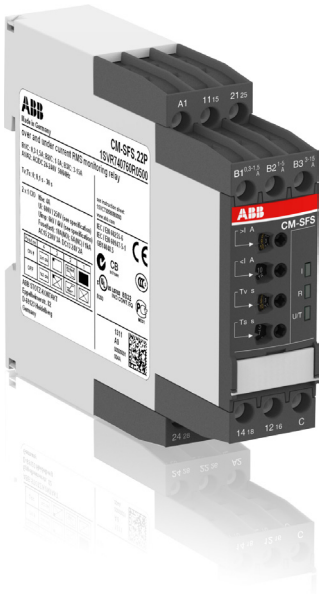
Data sheet

# Current monitoring relay CM-SFS.2
## For single-phase AC/DC currents

The CM-SFS.2 is an electronic current monitoring relay that protects single-phase mains (DC or AC) from over- and undercurrent from 3 mA to 15 A.

All devices are available with two different terminal versions. You can choose between the proven screw connection technology (double-chamber cage connection terminals) and the completely tool-free Easy Connect Technology (Push-in terminals).




2CDC 251 056 V0011

### Characteristics
- Monitoring of DC and AC currents (3 mA to 15 A)
- TRMS measuring principle
- One device includes 3 measuring ranges
- Over- and undercurrent monitoring
- ON- or OFF-delay configurable
- Open- or closed-circuit principle configurable
- Latching function configurable
- Threshold values for >I and <I adjustable
- Fixed hysteresis (5 %)
- Start-up delay $T_S$ adjustable (0 s; 0.1-30 s)
- Tripping delay $T_V$ adjustable (0 s; 0.1-30 s)
- Precise adjustment by front-face operating controls
- Screw connection technology or Easy Connect Technology available
- Housing material for highest fire protection classification UL 94 V-0
- Tool-free mounting on DIN rail as well as demounting
- 1x2 c/o (SPDT) contacts (common signal) or 2x1 c/o (SPDT) contact (separate signals for >I and <I) configurable
- 22.5 mm (0.89 in) width
- 3 LEDs for status indication

### Approvals
| | | |
|---|---|---|
| cULus LISTED | UL 508, CAN/CSA C22.2 No.14 | |
| GL | GL | (pending) |
| GOST | GOST | |
| CB | CB Scheme | |
| CCC | CCC | |
| RMRS | RMRS | |

### Marks
| | |
|---|---|
| CE | CE |
| C-Tick | C-Tick |

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## Order data

### Current monitoring relays

| Type | Rated control supply voltage | Connection technology | Measuring ranges | Order code |
|---|---|---|---|---|
| CM-SFS.21P | 24-240 V AC/DC | Push-in terminals | 3-30 mA, 10-100 mA, 0.1-1 A | 1SVR 740 760 R0400 |
| CM-SFS.21S | | Screw type terminals | | 1SVR 730 760 R0400 |
| CM-SFS.22S | | | 0.3-1.5 A, 1-5 A, 3-15 A | 1SVR 730 760 R0500 |

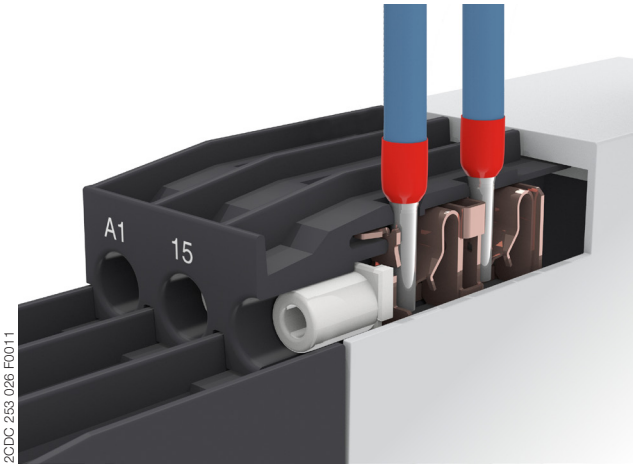
### Accessories

| Type | Description | Order code |
|---|---|---|
| ADP.01 | Adapter for screw mounting | 1SVR 430 029 R0100 |
| MAR.12 | Marker label for devices with DIP switches | 1SVR 730 006 R0000 |
| COV.11 | Sealable transparent cover | 1SVR 730 005 R0100 |

## Connection technology

### Maintenance free Easy Connect Technology with Push-in terminals

Type designation CM-xxS.yyP

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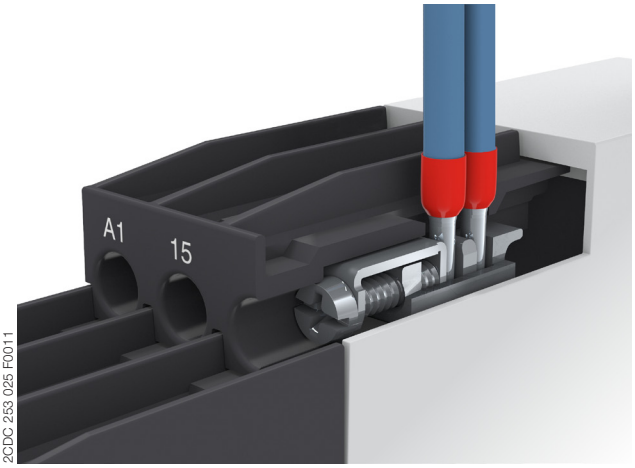
### Push-in terminals

- Tool-free connection of rigid and flexible wires with wire end ferrule according to DIN 46228-1-A, DIN 46228-4-E
  Wire size: 2 x 0.5-1.5 mm², (2 x 20 - 16 AWG)
- Easy connection of flexible wires without wire end ferrule by opening the terminals
- No retightening necessary
- One operation lever for opening both connection terminals
- For triggering the lever and disconnecting of wires you can use the same tool (Screwdriver according to DIN ISO 2380-1 Form A 0.8 x 4 mm (0.0315 x 0.157 in), DIN ISO 8764-1 PZ1 ø 4.5 mm (0.177 in))
- Constant spring force on terminal point independent of the applied wire type, wire size or ambient conditions (e. g. vibrations or temperature changes)
- Opening for testing the electrical contacting
- Gas-tight

### Approved screw connection technology with double-chamber cage connection terminals

Type designation CM-xxS.yyS

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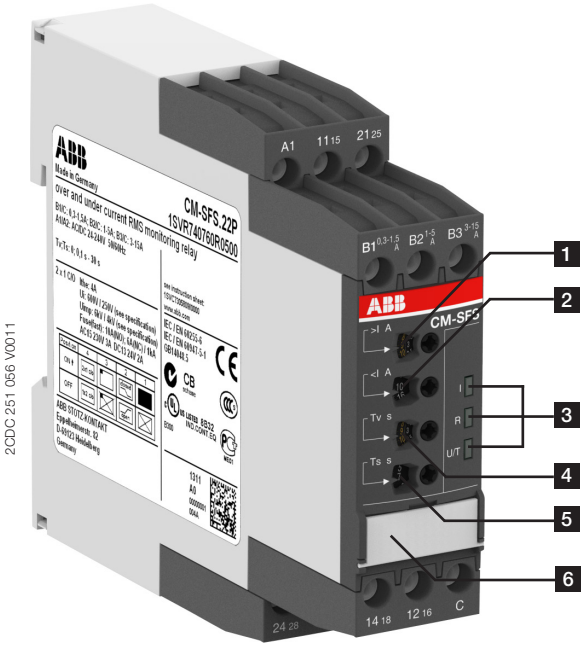
### Double-chamber cage connection terminals

