Data sheet

Voltage monitoring relay CM-EFS.2 for single-phase AC/DC voltages

For the monitoring of voltages in single-phase AC/DC systems, ABB's CM range comprises a wide selection of powerful and compact devices, all featuring only 22.5 mm (0.89 in) width.

This range includes voltage monitoring relays for over- and undervoltage protection from 3 V to 600 V.

Incorporating ABB's long-term experience, the CM range provides your electric installation with the highest safety and reliability.

Characteristics

- Monitoring of DC and AC voltages from 3-600 V
- TRMS measuring principle
- One device includes 4 measuring ranges
- Over- and undervoltage monitoring configurable
- ON- or OFF-delay configurable
- Open- or closed-circuit principle configurable
- Latching function configurable
- Threshold values for >U and <U adjustable
- Fixed hysteresis of 5 %
- Tripping delay T_V adjustable 0; 0.1-30 s
- 1x2 c/o contacts (common signal) or 2x1 c/o contact (separate signals for >U and <U) configurable
- 22.5 mm (0.89 in) width
- 3 LEDs for indication of operational states

Approvals

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

Marks

CE	CE
	C-Tick

Order data

Voltage monitoring relay

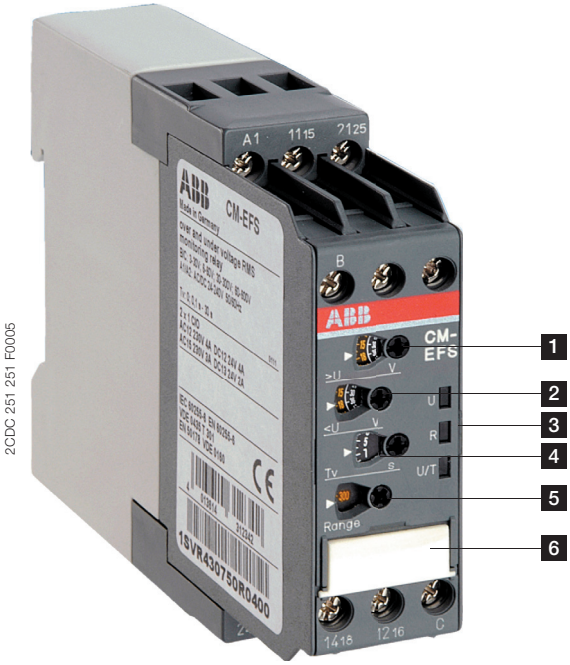
Type	Rated control supply voltage	Measuring ranges	Order code
CM-EFS.2	24-240 V AC/DC	3-30 V, 6-60 V, 30-300 V, 60-600 V	1SVR 430 750 R0400

Accessories

Type	Description	Order code
ADP.01	Adapter for screw mounting	1SVR 430 029 R0100
MAR.02	Marker label for devices with DIP switches	1SVR 430 043 R0000
COV.01	Sealable transparent cover	1SVR 430 005 R0100

Functions

Operating controls



1 **Adjustment of the hysteresis >U for overvoltage**

2 **Adjustment of the threshold value <U for undervoltage**

3 **Indication of operational states**

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

R: yellow LED – relay status

U: red LED – over- / undervoltage

4 **Adjustment of the tripping delay T_v**

5 **Adjustment of the measuring range**

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

Application

The window voltage monitoring relay CM-EFS.2 can be used for the simultaneous monitoring of over- (>U) and undervoltages (<U) in single-phase AC and/or DC systems. Depending on the configuration, one c/o contact each 1x2 c/o or both c/o contacts in parallel 2x1 c/o can be used for the over- and undervoltage monitoring. Open- open or closed-circuit principle closed as well as an adjustable ON or OFF tripping delay are configurable.

Operating mode

The CM-EFS.2 has 2 c/o contacts and includes 4 measuring ranges: 3-30 V, 6-60 V, 30-300 V, and 60-600 V.

The unit is adjusted with potentiometers and switches on the top of the unit. The selection of: ON-delay or OFF-delay , open- open or closed-circuit principle closed, latching function ON or OFF and 2x1 c/o 2x1 c/o or 1x2 c/o contacts 1x2 c/o is made with DIP switches. A potentiometer, with direct reading scale, allows the adjustment of the threshold $value_{max}$ (>U) for overvoltage and the threshold $value_{min}$ (<U) for undervoltage. There is also adjustment for the tripping delay T_V . The tripping delay T_V is adjustable over a range of instantaneous to a 30 s delay. The hysteresis is fixed at 5 %.

Function diagram: voltage window monitoring 1x2 c/o contacts ON-delayed without latching

Open-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

If the measured value exceeds the threshold value$_{max}$ (>U) or drops below the threshold value$_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) 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 supply voltage is interrupted, the green LED turns off.

