature measurements. Thanks to the multi-level safety concept in accordance with DIN EN 61010, they offer certified safety from the point of measurement to the data acquisition.

HV THMM 4/HV TH4 evo

- High voltage safe MiniModules for distributed measurement applications in test drives - also under extreme environmental conditions
- Certified safety concept in accordance with DIN EN 61010; routine test including testing certificate
- Four measurement inputs via 8-pin Redel multi-connector, galvanically isolated
- Reinforced insulation up to 846 V (HV THMM 4) or up to 1,000 V RMS (HV TH4 evo)
- Measurement categories (as of hardware revision B002)
  - CAT II: 600 V
  - CAT III: 300 V
- High measurement precision and extremely low temperature drift over the entire operating temperature range from -40 °C to +100 °C (HV THMM 4) or up to +125 °C (HV TH4 evo)
- Extremely compact and robust housing with protection class IP67

HV TH-TBM 8/HV TH8 evo

- High voltage safe 19-inch slide-in modules for the use in test benches and in vehicles
- Certified safety concept in accordance with DIN EN 61010; routine including testing certificate
- Eight measurement inputs via two 8-pin Redel-multi-connectors, galvanically isolated
- Reinforced insulation up to 846 V (HV TH-TBM 8) or up to 1,000 V RMS (HV TH8 evo)
- High measurement precision and extremely low temperature drift over the entire operating temperature range from up to -40 °C to +85 °C
- Compact and robust housing with protection class IP65
**E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY**

**4-CHANNEL HV TEMPERATURE SENSOR**

FEP cable

- **connector**
- **cable with double insulation**
- **measuring tip (see below)**

---

**diameter**
- total approx. 6,1 mm  
- pair approx. 1,9 mm

**min. bending radius**
- total 12 x cable diameter  
- pair of conductors 5 x cable diameter

**temperature range**
- thermo cable: -40 °C up to +150 °C (3000 h)  
- +125 °C constant use  
- FEP thermopairs: -40 °C up to +180 °C  
- plug: -50 °C up to +170 °C

**dielectric strength**
- over sheathed pair: 1000 V  
- plug: 1000 V

**routine test**
- plug: 3000 V / 1 minute

**delivery with protecting cap**

**serial number**

**marking**
- SAB BRÖCKSKES · D-VIERSEN · CSM GmbH · D-FILDERSTADT · L0433-9235 · Typ K HV-SENSOR

---

**CONFIGURATION EXAMPLES**

<table>
<thead>
<tr>
<th>item no.</th>
<th>cable length mm</th>
<th>stripping length mm</th>
<th>pairs</th>
<th>measuring tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>T141-051-650</td>
<td>2400</td>
<td>400</td>
<td><em>not scoop-proof</em></td>
<td>bare / quick response time <em>not scoop-proof</em></td>
</tr>
<tr>
<td>T141-056-330</td>
<td>2400</td>
<td>400</td>
<td><em>scoop-proof</em></td>
<td>insulated / mechanical heat shrinkable sleeve <em>scoop-proof</em></td>
</tr>
</tbody>
</table>
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

4-CHANNEL HV TEMPERATURE SENSOR

PI cable

✔ diameter
  total approx. 4.5 mm · pair approx. 1.0 mm

✔ min. bending radius
  total 12 x cable diameter · pair of conductors 5 x cable diameter

✔ temperature range
  thermo cable -40 °C up to +150 °C (3000 h)
  +125 °C constant use
  Pi insulated thermopairs -40 °C up to +250 °C
  plug -50 °C up to +170 °C

