Data sheet

Voltage monitoring relay CM-ESS.M
For single-phase AC/DC voltages

The CM-ESS.M is an electronic voltage monitoring relay that provides reliable monitoring of voltages as well as detection of phase loss.

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).



Characteristics

- Monitoring of DC and AC voltages (3-600 V)
- TRMS measuring principle
- One device includes 4 measuring ranges
- Over- or undervoltage monitoring configurable
- Open- or closed-circuit principle configurable
- Latching function configurable
- Hysteresis adjustable (3-30 %)
- 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
- 2 c/o (SPDT) contacts
- 22.5 mm (0.89 in) width
- 3 LEDs for status indication

Approvals

UL 508, CAN/CSA C22.2 No.14

GL (pending)

GOST

CB Scheme

CCC

RMRS

Marks

CE

C-Tick

Order data

Voltage monitoring relay

Type	Rated control supply voltage	Connection technology	Measuring ranges	Order code
CM-ESS.MP	24-240 V AC/DC	Push-in terminals	3-30 V, 6-60 V, 30-300 V, 60-600 V	1SVR 740 830 R0500
CM-ESS.MS		Screw type terminals		1SVR 730 830 R0500

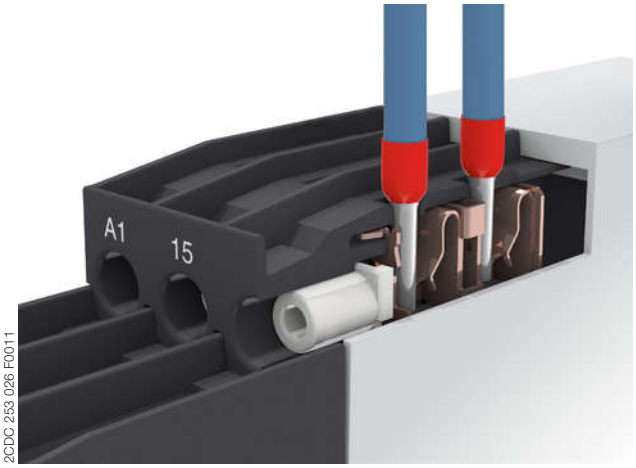
Accessories

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



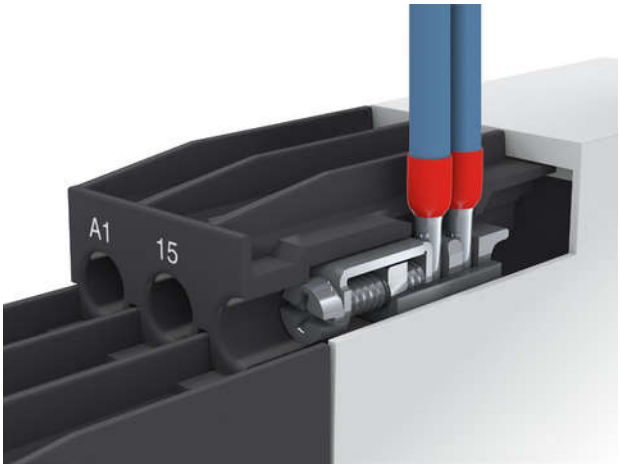
2CDC 253 026 F0011

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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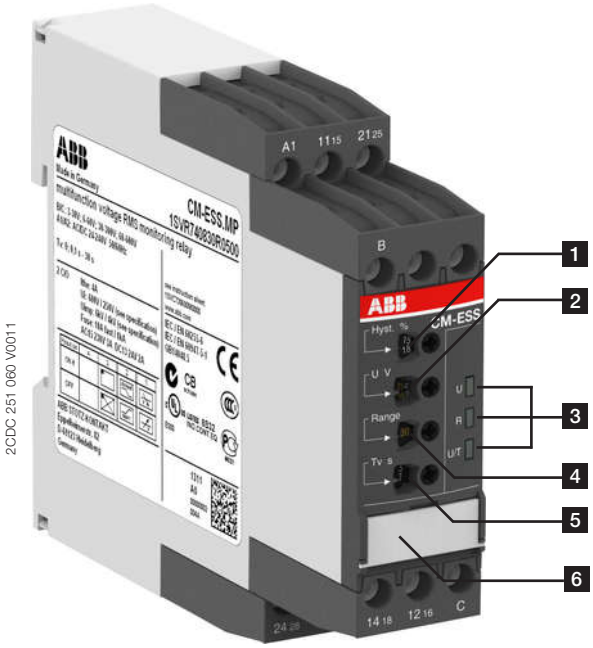
Double-chamber cage connection terminals

- 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 hysteresis**

2 **Adjustment of the threshold value**

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 measuring range**

5 **Adjustment of the tripping delay T_V**

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

When compared with our previous version, the position of the adjustment potentiometers 4 and 5 have changed places.

