Product overview

Power Quality and Energy Measurement

Electronic measuring and monitoring relays
Universal measuring devices and measuring relays to monitor electrical installations

Safety of power supply
To ensure personnel and equipment safety, operating conditions of electrical installations have to be monitored continuously. The physical quantities of current and voltage are not visible to humans without the use of appropriate measuring devices.

PEM series universal measuring devices (Power Quality and Energy Measurement) record all relevant parameters such as current, voltage, frequency, power, harmonics and the energy consumption of electrical supply systems, to mention but a few.

LINETRAXX® monitoring relays cover a broad spectrum; from single-channel current relays (CME420), loop monitoring (GM420) up to three-phase voltage relays (VMD460) for power generation systems in accordance with VDE-AR-N 4105. Bender also offers special solutions for specific applications such as fully analogue devices (VMD258) or fault voltage relays (SB146).

Highest level of availability despite system reactions
Increasing requirements regarding the high availability of electrical installations, and more and more complex production and automation processes conflict with an increased use of power electronics. System reactions become a topic of increasing concern to both operators and suppliers. Therefore digital universal measuring devices do more than record r.m.s. current and voltage values, they also replace analogue indicating instruments in switchboard and distributor cabinet doors. Harmonics, flicker severity, neutral currents and many more measuring quantities are recorded, evaluated and transferred via communication interfaces. Exceeded of configurable threshold values can also be signalled via relay outputs. The control centre of Bender Monitoring Systems centrally provides all relevant electrical installation data, which are easily accessible by means of a browser.

Power Quality and Energy Measurement PEM

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Measuring and monitoring relays

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Electrical supply systems are becoming larger over time. It is not rare that failures and disturbances are the consequence of overloaded systems. By means of a monitoring system comprising universal PEM series measuring devices of the potential impacts on protective measures, risks due to overloads or changes in energy consumption can be readily assessed before the next expansion stage.

**Design of the monitoring system**
A granular design of the monitoring system allows:

- Energy data acquisition by cost centres
- Faster fault localisation in the event of a fault
- An economic pyramid structure

The goal of a monitoring system must be to recognise even small changes in relevant measuring quantities such as leakage current or the harmonic content and to generate a prewarning in the event of deviations at the earliest possible stage. A single measuring point in an electrical installation is not sufficient to generate curves of relevant measuring quantities that adequately represent voltage quality or leakage currents. Several measuring points need to be installed and adapted to correspond to the structure of the system.
Example for system set-up
## Universal measuring devices
### Power Quality and Energy Measurement PEM

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<thead>
<tr>
<th>LINETRAXX® PEM330</th>
<th>LINETRAXX® PEM333</th>
<th>LINETRAXX® PEM533</th>
<th>LINETRAXX® PEM555</th>
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Energy meters and measuring current transformers

Energy meter

Along with numerous measuring values, all PEM series devices can measure energy and power values. If, however, a measuring point is used for billing purposes, special requirements must be met (subject to obligatory calibration). Energy meters with the Measurement Instrument Directive (MID) conformity mark meet these requirements.

Ordering information

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</tbody>
</table>

Measuring current transformers

All PEM series measuring devices can be operated with standard measuring current transformers (1 A or 5 A). To comply with the accuracy class (e.g. 0.5 S), the measuring device and the measuring current transformers used must comply with class 0.5 S or better.

Ordering information

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy meter 1Ph/22 A MID Modbus RTU</td>
<td>ALD1</td>
<td>B93101005</td>
</tr>
<tr>
<td>Energy meter 3Ph/65 A MID Modbus RTU</td>
<td>ALE3</td>
<td>B93101006</td>
</tr>
<tr>
<td>Energy meter 3Ph/6 A MID Modbus RTU</td>
<td>AW03</td>
<td>B93101007</td>
</tr>
<tr>
<td>50 pulse counter (four-fold) with Modbus RTU</td>
<td>PCD7</td>
<td>B93101008</td>
</tr>
<tr>
<td>Sealable cover for ALD1 (two per counter)</td>
<td>–</td>
<td>B93101009</td>
</tr>
<tr>
<td>Sealable cover for ALE3/AW03 (four per counter)</td>
<td>–</td>
<td>B93101010</td>
</tr>
</tbody>
</table>

Ordering information

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy meter 1Ph/32 A MID Modbus RTU</td>
<td>ALD1</td>
<td>B93101005</td>
</tr>
<tr>
<td>Energy meter 3Ph/6 A MID Modbus RTU</td>
<td>ALE3</td>
<td>B93101006</td>
</tr>
<tr>
<td>50 pulse counter (four-fold) with Modbus RTU</td>
<td>PCD7</td>
<td>B93101008</td>
</tr>
<tr>
<td>Sealable cover for ALD1 (two per counter)</td>
<td>–</td>
<td>B93101009</td>
</tr>
<tr>
<td>Sealable cover for ALE3/AW03 (four per counter)</td>
<td>–</td>
<td>B93101010</td>
</tr>
</tbody>
</table>
Condition Monitor for Bender BMS and universal measuring devices

Several measured values per second are generated by a monitoring system. This information is collected automatically, evaluated according to the system and processed specifically for each user groups.

### Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Condition Monitoring/Gateway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol input</td>
<td>BMS/Modbus RTU/TCP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol output</td>
<td>Ethernet/Modbus/TCP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indication</td>
<td>7&quot; colour LCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm messages</td>
<td>L, L, N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measured values</td>
<td>L, L, N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device parameterisation</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm list</td>
<td>L, L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History memory</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagrams</td>
<td>L, L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visualisation</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail notification</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device tests</td>
<td>L, L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data logger</td>
<td>O</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Connection

- **BMS**: pluggable screw terminals
- **Output**: RJ45
- **Supply voltage U_s**: DC 24 V
- **Browser**: Internet Explorer, Opera, Firefox etc. with Silverlight plugin

### System requirements

- **Supply voltage/frequency range U_s**
- **Power consumption (typ. 11 W/max. 26 W)**
- **Type**: CP700
- **Ordering information**: B95061030

---

1) Available functions on the web server – Accessible by means of a PC using a browser
2) Available via protocol
3) On the device's own LC display

### Ordering information

<table>
<thead>
<tr>
<th>Supply voltage/frequency range U_s</th>
<th>Power consumption</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 24 V/± 25 %</td>
<td>typ. 11 W/max. 26 W</td>
<td>CP700</td>
<td>B95061030</td>
</tr>
</tbody>
</table>
Measuring and monitoring relays

Voltage and phase monitoring

Multifunctional voltage and frequency monitoring relays are available for monitoring various parameters in main and auxiliary circuits. They provide essential information well in advance so that faults and disturbances are detected at an early stage and take appropriate action before time and cost intensive operational interruptions and damage to property occur.

Device overview voltage monitoring

<table>
<thead>
<tr>
<th>Measured quantity</th>
<th>Common causes of faults</th>
<th>Possible effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undervoltage</td>
<td>Voltage variations</td>
<td>Failure or destruction of motors due to overheating</td>
</tr>
<tr>
<td></td>
<td>Blown fuses</td>
<td>Accidental reset of a device</td>
</tr>
<tr>
<td></td>
<td>Wire breakage</td>
<td>Undefined switching and system states</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accidental restart</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>Voltage variations</td>
<td>Damage to system components due to overvoltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accidental switching on of a system</td>
</tr>
<tr>
<td>Phase sequence</td>
<td>Reversed conductors,</td>
<td>Incorrect rotation direction of a motor, destruction of roller drives</td>
</tr>
<tr>
<td></td>
<td>faulty extension cords</td>
<td>Hazardous situations to man and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>machine when using mobile devices and systems</td>
</tr>
<tr>
<td>Phase failure</td>
<td>Blowing of fuse(s)/control voltage failure</td>
<td>Overheating of motors due to single-phase operation</td>
</tr>
<tr>
<td></td>
<td>Wire breakage</td>
<td></td>
</tr>
<tr>
<td>Phase unbalance</td>
<td>Unbalanced distribution of the load</td>
<td>Overheating of motors due to unbalanced voltages</td>
</tr>
<tr>
<td></td>
<td>Phase failure with energy recovery</td>
<td>Failure of system parts</td>
</tr>
</tbody>
</table>

Example applications of voltage and phase monitoring

<table>
<thead>
<tr>
<th>Measured quantity</th>
<th>Common causes of faults</th>
<th>Possible effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undervoltage</td>
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<td>Failure or destruction of motors due to overheating</td>
</tr>
<tr>
<td></td>
<td>Blown fuses</td>
<td>Accidental reset of a device</td>
</tr>
<tr>
<td></td>
<td>Wire breakage</td>
<td>Undefined switching and system states</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accidental restart</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>Voltage variations</td>
<td>Damage to system components due to overvoltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accidental switching on of a system</td>
</tr>
<tr>
<td>Phase sequence</td>
<td>Reversed conductors,</td>
<td>Incorrect rotation direction of a motor, destruction of roller drives</td>
</tr>
<tr>
<td></td>
<td>faulty extension cords</td>
<td>Hazardous situations to man and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>machine when using mobile devices and systems</td>
</tr>
<tr>
<td>Phase failure</td>
<td>Blowing of fuse(s)/control voltage failure</td>
<td>Overheating of motors due to single-phase operation</td>
</tr>
<tr>
<td></td>
<td>Wire breakage</td>
<td></td>
</tr>
<tr>
<td>Phase unbalance</td>
<td>Unbalanced distribution of the load</td>
<td>Overheating of motors due to unbalanced voltages</td>
</tr>
<tr>
<td></td>
<td>Phase failure with energy recovery</td>
<td>Failure of system parts</td>
</tr>
</tbody>
</table>
Current monitoring

Current relays are mainly used to monitor the load current of motors and other electrical loads. They also provide essential information well in advance so that faults and disturbances are detected at an early stage and appropriate action is taken before time and cost-intensive operational interruptions and damage to property occur.

