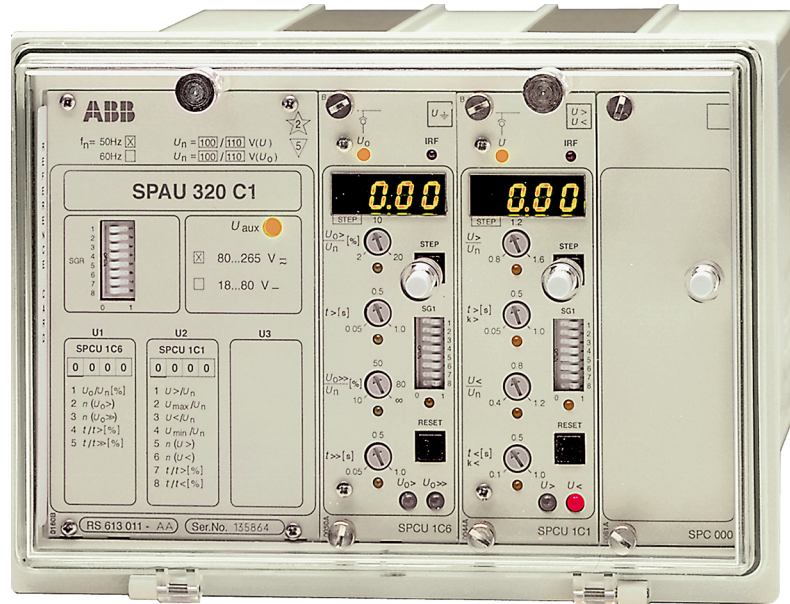


# Overvoltage, Undervoltage and Residual Voltage Relay SPAU 320 C

## Product Guide





## Features

- Supervision and protection relay for monitoring the substation busbar voltage
  - General-use voltage relay for applications requiring overvoltage or undervoltage supervision
  - Flexible selection of appropriate operational features in various applications
  - Local numerical display of setting values, measured values, recorded fault values, auto-diagnostic fault codes, etc.
  - Serial interface for two-way data communication with substation level equipment via fibre-optic bus
  - Powerful software support for setting and monitoring of the relay via a portable computer
  - Continuous self-supervision of relay hardware and software with autodiagnosis for enhanced system reliability and availability
  - Robust aluminium relay case with IP54 degree of protection by enclosure
  - High immunity to electrical and electromagnetic interference
  - CE marking according to the EC directive for EMC
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## Application

The voltage relay SPAU 320 C is intended for overvoltage and undervoltage supervision of the substation busbar phase-to-phase voltage and for supervision of the residual voltage of the distribution network. The relay can also

be used in other applications requiring overvoltage or undervoltage protection/supervision and/or residual overvoltage supervision e.g. for protection of motors, capacitor banks, transformers, etc.

## Design

The voltage relay forms an integrated protection scheme which includes a residual overvoltage relay module and two combined overvoltage and undervoltage relay modules. The relay is further 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.

The residual overvoltage module SPCU 1C6 incorporates two residual overvoltage stages, i.e. a low-set stage  $U_{0>}$  and a high-set stage  $U_{0>>}$ . Both stages feature definite time 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, if not required.

The combined overvoltage and undervoltage relay module SPCU 1C1 incorporates two protection stages, i.e. an overvoltage stage  $U_{>}$  and an undervoltage stage  $U_{<}$ . Both stages can be given definite time characteristic or inverse time characteristic. The undervoltage stage can be automatically blocked at voltage under  $0.2 \times U_n$ . The operation of the undervoltage stage can also be blocked by means of an external control signal.

### 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. Via the SPA bus the relay communicates with higher-level data acquisition and control systems.

### 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.

On detection of 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 over the serial bus to the higher-level system. 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 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, 28-29	13-15, 28-30
Rated voltage $U_n$	100 V	110 V
Continuous voltage withstand	$1.7 \times U_n$	
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 $L/R \leq 40$ 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	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 $\infty$ , 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: Overvoltage and undervoltage relay module SPCU 1C1**

Overvoltage stage $U_{>}$	Start voltage $U_{>}$	0.8...1.6 × $U_n$		
	Start time, preset values	0.1 s, 1 s, 10 s or 60 s		
	Operate time $t_{>}$ at definite time operation characteristic	0.05...10.0 s		
	Inverse time operation characteristic	Curve sets A and B		
	Time multiplier $k$ at inverse time operation characteristic	0.05...1.0		
	Reset time, typically	50 ms		
	Drop-off/pick-up ratio, typically	0.97		
	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 $U_{<}$	Start voltage $U_{<}$	0.4...1.2 × $U_n$		
	Start time, preset values	0.1 s or 30 s		
	Operate time at definite time operation characteristic	1...100 s		
	Inverse time operation characteristic	Curve sets A and B		
	Time multiplier $k_{<}$ at inverse time operation characteristic	0.1...1.0		
	Reset time, typically	60 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		

