

Three-phase Overcurrent Relay SPAJ 131 C

Product Guide



Features

- Three-phase low-set phase overcurrent stage with definite time or inverse time characteristic
- High-set phase overcurrent stage with definite time characteristic
- Both overcurrent stages can be blocked by an external control signal
- Output relay functions freely configurable for the desired operation
- Flexible adaptation of relay to specific applications
- Local numerical display of setting values, measured values and recorded fault values
- Serial interface for two-way data communication over fibre-optic bus between relay and substation and/or remote control systems
- Continuous self-supervision of hardware and software, including auto-diagnostics

Application

The overcurrent relay SPAJ 131 C is designed to be used for two-stage phase overcurrent protection of distribution feeders, large low-voltage motors, high-voltage motors, medium-sized and large generators and power transformers. The relay can be used both as main protection relay and back-up protection relay.

The relay has two protection stages: a low-set overcurrent stage $I>$ and a high-set overcurrent stage $I>>$. The low-set stage has a defi-

nite time or an inverse-time operation characteristic, while the high-set stage has a definite time characteristic only.

The overcurrent relay is provided with five output relays, four of which are freely configurable for the desired function. Two of the output relays have heavy-duty contacts capable of directly operating a circuit breaker.

Design

The overcurrent relay SPAJ 131 C is a secondary relay that is connected to the current transformers of the object protected. The relay can be used for single-phase, two-phase or three-phase overcurrent protection. The overcurrent relay continuously measures the phase currents of the object to be protected. On the occurrence of a fault the overcurrent relay generates an alarm signal, trips the circuit breaker or starts external auto-reclose functions, in accordance with the current application.

When the phase current exceeds the set start value $I_{>}$ of the low-set stage, the overcurrent relay starts. When, at definite time operation, the set operate time $t_{>}$ or, at inverse definite minimum time (IDMT) operation, the calculated operate time $t_{>}$, expires, the relay operates. In the same way, the high-set stage starts once the set start value $I_{>>}$ is exceeded and, when the set operate time $t_{>>}$ expires, the relay operates.

The low-set stage of the overcurrent relay can be given either definite-time or inverse-time characteristic. At inverse time characteristic four inverse time curve sets with different slopes are available: Normal inverse, Very inverse, Extremely inverse and Long-time inverse. These curve sets comply with the BS 142 and IEC 255 standards.

The start signals from the overcurrent relay are obtainable as contact functions. The start signal can be used, for instance, for blocking cooperating protection relays.

The relay contains one optically isolated logic input for external incoming control signals, generally blocking signals.

Data communication

The relay is provided with a serial interface on the rear panel. By means of a bus connection module type SPA-ZC 17 or SPA-ZC 21

the relay can be connected to the fibre-optic SPA bus. The bus connection module type SPA-ZC 21 is powered from the host relay, whereas the bus connection module SPA-ZC 17 is provided with a built-in power unit, which can be fed from an external secured power source. The relay communicates with higher-level data acquisition and control systems over the SPA bus.

Self-supervision

The relay incorporates a sophisticated self-supervision system with auto-diagnosis, which increases the availability of the relay and the reliability of the system. The self-supervision system continuously monitors the hardware and the software of the relay. The system also supervises the operation of the auxiliary supply module and the voltages generated by the module.

When the self-supervision system detects a permanent internal relay fault, the IRF indicator on the relay front panel is lit. At the same time the output relay of the self-supervision system operates and a fault message is transmitted to the higher-level system over the serial bus. Further, in most fault situations, a fault code is shown in the display of the protection relay module. The fault code indicates the type of the fault that has been detected.

Auxiliary supply voltage

The auxiliary supply of the relay is obtained from an internal plug-in type power supply module. Two auxiliary power module versions are available: type SPTU 240S1 for the supply voltage range 80...265 V ac/dc and type SPTU 48S1 for the supply voltage range 18...80 V dc. The power supply module forms the internal voltages required by the protection relay and the I/O module.

