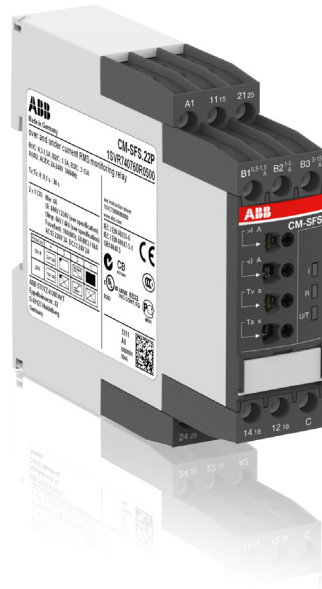


# Current monitoring relay CM-SFS.2

## 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

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

### Marks

- CE CE
- C-Tick C-Tick

## 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

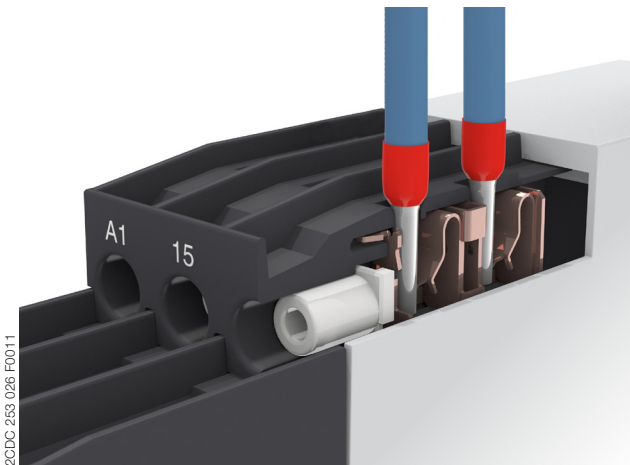
### Accessories

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

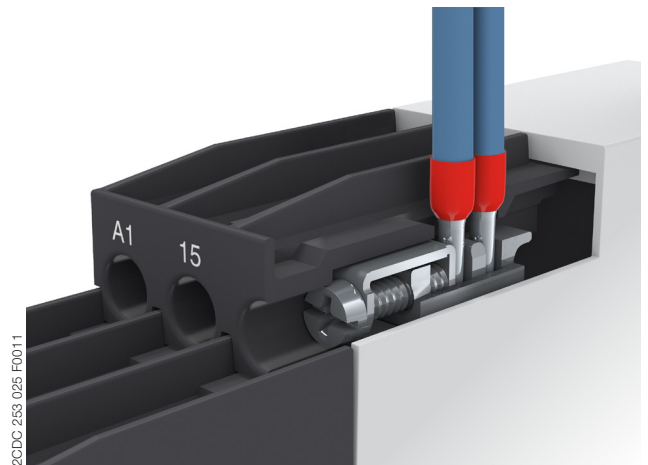


#### Push-in terminals

- 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 mm<sup>2</sup>, (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



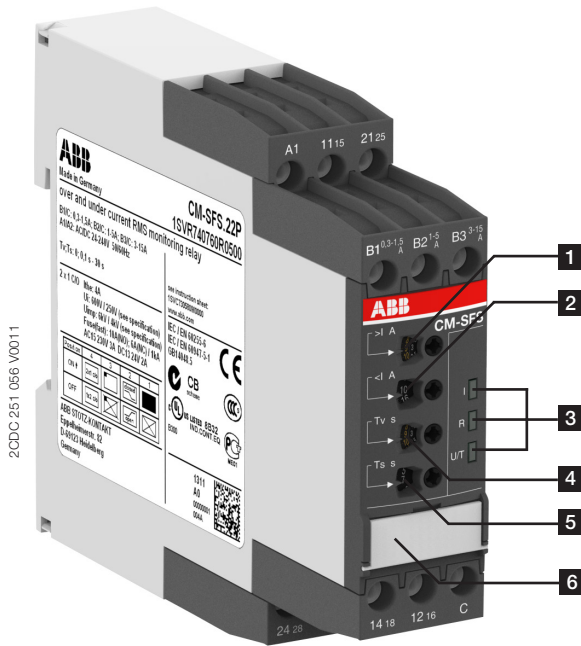
#### Double-chamber cage connection terminals

- Terminal spaces for different wire sizes:  
fine-strand with/without wire end ferrule:  
1 x 0.5-2.5 mm<sup>2</sup> (2 x 20 - 14 AWG),  
2 x 0.5-1.5 mm<sup>2</sup> (2 x 20 - 16 AWG)  
rigid:  
1 x 0.5-4 mm<sup>2</sup> (1 x 20 - 12 AWG),  
2 x 0.5-2.5 mm<sup>2</sup> (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 or 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 value  $\max (>I)$  for overcurrent, the threshold value  $\min (<I)$  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  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, 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 