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

If the measured value exceeds the threshold value$_{max}$ (>U) or drops below the threshold value$_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) respectively.

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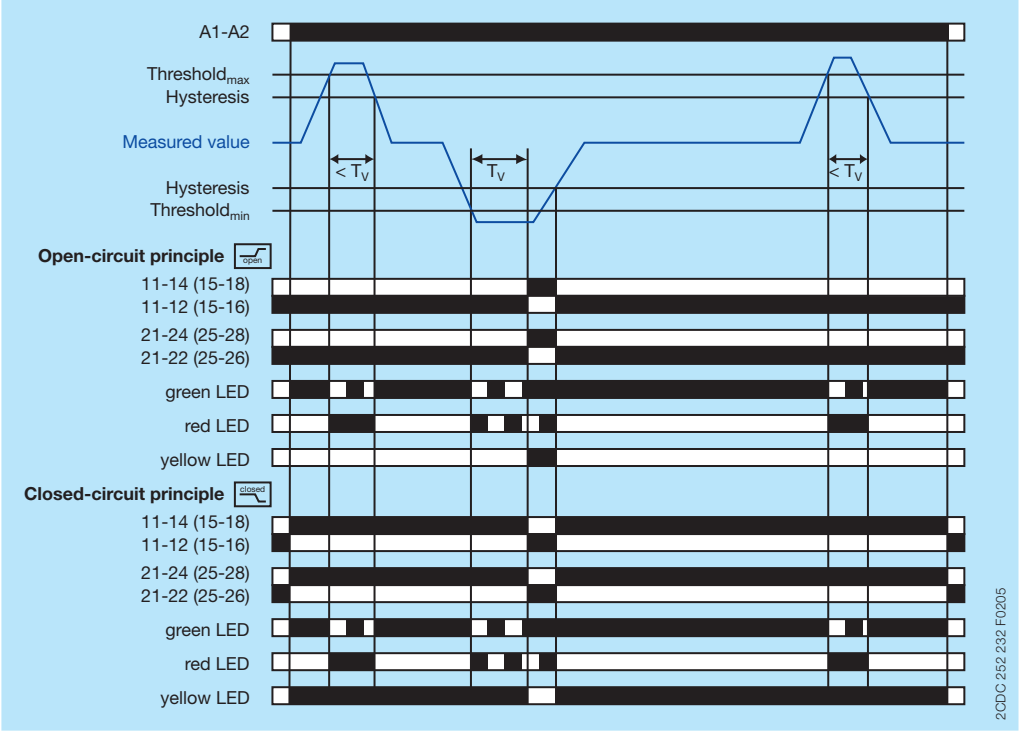
If supply voltage is interrupted, the output relays de-energize and the yellow and green LEDs turn off.



Function diagram: voltage window monitoring 1x2 c/o contacts OFF-delayed without latching

Open-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

If the measured value exceeds the threshold value$_{max}$ (>U) or drops below the threshold value$_{min}$ (<U), the output relays energize, the yellow LED (relays energized) glows and the red LED glows (overvoltage), or flashes (undervoltage) 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 supply voltage is interrupted, the green LED turns off.

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

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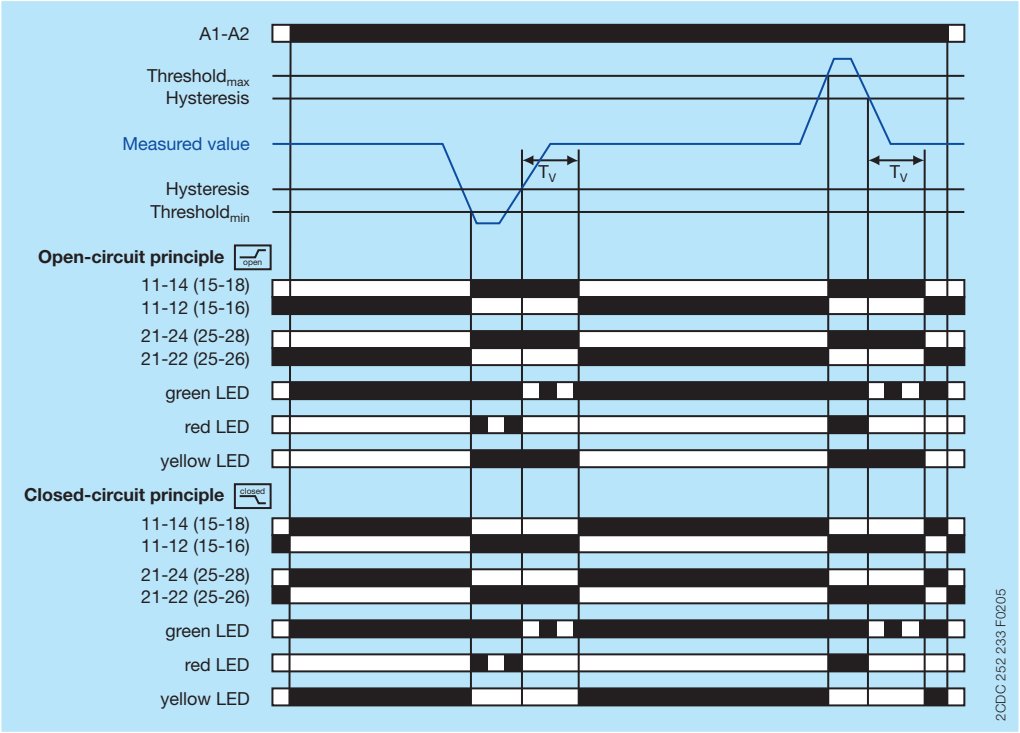