Technical data

Table 1: Energizing inputs

Terminals		1-3, 4-6, 7-9	1-2, 4-5, 7-8
Rated current I_n		1 A	5 A
Thermal withstand capability	continuously	4 A	20 A
	for 10 s	25 A	100 A
	for 1 s	100 A	500 A
Dynamic current withstand capability	Half-wave value	250 A	1250 A
Input impedance		<100 m Ω	<20 m Ω
Rated frequency f_n , according to order		50 Hz or 60 Hz	

Table 2: Output contact ratings

Type of contact		Tripping	Signalling
Terminals		65-66, 68-69	70-71-72, 77-78, 80-81
Rated voltage		250 V ac/dc	
Thermal withstand capability	Carry continuously	5 A	5 A
	Make and carry for 0.5 s	30 A	10 A
	Make and carry for 3 s	15 A	8 A
Breaking capacity for dc, when the control/signalling circuit time constant $L/R \leq 40$ ms, at the control voltages	220 V dc	1 A	0.15 A
	110 V dc	3 A	0.25 A
	48 V dc	5 A	1 A

Table 3: Control input, communication and power supply

External control input	Terminals	10-11		
	Control voltage level	18...265 V dc or 80...265 V ac		
	Power consumption when input activated	2...20 mA		
Data communication	Transmission mode	Fibre-optic serial bus		
	Data code	ASCII		
	Selectable data transfer rates	300, 1200, 2400, 4800 or 9600 Bd		
	Fibre-optic bus connection module, powered from the host relay	for plastic fibre cables	SPA-ZC 21BB	
		for glass fibre cables	SPA-ZC 21MM	
	Fibre-optic bus connection module with a built-in power supply unit	for plastic fibre cables	SPA-ZC 17BB	
for glass fibre cables		SPA-ZC 17MM		
Auxiliary supply modules	Power supply and I/O modules and voltage ranges	SPTU 240S1	80...265 V ac/dc	
		SPTU 48S1	18...80 V dc	
	Power consumption	under quiescent conditions	~4 W	
		under operating conditions	~6 W	

Technical data (cont'd)

Table 4: Overcurrent relay module SPCJ 3C3

Low-set overcurrent stage $I>$	Start current $I>$, setting range		$0.5...2.5 \times I_n$	
	Start time, typically		70 ms	
	Reset time, typically		60 ms	
	Retardation time		<30 ms	
	Drop-off/pick-up ratio, typically		0.96	
	Selectable modes of operation	Definite time characteristic	Operate time $t>$	0.05...100 s
		Inverse definite minimum time (IDMT) characteristic	Curve sets acc. to IEC 255-4 and BS 142	Normal inverse Very inverse Extremely inverse Long-time inverse
			Time multiplier k	0.05...1.00
	Operation time accuracy		Definite time operation characteristic	$\pm 2\%$ of set value or ± 25 ms
			Class E at inverse time operation	5
Operation accuracy			$\pm 3\%$ of set value	
High-set overcurrent stage $I>>$	Start current $I>>$, setting range		$0.5...20 \times I_n$ and ∞ , infinite	
	Start time, typically		40 ms	
	Operate time $t>>$		0.04...100 s	
	Reset time, typically		60 ms	
	Retardation time		<30 ms	
	Drop-off/pick-up ratio, typically		0.96	
	Operation time accuracy			$\pm 2\%$ of set value or ± 25 ms
	Operation accuracy			$\pm 3\%$ of set value

Technical data (cont'd)

Table 5: Tests and standards

Test voltages	Dielectric test voltage (IEC 60255-5)	2.0 kV, 50 Hz, 1 min
	Impulse test voltage (IEC 60255-5)	5 kV, 1.2/50 μ s, 0.5 J
	Insulation resistance (IEC 60255-5)	>100 M Ω , 500 V dc
Interference tests	High-frequency (1 MHz) disturbance test (IEC 60255-22-1), common mode	2.5 kV
	High-frequency (1 MHz) disturbance test (IEC 60255-22-1), differential mode	1.0 kV
	Fast transients (IEC 60255-22-4, class III and IEC 61000-4-4), power supply inputs	4 kV, 5/50 ns
	Fast transients (IEC 60255-22-4, class III and IEC 61000-4-4), other inputs	2 kV, 5/50 ns
	Electrostatic discharge (IEC 60255-22-2 and IEC 61000-4-2), air discharge	8 kV
	Electrostatic discharge (IEC 60255-22-2 and IEC 61000-4-2), contact discharge	6 kV
	Environmental conditions	Service temperature range
Transport and storage temperature range (IEC 60068-2-8)		-40...+70°C
Damp heat test (IEC 60068-2-3)		<95%, +40°C, 96 h
Relative humidity (IEC 60068-2-30)		93...95%, +55°C, 6 cycles
Degree of protection by enclosure when panel mounted		IP 54
Weight		3 kg