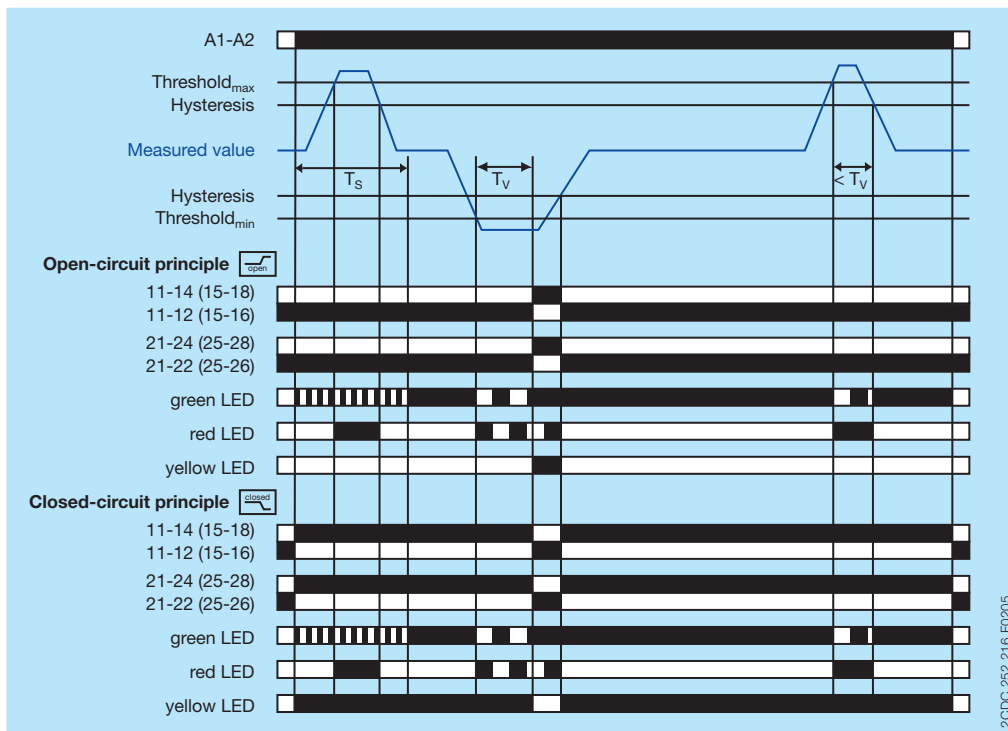
The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay  $T_S$  begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes  during the start-up delay  $T_S$  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) turns off.



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  $e_{max}$  ( $>I$ ) or drops below the threshold value  $e_{min}$  ( $<I$ ) 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  $e_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $e_{min}$  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.