- Terminal spaces for different wire sizes:
  fine-strand with/without wire end ferrule:
  1 x 0.5-2.5 mm² (2 x 20 - 14 AWG),
  2 x 0.5-1.5 mm² (2 x 20 - 16 AWG)
  rigid:
  1 x 0.5-4 mm² (1 x 20 - 12 AWG),
  2 x 0.5-2.5 mm² (2 x 20 - 14 AWG)
- One screw for opening and closing of both cages
- Pozidrive screws for pan- or crosshead screwdrivers according to DIN ISO 2380-1 Form A 0.8 x 4 mm (0.0315 x 0.157 in), DIN ISO 8764-1 PZ1 ø 4.5 mm (0.177 in)

Both the Easy Connect Technology with Push-in terminals and screw connection technology with double-chamber cage connection terminals have the same connection geometry as well as terminal position.

## Functions

### Operating controls




**1** **Adjustment of the threshold value >I for overcurrent**

**2** **Adjustment of the threshold value <I for undercurrent**

**3** **Indication of operational states**

U/T: green LED – control supply voltage/timing

R: yellow LED – relay status

U: red LED – over- / undercurrent

**4** **Adjustment of the tripping delay $T_V$**

**5** **Adjustment of the start-up delay $T_S$**

**6** **DIP switches (see DIP switch functions)**

### Application

The current monitoring relays CM-SFS.2 are designed for use in single-phase AC and/or DC systems for the simultaneous monitoring of over- or undercurrents. Depending on the configuration, one c/o (SPDT) contact each or both c/o (SPDT) contacts in parallel can be used for the over- and undercurrent monitoring. The devices operate over an universal range of supply voltages and provide an adjustable start-up as well as tripping delay. Open or closed-circuit principle as well as ON of OFF delay tripping are configurable.

### Operating mode

The CM-SFS.2 with 2 c/o (SPDT) contacts is available in 2 versions with 3 measuring ranges: 3-30 mA, 10-100 mA, 0.1-1 A (CM-SFS.21) and 0.3-1.5 A, 1-5 A, 3-15 A (CM-SFS.22). The measuring range is selected by connecting the monitored wire to the corresponding terminal B1/B2/B3-C.

The units are adjusted with front-face operating controls. The selection of: ON-delay ⊠ or OFF-delay ■, open- or closed-circuit principle, latching function ON or OFF and 2x1 c/o or 1x2 c/o (SPDT) contacts is made with DIP switches. Potentiometers, with direct reading scale, allow the adjustment of the threshold valuemax (>I) for overcurrent, the threshold valuemin (<I) for undercurrent, the tripping delay $T_V$ and the start-up delay $T_S$. The tripping delay $T_V$ and the start-up delay $T_S$ are adjustable over a range of instantaneous to a 30 s delay. The hysteresis is fixed at 5 %. Timing is displayed by a flashing green LED labelled U/T.

## Function diagrams

### Current window monitoring 1x2 c/o (SPDT) contacts 1x2 c/o ON-delayed without latching

*Open-circuit principle* open

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the tripping delay $T_V$ starts and the red LED glows, or flashes respectively. Timing of $T_V$ is displayed by the flashing green LED.

When $T_V$ is complete and the measured value still exceeds the threshold $value_{max}$ minus the fixed hysteresis (5 %) or is still below the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relays energize and the yellow LED (relay energized) glows.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relays de-energize and the red and yellow LEDs turn off.

If control supply voltage is interrupted, the green LED turns off.

*Closed-circuit principle* closed

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

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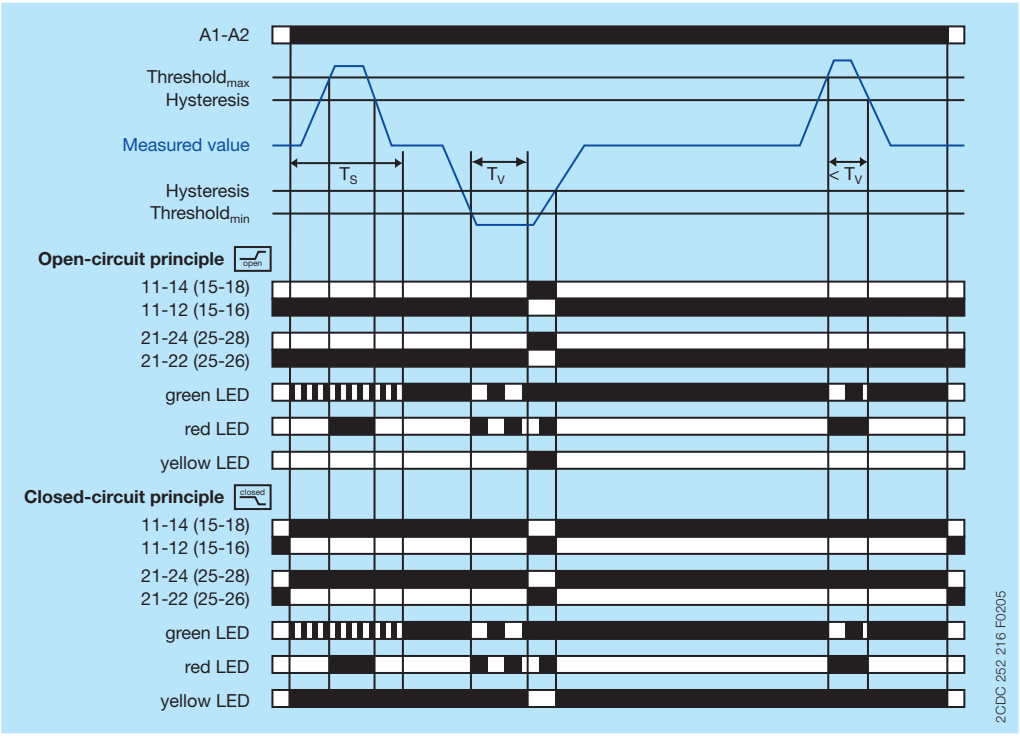
If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relays re-energize, the yellow LED glows and the red LED turns off.

If control supply voltage is interrupted, the output relays de-energize and the yellow and green LEDs turn off.



## Current window monitoring 1x2 c/o (SPDT) contacts OFF-delayed without latching

*Open-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the output relays energize, the yellow LED (relays energized) glows and the red LED glows (overcurrent), or flashes (undercurrent) respectively.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the tripping delay $T_V$ starts and the red LED turns off.

