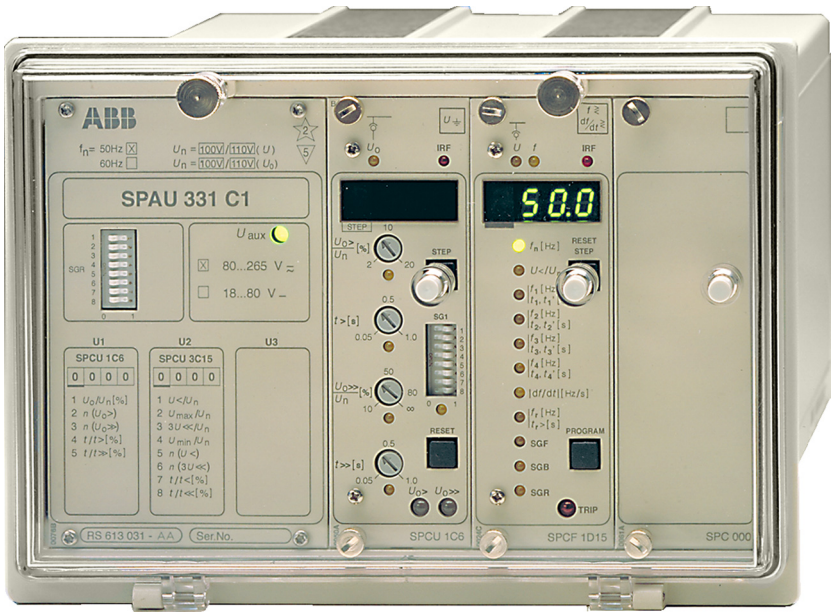
Voltage Relay

SPAU 331 C

Product Guide



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Features

- Two-stage residual overvoltage relay module containing a low-set residual overvoltage stage U_0> and a high-set residual overvoltage stage U_0>>
- Both residual overvoltage stages feature definite time characteristic and wide setting ranges
- Two-stage undervoltage relay module containing a higher undervoltage stage U< and a lower undervoltage stage 3U<<
- The three-phase undervoltage stage U< starts if one or more of the phase-to-phase voltages fall below the set start level
- The three-phase undervoltage stage 3U<< starts if all three phase-to-phase voltages fall below the set start level
- The undervoltage stage U< can be given definite time characteristic or inverse time characteristic while the undervoltage stage 3U<< has a definite time characteristic only
- Numerical display of setting values, currently measured values, fault values, operate times, event messages, etc.
- Serial interface for connection of the relay to the serial bus and a substation level communication and reporting system and/or a remote control system
- High system reliability and availability through integrated self-supervision system with auto-diagnostic capabilities in the relay modules
- CE marking according to the EC directive for EMC

Application

The voltage relay SPAU 331 C is intended for the supervision of the substation busbar voltages in distribution networks. The relay measures the phase-to-phase voltage and the residual voltage and provides three-phase undervoltage protection and residual overvoltage protection.

The relay can also be used in other applications requiring undervoltage protection and residual voltage supervision, e.g. for the protection of large motors.

Design

The voltage relay forms an integrated protection scheme which includes a residual overvoltage relay module, an undervoltage relay module and a disturbance recorder module. The relay is provided with one control input for an external control signal such as a blocking signal. Further, the voltage relay is equipped with six output relays for CB control, signalling, etc.

Residual overvoltage relay module SPCU 1C6

The residual overvoltage module incorporates two residual overvoltage stages, i.e. a low-set stage U_0> and a high-set stage U_0>>. Both stages have a definite time operation characteristic. The operation of both stages can be blocked by means of an external control signal. The high-set stage can be set out of function.

Undervoltage relay module SPCU 3C15

The three-phase undervoltage relay module incorporates two protection stages, i.e. a low-set undervoltage stage U< and a high-set undervoltage stage 3U<<. The low-set undervoltage stage can be given definite time characteristic or inverse time characteristic whereas the high-set undervoltage stage has a definite time characteristic. Both undervoltage stages can be blocked by means of an external control signal. The low-set stage starts if one or more of the phase-to-phase voltages fall below the set start level whereas the high-set stage starts when all three phase-to-phase voltages fall under the set start level at the same time. The operation of the low-set undervoltage stage can be automatically blocked on loss of energizing voltage.

