SIRIUS 3RU2/3RB3 overload relays 5

5.1 Standards

5.1.1 Standards

Applicable standards

3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays meet the requirements of the following standards:

Table 5- 1 Standards

Device standards	• IEC/EN 60947-1 • IEC/EN 60947-4-1 • IEC/EN 60947-5-1 • IEC 61000-4; UL 508/CSA C 22.2
EMC standard	3RB30/3RB31 solid-state overload relays also meet the requirements of EMC standards. These standards are not relevant in the case of the 3RU21 thermal overload relay.
Resistance to extreme climates	The overload relays are climate-proof according to IEC 60721-3.
Touch protection	Overload relays are safe to touch according to DIN VDE 0106 Part 100. Terminal covers may have to be fitted onto the connecting bars, depending on the assignment to other devices.

Reference

Other standards that 3RU21 and 3RB30/3RB31 overload relays conform to are listed in the chapter titled Technical data (Page 536). SIRIUS components have been approved by a whole range of bodies for various sectors (shipbuilding, etc.). An up-to-date list of approvals appears in Chapter 20 of the Siemens Low Voltage LV1 Catalog, and more information, as well as an option to download certificates, can be obtained on the Internet (http://www.siemens.com/automation/service&support).

5.2 Product description

5.2.1 Introduction

3RU21 thermal overload relays

3RU21 thermal overload relays up to 40 A have been designed to provide current-dependent protection for loads with normal starting against impermissibly high temperature rises due to overload, phase asymmetry or phase failure. An overload or phase failure results in an increase of the motor current beyond the set rated motor current.

Via heating elements, this current rise increasingly heats up the bimetal strips located inside the device. The deflection of these bimetal strips eventually activates the auxiliary contacts via a release mechanism. The contacts then disconnect the load via a contactor. (The contactor function is not an integral component of the overload relay.)

3RB30/3RB31 solid-state overload relays

3RB30/3RB31 solid-state overload relays up to 40 A have been designed to provide current-dependent protection for loads with normal and heavy-duty starting against impermissibly high temperature rises due to overload, phase asymmetry or phase failure.

An overload, phase asymmetry or a phase failure results in an increase of the motor current beyond the set rated motor current.

This current rise is detected by the current transformers integrated in the devices and evaluated by corresponding solid-state circuits which then supply a pulse to the auxiliary contacts. The contacts then disconnect the load via a contactor. (The contactor function is not an integral component of the overload relay.)

In addition to current-dependent protection for loads against impermissibly high temperature rise caused by overload, phase asymmetry, and phase failure, 3RB31 solid-state overload relays feature internal ground-fault detection (not possible in conjunction with contactor assemblies for star-delta (wye-delta) start). This provides protection of loads against high-impedance faults to ground caused by damaged insulation, moisture, condensation, etc.

System integration

The overload relays have been matched to the contactors in the 3RT series both electrically and mechanically and can be integrated in the feeder by means of direct mounting. The thermal and the solid-state overload relays are available in two sizes, S00 and S0.

Connection systems

The overload relays are available with the following connection system options:

- Screw-type connection system
- Spring-loaded connection system
- Ring cable lug connection system (3RU21 only)

Accessories

The accessories have been tailored to the overload relays; they can be mounted easily and without the need for tools.

5.2.2 Versions

Sizes, setting ranges, and device versions

The table below provides an overview of the various sizes in which 3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays are available. The maximum rated currents, the minimum and maximum setting ranges, and the available tripping classes are listed for each individual size.

Table 5- 2 Sizes

Size (width 45 mm each)	3RU21 thermal overload relay	3RB30 solid-state overload relay	3RB31 solid-state overload relay
Rated operational voltage U_e	690 V AC	690 V AC	690 V AC
Rated frequency	50/60 Hz	50/60 Hz	50/60 Hz
Tripping classes	CLASS 10	CLASS 10 or 20 (fixed)	CLASS 5, 10, 20, 30 (adjustable)
Current ranges for thermal overload releases	0.11 to 0.16 A to 34 to 40 A	-	-
Current ranges for solid-state overload releases	-	0.1 to 0.4 A to 10 to 40 A	0.1 to 0.4 A to 10 to 40 A
Rated operational power for three-phase motors at 400 V AC	0.04 kW to 18.5 kW	0.04 kW to 18.5 kW	0.04 kW to 18.5 kW

3RB30/3RB31 solid-state overload relays have the same dimensions as 3RU21 thermal overload relays. This means that thermal overload relays can easily be substituted with solid-state versions if increased overload protection is required (wide setting ranges (1:4), for example, or even reduced power loss and, as a result, minimized energy consumption).

5.2.3 Applications

Table 5- 3 Overview of applications

Applications	3RU21	3RB30/3RB31
System protection	✓[1)]	✓[1)]
Motor protection	✓	✓
Alternating current, 3-phase	✓	✓
Alternating current, 1-phase	✓	-
Direct current	✓	-

1) In the main circuit, the devices provide overload protection for the assigned electrical loads (e.g. motors), feeder cable, and other switching and protection devices in the respective load feeder. The 3 phases have to be under symmetrical load.

3RU21 thermal overload relays

3RU21 thermal overload relays have been designed to protect three-phase loads, DC loads, and single-phase AC loads.

Note

Protection of DC loads/single-phase AC loads

If a 3RU21 thermal overload relay is to be used to protect DC loads or single-phase AC loads, all the bimetal strips have to be heated. Therefore, all of the relay's main current paths have to be connected in series.

3RB30/3RB31 solid-state overload relays

3RB30/3RB31 solid-state overload relays are designed to protect three-phase loads in sinusoidal 50/60 Hz voltage supplies.

Note

DC loads/Single-phase AC loads

The relay is not suitable for protecting DC loads or single-phase AC loads. In the case of loads with single-pole load, the 3RU21 thermal overload relay or the 3RB22/3RB23 solid-state overload relay (only suitable for the protection of single-phase AC loads) should be used.

Reference

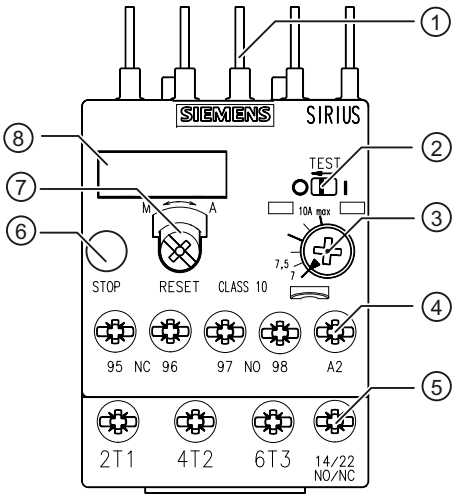
More information ...	Can be found in the chapter titled ...
About overload relay applications	Configuration (Page 503)

The advantages of load feeders with overload relays

Installing load feeders with overload relays (fuses + contactor + overload relay or MSP for starter combinations/circuit breaker (acc. to UL) + contactor + overload relay) has the following advantages over configurations without overload relays (motor starter protector + contactor):

- Overload release and short-circuit release are signaled separately. In the event of a short circuit the fuses or the MSP for starter combinations/circuit breaker (acc. to UL) limit the short-circuit current and in the event of an overload the overload relay disconnects the contactor (and thus the load).
- At voltages higher than 400 V, fuses have a short-circuit breaking capacity of more than 100 kA. Therefore, the fused option comprising fuses + contactor + overload relay is often used in 690 V supplies.
- An automatic RESET can be performed easily in conjunction with an overload relay. As a result, the feeder does not have to be powered back up locally following an overload release.
- Attachable electrical and mechanical RESET modules which are compatible for use with all sizes enable 3RU21 thermal overload relays to be reset remotely. Mechanical RESET modules which are compatible for use with all sizes can also be attached to 3RB30/3RB31 solid-state overload relays. An electrical remote RESET is an integral component of the 3RB31.
- Lengthy start times can be achieved with 3RB30/3RB31 solid-state overload relays.
- 3RB30/3RB31 solid-state overload relays support wide setting ranges of 1:4.
- MSP for starter combinations/circuit breaker (acc. to UL) + contactor + overload relay combinations have the advantage that the load feeder can be isolated easily and all three poles can be disconnected in the event of a short circuit.