Timing of $T_V$ is displayed by the flashing green LED. When $T_V$ is complete, the output relays de-energize and the yellow LED (relay energized) turns off.

If control supply voltage is interrupted, the green LED turns off.

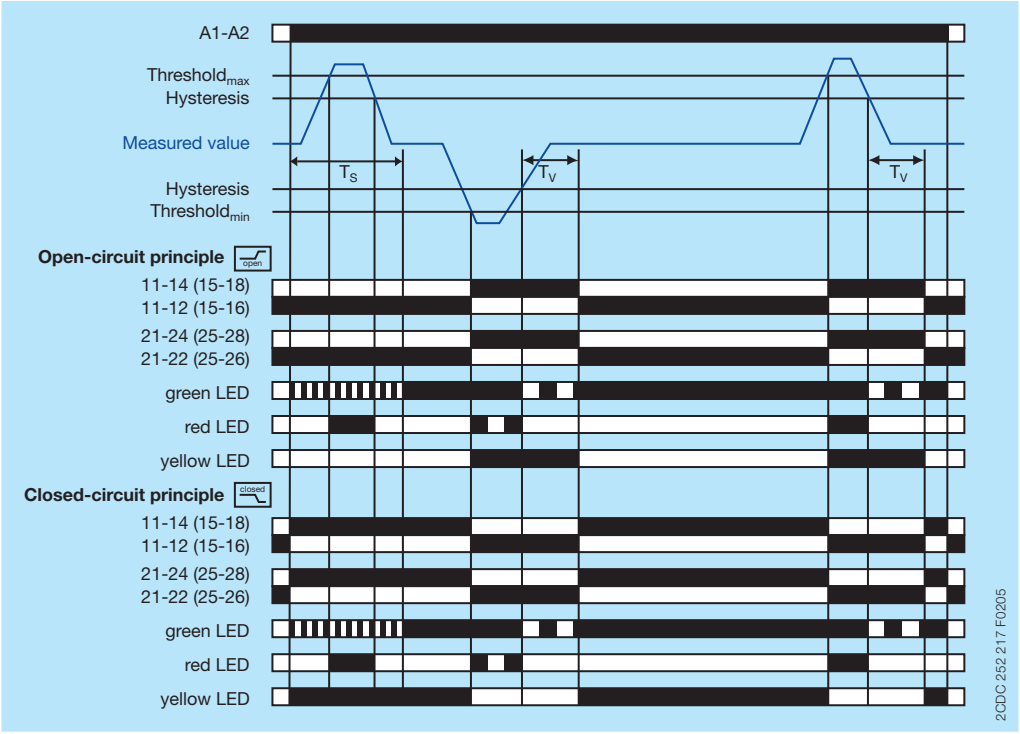
*Closed-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the output relays de-energize, the yellow LED turns off and the red LED glows (overcurrent), or flashes (undercurrent) respectively.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the tripping delay $T_V$ starts and the red LED turns off. Timing of $T_V$ is displayed by the flashing green LED. When $T_V$ is complete, the output relays energize and the yellow LED (relay energized) glows.

If control supply voltage is interrupted, the output relays de-energize and the yellow and green LEDs turn off.



## Current window monitoring 1x2 c/o (SPDT) contacts ON-delayed with latching

*Open-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the tripping delay $T_V$ starts and the red LED glows, or flashes respectively. Timing of $T_V$ is displayed by the flashing green LED.

When $T_V$ is complete and the measured value still exceeds the threshold $value_{max}$ minus the fixed hysteresis (5 %) or is still below the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relays energize and the yellow LED (relay energized) flashes.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relays remain energized (latching function).

If control supply voltage is interrupted (reset), the output relays de-energize and the yellow and green LEDs turn off.

*Closed-circuit principle*

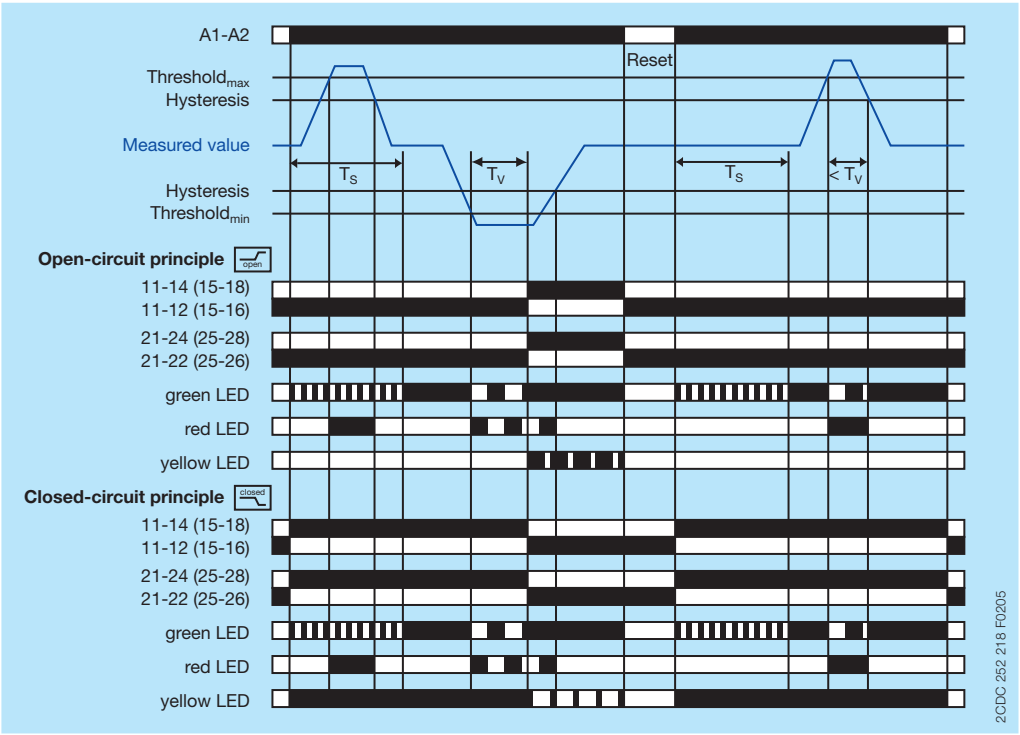
The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the tripping delay $T_V$ starts and the red LED glows, or flashes respectively. Timing of $T_V$ is displayed by the flashing green LED.

When $T_V$ is complete and the measured value still exceeds the threshold $value_{max}$ minus the fixed hysteresis (5 %) or is still below the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relays de-energize and the yellow LED (relays energized) flashes.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relays remain de-energized (latching function).

If control supply voltage is interrupted (reset), the yellow and green LEDs turn off. The output relays energize again when control supply voltage is re-applied.