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 a permanent internal relay fault is detected, 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 SPGU 240A1 for the supply voltage range 80…265 V ac/dc and type SPGU 48B2 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	13-14, 16-17, 19-20, 28-29	13-15, 16-18, 19-21, 28-30
Rated voltage U_n	100 V	110 V
Continuous voltage withstand	$2.0 \times U_n$	
Burden at rated voltage	<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	67-68-69, 70-71-72, 73-74-75, 76-77-78, 79-80-81
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 ≤ 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	SPGU 240A1	80…265 V ac/dc
		SPGU 48B2	18…80 V dc
	Power consumption	under quiescent conditions	~10 W
		under operating conditions	~15 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: Undervoltage relay module SPCU 3C15

Undervoltage stage U<	Start voltage U<		0.4…1.2 × U_n
	Start time, preset values		0.1 s, 1 s, 5 s or 30 s
	Operate time at definite time operation characteristic		0.1…10.0 s
	Time multiplier k< at inverse time operation characteristic		0.1…1.00
	Reset time, typically		80 ms
	Drop-off/pick-up ratio, typically		1.03
	Operation time accuracy	at definite time characteristic and start time accuracy	±2% of set value or ±25 ms
		at inverse time characteristic	±25 ms or the inaccuracy appearing when the measured voltage varies ±3%
	Operation accuracy		±3% of set value
Undervoltage stage 3U<<	Start voltage 3U<<		0.1…1.2 × U_n
	Start time, preset values		0.1 s or 1.0 s
	Operate time at definite time operation characteristic		0.1…10.0 s
	Reset time, typically		80 ms
	Drop-off/pick-up ratio, typically	when the start value of the 3U<< stage ≥0.4	≤1.03
		when the start value of the 3U<< stage <0.4	approx. 1.1
	Operation time accuracy and start time accuracy		±2% of set value or ±25 ms
	Operation accuracy		±3% of set value

Technical data (cont´d)

Table 6: Data communication

Transmission mode		Fibre-optic serial bus
Data code		ASCII
Data transfer rate, selectable		4800 or 9600 Bd
Electrical/optical bus connection module powered from the host relay	for plastic core cables	SPA-ZC 21BB
	for glass fibre cables	SPA-ZC 21MM
Electrical/optical bus connection module powered from the host relay or from an external power source	for plastic core cables	SPA-ZC 17BB
	for glass fibre cables	SPA-ZC 17MM

Table 7: 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 μs, 0.5 J
	Insulation resistance (IEC 60255-5)	>100 MΩ, 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 IEC61000-4-4), 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
	RF electromagnetic field test (IEC 61000-4-3 and ENV 50140)	10 V/m, f = 80…1000 MHz
	Conducted RF disturbance test (IEC 61000-4-6 and ENV 50141)	10 V, f = 150 kHz…80 MHz
Environmental conditions	Service temperature range	-10…+55°C
	Transport and storage temperature range (IEC 60068-2-8)	-40…+70°C
	Damp heat test (IEC 60068-2-30)	<95%, +55°C, 6 cycles
	Degree of protection by enclosure when panel mounted	IP 54
	Weight	~5.5 kg