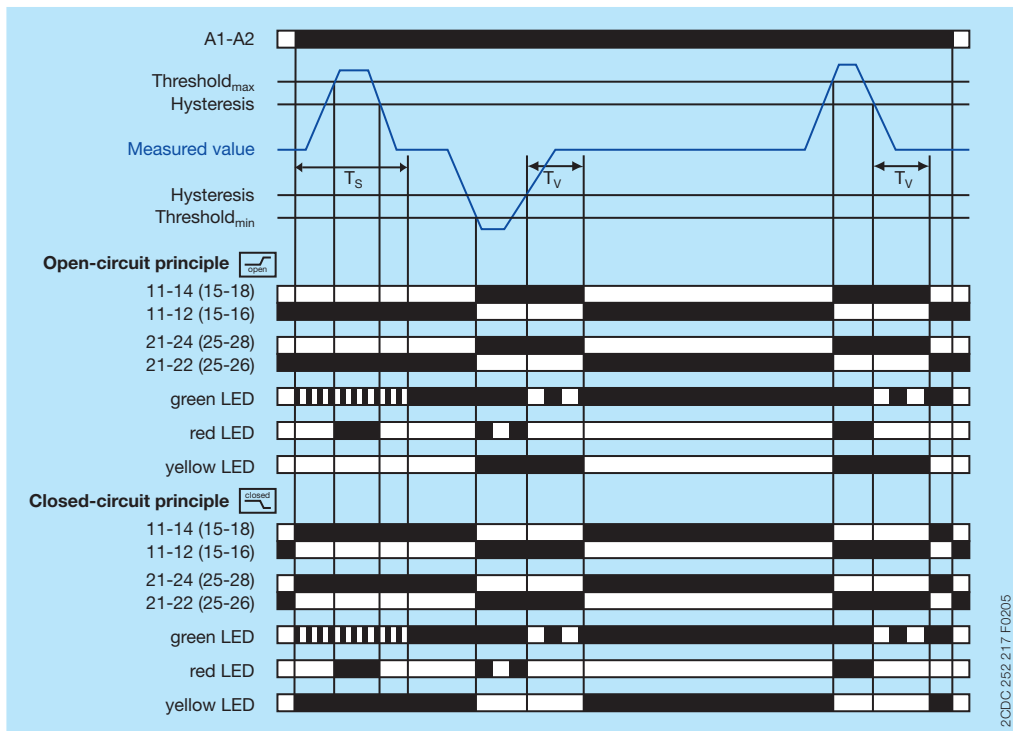
Closed-circuit principle 

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  $e_{max}$  ( $>I$ ) or drops below the threshold value  $e_{min}$  ( $<I$ ) 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  $e_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $e_{min}$  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.




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**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** 

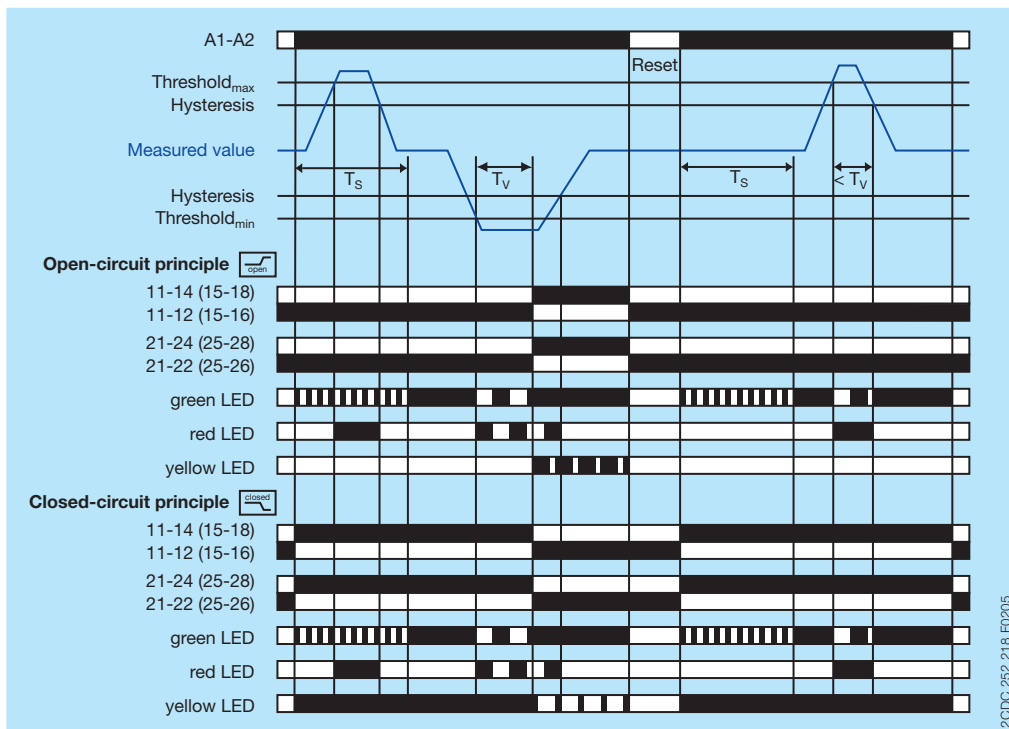
The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay  $T_S$  begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes  during the start-up delay  $T_S$  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.



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Current window monitoring 1x2 c/o (SPDT) contacts  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  $\square\square\square\square$  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  $\square\square\square$  (undercurrent) of the red LED.

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

If the measured value decreases below the threshold value  $v_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $v_{min}$  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.

