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# Protection Equipment

## Introduction

### Overview



Type	3RV10	3RV11	3RV13	3RV14	3RV16	3RV16	3RV17
<b>3RV motor starter protectors up to 100 A</b>							
<b>Applications</b>							
Plant protection	✓ <sup>1)</sup>	✓ <sup>1)</sup>	--	--	--	--	✓
Motor protection	✓	--	--	--	--	--	--
Motor protection with overload relay function	--	✓	--	--	--	--	--
Starter combinations	--	--	✓	--	--	--	--
Transformer protection	--	--	--	✓	--	--	--
Fuse monitoring	--	--	--	--	✓	--	--
Voltage transformer circuit-breakers for distance protection	--	--	--	--	--	✓	--
<b>Size</b>	S00, S0, S2, S3	S0, S2, S3	S0, S2, S3	S0, S2	S00	S00	S3
<b>Rated current <math>I_n</math></b>							
Size S00	A up to 12	--	--	--	up to 0.2	up to 3	--
Size S0	A up to 25	up to 25	up to 25	up to 20	--	--	--
Size S2	A up to 50	up to 50	up to 50	up to 40	--	--	--
Size S3	A up to 100	up to 100	up to 100	--	--	--	up to 70
<b>Rated operational voltage <math>U_e</math></b>	V 690 AC <sup>2)</sup>	690 AC <sup>2)</sup>	690 AC <sup>2)</sup>	690 AC <sup>2)</sup>	690 AC <sup>2)</sup>	400 AC	690 AC
<b>Rated frequency</b>	Hz 50/60	50/60	50/60	50/60	50/60	16 <sup>2</sup> / <sub>3</sub> ... 60	50/60
<b>Trip class</b>	CLASS 10 CLASS 20	CLASS 10	--	CLASS 10	--	--	--
<b>Thermal overload release</b>	A 0.11 ... 0.16 up to 80 ... 100	0.11 ... 0.16 up to 80 ... 100	None <sup>3)</sup>	0.11 ... 0.16 up to 28 ... 40	0.2	1.4 ... 3	10 ... 70 non-adjustable
<b>Overcurrent release</b>							
Multiple of the rated current	13 times	13 times	13 times	20 times	6 times	4 to 7 times	13 times
<b>Short-circuit breaking capacity <math>I_{cu}</math> at 400 V AC</b>	kA 50/100	50/100	50/100	50/100	100	50	100
<b>Accessories</b>							
For sizes	S00 S0 S2 S3	S0 S2 S3	S0 S2 S3	S0 S2	S00	S00	S3
Auxiliary switch	✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	✓ <sup>5)</sup>
Alarm switch	-- ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	--	--	--
Undervoltage release	✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	✓
Shunt release	✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	✓
Isolator module	-- ✓ ✓ --	✓ ✓ --	✓ ✓ --	✓ ✓	--	--	--
Insulated three-phase busbar system	✓ ✓ ✓ --	-- ✓ --	✓ ✓ --	✓ ✓	✓	✓	--
Busbar adapter for motor starter protectors	✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	--
Door-coupling rotary operating mechanism	-- ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	--	--	✓
Remote motorized operating mechanism	-- -- ✓ ✓	-- ✓ ✓	-- ✓ ✓	-- ✓	--	--	--
Link module	✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	--
Enclosure for surface mounting	✓ ✓ ✓ --	✓ ✓ --	✓ ✓ --	✓ ✓	✓	✓	--
Enclosure for flush mounting	✓ ✓ -- --	✓ -- --	✓ -- --	✓ --	✓	✓	--
Front plate	✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	--
Cage Clamp infeed system	✓ <sup>4)</sup> ✓ -- --	-- -- --	✓ -- --	✓ --	--	--	--

1) For symmetrical loading of the three phases.

2) With molded-plastic enclosure 500 V AC.

3) For overload protection of the motors, appropriate overload relays must be used.

4) Only for motor starter protectors with Cage Clamp terminals.

5) Only lateral auxiliary switches.

✓ available

-- not available



Type 3RU11 3RB20 3RB21 3RB22/3RB23

### Overload relays up to 630 A

Applications					
Plant protection	✓ <sup>1)</sup>	✓ <sup>1)</sup>	✓ <sup>1)</sup>	✓ <sup>1)</sup>	✓ <sup>1)</sup>
Motor protection	✓	✓	✓	✓	✓
Alternating current, 3-phase	✓	✓	✓	✓	✓
Alternating current, 1-phase	✓	–	–	–	✓
Direct current	✓	–	–	–	–
Size of contactor					
	S00, S0, S2, S3	S00 ... S12	S00 ... S12	S00 ... S12	S00 ... S12
Rated operational current $I_e$					
Size S00	A	up to 12	up to 12	up to 12	} up to 25
Size S0	A	up to 25	up to 25	up to 25	
Size S2	A	up to 50	up to 50	up to 50	} up to 100
Size S3	A	up to 100	up to 100	up to 100	
Size S6	A	--	up to 200	up to 200	up to 200
Size S10/S12, size 14 (3TF6)	A	--	up to 630	up to 630	up to 630
Rated operational voltage $U_e$					
	V	690/1000 AC <sup>2)</sup>	690/1000 AC <sup>2)</sup>	690/1000 AC <sup>2)</sup>	690/1000 AC <sup>3)</sup>
Rated frequency					
	Hz	50/60	50/60	50/60	50/60
Trip class					
		CLASS 10	CLASS 10, CLASS 20	CLASS 5, 10, 20, 30 adjustable	CLASS 5, 10, 20, 30 adjustable
Thermal overload release					
	A	0.11 ... 0.16 up to 80 ... 100	--	--	--
Solid-state overload release					
	A	--	0.1 ... 0.4 up to 160 ... 630	0.1 ... 0.4 up to 160 ... 630	0.3 ... 3 up to 63 ... 630
Rating for induction motor at 400 V AC					
	kW	0.04 to 45	0.04 ... 0.09 up to 90 ... 450	0.04 ... 0.09 up to 90 ... 450	0.09 ... 1.1 up to 37 ... 450

Accessories		S00 S0 S2 S3				S00 S0 S2 S3 S6 S10/S12				S00 S0 S2 S3 S6 S10/S12				S00 S0 S2 S3 S6 S10/S12									
Terminal brackets for stand-alone installation		✓	✓	✓	✓	✓	✓	4)	4)	4)	4)	✓	✓	4)	4)	4)	4)	4)	4)	4)	4)	4)	4)
Mechanical RESET		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--	--	--	--
Cable release for RESET		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--	--	--	--
Electrical remote RESET		✓	✓	✓	✓	--	--	--	--	--	--	Integrated in the unit				Integrated in the unit							
Terminal covers		--	--	✓	✓	--	--	--	✓	✓	✓	--	--	--	✓	✓	✓	--	--	--	✓	✓	✓
Sealable covers for setting knobs		Integrated in the unit				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1) The units are responsible in the main circuit for overload protection of the assigned electrical loads (e.g. motors), feeder cable and other switching and protection devices in the respective load feeder.  
 2) Size S3 and larger up to 1000 V AC.  
 3) Sizes S6 and S10/12 up to 1000 V AC.  
 4) Stand-alone installation without accessories is possible.

✓ available  
 -- not available



# 3RV Motor Starter Protectors up to 100 A

## General data

### Overview



S0 motor starter protectors

3RV1 motor starter protectors are compact, current limiting motor starter protectors, which are optimized for load feeders. The motor starter protectors are used for switching and protecting induction motors of up to 45 kW at 400 V AC and for other loads with rated currents of up to 100 A.

#### Type of construction

The motor starter protectors are available in four sizes:

- Size S00 – width 45 mm, max. rated current 12 A, at 400 V AC suitable for induction motors up to 5.5 kW.
- Size S0 – width 45 mm, max. rated current 25 A, at 400 V AC suitable for induction motors up to 11 kW.
- Size S2 – width 55 mm, max. rated current 50 A, at 400 V AC suitable for induction motors up to 22 kW.
- Size S3 – width 70 mm, max. rated current 100 A, at 400 V AC suitable for induction motors up to 45 kW.

### Design

#### Screw terminal

3RV1 motor starter protectors of sizes S00 and S0 are fitted with terminals with captive screws and clamping pieces, allowing the connection of 2 conductors with different cross-sections.

The box terminals of the S2 and S3 motor starter protectors also enable 2 conductors with different cross-sections to be connected. With the exception of S3 motor starter protectors which are equipped with 4 mm Allen screws, all terminal screws are tightened with a Pozidriv screwdriver size 2.

The box terminals of the S3 motor starter protectors can be removed in order to connect conductors with cable lugs or connecting bars. A terminal cover is available as touch protection and to ensure that the required clearances and creepage distances are maintained if the box terminals are removed.

#### Cage Clamp terminal

As an alternative to screw terminals, S00 motor starter protectors are also available with Cage Clamp terminal.



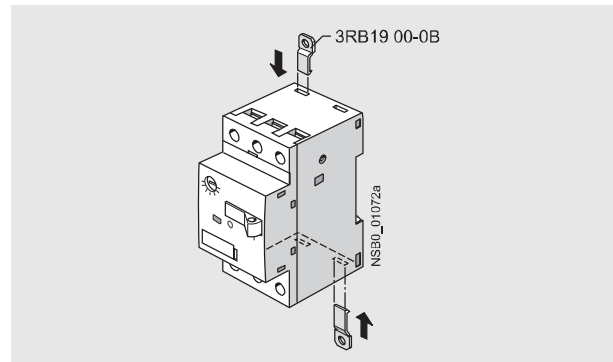
Motor starter protectors with Cage Clamp terminal

This screwless connection technique, already familiar from modular terminals, clamps the conductors using a spring-loaded terminal and is shock-proof and vibration-proof.

Motor starter protectors with Cage Clamp terminal allow independent connection of two conductors per terminal.

#### Mounting

The motor starter protectors are snap-mounted on a 35 mm standard mounting rail to EN 50022.



A standard mounting rail with a height of 15 mm is required for size S3 motor starter protectors. A 75 mm standard mounting rail can be used as an alternative for size S3.

S2 and S3 motor starter protectors can also be screwed directly onto a base plate.

The 3RB19 00-0B push-in lugs are available for screw mounting of S00 and S0 motor starter protectors.

# 3RV Motor Starter Protectors up to 100 A

## General data

### 3RV16 voltage transformer circuit-breakers up to 3 A

The voltage transformer circuit-breaker widely corresponds with the SIRIUS 3RV1 motor starter protector, size S00. Two special features are taken into account for safe prevention of false tripping of the distance protection device.

#### Auxiliary switch for blocking the distance protection

The main contacts of the circuit-breaker are opened if the voltage transformer circuit-breaker is tripped or switched off. The distance protection would falsely interpret low impedance as a fault, which results in immediate power cut-out within only a few milliseconds.

To prevent this fault response, special auxiliary contacts with a time-dependent assignment to the circuit-breaker's main contacts (see timing diagram) must be provided. The distance protection is blocked with the help of these auxiliary contacts and thus prevents false tripping.

An auxiliary switch for blocking the distance protection device is available as 1 changeover contact fitted permanently in the volt-

age transformer circuit-breaker. This changeover contact can be used as 1 NO (11-14) or 1 NC (11-12). Thanks to the high contact stability of these auxiliary contacts at the lowest possible rated operational currents, they are also suitable for modern solid-state distance protection devices.

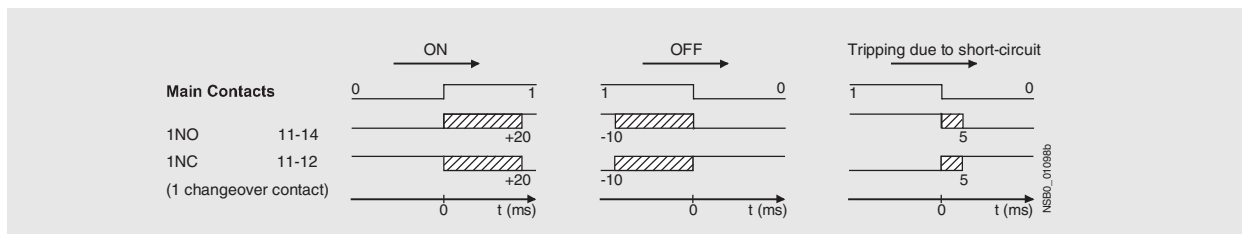
The laterally mounted auxiliary switches of the SIRIUS range can be used for signaling functions. They cannot be used for blocking the distance protection device.

#### Impedance across the main contacts

There is only minor current flow across the main contacts of the voltage transformer circuit-breaker.

To ensure reliable functioning of the distance protection, transfer resistance of the main contacts must be minimal and nearly constant throughout the endurance of the circuit-breaker.

This is implemented with suitable contacts and contact materials for the 3RV16 voltage transformer circuit-breaker.

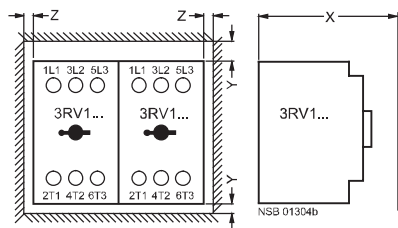


Timing diagram of auxiliary switches for blocking distance protection

### Rules for mounting motor starter protectors

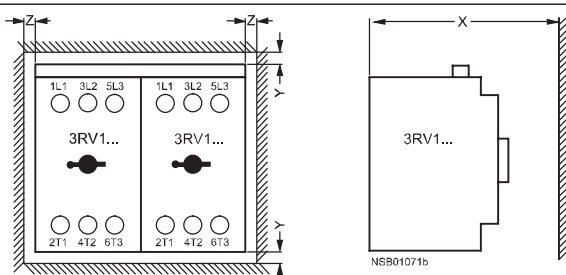
When mounting motor starter protectors, the following clearances must be maintained to grounded or live parts and to cable ducts made of molded plastic.

Motor starter protector		Distance to grounded or live parts according to IEC 60947-2			
Type	Size	$U_e$ V	Y mm	X mm	N mm
3RV1. 1	S00	up to 690	20	70	9
3RV1. 2	S0	up to 500	30	90	9
		up to 690	50	90	30
3RV1. 3	S2	up to 690	50	140	30
3RV1. 4	S3	up to 240	50	167	10
		up to 440	70	167	10
		up to 500	110	167	10
		up to 690	150	167	30



### Rules for mounting motor starter protectors with limiter function

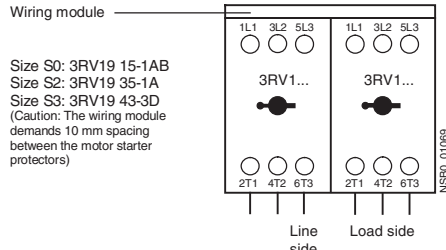
Motor starter protector		Distance to grounded or live parts according to IEC 60947-2			
Type	Size	$U_e$ V	Y mm	X mm	N mm
3RV1. 2	S0	up to 500	40	90	10
		up to 690	50	90	30
3RV1. 3	S2	up to 690	50	140	10
3RV1. 4	S3	up to 500	110	167	10
		up to 690	150	167	30



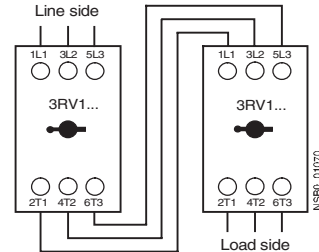
# 3RV Motor Starter Protectors up to 100 A

## General data

Standard mounting for S0, S2 and S3



Structure for S0 for the setting ranges  
5.5 A ... 8 A to 20 A ... 25 A for 690 V



## Function

### Releases

3RV1 motor starter protectors are equipped with inverse-time delayed overload releases based on the bimetal principle and with instantaneous overcurrent releases (electromagnetic short-circuit releases).

The overload releases can be adjusted in accordance with the load current. The overcurrent releases are permanently set to a value 13 times the rated current and thus enable trouble-free start-up of motors.

Motor starter protectors for line-side transformer protection are set to 20 times the rated current to prevent tripping as a result of high transformer inrush current.

The scale cover can be sealed to prevent unauthorized adjustments to the set current.

### Trip classes

The trip classes of thermally delayed releases are based on the tripping time ( $t_A$ ) at 7.2 times the operational current in cold state (excerpt from IEC 60947-4):

- CLASS 10A  $2 \text{ s} < t_A < 10 \text{ s}$
- CLASS 10  $4 \text{ s} < t_A < 10 \text{ s}$
- CLASS 20  $6 \text{ s} < t_A < 20 \text{ s}$
- CLASS 30  $9 \text{ s} < t_A < 30 \text{ s}$

The motor starter protector must trip within this time!

### Operating mechanisms

S00 motor starter protectors are activated by a rocker operating mechanism and S0, S2 and S3 motor starter protectors by a rotary operating mechanism. If the motor starter protector trips, the rotary operating mechanism switches to the tripped position to indicate this. Before the motor starter protector is reclosed, the rotary operating mechanism must be reset manually to the 0 position to prevent the motor starter protector from closing by mistake before the fault has been cleared. The motor starter protector can then only be set to the I position afterwards.

In the case of motor starter protectors with rotary operating mechanisms, an electrical signal can be output by an alarm switch to indicate that the motor starter protector has tripped.

All operating mechanisms can be locked in the 0 position with a padlock (shackle diameter 3.5 mm to 4.5 mm).

The motor starter protector isolating function complies with IEC 60947-2.

## Configuration

### Prevention of unintended tripping

In order to prevent unintended tripping due to the integrated phase failure sensitivity, motor starter protectors should always be connected to ensure current flows through all three main conducting paths.

### Short-circuit protection

If a short-circuit occurs, the short-circuit releases of 3RV1 motor starter protectors isolate the faulty load feeder from the mains supply and thus prevent further damage.

Motor starter protectors with a short-circuit breaking capacity of 50 kA or 100 kA are virtually short-circuit proof at a voltage of 400 V AC, since higher short-circuit currents are not to be expected in practice.

### Motor protection

The tripping characteristics of 3RV10/3RV11 motor starter protectors are designed mainly to protect induction motors.

They are therefore referred to as motor starter protectors.

The rated current  $I_n$  of the motor to be protected is set on the setting scale. Factory setting of the short-circuit release is 13 times the rated current of the motor starter protector. This permits trouble-free start-up and ensures that the motor is properly protected.

The phase failure sensitivity of the motor starter protector ensures that it is tripped in time in the event of a phase failure and overcurrents that occur as a result in the other phases.

Motor starter protectors with thermal overload releases are normally designed in accordance with trip class 10 (CLASS 10). Motor starter protectors of sizes S2 and S3 are also available in trip class 20 (CLASS 20) and therefore allow motors to be started up under arduous conditions.

### Motor protection with overload relay function (automatic reset)

Motor starter protectors for motor protection with overload relay function are designed for the protection of induction motors.

They are equipped with the same short-circuit release and overload release as motor starter protectors for motor protection without overload relay function.

The motor starter protector always remains closed in the event of an overload. The overload release activates only two auxiliary contacts (1 NO + 1 NC). The overload trip can be signaled to a higher-level control with the help of these auxiliary contacts. Generally, it is also possible to open a downstream contactor directly.

The overload signal is reset automatically. The motor starter protector itself only trips if a short-circuit occurs downstream.

# 3RV Motor Starter Protectors up to 100 A

## General data

### Plant protection

The 3RV10/3RV11 motor starter protectors for motor protection are also suitable for plant protection.

In order to prevent premature tripping due to phase failure sensitivity, the three conducting paths must always be uniformly loaded. The conducting paths must be connected in series in the case of single-phase loads.

The 3RV17 motor starter protectors are likewise suitable for plant protection and at the same time they are approved as Circuit Breaker according to UL489 and CSA 22.2 No. 5-02.

### Short-circuit protection for starter combinations

The 3RV13 motor starter protectors for starter combinations in sizes S0, S2 and S3 provide short-circuit protection with the help of a contactor and overload relay combination.

Like the motor starter protectors for motor protection, they are equipped with short-circuit releases which are permanently set to a value equivalent to 13 times the rated current of the motor starter protectors. They are not equipped with overload releases.

On overload, the overload relay triggers the contactor, the motor starter protector remains closed.

Only when a short-circuit occurs in the feeder does the motor starter protector trip as well.

The motor starter protector for starter combinations must always be used in combination with an overload relay because the motor starter protector alone cannot protect the motor and itself against overload.

### Transformer protection

When control-power transformers are protected on the line side, the high inrush currents generated at the time the transformers are switched on often cause spurious tripping in the protection mechanisms.

3RV14 motor starter protectors in sizes S0 and S2 for protecting transformers are therefore fitted with overcurrent releases which are permanently set in the factory to a value equivalent to 20 times the rated current.

Motor starter protectors can thus be used to provide line-side protection for transformers, the inrush peak currents of which are up to 30 times the rated current.

This version of motor starter protector is not necessary in the case of control-power transformers with low inrush currents, such as control transformers from Siemens. 3RV1 motor starter protectors for motor protection can be used in this case.

### Main and EMERGENCY-STOP switches

The 3RV10, 3RV11, 3RV13, 3RV14 and 3RV16 motor starter protectors comply with the isolating function to IEC 60947-2, therefore they can be used – taking IEC 60204-1 into account – as main and EMERGENCY-STOP switches.

3RV19 .6-2. door-coupling rotary operating mechanisms for heavy duty also comply with the requirements for the isolating function.

### Fuse monitoring

The 3RV16 11-0BD10 motor starter protector size S00 is used for fuse monitoring.

A fuse is connected in parallel with each conducting path of the starter protector. When a fuse blows, the current flows through the parallel conducting path and trips the motor starter protector.

The 3RV16 11-0BD10 motor starter protector must be equipped with a transverse or lateral auxiliary switch (accessories) that signals a tripping operation of the motor starter protector and thus the tripping of the fuse, or switches off all poles of the disrupted electric circuit with the help of an appropriate switching device.



Motor starter protector for fuse monitoring

### Notes on safety

When monitoring fuses with safety isolating functions, a warning sign must be affixed near the fuses indicating that voltage may still be present through the parallel circuit of the monitoring equipment assumed to be isolated after the fuse has been removed and if the monitoring equipment is not switched off.

We recommend the following text for this warning:

#### Important!

*For safety isolation, also switch off fuse monitoring equipment with the item code .....*

The 3RV16 11-0BD10 motor starter protector for fuse monitoring is suitable for the following voltages: AC 50 Hz/60 Hz from 24 V to 690 V and up to 450 V DC. Fuse monitoring with 3RV16 11-0BD10 motor starter protectors is not permissible in feeders with power controllers that can induce DC feedback of higher values when an error occurs.

With parallel cables and meshed systems, the motor starter protector will only trip, and a signal will be output to indicate this, if the voltage difference across the motor starter protector is at least 24 V.

### Use of IT systems (IT networks)

3RV1 motor starter protectors are suitable for operation in IT systems according to IEC 60947-2. In the event of a 3-pole short-circuit, their response in this system is the same as in others: Therefore, the same short-circuit breaking capacity applies, see Technical Specifications of  $I_{cu}$  and  $I_{cs}$ .

An initial fault (ground fault) does not necessarily force immediate shutdown of the network when operating IT systems. If a second independent error occurs (ground fault), the switching capacity of the motor starter protector might be reduced.

This is the case if both ground faults occur in different phases and if one of the ground faults occurs on the line-side and the other on the secondary side of the motor starter protector.

In order to maintain the short-circuit function of the motor starter protector even with two independent ground faults (double ground faults), the reduced short-circuit breaking capacity with double ground faults must be taken into account in IT systems  $I_{cuIT}$  (see Technical Specifications). If a ground fault is instantaneously recognized and remedied (ground-fault monitoring), the risk of double ground fault and thus reduced short-circuit breaking capacity  $I_{cuIT}$  can be minimized.

# 3RV Motor Starter Protectors up to 100 A

## General data

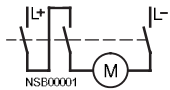
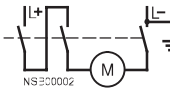

### Switching of DC currents

3RV1 motor starter protectors for alternating currents are also suitable for DC switching.

The maximum permissible DC voltage per conducting path must, however, be adhered to. Higher voltages require a series circuit with 2 or 3 conducting paths.

The response values of the overload release remain unchanged; the response values of a short-circuit release increase by approximately 30 % for DC. The recommended circuits for DC switching can be seen in the table below.

### Recommended circuit for size S00 to S3 3RV1 motor starter protectors

Recommended circuit for size S00 to S3 3RV1 motor starter protectors	Maximum permitted DC voltage $U_e$	Notes
	150 V DC	<u>2-pole switching, non-grounded system</u> <sup>1)</sup> If there is no possibility of a ground fault, or if every ground fault is rectified immediately (ground-fault monitoring), then the maximum permitted DC voltage can be tripled.
	300 V DC	<u>2-pole switching, grounded system</u> The grounded pole is always assigned to the individual current path, so that there are always 2 current paths in series in the event of a ground fault.
	450 V DC	<u>1-pole switching, grounded system</u> 3 current paths in series. The grounded pole is assigned to the unconnected current path.

1) It is assumed that this circuit always provides safe cut-out even in the event of a double ground fault that bridges two contacts.

### 3RV16 voltage transformer circuit-breakers up to 3 A

The voltage transformer circuit-breaker protects the secondary side of voltage transformers used to connect protection equipment with voltage-dependent starting. The circuit-breaker is used for distance protection with low-impedance starting. Special auxiliary contacts reliably prevent low-impedance starting from triggering distance protection if only one fault has occurred in the transformer line.

The voltage transformer circuit-breaker can also be used to safely disconnect the distance protection device from the voltage transformer. In this case, the special auxiliary contacts also prevent erratic triggering of the distance protection.

Additional fuses are not required. A "Fuse Failure Monitor" (FFM) is also not required.



# 3RV Motor Starter Protectors up to 100 A

## General data

### Technical specifications

#### Short-circuit breaking capacity $I_{cn}$ according to IEC 60947-2

This table shows the rated ultimate short-circuit breaking capacity  $I_{cu}$  and the rated service short-circuit breaking capacity  $I_{cs}$  of the 3RV1 motor starter protectors with different inception voltages dependent of the rated current  $I_n$  of the motor starter protectors.

Motor starter protector infeed is permissible at the upper or lower terminals without restricting the rated data. If the short-circuit current at the installation point exceeds that rated short-circuit breaking capacity of the motor starter protector as specified

in the table, a back-up fuse is required. Alternatively, a motor starter protector with a limiter function can be connected upstream.

The maximum rated current for the back-up fuse is specified in the tables. The rated ultimate short-circuit breaking capacity then applies as specified on the fuse.

#### Fuseless construction

Motor starter protector contactor combinations for short-circuit currents up to 50 kA can be ordered in the form of fuseless load feeders according to chapter "Load Feeders, Motor Starters and Soft Starters".

Motor starter protector	Rated current $I_n$	up to 240 V AC <sup>1)</sup>			up to 400 V AC <sup>1)/</sup> 415 V AC <sup>2)</sup>			up to 440 V AC <sup>1)/</sup> 460 V AC <sup>2)</sup>			up to 500 V AC <sup>1)/</sup> 525 V AC <sup>2)</sup>			up to 690 V AC <sup>1)</sup>		
		$I_{cu}$	$I_{cs}$	max. fuse (gL/gG)	$I_{cu}$	$I_{cs}$	max. fuse (gL/gG) <sup>3)</sup>	$I_{cu}$	$I_{cs}$	max. fuse (gL/gG) <sup>3)</sup>	$I_{cu}$	$I_{cs}$	max. fuse (gL/gG) <sup>3)</sup>	$I_{cu}$	$I_{cs}$	max. fuse (gL/gG) <sup>3)4)</sup>
Type	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
<b>3RV10,</b> <b>3RV16 11-0BD10</b> Size S00	0.16 ... 0.8	100	100	°	100	100	°	100	100	°	100	100	°	100	100	°
	1	100	100	°	100	100	°	100	100	°	100	100	°	100	100	°
	1.25	100	100	°	100	100	°	100	100	°	100	100	°	2	2	20
	1.6	100	100	°	100	100	°	100	100	°	100	100	°	2	2	20
	2	100	100	°	100	100	°	100	100	°	10	10	35	2	2	35
	2.5	100	100	°	100	100	°	100	100	°	10	10	35	2	2	35
	3.2	100	100	°	100	100	°	50	10	40	3	3	40	2	2	40
	4	100	100	°	100	100	°	50	10	40	3	3	40	2	2	40
	5	100	100	°	100	100	°	50	10	50	3	3	50	2	2	50
	6.3	100	100	°	100	100	°	50	10	50	3	3	50	2	2	50
	8	100	100	°	50	12.5	80	50	10	63	3	3	63	2	2	63
	10	100	100	°	50	12.5	80	10	10	63	3	3	63	2	2	63
12	100	100	°	50	12.5	80	10	10	80	3	3	80	2	2	80	
<b>3RV1. 2</b> Size S0	0.16 ... 1.25	100	100	°	100	100	°	100	100	°	100	100	°	100	100	°
	1.6	100	100	°	100	100	°	100	100	°	100	100	°	100	100	°
	2	100	100	°	100	100	°	100	100	°	100	100	°	8	8	25
	2.5	100	100	°	100	100	°	100	100	°	100	100	°	8	8	25
	3.2	100	100	°	100	100	°	100	100	°	100	100	°	8	8	32
	4	100	100	°	100	100	°	100	100	°	100	100	°	6	3	32
	5	100	100	°	100	100	°	100	100	°	100	100	°	6	3	32
	6.3	100	100	°	100	100	°	100	100	°	100	100	°	6	3	50
	8	100	100	°	100	100	°	50	25	63	42	21	63	6	3	50
	10	100	100	°	100	100	°	50	25	80	42	21	63	6	3	50
	12.5	100	100	°	100	100	°	50	25	80	42	21	80	6	3	63
	16	100	100	°	50	25	100	50	10	80	10	5	80	4	2	63
<b>3RV1. 3</b> Size S2	16	100	100	°	50	25	100	50	25	100	12	6	63	5	3	63
	20	100	100	°	50	25	100	50	25	100	12	6	80	5	3	63
	25	100	100	°	50	25	100	50	15	100	12	6	80	5	3	63
	32	100	100	°	50	25	125	50	15	125	10	5	100	4	2	63
	40	100	100	°	50	25	160	50	15	125	10	5	100	4	2	63
	45	100	100	°	50	25	160	50	15	125	10	5	100	4	2	63
<b>3RV1. 41</b> Size S3	50	100	100	°	50	25	160	50	15	125	10	5	100	4	2	80
	40	100	100	°	50	25	125	50	20	125	12	6	100	6	3	63
	50	100	100	°	50	25	125	50	20	125	12	6	100	6	3	80
	63	100	100	°	50	25	160	50	20	160	12	6	100	6	3	80
	75	100	100	°	50	25	160	50	20	160	8	4	125	5	3	100
	90	100	100	°	50	25	160	50	20	160	8	4	125	5	3	125
<b>3RV1. 42 / 3RV17 42</b> Size S3 with increased switching capacity	100	100	100	°	50	25	160	50	20	160	8	4	125	5	3	125
	16 / 10	100	100	°	100	50	°	100	50	°	30	15	80	12	7	63
	20 / 15	100	100	°	100	50	°	100	50	°	30	15	80	12	7	63
	25 / 20	100	100	°	100	50	°	100	50	°	30	15	80	12	7	63
	32 / 25	100	100	°	100	50	°	100	50	°	22	11	100	12	7	63
	40 / 30	100	100	°	100	50	°	100	50	°	18	9	160	12	6	80
	50 / 35 ... 40	100	100	°	100	50	°	100	50	°	15	7.5	160	10	5	100
	63 / 45 ... 50	100	100	°	100	50	°	70	50	200	15	7.5	160	7.5	4	100
75 / 60	100	100	°	100	50	°	70	50	200	10	5	160	6	3	125	
90 / 70	100	100	°	100	50	°	70	50	200	10	5	160	6	3	160	
100 / --	100	100	°	100	50	°	70	50	200	10	5	160	6	3	160	

° Short-circuit proof up to at least 50 kA  
No back-up fuse required, since short-circuit proof up to 100 kA

- 1) 10% overvoltage.
- 2) 5% overvoltage.
- 3) Back-up fuse only required if the short-circuit current at the installation point >  $I_{cu}$ .
- 4) Alternatively, fuseless limiter combinations for 690 V AC can also be used.

# 3RV Motor Starter Protectors up to 100 A

## General data

### Short-circuit breaking capacity $I_{cuIT}$ in the IT system (IT network) according to IEC 60947-2

3RV1 motor starter protectors are suitable for operation in IT systems. Values valid for triple-pole short-circuit are  $I_{cu}$  and  $I_{cs}$ . In case of double ground fault on different phases at the input and output side of a motor starter protector, the special short-circuit breaking capacity  $I_{cuIT}$  applies. The specifications in the table below apply to 3RV1 motor starter protectors.

In the colored areas,  $I_{cuIT}$  is 100 kA, or in some ranges it is 50 kA. Therefore the motor starter protectors are short-circuit proof in these ranges.

If the short-circuit current at the installation point exceeds that rated short-circuit breaking capacity of the motor starter protector as specified in the table, a back-up fuse is required. The maximum rated current for the back-up fuse is specified in the tables. The rated short-circuit breaking capacity then applies as specified on the fuse.

Motor starter protector	Rated current $I_n$	up to 240 V AC <sup>1)</sup>		up to 400 V AC <sup>1)</sup> /415 V AC <sup>2)</sup>		up to 500 V AC <sup>1)</sup> /525 V AC <sup>2)</sup>		up to 690 V AC <sup>1)</sup>	
		$I_{cuIT}$	max. fuse (gL/gG) <sup>3)</sup>	$I_{cuIT}$	max. fuse (gL/gG) <sup>3)4)</sup>	$I_{cuIT}$	max. fuse (gL/gG) <sup>3)</sup>	$I_{cuIT}$	max. fuse (gL/gG) <sup>3)</sup>
Type	A	kA	A	kA	A	kA	A	kA	A
<b>3RV10</b> <b>3RV16 11-0BD10</b> Size S00	0.16 ... 0.63	100	°	100	°	100	°	100	°
	0.8	100	°	100	°	100	°	2	16
	1	100	°	100	°	100	°	2	16
	1.25	100	°	2	20	2	20	2	20
	1.6	100	°	2	20	2	20	2	20
	2	100	°	2	35	2	35	2	35
	2.5	100	°	2	35	2	35	2	35
	3.2	100	°	2	40	2	40	2	40
	4	100	°	2	40	2	40	2	40
	5	100	°	2	50	2	50	2	50
	6.3	100	°	2	50	2	50	2	50
	8	50	80	2	63	2	63	2	63
	10	50	80	2	63	2	63	2	63
12	50	80	2	80	2	80	2	80	
<b>3RV1. 2</b> Size S0	0.16 ... 0.63	100	°	100	°	100	°	100	°
	0.8	100	°	100	°	100	°	6	16
	1	100	°	100	°	100	°	6	16
	1.25	100	°	100	°	8	20	6	20
	1.6	100	°	100	°	8	20	6	20
	2	100	°	8	25	8	25	6	25
	2.5	100	°	8	25	8	25	6	25
	3.2	100	°	8	32	8	32	6	32
	4	100	°	6	32	4	32	3	32
	5	100	°	6	32	4	32	3	32
	6.3	100	°	6	50	4	50	3	50
	8	100	°	6	50	4	50	3	50
	10	100	°	6	50	4	50	3	50
	12.5	100	°	6	63	4	63	3	63
	16	50	80	4	63	3	63	2	63
	20	50	80	4	63	3	63	2	63
22	50	80	4	63	3	63	2	63	
25	50	80	4	63	3	63	2	63	
<b>3RV1. 3</b> Size S2	16	50	100	8	100	6	80	5	63
	20	50	125	8	100	6	80	5	63
	25	50	125	8	100	6	80	5	63
	32	50	125	6	125	4	100	3	80
	40	50	160	6	125	4	100	3	80
	45	50	160	6	125	4	100	3	80
	50	50	160	6	125	4	100	3	80
<b>3RV1. 41</b> Size S3	40	50	125	10	63	5	50	5	50
	50	50	125	8	80	3	63	3	63
	63	50	160	6	80	3	63	3	63
	75	50	160	5	100	2	80	2	80
	90	50	160	5	125	2	100	2	100
	100	50	160	5	125	2	100	2	100
<b>3RV1. 42 / 3RV17 42</b> Size S3 with increased switching capacity	16 / 10	100	°	12	63	6	50	6	50
	20 / 15	100	°	12	63	6	50	6	50
	25 / 20	100	°	12	63	6	50	6	50
	32 / 25	100	°	12	63	6	50	6	50
	40 / 30	100	°	12	80	6	63	6	63
	50 / 35 ... 40	100	°	10	100	4	80	4	80
	63 / 45 ... 50	100	°	7.5	100	4	80	4	80
	75 / 60	100	°	6	125	3	100	3	100
	90 / 70	100	°	6	160	3	125	3	125
	100 / --	100	°	6	160	3	125	3	125

Short-circuit proof up to at least 50 kA

° No back-up fuse required, since short-circuit proof up to 100 kA

1) 10% overvoltage.