Device overview: current monitoring

<table>
<thead>
<tr>
<th>Measured quantity</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current monitoring</td>
<td>Current consumption of motors, such as pumps, elevators, cranes</td>
</tr>
<tr>
<td></td>
<td>Monitoring of lighting systems, heating circuits, charging stations</td>
</tr>
<tr>
<td></td>
<td>Overload control of hoisting gear and means of transportation</td>
</tr>
<tr>
<td></td>
<td>Monitoring of locking devices, driving to end stops</td>
</tr>
<tr>
<td></td>
<td>Monitoring of emergency lighting</td>
</tr>
<tr>
<td></td>
<td>Monitoring of navigation lighting on high-rise buildings</td>
</tr>
<tr>
<td></td>
<td>Monitoring of screw conveyors, for example, in sewage plants, in case of blocking of conveyor systems</td>
</tr>
<tr>
<td></td>
<td>Dust removal in wood working</td>
</tr>
<tr>
<td></td>
<td>Monitoring of small currents, for example, low-power motors, indicator lamps</td>
</tr>
</tbody>
</table>

Special monitoring tasks

Fault voltage relays are used as a protective measure for welding systems. The relays monitor the secondary windings of welding transformers in accordance with the requirements of DIN VDE 0545-1 (VDE 0545-1):1990-01.

Loop monitoring relays monitor conductor loops for interruptions and short-circuits, for example, supply leads of mobile machines and devices.

Device overview: specific applications

<table>
<thead>
<tr>
<th>Measured quantity</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault voltage relay</td>
<td>Loop monitoring</td>
</tr>
<tr>
<td>Energy storage</td>
<td>Fault voltage relay</td>
</tr>
</tbody>
</table>

Example applications

<table>
<thead>
<tr>
<th>Measured quantity</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current monitoring</td>
<td>Current consumption of motors, such as pumps, elevators, cranes</td>
</tr>
<tr>
<td></td>
<td>Monitoring of lighting systems, heating circuits, charging stations</td>
</tr>
<tr>
<td></td>
<td>Overload control of hoisting gear and means of transportation</td>
</tr>
<tr>
<td></td>
<td>Monitoring of locking devices, driving to end stops</td>
</tr>
<tr>
<td></td>
<td>Monitoring of emergency lighting</td>
</tr>
<tr>
<td></td>
<td>Monitoring of navigation lighting on high-rise buildings</td>
</tr>
<tr>
<td></td>
<td>Monitoring of screw conveyors, for example, in sewage plants, in case of blocking of conveyor systems</td>
</tr>
<tr>
<td></td>
<td>Dust removal in wood working</td>
</tr>
<tr>
<td></td>
<td>Monitoring of small currents, for example, low-power motors, indicator lamps</td>
</tr>
</tbody>
</table>
## Voltage and frequency monitoring relays for AC and DC systems

### Function

<table>
<thead>
<tr>
<th>AC</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underfrequency/overfrequency</td>
<td></td>
</tr>
<tr>
<td>Undervoltage/overvoltage</td>
<td></td>
</tr>
<tr>
<td>Preset function</td>
<td></td>
</tr>
<tr>
<td>Password protection</td>
<td></td>
</tr>
<tr>
<td>History memory (first alarm value)</td>
<td></td>
</tr>
</tbody>
</table>

### Supply voltage $U_s$

- **DC**: $9.6 \ldots 94 \text{ V}$
- **AC**: $16 \ldots 72 \text{ V}$, $70 \ldots 300 \text{ V}$

### Response values

- **Undervoltage** $U <$
  -AC/DC**: $6 \ldots 300 \text{ V}$
- **Overvoltage** $U >$
  -AC/DC**: $6 \ldots 300 \text{ V}$

- **Underfrequency** $f <$
  -AC/DC**: $10 \ldots 500 \text{ Hz}$
- **Overfrequency** $f >$
  -AC/DC**: $10 \ldots 500 \text{ Hz}$

### Hysteresis

- **$U$**
  -1...40 %
- **$f$**
  -0.1...2 Hz

### Response time

- AC: $\leq 70 \text{ ms}$
- DC: $\leq 130 \text{ ms}$

### Enclosure

- **Dimensions** (H x W x D)
  -90 x 36 x 70.5
  -90 x 36 x 105.5

### Accessories

- Mounting clip

### Interface option

- M

### Standards, approvals and certifications

- UL, Lloyd’s Register
The voltage and frequency monitoring relays are designed to monitor the upper and lower limits of one or several defined response values. The devices are suitable for AC and DC systems.

