Three-phase monitoring relay for grid feeding
CM-UFS.1, CM-UFS.13, CM-UFS.14
Data sheet

Features

- Monitoring of three-phase mains for grid feeding
- Type-tested in accordance with DIN V VDE V 0126-1-1: February 2006 (CM-UFS.1)
  - DIN V VDE V 0126-1-1/A1 VFR 2013 (CM-UFS.13)
  - DIN V VDE V 0126-1-1/A1 VFR 2014 (CM-UFS.14)
- Neutral conductor connection configurable
- Can also be used to monitor single-phase mains
- Threshold value for the 10 minutes average value adjustable (110-115% of \( U_s \))
- Start-up delay \( t_{S1} \) prior to first grid connection and after a short-term interruption, 30 s fixed
- Restart delay \( t_{S2} \), 30 s fixed
- Powered by the measuring circuit
- True RMS measuring principle
- 2 c/o (SPDT) contacts
- 3 LEDs for status indication

Approvals

- **CCC**

Marks

- **CE**

Order data

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated control supply voltage = Measuring voltage</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM-UFS.1</td>
<td>3 x 400 V AC (L-L) / 230 V AC (L-N); 50.2 Hz acc. to DIN V VDE V 0126-1-1: February 2006</td>
<td>1SVR 630 736 R0300</td>
</tr>
<tr>
<td>CM-UFS.13</td>
<td>3 x 400 V AC (L-L) / 230 V AC (L-N); 50.4 Hz acc. to DIN V VDE V 0126-1-1 and DIN V VDE V 0126-1-1/A1 VFR 2013</td>
<td>1SVR 630 736 R2300</td>
</tr>
<tr>
<td>CM-UFS.14</td>
<td>3 x 400 V AC (L-L) / 230 V AC (L-N); 50.6 Hz acc. to DIN V VDE V 0126-1-1 and DIN V VDE V 0126-1-1/A1 VFR 2014</td>
<td>1SVR 630 736 R3300</td>
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Order data - Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP.01</td>
<td>Adapter for screw mounting</td>
<td>1SVR 430 029 R0100</td>
</tr>
<tr>
<td>MAR.01</td>
<td>Marker label</td>
<td>1SVR 366 017 R0100</td>
</tr>
<tr>
<td>COV.01</td>
<td>Sealable transparent cover</td>
<td>1SVR 430 005 R0100</td>
</tr>
</tbody>
</table>

Application

The CM-UFS.1/CUFS.1x are monitoring relays for feeding in three-phase mains. The devices are connected between the grid connected, decentral electrical energy source such as photovoltaic systems, wind turbines, block-type thermal power stations, and the public grid. In case the public grid is disconnected due to any reason, for instance during maintenance work, the CM-UFS.1/C-UFS.1x recognize this powerless situation. Then, in conjunction with a switching device, the CM-UFS.1/C-UFS.1x disconnect the decentral electrical energy source from the public grid.

The devices detect overvoltage and undervoltage (voltage increase and decrease protection) as well as any changes in grid frequency (frequency increase and decrease protection) in accordance with DIN V VDE V 0126-1-1 and DIN V VDE V 0126-1-1/A1 VFR 2013 / VFR 2014. The connection of the neutral conductor is configurable. The threshold value for the 10 minutes average value is adjustable.

The CM-UFS.1/C-UFS.1x are also suitable for monitoring single-phase mains. For this, all three external conductors (L1, L2, L3) have to be jumpered and connected as one single conductor.
Automatized grid connection instead of a permanently accessible switching point with a disconnection function

May also be the inverter output. In this case, apply the signal of relay R2 to the relevant input.
Operating mode

Configuration of the device is made by means of setting elements accessible on the front of the unit and signalling is made by means of front-face LEDs.

Adjustment potentiometer

Threshold value for the 10 minutes average value

The threshold value for the 10 minutes average value can be adjusted within a range of 110-115 % of the rated control supply voltage \( U_s \) by means of the potentiometer „Average %“ with a linear scale. The value specified by the network provider has to be set!

Rotary switch

Neutral conductor connection

The connection of the neutral conductor is configurable by means of the rotary switch „Function“.

Neutral conductor not connected

Neutral conductor connected

To avoid any faulty tripping, the selection has to be made prior to commissioning. Do not change the switch setting during operation!