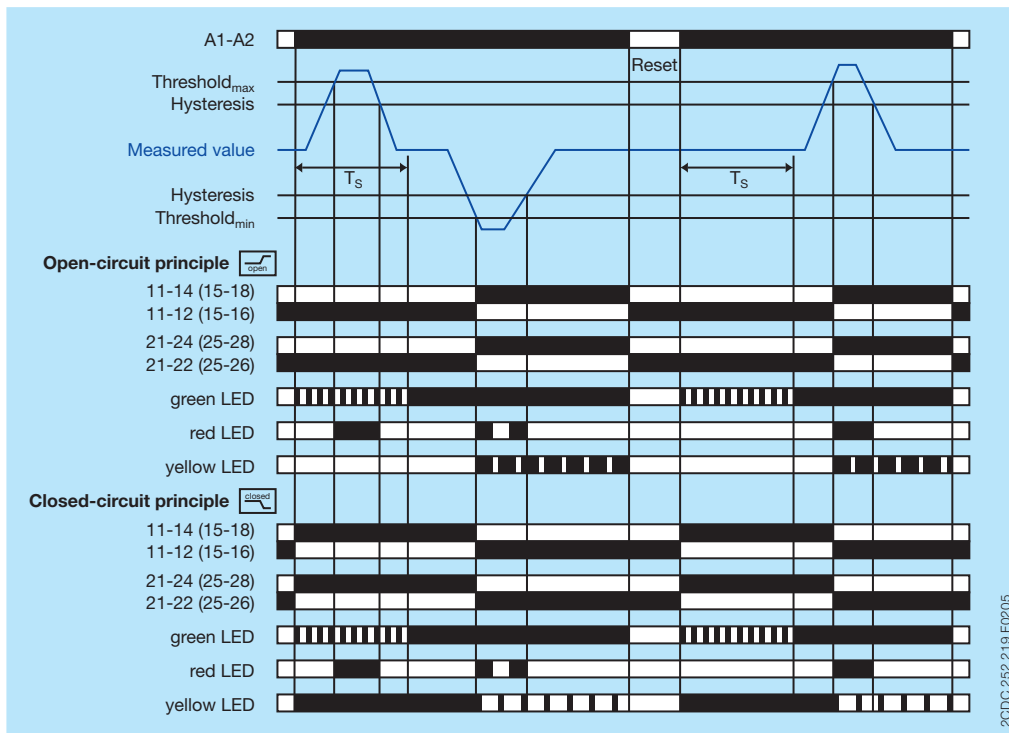
Closed-circuit principle

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  $\square\square\square\square$  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  $\square\square\square$  (undercurrent) of the red LED.

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

If the measured value decreases below the threshold value  $v_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $v_{min}$  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.







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

If the measured value decreases below the threshold value  $e_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $e_{min}$  plus the fixed hysteresis (5 %), the output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> ( $>I$ ), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> ( $<I$ ) 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 

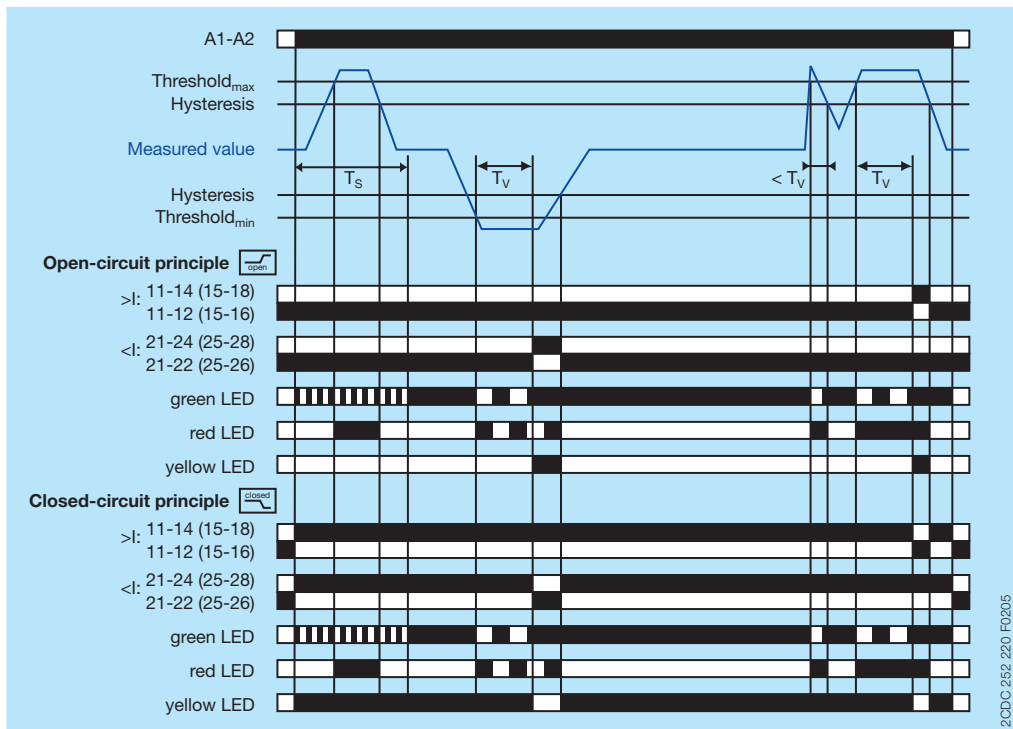
The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay  $T_S$  begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes  during the start-up delay  $T_S$  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.

