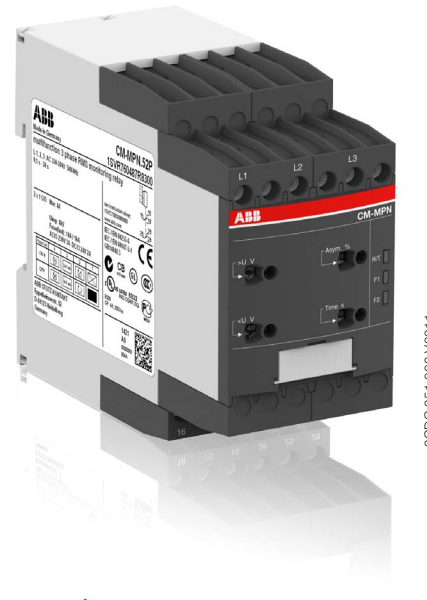


Multifunctional three-phase monitoring relays CM-MPN CM-MPN.52, CM-MPN.62 and CM-MPN.72

The three-phase monitoring relays CM-MPN.x2 monitor the phase parameters phase sequence, phase failure, over- and undervoltage as well as phase unbalance.

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 251 062 V0011

Characteristics

- Monitoring of three-phase mains for phase sequence (can be switched off), phase failure, over- and undervoltage as well as phase unbalance
- TRMS measuring principle
- Automatic phase sequence correction configurable
- Threshold values for over- and undervoltage as well as phase unbalance are adjustable as absolute values
- Tripping delay T_v can be adjusted or switched off by means of a logarithmic scale (0 s; 0,1-30 s)
- ON-delayed or OFF-delayed tripping delay selectable
- Powered by the measuring circuit
- 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
- 1 x 2 or 2 x 1 c/o (SPDT) contacts configurable
- 45 mm (1.78 in) width
- 3 LEDs for the indication of operational states

Approvals



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

(only CM-MPN.52 and CM-MPN.62)



GL



GOST



CB scheme



CCC



RMRS

Marks



CE



C-Tick

Order data

Three-phase monitoring relays

Type	Rated control supply voltage = measuring voltage	Connection technology	Order code
CM-MPN.52P	3 x 350-580 V AC	Push-in terminals	1SVR 760 487 R8300
CM-MPN.52S		Screw terminals	1SVR 750 487 R8300
CM-MPN.62P	3 x 450-720 V AC	Push-in terminals	1SVR 760 488 R8300
CM-MPN.62S		Screw terminals	1SVR 750 488 R8300
CM-MPN.72P	3 x 530-820 V AC	Push-in terminals	1SVR 760 489 R8300
CM-MPN.72S		Screw terminals	1SVR 750 489 R8300

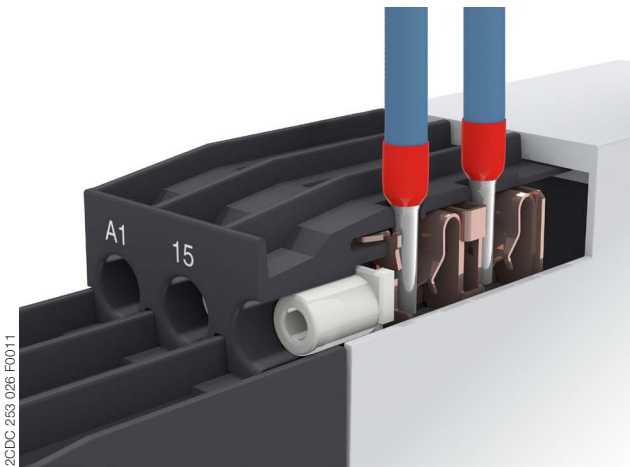
Accessories

Type	Description	Order code
ADP.02	Adapter für Schraubbefestigung	1SVR 440 029 R0100
MAR.12	Beschriftungsschild für Geräte mit DIP-Schalter	1SVR 730 006 R0000
COV.12	Plombierbare Klarsichtabdeckung	1SVR 750 005 R0100

Connection technology

Maintenance free Easy Connect Technology with push-in terminals

Type designation CM-xxS.yyP

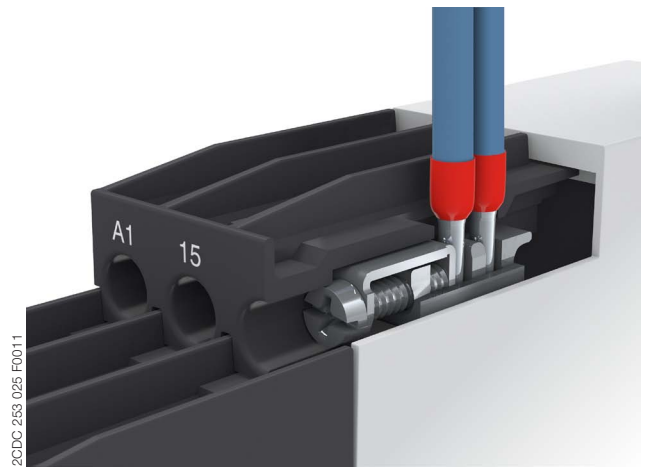


Push-in terminals

- Tool-free connection of rigid and flexible wires with wire end ferrule according to DIN 46228-1-A, DIN 46228-4-E
Wire size: $2 \times 0.5\text{--}1.5\text{ mm}^2$, (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 $0.8 \times 4\text{ mm}$ ($0.0315 \times 0.157\text{ in}$), DIN ISO 8764-1 PZ1 $\varnothing 4.5\text{ mm}$ (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