## Current window monitoring 1x2 c/o (SPDT) contacts 1x2 c/o OFF-delayed with latching

*Open-circuit principle* open

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the output relays energize, the yellow LED (relays energized) flashes and the red LED glows (overcurrent), or flashes (undercurrent) respectively.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relays remain energized (latching function).

If control supply voltage is interrupted (reset), the output relays de-energize and the yellow and green LEDs turn off.

*Closed-circuit principle* closed

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

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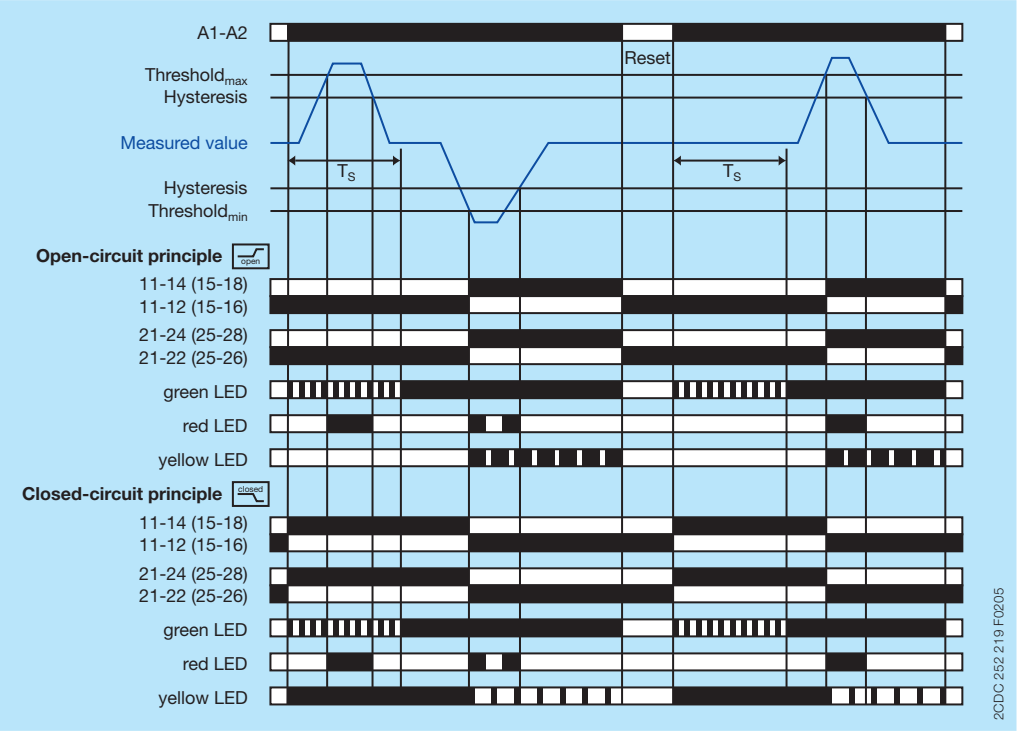
If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relays remain de-energized (latching function).

If control supply voltage is interrupted (reset), the yellow and green LEDs turn off. The output relays energize again when control supply voltage is re-applied.



## Current window monitoring 2x1 c/o (SPDT) contact ON-delayed without latching

*Open-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the tripping delay $T_V$ starts and the red LED glows (overcurrent), or flashes (undercurrent) respectively. Timing of $T_V$ is displayed by the flashing green LED.

When $T_V$ is complete and the measured value still exceeds the threshold $value_{max}$ minus the fixed hysteresis (5 %) or is still below the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, energizes and the yellow LED (relay energized) glows.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, de-energizes and the red and yellow LEDs turn off.

If control supply voltage is interrupted, the green LED turns off.

*Closed-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

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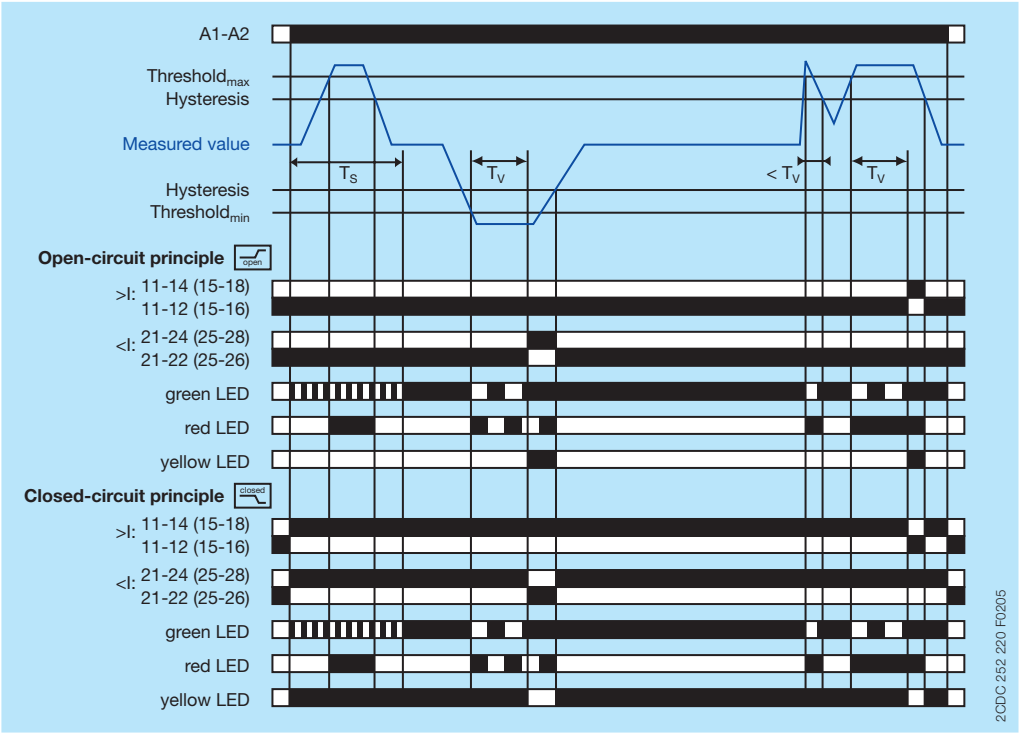
If control supply voltage is interrupted, the output relays de-energize and the yellow and green LEDs turn off.



## Current window monitoring 2x1 c/o (SPDT) contact OFF-delayed without latching

*Open-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, energizes, the yellow LED (relays energized) glows and the red LED glows (overcurrent), or flashes (undercurrent) respectively.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the tripping delay $T_V$ starts and the red LED turns off. Timing of $T_V$ is displayed by the flashing green LED. When $T_V$ is complete, the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, de-energizes and the yellow LED (relay energized) turns off.

If control supply voltage is interrupted, the green LED turns off.