2) 5% overvoltage.

3) Back-up fuse only required, if short-circuit current at the installation point  $> I_{cuIT}$ .

4) Alternatively, fuseless limiter combinations for 690 V AC can also be used.

# 3RV Motor Starter Protectors up to 100 A

## General data

### Limiting function with standard devices for 500 V AC and 690 V AC according to IEC 60947-2

The table shows the rated ultimate short-circuit breaking capacity  $I_{cu}$  and the rated service short-circuit breaking capacity  $I_{cs}$  with an upstream standard motor starter protector that fulfils the limiter function at 500 V AC and 690 V AC. The short-circuit breaking capacity can be increased significantly with an upstream standard motor starter protector.

The motor starter protector which is connected downstream must be set to the rated current of the load.

With motor starter protector combination assemblies, note the clearance to grounded parts and between the motor starter protectors. Short-circuit proof wiring between the circuit-breakers must be ensured. The motor starter protectors can be mounted side-by-side in a modular arrangement.

Standard motor starter protector	Standard motor starter protector with limiter function Type Rated current $I_n$	Rated current $I_n$ A	up to 500 V AC <sup>1)</sup> /525 V AC <sup>2)</sup>		up to 690 V AC <sup>1)</sup>	
			$I_{cu}$ kA	$I_{cs}$ kA	$I_{cu}$ kA	$I_{cs}$ kA
<b>3RV10 2</b> Size S0	<b>3RV13 21-4DC10</b> Size S0 $I_n = 25$ A	up to 1 1.25 1.6 2 2.5 3.2 4 5 6.3 8 10 12.5 16 20 22 25	° ° ° ° ° ° ° ° ° 100 100 100 100 100 100 100 100	° ° ° ° ° ° ° ° ° 50 50 50 50 50 50 50 50	° ° ° ° ° ° ° ° ° 50 50 50 50 50 50 50 50	° ° ° ° ° ° ° ° ° 25 25 25 25 25 25 25 25
<b>3RV10 3</b> Size S2	<b>3RV13 31-4HC10</b> Size S2 $I_n = 50$ A	16 20 25 32 40 50	100 100 100 100 100 100	50 50 50 50 50 50	50 50 50 50 50 50	25 25 25 25 25 25
<b>3RV10 4</b> Size S3	<b>3RV13 41-4HC10</b> Size S3 $I_n = 50$ A	32 40 50	100 100 100	50 50 50	50 50 50	25 25 25
<b>3RV10 4</b> Size S3	<b>3RV13 41-4MC10</b> Size S3 $I_n = 100$ A	50 63 75 90 100	100 100 100 100 100	50 50 50 50 50	50 50 50 50 50	25 25 25 25 25

Short-circuit proof up to 100 kA

°

No upstream motor starter protector required since short-circuit proof up to 100 kA

1) 10 % overvoltage.

2) 5% overvoltage.

# 3RV Motor Starter Protectors up to 100 A

## General data

General technical specifications			3RV1. 1 <sup>1)</sup>	3RV1. 2	3RV1. 3	3RV1. 4	3RV1742
<b>Type</b>							
<b>Standards</b>			Yes				
• IEC 60947-1, EN 60947-1 (VDE 0660 Part 100)			Yes				
• IEC 60947-2, EN 60947-2 (VDE 0660 Part 101)			Yes				
• IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)							no
<b>Size</b>			S00	S0	S2	S3	
<b>Number of poles</b>			3				
<b>Max. rated current <math>I_{nmax}</math> (= max. rated operational current <math>I_e</math>)</b>	A		12	25	50	100	70
Permissible ambient temperature							
• Storage/transport	°C		-50 ... +80				
• Operation	°C		-20 ... +70 <sup>2)</sup>				
Permissible rated current at inside temperature of cubicle							
• +60 °C	%		100				
• +70 °C	%		87				
Motor starter protector inside enclosure							
Permissible rated current at inside temperature of enclosure							
• +35 °C	%		100				
• +60 °C	%		87				
<b>Rated operational voltage <math>U_e</math></b>	V		690 <sup>3)</sup>				
<b>Rated frequency</b>	Hz		50/60				
<b>Rated insulation voltage <math>U_i</math></b>	V		690				
<b>Rated impulse withstand voltage <math>U_{imp}</math></b>	kV		6				
<b>Utilization categories</b>							
• IEC 60947-2 (motor starter protector)		A					
• IEC 60947-4-1 (motor starter)		AC-3					
<b>Trip class CLASS</b>	according to IEC 60947-4-1		10		10/20		--
<b>DC short-circuit breaking capacity</b> (time constant $t = 5$ ms)							
• 1 conducting path 150 V DC	kA		10				
• 2 conducting paths in series 300 V DC	kA		10				
• 3 conducting paths in series 450 V DC	kA		10				
<b>Power loss <math>P_v</math> per motor starter protector</b>							
Dependent on rated current $I_n$ (upper setting range)							
$R_{per\ conducting\ path} = P_v / I^2 \times 3$							
$I_n$ : ... 1.25 A	W		5	--	--	--	--
$I_n$ : 1.6 ... 6.3 A	W		6	--	--	--	--
$I_n$ : 8 ... 12 A	W		7	--	--	--	--
$I_n$ : ... 0.63 A	W		--	5	--	--	--
$I_n$ : 0.8 ... 6.3 A	W		--	6	--	--	--
$I_n$ : 8 ... 16 A	W		--	7	--	--	--
$I_n$ : 20 ... 25 A	W		--	8	--	--	--
$I_n$ : ... 25 A	W		--	--	12	--	--
$I_n$ : 32 A	W		--	--	15	--	--
$I_n$ : 40 ... 50 A	W		--	--	20	--	--
$I_n$ : ... 63 A	W		--	--	--	20	--
$I_n$ : 75 and 90 A	W		--	--	--	30	--
$I_n$ : ... 100 A	W		--	--	--	38	--
$I_n$ : ... 10 A	W		--	--	--	--	5.7
$I_n$ : ... 35 A	W		--	--	--	--	10.5
$I_n$ : ... 70 A	W		--	--	--	--	19.7
<b>Shock resistance</b>	according to IEC 60068-2-27	g/ms	25 /11 (square and sinusoidal pulse)				
<b>Degree of protection</b>	according to IEC 60529		IP20 <sup>4)</sup>				
<b>Touch protection</b>	according to EN 50274		Finger-safe				
<b>Temperature compensation</b>	according to IEC 60947-4-1	°C	-20 ... +60				
<b>Phase loss sensitivity</b>	according to IEC 60947-4-1		Yes				
<b>Explosion protection</b>	ATEX license to EU guideline 94/9/EG		Yes, for 3RV10 (CLASS 10), 3RV11 (CLASS 10)				
<b>Isolating function</b>	according to IEC 60947-2		Yes				
<b>Main and EMERGENCY-STOP switch characteristics<sup>5)</sup></b>	according to IEC 60204-1 (VDE 0113)		Yes				
<b>Safe isolation between main and auxiliary circuits, required for PELV applications</b>	according to EN 60947-1						
• Up to 400 V + 10 %			Yes				
• Up to 415 V + 5 % (higher voltages on request)			Yes				
<b>Mechanical endurance</b>	Operating cycles		100 000		50 000		
<b>Electrical endurance</b>	Operating cycles		100 000		25 000		
<b>Max. switching frequency per hour (motor starts)</b>	1/h		15				

- 1) For technical specifications of 3RV16 voltage transformer circuit-breakers see SIRIUS Motor Starter Protectors up to 100 A -> General Data.  
2) Over +60 °C current reduction.

- 3) 500 V with molded-plastic enclosure.  
4) Terminal compartment IP00.  
5) With appropriate accessories.

Rated short-circuit breaking capacity  $I_{cn}$  see table of same name.

# 3RV Motor Starter Protectors up to 100 A

## General data

Conductor cross-sections of main circuit					
Type		3RV1.	3RV1. 2	3RV1. 3	3RV1. 4/ 3RV17 42
Connection type		Screw terminal		Screw terminal with box terminal	
Terminal screw		Pozidriv size 2		Pozidriv size 2	4 mm Allen screw
Prescribed tightening torque	Nm	0.8 ... 1.2	2 ... 2.5	3 ... 4.5	4 ... 6
<ul style="list-style-type: none"> <li>• <b>Conductor cross-sections, 1 or 2 conductors</b></li> <li>- Solid</li> <li>- Finely stranded with end sleeve</li> <li>- Stranded</li> <li>- AWG conductors, solid or stranded</li> </ul>	mm <sup>2</sup>	2 x (0.5 ...1.5), 2 x (0.75 ...2.5)	2 x (1 ...2.5), 2 x (2.5 ...6)	2 x (0.75 ...16)	2 x (2.5 ...16)
	mm <sup>2</sup>	2 x (0.5 ...1.5), 2 x (0.75 ...2.5)	2 x (1 ...2.5), 2 x (2.5 ...6)	2 x (0.75 ...16), 1 x (0.75 ...25)	2 x (2.5 ...35), 1 x (2.5 ...50)
	mm <sup>2</sup>	2 x (0.5 ...1.5), 2 x (0.75 ...2.5)	2 x (1 ...2.5), 2 x (2.5 ...6)	2 x (0.75 ...25), 1 x (0.75 ...35)	2 x (10 ...50), 1 x (10 ...70)
	AWG	2 x (18 ...14)	2 x (14 ...10)	2 x (18 ...3), 1 x (18 ...2)	2 x (10 ...1/0), 2 x (10 ...2/0)
<ul style="list-style-type: none"> <li>• Ribbon cable conductors (number x width x circumference)</li> </ul>	mm	--	--	2 x (6 x 9 x 0.8)	2 x (6 x 9 x 0.8)
<ul style="list-style-type: none"> <li>• <b>Removable box terminal</b><sup>1)</sup></li> <li>- With copper bars</li> <li>- With cable lug</li> </ul>		--	--	--	18 x 10 up to 2 x 70
<ul style="list-style-type: none"> <li>• <b>Cage Clamp terminals</b><sup>2) 3)</sup> (1 or 2 conductors connectable)</li> <li>- Solid</li> <li>- Finely stranded with end sleeve</li> <li>- Finely stranded without end sleeve</li> <li>- AWG conductors, solid or stranded</li> </ul>	mm <sup>2</sup>	2 x (0.25 ...2.5)	--	--	--
	mm <sup>2</sup>	2 x (0.25 ...1.5)	--	--	--
	mm <sup>2</sup>	2 x (0.25 ...2.5)	--	--	--
	AWG	2 x (24 ...14)	--	--	--
Max. external diameter of the cable insulation: 3.6 mm.					
<b>Permissible mounting position</b>		Any, according to IEC 60447 start command "I" right-hand side or top			

- 1) Cable-lug and busbar connection possible after removing the box terminals.
- 2) Corresponding 8WA2803/8WA2804 opening tool, see accessories.
- 3) With conductor cross-sections of  $\leq 1 \text{ mm}^2$  an "insulation stop" must be used (see accessories for "Contactors and Contactor Assemblies").

# 3RV Motor Starter Protectors up to 100 A

## General data

### Permissible ratings of devices approved for North America (UL/CSA)

Motor starter protectors of the 3RV1 series are approved for UL/CSA and according to UL 508 and CSA 22.2 No. 14 they can also be used as a load feeder in combination with a contactor. These motor starter protectors can be used as "Manual Motor Controllers" for "Group Installations", as "Manual Motor Controllers Suitable for Tap Conductor Protection in Group Installations" and as "Self-Protected Combination Motor Controllers" (Type E).

### 3RV1 motor starter protectors as "Manual Motor Controllers"

If used as a "Manual Motor Controller", the motor starter protector is always operated in combination with an upstream short-circuit protection device. As short-circuit-protection device, approved fuses or a motor starter protector according to UL489/CSA 22.2 No.5 can be used. These devices must be dimensioned in accordance with the National Electrical Code (UL) or Canadian Electrical Code (CSA). Approval of the 3RV as a Manual Motor Controller can be found under the following file numbers: UL File No. 47705, CSA Master Contract 165071, Product Class 3211 05.

Motor starter protector	hp rating <sup>1)</sup> for FLA <sup>2)</sup> max.			Rated current $I_n$ A	240 V AC		480 Y/277 V AC		600 Y/347 V AC	
	V	1-phase	3-phase		UL	CSA	UL	CSA	UL	CSA
					$I_{bc}^{3)}$ kA	$I_{bc}^{3)}$ kA	$I_{bc}^{3)}$ kA	$I_{bc}^{3)}$ kA	$I_{bc}^{3)}$ kA	$I_{bc}^{3)}$ kA
<b>3RV10 11</b> <b>3RV16 11-0BD10</b>				0.16 ... 2	65	65	65	65	30	10
Size S00	115	1/2	--	2.5	65	65	65	65	30	10
	200	1 1/2	3	3.2	65	65	65	65	30	10
	230	2	3	4	65	65	65	65	30	10
	460	--	7 1/2	5	65	65	65	65	30	10
FLA <sup>2)</sup> max. 12 A,				6.3	65	65	65	65	30	10
600 V	575/600	--	10	8	65	65	65	65	30	10
NEMA size 00				10	65	65	65	65	30	10
				12	65	65	65	65	30	10
<b>3RV10 21 / 3RV11 21</b> <b>3RV13 21</b>				0.16 ... 3.2	65	65	65	65	30	30
Size S0	115	2	--	4	65	65	65	65	30	30
	200	3	7 1/2	5	65	65	65	65	30	30
	230	5	7 1/2	6.3	65	65	65	65	30	30
	460	--	15	8	65	65	65	65	30	30
FLA <sup>2)</sup> max. 25 A,				10	65	65	65	65	30	30
600 V	575/600	--	20	12.5	65	65	65	65	30	30
NEMA size 1				16	65	65	65	65	30	10
				20	65	65	65	65	30	10
				22	65	65	65	65	30	10
				25	65	65	65	65	30	10
<b>3RV10 31 / 3RV11 31</b> <b>3RV13 31</b>				16	65	65	65	65	25	25
Size S2	115	3	--	20	65	65	65	65	25	25
	200	7 1/2	15	25	65	65	65	65	25	25
	230	10	20	32	65	65	65	65	25	25
	460	--	40	40	65	65	65	65	25	25
FLA <sup>2)</sup> max. 50 A,				45	65	65	65	65	25	25
600 V	575/600	--	50	50	65	65	65	65	25	25
NEMA size 2										
<b>3RV10 41 / 3RV10 42</b> <b>3RV11 42</b> <b>3RV13 41 / 3RV13 42</b>				16	65	65	65	65	30	30
Size S3	115	10	--	20	65	65	65	65	30	30
	200	20	30	25	65	65	65	65	30	30
	230	20	40	32	65	65	65	65	30	30
	460	--	75	40	65	65	65	65	30	30
FLA <sup>2)</sup> max. 99 A,				50	65	65	65	65	30	30
600 V	575/600	--	100	63	65	65	65	65	30	30
NEMA size 3				75	65	65	65	65	30	30
				90	65	65	65	65	30	30
				100	65	65	65	65	30	30

- 1) hp rating = Power rating in horse power (maximum motor rating).
- 2) FLA = Full Load Amps/Motor full load current.
- 3) Complies with "short-circuit breaking capacity" according to UL/CSA.

# 3RV Motor Starter Protectors up to 100 A

## General data

### 3RV10 motor starter protectors as "Manual Motor Controllers Suitable for Tap Conductor Protection in Group Installations"

The application as "Manual Motor Controllers Suitable for Tap Conductor Protection in Group Installations" is only available from UL. CSA does not recognize this approval! When the motor circuit breaker is used as a "Manual Motor Controller Suitable for Tap Conductor Protection in Group Installations", it must always

be combined with upstream short-circuit protection. As short-circuit-protection device, approved fuses or a motor starter protector according to UL489 can be used.

These devices must be dimensioned in accordance with the National Electrical Code. The 3RV10 motor starter protectors are approved as "Manual Motor Controllers Suitable for Tap Conductor Protection in Group Installations" under the following file number: UL File No. 47705.

Motor starter protector	hp rating <sup>1)</sup> for FLA <sup>2)</sup> max.		Rated current $I_n$ A	240 V AC	Up to 480 Y/277 V AC	Up to 600 Y/347 V AC
	V	1-phase		3-phase	UL $I_{bc}^{(3)}$ kA	UL $I_{bc}^{(3)}$ kA
<b>3RV10 11</b>			0.16 ... 0.8	65	65	--
Size S00			1	65	65	--
	115	1/3	--	65	65	--
	200	3/4	2	65	65	--
	230	1	2	65	65	--
FLA <sup>2)</sup> max. 8 A, 480 V	460	--	5	65	65	--
	575/600	--	--	65	65	--
NEMA size 0			4	65	65	--
			5	65	65	--
			6.3	65	65	--
			8	65	65	--
<b>3RV10 21</b>			0.16 ... 1.6	50	50	30
			2	50	50	30
			2.5	50	50	30
Size S0			3.2	50	50	30
	115	2	--	50	50	30
	200	3	7 1/2	50	50	30
FLA <sup>2)</sup> max.	230	3	7 1/2	50	50	30
22 A, 480 V	460	--	15	50	50	30
12.5 A, 600 V	575/600	--	10	50	50	30
			10	50	50	30
NEMA size 1			12.5	50	50	30
			16	50	50	--
			20	50	50	--
			22	50	50	--
<b>3RV10 31</b>			16	50	50	25
			20	50	50	25
Size S2			25	50	50	25
	115	3	--	50	50	25
	200	7 1/2	15	50	50	25
FLA <sup>2)</sup> max.	230	10	20	50	50	25
50 A, 600 V	460	--	40	50	50	25
NEMA size 2	595/600	--	50	50	50	25
<b>3RV10 4.</b>			16	50	50	30
			20	50	50	30
			25	50	50	30
Size S3			32	50	50	30
	115	10	--	50	50	30
FLA <sup>2)</sup> max.	200	20	30	50	50	30
100 A, 480 V	230	20	40	50	50	30
	460	--	75	50	50	30
75 A, 600 V	575/600	--	75	50	50	30
			63	50	50	30
			75	50	50	30
NEMA size 3			90	50	50	--
			100	50	50	--

1) hp rating = Power rating in horse power (maximum motor rating).

2) FLA = Full Load Amps/Motor full load current.

3) Complies with "short-circuit breaking capacity" according to UL.

# 3RV Motor Starter Protectors up to 100 A

## General data

3RV10 motor starter protectors as "Self-Protected Combination Motor Controllers (Type E)"

As of 16 July 2001, UL 508 demands a line-side 1-inch air distance and 2-inch creepage distance for "Self-Protected Combination Motor Controllers".

Therefore, 3RV10 motor starter protectors of size S0 and S3 are approved to UL 508 in combination with the terminal blocks listed below.

The basic unit of the 3RV10 motor starter protector in size S2 conforms with the required air/creepage distances.

CSA does not demand these extended air/creepage distances. According to CSA, these terminal blocks can be omitted when the device is used as a "Self-Protected Combination Motor Controller".

The 3RV10 motor starter protectors are approved as "Self-Protected Combination Motor Controllers" under the following file numbers:

UL File No. E156943, Product Class NKJH,  
CSA Master Contract 165071, Product Class 3211 08.

Motor starter protector	hp rating <sup>1)</sup> for FLA <sup>2)</sup> max.		Rated current $I_n$	Up to 240 V AC		Up to 480 Y/277 V AC		Up to 600 Y/347 V AC			
				UL	CSA	UL	CSA	UL	CSA		
Type	V	1-phase	3-phase	A	$I_{bc}^{(3)}$ kA	$I_{bc}^{(3)}$ kA	$I_{bc}^{(3)}$ kA	$I_{bc}^{(3)}$ kA	$I_{bc}^{(3)}$ kA		
<b>3RV10 21 + 3RV19 28-1H<sup>4)</sup></b>				0.16 ... 1.6	65	65	65	65	30	30	
Size S0	115	2	--	2	65	65	65	65	30	30	
	200	3	7 1/2	2.5	65	65	65	65	30	30	
	230	3	7 1/2	3.2	65	65	65	65	30	30	
FLA <sup>2)</sup> max.	460	--	15	4	65	65	65	65	30	30	
22 A, 480 V 12.5 A, 600 V	575/600	--	10	5	65	65	65	65	30	30	
				6.3	65	65	65	65	30	30	
				8	65	65	65	65	30	30	
NEMA size 1				10	65	65	65	65	30	30	
				12.5	65	65	65	65	30	30	
				16	65	65	65	65	--	--	
				20	65	65	65	65	--	--	
22				22	65	65	65	65	--	--	
				16	65	65	65	65	25	25	
				20	65	65	65	65	25	25	
				25	65	65	65	65	25	25	
Size S2	115	3	--	32	65	65	65	65	25	25	
	200	7 1/2	15	40	65	65	65	65	25	25	
	230	10	20	45	65	65	65	65	25	25	
FLA <sup>2)</sup> max.	460	--	40	50	65	65	65	65	25	25	
50 A, 600 V	575/600	--	50	50	65	65	65	65	25	25	
NEMA size 2				16	65	65	65	65	30	30	
<b>3RV10 41 + 3RT19 46-4GA07<sup>4)</sup></b>				20	65	65	65	65	30	30	
Size S3	115	10	--	25	65	65	65	65	30	30	
	200	20	30	32	65	65	65	65	30	30	
	230	20	40	40	65	65	65	65	30	30	
FLA <sup>2)</sup> max.	460	--	75	50	65	65	65	65	30	30	
100 A, 480 V	575/600	--	75	63	65	65	65	65	30	30	
75 A, 600 V				75	65	65	65	65	65	30	30
90				65	65	65	65	--	--		
NEMA size 3				100	65	65	65	65	--	--	
				100	65	65	65	65	--	--	

1) hp rating = Power rating in horse power (maximum motor rating).

2) FLA = Full Load Amps/Motor full load current.

3) Complies with "short-circuit breaking capacity" according to UL/CSA.

4) Not required for CSA.



# 3RV Motor Starter Protectors up to 100 A

## General data

### 3RV17 motor starter protectors as "Circuit Breaker"

The 3RV17 motor starter protectors are approved as "Circuit Breakers" according to UL 489 and CSA 22.2 No. 5-02. They can be used therefore as upstream short-circuit protective devices for "Manual Motor Controllers" and "Manual Motor Controllers"

Suitable for Tap Conductor Protection in Group Installations". The 3RV17 motor starter protectors are approved as "Circuit Breaker" under the following file numbers:

UL File No. E235044  
CSA Master Contract 165071, Product Class 1432 01

Motor starter protector	Rated current $I_n$	240 V AC	480 Y/277 V AC	600 Y/347 V AC
		UL	UL	UL
Type	A	$I_{bc}^{1)}$ kA	$I_{bc}^{1)}$ kA	$I_{bc}^{1)}$ kA
<b>3RV17 42</b>	10	35	35	20
<b>Size S3</b>	15	35	35	20
	20	35	35	20
	25	35	35	20
	30	35	35	20
	35	35	35	20
	40	35	35	20
	45	35	35	20
	50	35	35	20
	60	35	35	20
	70	35	35	20

1) Complies with "short-circuit breaking capacity" according to UL.

### Rated data of the auxiliary switches and alarm switches

Type		Lateral auxiliary switch with 1 NO + 1 NC, 2 NO, 2 NC, 2 NO + 2 NC and alarm switch	Transverse auxiliary switch with 1 CO	Transverse auxiliary switch with 1 NO + 1 NC, 2 NO
<b>Max. rated voltage</b>				
According to NEMA (UL)	V AC	600		250
According to NEMA (CSA)	V AC	600		250
<b>Uninterrupted current</b>	A	10	5	2.5
<b>Switching capacity</b>		A600 Q300	B600 R300	C300 R300



# 3RV Motor Starter Protectors up to 100 A

## General data

### Voltage transformer circuit-breakers

#### General technical specifications

Type		3RV16 11-1AG14	3RV16 11-1CG14	3RV16 11-1DG14
<b>Rated current <math>I_n</math></b>	A	1.4	2.5	3
<b>Ambient temperature</b>				
• During storage/transport	°C	-50 ... +80		
• During operation	°C	-20 ... +60 (up to +70 °C is possible with derating)		
<b>Rated operational voltage <math>U_e</math></b>	V	400		
<b>Rated frequency</b>	Hz	16.66 ... 60		
<b>Rated insulation voltage <math>U_i</math></b>	V	690		
<b>Short-circuit breaking capacity <math>I_{cu}</math> at 400 V AC</b>	kA	50		
<b>Set value of the thermal overload release</b>	A	1.4	2.5	3
<b>Operating value of the instantaneous overcurrent release</b>	A	6 ± 20 %	10.5 ± 20 %	20 ± 20 %
<b>Tripping time of the instantaneous overcurrent release</b>	ms	Approx. 6 at 12 A	Approx. 6 at 20 A	Approx. 6 at 40 A
<b>Internal resistance</b>				
• In cold state		> 0.25 ± 6.5 %		
• In heated state		> 0.30 ± 6.5 %		
<b>Shock resistance</b> according to IEC 68 Part 2-27	g	15		
<b>Degree of protection</b> according to IEC 60529		IP20		
<b>Touch protection</b> according to EN 50274		Finger-safe		
<b>Endurance</b>				
• Mechanical	Operating cycles	10 000		
• Electrical	Operating cycles	10 000		
<b>Permissible mounting position</b>		Any		

#### Conductor cross-sections, main circuit, 1 or 2 conductors

Type		3RV16 11-1AG14	3RV16 11-1CG14	3RV16 11-1DG14
Connection type		Screw terminal		
Terminal screw		Pozi driv size 2		
Solid	mm <sup>2</sup>	2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5), max. 4		
Finely stranded with end sleeve	mm <sup>2</sup>	2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5)		
Stranded	mm <sup>2</sup>	2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5), max. 4		

#### Auxiliary switch for blocking the distance protection

• With defined lateral assignment for blocking distance protection		1 changeover contact (for use as 1 NO or 1 NC)		
• Rated operational voltage $U_e$ (AC voltage)	V	250		
• Rated operational current $I_e$ /AC-14 at $U_e = 250$ V	A	0.5		
• Rated operational current $I_e$ /AC-14 at $U_e = 125$ V	A	1		
• Rated operational voltage $U_e$ (direct voltage L/R 200 ms)	V	250		
• Rated operational current $I_e$ /DC-13 at $U_e = 250$ V	A	0.27		
• Rated operational current $I_e$ /DC-13 at $U_e = 125$ V	A	0.44		

#### Short-circuit protection for auxiliary circuit

• Fuse gL/gG	A	10		
• Miniature circuit-breaker, C characteristic	A	6 (prospective short-circuit current < 0.4 kA)		

#### Auxiliary switches for other signaling functions

For technical specifications see "Mountable Accessories"

# 3RV Motor Starter Protectors up to 100 A

## General data

### Characteristic curves

The time/current characteristic, the current limiting characteristics and the  $I^2t$  characteristic curves were determined according to DIN VDE 0660 and IEC 60947.

The time/current characteristic of the inverse-time delayed overload release (thermal overload releases, 'a' releases) for DC and AC with a frequency of 0 Hz to 400 Hz.

The characteristic curves apply to the cold state; at operating temperature, the tripping times of the thermal releases are reduced to approximately 25 %.

Under normal operating conditions, all three poles of the device must be loaded. The three main conducting paths must be connected in series in order to protect single-phase or DC loads.

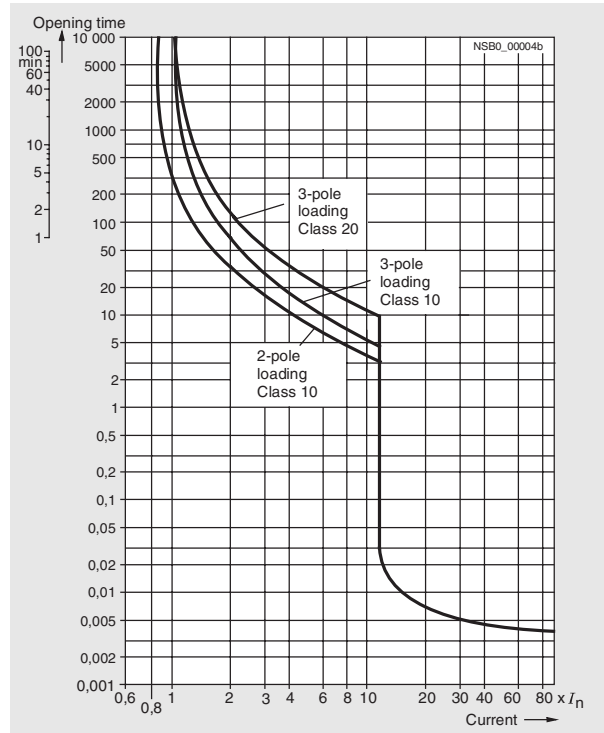
With 2-pole and 3-pole loading, the maximum deviation in the tripping time of 3 times the setting current and upwards is  $\pm 20\%$  and thus in accordance with DIN VDE 0165.

The tripping characteristics for the instantaneous, electromagnetic overcurrent releases (short-circuit releases, 'n' releases) are based on the rated current  $I_n$  that also represents the maximum value of the setting range for motor starter protectors with adjustable overload releases. If the current is set to a lower value, the tripping current of the 'n' release is increased by a corresponding factor.

The characteristic curves of the electromagnetic overcurrent releases apply to frequencies of 50 Hz/60 Hz. Appropriate correction factors must be used for lower frequencies down to  $16^{2/3}$  Hz, for higher frequencies up to 400 Hz and for DC.

The shown characteristic curve for the motor starter protector relates to a specific setting range. It is, however, also valid as a schematic representation of motor starter protectors with other current ranges.

Time/current characteristic curves, current limiting characteristic curves and  $I^2t$  curves can be ordered from "Technical Assistance" (e-mail: [nst.technical-assistance@siemens.com](mailto:nst.technical-assistance@siemens.com)).

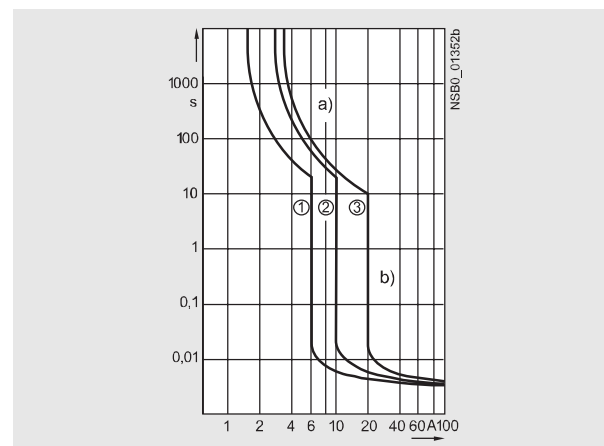


Schematic representation of typical time/current characteristic of 3RV10

### 3RV16 voltage transformer circuit-breakers up to 3 A

The specified tripping characteristics of the thermal overload release (a) correspond to the mean value of the scatter band in the cold state. At operating temperature, these times are reduced to approximately 25 % of the specified values.

The characteristic curves below are schematic representations. Precise characteristic curves are available from "Technical Assistance" (e-mail: [nst.technical-assistance@siemens.com](mailto:nst.technical-assistance@siemens.com)).