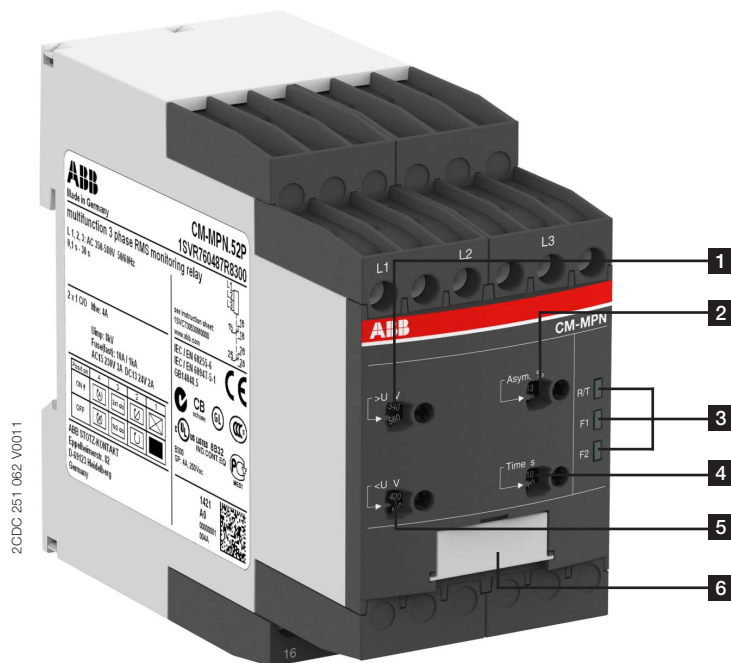
Double-chamber cage connection terminals

- Terminal spaces for different wire sizes:
fine-strand with/without wire end ferrule:
 $1 \times 0.5\text{--}2.5\text{ mm}^2$ (2 x 20 - 14 AWG),
 $2 \times 0.5\text{--}1.5\text{ mm}^2$ (2 x 20 - 16 AWG)
rigid:
 $1 \times 0.5\text{--}4\text{ mm}^2$ (1 x 20 - 12 AWG),
 $2 \times 0.5\text{--}2.5\text{ mm}^2$ (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 $0.8 \times 4\text{ mm}$ ($0.0315 \times 0.157\text{ in}$), DIN ISO 8764-1 PZ1 $\varnothing 4.5\text{ mm}$ (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 $>U$ for overvoltage
- 2 Adjustment of the threshold value Asym. for phase unbalance
- 3 Indication of operational states
R/T: red LED – Relay status / timing
F1: yellow LED – Fault message
F2: yellow LED – Fault message
- 4 Adjustment of the tripping delay T_v
- 5 Adjustment of the hysteresis $<U$ for undervoltage
- 6 DIP switches (see DIP switch functions)

Application

The three-phase monitoring relays CM-MPN.x2 are designed for use in three-phase mains for monitoring the phase parameters phase sequence, phase failure, over- and undervoltage as well as phase unbalance.

The CM-MPN.x2 provide an adjustable tripping delay and work according to the closed-circuit principle.

Operating mode

The CM-MPN.x2 have 2 c/o (SPDT) contacts and are available for 3-wire AC systems. The units are adjusted with front-face operating controls. The selection of ON- ☒ or OFF- ☐ delay, phase sequence monitoring activated ☒ or phase sequence monitoring deactivated ☐, 2 x 1 c/o ☒ or 1 x 2 c/o ☐ (SPDT) contacts as well as automatic phase sequence correction activated ☒ or automatic phase sequence correction deactivated ☐ is made with DIP switches. Potentiometers, with direct reading scale, allow the adjustment of the threshold values for overvoltage ($>U$), undervoltage ($<U$), phase unbalance (Asym %) and the tripping delay T_v . The tripping delay T_v is adjustable over a range of instantaneous to a 30 s delay. Timing is displayed by a flashing yellow LED labelled R/T.

Adjustment potentiometer

Threshold values

By means of three separate potentiometers with direct reading scales, the threshold values for over- and undervoltage as well as for phase unbalance can be adjusted within the measuring range.

	Measuring range for overvoltage	Measuring range for undervoltage	Measuring range for phase unbalance
CM-MPN.52	3 x 480-580 V AC	3 x 350-460 V AC	2-25 % of average of phase voltages
CM-MPN.62	3 x 600-720 V AC	3 x 450-570 V AC	
CM-MPN.72	3 x 690-820 V AC	3 x 530-660 V AC	

Tripping delay T_v

The tripping delay T_v can be adjusted within a range of 0.1 to 30 s by means of a potentiometer with logarithmic scale. By turning to the left stop, the tripping delay can be switched off.

Indication of operational states

LEDs, status information and fault messages

Operational state	R/T: LED yellow	F1: LED red	F2: LED red
Control supply voltage applied, output relay energized		-	-
Tripping delay T_v active		-	-
Phase failure	-		
Phase sequence	-		alternating
Overvoltage	-		-
Undervoltage	-	-	
Phase unbalance	-		
Adjustment error ¹⁾			

¹⁾
Possible misadjustments of the front-face operating controls:
Overlapping of the threshold values: The threshold value for overvoltage is set to a smaller value than the threshold value for undervoltage.
DIP switch 3 = OFF and DIP switch 4 = ON: Automatic phase sequence correction is activated and selected operating mode is 1 x 2 c/o (SPDT) contacts.
DIP switch 2 and 4 = ON: Phase sequence detection is deactivated and the automatic phase sequence correction is activated.

Function descriptions / diagrams

Phase sequence and phase failure monitoring

Applying control supply voltage begins the fixed start-up delay T_s . When T_s is complete and all phases are present with correct voltage, the output relays energize and the yellow LED R/T is on.

