

Solid-State Switching Devices for Resistive Loads

Solid-State Relays



3RF20 solid-state relays, single-phase, 45 mm

Overview

45 mm solid-state relays

The solid-state relays with a width of 45 mm provide for connection of the power supply lead and the load from above. This makes it easy to replace existing solid-state relays in existing arrangements. The connection of the control cable also saves space in much the same way as the 22.5 mm design, as it is simply plugged on.

Technical specifications

Type	3RF20 ..-1....		3RF20 ..-4....	
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 dB μ V; 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	
Connection, main contacts				
• Conductor cross-section	mm ²	2 x (1.5 ... 2.5) ¹⁾ , 2 x (2.5 ... 6) ¹⁾		--
- Solid	mm ²	2 x (1 ... 2.5) ¹⁾ , 2 x (2.5 ... 6) ¹⁾ , 1 x 10		--
- Finely stranded with end sleeve		2x (AWG 14 ... 10)		--
- Solid or stranded, AWG cables				--
• Terminal screw		M4		--
• Tightening torque	Nm	2 ... 2.5		--
	lb.in	7 ... 10.3		--
Connection, auxiliary/control contacts				
• Conductor cross-section	mm ²	1 x (0.5 ... 2.5), 2 x (0.5 ... 1.0), AWG 20 ... 12		0.5 ... 2.5, AWG 20 ... 12
• Stripped length	mm	7		10
• Terminal screw		M3		--
• Tightening torque	Nm	0.5 ... 0.6		--
	lb.in	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.

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Order No.	$I_{\max}^1)$ at $R_{\text{thha}}/T_u = 40\text{ °C}$		I_e acc. to IEC 60947-4-3 at $R_{\text{thha}}/T_u = 40\text{ °C}$		I_e acc. to UL/CSA at $R_{\text{thha}}/T_u = 50\text{ °C}$		Power loss at I_{\max}	Minimum load current	Leakage current
	A	K/W	A	K/W	A	K/W			
Main circuit									
3RF20 20-1.A..	20	2.0	20	1.7	20	1.3	28.6	0.1	10
3RF20 30-1.A..	30	1.1	30	0.79	30	0.56	44.2	0.5	10
3RF20 50-1.A..	50	0.68	50	0.48	50	0.33	66	0.5	10
3RF20 70-1.A..	70	0.40	50	0.77	50	0.6	94	0.5	10
3RF20 90-1.A..	88	0.33	50	0.94	50	0.85	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	
Main circuit			
3RF20 20-1.A..	200		200
3RF20 30-1.A.2	300		450
3RF20 30-1.A.4	300		450
3RF20 30-1.A.6	400		800
3RF20 50-1.A..	600		1800
3RF20 70-1.A.2	1200		7200
3RF20 70-1.A.4	1200		7200
3RF20 70-1.A.5	1200		7200
3RF20 70-1.A.6	1150		6600
3RF20 90-1.A..	1150		6600

Type		3RF20 .0-1.A.2	3RF20 .0-1.A.4	3RF20 .0-1.A.5	3RF20 .0-1.A.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		3RF20 .0-1.A.0.	3RF20 .0-1.A.2.	3RF20 .0-1.A.4.
Control circuit				
Method of operation		DC operation	AC operation	DC operation
Rated control supply voltage U_S	V	24 acc. to EN 61131-2	110 ... 230	4 ... 30
Rated frequency of the control supply voltage	Hz	--	50/60 ± 10 %	--
Control supply voltage, max.	V	30	253	30
Typical actuating current	mA	20	15	20
Response voltage	V	15	90	4
Drop-out voltage	V	5	40	1
Operating times				
• ON-delay	ms	1 + max. one half-wave ¹⁾	40 + max. one half-wave ¹⁾	1 + max. one half-wave ¹⁾
• OFF-delay	ms	1 + max. one half-wave	40 + max. one half-wave	1 + max. one half-wave

