

Three-phase monitoring relays

Product group picture

2



Three-phase monitoring relays

Table of contents

Three-phase monitoring relays

Benefits and advantages, Applications	2/29
Operating controls	2/30
Selection table singlefunctional	2/31
Selection table multifunctional	2/32
Ordering details - Singlefunctional	2/33
Ordering details - Multifunctional	2/34
Function diagrams	2/35
Connection diagrams	2/39
DIP switches, Rotary switches	2/40
Technical data	2/41

Three-phase monitoring relays

Benefits and advantages, Applications

2

Characteristics of the CM range three-phase monitors

- Adjustable phase unbalance threshold value ¹⁾
- Adjustable ON-delay/OFF-delay time ¹⁾
- Dual frequency measuring 50/60 Hz
- Powered by the measuring circuit
- 1 n/o contact, 1 or 2 c/o contacts
- LEDs for the indication of operational states
- Multifunctional and single-functional devices
- Phase failure detection
- Phase sequence monitoring ¹⁾
- Over- and undervoltage monitoring (fixed or adjustable)¹⁾
- Wide-range operating voltage guarantees world-wide operation
- Approvals / Marks

A C R K E  ²⁾ / a b

¹⁾ depending on device type

²⁾ Applicable in rail application following the latest standards for rail applications: NF F 16-101/102 (I2/F2 classified), EN 45545 (Hazard Level 3), DIN 5510, EN 50155, IEC 60571. Further information is available in our rail segment brochure 2CDC110084B0201.

Phase unbalance monitoring

If the supply by the three-phase system is unbalanced due to uneven distribution of the load, the motor will convert a part of the energy into reactive power. This energy gets lost unexploited; also the motor is exposed to higher thermal stress. Other thermal protection devices fail to detect continuing unbalances which can lead to damage or destruction of the motor. The CM range three-phase monitors with phase unbalance monitoring can reliably detect this critical situation.

Phase sequence

Changing the phase sequence during operation or a wrong phase sequence prior to startup causes a change of the rotational direction of the connected device. Generators, pumps or fans rotate in the wrong direction and the installation is no longer working properly. Especially for moveable equipment, such as construction machinery, phase sequence detection prior to the startup process is highly reasonable.

Phase loss

In case of phase loss, undefined states of the installation are likely to occur. E.g. the startup process of motors is disturbed. All three-phase monitors of the ABB CM range detect a phase loss as soon as the voltage of one phase drops below 60% of its nominal value.

Voltage monitoring

All electric devices can be damaged when operated continuously in a network with out-of-range voltages. For example, safe starting is not ensured in case of undervoltage. Also, the switching state of a contactor is not clearly defined when operated in a „forbidden“ voltage range. This can lead to undefined states of the installation and cause damage or destruction of valuable parts.

Extended functionality

ABB's new generation of three-phase monitoring relays feature additional functions making the application field for the devices considerably larger.

Selectable phase sequence monitoring

The phase sequence monitoring can be switched off by means of a rotary switch or a DIP switch. This enables monitoring of three-phase mains where phase sequence is not relevant for the application, for example in case of motors with forward and reverse rotation, heating applications, etc.

Automatic phase sequence correction

The automatic phase sequence correction is activated by means of a DIP switch. With activated phase sequence correction, it is ensured that for any non-fixed or portable equipment, e.g. construction machinery, the correct phase sequence is always applied to the input terminals of the load. For details regarding the wiring, please see function description / diagrams.

Structure of the type designation

CM-__ x.yz

x: width of enclosure

y: Control supply voltage / measuring range

1	110, 115, 120, 127 V supply systems (phase-neutral)
2	220, 230, 240 V supply systems (phase-neutral)
3	200, 208, 220, 230, 240, 257, 260 V supply systems (phase-phase)
4	440, 460 V supply systems (phase-phase)
5	480, 500 V supply systems (phase-phase)
6	575, 600 V supply systems (phase-phase)
7	660, 690 V supply systems (phase-phase)
8	200, 400 V supply systems (phase-phase)

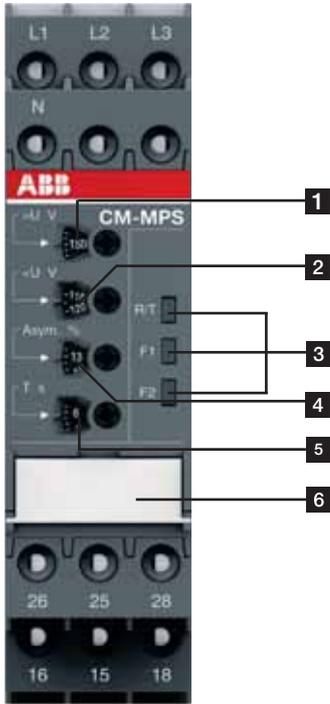
z: Rated frequency / output circuit

1	50/60 Hz – 1x2 c/o
2	50/60 Hz – 1x2 or 2x1 c/o
3	50/60/400 Hz – 1x2 oder 2x1 c/o

Three-phase monitoring relays

Operating controls

S-Range Housing



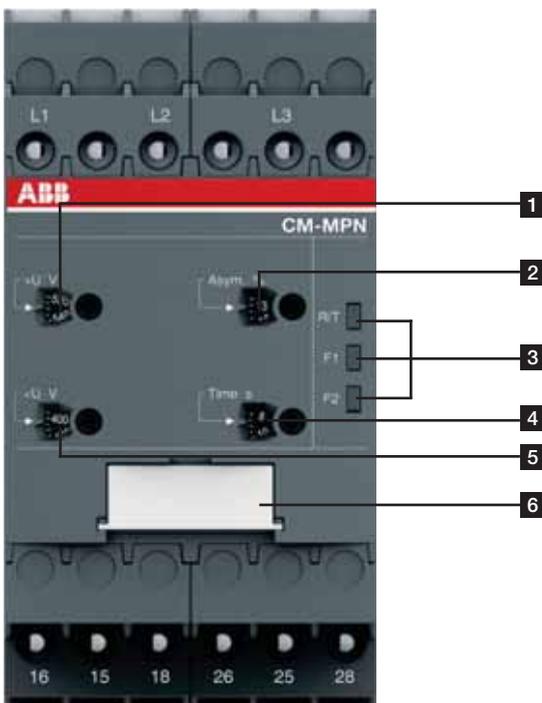
2CDC 283 017 F0013

- 1** Adjustment of the hysteresis $>U$ for overvoltage
- 2** Adjustment of the threshold value $<U$ for undervoltage
- 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 threshold value Asym. for phase unbalance
- 5** Adjustment of the tripping delay T_v
- 6** DIP switches (see DIP switch functions on page 2/40)
 - A ON-delay
 - B OFF-delay
 - l Phase sequence monitoring deactivated
 - k Phase sequence monitoring activated
 - m Phase sequence correction activated
 - n Phase sequence correction deactivated
 - i 2x1 c/o (SPDT) contact
 - j 1x2 c/o (SPDT) contacts

2

N-Range Housing



2CDC 283 016 F0013

- 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 on page 2/40)
 - A ON-delay
 - B OFF-delay
 - l Phase sequence monitoring deactivated
 - k Phase sequence monitoring activated
 - m Phase sequence correction activated
 - n Phase sequence correction deactivated
 - i 2x1 c/o (SPDT) contact
 - j 1x2 c/o (SPDT) contacts