✔ dielectric strength
  over inner sheath 1000 V
  plug 1000 V

✔ routine test
  plug 3000 V / 1 minute

✔ delivery with protecting cap

✔ serial number

✔ marking
  SAB BRÖCKSKES · D-VIersen ·
  L0433-9231 · Typ K HV-SENSOR

CONFIGURATION EXAMPLES

<table>
<thead>
<tr>
<th>item no.</th>
<th>cable length mm</th>
<th>stripping length mm</th>
<th>pairs</th>
<th>measuring tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>T141-051-647</td>
<td>2400</td>
<td>400</td>
<td>&quot;not scoop-proof&quot;</td>
<td>2 mm bare, quick response time &quot;not scoop-proof&quot;</td>
</tr>
<tr>
<td>T141-058-746</td>
<td>2500</td>
<td>500</td>
<td>&quot;not scoop-proof&quot;</td>
<td>insulated / mechanical heat shrinkable sleeve &quot;not scoop-proof&quot;</td>
</tr>
<tr>
<td>T141-058-907</td>
<td>2400</td>
<td>400</td>
<td>&quot;not scoop-proof&quot;</td>
<td>bare / oil resistant shrinkable sleeve &quot;not scoop-proof&quot;</td>
</tr>
</tbody>
</table>
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

4-CHANNEL HV THERMO EXTENSION

✔ diameter
   approx. 6.1 mm at 4-channel
   approx. 14.7 mm at 8-channel

✔ min. bending radius
   12 x cable diameter

✔ temperature range
   thermo cable  -40 °C up to +150 °C (3000 h)
                 +125 °C constant use
   plug        -50 °C up to +170 °C

✔ dielectric strength
   over outer sheath  1000 V
   plug/socket 1000 V

✔ routine test
   plug/socket 3000 V / 1 minute

✔ delivery with protecting cap

✔ serial number

✔ marking
   SAB BRÖCKSKES · D-VIERSEN ·
   L0433-9XXX · Typ K HV-SENSOR

CONFIGURATION EXAMPLES

<table>
<thead>
<tr>
<th>Item no.</th>
<th>channels</th>
<th>cable length mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>T141-064-030</td>
<td>4</td>
<td>1000</td>
</tr>
<tr>
<td>T141-064-075</td>
<td>4</td>
<td>3000</td>
</tr>
<tr>
<td>T141-064-076</td>
<td>4</td>
<td>5000</td>
</tr>
<tr>
<td>T141-060-447</td>
<td>8</td>
<td>1000</td>
</tr>
<tr>
<td>T141-060-446</td>
<td>8</td>
<td>3000</td>
</tr>
<tr>
<td>T141-060-445</td>
<td>8</td>
<td>5000</td>
</tr>
</tbody>
</table>
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

1-CHANNEL HV TEMPERATURE SENSOR

connector  cable with double insulation  measuring tip  (see below)

- □ connector
- □ cable with double insulation
- □ measuring tip

thermocouple K 1 x 2 x 0.20 mm Ø

HV-TC marking

thermocouple type K

cable length

stripping length

scoop-proof area

✔ diameter
  total approx. 3,4 mm  ·  pair approx. 1,9 mm

✔ min. bending radius
  total 12 x cable diameter  ·  pair of conductors 5 x cable diameter

✔ temperature range
  thermo cable  -40 °C up to +150 °C (3000 h)
  +125 °C constant use
  FEP thermopairs  -40 °C up to +180 °C
  plug  -50 °C up to +170 °C

✔ dielectric strength
  over sheathed pair  1000 V
  plug  1000 V

✔ routine test
  plug  3000 V / 1 minute

✔ delivery with protecting cap

✔ serial number

✔ marking
  SAB BRÖCKSKES · D-VIERSEN ·
  L0433-9241 · \( \uparrow \) Typ K HV-SENSOR \( \uparrow \)

<table>
<thead>
<tr>
<th>CONFIGURATION EXAMPLES</th>
<th>item no.</th>
<th>cable length mm</th>
<th>stripping length mm</th>
<th>pairs</th>
<th>measuring tip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T141-055-390</td>
<td>2400</td>
<td>400</td>
<td><em>scoop-proof</em></td>
<td>bare &quot;not scoop-proof&quot;</td>
</tr>
<tr>
<td></td>
<td>T141-059-052</td>
<td>2400</td>
<td>400</td>
<td><em>scoop-proof</em></td>
<td>insulated &quot;scoop-proof&quot;</td>
</tr>
</tbody>
</table>
HV ANALOGUE SENSOR CABLES

