Data sheet

Voltage monitoring relays CM-ESS.2
For single-phase AC/DC voltages

The CM-ESS.2 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 connecting 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
- Hysteresis adjustable (3-30 %)
- Tripping delay T_V adjustable (0 s; 0.1-30 s)
- 3 control supply voltage versions
- 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 / Marks

Classifcations:

EN 50155, IEC 60571, NF F 16-101/102, EN 45545-2

EN 50155, IEC 60571

Temp. class	Voltage supply				Vibration and shock acc to IEC/EN 61373	Coated pcb
	S1	S2	C1	C2		
T3	■	■	■	-	Cat 1, Class B	no

NF F 16-101/102		EN 45545-2
Flammability index	Opticity and toxicity of smoke index	Risk level achieved
I2	F2	HL3

Order data

Voltage monitoring relays

Type	Rated control supply voltage	Connection technology	Measuring ranges	Order code
CM-ESS.2P	24-240 V AC/DC	Push-in terminals	3-30 V, 6-60 V, 30-300 V, 60-600 V	1SVR740830R0400
	110-130 V AC			1SVR740831R0400
	220-240 V AC			1SVR740831R1400
CM-ESS.2S	24-240 V AC/DC	Screw type terminals	3-30 V, 6-60 V, 30-300 V, 60-600 V	1SVR730830R0400
	110-130 V AC			1SVR730831R0400
	220-240 V AC			1SVR730831R1400

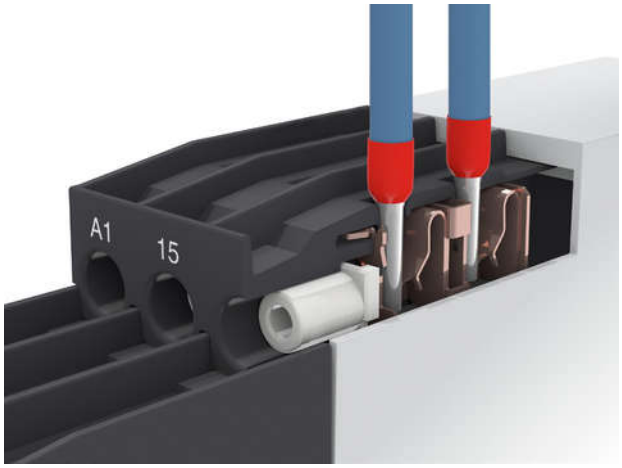
Accessories

Type	Description	Order code
ADP.01	Adapter for screw mounting	1SVR430029R0100
MAR.12	Marker label for devices with DIP switches	1SVR730006R0000
COV.11	Sealable transparent cover	1SVR730005R0100

Connection technology

Maintenance free Easy Connect Technology with push-in terminals

Type designation CM-xxS.yyP



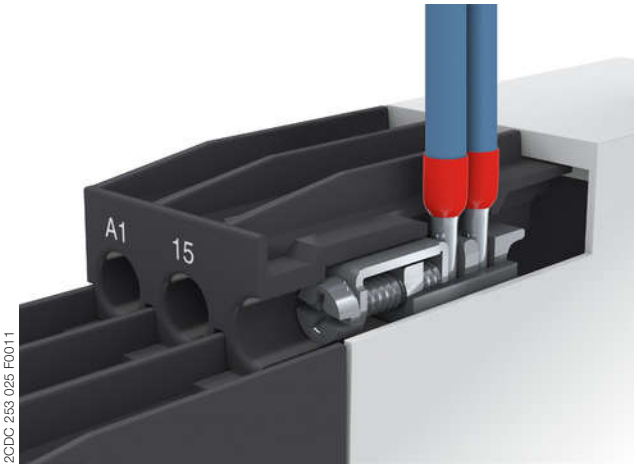
2CDC 253 026 F0011

Push-in terminals

- Tool-free connection of rigid and flexible wires with wire end ferrule
- Easy connection of flexible wires without wire end ferrule by opening the terminals
- No retightening necessary
- One operation lever for opening both connecting 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 connecting terminals

