

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

General data

Overview

More information

Homepage, see www.siemens.com/solid-state-switching-devices
Industry Mall, see www.siemens.com/product?3RF

Online configurator, see www.siemens.com/sirius/configurators

Solid-state contactors for switching motors



Solid-state contactor for direct-on-line starting

The solid-state contactors for switching motors are intended for frequently switching on and off three-phase current operating mechanisms up to 7.5 kW and reversing up to 3.0 kW. The devices are constructed with complete insulation and can be mounted directly on SIRIUS motor starter protectors, overload relays and current monitoring relays, resulting in a very simple integration into motor feeders.

These three-phase solid-state contactors are equipped with a three-phase control which is particularly suitable for typical motor current circuits without connecting to the neutral conductor.

Important features:

- Insulated enclosure with integrated heat sink
- Degree of protection IP20
- Integrated mounting foot to snap on a standard mounting rail or for assembly onto a support plate
- Variety of connection methods
- Plug-in control connection
- Display via LEDs
- Wide voltage range for AC control supply voltage

Switching functions

The solid-state contactors for switching motors are "Instantaneous switching", because this method is particularly suited for inductive loads. By distributing the ON point over the entire sine curve of the mains voltage, disturbances are reduced to a minimum.

Connection methods

You can choose between the following connection methods for the solid-state contactors for switching motors:

Screw terminals

The screw connection system is the standard among industrial controls. Open terminals and a plus-minus screw are just two features of this technology. Two conductors of up to 6 mm² can be connected in just one terminal.

Spring-type terminals

This innovative technology manages without any screw connection. This means that very high vibration resistance is achieved. Two conductors of up to 2.5 mm² can be connected to each terminal.

Motor feeders

The devices can use a link module to directly connect to a motor starter protector. Also possible is the mounting of a 3RB30/3RB31 electronic overload relay (see page 7/98) or a 3RR2 current monitoring relay (see pages 10/62 and 10/70) using a link adapter. The simultaneous mounting of a motor starter protector and an overload or current monitoring relay is not recommended for space and heat development reasons.

Rapid-switching fuseless and fused motor feeders can thereby be implemented in a time-saving manner.

Selecting solid-state contactors

The solid-state contactors are selected on the basis of details of the network, the load and the ambient conditions.

The following procedure is recommended:

- Determine the rated current of the load and the mains voltage
- Select a solid-state contactor with the same or higher rated current than the load
- Testing of the maximum permissible switching frequency based on the characteristic curves (see "More Information" → "Product Information"). To do this, the starting current, the starting time and the motor loaded in in the operating phase must be known.
- If the permissible switching frequency is under the desired frequency, it is possible to achieve an increase only by overdimensioning the motor and the solid-state contactor!

Alternatively, the tool for "Selection of solid-state contactors for switching motors" can be used. The correct device size can be determined by entering the network and motor data along with the application and ambient conditions, see www.siemens.com/solid-state-switching-devices.

Short-circuit protection

Despite the rugged power semiconductors that are used, solid-state switching devices respond more sensitively to short circuits in the load feeder. Consequently, special precautions have to be taken against destruction, depending on the type of design.

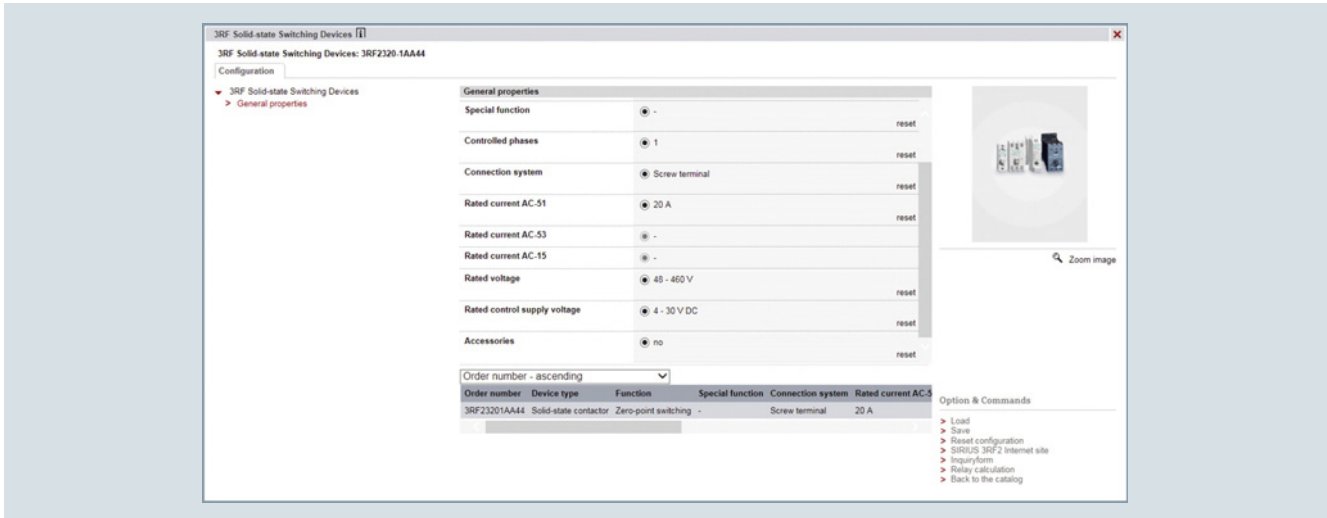
Siemens generally recommends using SITOR semiconductor fuses. These fuses also provide protection against destruction in the event of a short circuit even when the solid-state contactors and solid-state relays are fully utilized.

