



Features

- Definite-time residual overvoltage earth-fault protection and supervision
- Two independent operation stages, e.g. one for signalling and the other for tripping
- Freely selectable output relay functions
- Flexible adaptation to different protection applications
- Numerical display of setting values, measured values, recorded fault values, indications, etc.
- Built-in pulse-width-modulated galvanically isolating power unit for a wide range of auxiliary voltages
- Serial interface for bus connection module and fibre-optic substation bus
- Continuous self-supervision of relay hardware and software for enhanced system reliability and availability
- Auto-diagnostic fault indication to facilitate repair of a permanent internal relay fault

Application

The residual overvoltage relay SPAU 110 C is designed to be used for earth fault protection and supervision in isolated neutral, resistance earthed or reactance earthed systems. In resonant earthed systems relay starting can be used to control the switching device of the neutral resistor. The protection relay can also

be used for the earth fault protection of generators and motors and for the unbalance protection of capacitor banks. The protection relay forms an integrated protection scheme, including two-stage earth-fault protection and flexible trip and signal functions.

Design

The residual overvoltage relay SPAU 110 C is a secondary relay, which is to be connected to the voltage transformers of the object to be protected. When a fault occurs, the residual overvoltage relay can be used for tripping a circuit breaker or just for signalling an earth fault, as required by the protection application.

When the energizing voltage exceeds the set start value of the low-set voltage stage $U_{0>}$, the residual overvoltage relay starts. After the set operate time $t_{>}$ the low-set stage operates, if the fault still persists. The high-set voltage stage operates in the same way. When the measured voltage exceeds the set start value $U_{0>>}$, the high-set stage starts, and after the set time $t_{>>}$, the high-set stage operates, if the fault still persists.

Start information from the residual overvoltage relay is obtained as a contact function, which further can be used for controlling other cooperating protection relays such as neutral current measuring earth-fault relays.

The relay contains one optically isolated logic input to be controlled by an external control voltage. In the residual overvoltage relay the control input is used as a blocking input.

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	28-29	28-30
Rated voltage U_n	100 V	110 V
Continuous withstand	$2 \times U_n$	$2 \times U_n$
Power consumption at rated voltage U_n	<0.5 VA	
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, 73-74-75, 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
Contact material		AgCdO ₂	

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: Residual overvoltage relay module SPCU 1C6

Low-set overvoltage stage $U_{0>}$	Start voltage $U_{0>}$	2...100% of U_n	
	Start time, typically	70 ms	
	Operate time $t_{>}$	0.05...100 s	
	Reset time, typically	100 ms	
	Drop-off/pick-up ratio, typically	0.96	
	Operate time accuracy	±2% of set value or ±40 ms	
	Operation accuracy	10...100% of U_n	±3% of set value
2...20% of U_n		±5% of set value	
High-set overvoltage stage $U_{0>>}$	Start voltage $U_{0>>}$	2...80% of U_n and ∞, infinite	
	Start time, typically	70 ms	
	Operate time $t_{>>}$	0.05...100 s	
	Reset time, typically	100 ms	
	Drop-off/pick-up ratio, typically	0.96	
	Operate time accuracy	±2% of set value or ±25 ms	
	Operation accuracy	10...80% of U_n	±3% of set value
2...16% of U_n		±5% of set value	

Table 5: Tests and standards

Test voltages	Dielectric test voltage (IEC 255-5)	2.0 kV, 50 Hz, 1 min
	Impulse test voltage (IEC 255-5)	5 kV, 1.2/50 μs, 0.5 J
	Insulation resistance (IEC 255-5)	>100 MΩ, 500 V dc
Interference tests	High-frequency (1 MHz) disturbance test (IEC 255-22-1), common mode	2.5 kV
	High-frequency (1 MHz) disturbance test (IEC 255-22-1), differential mode	1.0 kV
	Fast transients (IEC 255-22-4, class III and IEC 801-4, level 4), power supply inputs	4 kV, 5/50 ns
	Fast transients (IEC 255-22-4, class III and IEC 801-4, level 4), other inputs	2 kV, 5/50 ns
	Electrostatic discharge (IEC 255-22-2 and IEC 801-2, class III), air discharge	8 kV
	Electrostatic discharge (IEC 255-22-2 and IEC 801-2, class III), contact discharge	6 kV
	Environmental conditions	Service temperature range
Transport and storage temperature range (IEC 68-2-8)		-40...+70°C
Damp heat test (IEC 68-2-3)		<95%, +40°C, 96 h
Relative humidity (IEC 68-2-30)		93...95%, +55°C, 6 cycles
Degree of protection by enclosure when panel mounted		IP 54
Weight		3 kg