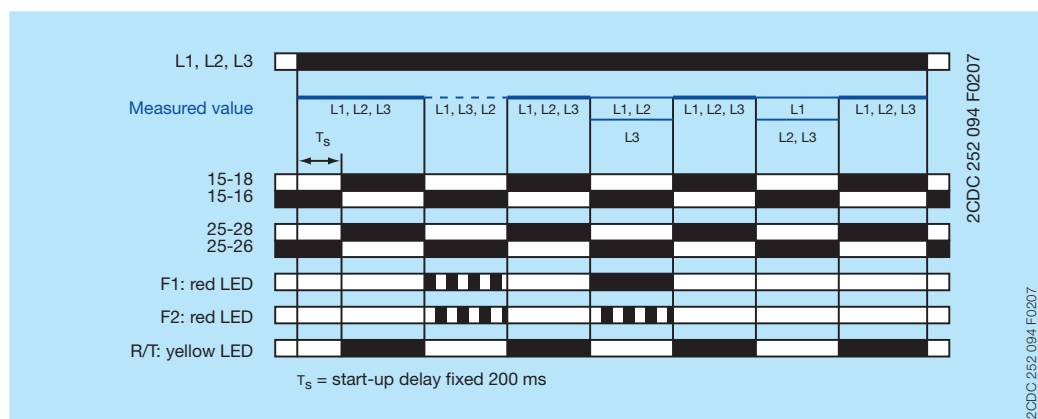
Phase sequence monitoring:

If phase sequence monitoring is activated (DIP switch 2 = OFF), the output relays de-energize as soon as a phase sequence error occurs. The fault is displayed by alternated flashing of the LEDs F1 and F2. The output relays re-energize automatically as soon as the phase sequence is correct again.

If phase sequence monitoring is deactivated (DIP switch 2 = ON), a phase sequence error will not cause tripping of the relays. The output relays do not change state and the LEDs F1 and F2 don't flash.

Phase failure monitoring:

The output relays de-energize instantaneously if a phase failure occurs. The fault is indicated by lightning of LED F1 and flashing of LED F2. The output relays re-energize automatically as soon as the voltage returns to the tolerance range.

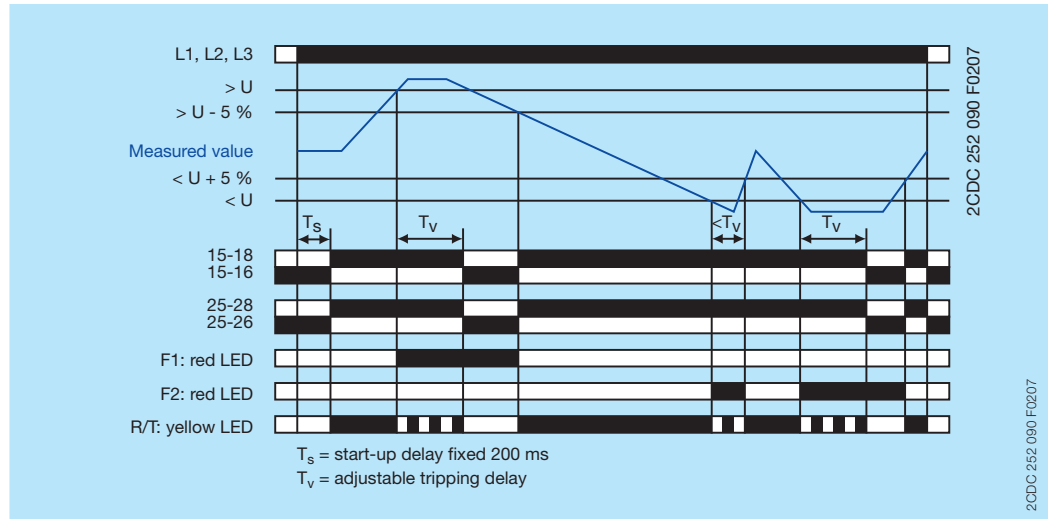


Over- and undervoltage monitoring 1 x 2 c/o (SPDT) contacts 1x2 c/o

Applying control supply voltage begins the fixed start-up delay T_s . When T_s is complete and all phases are present with correct voltage and with correct phase sequence, the output relays energize and the yellow LED R/T is on.

Type of tripping delay = ON-delay ON-delay

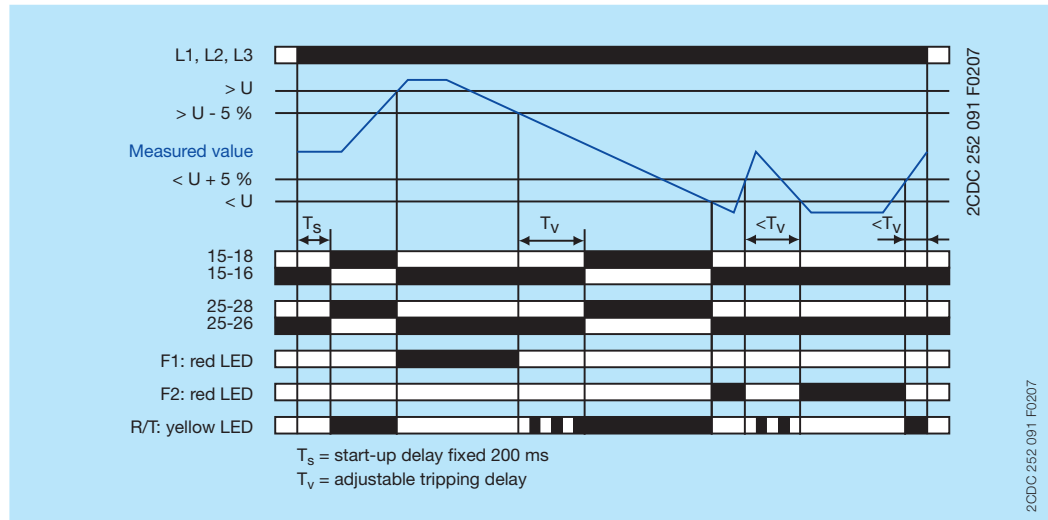
If the voltage to be monitored exceeds or falls below the set threshold value, the output relays de-energize after the set tripping delay T_v is complete. The LED R/T flashes during timing and turns off as soon as the output relays de-energize. The output relays re-energize automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %. The LED R/T is on.



Type of tripping delay = OFF-delay OFF-delay

If the voltage to be monitored exceeds or falls below the set threshold value, the output relays de-energize instantaneously and the LED R/T turns off.

As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %, the output relays re-energize automatically after the set tripping delay T_v is complete. The LED R/T flashes during timing and turns steady when timing is complete.