*Closed-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

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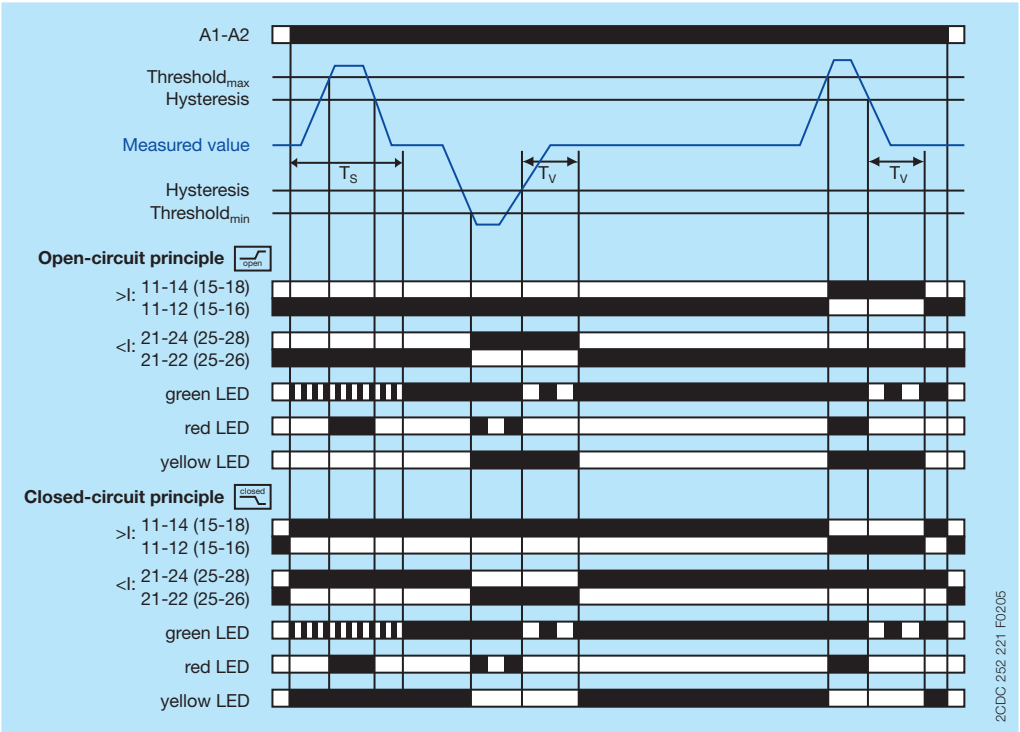
If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the tripping delay $T_V$ starts and the red LED turns off. Timing of $T_V$ is displayed by the flashing green LED. When $T_V$ is complete, the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, energizes and the yellow LED (relay energized) glows.

If control supply voltage is interrupted, the output relays de-energize and the yellow and green LEDs turn off.



## Current window monitoring 2x1 c/o (SPDT) contact 2x1 c/o ON-delayed with latching

*Open-circuit principle* open

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the tripping delay $T_V$ starts and the red LED glows, or flashes respectively. Timing of $T_V$ is displayed by the flashing green LED.

When $T_V$ is complete and the measured value still exceeds the threshold $value_{max}$ minus the fixed hysteresis (5 %) or is still below the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, energizes and the yellow LED (relay energized) flashes.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, remains energized (latching function).

If control supply voltage is interrupted (reset), the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, de-energizes and the yellow and green LEDs turn off.

*Closed-circuit principle* closed

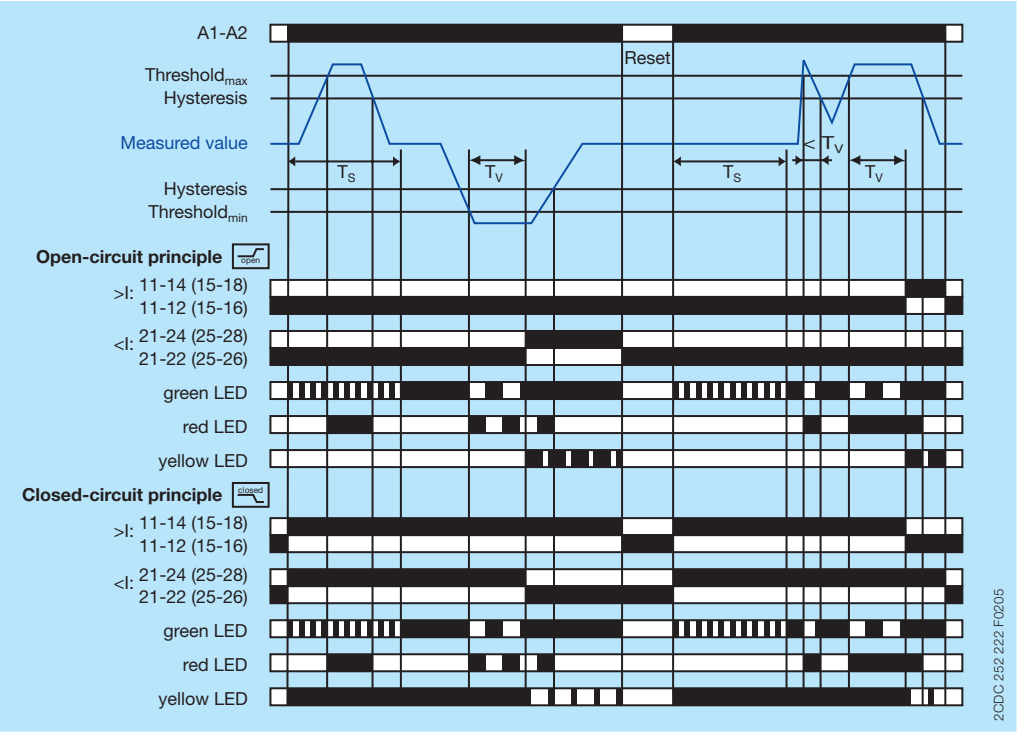
The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the tripping delay $T_V$ starts and the red LED glows, or flashes respectively. Timing of $T_V$ is displayed by the flashing green LED.

When $T_V$ is complete and the measured value still exceeds the threshold $value_{max}$ minus the fixed hysteresis (5 %) or is still below the threshold $value_{min}$ plus the fixed hysteresis (5 %), the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, de-energizes and the yellow LED (relays energized) flashes.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, remains de-energized (latching function).

If control supply voltage is interrupted (reset), the yellow and green LEDs turn off. The output relays energize again when control supply voltage is re-applied.



## Current window monitoring 2x1 c/o (SPDT) contact OFF-delayed with latching

*Open-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, energizes, the yellow LED (relays energized) flashes and the red LED glows (overcurrent), or flashes (undercurrent) respectively.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, remains energized (latching function).

If control supply voltage is interrupted (reset), the output relays de-energize and the yellow and green LEDs turn off.