Application

The multifunctional voltage monitoring relays CM-ESS.M are designed for use in single-phase AC and/or DC systems for over- or undervoltage monitoring as well as detection of phase loss. The devices operate over an universal range of supply voltages, provide an adjustable tripping delay and work according to the open-or closed-circuit principle.

Operating mode

The CM-ESS.2 have 2 c/o (SPDT) contacts and include 4 measuring ranges: 3-30 V, 6-60 V, 30-300 V and 60-600 V.

The units are adjusted with front-face operating controls. The selection of over- or undercurrent monitoring, open- or closed-circuit principle and latching function ON or OFF is made with DIP switches. Potentiometers, with direct reading scale, allow the adjustment of the threshold value U, the hysteresis % and the tripping delay T_V. The hysteresis % is adjustable within a range of 3 to 30 % of the threshold value and the tripping delay T_V over a range of instantaneous to a 30 s delay. Timing is displayed by a flashing green LED labelled U/T.

Function diagrams

Overvoltage monitoring without latching

Open-circuit principle

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

If the measured value exceeds the adjusted threshold value, the tripping delay T_V starts and the red LED (overvoltage) glows. 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 minus the adjusted hysteresis, the output relays energize and the yellow LED (relay energized) glows.

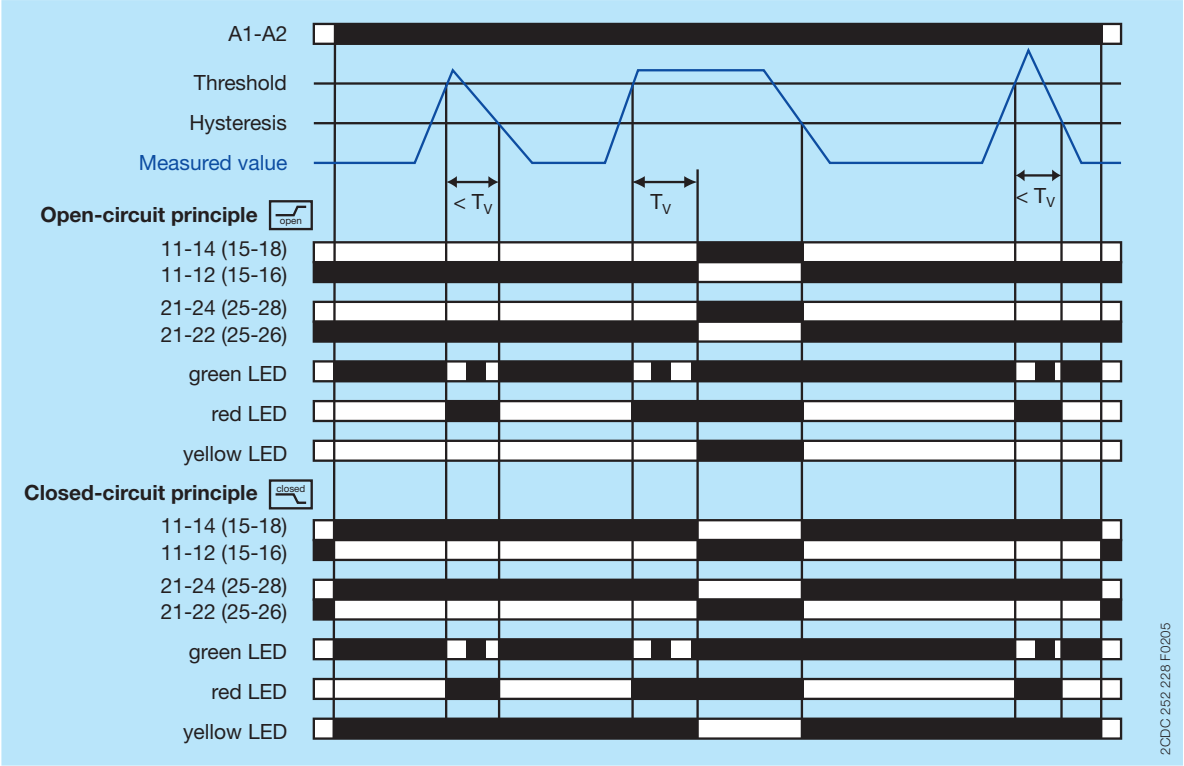
If the measured value drops below the threshold value minus the adjusted hysteresis, the output relays de-energize and the red and yellow LEDs turn off. If control supply voltage is interrupted, the green LED turns off.