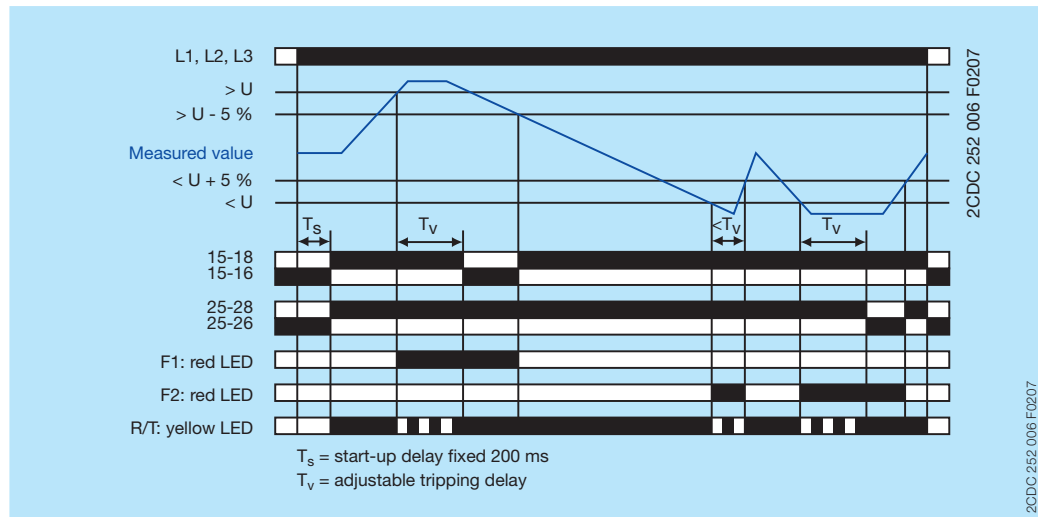
Over- and undervoltage monitoring 2 x 1 c/o (SPDT) contacts 2x1 c/o

Applying control supply voltage begins the fixed start-up delay T_s . When T_s is complete and all phases are present with correct voltage and with correct phase sequence, the output relays energize. The yellow LED R/T is on as long as at least one output relay is energized.

Type of tripping delay = ON-delay ON-delay

If the voltage to be monitored exceeds or falls below the set threshold value, output relay R1 (overvoltage) or output relay R2 (undervoltage) de-energizes after the set tripping delay T_v is complete. The LED R/T flashes during timing.

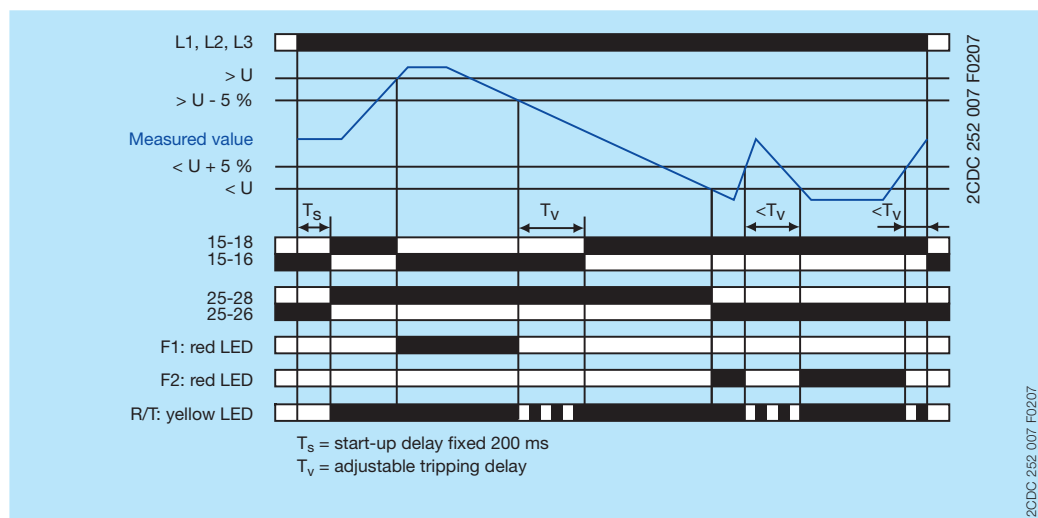
The corresponding output relay re-energizes automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %.



Type of tripping delay = OFF-delay OFF-delay

If the voltage to be monitored exceeds or falls below the set threshold value, output relay R1 (overvoltage) or output relay R2 (undervoltage) de-energizes instantaneously.

As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %, the corresponding output relay re-energizes automatically after the set tripping delay T_v is complete. The LED R/T flashes during timing.



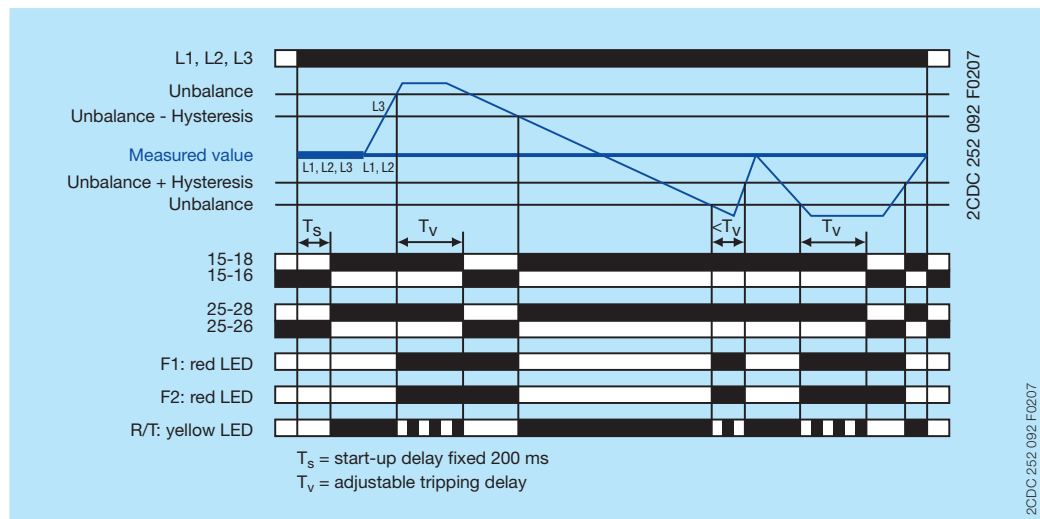
Phase unbalance monitoring

Applying control supply voltage begins the fixed start-up delay T_s . When T_s is complete and all phases are present with correct voltage and with correct phase sequence, the output relays energize and the yellow LED R/T is on.

