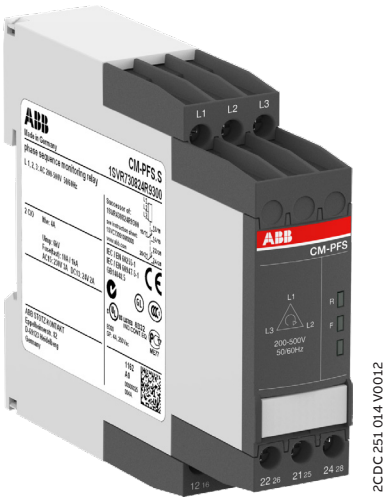
DATA SHEET

Three-phase monitoring relays
CM-PFS

The CM-PFS is a three-phase monitoring relay that is used to monitor three phase mains for incorrect phase sequence and phase failure.

All devices are available with two different terminal versions. You can choose between the proven screw connection technology (double-chamber cage connection terminals) and the completely tool-free Easy Connect Technology (Push-in terminals)



Characteristics

- Monitoring of three-phase mains for phase sequence and failure
- Suitable for railway applications
- Powered by the measuring circuit
- Closed-circuit principle
- 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
- 2 LEDs for the indication of operational states
- Various certifications and approvals (see overview, document no. 2CDC112246D0201)

Order data

Three-phase monitoring relays

Type	Rated control supply voltage = measuring voltage	Connection technology	Order code
CM-PFS.P	3 x 200-500 V AC	Push-in terminals	1SVR740824R9300
CM-PFS.S	3 x 200-500 V AC	Screw type terminals	1SVR730824R9300

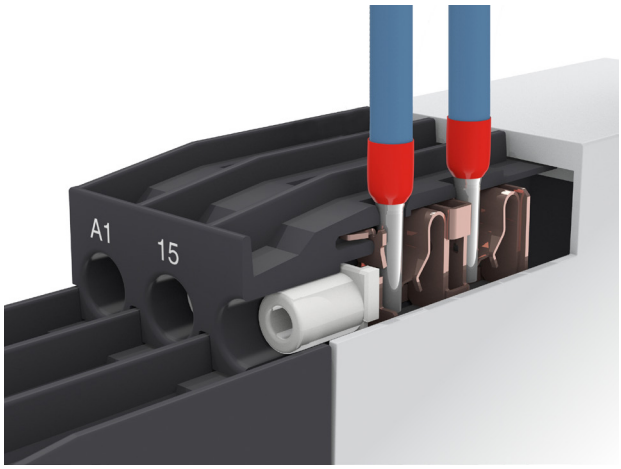
Accessories

Type	Description	Order code
ADP.01	Adapter for screw mounting	1SVR430029R0100
MAR.01	Marker label for devices without DIP switches	1SVR366017R0100
COV.11	Sealable transparent cover	1SVR730005R0100

Connection technology

Maintenance free Easy Connect Technology with push-in terminals

Type designation CM-xxS.yyP



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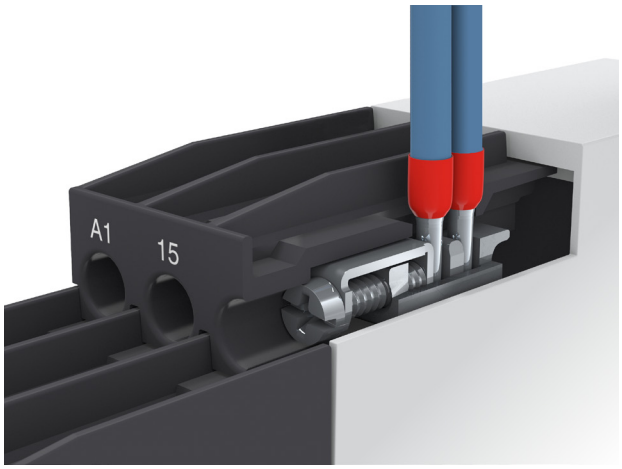
Approved screw connection technology with double-chamber cage connection terminals