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When control 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 adjusted threshold value, the tripping delay T_V starts and the red LED glows (overvoltage). 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 minus the adjusted hysteresis, the output relays de-energize and the yellow LED turns off.

If the measured value decreases below the threshold value minus the hysteresis, the output relays re-energize, the yellow LEDs glows and the red LED turns off. If control supply voltage is interrupted, the output relays de-energize and the green and yellow LEDs turn off.



Undervoltage monitoring without latching

Open-circuit principle

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

If the measured value decreases below the adjusted threshold value, the tripping delay T_V starts and the red LED (undervoltage) flashes ⎍⎍⎍. Timing of T_V is displayed by the flashing ⎍⎍⎍ green LED. When T_V is complete and the measured value is still below the threshold value plus the adjusted hysteresis, the output relays energize and the yellow LED (relay energized) glows.

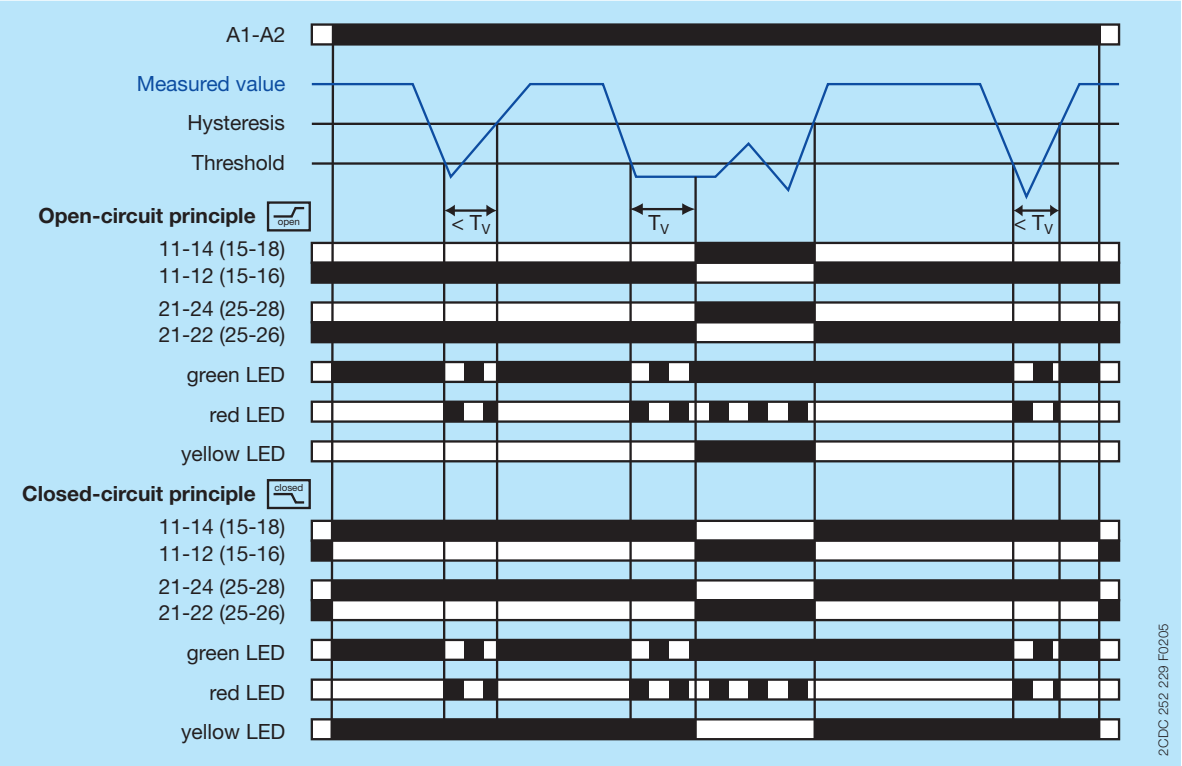
If the measured value exceeds the threshold value plus the adjusted hysteresis, the output relays de-energize and the red and yellow LEDs turn off. If control supply voltage is interrupted, the green LED turns off.