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



If the measured value decreases below the threshold value  $e_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $e_{min}$  plus the fixed hysteresis (5 %), the output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> ( $>I$ ), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> ( $<I$ ) respectively, re-energizes, 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 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  $I_{max}$  (>I) or drops below the threshold value  $I_{min}$  (<I) when  $T_S$  is complete, the output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> (>I), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> (<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  $I_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $I_{min}$  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<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> (>I), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> (<I) respectively, de-energizes and the yellow LED (relay energized) turns off.

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

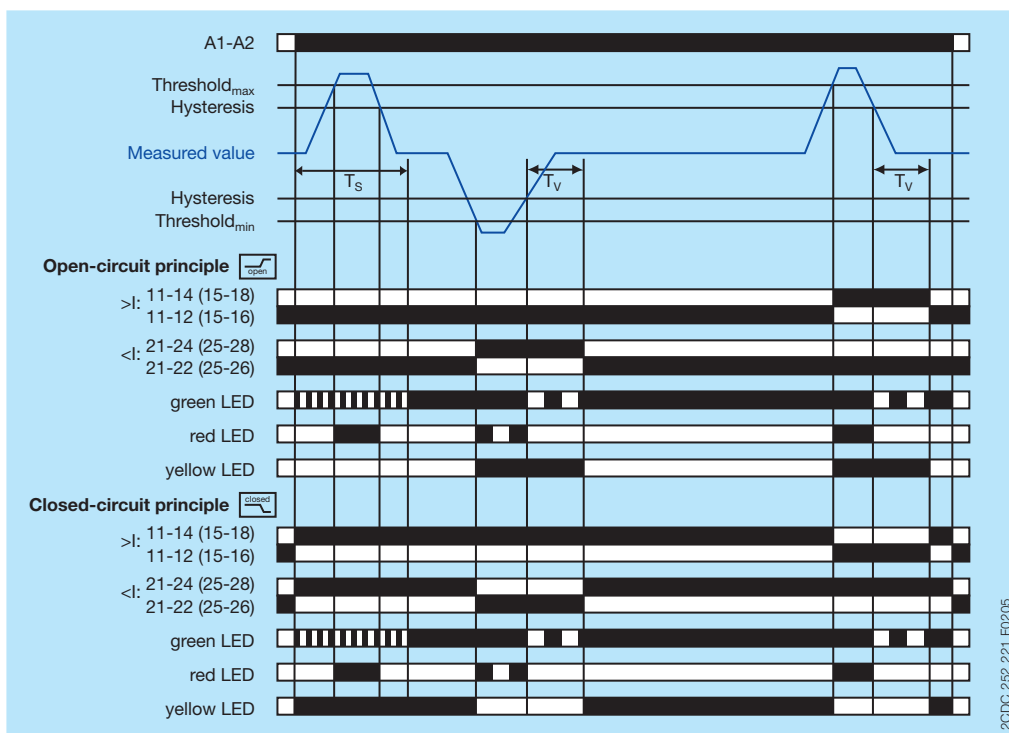
Closed-circuit principle 

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.



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



If the measured value decreases below the threshold value  $I_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $I_{min}$  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<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> (>I), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> (<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.