① 1.4 A / 6 A

② 2.5 A / 10.5 A

③ 3 A / 20 A

a) Thermal overload release

b) Instantaneous electromagnetic overcurrent release

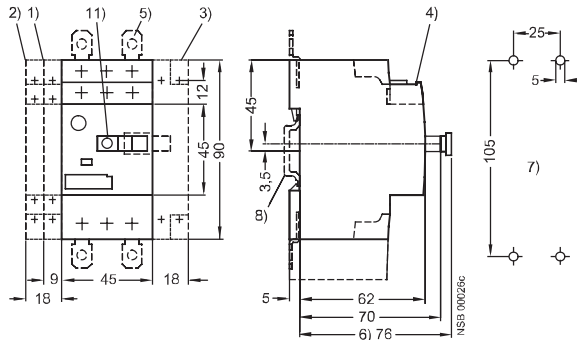
# 3RV Motor Starter Protectors up to 100 A

## General data

### Dimensional drawings

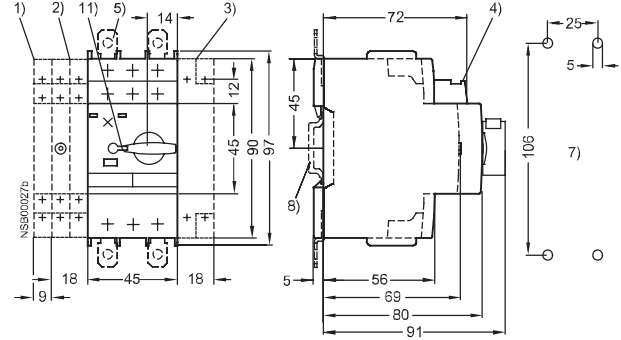
#### 3RV1 motor starter protectors, size S00

3RV10 11, 3RV16



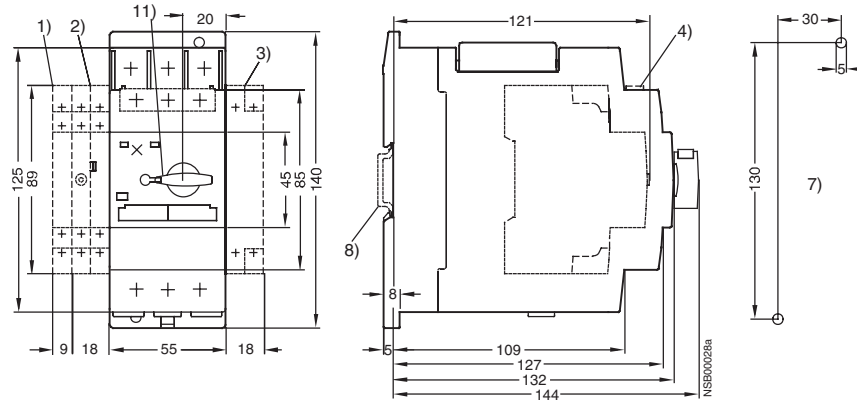
#### 3RV1 motor starter protectors, size S0

3RV10 21, 3RV13 21, 3RV14 21



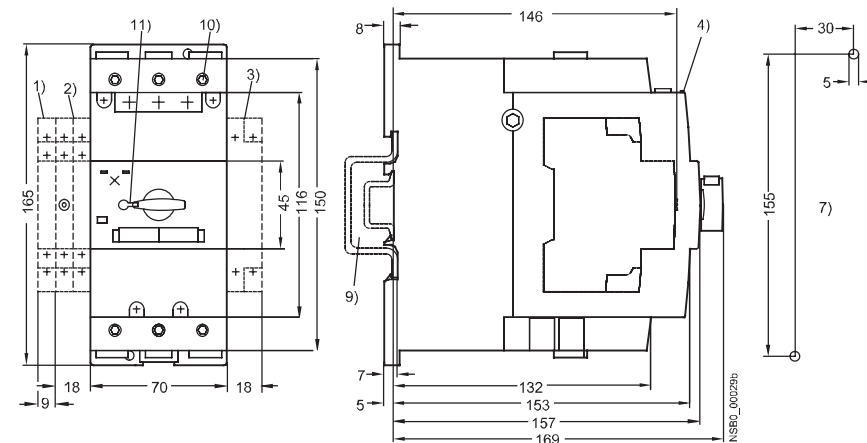
#### 3RV1 motor starter protectors, size S2

3RV10 31, 3RV13 31, 3RV14 31



#### 3RV1 motor starter protectors, size S3

3RV10 4, 3RV13 4



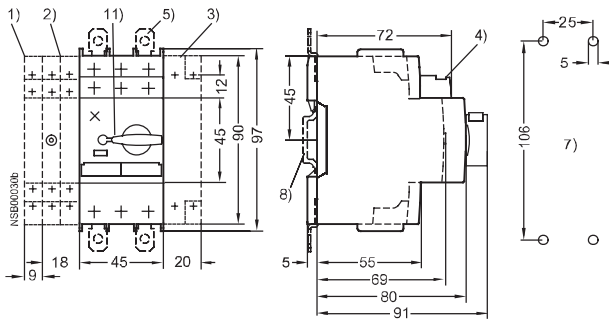
- 1) Lateral auxiliary switch, 2-pole.
- 2) Alarm switch (S0-S3) or lateral auxiliary switch, 4-pole (S00-S3).
- 3) Auxiliary release
- 4) Transverse auxiliary switch
- 5) Plug-in lugs for screw mounting
- 6) For undervoltage release with leading auxiliary switch only
- 7) Drilling diagram
- 8) 35 mm standard mounting rail according to EN 50022
- 9) Mounting onto 35 mm standard mounting rail, 15 mm high, according to EN 50022 or 75 mm standard mounting rail according to EN 50023
- 10) Allen screw 4 mm
- 11) Lockable in neutral position with 3.5 mm to 4.5 mm shackle diameter

# 3RV Motor Starter Protectors up to 100 A

## General data

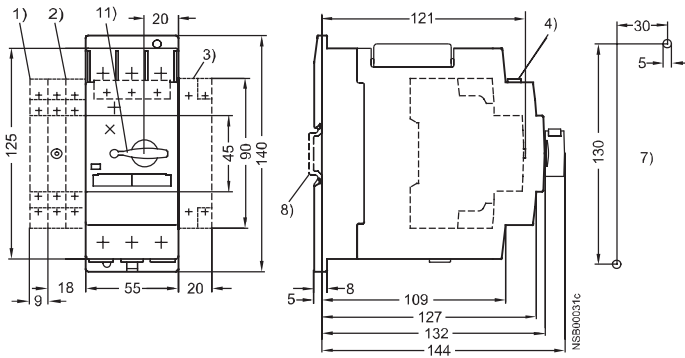
### 3RV11 motor starter protectors, size S0

3RV11 21



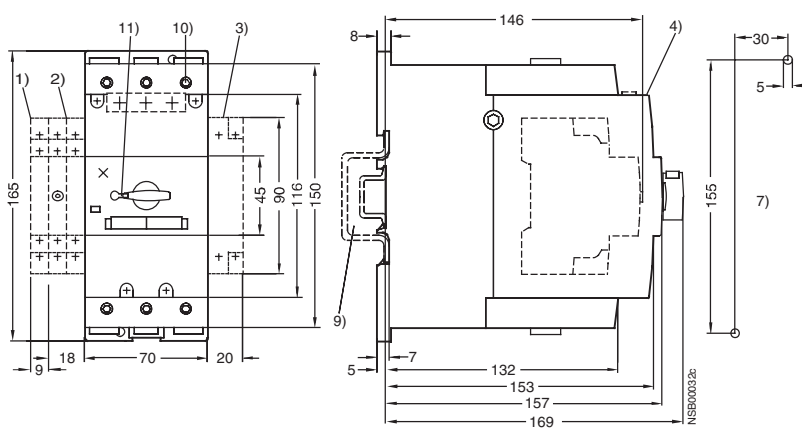
### 3RV11 motor starter protectors, size S2

3RV11 31



### 3RV11 motor starter protectors, size S3

3RV11 42



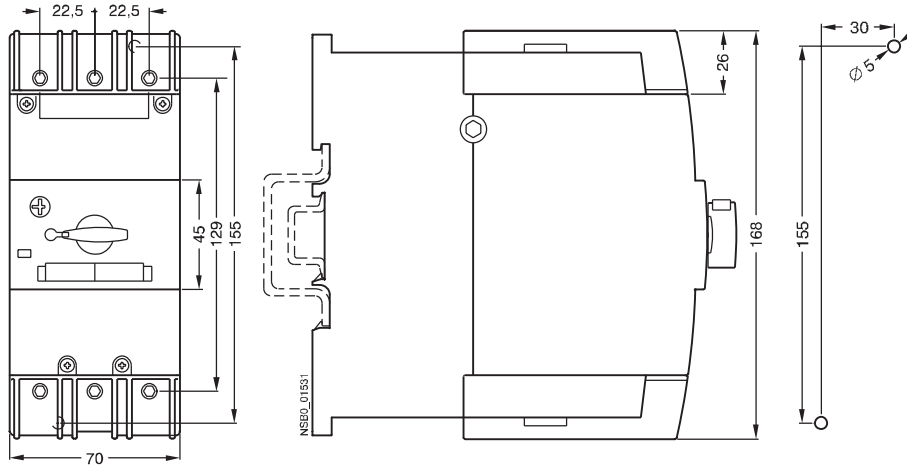
- 1) Lateral auxiliary switch, 2-pole.
- 2) Alarm switch or lateral auxiliary switch, 4-pole
- 3) Block for overload relay function
- 4) Transverse auxiliary switch
- 5) Plug-in lugs for screw mounting
- 7) Drilling diagram
- 8) 35 mm standard mounting rail according to EN 50022
- 9) Mounting onto 35 mm standard mounting rail, 15 mm high, according to EN 50022 or 75 mm standard mounting rail according to EN 50023
- 10) Allen screw 4 mm
- 11) Lockable in neutral position with 3.5 mm to 4.5 mm shackle diameter

# 3RV Motor Starter Protectors up to 100 A

## General data

### 3RV17 motor starter protectors, size S3

3RV17 42



# 3RV Motor Starter Protectors up to 100 A

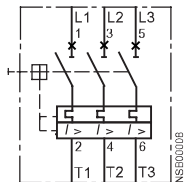
General data

## Schematics

### Internal connections

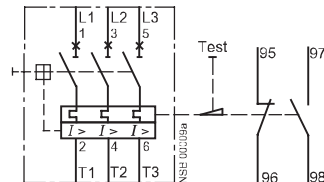
#### Motor starter protectors

3RV10..  
3RV14..  
3RV16 11-0BD10  
3RV17..



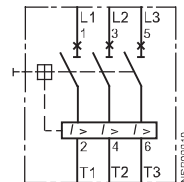
#### Motor starter protectors

3RV11..



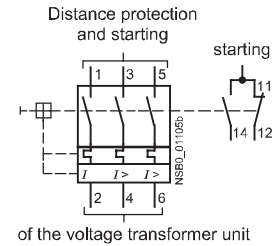
#### Motor starter protectors

3RV13..



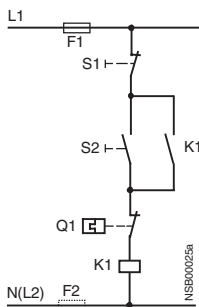
#### Voltage transformer circuit-breakers

3RV16 up to 3 A



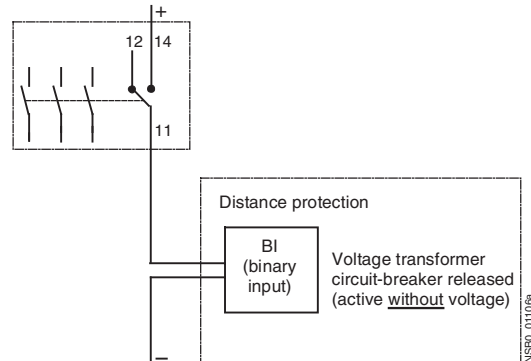
### Switching examples

#### 3RV11 motor starter protector with overload relay function



S1 OFF pushbutton  
S2 ON pushbutton  
K1 Latching contact  
F1; F2 Fuses gL/gG 6A  
Q1 3RV11 motor starter protectors

#### 3RV16 voltage transformer circuit-breakers up to 3 A



#### Note:

When using the NC contact to connect the voltage transformer circuit-breaker, the binary input of the distance protection device (Siemens 7 SA xxx) should be set to "active without voltage". This type of connection is used for additional monitoring of correct wiring.

## More information

### Conversion of voltage transformer circuit-breakers 3VU13 to 3RV1

The 3VU13 voltage transformer circuit-breakers previously available have been discontinued. The 3RV1 voltage transformer circuit-breakers are offered as replacement types.

Previous type	Replacement type
3VU13 11-6HR00	3RV16 11-1CG14
3VU13 21-6HR00	3RV16 11-1CG14 + 3RV19 01-1A
3VU13 11-6JR00	3RV16 11-1DG14

# 3RV Motor Starter Protectors up to 100 A Accessories

## Mountable accessories

### Overview

#### Mounting location and function

The 3RV1 motor starter protectors have three main contact elements. In order to achieve maximum flexibility, auxiliary switches, alarm switches, auxiliary releases and isolator modules can be supplied separately.

These components can be fitted as required on the motor starter protectors without using tools.

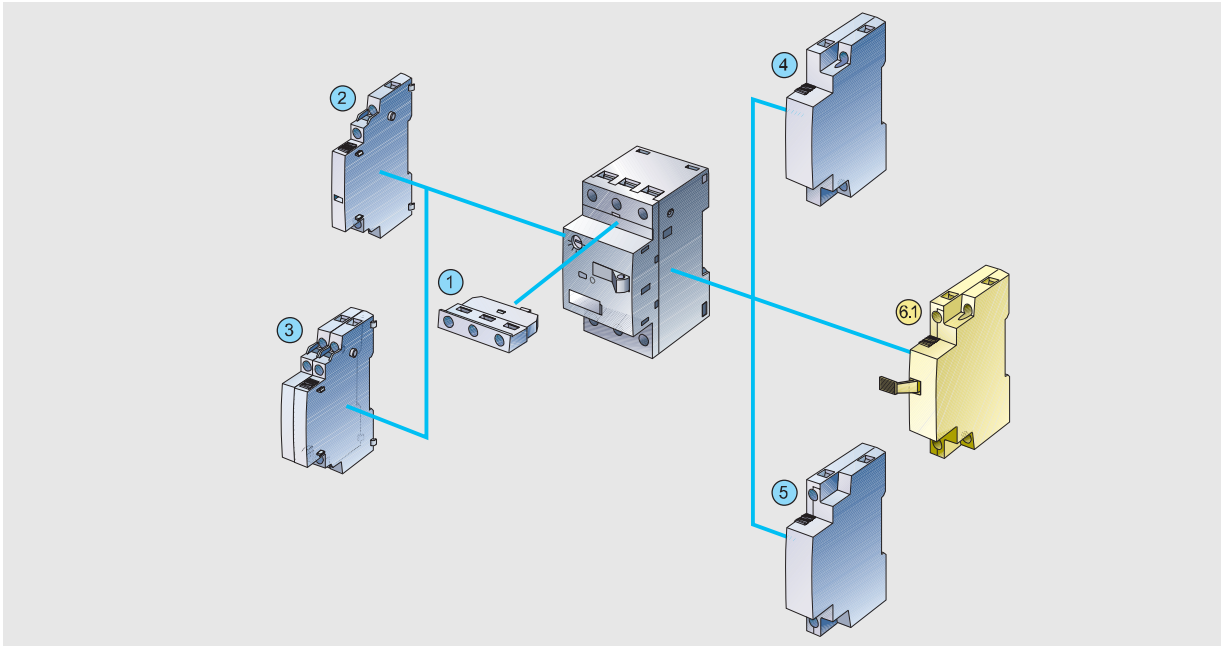
<p><b>Front panel</b></p> <p><u>Notes:</u></p> <ul style="list-style-type: none"> <li>• A maximum of 4 auxiliary contacts with auxiliary switches can be attached to each motor starter protector.</li> <li>• Transverse auxiliary switches must not be used for the 3RV17 motor starter protectors.</li> </ul>	<p><b>Transverse auxiliary switch</b></p> <p>1 NO + 1 NC or 2 NO or 1 changeover contact</p>	<p>An auxiliary contact block can be inserted transversely on the front. The overall width of the motor starter protectors remains unchanged.</p>
<p><b>Left-hand side</b></p> <p><u>Notes:</u></p> <ul style="list-style-type: none"> <li>• Auxiliary switches (2 contacts) and alarm switches can be mounted separately or together.</li> <li>• A maximum of 4 auxiliary contacts with auxiliary switches can be attached to each motor starter protector.</li> </ul>	<p><b>Lateral auxiliary switch (2 contacts)</b></p> <p>1 NO + 1 NC or 2 NO or 2 NC</p> <p><b>Lateral auxiliary switch (4 contacts)</b></p> <p>2 NO + 2 NC</p>	<p>One of the three auxiliary switches can be mounted laterally for each motor starter protector. The contacts of the auxiliary switch close and open together with the main contacts of the motor starter protector.</p> <p>The overall width of the lateral auxiliary switch with 2 contacts is 9 mm.</p> <p>One auxiliary switch can be mounted laterally for each motor starter protector. The contacts of the auxiliary switch close and open together with the main contacts of the motor starter protector.</p> <p>The overall width of the lateral auxiliary switch with 4 contacts is 18 mm.</p>
	<p><b>Alarm switches for sizes S0, S2, and S3</b></p> <p>Tripping 1 NO + 1 NC Short-circuit 1 NO + 1 NC</p>	<p>One alarm switch can be mounted at the side of each motor starter protector with a rotary operating mechanism.</p> <p>The alarm switch has two contact systems.</p> <p>One contact system always signals tripping irrespective of whether this was caused by a short-circuit, an overload or an auxiliary release. The other contact system only switches in the event of a short-circuit. There is no signaling as a result of switching off with the handle.</p> <p>In order to be able to switch on the motor starter protector again after a short-circuit, the alarm switch must be reset manually after the error cause has been eliminated.</p> <p>The overall width of the alarm switch is 18 mm.</p>
<p><b>Right-hand side</b></p> <p><u>Notes:</u></p> <ul style="list-style-type: none"> <li>• One auxiliary release can be mounted per motor starter protector.</li> <li>• Accessories cannot be mounted at the right-hand side of the 3RV11 motor starter protectors with overload relay function.</li> </ul>	<p><b>Shunt release</b></p> <p>or</p> <p><b>Undervoltage release</b></p> <p>or</p> <p><b>Undervoltage release with leading auxiliary contacts (2 NO)</b></p>	<p>For remote-controlled tripping of the motor starter protector. The release coil should only be energized for short periods (see schematics).</p> <p>Trips the motor starter protector when the voltage is interrupted and prevents the motor from being restarted accidentally when the voltage is restored. Used for remote-controlled tripping of the motor starter protector.</p> <p>Particularly suitable for EMERGENCY-STOP disconnection by way of the corresponding EMERGENCY-STOP button according to DIN VDE 0113.</p> <p>Function and use as for the undervoltage release without leading auxiliary contacts, but with the following additional function: the auxiliary contacts will open in switch position OFF to deenergize the coil of the undervoltage release, thus interrupting power consumption. In the "tripped" position, these auxiliary contacts are not guaranteed to open. The leading contacts permit the motor starter protector to reclose.</p> <p>The overall width of the auxiliary release is 18 mm.</p>
<p><b>Top</b></p> <p><u>Note:</u></p> <p>The isolator module covers the terminal screws of the transverse auxiliary switch. If the isolator module is used, we therefore recommend that either the lateral auxiliary switches be fitted or that the isolator module not be mounted until the auxiliary switch has been wired.</p>	<p><b>Isolator modules for motor starter protectors</b></p> <p>Size S0 and S2</p>	<p>Isolator modules can be mounted to the upper terminal end of motor starter protectors of sizes S0 and S2.</p> <p>The supply cable is connected to the motor starter protector through the isolator module.</p> <p>The plug can only be unplugged when the motor starter protector is open and isolates all 3 poles of the motor starter protector from the network. The shock-protected isolation point is clearly visible and secured with a padlock to prevent reinsertion of the plug.</p>



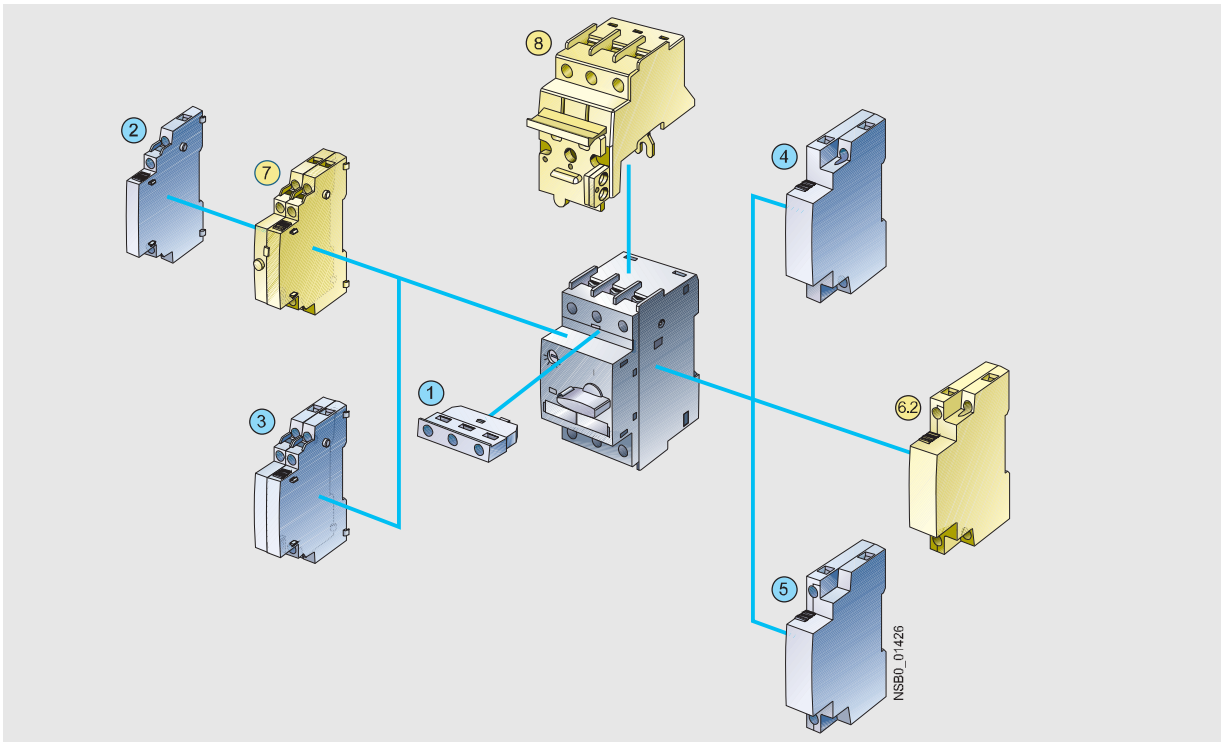
# 3RV Motor Starter Protectors up to 100 A Accessories

## Mountable accessories

S00 circuit-breakers with mountable accessories



Circuit-breakers, sizes S0, S2 or S3, with mountable accessories



Mountable accessories for all sizes S00 ... S3

- ① Transverse auxiliary switch
- ② Lateral auxiliary switch with 2 contacts
- ③ Lateral auxiliary switch with 4 contacts
- ④ Shunt release
- ⑤ Undervoltage release

Mountable accessories

- ⑥.1 Undervoltage release with leading auxiliary contacts
- ⑥.2 Undervoltage release with leading auxiliary contacts

for sizes

- S00
- S0 ... S3

Mountable accessories

- ⑦ Signalling switch
- ⑧ Isolator module

for sizes

- S0 ... S3
- S0 and S2

# 3RV Motor Starter Protectors up to 100 A Accessories

## Mountable accessories

### Technical specifications

#### Front transverse auxiliary switches

		Switching capacity for different voltages	
		1 CO contact	1 NO + 1 NC, 2 NO
<b>Rated operational current <math>I_e</math></b>			
• At AC-15, alternating voltage			
- 24 V	A	4	2
- 230 V	A	3	0.5
- 400 V	A	1.5	--
- 690 V	A	0.5	--
• At AC-12 = $I_{th}$ , alternating voltage			
- 24 V	A	10	2.5
- 230 V	A	10	2.5
- 400 V	A	10	--
- 690 V	A	10	--
• At DC-13, direct voltage L/R 200 ms			
- 24 V	A	1	1
- 48 V	A	--	0.3
- 60 V	A	--	0.15
- 110 V	A	0.22	--
- 220 V	A	0.1	--
<b>Minimum load capacity</b>	V	17	
	mA	1	

#### Front transverse solid-state compatible auxiliary switches

		1 CO contact
• <b>Rated operational voltage <math>U_e</math></b> alternating voltage	V	250
• <b>Rated operational current <math>I_e</math> /AC-14</b> at $U_e = 250$ V	A	0.5
• <b>Rated operational current <math>I_e</math> /AC-14</b> at $U_e = 125$ V	A	1
• <b>Rated operational voltage <math>U_e</math></b> direct voltage L/R 200 ms	V	250
• <b>Rated operational current <math>I_e</math> /DC-13</b> at $U_e = 250$ V	A	0.27
• <b>Rated operational current <math>I_e</math> /DC-13</b> at $U_e = 125$ V	A	0.44
<b>Minimum load capacity</b>	V	5
	mA	1

#### Lateral auxiliary switches

		Switching capacity for different voltages	
		1 NO+1 NC, 2 NO, 2 NC, 2 NO + 2 NC and alarm switch	
<b>Rated operational current <math>I_e</math></b>			
• At AC-15, alternating voltage			
- 24 V	A	6	
- 230 V	A	4	
- 400 V	A	3	
- 690 V	A	1	
• At AC-12 = $I_{th}$ , alternating voltage			
- 24 V	A	10	
- 230 V	A	10	
- 400 V	A	10	
- 690 V	A	10	
• At DC, direct voltage L/R 200 ms			
- 24 V	A	2	
- 110 V	A	0.5	
- 220 V	A	0.25	
- 440 V	A	0.1	
<b>Minimum load capacity</b>	V	17	
	mA	1	

#### Auxiliary releases

		Undervoltage release	Shunt release
<b>Power consumption</b>			
• During pick-up			
- AC voltages	VA / W	20.2 / 13	20.2 / 13
- DC voltages	W	20	13 ... 80
• During continuous operation			
- AC voltages	VA / W	7.2 / 2.4	--
- DC voltages	W	2.1	--
<b>Response voltage</b>			
• Tripping	V	0.35 ... 0.7 x $U_s$	0.7 ... 1.1 x $U_s$
• Pickup	V	0.85 ... 1.1 x $U_s$	--
<b>Maximum opening time</b>	ms	20	20

# 3RV Motor Starter Protectors up to 100 A Accessories

## Mountable accessories

### Short-circuit protection for auxiliary and control circuits

- Fuses gL/gG
- Miniature circuit-breaker, C characteristic

A	10
A	6 <sup>1)</sup>

1) Prospective short-circuit current < 0.4 kA

### Conductor cross-sections for auxiliary and control circuits

#### Connection type

##### Terminal screw

##### Conductor cross-sections 1 or 2 conductors

- Solid
- Finely stranded with end sleeve
- Stranded
- AWG cables

#### Screw terminal

Pozidriv size 2

mm <sup>2</sup>	2 x (0.5 ... 1.5) / 2 x (0.75 ... 2.5)
mm <sup>2</sup>	2 x (0.5 ... 1.5) / 2 x (0.75 ... 2.5)
mm <sup>2</sup>	2 x (0.5 ... 1.5) / 2 x (0.75 ... 2.5)
AWG	2 x (18 ... 14)

#### Connection type

##### Conductor cross-sections (1 or 2 conductors connectable)

- Solid
  - Finely stranded with end sleeve
  - Finely stranded without end sleeve
  - AWG conductors, solid or stranded
- Max. external diameter of the cable insulation: 3.6 mm.

#### Cage Clamp terminals <sup>1) 2)</sup>

mm <sup>2</sup>	2 x (0.25 ... 2.5)
mm <sup>2</sup>	2 x (0.25 ... 1.5)
mm <sup>2</sup>	2 x (0.25 ... 2.5)
AWG	2 x (24 ... 14)

1) With conductor cross-sections of ≤ 1 mm<sup>2</sup> an "insulation stop" must be used, see accessories for "Contactors and Contactor Assemblies".

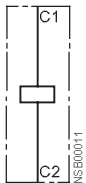
2) Corresponding 8WA2803/8WA2804 opening tool, see Accessories.

## Schematics

### Internal connections

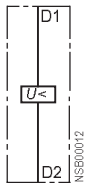
#### Shunt release

3RV19 02-1D



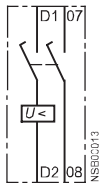
#### Undervoltage release

3RV19 02-1A



#### Undervoltage release with leading auxiliary contacts

3RV19 12-1C  
3RV19 22-1C



#### Transverse auxiliary switches

3RV19 01-1D  
3RV19 01-1G



3RV19 01-1E  
3RV19 01-2E



3RV19 01-1F  
3RV19 01-2F



#### Lateral auxiliary switches with 2 contacts

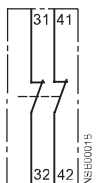
3RV19 01-1A  
3RV19 01-2A



3RV19 01-1B  
3RV19 01-2B

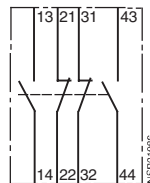


3RV19 01-1C  
3RV19 01-2C



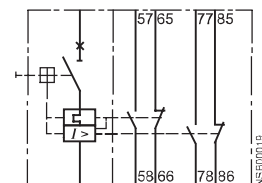
#### Lateral auxiliary switches with 4 contacts

3RV19 01-1J



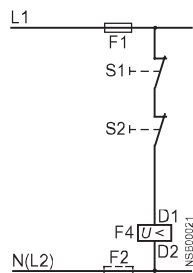
#### Alarm switch

3RV19 21-1M

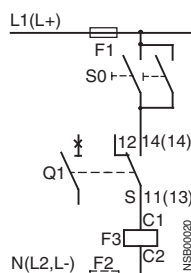


### Circuit diagrams

#### Undervoltage release



#### Shunt release



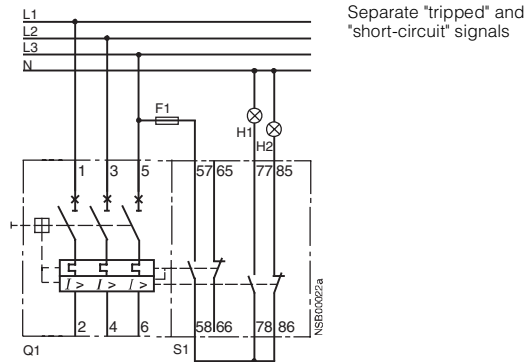
- S0; S1; S2 OFF button in the system
- Q1 Motor starter protector
- S Auxiliary switch of the motor starter protector Q1
- F1; F2 Fuse (gL/gG) max. 10 A
- F3 Shunt release
- F4 Undervoltage release

# 3RV Motor Starter Protectors up to 100 A Accessories

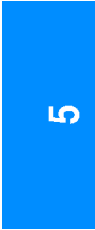
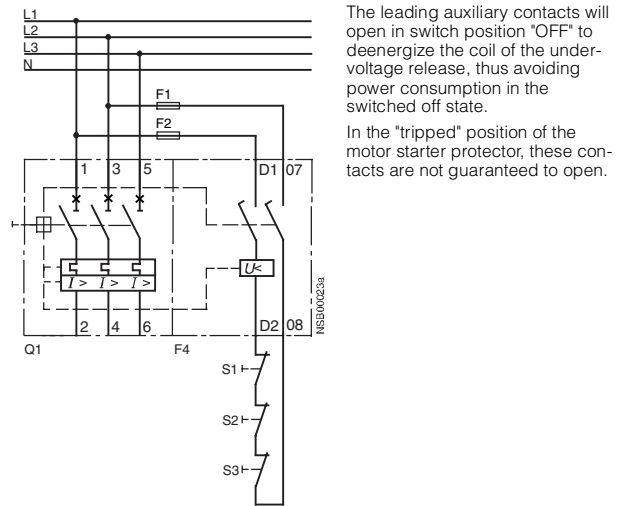
## Mountable accessories

### Switching examples

3RV1 motor starter protector with 3RV19 21-1M alarm switch



Motor starter protectors tripped by means of pushbutton or EMERGENCY-STOP button in the system



# 3RV Motor Starter Protectors up to 100 A

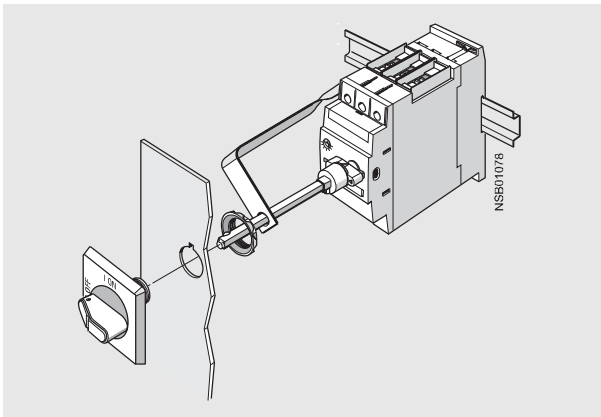
## Accessories

### Rotary operating mechanisms

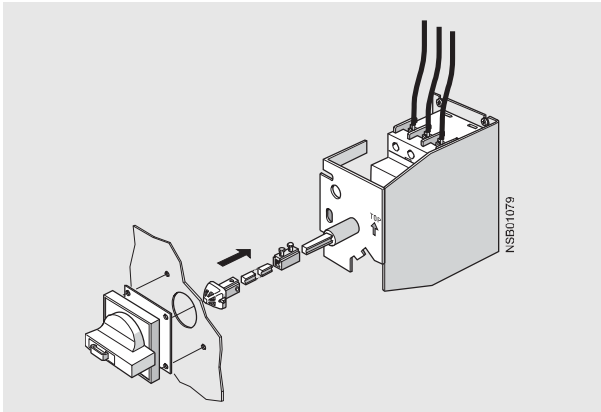
#### Overview

##### Door-coupling rotary operating mechanisms

Motor starter protectors with a rotary operating mechanism can be mounted in a control cabinet and operated externally by means of a door-coupling rotary operating mechanism. When the cabinet door with motor starter protector is closed, the operating mechanism is coupled. When the motor starter protector closes, the coupling is locked which prevents the door from being opened unintentionally. This lock can be defeated by the maintenance personnel. In the Open position, the rotary operating mechanism can be secured against reclosing with up to 3 padlocks. Inadvertent opening of the door is not possible in this case either.



3RV19 26-0K door-coupling rotary operating mechanism



3RV19 26-2B door-coupling rotary operating mechanism for arduous conditions

##### Remote motorized operating mechanism

3RV1 motor starter protectors are manually operated controls. They automatically trip in case of an overload or short-circuit. Intentional remote-controlled tripping is possible by means of a shunt release or an undervoltage release. Reclosing is only possible directly at the motor starter protector.

The remote motorized operating mechanism allows the motor starter protectors to be opened and closed by electrical commands. This enables a load or an installation to be isolated from the power system or reconnected to it from an operator panel.

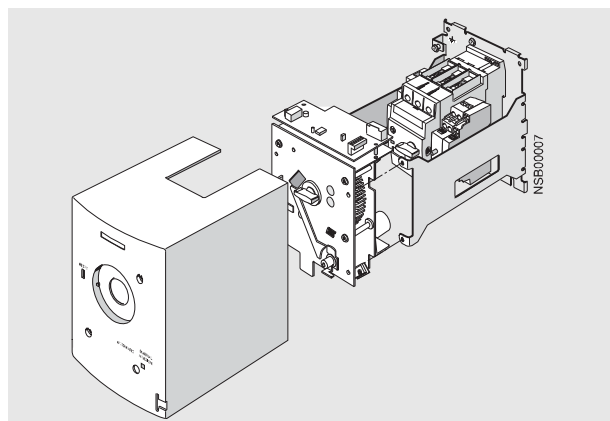
If the motor starter protector is tripped as a result of overload or short-circuit, it will be in tripped position. For reclosing, the remote motorized operating mechanism must first be set manually or electrically to the 0 position (electrically by means of the Open command). Then it can be reclosed.

The remote motorized operating mechanism is available for motor starter protectors of size S2 ( $I_{nmax} = 50 A$ ) and S3 ( $I_{nmax} = 100 A$ ) that are designed for control voltages of 230 V AC and 24 V DC. The motor starter protector is fitted into the remote motorized operating mechanism as shown in the drawing.

In the "MANUAL" position, the motor starter protector in the remote motorized operating mechanism can continue to be switched manually on site. In the "AUTOMATIC" position, the motor starter protector is switched by means of electrical commands. The switching command must be applied for a minimum of 100 ms. The remote motorized operating mechanism closes the motor starter protector after a maximum of 1 second. On voltage failure during the switching operation it is ensured that the motor starter protector remains in the Open or Closed position.

##### Reset function

The RESET button on the motorized operating mechanism serves to reset any 3RV19 21-1M alarm switch that might be installed.



# 3RV Motor Starter Protectors up to 100 A Accessories

## Rotary operating mechanisms

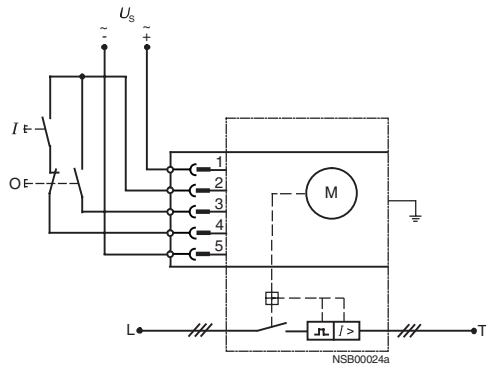
### Technical specifications

Remote motorized operating mechanism		
• Max. power consumption at $U_s = 24$ V DC	W	48
• Max. power consumption at $U_s = 230$ V AC	VA	170
• Operating range		$0.85 \dots 1.1 \times U_s$
• Minimum command duration at $U_s$	s	0.1
• Max. command duration		Unlimited (uninterrupted operation)
• Max. total break time, remote-controlled	s	2
• Ready to reclose after approx.	s	2.5
• Operating frequency	1/h	25
• Internal back-up fuse		
- 230 V AC	A	0.8
- 24 V DC	A	1.6
<b>Connection type of control leads</b>		Connector with screw terminal
<b>Shock resistance according to IEC 68 Part 2-27</b>		g/ms 25 /11 (square and sinusoidal pulse)

### Schematics

#### Switching examples

3RV1 motor starter protectors with 3RV19 36/3RV19 46 remote-controlled motorized operating mechanisms



# 3RV Motor Starter Protectors up to 100 A Accessories

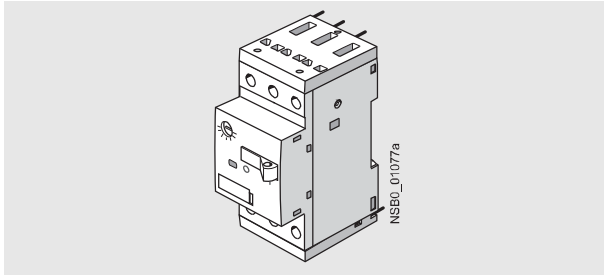
## Mounting accessories

### Overview

#### Soldering terminals

Soldering terminals are available for the main contacts and transverse auxiliary switches of size S00 motor starter protectors.

The prepared terminal parts are clamped to the upper and lower screw terminals of the motor starter protectors which allows them to be soldered into printed circuit boards.



3RV19 18-5A

#### Terminals for "Self-Protected Combination Motor Controllers (Type E)" according to UL508

The 3RV10 motor starter protectors are approved according to UL508 as "Self-Protected Combination Motor Controllers (Type E)".

As of 16 July 2001, for this application, UL 508 demands increased clearance and creepage distances (1 inch and 2 inches respectively) at the line side of the device.

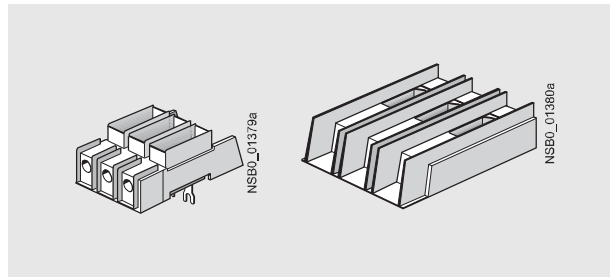
The 3RV19 28-1H terminal block must be used here for size S0; it is simply screwed onto the basic unit.

Basic units of size S2 are already compliant with the new clearance and creepage distance requirements.

The 3RT19 46-4GA07 terminal block must be used for size S3. The standard box terminal is to be replaced by this terminal block.

According to CSA, these modular terminals can be omitted when the device is used as a "Self-Protected Combination Motor Controller" (Type E).




Three-phase line-side terminals are required for constructing "Type E Starters" with an insulated busbar system (see Busbar Accessories).