Three-phase monitoring relays

Selection table singlefunctional

2



Order number	1SVR550881R9400	1SVR550882R9500	1SVR550870R9400	1SVR550871R9500	1SVR550824R9100	1SVR730824R9300	1SVR740824R9300	1SVR730784R2300	1SVR740784R2300	1SVR730784R3300	1SVR740784R3300	1SVR730794R1300	1SVR730794R3300	1SVR740794R2300	1SVR740794R3300	1SVR730774R1300	1SVR740774R1300	1SVR730774R3300	1SVR740774R3300	
Rated control supply voltage U_c	CM-PBE	CM-PBE	CM-PVE	CM-PVE	CM-PFE	CM-PFS.S	CM-PFS.P	CM-PSS.31S	CM-PSS.31P	CM-PSS.41S	CM-PSS.41P	CM-PVS.31S	CM-PVS.41S	CM-PVS.41P	CM-PVS.81S	CM-PVS.81P	CM-PAS.31S	CM-PAS.31P	CM-PAS.41S	CM-PAS.41P
Phase to Phase																				
160-300 V AC																				
200-400 V AC																				
200-500 V AC																				
208-440 V AC																				
300-500 V AC																				
320-460 V AC																				
350-580 V AC																				
380 V AC																				
380-440 V AC																				
400 V AC																				
Phase to Neutral																				
185-265 V AC																				
220-240 V AC																				
Rated frequency																				
50/60 Hz																				
Suitable for monitoring																				
Single-phase mains																				
Three-phase mains																				
Monitoring function																				
Phase failure																				
Phase sequence								sel	sel											
Automatic phase sequence correction																				
Overvoltage																				
Undervoltage																				
Unbalance																				
Neutral ¹⁾																				
Thresholds	fix	adj	adj	adj	adj	adj	adj	adj												
Timing functions for tripping delay																				
ON delay							fix	fix									sel	sel	sel	sel
On and OFF delay	fix	fix	fix	fix	fix				adj											
Connection type																				
Push-in terminals																				
Double-chamber cage connection terminals																				

¹⁾ The external conductor voltage towards the neutral conductor is measured.

adj: adjustable
sel: selectable

Three-phase monitoring relays

Selection table multifunctional



	Order number																		
Type	CM-MPS.11S	CM-MPS.11P	CM-MPS.21S	CM-MPS.21P	CM-MPS.31S	CM-MPS.31P	CM-MPS.41S	CM-MPS.41P	CM-MPS.23S	CM-MPS.23P	CM-MPS.43S	CM-MPS.43P	CM-MPN.52S	CM-MPN.52P	CM-MPN.62S	CM-MPN.62P	CM-MPN.72S	CM-MPN.72P	
Rated control supply voltage U_s	TSVR730885R1300 TSVR740885R1300 TSVR730885R3300 TSVR740885R3300 TSVR730884R1300 TSVR740884R1300 TSVR730884R3300 TSVR740884R3300 TSVR730885R4300 TSVR740885R4300 TSVR730884R4300 TSVR740884R4300 TSVR750487R8300 TSVR760487R8300 TSVR750488R8300 TSVR760488R8300 TSVR750489R8300 TSVR760489R8300																		
Phase to Phase																			
160-300 V AC					■	■													
300-500 V AC							■	■			■	■							
350-580 V AC													■	■					
450-720 V AC															■	■			
530-820 V AC																	■	■	■
Phase to Neutral																			
90-170 V AC	■	■																	
180-280 V AC			■	■					■	■									
Rated frequency																			
50/60 Hz	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■
50/60/400 Hz									■	■	■	■							
Suitable for monitoring																			
Single-phase mains	■	■	■	■					■	■									
Three-phase mains	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Monitoring function																			
Phase failure	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Phase sequence	sel	sel	sel	sel	sel	sel	sel	sel	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj
Automatic phase sequence correction									adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj
Overvoltage	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Undervoltage	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Unbalance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Neutral ¹⁾	■ ²⁾	■ ²⁾	■ ²⁾	■ ²⁾					■ ²⁾	■ ²⁾									
Thresholds																			
	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj
Timing functions for tripping delay																			
On and OFF delay	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj	adj
Connection type																			
Push-in terminals		■		■		■		■		■		■		■		■		■	
Double-chamber cage connection terminals	■		■		■		■		■		■		■		■		■		■

¹⁾ The external conductor voltage towards the neutral conductor is measured. adj: adjustable
²⁾ Interrupted neutral monitoring sel: selectable

Three-phase monitoring relays

Ordering details - Singlefunctional

2

Description

Only reliable and continuous monitoring of a three-phase network guarantees the trouble-free and economic operation of machines and installations.

Ordering details

Rated control supply voltage = measuring voltage	Monitoring function	Neutral monitoring	Type	Order code	Price 1 pce	Weight (1 pce) kg (lb)
3x380-440 V AC, 220-240 V C	Phase failure detection (Single- and three-phase)	■	CM-PBE ¹⁾	1SVR550881R9400		0.08 (0.17)
3x380-440 V AC			CM-PBE	1SVR550882R9500		0.08 (0.17)
3x320-460 V AC, 185-265 V AC	Over- / under-voltage and phase failure detection (Single- and three-phase)	■	CM-PVE ¹⁾	1SVR550870R9400		0.08 (0.17)
3x320-460 V AC			CM-PVE	1SVR550871R9500		0.08 (0.17)
3x208-440 V AC	Phase sequence monitoring and phase failure detection (Three-phase)		CM-PFE ²⁾	1SVR550824R9100		0.08 (0.17)



2CDC 251 064 V0011

CM-PBE

Ordering details

Rated control supply voltage = measuring voltage	Monitoring function	Type	Order code	Price 1 pce	Weight (1 pce) kg (lb)
3x200-500 V AC	Phase sequence monitoring and phase failure detection (Three-phase)	CM-PFS.S	1SVR730824R9300		0.127 (0.280)
		CM-PFS.P	1SVR740824R9300		0.119 (0.262)
3x380 V AC	Over- / undervoltage with fixed threshold values ± 10 %	CM-PSS.31S	1SVR730784R2300		0.132 (0.291)
		CM-PSS.31P	1SVR740784R2300		0.123 (0.271)
		CM-PSS.41S	1SVR730784R3300		0.132 (0.291)
		CM-PSS.41P	1SVR740784R3300		0.123 (0.271)
3x400 V AC	Over- and undervoltage with adjustable threshold values (Three-phase)	CM-PVS.31S	1SVR730794R1300		0.141 (0.311)
		CM-PVS.31P	1SVR740794R1300		0.132 (0.291)
		CM-PVS.41S	1SVR730794R3300		0.139 (0.306)
		CM-PVS.41P	1SVR740794R3300		0.131 (0.289)
3x300-500 V AC	Over- and undervoltage with adjustable threshold values (Three-phase)	CM-PVS.81S	1SVR730794R2300		0.136 (0.300)
		CM-PVS.81P	1SVR740794R2300		0.128 (0.282)
3x200-400 V AC	Phase unbalance (Three-phase)	CM-PAS.31S	1SVR730774R1300		0.133 (0.293)
		CM-PAS.31P	1SVR740774R1300		0.124 (0.273)
		CM-PAS.41S	1SVR730774R3300		0.132 (0.291)
3x300-500 V AC	Phase unbalance (Three-phase)	CM-PAS.41P	1SVR740774R3300		0.123 (0.271)



2CDC 251 064 V0011

CM-PSS.41P



2CDC 251 063 V0011

CM-PAS.31P

¹⁾ The version with neutral monitoring is also suitable for monitoring single-phase mains. For this, all three external conductors (L1,L2,L3) have to be jumpered and connected as one single conductor.