Technical data (cont'd)

**Table 6: 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 $\mu$ s, 0.5 J
	Insulation resistance (IEC 60255-5)	>100 M $\Omega$ , 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
	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
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

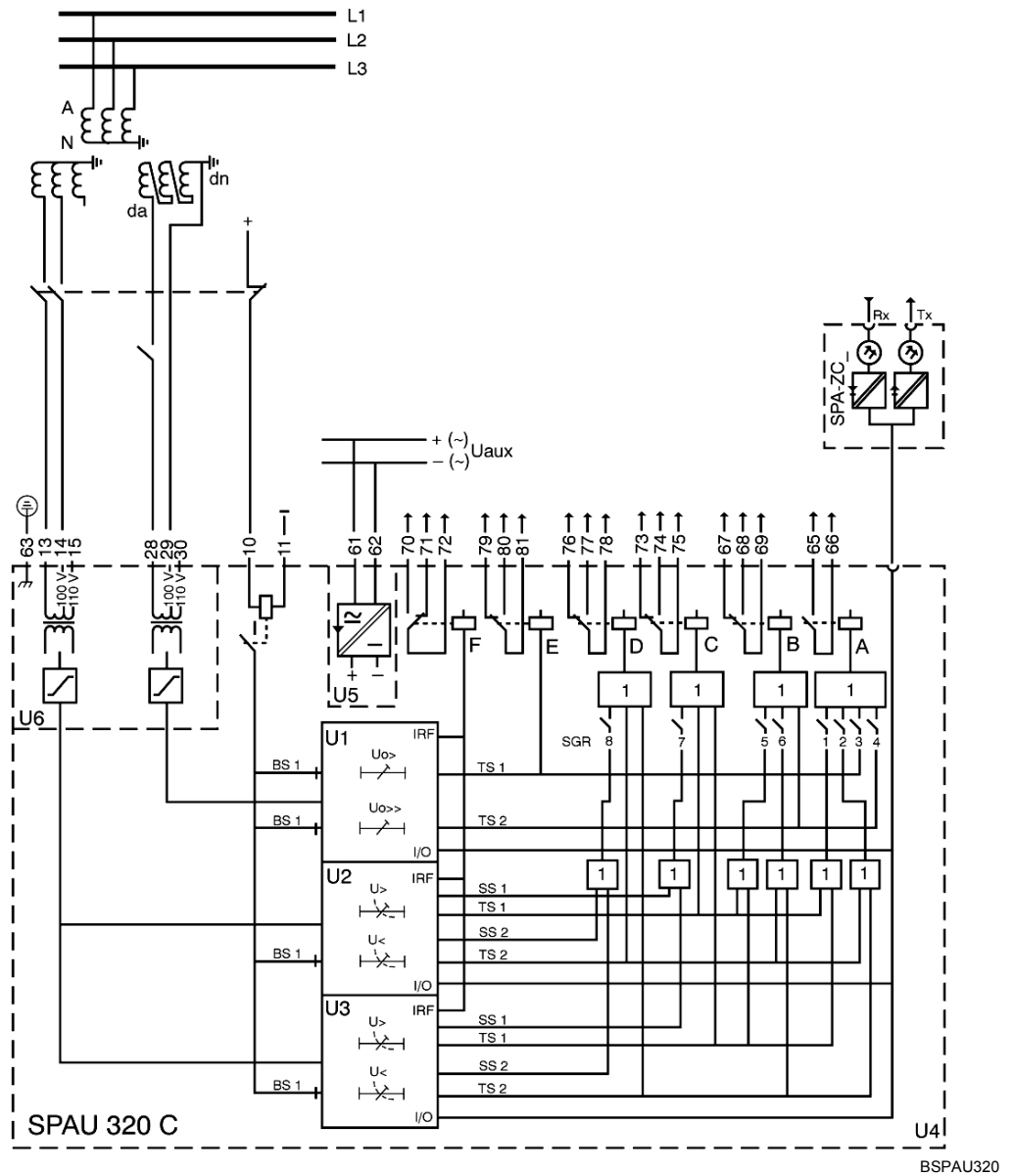


Fig. 1 Block diagram and sample connection diagram



Mounting and dimensions

Flush mounting

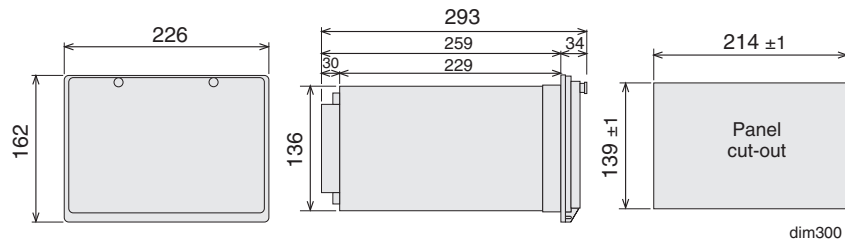
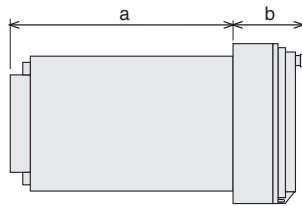