5.2.4 3RU21 thermal overload relays



1 Connection for contactor mounting:
In terms of their electrical and mechanical features and their design, these pins are perfectly compatible with the contactors and soft starters for the direct mounting of overload relays. Stand-alone assembly is also an option (in conjunction with a stand-alone assembly module).

2 Switch position indicator and TEST function for wiring:
Indicates a trip and facilitates testing of the wiring.

3 Motor current setting:
The large rotary button provides an easy means of setting the device to the rated motor current.

4 Control circuit terminal::
A screw-type, spring-loaded or ring cable lug connection system can be used to connect the control circuit.
Information about the date of manufacture and product version appears below.

5 Main circuit terminal:
A screw-type, spring-loaded or ring cable lug connection system can be used to connect the main circuit terminal.

6 STOP button:
Pressing the button opens the NC contact, thereby disconnecting the downstream contactor. The NC contact closes again when the button is released.

7 Selector switch for manual/automatic RESET and RESET button:
This switch is used to choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. The device can be reset remotely using the RESET modules (accessories) which are compatible for use with all sizes.

8 Label

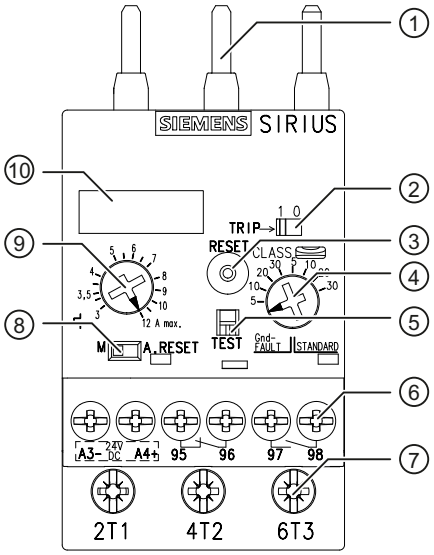
Figure 5-1 Equipment, 3RU21 overload relay

A sealable transparent cover can be optionally mounted (accessory). It stops the motor setting being tampered with.

Auxiliary contacts

3RU21 thermal overload relays are equipped with an NO contact for the "tripped" message and an NC contact for disconnecting the contactor.

5.2.5 3RB30/3RB31 solid-state overload relays



1 Connection for contactor mounting:
In terms of their electrical and mechanical features and their design, these pins are perfectly compatible with the contactors and soft starters for the direct mounting of overload relays. Stand-alone assembly is also an option (in some cases in conjunction with a stand-alone assembly module).

2 Switch position indicator and TEST function for wiring:
Indicates a trip and facilitates testing of the wiring.

3 RESET button

A device set to manual RESET can be reset locally by pressing the RESET button. On the 3RB31 an electronic remote RESET is integrated.

4 Tripping class setting/Internal ground-fault detection (3RB31 only):
This rotary switch is used to set the required tripping class dependent upon the starting conditions and activate internal ground-fault detection.

5 Electronics test (device test):
Enables a test of all major device components and functions.

6 Control circuit terminal (removable):
A screw-type or spring-loaded system can be used to connect the control circuit terminal.

7 Main circuit terminal:
A screw-type or spring-loaded system can be used to connect the main circuit terminal.

8 Selector switch for manual/automatic RESET and RESET button:
The slide switch is used to choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. On the 3RB31 an electrical remote RESET is integrated.
Information about the date of manufacture and product version appears below.

9 Motor current setting:
The large rotary button provides an easy means of setting the device to the rated motor current.

10 Label

Figure 5-2 Equipment, 3RB30/3RB31 overload relays

A sealable transparent cover can be optionally mounted (accessory). It stops the motor setting being tampered with.

Auxiliary contacts

3RB30/3RB31 solid-state overload relays are equipped with an NO contact for the "tripped" message and an NC contact for disconnecting the contactor.

5.3 Product combinations

Since the products from the innovative SIRIUS modular system are matched to one another both electrically and mechanically, they can be combined quickly and easily.

Reference

More information ...	Can be found in the chapter titled ...
About the possible combinations of standard products from the SIRIUS modular system	System overview, under Device combinations (Page 70)

5.4 Functions

5.4.1 Protection against overload, phase failure, and phase asymmetry

5.4.1.1 Functional principle

Overload relays are used for the current-dependent protection of electrical consumers (such as motors) against excessive temperature rises, which may be caused by overloading, asymmetrical power consumption, a phase failure in the line supply conductor or a locked rotor.

In the event of an overload, phase asymmetry or a phase failure, or if a rotor locks, the motor current will rise beyond the set rated motor current. This increased current - which, if sustained over a long period, may damage or even destroy the load - is detected by the overload relay and evaluated with the assistance of a thermal motor model.

Two functional principles are possible here:

- Thermal
- Solid-state

Functional principle of 3RU21 thermal overload relays

The current rise caused by the overload causes increased heat rise affecting the heating elements. The bimetals respond by deflecting, and actuate the auxiliary contacts via the release mechanism.

Functional principle of 3RB30/3RB31 solid-state overload relays

The current rise is detected by the integrated current transformers and evaluated by corresponding solid-state circuits which then supply a pulse to the auxiliary contacts. The contactor and the load are disconnected via the auxiliary contacts.

Note

Protection of DC loads and single-phase AC loads

Only 3RU21 thermal overload relays can provide an assurance of protecting DC loads and single-phase AC loads against overload.

If a 3RU21 thermal overload relay is to be used to protect DC loads or single-phase AC loads, all the bimetal strips have to be heated. Therefore, all of the relay's main current paths have to be connected in series.

Phase-failure protection

3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays feature phase loss sensitivity (see the chapter titled Tripping characteristics (Page 496)) to minimize load temperature rise in two-phase operation.

5.4.1.2 Time-delayed overload release

The time-delayed overload release is based on a thermal motor model and will trigger a release dependent upon the extent of the overload.

3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays compensate temperature up to 60 °C according to IEC 60947-4-1.

5.4.1.3 Tripping classes

The tripping classes describe time intervals within which the overload relays have to trip in the case of a symmetrical, 3-pole load from the cold state with 7.2 times the current setting.

3RU21 thermal overload relays

3RU21 thermal overload relays are available for normal starting conditions in tripping class CLASS 10. 3RB30/3RB31 solid-state overload relays can be used for heavy-duty starting conditions.