²⁾ For applications where a reverse fed voltage >60% is expected, we recommend to use our three-phase monitoring relays for unbalance CM-PAS.xx

S: screw connection

P: push-in / easy connect

Three-phase monitoring relays

Ordering details - Multifunctional



CM-MPS.23P



CM-MPN.52P

Ordering details

Rated control supply voltage = measuring voltage	DIP switch	Monitoring function	Neutral monitoring	Type	Order code	Price 1 pce	Weight (1 pce) kg (lb)
90-170 V AC	A B K I	Multifunctional (Three-phase phase failure detection, Phase sequence monitoring, overvoltage, undervoltage, Phase unbalance)	■	CM-MPS.11S	1SVR730885R1300		0.148 (0.326)
180-280 V AC				CM-MPS.11P	1SVR740885R1300		0.137 (0.302)
				CM-MPS.21S	1SVR730885R3300		0.146 (0.322)
3x160-300 V AC				CM-MPS.21P	1SVR740885R3300		0.135 (0.298)
				CM-MPS.31S	1SVR730884R1300		0.142 (0.313)
3x300-500 V AC				CM-MPS.31P	1SVR740884R1300		0.133 (0.293)
				CM-MPS.41S	1SVR730884R3300		0.140 (0.309)
				CM-MPS.41P	1SVR740884R3300		0.132 (0.291)
	180-280 V AC	CM-MPS.23S	1SVR730885R4300	■	0.149 (0.328)		
CM-MPS.23P		1SVR740885R4300		0.138 (0.304)			
3x300-500 V AC	A B K I m n i j	Multifunctional (Three-phase phase failure detection, Phase sequence monitoring, overvoltage, undervoltage, Phase unbalance)	■	CM-MPS.43S	1SVR730884R4300		0.148 (0.327)
				CM-MPS.43P	1SVR740884R4300		0.137 (0.302)
3x350-580 V AC	A B K I m n i j	Multifunctional (Three-phase phase failure detection, Phase sequence monitoring, overvoltage, undervoltage, Phase unbalance)	■	CM-MPN.52S	1SVR750487R8300		0.230 (0.507)
				CM-MPN.52P	1SVR760487R8300		0.226 (0.498)
3x450-720 V AC				CM-MPN.62S	1SVR750488R8300		0.229 (0.505)
				CM-MPN.62P	1SVR760488R8300		0.225 (0.496)
3x530-820 V AC				CM-MPN.72S	1SVR750489R8300		0.224 (0.494)
				CM-MPN.72P	1SVR760489R8300		0.220 (0.485)

- A ON-delayed
- B OFF-delayed
- K Phase sequence monitoring activated
- I Phase sequence monitoring deactivated
- m Phase sequence correction activated
- n Phase sequence correction deactivated
- i 2x1 c/o (SPDT) contacts
- j 1x2 c/o (SPDT) contacts

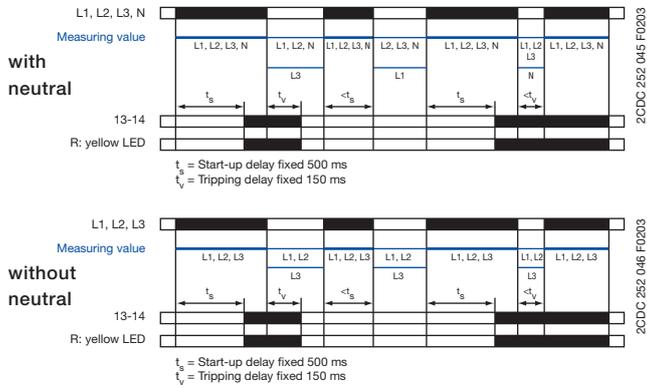
- S: screw connection
- P: push-in / easy connect

Three-phase monitoring relays

Function diagrams

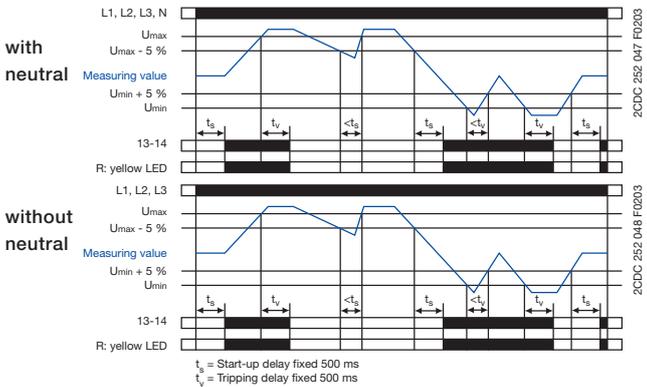
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Function diagrams - Phase failure detection CM-PBE



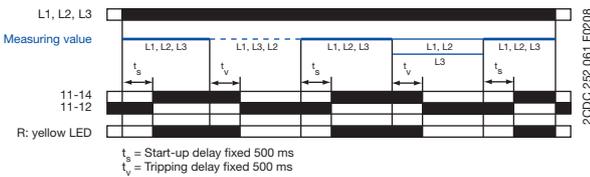
If all phases (and the neutral) are present, the output relay energizes after the start-up delay t_s is complete. If a phase failure occurs, the tripping delay t_v starts. When timing is complete, the output relay de-energizes. As soon as the voltage returns to the tolerance range, timing of t_s starts. When timing is complete, the output relay re-energizes automatically. The yellow LED glows when the output relay is energized.

Function diagrams - Phase failure, under- / overvoltage detection CM-PVE



If all phases (and the neutral) are present with correct voltage, the output relay energizes after the start-up delay t_s is complete. If the voltage exceeds or falls below the fixed threshold value or if a phase failure occurs, the tripping delay t_v starts. When timing is complete, the output relay de-energizes. As soon as the voltage returns to the tolerance range, timing of t_s starts. When timing is complete, the output relay re-energizes automatically. The yellow LED glows when the output relay is energized.

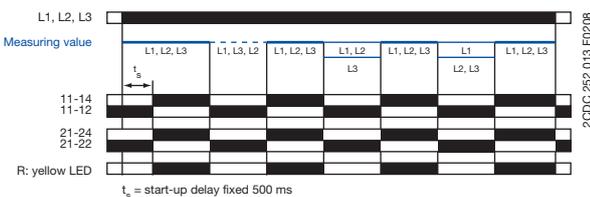
Function diagram - Phase failure detection, phase sequence monitoring CM-PFE



If all phases are present with the correct phase sequence, the output relay energizes after the start-up delay t_s is complete. If a phase failure or a phase sequence error occurs, the tripping delay t_v starts. When timing is complete, the output relay de-energizes. The yellow LED glows when the output relay is energized.

In case of motors which continue running with only two phases, the CM-PFE detects phase failure if the reverse fed voltage is less than 60 % of the originally applied voltage.

Function diagram - Phase failure detection, phase sequence monitoring CM-PFS



If all phases are present with the correct phase sequence, the output relay energizes after the start-up delay t_s is complete. If a phase failure or a phase sequence error occurs, the output relay de-energizes instantaneous. The yellow LED glows when the output relay is energized.

In case of motors which continue running with only two phases, the CM-PFS detects phase failure if the reverse fed voltage is less than 60 % of the originally applied voltage.

ATTENTION

If several CM-PFS units are placed side by side and the control supply voltage is higher than 415 V, spacing of at least 10 mm has to be kept between the individual units.

Three-phase monitoring relays

Function diagrams

CM-PSS.xx, CM-PVS.xx, CM-PAS.xx, CM-MPS.xx, CM-MPN.xx

Phase sequence monitoring and phase failure detection

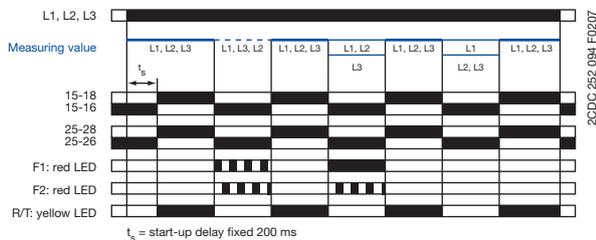
Applying control supply voltage begins the fixed start-up delay t_s . When t_s is complete and all phases are present with correct voltage, the output relays energize and the yellow LED R/T glows.

Phase sequence monitoring

If phase sequence monitoring is activated, 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.

Phase failure detection

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

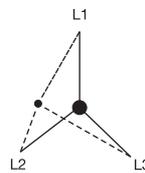


CM-MPS.11, CM-MPS.21, CM-MPS.23

Interrupted neutral monitoring

The interruption of the neutral in the main to be monitored is detected by means of phase unbalance evaluation. Determined by the system, in case of unloaded neutral, i.e. symmetrical load between all three phases, it may happen that an interruption of the neutral will not be detected. If the star point is displaced by asymmetrical load in the three-phase main, an interrupted neutral will be detected.

