

Overload Relays

SIRIUS 3RB2 Electronic Overload Relays

3RB20, 3RB21 for standard applications

Overview

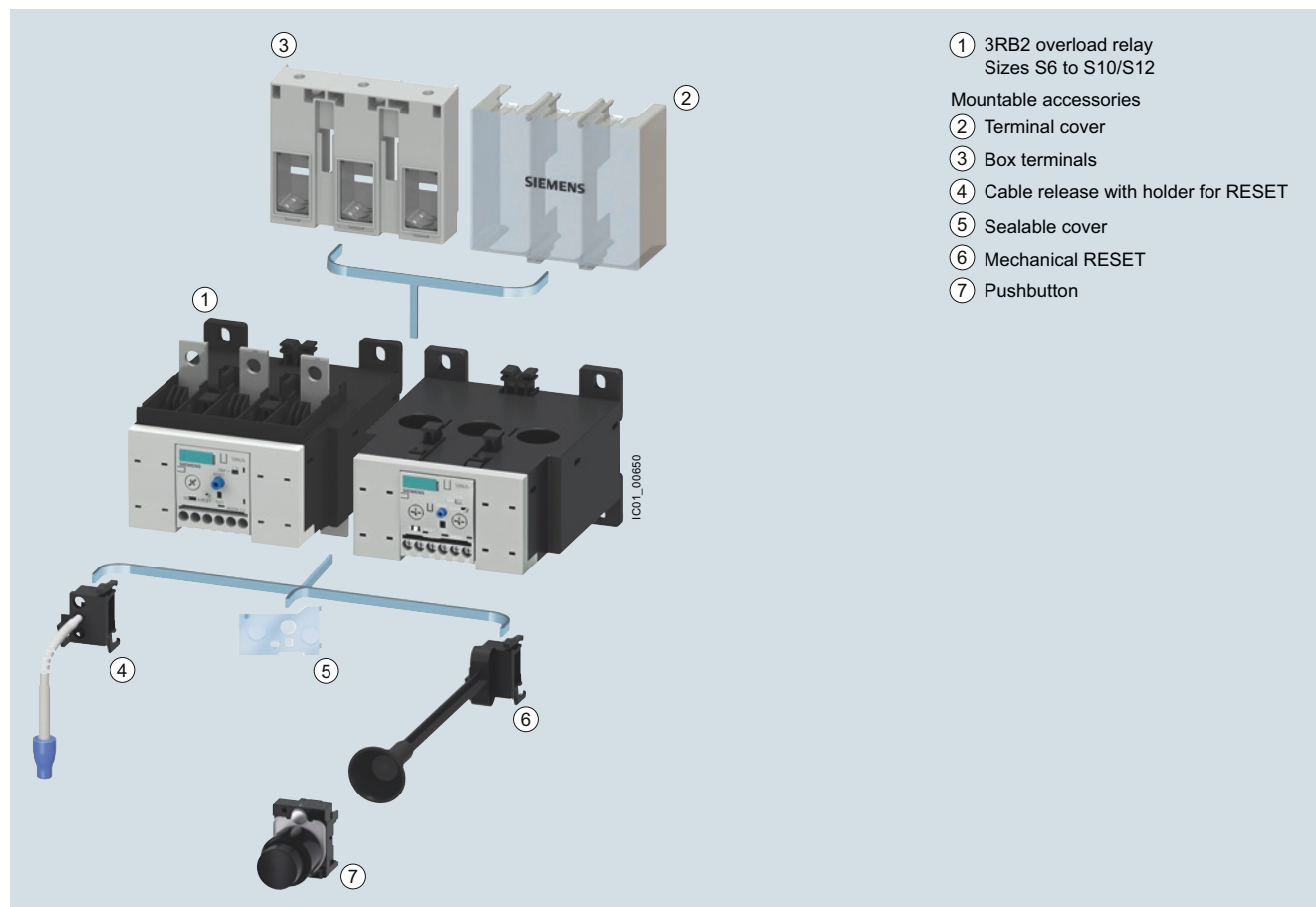
More information

Home page, see <http://www.siemens.com/sirius-overloadrelays>
 Industry Mall, see www.siemens.com/product?3RB2