Type of tripping delay = ON-delay ☒

If the voltage to be monitored exceeds or falls below the set phase unbalance threshold value, the output relays de-energize after the set tripping delay T_v is complete. The LED R/T flashes during timing and turns off as soon as the output relays de-energize.

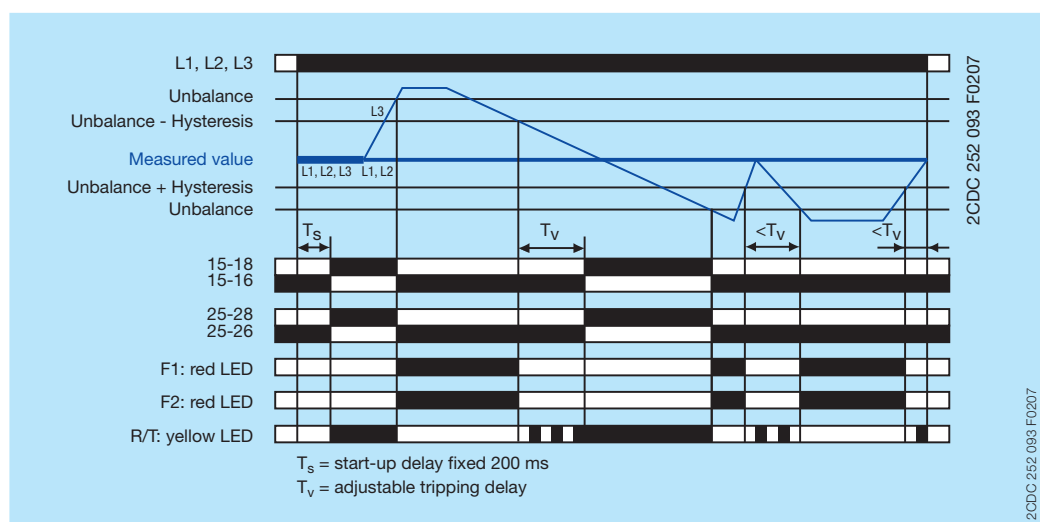
The output relays re-energize automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 20 %. The LED R/T is on.



Type of tripping delay = OFF-delay ■

If the voltage to be monitored exceeds or falls below the set phase unbalance threshold value, the output relays de-energize instantaneously and the LED R/T turns off.

As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 20 %, the output relays re-energize automatically after the set tripping delay T_v is complete. The LED R/T flashes during timing and turns steady when timing is complete.



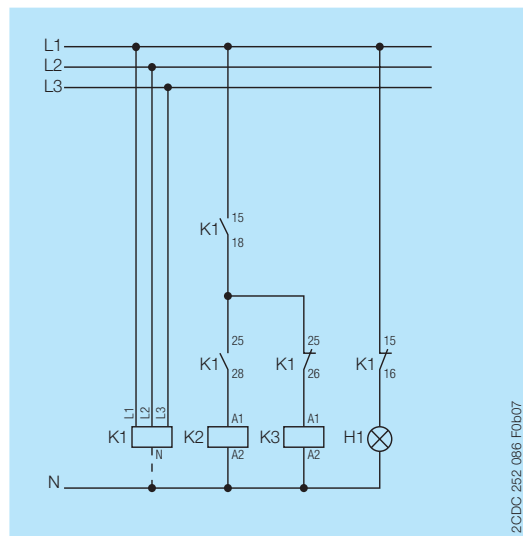
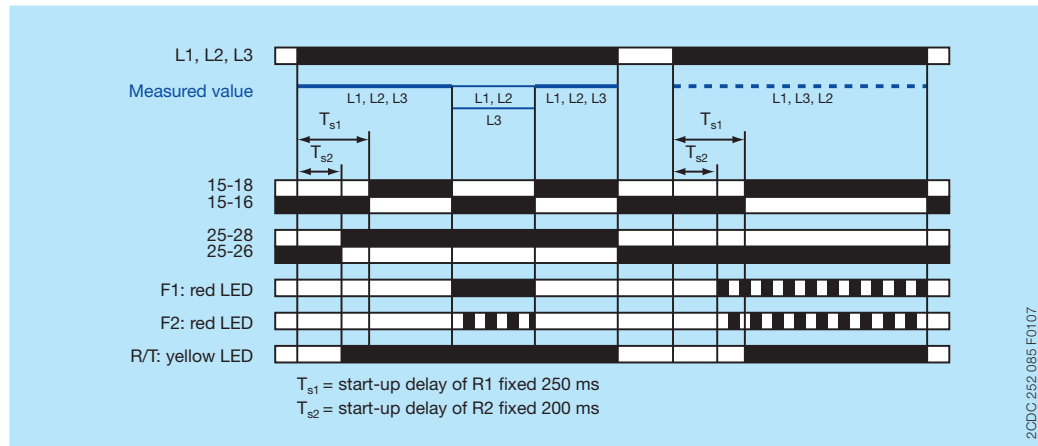
Automatic phase sequence correction

This function can be selected only if phase sequence monitoring is activated  (DIP switch 2 = ON) and operating mode 2 x 1 c/o (SPDT) contact  is selected (DIP switch 3 = OFF).