Item no. L3801-9192 / Item no. L3801-9196

- **diameter**
  - total approx. 7,1 mm
  - pair approx. 2,3 mm
- **min. bending radius**
  - total 12 x cable diameter
  - pair  5 x cable diameter
- **operating temperature**
  - fixed laying -40 °C up to +150 °C (3000 h)
- **voltage**
  - max. 1000 V
- **marking**
  - SAB BRÖCKSKES · D-VIERSEN ·
  - CSM GmbH · D-FILDERSTADT ·
  - L3801-9192 · HV-ANALOG

- **diameter**
  - total approx. 7,2 mm
  - 4er approx. 2,6 mm
- **min. bending radius**
  - 12 x cable diameter
- **operating temperature**
  - fixed laying -40 °C up to +150 °C (3000 h)
- **voltage**
  - max. 1000 V
- **marking**
  - SAB BRÖCKSKES · D-VIERSEN ·
  - CSM GmbH · D-FILDERSTADT ·
  - L3801-9196 · HV-ANALOG
HV-PT100: 2, 4, 6 AND 8 CHANNELS IN 4-WIRE CIRCUIT

E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

reduced outer diameter and flat PT100 chip resistances for a comfortable installation

✔ PT100
length x width x height: 2,3 mm x 2 mm x 0,47 mm
accuracy class A

✔ min. bending radius
12 x cable diameter

✔ temperature range
connection cable -40 °C up to +150 °C (3000 h)
+125 °C constant use
sensor -200 °C up to +200 °C
FEP insulation -40 °C up to +180 °C

✔ construction type
PT100 sensors in Pi foil,
25 x 12,5 mm (length x width)

✔ dielectric strength
over outer sheath 1000 V
plug 1000 V

✔ routine test
plug 3000 V / 1 minute

✔ delivery with protecting cap

✔ serial number

CONFIGURATION EXAMPLES

<table>
<thead>
<tr>
<th>item no.</th>
<th>channels</th>
<th>cable diameter</th>
<th>cable length</th>
<th>stripping length L1</th>
<th>stripping length L2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T641-059-530</td>
<td>2 x PT100</td>
<td>4.6</td>
<td>2500</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>T641-059-531</td>
<td>4 x PT100</td>
<td>7.5</td>
<td>2500</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>T641-059-532</td>
<td>6 x PT100</td>
<td>8.3</td>
<td>2500</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>T641-059-534</td>
<td>8 x PT100</td>
<td>8.6</td>
<td>2500</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

2-CHANNEL HV PT EXTENSION

✔ diameter
  approx. 7,1 mm
✔ min. bending radius
  12 x cable diameter
✔ temperature range
  thermo cable -40 °C up to +150 °C (3000 h)
  +125 °C constant use
  plug/socket -50 °C up to +170 °C
✔ dielectric strength
  over outer sheath 1000 V
  plug/socket 1000 V
✔ routine test
  plug 3000 V / 1 minute
✔ delivery with protecting cap
✔ serial number
✔ marking
  SAB BRÖCKSKES · D-VIERSEN ·
  CSM GmbH · D-FILDERSTADT ·
  L3801-9192 · HV-ANALOG

PT100 connection cable 4 x 2 x AWG 28

Delivery of high voltage plugs and sockets always with end cap!

