Main catalogue part 4

Residual current monitors
Residual current monitoring systems
Further information on other product ranges:
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Bender – Power in electrical safety

Electrical safety is indispensable. Safe and reliable use of electricity in various sectors calls for a high degree of electrical safety. Bender, a pioneer in this field, has made a major contribution to achieve this.

International presence

With more than 400 employees, Bender has been manufacturing and supplying electrical safety products since 1946. Ten technical offices in Germany and 50 agencies and distributors on all continents make us flexible to provide close and direct dialogue with our customers.

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With the first patent in the year 1939, Dipl.-Ing. Walther Bender, the founder of the company, not only had achieved that his idea had become reality, but also the philosophy to protect people and machines against the hazards of electrical current by innovative solutions and to make the use of electric energy even safer and more economical, had been realised. Still today, the name Bender is synonymous with this philosophy.
electrical safety

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Our products are subject to stringent quality guidelines during development, manufacturing and testing. Bender’s quality philosophy which have consistently been pursued is reflected in internationally accepted approvals and certifications, such as ISO9001.

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Service for you
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**Device overview – Residual current monitors RCM**

RCMs monitor residual currents respectively fault currents in earthed systems (TN, TT systems) and are predominantly used in electrical installations where an alarm must be provided but disconnection must be prevented in the event of a fault. RCMs are suitable for alternating respectively pulsed DC currents. They can also be used in combination with existing protective devices for monitoring and indication of the present fault current. For that purpose, response values and response times are variable.

### Examples of application

**Monitoring of an incoming supply for fault currents (line or PE)**

**Monitoring of an electric load**

**Monitoring of electric loads according to BGV A3 (Accident Prevention Regulation) (Germany)**
### Device Overview – Residual Current Monitors RCM

#### RCM420
- **TN/TT systems**: 1
- **AC + pulsed DC**: 42…2000 Hz
- **Type A**: 50…100 \% $I_{\Delta n2}$
- **10 mA…10 A**: 10 mA…10 A
- **≤ 180 ms (1 x $I_{\Delta n2}$); ≤ 30 ms (5 x $I_{\Delta n2}$)**
- **0…10 s**: 0…10 s
- **0…99 s**: 0…99 s
- **1 changeover contact**: 1 changeover contact
- **N/O or N/C operation**: N/O or N/C operation
- **W…, WR…, WS…**: --
- **LC display**: ×
- **Alarm 1, 2**: ×
- **Option**: ×
- **selectable**: ×
- **UL, GOST**: ×

#### RCM470LY
- **TN/TT systems**: 1
- **AC + pulsed DC**: 40…400 Hz (1000 Hz)
- **Type A**: 50…60 Hz
- **10 mA…10 A/100 mA…100 A**: 10 mA…10 A
- **≤ 250 ms (1 x $I_{\Delta n2}$); ≤ 20 ms (5 x $I_{\Delta n2}$)**
- **0…10 s**: 0…10 s
- **2 changeover contacts**: 2 changeover contacts
- **N/O or N/C operation**: N/O or N/C operation
- **W…, WR…, WS…**: --
- **LED bar graph indicator 0…100 %**: ×
- **--**: ×
- **Alarm 1, 2**: ×

#### RCM475LY
- **TN/TT systems**: 1
- **AC + pulsating DC**: 50…60 Hz
- **Type A**: 30 mA / 10…80 \% $I_{\Delta n2}$
- **10 mA…10 A**: 10 mA…10 A
- **≤ 250 ms (1 x $I_{\Delta n2}$); ≤ 20 ms (5 x $I_{\Delta n2}$)**
- **0…10 s**: 0…10 s
- **1 changeover contact**: 1 changeover contact
- **1 changeover contact**: 1 changeover contact
- **N/O or N/C operation**: N/O or N/C operation
- **W…, WR…, WS…**: --
- **18 mm**: --
- **--**: --
- **--**: --
- **Alarm 1, 2**: ×

#### RCM475YM2
- **TN/TT systems**: 1
- **AC + pulsating DC**: 50…60 Hz
- **Type A**: 30 mA / 10…80 \% $I_{\Delta n2}$
- **10 mA…10 A**: 10 mA…10 A
- **≤ 250 ms (1 x $I_{\Delta n2}$); ≤ 20 ms (5 x $I_{\Delta n2}$)**
- **0…10 s**: 0…10 s
- **1 changeover contact**: 1 changeover contact
- **N/O or N/C operation**: N/O or N/C operation
- **W…, WR…, WS…**: --
- **18 mm**: --
- **--**: --
- **--**: --
- **UL, GOST**: UL, GOST
AC/DC sensitive residual current monitors are used in earthed systems (TN, TT systems) where in addition to fault currents in different frequencies also smooth DC fault currents occur. This is especially true for loads containing six-pulse or two-pulse rectifiers with smoothing. Application fields are, for example, converters, frequency-controlled devices on construction sites, charging sets, uninterruptible power systems, medical facilities, PC switched mode power supplies and the like.

### Examples of application

- Monitoring of variable-speed drives
- Monitoring of computer rooms
- Monitoring of frequency-controlled devices on construction sites

### Type

**Fields of application**
- System configuration
- Measuring channels
- Residual currents
- Rated frequency \( I_{\Delta n} \)
- Classification acc. to IEC/TR 60755

**Device features – Response values/contacts**
- Response value \( I_{\Delta n1} \)
- Response value \( I_{\Delta n2} \)
- Response time
- Response delay alarm \( t_{on} \)
- Response delay prewarning \( t_{on} \)
- Start-up delay \( t \)
- Delay on release \( t_{off} \)
- Alarm relay, alarm
- Alarm relay, prewarning
- Operating principle, alarm relays

**Measuring current transformers**
- External measuring current transformers

**Displays**
- Measured value display
- Power On LED
- Alarm LED
- Connection, external measuring instrument

**General features**
- CT connection monitoring
- Test/reset button internal/external
- Fault memory
- Measured value memory
- Approvals and certifications
### Device overview – AC/DC sensitive residual current monitors RCMA

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<thead>
<tr>
<th>RCMA420</th>
<th>RCMA423</th>
<th>RCM475LY</th>
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<tr>
<td><strong>TN/TT systems</strong></td>
<td><strong>TN/TT systems</strong></td>
<td><strong>TN/TT systems</strong></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>AC + pulsed DC + DC</td>
<td>AC + pulsed DC + DC</td>
<td>AC + pulsed DC + DC</td>
</tr>
<tr>
<td>0…2000 Hz</td>
<td>0…700 Hz</td>
<td>0…2000 Hz</td>
</tr>
<tr>
<td>Type B</td>
<td>Type B</td>
<td>Type B</td>
</tr>
<tr>
<td>50…100 % $I_{\Delta n}$</td>
<td>30 mA…1 A</td>
<td>30…500 mA</td>
</tr>
<tr>
<td>10…500 mA</td>
<td>≤ 180 ms (1 x $I_{\Delta n}$) ≤ 30 ms (5 x $I_{\Delta n}$)</td>
<td>50 % of $I_{\Delta n}$ / 100 %</td>
</tr>
<tr>
<td>0…10 s</td>
<td>0…10 s</td>
<td>0…10 s</td>
</tr>
<tr>
<td>0…10 s</td>
<td>0…10 s</td>
<td>0…10 s</td>
</tr>
<tr>
<td>0…99 s</td>
<td>0…99 s</td>
<td>0 / 1 s</td>
</tr>
<tr>
<td>1 changeover contact</td>
<td>1 changeover contact</td>
<td>1 changeover contact</td>
</tr>
<tr>
<td>1 changeover contact</td>
<td>1 changeover contact</td>
<td>1 changeover contact</td>
</tr>
<tr>
<td>N/O or N/C operation</td>
<td>N/O or N/C operation</td>
<td>N/O or N/C operation</td>
</tr>
<tr>
<td>W20AB</td>
<td>W20AB</td>
<td>--</td>
</tr>
<tr>
<td>W35AB</td>
<td>W35AB</td>
<td>--</td>
</tr>
<tr>
<td>W60AB</td>
<td>W60AB</td>
<td>--</td>
</tr>
<tr>
<td>--</td>
<td>W120AB</td>
<td>W210AB</td>
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<td>--</td>
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<td>18 mm</td>
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<td>--</td>
<td>--</td>
<td>LED bar graph indicator 0…100 %</td>
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<td>--</td>
<td>--</td>
<td>Alarm / flashing at 50 % $I_{\Delta n}$</td>
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<td>--</td>
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<td>--</td>
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Device overview –
Residual current monitoring system RCMS460 / 490

The RCMS system is a multi-channel residual current monitoring system that is designed to monitor up to 12 measuring points or measuring channels per device or up to 1080 channels when several devices are interconnected. The RCMS system is suitable for alternating, pulsating and smooth direct currents depending on the selected type of measuring current transformer.

Examples of application

<table>
<thead>
<tr>
<th>Type</th>
<th>Fields of application</th>
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<tr>
<td></td>
<td>System configuration</td>
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<tr>
<td></td>
<td>Classification acc. to IEC/TR 60755</td>
</tr>
<tr>
<td></td>
<td>Residual current display range Type A (r.m.s)</td>
</tr>
<tr>
<td></td>
<td>Residual current display range Type B (r.m.s)</td>
</tr>
<tr>
<td></td>
<td>Rated frequency Type A/Type B</td>
</tr>
</tbody>
</table>

Device features – Response values/contacts

<table>
<thead>
<tr>
<th>Number of measuring channels</th>
<th>4 or 8 / 0</th>
</tr>
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<tbody>
<tr>
<td>Rated residual operating current $I_{\Delta n2}$ (alarm), AC/DC sensitive Type B (channel 1…12) pulsed DC and AC sensitive Type A (channel 1…12) pulsed DC and AC sensitive Type A channel 9…12 only (-D4)</td>
<td></td>
</tr>
<tr>
<td>Rated residual operating current $I_{\Delta n1}$ (prewarning)</td>
<td></td>
</tr>
<tr>
<td>Operating time for all channels</td>
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</tr>
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<td>Operating time for digital inputs I/O</td>
<td></td>
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<tr>
<td>Response delay $t_{\Delta}$ per channel</td>
<td></td>
</tr>
<tr>
<td>Response delay $t_{\Delta}$ per channel</td>
<td></td>
</tr>
<tr>
<td>Delay on release $t_{\Delta}$ per channel</td>
<td></td>
</tr>
<tr>
<td>Function selectable per channel</td>
<td></td>
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<tr>
<td>Factor for additional CT</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td></td>
</tr>
<tr>
<td>Common alarm relay for all channels</td>
<td></td>
</tr>
<tr>
<td>Alarm relay per channel</td>
<td></td>
</tr>
</tbody>
</table>

Measuring current transformers

| External measuring current transformer Type A |
| External measuring current transformer Type B |

Displays

| Power On LED, alarm LED |
| Alarm LED per channel |
| Seven-segment display |
| LC graphics display (backlit) |

General features

| CT connection monitoring |
| Test/reset button internal/external |
| History memory 300 data records |
| Fault memory |
| Analysis of the harmonics ($U_3$, DC, THD) |
| Data logger (300 data records per channel) |
| Preset function for $I_\Delta$ and I/O |
| Master / Slave function |
| Parameter setting function |
| Internal clock |
| Password |
| Address range BMS bus |
| Display error code |
| Cut-off frequency adjustable for personnel, plant and fire protection |
| Language |
| Approvals and certifications |
### Device Overview – Residual Current Monitoring Systems RCMS460/490

#### TN/TT Systems

<table>
<thead>
<tr>
<th>Type A or B (acc. to CT type)</th>
<th>0…30 A / 0…125 A (-D4)</th>
<th>0…20 A</th>
<th>42…200 Hz/0…2000 Hz</th>
</tr>
</thead>
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<tr>
<td>RCMS460-D… / -D4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCMS460-L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCMS490-D… / -D4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCMS490-L</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Type A or B**: According to CT type
- **Current Range**: 0…30 A / 0…125 A
- **Frequency Range**: 0…20 A
- **Cross Section**: 42…200 Hz / 0…2000 Hz

#### Technical Specifications

<table>
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<tr>
<th>Specification</th>
<th>Value</th>
</tr>
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<tr>
<td>Max. 1080 in the system</td>
<td>12 mA…10 A</td>
</tr>
<tr>
<td>m = 0…999 s</td>
<td>0…999 s</td>
</tr>
<tr>
<td>≤ 180 ms (1 x I&lt;sub&gt;Δn&lt;/sub&gt;)</td>
<td>≤ 3.5 s</td>
</tr>
<tr>
<td>≤ 180 ms (1 x I&lt;sub&gt;Δn&lt;/sub&gt;)</td>
<td>≤ 3.5 s</td>
</tr>
<tr>
<td>≤ 180 ms (1 x I&lt;sub&gt;Δn&lt;/sub&gt;)</td>
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<tr>
<td>≤ 180 ms (1 x I&lt;sub&gt;Δn&lt;/sub&gt;)</td>
<td>≤ 3.5 s</td>
</tr>
<tr>
<td>≤ 180 ms (1 x I&lt;sub&gt;Δn&lt;/sub&gt;)</td>
<td>≤ 3.5 s</td>
</tr>
</tbody>
</table>

- **Environmental**: 0…99% relative humidity
- **Power On, Alarm 1 / 2**: Selectable

#### Additional Features

- **Protocol**: RS-485 / BMS protocol
- **Contact**: 2 x 1 changeover contact
- **Selectability**: UL, GOST, LR

---

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Device overview – Directionally discriminating residual current monitors

The residual current monitors RCM470DY and RCM475DY monitor the residual current in unearthed AC and 3(N) AC systems (IT systems). The residual current is evaluated directionally, i.e. only insulation faults detected on the load side are signalled. That allows selective fault location in extended IT systems.

Example of application

Monitoring of residual currents in extended IT systems
## Device overview – Directionally discriminating residual current monitors

### Type

<table>
<thead>
<tr>
<th>RCM470DY</th>
<th>RCM475DY</th>
</tr>
</thead>
</table>

### Fields of application

- **System configuration**: IT systems
- **Residual currents**: AC + pulsating DC
- **Rated frequency**: 50...60 Hz
- **Classification acc. to IEC/TR 60755**: Type A

### Device features – Response values/contacts

<table>
<thead>
<tr>
<th>RCM470DY</th>
<th>RCM475DY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response value ( \Delta I )</strong>: 10 mA...10 A/100 mA...100 A</td>
<td><strong>Response delay</strong>: 0...10 s</td>
</tr>
<tr>
<td><strong>Response delay</strong>: 0...10 s</td>
<td><strong>Contacts, alarm</strong>: 2 changeover contacts</td>
</tr>
<tr>
<td><strong>Operating principle, alarm relays</strong>: N/O or N/C operation</td>
<td><strong>Operating principle, alarm relays</strong>: N/O or N/C operation</td>
</tr>
</tbody>
</table>

### Measuring current transformers

- **External measuring current transformers**: W..., WR...
- **Built-in measuring current transformers (diameter)**: -- 18 mm

### Displays

<table>
<thead>
<tr>
<th>RCM470DY</th>
<th>RCM475DY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power On LED</strong>: --</td>
<td><strong>Alarm LED</strong>: --</td>
</tr>
<tr>
<td><strong>LED bar graph indicator 0...100 %</strong>: --</td>
<td><strong>LED bar graph indicator 0...100 %</strong>: --</td>
</tr>
<tr>
<td><strong>Connection, external measuring instrument</strong>: --</td>
<td><strong>Connection, external measuring instrument</strong>: --</td>
</tr>
</tbody>
</table>

### General features

- **CT connection monitoring**: --
- **Internal test/reset button**: --
- **Test/reset button external**: --
- **Fault memory**: --
- **Approvals and certifications**: UL, GL, GOST

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---
Device overview –
Measuring current transformers
for residual current monitors

Bender measuring current transformers are highly sensitive and convert even the lowest residual currents into evaluable signals. The CTs are connected to the respective residual current monitor by means of measuring leads.

<table>
<thead>
<tr>
<th>Measuring current transformer series</th>
<th>W…</th>
<th>W10/600</th>
<th>WR…</th>
<th>W465-A26-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal diameter in mm (W x H)</td>
<td>20</td>
<td>10</td>
<td>70 x 175</td>
<td>23</td>
</tr>
<tr>
<td>Band length in mm</td>
<td>35</td>
<td>115 x 305</td>
<td>70 x 175</td>
<td>W465-A26-1</td>
</tr>
<tr>
<td>CT type</td>
<td>W20</td>
<td>W10/600</td>
<td>WR70x175</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W35</td>
<td>W10/600</td>
<td>WR115x305</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W60</td>
<td>W10/600</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W120</td>
<td>W10/600</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W210</td>
<td>W10/600</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product series</th>
<th>RCM420</th>
<th>RCM470LY</th>
<th>RCM470DY</th>
<th>RCM4420</th>
<th>RCM472LY</th>
<th>RCM5460/490</th>
<th>Approvals and certifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>GOST, LR</td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>GOST</td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>GOST, LR</td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>GOST</td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>GOST</td>
</tr>
</tbody>
</table>

Approvals and certifications:
- GOST
- LR

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Chapter 4.5 – Page 82 - 83
Chapter 4.5 – Page 89
## Device overview – Measuring current transformers for residual current monitors

<table>
<thead>
<tr>
<th>WR…S</th>
<th>WS…S</th>
<th>WS…S</th>
<th>WF…</th>
<th>W…AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 x 120</td>
<td>200 x 300</td>
<td>150 x 350</td>
<td>50 x 80</td>
<td>50 x 80</td>
</tr>
<tr>
<td>WR150x350S</td>
<td>WS20x30</td>
<td>WS50x80</td>
<td>WS80x120S</td>
<td>W20AB</td>
</tr>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>GOST</td>
<td>GOST, UL, LR</td>
<td>GOST</td>
<td>GOST</td>
<td>GOST, LR</td>
</tr>
<tr>
<td>Chapter 4.5 – Page 84 - 85</td>
<td>Chapter 4.5 – Page 88</td>
<td>Chapter 4.5 – Page 86 - 88</td>
<td>Chapter 4.5 – Page 78 - 81</td>
<td></td>
</tr>
</tbody>
</table>
## Device overview – Supplementary equipment
### Interface converters and repeaters

<table>
<thead>
<tr>
<th>Type</th>
<th>DI-1PSM</th>
<th>DI-2</th>
<th>DI-2USB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Interface repeater</td>
<td>Interface converter</td>
<td>Interface converter</td>
</tr>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion of bus devices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General features</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

- **Type**: DI-1PSM, DI-2, DI-2USB
- **Application**: Interface repeater, Interface converter, Interface converter
- **Input**:
  - **Connection**: Screw-type terminal
  - **Cable length**: ≤ 1200 m
- **Output**:
  - **Connection**: Screw-type terminal (DI-1PSM, DI-2), 9-pin Sub-D connector (DI-2USB)
  - **Cable length**: ≤ 120 m (DI-1PSM, DI-2), ≤ 5 m (DI-2USB)
- **Supply voltage**:
  - AC/DC 24 V ± 20 % (DI-1PSM)
  - DC 10…30 V (DI-2)
  - Via USB with driver CD (DI-2USB)
- **General features**:
  - DIN rail (DI-1PSM)
  - Screw mounting or DIN rail mounting (DI-2)
  - -- (DI-2USB)

---

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**Chapter 4.6 – Page 94**  
**Chapter 4.6 – Page 95**
### Device overview – Protocol converter for standard fieldbus systems and Ethernet networks

<table>
<thead>
<tr>
<th>Type</th>
<th>FTC470XET</th>
<th>FTC470XMB</th>
<th>FTC470XDP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol input</td>
<td>BMS</td>
<td>BMS</td>
<td>BMS</td>
</tr>
<tr>
<td>Protocol output</td>
<td>Ethernet (TCP/IP) OPC</td>
<td>Modbus RTU</td>
<td>PROFIBUS DP</td>
</tr>
<tr>
<td>Alarm messages</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Meas. values</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Device parameter setting</td>
<td>via PC with browser</td>
<td>via visualisation</td>
<td>via visualisation</td>
</tr>
<tr>
<td>Alarm list</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagrams</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail notification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data logger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail notification</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Axeda compatible</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Advantech compatible</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Active-X-Toolkit compatible</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Client communication</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td><strong>Connection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMS</td>
<td>screw-type terminal</td>
<td>screw-type terminal</td>
<td>screw-type terminal</td>
</tr>
<tr>
<td>Output</td>
<td>RJ45</td>
<td>9-pin Sub-D connector</td>
<td>9-pin Sub-D connector</td>
</tr>
<tr>
<td><strong>System requirements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Browser</td>
<td>Internet Explorer, Opera, Firefox etc.</td>
<td>GOST, GL, LR</td>
<td>GOST, GL, LR</td>
</tr>
<tr>
<td>Approvals and certifications</td>
<td>GOST, GL, LR</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Visualisation = SCADA software with appropriate programming
## Device overview – Alarm indicator and operator modules

### Type

<table>
<thead>
<tr>
<th></th>
<th>MK800-11</th>
<th>MK800-12</th>
<th>MK2430-11</th>
<th>MK2430-12</th>
<th>Touch Panel TPC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Displays</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDICS® systems</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>RCMS Residual current monitoring system</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EDS Insulation fault locator</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flush-mounting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cavity wall mounting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable-duct mounting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panel mounting</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td><strong>Inputs/outputs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital inputs (potential free)</td>
<td>16</td>
<td>--</td>
<td>12</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>N/O or N/C operation</td>
<td>selectable</td>
<td>--</td>
<td>selectable</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Relay outputs</td>
<td>1</td>
<td>--</td>
<td></td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>N/O or N/C operation</td>
<td>programmable</td>
<td></td>
<td>programmable</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Common alarm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>System fault alarm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--</td>
</tr>
<tr>
<td><strong>Display and operating controls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC display (backlit), screen resolution</td>
<td>4 x 20 characters</td>
<td>4 x 20 characters</td>
<td>320 x 600, 1024 x 768</td>
<td>programmable</td>
<td>programmable</td>
</tr>
<tr>
<td>Character height</td>
<td>8 mm</td>
<td>3.1 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indication LEDs, normal, warning, alarm</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Button “Buzzer mute”</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Button “Add. text”</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Parameter setting buttons</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Parameter setting/text message</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Languages selectable</td>
<td>20</td>
<td>20</td>
<td>320 x 600, 1024 x 768</td>
<td>programmable</td>
<td>programmable</td>
</tr>
<tr>
<td>Standard display</td>
<td>4 x 20 characters</td>
<td>4 x 20 characters</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Additional text can be displayed</td>
<td>3 x 20 characters</td>
<td>3 x 20 characters</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Pre-defined standard texts</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Freely configurable text messages</td>
<td>1000</td>
<td>1000</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>History memory, maximum number of data records</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Real-time clock</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Parameterisation software</td>
<td>TMK-Set V 3.xx (USB, BMS)</td>
<td>MK-Set V 2.xx (USB, BMS)</td>
<td>Advantech Studio</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Messages/alarms, medical gases</td>
<td>acc. to EN475, EN737-3</td>
<td>acc. to EN475, EN737-8</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS-485 (BMS protocol)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>BMS address range</td>
<td>Internal: 1 (…150), external: 1…99</td>
<td>Internal: 1 (…150), external: 1…99</td>
<td>1…150</td>
<td>1…150</td>
<td>1…150</td>
</tr>
<tr>
<td>Master redundancy, BMS internal</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Master redundancy, BMS external</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>USB</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>Ethernet (TCP/IP)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Voltage supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>AC/DC 24 V</td>
<td>AC/DC 24 V</td>
<td>AC/DC 24 V</td>
<td>AC/DC 24 V</td>
<td>AC/DC 24 V</td>
</tr>
<tr>
<td>Stored energy time in the event of power failure</td>
<td>≤ 2 s</td>
<td>≤ 15 s</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

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## Device overview – Software

### Axeda Wizcon
- **Type**: SCADA software for visualisation
- **Application**: FTC470XET, FTC470XMB or BMS OPC server
- **Appropriate gateway**: FTC470XET or BMS OPC server
- **Technical requirements**:
  - Compatible PC ≥ 1 GHz, ≥ 256 MB RAM
  - 500 MB storage space on the hard disk
  - CD ROM or DVD drive
  - Graphics card ≥ 8 MB
  - Screen resolution ≥ 800 x 600
  - USB or dongle - printer connection
- **Operating system software**: Windows 2000, XP
- **Scope of delivery**: Demo version, development or runtime versions for 100…65000 process items, operating manual
- **Note**: Additional services: customer-specific programming

### ActiveX Toolkit
- **Type**: Easy visualisation in combination with Microsoft Excel
- **Application**: FTC470XET or BMS OPC server
- **Appropriate gateway**: Refer to Excel respectively Windows
- **Technical requirements**:
  - Windows 2000, XP
  - Microsoft Excel 2000 or higher
- **Operating system software**: Windows 2000, XP
- **Scope of delivery**: CD, examples for RCMS, EDS and MEDICS® systems, operating manual
- **Note**: Additional services: customer-specific programming

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**Chapter 4.9 – Page 124 - 125**
## Device overview – E / A modules

<table>
<thead>
<tr>
<th>Type</th>
<th>RK170</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversion from</td>
<td>DC 0…400 μA, DC 0 / 4…20 mA, DC 0…10 V</td>
</tr>
<tr>
<td>to</td>
<td>DC 0…400 μA, DC 0 / 4…20 mA, DC 0…10 V</td>
</tr>
</tbody>
</table>

### Inputs
- Current: DC 0…400 μA

### Outputs
- Current: DC 0 / 4…20 mA, DC 0…10 V
- Voltage: DC 0…10 V

---

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## Device overview – Measuring instruments, mounting kits

<table>
<thead>
<tr>
<th>Type</th>
<th>9604-4241</th>
<th>X470/XM460</th>
<th>X470/XM460</th>
<th>XM420</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>External % measuring instrument</td>
<td>Mounting frame</td>
<td>Mounting parts</td>
<td>Mounting frame</td>
</tr>
<tr>
<td>For device family</td>
<td>RCM470, RCMA47…, RCM420, RCMA420</td>
<td>RCM470, RCMA47…, RCM5460</td>
<td>RCM470, RCMA47…, RCM5460</td>
<td>RCM420, RCMA420</td>
</tr>
<tr>
<td>Dimensions</td>
<td>96 x 96 mm</td>
<td>144 x 72 mm</td>
<td>--</td>
<td>54 x 72 mm</td>
</tr>
<tr>
<td>Technical data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>DC 0…400 μA</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scale</td>
<td>Division</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Scale centre point</td>
<td>50 %</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Display range</td>
<td>0…100%</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Enclosure</td>
<td>XM420</td>
<td>--</td>
<td>--</td>
<td>×</td>
</tr>
<tr>
<td>XM460</td>
<td>--</td>
<td>×</td>
<td>×</td>
<td>--</td>
</tr>
<tr>
<td>X470/X475</td>
<td>--</td>
<td>×</td>
<td>×</td>
<td>--</td>
</tr>
</tbody>
</table>

Chapter 4.10 – Page 132 Chapter 4.10 – Page 133 Chapter 4.10 – Page 133 Chapter 4.10 – Page 133
Residual current monitors for alternating and pulsating direct currents (Type A acc. to IEC/TR 60755)

Residual current monitors RCM measure the residual current in electrical installations where an alarm is to be activated in case of a fault, but disconnection must be prevented. They can also be used in combination with existing protective devices for continuous indication of the latest residual current value. RCM allow continuous monitoring of the electrical installation and the detection of gradually developing fault currents at an early stage. The insulation fault is detected in good time and can be eliminated with the shortest practical delay. Hence, loss of production and system downtimes can be reduced to a minimum. In production facilities, a purposeful shutdown in case of malfunction can be realised and damage to machines and tools can be avoided. Periodic tests are supported to fulfil the requirements of BGV A3 by continuous monitoring of the insulation level and scheduled maintenance.
Residual current monitor
RCM420

Product description
The AC and pulsed DC sensitive residual current monitor RCM420-D (Type A) from Bender is designed for fault and residual current monitoring in earthed power supply systems (TN and TT systems) where an alarm is to be activated in the event of a fault, but disconnection must be prevented. In addition, the device can be used to monitor single conductors, such as PE conductors, N-PE connections and PE-PAS connections.

The prewarning stage (50...100 % of the set response value $I_{\Delta n}$) allow to distinguish between prewarning and alarm. Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Applications
- Residual current monitoring in earthed two, three or four conductor systems
- Current monitoring of single conductors de-energised under normal conditions
- Socket-outlet circuits for devices which are operated unattended for a long time and which may not fail
- Alarm systems, safety devices
- Air conditioning systems, EDP systems
- Cooling equipment with valuable frozen goods
- Canteen kitchens
- Monitoring of earthed power supplies for stray currents
- Impact on N conductors
- Trace heating systems

Function
Once the supply voltage $U_s$ has been applied, the start-up delay "t" starts. Measured values exceeded during this time do not influence the switching state of the alarm relays. Residual current monitoring takes place via an external measuring current transformer. The actual measured value is indicated on the LCD. In this way any changes, for example when circuits are connected to the system, can be recognised easily.

If the measured value exceeds one or both response values, the response delays $t_{on1/2}$ begin. Once $t_{on1/2}$ have elapsed, the selected alarm relays switch. If the release value is not reached before the response delay $t_{on}$ has elapsed, the alarm LEDs "AL1 / AL2" do not light up and the alarm relays do not switch. The set release time $t_{off}$ begins when the measured value again falls below the release value (response value minus hysteresis) after the switching of the alarm relays. When $t_{off}$ has elapsed, the alarm relays switch back to their initial position. If the fault memory is enabled, the alarm relays remain in the alarm state until the reset button is pressed or until the supply voltage is interrupted. The device function can be tested using the test button. Parameters are assigned to the device via the LCD and the control buttons on the front panel; this function can be password-protected.

Connection monitoring
The CT connections are continuously monitored. In the event of a fault, the alarm relays K1 / K2 switch without delay, the alarm LEDs AL1 / AL2 / ON flash. After eliminating the fault, the alarm relays return to their initial position either automatically or by pressing the reset button (fault memory behaviour).

Restart function
If an alarm is pending after resetting the alarm relay and restarting the system being monitored, this reset process is repeated until the preset number of restart cycles is completed. As soon as the preset number of restart cycles is completed, the fault memory is set to ON.

Device features
- AC and pulsed DC sensitive residual current monitor Type A according to IEC 62020
- r.m.s. value measurement (AC)
- Two separately adjustable response values
- Frequency range 42...2000 Hz
- Start-up delay, response delay and delay on release
- Restart function
- Digital measured value display via LC display
- Measured value memory for operating value
- CT connection monitoring LED
- Power On LED, LEDs: Alarm 1 / 2
- Internal/external test/reset button
- Two separate alarm relays (one changeover contact each)
- N / O or N / C operation and fault memory behaviour selectable
- Password protection for device setting
- Device self monitoring
- Sealable transparent cover
- Two-module enclosure (36 mm)
- RoHS compliant
- Push-wire terminal (two terminals per connection)

Approvals and certifications

UL LISTED
CSA C22.2
AB25

Residual current monitor for TN and TT systems (AC and pulsed DC currents)
### Operating and display elements

1. **Power On LED "ON" (green)**: lights when supply voltage is applied and flashes in the event of system fault alarm respectively in the event of CT malfunction.
2. **Alarm LED "AL1" (yellow)**, prewarning, lights when the set response value $I_{\Delta n1}$ has been exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.
3. **Alarm LED "AL2" (yellow)**, alarm, lights when the set response value $I_{\Delta n2}$ has been exceeded and flashes in the event of system fault alarm and in the event of CT malfunction.
4. **Multi functional LC display**
5. **Test button "T"**: to call up the self test.
6. **Reset button "R"**: to delete saved alarms.
7. **"MENU" button**: to call up the menu system.
   - **Enter button**: confirm parameter change.
   - **Press ESC**: press the button > 1.5 seconds.

### Wiring diagram

1. **Supply voltage $U_S$** see ordering information, (6 A fuse recommended)
2. **Connection of the external measuring current transformer**
3. **Alarm relay K1**: Programmable for alarm $I_{\Delta n1} / I_{\Delta n2} / \text{TEST} / \text{ERROR}$
4. **Alarm relay K2**: Programmable for alarm $I_{\Delta n1} / I_{\Delta n2} / \text{TEST} / \text{ERROR}$
5. **Combined test and reset button "T/R"**
   - short-time pressing (< 1.5 s) = RESET
   - long-time pressing (> 1.5 s) = TEST
* when a shielded cable is used.