Block diagram

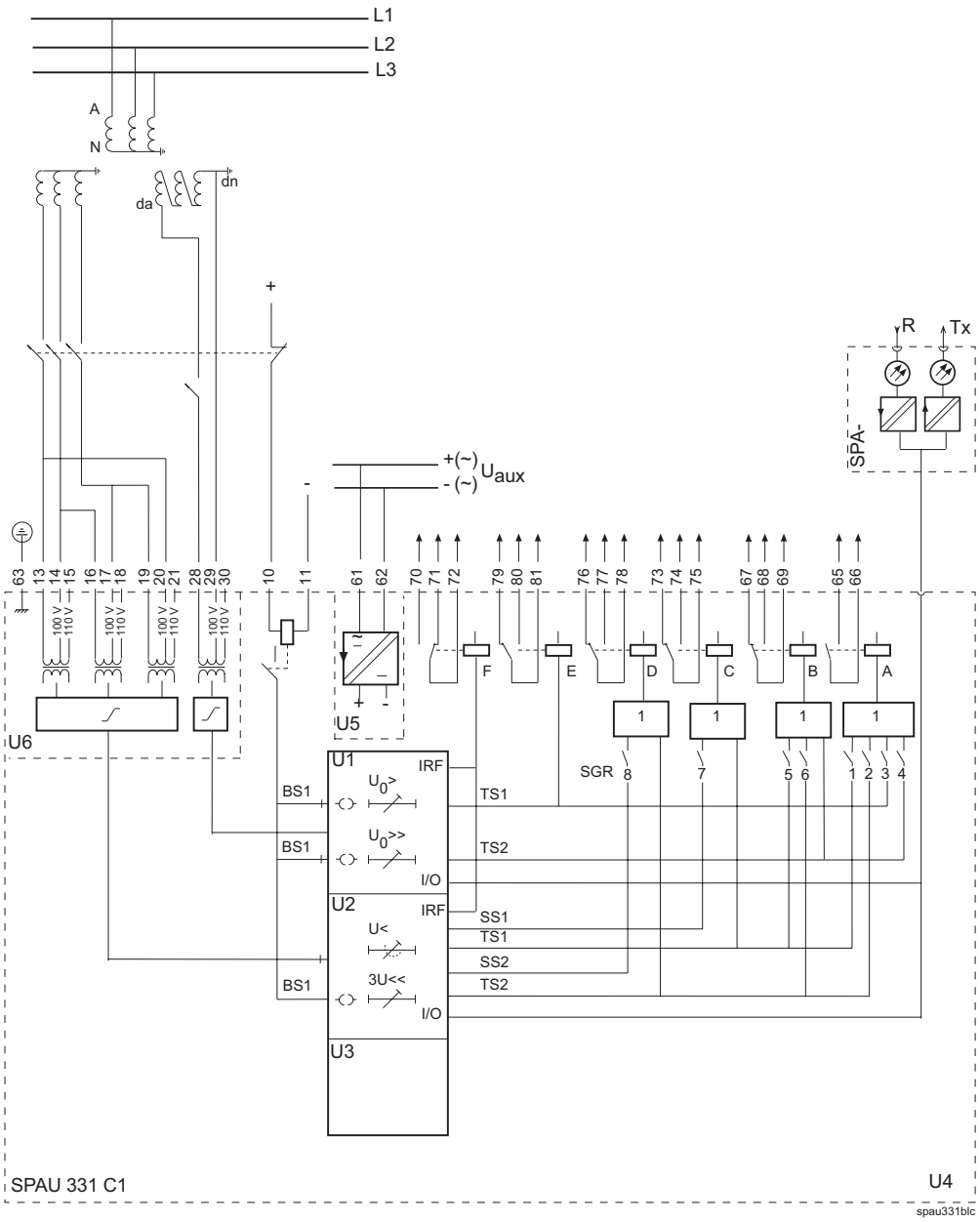


Fig. 1 Block diagram and sample connection diagram

Mounting and dimensions

Flush mounting

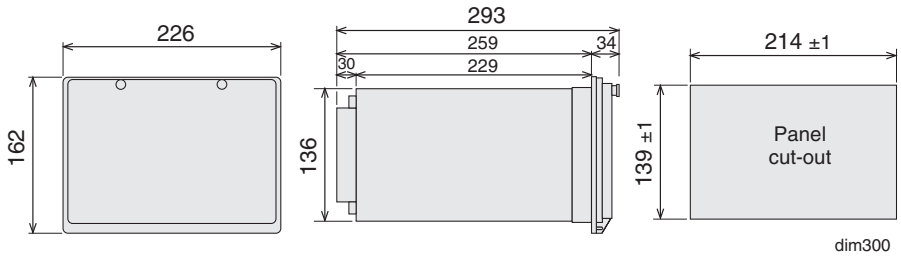
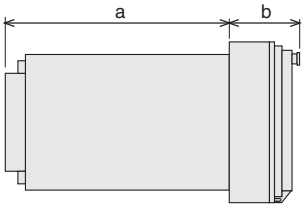