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


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

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

**Closed-circuit principle** 

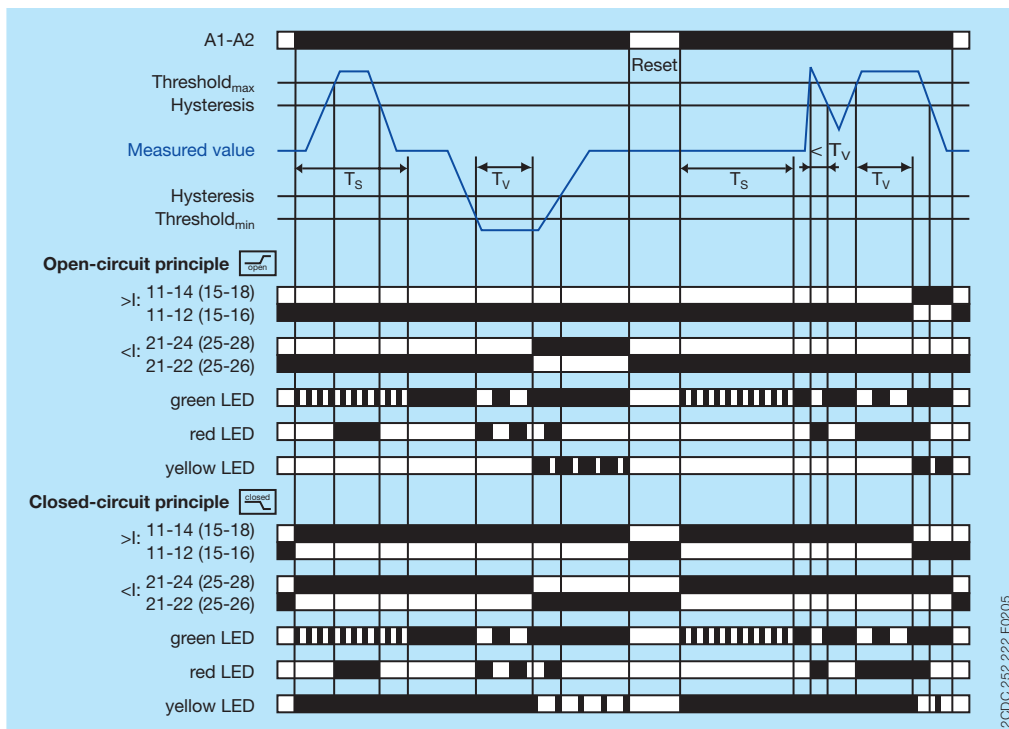
The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. When control supply voltage is applied to terminals A1-A2, the start-up delay  $T_S$  begins, the output relays energize and the yellow LED (relays energized) glows. The green LED flashes  during the start-up delay  $T_S$  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  $e_{max}$  ( $>I$ ) or drops below the threshold value  $e_{min}$  ( $<I$ ) 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  $e_{max}$  minus the fixed hysteresis (5 %) or is still below the threshold value  $e_{min}$  plus the fixed hysteresis (5 %), the output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> ( $>I$ ), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> ( $<I$ ) respectively, de-energizes and the yellow LED (relays energized) flashes .

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



2CDC 252 222 F0205

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  $I_{max}$  (>I) or drops below the threshold value  $I_{min}$  (<I) when  $T_S$  is complete, the output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> (>I), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> (<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  $I_{max}$  minus the fixed hysteresis (5 %) or exceeds the threshold value  $I_{min}$  plus the fixed hysteresis (5 %), the red LED turns off. The output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> (>I), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> (<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.

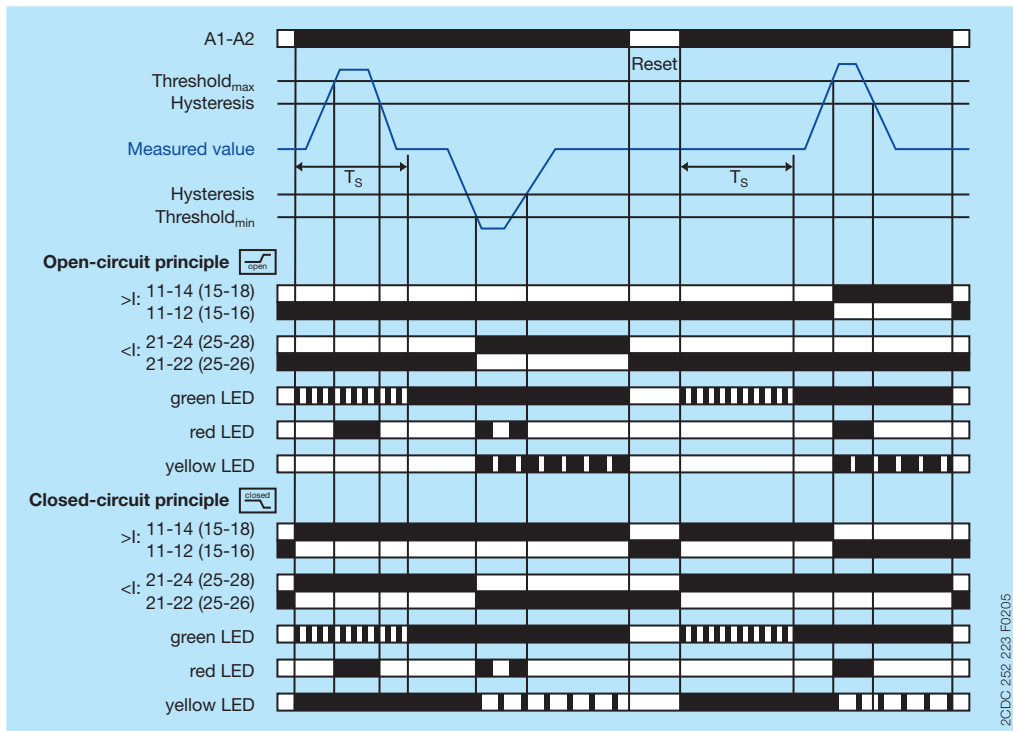
Closed-circuit principle

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.