The tripping times according to IEC/EN 60947-4-1 are as follows:

Table 5- 4 Tripping times dependent upon tripping classes according to standard IEC/EN 60947-4-1

Tripping class	Tripping time t_A in s at 7.2 x I_e from cold
CLASS 10 A	$2 < t_A \leq 10$
CLASS 10	$4 < t_A \leq 10$
CLASS 20	$6 < t_A \leq 20$
CLASS 30	$9 < t_A \leq 30$

3RB30/3RB31 solid-state overload relays

3RB30 solid-state overload relays are available for normal starting conditions in tripping class CLASS 10 or for heavy-duty starting conditions in tripping class CLASS 20 (all fixed settings).

3RB31 solid-state relays are suitable for normal and heavy-duty starting conditions. A rotary switch is used to set the required tripping class (CLASS 5, 10, 20 or 30) dependent upon the prevailing starting conditions.

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

Table 5- 5 Tripping times dependent upon tripping classes according to standard IEC/EN 60947-4-1, tolerance band E

Tripping class	Tripping time t_A in s at 7.2 x I_e from cold
CLASS 5	$3 < t_A \leq 5$
CLASS 10	$5 < t_A \leq 10$
CLASS 20	$10 < t_A \leq 20$
CLASS 30	$20 < t_A \leq 30$

5.4.1.4 Tripping characteristics

Introduction

The tripping characteristic curves map the relationship between tripping time and tripping current as a multiple of the current setting I_e ; they are specified for symmetrical 3-pole and for 2-pole loading from cold.

The lowest current at which tripping will occur is known as the minimum tripping current. According to IEC/EN 60947-4-1/VDE 0660 Part 102, this current has to lie within specific defined limits.

The limits for the total tripping current in the case of 3RU21/3RB30/3RB31 overload relays with symmetrical 3-pole loading are between 105 and 120 % of the current setting.

Tripping characteristics

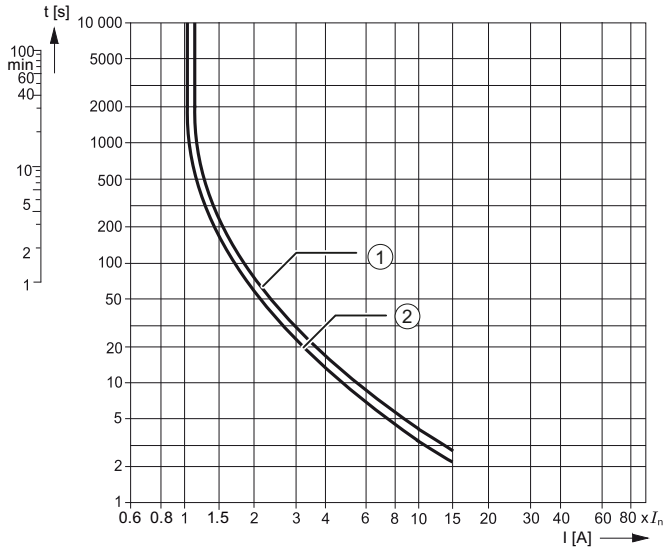
The limit tripping current determines the progression of the tripping characteristic curve up to higher tripping currents based on the characteristics of the tripping classes (CLASS 10, CLASS 20 etc., see the chapter titled Tripping classes (Page 495)).

The tripping classes describe time intervals within which the overload relays have to trip in the case of a symmetrical, 3-pole load from the cold state with 7.2 times the current setting I_e.

Tripping characteristic curves for the 3RU21 thermal overload relay

The tripping characteristic curve for the 3RU21 thermal overload relay loaded at 3 poles (see the figure below) applies subject to the prerequisite that all three bimetal strips are loaded with the same current at the same time. If only two bimetal strips are heated following a phase failure, these two strips alone have to generate the force required to trigger the release mechanism and would need a longer tripping time or a higher current if no additional action was taken. If these higher currents are applied over a longer period of time, they usually cause damage to the load. To avoid damage, 3RU21 overload relays feature phase loss sensitivity, which uses a corresponding mechanism to induce accelerated tripping in accordance with the characteristic curve for 2-pole loading from the cold state.

Compared with a cold load, a load at operating temperature obviously has a lower temerature reserve. 3RU21 thermal relays take account of this fact by reducing the tripping time to approximately a quarter following prolonged loading with the setting current I_e.



t [s] Tripping time

I [A] Current

1 3-pole load

2 2-pole load

Figure 5-3 Time-current characteristic curve, schematic diagram

Tripping characteristic curves for 3RB30/3RB31 solid-state overload relays

The tripping characteristic curve for an overload relay loaded at 3 poles from cold (see Figure 1) applies subject to the prerequisite that all three phases are loaded with the same current at the same time. In the event of a phase failure, the 3RB30/3RB31 solid-state overload relays disconnect the contactor more quickly to minimize the load's temperature rise in accordance with the tripping characteristic curve for 2-pole loading from the cold state (see Figure 2). In the event of phase asymmetry, the devices disconnect dependent upon the extent of the asymmetry between the two characteristic curves.

Compared with a cold load, a load at operating temperature obviously has a lower temerature reserve. It is for this reason that the tripping time of 3RB30/3RB31 solid-state overload relays is reduced to approximately 30 % following prolonged loading with the current setting I_e.

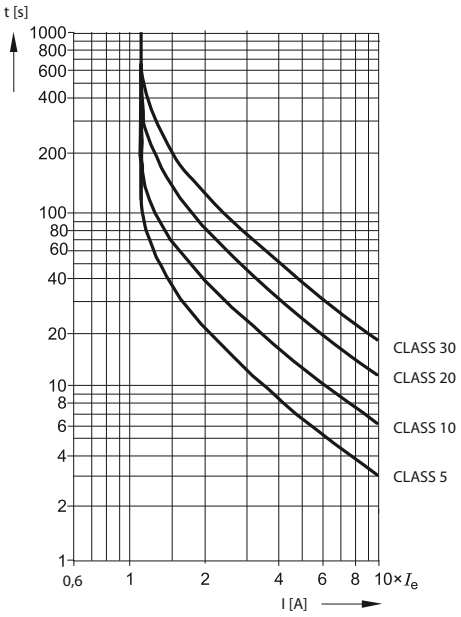


Figure 1

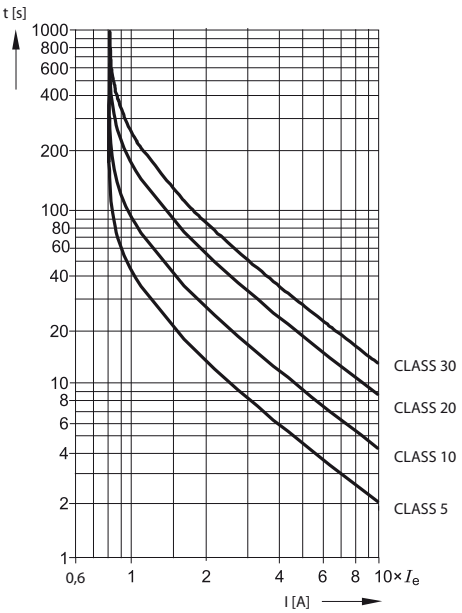


Figure 2

t [s] Tripping time
I [A] Current

Reference

The figures are schematic representations of the characteristic curves. The characteristic curves for the individual overload relays can be downloaded from the Internet (http://www.siemens.com/automation/service&support).