### Ordering information

<table>
<thead>
<tr>
<th>Nominal system voltage ² $U_n$</th>
<th>Supply voltage ² $U_S$</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 16…72 V, DC 9.6…94 V</td>
<td>AC 16…72 V, 15…460 Hz/DC 9.6…94 V</td>
<td>VME420-D-1</td>
<td>B73010001</td>
</tr>
<tr>
<td>AC/DC 70…300 V</td>
<td>AC 70…300 V, 15…460 Hz/DC 70…300 V</td>
<td>VME420-D-2</td>
<td>B73010002</td>
</tr>
<tr>
<td>AC 9.6…150 V, 15…460 Hz/DC 9.6…150 V</td>
<td>$U_n$</td>
<td>VME421H-D-1</td>
<td>B73010003</td>
</tr>
<tr>
<td>AC 70…300 V, 15…460 Hz/DC 70…300 V</td>
<td>$U_n$</td>
<td>VME421H-D-2</td>
<td>B73010004</td>
</tr>
</tbody>
</table>

² Absolute values

### Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for screw mounting (1 piece per device)</td>
<td>B98060008</td>
</tr>
</tbody>
</table>
# Voltage and frequency monitoring relays for 3(N)AC systems

<table>
<thead>
<tr>
<th>Main voltage</th>
<th>3AC</th>
<th>3NAC</th>
<th>3AC</th>
<th>3NAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undervoltage</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Undervoltage/overvoltage</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Unbalance/phase failure</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Phase sequence/frequency</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Preset function</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Password protection</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>History memory (first alarm value)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Supply voltage range $U_s$</td>
<td>AC 16…72 V, DC 9.6…94 V, AC/DC 70…300 V</td>
<td>AC 70…500 /70…288 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervoltage $U &lt;$</td>
<td>AC 6…500 V, 6…288 V</td>
<td>AC 70…500 V, 70…288 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overvoltage $U &gt;$</td>
<td>AC 6…500 V, 6…288 V</td>
<td>AC 70…500 V, 70…288 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underfrequency Hz $&lt; $</td>
<td>10…500 Hz</td>
<td>10…500 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overfrequency Hz $&gt; $</td>
<td>10…500 Hz</td>
<td>10…500 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated frequency</td>
<td>15…460 Hz</td>
<td>15…460 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unbalance</td>
<td>5…30 %</td>
<td>5…30 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis $U$</td>
<td>1…40 %</td>
<td>1…40 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis $f$</td>
<td>0.1…2 Hz</td>
<td>0.1…2 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating time voltage/frequency</td>
<td>$\leq 140/335$ ms</td>
<td>$\leq 140/335$ ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated energy storage device</td>
<td>–</td>
<td>min. 2.5 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response delay $t_{on}$</td>
<td>0…300 s</td>
<td>0…300 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delay on release $t_{off}$</td>
<td>0…300 s</td>
<td>0…300 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start-up delay $t$</td>
<td>0…300 s</td>
<td>0…300 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power On LED</td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm LEDs</td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervoltage/overvoltage</td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC/DC switches</td>
<td>Test “I”/Reset “R”/MENU</td>
<td>Test “I”/Reset “R”/MENU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of switching elements</td>
<td>2 x 1 changeover contacts, programmable</td>
<td>2 x 1 changeover contacts, programmable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating principle</td>
<td>N/O or N/C operation, programmable</td>
<td>N/O or N/C operation, programmable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure dimensions in mm (H x W x D)</td>
<td>90 x 36 x 70.5</td>
<td>90 x 36 x 105.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Mounting clip</td>
<td>Mounting clip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface option</td>
<td>M</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standards, approvals and certifications</td>
<td>UL, Lloyd’s Register</td>
<td>UL, Lloyd’s Register</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**LINETRAXX® VMD420**

**LINETRAXX® VMD421H**
The VMD420/421H series voltage and frequency monitoring relays are designed to monitor the upper and lower limits of one or several defined response values. The devices can be used for three-phase systems with or without an N conductor. Furthermore, the devices feature additional monitoring functions such as phase sequence, phase failure, frequency, and unbalance monitoring.

Ordering information

<table>
<thead>
<tr>
<th>Nominal system voltage $U_n$</th>
<th>Supply voltage $U_S$</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(N)AC 0…500/288 V</td>
<td>AC 16…72 V/DC 9.6…94 V, 15…460 Hz</td>
<td>VMD420-D-1</td>
<td>B73010005</td>
</tr>
<tr>
<td></td>
<td>AC/DC 70…300 V, 15…460 Hz</td>
<td>VMD420-D-2</td>
<td>B73010006</td>
</tr>
<tr>
<td>3(N)AC 70…500 V, 15…460 Hz</td>
<td>$U_n$</td>
<td>VMD421H-D-3</td>
<td>B73010007</td>
</tr>
</tbody>
</table>

Device version with screw terminals on request.

Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for screw mounting (1 piece per device)</td>
<td>B98060008</td>
</tr>
</tbody>
</table>
Voltage and frequency monitoring relays for mains decoupling of power generation systems

<table>
<thead>
<tr>
<th>Function</th>
<th>LINETRAXX® VMD423</th>
<th>LINETRAXX® VMD423H</th>
<th>LINETRAXX® VMD460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains voltage</td>
<td>3AC</td>
<td>3NAC</td>
<td></td>
</tr>
<tr>
<td>Overvoltage (10 minute measuring interval)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervoltage/overvoltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervoltage &lt;&lt; U</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Overvoltage &gt;&gt; U</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Underfrequency/overfrequency Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underfrequency Hz &lt;&lt;</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Overfrequency Hz &gt;&gt;</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Unbalance/phase failure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase sequence/frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Password protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROCOF df/dt</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Vector surge</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Supply voltage ½</td>
<td>AC 16…72 V/DC 9,6…94 V, AC/DC 70…300 V</td>
<td>Unn</td>
<td>AC/DC 100…240 V</td>
</tr>
<tr>
<td>Indication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power On LED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm LED undervoltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm LED overvoltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching elements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of switching elements</td>
<td>2 x 1 changeover contacts, programmable</td>
<td>2 x 1 changeover contacts, programmable</td>
<td>2 x 1 changeover contact</td>
</tr>
<tr>
<td>Operating principle</td>
<td>N/O or N/C operation, programmable</td>
<td>N/O or N/C operation, programmable</td>
<td>N/O or N/C operation, programmable</td>
</tr>
<tr>
<td>Enclosure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure dimensions in mm (H x W x D)</td>
<td>90 x 36 x 70.5</td>
<td>90 x 36 x 105.5</td>
<td>90 x 108 x 74</td>
</tr>
<tr>
<td>Accessories</td>
<td>Mounting rail</td>
<td>Mounting rail</td>
<td>Mounting rail</td>
</tr>
<tr>
<td>Standards, approvals and certifications</td>
<td>UL508</td>
<td>UL508</td>
<td>UL508</td>
</tr>
</tbody>
</table>
The VMD460 is an external Network and System protection (NS protection) the purpose of which disconnects the power generation system from the grid by coupling switches in the event that the threshold values are exceeded. If voltage and frequency measurement values of the power generation system do not meet the thresholds in the standards, the power generation system is disconnected from the grid.

The VMD460 is multifunctionally configurable for a wide variety of applications arising from country-specific or system-specific requirements. The related parameters are saved in pre-set basic programs. The VMD460 combines safe function with a high degree of flexibility and straightforward configuration.

Block diagram for continuous voltage and frequency monitoring

The principle of an installation according to CEI 0-21; VDE-AR-N 4105 (30 kW or higher), C10/11, BDEW guideline, DIN V VDE V 0126-1-1, G59/2, G59/3, G83/2

Ordering information

<table>
<thead>
<tr>
<th>Supply voltage $^{1)} U_s$</th>
<th>Response value</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC/DC 100…240 V</td>
<td>AC 400/230 V</td>
<td>VMD460-NA-D-2</td>
<td>B93010045</td>
</tr>
<tr>
<td>AC 16…72 V, 15…460 Hz/DC 9.6…94 V</td>
<td>AC 10…500 V</td>
<td>VMD423-D-1</td>
<td>B73010020$^{2)}$</td>
</tr>
<tr>
<td>AC 70…300 V, 15…460 Hz/DC 70…300 V</td>
<td>AC 10…500 V</td>
<td>VMD423-D-2</td>
<td>B73010021$^{2)}$</td>
</tr>
<tr>
<td>$U_n$</td>
<td>AC 70…500 V</td>
<td>VMD423H-D-3</td>
<td>B73010022$^{2)}$</td>
</tr>
</tbody>
</table>

$^{1)}$ Absolute values
$^{2)}$ Device version with screw terminals on request.

Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for screw mounting (1 piece per device)</td>
<td>B98060008</td>
</tr>
</tbody>
</table>
Voltage relay for 3AC systems

Voltage relays monitor the upper and lower limits of preset response values in 3AC systems up to 690 V. The VMD258 is a purely analogue device with no microcontroller and software and is highly accurate for plant protection.

### Ordering information

<table>
<thead>
<tr>
<th>Connection</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3AC 100 V</td>
<td>VMD258 3AC 100 V</td>
<td>B93010060</td>
</tr>
<tr>
<td>3AC 110 V</td>
<td>VMD258 3AC 110 V</td>
<td>B93010061</td>
</tr>
<tr>
<td>3AC 230 V</td>
<td>VMD258 3AC 230 V</td>
<td>B93010062</td>
</tr>
<tr>
<td>3AC 400 V</td>
<td>VMD258 3AC 400 V</td>
<td>B93010063</td>
</tr>
<tr>
<td>3AC 440 V</td>
<td>VMD258 3AC 440 V</td>
<td>B93010064</td>
</tr>
<tr>
<td>3AC 480 V</td>
<td>VMD258 3AC 480 V</td>
<td>B93010065</td>
</tr>
<tr>
<td>3AC 500 V</td>
<td>VMD258 3AC 500 V</td>
<td>B93010066</td>
</tr>
<tr>
<td>3AC 690 V</td>
<td>VMD258 3AC 690 V</td>
<td>B93010067</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art.No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional mounting clips (screw mounting)</td>
<td>B98060008</td>
</tr>
<tr>
<td>External storage ES258</td>
<td>B93010068</td>
</tr>
</tbody>
</table>

### Energy storage device

![Energy storage device](ES258)

Supply voltage $U_s$: DC $41\ldots47$ V

Enclosure dimensions in mm (H x W x D): $85 \times 52.5 \times 70$
Current relay for AC currents

Current relays are designed to monitor the upper and lower limits of one or several defined response values.