CONFIGURATION EXAMPLES

<table>
<thead>
<tr>
<th>item no.</th>
<th>cable length mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>T641-056-497</td>
<td>1000</td>
</tr>
<tr>
<td>T641-058-117</td>
<td>3000</td>
</tr>
<tr>
<td>T641-058-574</td>
<td>5000</td>
</tr>
</tbody>
</table>
**E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY**

**HIGH VOLTAGE MEASURING CABLE IEPE**

**with MicroCom plug**

<table>
<thead>
<tr>
<th>item no.</th>
<th>cable length</th>
<th>stripping length</th>
<th>earthing</th>
</tr>
</thead>
<tbody>
<tr>
<td>T642-059-674</td>
<td>2000</td>
<td>210</td>
<td>500</td>
</tr>
<tr>
<td>T642-059-675</td>
<td>2000</td>
<td>210</td>
<td>no</td>
</tr>
</tbody>
</table>

**CONFIGURATION EXAMPLES**

- **diameter**
  - approx. 4,3 mm
- **min. bending radius**
  - 7,5 x cable diameter
- **temperature range**
  - cable: -40 °C up to +150 °C (3000 h)
  - plug: +125 °C constant use, -50 °C up to +170 °C
- **dielectric strength**
  - over inner sheath: 1000 V
  - plug: 1000 V
- **routine test**
  - Redel-plug: 3000 V / 1 minute
- **delivery with protecting cap**
- **serial number**
- **marking**
  - SAB BRÖCKSKES · D-VIERSEN · L3833-9387 · HV-ANALOG IEPE

**Connecting element 1**
- Redel-plug, black, c-coded, 8-pin, gold contacts, scoop-proof under normal conditions only and when stretched (or with a cover cap)

**Connecting element 2**
- MicroCom female connector, 4 poles, shortened union nut, ¼-28 UNF

**earthing**
- L3349-9060, stand 0,5mm², with fork-type cable lug M4

**E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY**

**HIGH VOLTAGE MEASURING CABLE IEPE**

**with MicroCom plug**

<table>
<thead>
<tr>
<th>item no.</th>
<th>cable length</th>
<th>stripping length</th>
<th>earthing</th>
</tr>
</thead>
<tbody>
<tr>
<td>T642-059-674</td>
<td>2000</td>
<td>210</td>
<td>500</td>
</tr>
<tr>
<td>T642-059-675</td>
<td>2000</td>
<td>210</td>
<td>no</td>
</tr>
</tbody>
</table>

**CONFIGURATION EXAMPLES**

- **diameter**
  - approx. 4,3 mm
- **min. bending radius**
  - 7,5 x cable diameter
- **temperature range**
  - cable: -40 °C up to +150 °C (3000 h)
  - plug: +125 °C constant use, -50 °C up to +170 °C
- **dielectric strength**
  - over inner sheath: 1000 V
  - plug: 1000 V
- **routine test**
  - Redel-plug: 3000 V / 1 minute
- **delivery with protecting cap**
- **serial number**
- **marking**
  - SAB BRÖCKSKES · D-VIERSEN · L3833-9387 · HV-ANALOG IEPE

**Connecting element 1**
- Redel-plug, black, c-coded, 8-pin, gold contacts, scoop-proof under normal conditions only and when stretched (or with a cover cap)

**Connecting element 2**
- MicroCom female connector, 4 poles, shortened union nut, ¼-28 UNF

**earthing**
- L3349-9060, stand 0,5mm², with fork-type cable lug M4
**Application:** The high voltage measuring cable is used in the development of electric vehicles where scoop-proof testing & measuring of up to 1800 V DC operating voltage and application in the high voltage environment of electromobility takes place. Examples of applications are HV power electronics, HV batteries, electric motors, inverters, etc. High voltage measuring cables are used on the test benches and in test vehicles.

**Technical data:**

<table>
<thead>
<tr>
<th>Item no.</th>
<th>no. of cores</th>
<th>cross section (mm²)</th>
<th>largest outer ø (mm)</th>
<th>copper weight (kg/km)</th>
<th>cable weight (kg/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38339800</td>
<td>2 x 0,25</td>
<td>0,11</td>
<td>6,5</td>
<td>21,3</td>
<td>61</td>
</tr>
<tr>
<td>38339801</td>
<td>2 x 0,50</td>
<td>0,16</td>
<td>7,1</td>
<td>42,1</td>
<td>74</td>
</tr>
<tr>
<td>38339802</td>
<td>2 x 1,00</td>
<td>0,16</td>
<td>7,8</td>
<td>42,5</td>
<td>94</td>
</tr>
<tr>
<td>38339803</td>
<td>2 x 1,50</td>
<td>0,16</td>
<td>8,4</td>
<td>55,8</td>
<td>113</td>
</tr>
</tbody>
</table>

Other dimensions and colours are possible on request.