5.4.2 Ground-fault protection (3RB31 only)

Introduction

In addition to current-dependent protection for loads against impermissibly high temperature rise caused by overload, phase asymmetry, and phase failure, 3RB31 solid-state overload relays feature internal ground-fault detection (not possible in conjunction with contactor assemblies for star-delta (wye-delta) start). This provides protection of loads against high-impedance faults to ground caused by damaged insulation, moisture, condensation, etc.

Ground-fault protection

In the event of a ground fault, the device trips immediately, disconnecting the contactor (and thus the load) by means of the auxiliary contacts. To also protect the load and the system against ground faults caused by damaged insulation, moisture, condensation, etc., the overload relays support ground-fault monitoring by means of internal ground-fault detection.

Note

Contactor assembly for star-delta (wye-delta) start

Internal ground-fault detection is not possible with contactor assemblies star-delta (wye-delta) start.

Table 5- 6 Ground-fault detection

Type of ground-fault detection	Application
Internal ground-fault detection	For motors with three-wire connection for the detection of fault currents ≥ 75 % of the current setting I_e in operation

5.4.3 Auxiliary contacts

Function

The auxiliary contacts control the contactor and signal overloads.

Auxiliary contact	Response to overload
NC contact (NC 95-96)	Disconnects the contactor, thereby protecting: • The contactor • The cables • The load
NO contact (NO 97-98)	Sends a signal, e.g. to the: • Control system • Lamp • Other actuators

Note

Contact rating

The contact rating of the auxiliary switches to be taken into account is specified in the Technical data (Page 536).

Reference

More information ...	Can be found in...
About the response of auxiliary contacts	The chapter titled Response of the auxiliary contacts (Page 522)

5.4.4 Indication of the operating state

The prevailing operating state of the 3RU21/3RB30/3RB31 relays is indicated by the position of the marker on the "TEST function/Switch position indicator" slide.

If the relays are operating without errors, the slide marker will be set to "I". When a device trips, the slide marker moves to "0". An overload relay can trip for the following reasons:

- Overload,
- Phase asymmetry,
- Phase failure, or
- Ground fault (3RB31)
- Internal error (3RB30/3RB31)

Resetting

The relay is reset manually or automatically after a recovery time has elapsed.

Reference

Additional information...	Can be found in the chapter titled...
About resetting	RESET after release (Page 517)

5.4.5 Self-monitoring (3RB30/3RB31 only)

3RB30/3RB31 solid-state overload relays constantly monitor their ability to operate (self-monitoring) and trip in the event of an internal error.

In such cases you need to contact Technical Assistance on the Internet (http://www.siemens.com/automation/service&support)

5.4.6 Additional functions

RESET function

There are various ways to reset the device following an overload release.

Table 5- 7 RESET options for for overload relays

Overload relay	Auto RESET	Manual RESET	Mech. remote RESET (accessory)		Elect. remote RESET
			Release slide	Cable release	
3RU21	✓	✓	✓	✓	✓ (accessory)
3RB30	✓	✓	✓	✓	-
3RB31	✓	✓	✓	✓	✓ (built-in)

The relay cannot be reset until after the recovery time has elapsed.

Stop function (3RU21 only)

Pressing the STOP button on the 3RU21 thermal overload relay opens the NC contact, thereby disconnecting the downstream contactor and thus the load. The load is switched back on via the contactor when the STOP button is released. In the case of maintained-contact operation in the auxiliary circuit, the load is switched back on via the contactor when the red STOP button is released.

Test function for the 3RU21 thermal overload relay

The TEST slide can be used to check whether the operational 3RU21 thermal overload relay is working properly. The tripping of the relay can be simulated by moving the slide. This simulation process opens the NC contact (95-96) and closes the NO contact (97-98), thereby checking that the auxiliary circuit has been wired to the overload relay correctly.

Test function for the 3RB30/3RB31 solid-state overload relay

The correct function of the relay when ready for operation can be checked by pressing the TEST button with the motor current flowing (device/electronics test). Current sensing, the motor model, and the tripping unit are tested.

The switch position indicator slide can be used to test the auxiliary contacts and the control current wiring. The tripping of the relay can be simulated by moving the slide, thereby providing a means of checking that the auxiliary circuit has been wired correctly.

Reference

More information ...	Can be found in...
About the RESET function	The chapter titled RESET after release (Page 517)
About the test function	The chapter titled TEST function (Page 520)

5.5 Configuration

5.5.1 Overload relays in motor feeders

5.5.1.1 Overload relays in motor feeders

The individual overload relay families protect the following loads against the consequences of an overload, a phase failure, and phase asymmetry.

Table 5- 8 Overload relays in motor feeders

For the protection of	3RU21	3RB30/3RB31
Three-phase current loads	✓	✓
DC loads	✓	-
Single-phase AC loads	✓	-

Note

In the case of three-phase current loads, only 3-pole circuits (3 phases) are permitted. 4-pole circuits (3 phases + neutral conductor) are not permitted.

NOTICE

Design of motor feeders

An overload relay alone cannot protect a load against **overload**. The overload relay simply detects the current, evaluates it, and switches the auxiliary contacts according to the relevant tripping characteristic curve. The connected contactor, and thus the load, are disconnected via the auxiliary contacts.

A protective device such as a motor starter protector/circuit breaker (acc. to UL) or fuses must be installed upstream of the load to provide protection against **short circuits**.

Appropriate contactors are required to protect loads. The table below provides an overview of the assignments between overload relays and contactors, along with their power ratings.

Table 5- 9 Overload relay with contactor assemblies

Overload relay	Current range	Contactors (type, size, rating in kW)	
Type	[A]	3RT201 S00 3/4/5.5/7.5	3RT202 S0 5.5/7.5/11/15 /18.5
3RU211[1)]	0.11 … 16	✓	-
3RU212[1)]	1.8 … 40	-	✓
3RB301[1)]	0.1 … 16	✓	-
3RB302[1)]	0.1 … 40	-	✓
3RB311[1)]	0.1 … 16	✓	-
3RB312[1)]	0.1 … 40	-	✓

[1)] If you are using the overload relays in feeders, see Technical data (Page 536)

The configuration guide titled "Configuring SIRIUS Innovations - Selection data for load feeders in fuseless and fused designs" (order no. 3ZX1012-0RA21-1AC0) provides information about the assembly of type-tested motor feeders according to IEC/EN 60947-4-1 with type of coordination 1 or 2.

5.5.1.2 Normal and heavy-duty starting

Normal starting

Selecting the right overload relay means considering the start time as well as the rated motor current. The start time refers to the time required by the motor between switching on and reaching its rated speed.

Table 5- 10 Normal starting

Designation	Start time
Normal starting	< 10 s
Heavy-duty starting	> 10 s

Heavy-duty starting

Note

Special overload relays with corresponding tripping classes are required to protect heavy-duty-starting motors (for the acceleration of large centrifuges, for example). In the case of heavy-duty starting, the cables and contactors also have to be dimensioned specifically on account of the increasing thermal load.

5.5.1.3 Contactor assembly for star-delta (wye-delta) start

Overload relays in contactor assemblies for star-delta (wye-delta) start

When using overload relays in conjunction with contactor assemblies for star-delta (wye-delta) start, you need to bear in mind that only 1/√3 times the motor current flows through the line contactor. An overload relay mounted onto a line contactor has to be set to this 0.58-times motor current.