**Do not route the PE conductor through the measuring current transformer!**
Residual current monitor RCM420

**Technical data**

**Insulation coordination acc. to IEC 60664-1/IEC 60664-3**
- Rated insulation voltage: 250 V
- Rated impulse voltage/pollution degree: 4 kV / III
- Protective separation (reinforced insulation) between: (A1, A2) - (k, l, T/R) - (11, 12, 14) - (21, 22, 24)
- Voltage tests according to IEC 61010-1: 2.21 kV

**Supply voltage**
- RCM420-D-1:
  - Supply voltage: U<sub>S</sub> AC 16…72 V / DC 9.6…94 V
  - Frequency range: U<sub>S</sub> 42…460 Hz
- RCM420-D-2:
  - Supply voltage: U<sub>S</sub> AC/DC 70…300 V
  - Frequency range: U<sub>S</sub> 42…460 Hz

**Measuring circuit**
- Measuring current transformers, external type: W…, WR…, WS…
- Load: 68 Ω
- Rated insulation voltage (measuring current transformer): 800 V
- Operating characteristic acc. to IEC 62020 and IEC/TR 60755 Type A
- Rated frequency: 42…2000 Hz
- Measuring range: 3 mA…16 A
- Relative uncertainty: 0…-20%
- Relative uncertainty: 0…30%

**Response values**
- Rated residual operating current I<sub>Δn1</sub> (prewarning, AL1) 50…100 % x I<sub>Δn1</sub>
- Rated residual operating current I<sub>Δn2</sub> (alarm, AL2) 10 mA…10 A (30 mA)
- Hysteresis: 10…25 % (15%)*

**Specific time**
- Start-up delay t<sub>0</sub>: 0…10 s (0.5 s)*
- Response delay t<sub>on1</sub> (prewarning): 0…10 s (1 s)*
- Delay on release t<sub>off</sub>: 0…99 s (1 s)
- Operating time t<sub>op</sub> at I<sub>Δn</sub> = 1 x I<sub>Δn1/2</sub>: ≤ 180 ms
- Operating time t<sub>op</sub> at I<sub>Δn</sub> = 5 x I<sub>Δn1/2</sub>: ≤ 30 ms
- Response time t<sub>n</sub>: t<sub>n</sub> = t<sub>op</sub> + t<sub>on1</sub>
- Recovery time t<sub>r</sub>: ≤ 300 ms
- Number of restart cycles: 0…100 (0)*

**Cable lengths for measuring current transformers**
- Single wire ≥ 0.75 mm²: 0…1 m
- Single wire, twisted ≥ 0.75 mm²: 0…10 m
- Shielded cable ≥ 0.75 mm²: 0…40 m
- Recommended cable: J-Y(St)Y min. 2x0.8
- Connection: screw-type terminals

**Displays, memory**
- Display range, measuring value: 3 mA…16 A
- Error of indication: ±15 % / ± 2 digit
- Measured-value memory for alarm value: data record measured values
- Password: off / 0…999 (off)*
- Fault memory alarm relay: on / off (on)*

**Inputs/outputs**
- Cable length for external test/reset button: 0…10 m

**Switching elements**
- Number of switching elements: 2 x 1 changeover contact
- Operating principle: N/C operation / N/O operation (N/C operation)*
- Electrical endurance, number of cycles: 10000
- Contact data acc. to IEC 60947-5-1:
  - Utilisation category: AC-13
  - Transport (IEC 60721-3-2): 2K3 (except condensation and formation of ice)
  - Long-time storage (IEC 60721-3-1): 1K4 (except condensation and formation of ice)
  - Classification of mechanical conditions: IEC 60721
  - Stationary use (IEC 60721-3-3): 3M4
  - Transport (IEC 60721-3-2): 2M2
  - Long-time storage (IEC 60721-3-1): 1M3

**Environment/EMC**
- EMC: IEC 62020: 2005-11
- Operating temperature: -25 ºC…+55 ºC
- Climatic class acc. to IEC 60721:
  - Stationary use (IEC 60721-3-3): 3K5 (except condensation and formation of ice)
  - Transport (IEC 60721-3-2): 2K3 (except condensation and formation of ice)
  - Long-time storage (IEC 60721-3-1): 1K4 (except condensation and formation of ice)

**Connection**
- Connection type: push-wire terminals
- Connection properties:
  - rigid: 0.2…2.5 mm² / AWG 24-12
  - flexible without ferrule: 0.2…2.5 mm² / AWG 24-12
  - flexible with ferrule: 0.2…1.5 mm² / AWG 24-16
- Stripping length: 10 mm
- Opening force: 50 N
- Test opening, diameter: 2.1 mm

**Other**
- Operating mode: continuous operation
- Position of normal use: any
- Degree of protection, internal components (IEC 60529): IP30
- Degree of protection, terminals (IEC 60529): IP20
- Enclosure material: polycarbonate
- Flammability class: UL94V-0
- DIN rail mounting acc. to: IEC 60715
- Screw fixing: 2 x M4 with mounting clip
- Operating manual: TGH1410
- Weight: ≤ 150 g

( )* = factory setting

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Response range I&lt;sub&gt;Δn&lt;/sub&gt;</th>
<th>Frequency range</th>
<th>Measuring current transformers</th>
<th>Supply voltage U&lt;sub&gt;S&lt;/sub&gt;*</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCM420-D-1</td>
<td>10 mA…10 A</td>
<td>42…2000 Hz</td>
<td>W…, WR…, WS…</td>
<td>DC 9.6…94 V / AC 42…460 Hz 16…72 V</td>
<td>B 7401 4001</td>
</tr>
<tr>
<td>RCM420-D-2</td>
<td>10 mA…10 A</td>
<td>42…2000 Hz</td>
<td>W…, WR…, WS…</td>
<td>DC 70…300 V / AC 42…460 Hz 70…300 V</td>
<td>B 7401 4002</td>
</tr>
</tbody>
</table>

Device version with screw terminals on request.

* Absolute values
### 4.1 Residual current monitor RCM420

**Dimensions in mm**

Open the front plate cover in direction of arrow!

**Screw mounting**

Note: The upper mounting clip must be ordered separately (see ordering information).

---

<table>
<thead>
<tr>
<th>Type</th>
<th>Inside diameter (mm)</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20</td>
<td>ø 20</td>
<td>B 9808 0003</td>
</tr>
<tr>
<td>W35</td>
<td>ø 35</td>
<td>B 9808 0010</td>
</tr>
<tr>
<td>W60</td>
<td>ø 60</td>
<td>B 9808 0018</td>
</tr>
<tr>
<td>W120</td>
<td>ø 120</td>
<td>B 9808 0028</td>
</tr>
<tr>
<td>W210</td>
<td>ø 210</td>
<td>B 9808 0034</td>
</tr>
<tr>
<td>WR70x175</td>
<td>70 x 175</td>
<td>B 9808 0609</td>
</tr>
<tr>
<td>WR115x305</td>
<td>115 x 305</td>
<td>B 9808 0610</td>
</tr>
<tr>
<td>W520x30</td>
<td>20 x 30</td>
<td>B 9808 0601</td>
</tr>
<tr>
<td>W550x80</td>
<td>50 x 80</td>
<td>B 9808 0603</td>
</tr>
<tr>
<td>WS80x120</td>
<td>80 x 120</td>
<td>B 9808 0606</td>
</tr>
</tbody>
</table>

Other measuring current transformer types on request

<table>
<thead>
<tr>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for enclosure XM420</td>
<td>B 9806 0008</td>
</tr>
<tr>
<td>Snap-on mounting for W20…, W35…</td>
<td>B 9808 0501</td>
</tr>
<tr>
<td>Snap-on mounting for W60…</td>
<td>B 9808 0502</td>
</tr>
</tbody>
</table>
Residual current monitor
RCM470LY

Product description
The residual current monitor RCM470LY is designed for fault and residual current monitoring in earthed power supply systems (TN and TT systems) where an alarm is to be activated in the event of a fault, but disconnection must be prevented. In addition, the device can be used to monitor single conductors, such as PE conductors, N-PE connections and PE-PAS connections.

Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system. The device can also be used for busbar systems.

Application
• Residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
• Current monitoring of single conductors de-energised under normal conditions
• Socket-outlet circuits for devices which are operated unattended for a long time and which may not fail
• Alarm systems, safety devices
• Air conditioning systems, EDP systems
• Cooling equipment with valuable frozen goods
• Canteen kitchens
• Monitoring of earthed power supplies for stray currents, impact on N conductors

Function
Residual current monitoring takes place via an external measuring current transformer. When the residual current respectively the current exceeds the set response value, the alarm LED lights and the alarm relay switches after the expiry of the set response delay. The fault messages can be stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.

The currently measured value in per cent related to the set response value is indicated on the LED bar graph indicator. The CT circuit is continuously monitored. In case of wire breakage, the alarm relay switches and the alarm LED flashes.

Device features
• External measuring current transformer
• Response values adjustable
  10 mA…10 A / 100 A  40…400 Hz
• Response delay, adjustable 0…10 s
• Alarm relay with two potential-free changeover contacts
• N / O or N / C operation, selectable
• Fault memory behaviour, selectable
• Combined test / reset button
• Connection external test and reset button
• LED bar graph indicator % 0…100
• Connection external measuring instrument % 0…100
• CT connection monitoring
• Sealable transparent cover
• External supply voltage
• Type A acc. to IEC/TR 60755

Approvals and certifications

GL  UL  TUV  PCT  AE25
**Residual current monitor RCM470LY**

**Wiring diagram – system connection, external connections**

1 - Supply voltage $U_S$, see ordering information, 6 A fuse recommended.
2 - External measuring current transformer (refer to table "External measuring current transformers")
3 - External measuring instrument
4 - External test and reset button "T/R"
5 - Alarm relay: switches when the fault current exceeds the response value and in case of interruption of the CT connection.

**Note! Do not route the PE conductor through the measuring current transformer!**

**Wiring diagram – front plate**

1 - Combined test/reset button "T/R": short-time pressing (< 1s) = RESET; long-time pressing (> 2s) = TEST
2 - Power On LED "ON"
3 - Alarm LED "ALARM": lights when the fault current exceeds the response value and flashes in case of interruption of the CT connection.
4 - LED bar graph indicator: shows the measuring value in percent related to the preset response value.
5 - Potentiometer for setting the response delay (0…1 s).
6 - Potentiometer for setting the response value (x 1…10 mA).
7 - Setting of the DIP switches (white = switch position)
   A - N/O operation
   B - N/C operation
8 - Fault memory behaviour relay + LED
   A - Fault memory ON
   B - Fault memory OFF
9 - Setting the response range
   RCM470LY
   A - 10 mA
   B - 30 mA
   C - 100 mA
   D - 300 mA
   E - 500 mA
   F - 1000 mA
   \[
   \begin{align*}
   &\text{x 1…10} \\
   &\text{RCM470LY-72} \\
   &\text{A - 100 mA} \\
   &\text{B - 300 mA} \\
   &\text{C - 1 A} \\
   &\text{D - 3 A} \\
   &\text{E - 5 A} \\
   &\text{F - 10 A}
   \end{align*}
   \]
10 - Setting the response delay
   A - x 1
   B - x 10
   \[
   \begin{align*}
   &\text{0…1 s}
   \end{align*}
   \]
Technical data

Insulation coordination acc. to IEC 60664-1:
Rated insulation voltage AC 250 V
Rated impulse withstand voltage/pollution degree 4 kV/3

Voltage ranges
Supply voltage $U_s$ see ordering information
Operating range of $U_s$ 0.85 $\ldots$ 1.1 $x$ $U_s$
Frequency range of $U_s$ DC / 50 $\ldots$ 400 Hz
Power consumption $\leq$ 3 VA

Measuring circuit
External measuring current transformers W…, WR…, WS… series
Load 180 $\Omega$
Load RCM470LY-72 18 $\Omega$
Operating characteristics acc. to IEC 62020 and IEC/TR 60755 Type A
Rated residual operating current $I_{\Delta n}$ 10 mA $\ldots$ 10 A
Rated residual operating current $I_{\Delta n}$ for -72 100 mA $\ldots$ 100 A
Response delay $t_v$, adjustable 0 $\ldots$ 10 s
Accuracy of response delay $+ / -$ 20 %
Rated frequency 40 $\ldots$ 400 Hz
Relative uncertainty 40 $\ldots$ 400 Hz: 0 $\ldots$ - 25 %
400 $\ldots$ 1000 Hz: 10 $\ldots$ - 25 %
Hysteresis approx. 25 % of the response value
Response time $t_n$ at $I_{\Delta n} = 1 \times I_{\Delta n}$ ($t_v = 0$ s) $< 250$ ms
Response time $t_n$ at $I_{\Delta n} = 3 \times I_{\Delta n}$ ($t_v = 0$ s) $\leq 20$ ms
Number of measuring channels 1

Displays
LED bar graph indicator 0 $\ldots$ 100 %
LEDs Power On, Alarm

Inputs/outputs
Test and reset button internal/external selectable
Cable length external test and reset button $\leq$ 10 m
Current source for external measuring instrument DC 0 $\ldots$ 400 $\mu$A
Load 12.5 $k\Omega$

Cable lengths for measuring current transformers
Single wire $\geq$ 0.75 mm$^2$ 0 $\ldots$ 1 m
Single wire, twisted $\geq$ 0.75 mm$^2$ 0 $\ldots$ 10 m
Shielded cable $\geq$ 0.5 mm$^2$ 0 $\ldots$ 40 m
Recommended cable (shielded, shield on one side connected to terminal 1 of the RCM470, not connected to earth) J-Y(S)/Y min. 2x0.8

Switching elements
Number of switching elements 1 x 2 changeover contacts
Operating principle, adjustable N/C operation / N/O operation
Electrical endurance, number of cycles 12000
Rated contact voltage AC 250 V/DC 300 V
Making capacity AC/DC 5 A
Breaking capacity 2 A, AC 230 V, cos phi = 0.4
0.2 A, DC 220 V, L/R = 0.04 s
Fault memory on / off continuous operation

General data
EMC immunity EN 61543
EMC immunity EN 61000-6-4
Shock resistance IEC 60068-2-27 (during operation) 15 g/11 ms
Bumping IEC 60068-2-29 (during transport) 40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation) 1 g/10 $\ldots$ 150 Hz
Vibration resistance IEC 60068-2-6 (during transport) 2 g/10 $\ldots$ 150 Hz
Ambient temperature, during operation -10 °C $\ldots$ +55 °C
Ambient temperature for storage -40 °C $\ldots$ +70 °C
Climatic class acc. to DIN IEC 60721-3-3.
Operating mode continuous operation
Mounting any position
Connection type modular terminals
Connection properties rigid/flexible 0.2 $\ldots$ 40.2 $\ldots$ 2.5 mm$^2$
flexible with ferrules without/with plastic collar 0.25 $\ldots$ 2.5 mm$^2$
Conductor sizes (AWG) 24 $\ldots$ 12
Degree of protection, internal components (IEC 60529) IP30
Degree of protection, terminals (IEC 60529) IP30
Type of enclosure X470
Enclosure material polycarbonate
Screw mounting 2 $\times$ M4
DIN rail mounting acc. to IEC 60715
Flammability class UL94V-0
Operating manual TBP401003
Weight $\leq$ 350 g

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated frequency</th>
<th>Response delay</th>
<th>Measuring current transformer</th>
<th>Displays</th>
<th>Fault memory</th>
<th>Supply voltage $U_s$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCM470LY</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>B 9401 20172</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-13</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 90 $\ldots$ 132 V*</td>
<td>B 9401 20192</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-11</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 24 V</td>
<td>B 9401 20252</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-21</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>DC 9.6 $\ldots$ 84 V*</td>
<td>B 9401 20211</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-23</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>DC 77 $\ldots$ 286 V*</td>
<td>B 9401 20241</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-72</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>B 9401 20272</td>
<td></td>
</tr>
</tbody>
</table>

* Absolute values of the operating range

1) For industrial application only

Power consumption $\leq$ 3 VA

Cable lengths for measuring current transformers
Single wire $\geq$ 0.75 mm$^2$ 0 $\ldots$ 1 m
Single wire, twisted $\geq$ 0.75 mm$^2$ 0 $\ldots$ 10 m
Shielded cable $\geq$ 0.5 mm$^2$ 0 $\ldots$ 40 m
Recommended cable (shielded, shield on one side connected to terminal 1 of the RCM470, not connected to earth) J-Y(S)/Y min. 2x0.8

Switching elements
Number of switching elements 1 x 2 changeover contacts
Operating principle, adjustable N/C operation / N/O operation
Electrical endurance, number of cycles 12000
Rated contact voltage AC 250 V/DC 300 V
Making capacity AC/DC 5 A
Breaking capacity 2 A, AC 230 V, cos phi = 0.4
0.2 A, DC 220 V, L/R = 0.04 s
Fault memory on / off continuous operation
Mounting any position
Connection type modular terminals
Connection properties rigid/flexible 0.2 $\ldots$ 40.2 $\ldots$ 2.5 mm$^2$
flexible with ferrules without/with plastic collar 0.25 $\ldots$ 2.5 mm$^2$
Conductor sizes (AWG) 24 $\ldots$ 12
Degree of protection, internal components (IEC 60529) IP30
Degree of protection, terminals (IEC 60529) IP30
Type of enclosure X470
Enclosure material polycarbonate
Screw mounting 2 $\times$ M4
DIN rail mounting acc. to IEC 60715
Flammability class UL94V-0
Operating manual TBP401003
Weight $\leq$ 350 g

Other supply voltages on request
1) For industrial application only

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated frequency</th>
<th>Response delay</th>
<th>Measuring current transformer</th>
<th>Displays</th>
<th>Fault memory</th>
<th>Supply voltage $U_s$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCM470LY</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>B 9401 20172</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-13</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 90 $\ldots$ 132 V*</td>
<td>B 9401 20192</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-11</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 24 V</td>
<td>B 9401 20252</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-21</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>DC 9.6 $\ldots$ 84 V*</td>
<td>B 9401 20211</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-23</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>DC 77 $\ldots$ 286 V*</td>
<td>B 9401 20241</td>
<td></td>
</tr>
<tr>
<td>RCM470LY-72</td>
<td>40 $\ldots$ 400 Hz</td>
<td>0 $\ldots$ 10 s</td>
<td>W…, WR…, WS… internal / external</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>B 9401 20272</td>
<td></td>
</tr>
</tbody>
</table>

* Absolute values of the operating range

2) For industrial and household applications

Power consumption $\leq$ 3 VA
### Accessories

#### External measuring current transformers

<table>
<thead>
<tr>
<th>Type</th>
<th>Inside diameter (mm)</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20</td>
<td>ø 20</td>
<td>B 9808 0003</td>
</tr>
<tr>
<td>W35</td>
<td>ø 35</td>
<td>B 9808 0010</td>
</tr>
<tr>
<td>W60</td>
<td>ø 60</td>
<td>B 9808 0018</td>
</tr>
<tr>
<td>W120</td>
<td>ø 120</td>
<td>B 9808 0028</td>
</tr>
<tr>
<td>W210</td>
<td>ø 210</td>
<td>B 9808 0034</td>
</tr>
<tr>
<td>WR70x175</td>
<td>70 x 175</td>
<td>B 9808 0609</td>
</tr>
<tr>
<td>WR115x305</td>
<td>115 x 305</td>
<td>B 9808 0610</td>
</tr>
<tr>
<td>WS20x30</td>
<td>20 x 30</td>
<td>B 9808 0601</td>
</tr>
<tr>
<td>WS50x80</td>
<td>50 x 80</td>
<td>B 9808 0603</td>
</tr>
<tr>
<td>WS80x120</td>
<td>80 x 120</td>
<td>B 9808 0606</td>
</tr>
</tbody>
</table>

Other measuring current transformer types on request.

#### External measuring instruments

<table>
<thead>
<tr>
<th>Type</th>
<th>Displays</th>
<th>Size (mm)</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9604-4241</td>
<td>0…100 %</td>
<td>96 x 96</td>
<td>B 986 807</td>
</tr>
</tbody>
</table>

#### Measuring converter

<table>
<thead>
<tr>
<th>Type</th>
<th>Input</th>
<th>Output</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK170</td>
<td>0…400 µA</td>
<td>0…10 V / 0 / 4…20 mA</td>
<td>B 9804 1500</td>
</tr>
</tbody>
</table>

### Dimension diagram X470

Dimensions in mm
Residual current monitor
RCM475LY

Product description
The residual current monitor RCM475LY is designed for fault and residual current monitoring in earthed power supply systems (TN and TT systems) where an alarm is to be activated in the event of a fault, but disconnection must be prevented. In addition, the device can be used to monitor single conductors, such as PE conductors, N-PE connections and PE-PAS connections.
Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Application
• Residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
• Current monitoring of single conductors de-energised under normal conditions
• Socket-outlet circuits for devices which are operated unattended for a long time and which may not fail
• Alarm systems, safety devices
• Air conditioning systems, EDP systems
• Cooling equipment with valuable frozen goods
• Canteen kitchens
• Monitoring of earthed power supplies for stray currents, impact on N conductors

Function
Residual current monitoring takes place via an internal measuring current transformer. When the residual current respectively the current exceeds the set response value, the alarm LED lights and the alarm relay switches after the expiry of the set response delay. The fault messages can be stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.
The currently measured value in per cent related to the set response value is indicated on the LED bar graph indicator.
Residual current monitor RCM475LY

Wiring diagram – system connection, external connections

1 - Supply voltage $U_S$, see ordering information, 6 A fuse recommended.
2 - External measuring instrument
3 - External test and reset button "T/R"
4 - Alarm relay: switches when the fault current exceeds the response value.
5 - Internal measuring current transformer

Note! Do not route the PE conductor through the measuring current transformer!

Wiring diagram – front plate

1 - Combined test/reset button "T/R": short-time pressing (< 1s) = RESET; long-time pressing (> 2s) = TEST.
2 - Power On LED "ON"
3 - Alarm LED "ALARM": lights when the fault current exceeds the response value.
4 - LED bar graph indicator: shows the measuring value in percent related to the preset response value.
5 - Potentiometer for setting the response delay (0…1 s).
6 - Potentiometer for setting the response value (x 1…10 mA).
7 - Setting of the DIP switches (white = switch position)
   A - Fault memory ON
   B - Fault memory OFF

8 - Operating principle of the alarm relay
   A - N/O operation
   B - N/C operation

9 - Setting of the response range
   A - 10 mA
   B - 30 mA
   C - 100 mA
   D - 300 mA
   E - 500 mA
   F - 1000 mA

10 - Setting of the response delay
    A - x 1
    B - x 10
Residual current monitor RCM475LY

### Technical data

- **Insulation coordination acc. to IEC 60664-1**
  - Rated insulation voltage: AC 250 V
  - Rated impulse withstand voltage/pollution degree: 4 kV/3

- **Voltage ranges**
  - Supply voltage: \( U_S \) see ordering information
  - Operating range of \( U_S \): 0.85…1.1 x \( U_S \)
  - Frequency range of \( U_S \): DC 50…400 Hz
  - Power consumption: \( \leq 3 \) VA

- **Measuring circuit/response values**
  - Internal measuring current transformer: ø 18 mm
  - Load: 180 \( \Omega \)
  - Operating characteristics acc. to IEC/TR 60755
  - Type A
  - Rated residual operating current \( I_{\Delta n} \): 10 mA…10 A
  - Response delay \( t_v \), adjustable: 0…10 s
  - Accuracy of response delay: +/- 20 %
  - Rated frequency: 50…60 Hz
  - Relative uncertainty: 0…-20 % of the response value
  - Hysteresis: approx. 25% of the response value

- **Displays**
  - LED bar graph indicator: 0…100 %
  - LEDs: Power On, Alarm

- **Inputs/outputs**
  - Test and reset button, potential free
  - Connection type: modular terminals

### Switching elements

- **Number of switching elements**: 1 x 2 changeover contacts
- **Operating principle**: adjustable N/C operation / N/O operation
- **Electrical endurance, number of cycles**: 12000
- **Rated contact voltage**: AC 250 V/DC 300 V
- **Making capacity**: AC/DC 6 A
- **Breaking capacity**: 2 A, AC 230 V, cos \( \phi \) = 0.4
  - 0.2 A, DC 220 V, L/R = 0.04 s
- **Fault memory**: on / off

### General data

- **EMC immunity**: EN 61543
  - EN 61000-6-4
- **Shock resistance IEC 60068-2-27 (during operation)**: 15 g/11 ms
- **Bumping IEC 60068-2-25 (during transport)**: 40 g/6 ms
- **Vibration resistance IEC 60068-2-6 (during operation)**: 1 g/10…150 Hz
- **Vibration resistance IEC 60068-2-6 (during transport)**: 2 g/10…150 Hz
- **Ambient temperature, during operation**: -10 °C…+55 °C
- **Ambient temperature for storage**: -40 °C…+70 °C
- **Climatic class acc. to DIN IEC 60721-3-3**: 3K5
- **Operating mode**: continuous operation
- **Mounting**: any position

### Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Response range ( I_{\Delta n} )</th>
<th>Rated frequency</th>
<th>Time delay</th>
<th>Measuring current transformer inside diameter</th>
<th>Displays</th>
<th>Fault memory behaviour</th>
<th>Supply voltage ( U_S )</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCM475LY</td>
<td>10 mA…10 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>internal / external</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>B 9401 2018</td>
</tr>
<tr>
<td>RCM475LY-13</td>
<td>10 mA…10 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>internal / external</td>
<td>selectable</td>
<td>AC 90…132 V**</td>
<td>B 9401 2035</td>
</tr>
<tr>
<td>RCM475LY-23**</td>
<td>2 mA…10 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>internal / external</td>
<td>selectable</td>
<td>DC 77…286 V**</td>
<td>B 9401 2069</td>
</tr>
</tbody>
</table>

Other supply voltages on request

* Absolute values of the operating range

** no GL approval
Accessories

### External measuring instruments

<table>
<thead>
<tr>
<th>Type</th>
<th>Displays</th>
<th>Size (mm)</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9604-4241</td>
<td>0…100 %</td>
<td>96 x 96</td>
<td>B 986 807</td>
</tr>
</tbody>
</table>

### Measuring converter

<table>
<thead>
<tr>
<th>Type</th>
<th>Input</th>
<th>Output</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK170</td>
<td>0…400 μA</td>
<td>0…10 V / 0 / 4…20 mA</td>
<td>B 9804 1500</td>
</tr>
</tbody>
</table>

### Dimension diagram X470

Dimensions in mm

![Dimension diagram](image_url)
Residual current monitor
RCM475YM2

Device features
- Internal measuring current transformer ø 18 mm
- Two separately adjustable response values $I_{\Delta n2} 10 \text{mA} \ldots 10 \text{A (50...60 Hz)}$
  $I_{\Delta n1} 30 \text{mA}, 10...80 \%$ of $I_{\Delta n2} (50...60 \text{Hz})$
- Response delay for $I_{\Delta n2}$ adjustable 0...10 s
- Two separate alarm relays with one changeover contact each
- N / O or N / C operation, selectable
- Fault memory behaviour, selectable
- Combined test / reset button
- Connection external test and reset button
- Connection external measuring instrument $I_{\Delta n} 0\ldots100 \%$
- Sealable transparent cover
- External supply voltage
- Type A acc. to IEC/TR 60755

Approvals and certifications

Product description
The residual current monitor RCM475YM2 is designed for fault and residual current monitoring in earthed power supply systems (TN and TT systems) where an alarm is to be activated in the event of a fault, but disconnection must be prevented. Two separately adjustable response values and alarm relays allow to distinguish between prewarning and alarm. Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Application
- Two-stage residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
- Current monitoring of single conductors de-energised under normal conditions
- Socket-outlet circuits for devices which are operated unattended for a long time and which may not fail
- Alarm systems, safety devices
- Air conditioning systems, EDP systems
- Cooling equipment with valuable frozen goods
- Canteen kitchens
- Monitoring of earthed power supplies for stray currents, impact on N conductors

Function
Residual current monitoring takes place via an internal measuring current transformer. When the current respectively the residual current exceeds one or both preset response values, the respective alarm LED lights (applies to $I_{\Delta n2}$ only) and the alarm relay switches after the expiry of the set response delay.

The fault messages can be stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.
**Wiring diagram – system connection, external connections**

1. Supply voltage $U_s$, see ordering information, 6 A fuse recommended.
2. External measuring instrument
3. External test and reset button "T/R"
4. Alarm relay: switches when the fault current exceeds the response value Alarm 1
5. Alarm relay: switches when the fault current exceeds the response value Alarm 2
6. Internal measuring current transformer

**Note! Do not route the PE conductor through the measuring current transformer!**

**Wiring diagram – front plate**

1. Combined test/reset button "T/R": short-time pressing ($< 1\,\text{s}$) = RESET, long-time pressing ($> 2\,\text{s}$) = TEST
2. Power On LED "ON"
3. Alarm LEDs: Alarm 1 = prewarning, Alarm 2 = alarm
4. Response range Alarm 1 (prewarning)
5. Response range Alarm 2 (alarm)
6. Potentiometer for setting the response delay ($0\ldots1\,\text{s}$)
7. Potentiometer for setting the response value ($I_{\Delta n}\,\text{mA} \times 1\ldots10$)

**Setting of the DIP switches (white = switch position)**

**Operating principle and settings of the alarm relay Alarm 1**

8. Setting of the operating principle
   - A - N / C operation
   - B - N / O operation
9. Fault memory behaviour relay + LED
   - A - Fault memory ON
   - B - Fault memory OFF
10. Setting of the prewarning range
    - A - prewarning OFF
    - B - 10 % of $I_{\Delta n1}$
    - C - 20 % of $I_{\Delta n1}$
    - D - 40 % of $I_{\Delta n1}$
    - E - 60 % of $I_{\Delta n2}$
    - F - 80 % of $I_{\Delta n2}$
    - G - response value 30 mA

**Operating principle and settings of the alarm relay Alarm 2**

11. Setting of the operating principle
    - A - N / O operation
    - B - N / C operation
12. Fault memory behaviour relay + LED
    - A - Fault memory ON
    - B - Fault memory OFF
13. Setting of the alarm level
    - A - 10…100 mA
    - B - 30…300 mA
    - C - 100…1000 mA
    - D - 300…3000 mA
    - E - 500…9000 mA
    - F - 1…10 A
14. Setting of the response delay
    - A - $\times 10$
    - B - $\times 1$
### Technical data

#### Insulation coordination acc. to IEC 60664-1
- Rated insulation voltage: AC 250 V
- Rated impulse withstand voltage/pollution degree: 4 kV/3

#### Voltage ranges
- Supply voltage $U_S$: see ordering information
- Operating range of $U_S$: 0.85…1.1 x $U_S$
- Frequency range of $U_S$: 50…400 Hz
- Power consumption: $\leq 3$ VA

#### Measuring circuit/response values
- Internal measuring current transformer: ø 18 mm
- Load: $180 \Omega$
- Operating characteristics acc. to IEC/TR 60755: Type A
- Rated residual operating current $I_{\Delta n2}$ (alarm2): 10 mA…10 A
- Rated residual operating current $I_{\Delta n1}$ (alarm1): 30 mA, 10…80 % of $I_{\Delta n2}$ min. 8 mA
- Response delay $t_r$, adjustable: 0…10 s
- Accuracy of response delay: $+ / - 20 \%$
- Rated frequency: 50…60 Hz
- Response time $t_{\text{resp}}$ at $I_{\Delta n1}$: $\leq 200$ ms
- Response time $t_{\text{resp}}$ at $I_{\Delta n2}$: $1 \times \frac{t_{\Delta n2}}{t_r} (t_r = 0 \text{ s}) / 5 \times \frac{t_{\Delta n2}}{t_r} (t_r = 0 \text{ s})$ ≤ 250 ms / ≤ 20 ms
- Number of measuring channels: 1

#### Displays
- LEDs: Power On, Alarm

#### Inputs/outputs
- Test and reset button, potential free: internal / external
- Cable length for external test and reset button: $\leq 10$ m
- Current source for external measuring instrument: DC 0…400 μA
- Load: $\leq 12.5 \, k\Omega$

#### Switching elements
- Number of switching elements: 2 x 1 changeover contact
- Operating principle, adjustable: N/C operation / N/O operation
- Electrical endurance, number of cycles: 12000
- Rated contact voltage: AC 250 V/DC 300 V
- Making capacity: AC/DC 5 A
- Breaking capacity: 2 A, AC 230 V, cos phi = 0.4
- Fault memory: on / off

#### General data
- EMC immunity: EN 61543
- EMC immunity: EN 61000-6-4
- Shock resistance: IEC 60068-2-27 (during operation) 15 g/11 ms
- Bumping: IEC 60068-2-29 (during transport) 40 g/6 ms
- Vibration resistance: IEC 60068-2-6 (during operation) 1 g/10…150 Hz
- Vibration resistance: IEC 60068-2-6 (during transport) 2 g/10…150 Hz
- Ambient temperature, during operation: -10 °C…+55 °C
- Ambient temperature for storage: -40 °C…+70 °C
- Climatic class acc. to DIN IEC 60721-3-3: 3K5
- Operating mode: continuous operation

### Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Response range $I_{\Delta n2}$ / $I_{\Delta n1}$</th>
<th>Rated frequency</th>
<th>Time delay $t_r$</th>
<th>Response current transformer inside diameter</th>
<th>Displays</th>
<th>Fault memory behaviour</th>
<th>Supply voltage $U_S$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCM475LYM2</td>
<td>10 mA…10 A, 30 mA, 10…80 % of $I_{\Delta n2}$</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>external</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>B 9401 2016</td>
</tr>
<tr>
<td>RCM475LYM2-13</td>
<td>10 mA…10 A, 30 mA, 10…80 % of $I_{\Delta n2}$</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>external</td>
<td>selectable</td>
<td>AC 90…132 V*</td>
<td>B 9401 2036</td>
</tr>
</tbody>
</table>

* Absolute values of the operating range

### Accessories

#### External measuring instruments

<table>
<thead>
<tr>
<th>Type</th>
<th>Displays</th>
<th>Size (mm)</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9604-4241</td>
<td>0…100%</td>
<td>96 x 96</td>
<td>B 986 807</td>
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#### Measuring converter

<table>
<thead>
<tr>
<th>Type</th>
<th>Input</th>
<th>Output</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK170</td>
<td>0…400 μA</td>
<td>0…10 V / 0 / 4…20 mA</td>
<td>B 9804 1500</td>
</tr>
</tbody>
</table>

### Other supply voltages on request

### Dimension diagram X470

Dimensions in mm
AC / DC sensitive residual current monitors for TN and TT systems (AC, DC or AC / DC systems) (Type B acc. to IEC/TR 60755)

AC / DC sensitive residual current monitors are designed for all types of fault currents in electrical installations. They allow simultaneous measuring of smooth DC fault currents, pulsed DC residual currents and AC residual currents. In particular, the devices are used in electrical installations containing frequency converters, where all types of fault currents may occur in the event of a fault.