Application Manual "SIRIUS Controls with IE3/IE4 Motors", see
<https://support.industry.siemens.com/cs/ww/en/view/94770820>

Manual "SIRIUS – SIRIUS 3RU Thermal Overload Relays /
 SIRIUS 3RB Electronic Overload Relays", see
<https://support.industry.siemens.com/cs/ww/en/view/60298164>

Characteristics and certificates, see
<https://support.industry.siemens.com/cs/ww/en/ps/16278>

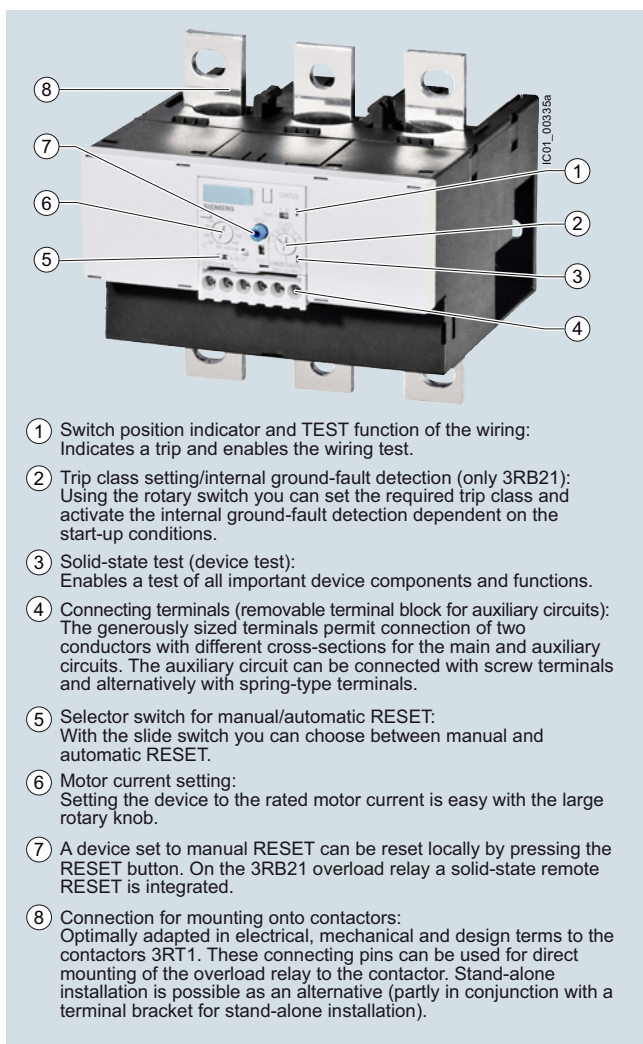


Mountable accessories for 3RB2 electronic overload relays (sizes S6 to S10/S12)

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SIRIUS 3RB2153-4FW2 electronic overload relay

- ① Switch position indicator and TEST function of the wiring:
Indicates a trip and enables the wiring test.
- ② Trip class setting/internal ground-fault detection (only 3RB21):
Using the rotary switch you can set the required trip class and activate the internal ground-fault detection dependent on the start-up conditions.
- ③ Solid-state test (device test):
Enables a test of all important device components and functions.
- ④ Connecting terminals (removable terminal block for auxiliary circuits):
The generously sized terminals permit connection of two conductors with different cross-sections for the main and auxiliary circuits. The auxiliary circuit can be connected with screw terminals and alternatively with spring-type terminals.
- ⑤ Selector switch for manual/automatic RESET:
With the slide switch you can choose between manual and automatic RESET.
- ⑥ Motor current setting:
Setting the device to the rated motor current is easy with the large rotary knob.
- ⑦ A device set to manual RESET can be reset locally by pressing the RESET button. On the 3RB21 overload relay a solid-state remote RESET is integrated.
- ⑧ Connection for mounting onto contactors:
Optimally adapted in electrical, mechanical and design terms to the contactors 3RT1. These connecting pins can be used for direct mounting of the overload relay to the contactor. Stand-alone installation is possible as an alternative (partly in conjunction with a terminal bracket for stand-alone installation).