NOTICE
Internal ground-fault detection on the 3RB31 If you are using the 3RB31 solid-state overload relay in conjunction with contactor assemblies for star-delta (wye-delta) start, internal ground-fault detection must not be activated due to the occurrence of transient current peaks when switching over from star (wye) to delta operation. These can cause ground-fault monitoring to respond.

5.5.1.4 Operation with frequency converters

3RU21 thermal overload relays

3RU21 thermal overload relays are suitable for operation with frequency converters. Depending on the frequency of the converter, eddy current and skin effects that occur mean that in some cases, a current higher than the motor current has to be set.

3RB30/3RB31 solid-state overload relays

3RB30/3RB31 solid-state overload relays are suitable for frequencies of 50/60 Hz and their associated harmonics. This makes it possible to use a 3RB30/3RB31 on the input side of the frequency converter. If motor protection is required on the outgoing side of the frequency converter, we recommend the 3RN thermistor motor protection devices or 3RU21 thermal overload relays.

Reference

More information ...	Can be found in the chapter titled ...
About the currents to be set	Project guidelines for use downstream of frequency converters/inverters with pulsed voltage (Page 398)

5.5.2 Short-circuit protection

Either fuses (fused design) or motor starter protectors/circuit breakers (acc. to UL) (fuseless design) must be used for short-circuit protection. The types of coordination must also be considered when selecting load feeders from the tables.

References

More information	Can be found in the chapter titled
About the assignments of corresponding short-circuit protective devices to overload relays with contactor	Technical data (Page 536) and in the configuration guide titled "Configuring SIRIUS Innovations - Selection data for load feeders in fuseless and fused designs" (order no.: 3ZX1012-0RA21-1AC0)

5.5.3 Protecting explosion-protected motors

SIRIUS components meet a wide range of requirements for operation in hazardous areas (ATEX explosion protection). An up-to-date type overview of approved devices appears in the Siemens Low Voltage LV1 Catalog. More information and certificates for download are available on the Internet (http://www.siemens.com/automation/service&support).

5.5.4 Application environment

The following information must be taken into account when planning applications involving overload relays.

Installation altitude

The overload relays are approved for installation altitudes up to 2,000 m. The reduced air density at altitudes higher than 2,000 meters affects the overload relays' electrical characteristics. The reduction factors which have to be taken into account when using overload relays at altitudes higher than 2,000 m can be obtained on request from our Technical Assistance on the Internet (http://www.siemens.com/automation/service&support).

Operating conditions and resistance to extreme climates

The overload relays are climate-proof.

The overload relays are not sensitive to external influences such as shocks, corrosive ambient conditions, ageing, and temperature fluctuations.

Ambient temperatures for 3RU21 overload relays

3RU21 thermal overload relays compensate temperature in the temperature range from –40 °C to +60 °C according to IEC/EN 60947-4-1. At temperatures from +60 °C to +80 °C, the upper set value of the setting range has to be reduced by a specific factor in accordance with the table below.

Table 5- 11 Ambient temperature for 3RU21 overload relays

Ambient temperature in °C	Reduction factor for the upper set value	
	Current ranges 0.11 to 20 A	Current ranges 17 to 40 A
+60	1.0	1.0
+65	0.87	0.97
+70	0.94	0.94
+75	0.81	0.90
+80	0.73	0.86

Ambient temperatures for 3RB30/3RB31 overload relays

3RB30/3RB31 solid-state overload relays compensate temperature in the temperature range from –25 °C to +60 °C according to IEC/EN 60947-4-1.

The reduction factors which have to be taken into account when using solid-state overload relays at an ambient temperature higher than 60°C can be obtained on request from our Technical Assistance on the Internet (http://www.siemens.com/automation/service&support).

Derating during heavy-duty starting for 3RB30/3RB31 overload relays

There is no derating during heavy-duty starting in size S00 (up to 16 A).

The following derating has to be taken into account in size S0 (up to 40 A).

Table 5- 12 Derating during heavy-duty starting, 3RB30/3RB31 overload relays

CLASS	Rated current
CLASS 20	$I_{e\ max}$ = 32 A
CLASS 30	$I_{e\ max}$ = 25 A

Special application environments

SIRIUS components have been approved by a whole range of bodies for various sectors (shipbuilding, etc.). An up-to-date list of approvals appears in Chapter 20 of the Siemens Low Voltage LV1 Catalog, and more information, as well as an option to download certificates, can be obtained on the Internet (http://www.siemens.com/automation/service&support).

5.6 Mounting

5.6.1 Mounting options

Mounting options for the 3RU21

3RU21 thermal overload relays are matched to 3RT contactors in terms of their electrical and mechanical features. As a result, direct mounting can be achieved easily. Alternatively, the devices are suitable for stand-alone assembly.

Mounting options for the 3RB30/3RB31

3RB30/3RB31 solid-state overload relays are suitable for space-saving, direct mounting onto 3RT contactors as well as for stand-alone assembly.

5.6.2 Minimum clearances and mounting position

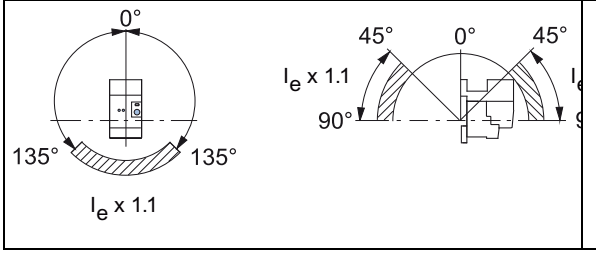
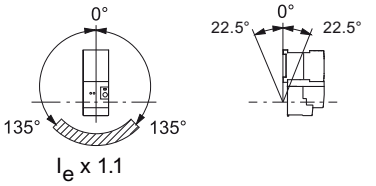
Minimum clearance

A minimum lateral clearance of > 6 mm must be maintained from grounded parts.

Mounting position for 3RU21 thermal overload relay

The diagrams below illustrate the permissible mounting positions for contactor mounting and stand-alone assembly in the case of 3RU21 thermal overload relays.

Table 5- 13 Permissible mounting positions for the 3RU21

Overload relay, stand-alone assembly	Contactor + overload relay
	

The set value is 1.1 times the motor current for a mounting position in the hatched area.

Mounting position for 3RB30/3RB31 solid-state overload relay

For 3RB30/3RB31 solid-state overload relays any mounting position can be chosen as required.

5.6.3 Mounting/Disassembly

Direct mounting on 3RT contactor

The diagram below shows an example mounting scenario based on mounting the 3RU21 thermal overload relay, size S0, on the 3RT2 contactor. The contactor/overload relay combinations can be snapped onto 35 mm DIN rails according to DIN EN 50022.

