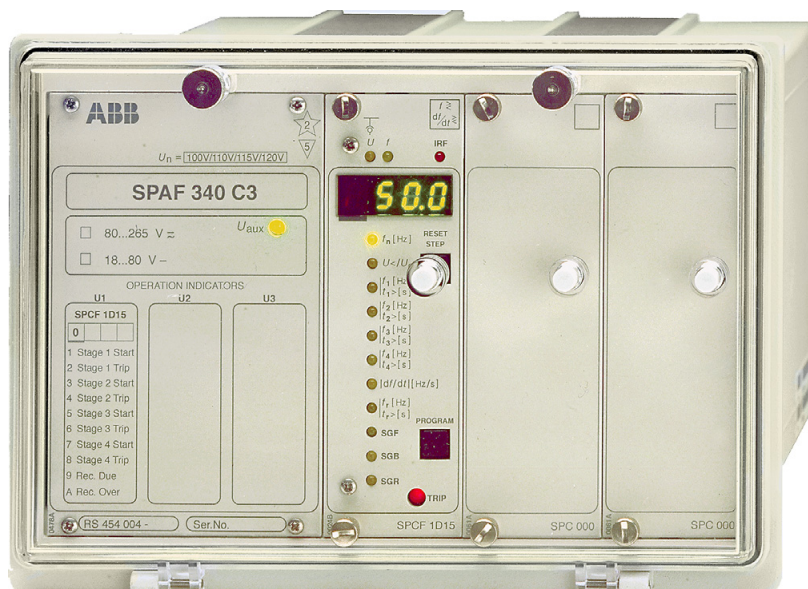


Frequency Relay

SPAF 340 C

Product Guide



Features

- Overfrequency and underfrequency relay with four frequency stages
- Each frequency stage can be set for definite time overfrequency or underfrequency function
- Each frequency stage can also be set for positive or negative frequency-rate-of-change (df/dt) function
- The definite time operating principle and the rate of change operating principle can be combined
- Each frequency stage can be given two separate operate times
- Adjustable undervoltage blocking level
- Field-adjustable relay rated frequency
- The protection stages can be separately blocked via external blocking inputs
- Five external control inputs for blocking the frequency stages
- Nine output relays, i.e. four for tripping, four for signalling and one for the self-supervision system
- Flexible configuration of blocking inputs, protection stages and output relays
- Recovery function with adjustable time delay for starting of network restoration
- Serial communication interface providing connection to remote control systems and enabling parameterization via a PC, and reading of registers and measured values
- High system reliability due to continuous self-supervision
- High immunity to electrical and electromagnetic interference and rugged aluminium case to IP 54 at panel mounting
- Powerful software support for parameterization of the relay and for reading and recording measured values, events, etc.
- Member of the SPACOM product family and ABB's Distribution Automation system
- CE marking according to the EC directive for EMC

Application

The frequency relay SPAF 340 C is used for load shedding in situations where power consumption exceeds the available power of the network. In such a situation of unbalance, the network frequency tends to fall. The frequency relay can control four circuit breakers, allowing four feeders to be disconnected from the network, one by one. Should the power deficiency still persist, the relay disconnects the plant for island operation.

The operation of the relay can be based on set frequency values ($f<$), on the rate of decrease of frequency (negative df/dt), or on both criteria ($f<$ and df/dt). In addition, output of each stage can be obtained via two separate time circuits and so eight different frequency/time combinations are available. Should the network frequency drop rapidly, this feature allows fast disconnection of various loads.

Design

The frequency relay SPAF 340 C is a secondary relay, which is connected to the voltage transformers of the network section to be protected. The relay incorporates one frequency relay module type SPCF 1D15, which includes a definite time overfrequency and/or underfrequency unit and a rate of change of frequency unit.

The relay module includes four frequency stages. Each frequency stage can be set to operate as an overfrequency ($f>$) stage or an underfrequency ($f<$) stage with definite time characteristic. Further, each stage can be set to function as a rate of change of frequency (df/dt) stage.

When the start frequency of a stage is set below the rated frequency, the stage operates as an underfrequency stage. Correspondingly, the stage has the function of an overfrequency stage, when the start frequency is set above the rated frequency. The frequency setting cannot be the same as the rated frequency.

The operation of the df/dt function of a protection stage is based on the same principle as the frequency function, which means that if a stage operates as an underfrequency stage, the sign of the df/dt function is negative. Then the df/dt function starts once the absolute value of the rate of frequency drop exceeds the set df/dt value. When required by the application, the definite time principle and the rate of change principle can be combined so that the criteria for operation of both functions have to be fulfilled at the same time to enable operation of the stage.

Once a preset condition is fulfilled, the stage starts and, at the same time, it activates a timing circuit. When the stage times out, the relay produces a trip signal. The trip signal can be assigned to the desired output relay.

Data communication

The feeder protection relay is provided with a serial interface on the rear panel. By means of a bus connection module type SPA-ZC21 or SPA-ZC 17 the feeder protection relay can be connected to the fibre-optic SPA bus. The bus connection module SPA-ZC 21 is powered from the host relay, whereas the bus connection module type 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 via 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 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 the fault that has been detected.