The 3RB20 and 3RB21 electronic overload relays up to 630 A with internal power supply have been designed for current-dependent protection of loads with normal and heavy starting (see [Manual](#)) against excessive temperature rises due to overload, phase asymmetry or phase failure.

An overload, phase asymmetry or phase failure result in an increase of the motor current beyond the set rated motor current. This current rise is detected by the current transformers integrated into the devices and evaluated by corresponding solid-state circuits which then output a pulse to the auxiliary contacts. The auxiliary contacts then switch off the load by means of a contactor. The break time depends on the ratio between the tripping current and the current setting I_n and is stored in the form of a long-term stable tripping characteristic curve, see [Characteristic curves](#).

In addition to inverse-time delayed protection of loads against excessive temperature rises due to overload, phase asymmetry and phase failure, the 3RB21 electronic overload relays also allow internal ground-fault detection (not possible in conjunction with contactor assemblies for star-delta (wye-delta) starting). This provides protection of loads against high-resistance short circuits due to damage to the insulation material, moisture, condensed water etc.

The "tripped" status is signaled by means of a switch position indicator. The relay is reset manually or automatically after the recovery time has elapsed.

The 3RB2 electronic overload relays are suitable for operation with frequency converters, see [Manual](#).

The devices are manufactured in accordance with environmental guidelines and contain environmentally friendly and reusable materials. They comply with all important worldwide standards and approvals.

For 3RB30 and 3RB31 overload relay sizes S00 to S3, see [page 7/97 onwards](#).

Use in hazardous areas

The 3RB20/3RB21 electronic overload relays are suitable for the overload protection of motors with the following types of protection:

- Ex II (2) G [Ex e] [Ex d] [Ex px]
- Ex II (2) D [Ex t] [Ex p]

EC type test certificate for Group II, Category (2) G/D exists. It has the number PTB 06 ATEX 3001.

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Article No. scheme

Product versions		Article number						
Electronic overload relays		3RB2 □ □ □ - □ □ □ □						
Device type	e. g. 0 = standard device, with internal supply, for three-phase loads	□	□	□	-	□	□	□
Size, rated operational current and power	e. g. 5 = 200 A (90 kW) for size S6	□	□	□	-	□	□	□
Version of the automatic RESET, electrical remote RESET	e. g. 6 = switchable between manual/auto RESET	□	□	□	-	□	□	□
Trip class (CLASS)	e. g. 1 = CLASS 10E	□	□	□	-	□	□	□
Setting range of the overload release	e.g. F = 5 ... 200 A	□	□	□	-	□	□	□
Connection methods	e.g. C = busbar connections main circuit; screw terminals auxiliary circuit	□	□	□	-	□	□	□
Installation type	e. g. 2 = mounting on contactor and stand-alone installation	□	□	□	-	□	□	□
Example		3RB2	0	5	6	-	1	F C 2

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.

Benefits

The most important features and benefits of the 3RB20/3RB21 electronic overload relays are listed in the overview table ([see "General Data", page 7/71 onwards](#))

Application

Industries

The 3RB20 and 3RB21 electronic overload relays are suitable for customers from all industries who want to guarantee optimum inverse-time delayed protection of their electrical loads (e.g. motors) under normal and heavy starting conditions (CLASS 5E to 30E), minimize project completion times, inventories and energy consumption, and optimize plant availability and maintenance management.

Application

The 3RB20 and 3RB21 electronic overload relays have been designed for the protection of three-phase motors in sinusoidal 50/60 Hz voltage networks. The relays are not suitable for the protection of single-phase AC or DC loads.

The 3RU21 thermal overload relays or the 3RB22 to 3RB24 electronic overload relays can be used for single-phase AC loads. For DC loads we recommend the 3RU21 thermal overload relay.