Threshold values

<table>
<thead>
<tr>
<th>Threshold value</th>
<th>Overvoltage</th>
<th>Undervoltage</th>
<th>Overfrequency</th>
<th>Underfrequency</th>
<th>10 minutes average value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overvoltage</td>
<td>( \geq 115 % ) of ( U_s )</td>
<td>( \leq 80 % ) of ( U_s )</td>
<td>( &gt; 50.2 \text{ Hz (acc. to DIN V VDE 0126-1-1: February 2006)} )</td>
<td>( &lt; 47.5 \text{ Hz} )</td>
<td>( 110-115 % ) of ( U_s ), adjustable</td>
</tr>
<tr>
<td>Undervoltage</td>
<td></td>
<td></td>
<td>( &gt; 50.4 \text{ Hz (acc. to VFR 2013 of DIN V VDE 0126-1-1/A1)} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overfrequency ( \text{CM-UFS.1} )</td>
<td></td>
<td></td>
<td>( &gt; 50.6 \text{ Hz (acc. to VFR 2014 of DIN V VDE 0126-1-1/A1)} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underfrequency ( \text{CM-UFS.13} )</td>
<td></td>
<td></td>
<td>( &lt; 47.5 \text{ Hz} )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEDs

<table>
<thead>
<tr>
<th>Function</th>
<th>R/T: yellow LED</th>
<th>F1: red LED</th>
<th>F2: red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output relay energized</td>
<td>( \text{I} )</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Delay active</td>
<td>( \text{\ldots} )</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>-</td>
<td>( \text{I} )</td>
<td>-</td>
</tr>
<tr>
<td>Undervoltage</td>
<td>-</td>
<td>-</td>
<td>( \text{\ldots} )</td>
</tr>
<tr>
<td>Overfrequency</td>
<td>-</td>
<td>( \text{\ldots} )</td>
<td>-</td>
</tr>
<tr>
<td>Underfrequency</td>
<td>-</td>
<td>-</td>
<td>( \text{\ldots} )</td>
</tr>
<tr>
<td>Exceedance of the average value</td>
<td>-</td>
<td>( \text{\ldots} )</td>
<td>( \text{\ldots} )</td>
</tr>
<tr>
<td>Phase failure</td>
<td>-</td>
<td>( \text{\ldots} )</td>
<td>( \text{\ldots} )</td>
</tr>
</tbody>
</table>
Function description / diagrams

Function diagram legend

Control supply voltage not applied / Output contact open / LED off
Control supply voltage applied / Output contact closed / LED glowing

Function of the yellow LED

The yellow LED is flashing during timing and turns steady as soon as the output relays are energized.

Phase failure monitoring

Applying control supply voltage begins the fixed start-up delay $t_{S1}$. When $t_{S1}$ is complete and all phases are present with correct voltage and frequency, the output relays energize. They de-energize instantaneously if a phase failure occurs. The fault is indicated by LEDs. As soon as all 3 phases are present again, the output relays re-energize automatically after the fixed re-start delay $t_{S2}$ is complete.

Over- and undervoltage monitoring

Applying control supply voltage begins the fixed start-up delay $t_{S1}$. When $t_{S1}$ is complete and all phases are present with correct voltage and frequency, the output relays energize. If the voltage to be monitored exceeds or falls below the fixed threshold value, the output relays de-energize instantaneously. The fault type is indicated by LEDs. As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5%, the output relays re-energize after the fixed restart delay $t_{S2}$ is complete.
Over- and underfrequency monitoring

Applying control supply voltage begins the fixed start-up delay $t_{S1}$. When $t_{S1}$ is complete and all phases are present with correct voltage and frequency, the output relays energize.

If the frequency to be monitored exceeds or falls below the fixed threshold value, the output relays de-energize instantaneously. The fault type is indicated by LEDs.

As soon as the frequency returns to the tolerance range, taking into account a fixed hysteresis, the output relays re-energize after the fixed restart delay $t_{S2}$ is complete.

10 minutes average value monitoring

Applying control supply voltage begins the fixed start-up delay $t_{S1}$. When $t_{S1}$ is complete and all phases are present with correct voltage and frequency, the output relays energize.

The voltages of the individual phases are measured over a period of 10 minutes and the average value is calculated. If the 10 minutes average value of a phase exceeds the set threshold value, the output relays de-energize instantaneously. The fault is indicated by LEDs.