Type designation CM-xxS.yyS



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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 connection terminals
- For triggering the lever and disconnecting of wires you can use the same tool (Screwdriver according to DIN ISO 2380-1 Form A 0.8 x 4 mm (0.0315 x 0.157 in), DIN ISO 8764-1 PZ1 ø 4.5 mm (0.177 in))
- Constant spring force on terminal point independent of the applied wire type, wire size or ambient conditions (e. g. vibrations or temperature changes)
- Opening for testing the electrical contacting
- Gas-tight

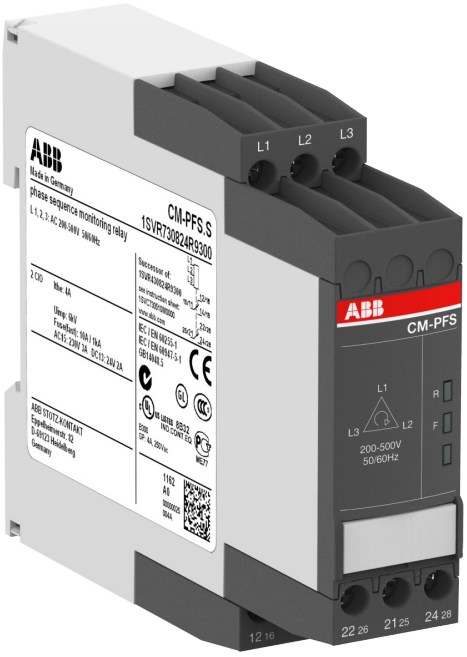
Double-chamber cage connection terminals

- 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 connection terminals have the same connection geometry as well as terminal position.

Functions

Operating controls



Indication of operational states
R: yellow LED – status indication of the output relays
F: red LED – fault message

Application

The CM-PFS is used to monitor three-phase mains for incorrect phase sequence and phase failure.

Operating mode

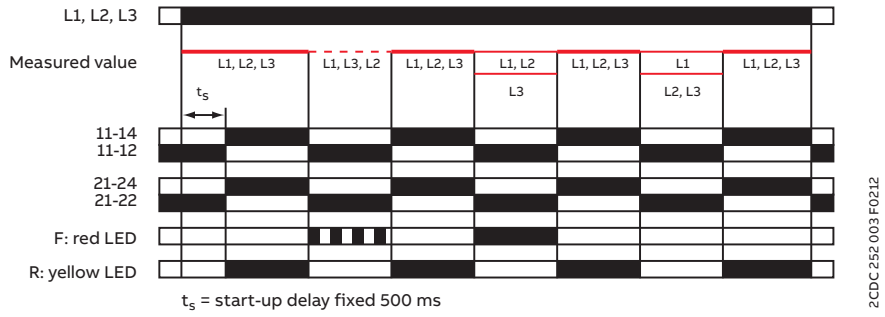
The three-phase main to be monitored is connected to terminals L1, L2, L3 in accordance to the wiring diagram. The device operates according to the closed-circuit principle – incorrect phase sequence or phase failure: relays de-energize. The signalling of status indication is made by means of the front-face LEDs.

Function descriptions / diagrams

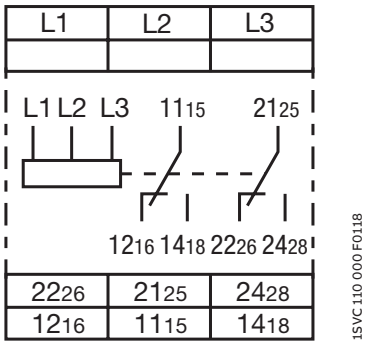
Phase sequence and phase failure monitoring

If all phases are present with the correct phase sequence, the output relays energize after the start-up delay t_s is complete.
If a phase failure or a phase sequence error occurs, the output relays de-energize instantaneously.
The LED R is on when output relays are 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.



Electrical connection



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Connection diagram

L1, L2, L3	Control supply voltage = measuring voltage
11_{15}-12_{16}/14_{18} 21_{25}-22_{26}/24_{28}	Output contacts - closed-circuit principle

Technical data

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

Input circuits

Type		**CM-PFS**
Supply circuit = measuring circuit		**L1, L2, L3**
Rated control supply voltage U_s = measuring voltage		3 x 200-500 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	400 V AC	16 mA / 11 VA

Measuring circuit		**L1, L2, L3**
Monitoring functions	Phase failure	■
	Phase sequence	■
Measuring ranges		3 x 200-500 V AC
Threshold value for phase failure	U_{min}	0.6 x U_N
Hysteresis related to the threshold value		-
Response time		500 ms