Ambient conditions

The devices are insensitive to external influences such as shocks, corrosive ambient conditions, ageing and temperature fluctuations.

For the temperature range from -25 °C to +60 °C, the 3RB20 and 3RB21 electronic overload relays compensate the temperature in accordance with IEC 60947-4-1.

For the 3RB20 and 3RB21 electronic overload relays with the sizes S6, S10 and S12, the upper set value of the setting range must be reduced for ambient temperatures > 50 °C by a certain factor.

Use of SIRIUS protection devices in conjunction with IE3/IE4 motors

Note:

For the use of 3RB20 and 3RB21 electronic overload relays in conjunction with highly energy-efficient IE3/IE4 motors, please observe the information on dimensioning and configuring, [see Application Manual](#).

For more information, [see Preface on page 7](#).

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Technical specifications

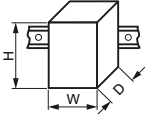
More information

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

Manual "SIRIUS – SIRIUS 3RU Thermal Overload Relays / SIRIUS 3RB Electronic Overload Relays", see <https://support.industry.siemens.com/cs/ww/en/view/60298164>

Technical specifications, see <https://support.industry.siemens.com/cs/ww/en/ps/16278>

The following technical information is intended to provide an initial overview of the various types of device and functions.

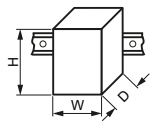
Type Size Dimensions (W x H x D) (overload relay with stand-alone installation support)		mm		
			3RB2056, 3RB2153	3RB2066, 3RB2163
			S6 120 x 119 x 155	S10/S12 145 x 147 x 156
General data				
Tripping in the event of			Overload, phase failure and phase asymmetry + ground fault (for 3RB21 only)	
Trip class acc. to IEC 60947-4-1			CLASS 3RB20: 10E or 20E; 3RB21: 5E, 10E, 20E and 30E adjustable	
Phase failure sensitivity			Yes	
Overload warning			No	
Reset and recovery				
• Reset options after tripping			3RB20: Manual and automatic RESET; 3RB21: Manual, Automatic and Remote RESET	
• Recovery time			Approx. 3 min	
- For automatic RESET			Immediately	
- For manual RESET			Immediately	
- For remote RESET			Immediately	
Features				
• Display of operating state on device			Yes, by means of switch position indicator slide	
• TEST function			Yes, test of electronics by pressing the TEST button/ test of auxiliary contacts and wiring of control circuit by actuating the switch position indicator slide/ self-monitoring	
• RESET button			Yes	
• STOP button			No	
Protection and operation of explosion-proof motors				
EC type-examination certificate number according to directive 2014/34/EU (ATEX)			PTB 06 ATEX 3001 ⚠ II (2) G [Ex e] [Ex d] [Ex px] ⚠ II (2) G [Ex t] [Ex p] see https://support.industry.siemens.com/cs/ww/en/view/23814648	
Ambient temperatures				
• Storage/transport			°C	-40 ... +80
• Operation			°C	-25 ... +60
• Temperature compensation			°C	+60
• Permissible rated current at				
- Temperature inside control cabinet 60 °C, stand-alone installation			%	100
- Temperature inside control cabinet 60 °C, mounted on contactor			%	70
- Temperature inside control cabinet 70 °C			%	On request
Degree of protection acc. to IEC 60529				
• Screw terminals/busbar connections			- IP20 (front side) - Terminal IP00 (use additional terminal covers for higher degree of protection)	
• Straight-through transformers			IP20	--

¹⁾ 90 % for relay with current setting range 160 A to 630 A.