Block diagram

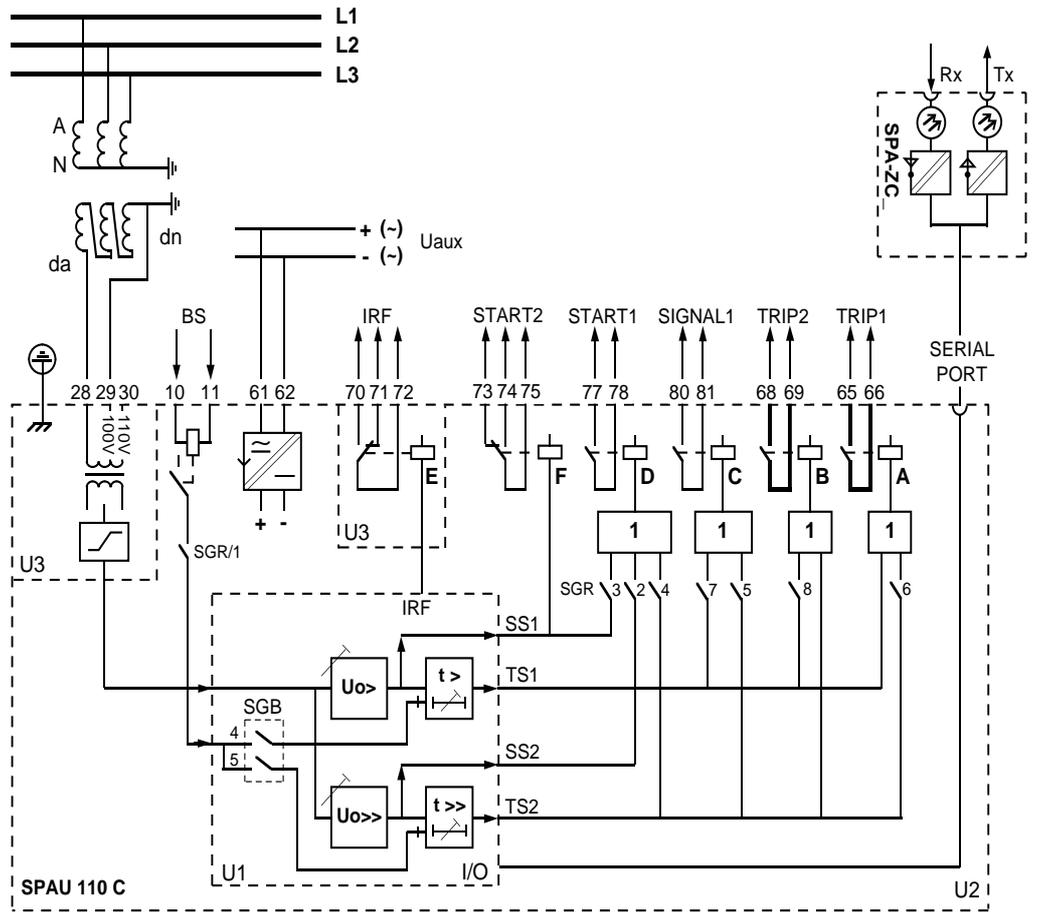


Fig. 1 Block diagram and sample connection diagram

Mounting and dimensions

Flush mounting

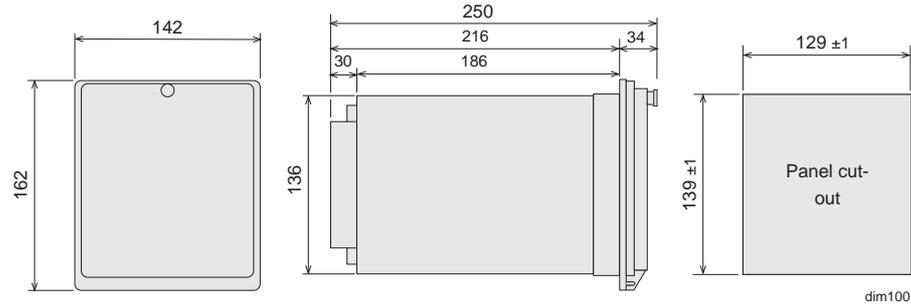


Fig. 2 Flush-mounting relay case (dimensions in mm)