Block diagram

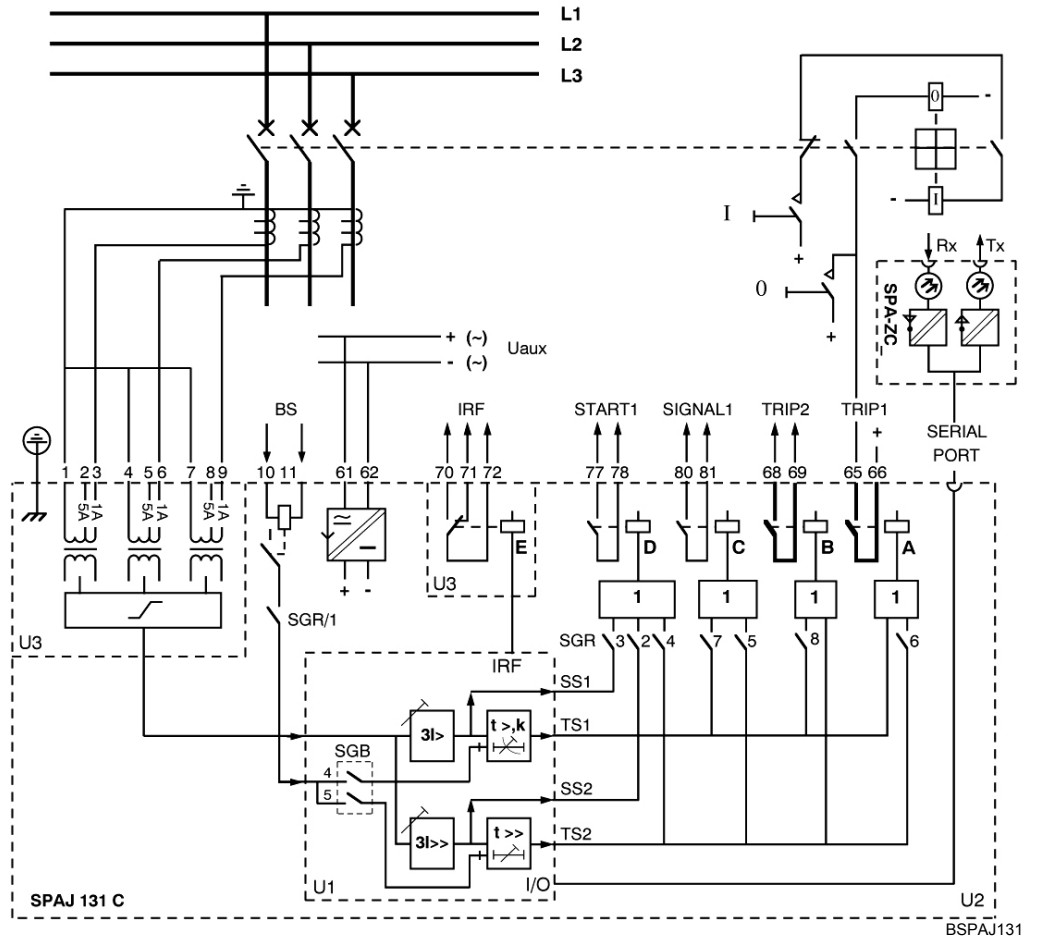


Fig. 1 Block diagram and sample connection diagram

Mounting and dimensions

Flush mounting

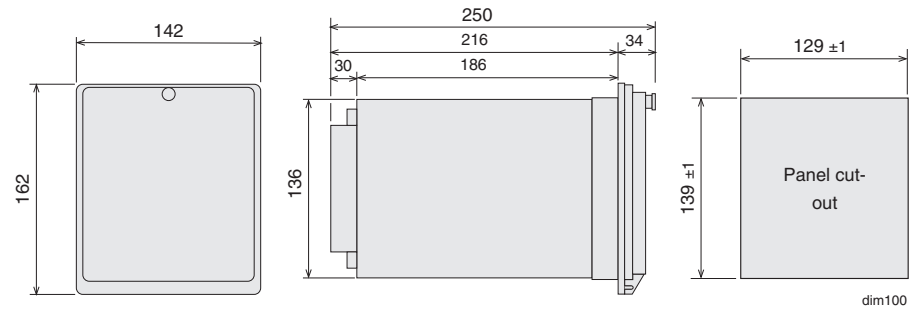


Fig. 2 Flush-mounting relay case (dimensions in mm)