Function diagram: voltage window monitoring 1x2 c/o contacts ON-delayed with latching

Open-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

If the measured value exceeds the threshold value$_{max}$ (>U) or drops below the threshold value$_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) 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 supply voltage is interrupted (reset), the output relays de-energize and the yellow and green LEDs turn off.

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

If the measured value exceeds the threshold value$_{max}$ (>U) or drops below the threshold value$_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) respectively.

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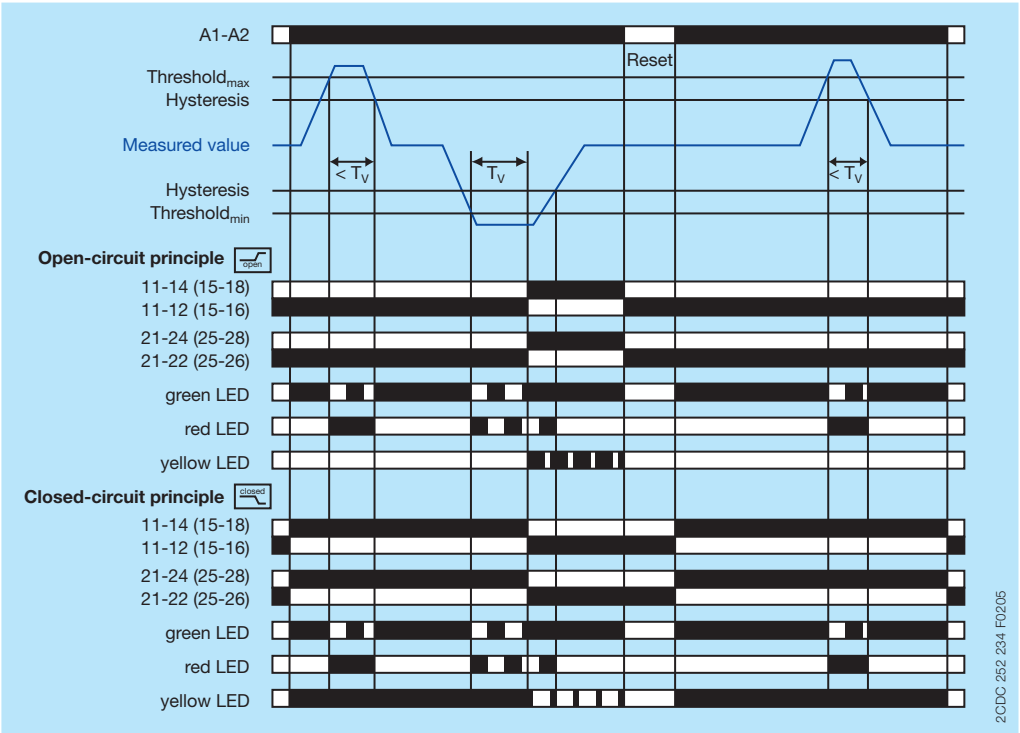
If the measured value decreases below the threshold value$_{max}$ minus the fixed hysteresis (5 %) or exceeds the threshold value$_{min}$ plus the fixed hysteresis (5 %), the red LED turns off. The output relays remain de-energized (latching function).

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



Function diagram: voltage window monitoring 1x2 c/o contacts OFF-delayed with latching

Open-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

If the measured value exceeds the threshold value$_{max}$ (>U) or drops below the threshold value$_{min}$ (<U), the output relays energize, the yellow LED (relays energized) flashes and the red LED glows (overvoltage), or flashes (undervoltage) 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 supply voltage is interrupted (reset), the output relays de-energize and the yellow and green LEDs turn off.

