3RF21 solid-state relays, single-phase, 22.5 mm

Overview

22.5 mm solid-state relays

With its compact design, which stays the same even at currents of up to 88 A, the 3RF21 solid-state relay is the ultimate in space-saving construction, at a width of 22.5 mm. The logical connection method, with the power infeed from above and load connection from below, ensures tidy installation in the control cabinet.

Technical specifications

Type		3RF21 ..-1....	3RF21 ..-2....	3RF21 ..-3....
General data				
Ambient temperature				
• During operation, derating from 40 °C	°C	-25 ... + 60		
• During storage	°C	-55 ... + 80		
Installation altitude	m	0 ... 1000; derating from 1000		
Shock resistance acc. to IEC 60068-2-27	*g*/ms	15/11		
Vibration resistance acc. to IEC 60068-2-6	*g*	2		
Degree of protection		IP20		
Electromagnetic compatibility (EMC)				
• Emitted interference				
- Conducted interference voltage acc. to IEC 60947-4-3		Class A for industrial applications		
- Emitted, high-frequency interference voltage acc. to IEC 60947-4-3		Class A for industrial applications		
• Interference immunity				
- Electrostatic discharge acc. to IEC 61000-4-2 (corresponds to degree of severity 3)	kV	Contact discharge 4; air discharge 8; behavior criterion 2		
- Induced RF fields acc. to IEC 61000-4-6	MHz	0.15 ... 80; 140 dBµV; behavior criterion 1		
- Burst acc. to IEC 61000-4-4	kV	2/5.0 kHz; behavior criterion 1		
- Surge acc. to IEC 61000-4-5	kV	Conductor - ground 2; conductor - conductor 1; behavior criterion 2		
Connection type		**Screw terminals**	**Spring-type terminals**	**Ring terminal lug connections**
Connection, main contacts				
• Conductor cross-section				
- Solid	mm^2	2 x (1.5 ... 2.5)[1], 2 x (2.5 ... 6)[1]	2 x (0.5 ... 2.5)	--
- Finely stranded with end sleeve	mm^2	2 x (1 ... 2.5)[1], 2 x (2.5 ... 6)[1], 1 x 10	2 x (0.5 ... 1.5)	--
- Finely stranded without end sleeve	mm^2	-	2 x (0.5 ... 2.5)	--
- Solid or stranded, AWG cables		2 x (AWG 14 ... 10)	2 x (AWG 18 ... 14)	--
• Terminal screw		M4	--	M5
• Tightening torque	Nm lb.in	2 ... 2.5 7 ... 10.3	-- --	2.5 ... 2 10.3 ... 7
• Cable lug				
- DIN		--	--	DIN 46234 -5-2.5, -5-6, -5-10, -5-16, -5-25
- JIS		--	--	JIS C 2805 R 2-5, 5.5-5, 8-5, 14-5
Connection, auxiliary/control contacts				
• Conductor cross-section	mm AWG	1 x (0.5 ... 2.5), 2 x (0.5 ... 1.0) 20 ... 12	0.5 ... 2.5 20 ... 12	1 x (0.5 ... 2.5), 2 x (0.5 ... 1.0) 20 ... 12
• Stripped length	mm	7	10	7
• Terminal screw		M3	--	M3
• Tightening torque	Nm lb.in	0.5 ... 0.6 4.5 ... 5.3	-- --	0.5 ... 0.6 4.5 ... 5.3

[1] If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Solid-State Relays

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Order No.	I_{max} [1] at R_{thha}/T_u = 40 °C		I_e acc. to IEC 60947-4-3 at R_{thha}/T_u = 40 °C		I_e acc. to UL/CSA at R_{thha}/T_u = 50 °C		Power loss at I_{max}	Minimum load current	Leakage current
	A	K/W	A	K/W	A	K/W	W	A	mA
Main circuit									
3RF21 20-.....	20	2.0	20	1.7	20	1.3	28.6	0.1	10
3RF21 30-1....	30	1.1	30	0.79	30	0.56	44.2	0.5	10
3RF21 50-1....	50	0.68	50	0.48	50	0.33	66	0.5	10
3RF21 50-2....	50	0.68	20	2.6	20	2.9	66	0.5	10
3RF21 50-3....	50	0.68	50	0.48	50	0.33	66	0.5	10
3RF21 70-1....	70	0.40	50	0.77	50	0.6	94	0.5	10
3RF21 90-1....	88	0.33	50	0.94	50	0.85	118	0.5	10
3RF21 90-2....	88	0.33	20	2.8	20	3.5	118	0.5	10
3RF21 90-3....	88	0.33	88	0.22	83	0.19	118	0.5	10

[1] I_{max} provides information about the performance of the solid-state relay. The actual permitted rated operational current I_e can be smaller depending on the connection method and cooling conditions.