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When control 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 decreases below the adjusted threshold value, the tripping delay T_V starts and the red LED flashes ⎍⎍⎍ (undervoltage). Timing of T_V is displayed by the flashing ⎍⎍⎍ green LED. When T_V is complete and the measured value is still below the threshold value plus the adjusted hysteresis, the output relays de-energize and the yellow LED turns off.

If the measured value exceeds the threshold value plus the hysteresis, 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 green and yellow LEDs turn off.



Overvoltage monitoring with latching

Open-circuit principle

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

If the measured value exceeds the adjusted threshold value, the tripping delay T_V starts and the red LED glows (overvoltage). 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 minus the adjusted hysteresis, the output relays energize and the yellow LED (relay energized) flashes.

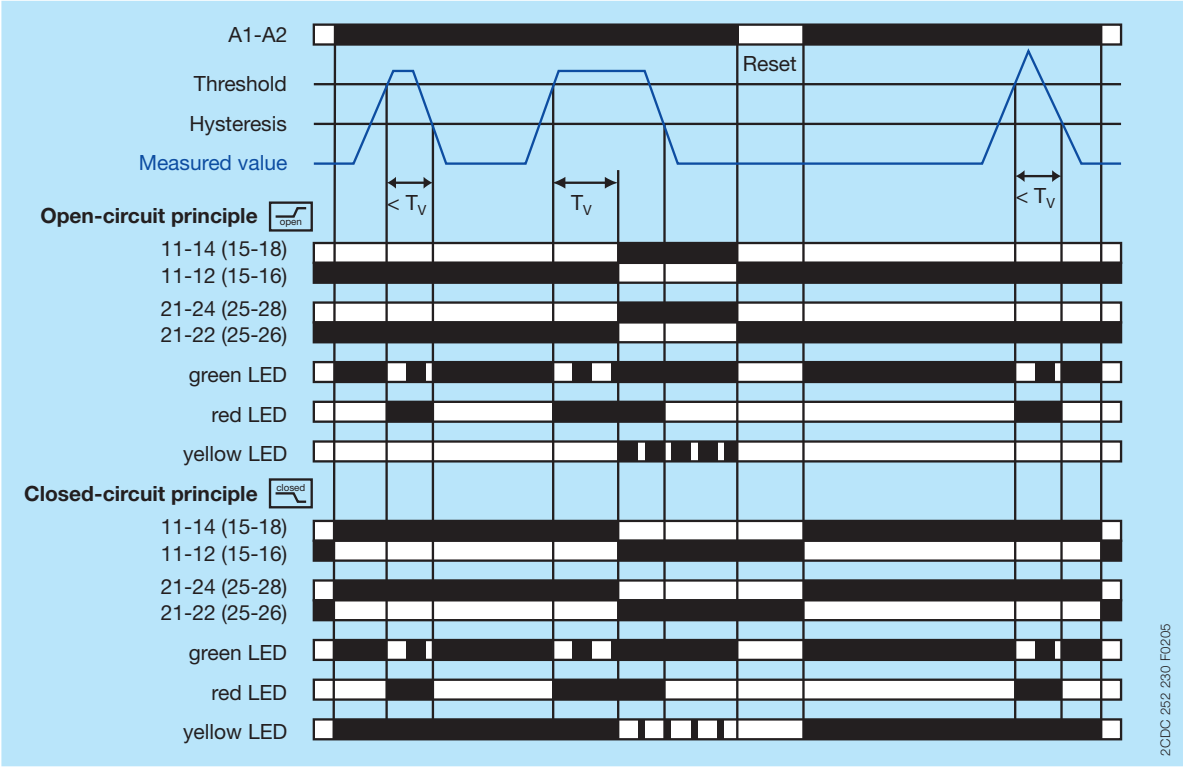
If the measured value decreases below the threshold value minus the hysteresis, the red LED turns off. The output relays remain energized (latching function). If control supply voltage is interrupted (reset), the output relays de-energize and the green and yellow LEDs turn off.