RCMA display the actual fault current and indicate a deterioration of the insulation resistance when a set prewarning level is reached, before disconnection takes place. In combination with a circuit breaker, it can be used as a switching protective device when the alarm level is reached.
Residual current monitor
RCMA420

Device features

• AC / DC sensitive residual current monitor
  Type B acc. to IEC 62020 and IEC/TR 60755
• r.m.s. value measurement (AC+DC)
• Two separately adjustable response values 10…500 mA
• Frequency range 0…2000 Hz
• Start-up delay, response delay and delay on release
• Digital measured value display via LC display
• Measured value memory for operating value
• CT connection monitoring
• Power On LED, LEDs: Alarm 1 / 2
• Internal/external test/reset button
• Two separate alarm relays
  (one changeover contact each)
• N/O or N/C operation and fault memory behaviour selectable
• Continuous self monitoring
• Multi-functional LC display
• Password protection for device settings
• Sealable transparent cover
• Two-module enclosure (36 mm)
• RoHS compliant
• Push-wire terminal
  (two terminals per connection)

Approvals and certifications

Product description

The AC/DC sensitive residual current monitor RCMA420 is designed for monitoring earthed power supply systems (TN and TT systems) where smooth DC fault currents or residual currents continuously greater than zero may occur. These are in particular loads containing six-pulse rectifiers or one way rectifiers with smoothing, such as converters, battery chargers, construction site equipment with frequency-controlled drives. Currents in single conductors can be monitored too.

The prewarning stage (50...100 % of the set response value $I_{\Delta n2}$) allow to distinguish between prewarning and alarm. Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Applications

• AC/DC sensitive residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
• Monitoring of variable-speed drives, UPS systems, construction site equipment, printing machines, battery systems, laboratory equipment, wood working machines, MF welding systems, furniture industry, medical electrical equipment, etc.
• AC/DC sensitive current monitoring of single conductors de-energised under normal conditions (e.g. N and PE conductors)

Function

Once the supply voltage $U_s$ is applied, the start-up delay is activated. Measured values changing during this time do not influence the switching state of the alarm relays.

Residual current measurement takes place via an external measuring current transformer of the W20AB…W60AB series. The currently measured value is shown on the LC display. In this way any changes, for example when circuits are connected to the system, can be recognised easily. If the measured value exceeds the set response values, the response delays $t_{on1/2}$ begin. Once the response delay $t_{on1/2}$ has elapsed, the K1/K2 alarm relays switch and the alarm LEDs AL1/AL2 light up. If the current falls below the release value (response value plus hysteresis), the release delay $t_{off}$. When $t_{off}$ has elapsed, the alarm relays return to their initial position and the alarm LEDs go out. If the fault memory is activated, the alarm relays remain in the alarm state and the LEDs light until the reset button is pressed or until the supply voltage is interrupted. The device function can be tested using the test button. Parameters are assigned to the device via the LCD and the control buttons on the front panel; this function can be password-protected.

Connection monitoring

The function of the device and the CT connections are continuously monitored. In the event of a fault, the alarm relays K1 / K2 switch without delay, the alarm LEDs AL1 / AL2 / ON flash. On removal of the fault, the alarm relays return to their initial position either automatically or by pressing the reset button.
4.2 Residual current monitor RCMA420

**Operating and display elements**

1. Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm respectively in the event of CT malfunction.

2. Alarm LED "AL1" (yellow), prewarning; lights when the set response value $I_{\Delta n1}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.

3. Alarm LED "AL2" (yellow), alarm; lights when the set response value $I_{\Delta n2}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.

4. Multi functional LC display

5. Test button "T": to call up the self test.

6. Reset button "R": to delete saved alarms.

7. "MENU" button: to call up the menu system.

Enter button: to confirm parameter change.

Press ESC; press the button > 1.5 seconds.

**Wiring diagram**

1. Supply voltage $U_S$ see ordering information (6 A fuse recommended)

2. Connector for the external W20AB…W60AB series measuring current transformer

3. Alarm relay K1: $I_{\Delta n1}$ (prewarning)

4. Alarm relay K2: alarm $I_{\Delta n2}$

5. Combined test and reset button "T/R"

short-time pressing (< 1.5 s) = RESET

long-time pressing (> 1.5 s) = TEST

Do not route the PE conductor through the measuring current transformer!

---

[Diagram of the residual current monitor RCMA420 showing the supply voltage, alarm relays, test and reset buttons, and wiring connections.]
**Residual current monitor RCMA420**

**Residual current monitor RCMA420**

**4.2**

<table>
<thead>
<tr>
<th>Dimension diagram XM420</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions in mm</strong></td>
</tr>
<tr>
<td>Open the front plate cover in direction of arrow!</td>
</tr>
</tbody>
</table>

**Screw mounting**

Note: The upper mounting clip must be ordered separately (see ordering information).

**Connection of measuring current transformers**

- PE L1 L2 L3 N
- $I_{\Delta n} \leq 500 \text{ mA}$
- $I_{\Delta n} > 500 \text{ mA}$

**Connection to the RCMA420 residual current monitor using the WX-… connecting cable.**

**Colour coding for WX-…:**

- $k = $ yellow
- $l = $ green
- $-12 \text{ V} = $ black
- $GND = $ brown
- $+12 \text{ V} = $ red
- $T = $ Test (T) = orange

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Response range $I_{\Delta n}$</th>
<th>Frequency range</th>
<th>Supply voltage $U_S$*</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCMA420-D-1</td>
<td>$10...500 \text{ mA}$</td>
<td>$0...2000 \text{ Hz}$</td>
<td>$DC \ 9.6...94 \text{ V}$ / $AC \ 42...460 \text{ Hz}$</td>
<td>16...72 \text{ V}</td>
</tr>
<tr>
<td>RCMA420-D-2</td>
<td>$10...500 \text{ mA}$</td>
<td>$0...2000 \text{ Hz}$</td>
<td>$DC \ 70...300 \text{ V}$ / $AC \ 42...460 \text{ Hz}$</td>
<td>$70...300 \text{ V}$</td>
</tr>
</tbody>
</table>

* Absolute values

**Measuring current transformers**

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal diameter (mm)</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20AB</td>
<td>ø 20</td>
<td>B 9808 0008</td>
</tr>
<tr>
<td>W35AB</td>
<td>ø 35</td>
<td>B 9808 0016</td>
</tr>
<tr>
<td>W60AB</td>
<td>ø 60</td>
<td>B 9808 0026</td>
</tr>
</tbody>
</table>

**Connection cable measuring current transformer – RCMA420-D**

<table>
<thead>
<tr>
<th>Type</th>
<th>Length/m</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WX-100</td>
<td>1</td>
<td>B 9808 0503</td>
</tr>
<tr>
<td>WX-250</td>
<td>2.5</td>
<td>B 9808 0504</td>
</tr>
<tr>
<td>WX-500</td>
<td>5</td>
<td>B 9808 0505</td>
</tr>
<tr>
<td>WX-1000</td>
<td>10</td>
<td>B 9808 0506</td>
</tr>
</tbody>
</table>

**Accessories**

<table>
<thead>
<tr>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for XM420 enclosure</td>
<td>B 9806 0008</td>
</tr>
<tr>
<td>Snap-on mounting W20…, W35…</td>
<td>B 9808 0501</td>
</tr>
<tr>
<td>Snap-on mounting W60…</td>
<td>B 9808 0502</td>
</tr>
</tbody>
</table>

(1 unit required for each device)
Technical data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3
Rated insulation voltage 250 V
Rated impulse voltage/pollution degree 2.5 kV / III
Protective separation (reinforced insulation) between (A1, A2) - (k, l, T/R) - (11, 12, 14) - (21, 22, 24)
Voltage tests according to IEC 61010-1 2.21 kV

Supply voltage
RCMA420-D-1:
Supply voltage $U_S$: AC 16…72 V / DC 9.6…94 V
Frequency range $U_S$: 42…460 Hz
Rated frequency 0…2000 Hz
Measuring range AC 0…1.5 A
Measuring range DC 0…600 mA
Relative uncertainty of the response value 0…35%*
Relative uncertainty 0…35%

RCMA420-D-2:
Supply voltage $U_S$: AC/DC 70…300 V
Frequency range $U_S$: 42…460 Hz
Power consumption ≤ 3 VA

Response values
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1) 50…100 % x $I_{\Delta n2}$ (50 %)*
Rated residual operating current $I_{\Delta n2}$ (alarm, AL2) 10…500 mA (30 mA)*
Hysteresis 10…25 % (15 %)*

Specific time
Start-up delay $t_0$ 0…10 s (0.5 s)*
Response delay $t_{\Delta n2}$ (alarm) 0…10 s (0 s)*
Response delay $t_{\Delta n1}$ (preameraming) 0…10 s (1 s)*
Delay on release $t_R$ 0…99 s (1 s)*
Operating time $t_{ae}$ at $I_{ae} = 1 \times I_{\Delta n1}/2$ ≤ 180 ms
Operating time $t_{ae}$ at $I_{ae} = 5 \times I_{\Delta n1}/2$ ≤ 30 ms
Response time $t_{ar}$ $t_{ar} = t_{ae} + t_{on}/2$
Recovery time $t_o$ ≤ 300 ms

Cable lengths for measuring current transformers
Connection (see ordering information) connecting cable WX…1 m / 2.5 m / 5 m / 10 m

Inputs/outputs
Cable length for external test/reset button 0…10 m

Switching elements
Number of switching elements 2 x 1 changeover contact
Operating principle N/C operation / N/O operation (N/C operation)*
Electrical endurance, number of cycles 10000
Contact data acc. to IEC 60947-5-1
Utilisation category AC-13 AC-14 DC-12 DC-12 DC-12
Rated operational voltage 230 V 230 V 24 V 110 V 220 V
Rated operational current 5 A 3 A 1 A 0.2 A 0.1 A
Minimum contact rating 1 mA at AC/DC ≥ 10 V

Environment/EMC
EMC IEC 62020
Operating temperature -25 ºC…+55 ºC
Climatic class acc. to IEC 60721
Stationary use (IEC 60721-3-3) 3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2) 2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1) 1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721
Stationary use (IEC 60721-3-3) 3M4
Transport (IEC 60721-3-2) 2M2
Long-time storage (IEC 60721-3-1) 1M3

Connection
Connection type push-wire terminals
Connection properties
rigid 0.2…2.5 mm² / AWG 24-12
flexible without ferrule 0.2…2.5 mm² / AWG 24-12
flexible with ferrule 0.2…1.5 mm² / AWG 24-16
Stripping length 10 mm
Opening force 50 N
Test opening, diameter 2.1 mm

Other
Operating mode continuous operation
Position of normal use display-oriented
Degree of protection, internal components (IEC 60529) IP30
Degree of protection, terminals (IEC 60529) IP20
Enclosure material polycarbonate
Flammability class UL94V-0
DIN rail mounting acc. to IEC 60715
Screw fixing 2 x M4 with mounting clip
Software version D242 V1.1x
Operating manual TGH1411
Weight ≤ 150 g

(*) = factory setting
Residual current monitor
RCMA423

Device features
- AC / DC sensitive residual current monitor
  Type B acc. to IEC 62020 and IEC/TR 60755
- r.m.s. value measurement (AC+DC)
- Two separately adjustable response values 30…3 A
- Frequency range 0…2000 Hz
- Start-up delay, response delay and delay on release
- Digital measured value display via LC display
- Measured value memory for operating value
- CT connection monitoring
- Power On LED, LEDs: Alarm 1 / 2
- Internal/external test/reset button
- Two separate alarm relays (one changeover contact each)
- N/O or N/C operation and fault memory behaviour selectable
- Continuous self monitoring
- Multi-functional LC display
- Password protection for device settings
- Sealable transparent cover
- Push-wire terminal (two terminals per connection)
- Two-module enclosure (36 mm)

Product description
The AC/DC sensitive residual current monitor RCMA423 is designed for monitoring earthed power supply systems (TN and TT systems) where smooth DC fault currents or residual currents continuously greater than zero may occur. These are in particular loads containing six-pulse rectifiers or one way rectifiers with smoothing, such as converters, battery chargers, construction site equipment with frequency-controlled drives. Currents in single conductors can also be monitored by RCMA423.

The prewarning stage (50…100 % of the set response value $I_{\Delta n2}$) allow to distinguish between prewarning and alarm. Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Applications
- AC/DC sensitive residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
- Monitoring of variable-speed drives, UPS systems, construction site equipment, printing machines, battery systems, laboratory equipment, wood working machines, MF welding systems, furniture industry, medical electrical equipment, etc.
- AC/DC sensitive current monitoring of single conductors de-energised under normal conditions (e.g. N and PE conductors)

Function
Once the supply voltage $U_S$ is applied, the start-up delay is activated. Measured values changing during this time do not influence the switching state of the alarm relays. Residual current monitoring takes place via a flexible external measuring current transformer. The actual measured value is indicated on the LCD. In this way any changes, for example when circuits are connected to the system, can be recognised easily. If the measured value exceeds the set response values, the response delays $t_{on 1/2}$ begin. Once the response delay $t_{on 1/2}$ has elapsed, the K1/K2 alarm relays switch and the alarm LEDs AL1/AL2 light up. If the current falls below the release value (response value plus hysteresis), the release delay $t_{off}$ begins. When $t_{off}$ has elapsed, the alarm relays return to their initial position and the alarm LEDs AL1/AL2 go out. If the fault memory is activated, the alarm relays remain in the alarm state and the LEDs light until the reset button is pressed or until the supply voltage is interrupted. The device function can be tested using the test button. Parameters are assigned to the device via the LCD and the control buttons on the front panel; this function can be password-protected.

Connection monitoring
The function of the device and the CT connections are continuously monitored. In the event of a fault, the alarm relays K1 / K2 switch without delay, the alarm LEDs AL1 / AL2 / ON flash. On removal of the fault, the alarm relays return to their initial position either automatically or by pressing the reset button.

AC/DC sensitive residual current monitor for TN and TT systems
(AC, DC and pulsed DC currents)
1 - Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm respectively in the event of CT malfunction.

2 - Alarm LED "AL1" (yellow), prewarning; lights when the set response value $I_{\Delta n1}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.

3 - Alarm LED "AL2" (yellow), alarm; lights when the set response value $I_{\Delta n2}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.

4 - Multi functional LC display

5 - Test button "T": To call up the self test.
   Arrow up key: change parameters, move upwards in the menu.

6 - Reset button "R": To delete saved alarms, change parameters, move downwards in the menu.

7 - "MENU" button: to call up the menu system.
   Enter button: to confirm parameter change.
   "ESC" button: press the button > 1.5 seconds.

1 - Supply voltage $U_s$ see ordering information
(6 A fuse recommended)

2 - Connector for the external W20AB…W210AB series measuring current transformer

3 - Alarm relay K1: $I_{\Delta n1}$ (prewarning)

4 - Alarm relay K2: alarm $I_{\Delta n2}$ (alarm)

5 - Combined test and reset button "T/R"
   short-time pressing (< 1.5 s) = RESET
   long-time pressing (> 1.5 s) = TEST

Do not route the PE conductor through the measuring current transformer!
Residual current monitor RCMA423

Connection of measuring current transformers

Connection to the RCMA423 residual current monitor using the WX-… connecting cable.

Colour coding for WX-…: k = yellow, l = green, -12 V = black, GND = brown, +12 V = red, Test (T) = orange

S1(k) S2 (l)

Coding

-12 V GND +12 V T

W…AB

Residual operating current ranges of the different measuring current transformers

<table>
<thead>
<tr>
<th>Residual operating current ranges</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 mA…3 A</td>
<td>W35AB</td>
</tr>
<tr>
<td>50 mA…500 mA</td>
<td>W20AB</td>
</tr>
<tr>
<td>300 mA…3 A</td>
<td>W35AB; W60AB; W120AB</td>
</tr>
<tr>
<td>300 mA…500 mA</td>
<td>W210AB</td>
</tr>
</tbody>
</table>

Measuring current transformers

<table>
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<tr>
<th>Type</th>
<th>Internal diameter (mm)</th>
<th>Art. No.</th>
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<td>Ø 35</td>
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</tr>
<tr>
<td>W60AB</td>
<td>Ø 60</td>
<td>B 9808 0026</td>
</tr>
<tr>
<td>W120AB</td>
<td>Ø 120</td>
<td>B 9808 0041</td>
</tr>
<tr>
<td>W210AB</td>
<td>Ø 210</td>
<td>B 9808 0040</td>
</tr>
</tbody>
</table>

Connection cable measuring current transformer – RCMA423-D

<table>
<thead>
<tr>
<th>Type</th>
<th>Length/m</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WX-100</td>
<td>1</td>
<td>B 9808 0503</td>
</tr>
<tr>
<td>WX-250</td>
<td>2,5</td>
<td>B 9808 0504</td>
</tr>
<tr>
<td>WX-500</td>
<td>5</td>
<td>B 9808 0505</td>
</tr>
<tr>
<td>WX-1000</td>
<td>10</td>
<td>B 9808 0511</td>
</tr>
</tbody>
</table>

Accessories

<table>
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<tr>
<th>Type</th>
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<tr>
<td>Mounting clip for XM420 enclosure</td>
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<tr>
<td>Snap-on mounting W20…, W35…</td>
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</tr>
<tr>
<td>Snap-on mounting W60…</td>
<td>B 9808 0502</td>
</tr>
</tbody>
</table>

(1 unit required for each device)
Technical data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3
Rated insulation voltage 250 V
Rated impulse voltage/pollution degree 2.5 kV / III
Protective separation (reinforced insulation) between
(A1, A2) - (k/l/T/–/GND/+, T/R) - (11, 12, 14) - (21, 22, 24)
Voltage tests according to IEC 61010-1 2.21 kV

Supply voltage
RCMA423-D-1:
Supply voltage $U_S$ AC 16…72 V / DC 9.6…94 V
Frequency range $f_S$ 42…460 Hz
Rated insulation voltage (measuring current transformer) 800 V
Rated frequency 0…2000 Hz
Relative uncertainty for $f \leq 2$ Hz or $\geq 16$ Hz 0…35 %
Relative uncertainty for $2$ Hz < $f < 16$ Hz -35…+100 %
Relative uncertainty 0…35 %
Rated residual operating current $I_{n1}$ (prewarning, AL1) 50…100 % of $I_{n2}$ (50 %)*
Rated residual operating current $I_{n2}$ (alarm, AL2) 30 mA…3 A (30 mA)*
Hysteresis 10…25 % (15 %)*

Start-up delay $t_0$ 0…10 s (0 s)*
Response delay $t_{n1}$ (prewarning) 0…10 s (1 s)*
Response delay $t_{n2}$ (alarm) 0…10 s (0 s)*
Delay on release $t_{d}$ 0…99 s (1 s)*
Operating time $t_{a}$ at $I_{n1} = 1 \times I_{n2}/2$ $\leq 180$ ms
Operating time $t_{a}$ at $I_{n2} = 5 \times I_{n2}/2$ $\leq 30$ ms
Response time $t_{e}$ $t_{a} = t_{e} + t_{d}/2$
Recovery time $t_b$ $\leq 300$ ms

Inputs/outputs
Cable length for external test/reset button 0…10 m

Cable lengths for measuring current transformers
Connecting cable WX… (see ordering information) 1 m / 2.5 m / 5 m / 10 m
Alternatively: single wire 6 x 0.75 mm² 0…10 m

Switching elements
Number of switching elements 2 x 1 changeover contact
Operating principle N/C operation / N/O operation (N/C operation)*
Electrical endurance, number of cycles 10000
Contact data acc. to IEC 60947-5-1
Utility category AC-13 AC-14 DC-12 DC-12 DC-12
Rated operational voltage 230 V 230 V 24 V 110 V 220 V
Rated operational current 5 A 3 A 1 A 0.2 A 0.1 A
Minimum contact rating 1 mA at AC/DC $\geq 10$ V

Environment/EMC
EMC IEC 62020
Operating temperature -25 °C…+55 °C
Climatic class acc. to IEC 60721
Stationary use (IEC 60721-3-3) 3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2) 2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1) 1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721
Stationary use (IEC 60721-3-3) 3M4
Transport (IEC 60721-3-2) 2M2
Long-time storage (IEC 60721-3-1) 1M3

Connection
Connection type push-wire terminals
Connection properties:
rigid 0.2…2.5 mm² / AWG 2414
flexible without ferrule 0.2…2.5 mm² / AWG 2414
flexible with ferrule 0.2…1.5 mm² / AWG 2416
Stripping length 10 mm
Opening force 50 N
Test opening, diameter 2.1 mm

Other
Operating mode continuous operation
Position of normal use display-oriented
Degree of protection, internal components (IEC 60529) IP30
Degree of protection, terminals (IEC 60529) IP20
Enclosure material polycarbonate
Flammability class UL94V-0
DIN rail mounting acc. to IEC 60715
Screw fixing 2 x M4 with mounting clip
Software version D330 V1.0x
Operating manual TGH1442
Weight $\leq 150$ g

* = factory setting
Residual current monitor
RCMA475LY

Product description
The AC / DC sensitive residual current monitor RCMA475LY is designed for monitoring earthed power supply systems (TN and TT systems) where DC fault currents or residual currents continuously greater than zero may occur. These are in particular loads containing six-pulse rectifiers or one way rectifiers with smoothing, such as converters, battery chargers, construction site equipment with frequency-controlled drives.

The prewarning stage (50 % of the set response value $I_{\Delta n1}$) allow to distinguish between prewarning and alarm. Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Application
• AC / DC sensitive residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
• AC / DC sensitive current monitoring of single conductors de-energised under normal conditions (e.g. N and PE conductors)
• Variable-speed drives
• Uninterruptible power supply systems (UPS)

Function
Residual current monitoring takes place via an internal measuring current transformer. When the current respectively the residual current exceeds the set response value, the alarm LED lights and the associated alarm relay switches when the set response delay has elapsed.

The alarm messages are stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.

The currently measured value in per cent related to the set response value is indicated on the LED bar graph indicator.

Device features
• Internal measuring current transformer ø 18 mm
• Two response values
  - alarm $I_{\Delta n2}$: 30 mA…500 mA (0…700 Hz)
  - prewarning $I_{\Delta n2}$: 50 % / 100 % of $I_{\Delta n1}$
• Response delay, adjustable 0…10 s (prewarning 0 / 1 s)
• Two separate alarm relays with one changeover contact each
• N / O or N / C operation, selectable
• Fault memory
• Combined test / reset button
• Connection external test and reset button
• LED bar graph indicator $I_{\Delta n}$ 0…100 %
• Connection external measuring instrument $I_{\Delta n}$ 0…100 %
• Sealable transparent cover
• External supply voltage
• Type B acc. to IEC/TR 60755

Approvals

4.2
Residual current monitor RCMA475LY

Wiring diagram– system connection, external connections

1 - Supply voltage $U_S$, see ordering information (6 A fuse recommended)
2 - External measuring instrument
3 - External test and reset button "T/R"
4 - Alarm relay (Alarm): switches when the fault current exceeds the response value of $I_{\Delta n1}$.
5 - Alarm relay (prewarning): switches when the fault current exceeds 50% or 100% of $I_{\Delta n1}$.
6 - Internal measuring current transformer

Do not route the PE conductor through the measuring current transformer!

Wiring diagram – front plate

1 - Combined test/reset button “TEST/RESET”; short-time pressing (< 1 s) = RESET, long-time pressing (> 2 s) = TEST.
2 - Power On LED "ON": lights when the device is in operation and flashes when the measuring range is exceeded.
3 - Alarm LED "ALARM": lights when the fault current exceeds the set response value and flashes when 50% of the set response value are reached.
4 - LED bar graph indicator, shows the measuring value in percent related to the preset response value.
5 - Potentiometer for setting the response delay (0…1 s).
6 - Potentiometer for setting the response value (x 1…10 mA).

Setting of the DIP switches (white = switch position)

7 - Contact 21-22-24 (prewarning)
   - A: at 50% of $I_{\Delta n1}$
   - B: at 100% of $I_{\Delta n1}$
8 - Response delay prewarning
   - A: Delay 1 s
   - B: Delay 0 s
9 - Alarm relay
   - A: N/O operation
   - B: N/C operation
10 - Response range
    - A: 30 mA x 1…10
    - B: 50 mA x 1
11 - Response delay
    - A: Setting value t/s x 10
    - B: Setting value t/s x 1
Residual current monitor RCMA475LY

4.2

Residual current monitor RCMA475LY

Insulation coordination acc. to IEC 60664-1
Rated insulation voltage AC 250 V
Rated impulse withstand voltage/pollution degree 4 kV/3

Voltage ranges
Supply voltage $U_S$ see ordering information
Operating range of $U_S$ 0.85…1.1 x $U_S$
Frequency range of $U_S$ DC / 50…60 Hz
Eigenverbrauch $\leq 3.5$ VA

Measuring circuit/response values
Internal measuring current transformer ø 18 mm
Operating characteristics acc. to IEC/TR 60755 Type B
Rated residual operating current $I_{\Delta n1}$ (alarm) 30…500 mA
Response delay $t_{v}$ adjustable 0…10 s
Rated frequency 0…700 Hz
Relative uncertainty of the response value 0…25 %
Hysteresis approx. 25% of the response value
Response time $t_{an}$ at $I_{\Delta n1} = 1 \times I_{\Delta n1}/2$ ($t_{v} = 0$ s) $\leq 70$ ms
Response time $t_{an}$ at $I_{\Delta n1} = 5 \times I_{\Delta n1}/2$ ($t_{v} = 0$ s) $\leq 40$ ms

Displays
LED bar graph indicator 0…100 %
LEDs Power On, prewarning, alarm

Inputs/outputs
Test and reset button internal/external
Cable length for external test and reset button $\leq 10$ m
Current source for external measuring instrument 0…100 % DC 0…400 μA
Load $\leq 12.5$ kΩ

Switching elements
Number of switching elements 2 x 1 changeover contact
Operating principle, adjustable N/C operation / N/O operation
Electrical endurance, number of cycles 12000
Rated contact voltage AC 250 V/DC 300 V
Making capacity AC/DC 5 A
Breaking capacity 2 A, AC 230 V, cos phi = 0.4
0.2 A, DC 220 V, L/R $= 0.04$ s
Fault memory ON

General data
EMC immunity EN 61543
EMC immunity EN 61000-6-4
Shock resistance IEC 60664-2-27 (during operation) 15 g/11 ms
Bumping IEC 60664-2-29 (during transport) 40 g/6 ms
Vibration resistance IEC 60664-2-6 (during operation) 1 g/10…150 Hz
Vibration resistance IEC 60664-2-6 (during transport) 2 g/10…150 Hz
Ambient temperature, during operation -25 °C…+70 °C
Ambient temperature for storage -40 °C…+75 °C
Climatic class acc. to DIN IEC 60721-3-3 3K5
Operating mode continuous operation
Mounting any position

Connection type modular terminals
Connection properties rigid / flexible 0.2…4 / 0.2…2.5 mm²
flexible with ferrules without / with plastic collar 0.25…2.5 mm²
Conductor sizes (AWG) 24…12
Degree of protection, internal components (IEC 60529) IP30
Degree of protection, terminals (IEC 60529) IP30
Type of enclosure X475
Enclosure material polycarbonate
Screw mounting 2 x M4
DIN rail mounting acc. to IEC 60715
Installation into standard distribution panels acc. to DIN 43871
Flammability class UL94V-0
Operating manual TBP404001
Weight $\leq 350$ g

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Response range $I_{\Delta n}$</th>
<th>Rated frequency</th>
<th>Time delay</th>
<th>Measuring current transformer internal diameter</th>
<th>Displays</th>
<th>Fault memory behaviour</th>
<th>Supply voltage $U_S$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCMA475LY</td>
<td>30…500 mA</td>
<td>0…700 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>internal / external</td>
<td>×</td>
<td>AC 230 V</td>
<td>B 9404 20022)</td>
</tr>
<tr>
<td>RCMA475LY-13</td>
<td>30…500 mA</td>
<td>0…700 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>internal / external</td>
<td>×</td>
<td>AC 90…132 V*</td>
<td>B 9404 20047)</td>
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<tr>
<td>RCMA475LY-21</td>
<td>30…500 mA</td>
<td>0…700 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>internal / external</td>
<td>×</td>
<td>DC 9.6…84 V*</td>
<td>B 9404 20141)</td>
</tr>
<tr>
<td>RCMA475LY-23</td>
<td>30…500 mA</td>
<td>0…700 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>internal / external</td>
<td>×</td>
<td>DC 77…286 V*</td>
<td>B 9404 20151)</td>
</tr>
</tbody>
</table>

Other supply voltages on request
1) For industrial application only
2) For industrial and household applications

50  Main catalogue part 4 – Residual current monitors, Residual current monitoring systems / 10.2010
## Accessory List

<table>
<thead>
<tr>
<th>External measuring instrument</th>
<th>Measuring converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Displays</td>
</tr>
<tr>
<td>9604-4241</td>
<td>0…100%</td>
</tr>
</tbody>
</table>

### Conditions of operation according to IEC 62020, IEC/TR 60755 amendment 2, Type B

<table>
<thead>
<tr>
<th>Current type</th>
<th>Graphic representation</th>
<th>Operating current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternating currents (50 Hz)</td>
<td></td>
<td>0.5…1 x (I_{\Delta n})</td>
</tr>
<tr>
<td>Pulsating direct currents (positive and negative half waves) half-wave current</td>
<td></td>
<td>0.5…1.4 x (I_{\Delta n})</td>
</tr>
<tr>
<td>Phase-controlled half-wave currents current delay angle 90° el / 135° el</td>
<td></td>
<td>0.5…1.4 x (I_{\Delta n})</td>
</tr>
<tr>
<td>Half-wave current superimposed by a smooth direct current of 6 mA</td>
<td></td>
<td>0.5…1.4 x (I_{\Delta n})</td>
</tr>
<tr>
<td>Smooth direct current</td>
<td></td>
<td>0.5…2 x (I_{\Delta n})</td>
</tr>
</tbody>
</table>

## Dimension diagram

Dimensions in mm

![Dimension diagram](image-url)
Residual current monitoring system
RCMS460/490 – Device components

Chapter 4.3

Residual current monitoring system
RCMS460/490 – Device components
In buildings with modern information technology, malfunctions or power failure always entail high costs.

In installations which require a high fault tolerance and good safety, an RCMS system should constantly monitor the TN-S system for insulation faults to ensure that the system is "clean" and electromagnetically compatible.