Timing circuit	
Start-up delay t_s	fixed 500 ms

User interface

Indication of operational states		
Relay status R1, R2	R: yellow LED	⎍ output relay energized
Fault message	F: red LED	⎍ Phase failure
		⎍⎍⎍ Phase sequence error

Output circuits

Kind of output		11(15)-12(16)/14(18)	relay, 1st c/o (SPDT) contact
		21(25)-22(26)/24(28)	relay, 2nd c/o (SPDT) contact
			1 x 2 c/o (SPDT) contacts
Operating principle			closed-circuit principle [1]
Contact material			AgNi alloy, Cd free
Rated operational voltage U_e			250 V AC
Minimum switching voltage / Minimum switching current			24 V / 10 mA
Maximum switching voltage / Maximum switching current			see "Load limit curves" on page 7
Rated operational voltage U_e and 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 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
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	6 A fast-acting
		n/o contact	10 A fast-acting
Conventional thermal current I_{th}			4 A

[1] Closed-circuit principle: output relays de-energize if the measured value exeeds/drops below the threshold.

General data

MTBF		on request	
Duty cycle		100 %	
Dimensions		see 'Dimensional drawings'	
Weight		**Screw connection technology**	**Easy Connect Technology (push-in)**
	net	0.128 kg (0.282 lb)	0.120 kg (0.265 lb)
Mounting		DIN rail (IEC/EN 60715), snap-on mounting without any tool	
Mounting position		any	
Minimum distance to other units	vertical / horizontal	≥ 10 mm (0.39 in) in case of continuous measuring voltage > 440 V	
Degree of protection	housing	IP50	
	terminals	IP20	

Electrical connection

		Screw connection technology	**Easy Connect Technology (push-in)**
Connnecting 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)	-
Recommended screw driver		DIN ISO 2380-1: Form A / 0.8x4.0 mm DIN ISO 8764-1: PZ 1 / Ø 4.5 mm	-

Environmental data

Ambient temperature ranges	operation	-25...+60 °C
	storage	-40...+85 °C
	transport	-40...+85 °C
Climatic class	IEC/EN 60721-3-3	3K3
Damp heat, cyclic	IEC/EN 60068-2-30	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	input circuit / output circuit	600 V
	output circuit 1 / output circuit 2	300 V
Rated impulse withstand voltage U_{imp}	input circuit / output circuit	6 kV
	output circuit 1 / output circuit 2	4 kV
Basic insulation	input circuit / output circuit	600 V AC
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*), C2*)
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		HL3
and components	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

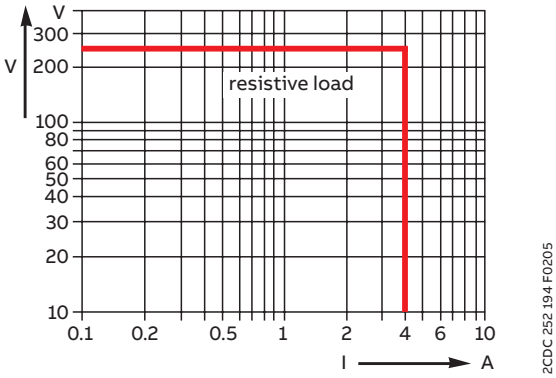
*) only applicable for devices with DC supply

Electromagnetic compatibility

Interference immunity to		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 (1 GHz) / 3 V/m (2 GHz) / 1 V/m (2.7 GHz)
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3, 2 kV / 5 kHz
surge	IEC/EN 61000-4-5	Level 3, 2 kV L-L
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3, 10 V
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		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



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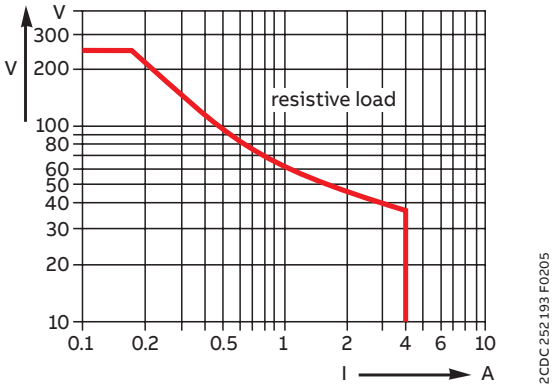
AC load (resistive)