### Ordering information

<table>
<thead>
<tr>
<th>Setting range</th>
<th>Supply voltage $U_S^{1)}$</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 0.1…16 A</td>
<td>AC 16…72 V, 42…460 Hz/ DC 9.6…94 V</td>
<td>CME420-D-1</td>
<td>B73060001</td>
</tr>
<tr>
<td>AC 0.1…16 A</td>
<td>AC 70…300 V, 42…460 Hz/ DC 70…300 V</td>
<td>CME420-D-2</td>
<td>B73060002</td>
</tr>
</tbody>
</table>

Device version with screw terminals on request.

1) Absolute values

### Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for XM420 enclosure</td>
<td>B98060008</td>
</tr>
</tbody>
</table>

---

**Table:**

<table>
<thead>
<tr>
<th>Function</th>
<th>Setting range</th>
<th>Supply voltage $U_S$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains voltage AC</td>
<td>AC 0.1…16 A</td>
<td></td>
</tr>
<tr>
<td>Undercurrent/overcurrent</td>
<td>AC 16…72 V</td>
<td></td>
</tr>
<tr>
<td>Window discriminator function</td>
<td>AC 9.6…94 V</td>
<td></td>
</tr>
<tr>
<td>Password protection</td>
<td>AC 70…300 V</td>
<td></td>
</tr>
<tr>
<td>History memory (first alarm value)</td>
<td>AC 42…460 Hz</td>
<td></td>
</tr>
<tr>
<td>Supply voltage $U_S$</td>
<td>DC 16…72 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC 9.6…94 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC 70…300 V</td>
<td></td>
</tr>
</tbody>
</table>

**Response values**

- **Current:** AC 0.05…16 A true r.m.s.
- **Setting range:** 0.1…16 A x transformation ratio $n$
- **Rated frequency:** 42…200 Hz
- **Transformation ratio $n$:** 1…2000
- **Hysteresis:** 10…40 %
- **Response time:** $\leq$ 70 ms
- **Response delay:** 0…99 s
- **Startup delay/delay on release:** 0…99 s

**Alarm LEDs**

- **Operation**
- **Alarm undercurrent**
- **Alarm overcurrent**

**Switching elements**

- **Number of switching elements:** 2 x 1 changeover contacts, programmable
- **Operating principle:** N/O or N/C operation, programmable

**Enclosure**

- **Enclosure dimensions in mm ($H \times W \times D$):** 90 x 36 x 70.5
- **Accessories:** Mounting clip
- **Interface option:** M
- **Standards, approvals and certifications:** UL508
Current relay for 3AC currents

AC current relays are designed to monitor the upper and lower limit of a defined response value.

Ordering information

<table>
<thead>
<tr>
<th>Supply voltage $U_S$</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 16...72 V/DC 9.6 V...94 V, 15...460 Hz</td>
<td>CMD420-D-1</td>
<td>B73060006</td>
</tr>
<tr>
<td>AC/DC 70...300 V, 15...460 Hz</td>
<td>CMD420-D-2</td>
<td>B73060007</td>
</tr>
<tr>
<td>AC 16...72 V/DC 9.6 V...94 V, 15...460 Hz</td>
<td>CMD421-D-1</td>
<td>B73060008</td>
</tr>
<tr>
<td>AC/DC 70...300 V, 15...460 Hz</td>
<td>CMD421-D-2</td>
<td>B73060009</td>
</tr>
</tbody>
</table>

Device version with screw terminals on request.

Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for XM420 enclosure</td>
<td>B9860008</td>
</tr>
</tbody>
</table>
### Current relay for AC currents

12 channel AC current relays monitor the upper and lower limits of a defined values.

#### Ordering information

<table>
<thead>
<tr>
<th>Supply voltage $U_S^{(1)}$</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 16…72 V, 42…460 Hz/DC 16…94 V</td>
<td>CMS460-D-1</td>
<td>B94053017</td>
</tr>
<tr>
<td>AC 70…276 V, 42…460 Hz/DC 70…276 V</td>
<td>CMS460-D-2</td>
<td>B94053018</td>
</tr>
</tbody>
</table>

$^{(1)}$ Absolute values

#### Function

- Alternating/pulsating current
- Undercurrent/overcurrent
- Unbalance monitoring
- Window discriminator function