The RCMS evaluators working according to the residual current measurement principle detect insulation deteriorations and send an alarm message to a central point, so that the faults can be eliminated with the shortest practical delay.
Residual current monitors
RCMS460-D... / -L...
RCMS490-D... / -L...

Device features
- Optional AC, pulsed DC or AC / DC sensitive measurement by selecting the respective measuring current transformer for each channel
- True r.m.s. value measurement
- 12 measuring channels per device for residual current measurement or digital input
- Up to 90 RCMS..., monitoring of 1080 measuring channels in the system
- Fast parallel scanning for all channels
- Response ranges
  - 10 mA...10 A (0...2000 Hz)
  - 6 mA...20 A (42...2000 Hz)
  - 10 mA...125 A (42...2000 Hz) RCMS...-D4
- Preset function
- Adjustable time delays
- The frequency response characteristics can be set for the protection of persons, fire and plant protection
- History memory with date and time stamp for 300 data records
- Data logger for 300 data records/ channel
- Analysis of the harmonics, DC, THD
- Two alarm relays with one changeover contact each
- Device version RCMS490 with one alarm contact per channel
- N / O or N / C operation and fault memory behaviour selectable
- Connection external test/reset button
- Backlit graphical display (7-segment display) and alarm LEDs
- Data exchange via BMS bus
- Password protection for device setting
- Continuous CT connection monitoring
- RoHS compliant

Approvals

Product description RCMS460-D... / -L... and RCMS490-D... / -L...
The RCMS system consists of one or more RCMS460-D/-L or RCMS490-D/-L residual current monitors, which are able to detect and evaluate fault, residual and operating currents in earthed power supplies via the related measuring current transformers. The maximum voltage of the system to be monitored depends on the nominal insulation voltage of the measuring current transformer used in the case of busbar systems, resp. depend on the cables or conductors that are routed through.
Closed W...AB series measuring current transformers are required to measure AC/DC sensitive residual currents (according to IEC/TR 60755: Type D). Six W...AB series measuring current transformers require one AN420 or AN110 power supply unit. W (closed), WR (rectangular), WS (split-core) and WF... (flexible) series measuring current transformers are used for alternating and pulsating currents (according to IEC/TR 60755: Type A).
Any combination of the various measuring current transformer series can be connected to the monitor measuring channels. Each RCMS460-D/-L and RCMS490-D/-L has 12 measuring channels. Up to 90 residual current monitors can be connected via a BMS bus (RS-485 interface with BMS protocol), thereby up to 1080 measuring channels (sub-circuits) can be monitored.
If this product is to be used for personnel, fire or plant protection, the frequency response can be set accordingly. The measured currents can be analysed for harmonics.

Typical applications
- Measuring and evaluating residual, fault and rated currents of loads and installations in the frequency range of 0...2000 Hz (W...AB series measuring current transformers), 42...2000 Hz (W, WR, WS WF series measuring current transformers).
- Monitoring of currents regarded as fire hazards in flammable atmospheres
- EMC monitoring of TN-S systems for "stray currents" and additional N-PE connections.
- Monitoring of N conductors for overload caused by harmonics
- Monitoring of PE and equipotential bonding conductors to ensure they are free of current
- Residual current monitoring of stationary electrical equipment and systems to determine test intervals which meet practical requirements in compliance with the accident prevention regulations BGV A3 (Germany).
- Personnel and fire protection due to rapid disconnection
- Monitoring of digital inputs

Function
The currents are detected and evaluated as true r.m.s. values in the frequency range of 0 (42) ... 2000 Hz. All channels are scanned simultaneously so that the maximum scanning time for all channels is 180 ms if 1x the response value is exceeded and 30 ms if 5x the response value is exceeded.
The current values of all channels are indicated on the LC display in bar graph format. If one of both values falls below or exceeds the set response value, the response delay begins. Once the response delay has expired, the common alarm relays "K1 / K2" switch and the alarm LEDs 1/2 light up.
Two response values/common alarm relays, which can be set separately, allow a distinction to be made between prewarning and alarm. The faulty channel(s) and the associated measured value are indicated on the LC display. If the current exceeds or falls below the release value (response value plus hysteresis), the delay on release toff begins. Once the delay has expired, the common alarm relays return to their initial position.
If the fault memory is enabled, the common alarm relays remain in the alarm state until the reset button is pressed or a reset command is sent via the BMS bus. The device function can be tested using the test button. Parameters are assigned to the device via the LCD and the control buttons on the front of one of the connected RCMS...-D devices or via connected panels and protocol converters (e.g. FTC470XET). The preset function allows the response values to be set for all channels considering the currently measured value for each channel.

Digital input
Each individual channel can be used for one of the following monitoring functions: as digital input using a potential-free contact 1/0 or for current or residual current monitoring in combination with measuring current transformers.
History memory in RCMS460-D, RCMS490-D

The device utilises a history memory for failsafe storing of up to 300 data records (date, time, channel, event code, measured value), so that all data about an outgoing circuit or an area can be traced back at any time (what happened when).

Analysis of harmonics

The analysis of the harmonics of the measured currents can be selected via a menu item in RCMS460-D, RCMS490-D. There, the DC component, the THD factor and the current value of the harmonics (1…40 at 50/60 Hz, 1…5 at 400 Hz) is displayed numerically and graphically.

Device variants

RCMS residual current monitoring systems differ in the type of residual current evaluator used. RCMS460… or RCMS490… are available as an option.

RCMS460-D

Device version RCMS460-D utilises a backlit graphical display. This version is applied when detailed information about all devices in the switchboard cabinet, connected to the bus, are to be displayed locally. This device is capable of assigning parameters to all RCMS devices connected to the BMS bus and displaying all measurement details. Several RCMS-D devices can be used in one system.

RCMS460-L

Device version RCMS460-L utilises a two-digit 7-segment display where the address of this device is displayed within the BMS bus. The alarm LEDs indicate in which measuring channel the response value has been exceeded. Parameter assignment can be carried out via an RCMS-D… or the protocol converter FTC470XET.

RCMS490-D/RCMS490-L

The function of the device versions RCMS490-D/RCMS490-L corresponds to the function described above. In addition, a galvanically isolated alarm contact (N/O contact) is provided, for example, to trigger a circuit breaker in this sub-circuit when a response value has been exceeded or the value has fallen below the set response value.

RCMS…-D4 / RCMS…-L4

The function of device version RCMS…-D4/RCMS…-L4 corresponds to the function described before. The functions of measuring channels k9…k12 vary from those described before. They are exclusively designed for current measurements with Type A measuring current transformers (measuring range 100 mA…125 A). For that reason, the measuring channels k9…k12 cannot be used in combination with W…AB series measuring current transformers or as digital inputs.

Standards

The following table gives an overview of the measuring functions per channel:

**Overview of measuring functions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Measuring functions, selectable</th>
<th>RCMS460-D / -L, RCMS490-D / -L</th>
<th>RCMS460-D4 / -L4, RCMS490-D4 / -L4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Channel 1…12</td>
<td>Channel 1…8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; / &gt; / OFF</td>
<td>&lt; / &gt; / OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Channel 9…12</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 / 0 / OFF</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>

1 - The "ALARMS 2" LED lights up if the measured value falls below or exceeds the "Alarm" response value in a measuring channel or an error is indicated by the digital input.

2 - LED "ALARMS 1" lights up if the measured value exceeds or falls below the "Prewarning" response value in a channel or in the event of device error

3 - Power LED "ON" lights up when the device is switched on or flashes until the device is ready for operation during switching on

4 - Backlit graphics LC display

5 - "INFO" button: to query standard information (does not apply to RCMS4…-L)

6 - "ESC" button: to exit the menu function without changing parameters

7 - "TEST" button: to call up the self test

8 - "RESET" button: to delete alarm and fault messages

9 - "SET" button: RCMS460-D/490-D: toggles between the

10 - "MENU" button: RCMS460-D/490-D/490-L: to set the BMS address

Enter button: to confirm parameter change

11 - Alarm LEDs "1…12" light up if a fault has been detected in the relevant measuring channel or flash if there is a fault with the measuring current transformer

12 - Digital display for device address and error codes
Residual current monitors RCMS460-D/-L – RCMS490-D/-L

4.3

1 - Connection of supply voltage $U_s$ (see ordering information), 6 A fuse recommended

2 - Connection measuring current transformers CT1…CT12. Either Type A or Type B measuring current transformers can be selected for each measuring channel. Six W…AB series measuring current transformers require one AN420-2 power supply unit. The channels k9…k12 of the device versions RCMS460-D4 / -L4 require the connection of Type A measuring current transformers.12

3 - RS-485 interface (with BMS protocol)

4 - External reset button “R” (N/O contact)

Wiring diagram – Digital input

1 - Potential-free contact
   $0 \triangleq$ Resistance between k and l > 250 Ω
   $1 \triangleq$ Resistance between k and l < 100 Ω

2 - Measuring current transformers
Connection W…, WR…, WS… series measuring current transformers (pulsed current sensitive)

Example: W…

Connection WF… series measuring current transformers

Connection W…AB series measuring current transformer (AC / DC current sensitive)

The connections k and l at the residual current monitor must not be interchanged.

**Frequency settings**

The frequency response of the equipment can be set to a linear frequency response (up to the maximum frequency of Hz) if used for fire protection or to a frequency response in accordance with IEC 60990 for personnel protection. For plant protection, the residual current is measured up to the rated system frequency. The figure below shows the corresponding frequency response.

**Frequency curves**

Response factor $= I_0 / I_{\text{an}}$

- $(I_0)$ Residual operating current: Measured value at which the RCMS responds.
- $(I_{\text{an}})$ Rated residual operating current:
  - Menu option “50 Hz” – plant protection: Only evaluates the fundamental component of the residual current.
  - Menu selection “60 Hz” – Plant protection: Only evaluates the fundamental component of the residual current.
  - Menu selection “IEC” – Touch current for let go (protection of persons) in accordance with IEC 60990
  - Menu selection “None” – Fire protection: Response factor remains the same over the entire frequency range.
Example for a design of a – minimum system consisting of an RCMS460-D and 12 measuring points

Measuring current transformers
AC/DC sensitive (0...2000 Hz)

TN-S system

Measuring current transformers
pulsed DC sensitive (42...2000 Hz)

Distribution board

Example for the design of a – standard system consisting of an RCMS460-D and RCMS460-L and a protocol converter FTC470XET

Note:
1 - When AC / DC sensitive measuring current transformers of the W...AB series are used, an AN420 or AN110* is required that supplies up to six measuring current transformers of this type.

When the supply voltage of AN110-1 is < 30 V, the output power decreases, so that only 5 measuring current transformers can be connected.

2 - The DI-1 repeater PSM only is required when the length of the cable exceeds 1200 m or when more than 32 devices are connected to the bus.
Technical data

Insulation coordination acc. to IEC 60664-1 / IEC 60664-3

- Rated insulation voltage: AC 250 V
- Rated impulse voltage/pollution degree: 6 kV / III
- Protective separation (reinforced insulation) between:
  - (A1, A2) - (k1, l1, k12, R, T, A, B) - (C11, C12, C14) - (C21, C22, C24) - (11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71, 74) - (81, 84) - (91, 94) - (101, 104) - (111, 114) - (121, 124)
- Voltage test acc. to IEC 61010-1: 3.3 kV
- Rated insulation voltage: AC 250 V
- Rated insulation voltage/pollution degree: 4 kV / III

Supply voltage

- Rated supply voltage: see ordering information
- Frequency range of $U_s$: see ordering information
- Power consumption: $\leq 10$ VA (RCMS460)
  - $\leq 12$ VA (RCMS490)

Measuring circuit

External measuring current transformer:
- W…, WR…, WS…, WF… series (Type A)
- W…AB series (Type B)

CT monitoring:
- on/off (on)*
- Rated burden RCMS…-D/-L: 68 Ω
- Rated burden RCMS…-D4/-L4 (channels 9…12 only): 1 Ω

Rated residual current $I_{\text{res}}$ (alarm):
- RCMS…-D/-L: 100 mA…125 A
- RCMS…-D4/-L4 (channels 9…12 only): 100 mA…125 A
- RCMS…-D4/-L4 (alarm for RCMS…-D/-L4 (channels 9…12 only)): 100 mA…125 A

Rated residual current $I_{\text{res}}$ (prewarming):
- RCMS…-D/-L: 100 % x $I_{\text{res}}$ min 5 mA (50 %)

Digital input:
- $1 \triangleq < 100 \Omega$, $0 \triangleq > 250 \Omega$
- Preset for alarm:
  - $x_{\text{factor}}$ x factor $\ldots$ 99 (3)*
  - Offset 0…20 A (30 mA)*
- Preset for digital input:
  - $0 \ldots 40 \%$
- Relative uncertainty RCMS…-D/-L:
  - 0…20 %
- Relative uncertainty RCMS…-D4/-L4 (channels 9…12)
  - +10…20 %
- Hysteresis:
  - 2…40 % (20 %)*
- Factor for additional CT:
  - $1 / \ldots 10 \times 250 \times 1 x$*
- Number of measuring channels (per device/system):
  - 12 / 1080

Displays, memory

Display range measured value RCMS…-D/L:
- 0…30 A (measuring current transformer type A)
- 0…20 A (measuring current transformer type B)

Measured value range RCMS…-D4/-L4 (channels 9…12):
- 0…125 A (measuring current transformer type A)

Error of indication:
- $\pm 10 \%$

LEDs:
- ON / ALARM (RCMS…-D/L)*

Start-up delay (backlight graphical display RCMS…-D/L):
- 0…99 s (200 ms)*

7-segment display:
- 2 x 7.62 mm (RCMS4…-L)*

History memory:
- 300 data records (RCMS…-D/L)*

Language:
- D, GB, F (GB)*

Fault memory alarm relay:
- on / off (off)*

Inputs/outputs

- Test / reset button:
  - internal/external
  - Cable length for external test/reset button: 0…10 m

Interface

- Interface/protocol:
  - RS-485 / BMS
- Baud rate:
  - 9.6 kbit / s
- Cable length:
  - 0…1200 m
- Recommended cable (shielded, shield connected to PE on one side):
  - J-Y(S)Y min. 2x0.8

Terminating resistor:
- 120 Ω (0.25 W) connectable via DIP switch
- Device address, BMS bus:
  - 1…90 (2)*
- Cable lengths for W…, WR…, WS…, WF… series measuring current transformers:
  - Single wire $\geq 0.75 \text{ mm}^2$:
    - 0…1 m
  - Single wire, twisted $\geq 0.75 \text{ mm}^2$:
    - 0…10 m
  - Shielded cable $\geq 0.5 \text{ mm}^2$:
    - 0…40 m
- Recommended cable (unshielded, not connected to earth):
  - J-Y(S)Y min. 2x0.8
- Cable length for W…AB series measuring current transformers:
  - Single wire $\geq 0.75 \text{ mm}^2$:
    - 0…10 m
- Connection plug-in connector, recommended WX…:

Switching elements

- Number:
  - 2 x 1 changeover contacts (RCMS460), 2 x 1 changeover contacts, 12 x 1 N / 0 contact (RCMS490)
- Operating principle:
  - NC / N/O operation (N/O operation)*
  - Electrical endurance, number of cycles: 10.000
- Data logger:
  - 300 data records per measuring channel (RCMS…-D…)
  - 300 data records per measuring channel (RCMS…-L…)
- History memory:
  - 300 data records per measuring channel (RCMS…-D…)
- Recorded operational current (alarm relay):
  - 2 A 0.2 A 5 A
  - Operating principle:
    - 0.2 A 0.1 A
- Minimum contact rating:
  - 1 mA at AC / DC $\geq 10$ V

EMC

- EMC:
  - IEC 62020:2003-11**
  - Operating temperature:
    - -25 °C +…+ 55 °C
  - Climatic class acc. to IEC 60721:
    - Stationary use (IEC 60721-3-3): 3K (except condensation and formation of ice)
    - Transport (IEC 60721-3-2): 2K (except condensation and formation of ice)
    - Long-time storage (IEC 60721-3-1): 1K (except condensation and formation of ice)
  - Classification of mechanical conditions IEC 60721:
    - Stationary use (IEC 60721-3-3): 1K4 (except condensation and formation of ice)
    - Transport (IEC 60721-3-2): 2K3 (except condensation and formation of ice)
    - Long-time storage (IEC 60721-3-1): 3K4 (except condensation and formation of ice)

Cable lengths:
- Single wire, twisted $\geq 0.75 \text{ mm}^2$:
  - 0…10 m
- Single wire $\geq 0.5 \text{ mm}^2$:
  - 0…40 m
- Single wire $\geq 0.75 \text{ mm}^2$:
  - 0…10 m
- Connection plug-in connector, recommended WX…:

Specific time

- Start-up delay $t_{\text{start-up}}$:
  - 0…99 s (0 ms)*
- Response delay $t_{\text{delay}}$:
  - 0…999 s (200 ms)*
- Delay on release:
  - 0…999 s (200 ms)*
- Operating time $t_{\text{op}}$ at $I_{\text{res}} = 1 \times I_{\text{op}}$:
  - $\leq 180$ ms
- Operating time $t_{\text{op}}$ at $I_{\text{res}} = 5 \times I_{\text{op}}$:
  - $\leq 30$ ms
- Response time $t_{\text{res}}$ for residual current measurement:
  - $t_{\text{res}} = t_{\text{op}} + t_{\text{delay}}$
- Scanning time for all measuring channels (residual current measurement): $\leq 180$ ms
- Recovery time $t_{\text{re}}$:
  - 500…600 ms

Temperature range:
- -25 °C…+ 55 °C

Cable lengths:
- Single wire, twisted $\geq 0.75 \text{ mm}^2$:
  - 0…10 m
- Single wire $\geq 0.5 \text{ mm}^2$:
  - 0…40 m
- Single wire $\geq 0.75 \text{ mm}^2$:
  - 0…10 m
- Connection plug-in connector, recommended WX…:

4.3

Residual current monitors RCMS460-D/L – RCMS490-D/L
### Connection screw-type terminals

**Connection properties:**
- **Rigid / flexible / conductor sizes:** 0.2...4 / 0.2...2.5 mm² / AWG 24...12
- **Multi-conductor connection (2 conductors with the same cross section):**
  - Rigid/flexible: 0.2...1.5 / 0.2...1.5 mm²

**Stripping length:** 8...9 mm
**Tightening torque:** 0.5...0.6 Nm

### Other
- **Operating mode:** continuous operation
- **Mounting:** display-oriented
- **Degree of protection, internal components (IEC 60529):** IP30
- **Degree of protection, terminals (IEC 60529):** IP20
- **Enclosure material:** polycarbonate
- **Flammability class:** UL94V-0
- **Screw mounting:** 2 x M4
- **DIN rail mounting acc. to:** IEC 60715
- **Operating manual:** TGH1393
- **Weight:** ≤ 360 g (RCMS460), ≤ 510 g (RCMS490)

*( )* Factory setting

**In the frequency range of < 15 Hz, the relative uncertainty is between -35 % and 100 %.
### Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage  $U_s$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCMS460-D-1</td>
<td>DC 16...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 9405 3001</td>
</tr>
<tr>
<td>RCMS460-D-4</td>
<td>DC 16...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 9405 3009</td>
</tr>
<tr>
<td>RCMS460-D-2</td>
<td>DC 70...276 V / AC 42...460 Hz 70...276 V</td>
<td>B 9405 3002</td>
</tr>
<tr>
<td>RCMS460-D-1</td>
<td>DC 16...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 9405 3003</td>
</tr>
<tr>
<td>RCMS460-L-1</td>
<td>DC 70...276 V / AC 42...460 Hz 70...276 V</td>
<td>B 9405 3004</td>
</tr>
<tr>
<td>RCMS460-L-2</td>
<td>DC 16...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 9405 3005</td>
</tr>
<tr>
<td>RCMS490-D-1</td>
<td>DC 16...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 9405 3006</td>
</tr>
<tr>
<td>RCMS490-D-2</td>
<td>DC 70...276 V / AC 42...460 Hz 70...276 V</td>
<td>B 9405 3007</td>
</tr>
<tr>
<td>RCMS490-L-1</td>
<td>DC 70...276 V / AC 42...460 Hz 70...276 V</td>
<td>B 9405 3008</td>
</tr>
</tbody>
</table>

### Pulsating current sensitive measuring current transformers for RCMS460/490

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal diameter/mm</th>
<th>Type of construction</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20</td>
<td>20</td>
<td>circular</td>
<td>B 9808 0003</td>
</tr>
<tr>
<td>W35</td>
<td>35</td>
<td>circular</td>
<td>B 9808 0010</td>
</tr>
<tr>
<td>W60</td>
<td>60</td>
<td>circular</td>
<td>B 9808 0018</td>
</tr>
<tr>
<td>W120</td>
<td>120</td>
<td>circular</td>
<td>B 9808 0028</td>
</tr>
<tr>
<td>W210</td>
<td>210</td>
<td>circular</td>
<td>B 9808 0034</td>
</tr>
<tr>
<td>WR70x175</td>
<td>70 x 175</td>
<td>rectangular</td>
<td>B 9808 0060</td>
</tr>
<tr>
<td>WR115x305</td>
<td>115 x 305</td>
<td>rectangular</td>
<td>B 9808 0061</td>
</tr>
<tr>
<td>WS20x30</td>
<td>20 x 30</td>
<td>split-core</td>
<td>B 9808 0061</td>
</tr>
<tr>
<td>WS50x80</td>
<td>50 x 80</td>
<td>split-core</td>
<td>B 9808 0063</td>
</tr>
<tr>
<td>WS80x120</td>
<td>80 x 120</td>
<td>split-core</td>
<td>B 9808 0066</td>
</tr>
</tbody>
</table>

### AC/DC sensitive measuring current transformers for RCMS460/490

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal diameter/mm</th>
<th>Type of construction</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20AB</td>
<td>20</td>
<td>circular</td>
<td>B 9808 0008</td>
</tr>
<tr>
<td>W35AB</td>
<td>35</td>
<td>circular</td>
<td>B 9808 0016</td>
</tr>
<tr>
<td>W60AB</td>
<td>60</td>
<td>circular</td>
<td>B 9808 0026</td>
</tr>
<tr>
<td>W120AB</td>
<td>120</td>
<td>circular</td>
<td>B 9808 0041</td>
</tr>
<tr>
<td>W210AB</td>
<td>210</td>
<td>circular</td>
<td>B 9808 0040</td>
</tr>
</tbody>
</table>

### Flexible measuring current transformers (pulsed DC sensitive) for RCMS460/490

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal diameter/ mm</th>
<th>Supply voltage $U_s$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WF170-1</td>
<td>170 DC 9.6...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 7808 0201</td>
<td></td>
</tr>
<tr>
<td>WF170-2</td>
<td>170 DC 70...300 V / AC 42...460 Hz 70...300 V</td>
<td>B 7808 0202</td>
<td></td>
</tr>
<tr>
<td>WF250-1</td>
<td>250 DC 9.6...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 7808 0203</td>
<td></td>
</tr>
<tr>
<td>WF250-2</td>
<td>250 DC 70...300 V / AC 42...460 Hz 70...300 V</td>
<td>B 7808 0204</td>
<td></td>
</tr>
<tr>
<td>WF500-1</td>
<td>500 DC 9.6...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 7808 0205</td>
<td></td>
</tr>
<tr>
<td>WF500-2</td>
<td>500 DC 70...300 V / AC 42...460 Hz 70...300 V</td>
<td>B 7808 0206</td>
<td></td>
</tr>
<tr>
<td>WF800-1</td>
<td>800 DC 9.6...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 7808 0207</td>
<td></td>
</tr>
<tr>
<td>WF800-2</td>
<td>800 DC 70...300 V / AC 42...460 Hz 70...300 V</td>
<td>B 7808 0208</td>
<td></td>
</tr>
<tr>
<td>WF1200-1</td>
<td>1200 DC 9.6...94 V / AC 42...460 Hz 16...72 V</td>
<td>B 7808 0209</td>
<td></td>
</tr>
<tr>
<td>WF1200-2</td>
<td>1200 DC 70...300 V / AC 42...460 Hz 70...300 V</td>
<td>B 7808 0210</td>
<td></td>
</tr>
</tbody>
</table>

### Other measuring current transformer types on request

### Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for enclosure XM420 (1 piece per device)</td>
<td>B 9806 0008</td>
</tr>
<tr>
<td>Snap-on mounting for W20...W35...</td>
<td>B 9808 0501</td>
</tr>
<tr>
<td>Snap-on mounting for W60...</td>
<td>B 9808 0502</td>
</tr>
<tr>
<td>XM460 mounting frame, 144 x 82 mm</td>
<td>B 990995</td>
</tr>
</tbody>
</table>

For further information about measuring current transformers, please refer to the respective data sheets.
Dimension diagrams

**Dimensions in mm**

**RCMS460-D / -L**

![Dimension diagram AN420](image1)

**RCMS490-D / -L**

![Dimension diagram AN110](image2)

**Screw mounting**

Note: The upper mounting clip must be ordered separately (see ordering information).

**Open the front plate cover in direction of arrow!**

**Dimension diagram AN420**

**Dimensions in mm**

**Screw mounting**

Note: The upper mounting clip must be ordered separately (see ordering information).
Directionally discriminating residual current monitors in IT systems

In addition to insulation monitoring devices, also directionally discriminating residual current monitors can be used in IT systems to locate insulation faults. In IT systems it must be ensured that on the occurrence of a fault the value of the residual current flowing in the system is greater than the response value. This means that the existing system leakage capacitances upstream a measuring current transformer must be correspondingly high.

In order to achieve that an insulation fault can be indicated on the load side of the measuring current transformer, a comparison of the phases between the neutral point displacement voltage and the residual current is required. Only on the occurrence of an insulation fault on the load side of the CT, the phase angle of the residual current leads in relation to the phase angle of the neutral point displacement voltage and the RCM signals an alarm. In this way, the objective is achieved, only insulation faults on the load side of the CT are signalled and residual currents flowing "backwards" into the CT do not cause an alarm.
Residual current monitor
RCM470DY

Product description

The residual current monitor RCM470DY monitors the residual current (AC, DC pulsating) in unearthed AC or 3NAC systems (IT systems). The residual current is evaluated directionally, i.e. only insulation faults detected on the load side are signalled. That allows selective fault location in extended IT systems.

A precondition for the use of the device are sufficient high leakage capacitances upstream the CT so that a residual current higher than the response value can flow. However, a high leakage current is not desirable in many sectors so that principally the value of the maximum permissible leakage current of the IT system and the application field has to be taken into consideration when using directionally discriminating residual current monitors. Also the nominal voltage has to be considered when selecting the appropriate device since the measuring principle requires the neutral point displacement voltage of the IT system to be monitored.

For the RCM470DY series, external measuring current transformers of the type W… or WR… can be used. The nominal voltage range can be extended up to AC resp. 3NAC 1000 V with the coupling device AKS470.

Device features

- External measuring current transformer
- Response value, adjustable 10 mA…10 A/100 mA…100 A
- Response delay, adjustable 0…10 s
- Alarm relay with two potential-free changeover contacts
- N / O or N / C operation, selectable
- Fault memory behaviour, selectable
- Internal/external test and reset button
- LEDs: Power On, Alarm
- Connection monitoring for external CTs
- Sealable transparent cover
- Enclosure for DIN rail mounting and screw mounting
- External supply voltage
- Type A acc. to IEC/TR 60755

Approvals and certifications

![Approvals and certifications]

66 Main catalogue part 4 – Residual current monitors, Residual current monitoring systems / 10.2010
**Wiring diagram – system connection, external connections**

1 - A 6 A fuse is recommended. The terminal W is not applied in single phase systems.
2 - External measuring current transformer (refer to table "External measuring current transformers")
3 - Supply voltage $U_s$ see ordering information, 6 A fuse recommended
4 - External test/reset button "T/R"
5 - Alarm relay: switches when the fault current exceeds or does not reach the response value and in case of interruption of the CT connection.

**Note: Do not route the PE conductor through the measuring current transformer!**

* When insulation or voltage tests are to be carried out, the device must be isolated from the system for the test period.

---

**Wiring diagram – front plate**

1 - Combined test/reset button "TEST/RESET"; short-time pressing (< 1 s) = RESET, long-time pressing (> 2 s) = TEST
2 - Power On LED "ON"
3 - Alarm LED "ALARM": lights when the fault current exceeds the response value and flashes in case of interruption of the CT connection.
4 - Potentiometer for setting the response delay (0…1 s)
5 - Potentiometer for setting the response value (x 1…10 mA)
6 - Setting the operating principle of the alarm relay
   A - N / O operation
   B - N / C operation
7 - Fault memory behaviour relay + LED
   A - Fault memory ON
   B - Fault memory OFF
8 - Response range setting
   RCM470DY
   A - 10 mA
   B - 30 mA
   C - 100 mA
   D - 300 mA
   E - 500 mA
   F - 1000 mA
   RCM470DY-72
   A - 100 mA
   B - 300 mA
   C - 1 A
   D - 3 A
   E - 5 A
   F - 10 A
9 - Setting of the response delay
   A - x 1
   B - x 10

Response range setting, white = switch position. Check that the system is in de-energised state before changing the functions N / O / N / C operation, response delay x 1/x 10 and fault memory behaviour!
Residual current monitor RCM470DY

**Technical data**

**Insulation coordination acc. to IEC 60664-1**
- Rated insulation voltage: AC 250 V
- Rated impulse withstand voltage/pollution degree: 4 kV/3

**Voltage ranges**
- System being monitored: U<br>  AC 50...60 Hz 400 V
- Operating range of U<br>  0.24...1.1 x Un
- Supply voltage: U<br>  see ordering information
- Frequency range of U<br>  50...60 Hz
- Operating range of U<br>  0.85...1.1 x Us
- Power consumption: ≤ 3 VA

**Measuring circuit**
- External measuring current transformer: W..., WR... series
- Load: 180 Ω
- Operating characteristics acc. to IEC/TR 60755: Type A
- Rated residual operating current: IΔn 10 mA...10 A / 100 mA...100 A
- Response delay: tν adjustable 0...10 s
- Accuracy of response delay: + / - 20 %
- Rated frequency: 50...60 Hz
- Relative uncertainty: 0...20 %
- Hysteresis: approx. 25 % of the response value
- Response time: tan ≤ 500 ms
- Number of measuring channels: 1

**Displays**
- LEDs: Power On, Alarm

**Inputs/outputs**
- Test and reset button: internal/external
- Cable length external test and reset button: ≤ 10 m
- Cable lengths for measuring current transformers:
  - Single wire: 0.75 mm², 0...1 m
  - Single wire, twisted: 0.75 mm², 0...10 m
  - Shielded cable: 0.5 mm², 0...40 m
- Recommended cable (shielded, shield on one side connected to terminal L of the RCM, not connected to earth): J-Y(S)J YM 2x0.8

**Switching elements**
- Number of switching elements: 1 x 2 changeover contacts
- Operating principle, adjustable: N/C operation / N/O operation
- Factory setting: N/O operation
- Electrical endurance, number of cycles: 12000
- Rated contact voltage: AC 250 V/DC 300 V
- Making capacity: AC/DC 5 A
- Breaking capacity:
  - AC 230 V, cos phi = 0.4: 0.2 A, DC 220 V, L/R = 0.04 s
  - Fault memory: on / off

**General data**
- EMC immunity: EN 61543
- Shock resistance: IEC 60608-2-27 (during operation) 15 g/11 ms
- Bumping IEC 60608-2-29 (during transport): 40 g/6 ms
- Vibration resistance IEC 60608-2-6 (during operation): 1 g/10...150 Hz
- Vibration resistance IEC 60608-2-6 (during transport): 2 g/10...150 Hz
- Ambient temperature, during operation: -10 °C...+55 °C
- Ambient temperature for storage: -40 °C...+70 °C
- Operating mode: continuous operation
- Mounting: any position
- Connection type: modular terminals
- Connection properties:
  - rigid / flexible: 0.2...4 / 0.2...2.5 mm²
  - flexible with ferrules without / with plastic collar: 0.25...2.5 mm²
- Conductor sizes (AWG): 24...12
- Degree of protection, internal components / terminal (DIN EN 60529): IP 30 / IP 20
- Type of enclosure/enclosure material: X470/polycarbonate
- Screw mounting: 2 x M4
- DIN rail mounting acc. to IEC 60715
- Installation into standard distribution panels acc. to DIN 43871
- Flammability class: UL94V-0
- Operating manual: TBP402002
- Weight: ≤ 350 g

In order to obtain directional selectivity the instructions concerning the conductors to be monitored through measuring current transformer have to be observed.
Residual current monitor RCM470DY

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Response range $I_\Delta$</th>
<th>Rated frequency</th>
<th>Time delay</th>
<th>Measuring current transformer</th>
<th>Fault memory behaviour</th>
<th>Supply voltage $U_S$</th>
<th>Nominal voltage $U_n$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCM470DY</td>
<td>10 mA…10 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>W…, WR…</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>AC/3AC 90…440 V**</td>
<td>B 9402 2025</td>
</tr>
<tr>
<td>RCM470DY-72**</td>
<td>100 mA…100 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>W…, WR…</td>
<td>selectable</td>
<td>AC 230 V</td>
<td>AC/3AC 90…440 V**</td>
<td>B 9402 2031</td>
</tr>
<tr>
<td>RCM470DY-13</td>
<td>10 mA…10 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>W…, WR…</td>
<td>selectable</td>
<td>AC 90…132 V*</td>
<td>AC/3AC 90…440 V**</td>
<td>B 9402 2029</td>
</tr>
</tbody>
</table>

* The values listed above are absolute values to which the operating range cannot be applied.