Closed-circuit principle

The voltage to be monitored (measured value) is applied to terminals B-C. When control 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 adjusted threshold value, the tripping delay T_V starts and the red LED glows (overvoltage). 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 minus the adjusted hysteresis, the output relays de-energize and the yellow LED flashes.

If the measured value decreases below the threshold value minus the hysteresis, the red LED turns off. The output relays remain de-energized (latching function). If control supply voltage is interrupted (reset), the green and yellow LEDs turn off. The output relays energize again when control supply voltage is re-applied.



Undervoltage monitoring with latching

Open-circuit principle

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

If the measured value decreases below the adjusted threshold value, the tripping delay T_V starts and the red LED flashes (undervoltage). Timing of T_V is displayed by the flashing green LED. When T_V is complete and the measured value is still below the threshold value plus the adjusted hysteresis, the output relays energize and the yellow LED (relays energized) flashes.

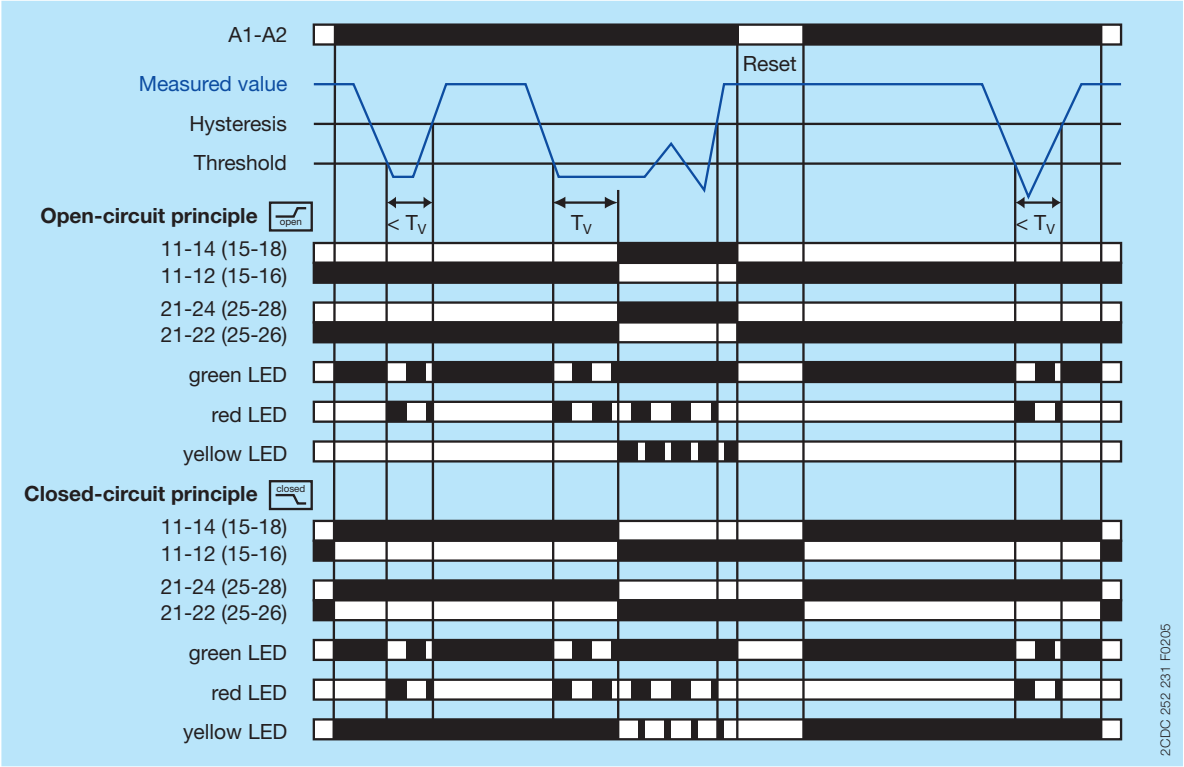
If the measured value exceeds the threshold value plus the hysteresis, the red LED turns off. The output relays remain energized (latching function). If control supply voltage is interrupted (reset), the output relays de-energize and the green and yellow LEDs turn off.