Table 5- 14 Mounting the 3RU21 overload relay with a screw-type connection system

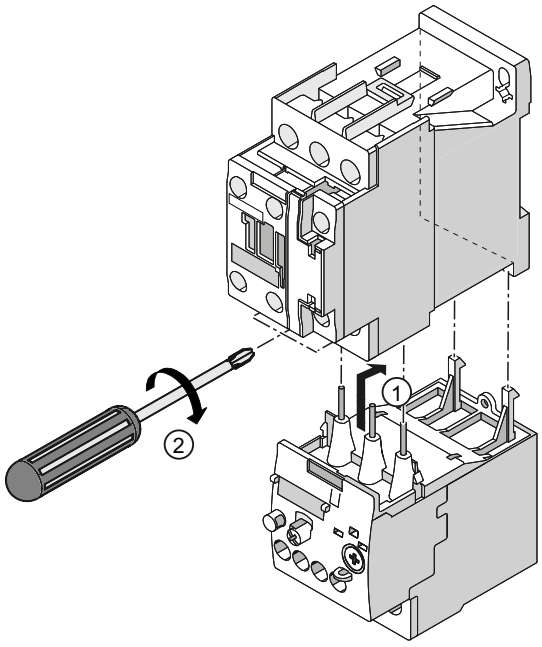
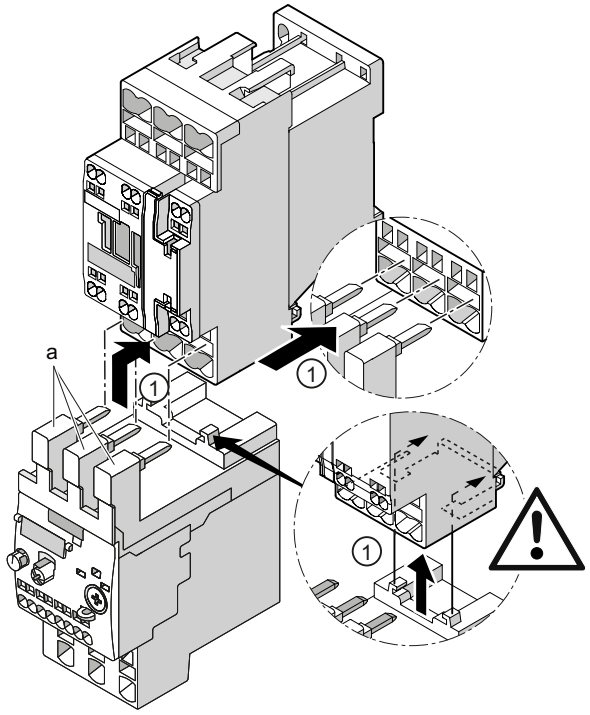
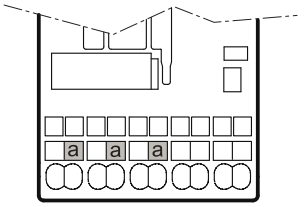
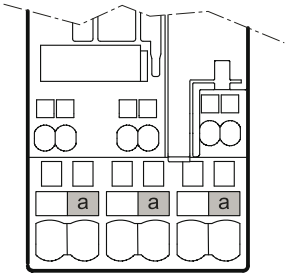
Step	Operating instruction	Figure
1	Push the overload relay into the contactor from below. Attach the two hooks on the overload relay to the two openings on the rear of the contactor. This pushes the main current contacts into the corresponding socket contacts on the contactor.	
2	Screw the contacts tight. Check that the cable is clamped tight.	

Table 5- 15 Mounting the 3RU21 overload relay with a spring-loaded connection system

Step	Operating instruction	Figure
1	Insert the contacts (a) into the central opening of the main conductor terminals on the contactor (see below, a), with the contacts flush to the right. Make sure that the guide tabs are inserted into the designated slots on the contactor. The overload relay will sit flush with the contactor on the left- and right-hand sides.	

The table below shows the openings of the main conductor terminals on the contactor into which the overload relay contacts have to be inserted.

Main conductor terminals on the contactor (a) (S00):	Main conductor terminals on the contactor (a) (S0):
	

Note

Ring cable lug connection system

The procedure for mounting the overload relays with ring cable lug connection system is similar to that for mounting with screw-type connection system.

Mounting on mounting plate

Screw mounting on a mounting plate is an alternative option to DIN rail mounting. For screw mounting, the contactor first has to be fastened with screws and then the overload relay mounted on the top of the contactor as shown in the figures.

Disassembly

To disassemble the contactor/relay combination from the DIN rail, press the contactor down and pull it toward you.

Table 5- 16 Overload relay disassembly, screw-type connection system

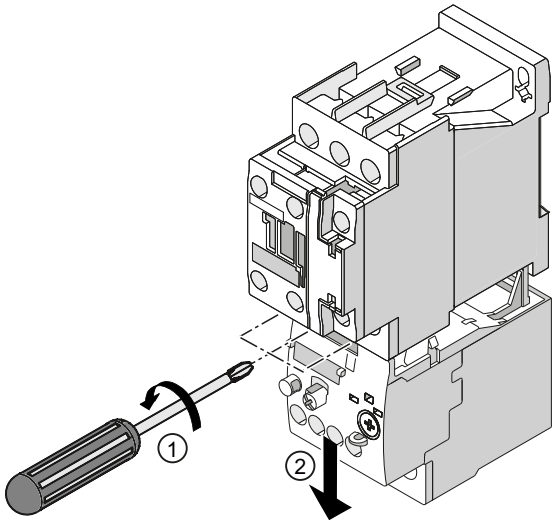
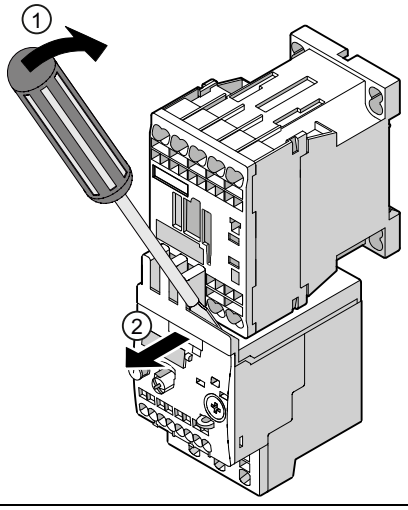
Step	Operating instruction	Figure
1	Undo the screw on the main conductor terminals.	
2	Pull the overload relay down and away from the contactor.	

Table 5- 17 Overload relay disassembly, spring-loaded connection system

Step	Operating instruction	Figure
1	Position the screwdriver on the overload relay as shown in the figure. Carefully dislodge the overload relay from the contactor.	
2	Pull the overload relay toward you and away from the contactor.	

Note

Ring cable lug connection system

The procedure for disassembling the overload relays with ring cable lug connection system is similar to that for disassembly with screw-type connection system.

5.7 Connection

Connection types

The overload relays are available with the following connection types for the main and auxiliary current paths:

- Screw-type connection system
- Spring-loaded connection system
- Ring cable lug connection system (3RU21 only) with optional terminal covers (accessories)

Conductor cross-sections

The conductor cross-sections of the devices in the SIRIUS modular system are matched to one another on a size-specific basis. For more information, see the chapter titled Connection (Page 74).

Coil repeat and auxiliary switch repeat terminal

In the case of size S00 3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays, direct contactor mounting involves feed-through of the auxiliary switch and coil terminals A2 on the contactor. This makes wiring much easier.

Touch protection

Please observe the information in the chapter titled Technical data (Page 536) with regard to touch protection for 3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays (according to IEC 61140). Devices with screw-type and spring-loaded connection systems are finger-safe. To achieve finger safety in the case of ring cable lug connection systems, the addition of terminal covers (accessories) is required.

5.7.1 Connection of 3RU21 overload relay

Control circuit

An additional power supply is not required for the operation of 3RU21 thermal overload relays.