**Possible on request:**

- also possible as harnessed measuring cable with connected lab plugs to collect the tension at HV components.
HIGH VOLTAGE MEASURING CABLE
1-channel with Redel-plug

- **diameter**: approx. 6.5 mm
- **min. bending radius**: 10 x cable diameter
- **temperature range**:
  - cable: -40 °C up to +150 °C (3000 h)
  - +125 °C constant use
  - cores: -40 °C up to +180 °C
  - plug: -40 °C up to +180 °C (short time use +205°C)
- **dielectric strength**:
  - over inner sheath: 1000 V
  - plug: 1000 V
- **routine test**:
  - plug: 3000 V / 1 minute
- **serial number**
- **delivery with protecting cap**
- **marking**
  - SAB BRÖCKSKES · D-VIERSEN ·
  - L3833-9800 · HV-measuring cable (2 x 0.25mm²)

**CONFIGURATION EXAMPLES**

<table>
<thead>
<tr>
<th>Item no.</th>
<th>cable length mm</th>
<th>stripping length mm</th>
<th>pairs</th>
<th>measuring tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0994-4002-00500</td>
<td>5000</td>
<td>100</td>
<td>&quot;scoop-proof&quot;</td>
<td>bare &quot;not scoop-proof&quot;</td>
</tr>
</tbody>
</table>

500 cm
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

HIGH VOLTAGE MEASURING CABLE
1-channel with laboratory plug

- **Cable**
  - L3833-9236
  - Ø approx. 5.2 mm

- **Min. bending radius**
  - 7.5 x cable diameter

- **Temperature range**
  - **Cable**: -40 °C up to +150 °C (3000 h)
    - +125 °C constant use
  - **Cores**: -40 °C up to +180 °C
  - **Plug**: +5 °C up to +40 °C

- **Dielectric strength**
  - Over inner sheath: 1000 V
  - Plug: 1000 V

- **Routine test**
  - Plug: 3000 V / 1 minute

- **Serial number**

- **Marking**
  - SAB BRÖCKSKES · D-VIERSEN ·
  - L3833-9236 · HV-measuring cable (2 x 0.25mm²)

- **Configuration examples**

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Cable Length (mm)</th>
<th>Stripping Length (mm)</th>
<th>Pairs</th>
<th>Measuring Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0994-4001</td>
<td>10000</td>
<td>80</td>
<td>&quot;scoop-proof&quot;</td>
<td>bare &quot;not scoop-proof&quot;</td>
</tr>
</tbody>
</table>

Conversion kit to automatic hinged lid for Redel apparatus boxes / size 2P to protect the apparatus box from dust, dirt and moisture

item no.

T021-060-467
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY

ACCESSORIES FOR HV SENSORS

dual shrinkable sleeve natural PTFE/FEP
dimension D(min) 1,65mm, d(max) 0,00mm, shrinking temperature 380°C, application temperature -190°C/+200°C

<table>
<thead>
<tr>
<th>item no.</th>
<th>quantity</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>T020-024-319</td>
<td>1000</td>
<td></td>
</tr>
</tbody>
</table>

HV cap for plugs

<table>
<thead>
<tr>
<th>item no.</th>
<th>configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>T021-050-281</td>
<td>4-channel type K</td>
</tr>
<tr>
<td>T021-054-558</td>
<td>PT100</td>
</tr>
</tbody>
</table>