¹⁾ 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 gR/SITOR	Cylindrical design gR/NEOZED ²⁾	LV HRC design aR/SITOR	Cylindrical design aR/SITOR	aR/SITOR	aR/SITOR
	3NE1	SILIZED 5SE1	3NE8	10 mm x 38 mm 3NC1 0	14 mm x 51 mm 3NC1 4	22 mm x 58 mm 3NC2 2
3RF20 20-1.A.2	3 NE1 814-0	5SE1 325	3 NE8 015-1	3NC1 020	3NC1 420	3NC2 220
3RF20 20-1.A.4	3 NE1 813-0 ⁴⁾	5SE1 320	3 NE8 015-1	3NC1 016 ⁴⁾	3NC1 420	3NC2 220
3RF20 20-1.A.5³⁾	3 NE1 813-0 ⁴⁾	5SE1 320	3 NE8 015-1	3NC1 016 ⁴⁾	3NC1 420	3NC2 220
3RF20 30-1.A.2	3 NE1 815-0 ⁴⁾	5SE1 335	3 NE8 003-1	3NC1 032	3NC1 432	3NC2 232
3RF20 30-1.A.4	3 NE1 815-0 ⁴⁾	5SE1 325 ⁴⁾	3 NE8 003-1	3NC1 025 ⁴⁾	3NC1 430	3NC2 232
3RF20 30-1.A.6	3 NE1 815-0 ⁴⁾	--	3 NE8 003-1	3NC1 032	3NC1 432	3NC2 232
3RF20 50-1.A.2	3 NE1 817-0	5SE1 350	3 NE8 017-1	--	3NC1 450	3NC2 250
3RF20 50-1.A.4	3 NE1 802-0 ⁴⁾	5SE1 335 ⁴⁾	3 NE8 017-1	--	3NC1 450	3NC2 250
3RF20 50-1.A.5³⁾	3 NE1 802-0 ⁴⁾	5SE1 335 ⁴⁾	3 NE8 017-1	--	3NC1 450	3NC2 250
3RF20 50-1.A.6	3 NE1 803-0 ⁴⁾	--	3 NE8 017-1	--	3NC1 450	3NC2 250
3RF20 70-1.A.2⁵⁾	3 NE1 820-0	5SE1 363 ⁴⁾	3 NE8 020-1	--	--	3NC2 280
3RF20 70-1.A.4⁵⁾	3 NE1 020-2	5SE1 363 ⁴⁾	3 NE8 020-1	--	--	3NC2 280
3RF20 70-1.A.5³⁾⁵⁾	3 NE1 020-2	--	3 NE8 020-1	--	--	3NC2 280
3RF20 70-1.A.6⁵⁾	3 NE1 020-2	--	3 NE8 020-1	--	--	3NC2 280
3RF20 90-1.A.2⁵⁾	3 NE1 021-2	--	3 NE8 021-1	--	--	3NC2 200
3RF20 90-1.A.4⁵⁾	3 NE1 021-2	--	3 NE8 021-1	--	--	3NC2 280 ⁴⁾
3RF20 90-1.A.5³⁾⁵⁾	3 NE1 021-2	--	3 NE8 021-1	--	--	3NC2 280 ⁴⁾
3RF20 90-1.A.6⁵⁾	3 NE1 817-0 ⁴⁾	--	3 NE8 021-1	--	--	3NC2 280 ⁴⁾

Order No.	Cable and line protection fuses				
	LV HRC design ⁴⁾ gG	Cylindrical design ⁴⁾ gG	gG	gG	DIAZED ⁴⁾ quick
	3NA2	10 mm x 38 mm 3NW6 0	14 mm x 51 mm 3NW6 1	22 mm x 58 mm 3NW6 2	5SB
3RF20 20-1.A.2	3NA2 803	3NW6 001-1	3NW6 101-1	--	5SB1 41
3RF20 20-1.A.4	3NA2 801	--	3NW6 101-1	--	5SB1 41
3RF20 20-1.A.5³⁾	3NA2 801	--	3NW6 101-1	--	5SB1 41
3RF20 30-1.A.2	3NA2 803	--	3NW6 103-1	--	5SB1 71
3RF20 30-1.A.4	3NA2 803	--	3NW6 101-1	--	5SB1 71
3RF20 30-1.A.6	3NA2 803-6	--	--	--	--
3RF20 50-1.A.2	3NA2 810	--	3NW6 107-1	3NW6 207-1	5SB3 11
3RF20 50-1.A.4	3NA2 807	--	--	3NW6 205-1	5SB3 11
3RF20 50-1.A.5³⁾	3NA2 807	--	--	3NW6 205-1	5SB3 11
3RF20 50-1.A.6	3NA2 807-6	--	--	--	--
3RF20 70-1.A.2⁵⁾	3NA2 817	--	--	3NW6 217-1	5SB3 31
3RF20 70-1.A.4⁵⁾	3NA2 812	--	--	3NW6 212-1	5SB3 31
3RF20 70-1.A.5³⁾⁵⁾	3NA2 812	--	--	3NW6 212-1	--
3RF20 70-1.A.6⁵⁾	3NA2 812-6	--	--	--	--
3RF20 90-1.A.2⁵⁾	3NA2 817	--	--	3NW6 217-1	--
3RF20 90-1.A.4⁵⁾	3NA2 812	--	--	3NW6 212-1	--
3RF20 90-1.A.5³⁾⁵⁾	3NA2 812	--	--	3NW6 212-1	--
3RF20 90-1.A.6⁵⁾	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".