Fig. 2 Flush-mounting relay case (dimensions in mm)

Semi-flush mounting



Raising frame	a	b
SPA-ZX 301	219	74
SPA-ZX 302	179	114
SPA-ZX 303	139	154

SFM300_1

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 304 accommodates two size 300 relays and type SPA-ZX 305 one size 300 relay.

Projecting mounting

When projecting mounting is preferred, a relay case type SPA-ZX 306 is used. The relay case for projecting mounting is provided with front connectors.

SPA-ZX304
SPA-ZX305
SPA-ZX201

SPA-ZX306
SPA-ZX307
SPA-ZX317
SPA-ZX318

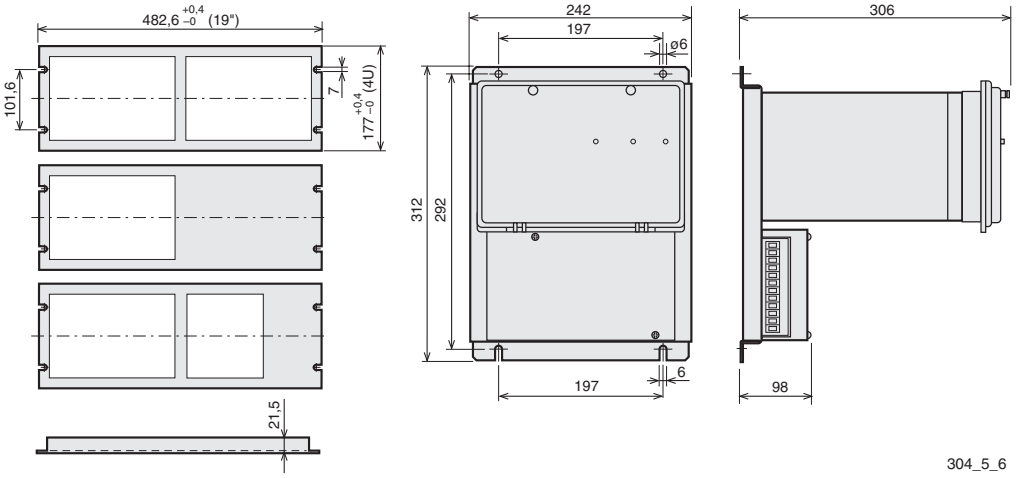


Fig. 4 Mounting cabinets and frames as well as projecting mounting (dimensions in mm)

Ordering

When ordering, please specify:

Ordering information	Ordering example
1. Type designation and quantity	SPAU 331 C, 5 pieces
2. Order number	RS 613 031-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

Voltage relays SPAU 331 C_	
SPAU 331 C1, incl. modules SPCU 1C6 and SPCU 3C15	RS 613 031-AA, CA, DA, FA
SPAU 331 C5, incl. module SPCU 3C15	RS 613 035-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…265 V ac/d
	CA equals f_n = 50 Hz and U_{aux} = 18…80 V dc
	DA equals f_n = 60 Hz and U_{aux} = 80…265 V ac/dc
	FA equals f_n = 60 Hz and U_{aux} = 18…80 V dc

Voltage relays SPAU 331 C_ including a test adapter type RTXP18	
SPAU 331 C1, incl. modules SPCU 1C6 and SPCU 3C15	RS 613 231-AA, CA, DA, FA
SPAU 331 C5, incl. module SPCU 3C15	RS 613 235-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…265 V ac/d
	CA equals f_n = 50 Hz and U_{aux} = 18…80 V dc
	DA equals f_n = 60 Hz and U_{aux} = 80…265 V ac/dc
	FA equals f_n = 60 Hz and U_{aux} = 18…80 V dc

References

Additional information

User’s manual and technical description “Voltage relay SPAU 331 C”	1MRS 750123-MUM EN

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