Displacement of the star point



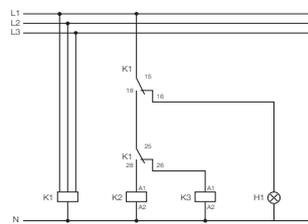
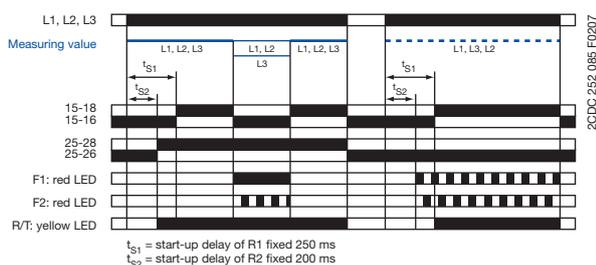
CM-MPS.x3, CM-MPN.x2

Automatic phase sequence correction

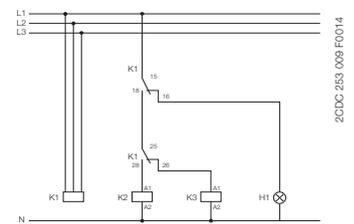
This function can be selected only if phase sequence monitoring is activated k and operating mode 2x1 c/o (SPDT) contact j is selected.

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.

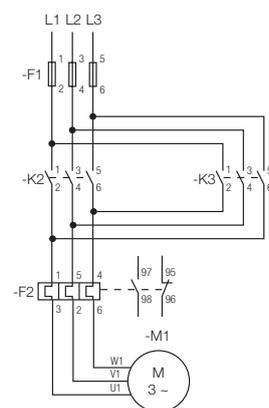
Output relay R2 is responsive only to a false phase sequence. In conjunction with a reversing contactor combination, this enables an automatic correction of the rotation direction. See circuit diagrams on the right.



Control circuit diagram
(K1 = CM-MPS.23)



Control circuit diagram
(K1 = CM-MPS.43 or CM-MPN.xx)



Power circuit diagram

Three-phase monitoring relays

Function diagrams

CM-PSS.xx¹, CM-PVS.xx², CM-MPS.xx², CM-MPN.xx²

Over- and undervoltage monitoring j

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 glows.

Type of tripping delay = ON-delay

If the voltage to be monitored exceeds or falls below the fixed¹) or set²) 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.

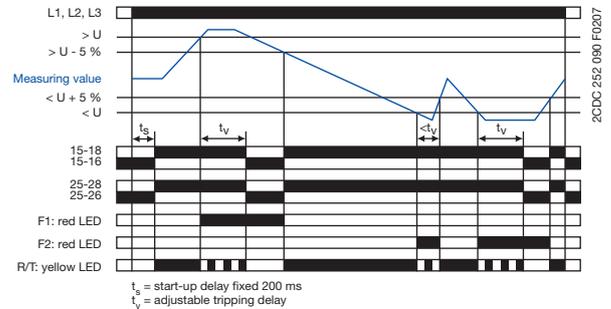
The output relays re-energize automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 % and the LED R/T glows.

Type of tripping delay = OFF-delay

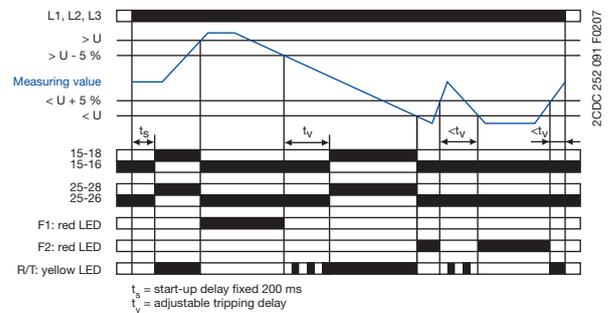
If the voltage to be monitored exceeds or falls below the fixed¹) or set²) threshold value, the output relays de-energize instantaneously and the LED R/T turns off.

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.

ON-delay A , 1x2 c/o contacts j



OFF-delay B , 1x2 c/o contacts j



CM-MPS.x3, CM-MPN.x2

Over- and undervoltage monitoring i

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 glows as long as at least one output relay is energized.

Type of tripping 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.

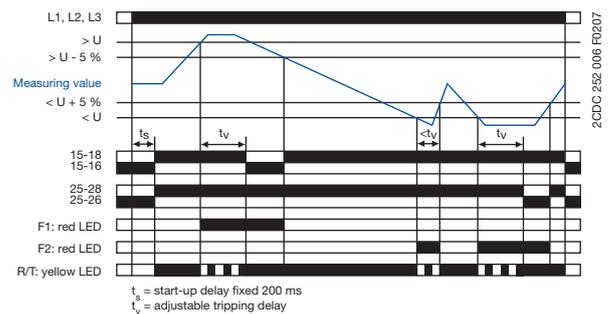
The corresponding output relay re-energizes automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %.

Type of tripping delay = OFF-delay

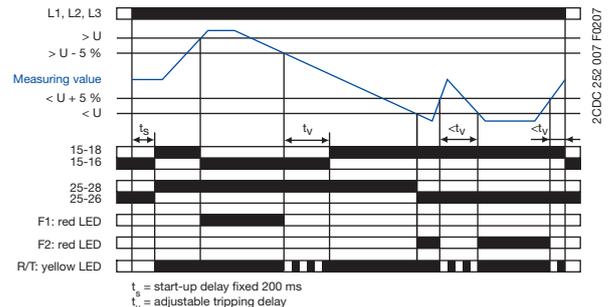
If the voltage to be monitored exceeds or falls below the set threshold value, output relay R1 (overvoltage) or output relay R2 (undervoltage) de-energizes instantaneously.

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.

ON-delay A , 2x1 c/o contact i



OFF-delay B , 2x1 c/o contact i



Three-phase monitoring relays

Function diagrams

CM-PAS.xx, CM-MPS.xx, CM-MPN.xx

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 glows.

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.

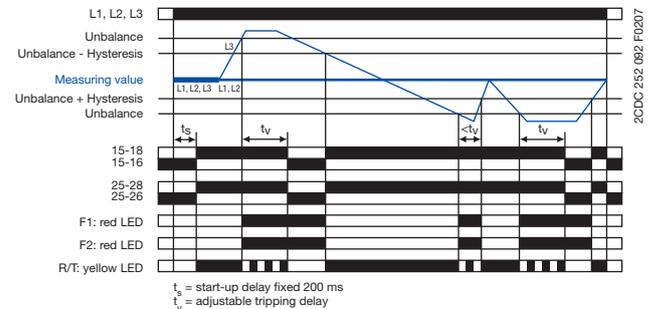
The output relays re-energize automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 20 % and the LED R/T glows.

Type of tripping delay = OFF-delay

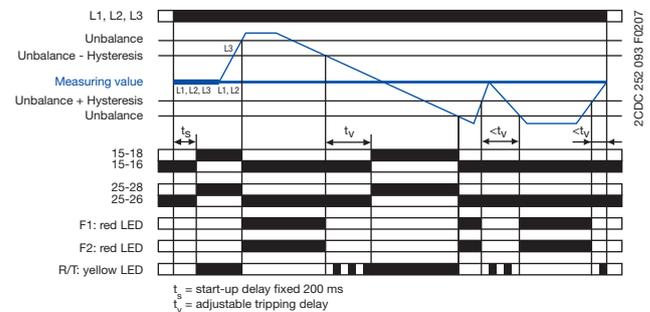
If the voltage to be monitored exceeds or falls below the set phase unbalance threshold value, the output relays de-energize instantaneously and the LED R/T turns off.

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.

ON-delay A



OFF-delay B



CM-PSS.xx, CM-PSV.xx, CM-PAS.xx, CM-MPS.xx, CM-MPN.xx

LED functions

Function	R/T: yellow LED	F1: red LED	F2: red LED
Control supply voltage applied, output relay energized	✓	-	-
Tripping delay t_v active	✓	-	-
Phase failure	-	✓	✓
Phase sequence	-	✓	alternating
Overvoltage	-	✓	-
Undervoltage	-	-	✓
Phase unbalance	-	✓	✓
Interruption of the neutral	-	✓	✓
Adjustment error ¹⁾	✓	✓	✓

1) Possible misadjustments of the front-face operating controls:
 Overlapping of the threshold values: An overlapping of the threshold values is given, if 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 1x2 c/o contacts
 DIP switch 2 and 4 = ON: Phase sequence detection is deactivated and the automatic phase sequence correction is activated

CM-PSS.xx, CM-PSV.xx, CM-PAS.xx, CM-MPS.xx, CM-MPN.xx

Type of tripping delay

The type of tripping delay A / B can be adjusted via a rotary (CM-PxS.xx) or a DIP switch (CM-MPx.xx).