As soon as the 10 minutes average value drops again below the set threshold value, the output relays re-energize instantaneously.
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Connection diagram

L1, L2, L3, N Control supply voltage = Measuring voltage
15-16/18 Output contacts -
25-26/28 closed-circuit principle

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Data at $T_a = 25 \, ^\circ C$ and rated values, unless otherwise indicated

<table>
<thead>
<tr>
<th>Type</th>
<th>CM-UFS.1, CM-UFS.13, CM-UFS.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input circuit - Supply circuit</td>
<td>L1, L2, L3</td>
</tr>
<tr>
<td>Rated control supply voltage $U_s$ = Measuring voltage</td>
<td>3 x 400 V AC</td>
</tr>
<tr>
<td>Rated control supply voltage $U_s$ tolerance</td>
<td>-20...+20 %</td>
</tr>
<tr>
<td>Control supply voltage range</td>
<td>3 x 300-500 V AC</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Frequency range</td>
<td>45-55 Hz</td>
</tr>
<tr>
<td>Typical current / power consumption</td>
<td>23 mA / 16 VA</td>
</tr>
<tr>
<td>Power failure buffering time</td>
<td>min. 20 ms</td>
</tr>
</tbody>
</table>

| Input circuit - Measuring circuit | L1, L2, L3 | L-N |
| Monitoring functions | Phase failure | |
| Over-/undervoltage | |
| Over-/underfrequency | |
| 10 minutes average value | |
| Measuring range | Voltage range | 3 x 320-460 V AC | 3 x 184-264.5 V AC |
| Frequency range | 45-55 Hz |
| Threshold values | Overvoltage | 115 % of $U_s$, fixed |
| Undervoltage | 80 % of $U_s$, fixed |
| Overfrequency | 50.2 Hz fixed (CM-UFS.1) |
| 50.4 Hz fixed (CM-UFS.13) |
| 50.6 Hz fixed (CM-UFS.14) |
| Underfrequency | 47.5 Hz fixed |
| 10 minutes average value | 110-115% of $U_s$, adjustable |
| Hysteresis related to the threshold value | Over-/undervoltage | 5 % fixed |
| Over-/underfrequency | 20 mHz fixed |
| Rated frequency of the measuring signal | 50 Hz |
| Frequency range of the measuring signal | 45-55 Hz |
| Maximum measuring cycle | 50 ms |
| Maximum reaction time (time between fault detection and change of switching status of the relay) | Over-/undervoltage | < 120 ms |
| Over-/underfrequency | < 100 ms |
| 10 minutes average value | without delay |
| Accuracy within the rated control supply voltage tolerance | $\Delta U \leq 0.5 \%$ |
| Accuracy within the temperature range | $\Delta U \leq 0.06 \% / ^\circ C$ |
| Measuring method | True RMS |

Timing circuit

Start-up delay $t_{S1}$ prior to first grid connection and after a short-term interruption | 30 s fixed |
| Restart delay $t_{S2}$ | 30 s fixed |
| Accuracy within the rated control supply voltage tolerance | $\Delta t \leq 0.5 \%$ |
| Accuracy within the temperature range | $\Delta t \leq 0.06 \% / ^\circ C$ |

Indication of operational states

1 yellow LED, 2 red LEDs Details see operating mode and function description/diagrams

Output circuits

| Kind of output | Relay, 1 x 2 c/o (SPDT) contacts |
| Operating principle | closed-circuit principle |
| Contact material | AgNi alloy, Cd free |
| Rated operational voltage $U_e$ (IEC/EN 60947-1) | 250 V |
| Minimum switching voltage / switching current | 24 V / 10 mA |
| Maximum switching voltage / switching current | see load limit curve |
| Rated operational current $I_e$ (IEC/EN 60947-5-1) | AC12 (resistive) 230 V | 4 A |
| AC15 (inductive) 230 V | 3 A |
| DC12 (resistive) 24 V | 4 A |
| DC13 (inductive) 24 V | 2 A |
| Mechanical lifetime | 30 x 10⁶ switching cycles |
| Electrical lifetime (AC12, 230 V, 4 A) | 0.1 x 10⁶ switching cycles |
Data at $T_a = 25\degree C$ and rated values, unless otherwise indicated

<table>
<thead>
<tr>
<th>Type</th>
<th>CM-UFS.1, CM-UFS.13, CM-UFS.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. fuse rating to achieve</td>
<td>n/c contact</td>
</tr>
<tr>
<td>short-circuit protection</td>
<td>6 A fast-acting</td>
</tr>
<tr>
<td>n/o contact</td>
<td>10 A fast-acting</td>
</tr>
</tbody>
</table>

**General data**

Mean time between failures (MTBF)