Auxiliary supply voltage

The auxiliary supply voltage 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, voltage inputs

Rated voltage U_n	100 V, 110 V, 115 V or 120 V
Continuous voltage withstand	200 V
Rated burden of voltage input at U_n	<0.5 VA
Rated frequency f_n , programmable	30...65 Hz

Table 2: Output contact ratings

Type of contact		Tripping	Signalling
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 signal circuit time constant $L/R \leq 40$ ms, at the signalling voltage levels	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: External control inputs

Operative control voltage range	18...250 V dc or 80...250 V ac
Current drain of activated control input	2...20 mA

Table 4: Frequency relay module SPCF 1D15

Rated frequency f_n	30...65 Hz	
Number of frequency stages	4	
Operating principles	Definite time overfrequency	$f >$
	Definite time underfrequency	$f <$
	Rate of change of frequency	df/dt
$f >$ or $f <$ operation principle	Start frequency	25.00...70.00 Hz
	Measuring range	20.00...75.00 Hz
	Correction range of LV side neutral connection CT ratio I_{02}/I_n	0.40...1.50
	Frequency measuring time, programmable	3...20 periods
	Drop-off hysteresis	20 mHz
	Operation accuracy	± 10 mHz
	Operate time, min. time depends on frequency	0.10...120.00 s
	Operation time accuracy	$\pm 1\%$ or ± 30 ms
df/dt operation principle	Minimum measuring voltage	$0.25 \times U_n$
	Start value, in steps of 0.1 Hz/s	0.2... ± 10.0 Hz/s
	Operation accuracy	± 150 mHz/s
	Operate time, min. time depends on frequency	0.10...120.00 s
	Operation time accuracy	$\pm 1\%$ or ± 30 ms
Undervoltage blocking	Minimum measuring voltage	$0.25 \times U_n$
	Start voltage	$0.30...0.90 \times U_n$
	Measuring range	$0.0...1.4 \times U_n$
Recovery function	Operation accuracy, in the range of 25...70 Hz	$\pm 3\%$ of set value
	Frequency difference from rated frequency	0.1...10.0 Hz
	Operate time	1 s...120 min 59 s
	Operation time accuracy	$\pm 1\%$ or ± 30 ms

Technical data (cont'd)

Table 5: Auxiliary supply modules

Type of module	Rated voltages U_n	SPGU 240A1	110/120/230/240 V ac 110/125/220 V dc
		SPGU 48B2	24/48/60 V ac
	Operative voltage range	SPGU 240A1	80...265 V ac/dc
		SPGU 48B2	18...80 V dc
	Power consumption	under quiescent conditions	~15 W
		under operating conditions	~20 W

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 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
Mechanical environmental tests	Vibration test (IEC 60255-21-1)	class 2
	Chock/bump test (IEC 60255-21-2)	class 2
	Seismic test (IEC 60255-21-3)	class 2
Interference tests	High frequency disturbance test (IEC 60255-22-1), common mode	2.5 kV, 1 MHz
	High frequency disturbance test (IEC 60255-22-1), differential mode	1.0 kV, 1 MHz
	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
	Fast transients (IEC 60255-22-4, and IEC 61000-4-4), power supply inputs	4 kV, 5/50 ns
	Fast transients (IEC 60255-22-4, and IEC 61000-4-4), other inputs	2 kV, 5/50 ns
Environmental conditions	Service temperature range	-10...+55°C
	Temperature influence	$\pm 0.05\%$ /frequency measurement in the range -10°C...+55°C <0.2%/°C, voltage measurement
	Relative humidity (IEC 60068-2-8)	+55°C, 93...95%, 6 cycles
	Transport and storage temperature range (IEC 60068-2-8)	-40...+70°C
	Degree of protection by enclosure of flush mounting relay case	IP 54
	Weight of relay including flush mounting relay case	6 kg