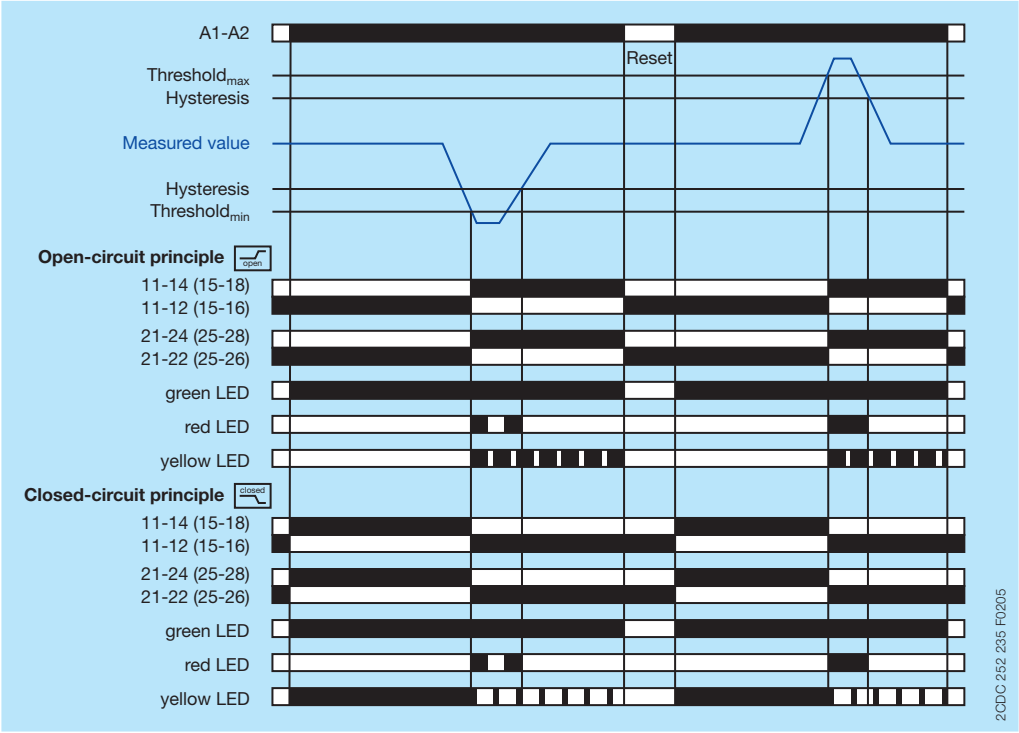
Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

If the measured value exceeds the threshold value$_{max}$ (>U) or drops below the threshold value$_{min}$ (<U), the output relays de-energize, the yellow LED (relays energized) flashes and the red LED glows (overvoltage), or flashes (undervoltage) 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 de-energized (latching function).

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



Function diagram: voltage window monitoring 2x1 c/o contact ON-delayed without latching

Open-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

If the measured value exceeds the threshold $value_{max}$ (>U) or drops below the threshold $value_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) 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} (>U), or 21_{25}-22_{26}/24_{28} (<U) 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} (>U), or 21_{25}-22_{26}/24_{28} (<U) respectively, de-energizes and the red and yellow LEDs turn off.

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

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

If the measured value exceeds the threshold $value_{max}$ (>U) or drops below the threshold $value_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) 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} (>U), or 21_{25}-22_{26}/24_{28} (<U) respectively, de-energizes and the yellow LED (relays energized) turns off.

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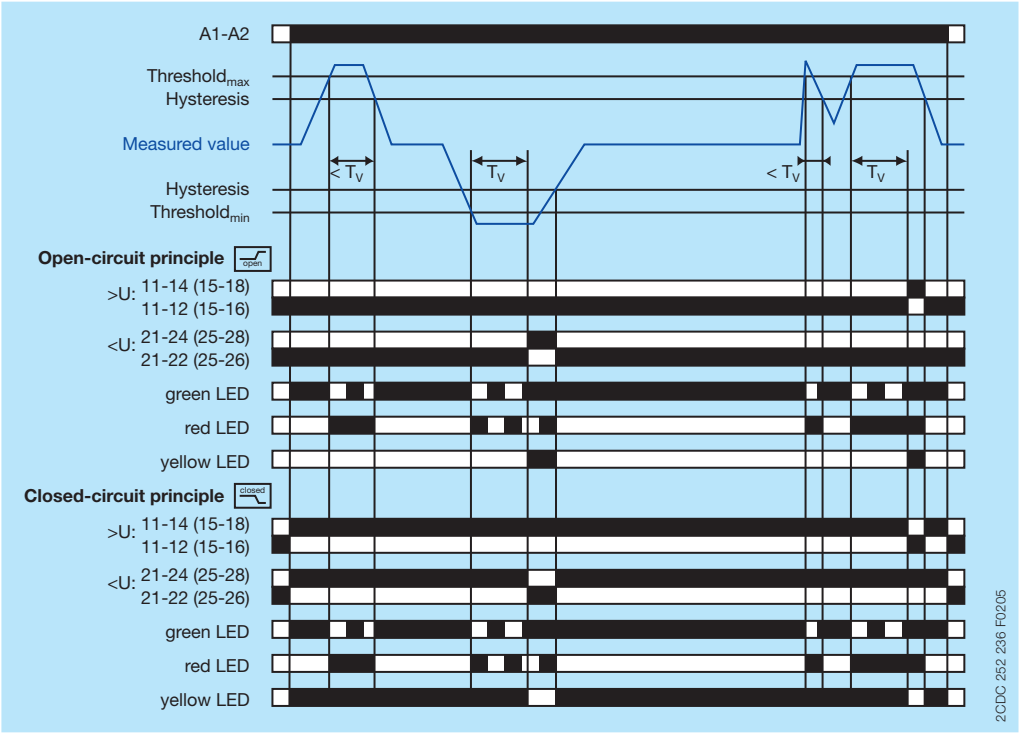
If supply voltage is interrupted, the output relays de-energize and the yellow and green LEDs turn off.