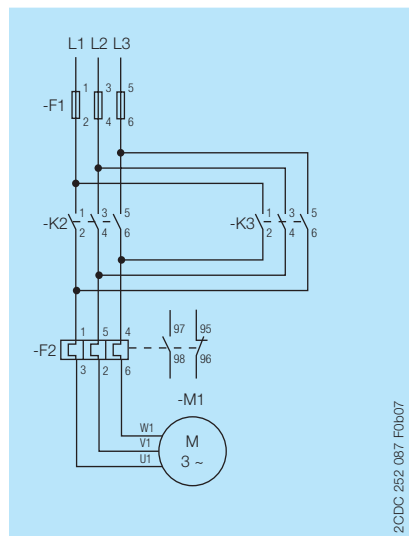
Applying control supply voltage begins the fixed start-up delay T_{s1} . When T_{s1} is complete and all phases are present with correct voltage, output relay R1 energizes. Output relay R2 energizes when the fixed start-up delay T_{s2} is complete and all phases are present with correct phase sequence. Output relay R2 remains de-energized if the phase sequence is incorrect.

If the voltage to be monitored exceeds or falls below the set threshold values for phase unbalance, over- or undervoltage or if a phase failure occurs, output relay R1 de-energizes and the LEDs F1 and F2 indicate the fault.

Output relay R2 is responsive only to a false phase sequence. In conjunction with a reversing contactor combination, this enables an automatic correction of the rotation direction. See circuit diagrams.

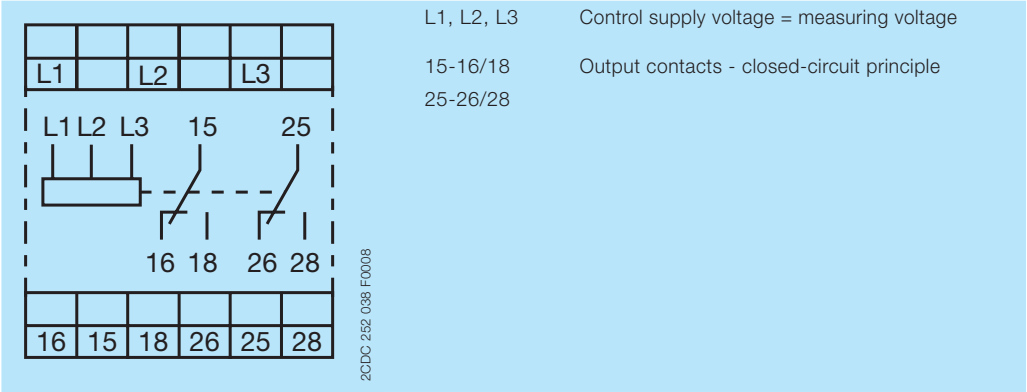


Control circuit diagram (K1 = CM-MPN.x3)



Power circuit diagram

Electrical connection



Connection diagram CM-MPN.x2

DIP switches

Position	4	3	2	1
ON ↑		2x1 c/o		
OFF		1x2 c/o		

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1 Timing function	ON	ON-delayed : In case of a fault, the de-energizing of the output relays and the respective fault message are suppressed for the adjusted tripping delay T_v .
	OFF	OFF-delayed : In case of a fault, the output relays de-energize instantaneously and a fault message is displayed and stored for the length of the adjusted tripping delay T_v . Thereby, also momentary undervoltage conditions are recognized.
2 Phase sequence monitoring	ON	Phase sequence monitoring deactivated : Phase sequence errors will not cause tripping of the relays.
	OFF	Phase sequence monitoring activated : The output relays de-energize as soon as a phase sequence error occurs. The output relays re-energize automatically as soon as the phase sequence is correct again.
3 Operating principle of the output relays	ON	2x1 c/o (SPDT) contact : Depending on the configuration of automatic phase sequence correction and on the fault type, the output relays R1 (15-16/18) and R2 (25-26/28) react differently, if operating principle 2x1 c/o (SPDT) contact is selected. <i>Automatic phase sequence correction deactivated </i> : • Overvoltage: only 1st c/o (SPDT) contact R1 (15-16/18) switches • Undervoltage: only 2nd c/o (SPDT) contact R2 (25-26/28) switches • Phase unbalance, phase sequence, phase failure, interrupted neutral: both output relays R1 (15-16/18) and R2 (25-26/28) react synchronously <i>Automatic phase sequence correction activated </i> : • Overvoltage, undervoltage, phase unbalance, phase failure, interrupted neutral: only 1st c/o (SPDT) contact R1 (15-16/18) switches • Phase sequence: only 2nd c/o (SPDT) contact R2 (25-26/28) switches Operating principle 2x1 c/o (SPDT) contact is mandatory if automatic phase sequence correction is activated.
	OFF	1x2 c/o (SPDT) contacts : If operating principle 1x2 c/o (SPDT) contacts is selected, both output relays R1 (15-16/18) and R2 (25-26/28) react synchronously, independent of the fault type.
4 Automatic phase sequence correction	ON	Phase sequence correction activated : In conjunction with a reversing contactor combination, it is ensured that the correct phase sequence is applied to the input terminals of the load.
	OFF	Phase sequence correction deactivated : No automatic phase sequence correction in case of phase sequence error.