Switch position ON-delay A :

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 .

Switch position OFF-delay B :

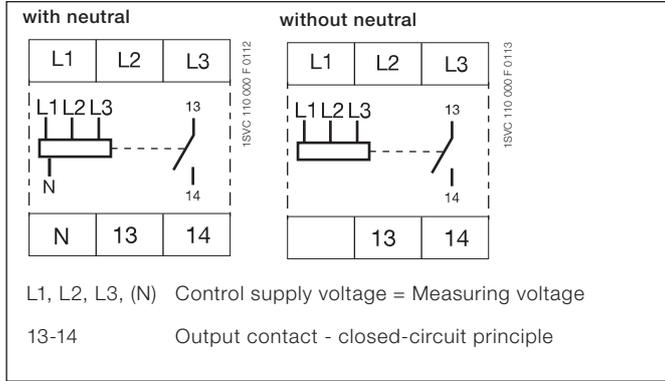
In case of a fault, the output relays de-energize instantaneously and a fault message is displayed and stored for the length of the adjusted tripping delay t_v . Thereby, also momentary undervoltage conditions are recognized.

Three-phase monitoring relays

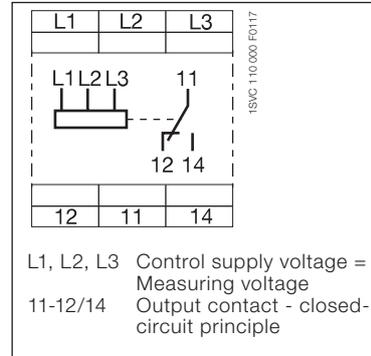
Connection diagrams

2

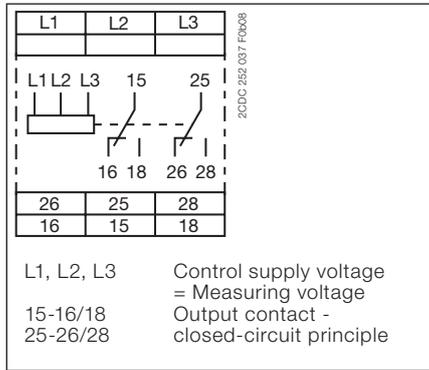
Connection diagrams CM-PBE, CM-PVE



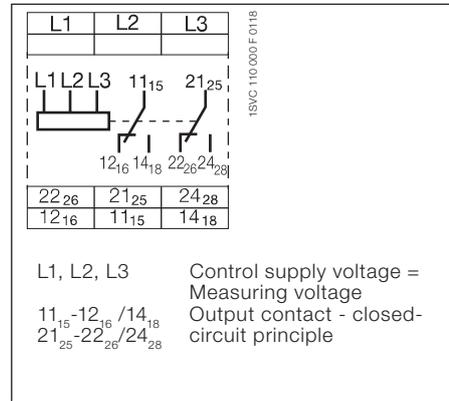
Connection diagram CM-PFE



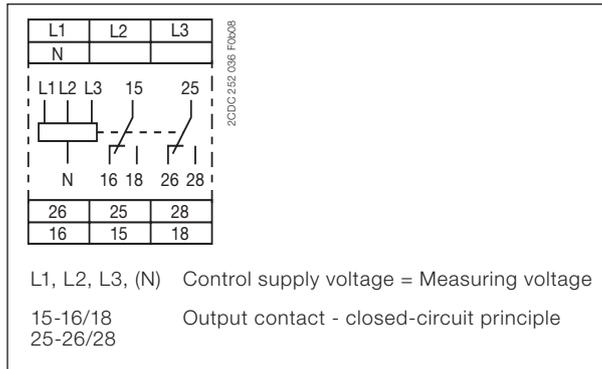
Connection diagram CM-PVS.x1, CM-PSS.x1, CM-PAS.x1



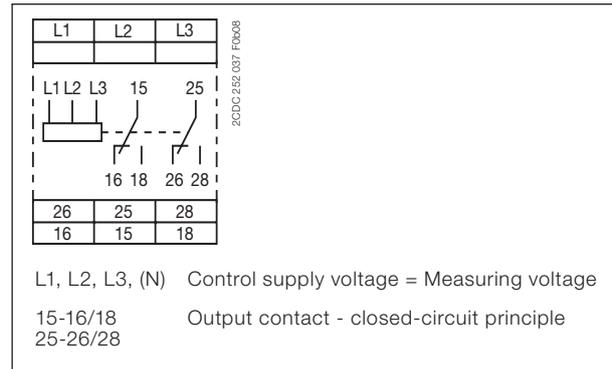
Connection diagram CM-PFS



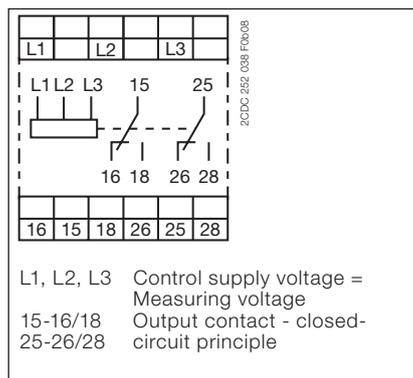
Connection diagram CM-MPS.11, CM-MPS.21, CM-MPS.23



Connection diagram CM-MPS.31, CM-MPS.41, CM-MPS.43



Connection diagram CM-MPN.x2



Three-phase monitoring relays DIP switches, Rotary switches

Rotary switch "Function" CM-PVS

	ON-delay with phase sequence monitoring
	OFF-delay with phase sequence monitoring
	ON-delay without phase sequence monitoring
	OFF-delay without phase sequence monitoring

Rotary switch "Function" CM-PSS

	ON-delay with phase sequence monitoring
	OFF-delay with phase sequence monitoring
	ON-delay without phase sequence monitoring
	OFF-delay without phase sequence monitoring

DIP switch functions CM-MPS.x3 and CM-MPN.x2

Position	4	3	2	1
ON ↑				
OFF				

2CDC 282 041 FEN/6

1 Timing function ON ON-delayed OFF OFF-delayed	2 Phase sequence monitoring ON deactivated OFF activated
3 Operating principle of output ON 2x1 c/o contact OFF 1x2 c/o contact	4 Phase sequence correction ON activated OFF deactivated

Output relay R1 is responsive to overvoltage, output relay R2 is responsive to undervoltage. In case of other faults, both output relays react synchronously.