Function diagram: voltage window monitoring 2x1 c/o contact OFF-delayed without latching

Open-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

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

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

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

If the measured value exceeds the threshold $value_{max}$ (>U) or drops below the threshold $value_{min}$ (<U), the output relay 11_{15}-12_{16}/14_{18} (>U), or 21_{25}-22_{26}/24_{28} (<U) respectively, de-energizes, the yellow LED turns off and the red LED glows (overvoltage), or flashes (undervoltage) respectively.

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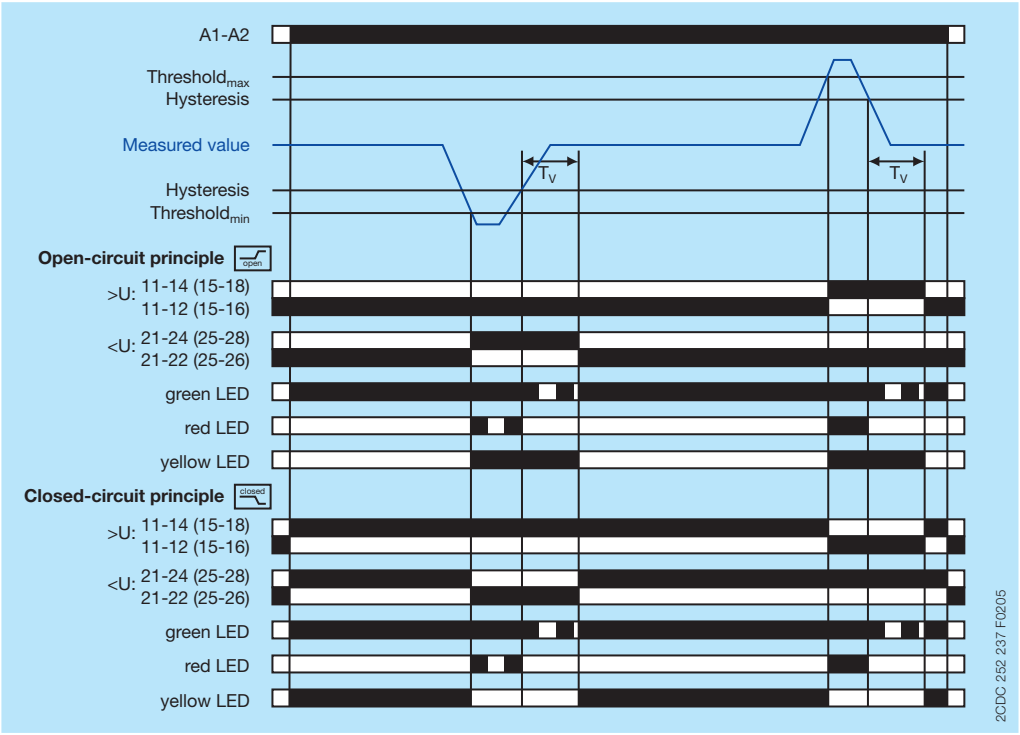
Timing of T_V is displayed by the flashing green LED. When T_V is complete, the output relay 11_{15}-12_{16}/14_{18} (>U), or 21_{25}-22_{26}/24_{28} (<U) respectively, energizes and the yellow LED (relay energized) glows.

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



Function diagram: voltage window monitoring 2x1 c/o contact 2x1 c/o ON-delayed with latching

Open-circuit principle open

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

If the measured value exceeds the threshold $value_{max}$ (>U) or drops below the threshold $value_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) respectively.