Technical data

Data at $T_a = 25\text{ °C}$ and rated values, unless otherwise indicated

Input circuit

Type	CM-MPN.52	CM-MPN.62	CM-MPN.72
Supply circuit = measuring circuit			
	L1, L2, L3		
Rated control supply voltage U_s = measuring voltage	3 x 350-580 V AC	3 x 450-720 V AC	3 x 530-820 V AC
Rated control supply voltage U_s tolerance	-15...+10 %		
Rated frequency	50/60 Hz		
Frequency range	45-65 Hz		
Typical current / power consumption	29 mA / 41 VA (480 V AC)	29 mA / 52 VA (600 V AC)	29 mA / 59 VA (690 V AC)

Measuring circuit		L1, L2, L3		
Monitoring functions	Phase failure	■	■	■
	Phase sequence	can be switched off	can be switched off	can be switched off
	Automatic phase sequence correction	configurable	configurable	configurable
	Over-/undervoltage	■	■	■
	Phase unbalance	■	■	■
Measuring range	Overvoltage	3 x 480-580 V AC	3 x 600-720 V AC	3 x 690-820 V AC
	Undervoltage	3 x 350-460 V AC	3 x 450-570 V AC	3 x 530-660 V AC
	Phase unbalance	2-25 % of average of phase voltages		
Thresholds	Overvoltage	adjustable within measuring range		
	Undervoltage	adjustable within measuring range		
	Phase unbalance (switch-off value)	adjustable within measuring range		
Hysteresis related to the threshold value	Over-/undervoltage	fixed 5 %		
	Phase unbalance	fixed 20 %		
Rated frequency of the measuring signal		50/60 Hz		
Frequency range of the measuring signal		45-65 Hz		
Maximum measuring cycle time		100 ms		
Accuracy within the rated control supply voltage tolerance		$\Delta U \leq 0.5\text{ %}$		
Accuracy within the temperature range		$\Delta U \leq 0.06\text{ % / °C}$		
Measuring method		True RMS		

Timing circuit		
Start-up delay T_{s1} and T_{s2}		fixed 200 ms
Start-up delay T_{s1}		fixed 250 ms
Tripping delay T_v		ON- or OFF-delay 0 s; 0.1-30 s adjustable
Repeat accuracy (constant parameters)		$< \pm 0.2\text{ %}$
Accuracy within the rated control supply voltage tolerance		$\Delta t \leq 0.5\text{ %}$
Accuracy within the temperature range		$\Delta t \leq 0.06\text{ % / °C}$

User interface

Indication of operational states		
Relay status / timing	R/T	yellow LED
Fault message	F1	red LED
Fault message	F2	red LED

Details see table 'LEDs, status information and fault messages' on page 5 and 'Function descriptions / diagrams' on page 5.

Output circuits

Kind of output	15-16/18 25-26/28	relays, 1 x 2 or 2 x 1 (SPDT) contact(s) configurable
Operating principle		closed-circuit principle ¹⁾
Contact material		AgNi alloy, Cd free
Rated operational voltage U ₀ (IEC/EN 60947-1)		250 V
Minimum switching voltage / Minimum switchtching current		24 V / 10 mA
Maximum switchtching voltage / Maximum switching current		see load limit curves
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	n/c contact	10 A fast-acting
short-circuit protection	n/o contact	10 A fast-acting

General data

MTBF			on request			
Duty time			100 %			
Dimensions (W x H x D)			product dimensions	45 x 85.6 x 104.8 mm (1.78 x 3.37 x 4.13 in)		
			packaging dimensions	97 x 109 x 52.5 mm (3.82 x 4.29 x 2.07 in)		
Weight			Screw connection technology		Easy Connect Technology (push-in)	
			net weight	CM-MPN.52	0.230 kg (0.507 lb)	0.226 kg (0.498 lb)
				CM-MPN.62	0.229 kg (0.504 lb)	0.224 kg (0.494 lb)
				CM-MPN.72	0.224 kg (0.494 lb)	0.220 kg (0.485 lb)
			gross weight	CM-MPN.52	0.255 kg (0.562 lb)	0.251 kg (0.553 lb)
				CM-MPN.62	0.254 kg (0.560 lb)	0.250 kg (0.551 lb)
				CM-MPN.72	0.249 kg (0.549 lb)	0.245 kg (0.540 lb)
Mounting			DIN rail (IEC/EN 60715), snap-on mounting without any tool			
Mounting position			any			
Minimum distance to other units			not necessary			
Material of housing			UL 94 V-0			
Degree of protection			housing	IP50		
			terminals	IP20		

¹⁾ Closed-circuit principle: Output relay(s) de-energize(s) if measured value exceeds or falls below the adjusted threshold value.

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	-25...+60 °C
	storage	-40...+85 °C
Damp heat, cyclic (IEC/EN 60068-2-30)		55 °C, 6 cycles
Climatic category		3K3
Vibration, sinusoidal (IEC/EN 60255-21-1)		Class 2
Shock (IEC/EN 60255-21-2)		Class 2

Isolation data

Type		
Rated insulation voltage U _i	input circuit / output circuit	1000 V
	output circuit 1 / output circuit 2	300 V
Rated impulse withstand voltage U _{imp} (IEC/EN 60664)	input circuit	8 kV, 1.2/50 µs
	output circuit	4 kV, 1.2/50 µs
Test voltage (routine test) between	isolated output circuits	2.5 kV, 50 Hz, 1 s
	input circuit and isolated output circuits	4 kV, 50 Hz, 1 s
Basic insulation		input circuit / output circuit 1000 V
Protective separation (IEC/EN 61140, EN 50178)	input circuit /	-
	output circuit	
Pollution degree (IEC/EN 60664, IEC/EN 60255-5)		3
Overvoltage category (IEC/EN 60664, IEC/EN 60255-5)		III

Standards

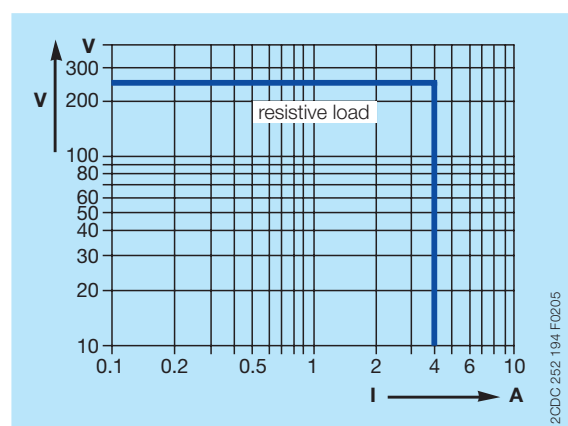
Product standard	IEC/EN 60255-6, EN 50178
Low Voltage Directive	2006/95/EC
EMC directive	2004/108/EC
RoHS directive	2002/95/EC