DIP switch functions CM-MPS.x1

Position	2	1
ON ↑		
OFF		

2CDC 282 040 FEN/6

1 Timing function ON ON-delayed OFF OFF-delayed	2 Phase sequence monitoring ON deactivated OFF activated
--	---

Three-phase monitoring relays

Technical data

2

Type	CM-PBE ¹⁾	CM-PBE	CM-PVE ¹⁾	CM-PVE	CM-PFE	CM-PFS	
Supply circuit = measuring circuit	L1-L2-L3-N	L1-L2-L3	L1-L2-L3-N	L1-L2-L3	L1-L2-L3		
Rated control supply voltage U_s = measuring voltage	3x380-440 V AC, 220-240 V AC	3x380-440 V AC	3x320-460 V AC, 185-265 V AC	3x320-460 V AC	3x208-440 V AC	3x200-500 V AC	
Power consumption						approx. 15 VA	
Rated control supply voltage U_s tolerance	-15...+15 %		-15...+10 %		-10...+10 %	-15...+10 %	
Rated frequency	50/60 Hz		50/60 Hz (-10...+10 %)			50/60 Hz	
Duty time	100 %						
Measuring circuit	L1-L2-L3-N	L1-L2-L3	L1-L2-L3-N	L1-L2-L3	L1-L2-L3		
Monitoring functions							
phase failure	■	■	■	■	■	■	
phase sequence	-	-	-	-	■	■	
over- / undervoltage	-	-	■	■	-	-	
neutral	■	-	■	-	-	-	
Measuring ranges	3x380-440 V AC, 220-240 V AC	3x380-440 V AC	3x320-460 V AC, 185-265 V AC	3x320-460 V AC	3x208-440 V AC	3x200-500 V AC	
Thresholds	U_{min}	0.6 x U_N		fixed 185 V / 320 V	fixed 320 V	0.6 x U_N	
	U_{max}			fixed 265 V / 460 V	fixed 460 V		
Hysteresis related to the threshold value	fixed 5 % (release value = 0.65 x U_N)		fixed 5 %		-		
Measuring voltage frequency	50/60 Hz (-10 %...+10 %)				50/60 Hz		
Response time	40 ms		80 ms		500 ms		
Accuracy within the rated control supply voltage tolerance	-				$\Delta U \leq 0.5 \%$		
Accuracy within the temperature range	-		$\Delta U \leq 0.06 \%$ / °C				
Timing circuit							
Start-up delay t_s	fixed 500 ms ($\pm 20 \%$)				fixed 500 ms		
Tripping t_v	fixed 150 ms ($\pm 20 \%$)		at over- / undervoltage fixed 500 ms ($\pm 20 \%$)		fixed 500 ms	-	
Indication of operational states							
Relay status	R: yellow LED	V Output relay energized					
Fault message	F: red LED	Only CM-PFS: V		Phase failure / V	Phase sequence error		
Output circuits				13-14	11-12/14	11₁₅-12₁₆ / 14₁₈¹⁾ 21₂₅-22₂₆ / 24₂₈	
Kind of output	1 n/o contact				1 c/o contact	2 c/o contacts	
Operating principle	closed-circuit principle ²⁾						
Contact material	AgCdO					AgNi allow, Cd free	
Rated operational voltage U_e	IEC/EN 60947-1		250 V		250 V AC		
Minimum switching voltage / Minimum switching current	- / -						
Maximum switching voltage	250 V AC, 250 V DC						
Rated operational current I_e (IEC/EN 60947-5-1)	AC-12 (resistive) 230 V	4 A					
	AC-15 (inductive) 230 V	3 A					
	DC-12 (resistive) 24 V	4 A					
	DC-13 (inductive) 24 V	2 A					
Mechanical lifetime	30 x 10 ⁶ switching cycles						
Electrical lifetime (AC-12, 230 V, 4 A)	0.1 x 10 ⁶ switching cycles						
Max. fuse rating to achieve short-circuit protection	n/c contact	10 A fast-acting				6 A fast-acting	
	n/o contact	10 A fast-acting					
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)	B 300, CM-PFS: B300, pilot duty general purpose (250 V, 4 A, cos phi 0.75)					
	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					

¹⁾ Device with neutral monitoring: The external conductor voltage towards the neutral conductor is measured.

²⁾ Closed-circuit principle: Output relay is de-energized if the measured value exceeds/drops below the adjusted threshold.

Three-phase monitoring relays

Technical data

Type	CM-PBE ¹⁾	CM-PBE	CM-PVE ¹⁾	CM-PVE	CM-PFE	CM-PFS	
General data							
Dimensions (W x H x D)	22.5 x 78 x 78.5 mm (0.89 x 3.07 x 3.09 in) CM-PFS: 22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)						
Weight	see data sheet						
Mounting	DIN rail (IEC/EN 60715)						
Mounting position	any						
Degree of protection	housing / terminals IP50 / IP20						
Electrical connection							
Wire size	fine-strand with wire end ferrule	2 x 0.75-1.5 mm ² (2 x 18-16 AWG)				Same as CM-PSS.31, see page 2/44.	
	fine-strand without wire end ferrule	2 x 1-1.5 mm ² (2 x 18-16 AWG)					
	rigid	2 x 0.75-1.5 mm ² (2 x 18-16 AWG)					
Stripping length	10 mm (0.39 in)				Same as CM-PSS.31, see page 2/44.		
Tightening torque	0.6-0.8 Nm						
Environmental data							
Ambient temperature range	operation / storage	-20...+60 °C / -40...+85 °C					
Environmental testing (IEC 68-2-30)	24 h cycle time, 55 °C, 93 % rel., 96 h				-		
Operational reliability (IEC 68-2-6)	6 g				-		
Mechanical resistance (IEC 68-2-6)	10 g				-		
Climatic category	IEC/EN 60721-3-3	-				3K3	
Damp heat, cyclic	IEC/EN 60068-2-30	CM-PFS: 6 x 24 h cycle, 55 °C, 95 % RH				-	
Vibration, sinusoidal	IEC/EN 60255-21-1	-				Class 2	
Shock	IEC/EN 60255-21-2	-				Class 2	
Isolation data							
Rated insulation voltage U _i (IEC/EN 60947-1, IEC/EN 60664-1)	between supply, measuring and output circuits	400 V				-	
	supply circuit / output circuit	-				600 V	
	output circuit 1 / output circuit 2	-				300 V	
Rated impulse withstand voltage U _{imp} between all isolated circuits (VDE 0110, IEC 664)	supply circuit / output circuit	4 kV / 1.2 - 50 μs				-	
	output circuit 1 / output circuit 2	-				6 kV	
	supply circuit / output circuit	-				4 kV	
Basic insulation for rated control supply voltage (IEC/EN 60664-1)	supply circuit / output circuit	-				600 V AC	
Protective separation (IEC/EN 61140, EN 50178)	supply circuit / output circuit	-				n/a	
Test voltage (routine test)	supply circuit / output circuit	2.5 kV, 50 Hz, 1 min.				-	
	output circuit 1 / output circuit 2	-				2.5 kV, 50 Hz, 1 min.	
	supply circuit / output circuit	-				2.5 kV, 50 Hz, 1 min.	
Pollution degree (IEC/EN 60664-1)	3						
Overvoltage category (IEC/EN 60664-1)	III						
Standards							
Product standard	IEC 255-6, EN 60255-6, CM-PFS: IEC/EN 60255-1, IEC/EN 60255-27, EN 50178						
Low Voltage Directive	2006/95/EC						
EMC Directive	2004/108/EC						
RoHS Directive	CM-PFS: 2011/65/EC						
Electromagnetic compatibility							
Interference immunity to	EN 61000-6-2, CM-PFS: EN 61000-6-1, 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 (1 GHz) / 3 V/m (2 GHz) / 1 V/m (2.7 GHz)					
electrical fast transient / burst surge	IEC/EN 61000-4-4	Level 3 - 2 kV / 5 kHz					
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-5	Level 4 - 2 kV-L					
voltage dips, short interruptions and voltage variations	IEC/EN 61000-4-11	-				Class 3	
harmonics and interharmonics	IEC/EN 61000-4-13	-				Class 3	
Interference emission	EN 61000-6-4, CM-PFS: EN 61000-6-3, EN 61000-6-4						
high-frequency radiated	IEC/CISPR 22, EN 55022					Class B	
high-frequency conducted	IEC/CISPR 22, EN 55022					Class B	

¹⁾ Device with neutral monitoring: The external conductor voltage towards the neutral conductor is measured.