Connection of terminals

Terminal	Designation
2T1	Main circuit terminals
4T2	
6T3	
95	NC contact (NC 95-96)
96	
97	NO contact (NO 97-98)
98	
14/22	Feed-through contactor auxiliary switch (S00 only)
A2	Feed-through contactor coil terminal (S00 only)

Reference

More information ...	Can be found in the chapter titled ...
About connecting the SIRIUS modular system	System overview, under Connection (Page 74)
About conductor cross-sections and tightening torques	Conductor cross-sections main circuit (Page 541)

5.7.2 Connection of 3RB30/3RB31 overload relays

Control circuit

3RB30/3RB31 solid-state overload relays have an intrinsic supply; i.e. an additional power supply is not required.

Connection of terminals

Terminal	Designation
2T1	Main circuit terminals
4T2	
6T3	
95	NC contact (NC 95-96)
96	
97	NO contact (NO 97-98)
98	
14/22	Feed-through contactor auxiliary switch (S00 only)
A2	Feed-through contactor coil terminal (S00 only)

Reference

More information ...	Can be found in the chapter titled ...
About connecting the SIRIUS modular system	System overview, under Connection (Page 74)
About conductor cross-sections and tightening torques	Conductor cross-sections main circuit (Page 549)

5.8 Operation

5.8.1 Setting the current

Setting the rated motor current on 3RU21/3RB30/3RB31 overload relays

3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays are set to the rated motor current with a rotary knob. The scale on the rotary knob is in amperes.

NOTICE
The overload relays may only be set between the setting marks at the top and the bottom of the scale; in other words, a setting above or below the setting scale is not permitted.

The figure below shows how to set the rated motor current based on the example of the 3RU21 thermal overload relay, size S0.

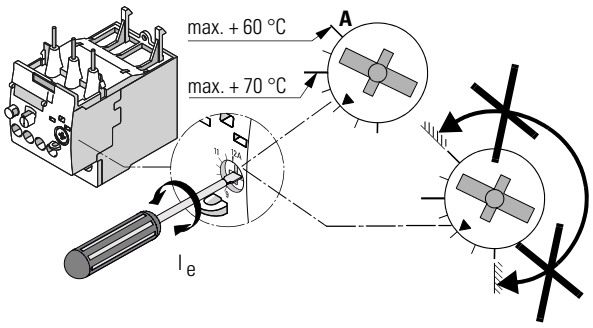


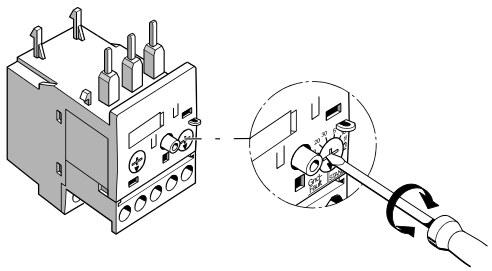
Figure 5-4 Setting the current I_e

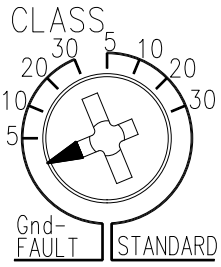
5.8.2 Setting the tripping class/ground-fault detection (3RB31)

In the case of the 3RB31 solid-state overload relay, it is also possible to select the tripping class (CLASS 5, 10, 20 or 30) via a second rotary knob using a screwdriver and activate or deactivate internal ground-fault monitoring.

There are 8 possible settings:

- CLASS 5 , 10, 20, and 30 without ground-fault detection (STANDARD)
- CLASS 5 , 10, 20, and 30 with ground-fault detection (Gnd-FAULT)

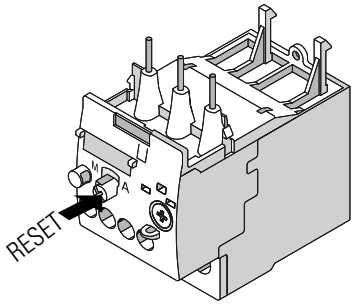




5.8.3 RESET after release

Manual and automatic reset

If manual reset is selected, resetting can be carried out directly on the device by pressing the RESET button.



A remote reset (remote RESET) is possible in conjunction with the mechanical and electrical RESET modules, which are available as accessories. If automatic RESET is set on the overload relay, the relay will be reset automatically. A relay can only ever be reset after the recovery time has elapsed.

⚠ WARNING

Automatic machine restart!

Can result in death, serious injury, or property damage.

If a switch-on command is present after an overload trip and a manual reset or automatic reset is performed, the machine will start up immediately. People may be injured if they stay in the danger area of the machine.

Make sure that the motor does not start up again following an overload trip until a new switch-on command has been issued (e.g. via an additional ON button) and that no one is in the machine danger zone at the time of restarting.

Recovery time following overload release

This time gives the load a chance to cool down.

- 3RU21 thermal overload relays

  The device cannot be reset until the bimetal strips have cooled down. The recovery time is dependent upon the tripping characteristic curve and the extent of the tripping current.

- 3RB30/3RB31 solid-state overload relays

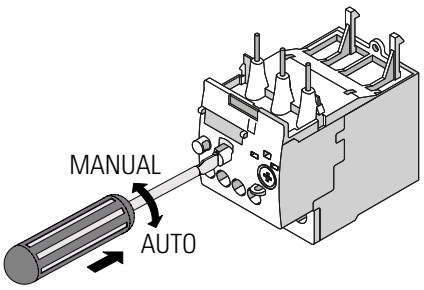
  In the case of the 3RB30/3RB31 solid-state overload relays, the recovery time is stored as a fixed value and is 3 minutes following a current-dependent release with automatic RESET selected.

  If manual RESET is selected, the 3RB30/3RB31 relays can be reset immediately after tripping.

Setting the RESET function on the 3RU21 thermal overload relay

On the 3RU21 thermal overload relay, automatic and manual resetting is selected by pressing and turning the blue button (RESET button). The figure below shows how to switch between automatic and manual reset on the 3RU21 thermal overload relay, size S0.

Table 5- 18 Switching between manual and automatic on the 3RU21 thermal overload relay

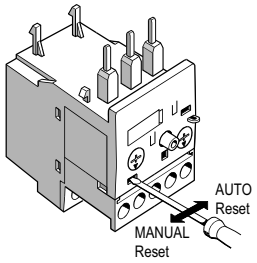
Step	Operating instruction	Figure
1	Press the blue RESET button down with a screwdriver.	
2	Turn the blue RESET button to M (manual reset) or A (automatic reset).	

Setting the RESET function on the 3RB30/3RB31 solid-state overload relay

In the case of the 3RB30/3RB31 solid-state overload relays, a slide switch can be used to choose between automatic and manual reset.

As an alternative to the reset options, an electrical remote RESET (manual/automatic) can be implemented on 3RB31 solid-state overload relays by applying a 24 V DC voltage at terminals A3 and A4. When a voltage of 24 V is applied at terminals A3/A4 of the 3RB31, a current flows for approx. 20 ms which can be 200 mA for a short time. After the 20 ms, the current drops to less than 10 mA. The voltage needs to be applied for at least 200 ms.

Table 5- 19 Switching between manual and automatic on 3RB30/3RB31 solid-state overload relays

Step	Operating instruction	Figure
1	Using a screwdriver, slide the switch to the required position.	