3RV19 28-1H (left), 3RT19 46-4GA07 (right)



### Technical specifications

Terminals for "Self-Protected Combination Motor Controllers (Type E)" according to UL508			
Type		3RV19 28-1H	3RT19 46-4GA07
<b>Conductor cross-sections</b>			
<b>• Front clamping point connected</b>			
	- Solid	mm <sup>2</sup>	1 ... 10
	- Finely stranded with end sleeve	mm <sup>2</sup>	1 ... 16
	- Stranded	mm <sup>2</sup>	2.5 ... 25
	- AWG conductors, solid or stranded	mm <sup>2</sup>	14 ... 3
	- Terminal screw		M4
See data for 3RV1.4 motor starter protectors			
<b>• Rear clamping point connected</b>			
	- Solid	mm <sup>2</sup>	1 ... 10
	- Finely stranded with end sleeve	mm <sup>2</sup>	1 ... 16
	- Stranded	mm <sup>2</sup>	1.5 ... 25
	- AWG conductors, solid or stranded	mm <sup>2</sup>	16 ... 3
	- Terminal screw		M4
<b>• Both clamping points connected</b>			
	<b>- Front clamping point</b>		
	- Solid	mm <sup>2</sup>	1 ... 10
	- Finely stranded with end sleeve	mm <sup>2</sup>	1 ... 10
	- Stranded	mm <sup>2</sup>	2.5 ... 10
	- AWG conductors, solid or stranded	mm <sup>2</sup>	14 ... 6
	- Terminal screw		M4
	<b>- Rear clamping point</b>		
	- Solid	mm <sup>2</sup>	1 ... 10
	- Finely stranded with end sleeve	mm <sup>2</sup>	1 ... 10
	- Stranded	mm <sup>2</sup>	5 ... 25
- AWG conductors, solid or stranded	mm <sup>2</sup>	16 ... 3	
- Terminal screw		M4	

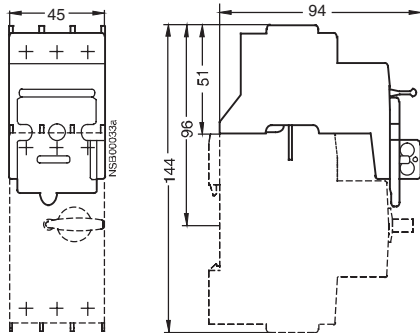
# 3RV Motor Starter Protectors up to 100 A Accessories

## Project planning aids

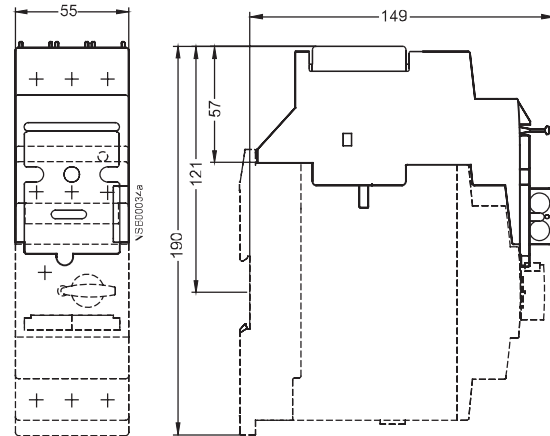
### Dimensional drawings

#### Disconnecter modules

3RV19 28-1A  
For motor starter protector size S0



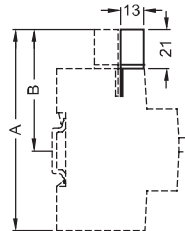
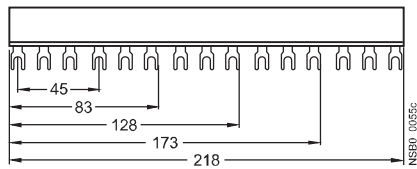
3RV19 38-1A  
For motor starter protector size S2



#### Busbars

##### 3RV19 15-1.. 3-phase busbar

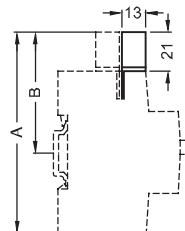
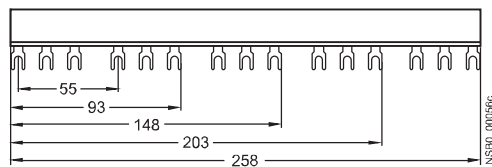
For motor starter protector sizes S00 and S0, modular spacing 45 mm  
 3RV19 15-1AB for two motor starter protectors  
 3RV19 15-1BB for three motor starter protectors  
 3RV19 15-1CB for four motor starter protectors  
 3RV19 15-1DB for five motor starter protectors



	S00	S0
A	111	119
B	67	70

##### 3RV19 15-2.. 3-phase busbar

For motor starter protector sizes S00 and S0, modular spacing 55 mm  
 3RV19 15-2AB for two motor starter protectors with accessory  
 3RV19 15-2BB for three motor starter protectors with accessory  
 3RV19 15-2CB for four motor starter protectors with accessory  
 3RV19 15-2DB for five motor starter protectors with accessory



	S00	S0
A	111	119
B	67	70



# 3RV Motor Starter Protectors up to 100 A Accessories

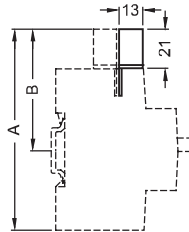
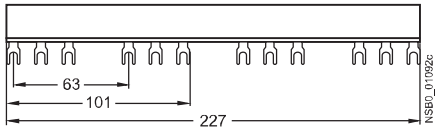
## Project planning aids

### 3RV19 15-3.. 3-phase busbar

For motor starter protector sizes S00 and S0, modular spacing 63 mm

3RV19 15-3AB for two motor starter protectors with accessory

3RV19 15-3CB for four motor starter protectors with accessory



	S00	S0
A	111	119
B	67	70

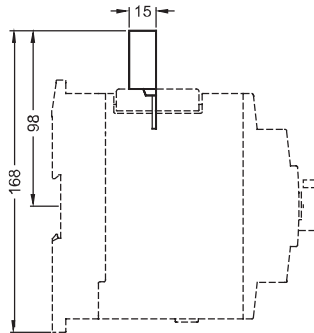
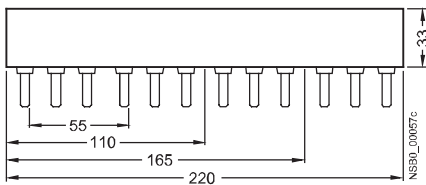
### 3RV19 35-1. 3-phase busbar

For motor starter protector size S2, modular spacing 55 mm

3RV19 35-1A for two motor starter protectors

3RV19 35-1B for three motor starter protectors

3RV19 35-1C for four motor starter protectors



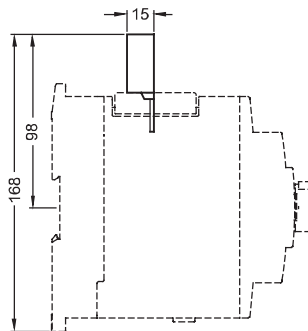
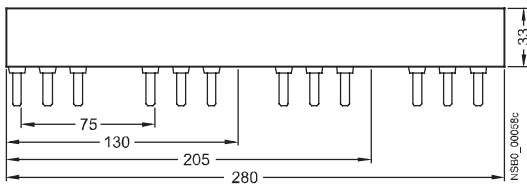
### 3RV19 35-3. 3-phase busbar

For motor starter protector size S2, modular spacing 75 mm

3RV19 35-3A for two motor starter protectors with accessory

3RV19 35-3B for three motor starter protectors with accessory

3RV19 35-3C for four motor starter protectors with accessory

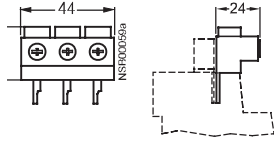


# 3RV Motor Starter Protectors up to 100 A Accessories

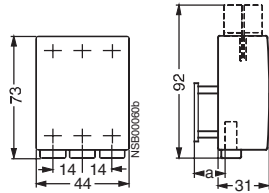
## Project planning aids

### 3RV19 15-5. 3-phase line-side terminals

3RV19 15-5A  
Connected from top  
Size S00



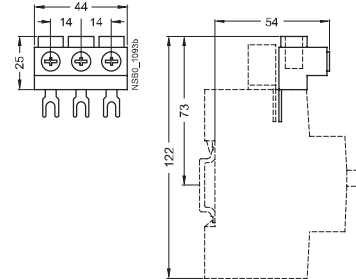
3RV19 15-5B  
Connected from below  
Size S00 and S0



a) 3RV1. 1 19 mm  
3RV1. 2 23 mm

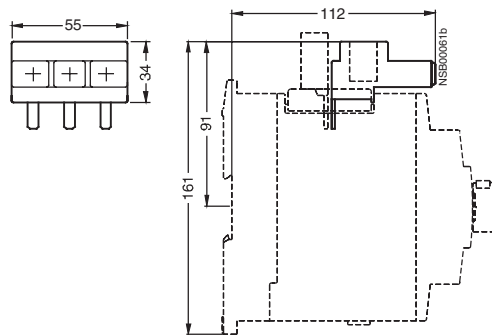
### 3RV19 25-5AB 3-phase line-side terminal

Connected from top  
Size S0



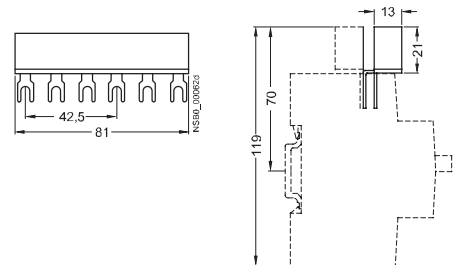
### 3RV19 35-5A 3-phase line-side terminal

For motor starter protector size S2



### 3RV19 15-5DB connecting piece

For connecting three-phase busbars  
for motor starter protector  
Size S0 (left) to size S00 (right)

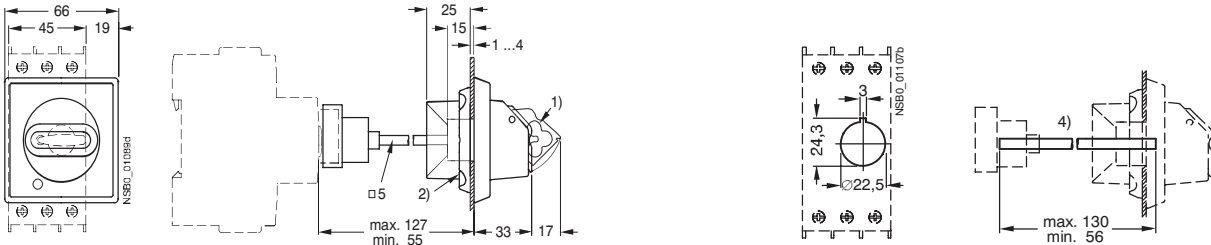


# 3RV Motor Starter Protectors up to 100 A Accessories

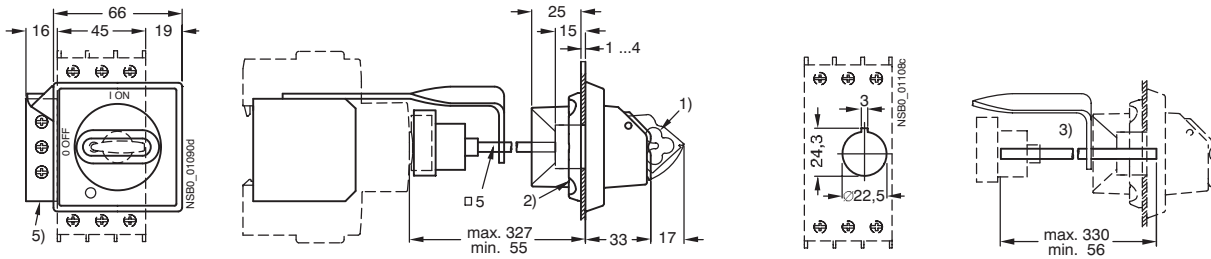
## Project planning aids

### 3RV19 26-0. door-coupling rotary operating mechanisms

3RV19 26-0B  
3RV19 26-0C  
Short shaft<sup>4)</sup>, for motor starter protector sizes S0, S2, S3



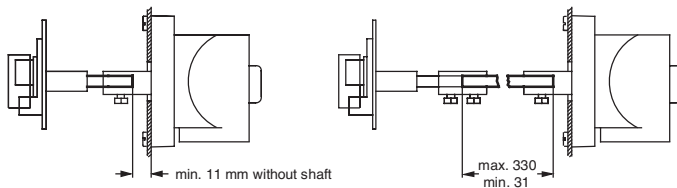
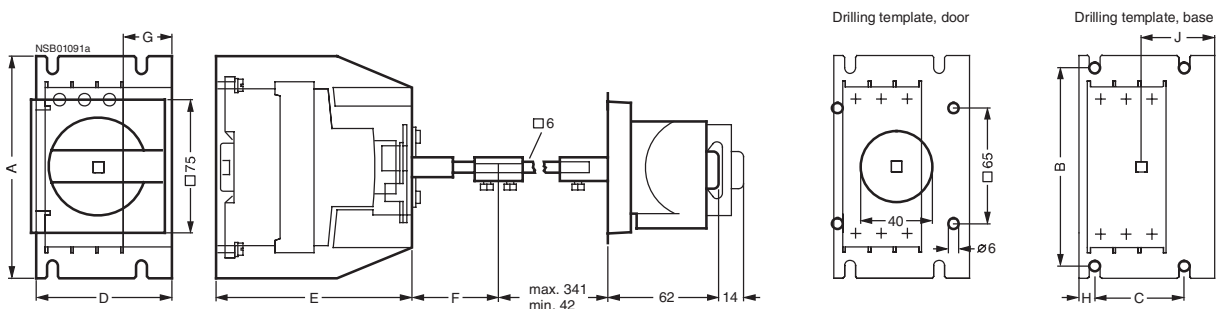
3RV19 26-0K  
3RV19 26-0L  
Long shaft (with bracket)<sup>3)</sup>, for motor starter protector sizes S0, S2, S3



- 1) Lockable in neutral position with max. 8 mm shackle diameter.
- 2) Mounted with screw cap.
- 3) Supplied with a shaft length of 330 mm; can be adjusted by shortening the shaft.
- 4) Supplied with a shaft length of 130 mm; can be adjusted by shortening the shaft.
- 5) 35 mm<sup>2</sup> ground terminal and fixing bracket for 330 mm shaft.

### 3RV19 .6-2 door-coupling rotary operating mechanisms for arduous conditions

3RV19 26-2., 3RV19 36-2., 3RV19 46-2.  
for sizes S0, S2 and S3



Type	Size	Dimensions								
		A	B	C	D	E	F	G	H	J
3RV19 26-2. S0		125	111	50	77	112	50	27	9	42
3RV19 36-2. S2		170	160	60	87	162	50	27	10	47
3RV19 46-2. S3		194	185	60	100	187	48	25	10	53

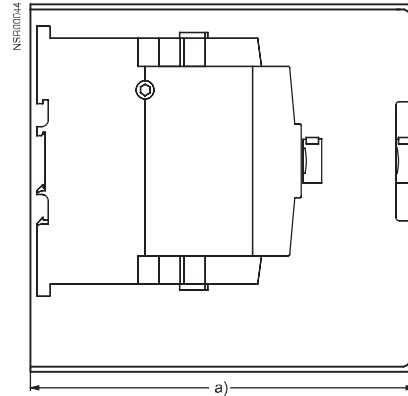
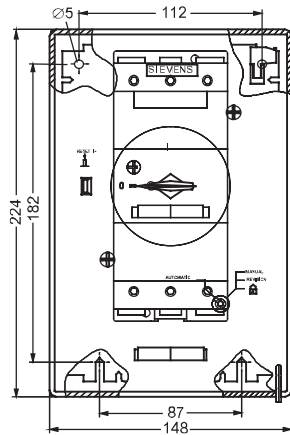


# 3RV Motor Starter Protectors up to 100 A Accessories

## Project planning aids

### Remote motorized operating mechanisms

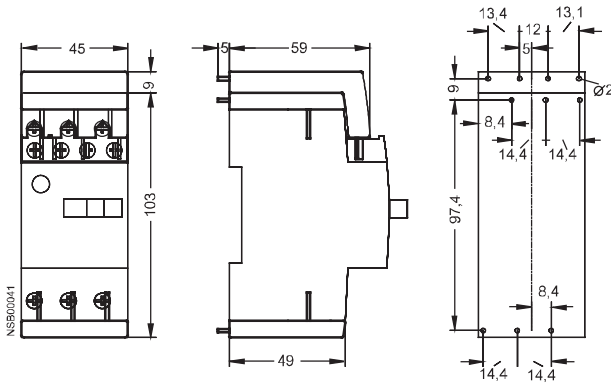
3RV19 6-3AP0  
For sizes S2 and S3



a) 3RV19 36-3AP0: 211 mm  
3RV19 46-3AP0: 236 mm

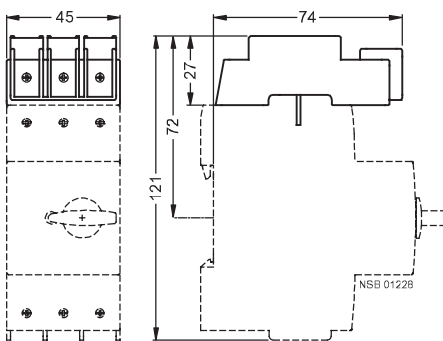
### 3RV19 18-5. solder pin adapter

3RV19 18-5A  
3RV19 18-5B

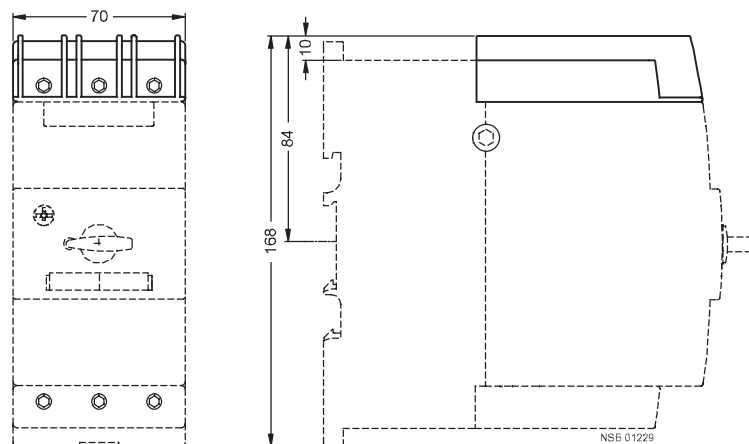


### Terminals for "Self-Protected Combination Motor Controller (Type E)" according to UL508

3RV19 28-1H



3RT19 46-4GA07

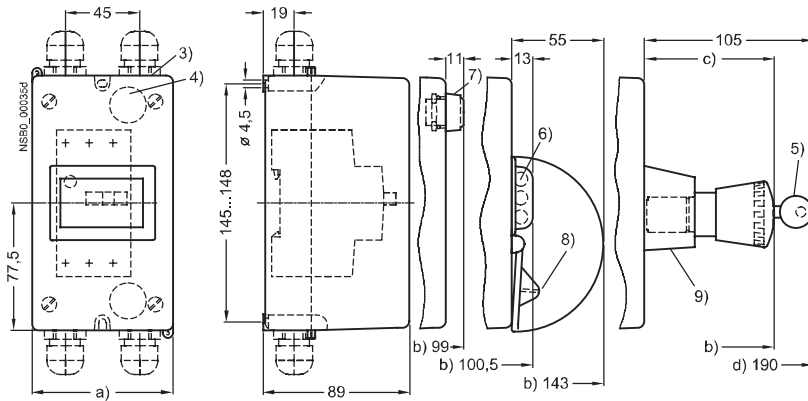


# 3RV Motor Starter Protectors up to 100 A Accessories

## Project planning aids

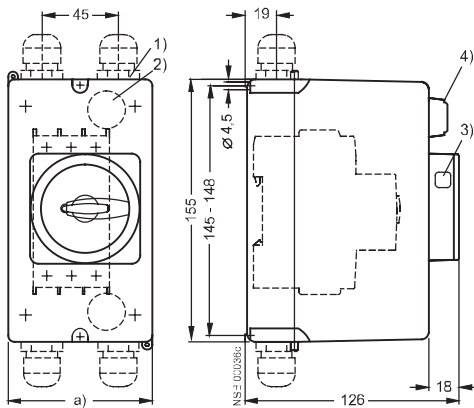
### 3RV19 .3-1.... molded-plastic enclosure for surface mounting

For motor starter protector size S00  
3RV19 13-1....



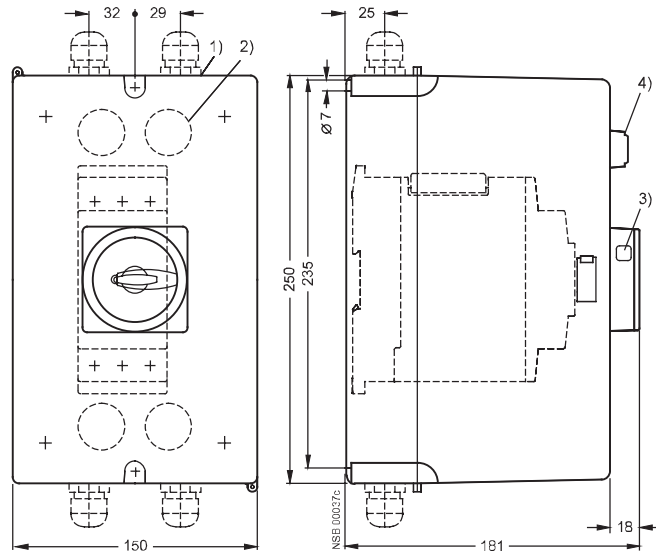
- a) 3RV19 13-1CA00 85 mm
- b) With 3RV19 13-7D: 154 mm  
With 3RV19 13-7E: 174 mm  
Dimensions refer to mounting surface.
- c) With 3RV19 13-7D: 64 mm  
With 3RV19 13-7E: 84 mm.
- d) Dimensions refer to mounting surface.
- 3) Knock-outs for M25.
- 4) Knock-outs for rear main conductor connection M20.
- 5) With safety lock.
- 6) Max. shackle diameter for padlock 8 mm.
- 7) 3RV19 03-5 indicator light.
- 8) 3RV19 13-6B locking device.
- 9) 3RV19 13-7 EMERGENCY-STOP mushroom button.

For motor starter protector size S0  
3RV19 23-1....



- a) 3RV19 23-1CA00 85 mm  
3RV19 23-1DA00 105 mm.
- 1) Knock-outs for M25.
- 2) Knock-outs for rear main conductor connection M20.
- 3) Opening for padlock with shackle diameter max. 6 mm ... 8 mm.
- 4) 3RV19 03-5 indicator light.

For motor starter protector size S2  
3RV19 33-1....



- 1) Knock-outs for M32 (left) and M40 (right).
- 2) Knock-outs for rear main conductor connection M32.
- 3) Opening for padlock with shackle diameter max. 6 mm ... 8 mm.
- 4) 3RV19 03-5 indicator light.

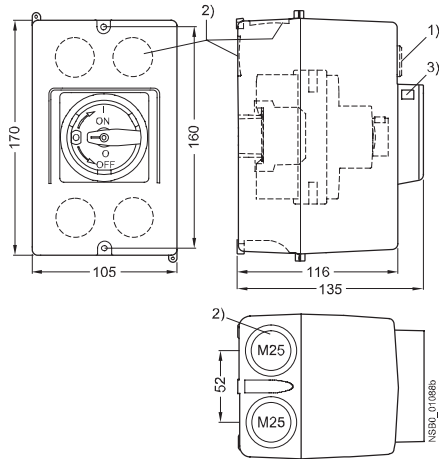


# 3RV Motor Starter Protectors up to 100 A Accessories

## Project planning aids

### 3RV19 23-1. . . . cast aluminum enclosure for surface mounting

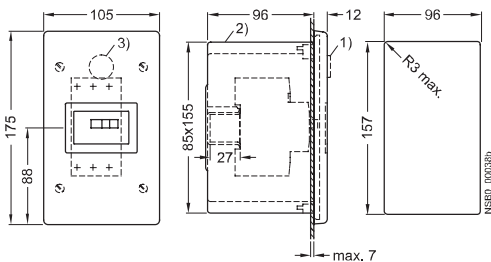
for motor starter protector size S0  
3RV19 23-1DA01  
3RV19 23-1G



- 1) 3RV19 03-5 indicator light.
- 2) Knock-outs for M25 cable glands.
- 3) Opening for padlock with shackle diameter of 6 mm to 8 mm.

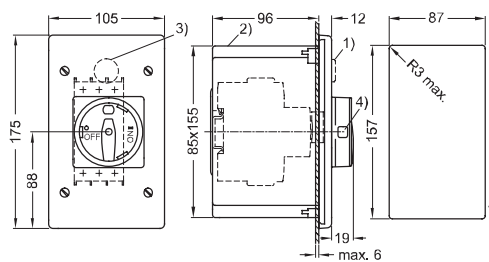
### 3RV19 .3-2.... molded-plastic enclosure for flush mounting

For motor starter protector size S00  
3RV19 13-2DA00



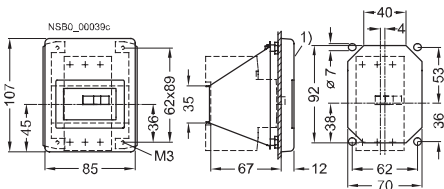
- 1) 3RV19 03-5 indicator light.
- 2) Knock-outs for M25.
- 3) Knock-outs for M20.
- 4) Opening for padlock with shackle diameter of 6 mm to 8 mm.

For motor starter protector size S0  
3RV19 23-2DA00  
3RV19 23-2GA00



### 3RV19 13-4C molded-plastic front plate

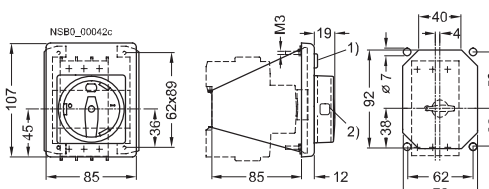
For motor starter protector size S00  
3RV19 13-4C



- 1) 3RV19 03-5 indicator light.
- 2) Opening for padlock with shackle diameter of 6 mm to 8 mm.

### 3RV19 23-4. molded-plastic front plate


For motor starter protector size S0, S2, S3  
3RV19 23-4B  
3RV19 23-4E  
3RV19 23-4G (for size S0 only)



# Overload Relays

## General data

### Overview

Features	Benefits	3RU11	3RB20/3RB21	3RB22/3RB23
				
<b>General data</b>				
<b>Sizes</b>	<ul style="list-style-type: none"> <li>Are coordinated with the dimensions, connections and technical characteristics of the other devices in the SIRIUS modular system (contactors, soft starters, ...)</li> <li>Permit the mounting of slim and compact load feeders in widths of 45 mm (S00), 45 mm (S0), 55 mm (S2), 70 mm (S3), 120 mm (S6) and 145 mm (S10/S12)</li> <li>Simplify configuration</li> </ul>	S00 ... S3	S00 ... S12	S00 ... S12
<b>Seamless current range</b>	<ul style="list-style-type: none"> <li>Allows easy and consistent configuration with one series of overload relays (for small to large loads)</li> </ul>	0.11 ... 100 A	0.1 ... 630 A	0.3 ... 630 A (... 820 A) <sup>1)</sup>
<b>Protective functions</b>				
<b>Tripping in the event of overload</b>	<ul style="list-style-type: none"> <li>Provides optimum inverse-time delayed protection of loads against excessive temperature rises due to overload</li> </ul>	✓	✓	✓
<b>Tripping in the event of phase unbalance</b>	<ul style="list-style-type: none"> <li>Provides optimum inverse-time delayed protection of loads against excessive temperature rises due to phase unbalance</li> </ul>	(✓)	✓	✓
<b>Tripping in the event of phase failure</b>	<ul style="list-style-type: none"> <li>Minimizes heating of induction motors during single-phase operation <sup>2)</sup></li> </ul>	✓	✓	✓
<b>Tripping in the event of overheating</b>	<ul style="list-style-type: none"> <li>Provides optimum temperature-dependent protection of loads against excessive temperature rises e.g. for stator-critical motors or in the event of insufficient coolant flow, contamination of the motor surface or for long starting or braking operations</li> <li>Eliminates the need for additional special equipment</li> <li>Saves space in the controlgear cabinet</li> <li>Reduces wiring overhead and costs</li> </ul>	-- <sup>3)</sup>	-- <sup>3)</sup>	✓
by <b>integrated thermistor motor protection function</b>				
<b>Tripping in the event of a ground fault</b>	<ul style="list-style-type: none"> <li>Provides optimum protection of loads against high-resistance short-circuits or ground faults due to moisture, condensed water, damage to the insulation material, etc.</li> <li>Eliminates the need for additional special equipment.</li> <li>Saves space in the controlgear cabinet</li> <li>Reduces wiring overhead and costs</li> </ul>	--	✓ (only 3RB21)	✓
by <b>internal ground fault detection (activatable)</b>				
<b>Features</b>				
<b>RESET function</b>	<ul style="list-style-type: none"> <li>Allows manual or automatic resetting of the relay</li> </ul>	✓	✓	✓
<b>TEST function for auxiliary contacts</b>	<ul style="list-style-type: none"> <li>Allows easy checking of the function and wiring</li> </ul>	✓	✓	✓
<b>TEST function for electronics</b>	<ul style="list-style-type: none"> <li>Allows complete checking of the electronics</li> </ul>	--	✓	✓
<b>Status display</b>	<ul style="list-style-type: none"> <li>Displays the current operating status</li> </ul>	✓	✓	✓
<b>Large current adjustment button</b>	<ul style="list-style-type: none"> <li>Makes it easier to set the relay exactly to the correct current value</li> </ul>	✓	✓	✓
<b>Integrated auxiliary contacts (1 NO + 1 NC)</b>	<ul style="list-style-type: none"> <li>Allows the load to be switched off if necessary</li> <li>Can be used to output signals</li> </ul>	✓	✓	✓ (2 ×)


1) For motor currents up to 820 A, a current measuring module, e.g. 0.3 ... 3 A, can be used in combination with a 3UF18 series transformer.

2) Single-phase operation: Abnormal operating status of a three-phase asynchronous motor where one phase is interrupted.

3) The SIRIUS 3RN thermistor motor protection devices can be used to provide additional temperature-dependent protection.

# Overload Relays

## General data

Features	Benefits	3RU11	3RB20/3RB21	3RB22/3RB23
				
<b>Design of load feeders</b>				
<b>Short-circuit strength up to 100 kA at 690 V</b> (in conjunction with the corresponding fuses or the corresponding motor starter protector)	<ul style="list-style-type: none"> <li>Provides optimum protection of the loads and operating personnel in the event of short-circuits due to insulation faults or faulty switching operations</li> </ul>	✓	✓	✓
<b>Electrical and mechanical matching to 3RT1 contactors</b>	<ul style="list-style-type: none"> <li>Simplifies configuration</li> <li>Reduces wiring overhead and costs</li> <li>Enables stand-alone installation as well as space-saving direct mounting</li> </ul>	✓	✓	✓ <sup>1)</sup>
<b>Straight-through transformers for main circuit<sup>2)</sup></b> (in this case the cables are routed through the feed-through openings of the overload relay and connected directly to the box terminals of the contactor)	<ul style="list-style-type: none"> <li>Reduces the contact resistance (only one point of contact)</li> <li>Saves wiring costs (easy, no need for tools, and fast)</li> <li>Saves material costs</li> <li>Reduces installation costs</li> </ul>	--	✓ (S2 ... S6)	✓ (S00 ... S6)
<b>Spring-loaded terminal connection system for main circuit<sup>2)</sup></b>	<ul style="list-style-type: none"> <li>Enables fast connections</li> <li>Permits vibration-resistant connections</li> <li>Enables maintenance-free connections</li> </ul>	✓ (S00)	--	--
<b>Spring-loaded terminal connection system for auxiliary circuits<sup>2)</sup></b>	<ul style="list-style-type: none"> <li>Enables fast connections</li> <li>Permits vibration-resistant connections</li> <li>Enables maintenance-free connections</li> </ul>	✓	✓	✓
<b>Other features</b>				
<b>Temperature compensation</b>	<ul style="list-style-type: none"> <li>Allows the use of the relays at high temperatures without derating</li> <li>Prevents premature tripping</li> <li>Allows compact installation of the controlgear cabinet without distance between the devices/load feeders</li> <li>Simplifies configuration</li> <li>Enables space to be saved in the controlgear cabinet</li> </ul>	✓	✓	✓
<b>Very high long-term stability</b>	<ul style="list-style-type: none"> <li>Provides safe protection for the loads even after years of use in severe operating conditions</li> </ul>	(✓)	✓	✓
<b>Wide setting ranges</b>	<ul style="list-style-type: none"> <li>Reduce the number of variants</li> <li>Minimize the engineering outlay and costs</li> <li>Minimize storage overhead, storage costs, tied-up capital</li> </ul>	--	✓ (1:4)	✓ (1:10)
<b>Trip class CLASS 5</b>	<ul style="list-style-type: none"> <li>Enables solutions for very fast starting motors requiring special protection (e.g. Ex motors)</li> </ul>	--	✓ (only 3RB21)	✓
<b>Trip classes &gt; CLASS 10</b>	<ul style="list-style-type: none"> <li>Enable heavy starting solutions</li> </ul>	--	✓	✓
<b>Low power loss</b>	<ul style="list-style-type: none"> <li>Reduces power consumption and energy costs (up 98% less power is used than for thermal overload relays).</li> <li>Minimizes temperature rises of the contactor and controlgear cabinet – in some cases this may eliminate the need for controlgear cabinet cooling.</li> <li>Direct mounting to contactor saves space, even for high motor currents (i.e. no heat decoupling is required).</li> </ul>	--	✓	✓


1) Exception: Up to size S3, only stand-alone installation is possible.

2) Alternatively available for screw terminal.



# Overload Relays

## General data




Features	Benefits	3RU11	3RB20/3RB21	3RB22/3RB23
				
<b>Other features</b>				
<b>Internal power supply</b>	<ul style="list-style-type: none"> <li>Eliminates the need for configuration and connecting an additional control circuit</li> </ul>	-- 1)	✓	--
<b>Variable adjustment of the trip classes</b> (The required trip class can be adjusted by means of a rotary knob depending on the current starting condition.)	<ul style="list-style-type: none"> <li>Reduces the number of variants</li> <li>Minimizes the configuring outlay and costs</li> <li>Minimizes storage overhead, storage costs, and tied-up capital</li> </ul>	--	✓ (only 3RB21)	✓
<b>Overload warning</b>	<ul style="list-style-type: none"> <li>Indicates imminent tripping of the relay directly on the device due to overload, phase unbalance or phase failure</li> <li>Allows the imminent tripping of the relay to be signaled</li> <li>Allows measures to be taken in time in the event of continuous inverse-time delayed overloads</li> <li>Eliminates the need for an additional device</li> <li>Saves space in the controlgear cabinet</li> <li>Reduces wiring overhead and costs</li> </ul>	--	--	✓
<b>Analog output</b>	<ul style="list-style-type: none"> <li>Allows the output of an analog output signal for actuating moving-coil instruments, feeding programmable logic controllers or transfer to bus systems</li> <li>Eliminates the need for an additional measuring transformer and signal converter</li> <li>Saves space in the controlgear cabinet</li> <li>Reduces wiring overhead and costs</li> </ul>	--	--	✓

1) The SIRIUS 3RU11 thermal overload relays use a bimetal contactor and therefore do not require an additional control circuit.



# Overload Relays

## General data

Overload Relays	Current measurement	Current range	Contactors (type, size, rating in kW)							
			3RT10 1	3RT10 2	3RT10 3	3RT10 4	3RT10 5	3RT10 6	3RT10 7	3TF68/69
Type	Type	A	S00 3/4/5.5	S0 5.5/7.5/11	S2 15/18.5/22	S3 30/37/45	S6 55/75/90	S10 110/132/160	S12 200/250	Size 14 375/450
<b>3RU11 thermal overload relays</b>										
	3RU11 1	Integrated	0.11 ... 12	✓						
	3RU11 2		1.8 ... 25		✓					
	3RU11 3		5.5 ... 50			✓				
	3RU11 4		18 ... 100				✓			
<b>3RB20/3RB21<sup>1)</sup> solid-state overload relays</b>										
	3RB2. 1	Integrated	0.1 ... 12	✓						
	3RB2. 2		3 ... 25		✓					
	3RB2. 3		6 ... 50			✓				
	3RB2. 4		12.5 ... 100				✓			
	3RB2. 5		50 ... 200					✓		
	3RB2. 6		55 ... 630						✓	✓
<b>3RB22/3RB23<sup>1)</sup> solid-state overload relays</b>										
	3RB22/3RB23 + 3RB29 0		0.3 ... 25	✓	✓					
	3RB29 0		10 ... 100			✓	✓			
	3RB29 5		20 ... 200					✓		
	3RB29 6		63 ... 630						✓	✓
	3RB29 0 + 3UF18		630 ... 820							✓

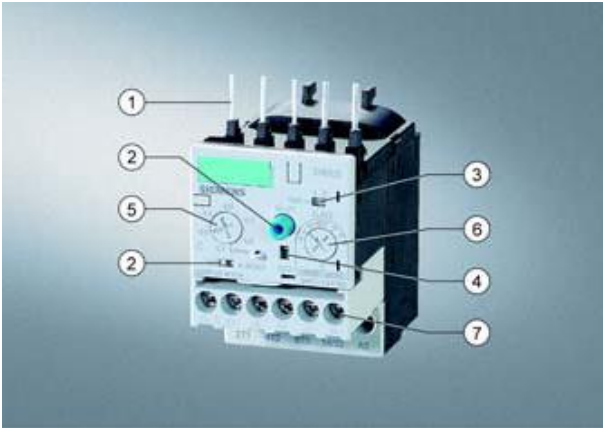
1) When using the overload relays with trip class  $\geq$  CLASS 20, see Technical Specifications, Short-Circuit Protection with Fuses for Motor Feeders, and the configuring aid "Configuring SIRIUS Fuseless Load Feeders".

# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB20, 3RB21 for standard applications

#### Overview



- (1) Connection for mounting onto contactors:  
Optimally adapted in electrical, mechanical and design terms to the contactors and soft starters, these connecting pins can be used for direct mounting of the overload relays. Stand-alone installation is possible as an alternative (in some cases in conjunction with a stand-alone installation module).
- (2) Selector switch for manual/automatic RESET and RESET button:  
With the slide switch you can choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. On the 3RB21 a solid-state remote RESET is integrated.
- (3) Switch position indicator and TEST function of the wiring:  
Indicates a trip and enables the wiring test.
- (4) Solid-state test:  
Enables a test of all important device components and functions.
- (5) Motor current setting:  
Setting the device to the rated motor current is easy with the large rotary knob.
- (6) 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 starting conditions.
- (7) 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-type terminals and alternatively with spring-loaded terminals.

The 3RB20 and 3RB21 solid-state overload relays up to 630 A with internal power supply have been designed for inverse-time delayed protection of loads with normal and heavy starting (see [Function](#)) against excessive temperature rises due to overload, phase unbalance or phase failure. An overload, phase unbalance or phase failure result in an increase of the motor current beyond the set motor rated 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 set current  $I_e$  and is stored in the form of a long-term stable tripping characteristic (see [Characteristic Curves](#)).

In addition to inverse-time delayed protection of loads against excessive temperature rises due to overload, phase unbalance and phase failure, the 3RB21 solid-state overload relays also allow internal ground-fault detection (not possible in conjunction with wye-delta assemblies). 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 (see [Function](#)). Resetting takes place either manually or automatically after the recovery time has elapsed (see [Function](#)).

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.

#### Design

##### Device concept

The 3RB20/3RB21 solid-state overload relays are compact devices, i.e. current measurement (transformer) and the evaluation unit are integrated in a single enclosure.

##### Mounting options

The 3RB20/3RB21 solid-state overload relays are suitable for direct and space-saving mounting onto 3RT1 contactors and 3RW30/3RW31 soft starters as well as for stand-alone installation. For more information on the mounting options, please see [Technical Specifications and Selection and Ordering Data](#).

##### Connection technique

###### Main circuit

All sizes of the 3RB20/3RB21 solid-state overload relays can be connected with screw-type terminals. As an alternative for sizes S3 to S10/S12, the main circuits can be connected with the help of rails. Sizes S2 to S6 of the 3RB20/3RB21 relays are also available with a straight-through transformer. In this case, the cables of the main circuit are routed directly through the feed-through openings of the relay to the contactor terminals.

###### Auxiliary circuit

Connection of the auxiliary circuit (removable terminal block) is possible with either screw terminals or spring-loaded terminals (special device variants).

For more information on the connection options, see [Technical Specifications and Selection and Ordering Data](#).

##### Overload relays in contactor assemblies for Wye-Delta starting

When overload relays are used in combination with contactor assemblies for Wye-Delta starting it must be noted that only 0.58 times the motor current flows through the line contactor. An overload relay mounted onto the line contactor must be set to 0.58 times the motor current.

An assignment of the 3RB20 solid-state overload relays to the line contactors of our 3RA Wye-Delta assemblies can be found under "Controls: Contactors and Contactor Assemblies".

When 3RB21 solid-state overload relays are used in combination with contactor assemblies for Wye-Delta starting, the internal ground-fault detection must not be activated.

##### Operation with frequency converter

The 3RB20/3RB21 solid-state overload relays are suitable for frequencies of 50/60 Hz and the associated harmonics. This permits the 3RB20/3RB21 overload relays to be used on the incoming side of the frequency converter.

If motor protection is required on the outgoing side of the frequency converter, Siemens recommends the 3RN thermistor motor protection devices or the 3RU11 thermal overload relays for this purpose.

# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB20, 3RB21 for standard applications

#### Function

##### Basic functions

The 3RB20/3RB21 solid-state overload relays are designed for:

- Inverse-time delayed protection of loads from overloading
- Inverse-time delayed protection of loads from phase unbalance
- Inverse-time delayed protection of loads from phase failure
- Protection of loads from high-resistance short-circuits (internal ground-fault detection only with 3RB21).

##### Control circuit

The 3RB20/3RB21 solid-state overload relays have an internal power supply, i.e. no additional supply voltage is required.

##### Short-circuit protection

Fuses or motor starter protectors must be used for short-circuit protection. For assignments of the corresponding short-circuit protection devices to the 3RB20/3RB21 solid-state overload relays with/without contactor see [Technical Specifications and Selection and Ordering Data](#).

##### Trip classes

The 3RB20 solid-state overload relays are available for normal starting conditions with trip CLASS 10 or for heavy starting conditions with trip CLASS 20 (fixed setting in each case).

The 3RB21 solid-state overload relays are suitable for normal and heavy starting. The required trip class (CLASS 5, 10, 20 or 30) can be adjusted by means of a rotary knob depending on the current starting condition.

For details of the trip classes see [Characteristic Curves](#).

##### Phase failure protection

The 3RB20/3RB21 solid-state overload relays are fitted with phase failure protection (see [Characteristic Curves](#)) in order to minimize temperature rises of the load during single-phase operation.

Phase failure protection is not effective for loads with star-connection and a grounded neutral point or a neutral point which is connected to a neutral conductor.

##### Setting

The 3RB20/3RB21 solid-state overload relays are set to the motor rated current by means of a rotary knob. The scale of the rotary knob is shown in ampere.

With the 3RB21 solid-state overload relay it is also possible to select the trip class (CLASS 5, 10, 20 or 30) using a second rotary knob and to switch the internal ground-fault detection on and off.

##### Manual and automatic reset

In the case of the 3RB20/3RB21 solid-state overload relays, a slide switch can be used to choose between automatic and manual resetting.

If manual reset is set, a reset can be carried out directly on the device after a trip by pressing the blue RESET button. Resetting is possible in combination with the mechanical reset options from the accessories range (see [Accessories](#)). As an alternative to the mechanical RESET options, the 3RB21 solid-state overload relays can be equipped with electrical remote RESET by applying a voltage of 24 V DC to the terminals A3 and A4.

If the slide switch is set to automatic RESET, the relay is reset automatically.

The time between tripping and resetting is determined by the recovery time.

##### Recovery time

With the 3RB20/3RB21 solid-state overload relays the recovery time after inverse-time delayed tripping is between 0.5 and 3 minutes depending on the preloading when automatic RESET is set. These recovery times allow the load to cool down.

If the button is set to manual RESET, the 3RB20/3RB21 devices can be reset immediately after inverse-time delayed tripping.

After a ground fault trip the 3RB21 solid-state overload relays (with ground-fault detection activated) can be reset immediately without a recovery time regardless of the reset mode set.

##### TEST function

With motor current flowing, the TEST button can be used to check whether the relay is working correctly (device/solid-state TEST). Current measurement, motor model and trip unit are tested. If these components are OK, the device is tripped in accordance with the table below. If there is an error, no tripping takes place.

Trip class	Required loading with the rated current prior to pressing the test button	Tripping within
CLASS 5	2 min	8 s
CLASS 10	4 min	15 s
CLASS 20	8 min	30 s
CLASS 30	12 min	45 s

Note: The test button must be kept pressed throughout the test.

Testing of the auxiliary contacts and the control current wiring is possible with the switch position indicator slide. Actuating the slide simulates tripping of the relay. During this simulation the NC contact (95-96) is opened and the NO contact (97-98) is closed. This tests whether the auxiliary circuit has been correctly wired.

After a test trip the relay is reset by pressing the RESET button.

##### Self-monitoring

The 3RB20/3RB21 solid-state overload relays have a self-monitoring feature, i.e. the devices constantly monitor their own basic functions and trip if an internal fault is detected.

##### Display of operating status

The respective operating status of the 3RB20/3RB21 solid-state overload relays is displayed by means of the position of the marking on the switch position indicator slide. After tripping due to overload, phase failure, phase unbalance or ground fault (ground fault detection possible only with 3RB21) the marking on the slide is to left on the "O" mark, otherwise it is on the "I" mark.

##### Auxiliary contacts

The 3RB20/3RB21 solid-state overload relays are fitted with an NO contact for the "tripped" signal, and an NC contact for switching off the contactor.

# Overload Relays

## 3RB2 Solid-State Overload Relays

3RB20, 3RB21 for standard applications

### Technical specifications

Type	3RB20 16, 3RB21 13	3RB20 26, 3RB21 23	3RB20 36, 3RB21 33	3RB20 46, 3RB21 43	3RB20 56, 3RB21 53	3RB20 66, 3RB21 63
Size	S00	S0	S2	S3	S6	S10/S12
Width	45 mm	45 mm	55 mm	70 mm	120 mm	145 mm
<b>General data</b>						
<b>Trips in the event of</b>	Overload, phase failure, and phase unbalance + ground fault (for 3RB21 only)					
<b>Trip class</b> according to IEC 60947-4-1	CLASS	10 / 20 / 5, 10, 20 and 30 adjustable (depending on the version)				
<b>Phase failure sensitivity</b>	Yes					
<b>Overload warning</b>	No					
<b>Reset and recovery</b>	Manual, automatic and remote RESET (depending on the version)					
• Reset options after tripping						
• Recovery time		Between 0.5 and 3 min (depending on the preloading)				
- For automatic RESET	min.	Immediately				
- For manual RESET	min.	Immediately				
- For remote RESET	min.	Immediately				
<b>Features</b>	Yes, by means of switch position indicator slide					
• Display of operating status on device	Yes, test of electronics by pressing the button Test					
• TEST function	Test of auxiliary contacts and wiring of control current circuit by actuating the switch position indicator slide					
	Self-monitoring					
• RESET button	Yes					
• STOP button	No					
<b>Safe operation of motors with "increased safety" type of protection</b>	EU type test certificate number according to guideline 94/9/EU					
	1)					
<b>Ambient temperatures</b>						
• Storage/transport	°C	-40 ... +80				
• Operation	°C	-25 ... +60				
• Temperature compensation	°C	+60				
• Permissible rated current at		100				
- Temperature inside cubicle 60°C	%	100				
- Temperature inside cubicle 70°C	%	1)				
<b>Repeat terminals</b>	Yes Not required					
• Coil repeat terminal	Yes	Not required				
• Auxiliary contact repeat terminal	Yes	Not required				
<b>Degree of protection</b> according to IEC 60529	IP20		IP20 <sup>2)</sup>			
<b>Touch protection</b> according to IEC 61140	Finger-safe				Finger-safe, for busbar connection with cover	Finger-safe with cover
<b>Shock resistance with sine</b> according to IEC 60068-2-27 <i>g</i> /ms	15/11					
<b>Electromagnetic compatibility (EMC) – Interference immunity</b>						
• Conductor-related interference						
- Burst according to IEC 61000-4-4 (corresponds to degree of severity 3)	kV	2 (power ports), 1 (signal ports)				
- Surge according 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 according to IEC 61000-4-3 (corresponds to degree of severity 3)	V/m	10				
<b>Electromagnetic compatibility (EMC) – Emitted interference</b>	Degree of severity B according to EN 55011 (CISPR 11) and EN 55022 (CISPR 22)					
<b>Resistance to extreme climates – air humidity</b>	%	100				
<b>Dimensions</b>	See dimensional drawings					
<b>Installation altitude above sea level</b>	m	Up to 2000				
<b>Mounting position</b>	Any					
<b>Type of mounting</b>	Direct mounting / Stand-alone installation with terminal bracket			Direct mounting / Stand-alone installation		

1) On request.

2) Terminal compartment: degree of protection IP00.

# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB20, 3RB21 for standard applications

Type	3RB20 16, 3RB21 13 S00	3RB20 26, 3RB21 23 S0	3RB20 36, 3RB21 33 S2	3RB20 46, 3RB21 43 S3
Size	S00	S0	S2	S3
Width	45 mm	45 mm	55 mm	70 mm
<b>Main circuit</b>				
Rated insulation voltage $U_i$ (pollution degree 3)	V	690		1000
Rated impulse withstand voltage $U_{imp}$	kV	6		8
Rated operational voltage $U_e$	V	690		1000
Type of current		no		
• Direct current		Yes, 50/60 Hz $\pm$ 5 (other frequencies on request)		
• Alternating current				
Set current	A	0.1 ... 0.4 to 3 ... 12	3 ... 12 to 6 ... 25	6 ... 25 to 12.5 ... 50
Power loss per unit (max.)	W	0.05		
Short-circuit protection		See Selection and Ordering Data See Technical Specifications (short-circuit protection with fuses for motor feeders)		
- With fuse without contactor				
- With fuse and contactor				
Safe isolation between main and auxiliary conducting path according to IEC 60947-1	V	690 <sup>1)</sup>		
<b>Connection for main circuit</b>				
Electrical connection version		Screw terminal	Screw terminal with box terminal / straight-through transformer	Screw terminal with box terminal / bus connection / straight-through transformer
<b>Screw terminal</b>				
• Terminal screw		Pozidriv size 2		Allen screw 4 mm
• Tightening torque	Nm	0.8 ... 1.2	2 ... 2.5	3 ... 4.5
• Conductor cross-sections (min./max.), 1 or 2 conductors				
- Solid	mm <sup>2</sup>	2 × (0.5 ... 1.5), 2 × (0.75 ... 2.5)	2 × (1 ... 2.5), 2 × (2.5 ... 6)	2 × (1 ... 16)
- Finely stranded without end sleeve	mm <sup>2</sup>	--		2 × (2.5 ... 16)
- Finely stranded with end sleeve	mm <sup>2</sup>	2 × (0.5 ... 1.5), 2 × (0.75 ... 2.5)	2 × (1 ... 2.5), 2 × (2.5 ... 6)	2 × (1 ... 16), 1 × (1 ... 25)
- Stranded	mm <sup>2</sup>	--		2 × (max. 25), 1 × (1 ... 35)
- AWG conductors, solid or stranded	AWG	2 × (18 ... 14)	2 × (14 ... 10)	2 × (max. 3), 1 × (18 ... 2)
- Ribbon cable conductors (number x width x circumference)	mm	--		2 × (6 × 9 × 0.8)
<b>Busbar connections</b>				
• Terminal screw		--		M 6 × 20
• Tightening torque	Nm	--		4 ... 6
• Conductor cross-section (min./max.)				
- Finely stranded with cable lug	mm <sup>2</sup>	--		2 × 70
- Stranded with cable lug	mm <sup>2</sup>	--		3 × 70
- AWG connections, solid or stranded, with cable lug	AWG	--		2/0
- With connecting bar (max. width)	mm	--		12
<b>Straight-through transformers</b>				
• Diameter of opening	mm	--	15	18
• Conductor cross-section (max.)				
- NYY	mm <sup>2</sup>	--		2)
- H07RN-F	mm <sup>2</sup>	--		2)

1) For grounded networks, otherwise 600 V.  
2) On request.

# Overload Relays

## 3RB2 Solid-State Overload Relays

3RB20, 3RB21 for standard applications



Type	3RB20 56, 3RB21 53	3RB20 66, 3RB21 63
<b>Size</b>	<b>S6</b>	<b>S10/S12</b>
<b>Width</b>	<b>120 mm</b>	<b>145 mm</b>
<b>Main circuit</b>		
<b>Rated insulation voltage <math>U_i</math></b> (pollution degree 3)	V	1000
<b>Rated impulse withstand voltage <math>U_{imp}</math></b>	kV	8
<b>Rated operational voltage <math>U_e</math></b>	V	1000
<b>Type of current</b>	No Yes, 50/60 Hz $\pm$ 5 (other frequencies on request)	
• Direct current		
• Alternating current		
<b>Set current</b>	A	50 ... 200 55 ... 250 to 160 ... 630
<b>Power loss per unit (max.)</b>	W	0.05
<b>Short-circuit protection</b>	See Selection and Ordering Data	
- With fuse without contactor	See Technical Specifications (short-circuit protection with fuses for motor feeders)	
- With fuse and contactor		
<b>Safe isolation between main and auxiliary conducting path</b> according to IEC 60947-1	V	690 <sup>1)</sup>
<b>Connection for main circuit</b>		
<b>Electrical connection version</b>	Screw terminal with box terminal/ Bus connection / Straight-through transformer	Screw terminal with box terminal/ Bus connection
<b>Screw terminal</b>		
• Terminal screw	4 mm Allen screw	5 mm Allen screw
• Tightening torque	Nm 10 ... 12	20 ... 22
• Conductor cross-sections (min./max.), 1 or 2 conductors		
- Solid	mm <sup>2</sup>	--
- Finely stranded without end sleeve	mm <sup>2</sup>	2 x (50 ... 185), front clamping point only: 1 x (70 ... 240) rear clamping point only: 1 x (120 ... 185)
- Finely stranded with end sleeve	mm <sup>2</sup>	2 x (50 ... 185), front clamping point only: 1 x (70 ... 240) rear clamping point only: 1 x (120 ... 185)
- Stranded	mm <sup>2</sup>	2 x (70 ... 240), front clamping point only: 1 x (95 ... 300) rear clamping point only: 1 x (120 ... 240)
- AWG conductors, solid or stranded	AWG	2 x (2/0 ... 500 kcmil), front clamping point only: 1 x (3/0 ... 600 kcmil) rear clamping point only: 1 x (250 kcmil ... 500 kcmil)
- Ribbon cable conductors (number x width x circumference)	mm	2 x (20 x 24 x 0.5), 1 x (6 x 9 x 0.8 ... 20 x 24 x 0.5)
<b>Busbar connections</b>		
• Terminal screw	M 8 x 25	M 10 x 30
• Tightening torque	Nm 10 ... 14	14 ... 24
• Conductor cross-section (min./max.)		
- Finely stranded with cable lug	mm <sup>2</sup>	16 ... 95 <sup>2)</sup>
- Stranded with cable lug	mm <sup>2</sup>	25 ... 120 <sup>2)</sup>
- AWG connections, solid or stranded, with cable lug	AWG	4 ... 250 kcmil
- With connecting bar (max. width)	mm	15
<b>Straight-through transformers</b>		
• Diameter of opening	mm	24.5
• Conductor cross-section (max.)		
- NYY	mm <sup>2</sup>	120
- H07RN-F	mm <sup>2</sup>	70

1) For grounded networks, otherwise 600 V.

2) When connecting cable lugs according to DIN 46235, use the 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm<sup>2</sup> to ensure phase spacing.

3) When connecting cable lugs according to DIN 46234 for conductor cross-sections from 240 mm<sup>2</sup> as well as DIN 46235 for conductor cross-sections from 185 mm<sup>2</sup>, use the 3RT19 56-4EA1 terminal cover to ensure phase spacing.

# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB20, 3RB21 for standard applications

Type	3RB20 16, 3RB21 13	3RB20 26, 3RB21 23	3RB20 36, 3RB21 33	3RB20 46, 3RB21 43	3RB20 56, 3RB21 53	3RB20 66, 3RB21 63																																																									
Size	S00	S0	S2	S3	S6	S10/S12																																																									
Width	45 mm	45 mm	55 mm	70 mm	120 mm	145 mm																																																									
<b>Auxiliary circuit</b>																																																															
Number of NO contacts	1																																																														
Number of NC contacts	1																																																														
Auxiliary contacts – assignment	1 NO for the signal "tripped", 1 NC for switching off the contactor																																																														
Rated insulation voltage $U_i$ (pollution degree 3)	V	300																																																													
Rated impulse withstand voltage $U_{imp}$	kV	4																																																													
<b>Auxiliary contacts – Contact rating</b>																																																															
<ul style="list-style-type: none"> <li>NC contact with alternating current AC-14/AC-15 Rated operational current <math>I_e</math> at <math>U_e</math>:           <table border="0"> <tr><td>- 24 V</td><td>A</td><td>1)</td></tr> <tr><td>- 120 V</td><td>A</td><td>1)</td></tr> <tr><td>- 125 V</td><td>A</td><td>1)</td></tr> <tr><td>- 250 V</td><td>A</td><td>3</td></tr> <tr><td>- 400 V</td><td>A</td><td>1)</td></tr> <tr><td>- 600 V</td><td>A</td><td>1)</td></tr> <tr><td>- 690 V</td><td>A</td><td>1)</td></tr> </table> </li> <li>NO contact with alternating current AC-14/AC-15: Rated operational current <math>I_e</math> at <math>U_e</math>:           <table border="0"> <tr><td>- 24 V</td><td>A</td><td>1)</td></tr> <tr><td>- 120 V</td><td>A</td><td>1)</td></tr> <tr><td>- 125 V</td><td>A</td><td>1)</td></tr> <tr><td>- 250 V</td><td>A</td><td>3</td></tr> <tr><td>- 400 V</td><td>A</td><td>1)</td></tr> <tr><td>- 600 V</td><td>A</td><td>1)</td></tr> <tr><td>- 690 V</td><td>A</td><td>1)</td></tr> </table> </li> <li>NC, NO contact with direct current DC-13: Rated operational current <math>I_e</math> at <math>U_e</math>:           <table border="0"> <tr><td>- 24 V</td><td>A</td><td>2</td></tr> <tr><td>- 60 V</td><td>A</td><td>0.55</td></tr> <tr><td>- 110 V</td><td>A</td><td>0.3</td></tr> <tr><td>- 125 V</td><td>A</td><td>0.3</td></tr> <tr><td>- 250 V</td><td>A</td><td>0.1</td></tr> </table> </li> <li>Continuous thermal current <math>I_{th}</math></li> <li>Contact reliability (suitability for PLC control; 17 V, 5 mA)</li> </ul>							- 24 V	A	1)	- 120 V	A	1)	- 125 V	A	1)	- 250 V	A	3	- 400 V	A	1)	- 600 V	A	1)	- 690 V	A	1)	- 24 V	A	1)	- 120 V	A	1)	- 125 V	A	1)	- 250 V	A	3	- 400 V	A	1)	- 600 V	A	1)	- 690 V	A	1)	- 24 V	A	2	- 60 V	A	0.55	- 110 V	A	0.3	- 125 V	A	0.3	- 250 V	A	0.1
- 24 V	A	1)																																																													
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<b>Short-circuit protection</b>																																																															
<ul style="list-style-type: none"> <li>With fuse           <table border="0"> <tr><td>- gL/gG operational class</td><td>A</td><td>6</td></tr> <tr><td>- quick</td><td>A</td><td>1)</td></tr> </table> </li> <li>With miniature circuit-breaker (C-characteristic)</li> </ul>							- gL/gG operational class	A	6	- quick	A	1)																																																			
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Safe isolation between main and auxiliary conducting path according to IEC 60947-1	V	300																																																													
<b>CSA, UL, and UR rated data</b>																																																															
Auxiliary circuit – switching capacity	B300, R300																																																														
<b>Connection of the auxiliary circuit</b>																																																															
Connection type	Screw terminal or spring-loaded terminals																																																														
<b>Screw terminal</b>																																																															
Terminal screw	Pozidriv size 2																																																														
Tightening torque	Nm	0.8 ... 1.2																																																													
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<b>Spring-loaded terminals</b>																																																															
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1) On request.



# Overload Relays 3RB2 Solid-State Overload Relays

3RB20, 3RB21 for standard applications

## Short-circuit protection with fuses for motor feeders

For short-circuit currents up to 50 kA at 400 to 690 V

Overload relays	Contactor	CLASS									690 V	
		5 and 10			20			30			Fuse links <sup>1)</sup>	
Setting range	Type	Rated operational current $I_e$ AC-3 in A at									Type of coordination <sup>2)</sup>	
		400 V	500 V	690 V	400 V	500 V	690 V	400 V	500 V	690 V	1	2
<b>Size S00</b>												
0.1 ... 0.4 A	3RT10 15	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	35	6
0.32 ... 1.25 A	3RT10 15	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	35	6
1 ... 4 A	3RT10 15	4	4	4	4	4	4	4	4	4	35	20
	3RT10 16	4	4	4	4	4	4	4	4	4	35	20
	3RT10 17	4	4	4	4	4	4	4	4	4	35	20
3 ... 12 A	3RT10 16	9	6.5	5.2	9	6.5	5.2	9	6.5	5.2	35	20
	3RT10 17	12	9	6.3	10	9	6.3	9	9	6.3	35	20
<b>Size S0</b>												
3 ... 12 A	3RT10 23	9	6.5	5.2	9	6.5	5.2	--	--	--	63	25
	3RT10 24	12	12	9	12	12	9	12	12	9	63	25
	3RT10 25	12	12	12	12	12	12	12	12	12	63	25
6 ... 25 A	3RT10 24	12	12	9	12	12	9	12	12	9	63	25
	3RT10 25	17	17	13	16	16	13	14	14	13	63	25
	3RT10 26	25	18	13	16	16	13	14	14	13	100	35
<b>Size S2</b>												
6 ... 25 A	3RT10 34	25	25	20	22.3	22.3	20	19.1	19.1	19.1	125	63
	3RT10 35	25	25	24	25	25	24	25	25	24	125	63
12.5 ... 50 A	3RT10 34	32	32	20	22.3	22.3	20	19.1	19.1	19.1	125	63
	3RT10 35	40	40	24	29.4	29.4	24	26.5	26.5	24	125	63
	3RT10 36	50	50	24	32.7	32.7	24	26.5	26.5	24	160	80
<b>Size S3</b>												
12.5 ... 50 A	3RT10 44	50	50	47	49	49	47	41.7	41.7	41.7	200	125
	3RT10 45	50	50	50	50	50	50	45	45	45	200	160
25 ... 100 A	3RT10 44	65	65	47	49	49	47	41.7	41.7	41.7	200	125
	3RT10 45	80	80	58	53	53	53	45	45	45	200	160
	3RT10 46	95	95	58	59	59	58	50	50	50	200	160
	3RT10 54	100	100	100	81.7	81.7	81.7	69	69	69	355	315
	3RT10 55	--	--	--	100	100	100	90	90	90	355	315
<b>Size S6</b>												
50 ... 200 A	3RT10 54	115	115	115	81.7	81.7	81.7	69	69	69	355	315
	3RT10 55	150	150	150	107	107	107	90	90	90	355	315
	3RT10 56	185	185	170	131	131	131	111	111	111	355	315
<b>Size S10/S12</b>												
55 ... 250 A	3RT10 64	225	225	225	160	160	160	135	135	135	500	400
	3RT10 65	250	250	250	188	188	188	159	159	159	500	400
	3RT10 66	250	250	250	213	213	213	180	180	180	500	400
160 ... 630 A	3RT10 64	225	225	225	160	160	160	--	--	--	500	400
	3RT10 65	265	265	265	188	188	188	--	--	--	500	400
	3RT10 66	300	300	280	213	213	213	180	180	180	500	400
	3RT10 75	400	400	400	284	284	284	240	240	240	630	400
	3RT10 76	500	500	450	355	355	355	300	300	300	630	500
	3RT12 64	225	225	225	225	225	225	173	173	173	500	500
	3RT12 65	265	265	265	265	265	265	204	204	204	500	500
	3RT12 66	300	300	300	300	300	300	231	231	231	500	500
	3RT12 75	400	400	400	400	400	400	316	316	316	800	800
	3RT12 76	500	500	500	500	500	500	385	385	385	800	800
	3TF68 <sup>3)</sup>	630	630	630	440	440	440	376	376	376	800	500 <sup>4)</sup>
	3TF69 <sup>3)</sup>	630	630	630	572	572	572	500	500	500	800	630 <sup>4)</sup>

1) Please observe operational voltage.

2) Coordination and short-circuit equipment according to EN 60947-4-1:

**Type of coordination 1:** the contactor or starter must not endanger persons or the installation in the event of a short-circuit.

They do not need to be suitable for further operation without repair and the renewal of parts.

**Type of coordination 2:** the contactor or starter must not endanger persons or the installation in the event of a short-circuit.

They must be suitable for further operation.

There is a risk of contact welding.

3) Contactor cannot be mounted.

4) Please ensure that the maximum AC-3 operational current has sufficient safety clearance from the rated current of the fuses.

# Overload Relays

## 3RB2 Solid-State Overload Relays

3RB20, 3RB21 for standard applications

### Characteristic curves

The tripping characteristics show the relationship between the tripping time and tripping current as multiples of the set current  $I_e$  and are given for symmetrical three-pole and two-pole loads from the cold state.

The smallest current used for tripping is called the minimum tripping current. According to IEC 60947-4-1, this current must be within specified limits. The limits of the total tripping current for the 3RB20/3RB21 solid-state overload relays for symmetrical three-pole loads are between 105 % and 120 % of the set current.

The tripping characteristic starts with the minimum tripping current and continues with higher tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time intervals within which the overload relays have to trip with 7.2 times the set current  $I_e$  from the cold state for symmetrical three-pole loads.

The tripping times according to IEC 60947-4-1, tolerance band E, are as follows for:

Trip class	Tripping time
CLASS 5	3 ... 5 s
CLASS 10	5 ... 10 s
CLASS 20	10 ... 20 s
CLASS 30	20 ... 30 s

The tripping characteristic for a three-pole overload relay from the cold state (see illustration 1) only apply if all three phases are simultaneously loaded with the same current. In the event of a phase failure the 3RB20/3RB21 solid-state overload relays switch off the contactor more quickly in order to minimize heating of the load in accordance with the tripping characteristic for two-pole loads from the cold state (see illustration 2). With phase unbalance the devices switch off depending on the reason for the unbalance between the two characteristic curves.

Compared with a cold load, a load at operating temperature obviously has a lower temperature reserve. The tripping time of the 3RB20/3RB21 solid-state overload relays is reduced therefore to about 30 % when loaded with the set current  $I_e$  for an extended period.

### Tripping characteristics for 3-pole loads

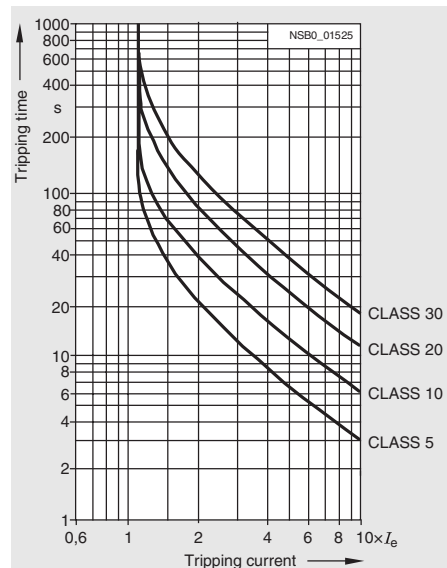


Illustration 1

### Tripping characteristics for 2-pole loads

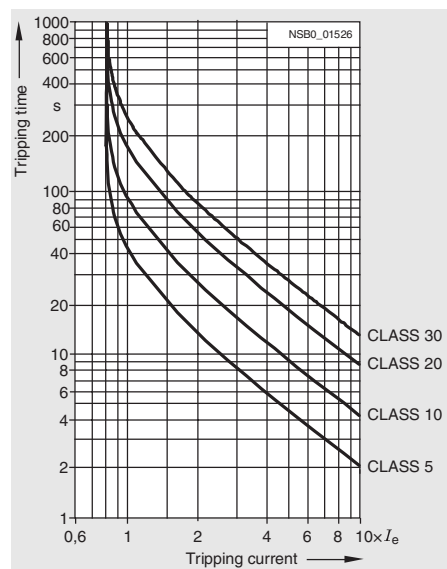


Illustration 2

The above illustrations are schematic representations of characteristic curves. The characteristic curves of the individual 3RB20/3RB21 solid-state overload relays can be requested from Technical Assistance at the following e-mail address:

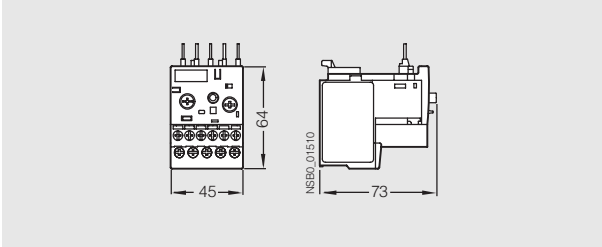
[Technical-assistance@siemens.com](mailto:Technical-assistance@siemens.com)