Other supply voltages on request

** not GL and UL approved

External measuring current transformers

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal diameter (mm)</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20</td>
<td>ø 20</td>
<td>B 9808 0003</td>
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<tr>
<td>W35</td>
<td>ø 35</td>
<td>B 9808 0010</td>
</tr>
<tr>
<td>W60</td>
<td>ø 60</td>
<td>B 9808 0018</td>
</tr>
<tr>
<td>W120</td>
<td>ø 120</td>
<td>B 9808 0028</td>
</tr>
<tr>
<td>W210</td>
<td>ø 210</td>
<td>B 9808 0034</td>
</tr>
<tr>
<td>WR70x175</td>
<td>70 x 175</td>
<td>B 9808 0609</td>
</tr>
<tr>
<td>WR115x305</td>
<td>115 x 305</td>
<td>B 9808 0610</td>
</tr>
</tbody>
</table>

Coupling device

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal voltage $U_n$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKS470</td>
<td>AC / 3AC 1000 V</td>
<td>B 9803 9001</td>
</tr>
</tbody>
</table>

Accessories

Dimension diagram X470

Dimensions in mm

4.3 screw mounting
Residual current monitor
RCM475DY

Product description
The residual current monitor RCM470DY monitors the residual current (AC, DC pulsating) in unearthed AC or 3NAC systems (IT systems). The residual current is evaluated directionally, i.e. only insulation faults detected on the load side are signalled. That allows selective fault location in extended IT systems.

A precondition for the use of the device are sufficient high leakage capacitances upstream the CT so that a residual current higher than the response value can flow. However, a high leakage current is not desirable in many sectors so that principally the value of the maximum permissible leakage current of the IT system and the application field has to be taken into consideration when using directionally discriminating residual current monitors. Also the nominal voltage has to be considered when selecting the appropriate device since the measuring principle requires the neutral point displacement voltage of the IT system to be monitored.

Version RCM475DY utilises an internal measuring current transformer, ø 18 mm.

Device features
- Internal measuring current transformer ø 18 mm
- Response value, adjustable 10 mA…10 A
- Response delay, adjustable 0…10 s
- Alarm relay with two potential-free changeover contacts
- N / O or N / C operation, selectable
- Fault memory behaviour, selectable
- Internal/external test and reset button
- LEDs: Power On, Alarm
- Sealable transparent cover
- Enclosure for DIN rail mounting and screw mounting
- Type A acc. to IEC/TR 60755

Approvals and certifications

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4.4

Residual current monitor
RCM475DY

4.4

Directionally discriminating residual current monitor for IT AC systems (AC and pulsating DC currents)
1 - A 6 A fuse is recommended
   Terminal W is not applied in single-phase systems.
2 - External test and reset button "T/R"
3 - Alarm relay: switches when the fault current exceeds the response value.
4 - Internal measuring current transformer

Note: Do not route the PE conductor through the measuring current transformer!
Residual current monitor RCM475DY

Technical data

Insulation coordination acc. to IEC 60664-1
- Rated insulation voltage: AC 250 V
- Rated impulse withstand voltage/pollution degree: 4 kV/3

Voltage ranges
- System being monitored $U_n$: see ordering information
- Power consumption: $\leq$ 3 VA

Measuring circuit
- Internal measuring current transformer: ø 18 mm
- Load: 180 Ω
- Operating characteristics acc. to IEC/TR 60755: Type A
- Rated residual operating current $I_{\Delta n}$: 10 mA…10 A
- Response delay $t_v$: adjustable 0…10 s
- Accuracy of response delay: + / - 20 %
- Rated frequency: 50…60 Hz
- Relative uncertainty: 0…- 20 %
- Hysteresis: approx. 25% of the response value
- Response timetan: $\leq$ 500 ms
- Number of measuring channels: 1

Displays
- LEDs: Power On, Alarm

Inputs/outputs
- Test and reset button: internal/external
- Cable length external test and reset button: $\leq$ 10 m

Switching elements
- Number of switching elements: 1 x 2 changeover contacts
- Operating principle, adjustable (factory setting): N / C operation/N / O operation
- Electrical endurance, number of cycles: 12000
- Rated contact voltage: AC 250 V/DC 300 V
- Making capacity: AC/DC 5 A
- Breaking capacity: 2 A, AC 230 V, cos phi = 0.4
  0.2 A, DC 220 V, L/R = 0.04 s
- Fault memory: on / off

General data
- EMC immunity: EN 61543
- Shock resistance IEC 60068-2-27 (during operation): 15 g/11 ms
- Bumping IEC 60068-2-29 (during transport): 40 g/6 ms
- Vibration resistance IEC 60068-2-6 (during operation): 1 g/10…150 Hz
- Vibration resistance IEC 60068-2-6 (during transport): 2 g/10…150 Hz
- Ambient temperature, during operation: - 10 °C…+ 55 °C
- Ambient temperature, when stored: - 40 °C…+ 70 °C
- Climatic class acc. to DIN 60721-3-3: 3K2
- Operating mode: continuous operation
- Mounting: any position
- Connection type: modular terminals
- Connection properties: rigid / flexible
  - 0.2…4 / 0.2…2.5 mm²
  - 0.25…2.5 mm²
- Conductor sizes (AWG): 24…12
- Degree of protection, internal components (IEC 60529): IP30
- Degree of protection, terminals (IEC 60529): IP30
- Type of enclosure: X475
- Enclosure material: polycarbonate
- Screw mounting: 2 x M4
- DIN rail mounting acc. to: IEC 60715
- Installation into standard distribution panels acc. to: DIN 43871
- Flammability class: UL94V-0
- Operating manual: TBP402002
- Weight: $\leq$ 350 g

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Response range $I_{\Delta n}$</th>
<th>Rated frequency</th>
<th>Time delay</th>
<th>Measuring current transformer inside diameter</th>
<th>Fault memory behaviour</th>
<th>Nominal voltage $U_n$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCM475DY</td>
<td>10 mA…10 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>selectable</td>
<td>AC/3AC 195…253 V*</td>
<td>B 9402 2026</td>
</tr>
<tr>
<td>RCM475DY-13</td>
<td>10 mA…10 A</td>
<td>50…60 Hz</td>
<td>0…10 s</td>
<td>ø 18 mm</td>
<td>selectable</td>
<td>AC 90…132 V*</td>
<td>B 9402 2028</td>
</tr>
</tbody>
</table>

* The values listed above are absolute values to which the operating range cannot be applied. Other nominal voltages on request.

Dimension diagram X475

Dimensions in mm
Measuring current transformers are used for the detection of residual currents in earthed systems or for the detection of test current signals in EDS systems.
**W… series measuring current transformers**

**W…-8000 series measuring current transformers**

**Product description**

W… and W…-8000 series measuring current transformers of the are highly sensitive measuring current transformers which measure AC currents and convert them into evaluable measurement signals, in combination with RCM series residual current monitors resp. RCMS series residual current monitoring systems.

In addition, the measuring current transformers can be used in combination with insulation fault locators (EDS) for IT systems. They are designed to measure the test current generated by a PGH locating current injector or an A-ISOMETER® IRDH. In combination with EDS series insulation fault locators the test current is converted into evaluable signals.

Connection to the respective devices is via a two-wire cable.

**Installation instructions**

- Make sure that all live conductors are routed through the measuring current transformer
- Do not route shielded conductors through the measuring current transformer
- Never route a PE conductor through the measuring current transformer!

**Wiring diagram**

**Device features**

**W… measuring current transformers**
- For RCMS460/490 series residual current monitoring systems
- For RCM420, RCM460 and RCM470 series residual current monitors
- For EDS460/490 and EDS470 series insulation fault locators

**W…-8000 measuring current transformers**
- For EDS473(E)-12, EDS474(E)-12, EDS461 and EDS491 series insulation fault evaluators

**Approvals and certifications**

Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitor or to an EDS series insulation fault locator.

Connection to the respective insulation fault locator EDS473(E)-12, EDS474(E)-12, EDS461 and/or EDS491.
Technical data

Insulation coordination acc. to IEC 60664-1 / IEC 60664-3
Rated insulation voltage 800 V
Rated impulse voltage/pollution degree 8 kV / III

CT circuit W…
Rated primary residual current 10 mA … 10 A
Rated secondary residual current 0.0167 A
Rated transformation ratio $K_n$ 10 / 0.0167 A
Rated burden ≤ 180 $\Omega^*$
Nominal power 0.05 VA
Frequency range 42 Hz … 3 kHz
Rated continuous thermal current $I_{cth}$ 40 A
Rated short-time thermal current $I_{th}$ 2.4 kA / 1 s
Rated dynamic current $I_{dyn}$ 6.0 kA / 40 ms

CT circuit W…-8000
Rated primary residual current 1 A
Rated secondary residual current 0.125 mA
Rated transformation ratio $K_n$ 1 A / 0.125 mA
Rated burden 2400 $\Omega$
Nominal power 0.0375 VA
Frequency range 42 Hz … 3 kHz
Rated continuous thermal current $I_{cth}$ 6 A
Rated short-time thermal current $I_{th}$ 60 x $I_{th}$ = 0.36 kA / 1 s
Rated dynamic current $I_{dyn}$ 2.5 x $I_{th}$ = 0.9 kA / 40 ms

Environmental conditions
Operating temperature -25 °C … +70 °C
Climatic class acc. to IEC 60721
Stationary use (IEC 60721-3-3) 3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2) 2K5 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1) 1K5 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721
Stationary use (IEC 60721-3-3) 3M4
Transport (IEC 60721-3-2) 2M2
Long-time storage (IEC 60721-3-1) 1M3

Connection
Connection cage clamp terminals
rigid/flexible/conductor sizes 0.08 … 2.5 / 0.08 … 2.5 mm² / 28 … 12 AWG
Stripping length 8 … 9 mm

Connection EDS, RCMs-measuring current transformer
Single wire ≥ 0.75 mm² 0 … 1 m
Single wire, twisted ≥ 0.75 mm² 0 … 10 m
Shielded cable ≥ 0.5 mm² 0 … 40 m
Recommended cable
(shielded, shield on one side connected to I-conductor, not connected to earth) J-Y (ST) Y min. 2 x 0.8

Other
Degree of protection, internal components (IEC 60529) IP40
Degree of protection, terminals (IEC 60529) IP20
Screw mounting MS with mounting brackets
Flammability class UL94V-0
Product standards IEC 60044-1
Operating manual W…, W…-8000 TBP409013
Approvals and certifications UL under consideration, GOST

*The rated burden may vary depending on the respective device data sheet.

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal diameter</th>
<th>DIN rail</th>
<th>Mounting</th>
<th>Mounting</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20</td>
<td>20 mm × ×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0003</td>
</tr>
<tr>
<td>W35</td>
<td>35 mm × ×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0010</td>
</tr>
<tr>
<td>W60</td>
<td>60 mm × ×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0018</td>
</tr>
<tr>
<td>W120</td>
<td>120 mm --</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0028</td>
</tr>
<tr>
<td>W210</td>
<td>210 mm --</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0034</td>
</tr>
<tr>
<td>W20-8000*</td>
<td>20 mm × ×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0009</td>
</tr>
<tr>
<td>W35-8000*</td>
<td>35 mm × ×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0017</td>
</tr>
<tr>
<td>W60-8000*</td>
<td>60 mm × ×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>B 9808 0027</td>
</tr>
</tbody>
</table>

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20</td>
<td>76.4</td>
<td>50</td>
<td>56.3</td>
<td>29.8</td>
<td>30</td>
<td>16.4</td>
<td>ø 20</td>
<td>≤ 0.13 kg</td>
</tr>
<tr>
<td>W35</td>
<td>99.5</td>
<td>62</td>
<td>79.2</td>
<td>41.7</td>
<td>30</td>
<td>20</td>
<td>ø 35</td>
<td>≤ 0.175 kg</td>
</tr>
<tr>
<td>W60</td>
<td>135</td>
<td>79</td>
<td>116.4</td>
<td>60.4</td>
<td>37</td>
<td>24</td>
<td>ø 60</td>
<td>≤ 0.315 kg</td>
</tr>
<tr>
<td>W120</td>
<td>210</td>
<td>116.5</td>
<td>191.5</td>
<td>98</td>
<td>37</td>
<td>33.5</td>
<td>ø 120</td>
<td>≤ 0.96 kg</td>
</tr>
<tr>
<td>W210</td>
<td>323</td>
<td>173</td>
<td>304.5</td>
<td>154.5</td>
<td>45</td>
<td>45</td>
<td>ø 210</td>
<td>≤ 2.9 kg</td>
</tr>
<tr>
<td>W20-8000*</td>
<td>76.4</td>
<td>50</td>
<td>56.3</td>
<td>29.8</td>
<td>30</td>
<td>16.4</td>
<td>ø 20</td>
<td>≤ 0.15 kg</td>
</tr>
<tr>
<td>W35-8000*</td>
<td>99.5</td>
<td>62</td>
<td>79.2</td>
<td>41.7</td>
<td>30</td>
<td>20</td>
<td>ø 35</td>
<td>≤ 0.205 kg</td>
</tr>
<tr>
<td>W60-8000*</td>
<td>135</td>
<td>79</td>
<td>116.4</td>
<td>60.4</td>
<td>37</td>
<td>24</td>
<td>ø 60</td>
<td>≤ 0.355 kg</td>
</tr>
</tbody>
</table>

Dimensions in mm
* For EDS461/491 and EDS473/474 series insulation fault locators
Mounting details

Screw mounting with mounting brackets: W20, W35, W60 and W20-8000, W35-8000, W60-8000

Snap-on mounting on DIN rail: for vertical or horizontal mounting: W20, W35, W60 and W20-8000, W35-8000, W60-8000

Screw mounting: W120, W210

Dimensions in mm

### Dimensions screw mounting

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20/W20-8000 (fixing with two mounting brackets, diagonally)</td>
<td>47</td>
<td>31.4</td>
<td>63</td>
<td>18.6</td>
</tr>
<tr>
<td>W35 / W35-8000 (fixing with two mounting brackets, diagonally)</td>
<td>47</td>
<td>49.8</td>
<td>63</td>
<td>12.1</td>
</tr>
<tr>
<td>W60 / W60-8000 (fixing with four mounting brackets)</td>
<td>54</td>
<td>66</td>
<td>70</td>
<td>17.7</td>
</tr>
<tr>
<td>W120 screw mounting</td>
<td>51</td>
<td>103</td>
<td>60.6</td>
<td>65</td>
</tr>
<tr>
<td>W210 screw mounting</td>
<td>59</td>
<td>180</td>
<td>68.6</td>
<td>83</td>
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### Dimensions snap-on mounting

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20 / W20-8000</td>
<td>43.5</td>
<td>32</td>
</tr>
<tr>
<td>W35 / W35-8000</td>
<td>43.5</td>
<td>32</td>
</tr>
<tr>
<td>W60 / W60-8000</td>
<td>50</td>
<td>39</td>
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Dimensions in mm

### Dimensions screw mounting

<table>
<thead>
<tr>
<th>Type</th>
<th>RCM420</th>
<th>RCM470</th>
<th>RCMS460/490</th>
<th>EDS460/490</th>
<th>EDS461/491</th>
<th>EDS473</th>
<th>EDS474</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>W35</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>W60</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>W120</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>W210</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>W20-8000</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>W35-8000</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>W60-8000</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>
Measuring current transformers of the W...AB series

Product description
Measuring current transformers of the W...-AB series are measuring current transformers which in combination with devices of the RCMA420 resp. RCMS460/423 490 series convert AC and DC currents into evaluable measurement signals. Connection to the respective devices is via a five-wire or six-wire cable. The CTs can be used in DC, AC, and 3(N) AC systems. If the measuring current transformers are to be connected to an RCMS460/490 system, one AN420 or AN110 power supply unit is required for six measuring current transformers each. The measuring current transformers of the W35ABP and W60ABP series feature an integrated Mumetal shield.

Standards
The measuring current transformers of the W...-AB series comply with the requirements of IEC 60044-1.

Installation instructions
• Make sure that all live conductors are routed through the measuring current transformer
• Do not route shielded conductors through the measuring current transformer
• Never route a PE conductor through the measuring current transformer!

Device features
• W20AB...W60AB for AC/DC sensitive RCMA420 series residual current monitors
• W20AB...W210AB for RCMS460 / 490 series residual current monitoring systems or for RCMA423 residual current monitors
• W35ABP...W60ABP for RCMS460 / 490 and RCMA420 / 423 series residual current monitors. Suitable for systems where short-term system-related load currents occur

Approvals and certifications

4.5
Connection to the RCMS460/490 residual current monitor using the WXS... connecting cable.

Connection to the RCMA420 residual current monitor using the WX... connecting cable.

Colour coding for WXS... and WX...:
k = yellow, l = green, -12 V = black, GND = brown, +12 V = red, Test (T) = orange
Technical data

Insulation coordination acc. to IEC 60664-1 / IEC 60664-3

- Rated insulation voltage: 800 V
- Rated impulse voltage/pollution degree: 8 kV / III

Supply voltage

- Supply voltage $U_S$: DC + / - 12 V
- Operating range of $U_S$: 0.95 … 1.05 x $U_S$
- Power consumption: $\leq 2.5$ VA

CT circuit

- Rated primary residual current $W20AB$: 10 … 500 mA
- Rated primary residual current $W35AB…W120AB$: 10 mA … 10 A
- Rated primary residual current $W35ABP$ and $W60ABP$: 10 mA … 10 A
- Rated continuous thermal current $I_{cth}$: 40 A
- Rated short-time thermal current $I_{sth}$: 2.4 kA / 1 s
- Rated dynamic current $I_{dyn}$: 6.0 kA / 40 ms

EMC

- EMC: IEC 62020

Ambient temperature, operation: $-10 \degree C ... +55 \degree C$

Climatic class acc. to IEC 60721

- Stationary use (IEC 60721-3-3): 3K5 (except condensation and formation of ice)
- Transport (IEC 60721-3-2): 2K5 (except condensation and formation of ice)
- Long-time storage (IEC 60721-3-1): 1K5 (except condensation and formation of ice)

Classification of mechanical conditions IEC 60721

- Stationary use (IEC 60721-3-3): 3M4
- Transport (IEC 60721-3-2): 2M2
- Long-time storage (IEC 60721-3-1): 1M3

Connection

- Type of connection: plug-in connectors
- Connection RCMA/RCMS-measuring current transformer: refer to table "Connecting cables"

Other

- Degree of protection, internal components (IEC 60529): IP40
- Degree of protection, terminals (IEC 60529): IP20
- Screw mounting: MS with mounting bracket
- DIN rail mounting (W20AB, W35AB(P), W60AB(P) only) with snap-on mounting
- Flammability class: UL94 V-0
- Operating manual: TBP409012

Ordering information - Connecting cables

<table>
<thead>
<tr>
<th>Type</th>
<th>For device</th>
<th>Length/m</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WX-100</td>
<td>RCMA420 / 423</td>
<td>1</td>
<td>B 9808 0503</td>
</tr>
<tr>
<td>WX-250</td>
<td>RCMA420 / 423</td>
<td>2.5</td>
<td>B 9808 0504</td>
</tr>
<tr>
<td>WX-500</td>
<td>RCMA420 / 423</td>
<td>5</td>
<td>B 9808 0505</td>
</tr>
<tr>
<td>WX-1000</td>
<td>RCMA420 / 423</td>
<td>10</td>
<td>B 9808 0511</td>
</tr>
<tr>
<td>WX5-100</td>
<td>RCS460/490</td>
<td>1</td>
<td>B 9808 0506</td>
</tr>
<tr>
<td>WX5-250</td>
<td>RCS460/490</td>
<td>2.5</td>
<td>B 9808 0507</td>
</tr>
<tr>
<td>WX5-500</td>
<td>RCS460/490</td>
<td>5</td>
<td>B 9808 0508</td>
</tr>
<tr>
<td>WX5-1000</td>
<td>RCS460/490</td>
<td>10</td>
<td>B 9808 0509</td>
</tr>
</tbody>
</table>

Control cable LlYY flexible, 6 x AWG 20 (6 x 0.56 mm²), approved by UL 2464

Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snap-on mounting for W20AB, W35AB(P)</td>
<td>B 9808 0501</td>
</tr>
<tr>
<td>Snap-on mounting for W60AB(P)</td>
<td>B 9808 0502</td>
</tr>
</tbody>
</table>

Dimension diagram

Dimensions in mm

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal diameter</th>
<th>DIN rail</th>
<th>Mounting</th>
<th>Screw mounting</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20AB</td>
<td>ø 20 mm</td>
<td>×</td>
<td>×</td>
<td></td>
<td>B 9808 0008</td>
</tr>
<tr>
<td>W35AB</td>
<td>ø 35 mm</td>
<td>×</td>
<td>×</td>
<td></td>
<td>B 9808 0016</td>
</tr>
<tr>
<td>W60AB</td>
<td>ø 60 mm</td>
<td>×</td>
<td>×</td>
<td></td>
<td>B 9808 0026</td>
</tr>
<tr>
<td>W120AB</td>
<td>ø 120 mm</td>
<td>--</td>
<td>×</td>
<td></td>
<td>B 9808 0041</td>
</tr>
<tr>
<td>W210AB</td>
<td>ø 210 mm</td>
<td>--</td>
<td>×</td>
<td></td>
<td>B 9808 0040</td>
</tr>
<tr>
<td>W35ABP</td>
<td>ø 35 mm</td>
<td>×</td>
<td>×</td>
<td></td>
<td>B 9808 0051</td>
</tr>
<tr>
<td>W60ABP</td>
<td>ø 60 mm</td>
<td>×</td>
<td>×</td>
<td></td>
<td>B 9808 0052</td>
</tr>
</tbody>
</table>

Power supply unit

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage $U_S$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN420-2</td>
<td>DC 70 … 300 V / AC 42 … 460 Hz</td>
<td>B 9405 3100</td>
</tr>
<tr>
<td>AN110-1</td>
<td>DC 18 … 72 V / AC 50 … 60 Hz</td>
<td>B 9405 3101</td>
</tr>
<tr>
<td>AN110-2</td>
<td>DC 100 … 353 V / AC 50 … 60 Hz</td>
<td>B 9408 3102</td>
</tr>
</tbody>
</table>

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20AB</td>
<td>30</td>
<td>56.3</td>
<td>50</td>
<td>76.4</td>
<td>48.5</td>
<td>ø 20</td>
<td>56.3</td>
<td>16.4</td>
<td>0.18 kg</td>
</tr>
<tr>
<td>W35AB(P)</td>
<td>30</td>
<td>79.2</td>
<td>62</td>
<td>99.5</td>
<td>55</td>
<td>ø 35</td>
<td>79.2</td>
<td>20</td>
<td>0.35 kg</td>
</tr>
<tr>
<td>W60AB(P)</td>
<td>37</td>
<td>116.4</td>
<td>79</td>
<td>135</td>
<td>67</td>
<td>ø 60</td>
<td>116.4</td>
<td>24</td>
<td>0.57 kg</td>
</tr>
<tr>
<td>W120AB</td>
<td>37</td>
<td>191.5</td>
<td>116.5</td>
<td>210</td>
<td>67</td>
<td>ø 120</td>
<td>191.5</td>
<td>33.5</td>
<td>1.92 kg</td>
</tr>
<tr>
<td>W210AB</td>
<td>45</td>
<td>304.5</td>
<td>173</td>
<td>323</td>
<td>80</td>
<td>ø 210</td>
<td>304.5</td>
<td>45</td>
<td>5.8 kg</td>
</tr>
</tbody>
</table>
**Mounting details**

Screw mounting with mounting brackets: W20AB, W35AB(P), W60AB(P)

Snap-on mounting on DIN rail, for vertical or horizontal mounting: W20AB, W35AB(P), W60AB(P)

---

### Dimensions screw mounting

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20AB (mounting with 2 mounting brackets diagonal)</td>
<td>47</td>
<td>21.4</td>
<td>63</td>
<td>18.6</td>
</tr>
<tr>
<td>W35AB(P) (mounting with 2 mounting brackets diagonal)</td>
<td>47</td>
<td>49.8</td>
<td>63</td>
<td>12.1</td>
</tr>
<tr>
<td>W60AB(P) (mounting with up to 3 mounting brackets)</td>
<td>54</td>
<td>66</td>
<td>70</td>
<td>17.7</td>
</tr>
<tr>
<td>W120AB</td>
<td>81</td>
<td>103</td>
<td>90.6</td>
<td>65</td>
</tr>
<tr>
<td>W210AB</td>
<td>98</td>
<td>180</td>
<td>117.1</td>
<td>83</td>
</tr>
</tbody>
</table>

Dimensions in mm

### Dimensions snap-on mounting

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20AB</td>
<td>43.5</td>
<td>32</td>
</tr>
<tr>
<td>W35AB(P)</td>
<td>43.5</td>
<td>32</td>
</tr>
<tr>
<td>W60AB(P)</td>
<td>50</td>
<td>39</td>
</tr>
</tbody>
</table>

Dimensions in mm

### Selection list

<table>
<thead>
<tr>
<th>Type</th>
<th>RCMA420</th>
<th>RCMA423</th>
<th>RCMS460/490</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20AB</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>W35AB(P)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>W60AB(P)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>W120AB</td>
<td>--</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>W210AB</td>
<td>--</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
Measuring current transformers of the WR... series

**Product description**
The measuring current transformers of the WR... series are highly sensitive measuring current transformers of rectangular type which in combination with RCM series residual current monitors and RCMS series residual current monitoring systems convert AC currents into evaluable measurement signals.

In addition, the measuring current transformers can be used in combination with insulation fault locators (EDS) for IT systems. They are designed to measure the test current generated by a PGH locating current injector or an A-ISOMETER® IRDH. In combination with EDS series insulation fault locators the test current is converted into evaluable signals.

Connection to the respective devices is via a two-wire cable.

**Installation instructions**
- Make sure that all live conductors are routed through the measuring current transformer
- Do not route shielded conductors through the measuring current transformer
- Never route a PE conductor through the measuring current transformer!

**Wiring diagram**
Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitor or to an EDS series insulation fault locator.

**Device features**
- For RCMS460/490 series residual current monitoring systems
- For RCM420, RCM460 and RCM470 series residual current monitors
- For EDS460/490 and EDS470 series insulation fault locators

**Approvals and certifications**

![WR115x305 measuring current transformer](image-url)
Technical data

Insulation coordination acc. to IEC 60664-1 / IEC 60664-3

- Rated insulation voltage: 800 V
- Rated impulse voltage/pollution degree: 8 kV / III

CT circuit

- Rated primary residual current: 30 mA → 10 A
- Rated secondary residual current: 0.0167 A
- Rated transformation ratio: \( K_n = 10 / 0.0167 \) A
- Rated burden: \( \leq 180 \Omega \)
- Nominal power: 0.05 VA
- Frequency range: 42 Hz → 3 kHz
- Rated continuous thermal current: \( I_{cth} = 40 \) A
- Rated short-time thermal current: \( I_{th} = 2.4 \) kA / 1 s
- Rated dynamic current: \( I_{dyn} = 6.0 \) kA / 40 ms

Environmental conditions

- Operating temperature: -25 °C → +70 °C
- Climatic class acc. to IEC 60721: 3K5 (except condensation and formation of ice)
- Transport (IEC 60721-3-2): 2K5 (except condensation and formation of ice)
- Long-time storage (IEC 60721-3-1): 1K5 (except condensation and formation of ice)
- Classification of mechanical conditions IEC 60721: Stationary use (IEC 60721-3-3) 3M4, Transport (IEC 60721-3-2) 2M2, Long-time storage (IEC 60721-3-1) 1M3

Connection

- Connection: cage clamp terminals
- rigid/flexible/conductor sizes: 0.08 → 2.5 / 0.08 → 2.5 mm² / 28 → 12 AWG
- Stripping length: 8 → 9 mm

Connection EDS, RCM(S) measuring current transformers

- Single wire: \( \geq 0.75 \) mm², 0 → 1 m
- Single wire, twisted: \( \geq 0.75 \) mm², 0 → 10 m
- Shielded cable: \( \geq 0.5 \) mm², 0 → 40 m
- Recommended cable: (shielded, shield on one side connected to I-conductor, not connected to earth) J-Y (ST) Y min. 2 x 0.8

Other

- Degree of protection, internal components (IEC 60529): IP40
- Degree of protection, terminals (IEC 60529): IP20
- Screw mounting: M5 with mounting brackets
- Flammability class: UL94V-0
- Operating manual: TBP49014
- Approvals and certifications: UL under consideration, GOST

*The rated burden may vary depending on the respective device data sheet.

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal dimensions</th>
<th>Mounting brackets</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR70x175</td>
<td>70 x 175 mm</td>
<td>×</td>
<td>B 9808 0609</td>
</tr>
<tr>
<td>WR115x305</td>
<td>115 x 305 mm</td>
<td>×</td>
<td>B 9808 0610</td>
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</table>

Dimension diagram

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>Weight</th>
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<tbody>
<tr>
<td>WR70x175</td>
<td>90</td>
<td>75</td>
<td>35</td>
<td>176</td>
<td>71</td>
<td>56</td>
<td>51</td>
<td>37</td>
<td>5</td>
<td>190</td>
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<tr>
<td>WR115x305</td>
<td>110</td>
<td>526</td>
<td>306</td>
<td>116</td>
<td>67</td>
<td>53</td>
<td>506</td>
<td>72.5</td>
<td>242,5</td>
<td>5,56 kg</td>
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Mounting

Selection list

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<thead>
<tr>
<th>Type</th>
<th>RCM420</th>
<th>RCM470</th>
<th>RCM5460</th>
<th>RCM5490</th>
<th>EDS540</th>
<th>EDS5490</th>
<th>EDS5470</th>
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<tr>
<td>WR70x175</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR115x305</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
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<td></td>
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</table>
WS... series split-core type measuring current transformers
WS...-8000 series split-core type measuring current transformers

Product description
WS... and WS...-8000 series split-core type measuring current transformers can be opened using the interlock knob to enclose the conductors to be monitored. That allows easy retrofitting in existing installations.

WS... and WS...-8000 series measuring current transformers are highly sensitive measuring current transformers of split-core type which in combination with RCM series residual current monitors and RCMS residual current monitoring systems convert AC currents into evaluable measurement signals.

In addition, the measuring current transformers can be used in combination with insulation fault locators (EDS) for IT systems. They are designed to measure the test current generated by a PGH locating current injector or an A-ISOMETER® IRDH. In combination with EDS series insulation fault locators the test current is converted into evaluable signals.

Connection to the respective devices is via a two-wire cable.

Installation instructions
• Make sure that all live conductors are routed through the measuring current transformer
• Do not route shielded conductors through the measuring current transformer
• Never route a PE conductor through the measuring current transformer!

Wiring diagram

WS... series measuring current transformer
Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitor or to an EDS series insulation fault locator.

WS...-8000 measuring current transformer
Connection to the respective insulation fault locator EDS473(E)-12, EDS474(E)-12, EDS461 and/or EDS491.