Closed-circuit principle

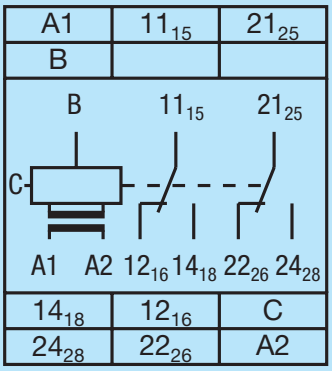
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If the measured value exceeds the threshold value plus the hysteresis, the red LED turns off. The output relays remain de-energized (latching function). If control supply voltage is interrupted (reset), the green and yellow LEDs turn off. The output relays energize again when control supply voltage is re-applied.



Electrical connection

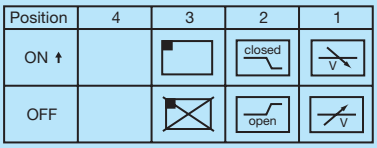


2CDC 252 207 F0005

Connection diagram

A1-A2	Rated control supply voltage
B-C	Measuring ranges: 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 switches



2CDC 252 276 F0005

1	ON	Undervoltage monitoring
	OFF	Overvoltage monitoring
2	ON	Closed-circuit principle
	OFF	Open-circuit principle
3	ON	Latching function activated
	OFF	Latching function not activated

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
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		**B-C**
Monitoring function		over- or 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
	continuous capacity	660 V
Threshold value		adjustable within the indicated measuring range
Tolerance of the adjusted threshold value		10 % of the range end value
Hysteresis related to the threshold value		3-30 % adjustable
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
Transient overvoltage protection		varistors

Timing circuit	
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 the temperature range	Δt ≤ 0.06 % / °C

User interface

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	⎍: output relay energized, no latching function ⎍⎍⎍⎍: relay energized, active latching function ⎍⎍⎍⎍: 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
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 exeeds / 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	10 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	0.154 kg (0.340 lb)	0.143 kg (0.315 lb)
	Gross weight	0.176 kg (0.388 lb)	0.165 kg (0.364 lb)
Mounting		DIN rail (IEC/EN 60715), snap-on mounting without any tool	
Mounting position		any	
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 (1 x 20-14 AWG) 2 x 0.5-1.5 mm² (2 x 20-16 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)	2 x 0.5-1.5 mm² (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_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
Overvoltage category (VDE 0110, IEC/EN 60664, IEC/EN 60255-5)		III

Standards

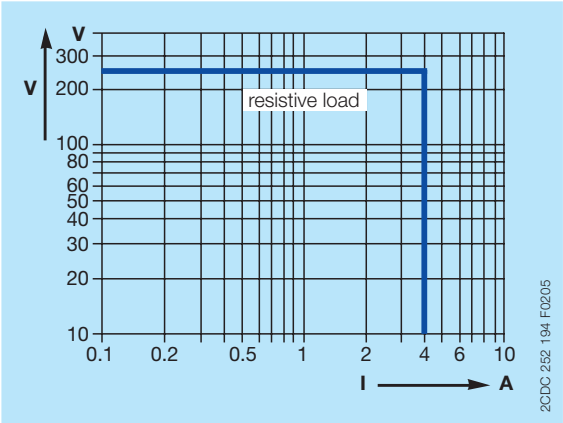
Product standard	IEC/EN 60255-6
Low Voltage Directive	2006/95/EC
EMC Directive	2004/108/EC
RoHS Directive	2002/95/EC

Electromagnetic compatibility

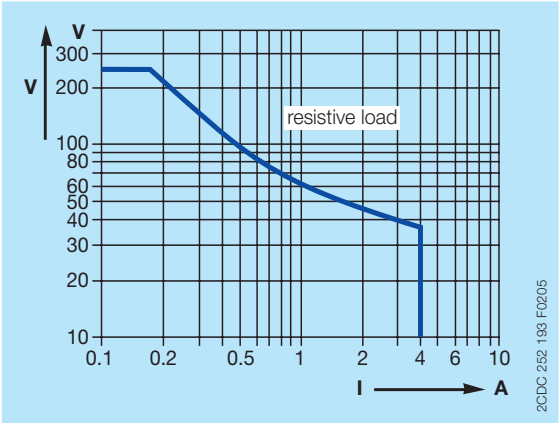
Interference immunity to		IEC/EN 61000-6-2
electrostatic discharge	IEC/EN 61000-4-2	Level 3
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3
surge	IEC/EN 61000-4-5	Level 3
conducted disturbances, induced by radio-frequency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