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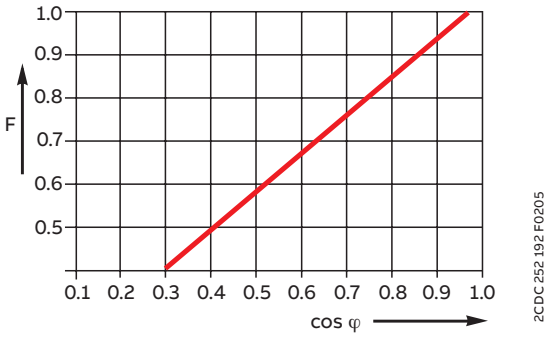
DC load (resistive)



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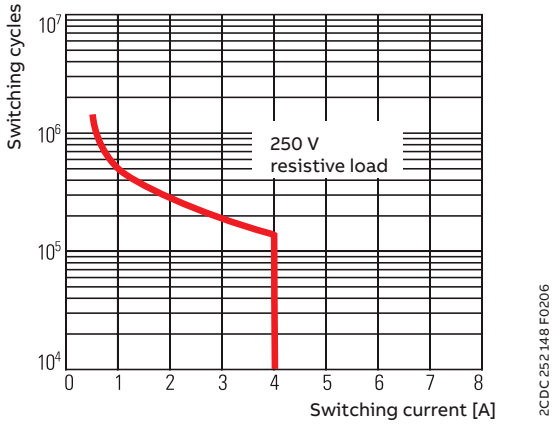
Derating factor F for inductive AC load



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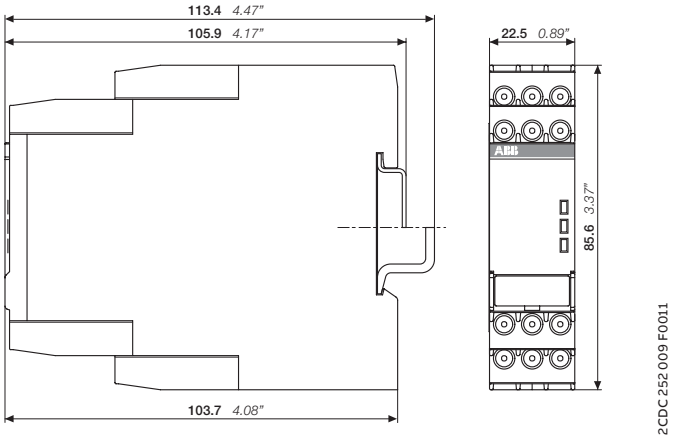
Contact lifetime

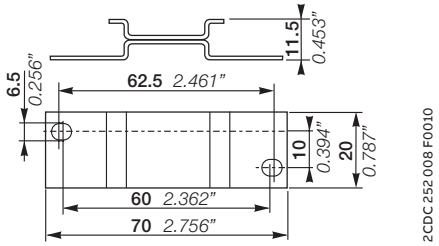
Dimensional drawings

in mm and inches



Accessories

in mm and inches



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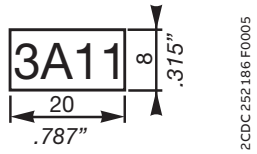
ADP.01 - Adapter for screw mounting



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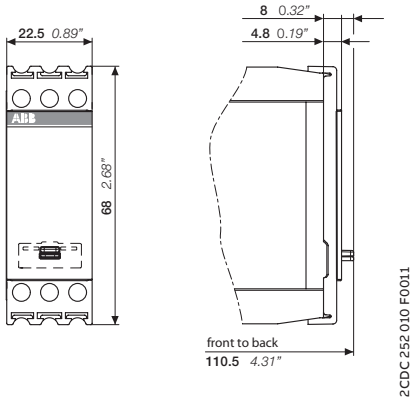
MAR.01 - Marker label



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COV.11 - Sealable transparent cover

Further documentation

Document title	Document type	Document number
Electronic relays and controls	Catalog	2CDC 110 004 C02xx
CM-PAS, CM-PFS, CM-PSS, CM-PVS	Instruction manual	1SVC 630 510 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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