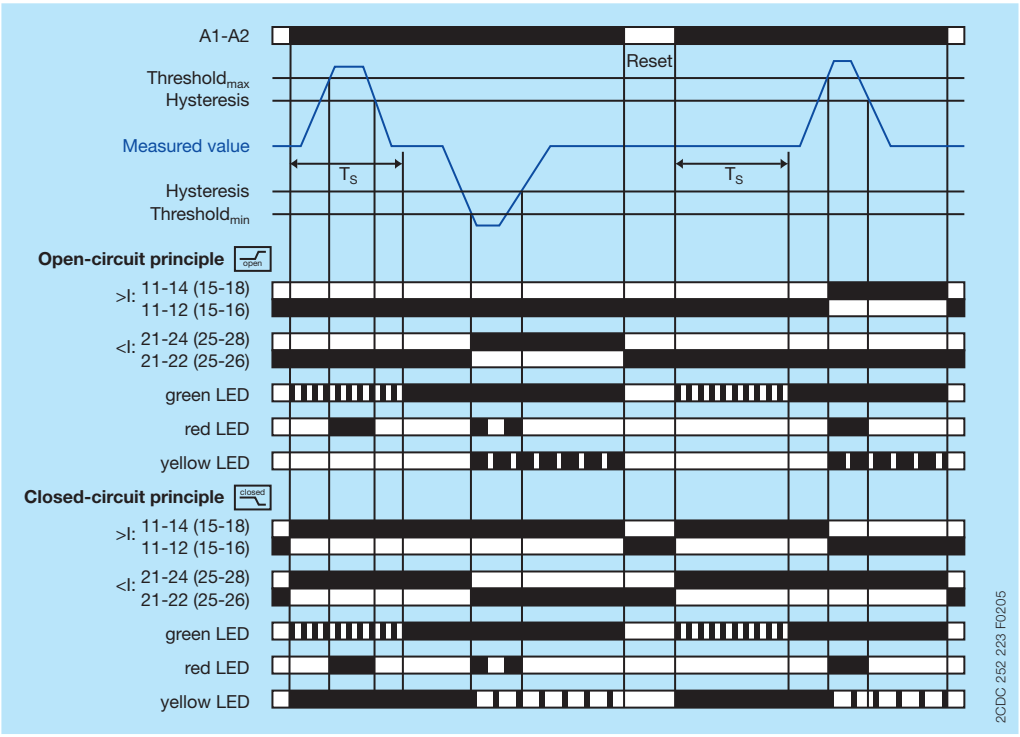
*Closed-circuit principle*

The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay $T_S$ begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes during the start-up delay $T_S$ and then turns steady. During the start-up delay $T_S$ under- or overcurrent is only displayed by glowing (overcurrent) or flashing (undercurrent) of the red LED.

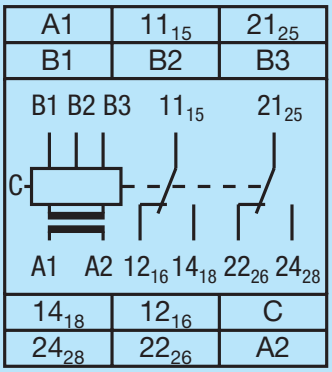
If the measured value exceeds the threshold $value_{max}$ (>I) or drops below the threshold $value_{min}$ (<I) when $T_S$ is complete, the output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, de-energizes, the yellow LED (relays energized) flashes and the red LED glows (overcurrent), or flashes (undercurrent) respectively.

If the measured value decreases below the threshold $value_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold $value_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relay $11_{15}$-$12_{16}$/$14_{18}$ (>I), or $21_{25}$-$22_{26}$/$24_{28}$ (<I) respectively, remains de-energized (latching function).

If control supply voltage is interrupted (reset), the yellow and green LEDs turn off. The output relays energize again when control supply voltage is re-applied.



## Electrical connection

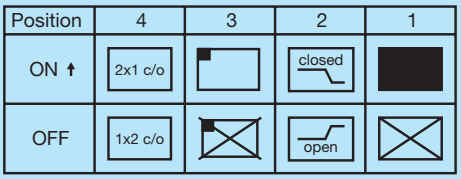



2CDC 252 205 F0005

| | | |
|---|---|---|
| A1-A2 | Rated control supply voltage | |
| B1-C | Measuring range 1: | CM-SFS.21: 3-30 mA<br>CM-SFS.22: 0.3-1.5 A |
| B2-C | Measuring range 2: | CM-SFS.21: 10-100 mA<br>CM-SFS.22: 1-5 A |
| B3-C | Measuring range 3: | CM-SFS.21: 0.1-1 A<br>CM-SFS.22: 3-15 A |
| $11_{15}$-$12_{16}$/$14_{18}$<br>$21_{25}$-$22_{26}$/$24_{28}$ | Output contacts - open- or closed-circuit principle | |

**Connection diagram**

## DIP switches




2CDC 252 274 F0005

| | | |
|---|---|---|
| 1 | ON | OFF-delay |
| | OFF | ON-delay |
| 2 | ON | Closed-circuit principle |
| | OFF | Open-circuit principle |
| 3 | ON | Latching function activated |
| | OFF | Latching function not activated |
| 4 | ON | 2x1 c/o (SPDT) contact |
| | OFF | 1x2 c/o (SPDT) contacts |

OFF = Default

## Technical data

Data at $T_a$ = 25 °C and rated values, unless otherwise indicated

### Input circuits

| **Supply circuit** | | **A1-A2** |
|---|---|---|
| Rated control supply voltage $U_s$ | | 24-240 V AC |
| Rated control supply voltage $U_s$ tolerance | | -15...+10 % |
| Rated frequency | | 50/60 Hz or DC |
| Typical current / power consumption | 24 V DC | 30 mA / 0.75 W |
| | 115 V AC | 17 mA / 1.9 VA |
| | 230 V AC | 11 mA / 2.6 VA |
| Power failure buffering time | | 20 ms |
| Transient overvoltage protection | | varistors |

| **Measuring circuit** | | **B1/B2/B3-C** | | | | | |
|---|---|---|---|---|---|---|---|
| Monitoring function | | over- and undercurrent monitoring | | | | | |
| Measuring method | | TRMS measuring principle | | | | | |
| Measuring inputs | | CM-SFS.21 | | | CM-SFS.22 | | |
| | terminal connection | B1-C | B2-C | B3-C | B1-C | B2-C | B3-C |
| | measuring range | 3-30 mA | 10-100 mA | 0.1-1 A | 0.3-1.5 A | 1-5 A | 3-15 A |
| | input resistance | 3.3 Ω | 1 Ω | 0.1 Ω | 0.05 Ω | 0.01 Ω | 0.0025 Ω |
| | pulse overload capacity t < 1 s | 500 mA | 1 A | 10 A | 15 A | 50 A | 100 A |
| | continuous capacity | 50 mA | 150 mA | 1.5 A | 2 A | 7 A | 17 A |
| Threshold value | | >I and <I adjustable within the indicated measuring range | | | | | |
| Tolerance of the adjusted threshold value | | 10 % of the range end value | | | | | |
| Hysteresis related to the threshold value | | 5 % fixed | | | | | |
| Measuring signal frequency range | | DC / 15 Hz - 2 kHz | | | | | |
| Rated measuring signal frequency range | | DC / 50-60 Hz | | | | | |
| Maximum response time | AC | 80 ms | | | | | |
| | DC | 120 ms | | | | | |
| Accuracy within the rated control supply voltage tolerance | | ΔU ≤ 0.5 % | | | | | |
| Accuracy within the temperature range | | ΔU ≤ 0.06 % / °C | | | | | |

| **Timing circuit** | |
|---|---|
| Start-up delay $T_S$ | 0 s or 0.1-30 s adjustable |
| Time delay $T_V$ | 0 s or 0.1-30 s adjustable |
| Repeat accuracy (constant parameters) | ±0.07 % of full scale |
| Tolerance of the adjusted time delay | - |
| Accuracy within the rated control supply voltage tolerance | Δt ≤ 0.5 % |
| Accuracy within temperature range | Δt ≤ 0.06 % / °C |

