

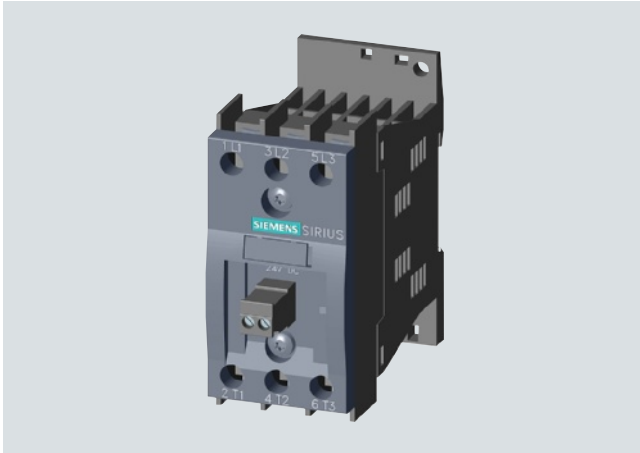
Solid-State Switching Devices for Switching Motors

Solid-State Contactors

General data

Overview

Solid-state contactors for switching motors



The solid-state contactors for switching motors are intended for frequently switching on and off three-phase current operating mechanisms up to 5 HP and reversing up to 3.0 HP. 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 starters.

These three-phase solid-state contactors are equipped with a two-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 connection

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.

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 the maximum permissible switching frequency based on the characteristic curves (see note on [Technical Information on page 4/1](#)). 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 the required increase 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. You will find the tool on the Internet at:

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 motor starter. 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.

Benefits

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

Application

Use in motor starters

There is no typical design of a motor starter 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 starters, as required.

Standards and approvals

- IEC 60947-4-3
- UL 508, CSA for North America¹⁾
- CE marking for Europe
- C-Tick approval for Australia
- CCC approval for China



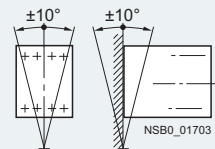
¹⁾ Please note: Use overvoltage protection device; max. cut-off-voltage 6000 V; min. energy handling capability 100 J.

Solid-State Switching Devices for Switching Motors

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General data

More information

Type	3RF34 ...-1BB... 3RF34 ...-1BD..	3RF34 ...-2BB..
General technical specifications		
Ambient temperature		
• During operation, derating from 40 °C	°C	-25 ... +60
• During storage	°C	-55 ... +80
Installation altitude	m	0 ... 1000; derating above 1000 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	4000
Electromagnetic compatibility (EMC)		
• Emitted interference acc. to IEC 60947-4-3		
- 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 acc. 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 1
- 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⁾
• Finely stranded with end sleeve	mm ²	2 x (1 ... 2.5) ³⁾ , 2 x (2.5 ... 6) ³⁾ , 1 x 10
• Finely stranded without end sleeve	mm ²	--
• AWG cables, solid or stranded		2 x (AWG 14 ... 10)
Conductor cross-sections, auxiliary/control contacts		
• With/without end sleeve	mm ²	1 x (0.5 ... 2.5), 2 x (0.5 ... 1.0)
• AWG cables, solid or stranded		AWG 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 lead in radio interference. In this case these may be required to introduce additional interference suppression measures.

²⁾ The following applies for reversing contactors: To maintain the values, a 3TX7 462-3L surge suppressor (see Catalog LV 1, Chapter 3, page 3/120) should be used between the 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 the range specified.

Order No. scheme

Digit of the Order No.	1st - 3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
	□□□	□	□	□	□	-	□	□	□	□
Solid-state switching devices	3 R F									
SIRIUS solid-state switching device generation	□									
Design	□									
Rated operational current	□ □									
Connection type	□									
Switching function	□									
Number of controlled phases	□									
Rated control supply voltage	□									
Rated operational voltage	□									
Example	3 R F 3 4 1 0 - 1 B B 0 4									

Note:

The Order No. scheme is presented here merely for information purposes and for better understanding of the logic behind the order numbers.

For your orders, please use the order numbers quote in the catalog in the Selection and ordering data.

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

3RF34 solid-state contactors, three-phase

Overview

These two-phase controlled, instantaneous switching solid-state contactors in the insulating enclosure are offered in 45 mm width to 3.4 A – and in 90 mm width to 7,6 A. This means that it is possible to operate motors up to 5 HP.