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Type		mm	3RB2056, 3RB2153	3RB2066, 3RB2163
Size			S6	S10/S12
Dimensions (W x H x D) (overload relay with stand-alone installation support)			120 x 119 x 155	145 x 147 x 156
General data (continued)				
Touch protection acc. to IEC 60529			Finger-safe with terminal covers for vertical contact from the front	
• Screw terminals/busbar connections			Finger-safe	--
• Straight-through transformers				
Shock resistance with sine acc. to IEC 60068-2-27			g/ms	15/11 (signaling contact 97/98 in position "tripped": 4 g/ 11 ms)
Electromagnetic compatibility (EMC) – Interference immunity				
• Conductor-related interference				
- Burst acc. to IEC 61000-4-4 (corresponds to degree of severity 3)			kV	2 (power ports), 1 (signal port)
- Surge acc. to IEC 61000-4-5 (corresponds to degree of severity 3)			kV	2 (line to earth), 1 (line to line)
• Electrostatic discharge according to IEC 61000-4-2 (corresponds to degree of severity 3)			kV	8 (air discharge), 6 (contact discharge)
• Field-related interference acc. to IEC 61000-4-3 (corresponds to degree of severity 3)			V/m	10
Electromagnetic compatibility (EMC) – Emitted interference			Degree of severity B acc. to EN 55011 (CISPR 11) and EN 55022 (CISPR 22)	
Resistance to extreme climates – air humidity			%	100
Installation altitude above sea level			m	Up to 2 000
Mounting position			Any	
Type of mounting			Direct mounting/stand-alone installation	

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Type		3RB2056, 3RB2153	3RB2066, 3RB2163
Size		S6	S10/S12
Main circuit			
Rated insulation voltage U_i (pollution degree 3)	V	1 000	
Rated impulse withstand voltage U_{imp}	kV	8	
Rated operational voltage U_e	V	1 000	
Type of current			
• Direct current		No	
• Alternating current		Yes, 50/60 Hz ± 5 %	
Current setting	A	50 ... 200	55 ... 250, 160 ... 630
Power loss per unit (max.)	W	0.05	
Short-circuit protection			
• With fuse without contactor		See "Selection and ordering data", pages 7/109 ... 7/111	
• With fuse and contactor		"Short-Circuit Protection with Fuses/Motor Starter Protectors for Motor Feeders" see Configuration Manual.	
Protective separation between main and auxiliary current paths acc. to IEC 60947-1 (pollution degree 2)			
• For systems with grounded neutral point	V	690	
• For systems with ungrounded neutral point	V	600	
Conductor cross-sections of the main circuit			
Connection type		 Screw terminals with box terminal	
Terminal screw	mm	4 mm Allen screw	5 mm Allen screw
Operating devices	mm	4 mm Allen screw	5 mm Allen screw
Prescribed tightening torque	Nm	1 ... 12	20 ... 22
Conductor cross-sections (min./max.), 1 or 2 conductors can be connected			
• Solid	mm ²	--	--
• Finely stranded without end sleeve	mm ²	With 3RT1955-4G box terminal: 2 × (1 × max. 50, 1 × max. 70), 1 × (10 ... 70); With 3RT1956-4G box terminal: 2 × (1 × max. 95, 1 × max. 120), 1 × (10 ... 120)	2 × (50 ... 185), Front clamping point only: 1 × (70 ... 240); Rear clamping point only: 1 × (120 ... 185)
• Finely stranded with end sleeve (DIN 46228-1)	mm ²	With 3RT1955-4G box terminal: 2 × (1 × max. 50, 1 × max. 70), 1 × (10 ... 70); With 3RT1956-4G box terminal: 2 × (1 × max. 95, 1 × max. 120), 1 × (10 ... 120)	2 × (50 ... 185), Front clamping point only: 1 × (70 ... 240); Rear clamping point only: 1 × (120 ... 185)
• Stranded	mm ²	With 3RT1955-4G box terminal: 2 × (max. 70), 1 × (16 ... 70); With 3RT1956-4G box terminal: 2 × (max. 120), 1 × (16 ... 120)	2 × (70 ... 240), Front clamping point only: 1 × (95 ... 300); Rear clamping point only: 1 × (120 ... 240)
• AWG cables, solid or stranded	AWG	With 3RT1955-4G box terminal: 2 × (max. 1/0), 1 × (6 ... 2/0); With 3RT1956-4G box terminal: 2 × (max. 3/0), 1 × (6 ... 250 kcmil)	2 × (2/0 ... 500 kcmil), Front clamping point only: 1 × (3/0 ... 600 kcmil); Rear clamping point only: 1 × (250 kcmil ... 500 kcmil)
• Ribbon cables (Number x Width x Thickness)	mm	With 3RT1955-4G box terminal: 2 × (6 × 15.5 × 0.8), 1 × (3 × 9 × 0.8 ... 6 × 15.5 × 0.8); With 3RT1956-4G box terminal: 2 × (10 × 15.5 × 0.8), 1 × (3 × 9 × 0.8 ... 10 × 15.5 × 0.8)	2 × (20 × 24 × 0.5), 1 × (6 × 9 × 0.8 ... 20 × 24 × 0.5)
Connection type		 Busbar connections	
Terminal screw		M8 × 25	M10 × 30
Prescribed tightening torque	Nm	10 ... 14	14 ... 24
Conductor cross-sections (min./max.)			
• Finely stranded with cable lug	mm ²	16 ... 95 ¹⁾	50 ... 240 ²⁾
• Stranded with cable lug	mm ²	25 ... 120 ¹⁾	70 ... 240 ²⁾
• AWG cables, solid or stranded, with cable lug	AWG	4 ... 250 kcmil	2/0 ... 500 kcmil
• With connecting bars (max. width)	mm	15	25
Connection type		 Straight-through transformers	
Diameter of opening	mm	24.5	--