Type designation CM-xxS.yyS



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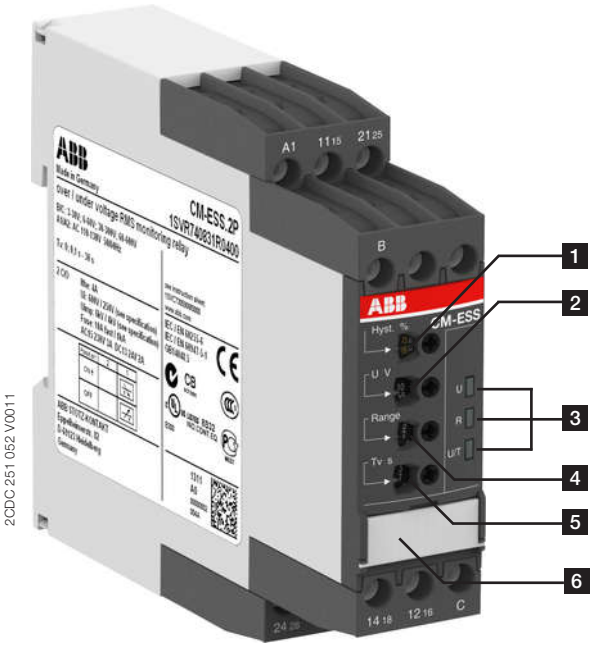
Double-chamber cage connecting terminals

- Terminal spaces for different wire sizes
- 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 connecting 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: LED green – control supply voltage

R: LED yellow – relay status

U: LED red – over- / undervoltage

4 **Adjustment of the measuring range**

5 **Adjustment of the tripping delay T_V**

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

Application

The voltage monitoring relays CM-ESS.2 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 are available with different supply voltage ranges, provide an adjustable tripping delay and work according to the open-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 undervoltage monitoring is made with a DIP switch. 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.

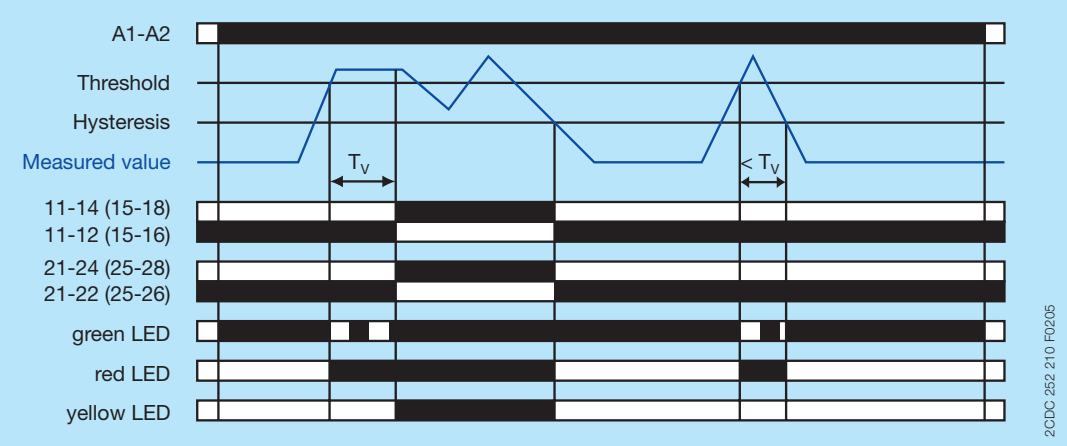
Function diagrams

Overvoltage monitoring

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.