Alternatively, if there is lower loading, protection can also be provided by standard fuses or miniature circuit breakers. This protection is achieved by overdimensioning the solid-state switching devices accordingly.

Online Configurator

- Simple selection of individual solid-state switching devices by means of technical characteristics (e.g. zero-point switching, spring-type terminal and rated current)
- Once configuration is complete, you receive the article numbers corresponding to the products.

see
www.siemens.com/sirius/configurators



Article No. scheme

Product versions		Article number					
Solid-state contactors		3RF34	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Three-phase
Rated operational current	3.8 A	0 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Only for reversing contactor
	5.2 A (5.4 A for reversing contactor)	0 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	9.2 A (7.4 A for reversing contactor)	1 0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	12.5 A	1 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Only for solid-state contactor
	16 A	1 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Only for solid-state contactor
Connection type	Screw terminals	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Spring-type terminals	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Switching function	Instantaneous switching		B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Number of controlled phases	Three-phase		B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Reversing contactor		D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Rated control supply voltage U_s	24 V DC		0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	110 ... 230 V AC		2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Rated operational voltage U_e	48 ... 460 V AC		4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	48 ... 600 V AC		6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Blocking voltage 1 600 V, solid-state contactor only
Example		3RF34	1 0	-	1 B B 0 4		

Note:

The Article No. scheme shows an overview of product versions for better understanding of the logic behind the article numbers.

For your orders please use the article numbers quoted in the selection and ordering data.

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

General data

Benefits

- Units with integrated heat sink, "ready to use"
- Compact and space-saving design
- Reversing contactors with integrated interlocking

Application

Use in load feeders

There is no typical design of a load feeder with solid-state relays or solid-state contactors; instead, the great variety of connection methods and control voltages offers universal application opportunities.

SIRIUS solid-state relays and solid-state contactors can be installed in fuseless or fused feeders, as required.

See Configuration Manual "Load Feeders – Configuring the SIRIUS Modular System – Selection Data for Fuseless and Fused Load Feeders",
<https://support.industry.siemens.com/cs/ww/en/view/39714188>.

Standards and approvals

- IEC 60947-4-2
- UL 508, CSA for North America¹⁾
- CE marking for Europe
- C-Tick approval for Australia
- CCC approval for China

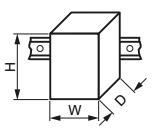


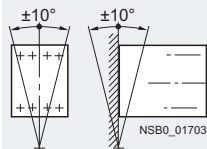
¹⁾ Please note: Use overvoltage protection device;
 max. cut-off-voltage 6 000 V;
 min. energy handling capability 100 J.