¹⁾ When connecting cable lugs according to DIN 46235 with conductor cross-sections of 95 mm² and more, the 3RT1956-4EA1 terminal cover must be used to ensure phase clearance, see page 7/112.

²⁾ When connecting cable lugs according to DIN 46234 for conductor cross-sections from 240 mm², as well as DIN 46235 for cable cross-sections from 185 mm², the 3RT1956-4EA1 terminal cover must be used to ensure phase clearance, see page 7/112.

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Type	3RB2056, 3RB2153		3RB2066, 3RB2163	
Size	S6		S10/S12	
Auxiliary circuit				
Number of NO contacts			1	
Number of NC contacts			1	
Auxiliary contacts – assignment			1 NO for the signal "tripped"; 1 NC for disconnecting the contactor	
Rated insulation voltage U_i (pollution degree 3)	V	300		
Rated impulse withstand voltage U_{imp}	kV	4		
Auxiliary contacts – contact rating				
• NC contact with alternating current AC-14/AC-15, rated operational current I_e at U_e :				
- 24 V	A	4		
- 120 V	A	4		
- 125 V	A	4		
- 250 V	A	3		
• NO contact with alternating current AC-14/AC-15, rated operational current I_e at U_e :				
- 24 V	A	4		
- 120 V	A	4		
- 125 V	A	4		
- 250 V	A	3		
• NC, NO contacts with DC current DC-13, rated operational current I_e at U_e :				
- 24 V	A	2		
- 60 V	A	0.55		
- 110 V	A	0.3		
- 125 V	A	0.3		
- 250 V	A	0.11		
• Conventional thermal current I_{th}	A	5		
• Contact reliability (suitability for PLC control; 17 V, 5 mA)		Yes		
Short-circuit protection				
• With fuse, operational class gG	A	6		
Ground-fault protection (only 3RB21)				
• Tripping value I_{Δ}			The information refers to sinusoidal residual currents at 50/60 Hz. > $0.75 \times I_{motor}$	
• Operating range I			Lower current setting < I_{motor} < 3.5 × upper current setting	
• Response time t_{trip} (in steady-state condition)	s		< 1	
Integrated electrical remote RESET (only 3RB21)				
Connecting terminals A3, A4			24 V DC, 100 mA, 2.4 W short-term	
Protective separation between auxiliary current paths acc. to IEC 60947-1	V	300		
CSA, UL, UR rated data				
Auxiliary circuit – switching capacity		B300, R300		
Conductor cross-sections of the auxiliary circuit				
Connection type		 Screw terminals		
Terminal screw		M3, Pozidriv size 2		
Operating devices		mm	Ø 5 ... 6	
Prescribed tightening torque		Nm	0.8 ... 1.2	
Conductor cross-sections (min./max.), 1 or 2 conductors can be connected				
• Solid and stranded	mm ²	1 × (0.5 ... 4) ¹⁾ , 2 × (0.5 ... 2.5) ¹⁾		
• Finely stranded without end sleeve	mm ²	--		
• Finely stranded with end sleeve (DIN 46228-1)	mm ²	1 × (0.5 ... 2.5) ¹⁾ , 2 × (0.5 ... 1.5) ¹⁾		
• AWG cables, solid or stranded	AWG	2 × (20 ... 14)		
Connection type		 Spring-type terminals		
Operating devices		mm	3.0 × 0.5	
Conductor cross-sections (min./max.), 1 or 2 conductors can be connected				
• Solid and stranded	mm ²	2 × (0.25 ... 1.5)		
• Finely stranded without end sleeve	mm ²	--		
• Finely stranded with end sleeve (DIN 46228-1)	mm ²	2 × (0.25 ... 1.5)		
• AWG cables, solid or stranded	AWG	2 × (24 ... 16)		