The devices can use a link module to directly connect to a motor starter protector. Also possible is the direct mounting of a

3RB30/3RB31 solid-state overload relay (see Chapter 5 "Protection Equipment") or a 3RR2 current monitoring relay (see Chapter 7 "Monitoring and Control Devices"). Rapid-switching fuseless and fuse motor starters can thereby be implemented in a time-saving manner.

Selection and ordering data

Motor contactors · Instantaneous switching · Two-phase controlled



3RF34 05-1BB



3RF34 05-2BB



3RF34 10-1BB



3RF34 10-2BB

Rated operational current I_e (FLA)	Rated power at I_e and U_e	Rated control supply voltage U_s	Screw terminals	Weight approx.	Spring-type terminals	Weight approx.
A	460 V HP	V	Order No.	kg	Order No.	kg
Rated operational voltage U_e						
48 ... 480 V AC						
3.4	2	24 DC acc. to EN 61131-2	3RF34 05-1BB04	0.250	3RF34 05-2BB04	0.250
4.8	3		3RF34 10-1BB04	0.380	3RF34 10-2BB04	0.380
7.6	5		3RF34 12-1BB04	0.380	3RF34 12-2BB04	0.380
7.6	5¹⁾		3RF34 16-1BB04	0.380	3RF34 16-2BB04	0.380
3.4	2	110 ... 230 AC	3RF34 05-1BB24	0.250	3RF34 05-2BB24	0.250
4.8	3		3RF34 10-1BB24	0.380	3RF34 10-2BB24	0.380
7.6	5		3RF34 12-1BB24	0.380	3RF34 12-2BB24	0.380
7.6	5¹⁾		3RF34 16-1BB24	0.380	3RF34 16-2BB24	0.380
Rated operational voltage U_e						
48 ... 600 V AC, blocking voltage 1600 V						
3.4	2	24 DC acc. to EN 61131-2	3RF34 05-1BB06	0.250	3RF34 05-2BB06	0.250
4.8	3		3RF34 10-1BB06	0.380	3RF34 10-2BB06	0.380
7.6	5		3RF34 12-1BB06	0.380	3RF34 12-2BB06	0.380
7.6	5¹⁾		3RF34 16-1BB06	0.380	3RF34 16-2BB06	0.380
3.4	2	110 ... 230 AC	3RF34 05-1BB26	0.250	3RF34 05-2BB26	0.250
4.8	3		3RF34 10-1BB26	0.380	3RF34 10-2BB26	0.380
7.6	5		3RF34 12-1BB26	0.380	3RF34 12-2BB26	0.380
7.6	5¹⁾		3RF34 16-1BB26	0.380	3RF34 16-2BB26	0.380

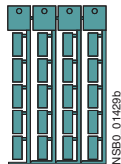
¹⁾ Higher 600 volt HP ratings than 3RF34 12

Solid-State Switching Devices for Switching Motors

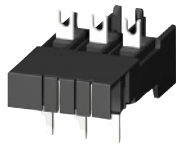
Solid-State Contactors

3RF34 solid-state contactors, three-phase

Accessories






3SB19 00-1SB20



3RA29 21-1BA00



3RA29 08-1A

Version	Order No.	PU (UNIT, SET, M)	PS*	Weight approx. kg
Link modules for solid-state contactors to motor starter protectors				
Link modules between solid-state contactor and motor starter protector with screw terminals For 3RV2 motor starter protectors size S00/S0	Screw terminals 			
	3RA29 21-1BA00	1	1 unit	0.001
Insulation stop for securely holding back the conductor insulation on conductors up to 1 mm²				
Insulation stop strips for all SIRIUS devices with spring-type terminals Can be inserted in cable entry of the spring-type terminal (2 strips per contactor required; removable in pairs) For conductor cross-sections up to 2.5 mm ²	Spring-type terminals 			
	3RT29 16-4JA02	1	20 units	0.005
Tools for opening spring-type terminals by hand				
Screwdrivers for all SIRIUS devices with spring-type terminals Length approx. 200 mm, 3.0 mm x 0.5 mm, titanium gray/black, partially insulated	Spring-type terminals 			
	3RA29 08-1A	1	1 unit	0.045
Blank labels				
Unit labeling plates¹⁾ for SIRIUS devices 20 mm x 7 mm, pastel turquoise	3RT19 00-1SB20	100	340 units	0.200

¹⁾ PC labeling system for individual inscription of unit labeling plates available from: murrplastik Systems, Inc. www.murrplastik.com.