# Overload Relays

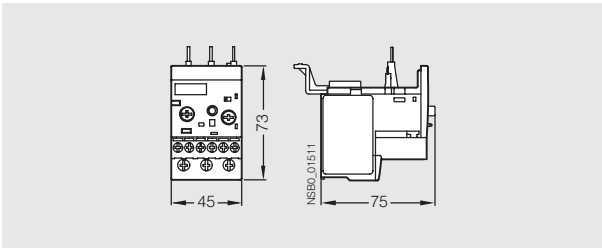
## 3RB2 Solid-State Overload Relays

3RB20, 3RB21 for standard applications

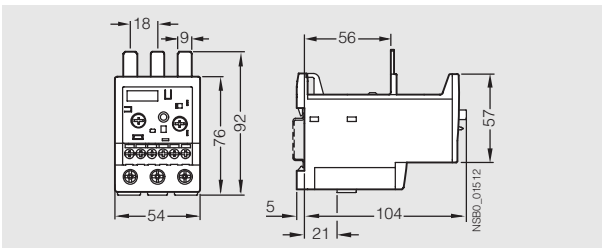
### Dimensional drawings



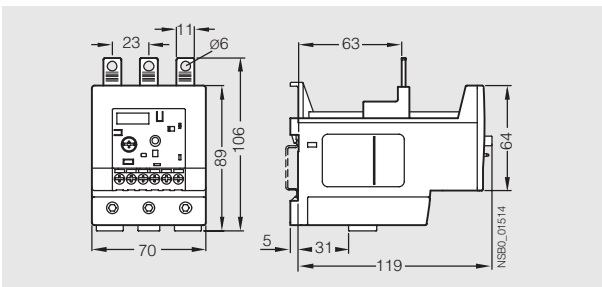
3RB20 16, 3RB21 13, size S00



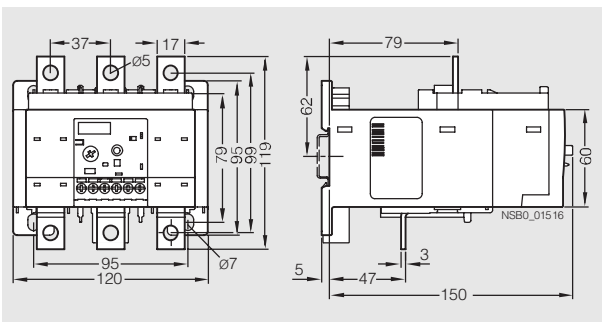
3RB20 26, 3RB21 23, size S0



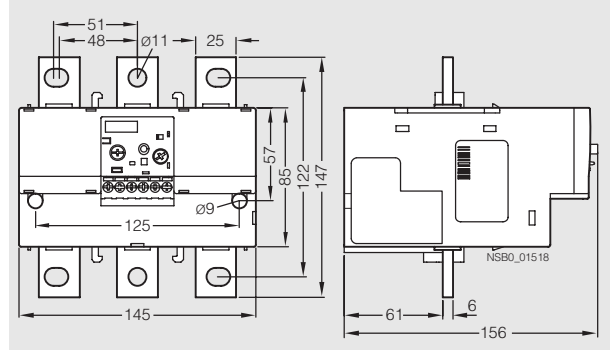
3RB20 36, 3RB21 33, size S2



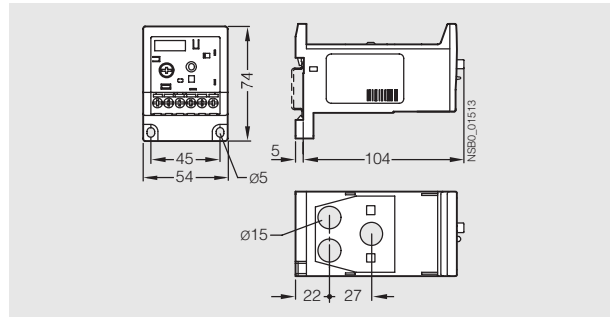
3RB20 46, 3RB21 43, size S3



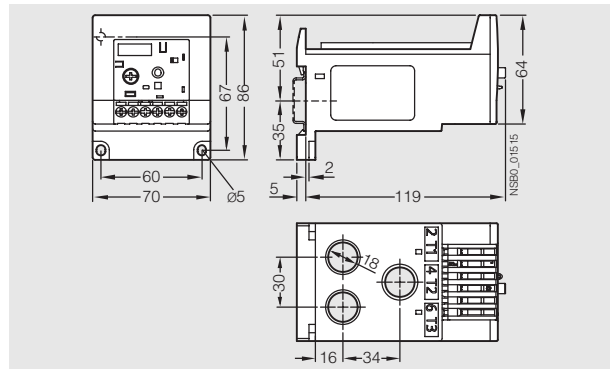
3RB20 56, 3RB21 53, size S6



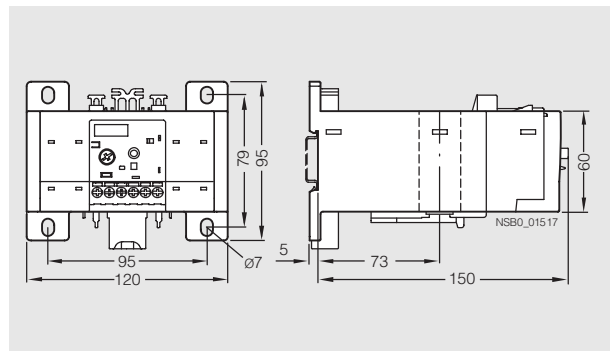
3RB20 66, 3RB21 63, size S10/S12



3RB20 36, 3RB21 33, size S2 with straight-through transformer



3RB20 46, 3RB21 43, size S3 with straight-through transformer



3RB20 56, 3RB21 53, size S6 with straight-through transformer

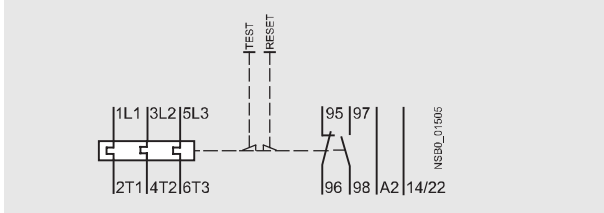


# Overload Relays

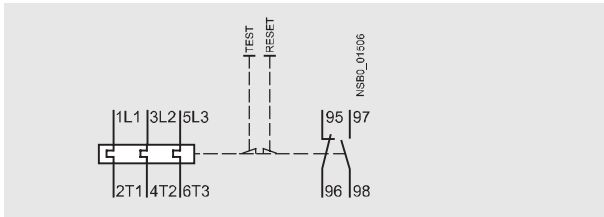
## 3RB2 Solid-State Overload Relays

3RB20, 3RB21 for standard applications

### Schematics

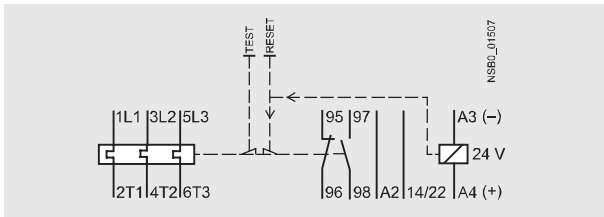


3RB20 16 overload relays

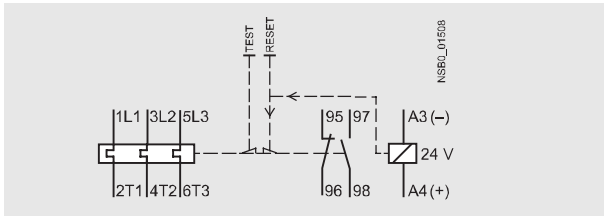


3RB20 26 to 3RB20 66 overload relays

5



3RB21 13 overload relays



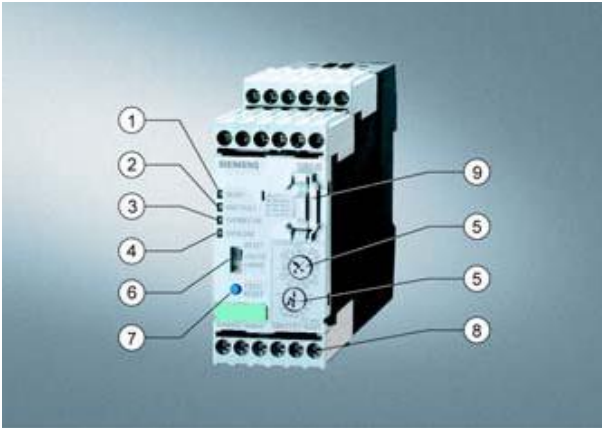
3RB21 23 to 3RB21 63 overload relays

# Overload Relays

## 3RB2 Solid-State Overload Relays

3RB22, 3RB23 for High-Feature applications

### Overview



3RB22/3RB23 evaluation module

- (1) Green "Ready" LED:  
A continuous green light signals that the device is working correctly.
- (2) Red "Ground Fault" LED:  
A continuous red light signals a ground fault.
- (3) Red "Thermistor" LED:  
A continuous red light signals an active thermistor trip.
- (4) Red "Overload" LED:  
A continuous red light signals an active overload trip; a flickering red light signals an imminent trip (overload warning).
- (5) Motor current and trip class adjustment:  
Setting the device to the motor current and to the required trip class dependent on the starting conditions is easy with the two rotary knobs.
- (6) Selector switch for manual/automatic RESET:  
With this switch you can choose between manual and automatic RESET.
- (7) Test/RESET button:  
Enables testing of all important device components and functions, plus resetting of the device after a trip when manual RESET is selected.
- (8) Connecting terminals (removable terminal block):  
The generously sized terminals permit connection of two conductors with different cross-sections for the auxiliary, control and sensor circuits. Connection is possible with screw-type terminals and alternatively with spring-loaded terminals.
- (9) 3RB29 85 function expansion module:  
Enables more functions to be added, e.g. internal ground fault detection and/or an analog output with corresponding signals.



3RB29 06 current measuring module

The modular, solid-state overload relays with external power supply type 3RB22 (with monostable auxiliary contacts) and type 3RB23 (with bistable auxiliary contacts) up to 630 A (up to 820 A possible with a series transformer) have been designed for inverse-time delayed protection of loads with normal and heavy starting (see [Function](#)) against excessive temperature rises due to overload, phase unbalance or phase failure. An overload, phase unbalance or phase failure result in an increase of the motor current beyond the set motor rated current. This current rise is detected by means of a current measuring module and electronically evaluated by a special evaluation module which is connected to it. The evaluation electronics sends a signal 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 set current  $I_e$  and is stored in the form of a long-term stable tripping characteristic (see [Characteristic Curves](#)). The "tripped" status is signaled by means of a continuous red "Overload" LED.

The LED indicates imminent tripping of the relay due to overload, phase unbalance or phase failure by flickering when the limit current has been violated. This warning can also be issued as a signal through auxiliary contacts.

In addition to the described inverse-time delayed protection of loads against excessive temperature rises, the 3RB22/3RB23 solid-state overload relays also allow direct temperature monitoring of the motor windings (full motor protection) by failsafe connection of a PTC sensor circuit. With this temperature-dependent protection, the loads can be protected against overheating caused indirectly by reduced coolant flow, for example, which cannot be detected by means of the current alone. In the event of overheating, the devices switch off the contactor, and thus the load, by means of the auxiliary contacts. The "tripped" status is signaled by means of a continuous red "Thermistor" LED.

To also protect the loads against high-resistance short-circuits due to damage to the insulation, humidity, condensed water, etc., the 3RB22/3RB23 solid-state overload relays offer the possibility of internal ground fault monitoring in conjunction with a function expansion module (for details see [Catalog LV 1, Selection and Ordering Data](#)); not possible in conjunction with contactor assembly for Wye-Delta starting). In the event of a ground fault the 3RB22/3RB23 relays trip instantaneously. The "tripped" status is signaled by means of a red "Ground Fault" LED. Signaling through auxiliary contacts is also possible.

After tripping due to overload, phase unbalance, phase failure, thermistor tripping or ground fault, the relay is reset manually or automatically after the recovery time has elapsed (see [Function](#)).

In conjunction with a function expansion module the motor current measured by the microprocessor can be output in the form of an analog signal 4 ... 20 mA DC for operating rotary coil instruments or for feeding into analog inputs of programmable logic controllers. With an additional AS-Interface analog module the current values can also be transferred over the AS-i bus system.

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.



# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB22, 3RB23 for High-Feature applications

#### Design

##### Device concept

The 3RB22/3RB23 solid-state overload relays are based on a modular device concept. Each device always comprises an evaluation module, which is independent of the motor current, and a current measuring module, which is dependent on the motor current. The two modules are electrically interconnected by a connection cable through the system interface.

The basic functionality of the evaluation module can be optionally expanded with corresponding function expansion modules. The function expansion modules are integrated in the evaluation module for this purpose through a simple plug connection.

##### Mounting options

###### Current measuring modules

The current measuring modules size S00/S0 and S2/S3 are designed for stand-alone installation. By contrast, the current measuring modules size S6 and S10/S12 are suitable for stand-alone installation and direct mounting.

###### Evaluation modules

The evaluation modules can be mounted either on the current measuring module (only sizes S00/S0 and S2/S3) or separately.

For more information on the mounting options, [please see Technical Specifications and Selection and Ordering Data](#).

##### Connection technique

###### Main circuit (current measuring module)

For sizes S00/S0, S2/S3 and S6, the main circuit can also be connected by the straight-through transformer method. In this case, the cables of the main circuit are routed directly through the feed-through openings of the relay to the contactor terminals.

For sizes S6 and S10/S12, the main circuit can be connected with the help of rails. In conjunction with the corresponding box terminals, screw terminal is also possible.

###### Auxiliary circuit (evaluation module)

Connection of the auxiliary circuit (removable terminal block) is possible with either screw terminals or spring-loaded terminals (special variants).

For more information on the connection options, [see Technical Specifications and Selection and Ordering Data](#).

##### Overload relays in contactor assemblies for Wye-Delta starting

When overload relays are used in combination with contactor assemblies for Wye-Delta starting it must be noted that only 0.58 times the motor current flows through the line contactor. An overload relay mounted onto the line contactor must be set to 0.58 times the motor current.

When 3RB22/3RB23 solid-state overload relays are used in combination with contactor assemblies for Wye-Delta starting, the function expansion modules for internal ground-fault detection must not be used.

##### Operation with frequency converter

The 3RB22/3RB23 solid-state overload relays are suitable for frequencies of 50/60 Hz and the associated harmonics. This permits the 3RB22/3RB23 overload relays to be used on the incoming side of the frequency converter.

If motor protection is required on the outgoing side of the frequency converter, Siemens recommends the 3RN thermistor motor protection devices or the 3RU11 thermal overload relays for this purpose.

#### Function

##### Basic functions

The 3RB22/3RB23 solid-state overload relays are designed for:

- Inverse-time delayed protection of loads from overloading
- Inverse-time delayed protection of loads from phase unbalance
- Inverse-time delayed protection of loads from phase failure
- Temperature-dependent protection of loads by connecting a PTC sensor circuit
- Protection of loads from high-resistance short-circuits (internal ground-fault detection; detection of fault currents > 30 % of the set current  $I_{\rho}$ )
- Output of an overload warning
- Output of an analog signal 4 to 20 mA DC as image of the flowing motor current

The basic functions of the evaluation modules in conjunction with function expansion modules are listed in the following table:

Evaluation module	Function expansion module	Basic functions
3RB22 83-4AA1 3RB22 83-4AC1 3RB23 83-4AA1 3RB23 83-4AC1	None	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning
	3RB29 85-2CA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning
	3RB29 85-2CB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground fault signal
	3RB29 85-2AA0	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning, analog output
	3RB29 85-2AA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning, analog output
	3RB29 85-2AB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground fault signal, analog output

##### Control circuit

The 3RB22/3RB23 solid-state overload relays require an external power supply, i.e. an additional supply voltage is necessary. Power is supplied through a wide-range power supply unit for 24 to 240 V AC/DC.

##### Short-circuit protection

Fuses or motor starter protectors must be used for short-circuit protection. For assignments of the corresponding short-circuit protection devices to the 3RB22/3RB23 solid-state overload relays with/without contactor [see Technical Specifications and Selection and Ordering Data](#).

##### Trip classes

The 3RB22/3RB23 solid-state overload relays are suitable for normal and heavy starting. The required trip class (CLASS 5, 10, 20 or 30) can be adjusted by means of a rotary knob depending on the current starting condition.

For details of the trip classes [see Characteristic Curves](#).

# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB22, 3RB23 for High-Feature applications

#### Phase failure protection

The 3RB22/3RB23 solid-state overload relays are fitted with phase failure protection (see [Characteristic Curves](#)) in order to minimize temperature rises of the load during single-phase operation.

#### Setting

The 3RB22/3RB23 solid-state overload relays are set to the motor rated current by means of two rotary knobs.

- The upper rotary knob (CLASS/ $I_{\text{emax}}$ ) is divided into 4 ranges: 1 A, 10 A, 100 A and 1000 A. The zone must be selected which corresponds to the rated motor current and the current measuring module to be used with it. With the range selected the required trip class (CLASS 5, 10, 20 or 30) can be determined.
- The lower rotary knob with percent scale (10 % ... 100 %) is then used to set the rated motor current in percent of the range selected with the upper rotary button.

#### Example

- Rating of induction motor = 45 kW (50 Hz, 400 V AC)
- Rated motor current = 80 A
- Required trip class = CLASS 20
- Selected transformer: 10 to 100 A

#### Solution

- Step 1: Use the upper rotary knob (CLASS) to select the 100 A range
- Step 2: Within the 100 A range set the trip class CLASS 20
- Step 3: Set the lower rotary knob to 80 % (= 0.8) of  $100 \text{ A} \times 0.8 = 80 \text{ A}$ .

If the current which is set on the evaluation module does not correspond to the current range of the connected current transformer, an error will result.

#### Manual and automatic reset

In the case of the 3RB22/3RB23 solid-state overload relays, a slide switch can be used to choose between automatic and manual resetting.

If manual reset is set, a reset can be carried out directly on the device after a trip by pressing the blue TEST/RESET button. A remote RESET can be carried out electrically by jumpering the terminals Y1 and Y2.

If the slide switch is set to automatic RESET, the relay is reset automatically.

The time between tripping and resetting is determined by the recovery time.

#### Recovery time

With the 3RB22/3RB23 solid-state overload relays the recovery time after inverse-time delayed tripping is approx. 3 minutes regardless of the selected reset mode. The recovery time allows the load to cool down.

However, in the event of temperature-dependent tripping by means of a connected PTC thermistor sensor circuit, the device can only be manually or automatically reset once the winding temperature at the installation location of the PTC thermistor has fallen 5 Kelvin below its response temperature.

After a ground fault trip the 3RB22/3RB23 solid-state overload relay trips can be reset immediately without a recovery time.

#### TEST function

The combined TEST/RESET button can be used to check whether the relay is working correctly. The test can be aborted at any time by letting go of the TEST/RESET button.

LEDs, the device configuration (this depends on which expansion module is plugged in) and the device hardware are tested while the button is kept pressed for 6 seconds. Simultaneously and for another 18 seconds a direct current proportional in size to the maximum phase of the main current is fed in at the terminals I(+) and I(-). By comparing the analog signal, which is to be measured, with the main current, the accuracy of the current measurement can be determined. In this case 4 mA corresponds to 0 % and 20 mA to 125 % of the set current. After 24 seconds the auxiliary contacts are switched and the feeder switch off as the result, bringing the test to an end.

After a test trip a faultless relay is reset by pressing the TEST/RESET button. If a hardware fault is detected, the device trips and cannot be reset.

#### Self-monitoring

The 3RB22/3RB23 solid-state overload relays have a self-monitoring feature, i.e. the devices constantly monitor their own basic functions and trip if an internal fault is detected.

#### Display of the operating status

The particular operating status of the 3RB22/3RB23 solid-state overload relays is displayed by means of four LEDs:

- Green "Ready" LED: A continuous green light signals that the overload relay is ready for operation. The 3RB22/3RB23 overload relays are not ready (LED "OFF") if there is no control supply voltage or if the function test was negative.
- Red "Ground fault" LED: A continuous red light signals a ground fault.
- Red "Thermistor" LED: A continuous red light signals a temperature-dependent trip.
- Red "Overload" LED: A continuous red light signals an inverse-time delayed trip; a flickering red light signals an imminent inverse-time delayed trip (overload warning).

#### Auxiliary contacts

The 3RB22/3RB23 solid-state overload relays have two outputs, each with one NO contact and one NC contact. Their basic assignment/function may be influenced by function expansion modules.

The 3RB22 and 3RB23 differ with respect to the tripping characteristics of their auxiliary contacts – monostable or bistable:

The monostable 3RB22 solid-state overload relays will enter the "tripped" state if the control supply voltage fails (> 200 ms), and return to the original state they were in before the control supply voltage failed when the voltage returns. These devices are therefore especially suited for plants in which the control voltage is not strictly monitored.

The bistable 3RB23 overload relays do not change their "tripped" or "not tripped" status if the control voltage fails. The auxiliary contacts only switch over in the event of an overload and if the supply voltage is present. These devices are therefore especially suited for plants in which the control voltage is monitored separately.

#### Response if the control supply voltage fails

If the control supply voltage fails for more than 0.2 s, the output relays respond differently depending on the version: Monostable or bistable.

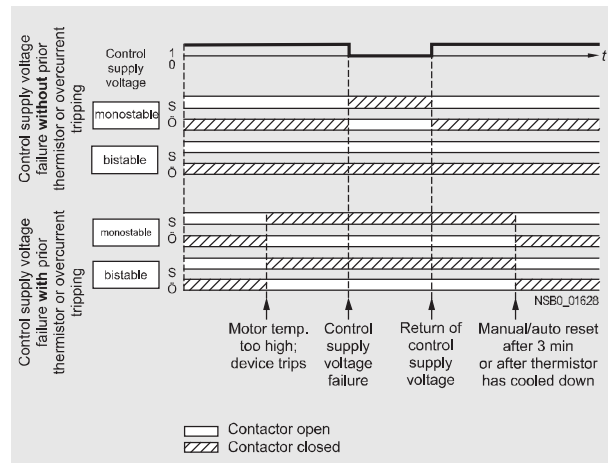
# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB22, 3RB23 for High-Feature applications

Response of the output relays in the event of	Monostable 3RB22	Bistable 3RB23
Failure of the control supply voltage	The device trips	No change of the switching status of the auxiliary contacts
Return of the control supply voltage without previous tripping	The device resets	No change of the switching status of the auxiliary contacts
Return of the control supply voltage after previous tripping	The device remains tripped Reset: <ul style="list-style-type: none"> <li>For overload tripping, after 3 minutes</li> <li>For thermistor tripping, after the temperature has fallen 5 K below the response temperature</li> <li>For ground-fault tripping, immediately</li> </ul>	The device remains tripped Reset: <ul style="list-style-type: none"> <li>For overload tripping, after 3 minutes</li> <li>For thermistor tripping, after the temperature has fallen 5 K below the response temperature</li> <li>For ground-fault tripping, immediately</li> </ul>

Monostable and bistable responses of the output relays





# Overload Relays

## 3RB2 Solid-State Overload Relays

3RB22, 3RB23 for High-Feature applications

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### Technical specifications

<b>Type – Overload relay of complete system</b>	<b>3RB22, 3RB23</b>	
<b>Size</b>	<b>S00 ... S10/S12</b>	
<b>General data</b>		
<b>Trips in the event of</b>	Overload, phase failure and phase unbalance (> 40 % according to NEMA), + ground fault (with corresponding function expansion module) and activation of the thermistor motor protection (with closed PTC sensor circuit)	
<b>Trip class</b> according to IEC 60947-4-1	CLASS	5, 10, 20 and 30 adjustable
<b>Phase failure sensitivity</b>	Yes	
<b>Overload warning</b>	Yes, from $1.125 \times I_n$ for symmetrical loads and from $0.85 \times I_n$ for unsymmetrical loads	
<b>Reset and recovery</b>	Manual, automatic and remote RESET	
• Reset options after tripping		
• Recovery time		
- For automatic RESET	min	- For tripping due to overcurrent: 3 (stored permanently) - For tripping by thermistor: time until the motor temperature has fallen 5 K below the response temperature
- For manual RESET	min	- For tripping due to a ground fault: no automatic RESET - For tripping due to overcurrent: 3 (stored permanently) - For tripping by thermistor: time until the motor temperature has fallen 5 K below the response temperature
- For remote RESET	min	- For tripping due to a ground fault: immediately - For tripping due to overcurrent: 3 (stored permanently) - For tripping by thermistor: time until the motor temperature has fallen 5 K below the response temperature - For tripping due to a ground fault: immediately
<b>Features</b>	Yes, with 4 LEDs: Green "Ready" LED, red "Ground Fault" LED, red "Thermistor" LED and red "Overload" LED	
• Display of operating status on device	Yes, test of LEDs, electronics, auxiliary contacts and wiring of control current circuit by pressing the button TEST/RESET / Self-monitoring	
• TEST function	Yes, with the TEST/RESET button	
• RESET button	No	
• STOP button	No	
<b>For safe operation of motors with type of protection "Increased Safety"</b>	1)	
EU type test certificate number according to guideline 94/9/EU (ATEX)	1)	
<b>Ambient temperatures</b>		
Storage/transport	°C	-40 ... +80
Operation	°C	-25 ... +60
Temperature compensation	°C	+60
Permissible rated current		
- Temperature inside cubicle 60 °C	%	100
- Temperature inside cubicle 70 °C	%	1)
<b>Repeat terminals</b>	Not required	
• Coil repeat terminal	Not required	
• Auxiliary contact repeat terminal	Not required	
<b>Degree of protection</b> according to IEC 60529	IP20 <sup>2)</sup>	
<b>Touch protection</b> according to IEC 61140	Finger-safe <sup>2)</sup>	
<b>Shock resistance with sine</b> according to IEC 60068-2-27	g/ms	15/11
<b>Electromagnetic compatibility (EMC) – Interference immunity</b>		
• Conductor-related interference		
- Burst according to IEC 61000-4-4 (corresponds to degree of severity 3)	kV	2 (power ports), 1 (signal ports)
- Surge according 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 according to IEC 61000-4-3 (corresponds to degree of severity 3)	V/m	10
<b>Electromagnetic compatibility (EMC) – Emitted interference</b>	Degree of severity A according to EN 55011 (CISPR 11) and EN 55022 (CISPR 22)	
<b>Resistance to extreme climates – air humidity</b>	%	100
<b>Dimensions</b>	See dimensional drawings	
<b>Installation altitude above sea level</b>	m	Up to 2000
<b>Mounting position</b>	Any	
<b>Type of mounting</b>	Evaluation module: Stand-alone installation, current measuring module size S00 to S3: Stand-alone installation, current measuring module size S6 and S10/S12: Stand-alone installation and mounting onto contactors	

1) On request.

2) Current measuring modules size S6 and S10/S12 with busbar connection in conjunction with cover.

# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB22, 3RB23 for High-Feature applications

Type – Overload relay of current measuring module	3RB29	3RB29	3RB29	3RB29
Size	S00/S0	S2/S3	S6	S10/S12
Width	45 mm	55 mm	120 mm	145 mm
<b>Main circuit</b>				
Rated insulation voltage $U_i$ (pollution degree 3)	V	690		1000
Rated impulse withstand voltage $U_{imp}$	kV	6		8
Rated operational voltage $U_e$	V	690		1000
Type of current		No		
• Direct current		Yes, 50/60 Hz $\pm$ 5 % (other frequencies on request)		
• Alternating current				
Set current	A	0.3 ... 3; 2.4 ... 25	10 ... 100	20 ... 200
Power loss per unit (max.)	W	0.5		
Short-circuit protection		See Selection and Ordering Data		
• With fuse without contactor		See Technical Specifications (short-circuit protection with fuses for motor feeders)		
• With fuse and contactor				
Safe isolation between main and auxiliary conducting path according to IEC 60947-1	V	690 <sup>1)</sup>		
<b>Connection for main circuit</b>				
Electrical connection version		Straight-through transformers	Screw terminal with box terminal / bus connection / straight-through transformer	Screw terminal with box terminal / bus connection
<b>Screw terminal</b>				
• Terminal screw		--	4 mm Allen screw	5 mm Allen screw
• Tightening torque		--	10 ... 12	20 ... 22
• Conductor cross-sections (min./max.), 1 or 2 conductors				
- Solid	mm <sup>2</sup>	--	--	--
- Finely stranded without end sleeve	mm <sup>2</sup>	--	With 3RT19 55-4G box terminal: 2 x (1 x max. 50, 1 x max. 70), 1 x (10 ... 70)	2 x (50 ... 185), front clamping point only: 1 x (70 ... 240)
			With 3RT19 56-4G box terminal: 2 x (1 x max. 95, 1 x max. 120), 1 x (10 ... 120)	rear clamping point only: 1 x (120 ... 185)
- Finely stranded with end sleeve	mm <sup>2</sup>	--	With 3RT19 55-4G box terminal: 2 x (1 x max. 50, 1 x max. 70), 1 x (10 ... 70)	2 x (50 ... 185), front clamping point only: 1 x (70 ... 240)
			With 3RT19 56-4G box terminal: 2 x (1 x max. 95, 1 x max. 120), 1 x (10 ... 120)	rear clamping point only: 1 x (120 ... 185)
- Stranded	mm <sup>2</sup>	--	With 3RT19 55-4G box terminal: 2 x (max. 70), 1 x (16 ... 70)	2 x (70 ... 240), front clamping point only: 1 x (95 ... 300)
			With 3RT19 56-4G box terminal: 2 x (max. 120), 1 x (16 ... 120)	rear clamping point only: 1 x (120 ... 240)
- AWG conductors, solid or stranded	AWG	--	With 3RT19 55-4G box terminal: 2 x (max. 1/0), 1 x (6 ... 2/0)	2 x (2/0 ... 500 kcmil), front clamping point only: 1 x (3/0 ... 600 kcmil)
			With 3RT19 56-4G box terminal: 2 x (max. 3/0), 1 x (6 ... 250 kcmil)	rear clamping point only: 1 x (250 kcmil ... 500 kcmil)
- Ribbon cable conductors (number x width x circumference)	mm	--	With 3RT19 55-4G box terminal: 2 x (6 x 15.5 x 0.8), 1 x (3 x 9 x 0.8 ... 6 x 15.5 x 0.8)	2 x (20 x 24 x 0.5), 1 x (6 x 9 x 0.8 ... 20 x 24 x 0.5)
			With 3RT19 56-4G box terminal: 2 x (10 x 15.5 x 0.8), 1 x (3 x 9 x 0.8 ... 10 x 15.5 x 0.8)	
<b>Busbar connections</b>				
• Terminal screw		--	M8 x 25	M10 x 30
• Tightening torque	Nm	--	10 ... 14	14 ... 24
• Conductor cross-section (min./max.)				
- Solid with cable lug	mm <sup>2</sup>	--	16 ... 95 <sup>2)</sup>	50 ... 240 <sup>3)</sup>
- Stranded with cable lug	mm <sup>2</sup>	--	25 ... 120 <sup>2)</sup>	70 ... 240 <sup>3)</sup>
- AWG connections, solid or stranded, with cable lug	AWG	--	4 ... 250 kcmil	2/0 ... 500 kcmil
- With connecting bar (max. width)	mm	--	15	25
<b>Straight-through transformers</b>				
• Diameter of opening	mm	7.5	14	25
• Conductor cross-section (max.)				
- NYY	mm <sup>2</sup>	4)	4)	120
- H07RN-F	mm <sup>2</sup>	4)	4)	70

1) For grounded networks, otherwise 600 V.

2) When connecting cable lugs according to DIN 46235, use the 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm<sup>2</sup> to ensure phase spacing.

3) When connecting cable lugs according to DIN 46234 for conductor cross-sections from 240 mm<sup>2</sup> as well as DIN 46235 for conductor cross-sections from 185 mm<sup>2</sup>, use the 3RT19 56-4EA1 terminal cover to ensure phase spacing.

4) On request.

# Overload Relays

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3RB22, 3RB23 for High-Feature applications



<b>Type – Overload relay of evaluation module</b>	<b>3RB22, 3RB23</b>																																																												
<b>Size</b>	<b>S00 ... S10/S12</b>																																																												
<b>Width</b>	<b>45 mm</b>																																																												
<b>Auxiliary circuit</b>																																																													
<b>Number of NO contacts</b>	2																																																												
<b>Number of NC contacts</b>	2																																																												
<b>Auxiliary contacts – assignment</b>	1 NO for the signal "tripped due to overload and/or thermistor", 1 NC for switching off the contactor 1 NO for the signal "tripped due to ground fault", 1 NC for switching off the contactor or <sup>1)</sup> 1 NO for the signal "tripped due to overload and/or thermistor and/or ground fault", 1 NC for switching off the contactor 1 NO for overload warning, 1 NC for switching off the contactor																																																												
<b>Rated insulation voltage <math>U_i</math></b> (degree of pollution 3)	V	300																																																											
<b>Rated impulse withstand voltage <math>U_{imp}</math></b>	kV	4																																																											
<b>Auxiliary contacts – Contact rating</b>																																																													
<ul style="list-style-type: none"> <li>• NC contact with alternating current AC-14/AC-15: Rated operational current <math>I_e</math> at <math>U_e</math>:               <table border="1"> <tr><td>- 24 V</td><td>A</td><td>6</td></tr> <tr><td>- 120 V</td><td>A</td><td>6</td></tr> <tr><td>- 125 V</td><td>A</td><td>6</td></tr> <tr><td>- 250 V</td><td>A</td><td>3</td></tr> <tr><td>- 400 V</td><td>A</td><td>1.5</td></tr> <tr><td>- 600 V</td><td>A</td><td>2)</td></tr> <tr><td>- 690 V</td><td>A</td><td>2)</td></tr> </table> </li> <li>• NO contact with alternating current AC-14/AC-15: Rated operational current <math>I_e</math> at <math>U_e</math>:               <table border="1"> <tr><td>- 24 V</td><td>A</td><td>6</td></tr> <tr><td>- 120 V</td><td>A</td><td>6</td></tr> <tr><td>- 125 V</td><td>A</td><td>6</td></tr> <tr><td>- 250 V</td><td>A</td><td>3</td></tr> <tr><td>- 400 V</td><td>A</td><td>1.5</td></tr> <tr><td>- 600 V</td><td>A</td><td>2)</td></tr> <tr><td>- 690 V</td><td>A</td><td>2)</td></tr> </table> </li> <li>• NC, NO contact with direct current DC-13: Rated operational current <math>I_e</math> at <math>U_e</math>:               <table border="1"> <tr><td>- 24 V</td><td>A</td><td>2</td></tr> <tr><td>- 60 V</td><td>A</td><td>0.55</td></tr> <tr><td>- 110 V</td><td>A</td><td>0.25</td></tr> <tr><td>- 125 V</td><td>A</td><td>0.3</td></tr> <tr><td>- 250 V</td><td>A</td><td>0.2</td></tr> </table> </li> <li>• Continuous thermal current <math>I_{th}</math></li></ul>			- 24 V	A	6	- 120 V	A	6	- 125 V	A	6	- 250 V	A	3	- 400 V	A	1.5	- 600 V	A	2)	- 690 V	A	2)	- 24 V	A	6	- 120 V	A	6	- 125 V	A	6	- 250 V	A	3	- 400 V	A	1.5	- 600 V	A	2)	- 690 V	A	2)	- 24 V	A	2	- 60 V	A	0.55	- 110 V	A	0.25	- 125 V	A	0.3	- 250 V	A	0.2	A	6 <sup>1)</sup>
- 24 V	A	6																																																											
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<b>Short-circuit protection</b>																																																													
<ul style="list-style-type: none"> <li>• With fuse               <table border="1"> <tr><td>- gL/gG operational class</td><td>A</td><td>6</td></tr> <tr><td>- Quick</td><td>A</td><td>2)</td></tr> </table> </li> <li>• With miniature circuit-breaker (C-characteristic)</li></ul>			- gL/gG operational class	A	6	- Quick	A	2)	A	1.6																																																			
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<b>Safe isolation between main and auxiliary conducting path</b> according to IEC 60947-1	V	300																																																											
<b>CSA, UL, and UR rated data</b>																																																													
<b>Auxiliary circuit – switching capacity</b>	B300, R300																																																												
<b>Connection of the auxiliary circuit</b>																																																													
<b>Connection type</b>	Screw terminal or spring-loaded terminals																																																												
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1) The assignment of auxiliary contacts may be influenced by function expansion modules.

2) On request.

# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB22, 3RB23 for High-Feature applications

<b>Type – Overload relay of evaluation module</b>	<b>3RB22, 3RB23</b>	
<b>Size</b>	<b>S00 ... S10/S12</b>	
<b>Width</b>	<b>45 mm</b>	
<b>Connection of the auxiliary circuit</b>		
<b>Spring-loaded terminals</b>		
• Conductor cross-section (min./max.), 1 or 2 conductors		
- Solid	mm <sup>2</sup>	2 × (0.25 ... 1.5)
- Finely stranded without end sleeve	mm <sup>2</sup>	--
- Finely stranded with end sleeve	mm <sup>2</sup>	2 × (0.25 ... 1.5)
- Stranded	mm <sup>2</sup>	2 × (0.25 ... 1.5)
- AWG conductors, solid or stranded	AWG	2 × (24 ... 16)
<b>Control and sensor circuit as well as analog output</b>		
<b>Rated insulation voltage <math>U_i</math></b> (degree of pollution 3) <sup>1)</sup>	V	300
<b>Rated impulse withstand voltage <math>U_{imp}</math></b> <sup>1)</sup>	kV	4
<b>Rated control supply voltage <math>U_s</math></b> <sup>1)</sup>		
• AC 50/60 Hz	V	24 ... 240
• DC	V	24 ... 240
<b>Operating range</b> <sup>1)</sup>		
• AC 50/60 Hz		$0.85 \times U_{s \min} \leq U_s \leq 1.1 \times U_{s \max}$
• DC		$0.85 \times U_{s \min} \leq U_s \leq 1.1 \times U_{s \max}$
<b>Rated output power</b> <sup>1)</sup>		
• AC 50/60 Hz	W	0.5
• DC	W	0.5
<b>Mains buffering time</b> <sup>1)</sup>	ms	200
<b>Thermistor motor protection (PTC thermistor detector)</b> <sup>2)</sup>		
• Summation cold resistance	kΩ	≤ 1.5
• Operating value	kΩ	3.4 ... 3.8
• Return value	kΩ	1.5 ... 1.65
<b>Response time following ground fault detection</b>		
• Internal <sup>3)</sup>	ms	500 ... 1000
<b>Analog output</b> <sup>3)</sup>		
• Output signal	mA	4 ... 20
• Measuring range		0 to $1.25 \times I_e$ 4 mA corresponds to $0 \times I_e$ 16.8 mA corresponds to $1.0 \times I_e$ 20 mA corresponds to $1.25 \times I_e$
<b>Connection for the control and sensor circuit as well as the analog output</b>		
<b>Connection type</b>	Screw terminal or spring-loaded terminals	
<b>Screw terminal</b>		
• Terminal screw		Pozidriv size 2
• Tightening torque	Nm	0.8 ... 1.2
• Conductor cross-section (min./max.), 1 or 2 conductors		
- Solid	mm <sup>2</sup>	1 × (0.5 ... 4), 2 × (0.5 ... 2.5)
- Finely stranded without end sleeve	mm <sup>2</sup>	--
- Finely stranded with end sleeve	mm <sup>2</sup>	1 × (0.5 ... 2.5), 2 × (0.5 ... 1.5)
- Stranded	mm <sup>2</sup>	--
- AWG conductors, solid or stranded	AWG	2 × (20 ... 14)
<b>Spring-loaded terminals</b>		
• Conductor cross-section (min./max.), 1 or 2 conductors		
- Solid	mm <sup>2</sup>	2 × (0.25 ... 1.5)
- Finely stranded without end sleeve	mm <sup>2</sup>	--
- Finely stranded with end sleeve	mm <sup>2</sup>	2 × (0.25 ... 1.5)
- Stranded	mm <sup>2</sup>	2 × (0.25 ... 1.5)
- AWG conductors, solid or stranded	AWG	2 × (24 ... 16)

1) Control circuit.