### User interface

| **Indication of operational states** | | |
|---|---|---|
| Control supply voltage | U/T: green LED | ⎍: control supply voltage applied<br>⎍⎍⎍: start-up delay $T_S$ active<br>⎍⎍⎍: tripping delay $T_V$ active |
| Measured value | U: red LED | ⎍: overcurrent<br>⎍⎍⎍: undercurrent |
| Relay status | R: yellow LED | ⎍: output relay energized, no latching function<br>⎍⎍⎍: output relay energized, active latching function<br>⎍⎍⎍: output relay de-energized, active latching function |

## Output circuits

| | | |
|---|---|---|
| Kind of output | 11-12/14 | relay, 1st c/o (SPDT) contact |
| | 21-22/24 | relay, 2nd c/o (SPDT) contact |
| | | 1 x 2 c/o (SPDT) contacts (common signal) or |
| | | 2 x 1 c/o (SPDT) contact (separate signal for >I and <I) |
| | | configurable |
| Operating principle | | open- or closed-circuit principle configurable (open-circuit principle: output relays energize if the measured value exceeds / falls below the adjusted threshold value, closed-circuit principle: output relays de-energize if measured value exceeds / falls below the adjusted threshold value) |
| Contact material | | AgNi |
| Rated operational voltage $U_e$ (VDE 0110, IEC/EN 60947-1) | | 250 V |
| Minimum switching voltage / Minimum switching current | | 24 V / 10 mA |
| Maximum switching voltage / Maximum switching current | | 250 V AC / 4 A AC |
| Rated operational current $I_e$ (IEC/EN 60947-5-1) | AC12 (resistive) at 230 V | 4 A |
| | AC15 (inductive) at 230 V | 3 A |
| | DC12 (resistive) at 24 V | 4 A |
| | DC13 (inductive) at 24 V | 2 A |
| AC rating (UL 508) | utilization category (Control Circuit Rating Code) | B 300 |
| | max. rated operational voltage | 300 V AC |
| | max. continuous thermal current at B 300 | 5 A |
| | max. making/breaking apparent power at B 300 | 3600/360 VA |
| Mechanical lifetime | | 30 x $10^6$ switching cycles |
| Electrical lifetime | AC12, 230 V, 4 A | 0.1 x $10^6$ switching cycles |
| Maximum fuse rating to achieve short-circuit protection | n/c contact | 6 A fast-acting |
| | n/o contact | 10 A fast-acting |

## General data

| | | | | |
|---|---|---|---|---|
| MTBF | | | on request | |
| Duty time | | | 100 % | |
| Dimensions (W x H x D) | | product dimensions | 22.5 x 85.6 x 103.7 mm (0.89 x 3.37 x 4.08 in) | |
| | | packaging dimensions | 97 x 109 x 30 mm (3.82 x 4.29 x 1.18 in) | |
| Weight | | | **Screw connection technology** | **Easy Connect Technology (Push-in)** |
| | net weight | CM-SFS.21 | 0.150 kg (0.331 lb) | 0.139 kg (0.306 lb) |
| | | CM-SFS.22 | 0.158 kg (0.348 lb) | - |
| | gross weight | CM-SFS.21 | 0.173 kg (0.381 lb) | 0.162 kg (0.371 lb) |
| | | CM-SFS.22 | 0.180 kg (0.397 lb) | - |
| Mounting | | | DIN rail (IEC/EN 60715), snap-on mounting without any tool | |
| Mounting position | | | any | |
| Minimum distance to other units | | | 10 mm (0.39 in) at measured current > 10 A | |
| Material of housing | | | UL 94 V-0 | |
| Degree of protection | | housing | IP50 | |
| | | terminals | IP20 | |

## Electrical connection

| | | Screw connection technology | Easy Connect Technology (Push-in) |
|---|---|---|---|
| Wire size | fine-strand with(out) wire end ferrule | 1 x 0.5-2.5 mm²<br>(1 x 20-14 AWG)<br>2 x 0.5-1.5 mm²<br>(2 x 20-16 AWG) | 2 x 0.5-1.5 mm²<br>(2 x 20-16 AWG) |
| | rigid | 1 x 0.5-4 mm²<br>(1 x 20-12 AWG)<br>2 x 0.5-2.5 mm²<br>(2 x 20-14 AWG) | 2 x 0.5-1.5 mm²<br>(2 x 20-16 AWG) |
| Stripping length | | 8 mm (0.32 in) | |
| Tightening torque | | 0.6 - 0.8 Nm<br>(5.31 - 7.08 lb.in) | - |

## Environmental data

| | | |
|---|---|---|
| Ambient temperature ranges | operation | -20...+60 °C |
| | storage | -40...+85 °C |
| Damp heat, cyclic (IEC 60068-2-30) | | 55 °C, 6 cycle |
| Vibration, sinusoidal (IEC/EN 60255-21-1) | | Class 2 |
| Shock (IEC/EN 60255-21-2) | | Class 2 |

## Isolation data

| | | |
|---|---|---|
| Rated insulation voltage $U_i$ (VDE 0110, IEC/EN 60947-1, IEC/EN 60255-5) | supply / measuring circuit / output | 600 V |
| | supply / output 1 / output 2 | 250 V |
| Rated impulse withstand voltage $U_{imp}$ (IEC/EN 60947-1, IEC/EN 60255-5) | supply / measuring circuit / output | 6 kV 1.2/50 µs |
| | supply / output 1 / output 2 | 4 kV 1.2/50 µs |
| Test voltage between all isolated circuits (type test) | rated insulation voltage 250 V | 2.0 kV, 50 Hz |
| | rated insulation voltage 600 V | 2.5 kV, 50 Hz |
| Pollution degree (VDE 0110, IEC/EN 60664, IEC/EN 60255-5) | | 3 |
| Overcurrent category (VDE 0110, IEC/EN 60664, IEC/EN 60255-5) | | III |