Timing of T_V is displayed by the flashing green 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 relay 11_{15}-12_{16}/14_{18} (>U), or 21_{25}-22_{26}/24_{28} (<U) respectively, remains energized (latching function).

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

Closed-circuit principle closed

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

If the measured value exceeds the threshold $value_{max}$ (>U) or drops below the threshold $value_{min}$ (<U), the tripping delay T_V starts and the red LED glows (overvoltage), or flashes (undervoltage) 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} (>U), or 21_{25}-22_{26}/24_{28} (<U) respectively, de-energizes and the yellow LED (relays energized) flashes.

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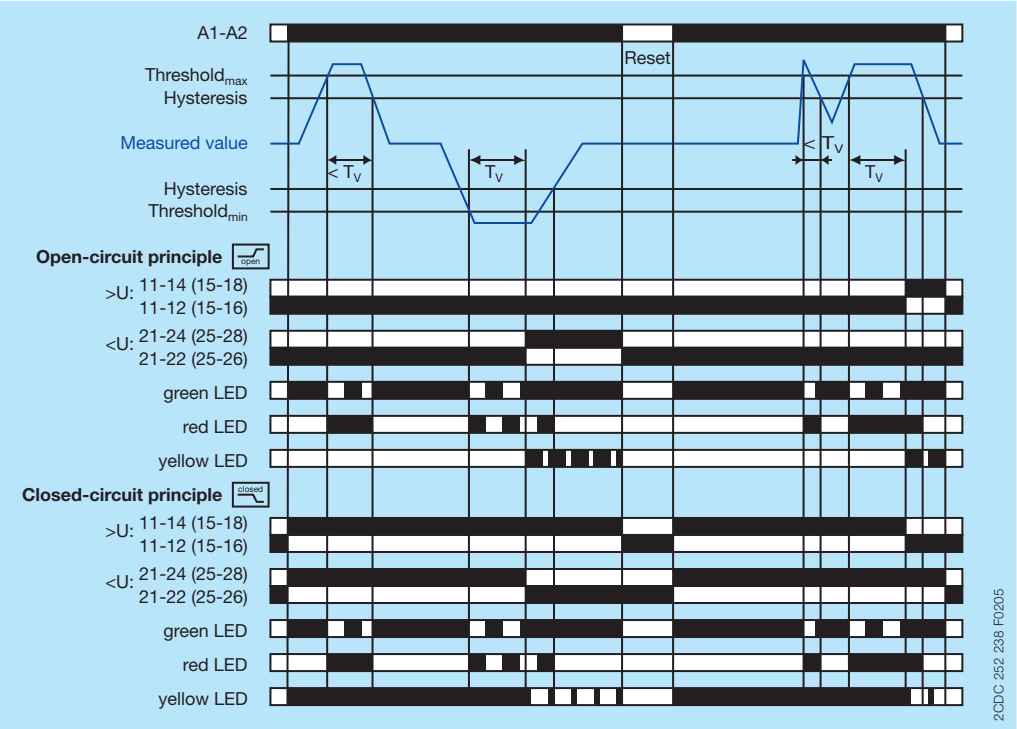
If supply voltage is interrupted (reset), the yellow and green LEDs turn off. The output relays energize again when supply voltage is re-applied.



Function diagram: voltage window monitoring 2x1 c/o contact OFF-delayed with latching

Open-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. The supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

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

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Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When supply voltage is applied to terminals A1-A2, the output relays energize and the green and yellow LED (relays energized) glow.