Semi-flush mounting

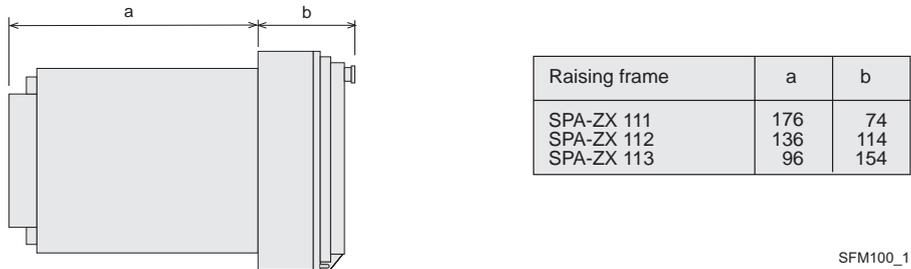


Fig. 3 Semi-flush mounting relay case (dimensions in mm)

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.

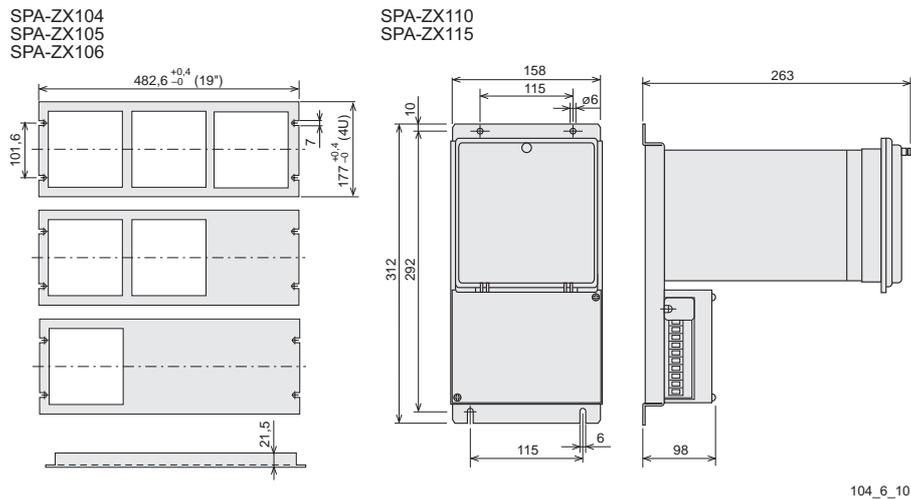


Fig. 4 Mounting cabinets and frames as well as projecting mounting (dimensions in mm)

Ordering

When ordering, please specify:

Ordering information	Ordering example
1. Type designation and quantity	SPAU 110 C, 5 pieces
2. Order number	RS 422 010-AA
3. Rated values	$U_n=110$ V, $f_n=50$ Hz
4. Auxiliary voltage	$U_{aux}=110$ V dc
5. Accessories	-
6. Special requirements	-

Order numbers

Residual overvoltage relay SPAU 110 C without test adapter	RS 422 010-AA, CA, DA, FA
Residual overvoltage relay SPAU 110 C including test adapter RTXP 18	RS 422 210-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 $f_n = 50$ Hz and $U_{aux} = 80\dots265$ V ac/dc
	CA equals $f_n = 50$ Hz and $U_{aux} = 18\dots80$ V dc
	DA equals $f_n = 60$ Hz and $U_{aux} = 80\dots265$ V ac/dc
	FA equals $f_n = 60$ Hz and $U_{aux} = 18\dots80$ V dc

References

Additional information

Brochure "Voltage and current measuring relays"	1MRS 750270-MDS EN
Manual "Residual overvoltage relay SPAU 110 C"	1MRS 750607-MUM EN



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