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

General data

Technical specifications

Type		3RF3405-1BB.. 3RF3403-1BD.., 3RF3405-1BD..	3RF3410-1BB.., 3RF3412-1BB.., 3RF3416-1BB.. 3RF3410-1BD..	3RF3405-2BB..	3RF3410-2BB.., 3RF3412-2BB.., 3RF3416-2BB..	
Dimensions (W x H x D) • 3RF34..-1BB.. • 3RF34..-1BD..		mm	45 x 95 x 96.5	90 x 95 x 96.5	45 x 95 x 96.5	90 x 95 x 96.5
		mm	45 x 95 x 108.5	90 x 95 x 108.5	--	--
General technical specifications						
Ambient temperature						
• During operation, derating from 40 °C	°C	-25 ... +60				
• During storage	°C	-55 ... +80				
Installation altitude						
	m	0 ... 1 000; derating over 1 000 m on request				
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				
Insulation strength at 50/60 Hz (main/control circuit to floor)						
	V rms	4 000				
Electromagnetic compatibility (EMC)						
• Emitted interference according to IEC 60947-4-2						
- Conducted interference voltage		Class A for industrial applications ¹⁾				
- Emitted, high-frequency interference voltage		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 according to IEC 61000-4-6	MHz	0.15 ... 80; 140 dBµV; behavior criterion 1				
- Burst acc. to IEC 61000-4-4	kV	2; at 5 kHz; behavior criterion 2				
- Surge acc. to IEC 61000-4-5 ²⁾	kV	Conductor - ground: 2; conductor - conductor: 1; behavior criterion 2				
Connection type		 Screw terminals		 Spring-type terminals		
Operating devices		Standard screwdriver size 2 and Pozidriv 2		3.0 x 0.5 and 3.5 x 0.5		
Conductor cross-sections, main contacts						
• Solid	mm ²	2 x (1.5 ... 2.5) ³⁾ , 2 x (2.5 ... 6) ³⁾		2 x (0.5 ... 2.5)		
• Finely stranded with end sleeve	mm ²	2 x (1 ... 2.5) ³⁾ , 2 x (2.5 ... 6) ³⁾ , 1 x 10		2 x (0.5 ... 1.5)		
• Finely stranded without end sleeve	mm ²	--		2 x (0.5 ... 2.5)		
• AWG cables, solid or stranded	AWG	2 x (14 ... 10)		2 x (18 ... 14)		
Conductor cross-sections, auxiliary/control contacts						
• With/without end sleeve	mm ²	1 x (0.5 ... 2.5), 2 x (0.5 ... 1.0)		0.5 ... 2.5		
• AWG cables, solid or stranded	AWG	20 ... 12		20 ... 12		
Permissible mounting position						
						

¹⁾ These products were built as Class A devices. The use of these devices in residential areas could result in radio interference. In this case the user may be required to introduce additional interference suppression measures.

²⁾ The following applies for reversing contactors: To maintain the values, a 3TX7462-3L surge suppressor should be used between phases L1 and L3 as close as possible to the reversing contactor.

³⁾ If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in one of the ranges specified.

More information

For more information, see

- System Manual "SIRIUS – System Overview", <https://support.industry.siemens.com/cs/WW/en/view/60311318>
- Manual "SIRIUS – 3RF34 Solid-State Switching Devices", <https://support.industry.siemens.com/cs/ww/en/view/60298187>

Product information and technical specifications

For product data sheets with detailed technical specifications, dimensional drawings and characteristic curves, see <https://support.industry.siemens.com/cs/ww/en/ps/16237>.

For additional information, please enter the article number of the required device under the tab "Product List".

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

SIRIUS 3RF34 solid-state contactors, three-phase

Overview

These three-phase controlled, instantaneous switching solid-state contactors in the insulating enclosure are offered in a width of 45 mm up to 5.2 A – and in a width of 90 mm up to 16 A. They allow the operation of motors up to 7.5 kW.¹⁾

¹⁾ In accordance with the product standard IEC 60947-4-2, the motor contactors are designed for motors with maximum starting current conditions of $I/I_e \leq 8$.

For configuring motors with higher starting current conditions (typically $I/I_e \geq 8$) the data in the manual "SIRIUS – 3RF34 Solid-State Switching Devices" must be taken into account, see

<https://support.industry.siemens.com/cs/ww/en/view/60298187>.

Technical specifications

More information

System Manual "SIRIUS Modular System – System Overview", see <https://support.industry.siemens.com/cs/ww/en/view/60311318>

FAQs, see <https://support.industry.siemens.com/cs/ww/en/ps/16239/faq>

Manual "SIRIUS – 3RF34 Solid-State Switching Devices", see <https://support.industry.siemens.com/cs/ww/en/view/60298187>

Type		3RF3405-.BB..	3RF3410-.BB..	3RF3412-.BB..	3RF3416-.BB..
Fuseless design with 3RV2 motor starter protector, CLASS 10					
Rated operational current I_{AC-53a}¹⁾ acc. to IEC 60947-4-2					
• At 40 °C	A	5.2 (4.5)	9.2	12.5	16
• UL/CSA, at 50 °C	A	4.6 (4.0)	8.4	11.5	14
• At 60 °C	A	4.2 (3.5)	7.6	10.5	12.5
Power loss at I_{AC-53a}					
• At 40 °C	W	10 (8)	16	22	28
Short-circuit protection with type of coordination "1" at operational voltage U_e up to 440 V					
• Motor starter protector, type		3RV2011-1GA10	3RV2011-1JA10	3RV2011-1KA10	3RV2011-4AA10
• Current I_q	kA	50	5		3

¹⁾ The reduced values in brackets apply to a directly mounted motor starter protector and simultaneous side-by-side mounting.