Three-phase monitoring relays

Technical data

2

Type	CM-PSS.31	CM-PSS.41	CM-PVS.31	CM-PVS.41	CM-PVS.81	CM-PAS.31	CM-PAS.41	
Input circuit = Measuring circuit	L1, L2, L3							
Rated control supply voltage U_s = measuring voltage	3x380 V AC	3x400 V AC	3x160-300 V AC	3x300-500 V AC	3x200-400 V AC	3x160-300 V AC	3x300-500 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	25 mA / 18 VA (380 V AC)	25 mA / 18 VA (400 V AC)	25 mA / 10 VA (230 V AC)	25 mA / 18 VA (400 V AC)	19 mA / 10 VA (300 V AC)	25 mA / 10 VA (230 V AC)	25 mA / 18 VA (400 V AC)	
Measuring circuit	L1, L2, L3							
Monitoring functions	Phase failure							
	■	■	■	■	■	■	■	
	Phase sequence							
	can be switched off							
	-	-	-	-	-	-	-	
	Automatic phase sequence correction							
	■	■	■	■	■	-	-	
	Over- / undervoltage							
	-	-	-	-	-	■	■	
	Phase unbalance							
	-	-	-	-	-	-	-	
	Neutral							
Measuring range	Overvoltage							
	3x418 V AC	3x440 V AC	3x220-300 V AC	3x420-500 V AC	3x300-400 V AC	-	-	
	Undervoltage							
	3x342 V AC	3x360 V AC	3x160-230 V AC	3x300-380 V AC	3x210-300 V AC	-	-	
	Phase unbalance							
	-	-	-	-	-	2-25 % of average of phase voltages		
Thresholds	Overvoltage							
	fixed		adjustable within measuring range				-	-
	Undervoltage							
	fixed		adjustable within measuring range				-	-
	Phase unbalance (switch-off value)							
	-	-	-	-	-	adjust. within meas. 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	$\Delta U \leq 0.5 \%$							
Accuracy within the temperature range	$\Delta U \leq 0.06 \%$ / °C							
Measuring method	True RMS							
Timing circuit								
Start-up delay t_s	fixed 200 ms							
Tripping delay t_v	ON- or OFF-delay 0; 0.1-30 s adjustable					ON- delay 0; 0.1-30 s adjustable		
Repeat accuracy (constant parameters)	-	-	-	-	< $\pm 0.2 \%$	-	-	
Accuracy within the rated control supply voltage tolerance	$\Delta t \leq 0.5 \%$							
Accuracy within the temperature range	$\Delta t \leq 0.06 \%$ / °C							
Indication of operational states	Details see function description / -diagrams		1 yellow LED, 2 red LED's			Details see function description / -diagrams		
Output circuits	15-16/18, 25-26/28							
Kind of output	relay, 2 x 1 c/o contact							
Operating principle	closed-circuit principle ¹⁾							
Contact material	AgNi alloy, Cd free							
Rated operational voltage U_o	IEC/EN 60947-1 250 V							
Minimum switching power	24 V / 10 mA							
Maximum switching voltage	see „Load limit curves“ on page 127							

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

Three-phase monitoring relays

Technical data

Type	CM-PSS.31	CM-PSS.41	CM-PVS.31	CM-PVS.41	CM-PVS.81	CM-PAS.31	CM-PAS.41
Rated operational current I _o (IEC/EN 60947-5-1)	AC-12 (resistive) 230 V	4 A					
	AC-15 (inductive) 230 V	3 A					
	DC-12 (resistive) 24 V	4 A					
	DC-13 (inductive) 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					
Max. fuse rating to achieve short-circuit protection	n/c contact	6 A fast-acting					
	n/o contact	10 A fast-acting					
General data							
MTBF		on request					
Duty time		100%					
Dimensions (W x H x D)	product dimensions	22.5 x 85.6 x 103.7 mm (0.89 x 3.37 x 4.08 in)					
	packaging dimensions	97 x 109 x 30 mm (3.82 x 4.29 x 1.18 in)					
Weight		depending on device, see ordering details					
Mounting		DIN rail (IEC/EN 60715), snap-on mounting without any tool					
Mounting position		any					
Minimum distance to other units	horizontal	10 mm (0.39 in) in case of continuous measuring voltages					
		> 400 V	> 400 V	> 220 V	> 400 V	-	> 220 V > 400 V
Material of housing		UL 94 V-0					
Degree of protection	housing / terminals	IP50 / IP20					
Electrical connection							
Wire size		Screw connection technology			Easy Connect Technology (Push-in)		
fine-strand with(out) wire end ferrule		1 x 0.5-2.5 mm ² (1 x 20-14 AWG)			2 x 0.5-1.5 mm ² (2 x 20-16 AWG)		
		2 x 0.5-1.5 mm ² (2 x 20-16 AWG)					
	rigid	1 x 0.5-4 mm ² (1 x 20-12 AWG)			2 x 0.5-1.5 mm ² (2 x 20-16 AWG)		
		2 x 0.5-2.5 mm ² (2 x 20-14 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 / storage	-25...+60 °C / -40...+85 °C					
Damp heat (IEC 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							
Rated insulation voltage U _i	input circuit / output circuit	600 V					
	output circuit 1 / output circuit 2	300 V					
Rated impulse withstand voltage U _{imp} (VDE 0110, IEC/EN 60664)	input circuit	6 kV; 1.2/50 μs					
	output circuit	4 kV; 1.2/50 μs					
Test voltage between all isolated circuits (routine test)		2.5 kV, 50 Hz, 1 s					
Basic insulation	input circuit / output circuit	600 V					
Protective separation (VDE 0106 part 101 and 101/A, IEC/EN 1140)	input circuit / output circuit	-					
Pollution degree (VDE 0110, IEC/EN 60664)		3					
Overvoltage category (VDE 0110, IEC 60664)		III					
Standards							
Product standard		IEC/EN 60255-6, EN 50178					
Low Voltage Directive		2006/95/EC					
EMC directive		2004/108/EC					
RoHS directive		2011/65/EC					
Electromagnetic compatibility							
Interference immunity to		EN 61000-6-1, 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)					
Interference emission		EN 61000-6-3, EN 61000-6-4					
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B					
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B					

Three-phase monitoring relays

Technical data

2

Type	CM-MPS.11	CM-MPS.21	CM-MPS.31	CM-MPS.41
Input circuit = Measuring circuit	L1, L2, L3, N		L1, L2, L3	
Rated control supply voltage U_s = measuring voltage	3x90-170 V AC	3x180-280 V AC	3x160-300 V AC	3x300-500 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	25 mA / 10 VA (115 V AC)	25 mA / 18 VA (230 V AC)	25 mA / 10 VA (230 V AC)	25 mA / 18 VA (400 V AC)
Measuring circuit	L1, L2, L3, N		L1, L2, L3	
Monitoring functions	Phase failure	■	■	■
	Phase sequence	can be switched off		
	Automatic phase sequence correction	-	-	-
	Over- / undervoltage	■	■	■
	Phase unbalance	■	■	■
	Interrupted neutral	■	■	-
Measuring range	Overvoltage	3x120-170 V AC	3x240-280 V AC	3x220-300 V AC
	Undervoltage	3x90-130 V AC	3x180-220 V AC	3x160-230 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	$\Delta U \leq 0.5 \%$			
Accuracy within the temperature range	$\Delta U \leq 0.06 \% / ^\circ\text{C}$			
Measuring method	True RMS			
Timing circuit				
Start-up delay t_s	fixed 200 ms			
Tripping delay t_r	ON- or OFF-delay 0; 0.1-30 s adjustable			
Accuracy within the rated control supply voltage tolerance	$\Delta t \leq 0.5 \%$			
Accuracy within the temperature range	$\Delta t \leq 0.06 \% / ^\circ\text{C}$			
Indication of operational states	Details see function description / -diagrams			
Output circuits	15-16/18, 25-26/28			
Kind of output	relay, 1 x 2 c/o contacts			
Operating principle	closed-circuit principle ¹⁾			
Contact material	AgNi alloy, Cd free			
Rated operational voltage U_o (IEC/EN 60947-1)	250 V			
Minimum switching power	24 V / 10 mA			
Maximum switching voltage	see „Load limit curves“ on page 127			
Rated operational current I_o (IEC/EN 60947-5-1)	AC-12 (resistive) 230 V	4 A		
	AC-15 (inductive) 230 V	3 A		
	DC-12 (resistive) 24 V	4 A		
	DC-13 (inductive) 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			
Max. fuse rating to achieve short-circuit protection	n/c contact	6 A fast-acting		
	n/o contact	10 A fast-acting		