Fig. 2 Flush-mounting relay case (dimensions in mm)

Semi-flush mounting



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

SFM300\_1

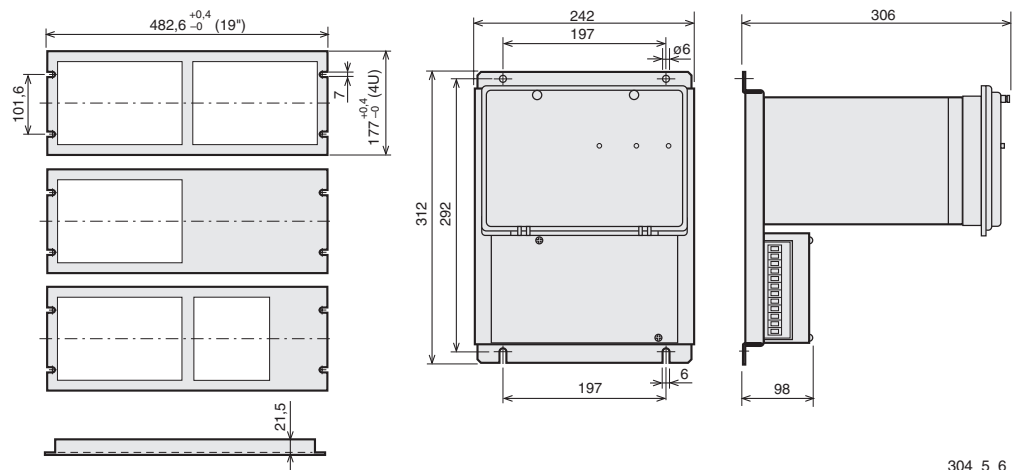
Fig. 3 Semi-flush mounting relay case (dimensions in mm)

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.

SPA-ZX304  
SPA-ZX305  
SPA-ZX201

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



304\_5\_6

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 320 C, 5 pieces
2. Order number	RS 613 010-AA
3. Rated values	$U_n = 110 \text{ V}$ , $f_n = 50 \text{ Hz}$
4. Auxiliary voltage	$U_{aux} = 110 \text{ V dc}$
5. Accessories	-
6. Special requirements	-

**Order numbers**

Voltage relays SPAU 320 C_	
SPAU 320 C, completely equipped	RS 613 010-AA, CA, DA, FA
SPAU 320 C1, incl. modules SPCU 1C6 and one SPCU 1C1	RS 613 011-AA, CA, DA, FA
SPAU 320 C3, incl. module SPCU 1C6 only	RS 613 013-AA, CA, DA, FA
SPAU 320 C4, incl. two modules SPCU 1C1 only	RS 613 014-AA, CA, DA, FA
SPAU 320 C5, incl. one module SPCU 1C1 only	RS 613 015-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 $U_{aux} = 80 \dots 265 \text{ V ac/dc}$
	CA equals $f_n = 50 \text{ Hz}$ and $U_{aux} = 18 \dots 80 \text{ V dc}$
	DA equals $f_n = 60 \text{ Hz}$ and $U_{aux} = 80 \dots 265 \text{ V ac/dc}$
	FA equals $f_n = 60 \text{ Hz}$ and $U_{aux} = 18 \dots 80 \text{ V dc}$

Voltage relays SPAU 320 C_ including a test adapter type RTXP18	
SPAU 320 C, completely equipped	RS 613 210-AA, CA, DA, FA
SPAU 320 C1, incl. modules SPCU 1C6 and one SPCU 1C1	RS 613 211-AA, CA, DA, FA
SPAU 320 C3, incl. module SPCU 1C6 only	RS 613 213-AA, CA, DA, FA
SPAU 320 C4, incl. two modules SPCU 1C1 only	RS 613 214-AA, CA, DA, FA
SPAU 320 C5, incl. one module SPCU 1C1 only	RS 613 215-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 $U_{aux} = 80 \dots 265 \text{ V ac/dc}$
	CA equals $f_n = 50 \text{ Hz}$ and $U_{aux} = 18 \dots 80 \text{ V dc}$
	DA equals $f_n = 60 \text{ Hz}$ and $U_{aux} = 80 \dots 265 \text{ V ac/dc}$
	FA equals $f_n = 60 \text{ Hz}$ and $U_{aux} = 18 \dots 80 \text{ V dc}$

**References**

**Additional information**

User's manual "Overvoltage, undervoltage and residual voltage relay SPAU 320 C"	1MRS 750726-MUM EN
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