2) Sensor circuit.

3) In conjunction with corresponding function expansion module.

# Overload Relays 3RB2 Solid-State Overload Relays

3RB22, 3RB23 for High-Feature applications

## Short-circuit protection with fuses for motor feeders

For short-circuit currents up to 50 kA at 400 to 690 V

Overload relays	Contactor	CLASS									690 V		
		5 and 10			20			30			Fuse links <sup>1)</sup>		
Setting range	Type	400 V	500 V	690 V	400 V	500 V	690 V	400 V	500 V	690 V	g/L/gG operational class	Type of coordination <sup>2)</sup>	
		Rated operational current $I_e$ AC-3 in A at									1	2	
<b>Size S00/S0</b>													
0.3 ... 3 A	3RT10 15	3	3	3	3	3	3	3	3	3	35	20	
	3RT10 16	3	3	3	3	3	3	3	3	3	35	20	
2.4 ... 25 A	3RT10 15	7	5	4	7	5	4	7	5	4	35	20	
	3RT10 16	9	6.5	5.2	9	6.5	5.2	9	6.5	5.2	35	20	
	3RT10 17	12	9	6.3	10	9	6.3	9	9	6.3	35	20	
	3RT10 23	9	6.5	5.2	9	6.5	5.2	--	--	--	63	25	
	3RT10 24	12	12	9	12	12	9	12	12	9	63	25	
	3RT10 25	17	17	13	16	16	13	14	14	13	63	25	
	3RT10 26	25	18	13	16	16	13	14	14	13	100	35	
	3RT10 34	25	25	20	22.3	22.3	20	19.1	19.1	19.1	125	63	
	3RT10 35	25	25	24	25	25	24	25	25	24	125	63	
	<b>Size S2/S3</b>												
10 ... 100 A	3RT10 34	32	32	20	22.3	22.3	20	19.1	19.1	19.1	125	63	
	3RT10 35	40	40	24	29.4	29.4	24	26.5	26.5	24	125	63	
	3RT10 36	50	50	24	32.7	32.7	24	26.5	26.5	24	160	80	
	3RT10 44	65	65	47	49	49	47	41.7	41.7	41.7	200	125	
	3RT10 45	80	80	58	53	53	53	45	45	45	200	160	
	3RT10 46	95	95	58	59	59	58	50	50	50	200	160	
	3RT10 54	100	100	100	81.7	81.7	81.7	69	69	69	355	315	
	3RT10 55	--	--	--	100	100	100	90	90	90	355	315	
	<b>Size S6</b>												
	20 ... 200 A	3RT10 54	115	115	115	81.7	81.7	81.7	69	69	69	355	315
3RT10 55		150	150	150	107	107	107	90	90	90	355	315	
3RT10 56		185	185	170	131	131	131	111	111	111	355	315	
<b>Size S10/S12</b>													
160 ... 630 A	3RT10 64	225	225	225	160	160	160	135	135	135	500	400	
	3RT10 65	265	265	265	188	188	188	159	159	159	500	400	
	3RT10 66	300	300	280	213	213	213	180	180	180	500	400	
	3RT10 75	400	400	400	284	284	284	240	240	240	630	400	
	3RT10 76	500	500	450	355	355	355	300	300	300	630	500	
	3RT12 64	225	225	225	225	225	225	173	173	173	500	500	
	3RT12 65	265	265	265	265	265	265	204	204	204	500	500	
	3RT12 66	300	300	300	300	300	300	231	231	231	500	500	
	3RT12 75	400	400	400	400	400	400	316	316	316	800	800	
	3RT12 76	500	500	500	500	500	500	385	385	385	800	800	
	3TF69 <sup>3)</sup>	630	630	630	440	440	440	376	376	376	800	500 <sup>4)</sup>	
	3TF69 <sup>3)</sup>	630	630	630	572	572	572	500	500	500	800	630 <sup>4)</sup>	

1) Please observe operational voltage.

2) Coordination and short-circuit equipment according to EN 60947-4-1:

**Type of coordination 1:** the contactor or starter must not endanger persons or the installation in the event of a short-circuit. They do not need to be suitable for further operation without repair and the renewal of parts.

**Type of coordination 2:** the contactor or starter must not endanger persons or the installation in the event of a short-circuit. They must be suitable for further operation. There is a risk of contact welding.

3) Contactor cannot be mounted.

4) Please ensure that the maximum AC-3 operational current has sufficient safety clearance from the rated current of the fuses.

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3RB22, 3RB23 for High-Feature applications

### Characteristic curves

The tripping characteristics show the relationship between the tripping time and tripping current as multiples of the set current  $I_e$  and are given for symmetrical three-pole and two-pole loads from the cold state.

The smallest current used for tripping is called the minimum tripping current. According to IEC 60947-4-1, this current must be within specified limits. The limits of the minimum tripping current for the 3RB22/3RB23 solid-state overload relays for symmetrical three-pole loads are between 105 % and 120 % of the set current.

The tripping characteristic starts with the minimum tripping current and continues with higher tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time intervals within which the overload relays have to trip with 7.2 times the set current  $I_e$  from the cold state for symmetrical three-pole loads.

The tripping times according to IEC 60947-4-1, tolerance band E, are as follows for:

Trip class	Tripping time
CLASS 5	3 ... 5 s
CLASS 10	5 ... 10 s
CLASS 20	10 ... 20 s
CLASS 30	20 ... 30 s

The tripping characteristic for a three-pole overload relay from the cold state (see illustration 1) only apply if all three phases are simultaneously loaded with the same current. In the event of a phase failure or a current unbalance of more than 40 %, the 3RB22/3RB23 solid-state overload relays switch off the contactor more quickly in order to minimize heating of the load in accordance with the tripping characteristic for two-pole loads from the cold state (see illustration 2).

Compared with a cold load, a load at operating temperature obviously has a lower temperature reserve. The tripping time of the 3RB22/3RB23 solid-state overload relays are reduced therefore to about 30 % when loaded with the set current  $I_e$  for an extended period.

### Tripping characteristics for 3-pole loads

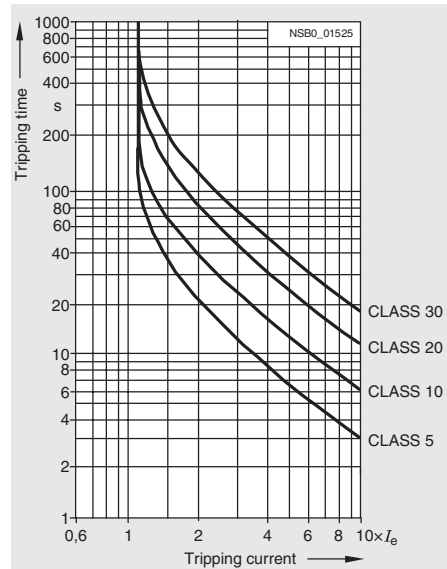


Illustration 1

### Tripping characteristics for 2-pole loads

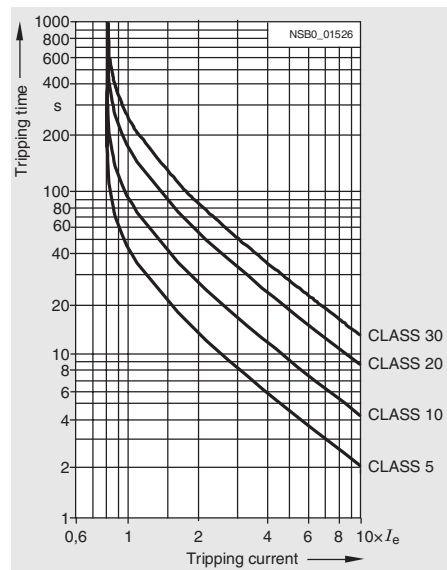


Illustration 2

The above illustrations are schematic representations of characteristic curves. The characteristic curves of the individual 3RB22/3RB23 solid-state overload relays can be requested from Technical Assistance at the following e-mail address:

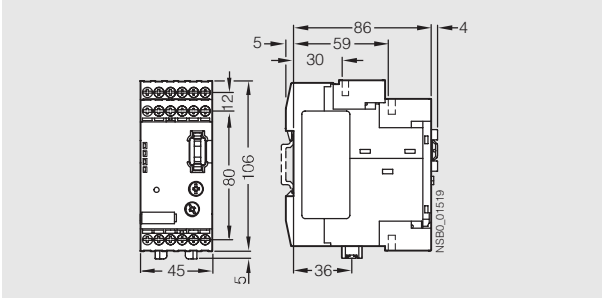
[Technical-assistance@siemens.com](mailto:Technical-assistance@siemens.com)

# Overload Relays

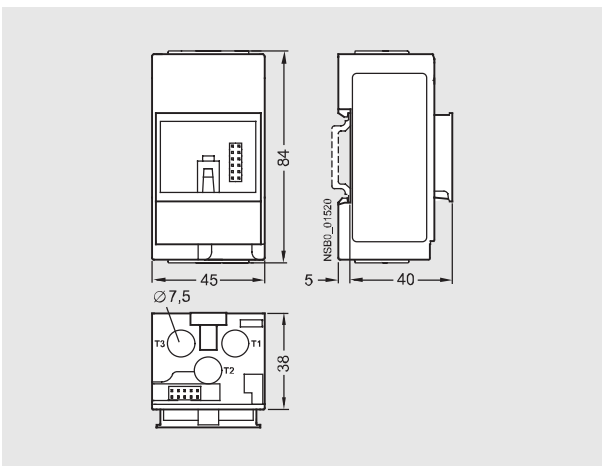
## 3RB2 Solid-State Overload Relays

3RB22, 3RB23 for High-Feature applications

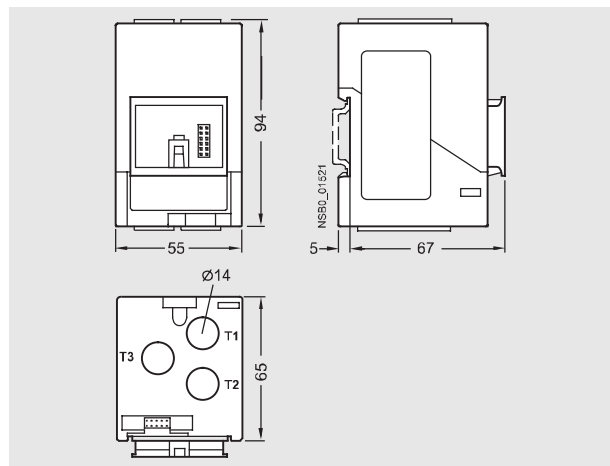
### Dimensional drawings



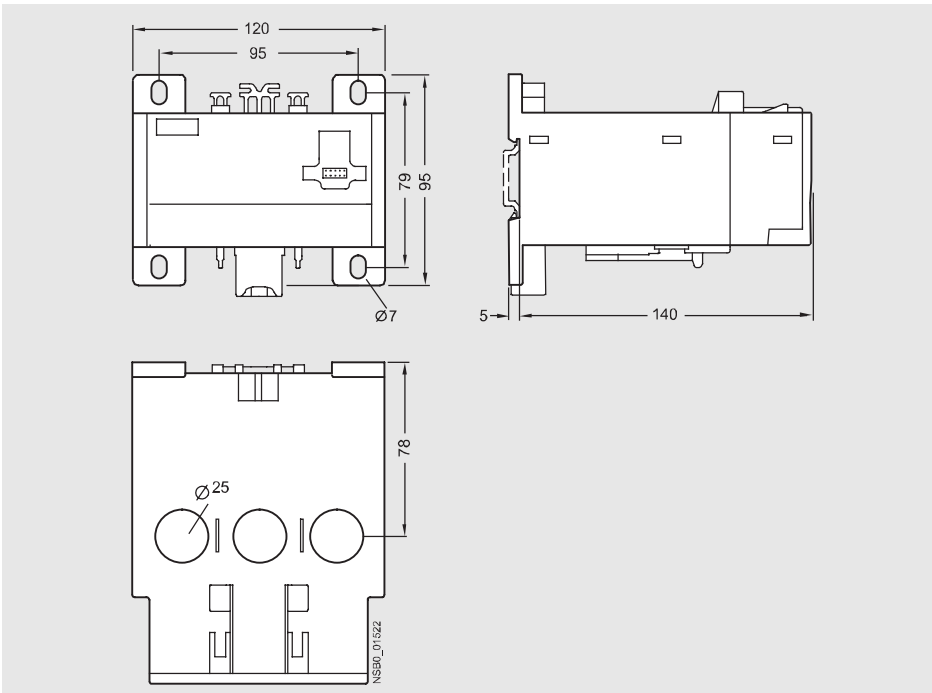
3RB22 83-4, 3RB23 83-4 evaluation module



3RB29 06-2BG1, 3RB29 06-2DG1 current measuring module



3RB29 06-2JG1 current measuring module



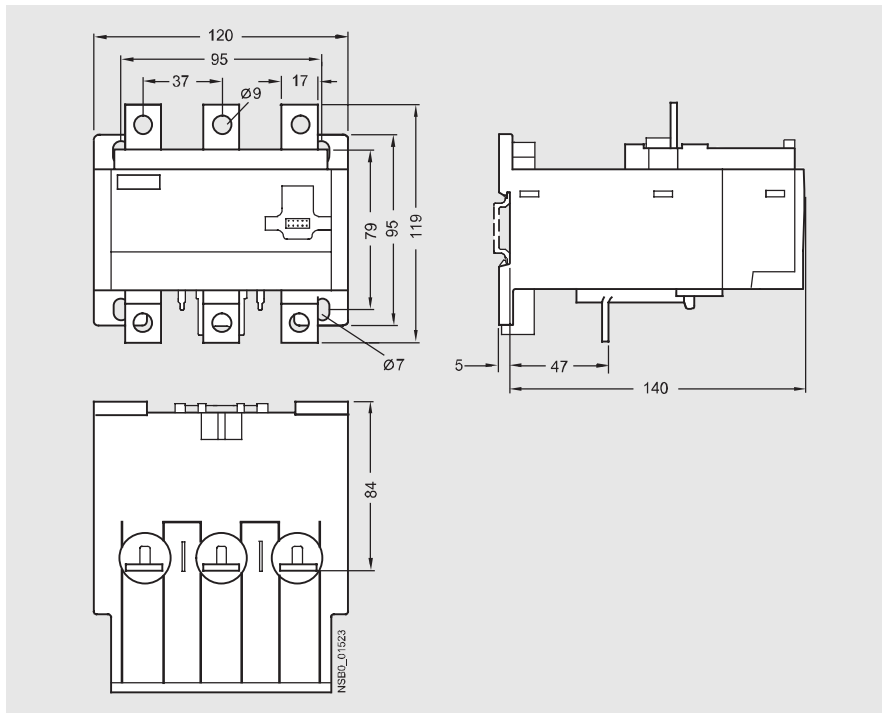
3RB29 56-2TG2 current measuring module



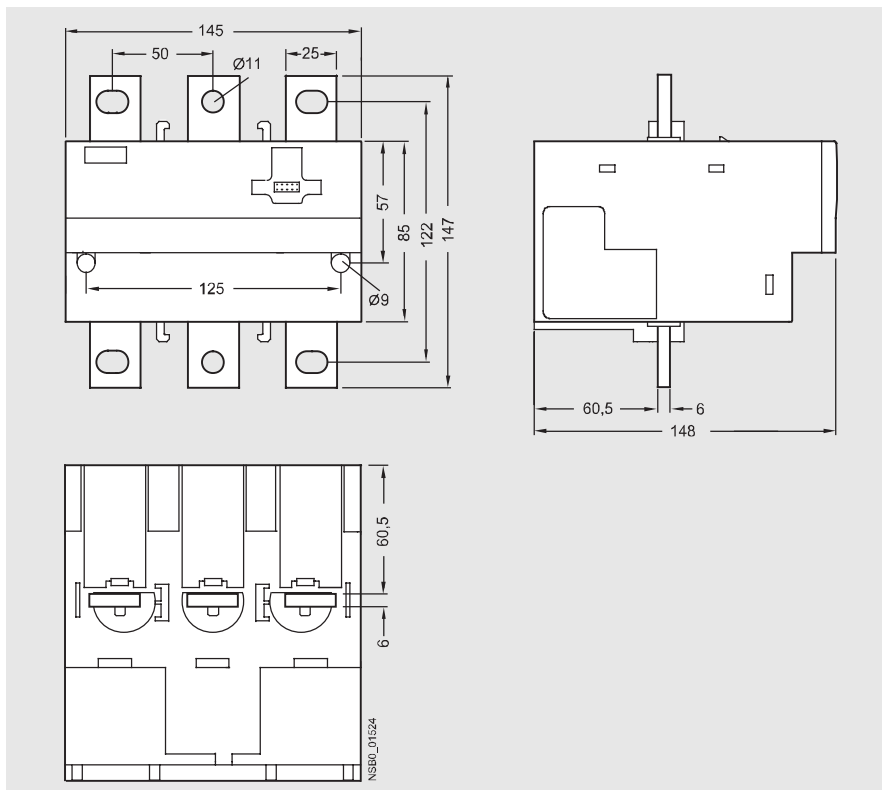
# Overload Relays

## 3RB2 Solid-State Overload Relays

3RB22, 3RB23 for High-Feature applications



3RB29 56-2TH2 current measuring module



3RB29 66-2WH2 current measuring module



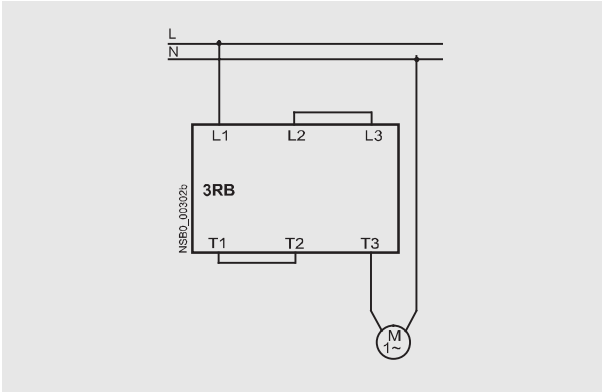
# Overload Relays 3RB2 Solid-State Overload Relays

3RB22, 3RB23 for High-Feature applications

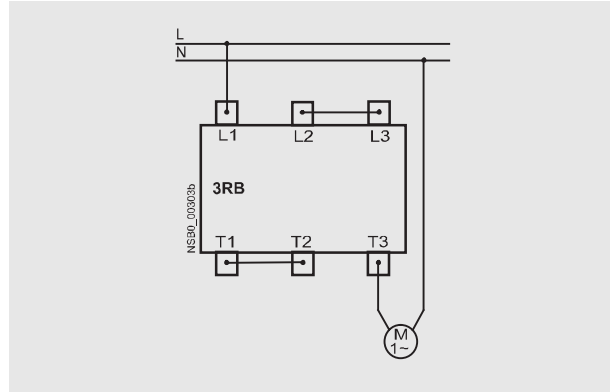
## Schematics

### Protection of single-phase motors

(not in conjunction with internal ground-fault detection)

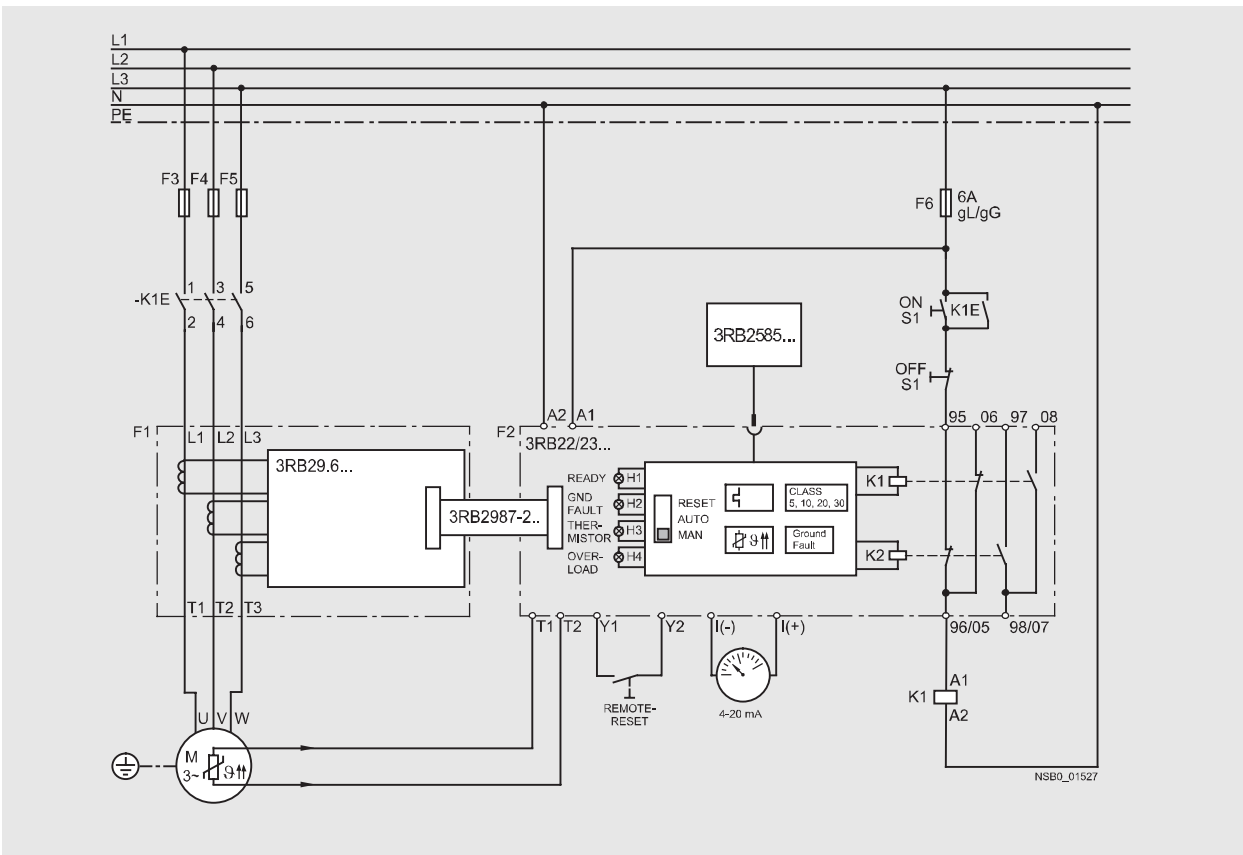


3RB29 06-2.G1, 3RB29 56-2TG2



3RB29 56-2TH2, 3RB29 66-2WH2

### Schematic representation of a possible application (3-phase)



# Overload Relays

## 3RB2 Solid-State Overload Relays

### 3RB22, 3RB23 for High-Feature applications

#### Connections

Evaluation module	Function expansion module	Basic functions	Inputs		
			A1/A2	T1/T2	Y1/Y2
3RB22 83-4AA1 3RB22 83-4AC1 3RB23 83-4AA1 3RB23 83-4AC1	None	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2CA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2CB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground fault signal	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2AA0	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning, analog output	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2AA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning, analog output	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2AB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground fault signal, analog output	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET

Evaluation module	Function expansion module	Outputs				
		I (-) / I (+)	95/96 NC	97/98 NO	05/06 NC	07/08 NO
3RB22 83-4AA1 3RB22 83-4AC1 3RB23 83-4AA1 3RB23 83-4AC1	None	No	Switching off the contactor (inverse-time delayed/temperature-dependent protection)	Signal "tripped"	Overload warning	Overload warning
	3RB29 85-2CA1	No	Switching off the contactor (inverse-time delayed/temperature-dependent protection + ground fault)	Signal "tripped"	Overload warning	Overload warning
	3RB29 85-2CB1	No	Switching off the contactor (inverse-time delayed/temperature-dependent protection)	Signal "tripped"	Switching off the contactor (ground fault)	Signal "ground fault trip"
	3RB29 85-2AA0	Analog signal	Switching off the contactor (inverse-time delayed/temperature-dependent protection)	Signal "tripped"	Overload warning	Overload warning
	3RB29 85-2AA1	Analog signal	Switching off the contactor (inverse-time delayed/temperature-dependent protection + ground fault)	Signal "tripped"	Overload warning	Overload warning
	3RB29 85-2AB1	Analog signal	Switching off the contactor (inverse-time delayed/temperature-dependent protection)	Signal "tripped"	Switching off the contactor (ground fault)	Signal "ground fault trip"

# Overload Relays

## 3RB2 Solid-State Overload Relays

### Accessories

#### Overview

##### Overload relays for standard applications

The following accessories are available for the 3RB20/3RB21 solid-state overload relays:

- One terminal bracket each for the overload relays size S00 and S0 (sizes S2 to S12 can be installed as stand-alone installation without a terminal bracket)
- One mechanical remote RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- One sealable cover for all sizes
- Box terminal blocks for sizes S6 and S10/S12
- Terminal covers for sizes S2 to S10/S12

##### Overload relays for High-Feature applications

The following accessories are available for the 3RB22/3RB23 solid-state overload relays:

- A sealable cover for the evaluation module
- Box terminal blocks for the current measuring modules size S6 and S10/S12
- Terminal covers for the current measuring modules size S6 and S10/S12

#### Technical specifications

##### Terminal brackets for stand-alone installation

Type	3RB29 13-0AA1	3RB29 23-0AA1
For overload relay	3RB20 16, 3RB21 13	3RB20 26, 3RB21 23
Size	S00	S0
Type of mounting	For screw and snap-on mounting onto TH35 standard mounting rail	

##### Connection for main circuit

Connection type		Screw terminal	
<b>Screw terminal</b>			
• Terminal screw		Pozidriv size 2	
• Tightening torque	Nm	0.8 ... 1.2	2 ... 2.5
• Conductor cross-section (min./max.), 1 or 2 conductors			
- Solid	mm <sup>2</sup>	1 × (0.5 ... 2.5), Max. 1 × (... 4)	1 × (1 ... 6), Max. 1 × (... 10)
- Finely stranded without end sleeve	mm <sup>2</sup>	--	--
- Finely stranded with end sleeve	mm <sup>2</sup>	1 × (0.5 ... 2.5)	1 × (1 ... 6)
- Stranded	mm <sup>2</sup>	1 × (0.5 ... 2.5), Max. 1 × (... 4)	1 × (1 ... 6), Max. 1 × (... 10)
- AWG conductors, solid or stranded	AWG	1 × (18 ... 14)	1 × (14 ... 10)

# Overload Relays

## 3RU1 Thermal Overload Relays

### 3RU11 for standard applications

#### Overview



- (1) Connection for mounting onto contactors:  
Optimally adapted in electrical, mechanical and design terms to the contactors and soft starters, these connecting pins can be used for direct mounting of the overload relays. Stand-alone installation is possible as an alternative (in some cases in conjunction with a stand-alone installation module).
- (2) Selector switch for manual/automatic RESET and RESET button:  
With this switch you can choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. A remote RESET is possible using the RESET modules (accessories), which are independent of size.
- (3) Switch position indicator and TEST function of the wiring:  
Indicates a trip and enables the wiring test.
- (4) Motor current setting:  
Setting the device to the rated motor current is easy with the large rotary knob.
- (5) STOP button:  
If the STOP button is pressed, the NC contact is opened. This switches off the contactor downstream. The contactor is switched on again when the STOP button is released.
- (6) Transparent, sealable cover  
Secures the motor current setting, TEST function and the selector switch for manual/automatic RESET against adjustment.
- (7) Supply terminals:  
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-type terminals and alternatively with spring-loaded terminals.

The 3RU11 thermal overload relays up to 100 A have been designed for inverse-time delayed protection of loads with normal starting (see [Function](#)) against excessive temperature rises due to overload or phase failure. An overload or phase failure results in an increase of the motor current beyond the set motor rated current. Via heating elements, this current rise heats up the bi-metal strips inside the device which then bend and as a result trigger the auxiliary contacts by means of a tripping mechanism. 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 set current  $I_{tr}$  and is stored in the form of a long-term stable tripping characteristic (see [Characteristic Curves](#)).

The "tripped" status is signaled by means of a switch position indicator (see [Function](#)). Resetting takes place either manually or automatically after the recovery time has elapsed (see [Function](#)).

The devices are manufactured in accordance with environmental guidelines and contain environmentally friendly and reusable materials.

#### Design

##### Device concept

The 3RU11 thermal overload relays are compact devices, i.e. current measurement and the evaluation unit are integrated in a single enclosure.

##### Mounting options

The 3RU11 thermal overload relays can be mounted directly onto the 3RT1 contactors (exception: size S00 with Cage Clamp connection can only be installed as a stand-alone installation). The devices can also be installed as stand-alone installations with the corresponding terminal brackets.

For more information on the mounting options, please see [Technical Specifications and Selection and Ordering Data](#).

##### Connection technique

All sizes of the 3RU11 thermal overload relays with screw terminal can be connected to the auxiliary and main conducting paths. Rails can be connected to the main conducting path terminals of size S3 overload relays if the box terminals are removed.

As an alternative, the devices are also available with Cage Clamp terminal. The auxiliary conducting path terminals of these devices, and for size S00 the main conducting path terminals as well, are fitted with Cage Clamp terminals.

For more information on the connection options, see [Technical Specifications and Selection and Ordering Data](#).

##### Overload relays in contactor assemblies for Wye-Delta starting

When overload relays are used in combination with contactor assemblies for Wye-Delta starting it must be noted that only 0.58 times the motor current flows through the line contactor. An overload relay mounted onto the line contactor must be set to 0.58 times the motor current.

An assignment of the 3RU11 thermal overload relays to the line contactors of our 3RA contactor assemblies for Wye-Delta starting can be found under "Controls: Contactors and Contactor Assemblies".

##### Operation with frequency converter

The 3RU11 thermal overload relays are suitable for operation with frequency converters. Depending on the frequency of the converter, a higher current than the motor current must be used in some cases due to eddy-currents and skin effects.

# Overload Relays

## 3RU1 Thermal Overload Relays

### 3RU11 for standard applications

#### Function

##### Basic functions

The 3RU11 thermal overload relays are designed for:

- Inverse-time delayed protection of loads from overloading
- Inverse-time delayed protection of loads from phase failure

##### Control circuit

The 3RU11 thermal overload relays do not require an additional supply voltage for operation.

##### Short-circuit protection

Fuses or motor starter protectors must be used for short-circuit protection. For assignments of the corresponding short-circuit protection devices to the 3RU11 thermal overload relays with/without contactor see [Technical Specifications and Selection and Ordering Data](#).

##### Trip classes

The 3RU11 thermal overload relays are available for normal starting conditions with trip class CLASS 10. For heavy starting conditions see 3RB2 Solid-state Overload Relays.

For details of the trip classes see [Characteristic Curves](#).

##### Phase failure protection

The 3RU11 thermal overload relays are fitted with phase failure sensitivity (see [Characteristic Curves](#)) in order to minimize temperature rises of the load in the case of a phase failure during single-phase operation.

##### Setting

The 3RU11 thermal overload relays are set to the motor rated current by means of a rotary knob. The scale of the rotary knob is shown in ampere.

##### Manual and automatic reset

Automatic and manual reset is selected by pressing and turning the blue button (RESET button). If the button is set to manual reset, the overload relay can be reset directly by pressing the RESET button. Resetting is possible in combination with mechanical and electrical RESET options from the accessories range (see [Accessories](#)). If the blue button is set to automatic RESET, the relay is reset automatically.

The time between tripping and resetting is determined by the recovery time.

##### Recovery time

After tripping due to overload, the 3RU11 thermal overload relays require some time until the bimetal strips have cooled down. The device can only be reset after the bimetal strips have cooled down. This time (recovery time) depends on the tripping characteristics and strength of the tripping current.

The recovery time allows the load to cool down after tripping due to overload.

##### TEST function

The TEST slide can be used to check whether the operational 3RU11 thermal overload relay is working properly. Actuating the slide simulates tripping of the relay. During this simulation the NC contact (95-96) is opened and the NO contact (97-98) is closed. This tests whether the auxiliary circuit has been correctly connected to the overload relay. If the 3RU11 thermal overload relay has been set to automatic RESET, the overload relay is automatically reset when the TEST slide is released. The relay must be reset with the RESET button if it has been set to manual RESET.

##### STOP function

If the STOP button is pressed, the NC contact is opened. This switches off the contactor downstream and thus the load. The load is switched on again when the STOP button is released.

##### Display of the operating status

The respective operating status of the 3RU11 thermal overload relay is displayed by means of the position of the marking on the TEST function/switch position indicator slide. After tripping due to overload or phase failure, the marking on the slide is to left on the "O" mark, otherwise it is on the "I" mark.

##### Auxiliary contacts

The 3RU11 thermal overload relays are fitted with an NO contact for the "tripped" signal, and an NC contact for switching off the contactor.