Electromagnetic compatibility

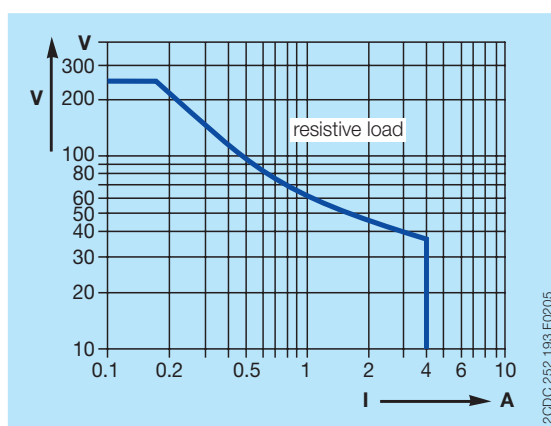
Type		
Interference immunity to		IEC/EN 61000-6-1, IEC/EN 61000-6-2
electrostatic discharge	IEC/EN 61000-4-2	Level 3 (6 kV / 8 kV)
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3 (10 V/m)
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3 (2 kV / 2 kHz)
surge	IEC/EN 61000-4-5	Level 4 (2 kV L-L)
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3 (10 V)
harmonics and interharmonics	IEC/EN 61000-4-13	Class 3
Interference emission		IEC/EN 61000-6-3, IEC/EN 61000-6-4
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B

Technical diagrams

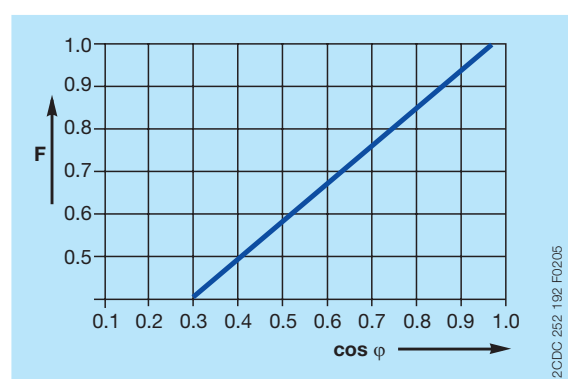
Load limit curves



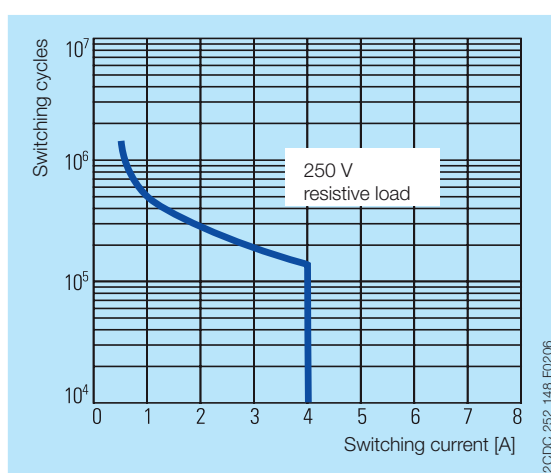
AC load (resistive)



DC load (resistive)



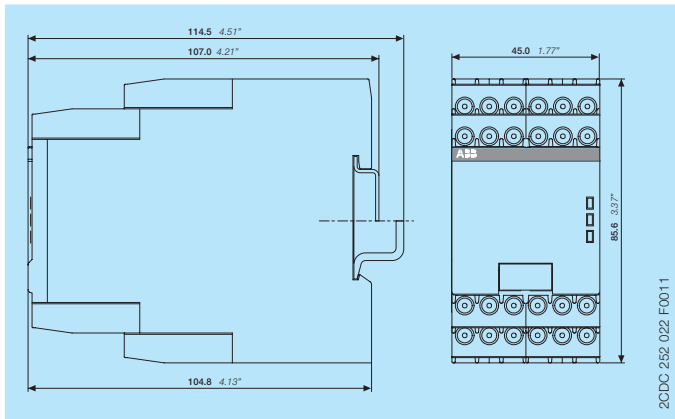
Derating factor F for inductive AC load



Contact lifetime

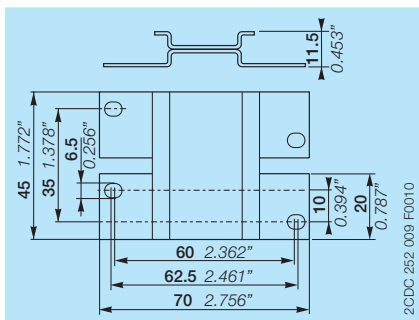
Dimensions

in **mm** and *inches*

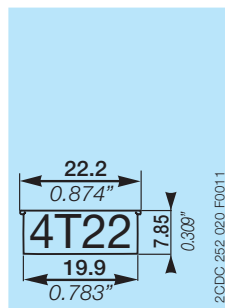


Accessories

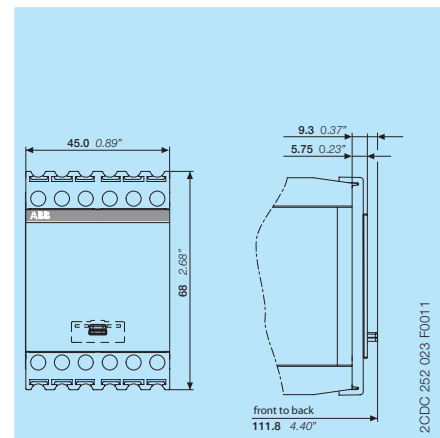
in **mm** and *inches*



ADP.02 - Adapter for screw mounting



MAR.12 - Marker label for devices with DIP switches



COV.12 - Sealable transparent cover

Further documentation

Document title	Document type	Document number
Electronic products and relays	Technical catalogue	2CDC 110 004 C02xx
CM-MPS.23, CM-MPS.43, CM-MPN.52, CM-MPN.62, CM-MPN.72	Instruction manual	1SVC 730 530 M0000

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

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