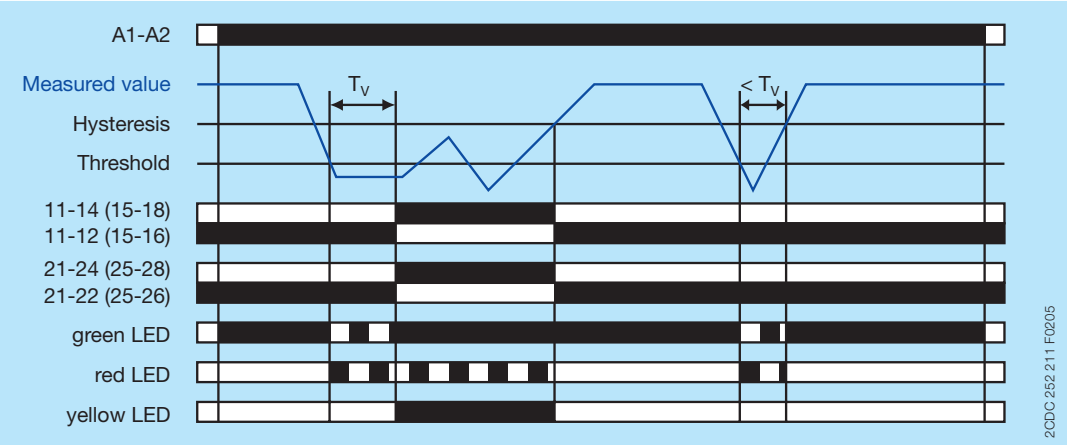


Undervoltage monitoring

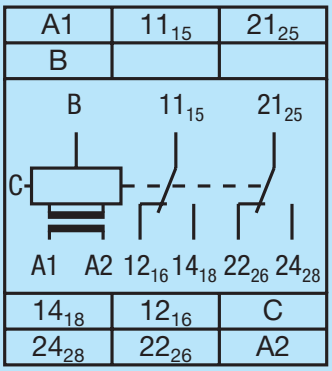
The voltage to be monitored (measured value) is applied to terminals B-C. The control supply voltage applied to terminals A1-A2 is displayed by the glowing green LED.

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 relay de-energizes and the red and yellow LEDs turn off.



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

Position	2	1
ON ↑		V
OFF		V

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1	ON	Undervoltage monitoring
	OFF	Overvoltage monitoring

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		110-130 V AC	220-240 V AC	24-240 V AC/DC
Rated control supply voltage U_s tolerance		-15...+10 %		
Rated frequency		50/60 Hz		50/60 Hz or DC
Typical current / power consumption	24 V DC	-	-	30 mA / 0.75 W
	115 V AC	24 mA / 2.6 VA	-	17 mA / 1.9 VA
	230 V AC	-	12 mA / 2.6 VA	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

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-circuit principle (output relay energizes if the measured value exceeds / falls below the adjusted threshold value)
Contact material		AgNi
Rated operational voltage U_e		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	AC-12 (resistive) at 230 V	4 A
	AC-15 (inductive) at 230 V	3 A
	DC-12 (resistive) at 24 V	4 A
	DC-13 (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	AC-12, 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	Version 24-240 V AC/DC	0.153 kg (0.337 lb)	0.142 kg (0.313 lb)
		Version 110-130 V AC	0.181 kg (0.399 lb)	0.170 kg (0.375 lb)
		Version 220-240 V AC	0.181 kg (0.399 lb)	0.170 kg (0.375 lb)
	Gross weight	Version 24-240 V AC/DC	0.176 kg (0.388 lb)	0.164 kg (0.361 lb)
		Version 110-130 V AC	0.204 kg (0.450 lb)	0.193 kg (0.425 lb)
		Version 220-240 V AC	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)
Connecting capacity	fine-strand with(out) wire end ferrule	1 x 0.5-2.5 mm² (1 x 18-14 AWG) 2 x 0.5-1.5 mm² (2 x 18-16 AWG)	2 x 0.5-1.5 mm² (2 x 18-16 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 (7.08 lb.in)	-

Environmental data

Ambient temperature ranges	operation	-25...+60 °C (-13...+140 °F)
	storage	-40...+85 °C (-40...+185 °F)
Damp heat, cyclic (IEC/EN 60068-2-30)		55 °C, 6 cycles
Vibration, sinusoidal		Class 2
Shock		Class 2