Semi-flush mounting

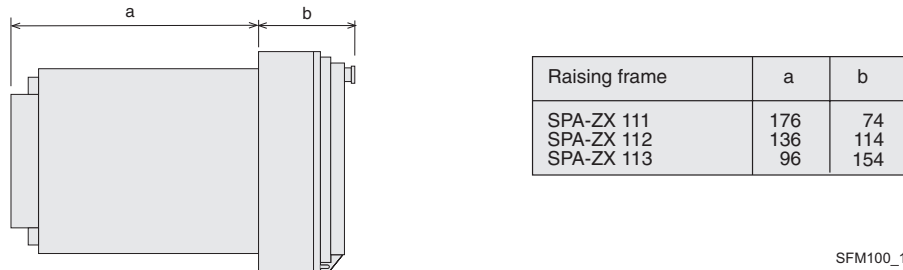


Fig. 3 Semi-flush mounting relay case (dimensions in mm)

Mounting in 19 inch cabinets and frames

An ancillary mounting plate, height 4U (~177 mm), is recommended to be used when the protection relays are to be mounted in 19 inch frames or cabinets. The ancillary mounting plate type SPA-ZX 104 accommodates three relays, type SPA-ZX 105 two relays and type SPA-ZX 106 one relay.

Projecting mounting

When projecting mounting is preferred, a relay case type SPA-ZX 110 is used. The relay case for projecting mounting is provided with front connectors.

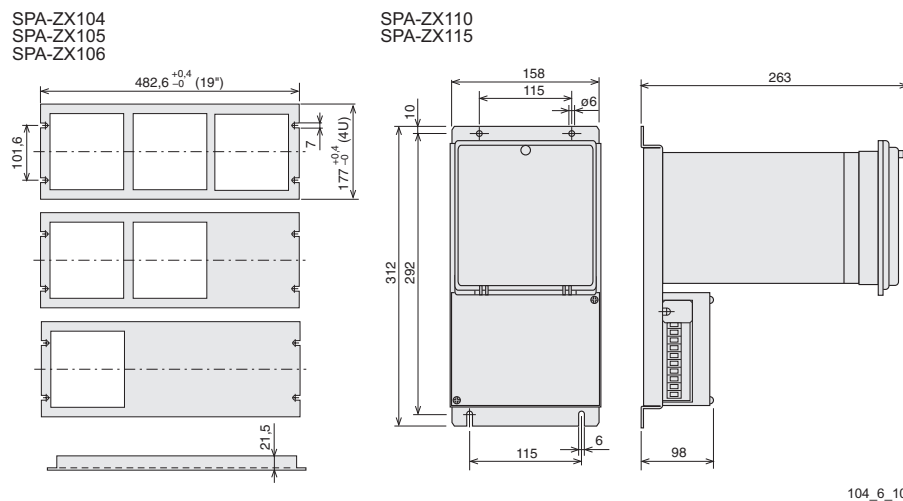


Fig. 4 Mounting cabinets and frames as well as projecting mounting (dimensions in mm)

Product Guide

Ordering

When ordering, please specify:

Ordering information	Ordering example
1. Type designation and quantity	SPAJ 131 C, 5 pieces
2. Order number	RS 421 013-AA
3. Rated values	$I_n=5\text{ A}$, $f_n=50\text{ Hz}$
4. Auxiliary voltage	$U_{aux}=110\text{ V dc}$
5. Accessories	-
6. Special requirements	-

Order numbers

Three-phase overcurrent relay SPAJ 131 C without test adapter	RS 421 013-AA, CA, DA, FA
Three-phase overcurrent relay SPAJ 131 C including test adapter RTXP 18	RS 421 213-AA, CA, DA, FA
The last two letters of the order number indicate the rated frequency f_n and the auxiliary voltage U_{aux} of the relay as follows:	AA equals $f_n = 50\text{ Hz}$ and $U_{aux} = 80\dots265\text{ V ac/dc}$
	CA equals $f_n = 50\text{ Hz}$ and $U_{aux} = 18\dots80\text{ V dc}$
	DA equals $f_n = 60\text{ Hz}$ and $U_{aux} = 80\dots265\text{ V ac/dc}$
	FA equals $f_n = 60\text{ Hz}$ and $U_{aux} = 18\dots80\text{ V dc}$

References

Additional information

Manual "Overcurrent relay SPAJ 131 C"	1MRS 750660-MUM EN
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ABB Oy
Distribution Automation
P.O. Box 699
FI-65101 Vaasa, FINLAND
Tel +358 10 22 11
Fax +358 10 224 1094
www.abb.com/substationautomation