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

3RF34 solid-state contactors, three-phase

More information

Type		3RF34 05-.BB..	3RF34 10-.BB..	3RF34 12-.BB..	3RF34 16-.BB..
Fuseless design with 3RV2 motor starter protector, CLASS 10					
Rated operational current I_{AC-53}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-53}					
• At 40 °C	W	10 (8)	16	22	28
Short-circuit protection with type of coordination '1' at an operational voltage of U_e up to 440 V					
• Motor starter protectors, type		3RV20 11-1GA10	3RV20 11-1JA10	3RV20 11-1KA10	3RV20 11-4AA10
• Current I_q	kA	50	5	5	3

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

Type		3RF34 05-.BB.4	3RF34 05-.BB.6	3RF34 10-.BB..	3RF34 12-.BB.4	3RF34 12-.BB.6	3RF34 16-.BB..
Fused design with directly connected 3RB3 overload relay							
Rated operational current I_{AC-53} 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-53}							
• At 40 °C	W	7		13	16		18
Minimum load current	A	0.5					
Max. leakage current	mA	10					
Rated impulse withstand capacity I_{tsm}	A	200	600	600	1200	1150	1150
I^2t value	A ² s	200	1800	1800	7200	6600	6600

Type		3RF34 ...-BB.4	3RF34 ...-BB.6
Main circuit			
Controlled phases		Two-phase	Two-phase
Rated operational voltage U_e	V AC	48 ... 480	48 ... 600
• Primary operating range	V AC	40 ... 506	40 ... 660
• Rated frequency	Hz	50/60 ± 10 %	50/60 ± 10 %
Rated insulation voltage U_i	V	600	600
Rated impulse withstand voltage U_{imp}	kV	6	6
Blocking voltage	V	1200	1600
Rage of voltage rise	V/μs	1000	1000

Type		3RF34 ...-BB0.	3RF34 ...-BB2.
Control circuit			
Method of operation		DC operation	AC operation
Rated control supply voltage U_s	V	24 according to EN 61131-2	110 ... 230
Rated frequency of the control supply voltage	Hz	--	50/60 ± 10 %
Control supply voltage, max.	V	30	253
Typical actuating current	mA	20	15
Response voltage	V	15	90
Drop-out voltage	V	5	< 40
Operating times			
• ON-delay	ms	1	5
• OFF-delay	ms	1 + max. one half-wave	30 + max. one half-wave

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

3RF34 solid-state reversing contactors, three-phase

Overview

The integration of four conducting paths to a reverse switch, combined in one enclosure makes this device a particularly compact solution. Compared to conventional systems, for which two contactors are required, it is possible to save up to 50 % width with the three-phase reversing contactors. Devices with 45 mm width cover motors up to 3 HP – and those with 90 mm width up to 3 HP.

Due to the integration into the SIRIUS modular system, it is possible to make a connection to a SIRIUS motor starter protector using a link module or with a 3RB30/3RB31 solid-state overload relay (see Chapter 5 "Protection Equipment") or 3RF2 current monitoring relay (see Chapter 7 "Monitoring and Control Devices") without additional steps. It is possible to mount fuseless or fused motor starters easily and quickly.

Selection and ordering data

Reversing contactors · Instantaneous switching · Two-phase controlled

Start of delivery on request



3RF34 03-1BD

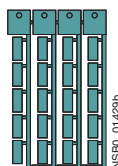


3RF34 10-1BD

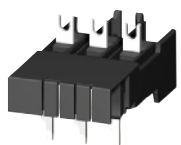
Rated operational current I_e (FLA)	Rated power at I_e and U_e	Rated control supply voltage U_s	Screw terminals	PU (UNIT, SET, M)	PS*	Weight approx.
A	460 V HP	V	Order No.			kg
Rated operational voltage U_e 48 ... 480 V AC						
3.4	2	24 DC acc. to EN 61131-2	3RF34 03-1BD04	1	1 unit	0.280
4.8	3		3RF34 05-1BD04	1	1 unit	0.280
4.8	3 ¹⁾		3RF34 10-1BD04	1	1 unit	0.410
3.4	2	110 ... 230 AC	3RF34 03-1BD24	1	1 unit	0.280
4.8	3		3RF34 05-1BD24	1	1 unit	0.280
4.8	3 ¹⁾		3RF34 10-1BD24	1	1 unit	0.410