Type		3RF3405-.BB.4	3RF3405-.BB.6	3RF3410-.BB..	3RF3412-.BB.4	3RF3412-.BB.6	3RF3416-.BB..
Fused design with directly connected 3RB3 overload relay							
Rated operational current I_{AC-53a} acc. to IEC 60947-4-2							
• At 40 °C	A	4		7.8	9.5		11
• UL/CSA, at 50 °C	A	3.6		7	8.5		10
• At 60 °C	A	3.2		6.2	7.6		9
Power loss at I_{AC-53a}							
• At 40 °C	W	7		13	16		18
Minimum load current							
	A	0.1	0.5				
Max. off-state current							
	mA	10					
Rated peak withstand current I_{tsm}							
	A	200	600		1 200	1 150	
I^2t value							
	A ² s	200	1 800		7 200	6 600	

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

SIRIUS 3RF34 solid-state contactors, three-phase **IE3/IE4 ready**


Selection and ordering data

More information


System Manual "SIRIUS Modular System – System Overview", see <https://support.industry.siemens.com/cs/ww/en/view/60311318>

Manual "SIRIUS – 3RF34 Solid-State Switching Devices", see <https://support.industry.siemens.com/cs/ww/en/view/60298187>


Motor contactors · Instantaneous switching · Three-phase controlled

Rated operational current I_e	Rated power at I_e and U_e	Rated control supply voltage U_s	SD	Screw terminals 		PU (UNIT, SET, M)	PS*	PG
				Article No.	Price per PU			
Rated operational voltage U_e								
48 ... 480 V AC								
5.2	2.2	24 DC	2	3RF3405-1BB04		1	1 unit	41C
9.2	4.0		5	3RF3410-1BB04		1	1 unit	41C
12.5	5.5		5	3RF3412-1BB04		1	1 unit	41C
16	7.5		5	3RF3416-1BB04		1	1 unit	41C
5.2	2.2	110 ... 230 AC	5	3RF3405-1BB24		1	1 unit	41C
9.2	4.0		5	3RF3410-1BB24		1	1 unit	41C
12.5	5.5		5	3RF3412-1BB24		1	1 unit	41C
16	7.5		5	3RF3416-1BB24		1	1 unit	41C


3RF3405-1BB

Rated operational current I_e	Rated power at I_e and U_e	Rated control supply voltage U_s	SD	Spring-type terminals 		PU (UNIT, SET, M)	PS*	PG
				Article No.	Price per PU			
Rated operational voltage U_e								
48 ... 600 V AC, blocking voltage 1 600 V								
5.2	2.2	24 DC	5	3RF3405-1BB06		1	1 unit	41C
9.2	4.0		5	3RF3410-1BB06		1	1 unit	41C
12.5	5.5		5	3RF3412-1BB06		1	1 unit	41C
16	7.5		5	3RF3416-1BB06		1	1 unit	41C
5.2	2.2	110 ... 230 AC	5	3RF3405-1BB26		1	1 unit	41C
9.2	4.0		5	3RF3410-1BB26		1	1 unit	41C
12.5	5.5		5	3RF3412-1BB26		1	1 unit	41C
16	7.5		5	3RF3416-1BB26		1	1 unit	41C

3RF3410-1BB

Rated operational current I_e	Rated power at I_e and U_e	Rated control supply voltage U_s	SD	Spring-type terminals 		PU (UNIT, SET, M)	PS*	PG
				Article No.	Price per PU			
Rated operational voltage U_e								
48 ... 480 V AC								
5.2	2.2	24 DC	5	3RF3405-2BB04		1	1 unit	41C
9.2	4.0		5	3RF3410-2BB04		1	1 unit	41C
12.5	5.5		5	3RF3412-2BB04		1	1 unit	41C
16	7.5		5	3RF3416-2BB04		1	1 unit	41C
5.2	2.2	110 ... 230 AC	5	3RF3405-2BB24		1	1 unit	41C
9.2	4.0		5	3RF3410-2BB24		1	1 unit	41C
12.5	5.5		5	3RF3412-2BB24		1	1 unit	41C
16	7.5		5	3RF3416-2BB24		1	1 unit	41C

3RF3405-2BB

Rated operational current I_e	Rated power at I_e and U_e	Rated control supply voltage U_s	SD	Spring-type terminals 		PU (UNIT, SET, M)	PS*	PG
				Article No.	Price per PU			
Rated operational voltage U_e								
48 ... 600 V AC, blocking voltage 1 600 V								
5.2	2.2	24 DC	5	3RF3405-2BB06		1	1 unit	41C
9.2	4.0		5	3RF3410-2BB06		1	1 unit	41C
12.5	5.5		5	3RF3412-2BB06		1	1 unit	41C
16	7.5		5	3RF3416-2BB06		1	1 unit	41C
5.2	2.2	110 ... 230 AC	5	3RF3405-2BB26		1	1 unit	41C
9.2	4.0		5	3RF3410-2BB26		1	1 unit	41C
12.5	5.5		5	3RF3412-2BB26		1	1 unit	41C
16	7.5		5	3RF3416-2BB26		1	1 unit	41C

3RF3410-2BB