#### Mains voltage AC

<table>
<thead>
<tr>
<th>Function</th>
<th>AC 16…72 V, 42…460 Hz/DC 16…94 V</th>
<th>AC 70…276 V, 42…460 Hz/DC 70…276 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage $U_S$</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Measuring channels per device</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>42…2000 Hz</td>
<td>42…2000 Hz</td>
</tr>
<tr>
<td>Hysteresis approx.</td>
<td>2…40 %</td>
<td>2…40 %</td>
</tr>
<tr>
<td>Response time</td>
<td>$\leq$ 180 ms</td>
<td>$\leq$ 180 ms</td>
</tr>
<tr>
<td>Response delay</td>
<td>0…999 s</td>
<td>0…999 s</td>
</tr>
<tr>
<td>Delay on release</td>
<td>0…999 s</td>
<td>0…999 s</td>
</tr>
<tr>
<td>LC display</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Operation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Alarm undercurrent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Alarm overcurrent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number of switching elements</td>
<td>2 x 1 changeover contact</td>
<td>2 x 1 changeover contact</td>
</tr>
<tr>
<td>Operating principle</td>
<td>N/O or N/C operation</td>
<td>N/O or N/C operation</td>
</tr>
<tr>
<td>Enclosure dimensions in mm (H x W x D)</td>
<td>90 x 108 x 74</td>
<td>90 x 108 x 74</td>
</tr>
<tr>
<td>Accessories</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Monitoring relays for special applications

<table>
<thead>
<tr>
<th>Loop monitoring</th>
<th>Fault voltage monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LINETRAXX® GM420</strong></td>
<td><strong>RM475/RM475LY</strong></td>
</tr>
<tr>
<td><strong>SB146</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Supply voltage $U_S$
- AC 16…72 V/DC 9.6…94 V
  - AC/DC 70…300 V
- AC 90…132/230/400/500 V
- DC 9.8…84/77…286 V
- AC 10…65 V/DC 10…90 V
- AC 10…276 V/DC 90…308 V

### Measuring circuit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>GM420</th>
<th>RM475</th>
<th>SB146</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop resistance &gt; $R$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Series resistance</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Cross resistance</td>
<td>–</td>
<td>50…500 Ω</td>
<td></td>
</tr>
<tr>
<td>Max. system leakage capacitance</td>
<td>–</td>
<td>50 μF</td>
<td></td>
</tr>
<tr>
<td>Measuring channels</td>
<td>–</td>
<td>–</td>
<td>6</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>42…460 Hz</td>
<td>50…60 Hz</td>
<td>50…1000 Hz</td>
</tr>
<tr>
<td>Hysteresis approx.</td>
<td>1…40 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response delay</td>
<td>0.1…10 s</td>
<td>1…10 s</td>
<td>–</td>
</tr>
<tr>
<td>Response value $U_A$</td>
<td>0.1…100 Ω</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Fault voltage $U_f$</td>
<td>–</td>
<td>–</td>
<td>AC 21.6…24 V/DC 19…24 V</td>
</tr>
</tbody>
</table>

### Alarm LEDs

| Operation                          |       |       |       |
| Cross/series resistance            |       |       | Cross/series resistance |
| (connection) and per channel       |       |       |       |

### Switches/buttons

| Operation                          |       | TEST/RESET | TEST/RESET |
| Loop resistance > $R$              |       |           |           |
| Extrinsic voltage > $U_f$          |       |           |           |

### Enclosure

<table>
<thead>
<tr>
<th>Enclosure dimensions in mm (H x W x D)</th>
<th>GM420</th>
<th>RM475</th>
<th>SB146</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 x 36 x 70.5</td>
<td></td>
<td>73 x 99 x 75</td>
<td>99 x 45 x 114.5</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Mounting clip EV22S</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
Loop monitoring relays monitor conductor loops, for example, supply leads of mobile machines and devices, for interruptions and short-circuits.

**Ordering information**

<table>
<thead>
<tr>
<th>Series resistance</th>
<th>Response delay</th>
<th>Supply voltage $U_S$</th>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>0…99 s</td>
<td>AC 16…72 V, 15…460 Hz/DC 9.6…94 V</td>
<td>GM420-D-1</td>
<td>B73082001²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC 70…300 V, 15…460 Hz/DC 70…300 V</td>
<td>GM420-D-2</td>
<td>B73082002²</td>
</tr>
<tr>
<td>200 Ω</td>
<td>&lt; 1 s</td>
<td>AC 230 V, 50…60 Hz</td>
<td>RM475</td>
<td>B97022001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC 90…132 V, 50…60 Hz</td>
<td>RM475-13</td>
<td>B97022002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC 9.8…84 V</td>
<td>RM475-21</td>
<td>B97022005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC 77…286 V</td>
<td>RM475-23</td>
<td>B97022006</td>
</tr>
<tr>
<td>adjustable 50…500 Ω</td>
<td>adjustable 1…10 s</td>
<td>AC 230 V, 50…60 Hz</td>
<td>RM475LY</td>
<td>B97022007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC 90…132 V, 50…60 Hz</td>
<td>RM475LY-13</td>
<td>B97022008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC 400 V, 50…60 Hz</td>
<td>RM475LY-15</td>
<td>B97022009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC 500 V, 50…60 Hz</td>
<td>RM475LY-16</td>
<td>B97022010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC 9.8…84 V</td>
<td>RM475LY-21</td>
<td>B97022011</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC 77…286 V</td>
<td>RM475LY-23</td>
<td>B97022012</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>AC 10…65 V/DC 10…90 V</td>
<td>SB146-34</td>
<td>B93083017</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>AC 65…276/DC 90…308 V</td>
<td>SB146-35</td>
<td>B93083018</td>
</tr>
</tbody>
</table>

¹ Absolute values
² Device version with screw terminals on request.