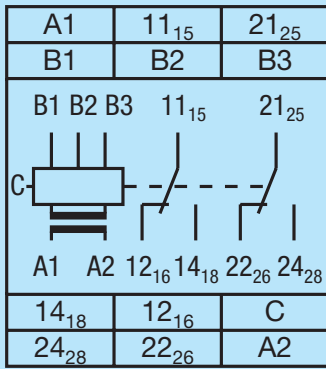
If the measured value exceeds the threshold value  $I_{max}$  (>I) or drops below the threshold value  $I_{min}$  (<I) when  $T_S$  is complete, the output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> (>I), or 21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub> (<I) respectively, de-energizes, the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

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



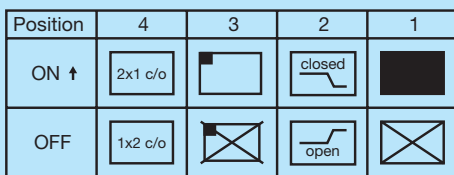
## Electrical connection



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

Connection diagram

## DIP switches



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  $T_a = 25\text{ °C}$  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 $\Omega$	1 $\Omega$	0.1 $\Omega$	0.05 $\Omega$	0.01 $\Omega$	0.0025 $\Omega$	
pulse overload capacity $t < 1\text{ s}$		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		$\Delta U \leq 0.5\%$						
Accuracy within the temperature range		$\Delta U \leq 0.06\% / \text{°C}$						
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)		$\pm 0.07\%$ of full scale						
Tolerance of the adjusted time delay		-						
Accuracy within the rated control supply voltage tolerance		$\Delta t \leq 0.5\%$						
Accuracy within temperature range		$\Delta t \leq 0.06\% / \text{°C}$						

### User interface

Indication of operational states		
Control supply voltage	U/T: green LED	 : control supply voltage applied  : start-up delay $T_S$ active  : tripping delay $T_V$ active
Measured value	U: red LED	 : overcurrent  : undercurrent
Relay status	R: yellow LED	 : output relay energized, no latching function  : output relay energized, active latching function  : 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 $\square$ / falls below $\square$ the adjusted threshold value, closed-circuit principle: output relays de-energize if measured value exceeds $\square$ / falls below $\square$ the adjusted threshold value)
Contact material		AgNi
Rated operational voltage $U_o$ (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 <sup>6</sup> switching cycles
Electrical lifetime	AC12, 230 V, 4 A	0.1 x 10 <sup>6</sup> 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	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 mm <sup>2</sup> (1 x 20-14 AWG) 2 x 0.5-1.5 mm <sup>2</sup> (2 x 20-16 AWG)	2 x 0.5-1.5 mm <sup>2</sup> (2 x 20-16 AWG)
	rigid	1 x 0.5-4 mm <sup>2</sup> (1 x 20-12 AWG) 2 x 0.5-2.5 mm <sup>2</sup> (2 x 20-14 AWG)	2 x 0.5-1.5 mm <sup>2</sup> (2 x 20-16 AWG)
Stripping length		8 mm (0.32 in)	
Tightening torque		0.6 - 0.8 Nm (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 <sub>i</sub> (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 <sub>imp</sub> (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