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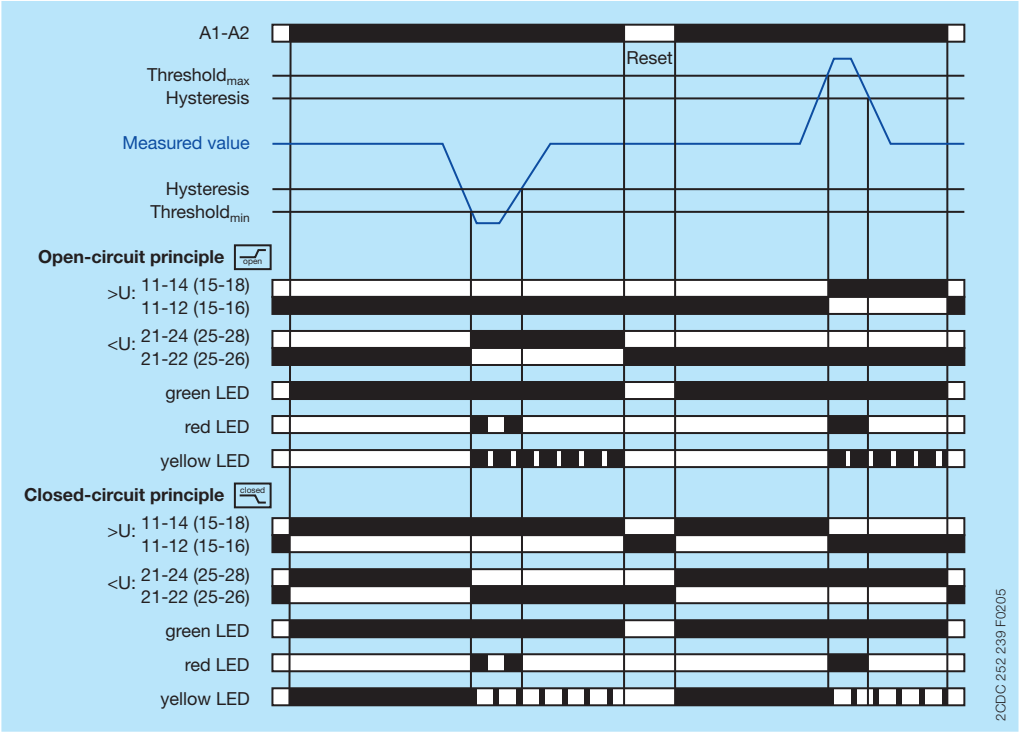
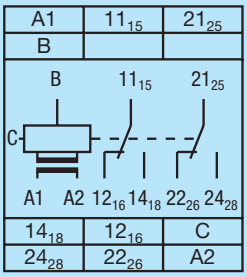


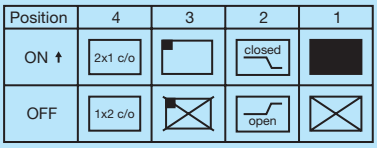
Connection diagram



2CDC 252 207 F0005

A1-A2	Control supply voltage
B-C	Measuring range: 3-30 V, 6-60 V, 30-300 V, 60-600 V
11_{15}-12_{16}/14_{18} 21_{25}-22_{26}/24_{28}	Output contacts - open- or closed-circuit principle

DIP switch functions



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 contact
	OFF	1x2 c/o contacts

OFF = Default

Technical data

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

Input circuit

Supply circuit		**A1-A2**
Rated control supply voltage U_S		24-240 V AC
Rated control supply voltage tolerance		-15...+10 %
Rated frequency		50/60 Hz
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
On-period		100 %
Power failure buffering time		20 ms
Transient overvoltage protection		varistors

Measuring circuit		**B-C**
Monitoring function		over- and undervoltage monitoring configurable
Measuring method		TRMS measuring principle
Measuring inputs	terminal connection	B-C
	measuring range	3-30 V, 6-60 V, 30-300 V, 60-600 V
	input resistance	600 kΩ
	pulse overload capacity t < 1 s	800 V
	continous capacity	660 V
Threshold value		>U and <U 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 control supply voltage tolerance		ΔU ≤ 0.5 %
Accuracy within the temperature range		ΔU ≤ 0.06 % / °C
Transient overvoltage protection		varistors

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

Indication of operational states

Control supply voltage	U/T: green LED	: control supply voltage applied : tripping delay T_V active
Measured value	U: red LED	: overvoltage : undervoltage
Relay status	R: yellow LED	: relay energized, no latching function : relay energized, active latching function : relay de-energized, active latching function

Output circuits

Kind of output	11-12/14 21-22/24	1st relay 2nd relay 1 x 2 c/o contacts (common signal) or 2 x 1 c/o contact (separate signal for >U and <U) 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 (Make/Break) 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		available on request
Dimensions (W x H x D)	product dimensions	22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)
	packaging dimensions	81 x 106 x 26 mm (3.19 x 4.17 x 1.02 in)
Weight	net weight	0.142 kg (0.313 lb)
	gross weight	0.164 kg (0.362 lb)
Material of enclosure		PA 6
Mounting		DIN rail (IEC/EN 60715)
Mounting position		any
Degree of protection	enclosure	IP50
	terminals	IP20

Electrical connection

Wire size	fine-strand with(out) wire end ferrule	2 x 0.75-2.5 mm² (2 x 18-14 AWG)
	rigid	2 x 0.5-4 mm² (2 x 20-12 AWG)
Stripping length		7 mm (0.28 in)
Tightening torque		0.6-0.8 Nm (5.31-7.08 lb.in)

Environmental data

Ambient temperature	operation	-20...+60 °C
	storage	-40...+85 °C
Damp heat (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 (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 664, IEC/EN 60255-5)		3
Overvoltage category (VDE 0110, IEC 664, IEC/EN 60255-5)		III