Note: The required heat sinks for the corresponding load currents can be determined from the characteristic curves. The minimum thickness values for the mounting surface must be observed.

Order No.	Rated impulse withstand capacity I_{tsm}	I^2t value
	A	A^2s
Main circuit		
3RF21 20-.....	200	200
3RF21 30-..A.2	300	450
3RF21 30-..A.4	300	450
3RF21 30-..A.5	300	450
3RF21 30-..A.6	400	800
3RF21 50-.....	600	1800
3RF21 70-..A.2	1200	7200
3RF21 70-..A.4	1200	7200
3RF21 70-..A.5	1200	7200
3RF21 70-..A.6	1150	6600
3RF21 90-.....	1150	6600

Type		3RF21 ..-....2	3RF21 ..-....4	3RF21 ..-....5	3RF21 ..-....6
Main circuit					
Rated operational voltage U_e	V	24 ... 230	48 ... 460	48 ... 600	48 ... 600
• Operating range	V	20 ... 253	40 ... 506	40 ... 660	40 ... 660
• Rated frequency	Hz	50/60 ± 10 %			
Rated insulation voltage U_i	V	600			
Blocking voltage	V	800	1200		1600
Rage of voltage rise	V/µs	1000			

Type		3RF21 ..-...0.	3RF21 ..-...1.		3RF21 ..-...2.	3RF21 ..-...4.
Control circuit						
Method of operation		DC operation	AC/DC operation		AC operation	DC operation
Rated control supply voltage U_s	V	24 acc. to EN 61131-2	24 AC	24 DC	110 ... 230	4 ... 30
Rated frequency of the control supply voltage	Hz	--	50/60 ± 10 %	--	50/60 ± 10 %	--
Control supply voltage, max.	V	30	26.5 AC	30 DC	253	30
Typical actuating current	mA	20 / Low Power: 6.5[1]	20	20	15	20
Response voltage	V	15	14 AC	15 DC	90	4
Drop-out voltage	V	5	5 AC	5 DC	40	1
Operating times						
• ON-delay	ms	1 + max. one half-wave[2]	10 + max. one half-wave[2]		40 + max. one half-wave[2]	1 + max. one half-wave[2]
• OFF-delay	ms	1 + max. one half-wave	15 + max. one half-wave		40 + max. one half-wave	1 + max. one half-wave

[1] Applies to the version "Low Power" 3RF21 ..-.AA..-**0KN0**.

[2] Only for zero-point-switching devices.

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Fused version with semiconductor protection (similar to type of coordination "2")[1)]

The semiconductor protection for the SIRIUS controls can be used with different protective devices. This allows protection by means of LV HRC fuses of gG operational class or miniature circuit breakers. Siemens recommends the use of special SITOR semiconductor fuses. The table below lists the maximum permissible fuses for each SIRIUS control.

If a fuse is used with a higher rated current than specified, semiconductor protection is no longer guaranteed. However, smaller fuses with a lower rated current for the load can be used without problems.

For protective devices with gG operational class and for SITOR 3NE1 all-range fuses, the minimum cross-sections for the conductor to be connected must be taken into account.