¹⁾ Higher 600 volt HP ratings than 3RF34 05

Accessories



3SB19 00-1SB20



3RA29 21-1BA00

Version	Order No.	PU (UNIT, SET, M)	PS*	Weight approx.
Link modules for solid-state contactors to motor starter protectors				
Link modules between solid-state reversing contactor and motor starter protector with screw terminals For 3RV2 motor starter protectors size S00/S0	3RA29 21-1BA00	1	1 unit	0.001
Blank labels Unit labeling plates¹⁾ for SIRIUS devices 20 mm × 7 mm, pastel turquoise	3RT19 00-1SB20	100	340 units	0.200

¹⁾ PC labeling system for individual inscription of unit labeling plates available from: murrplastik Systems, Inc. www.murrplastik.com.

Solid-State Switching Devices for Switching Motors

Solid-State Contactors

3RF34 solid-state reversing contactors, three-phase

More information

Type		3RF34 03-.BD.4	3RF34 05-.BD.4	3RF34 10-.BD.4
Fuseless design with 3RV2 motor starter protector, CLASS 10				
Rated operational current I_{AC-53}¹⁾ acc. to IEC 60947-4-2				
• At 40 °C	A	3.8 (3.4)	5.4 (4.8)	7.4
• UL/CSA, at 50 °C	A	3.5 (3.1)	5 (4.3)	6.8
• At 60 °C	A	3.2 (2.8)	4.6 (3.8)	6.2
Power loss at I_{AC-53}				
• At 40 °C	W	7 (6)	9 (8)	13
Short-circuit protection with type of coordination "1" at an operational voltage of U_e up to 440 V				
• Motor starter protectors, type		3RV20 11-1FA10	3RV20 11-1GA10	3RV20 11-1JA10
• Current I_q	kA	50	50	10

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

Type		3RF34 03-.BD.4	3RF34 05-.BD.4	3RF34 10-.BD.4
Fused design with directly connected 3RB3 overload relay				
Rated operational current I_{AC-53} acc. to IEC 60947-4-2				
• At 40 °C	A	3.8	5.4	7.4
• UL/CSA, at 50 °C	A	3.5	5	6.8
• At 60 °C	A	3.2	4.6	6.2
Power loss at I_{AC-53}				
• At 40 °C	W	6	8	16
Minimum load current	A	0.5		
Max. leakage current	mA	10		
Rated impulse withstand capacity I_{tsm}	A	200	600	
I^2t value	A ² s	200	1800	

Type		3RF34 ...-BD.4		
Main circuit				
Controlled phases				
Two-phase				
Rated operational voltage U_e¹⁾				
	V AC	48 ... 480		
• Primary operating range	V AC	40 ... 506		
• Rated frequency	Hz	50/60 ±10 %		
Rated insulation voltage U_i				
	V	600		
Rated impulse withstand voltage U_{imp}				
	kV	6		
Blocking voltage				
	V	1 200		
Rate of voltage rise				
	V/μs	1 000		

¹⁾ To reduce the risk of a phase short circuit due to overvoltage, we recommend using a varistor type 3TX7 462-3L between the phases L1 and L3 and as close as possible to the switchgear. We recommend a design with semiconductor protection as short-circuit protection.

Type		3RF34 ...-BD0.	3RF34 ...-BD2.
Control circuit			
Method of operation			
		DC operation	AC operation
Rated control supply voltage U_s			
	V	24 acc. to EN 61131-2	110 ... 230
Rated frequency of the control supply voltage			
	Hz	--	50/60 ±10 %
Control supply voltage, maximum			
	V	30	253
Typical actuating current			
	mA	15	10
Response voltage			
	V	15	90
Drop-out voltage			
	V	5	< 40
Operating times			
• ON-delay	ms	5	20
• OFF-delay	ms	5 + max. one half-wave	10 + max. one half-wave
• Interlocking time	ms	60 ... 100	50 ... 100

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Solid-State Contactors

Notes

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