

Solid-State Switching Devices for Resistive Loads

Solid-State Relays

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

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 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-loaded terminals |
| Connection, main contacts | | | |
| • Conductor cross-section - solid | mm ² | 2 x (1.5 ... 2.5) ¹⁾ , 2 x (2.5 ... 6) ¹⁾ | -- |
| - finely stranded with end sleeve | mm ² | 2 x (1 ... 2.5) ¹⁾ , 2 x (2.5 ... 6) ¹⁾ , 1 x 10 | -- |
| - solid or stranded, AWG cables | | 2x (AWG 14 ... 10) | -- |
| • 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.

Solid-State Switching Devices for Resistive Loads

Solid-State Relays

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

| 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 | W | A | mA |
| 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, page 4/10. The minimum thickness values for the mounting surface must be observed.

| Order No. | Rated impulse withstand capacity I_{tsm} | I^2t value |
|----------------|---|--------------|
| | A | A²s |
| 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 | 1.800 |
| 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.A0. | 3RF20 .0-1.A2. | 3RF20 .0-1.A4. |
|--|----|--------------------------------------|---------------------------------------|--------------------------------------|
| 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.

Solid-State Switching Devices for Resistive Loads

Solid-State Relays

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

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 full range fuses, the minimum cross-sections for the conductor to be connected must be taken into account.

| Order No. | All-range fuses | | Semiconductor fuses / back-up fuses | | | |
|--------------------------------------|---------------------------|-------------------------|-------------------------------------|-------------------------|-------------------------|-------------------------|
| | LV HRC design | Cylindrical design | LV HRC design | Cylindrical design | aR/SITOR | aR/SITOR |
| | gR/SITOR | gR/NEOZED ²⁾ | aR/SITOR | 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⁾ | Cylindrical design ⁴⁾ | | | |
| | gG | gG | gG | gG | DIAZED ⁴⁾ |
| | 3NA2 | 10 mm x 38 mm 3NW6 0 | 14 mm x 51 mm 3NW6 1 | 22 mm x 58 mm 3NW6 2 | Quick 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 Catalog LV 1, Chapter 19.

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_o up to 400 V.

³⁾ For use only with operational voltage U_o 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".