¹⁾ If two different conductor cross-sections are connected to one clamping point, both cross-sections must be in the range specified.

Overload Relays

SIRIUS 3RB2 Electronic Overload Relays

IE3/IE4 ready 3RB20, 3RB21 for standard applications

3RB21 electronic overload relays for mounting onto contactors and stand-alone installation, CLASS 5E, 10E, 20E and 30E adjustable

Features and technical specifications:

- Connection methods
 - Size S6
Main circuit: With busbar connection or as straight-through transformer,
Auxiliary circuit: Either screw or spring-type terminals
 - Sizes S10/S12:
Main circuit: With busbar connection,
Auxiliary circuit: Either screw or spring-type terminals
- Overload protection, phase failure protection and asymmetry protection
- Internal ground-fault detection (activatable)
- Internal power supply
- Auxiliary contacts 1 NO + 1 NC
- Manual and automatic RESET
- Electrical remote RESET integrated
- Switch position indicator
- TEST function and self-monitoring

 PU (UNIT, SET, M) = 1
 PS* = 1 unit
 PG = 41G


3RB2153-4FX2



3RB2163-4MC2

Size contactor	Rated power for three-phase motors, rated value ¹⁾	Current setting value of the inverse-time delayed overload release	Short-circuit protection with fuse, type of coordination "2", operational class gG ²⁾	SD	Screw terminals (on auxiliary current side)	SD	Spring-type terminals (on auxiliary current side)	
	kW	A	A	d	Article No.	Price per PU	Article No.	Price per PU
Size S6								
Devices with busbar connection for mounting onto contactor and stand-alone installation								
S6	22 ... 90	50 ... 200	315	▶	3RB2153-4FC2	▶	3RB2153-4FF2	
Devices with straight-through transformer for mounting onto contactor and stand-alone installation								
For mounting onto S6 contactors with box terminals	22 ... 90			▶	3RB2153-4FW2	▶	3RB2153-4FX2	
Size S10/S12 ²⁾								
Devices with busbar connection for mounting onto contactor and stand-alone installation								
S10/S12	22 ... 110	55 ... 250	400	▶	3RB2163-4GC2	▶	3RB2163-4GF2	
and size 14 (3TF68/3TF69) ³⁾	90 ... 450	160 ... 630	800	▶	3RB2163-4MC2	▶	3RB2163-4MF2	

¹⁾ Guide value for 4-pole standard motors at 50 Hz 400 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

²⁾ Maximum protection by fuse only for overload relays, type of coordination "2". For fuse values in connection with contactors, see [Configuration Manual](#).

³⁾ For 3TF68/3TF69 contactors, direct mounting is not possible.