Device features
WS... series measuring current transformer
- For RCMS460/490 series residual current monitoring systems
- For RCM420, RCM460 and RCM470 series residual current monitors
- For EDS460/490 and EDS470 series insulation fault locators

WS...-8000 measuring current transformer
- For EDS473(E)-12, EDS474(E)-12, EDS461 and EDS491 series insulation fault locators

Approvals and certifications
Technical data

Insulation coordination acc. to IEC 60664-1 / IEC 60664-3
- Rated insulation voltage: 800 V
- Rated impulse voltage/pollution degree: 8 kV / III

CT circuit WS…
- Rated primary residual current: 30 mA…10 A
- Rated secondary residual current: 0.0167 A
- Rated transformation ratio: $K_n = 10 / 0.0167 A$
- Rated burden: ≤ 180 $\Omega^*$
- Nominal power: 0.05 VA
- Frequency range: 42 Hz…3 kHz
- Rated continuous thermal current: $I_{cth} = 40 A$
- Rated short-time thermal current: $I_{th} = 2.4 kA / 1 s$
- Rated dynamic current: $I_{dyn} = 6.0 kA / 40 ms$

CT circuit WS…-8000
- Rated primary residual current: 30 mA…1 A
- Rated secondary residual current: 0.000125 A
- Rated transformation ratio: $K_n = 10 / 0.000125 A$
- Rated burden: 2400 $\Omega$
- Nominal power: 0.0375 VA
- Frequency range: 42 Hz…3 kHz
- Rated continuous thermal current: $I_{cth} = 6 A$
- Rated short-time thermal current: $I_{th} = 60 \times I_{cth} = 0.36 kA / 1 s$
- Rated dynamic current: $I_{dyn} = 2.5 \times I_{th} = 0.9 kA / 40 ms$

Environmental conditions
- Operating temperature: -10 °C…+70 °C
- Climatic class acc. to IEC 60721
  - Stationary use (IEC 60721-3-3): 3K5 (except condensation and formation of ice)
  - Transport (IEC 60721-3-2): 2K5 (except condensation and formation of ice)
  - Long-time storage (IEC 60721-3-1): 1K5 (except condensation and formation of ice)
- Classification of mechanical conditions IEC 60721
  - Stationary use (IEC 60721-3-3): 3M4
  - Transport (IEC 60721-3-2): 2M2
  - Long-time storage (IEC 60721-3-1): 1M3

Connection
- Connection screw-type terminals
- rigid/flexible/conductor sizes: 0.08…2.5 / 0.08…2.5 mm² / 28…12 AWG
- Stripping length: 8…9 mm

Connection EDS, RCM(S) measuring current transformers
- Single wire: ≥ 0.75 mm² / 0.1…1 m
- Single wire, twisted: ≥ 0.75 mm² / 0.1…10 m
- Shielded cable: ≥ 0.5 mm² / 0.4…40 m
- Recommended cable: (shielded, shield on one side connected to I-conductor, not connected to earth) J-Y ST Y min. 2 x 0.8

Other
- Degree of protection, internal components (IEC 60529): IP40
- Degree of protection, terminals (IEC 60529): IP20
- Screw mounting: MS with mounting brackets
- Flammability class: UL94V-0
- Product standards: IEC 60044-1
- Operating manual WS…: TBP409015
- Operating manual WS…-8000: TBP108018

* The rated burden may vary depending on the respective device data sheet.

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Internal dimensions</th>
<th>Mounting brackets</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS20x30</td>
<td>20 x 30 mm</td>
<td>×</td>
<td>B 9808 0601</td>
</tr>
<tr>
<td>WS50x80</td>
<td>50 x 80 mm</td>
<td>×</td>
<td>B 9808 0603</td>
</tr>
<tr>
<td>WS80x120</td>
<td>80 x 120 mm</td>
<td>×</td>
<td>B 9808 0606</td>
</tr>
<tr>
<td>WS20x30-8000*</td>
<td>20 x 30 mm</td>
<td>×</td>
<td>B 9808 0602</td>
</tr>
<tr>
<td>WS50x80-8000*</td>
<td>50 x 80 mm</td>
<td>×</td>
<td>B 9808 0604</td>
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</tbody>
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Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS20x30</td>
<td>93</td>
<td>106.15</td>
<td>23</td>
<td>33</td>
<td>64</td>
<td>≤ 0.6 kg</td>
</tr>
<tr>
<td>WS50x80</td>
<td>125</td>
<td>158.15</td>
<td>55</td>
<td>85</td>
<td>96</td>
<td>≤ 1.04 kg</td>
</tr>
<tr>
<td>WS80x120</td>
<td>155</td>
<td>198.15</td>
<td>85</td>
<td>125</td>
<td>126</td>
<td>≤ 1.4 kg</td>
</tr>
<tr>
<td>WS20x30-8000*</td>
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<td>106.15</td>
<td>33</td>
<td>33</td>
<td>64</td>
<td>≤ 0.63 kg</td>
</tr>
<tr>
<td>WS50x80-8000*</td>
<td>125</td>
<td>158.15</td>
<td>85</td>
<td>85</td>
<td>96</td>
<td>≤ 1.08 kg</td>
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Dimensions in mm

Selection list

<table>
<thead>
<tr>
<th>Type</th>
<th>ROM420</th>
<th>ROM470</th>
<th>ROM560</th>
<th>ROM570</th>
<th>B5460</th>
<th>B5490</th>
<th>B5461</th>
<th>B5470</th>
<th>B5474</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS20x30</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>WS50x80</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>WS80x120</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>WS20x30-8000*</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>WS50x80-8000*</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

* For EDS461/491 and EDS473/474 series insulation fault locators
WF... series flexible measuring current transformers
Consisting of an RCC420 signal converter and a W...F measuring current transformer

Product description
Flexible WF... series measuring current transformers are highly sensitive measuring current transformers, which measure AC currents in conjunction with a RCMS460 / 490 series residual current monitoring system and convert them into an evaluable measuring signal.
They consist of one flexible W...F measuring current transformer and one RCC420 signal converter.
Connection to the respective residual current monitor is via a two-wire cable.

Application
• Residual, fault and nominal current monitoring of loads and systems which cannot be switched off
• EMC monitoring of TN-S systems for "stray currents" and additional N-PE connections in the central earthing point (CEP)
• Monitoring of PE and equipotential bonding conductors to ensure they are free of current

Installation instructions
• Make sure to pass all live conductors through the measuring current transformer
• Arrange the conductors so that they pass centrically at right angle through the opening
• Do not place the measuring current transformer close to strong magnetic fields

Wiring diagram
Connection to the respective RCMS460 / 490 series residual current evaluator

1 - Power On LED "ON": lights up when voltage is available and when the device is in operation.
2 - Alarm LED "ERR": lights in the event of a short-circuit and interruption of the W...F

* - Up to software version D233 V 2.21
  Switch off CT monitoring
  Software version D233 V 2.31 and higher
  Set the CT type to "flex".
**Technical data**

**Electrical safety**
- Standard: RCC420
- Pollution degree: 3
- Rated insulation voltage: 250 V
- Standard: WF…
  - IEC 61010-1 and IEC 61010-2-032 CAT III
  - Pollution degree: 2
  - Rated insulation voltage (CAT III): 1000 Vrms or DC

**Supply voltage**
- Supply voltage $U_S$: see ordering information
- Power consumption: $\leq 3$ VA

**Measuring circuit**
- Measuring range: 100 mA…20 A
- Rated transformation ratio $K_n (U - I)$: 100 mV / A, $K_n (k - l)$: 1.67 mA / A
- Rated burden (signal output $k$, $l$): 68 $\Omega$
- Rated frequency: 42…2000 Hz
- Rated continuous thermal current $I_{cth}$: 1 kA
- Rated short-time thermal current $I_{th}$: 60 kA / 1 s
- Rated dynamic current $I_{dyn}$: 150 kA / 40 ms

**EMC**
- Operating temperature: -25 °C…+ 55 °C
- Climatic class acc. to IEC 60721
  - Stationary use (IEC 60721-3-3): 3K5 (except condensation and formation of ice)
  - Transport (IEC 60721-3-2): 2K3 (except condensation and formation of ice)
  - Long-time storage (IEC 60721-3-1): 1K4 (except condensation and formation of ice)
- Classification of mechanical conditions IEC 60721
  - Stationary use (IEC 60721-3-3): 3M4
  - Transport (IEC 60721-3-2): 2M2
  - Long-time storage (IEC 60721-3-1): 1M3

**Connection RCC420**
- Connection type: push-wire terminals
- Connection properties:
  - Rigid: 0.2…2.5 mm² / AWG 24-14
  - Flexible without ferrule: 0.2…2.5 mm² / AWG 24-14
  - Flexible with ferrule: 0.2…1.5 mm² / AWG 24-16
- Stripping length: 10 mm
- Opening force: 50 N
- Test opening, diameter: 2.1 mm
- Connection measuring current transformer $W$…$F$
  - Cable length $W$…$F$: 2 m

**Cable lengths RCMS-RCC420…**
- Single wire: 0.75 mm²
  - 0.1 m
- Single wire, twisted: 0.75 mm²
  - 0.1…10 m
- Shielded cable: 0.5 mm²
  - 0.1…40 m
- Recommended cable (shielded, shield to terminal, not connected to earth): J-Y(Y)Y min. 2x0.8

**Accessories**
- Type: Mounting clip for XM420 enclosure (RCC420)
- Art. No.: B 9806 0008
- (one unit required per device)

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Length A</th>
<th>Supply voltage $U_S^*$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WF170-1</td>
<td>170 mm</td>
<td>DC 9.6…94 V / AC 42…460 Hz 16…72 V</td>
<td>B 7808 0201</td>
</tr>
<tr>
<td>WF170-2</td>
<td>170 mm</td>
<td>DC 70…300 V / AC 42…460 Hz 70…300 V</td>
<td>B 7808 0202</td>
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<tr>
<td>WF250-1</td>
<td>250 mm</td>
<td>DC 9.6…94 V / AC 42…460 Hz 16…72 V</td>
<td>B 7808 0203</td>
</tr>
<tr>
<td>WF250-2</td>
<td>250 mm</td>
<td>DC 70…300 V / AC 42…460 Hz 70…300 V</td>
<td>B 7808 0204</td>
</tr>
<tr>
<td>WF500-1</td>
<td>500 mm</td>
<td>DC 9.6…94 V / AC 42…460 Hz 16…72 V</td>
<td>B 7808 0205</td>
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<tr>
<td>WF500-2</td>
<td>500 mm</td>
<td>DC 70…300 V / AC 42…460 Hz 70…300 V</td>
<td>B 7808 0206</td>
</tr>
<tr>
<td>WF800-1</td>
<td>800 mm</td>
<td>DC 9.6…94 V / AC 42…460 Hz 16…72 V</td>
<td>B 7808 0207</td>
</tr>
<tr>
<td>WF800-2</td>
<td>800 mm</td>
<td>DC 70…300 V / AC 42…460 Hz 70…300 V</td>
<td>B 7808 0208</td>
</tr>
<tr>
<td>WF1200-1</td>
<td>1200 mm</td>
<td>DC 9.6…94 V / AC 42…460 Hz 16…72 V</td>
<td>B 7808 0209</td>
</tr>
<tr>
<td>WF1200-2</td>
<td>1200 mm</td>
<td>DC 70…300 V / AC 42…460 Hz 70…300 V</td>
<td>B 7808 0210</td>
</tr>
</tbody>
</table>

* Absolute values

**Other**
- Operating mode: continuous operation
- Mounting: any position
- Degree of protection, internal components / terminal (DIN EN 60529): IP30 / IP20
- Enclosure material RCC420: polycarbonate
- Flammability class: UL94V-0
- DIN rail mounting acc. to: IEC 60715
- Screw mounting: 2 x M4 with mounting clip
- Operating manual: TBP409020
- Weight:
  - RCC 420 ≤ 160 g
  - WF500 ≤ 200 g
  - WF170 ≤ 160 g
  - WF800 ≤ 230 g
  - WF250 ≤ 180 g
  - WF1200 ≤ 310 g

Note: The measuring current transformer is adapted to the associated signal converter RCC420.
Measuring current transformers flexible WF series...

**Dimension diagram XM420**

Dimensions in mm
Open the front plate cover in direction of arrow!

**Screw mounting**
Note: The upper mounting clip must be ordered separately (see ordering information).

**Dimension diagram W…F series measuring current transformers**
A = For details about the length of the measuring current transformer refer to ordering information.

- Locking connector measuring current transformer W500F…W1200F
  Keep the locking connector clean

- Locking connector measuring current transformer W170F…W250F
W465-A26-1 measuring current transformers

Product description
The highly-sensitive W465-A26 measuring current transformer in combination with RCMA472LY devices converts AC and DC residual currents into evaluable AC voltage. The CTs are connected to the respective device by four-wires. The cable length between the CT and the device should not exceed 10 m.

Installation instructions
• Make sure that all live conductors are routed through the measuring current transformer and that these conductors are not shielded.

Application
• for AC/DC sensitive RCMA420 series residual current monitors

Standards
The W465-A26 measuring current transformer complies with the requirements of IEC 60044-1 and DIN VDE 0414.

Approvals and certifications

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
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<tbody>
<tr>
<td>Insulation coordination acc. to IEC 60664-1 / IEC 60664-3</td>
<td></td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>800 V</td>
</tr>
<tr>
<td>Rated impulse voltage/pollution degree</td>
<td>8 kV / III</td>
</tr>
<tr>
<td>CT circuit</td>
<td></td>
</tr>
<tr>
<td>Rated primary residual current</td>
<td>30...500 mA</td>
</tr>
<tr>
<td>Rated continuous thermal current Icth</td>
<td>20 A</td>
</tr>
<tr>
<td>Environmental conditions</td>
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<tr>
<td>Operating temperature</td>
<td>-10 °C...+ 50 °C</td>
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<tr>
<td>Climatic class acc. to IEC 60721</td>
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<tr>
<td>Stationary use (IEC 60721-3-3)</td>
<td>3K5 (except condensation and formation of ice)</td>
</tr>
<tr>
<td>Transport (IEC 60721-3-2)</td>
<td>2K5 (except condensation and formation of ice)</td>
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<tr>
<td>Long-time storage (IEC 60721-3-1)</td>
<td>1K5 (except condensation and formation of ice)</td>
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<tr>
<td>Classification of mechanical conditions IEC 60721</td>
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<tr>
<td>Stationary use (IEC 60721-3-3)</td>
<td>3M4</td>
</tr>
<tr>
<td>Transport (IEC 60721-3-2)</td>
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<tr>
<td>Connection</td>
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<tr>
<td>Connection type</td>
<td>modular terminals</td>
</tr>
<tr>
<td>rigid / flexible</td>
<td>0.2...4 / 0.2...2.5 mm²</td>
</tr>
<tr>
<td>flexible with ferrules, without / with plastic collar</td>
<td>0.25...2.5 mm²</td>
</tr>
<tr>
<td>Connection RCMA472LY-measuring current transformer</td>
<td></td>
</tr>
<tr>
<td>Single wire ≥ 0.75 mm²</td>
<td>0...10 m</td>
</tr>
<tr>
<td>Other</td>
<td></td>
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<tr>
<td>Degree of protection, internal components (IEC 60529)</td>
<td>IP40</td>
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<tr>
<td>Degree of protection, terminals (IEC 60529)</td>
<td>IP20</td>
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<tr>
<td>Type of enclosure</td>
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<tr>
<td>Enclosure material</td>
<td>polycarbonate</td>
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<tr>
<td>Screw mounting</td>
<td>2 x M4</td>
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<td>DIN rail mounting acc. to</td>
<td>IEC 60715</td>
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<tr>
<td>Flammability class</td>
<td>UL94V-0</td>
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<td>Operating manual</td>
<td>TBP409003</td>
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<tr>
<th>Ordering information</th>
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<tbody>
<tr>
<td>Type</td>
<td>Internal diameter (mm)</td>
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<td>W465-A26-1</td>
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Dimension diagram XL465
Dimensions in mm

<table>
<thead>
<tr>
<th>Selection list</th>
<th></th>
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<tbody>
<tr>
<td>Type</td>
<td>RCMA470LY</td>
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<tr>
<td>W465-A26-1</td>
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</tr>
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</table>
The outside diameters of cables and conductors and the appropriate measuring current transformers are listed in the table below. Please note that the outside diameters are approximate values only. In case of doubt select a measuring current transformer of the next larger outside diameter.

<table>
<thead>
<tr>
<th>Wire cross section mm²</th>
<th>NYM</th>
<th>NYY</th>
<th>NYCY/NYCYW</th>
<th>H07RN-F</th>
<th>NSSHÖU</th>
<th>Recommended measuring current transformer diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>circular</td>
</tr>
<tr>
<td>3 x 1.5</td>
<td>10</td>
<td>11</td>
<td>13</td>
<td>12.5</td>
<td>15</td>
<td>20 mm</td>
</tr>
<tr>
<td>3 x 2.5</td>
<td>11</td>
<td>13</td>
<td>14</td>
<td>14.5</td>
<td>16.5</td>
<td>20 mm</td>
</tr>
<tr>
<td>3 x 4</td>
<td>12.5</td>
<td>15</td>
<td>16</td>
<td>16</td>
<td>20</td>
<td>20 mm</td>
</tr>
<tr>
<td>3 x 6</td>
<td>14</td>
<td>16</td>
<td>17</td>
<td>20</td>
<td>22</td>
<td>20 / 35 mm</td>
</tr>
<tr>
<td>3 x 10</td>
<td>17</td>
<td>19</td>
<td>18</td>
<td>25.5</td>
<td>--</td>
<td>20 / 35 mm</td>
</tr>
<tr>
<td>3 x 16</td>
<td>20</td>
<td>21</td>
<td>21</td>
<td>29</td>
<td>--</td>
<td>35 mm</td>
</tr>
<tr>
<td>4 x 1.5</td>
<td>10.5</td>
<td>13</td>
<td>14</td>
<td>13.5</td>
<td>16</td>
<td>35 mm</td>
</tr>
<tr>
<td>4 x 2</td>
<td>12</td>
<td>14</td>
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<td>15.5</td>
<td>19</td>
<td>35 mm</td>
</tr>
<tr>
<td>4 x 4</td>
<td>14</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>21.5</td>
<td>35 mm</td>
</tr>
<tr>
<td>4 x 6</td>
<td>15</td>
<td>17</td>
<td>18</td>
<td>22</td>
<td>23</td>
<td>35 mm</td>
</tr>
<tr>
<td>4 x 10</td>
<td>18</td>
<td>20</td>
<td>20</td>
<td>23</td>
<td>27.5</td>
<td>35 mm</td>
</tr>
<tr>
<td>4 x 16</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>32</td>
<td>32</td>
<td>35 / 60 mm</td>
</tr>
<tr>
<td>4 x 25</td>
<td>27.5</td>
<td>27</td>
<td>28</td>
<td>37</td>
<td>39</td>
<td>35 / 60 mm</td>
</tr>
<tr>
<td>4 x 35</td>
<td>31</td>
<td>30</td>
<td>29</td>
<td>42</td>
<td>42.5</td>
<td>35 / 60 mm</td>
</tr>
<tr>
<td>4 x 50</td>
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<td>35</td>
<td>34</td>
<td>48</td>
<td>49</td>
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<td>4 x 70</td>
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<td>37</td>
<td>54</td>
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<td>60 mm</td>
</tr>
<tr>
<td>4 x 95</td>
<td>--</td>
<td>45</td>
<td>42</td>
<td>60</td>
<td>--</td>
<td>60 / 105 / 120 mm</td>
</tr>
<tr>
<td>4 x 120 --</td>
<td>50</td>
<td>47</td>
<td>65.5</td>
<td>--</td>
<td>--</td>
<td>60 / 105 / 120 mm</td>
</tr>
<tr>
<td>4 x 150 --</td>
<td>53</td>
<td>52</td>
<td>--</td>
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<td>4 x 185 --</td>
<td>60</td>
<td>60</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>4 x 240 --</td>
<td>71</td>
<td>70</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
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<td>11</td>
<td>13.5</td>
<td>15</td>
<td>15</td>
<td>17</td>
<td>20 mm</td>
</tr>
<tr>
<td>5 x 2.5</td>
<td>15</td>
<td>17</td>
<td>17</td>
<td>20</td>
<td>--</td>
<td>20 / 35 mm</td>
</tr>
<tr>
<td>5 x 4</td>
<td>15</td>
<td>16.5</td>
<td>18</td>
<td>19</td>
<td>23</td>
<td>20 / 35 mm</td>
</tr>
<tr>
<td>5 x 6</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>24</td>
<td>26.5</td>
<td>20 / 35 mm</td>
</tr>
<tr>
<td>5 x 10</td>
<td>20</td>
<td>21</td>
<td>21</td>
<td>30</td>
<td>30</td>
<td>35 mm</td>
</tr>
<tr>
<td>5 x 16</td>
<td>24</td>
<td>23</td>
<td>23</td>
<td>35</td>
<td>34</td>
<td>35 / 60 mm</td>
</tr>
<tr>
<td>5 x 25</td>
<td>31</td>
<td>--</td>
<td>--</td>
<td>41</td>
<td>42</td>
<td>35 / 60 mm</td>
</tr>
</tbody>
</table>
Protocol converters are used to convert predefined interface variations into different interface variations.
RS-485 interface repeater DI-1PSM

Product description
The RS-485 interface repeater DI-1PSM is designed for signal amplification on the RS-485 interface (BMS bus). This is required when the network distance exceeds a length of 1200 m and when more than 32 bus nodes exist.

Application
• Extension of the maximum possible bus length by 1200 m in BMS systems (EDS, RCMS, MEDICS® systems)
• Extension of the maximum possible bus nodes by 32
• Protection against spikes by galvanic separation between the input and output circuit and the power supply

Device features
• Plastic enclosure for DIN rail mounting
• Adjustable baud rate
• Galvanic separation between the input and output circuit and the power supply
• Supply voltage AC / DC 24 V ±20 %
Wiring diagram

Note:
• Take the BMS bus termination into consideration

Technical data RS-485 interface repeater DI-1PSM

Insulation coordination acc. to IEC 60664-1
Rated voltage
Rated impulse withstand voltage/pollution degree 2 kV/3

Supply voltage
Supply voltage \( U_S \) see ordering information
Power consumption 90 mVA

Interfaces
BMS
Interface / protocol 2 x RS-485 / BMS
Baud rate adjustable via DIP switch 4.8…1500 kbit/s
Cable length \( \leq 1200 \) m
Recommended cable (shielded, shield connected to PE on one side) J-Y(ST)Y min. 2x0.6
Operating mode half-duplex
Change of data direction automatic data direction control
Cascading capability 9 (4.8…93.75 kbit / s)
Terminating resistor, selectable via DIP switch 220 \( \Omega \)
Device address, BMS bus --
Alarm LEDs ON (green), R x D (green), T x D (yellow)

General data
EMC immunity EN 61000-6-2
EMV emission EN 50081-1
Classification of climatic conditions acc. to IEC 60721
Stationary use 3K5
Transport 2K3
Long-time storage 1K4
Operating temperature 0 °C…+55 °C
Classification of mechanical conditions acc. to IEC 60721
Stationary use 3M4
Transport 2M2
Long-time storage 1M3
Operating mode continuous operation
Mounting any position
Connection screw-type terminals
Connection properties rigid/flexible/conductor sizes 0.2…2.5 mm² / AWG 24…12
Degree of protection, internal components (IEC 60529) IP30
Degree of protection, terminals (IEC 60529) IP20
DIN rail mounting acc. to IEC 60715
Operating manual TBPS01012
Weight \( \leq 130 \) g

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage ( U_S )</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI-1PSM</td>
<td>AC/DC 24 V ( \pm 20 % )</td>
<td>B 9501 2044</td>
</tr>
</tbody>
</table>

Dimension diagram DI-1PSM
Dimension in mm

---

Note:
• Take the BMS bus termination into consideration
Interface converter DI-2

Product description
The DI-2 converter is designed for the connection of personal computers and workstations utilising an RS-232 interface with Bender devices utilising an RS-485 interface. The hardware and software of the computers need not to be changed. A typical application is the connection of a personal computer to a BMS network.

Application
- RS-232 signals are converted into RS-485 signals
- Parameterisation of alarm indicator and operator panels (MK800, MK2430) with RS-485 interface via PC with RS-232 interface using software

Function
Many PCs and workstations are equipped with serial RS-232 interfaces. The interface converter DI-2 is designed to connect these devices via an RS-232 interface to the BMS bus using the RS-485 standard. The connected devices are protected against spikes by galvanic separation between the input and output circuit. Additional internal measures protect the device against voltage spikes.

Approvals and certifications

Device features
- Plastic enclosure for DIN rail mounting
- Electrical separation between the input and output circuit
- Supply voltage DC 10…30 V

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage $U_s$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI-2</td>
<td>DC 10…30 V*</td>
<td>B 9501 2022</td>
</tr>
</tbody>
</table>

* Absolute values

Wiring diagram (example)
DI-2 for the integration of a personal computer utilising an RS-232 interface into a BMS network.

Note:
- Terminate both ends of the BMS bus with 120 Ω resistors (R).

Technical data DI-2 interface converter

Insulation coordination acc. to IEC 60664-1
Rated voltage
Rated impulse voltage/pollution degree 3 kV / 3

Supply voltage
Supply voltage $U_s$ see ordering information
Power consumption ≤ 2.2 W

Interfaces
BMS
Interface / protocol 1 x RS-485 / --
Baud rate 9.6…115.2 kbit / s
Cable length ≤ 1200 m
Recommended cable (shielded, shield connected to PE on one side) J-Y(St)Y min. 2x0.6
Mode --
Connection DATA + (A), DATA - (B)
Terminating resistor 120 Ω (0.25 W)
Device address, BMS bus --
Serial interface 1 x RS-232
Alarm LEDs ON

General data
EMV immunity / EMC emission EN 61000-6-2 / EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721
Stationary use / Transport / Long-time storage 3K5 / 2K3 / 1K4
Ambient temperature, operation - 10 °C…+ 55 °C
Classification of mechanical conditions acc. to IEC 60721
Stationary use / Transport / Long-time storage 3M4 / 2M2 / 1M3
Operating mode continuous operation
Mounting any position
Connection screw-type terminals
Connection rigid / flexible / conductor sizes 0.5…2.5 mm² / AWG 22…12
Degree of protection, internal components /terminal (DIN EN 60529) IP 30 / IP 20
Screw mounting 2 x M3
DIN rail mounting acc. to IEC 60715
Operating manual TBP109010
Weight ≤ 160 g
Interface converter DI-2USB

**Device features**
- Plastic enclosure
- Electrical separation between the input and output circuit
- Power supply via USB port
- USB cable and driver CD included in the scope of delivery

**Wiring diagram (example)**

DI-2USB for the integration of a personal computer utilising a USB interface into a BMS network.

**Note:**
- Take the BMS bus termination into consideration

**Dimension diagram DI-2**

Dimensions in mm

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI-2USB</td>
<td>supplied by USB port, no additional power supply required</td>
<td>B 9501 2045</td>
</tr>
</tbody>
</table>

*Absolute value

**Product description**
The DI-2USB interface converter is designed for connecting PCs and work stations via the USB interface to Bender devices utilising an RS-485 interface. The hardware and software of the computers need not to be changed. A personal computer can be connected to a BMS network via the DI-2USB converter, for example.

**Application**
- Conversion of USB interface into RS-485 interface
- Parameterisation of alarm indicator and operator panels (MK800, MK2430) utilising an RS-485 interface via PC utilising a USB interface by means of software

**Function**
Many PCs and work stations are equipped with USB interfaces. The DI-2USB interface converter is designed to connect these devices via a USB interface to the BMS bus using the RS-485 standard. The connected devices are protected against spikes by galvanic separation between the input and output circuit. Additional internal measures protect the device against voltage spikes. Driver for Windows 98, ME, 2000, XP, Linux (Kernel 2.4.18 and higher)

**Technical data interface converter DI-2USB**

**Insulation coordination acc. to IEC 60664-1**
- Rated voltage
  - Rated impulse voltage/pollution degree 3 kV / 3
- Supply voltage
  - Supply voltage $U_s$ see ordering information
  - Power consumption 95 mVA

**Interfaces**
- BMS
  - Interface / protocol 1 x RS-485 / --
  - Baud rate 9.6 … 115.2 kbit / s
  - Cable length $\leq$ 1200 m
  - Recommended cable (shielded, shield connected to PE on one side) J-Y(St)Y min. 2x0.6
  - Mode --
  - Connection A, B
  - Integrated terminating resistors, selectable via jumper, factory setting terminating resistors included
  - Device address, BMS bus --
  - Serial interface 1 x USB
  - Alarm ON (yellow) Data (green), T x Data (red)

**General data**
- Classification of climatic conditions acc. to IEC 60721
  - Stationary use / transport / long-time storage 3K5 / 2K3 / 1K4
  - Ambient temperature, operation $-10 \, ^\circ \text{C} \ldots +55 \, ^\circ \text{C}$
  - Classification of mechanical conditions acc. to IEC 60721
    - Stationary use / transport / long-time storage 3M4 / 2M2 / 1M3
    - Operating mode continuous operation
  - Mounting any position
  - Connection screw-type terminals/USB plug Type B
  - Connection rigid / flexible / conductor sizes $0.5 \ldots 2.5 \, \text{mm}^2 / \text{K} \text{WG} 22 \ldots 32$
  - Screw mounting $2 \times M3$
  - DIN rail mounting acc. to IEC 60715
  - Operating manual manual of third-party manufacturer
  - Weight $\leq 25 \, \text{g}$
Protocol converters for standard fieldbus systems and Ethernet networks

Chapter 4.7

The FTC series protocol converters allow easy connection of Bender monitoring systems utilising a BMS bus to standard fieldbus systems.
Protocol converter FTC470XET

Device features
- Display of BMS data via standard web browser
- Fast, simple parameterisation of Bender system settings in a central location
- Display of current operating and alarm messages and measured values
- Detailed information at a glance
- Display of historical data
- Useful data logger function
- OPC interface for communication with higher-level systems (building management systems or visualisation software)
- Easy installation and commissioning
- E-mail notification in case of alarm and system faults
- Remote maintenance and remote diagnosis per LAN, WAN or Internet
- Independent of hard and software

Product description
The protocol converter FTC470XET is designed to be used as Ethernet gateway with web server. The FTC470XET converts data from the BMS bus into TCP/IP protocol (Ethernet). In this way, data from BMS systems can be displayed on a personal computer via a web browser. Additional software need not to be installed.

Application
- Conversion of BMS data into TCP/IP protocol (Ethernet)
- Querying and setting Bender devices with communication possibilities, such as RCMS, EDS and MEDICS systems
- Data transmission to building services management systems and visualisation systems via an integrated OPC interface.

Function
The protocol converter FTC470XET can be integrated into existing EDP systems like a personal computer. After entering an IP address and connection to the network and to a BMS system, a standard web browser (e.g. Internet Explorer, Netscape Navigator) of a personal computer allows access to the entire data of a BMS system. In this way, all important measuring data of the system are directly available. The parameterisation of the Bender systems is protected by a password.

Approvals and certifications

Operating elements

| 1 | Ethernet status indication “LINK” |
| 2 | BMS bus status indication “FAULT” |
| 3 | DIP switches for binary BMS bus address setting: 1…30 |
| 4 | Reset button “R” |

Wiring diagram

1 - $U_5$ see ordering information, 6 A fuse recommended
2 - System $U_5 = DC 85…276 V$
3 - System $U_5 = AC 85…276 V$
4 - Ethernet connection RJ45
5 - Digital input to restore factory settings
6 - BMS bus connection
### Technical data

**Insulation coordination acc. to IEC 60664-1**
- Rated insulation voltage: AC 250 V
- Rated impulse withstand voltage/pollution degree: 4 kV/3

**Supply voltage**
- Supply voltage $U_S$: see ordering information
- Frequency range $U_S$: AC 50 ... 400 Hz / DC
- Power consumption: $\leq 12$ VA

**Interfaces**
- **BMS**
  - Interface / protocol: RS-485 / BMS (internal)
  - Baud rate: 9.6 kbit / s
  - Cable length: $\leq 1200$ m
  - Recommended cable: (shielded, shield connected to PE on one side) J-Y(S)Y min. 2x0.6
  - Modus: Master / Slave
  - Connection: terminals A/B
  - Terminating resistor: 120 $\Omega$ (0.25 W)
  - Device address, BMS bus: DIP switch 1 ... 30
  - Alarm LEDs: ON/FAULT/BMS

- **BMS**
  - Connection: terminals A/B
  - Terminating resistor: 120 $\Omega$ (0.25 W)
  - Device address, BMS bus: DIP switch 1 ... 30
  - Alarm LEDs: ON/FAULT/BMS

**General data**
- **Ethernet**
  - Interface/protocol: Ethernet 10-base-T/TCP/IP
  - Connection: RJ45
  - Baud rate: 10 Mbit / s
  - Alarm LEDs: Link/Activity

### Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage $U_S$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTC470XET</td>
<td>AC / DC 85 ... 276 V*</td>
<td>B 9506 1001</td>
</tr>
</tbody>
</table>

*Absolute value

### Dimension diagram X470

Dimensions in mm

**Visualization of BMS data**

FTC470XET display: currently measured values of a BMS device

**FTC470XET display: E-mail function setting**
Protocol converter FTC470XMB
 Protocol converter to interface the BMS bus with Modbus RTU

Product description
The protocol converter FTC470XMB is designed to transmit data from the BMS bus to the Modbus RTU and vice versa. In this way, information from communication-capable Bender products, such as EDS, RCMS or MEDICS® systems can be integrated into a Modbus RTU system. Programming and adaptations on the Modbus RTU side have to be carried out by the user. In mode 1, up to 10 BMS-compatible Bender devices can be displayed with one FTC470XMB.