Order No.	All-range fuses		Semiconductor fuses/partial-range fuses			
	LV HRC design	Cylindrical design	LV HRC design	Cylindrical design		
	gR/SITOR	gR/NEOZED[2)]	aR/SITOR	aR/SITOR	aR/SITOR	aR/SITOR
		SILIZED		10 mm x 38 mm	14 mm x 51 mm	22 mm x 58 mm
	3NE1	5SE1	3NE8	3NC1 0	3NC1 4	3NC2 2
3RF21 20-...2	3NE1 814-0	5SE1 325	3NE8 015-1	3NC1 020	3NC1 420	3NC2 220
3RF21 20-...4	3NE1 813-0[4)]	5SE1 320	3NE8 015-1	3NC1 016[4)]	3NC1 420	3NC2 220
3RF21 20-....5[3)]	3NE1 813-0[4)]	5SE1 320	3NE8 015-1	3NC1 016[4)]	3NC1 420	3NC2 220
3RF21 30-...2	3NE1 815-0[4)]	5SE1 335	3NE8 003-1	3NC1 032	3NC1 432	3NC2 232
3RF21 30-...4	3NE1 815-0[4)]	5SE1 325[4)]	3NE8 003-1	3NC1 025[4)]	3NC1 430	3NC2 232
3RF21 30-....5[3)]	3NE1 815-0[4)]	5SE1 325[4)]	3NE8 003-1	3NC1 025[4)]	3NC1 430	3NC2 232
3RF21 30-...6	3NE1 815-0[4)]	--	3NE8 003-1	3NC1 032	3NC1 432	3NC2 232
3RF21 50-...2	3NE1 817-0	5SE1 350	3NE8 017-1	--	3NC1 450	3NC2 250
3RF21 50-...4	3NE1 802-0[4)]	5SE1 335[4)]	3NE8 017-1	--	3NC1 450	3NC2 250
3RF21 50-....5[3)]	3NE1 802-0[4)]	5SE1 335[4)]	3NE8 017-1	--	3NC1 450	3NC2 250
3RF21 50-...6	3NE1 803-0[4)]	--	3NE8 017-1	--	3NC1 450	3NC2 250
3RF21 70-...2[5)]	3NE1 820-0	5SE1 363[4)]	3NE8 020-1	--	--	3NC2 280
3RF21 70-...4[5)]	3NE1 020-2	5SE1 363[4)]	3NE8 020-1	--	--	3NC2 280
3RF21 70-....5[3)5)]	3NE1 020-2	--	3NE8 020-1	--	--	3NC2 280
3RF21 70-...6[5)]	3NE1 020-2	--	3NE8 020-1	--	--	3NC2 280
3RF21 90-...2[5)]	3NE1 021-2	--	3NE8 021-1	--	--	3NC2 200
3RF21 90-...4[5)]	3NE1 021-2	--	3NE8 021-1	--	--	3NC2 280[4)]
3RF21 90-....5[3)5)]	3NE1 021-2	--	3NE8 021-1	--	--	3NC2 280[4)]
3RF21 90-...6[5)]	3NE1 817-0[4)]	--	3NE8 021-1	--	--	3NC2 280[4)]

Order No.	Cable and line protection fuses				
	LV HRC design[4)]	Cylindrical design[4)]			DIAZED[4)]
	gG	gG	gG	gG	quick
		10 mm x 38 mm	14 mm x 51 mm	22 mm x 58 mm	
	3NA2	3NW6 0	3NW6 1	3NW6 2	5SB
3RF21 20-...2	3NA2 803	3NW6 000-1	3NW6 101-1	--	5SB1 41
3RF21 20-...4	3NA2 801	--	3NW6 101-1	--	5SB1 41
3RF21 20-....5[3)]	3NA2 801	--	3NW6 101-1	--	5SB1 41
3RF21 30-...2	3NA2 803	--	3NW6 103-1	--	5SB1 71
3RF21 30-...4	3NA2 803	--	3NW6 101-1	--	5SB1 71
3RF21 30-....5[3)]	3NA2 803	--	3NW6 101-1	--	5SB1 71
3RF21 30-...6	3NA2 803-6	--	--	--	--
3RF21 50-...2	3NA2 810	--	3NW6 107-1	3NW6 207-1	5SB3 11
3RF21 50-...4	3NA2 807	--	--	3NW6 205-1	5SB3 11
3RF21 50-....5[3)]	3NA2 807	--	--	3NW6 205-1	5SB3 11
3RF21 50-...6	3NA2 807-6	--	--	--	--
3RF21 70-...2[5)]	3NA2 817	--	--	3NW6 217-1	5SB3 31
3RF21 70-...4[5)]	3NA2 812	--	--	3NW6 212-1	5SB3 31
3RF21 70-....5[3)5)]	3NA2 812	--	--	3NW6 212-1	--
3RF21 70-...6[5)]	3NA2 812-6	--	--	--	--
3RF21 90-...2[5)]	3NA2 817	--	--	3NW6 217-1	--
3RF21 90-...4[5)]	3NA2 812	--	--	3NW6 212-1	--
3RF21 90-....5[3)5)]	3NA2 812	--	--	3NW6 212-1	--
3RF21 90-...6[5)]	3NA2 812-6	--	--	--	--

Suitable fuse holders, fuse bases and controls can be found in "BETA Low-Voltage Circuit Protection".

1) Type of coordination "2" according to EN 60947-4-1:
In the event of a short-circuit, the controls in the load feeder must not endanger persons or the installation. They must be suitable for further operation. For fused configurations, the protective device must be replaced.

2) For use only with operational voltage U_e up to 400 V.

3) For use only with operational voltage U_e up to 506 V.

4) These fuses have a smaller rated current than the solid-state relays.

5) These versions can also be protected against short-circuits with miniature circuit breakers as described in the notes on "SIRIUS Solid-State Contactors → Special Version Short-Circuit Resistant".