# Overload Relays

## 3RU1 Thermal Overload Relays

### 3RU11 for standard applications

#### Technical specifications

Type	3RU11 16	3RU11 26	3RU11 36	3RU11 46
<b>Size</b>	<b>S00</b>	<b>S0</b>	<b>S2</b>	<b>S3</b>
<b>Width</b>	<b>45mm</b>	<b>45mm</b>	<b>55mm</b>	<b>70mm</b>
<b>General data</b>				
<b>Trips in the event of</b>	Overload and phase failure			
<b>Trip class</b> according to IEC 60947-4-1	CLASS	10		
<b>Phase failure sensitivity</b>	Yes			
<b>Overload warning</b>	No			
<b>Reset and recovery</b>	Manual, automatic and remote RESET <sup>1)</sup>			
<ul style="list-style-type: none"> <li>Reset options after tripping</li> <li>Recovery time                             <ul style="list-style-type: none"> <li>- For automatic RESET min</li> <li>- For manual RESET min</li> <li>- For remote RESET min</li> </ul> </li> </ul>	Depends on the strength of the tripping current and characteristic Depends on the strength of the tripping current and characteristic Depends on the strength of the tripping current and characteristic			
<b>Features</b>				
<ul style="list-style-type: none"> <li>Display of operating status on device</li> <li>TEST function</li> <li>RESET button</li> <li>STOP button</li> </ul>	Yes, by means of TEST function/switch position indicator slide Yes Yes Yes			
<b>Safe operation of motors with "increased safety" type of protection</b>				
EU type test certificate number according to guideline 94/9/EU	KEMA test certificate No. EX-97.Y.3235 DMT 98 ATEX 6001			
<b>Ambient temperature</b>				
<ul style="list-style-type: none"> <li>Storage/transport °C</li> <li>Operation °C</li> <li>Temperature compensation °C</li> <li>Permissible rated current at                             <ul style="list-style-type: none"> <li>- Temperature inside cubicle 60 °C %</li> <li>- Temperature inside cubicle 70 °C %</li> </ul> </li> </ul>	-55 ... +80 -20 ... +70 Up to 60 100 (over 60 °C current reduction is not required) 87			
<b>Repeat terminals</b>				
<ul style="list-style-type: none"> <li>Coil repeat terminal</li> <li>Auxiliary contact repeat terminal</li> </ul>	Yes	Yes	Not required	Not required
<b>Degree of protection</b> according to IEC 60529	IP20		IP20 <sup>2)</sup>	
<b>Touch protection</b> according to IEC 61140	Finger-safe			
<b>Shock resistance with sine</b> according to IEC 60068-2-27	<i>g/ms</i>	8/10		
<b>Electromagnetic compatibility (EMC) – Interference immunity</b>				
<ul style="list-style-type: none"> <li>Conductor-related interference                             <ul style="list-style-type: none"> <li>- Burst according to IEC 61000-4-4 (corresponds to degree of severity 3) kV</li> <li>- Surge according to IEC 61000-4-5 (corresponds to degree of severity 3) kV</li> </ul> </li> <li>Electrostatic discharge according to IEC 61000-4-2 (corresponds to degree of severity 3) kV</li> <li>Field-related interference according to IEC 61000-4-3 (corresponds to degree of severity 3) V/m</li> </ul>	EMC interference immunity is not relevant for thermal overload relays EMC interference immunity is not relevant for thermal overload relays EMC interference immunity is not relevant for thermal overload relays EMC interference immunity is not relevant for thermal overload relays			
<b>Electromagnetic compatibility (EMC) – Emitted interference</b>	EMC interference immunity is not relevant for thermal overload relays			
<b>Resistance to extreme climates – air humidity</b>	%	100		
<b>Dimensions</b>	See dimensional drawings			
<b>Installation altitude above sea level</b>	m	Up to 2000; above this, please enquire		
<b>Mounting position</b>	The diagrams show the permissible mounting positions for direct mounting and stand-alone installation. For installation in the hatched area, a setting correction of 10% must be implemented.			
	Stand-alone installation:			
	Contactor + overload relay:			
<b>Type of mounting</b>	Direct mounting <sup>3)</sup> / Stand-alone installation with terminal bracket <sup>4)</sup>		Direct mounting/ Stand-alone installation with terminal bracket <sup>4)</sup>	

# Overload Relays

## 3RU1 Thermal Overload Relays

3RU11 for standard applications

Type		3RU11 16	3RU11 26	3RU11 36	3RU11 46
<b>Size</b>		<b>S00</b>	<b>S0</b>	<b>S2</b>	<b>S3</b>
<b>Width</b>		<b>45 mm</b>	<b>45 mm</b>	<b>55 mm</b>	<b>70 mm</b>
<b>Main circuit</b>					
<b>Rated insulation voltage <math>U_i</math></b> (pollution degree 3)	V	690			1 000
<b>Rated impulse withstand voltage <math>U_{imp}</math></b>	kV	6			8
<b>Rated operational voltage <math>U_e</math></b>	V	690			1 000
<b>Type of current</b>		Yes			
• Direct current		Yes, frequency range up to 400 Hz			
• Alternating current					
<b>Set current</b>	A	0.11 ... 0.16 to 9 ... 12	1.8 ... 2.5 to 20 ... 25	5.5 ... 8 to 40 ... 50	18 ... 25 to 80 ... 100
<b>Power loss per unit (max.)</b>	W	3.9 ... 6.6	3.9 ... 6	6 ... 9	10 ... 16.5
<b>Short-circuit protection</b>		See Selection and Ordering Data			
• With fuse without contactor		See Technical Specifications			
• With fuse and contactor		(short-circuit protection with fuses/motor starter protectors for motor feeders)			
<b>Safe isolation between main and auxiliary conducting path</b> according to IEC 60947-1	V	500	690		
<b>Connection for main circuit</b>					
<b>Connection type</b>		Screw terminal/ Cage Clamp connection	Screw terminal	Screw terminal with box terminal	Screw terminal with box terminal/rail connection <sup>1)</sup>
<b>Screw terminal</b>		Pozidriv size 2			
• Terminal screw	Nm	0.8 ... 1.2	2 ... 2.5	3 ... 4.5	Allen screw 4 mm 4 ... 6
• Tightening torque					
• Conductor cross-sections (min./max.), 1 or 2 conductors					
- Solid	mm <sup>2</sup>	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5) Max. 2 x (1 ... 4)	2 x (1 ... 2.5) 2 x (2.5 ... 6) Max. 2 x (2.5 ... 10)	2 x (0.75 ... 16)	2 x (2.5 ... 16)
- Finely stranded without end sleeve	mm <sup>2</sup>	--			
- Finely stranded with end sleeve	mm <sup>2</sup>	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5)	2 x (1 ... 2.5) 2 x (2.5 ... 6)	2 x (0.75 ... 16) 1 x (0.75 ... 25)	2 x (2.5 ... 35) 1 x (2.5 ... 50)
- Stranded	mm <sup>2</sup>	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5) Max. 2 x (1 ... 4)	2 x (1 ... 2.5) 2 x (2.5 ... 6) Max. 2 x (2.5 ... 10)	2 x (0.75 ... 25) 1 x (0.75 ... 35)	2 x (10 ... 50) 1 x (10 ... 70)
- AWG conductors, solid or stranded	AWG	2 x (18 ... 14)	2 x (14 ... 10)	2 x (18 ... 3) 1 x (18 ... 1)	2 x (10 ... 1/0) 1 x (10 ... 2/0)
- Ribbon cable conductors (number x width x circumference)	mm	--		2 x (6 x 9 x 0.8)	2 x (6 x 9 x 0.8)
<b>Cage Clamp terminal</b>					
• Conductor cross-sections (min./max.)					
- Solid	mm <sup>2</sup>	2 x (0.25 ... 2.5)	--		
- Finely stranded without end sleeve	mm <sup>2</sup>	2 x (0.25 ... 2.5)	--		
- Finely stranded with end sleeve	mm <sup>2</sup>	2 x (0.25 ... 1.5)	--		
- Stranded	mm <sup>2</sup>	--	--		
- AWG conductors, solid or stranded	AWG	2 x (24 ... 14)	--		
<b>Busbar connections</b>					
• Terminal screw		--			M6 x 20
• Tightening torque	Nm	--			4 ... 6
• Conductor cross-sections (min./max.)					
- Finely stranded with cable lug	mm <sup>2</sup>	--			2 x 70
- Stranded with cable lug	mm <sup>2</sup>	--			3 x 70
- AWG connections, solid or stranded, with cable lug	AWG	--			2/0
- With connecting bar (max. width)	mm	--			12
<b>Straight-through transformers</b>					
• Diameter of opening	mm	--			
• Conductor cross-section (max.)					
- NYY	mm <sup>2</sup>	--			
- H07RN-F	mm <sup>2</sup>	--			

1) The box terminal is removable. Rail and cable lug connections are possible if the box terminal is removed.

#### Footnotes for page 5/70:

- 1) Remote RESET in combination with the corresponding accessories.
- 2) Terminal compartment: Degree of protection IP00.
- 3) The 3RU11 16 overload relay with Cage Clamp terminal can only be installed as a stand-alone installation.
- 4) For screw and snap-on mounting TH 35 standard mounting rail; size S3 also for TH 75 standard mounting rail. For more detailed information about terminal brackets, please see Accessories, Technical Specifications.

5

# Overload Relays

## 3RU1 Thermal Overload Relays

### 3RU11 for standard applications

Type	3RU11 16	3RU11 26	3RU11 36	3RU11 46																																																									
Size	S00	S0	S2	S3																																																									
Width	45mm	45mm	55mm	70mm																																																									
<b>Auxiliary circuit</b>																																																													
Number of NO contacts	1																																																												
Number of NC contacts	1																																																												
Auxiliary contacts – assignment	1 NO for the signal "tripped", 1 NC for switching off the contactor																																																												
Rated insulation voltage $U_i$ (degree of pollution 3)	V	690																																																											
Rated impulse withstand voltage $U_{imp}$	kV	6																																																											
<b>Contact rating of the auxiliary contacts</b>																																																													
<ul style="list-style-type: none"> <li>NC contact with alternating current AC-14/AC-15, rated operational current <math>I_e</math> at <math>U_e</math>:           <table border="0"> <tr><td>- 24 V</td><td>A</td><td>4</td></tr> <tr><td>- 120 V</td><td>A</td><td>4</td></tr> <tr><td>- 125 V</td><td>A</td><td>4</td></tr> <tr><td>- 230 V</td><td>A</td><td>3</td></tr> <tr><td>- 400 V</td><td>A</td><td>2</td></tr> <tr><td>- 600 V</td><td>A</td><td>0.6</td></tr> <tr><td>- 690 V</td><td>A</td><td>0.5</td></tr> </table> </li> <li>NO contact with alternating current AC-14/AC-15, rated operational current <math>I_e</math> at <math>U_e</math>:           <table border="0"> <tr><td>- 24 V</td><td>A</td><td>3</td></tr> <tr><td>- 120 V</td><td>A</td><td>3</td></tr> <tr><td>- 125 V</td><td>A</td><td>3</td></tr> <tr><td>- 230 V</td><td>A</td><td>2</td></tr> <tr><td>- 400 V</td><td>A</td><td>1</td></tr> <tr><td>- 600 V</td><td>A</td><td>0.6</td></tr> <tr><td>- 690 V</td><td>A</td><td>0.5</td></tr> </table> </li> <li>NC contact, NO contact with direct current DC-13, rated operational current <math>I_e</math> at <math>U_e</math>:           <table border="0"> <tr><td>- 24 V</td><td>A</td><td>1</td></tr> <tr><td>- 60 V</td><td>A</td><td>1)</td></tr> <tr><td>- 110 V</td><td>A</td><td>0.22</td></tr> <tr><td>- 125 V</td><td>A</td><td>0.22</td></tr> <tr><td>- 220 V</td><td>A</td><td>0.11</td></tr> </table> </li> <li>Continuous thermal current <math>I_{th}</math></li> <li>Contact reliability (suitability for PLC control; 17 V, 5 mA)</li> </ul>					- 24 V	A	4	- 120 V	A	4	- 125 V	A	4	- 230 V	A	3	- 400 V	A	2	- 600 V	A	0.6	- 690 V	A	0.5	- 24 V	A	3	- 120 V	A	3	- 125 V	A	3	- 230 V	A	2	- 400 V	A	1	- 600 V	A	0.6	- 690 V	A	0.5	- 24 V	A	1	- 60 V	A	1)	- 110 V	A	0.22	- 125 V	A	0.22	- 220 V	A	0.11
- 24 V	A	4																																																											
- 120 V	A	4																																																											
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- 230 V	A	3																																																											
- 400 V	A	2																																																											
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- 24 V	A	3																																																											
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- 24 V	A	1																																																											
- 60 V	A	1)																																																											
- 110 V	A	0.22																																																											
- 125 V	A	0.22																																																											
- 220 V	A	0.11																																																											
<b>Short-circuit protection</b>																																																													
<ul style="list-style-type: none"> <li>With fuse           <table border="0"> <tr><td>- gL/gG operational class</td><td>A</td><td>6</td></tr> <tr><td>- Quick</td><td>A</td><td>10</td></tr> </table> </li> <li>With miniature circuit-breaker (C-characteristic)</li> </ul>					- gL/gG operational class	A	6	- Quick	A	10																																																			
- gL/gG operational class	A	6																																																											
- Quick	A	10																																																											
Safe isolation between main and auxiliary conducting path according to IEC 60947-1	V	415																																																											
<b>CSA, UL, and UR rated data</b>																																																													
Auxiliary circuit – switching capacity	B600, R300																																																												
<b>Connection of the auxiliary circuit</b>																																																													
Connection type	Screw terminal or Cage Clamp terminal																																																												
<b>Screw terminal</b>																																																													
<ul style="list-style-type: none"> <li>Terminal screw</li> <li>Tightening torque</li> <li>Conductor cross-sections (min./max.), 1 or 2 conductors           <table border="0"> <tr><td>- Solid</td><td>mm<sup>2</sup></td><td>2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5)</td></tr> <tr><td>- Finely stranded without end sleeve</td><td>mm<sup>2</sup></td><td>--</td></tr> <tr><td>- Finely stranded with end sleeve</td><td>mm<sup>2</sup></td><td>2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5)</td></tr> <tr><td>- Stranded</td><td>mm<sup>2</sup></td><td>2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5)</td></tr> <tr><td>- AWG conductors, solid or stranded</td><td>AWG</td><td>2 x (18 ... 14)</td></tr> </table> </li> </ul>					- Solid	mm <sup>2</sup>	2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5)	- Finely stranded without end sleeve	mm <sup>2</sup>	--	- Finely stranded with end sleeve	mm <sup>2</sup>	2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5)	- Stranded	mm <sup>2</sup>	2 x (0.5 ... 1.5), 2 x (0.75 ... 2.5)	- AWG conductors, solid or stranded	AWG	2 x (18 ... 14)																																										
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- AWG conductors, solid or stranded	AWG	2 x (18 ... 14)																																																											
<b>Cage Clamp terminal</b>																																																													
<ul style="list-style-type: none"> <li>Conductor cross-sections (min./max.)           <table border="0"> <tr><td>- Solid</td><td>2 x (0.25 ... 2.5)</td></tr> <tr><td>- Finely stranded without end sleeve</td><td>2 x (0.25 ... 2.5)</td></tr> <tr><td>- Finely stranded with end sleeve</td><td>2 x (0.25 ... 1.5)</td></tr> <tr><td>- Stranded</td><td>--</td></tr> <tr><td>- AWG conductors, solid or stranded</td><td>2 x (24 ... 14)</td></tr> </table> </li> </ul>					- Solid	2 x (0.25 ... 2.5)	- Finely stranded without end sleeve	2 x (0.25 ... 2.5)	- Finely stranded with end sleeve	2 x (0.25 ... 1.5)	- Stranded	--	- AWG conductors, solid or stranded	2 x (24 ... 14)																																															
- Solid	2 x (0.25 ... 2.5)																																																												
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- Finely stranded with end sleeve	2 x (0.25 ... 1.5)																																																												
- Stranded	--																																																												
- AWG conductors, solid or stranded	2 x (24 ... 14)																																																												

1) On request.

2) Up to  $I_k \leq 0.5$  kA;  $\leq 260$  V.



# Overload Relays 3RU1 Thermal Overload Relays

3RU11 for standard applications

## Short-circuit protection with fuses/motor starter protectors for motor feeders

With short-circuit currents up to 50 kA at 50/60 Hz 690 V AC

Permissible short-circuit protection fuse for motor starters comprising overload relay and contactor, type of coordination 2<sup>1)</sup>

Size S00											
Setting range	3 kW $\cong$ 3RT10 15 $I_{e\max} = 7$ A (at 50 Hz 400 V AC)			4 kW $\cong$ 3RT10 16 $I_{e\max} = 9$ A (at 50 Hz 400 V AC)			5.5 kW $\cong$ 3RT10 17 $I_{e\max} = 12$ A (at 50 Hz 400 V AC)			UL-listed fuses RK5	Motor starter protectors for starter protection at $I_q = 50$ kA/400 V AC
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
0.11 ... 0.16	0.5	--	--	0.5	--	--	0.5	--	--	1	--
0.14 ... 0.2	1	--	--	1	--	--	1	--	--	1	3RV13 21-0BC10
0.18 ... 0.25	1	--	--	1	--	--	1	--	--	1	3RV13 21-0CC10
0.22 ... 0.32	1.6	--	2	1.6	--	2	1.6	--	2	1	3RV13 21-0DC10
0.28 ... 0.4	2	--	2	2	--	2	2	--	2	1.6	3RV13 21-0EC10
0.35 ... 0.5	2	--	2	2	--	2	2	--	2	2	3RV13 21-0FC10
0.45 ... 0.63	2	--	4	2	--	4	2	--	4	2.5	3RV13 21-0GC10
0.55 ... 0.8	4	--	4	4	--	4	4	--	4	3	3RV13 21-0HC10
0.7 ... 1	4	--	6	4	--	6	4	--	6	4	3RV13 21-0JC10
0.9 ... 1.25	4	--	6	4	--	6	4	--	6	5	3RV13 21-0KC10
1.1 ... 1.6	6	--	10	6	--	10	6	--	10	6	3RV13 21-1AC10
1.4 ... 2	6	--	10	6	--	10	6	--	10	8	3RV13 21-1BC10
1.8 ... 2.5	10	--	10	10	--	10	10	--	10	10	--
2.2 ... 3.2	10	--	16	10	--	16	10	--	16	12	--
2.8 ... 4	16	--	16	16	--	16	16	--	16	16	--
3.5 ... 5	20	6	20	20	6	20	20	6	20	20	--
4.5 ... 6.3	20	6	20	20	6	20	20	6	20	25	--
5.5 ... 8	20	10	20	20	10	20	20	10	20	30	--
7 ... 10	--	--	--	20	16	20	20	16	20	40	--
9 ... 12	--	--	--	--	--	--	20	16	25	45	--

Size S0											
Setting range	5.5 kW $\cong$ 3RT10 24 $I_{e\max} = 12$ A (at 50 Hz 400 V AC)			7.5 kW $\cong$ 3RT10 25 $I_{e\max} = 17$ A (at 50 Hz 400 V AC)			11 kW $\cong$ 3RT10 26 $I_{e\max} = 25$ A (at 50 Hz 400 V AC)			UL-listed fuses RK5	Motor starter protectors for starter protection at $I_q = 50$ kA/400 V AC
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
1.8 ... 2.5	10	--	10	10	--	10	10	--	10	10	3RV13 21-1CC10
2.2 ... 3.2	10	--	16	10	--	16	10	--	16	12	3RV13 21-1DC10
2.8 ... 4	16	--	16	16	--	16	16	--	16	16	3RV13 21-1EC10
3.5 ... 5	20	6	20	20	6	20	20	6	20	20	3RV13 21-1FC10
4.5 ... 6.3	20	6	25	20	6	25	20	6	25	25	3RV13 21-1GC10
5.5 ... 8	25	10	25/32 <sup>2)</sup>	25	10	25/32 <sup>2)</sup>	25	10	32	30	3RV13 21-1HC10
7 ... 10	25	16	25/32 <sup>2)</sup>	25	16	25/32 <sup>2)</sup>	32	16	35	40	3RV13 21-1JC10
9 ... 12.5	25	20	25/32 <sup>2)</sup>	25	20	25/32 <sup>2)</sup>	35	20	35	45	3RV13 21-1KC10
11 ... 16	25	20	25/32 <sup>2)</sup>	25	20	25/32 <sup>2)</sup>	35	20	35	60	3RV13 21-1AC10
14 ... 20	--	--	--	25	20	25/32 <sup>2)</sup>	35	20	35	80	3RV13 21-1BC10
17 ... 22	--	--	--	--	--	--	35	20	35	80	3RV13 21-1CC10
20 ... 25	--	--	--	--	--	--	35	20	35	100	--

For type of coordination 1<sup>1)</sup> see short-circuit protection of the contactors without overload relay under "Controls - Contactors and Contactor Assemblies".

1) Assignment and short-circuit protective devices according to IEC 60947-4-1:

**Type of coordination 1:** the contactor or starter must not endanger persons or the installation in the event of a short-circuit. They do not need to be suitable for further operation without repair and the renewal of parts.

**Type of coordination 2:** The contactor or starter must not endanger persons or the installation in the event of a short-circuit. This must be suitable for further operation. There is a risk of contact welding.

2) At max. 415 V.



# Overload Relays

## 3RU1 Thermal Overload Relays

### 3RU11 for standard applications

#### Short-circuit protection with fuses/motor starter protectors for motor feeders

With short-circuit currents up to 50 kA at 50/60 Hz 690 V AC

Permissible short-circuit protection fuse for motor starters comprising overload relay and contactor, type of coordination 2<sup>1)</sup>

Size S2											
Setting range	15 kW $\cong$ 3RT10 34 $I_{e\max} = 32$ A (at 50 Hz 400 V AC)			18.5 kW $\cong$ 3RT10 35 $I_{e\max} = 40$ A (at 50 Hz 400 V AC)			22 kW $\cong$ 3RT10 36 $I_{e\max} = 50$ A (at 50 Hz 400 V AC)			UL-listed fuses RK5	Motor starter protectors for starter protection at $I_q = 50$ kA/400 V AC
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
5.5 ... 8	25	10	25	25	10	25	25	10	25	30	--
7 ... 10	32	16	32	32	16	32	32	16	32	40	--
9 ... 12.5	35	16	35	35	16	35	35	16	35	50	--
11 ... 16	40	20	40	40	20	40	40	20	40	60	--
14 ... 20	50	25	50	50	25	50	50	25	50	80	--
18 ... 25	63	32	63	63	32	63	63	32	63	100	3RV13 31-4DC10
22 ... 32	63	35	63	63	35	63	80	35	80	125	3RV13 31-4EC10
28 ... 40	63	50	63	63	50	63	80	50	80	150	3RV13 31-4FC10
36 ... 45	--	--	--	63	50	80	80	50	80	175	3RV13 31-4GC10
40 ... 50	--	--	--	--	--	--	80	50	80	200	3RV13 31-4HC10

5

Size S3											
Setting range	30 kW $\cong$ 3RT10 44 $I_{e\max} = 65$ A (at 50 Hz 400 V AC)			37 kW $\cong$ 3RT10 45 $I_{e\max} = 80$ A (at 50 Hz 400 V AC)			45 kW $\cong$ 3RT10 46 $I_{e\max} = 95$ A (at 50 Hz 400 V AC)			UL-listed fuses RK5	Motor starter protectors for starter protection at $I_q = 50$ kA/400 V AC
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
18 ... 25	63	32	63	63	32	63	63	32	63	100	--
22 ... 32	80	35	80	80	35	80	80	35	80	125	--
28 ... 40	80	50	80	80	50	80	80	50	80	150	--
36 ... 50	125	50	125	125	50	125	125	50	125	200	--
45 ... 63	125	63	125	160	63	160	160	63	160	250	3RV13 41-4JC10
57 ... 75	--	--	--	160	80	160	160	80	160	300	3RV13 41-4KC10
70 ... 90	--	--	--	--	--	--	160	100	160	350	3RV13 41-4LC10
80 ... 100	--	--	--	--	--	--	160	100	160	350	3RV13 41-4MC10

For type of coordination 1<sup>1)</sup> see short-circuit protection of the contactors without overload relay under "Controls - Contactors and Contactor Assemblies".

1) Assignment and short-circuit protective devices according to IEC 60947-4-1:

**Type of coordination 1:** the contactor or starter must not endanger persons or the installation in the event of a short-circuit. They do not need to be suitable for further operation without repair and the renewal of parts.

**Type of coordination 2:** the contactor or starter must not endanger persons or the installation in the event of a short-circuit. This must be suitable for further operation. There is a risk of contact welding.

# Overload Relays

## 3RU1 Thermal Overload Relays

3RU11 for standard applications

### Characteristic curves

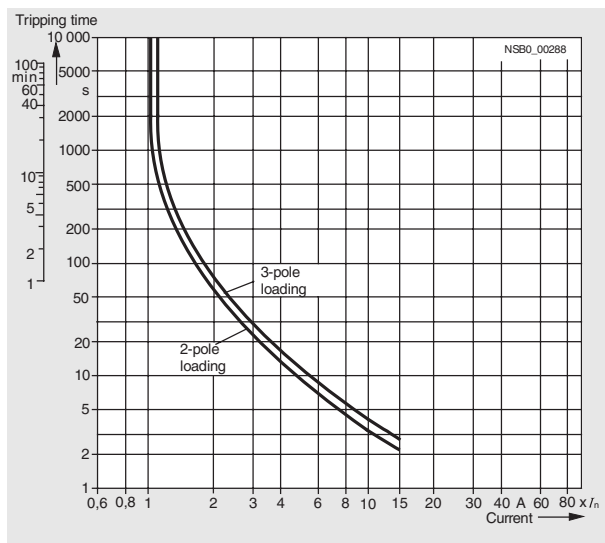
The tripping characteristics show the relationship between the tripping time and tripping current as multiples of the set current  $I_e$  and are given for symmetrical three-pole and two-pole loads from the cold state.

The smallest current used for tripping is called the minimum tripping current. According to IEC 60947-4-1, this current must be within specified limits. The limits of the minimum tripping current for the 3RU11 thermal overload relays for symmetrical three-pole loads are between 105 % and 120 % of the set current.

The tripping characteristic starts with the minimum tripping current and continues with higher tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time intervals within which the overload relays have to trip with 7.2 times the set current  $I_e$  from the cold state for symmetrical three-pole loads.

The tripping times are as follows for:

Trip class	Tripping times
CLASS 10A	2 ... 10 s
CLASS 10	4 ... 10 s
CLASS 20	6 ... 20 s
CLASS 30	9 ... 30 s



This is the schematic representation of a characteristic curve. The characteristic curves for the individual 3RU11 thermal overload relays can be requested from Technical Assistance at the following e-mail address:

[Technical-assistance@siemens.com](mailto:Technical-assistance@siemens.com)

The tripping characteristic for a three-pole 3RU11 thermal overload relay (see characteristic for symmetrical three-pole loads from the cold state) only applies if all three bimetal strips are simultaneously loaded with the same current. If only two bimetal strips are heated due to a phase failure, these two strips alone must generate the necessary force to trigger the tripping mechanism which would result in a longer tripping time or require a higher current. If these higher currents are applied over a longer period, they usually cause damage to the load. To avoid damage, the 3RU11 thermal overload relays are fitted with phase failure sensitivity which ensures faster tripping in accordance with the characteristic for double-pole loads from the cold state by means of a suitable mechanical mechanism.

Compared with a cold load, a load at operating temperature obviously has a lower temperature reserve. This is taken into account by the 3RU11 thermal overload relays by reducing the tripping time to about 25 % when loaded with the set current  $I_e$  for an extended period.

# Overload Relays

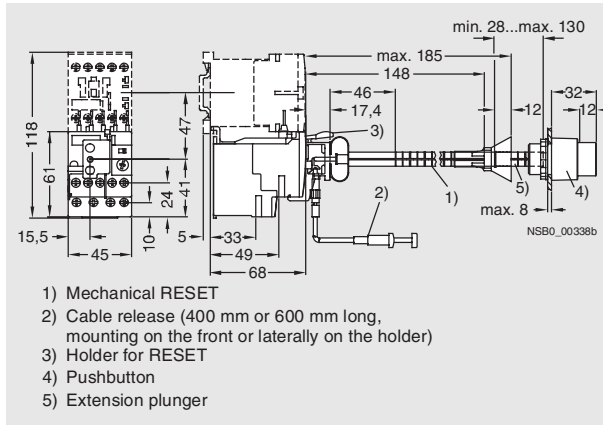
## 3RU1 Thermal Overload Relays

### 3RU11 for standard applications

#### Dimensional drawings

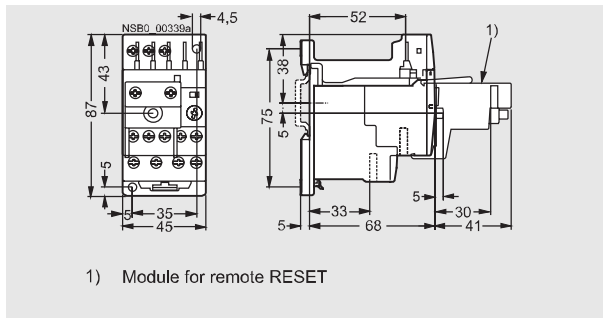
##### Screw terminal system

Lateral distance to grounded components: at least 6 mm.



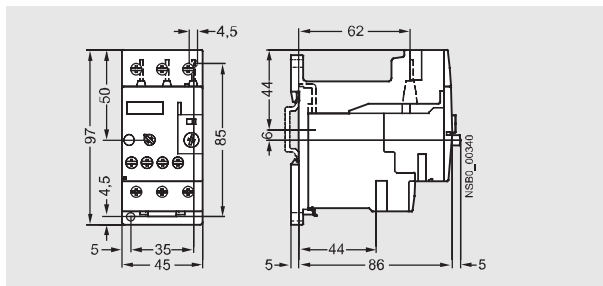
- 1) Mechanical RESET
- 2) Cable release (400 mm or 600 mm long, mounting on the front or laterally on the holder)
- 3) Holder for RESET
- 4) Pushbutton
- 5) Extension plunger

3RU11 16-..B0 overload relay  
Size S00, with mechanical RESET

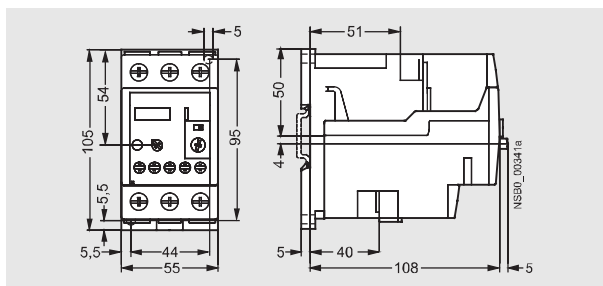


- 1) Module for remote RESET

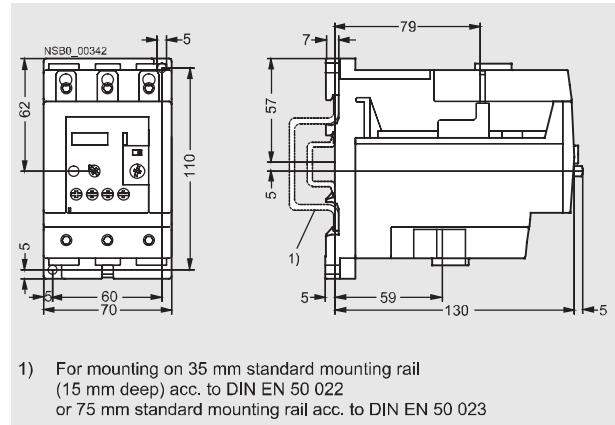
3RU11 16-..B.  
Size S00, with terminal bracket for stand-alone installation, with remote RESET



3RU11 26-..B.  
Size S0, with terminal bracket for stand-alone installation



3RU11 36-..B.  
Size S2, with terminal bracket for stand-alone installation

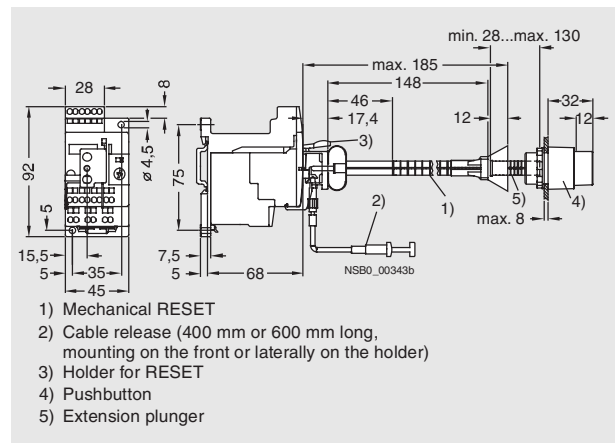


- 1) For mounting on 35 mm standard mounting rail (15 mm deep) acc. to DIN EN 50 022 or 75 mm standard mounting rail acc. to DIN EN 50 023

3RU11 46-..B.  
Size S3, with terminal bracket for stand-alone installation

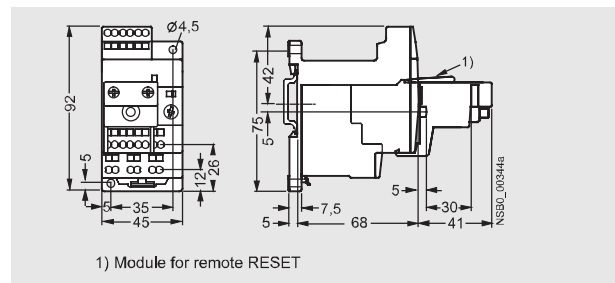
##### Cage Clamp terminal system

The lateral distance to grounded components must be at least 6 mm.



- 1) Mechanical RESET
- 2) Cable release (400 mm or 600 mm long, mounting on the front or laterally on the holder)
- 3) Holder for RESET
- 4) Pushbutton
- 5) Extension plunger

3RU11 16-..C1  
Size S00, with mechanical RESET (same for sizes S00 to S3).



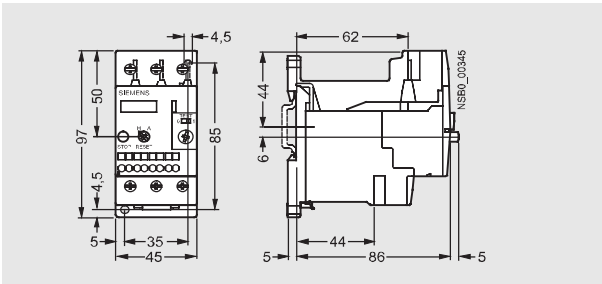
- 1) Module for remote RESET

3RU11 16-..C1  
Size S00, with remote RESET

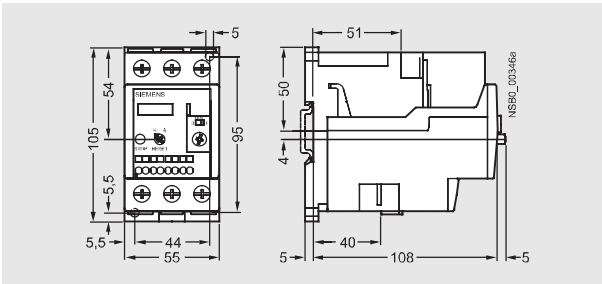
# Overload Relays

## 3RU1 Thermal Overload Relays

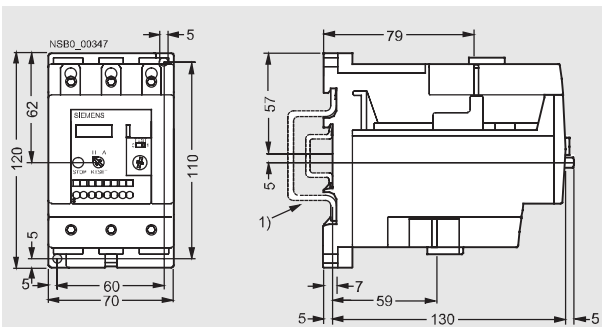
3RU11 for standard applications



3RU11 26-.D.  
Size S0, with terminal bracket for stand-alone installation



3RU11 36-.D.  
Size S2, with terminal bracket for stand-alone installation

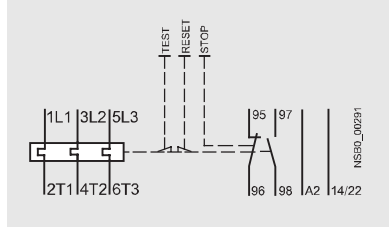


- 1) For mounting on 35 mm standard mounting rail (15 mm deep) acc. to DIN EN 50 022 or 75 mm standard mounting rail acc. to DIN EN 50 023

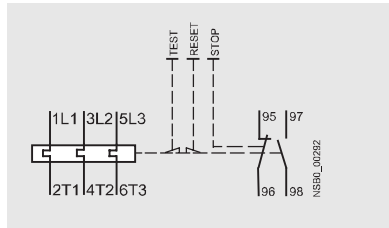
3RU11 46-.D.  
Size S3, with terminal bracket for stand-alone installation

For dimensional drawings of overload relays mounted onto contacts see "Controls - Contactors and Contactor Assemblies".

### Schematics

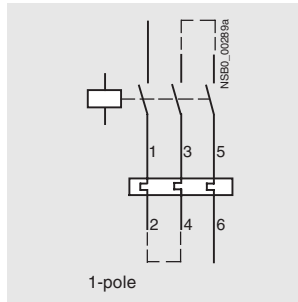


3RU11 16 overload relays

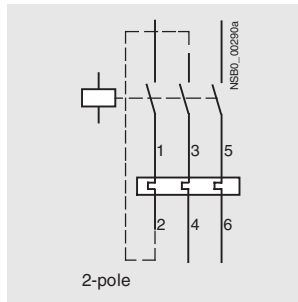


3RU11 26 to 3RU11 46 overload relays

### Protection of DC motors



1-pole



2-pole



# Overload Relays

## 3RU1 Thermal Overload Relays

### Accessories

#### Overview

The following accessories are available for the 3RU11 thermal overload relays:

- For the four overload relay frame sizes S00 to S3 one terminal bracket each for stand-alone installation
- One electrical remote RESET module in three voltage variants for all sizes
- One mechanical RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- Terminal covers

#### Technical specifications

##### Terminal brackets for stand-alone installation

Type	3RU1916-3AA01	3RU1926-3AA01	3RU1936-3AA01	3RU1946-3AA01
<b>For overload relay</b>	<b>3RU1116</b>	<b>3RU1126</b>	<b>3RU1136</b>	<b>3RU1146</b>
<b>Mounting type</b>	For screw and snap-on mounting onto TH 35 standard mounting rails, size S3 also for TH 75 standard mounting rails.			
<b>Connection for main circuit</b>				
<b>Connection type</b>	Screw terminal		Screw terminal with box terminal	
<b>Screw terminal</b>	Pozidriv size 2		Allen screw 4 mm	
• Terminal screw				
• Conductor cross-section (min./max.), 1 or 2 conductors				
- Solid	mm <sup>2</sup> 1 x (0.5 ... 2.5) Max. 1 x (... 4)	1 x (1 ... 6) Max. 1 x (... 10)	2 x (0.75 ... 16)	2 x (2.5 ... 16)
- Finely stranded without end sleeve	mm <sup>2</sup> --			
- Finely stranded with end sleeve	mm <sup>2</sup> 1 x (0.5 ... 2.5)	1 x (1 ... 6)	2 x (0.75 ... 16), 1 x (0.75 ... 25)	2 x (2.5 ... 35), 1 x (2.5 ... 50)
- Stranded	mm <sup>2</sup> 1 x (0.5 ... 2.5) Max. 1 x (... 4)	1 x (1 ... 6) Max. 1 x (... 10)	2 x (0.75 ... 25), 1 x (0.75 ... 35)	2 x (10 ... 50), 1 x (10 ... 70)
- AWG conductors, solid or stranded	AWG 1 x (18 ... 14)	1 x (14 ... 10)	2 x (18 ... 3), 1 x (18 ... 1)	2 x (10 ... 1/0), 2 x (10 ... 2/0)
- Ribbon cable conductors (number x width x circumference)	mm --	--	2 x (6 x 9 x 0.8)	2 x (6 x 9 x 0.8)