Isolation data

Rated insulation voltage U_i	supply / measuring circuit / output	600 V
	output 1 / output 2	250 V
Rated impulse withstand voltage U_{imp}	supply / measuring circuit / output	6 kV 1.2/50 µs
	output 1 / output 2	4 kV 1.2/50 µs
Pollution degree		3
Overvoltage category		III

Standards / Directives

Standards	IEC/EN 60947-5-1, IEC/EN 60255-27, EN 50178
Low Voltage Directive	2014/35/EU
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

Railway application standards

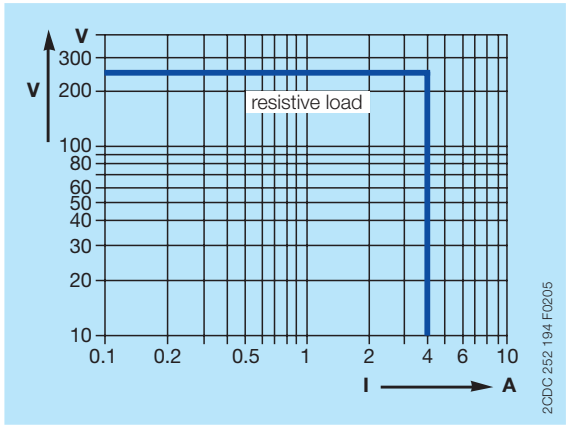
EN 50155, IEC 60571 “Railway applications – Electronic equipment used on rolling stock”	temperature class	T3
	supply voltage category	S1, S2, C1
IEC/EN 61373 “Railway applications – Rolling stock equipment – Shock and vibration tests”		Category 1, Class B
EN 45545-2 Railway applications – Fire protection on railway vehicles – part 2: Requirements for fire behavior of materials and components		HL3
	ISO 4589-2	LOI 32.3 %
	NF X-70-100-1	C.I.T. (T12) 0.45
	EN ISO 5659-2	Ds max (T10.03) 104
NF F 16-101: Rolling stock. Fire behaviour. Materials choosing NF F 16-102: Railway rolling stock. Fire behaviour. Materials choosing, application for electric equipment		I2 / F2
DIN 5510-2 Preventive fire protection in railway vehicles. Part 2: Fire behaviour and fire side effects of materials and parts		fullfilled

Electromagnetic compatibility

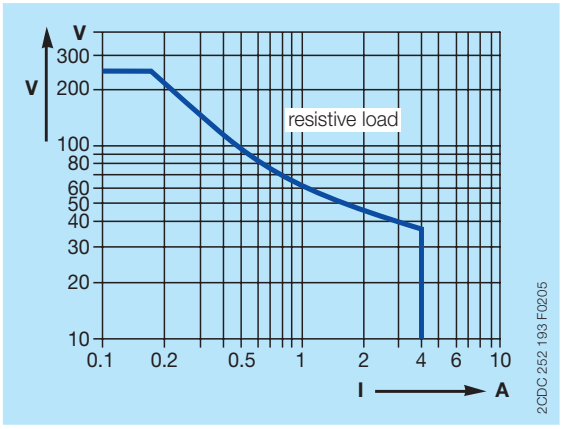
Interference immunity to		IEC/EN 61000-6-2
electrostatic discharge	IEC/EN 61000-4-2	Level 3
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3
surge	IEC/EN 61000-4-5	Level 3
conducted disturbances, induced by radio-frequency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