Application
- Transmitting all BMS data to Modbus RTU
- Displaying Bender data on Modbus-RTU-compatible software
- Reactions on the Modbus RTU side to BMS events
- Control of BMS systems via Modbus RTU
- Connection to Modbus-RTU-compatible building services management systems
- Reactions on the BMS side to events on the Modbus RTU side

Function
The protocol converter FTC470XMB is incorporated into the Modbus RTU network as a slave and in a BMS system either as a master or a slave. The Modbus RTU master, e.g. a personal computer utilising a Modbus RTU interface or a PLC must be programmed in a way that the protocol converter is capable of triggering the respective requests and getting the replies. For appropriate programming, the user is required to have a thorough Modbus RTU knowledge. The entire command syntax is a component of the FTC470XMB operating manual.

Approvals and certifications

Device features
- Modbus-RTU interface for communication with higher-level systems (building management systems or visualisation software)

Operating elements
1 - Socket for Modbus RTU cable: 9-pin SUB-D
2 - Micro switch for Modbus RTU termination: "ON" = terminating resistor activated
3 - DIP switches for binary addressing of Modbus RTU: 1…127
4 - DIP switches for binary baud rate setting of Modbus RTU: 1200…57600 bit/s
5 - DIP switches for binary parity setting of Modbus RTU: none/even/odd
6 - Modbus RTU status indication
7 - BMS bus status indication
8 - DIP switches for binary BMS bus address setting: 1…30

Wiring diagram
1 - System connection Us = DC 85…276 V
2 - System connection Us = AC 85…276 V
3 - BMS bus connection
4 - Modbus-RTU 9-pin SUB-D
5 - Us see ordering information, 6 A fuse recommended
Protocol converter FTC470XMB

**Technical data**

**Insulation coordination acc. to IEC 60664-1**
- Rated insulation voltage: AC 250 V
- Rated impulse withstand voltage: 4 kV/3

**Supply voltage**
- Supply voltage $U_S$: see ordering information
- Frequency range $U_S$: AC 50…400 Hz / DC
- Power consumption: $\leq$ 12 VA

**Interfaces**

**BMS**
- Interface / protocol: RS-485 / BMS (internal)
- Baud rate: 9.6 kbit / s
- Cable length: $\leq$ 1200 m
- Recommended cable: (shielded, shield connected to PE on one side) J-Y(St)Y min. 2x0.6

**Modbus**
- Interface / protocol: RS-485 / Modbus RTU
- Mode: Modbus RTU slave
- Connection: 9-pin SUB-D
- Baud rate: 1.2…57.6 kbit/s
- Terminator resistor: DIP switch
- Address assignment: Modbus RTU DIP switches 1…127

**General data**

**EMC immunity** EN 61000-6-2
**EMC emission** EN 61000-6-4

**Classification of climatic conditions acc. to IEC 60721**
- Stationary use: 3K5
- Transport: 2K3
- Long-time storage: 1K4

**Operating temperature**
- Stationary use: $-10 ^\circ C \ldots +55 ^\circ C$

**Classification of mechanical conditions acc. to IEC 60721**
- Stationary use: 3M4
- Transport: 2M2
- Long-time storage: 1M3

**Operating mode**
- 3M4
- 2M2
- 1M3

**Mounting**
- any position

**Connection**
- screw-type terminals

**Connection properties**
- rigid/flexible/conductor sizes: 0.2…4 / 0.2…2.5 mm² / AWG 22-12

**Flexible with ferrule, without/with plastic sleeve**
- 0.25…2 mm²

**Stripping length**
- 8 mm

**Tightening torque**
- 0.5 Nm

**Degree of protection, internal components (IEC 60529)**
- IP30

**Degree of protection, terminals (IEC 60529)**
- IP20

**Type of enclosure / dimension diagram**
- X470

**Screw mounting**
- 2 x M4

**DIN rail mounting acc. to IEC 60715**

**Flammability class**
- UL94V-0

**Operating manual**
- TGH1367

**Weight**
- $\leq$ 360 g

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage $U_S$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTC470XMB</td>
<td>AC / DC 85…276 V*</td>
<td>B 9506 1002</td>
</tr>
</tbody>
</table>

*Absolute value

**Dimension diagram X470**

Dimensions in mm
Product description
The protocol converter FTC470XDP is designed to transmit data from the BMS bus to the PROFIBUS DP and vice versa. In this way, information from communication-capable Bender products, such as EDS, RCMS or MEDICS® systems can be integrated into a PROFIBUS DP system. Programming or adaptations on the PROFIBUS DP side have to be carried out by the user.

Application
• Converting BMS data into PROFIBUS DP data
• Querying and setting Bender devices with communication possibilities, such as RCMS, EDS and MEDICS systems
• Transmitting all BMS data to PROFIBUS DP
• Displaying Bender data on PROFIBUS-compatible software
• Reactions on the PROFIBUS side to BMS events
• Connection to PROFIBUS-compatible building services management systems
• Reactions on the BMS side to events on the PROFIBUS DP side

Function
The protocol converter FTC470XDP is incorporated into the PROFIBUS DP system as a slave and into a BMS system either as a master or a slave. The PROFIBUS DP master, e.g. a personal computer utilising a PROFIBUS card or a PLC must be programmed in a way that the protocol converter is capable of triggering the respective requests and getting replies. For appropriate programming, the user is required to have a thorough PROFIBUS DP knowledge. The necessary documentation together with the entire command syntax is a component of the FTC470XDP manual.

Approvals and certifications

Operating elements
1 - Socket for PROFIBUS cable: 9-pin SUB-D
2 - BMS bus status indication
3 - Micro switch for PROFIBUS DP termination: "ON" = terminating resistor activated
4 - Switch for BMS bus address setting: 1…30
5 - Rotary switch for PROFIBUS DP address setting: 1…99
6 - PROFIBUS DP status indication

Wiring diagram

1 - System connection $U_S = \text{DC 85}...276 \text{ V}$
2 - System connection $U_S = \text{AC 85}...276 \text{ V}$
3 - BMS bus connection
4 - PROFIBUS DP 9-pin SUB-D
5 - $U_S$, see ordering information, 6 A fuse recommended
Technical data

Insulation coordination acc. to IEC 60664-1
Rated insulation voltage
AC 250 V
Rated impulse withstand voltage/pollution degree
4 kV/3

Supply voltage
Supply voltage $U_S$
see ordering information
Frequency range $U_S$
AC 50…400 Hz / DC
Power consumption
≤ 12 VA

Interfaces

BMS
Interface / protocol
RS-485 / BMS (internal)
Baud rate
9.6 kbit / s
Cable length
≤ 1200 m
Recommended cable (shielded, shield connected to PE on one side)
J-Y(St)Y min. 2x0.6
Modus
Master / Slave
Connection resistors A/B
Terminating resistor
120 Q (0.25 W)
Device address, BMS bus
DIP switch 1…30
Alarm LEDs
ON / Alarm / FAULT / BMS

PROFIBUS DP
Interface / protocol
RS-485 / PROFIBUS-DP
Mode
PROFIBUS DP slave
Connection
9-pin SUB-D
Alarm LEDs
Run / Diag / bus error
Baud rate
9.6 kBit/s…12 Mbit/s automatic recognition
Terminating resistor
DIP switch
Address setting PROFIBUS DP
rotary switch, 1…99

General data

EMC immunity
EN 61000-6-2
EMC emission
EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721
Stationary use
3K5
Transport
2K3
Long-time storage
1K4
Operating temperature
-10 °C…+55 °C
Classification of mechanical conditions acc. to IEC 60721
Stationary use
3M4
Transport
2M2
Long-time storage
1M3
Operating mode
continuous operation
Mounting
any position
Connection
screw-type terminals
Connection properties
rigid/flexible/conductor sizes
0.2…4 / 0.2…2.5 mm² / AWG 22-12
flexible with ferrule, without/with plastic sleeve
0.25…2 mm²
Stripping length
8 mm
Tightening torque
0.5 Nm
Degree of protection, internal components (IEC 60529)
IP3O
Degree of protection, terminals (IEC 60529)
IP20
Type of enclosure / dimension diagram
X470
Screw mounting
2 x M4
DIN rail mounting acc. to IEC 60715
Flammability class
UL94V-0
Operating manual
TGH1358
Weight
≤ 360 g

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage $U_S$</th>
<th>Art No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTC470XDP</td>
<td>AC / DC 85…276 V*</td>
<td>B 9506 1000</td>
</tr>
</tbody>
</table>
*Absolute value

Dimension diagram X470

Dimensions in mm
Bender alarm indicator and operator units are used for on-site indication of operating status and alarm messages from Bender monitoring systems via LC display or a graphical display.
Remote alarm indicator and test combination MK800

Device features
- Display of operating, warning and alarm messages from Bender monitoring systems
- Backlit clear LC text display 
  (4 x 20 characters, 8 mm)
- Additional text to be displayed, if required.
- A set of LEDs, red, yellow and green, allowing messages to be indicated in an order of priority
- 80 predefined standard texts in 20 languages
- 1000 freely programmable message texts
- Easy parameter setting with PC (USB interfaces) or menu
- Memory with real-time clock to store 1000 alarm messages with date and time stamp
- 16 digital inputs (option)
- One programmable relay (option)
- Five large function keys
- Versions available for flush and surface mounting as well as for mounting into cavity walls or for door mounting
- Non-reflecting, multicoloured foil
- Smooth surfaces without openings to meet the hygiene requirements for medical locations

Approvals and certifications

Product description
The universal MK800 remote alarm indicator and test combination is used for
- indication and visualisation of operating status and alarm messages
- central operation and parameter setting of BMS bus devices
- indication and visualisation of operating status and alarm messages
- displaying measured values and setting of response values for monitoring purposes from Bender monitoring systems with BMS-bus capability, such as MEDICS, RCMS or EDS. The MK800 is available for flush and surface mounting. The flush-mounting version is suitable for cavity wall or door mounting. The appropriate cover frames are available in different colours.

Function
On its backlit display, the MK800 displays messages from all BMS-bus devices assigned via alarm addresses. As well as being used as a standalone indicator, the MK800 also supports parallel indication. In the event of an alarm message, the yellow warning LED or the red alarm LED lights up and the message appears on the LC display in plain text format. An additional text button allows three additional text lines to be displayed to each alarm message (for example, instructions what to do). At the same time, there is an audible signal the frequency and interval of which can be set accordingly to distinguish different alarms. The audible alarm is acknowledgeable and sounds again once a configurable period of time has elapsed. If a second message is received whilst the first is still pending, the audible signal will sound again and the messages will flash up alternately on the LC display.

The MK800 provides a test button to check the operation of an assigned A-ISOMETER® 107TD47 or IRDH. The test is carried out sequentially and evaluated automatically. A message is indicated only on that MK800 the test button of which was pressed - in this way other areas will not be disturbed.

The MK800 can be used as a master device in all BMS systems.

Display/operating elements
The MK800 backlit LC text display features four lines of 20 characters (8 mm high). It supplies medical and technical personnel with information that is always clear and unambiguous, in order to help them to make decisions. Every alarm message comprises three lines which appear spontaneously and three additional lines which can be displayed at the touch of a button. This additional text provides further information, e.g. instructions what to do in this case of fault. The fourth line contains status information, such as number of messages, test procedures or menu information.

Three LEDs in different colours are located below the text display which allow to distinguish between warning and alarm messages.

Five illuminated large buttons are available for operating the MK800. These buttons provide the following functions:
- Acknowledgement of acoustic alarms
- Functional test of assigned ISOMETER®
- Lamp test
- Scrolling alarm textes and messages
- MK800 parameter setting
**Parameter setting**

The memory of the MK800 provides 80 predefined alarm texts in 20 languages, therefore parameters can easily be set via the function buttons of the MK800. That means, a personal computer is not required for commissioning.

The intuitive, user-friendly TMK-Set PC software also allows individual texts to be programmed and assigned to 1000 individual messages via USB interface or the external BMS bus. A warning or alarm LED as well as an acoustic signal can be assigned to each message.

**History memory**

Warning and alarm messages with date and time stamp are automatically stored in the memory as well as analogue values with maximum and minimum values. This guarantees reproducibility at all times. Up to 1000 messages are stored. The data of the history memory can be displayed directly on the MK800.

The history memory can be read out via the TMK-History software which also provides clear data analysis.

**Digital inputs/ relay output (option MK800-11)**

16 digital inputs are available allowing messages from third-party systems to be displayed. The digital inputs are designed for voltages of AC/DC 0...30 V, in practice these inputs are controlled by potential-free contacts. The logic of these inputs can be set as required.

For test functions or common alarms, a programmable relay is available.

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**Operating and display elements**

1 - LCD: Display of operating, warning and alarm messages
2 - LED "NORMAL": Power On indicator
3 - LED "WARNING": Warning messages
4 - LED "ALARM": Alarm messages
5 - Test button "TEST": to activate the test for connected and assigned insulation monitoring devices
6 - Buzzer mute: in operating mode: to mute the buzzer.
   in menu mode: ESC function
7 - Scroll key in operating mode: to scroll messages.
   in menu mode: UP
8 - Additional text button: in operating mode: additional text.
   in menu mode: down
9 - "MENU" button: in operating mode: to call up the menu mode.
   in menu mode: Enter function
Remote alarm indicator and test combination MK800

Wiring diagram

1 - Supply voltage US
2 - Looped through connection for supply voltage (e.g. for control voltage, relay contacts)
3 - Switches S1, S2 for BMS bus termination (terminating resistor 120 Ω)
4 - Wiring between the MK800 and devices with BMS-bus capability
5 - USB connection for programming

6 - Digital inputs
   The digital inputs either have to be activated via potential free contacts or via voltage signals
   When the inputs are activated via an external voltage, the common 0(-) is connected to terminal 0 and the 1(+) signal is connected to the respective input IN1…IN16
7 - Programmable contact for device errors, ISOMETER® test, device failure, common alarm message
**Technical data**

### Insulation coordination acc. to IEC 60664-1
- Rated insulation voltage: AC 250 V
- Rated impulse voltage/pollution degree: 4 kV/3

### Supply voltage
- Supply voltage \( U_S \): AC / DC 24 V
- Frequency range \( f_1 \): AC 40...60 Hz / DC
- Operating range \( U_S \): AC 18...28 / DC 18...30 V
- Power consumption: ≤ 5 VA

### Displays and LEDs
- Display, characters, four lines: 4 x 20 characters
- Standard message text in: 20 languages
- Alarm addresses: < 250
- Programmable text messages: 1000
- History memory (messages): 1000
- Standard text message: 3 x 20 characters
- Additional text message (press button to access): 3 x 20 characters
- Alarm LEDs (three different colours): NORMAL (green), WARNING (yellow), ALARM (red)
- Menu texts: German/English
- Buttons: 5 (Isometer test, buzzer mute, additional text, scroll, menu)

### Buzzer
- Buzzer message: can be acknowledged, adoption of characteristics of new value
- Buzzer interval: configurable
- Buzzer frequency: configurable
- Buzzer repetition: configurable

### Inputs (option) (MK800-11 only)
- Digital inputs: 16 (IN1...IN16)
- Galvanically isolated
- Control of digital inputs via voltage-free contacts/ extraneous voltage
- Operating principle N / O or N / C operation / Off can be selected for each input
- Factory setting: Off
- Voltage range (high): AC / DC 10...30 V
- Voltage range (low): AC / DC 0...2 V

### Interface internal/external
- Interface / protocol: 2 x RS-485 / BMS
- Baud rate internal / external (default setting): 9.6 kBit / s / 57.6 kBit / s
- Cable length: ≤ 1200 m
- Recommended cable (shielded, shield connected to PE on one side): J-Y(ST)Y min. 2x0.6
- Terminating resistor: 120 Ω (0.25 W) connectable via DIP switch
- Device address, BMS bus internal/external: 1(150)/1...99
- Factory setting device address internal / external: 1 (master)/ 1 (master)

### Programming
- Interfaces: RS-485 / BMS / USB
- Software TMK-SET: V 3.0 and higher
- Factory setting password query: activated

### Cable length when the power supply for the MK800 is taken from AN450
- 0.28 mm²: 50 m
- 0.5 mm²: 90 m
- 0.75 mm²: 150 m
- 1.5 mm²: 250 m
- 2.5 mm²: 400 m

### Colours
- Front foil: RAL 7035 (light grey) / RAL 7012 (basalt grey)
- Marking buttons: RAL 5002 (ultramarine blue): RAL 7035 (light grey)
- Front plate: RAL 7035 (light grey)

### Switching elements
- Number: 1 (MK800-11 only)
- Operating principle: N/C or N/O operation (programmable)
- Electrical endurance, number of cycles: 10.000
- Contact data acc. to IEC 60947-5-1
- Utilisation category: AC-13, AC-14, DC-12
- Rated operational voltage: 24 V
- Rated operational current: 5 A
- Minimum contact rating: 1 mA at AC / DC > 10 V

### General data
- EMC immunity: EN 61000-6-2
- EMC emission: EN 61000-6-4
- Operating temperature: - 5...+ 55 °C
- Classification of climatic conditions acc. to IEC 60721
- Stationary use: 3K5
- Transport: 2R3
- Storage: 1K4
- Classification of mechanical conditions acc. to IEC 60721
- Stationary use: 3M4
- Transport: 2M2
- Storage: 1M3
- Operating mode: continuous operation
- Mounting: display-oriented
- Connection: plug-in terminals
- Connection properties (supply voltage, BMS bus)
  - rigid / flexible / conductor sizes
  - 0.2 ... 2.5 / 0.2 ... 2.5 mm² / AWG 24-12
  - flexible with ferrule without/with plastic sleeve
  - 0.25 ... 2.5 / 0.25 ... 2.5 mm²
- Connection properties (inputs)
  - rigid / flexible / conductor sizes
  - 0.08 ... 1.5 / 0.08 ... 1.5 mm² / AWG 28-16
  - flexible with ferrule without / with plastic sleeve
  - 0.25 ... 1.5 / 0.25 ... 0.5 mm²
- Stripping length: 7 mm
- Tightening torque: 0.5...0.6 Nm
- Degree of protection, internal components (IEC 60529): IP50
- Degree of protection, terminals (IEC 60529): IP20
- Flammability class: UL94V-0
- Product standard: IEC 60364-7-710, DIN VDE 0106-710
- Operating manual: Tgl1408
- Weight: Flux-mounting (MK800) < 950 g
- Surface mounting (MK800A) < 880 g
- Surface mounting (MK800AF) < 1150 g
Remote alarm indicator and test combination MK800

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Digital inputs</th>
<th>Enclosure</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MK800-11</td>
<td>16</td>
<td>Flush-mounting enclosure</td>
<td>B 9510 0100</td>
</tr>
<tr>
<td>MK800-12</td>
<td>--</td>
<td>Flush-mounting enclosure</td>
<td>B 9510 0101</td>
</tr>
<tr>
<td>MK800A-11</td>
<td>16</td>
<td>Surface mounting</td>
<td>B 9510 0102</td>
</tr>
<tr>
<td>MK800A-12</td>
<td>--</td>
<td>Surface mounting</td>
<td>B 9510 0103</td>
</tr>
<tr>
<td>MK800AF-11</td>
<td>16</td>
<td>Surface mounting, front door</td>
<td>B 9510 0104</td>
</tr>
<tr>
<td>MK800AF-12</td>
<td>--</td>
<td>Surface mounting, front door</td>
<td>B 9510 0105</td>
</tr>
<tr>
<td>MK800E-11</td>
<td>16</td>
<td>Built-in type device without enclosure</td>
<td>B 9510 0106</td>
</tr>
<tr>
<td>MK800E-12</td>
<td>--</td>
<td>Built-in type device without enclosure</td>
<td>B 9510 0107</td>
</tr>
<tr>
<td>UP800</td>
<td>--</td>
<td>Flush-mounting enclosure for MK800</td>
<td>B 9510 0110</td>
</tr>
<tr>
<td>BR800-1</td>
<td>--</td>
<td>Bezel frame silver for MK800</td>
<td>B 9510 0111</td>
</tr>
<tr>
<td>BR800-2</td>
<td>--</td>
<td>Bezel frame white for MK800</td>
<td>B 9510 0112</td>
</tr>
<tr>
<td>TMK-SET V3.xx</td>
<td>Software</td>
<td>as download or CD</td>
<td>B 9602 0087</td>
</tr>
</tbody>
</table>

**Dimension diagram MK800A-11 / MK800A-12, surface mounting enclosure**

Dimensions in mm

**Dimension diagram MK800AF-11 / MK800AF-12, surface mounting enclosure with door**

Dimensions in mm
Remote alarm indicator and test combination MK800

Dimension diagram flush-mounting enclosure UP800
Dimensions in mm

Dimension diagram MK800-11 / MK800-12 with bezel frame BR800 and UP800 flush-mounting enclosure, example: cavity wall mounting
Dimensions in mm

Dimension diagram MK800-11 / MK800-12, example: door mounting
Dimensions in mm
MK2430

**Product description**

The universal remote alarm indicator and test combination MK2430 is designed for visual and audible indication of alarm messages from Bender systems such as EDS, RCMS and MEDICS. In MEDICS® monitoring systems, the MK800 meets the requirements of IEC 60364-7-710 and DIN VDE 0100-710:2002-11 in respect of test functions for IT system monitoring and alarms from changeover modules.

The IT system monitoring equipment can be tested using the programmable test button.

**Important display functions:**

- Normal operation (green LED)
- Insulation fault
- Overload
- Overtemperature
- Messages from insulation fault locators (EDS) and residual current monitoring systems (RCMS)
- Supply line failure
- Interruption of the phase conductor or PE conductor of the A-ISOMETER®
- Power supply fault conditions and changeover system faults
- Device failure
- Test results
- Measured values

**Function**

On its backlit LC display (4 x 20 characters), the MK2430 displays messages from all BMS bus devices assigned via alarm addresses. As well as being used as a standalone indicator, the MK2430 also supports parallel operation. In the event of an alarm message, the yellow warning LED or the red alarm LED lights up and the message appears on the LC display in plain text format. At the same time there is an audible signal (acknowledgeable). If a second message is received whilst the first is still pending, the audible signal will sound again and the messages will flash up alternately on the LC display. The address of the device triggering the alarm can also be called up. The audible signal sounds again once a configurable period of time has elapsed.

Internal device parameters (alarm addresses, test addresses,…) and the parameter setting for EDS and RCM systems can be accessed via the menu system.

As a master, the MK2430 can also be used in installations with a number of IT and EDS systems. The test button can be used to check the operation of an A-ISOMETER® 107TD47 or IRDH. A message is only output on the MK2430 on which the test button was pressed.

When wiring the bus connection, please note that a 4-wire cable (2 x BUS, 2 x US) with a suitable cross section is required when the supply voltage US is incorporated in the cable.

**Display/operating elements**

The backlit display features four lines of 20 characters. It supplies medical and technical personnel with information that is always clear and unambiguous, in order to help them to make decisions. Every alarm message comprises three lines which appear spontaneously and three additional lines which can be displayed at the touch of a button. The fourth line contains status information (number of messages, test procedures, menu information). Three LEDs are located above the text display. They indicate: normal operation (green), warnings (yellow) or alarms (red). Five buttons are available for acknowledging alarms and warnings, and for the menu system.
**Programming**

Standard message texts can be activated by enabling alarm addresses. These texts are available in 20 languages. Alarm addresses can be enabled via the device menu system (without PC). Individual message texts, each comprising 6 lines of 20 characters can be programmed with the TMK-SET software. An LED (yellow or red) and an audible signal can be assigned to each message. For this purpose, the PC is connected to the USB interface or BMS bus (RS-485) via converter.

**History memory**

Warning and alarm messages are written to the history memory automatically with date and time stamp. 250 text messages can be saved; the history memory can be read out via the operating menu, the Medi-History PC software or MK-Set.

**MK2430-12**

The MK2430-12 is used for visual and audible indication of alarms from Bender systems, such as EDS, RCMS and MEDICS systems and to trigger the ISOMETER test function via the BMS bus. Furthermore, the MK2430-12 can also be used with older changeover modules in conjunction with SMI470-9 or as a parallel display in conjunction with MK2430-11 or SMI472-12. The programmed message texts are displayed on the LCD in the selected language.

**Operating and display elements**

![Image of MK2430-12](image)

1. LED "NORMAL": Power On indicator
2. LED "WARNING": Warning messages
3. LED "ALARM": Alarm messages
4. LCD: Display of operating and alarm messages
5. Mute button: In operating mode: to mute the buzzer. In menu mode: ESC function
6. Test button "TEST": to activate the test for connected and assigned insulation monitoring devices
7. "MENU" button In operating mode: to call up the menu mode. In menu mode: Enter function
8. Additional text button In operating mode: additional text. In menu mode: down
9. Scroll button: In operating mode: to scroll messages. In menu mode: UP

**Typical alarm messages:**

**a) Standard text**

Information about the assigned system
Standard alarm text (lines 2…3)
Status line

Standard additional text (lines 5…7)
Status line

**b) Individually programmed alarm text**

Individual alarm text (lines 1…3)
Status line

Individual additional text (lines 5…7)
Status line

**MK2430-11**

The MK2430-11 features all the functions of the MK2430-12, plus 12 digital inputs. These digital inputs (IN1 … IN12) are controlled via potential-free contacts (N/C, N/O operation configurable). Any message text can be assigned to the inputs.

**MK2430P…**

The MK2430P… contains the programming of the standard display and the factory activation of up 20 alarm addresses. A line containing a note about the assigned equipment can be programmed individually for each alarm address. This line appears as the first line in an alarm message, the message itself is displayed together with the standard text (line 2, 3, 5, 6, 7) (see example a). For many applications with medical IT systems, this programming scope is sufficient. A programming template in the shape of a form is available for customer-specific programming. Furthermore, up to 200 individual alarms can be programmed in the factory subject to an additional fee (see example b). This type of programming is recommended for EDS, RCMS, medical gases or UPS systems.
Alarm indicator and test combination MK2430

1 - Terminating resistor BMS bus (120 Ω)
2 - Connection BMS bus
3 - Power supply unit incorporated in the MEDICS® module, sufficient for supplying power to maximum three MK2430.
4 - Wiring between the MEDICS® module and MK2430
   When the MK2430 is supplied by the AN450 power supply unit incorporated in MEDICS® modules, the permissible cable lengths and cable cross sections have to be considered.

5 - Digital inputs
   The digital inputs may be controlled either via potential-free contacts or via voltage signals. If you are using potential-free contacts, the voltage can be drawn from the AN450 (3).
   If the inputs are controlled via an external voltage, the common 0(-) is applied to terminal 0 and the 1(+) signal to the relevant input IN1…IN12. In this case, the connections between the terminals 0 and V2 and the common connections and U2 are not required.

6 - USB connection for programming

Ordering information

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>Factory-programmed alarm texts</th>
<th>BMS bus</th>
<th>Enclosure</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MK2430-11</td>
<td>×</td>
<td>--</td>
<td>×</td>
<td>B 9510 0001</td>
</tr>
<tr>
<td>MK2430A-11</td>
<td>×</td>
<td>--</td>
<td>×</td>
<td>B 9510 0005</td>
</tr>
<tr>
<td>MK2430-12</td>
<td>--</td>
<td>--</td>
<td>×</td>
<td>B 9510 0002</td>
</tr>
<tr>
<td>MK2430A-12</td>
<td>--</td>
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<td>×</td>
<td>B 9510 0006</td>
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<td>MK2430P-11</td>
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<td>×</td>
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<td>MK2430PA-11</td>
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<td>×</td>
<td>×</td>
<td>B 9510 0007</td>
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<td>×</td>
<td>B 9510 0004</td>
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<td>B 9510 0008</td>
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<tr>
<td>MK2430S-11</td>
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<td>×</td>
<td>B 9510 0011</td>
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<td>MK2430S-12</td>
<td>--</td>
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<td>×</td>
<td>B 9510 0012</td>
</tr>
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</table>

TMK-SET (Accessory: Software for parameter setting, in the download area of the Internet)

Accessories

<table>
<thead>
<tr>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MK24…-Cavity wall mounting kit B B 923 711</td>
</tr>
<tr>
<td>MK24…-Panel mounting kit B B 923 780</td>
</tr>
<tr>
<td>MK2430-mounting kit, complete B 9510 1000</td>
</tr>
</tbody>
</table>
### Technical data

#### Insulation coordination acc. to IEC 60664-1
- Rated insulation voltage: AC 250 V
- Rated impulse withstand voltage/pollution degree: 4 kV/3

#### Supply voltage
- Supply voltage $U_s$: AC / DC 24 V
- Frequency range $f_s$: 0 / 40…60 Hz
- Operating range $U_s$: AC 18…28 / DC 18…30 V
- Power consumption: $\leq$ 3 VA
- Voltage failure without reset: $\geq$ 15 s

#### Displays and LEDs
- Display: four lines, 4 x 20 characters
- Standard message texts in 20 languages
- Programmable text messages: 200
- History memory (messages): 250
- Standard text message: 3 x 20 characters
- Additional text message (press button to access): 3 x 20 characters
- Alarm LEDs: NORMAL (green), WARNING (yellow), ALARM (red)
- Menu texts: German/English
- Buttons: 5 (Isometer test, buzzer mute, additional text, scroll, menu)

#### Buzzer
- Buzzer message: can be acknowledged, adoption of characteristics of new value
- Buzzer interval: configurable
- Buzzer frequency: configurable
- Buzzer repetition: configurable

#### Inputs (MK2430…-11 only)
- Digital inputs: 12 (IN1…IN12)
- Galvanic separation: yes
- Control of digital inputs: via potential-free contacts / extraneous voltage
- Operating principle: N/O or N/C operation can be selected for each input
- Factory setting: N/O operation
- Voltage range (high): AC / DC 10…30 V
- Voltage range (low): AC / DC 0…2 V

#### Interface
- Interface/protocol: RS-485 / BMS
- Baud rate: 9.6 kbit / s
- Cable length: $\leq$ 1200 m
- Terminating resistor: 120 Ω (0.25 W) via DIP switch connectable
- Device address, BMS bus: DIP switch 1…150
- Factory setting device address: 1 (master)

#### Programming
- Interfaces: RS-485 or USB
- Software: TGM-SET V 3.0 (V2.0 / V1.1) or higher
- Factory setting password query: activated

#### Cable length when the power supply for 1 2 3 MK2430 is taken from one AN450
- 0.28 mm²: 60 / 40 / -- m
- 0.5 mm²: 250 / 70 / -- m
- 0.75 mm²: 400 / 100 / -- m
- 1.5 mm²: 800 / 210 / 10 m
- 2.5 mm²: 1300 / 360 / 20 m

#### Colours
- Front foil: RAL 7035 (light grey) / RAL 7012 (basalt grey)
- Marking buttons: RAL 5002 (ultramarine blue) RAL 7035 (light grey)
- Front plate: RAL 7035 (light grey)

#### Switching elements
- Number of changeover contacts: one (MK2430-11 only)
- Function: programmable
- Operating principle: N/C or N/O operation (programmable)
- Electrical service life under rated operating conditions, number of cycles: 10.000
- Contact data acc. to IEC 60947-5-1
- Utilisation category: AC-13 AC-14 DC-12
- Rated operational voltage: 24 V
- Rated operational current: 5 A
- Minimum contact rating: 1 mA at AC / DC $\leq$ 10 V

#### General data
- EMC immunity: EN 61000-6-2
- EMC emission: EN 61000-6-3
- Classification of climatic conditions acc. to IEC 60721
  - Stationary use: 3K5
  - Transport: 2K3
  - Long-time storage: 1K4
  - Operating temperature: -5 °C…+55 °C
- Classification of mechanical conditions acc. to IEC 60721
  - Stationary use: 3M4
  - Transport: 2M2
  - Long-time storage: 1M3
- Operating mode: continuous operation
- Mounting: display-oriented
- Connection: plug-in terminals
- Connection properties (supply voltage, BMS bus)
  - rigid / flexible / conductor sizes
  - 0.2…2.5 / 0.2…2.5 mm² / AWG 24-12
- Connection properties (inputs)
  - rigid / flexible / conductor sizes
  - 0.08…1.5 / 0.08…1.5 mm² / AWG 28-16
- Stripping length: 7 mm
- Tightening torque: 0.5…0.6 Nm
- Degree of protection, internal components (IEC 60529): IP50 (surface-mounting type IP54)
- Degree of protection, terminals (IEC 60529): IP20
- Flammability class: UL94V-0
- Product standards:
  - IEC 60364-7-710 / DIN VDE 0100-710 (VDE 0100-710):
    - Operating manual: TGH1389
  - Weight: flush mounting $\leq$ 210 g, surface mounting $\leq$ 400 g
Alarm indicator and test combination MK2430

**Dimension diagram flush-mounting type**
Dimensions in mm

**Dimension diagram surface-mounting type**
Dimensions in mm
Touch Panel TPC

Device features
- The Touch PC allows easy visualisation of Bender monitoring systems
- Application-specific data representation
- Different unit sizes
- Fanless cooling system
- IP65-compliant front plate
- Flat and compact design (max. 50 mm)
- Offer of service: programming

Product description
Data from Bender systems with BMS interface can be visualised by means of the Touch Panel. Bender favours the use of Advantech Touch Panels. These PCs are equipped with a resistive touch screen and are available in screen sizes of 5.7”, 12” and 15”. The 5.7” version is based on the Windows CE operating system. Larger screen sizes are optionally equipped with Windows CE or Windows 2000. All Touch PCs provide an Ethernet adapter, serial interfaces and a runtime version of the visualisation software Advantech Studio.