**Accessories**

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for XM420 enclosure</td>
<td>B98060008</td>
</tr>
<tr>
<td>EV22S Cable end unit</td>
<td>B984800</td>
</tr>
</tbody>
</table>
Is your system still state of the art?

Even the most modern electrical systems cannot escape the marks of time. Whether diminishing operational reliability, changed legal stipulations or increasing energy costs: Upgrading to the respective current state of the art is indispensable. Products for monitoring energy quality and fault search are typically retrofitted.

Risk assessment according to operating safety regulations: Does your presently installed monitoring equipment recognise symmetrical and asymmetrical insulation faults?

Symmetrical and asymmetrical insulation faults present a high risk potential. Bender insulation monitoring devices continuously monitor your systems, insulation faults are captured and reported. Bender insulation monitoring devices comply with IEC 61557-8.

We will check your electrical installations and provide you with recommendations on how to proceed further.

Bender delivers flexible solutions for retrofit projects

Modern monitoring methods can be integrated in older installations as well – also during ongoing operations. Retrofitting is possible via devices such as divisible transformers, whereby the transformers are not even required to be shut down nor must cable installations be disconnected.

Successor devices from Bender can conveniently replace older installations. Long-term availability is thus guaranteed.
POWERSCOUT®
Find out today what won’t happen tomorrow

Moisture, deterioration, dirt, mechanical damage or faults due to the impact of current, voltage and temperature cause malfunctions in every electrical installation. The web-based software solution POWERSCOUT® helps you detect malfunctions at an early stage and eliminate the causes in an economically reasonable way. This guarantees high installation and operational safety and reduces costs.

Analysis – as individual as your system – as simple as possible
Predictive maintenance prevents downtimes, reduces costs and staff deployment. POWERSCOUT® informs you about the condition of your electrical installation at all times, since the meaningful visualisations with flexible dashboards can be retrieved via any display device: smartphone, laptop, computer. On request, POWERSCOUT® sends you graphically processed reports at specified intervals.

Continuous monitoring instead of random tests
Manual data acquisition is time consuming, error prone and only provides random sampling results. POWERSCOUT® gives you an insight into the entire data of your installation at any time, since all measured values are automatically and continuously saved. Your data is stored reliably and remains available for years.

Basis for periodic verification
The automated POWERSCOUT® report on residual currents forms the basis for measuring without switch-off by means of periodic verification. In order to maintain the correct status for electrical installations and stationary electrical equipment, periodic verification must be carried out.

This can be ensured, for example, by means of continuous monitoring of the installation carried out by qualified personnel. In this case, it would be smart to rely on continuous monitoring with multi-channel residual current monitoring systems (RCMS) and an evaluation (CP700) adapted to the system. The automatic POWERSCOUT® reports based on this monitoring enable the qualified person in charge to adjust the time limits for the insulation test within the context of periodic verification.

Analysis
- Continuously recording insulation values
- Recognising connections and optimising maintenance
- Cross-system evaluation possibilities
- Access from any place
- Supporting investment decisions

Predictive maintenance
- Higher availability
- Continuous monitoring
- Early detection of gradually developing insulation faults
- Early detection and reporting of short-time insulation degradation
- Less costs incurred due to unexpected malfunctions and shutdowns

Reports
- Historical comparisons
- Safe storage of measured values
- Event and alarm statistics
Support during all stages
Comprehensive service for your installation: remote, by phone, on site

From planning to modernisation – Our extensive know-how is at your disposal during all project phases.

Furthermore, with our first-class service we guarantee maximum safety for your electrical installations.
We offer services ranging from support over telephone to repairs and on-site service – with modern measuring devices and competent employees.

Secure yourself:
- High availability of your installation thanks to fast reaction to fault messages
- Increased profitability of your capital expenditure (CapEx) via optimised maintenance processes
- Targeted operating expenditure (OpEx) due to less downtimes and shorter service visits
- Support for your prospective system monitoring and regular tests of your system/power quality/monitoring devices
- Automatic control, analysis, correction, new settings/updates
- Competent assistance with setting changes and updates

Bender Remote Assist
Bender Remote Assist offers you support via remote access, high-quality service and advice for your challenging task consisting in ensuring consistent high safety in your systems.

Many service visits, fault clearance but also analyses and controls can be carried out remotely – without the expenses of time and money that an on-site visit of a technician implies.

This fast, efficient help and advice by our expert network allows the highest possible availability of your system.
Bender. So that your world is safer.

Our world is networked on a global scale; it is digital, mobile and highly automated – whether in manufacturing industry, inside or outside buildings, in operating theatres and power stations, in trains, underwater or underground: it never stands still and it is more dependent than ever on a reliable and, above all, safe electrical power supply.

And exactly that is our mission: we make electricity safe. Using our technologies we ensure that electricity is permanently available and guarantee faultless protection against the hazards of electric shock. We protect buildings, plants and machinery and therefore your investments and plans. But what we primarily protect are the lives of the people who are involved with electricity.

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