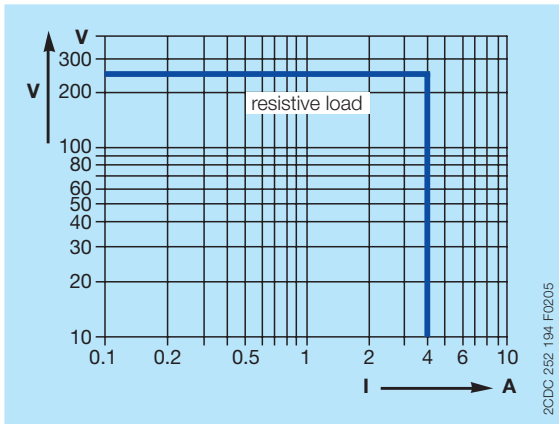
## Electromagnetic compatibility

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

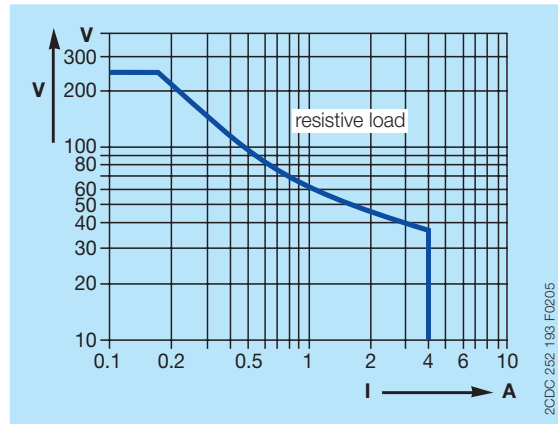


## Technical diagrams

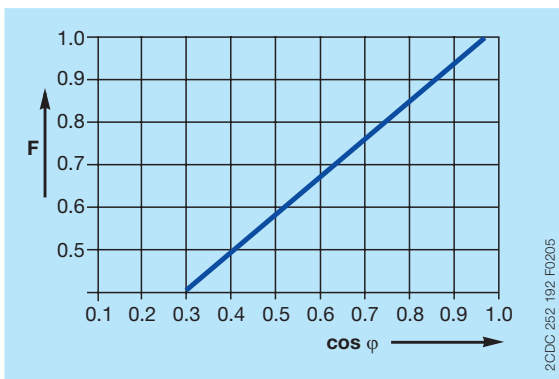
### Load limit curves



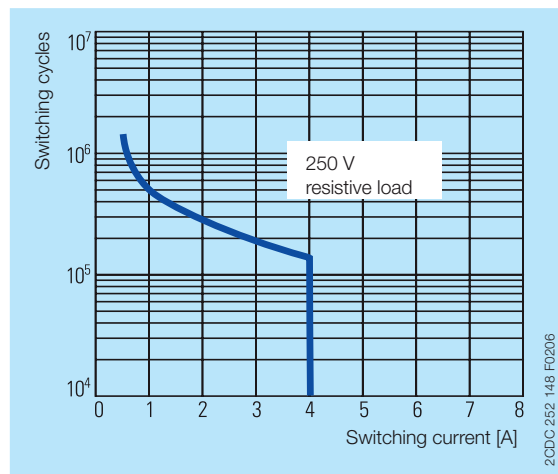
AC load (resistive)



DC load (resistive)



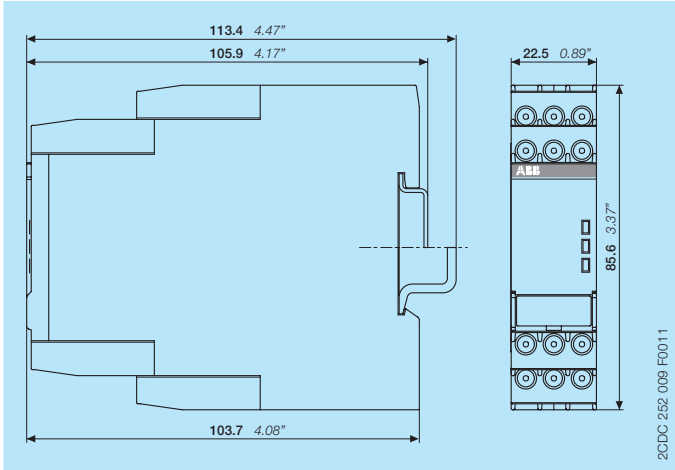
Derating factor F for inductive AC load



Contact lifetime

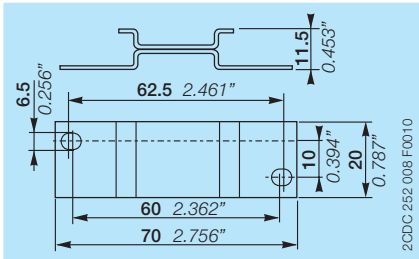
## Dimensions

in **mm** and *inches*

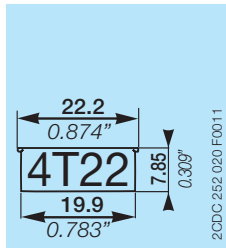


## Accessories

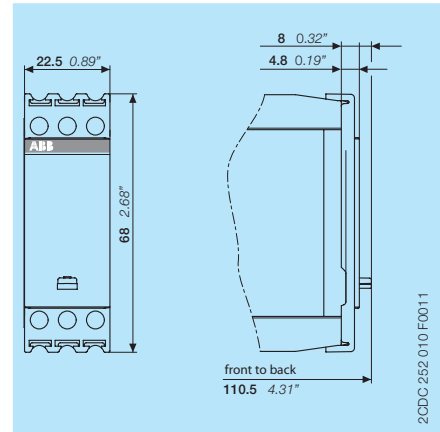
in **mm** and *inches*



**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](http://www.abb.com/lowvoltage) -> Control Products -> Electronic Relays and Controls -> Single Phase Monitors

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