HV cap for sockets

<table>
<thead>
<tr>
<th>item no.</th>
<th>configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>T021-053-127</td>
<td>4-channel type K</td>
</tr>
<tr>
<td>T021-055-802</td>
<td>PT100</td>
</tr>
</tbody>
</table>

cable clamp screwing for HV sensors made of nickel plated brass with FPM sealing
temperature -40°C/+200°C

<table>
<thead>
<tr>
<th>item no.</th>
<th>thread</th>
<th>no. of holes</th>
<th>for cable Ø mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>T025-059-232</td>
<td>M32 x 1,5</td>
<td>2</td>
<td>6,1</td>
</tr>
<tr>
<td>T025-059-042</td>
<td>M25 x 1,5</td>
<td>2</td>
<td>4,5</td>
</tr>
</tbody>
</table>

Filler plugs for cable glands Ø 4,5 mm & Ø 6,1 mm
Plastic (PEEK) beige/nature

<table>
<thead>
<tr>
<th>item no.</th>
<th>quantity</th>
<th>pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>T055-060-544</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

spare pads

<table>
<thead>
<tr>
<th>item no.</th>
<th>material</th>
<th>cutting size</th>
<th>packaging unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>T095-044-258</td>
<td>glass cloth tape</td>
<td>25 x 25 mm</td>
<td>100 pieces</td>
</tr>
<tr>
<td>T095-056-403</td>
<td>Pi foil</td>
<td>12,5 x 25 mm</td>
<td>100 pieces</td>
</tr>
</tbody>
</table>

temperature range
glass cloth tape: +230 °C
Pi foil: +250 °C
**E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNOLOGY**

**BESILEN® - SILICONE CABLE**

**B 110 C Besilen® insulated shielded copper rope**

---

**Nominal voltage up to Uo/U 1,8/3 kV AC**

---

**Application:** The connection cable is particularly appropriate to connect converters to electric-mobility test benches. Due to the high voltage rating, the cable can be used for various components and the power electronics. The extremely flexible cable design enables an easy laying.

---

### Construction:

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Nominal cross section mm²</th>
<th>Nominal largest single wire ø mm</th>
<th>ø over inner sheath approx. mm</th>
<th>Outer ø ± 5% mm</th>
<th>Copper figure kg/km</th>
<th>Cable weight kg/km</th>
</tr>
</thead>
<tbody>
<tr>
<td>01100407</td>
<td>4,00</td>
<td>0,07</td>
<td>5,3</td>
<td>6,0</td>
<td>50,2</td>
<td>101</td>
</tr>
<tr>
<td>01100607</td>
<td>6,00</td>
<td>0,07</td>
<td>5,7</td>
<td>8,4</td>
<td>108,8</td>
<td>148</td>
</tr>
<tr>
<td>01101007</td>
<td>10,00</td>
<td>0,07</td>
<td>8,2</td>
<td>11,7</td>
<td>147,7</td>
<td>229</td>
</tr>
<tr>
<td>011012507</td>
<td>25,00</td>
<td>0,10</td>
<td>11,2</td>
<td>14,7</td>
<td>307,4</td>
<td>420</td>
</tr>
<tr>
<td>01102507</td>
<td>35,00</td>
<td>0,10</td>
<td>12,8</td>
<td>16,3</td>
<td>432,6</td>
<td>548</td>
</tr>
<tr>
<td>01103507</td>
<td>50,00</td>
<td>0,10</td>
<td>14,6</td>
<td>18,2</td>
<td>599,6</td>
<td>721</td>
</tr>
<tr>
<td>01105007</td>
<td>75,00</td>
<td>0,10</td>
<td>16,5</td>
<td>20,6</td>
<td>804,4</td>
<td>953</td>
</tr>
<tr>
<td>01106007</td>
<td>100,00</td>
<td>0,10</td>
<td>18,4</td>
<td>22,3</td>
<td>1064,5</td>
<td>1232</td>
</tr>
<tr>
<td>01107507</td>
<td>150,00</td>
<td>0,10</td>
<td>20,1</td>
<td>24,2</td>
<td>1311,0</td>
<td>1493</td>
</tr>
<tr>
<td>01110007</td>
<td>200,00</td>
<td>0,10</td>
<td>22,3</td>
<td>27,4</td>
<td>1627,6</td>
<td>1833</td>
</tr>
<tr>
<td>01112507</td>
<td>250,00</td>
<td>0,15</td>
<td>24,9</td>
<td>29,2</td>
<td>1970,3</td>
<td>2202</td>
</tr>
<tr>
<td>01120007</td>
<td>300,00</td>
<td>0,15</td>
<td>27,5</td>
<td>31,5</td>
<td>2355,4</td>
<td>2771</td>
</tr>
</tbody>
</table>