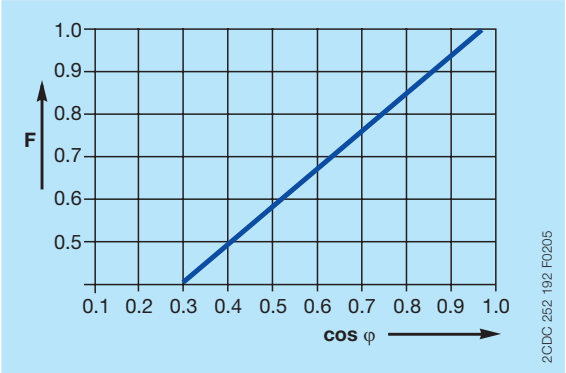
Load limit curves



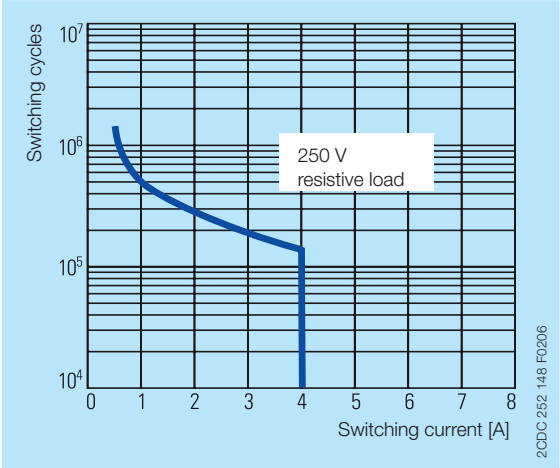
AC load (resistive)



DC load (resistive)



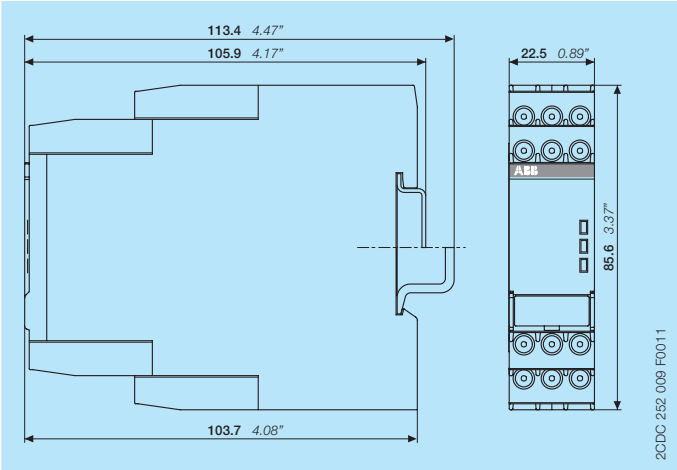
Derating factor F for inductive AC load



Contact lifetime

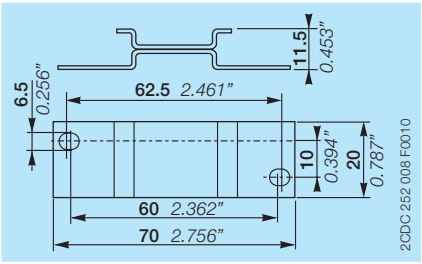
Dimensions

in **mm** and *inches*

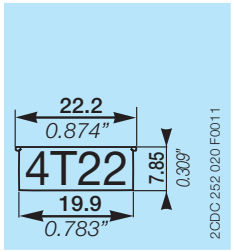


Accessories

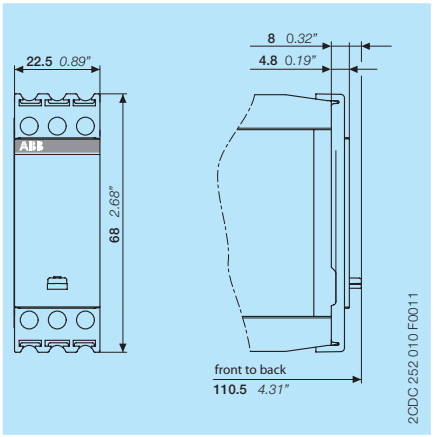
in **mm** and *inches*



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-ESS.M	Instruction manual	1SVC 730 600 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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