Communication structure
There are several ways of exchanging data between Bender systems and Touch PCs.

a) Protocol converter / web server FTC470XET

Alarms and measured values from Bender systems are passed to the internal OPC server which makes them available as OPC items. The software AStudio installed on the Touch PC contains an OPC client which receives the data from the OPC server. The graphics module AStudio allows plant-specific data representation.

b) Protocol converter FTC470XMB

Alarms and measured values from Bender systems are converted into a Modbus RTU protocol and are stored in the registers of the FTC470XMB. In this way, one FTC470XMB can display data of 10 BMS compatible Bender devices. The software AStudio incorporated in the Touch PC contains a Modbus RTU driver which, as a master, is capable of reading out data from the respective registers of the FTC470XMB. The graphics module AStudio allows plant-specific data representation. The protocol converter DI-2 is used for RS-485/RS-232 conversion.

c) BMS OPC server

The BMS OPC server is installed on a PC as software and connected to the Bender system via the DI-2 interface converter. Controlled by a configuration file, the OPC server only provides alarms from the external bus of the Bender system as OPC items. The software AStudio installed on the Touch PC contains an OPC client which receives the data from the OPC server. The graphics module AStudio allows plant-specific data representation.

Note: The BMS OPC server can directly be installed on a Touch PC based on Windows 2000 operating system; a separate PC is not required.
Programming of visualisation

Your Bender system will only become "visible" when a plant-specific application has been created. This application is created on a computer using a development version of Advantech Studio. Bender offers the service to create a plant-specific application. A Runtime version of the visualisation software Advantech Studio is required (included in the scope of delivery) to run the visualization on the Touch PC. Depending on the BMS system to be visualised, you can determine the number of application tags required for your Bender system. Typical are versions of 512, 1500 or 4000 tags. Contact your Bender adviser to determine the appropriate number of application tags.

Programming check list

The visualisation of a Bender system is not offered as a standard product with a specified scope of performance and price, it must be specifically configured to meet the needs of the individual application. During the projecting stage of visualisation the Bender service department will assist you starting from the first planning to the creation of a customer-specific application. The most important questions to be answered:

- Internal or external BMS bus
- Number and type of all connected BMS-capable Bender devices
- Bender device address assignment
- Selection of the appropriate gateway
- Determination of the number of application tags required
- Selection of the Touch PC (5.7", 12 or 15") and the appropriate operating system
- Selection of the AStudio Runtime version based on the number of application tags
- Determination of suitable additional components, such as hubs or switches and cables
- Design of an application-specific representation

Product overview

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPC-60S</td>
<td>5.7&quot;</td>
<td>QVGA color STN LCD</td>
</tr>
<tr>
<td>TPC-1260T</td>
<td>12.1&quot;</td>
<td>SVGA TFT LCD</td>
</tr>
<tr>
<td>TPC-1560</td>
<td>15&quot;</td>
<td>XGA TFT LCD</td>
</tr>
<tr>
<td>AStudio Runtime</td>
<td>512 tags</td>
<td></td>
</tr>
<tr>
<td>AStudio Runtime</td>
<td>1500 tags</td>
<td></td>
</tr>
<tr>
<td>AStudio Runtime</td>
<td>4000 tags</td>
<td></td>
</tr>
</tbody>
</table>

Technical data

<table>
<thead>
<tr>
<th>TPC-60S</th>
<th>TPC-1260T</th>
<th>TPC-1560</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display size</td>
<td>5.7&quot;</td>
<td>12.1&quot;</td>
</tr>
<tr>
<td>Colours</td>
<td>256</td>
<td>256</td>
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<tr>
<td>Resolution</td>
<td>320 x 240</td>
<td>800 x 600</td>
</tr>
<tr>
<td>Interfaces</td>
<td>3 serial ports</td>
<td>4 serial ports</td>
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<tr>
<td></td>
<td>1 RS-232</td>
<td>1 configurable</td>
</tr>
<tr>
<td></td>
<td>RS-422 / 485</td>
<td>RS-422 / 485</td>
</tr>
<tr>
<td></td>
<td>14-pin RS-232</td>
<td>1 parallel port</td>
</tr>
<tr>
<td></td>
<td>1 Ethernet port</td>
<td>1 Ethernet port</td>
</tr>
<tr>
<td></td>
<td>(10 / 100Base-T)</td>
<td>(10 / 100Base-T)</td>
</tr>
<tr>
<td></td>
<td>2 USB ports</td>
<td>2 USB ports</td>
</tr>
<tr>
<td></td>
<td>2 PS/2 ports</td>
<td>2 PS/2 ports</td>
</tr>
<tr>
<td>Weight</td>
<td>0.8 kg</td>
<td>2.2 kg</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>0…+50 °C</td>
<td>0…+50 °C</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>DC 24 V, 0.5 A</td>
<td>DC 24 V, 0.8 A</td>
</tr>
</tbody>
</table>

Dimension diagrams

Dimensions in mm
There are several ways to visualise data from Bender monitoring systems. There is a wide range of visualisation tools ranging from comprehensive SCADA software to visualisation via a standard web browser.
Axeda Supervisor

Device features

- Easy representation of Bender monitoring systems on standard computers (PC)
- Application-specific graphic visualisation
- Presentation in website format
- Extensive alarm handling
- Alarm lists, history memory, diagrams
- Customer-specific programming services

Product description

Axeda Supervisor is a powerful software for the visualisation of Bender systems utilising a BMS interface via gateways on a standard PC. For this purpose, the computers are equipped with a Runtime version of the Axeda Supervisor software. Suitable gateways are FTC470XET, FTC470XMB and the BMS OPC server. Axeda Supervisor runs under the operating systems Windows NT, Windows 2000 und Windows XP Professional.

There are different versions of Axeda Supervisor available:
- Demo version
- System Integrator Kit with a two-hour development time
- Development versions for 100, 300, 500, 2000, 10000 and 65000 tags
- Runtime versions for 100, 300, 500, 2000, 10000 and 65000 tags

The version is determined via a dongle for USB or the parallel port. It can also be run on a Touch Panel.

Communication structure

Suitable data sources are Bender gateways FTC470XET, FTC470XMB and the BMS OPC server.

FTC470XET:

Alarms and measured values from Bender systems are passed to the internal OPC server which makes them available as OPC items. The software Axeda Supervisor installed on the PC contains an OPC client which receives the data from the OPC server. The graphics module of Axeda Supervisor allows application-specific data representation.

FTC470XMB:

Alarms and measured values from Bender systems are converted into a Modbus RTU protocol and are stored in the registers of the FTC470XMB. In this way, one FTC470XMB can display data of 10 BMS-capable Bender devices.

The software Axeda Supervisor installed on the PC contains a Modbus RTU driver which, as a Modbus master, is capable of reading out data from the respective registers of the FTC470XMB. The graphics module of Axeda Supervisor allows application-specific data representation.

BMS OPC server:

The BMS OPC server is installed on a PC as software and connected to the Bender system via the DI-2 interface converter. Controlled by a configuration file, the OPC server only provides alarms from the external bus of the Bender system as OPC items. The software Axeda Supervisor installed on the PC contains an OPC client which receives the data from the OPC server. The graphics module of Axeda Supervisor allows application-specific data representation.
Programming check list

The visualisation of a Bender system is not offered as a standard product with a specified scope of performance and price. However, for each case, application-specific configuration is required. During the projecting stage of visualisation the Bender service department will assist you starting from the first planning to the creation of a customer-specific application. The most important questions to be answered:

- Internal or external BMS bus
- Number and type of all connected BMS-capable Bender devices
- Bender device address assignment
- Selection of the appropriate gateway
- Gateway configuration
- Determination of the number of application tags required
- Selection of the PC and the appropriate operating system
- Selection of the Axeda Supervisor version based on the number of application tags
- Determination of suitable additional components, such as hubs or switches and cables
- Design of an application-specific representation
- Price calculation

Product overview

<table>
<thead>
<tr>
<th>Type</th>
<th>Axeda Demo version</th>
<th>Axeda System Integrator Kit with a two-hour development time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Axeda development versions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 tags</td>
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<tr>
<td>300 tags</td>
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<td>500 tags</td>
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<tr>
<td>2000 tags</td>
<td></td>
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<tr>
<td>10000 tags</td>
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<td></td>
</tr>
<tr>
<td>65000 tags</td>
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</tr>
<tr>
<td><strong>Axeda Runtime versions</strong></td>
<td></td>
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<tr>
<td>100 tags</td>
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<td>10000 tags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65000 tags</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scope of delivery: CD, Dongle

System requirements: Windows 2000, XP

- Intel or compatible processor providing at least 1 GHz clock frequency
- At least 256 MB RAM
- 500 MB of free hard disk space
- CD Rom or DVD drive
- Graphics card providing a storage space of 8 MB at least
- Screen resolution of 800 x 600 pixels or higher
- USB or printer connection for the dongle

Typical display
ActiveX Toolkit

Product description
The ActiveX Toolkit allow the visualisation of Bender systems utilising a BMS interface on commonly used PCs using Active-X-capable application programs. The OPC server of the FTC470XET or the BMS OPC server is required to be used as a gateway.

The ActiveX control element, a component of the toolkit, contains an OPC client which receives the data of the BMS system through the gateway. The data is made available to the ActiveX interface of the Windows operating system. In this way, all ActiveX-capable application programs are capable of representing the data.

The ActiveX Toolkit includes Microsoft Excel application examples for typical Bender systems. These examples can be edited by the user to meet the application-specific requirements. Our service offers the creation of customer-specific representation in Excel on request.

Preconditions for the use of ActiveX Toolkit
The ActiveX Toolkit requires a commonly used PC running under the operating systems Windows NT, Windows 2000 or Windows XP. For displaying Bender templates, Microsoft Excel version 2000 has to be installed.

An experienced software engineer is capable of visualising data from Bender systems with the ActiveX Toolkit also in other Windows application programs. These can be, for example, the Internet Explorer, Active Server Pages or own programs in Visual Basic or C++.

Communication structure
Suitable data sources are the Bender OPC server of the FTC470XET and the BMS OPC server.

Protocol converter/web server FTC470XET:
Alarms and measured values from Bender systems are passed to the internal OPC server which makes them available as OPC items. The ActiveX Toolkit installed on the PC contains an OPC client which receives the data from the OPC server and makes them available to the ActiveX interface. That allows application-specific representation of data in an MS Excel template.

BMS OPC server:

Communication diagram:

The BMS OPC server is installed on a PC as software and connected to the Bender system via the DI-2 interface converter. Controlled by a configuration file, the OPC server only provides alarms from the external bus of the Bender system as OPC items. The ActiveX Toolkit installed on the PC contains an OPC client which receives the data from the OPC server and makes them available to the ActiveX interface. That allows application-specific representation of data in an MS Excel template.
Programming check list

The ActiveX Toolkit enables the experienced user to create his own applications in Excel (or other Active-X-capable programs) based on the Excel templates.

The Bender Service Department will guide you through each project phase starting from the first planning to the creation of customer-specific applications. The most important questions to be answered:

- Internal or external BMS bus
- Number and type of all connected BMS-capable Bender devices
- Bender device address assignment
- Selection of the appropriate OPC server
- Configuration of the OPC server, if required
- Selection of the PC and the appropriate operating system
- Design of data representation
- Determination of suitable additional components, such as hubs or switches and cables
- Design of an application-specific representation
- Price calculation

Typical display

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ActiveX Toolkit</td>
<td>B 9507 0002</td>
</tr>
</tbody>
</table>

**Scope of delivery:** CD, examples for RCMS, EDS, MEDICS® systems, operating manual

**System requirements:** Windows 2000, XP, MS-Excel 2000 or higher

Presentation of a central alarm acquisition

Presentation of a measured value graph
**Product description**

The measuring transducer RK170 is designed to convert current signals of measuring instrument outputs of A-ISOMETER’s (0…400 μA) and residual current monitors (RCM, RCMA) into standard current signals 0(4)…20 mA or into voltage signals (0…10 V). These currents and voltages are usually required in process technology.

**Application**

- Conversion of DC 0…400 μA current signals into 0(4)…20 mA or 0…10 V signals
- For A-ISOMETERs * and residual current monitors RCM, RCMA with measuring instrument output of DC 0…400 μA

**RK170 adjustments**

The signals at the outputs 0(4)…20 mA and 0…10 V are simultaneously available and their own nominal load must not be exceeded.

Setting the zero and the full-scale value will have an effect on both outputs. Hence, optimum adjustment is only possible for one output at a time.

The measuring transducer RK170 is factory-set to an input signal of DC 0…400 μA providing a galvanically isolated output signal of 0…20 mA or 0…10 V. When an output signal of 4…20 mA is required or the measuring transducer RK170 is to be adjusted for other reasons, the adjustment can be carried out using the trimmers “Zero” and “Scale”.

---

**Device features**

- Plastic enclosure for DIN rail mounting
- Zero setting 0 or 4 mA
- Electrical separation between the input and output signal

---

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage $U_S$</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK170</td>
<td>AC 19…264 V* / DC 20…297 V*</td>
<td>B 9804 1500</td>
</tr>
</tbody>
</table>

*Absolute value
Technical data measuring transducer RK170

**Voltage ranges**
- Supply voltage $U_S$: DC 20…297 V / AC 19…264 V
- Frequency range $f_S$: 50…120 Hz
- Power consumption ≤ 3 VA

**Inputs**
- Current input: DC 0…400 μA
- Max. permissible current: DC 4 mA
- Rated input resistance: approx. 2.5 kΩ

**Outputs**
- Two outputs with common ground
- Voltage output: DC 0…10 V
- Open-circuit voltage: DC 12 V
- Rated burden: 1 kΩ
- Current output: DC 0 / 4…20 mA
- Short-circuit current: ≤ DC 50 mA short-circuit proof
- Rated burden: 500 Ω
- Accuracy at $T_u = 23 ^\circ C$: class 0.5
- Temperature coefficient: 0.025 % / °C
- Rated rise time $T_{0.9}$: 50 ms
- Dielectric strength input/output/supply: AC 2500 V

**General data**
- Shock resistance IEC 60068-2-27 (during operation): 5 g/11 ms
- Vibration resistance IEC 60068-2-6 (during operation): 1 g/10…150 Hz
- Vibration resistance IEC 60068-2-6 (during transport): 2 g/10…150 Hz
- Ambient temperature (during operation): 0 °C…+50 °C
- Ambient temperature (during storage): -20 °C…+70 °C
- Climatic class acc. to IEC 60721-3-3: 3K3
- Operating mode: continuous operation
- Mounting: any position
- Connection type: modular terminals
- Connection properties rigid / flexible: 0.5…2.5 mm² / 0.14…1.5 mm²
- Degree of protection, internal components (IEC 60529): IP40
- Degree of protection, internal components (IEC 60529): IP20
- Dimensions: 75 x 22.5 x 110 mm
- DIN rail mounting acc. to IEC 60715
- Flammability class: UL94V-2
- Operating manual: BP109006
- Weight: ≤ 200 g

**Type of enclosure/dimension diagram**

Dimensions in mm
Product description

The power supply unit AN420 is used to supply measuring current transformers of the W...AB series. The CTs are to be supplied with a symmetrical supply voltage of DC ± 12 V using a pre-fabricated connecting cable of the WXS... series.

The power supply unit is capable of supplying up to six W...AB series measuring current transformers.

The ON LEDs +12 V, -12 V indicate that the symmetrical output voltage of ± 12 V is applied.

Approvals and certifications

Wiring diagram

1 - Supply voltage $U_S$
2 - Short-circuit protection of $U_S$, 6 A fuse recommended
3 - Symmetrical output voltage

Colour coding for the conductors of the WXS... connecting cable
k1 = yellow, l = green, - 12 V = black, GND = brown, + 12 V = red
Technical data

Insulation coordination acc. to IEC 60664-1 / IEC 60664-3
Rated insulation voltage AC 250 V
Rated impulse voltage/pollution degree 4 kV / III
Protective separation (reinforced insulation) between (A1, A2) - (+ 12 V, GND, - 12 V)
Voltage test acc. to IEC 61010-1 2.21 kV

Supply voltage
Supply voltage $U_S$ AC/DC 70...276 V
Frequency range $U_S$ DC, AC 42...460 Hz
Power consumption ≤ 30 VA

Output of the power supply unit
Output voltage $U_{out}$ DC ± 12 V, short-circuit proof
Operating range 11.9...12.1 V
Rated output 9 W

Cable length
Recommended cable WXS100...WXS1000 (see ordering information)

EMC
EMC DIN EN 61000-6-4
Clarithmic class acc. to IEC 60721 -25 °C...+ 55 °C
Stationary use (IEC 60721-3-3) 3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2) 2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1) 1K4 (except condensation and formation of ice)

Connection
Connection type screwless-type terminals
Connection properties rigid
Flexible without ferrule 0.2...2.5 mm² / AWG 24-14
Flexible with ferrule 0.2...1.5 mm² / AWG 24-16
Stripping length 10 mm
Opening force 50 N
Test opening, diameter 2.1 mm

Other
Operating mode continuous operation
Mounting any position
Degree of protection, internal components (IEC 60529) IP30
Degree of protection, terminals (IEC 60529) IP20
Enclosure material polycarbonate
Flammability class UL94 V-0
DIN rail mounting acc. to IEC 60715
Screw fixins 2 x M4 with mounting clip
Operating Manual BP409017
Weight ≤ 140 g

Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Supply voltage $U_S$</th>
<th>Output voltage</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH420-2</td>
<td>DC / AC 42...460 Hz</td>
<td>DC ± 12 V, 400 mA</td>
<td>B 7405 3100</td>
</tr>
</tbody>
</table>

Device version with screw terminals on request.

Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for screw mounting (1 piece per device, accessories)</td>
<td>B 9806 0008</td>
</tr>
</tbody>
</table>

Connecting cables for measuring current transformers of the W...AB series

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WXS-100</td>
<td>1 m</td>
<td>B 9808 0506</td>
</tr>
<tr>
<td>WXS-250</td>
<td>2.5 m</td>
<td>B 9808 0507</td>
</tr>
<tr>
<td>WXS-500</td>
<td>5 m</td>
<td>B 9808 0508</td>
</tr>
<tr>
<td>WXS-1000</td>
<td>10 m</td>
<td>B 9808 0509</td>
</tr>
</tbody>
</table>

Dimension diagram XM420
Dimensions in mm
Open the front plate cover in direction of arrow!

Screw mounting
Note: The upper mounting clip must be ordered separately (see ordering information).
Measuring instrument 9604

**Product description**

The analogue measuring instruments of the 9604 series are designed for indication of measured values from Bender devices equipped with the appropriate current output DC 0…400 μA. These are, for example, A-ISOMETER®s and residual current monitors RCM/RCMA.

**"Standard" version**

The enclosures are made of polycarbonate, which is self-extinguishing and of non-melting material (according to UL94V0). For space-saving arrangement, several instruments can be installed close together without spacers. Connection is made via hexagon head bolts with spring-loaded terminal bolts. The terminals of the enclosure are protected against accidental contact according to BGV A3.

**"S" version**

The measuring instruments of the "S" series are designed to meet the requirements of harsh environmental conditions, e.g. for use on ships.

**Device features:**

- Dimensions 96 x 96 mm (9604)
- Version S for increased shock and vibration resistance
- Scale background: white, imprint: black

**Technical data**

<table>
<thead>
<tr>
<th>Test voltage</th>
<th>3 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy class acc. to DIN 43780</td>
<td>1.5</td>
</tr>
<tr>
<td>Normal position</td>
<td>vertical, +5 degree</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-25...+40 °C</td>
</tr>
<tr>
<td>Protection class acc. to DIN 40050</td>
<td>IP52</td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP52</td>
</tr>
<tr>
<td>Terminals</td>
<td>IP00</td>
</tr>
<tr>
<td>Terminals with contact protection</td>
<td>IP20</td>
</tr>
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</table>

**Ordering information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Display range</th>
<th>Dimensions</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9604-4241</td>
<td>0...100 %</td>
<td>96 x 96 mm</td>
<td>B 986 807</td>
</tr>
</tbody>
</table>
**Enclosure mounting**

**Mounting frame for enclosure fixing into panels with standard cutout**
For mounting X470/XM460 enclosures into panels with 144 x 72 mm cutout, made of silver anodised aluminium. Suitable for the 470 and 460 series, e.g. IR470, EDS470, RCMS470, RCMS460 and EDS460 devices.

For mounting XM490 enclosures into panel cutouts of 198 x 72 mm. Suitable for 490 series device, e.g. RCMS490, EDS490/491. Dimensions in mm.

**Fixing set for enclosure mounting into panels with 45 mm cutout**
For mounting X440, X460, X470 enclosures into 45 mm panel cutouts, made of stainless steel. Suitable for all 470 series devices, e.g. RCM470, RCMA470.

**XM420 mounting frame for mounting enclosures into panels**
For mounting XM420 enclosures into panels. Suitable for all XM420 series devices, e.g. RCM420, RCMA420.
## Applied product standards and guidelines

<table>
<thead>
<tr>
<th>Device families</th>
<th>International (IEC)</th>
<th>Europe (EN)</th>
<th>National standards (DIN VDE / DIN EN)</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>and according to IEC 60947-2: 2006-05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power supply units, energy backup, communication modules (FTCs) and the like, alarm indicator and test combinations (MIX), operator and indicator panels</strong></td>
<td>IEC 60664-1: 2002-06</td>
<td>EN 60664-1: 2003-04</td>
<td>DIN EN 60664-1 (VDE0110-1): 2003-11</td>
<td></td>
</tr>
<tr>
<td><strong>Insulation coordination</strong></td>
<td>IEC 60721-3-1: 1997-02</td>
<td>EN 60721-3-1: 1997-03</td>
<td>DIN EN 60721-3-1: 1998-03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IEC 60721-3-2: 1997-03</td>
<td>EN 60721-3-2: 1997-03</td>
<td>DIN EN 60721-3-2: 1998-03</td>
<td></td>
</tr>
<tr>
<td><strong>Classification of climatic conditions</strong></td>
<td>IEC 60721-3-1: 1997-02</td>
<td>EN 60721-3-1: 1997-03</td>
<td>DIN EN 60721-3-1: 1998-03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IEC 60721-3-2: 1997-03</td>
<td>EN 60721-3-2: 1997-03</td>
<td>DIN EN 60721-3-2: 1998-03</td>
<td></td>
</tr>
</tbody>
</table>

The edition of the standards listed above corresponds to the catalogue’s latest date of issue.
Protection technology in electrical power systems is inevitably based on the requirements of standards and regulations. This is also true for the nomenclature. For this reason, whenever possible terms from standards are used to speak a uniform clear language without ambiguity.

**A-ISOMETER®**
Registered trademark of Dipl.-Ing. W. Bender GmbH & Co. KG, Grünberg.
An A-(absolute) ISOMETER® actively measures the insulation resistance in IT systems with a measuring voltage which is superimposed between the system and the PE conductor.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alarm state</strong></td>
<td>Alarm state indicates that the residual current in the installation monitored has exceeded the preset level of the RCM.</td>
</tr>
<tr>
<td><strong>Rated residual operating current ($I_{\Delta n}$)</strong></td>
<td>The value of residual operating current, assigned to the RCM by the manufacturer, at which the RCM shall operate under specified conditions.</td>
</tr>
<tr>
<td><strong>Response time ($t_{an}$)</strong></td>
<td>Time required by a residual current monitor to respond under specified conditions.</td>
</tr>
<tr>
<td><strong>Output voltage ($U_a$)</strong></td>
<td>Voltage across the measuring equipment terminals where this equipment does or can output electric power.</td>
</tr>
<tr>
<td><strong>Residual operating current</strong></td>
<td>Value of the residual current which causes the RCM to operate under specified conditions.</td>
</tr>
<tr>
<td><strong>Rated operating conditions</strong></td>
<td>A set of specified measuring ranges for performance characteristics and specified operating ranges for influence quantities, within which the variations of operating errors of an instrument are specified and determined.</td>
</tr>
<tr>
<td><strong>Touch voltage ($U_t$)</strong></td>
<td>Voltage appearing during an insulation fault, between simultaneous accessible parts.</td>
</tr>
<tr>
<td><strong>Touch voltage ($U_L$)</strong></td>
<td>Maximum value of the touch voltage which is permitted to be maintained indefinitely in specified conditions of external influences and is usually equal to AC 50 V, r.m.s. or 120 V ripple free DC.</td>
</tr>
<tr>
<td><strong>Specified operating range</strong></td>
<td>Range of values of a single influence quantity which forms a part of the rated operating conditions.</td>
</tr>
<tr>
<td><strong>Operating voltage in a system</strong></td>
<td>The value of the voltage under normal conditions at a given, specific point of the system.</td>
</tr>
<tr>
<td><strong>Fiducial value</strong></td>
<td>A clearly specified value to which reference is made in order to define the fiducial error.</td>
</tr>
<tr>
<td><strong>Residual current ($I_\Delta$)</strong></td>
<td>Vector sum of the instantaneous values of the current flowing in the main circuit of the RCM.</td>
</tr>
<tr>
<td><strong>Residual current monitoring system</strong></td>
<td>Usually consists of the residual current monitor and measuring current transformers. The system localises occurring residual currents and indicates the location of the fault.</td>
</tr>
<tr>
<td><strong>Residual current monitor</strong></td>
<td>Device or association of devices which monitors the residual current in an electrical installation, and which activates an alarm when the residual current exceeds the operating value of the device.</td>
</tr>
<tr>
<td><strong>Variation</strong></td>
<td>The difference between the indicated values for the same value of the measured quantity of an indicating or recording instrument, of the (conventional) true value of a supply instrument, when a single influence quantity assumes successively two different values.</td>
</tr>
<tr>
<td><strong>Influence quantity</strong></td>
<td>A quantity which is not the subject of the measurement, but which influences the value of the measured quantity, or the indication of measuring equipment.</td>
</tr>
<tr>
<td><strong>Earth</strong></td>
<td>The conductive mass of the earth whose electric potential at any point is conventionally taken as equal to zero.</td>
</tr>
<tr>
<td><strong>Earth fault current</strong></td>
<td>Current flowing to earth due to an insulation fault.</td>
</tr>
</tbody>
</table>
## Technical terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault voltage ($U_f$)</td>
<td>Voltage appearing under fault conditions between exposed conductive and/or extraneous conductive parts and earth.</td>
</tr>
<tr>
<td>Extraneous DC voltage ($U_{fg}$)</td>
<td>A DC voltage occurring in AC systems between the AC conductors and earth (caused by DC components).</td>
</tr>
<tr>
<td>Extraneous voltage</td>
<td>Voltage to which the measuring equipment can be subjected by external influences. This is not required for the operation of the measuring equipment, but can interfere with its operation.</td>
</tr>
<tr>
<td>Total earthing resistance ($R_A$)</td>
<td>The resistance between the main earthing terminal and earth.</td>
</tr>
<tr>
<td>Pulsating direct current</td>
<td>Current of pulsating waveform which assumes, in each period of the rated power frequency, the value 0 or the value not exceeding 0.006 A d.c. during one single interval of time, expressed in angular measure, of at least 150°.</td>
</tr>
<tr>
<td>Insulation resistance ($R_F$)</td>
<td>Resistance in the system being monitored, including the resistance of all the connected appliances to earth.</td>
</tr>
<tr>
<td>Performance characteristic</td>
<td>One of the quantities (described by values, tolerances, ranges) assigned to an equipment in order to define its performance.</td>
</tr>
<tr>
<td>Rated contact voltage</td>
<td>Voltage for which a relay contact is rated to open and close under specified conditions.</td>
</tr>
<tr>
<td>Short-circuit current ($I_k$)</td>
<td>Current flowing across the short-circuited terminals of the measuring equipment.</td>
</tr>
<tr>
<td>Open-circuit voltage ($U_q$)</td>
<td>Voltage present across unloaded terminals on the measuring equipment.</td>
</tr>
<tr>
<td>Nominal frequency ($f_n$)</td>
<td>Frequency for which the measuring equipment is intended to be used and designed.</td>
</tr>
<tr>
<td>Nominal voltage of the measuring equipment ($U_{me}$)</td>
<td>Voltage for which the measuring equipment is intended to be used and the value of which is marked on the equipment.</td>
</tr>
<tr>
<td>Nominal voltage range</td>
<td>Voltage range for which the measuring and monitoring equipment is intended to be used and for which it has been designed.</td>
</tr>
<tr>
<td>Nominal current ($I_n$)</td>
<td>Current of the measuring equipment under normal conditions.</td>
</tr>
<tr>
<td>Nominal voltage of the distribution system ($U_n$)</td>
<td>Voltage by which a distribution system or equipment is designated and to which certain operating characteristics are referred.</td>
</tr>
<tr>
<td>Effects of the distribution system voltage</td>
<td>Effect influencing the operation and, consequently, the measured value produced by it.</td>
</tr>
<tr>
<td>RCM type A</td>
<td>RCM for which actuation is ensured for residual sinusoidal alternating currents and residual pulsating direct currents, whether suddenly applied or slowly rising.</td>
</tr>
<tr>
<td>RCM type B</td>
<td>RCM for which actuation is ensured for residual sinusoidal alternating currents, residual pulsating direct currents or smooth residual direct currents, whether suddenly applied or slowly rising.</td>
</tr>
</tbody>
</table>
### Technical terms

**RCM directionally discriminating**
RCM used in IT systems, capable of directionally discriminating between supply side and load side residual currents.

**Voltage against earth \( (U_0) \)**

- a) In distribution systems with an earthed neutral point, the voltage between a phase conductor and the earthed neutral point.
- b) In all other distribution systems, the voltage present between the remaining phase conductors and earth when one of the phase conductors is shorted to earth.

**Supply voltage \( (U_S) \)**
Voltage at a point where the measuring equipment does or can accept electric energy as a supply.

**Effect of the supply voltage**
Effect influencing the functioning of measuring equipment and, consequently, the measured value produced by it.

**True value**
The value which characterises a quantity perfectly defined, under the conditions which exist when the quantity is considered.

### Short forms of residual current protective devices

<table>
<thead>
<tr>
<th>Short form</th>
<th>Definition</th>
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<tbody>
<tr>
<td>RCD (generic term)</td>
<td>residual current protective device</td>
</tr>
<tr>
<td>PRCD</td>
<td>portable residual current protective device</td>
</tr>
<tr>
<td>PRCD-S</td>
<td>portable residual current protective device-safety</td>
</tr>
<tr>
<td>SRCD</td>
<td>fixed residual current protective device, socket outlet design</td>
</tr>
<tr>
<td>RCCB</td>
<td>residual current operated circuit breakers without integrated overcurrent protection</td>
</tr>
<tr>
<td>RCBO</td>
<td>residual current operated circuit breakers with integrated overcurrent protection</td>
</tr>
<tr>
<td>RCM</td>
<td>Residual current monitor for household and similar uses</td>
</tr>
<tr>
<td>MRCD</td>
<td>modular residual current device</td>
</tr>
</tbody>
</table>
Service & Project planning

Service & Support

Planning & Concept
From support to customized solutions
- Detailed as-is analysis
- Technical support for products and systems
- Application assistance
- Seminars, training and presentations

Selection of Devices & Project Scheduling
From the selection of the device to project scheduling
- Selection of the appropriate components and systems
- Working out a detailed solution
- Assistance in tender invitations and project awarding

Commissioning
From installation to final inspection
- Installation check
- Parameter settings and adjustments
- Test run and final inspection
- Operator instruction / training

Operation & Maintenance
From maintenance to repair
- Repair / troubleshooting
- Maintenance, repairs, spare parts
- Maintenance / repair works

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