Standards

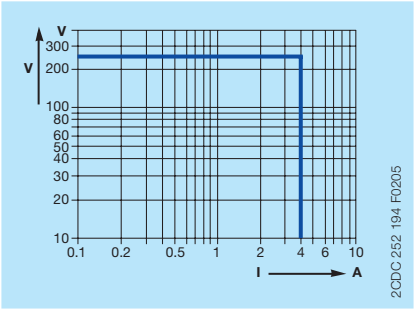
Product standard	IEC/EN 60255-6
Low Voltage Directive	2006/95/EC
EMC Directive	2004/108/EC
RoHS Directive	2002/95/EC

Electromagnetic compatibility

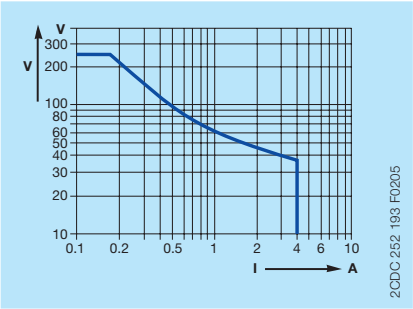
Interference immunity to		IEC/EN 61000-6-2
electrostatic discharge	IEC/EN 61000-4-2	Level 3
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3
surge	IEC/EN 61000-4-5	Level 3
conducted disturbances, induced by radio-frequency 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

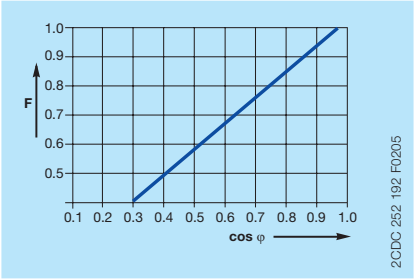
Load limit curves



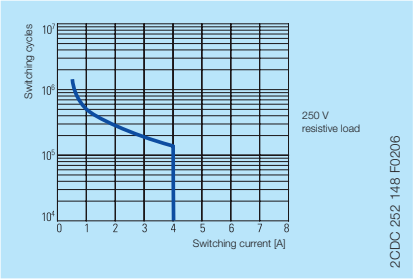
AC load (resistive)



DC load (resistive)



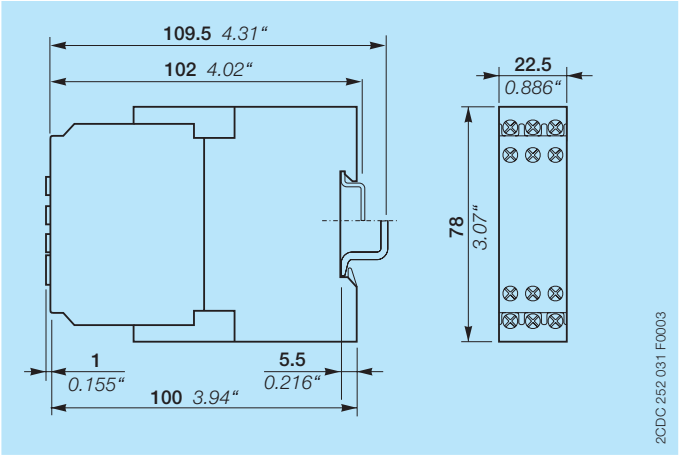
Derating factor F for inductive AC load



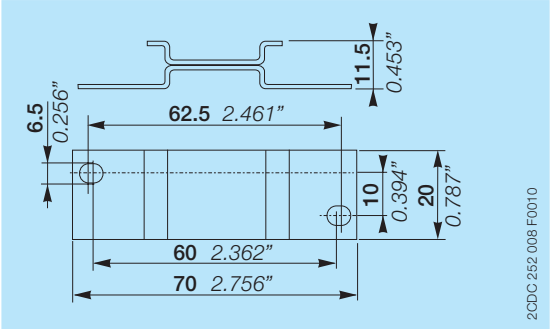
Contact lifetime

Dimensions

in **mm** and inches

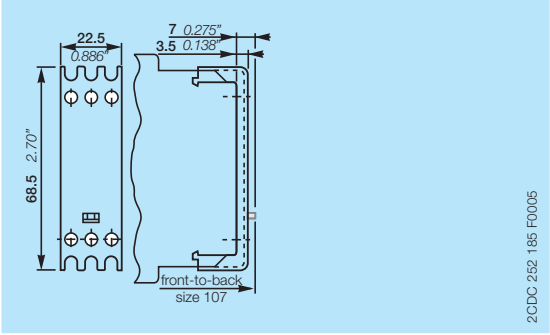


CM-EFS.2



ADP.01 - Adapter for screw mounting

MAR.02 - Marker label for devices with DIP switches



COV.01 - Sealable transparent cover

Further documentation

Document title	Document type	Document number
Electronic products and relays	Technical catalogue	2CDC 110 004 C020x
CM-EFS.2	Instruction manual	1SVC 437 752 M1000

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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