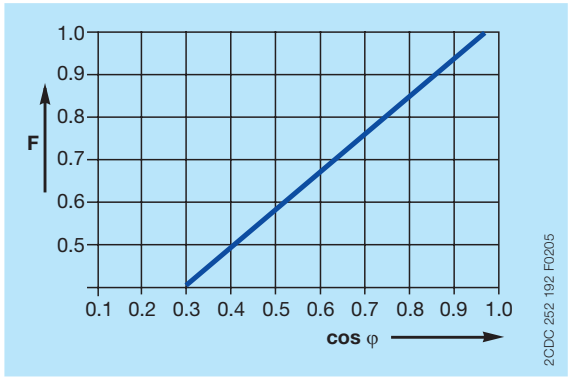
Load limit curves



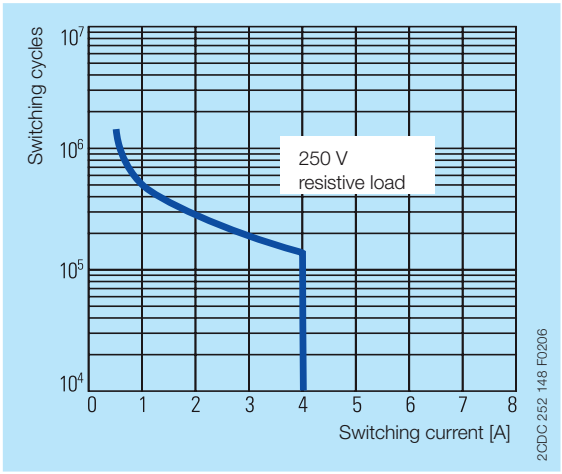
AC load (resistive)



DC load (resistive)



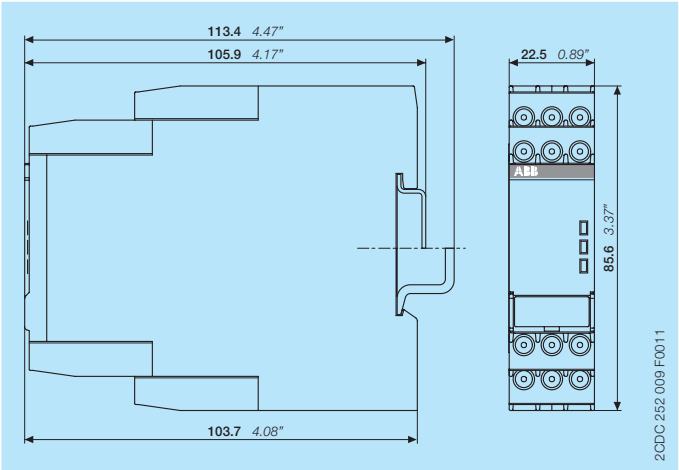
Derating factor F for inductive AC load



Contact lifetime

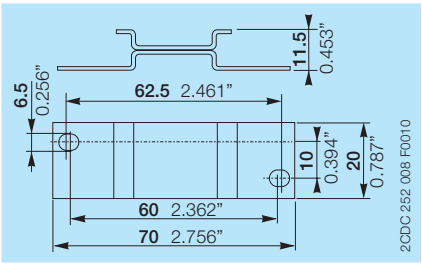
Dimensions

in **mm** and inches

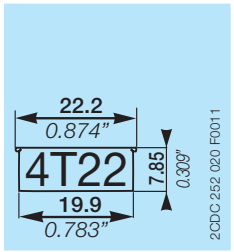


Accessories

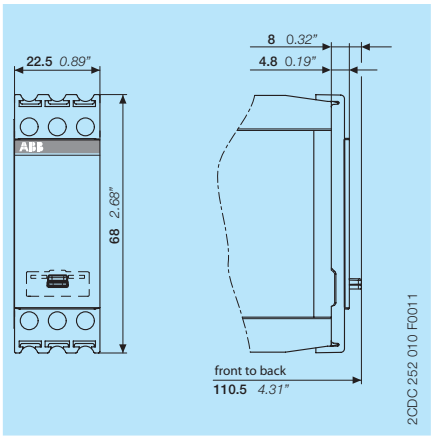
in **mm** and inches



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 C02xx
CM-ESS.1, CM-ESS.2	Instruction manual	1SVC 730 590 M0000

You can find the documentation on the internet at www.abb.com/lowvoltage
-> Automation, control and protection -> Electronic relays and controls -> Measuring and monitoring relays.

CAD system files

You can find the CAD files for CAD systems at http://abb-control-products.partcommunity.com
-> Low Voltage Products & Systems -> Control Products -> Electronic Relays and Controls.

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