Block diagram

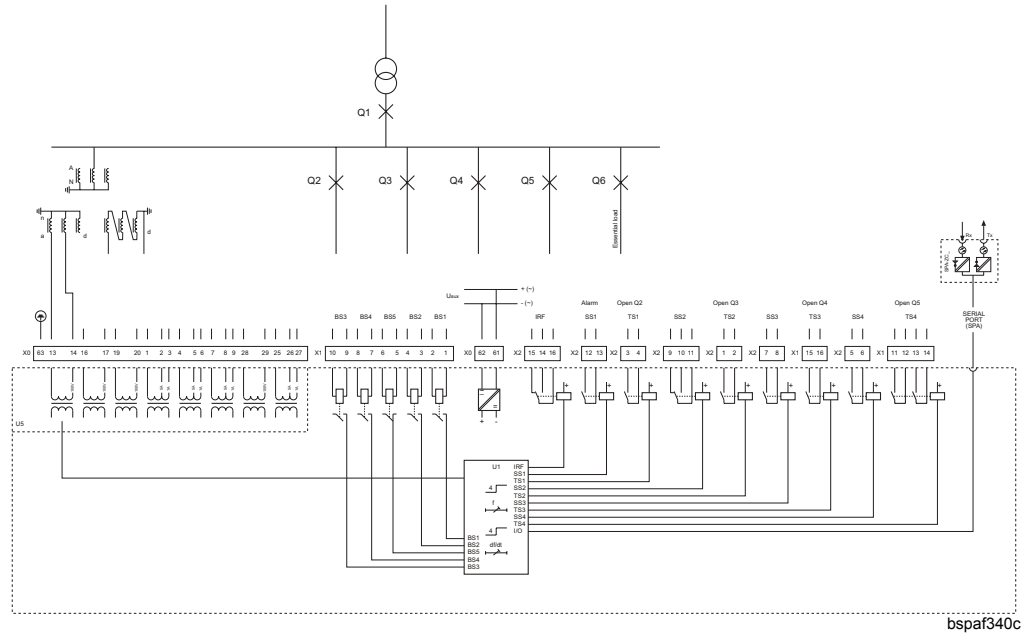


Fig. 1 Block diagram and sample connection diagram

bspaf340c

Mounting and dimensions

Flush mounting

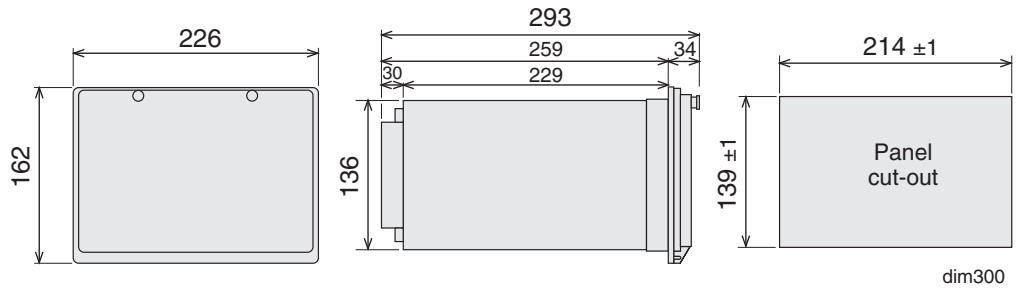
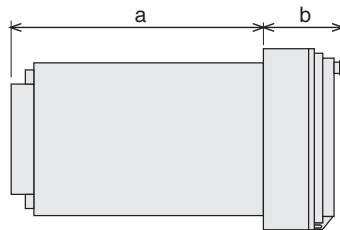


Fig. 2 Flush-mounting relay case (dimensions in mm)

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

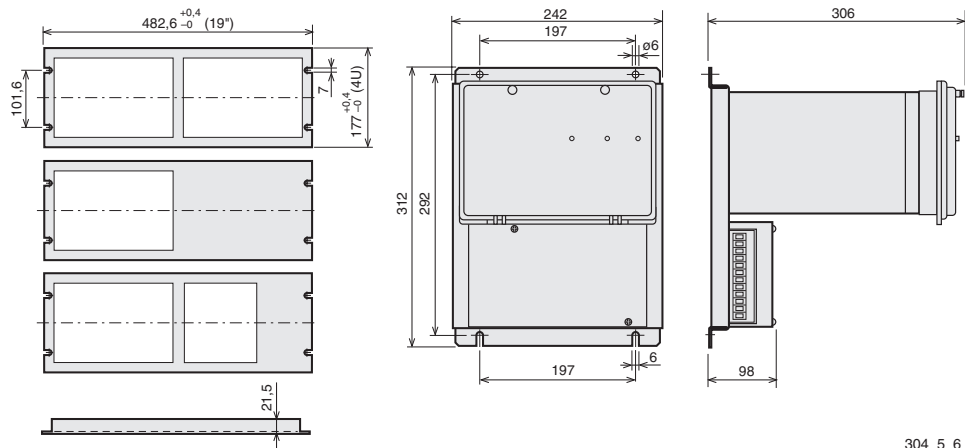
An ancillary mounting plate, height 4U (~177 mm), is recommended to be used when the protection relays are to be mounted in 19 inch frames or cabinets. The ancillary mounting plate type SPA-ZX 304 accommodates two size 300 relays and type SPA-ZX 305 one size 300 relay.

Projecting mounting

When projecting mounting is preferred, a relay case type SPA-ZX 317 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



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	SPAF 340 C3, 5 pieces
2. Order number	RS 454 004-AA
3. Auxiliary voltage	$U_{aux} = 110 \text{ V dc}$
4. Accessories	-
5. Special requirements	-

Order numbers

Frequency relay SPAF 340 C3 without test adapter	RS 454 004-AA, CA
Frequency relay SPAF 340 C3 including test adapter RTXP	RS 454 204-AA, CA
The last two letters of the order number indicate the auxiliary voltage U_{aux} of the annunciator unit as follows:	AA equals $U_{aux} = 80 \dots 265 \text{ V ac/dc}$
	CA equals $U_{aux} = 18 \dots 80 \text{ V dc}$

References

Additional information

Manual "Frequency relay SPAF 340 C"	1MRS 750582-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