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

Three-phase monitoring relays

Technical data

Type	CM-MPS.11	CM-MPS.21	CM-MPS.31	CM-MPS.41
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	depending on device, see ordering details		
	gross weight	depending on device, see ordering details		
Mounting	DIN rail (IEC/EN 60715), snap-on mounting without any tool			
Mounting position	any			
Minimum distance to other units	horizontal	10 mm (0.39 in) in case of continuous measuring voltages		
		> 120 V	> 240 V	> 220 V
Material of housing	UL 94 V-0			
Degree of protection	housing / terminals	IP50 / IP20		
Electrical connection				
Wire size	Screw connection technology		Easy Connect Technology (Push-in)	
	fine-strand with(out) wire end ferrule	1 x 0.5-2.5 mm ² (1 x 20-14 AWG)	2 x 0.5-1.5 mm ² (2 x 20-16 AWG)	
		2 x 0.5-1.5 mm ² (2 x 20-16 AWG)		
rigid	1 x 0.5-4 mm ² (1 x 20-12 AWG)	2 x 0.5-1.5 mm ² (2 x 20-16 AWG)		
		2 x 0.5-2.5 mm ² (2 x 20-14 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 / storage	-25...+60 °C / -40...+85 °C		
Damp heat (IEC 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				
Rated insulation voltage U _i	input circuit / output circuit	600 V		
	output circuit 1 / output circuit 2	300 V		
Rated impulse withstand voltage U _{imp} (VDE 0110, IEC/EN 60664)	input circuit	6 kV; 1.2/50 μs		
	output circuit	4 kV; 1.2/50 μs		
Test voltage between all isolated circuits (routine test)		2.5 kV, 50 Hz, 1 s		
Basic insulation	input circuit / output circuit	600 V		
Protective separation (VDE 0106 part 101 and 101/A, IEC/EN 61140)	input circuit / output circuit	yes	-	
Pollution degree (VDE 0110, IEC/EN 60664)	3			
Overvoltage category (VDE 0110, IEC 60664)	III			
Standards				
Product standard	IEC/EN 60255-1, EN 50178			
Low Voltage Directive	2006/95/EC			
EMC directive	2004/108/EC			
RoHS directive	2011/65/EC			
Electromagnetic compatibility				
Interference immunity to		EN 61000-6-1, 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		EN 61000-6-3, EN 61000-6-4		
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B		
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B		

Three-phase monitoring relays

Technical data

2

Type	CM-MPS.23	CM-MPS.43	CM-MPN.52	CM-MPN.62	CM-MPN.72																																				
Input circuit = Measuring circuit	L1, L2, L3, N		L1, L2, L3																																						
Rated control supply voltage U_s = measuring voltage	3x180-280 V AC	3x300-500 V AC	3x350-580 V AC	3x450-720 V AC	3x530-820 V AC																																				
Rated control supply voltage U_s tolerance	-15...+10 %																																								
Rated frequency	50/60/400 Hz		50/60 Hz																																						
Frequency range	45-440 Hz		45-65 Hz																																						
Typical current / power consumption	5 mA / 4 VA (230 V AC)	5 mA / 4 VA (400 V AC)	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, N		L1, L2, L3																																						
Monitoring functions	<table border="0"> <tr> <td>Phase failure</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> </tr> <tr> <td>Phase sequence</td> <td colspan="5">can be switched off</td> </tr> <tr> <td>Automatic phase sequence correction</td> <td colspan="5">configurable</td> </tr> <tr> <td>Over- / undervoltage</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> </tr> <tr> <td>Phase unbalance</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> </tr> <tr> <td>Interrupted neutral</td> <td>■</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> </table>					Phase failure	■	■	■	■	■	Phase sequence	can be switched off					Automatic phase sequence correction	configurable					Over- / undervoltage	■	■	■	■	■	Phase unbalance	■	■	■	■	■	Interrupted neutral	■	-	-	-	-
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Measuring method	True RMS																																								
Timing circuit	15-16/18, 25-26/28																																								
Start-up delay t_{s2} and t_{s2}	fixed 200 ms																																								
Start-up delay t_{s1}	fixed 250 ms																																								
Tripping delay t_v	ON- or OFF-delay 0; 0.1-30 s adjustable																																								
Accuracy within the rated control supply voltage tolerance	$\Delta t \leq 0.5 \%$																																								
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Indication of operational states	Details see function description / -diagrams																																								
Output circuits	15-16/18, 25-26/28																																								
Kind of output	relay, 2 x 1 or 1 x 2 c/o contacts configurable																																								
Operating principle	closed-circuit principle ¹⁾																																								
Contact material	AgNi alloy, Cd free																																								
Rated operational voltage U_e	IEC/EN 60947-1 250 V																																								
Minimum switching power	24 V / 10 mA																																								
Maximum switching voltage	see „Load limit curves“ on page 127																																								
Rated operational current I_e (IEC/EN 60947-5-1)	<table border="0"> <tr> <td>AC-12 (resistive) 230 V</td> <td>4 A</td> </tr> <tr> <td>AC-15 (inductive) 230 V</td> <td>3 A</td> </tr> <tr> <td>DC-12 (resistive) 24 V</td> <td>4 A</td> </tr> <tr> <td>DC-13 (inductive) 24 V</td> <td>2 A</td> </tr> </table>					AC-12 (resistive) 230 V	4 A	AC-15 (inductive) 230 V	3 A	DC-12 (resistive) 24 V	4 A	DC-13 (inductive) 24 V	2 A																												
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Mechanical lifetime	30 x 10 ⁶ switching cycles																																								
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Max. fuse rating to achieve short-circuit protection	n/c contact 6 A fast-acting		n/o contact 10 A fast-acting																																						

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

Three-phase monitoring relays

Technical data

Type	CM-MPS.23	CM-MPS.43	CM-MPN.52	CM-MPN.62	CM-MPN.72
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	depending on device, see ordering details				
Mounting	DIN rail (IEC/EN 60715), snap-on mounting without any tool				
Mounting position	any				
Minimum distance to other units	vertical / horizontal	not necessary / not necessary			
Material of housing	UL 94 V-0				
Degree of protection	housing / terminals	IP50 / IP20			
Electrical connection					
Wire size	fine-strand with(out) wire end ferrule	Screw connection technology		Easy Connect Technology (Push-in)	
		1 x 0.5-2.5 mm ² (1 x 20-14 AWG)		2 x 0.5-1.5 mm ² (2 x 20-16 AWG)	
		2 x 0.5-1.5 mm ² (2 x 20-16 AWG)		2 x 0.5-1.5 mm ² (2 x 20-16 AWG)	
Stripping length	rigid	1 x 0.5-4 mm ² (1 x 20-12 AWG)		2 x 0.5-1.5 mm ² (2 x 20-16 AWG)	
		2 x 0.5-2.5 mm ² (2 x 20-14 AWG)		8 mm (0.32 in)	
Tightening torque	0.6-0.8 Nm (5.31-7.08 lb.in)			-	
Environmental data					
Ambient temperature ranges	operation / storage	-25...+60 °C / -40...+85 °C			
Damp heat (IEC 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					
Rated insulation voltage U _i	input circuit / output circuit	600 V		1000 V	
	output circuit 1 / 2	300 V			
Rated impulse withstand voltage U _{imp} (VDE 0110, IEC/EN 60664)	input circuit	6 kV; 1.2/50 μs		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	2.5 kV, 50 Hz, 1 s		4 kV, 50 Hz, 1 s	
Basic insulation	input circuit / output circuit	600 V		1000 V	
Protective separation (VDE 0106 part 101 and 101A, IEC/EN 61140)	input circuit / output circuit	-			
Pollution degree (VDE 0110, IEC/EN 60664)	3				
Overvoltage category (VDE 0110, IEC 60664)	III				
Standards					
Product standard	IEC/EN 60255-1, EN 50178				
Low Voltage Directive	2006/95/EC				
EMC directive	2004/108/EC				
RoHS directive	2011/65/EC				
Electromagnetic compatibility					
Interference immunity to	electrostatic discharge	EN 61000-6-1, EN 61000-6-2			
	radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-2	Level 3 (6 kV / 8 kV)		
	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-N)	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	high-frequency radiated	EN 61000-6-3, EN 61000-6-4			
	high-frequency conducted	IEC/CISPR 22, EN 55022	Class B		
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