Duty time: 100 %

Repeat accuracy (constant parameters): $\leq \pm 0.5\%$

Dimensions (W x H x D):

$22.5 \times 78 \times 100\, mm$ (0.89 x 3.07 x 3.94 in)

Weight:

0.14 kg (0.31 lb)

Mounting:

DIN rail (IEC/EN 60715), snap-on mounting without any tool

Mounting position:

any

Minimum distance to other units:

not necessary

Degree of protection:

enclosure / terminals

IP50 / IP20

**Electrical connection**

Wire size:

- fine-strand with/without wire end ferrule: $2 \times 0.75$-2.5 mm$^2$ (2 x 18-14 AWG)
- rigid: $2 \times 0.5$-4 mm$^2$ (2 x 20-12 AWG)

Stripping length:

7 mm (0.28 in)

Tightening torque:

0.6-0.8 Nm (5.31-7.08 in.lb)

**Environmental data**

Ambient temperature range:

operation / storage: $-25\ldots+60\degree C / -40\ldots+85\degree C$

Damp heat, cyclic (IEC/EN 60068-2-30):

$2 \times 12\, h$ cycle, 55 $\degree C$, 95 % RH

Climatic category (IEC/EN 60721-3-1):

3K3

Vibration, sinusoidal (IEC/EN 60255-21-1):

Class 2

Shock (IEC/EN 60255-21-2):

Class 2

Isolation data:

Rated insulation voltage $U_{i}$:

- input circuit / output circuit: 600 V
- output circuit 1 / output circuit 2: 300 V

Rated impulse withstand voltage $U_{imp}$:

- input circuit: 6 kV; 1.2/50 $\mu$s
- output circuit: 4 kV; 1.2/50 $\mu$s

Test voltage between all isolated circuits (type test):

2.5 kV, 50 Hz, 1 s

Basis isolation:

- input circuit / output circuit: 600 V

Protective separation (VDE 0106 part 101 and 101/A, IEC/EN 61140):

input circuit / output circuit: yes

Pollution degree (VDE 0110, IEC/EN 60664):

3

Overvoltage category (VDE 0110, IEC/EN 60664):

III

**Standards**

- Product standard:

- Further standards:
  - EN 50178, EN 61727
  - Low Voltage Directive: 2006/95/EC
  - RoHS Directive: 2002/95/EC

**Electromagnetic compatibility**

Interference immunity to:

- electrostatic discharge (VDE 0106 part 101 and 101/A, IEC/EN 61140):
  IEC/EN 61000-4-2:
  - Level 3 (6 kV / 8 kV)
  - Level 3 (10 V/m)

- radiated, radio-frequency, electromagnetic field:
  IEC/EN 61000-4-3:
  - Level 3 (2 kV / 5 kHz)

- electrical fast transient (burst):
  IEC/EN 61000-4-4:
  - Level 4 (2 kV L-L, L-N)

- conducted disturbances, induced by radio-frequency fields:
  IEC/EN 61000-4-6:
  - Level 3 (10 V)

- harmonics and interharmonics:
  IEC/EN 61000-4-13:
  - Class 3

- interference emission:
  IEC/EN 61000-6-3, IEC/EN 61000-6-4

- high-frequency radiated:
  IEC/CISPR 22, EN 50022:
  - Class B

- high-frequency conducted:
  IEC/CISPR 22, EN 50022:
  - Class B

1) Closed-circuit principle: Output relay(s) de-energize(s), if measured value exceeds or falls below the adjusted threshold value.
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CM-UFS.1, CM-UFS.13, CM-UFS.14
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Technical diagrams

Load limit curve

AC load (resistive)

DC load (resistive)

Derating factor \( F \)
at inductive AC load

Contact lifetime

Dimensions

in mm
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Dimensions - Accessories
in mm

ADP.01 - Adapter for screw mounting
MAR.01 - Marker label
COV.01 - Sealable transparent cover

Further documentation

<table>
<thead>
<tr>
<th>Document title</th>
<th>Document type</th>
<th>Document number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Products and Relays</td>
<td>Technical catalogue</td>
<td>2CDC 110 004 C020x</td>
</tr>
<tr>
<td>CM-UFS.1, CM-UFS.13, CM-UFS.14, CM-UFS.2</td>
<td>Instruction manual</td>
<td>1SVC 630 540 M0002</td>
</tr>
</tbody>
</table>

You can find the documentation online at www.abb.com/lowvoltage → Control Products → Electronic Relays and Controls
Contact us

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