---

**Outstanding features:**

- good EMC characteristics
- halogen-free
- heat resistant
- flexible at low temperatures
- flame retardant and self-extinguishing
- weather resistant

---

**Technical data:**

- **Nominal voltage:**
  - 4,0 - 6,0 mm²: Uo/U 1,5/1,5 kV AC
  - 10,0 - 240,0 mm²: Uo/U 2,2/2,2 kV DC

- **Testing voltage:**
  - 4,0 - 6,0 mm²: 4000 V
  - 10,0 - 240,0 mm²: 6000 V

- **Current-carrying capacity:**
  - fixed laying: acc. to VDE 0298-4
  - flexible application: 6 x d

- **Min. bending radius:**
  - flexible application: 10 x d

- **Temperature range:**
  - fixed laying: -40/+180 °C
  - flexible application: -25/+180 °C
  - short-time use: +250 °C

- **Halogen-free:**
  - acc. to IEC 60754-1 + VDE 0482-754-1

- **Fire performance:**
  - flame retardant and self-extinguishing acc. to IEC 60332-1-2 + VDE 0482-332-1-2

- **Corrosiveness of conflagration gases:**
  - no development of corrosive conflagration gases

- **Weather resistance:**
  - very good

- **Absence of harmful substances:**
  - acc. to RoHS directive of the European Union

---

**Application:**

Other dimensions and colours are possible on request.
BESILEN® - SILICONE CABLE
B 107 Besilen® insulated copper rope

Outstanding features:
- halogen-free
- heat resistant
- flexible at low temperatures
- flame retardant and self-extinguishing
- weather resistant

Technical data:
- Nominal voltage:
  - up to 4,0 - 6,0 mm²: Uo/U 1,5/1,5 kV
  - 10,0 - 185,0 mm²: Uo/U 1,8/3,0 kV
- Testing voltage:
  - 4,0 - 6,0 mm²: 4000 V
  - 10,0 - 185,0 mm²: 6000 V
- Current-carrying capacity: acc.to VDE 0298-4
- Min. bending radius: 5 x d
- Temperature range:
  - fixed laying: -40/+180 °C
  - flexible application: -25/+180 °C
  - short-time use: +250 °C
- Halogen-free: acc.to IEC 60754-1 + VDE 0482-754-1
- Fire performance: flame retardant and self-extinguishing acc. to IEC 60332-1-2 + VDE 0482-332-1-2
- Corrosiveness of conflagration gases: - no development of corrosive conflagration gases
- Weather resistance: very good
- Absence of harmful substances: acc. to RoHS directive of the European Union

Other dimensions and colours are possible on request.

for E-Mobility HV test benches
E-MOBILITY HIGH VOLTAGE MEASUREMENT TECHNIQUE

APPLICATION FOR HIGH VOLTAGE MEASURING CABLES

**ELECTRIC VEHICLE**

- HV cable 2 x 0.25 mm²
  - S0994-4006-00050
- Screened LV cable 2 x 0.5 mm²
  - S3833-4555-00700

**HV cable 2 x 0.25 mm² screened**
- S3833-3002-00015
- S3833-3003-00025

**HV adapter with clamping points**
- (vehicle specific)

**LV connection**
- (for example 12 V vehicle battery)

**Screened LV cable 2 x 0.5 mm²**
- T641-060-343

**Extension**
- T641-061-127