## Standards

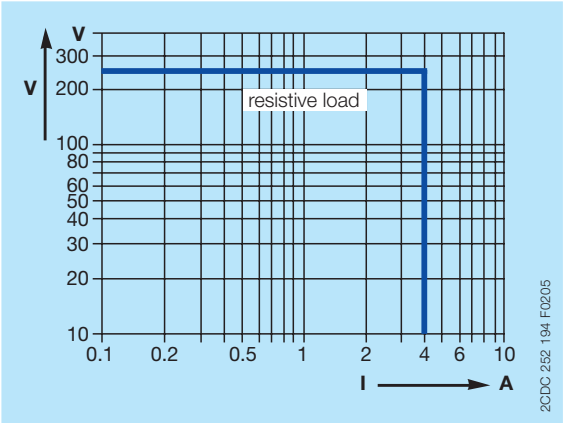
| | |
|---|---|
| Product standard | IEC/EN 60255-6 |
| Low Voltage Directive | 2006/95/EC |
| EMC Directive | 2004/108/EC |
| RoHS Directive | 2002/95/EC |

## Electromagnetic compatibility

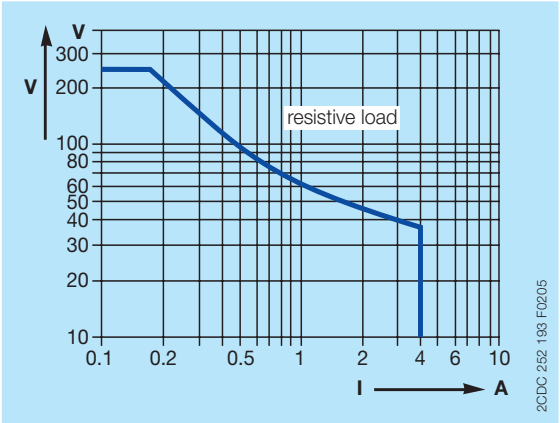
| | | |
|---|---|---|
| Interference immunity to | | IEC/EN 61000-6-2 |
| electrostatic discharge | IEC/EN 61000-4-2 | Level 3 |
| radiated, radio-frequency, electromagnetic field | IEC/EN 61000-4-3 | Level 3 |
| electrical fast transient / burst | IEC/EN 61000-4-4 | Level 3 |
| surge | IEC/EN 61000-4-5 | Level 3 |
| conducted disturbances, induced by radio-frequency fields | IEC/EN 61000-4-6 | Level 3 |
| Interference emission | | IEC/EN 61000-6-3 |
| high-frequency radiated | IEC/CISPR 22, EN 55022 | Class B |
| high-frequency conducted | IEC/CISPR 22, EN 55022 | Class B |

## Technical diagrams

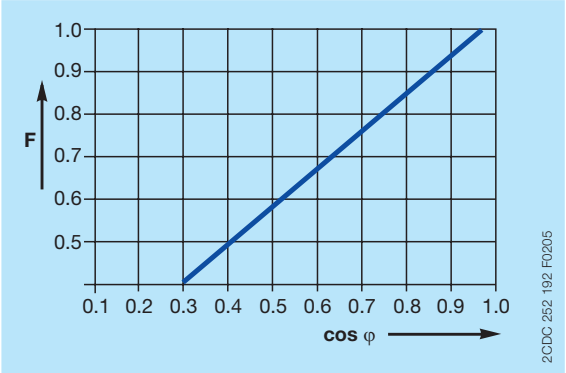
### Load limit curves



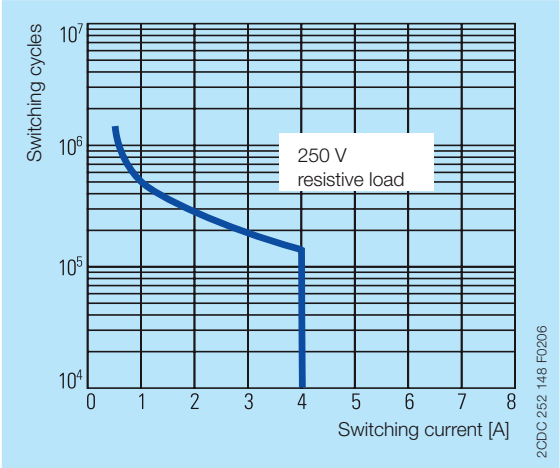

AC load (resistive)




DC load (resistive)



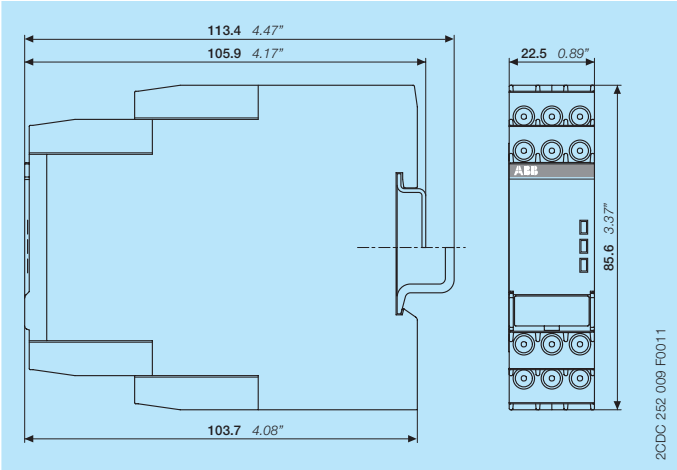

Derating factor F for inductive AC load




Contact lifetime

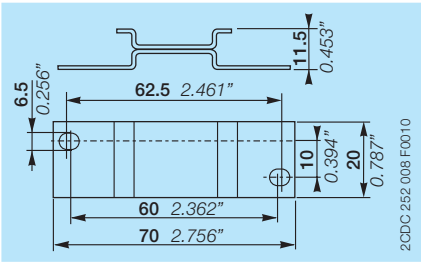
## Dimensions

in **mm** and *inches*

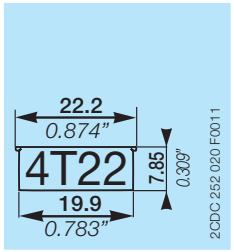



## Accessories

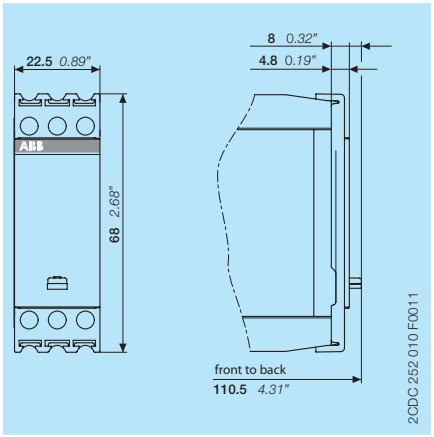
in **mm** and *inches*




**ADP.01 - Adapter for screw mounting**




**MAR.12 - Marker label for devices with DIP switches**




**COV.11 - Sealable transparent cover**

## Further documentation

| Document title | Document type | Document number |
|---|---|---|
| Electronic products and relays | Technical catalogue | 2CDC 110 004 C020x |
| CM-SFS.2 | Instruction manual | 1SVC 730 580 M0000 |

You can find the documentation on the internet at www.abb.com/lowvoltage -> Control Products -> Electronic Relays and Controls -> Single Phase Monitors

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