Reference

More information ...	Can be found in...
About optional mechanical and electrical RESET modules	The chapter titled Accessories (Page 523)

5.8.4 TEST function

Test function for the 3RU21 thermal overload relay

The TEST slide can be used to check whether the operational 3RU21 thermal overload relay is working properly. The tripping of the relay can be simulated by moving the slide with a screwdriver. This simulation process opens the NC contact and closes the NO contact, thereby checking that the auxiliary circuit has been wired to the overload relay correctly.

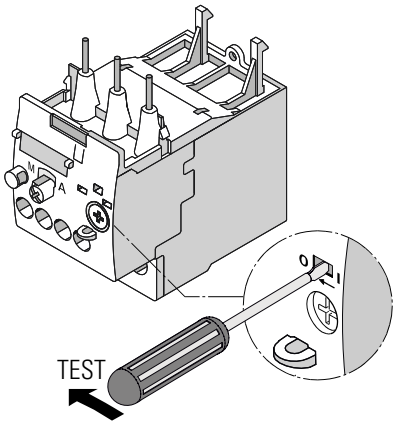


Figure 5-5 Testing the TEST function

Resetting

If the 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.

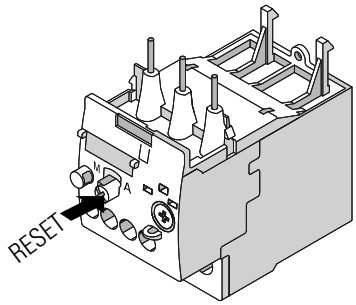


Figure 5-6 Resetting the TEST function

Test function for the 3RB30/3RB31 solid-state overload relay

The correct function of the relay when ready for operation can be checked by pressing the TEST button with the motor current flowing (device/electronics test). Current sensing, the motor model, and the tripping unit are tested. If these components are OK, the device is tripped in accordance with the table below. In the event of an error, the device is not tripped.

Tripping class	Required loading with the rated current prior to pressing the TEST button	Tripping within
CLASS 5	3 min	30 s
CLASS 10	5 min	1 min
CLASS 20	10 mins	2 mins
CLASS 30	15 mins	3 min

Note

The TEST button must be held down throughout the test. In this case the motor current must be > 80% of the current setting I_e and equal to at least the value of the lower current setting.

The switch position indicator slide can be used to test the auxiliary contacts and the control current wiring. The tripping of the relay can be simulated by moving the slide. This simulation process opens the NC contact and closes the NO contact, thereby checking that the auxiliary circuit has been wired correctly. The relay is reset after a test trip by pressing the RESET button.

The user test has been completed successfully if:

- The device trips within the maximum permissible time and
- Contact 95-96 is open (test for welding)

5.8.5 Response of the auxiliary contacts

Auxiliary contacts

The overload relay is equipped with an NO contact (NO 97-98) for the "tripped" signal and an NC contact (NC 95-96) for disconnecting the contactor. The auxiliary contacts have high contact reliability; this makes them suitable for PLCs. Furthermore, the high switching capacity facilitates direct switching of the contactor coil.

The table below shows how the auxiliary contacts respond when the TEST, STOP (3RU21 only), and RESET buttons are pressed.

	READY	TEST	STOP	RESET
NC 95/96				
NO 97/98				
TRIP				

5.9 Accessories

5.9.1 Accessories

For maximum flexibility, accessories can be added to the overload relays as required, easily, and without the need for tools.

Accessories	3RU21	3RB30	3RB31
Terminal support for stand-alone assembly	✓	✓	✓
Release slide (mechanical remote RESET), compatible for use with all sizes	✓	✓	✓
Release slide (mechanical remote RESET), compatible for use with all sizes	✓	✓	✓
Electrical remote RESET module in three voltage variants, compatible for use with all sizes	✓	--	✓ integrated in device
Terminal cover for ring cable lug connections, compatible for use with all sizes	✓	--	--
Sealable cover	✓	✓	✓

5.9.2 Terminal support for stand-alone assembly

5.9.2.1 Description

Modules for stand-alone assembly

3RU21 thermal overload relays and 3RB30/3RB31 solid-state overload relays can also be installed individually with the corresponding terminal supports for stand-alone assembly.

The terminal supports for stand-alone assembly are available for both screw-type and spring-loaded connection systems.

5.9.2.2 Mounting/Disassembly

The terminal supports can be snapped onto 35 mm DIN rails according to DIN EN 50022. They can also be screw-mounted.

The figure below shows how the terminal support for stand-alone assembly is mounted, based on the example of a 3RU21 thermal overload relay.

Table 5- 20 Mounting the terminal support (screw-type connection system)

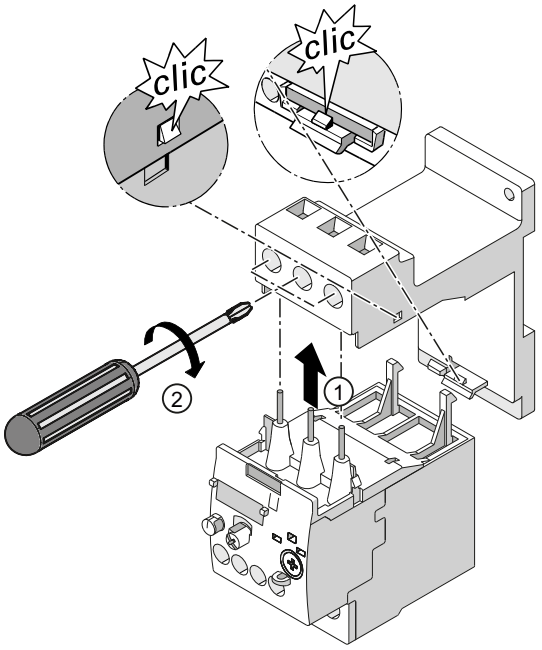
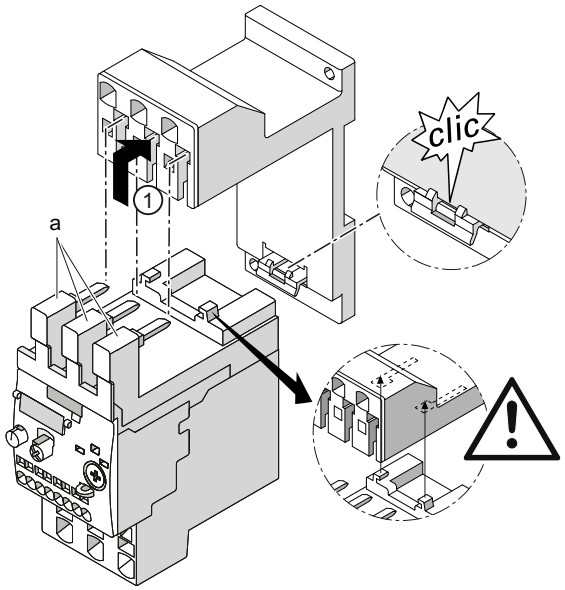
Step	Operating instruction	Figure
1	Guide the overload relay into the terminal support from below. Screw the contacts tight.	

Table 5- 21 Mounting the terminal support (spring-loaded connection system)

Step	Operating instruction	Figure
1	Insert the contacts (a) into the central opening of the main conductor terminals on the terminal support, with the contacts flush to the right. Make sure that the guide tabs are inserted into the designated slots on the terminal support.	

Disassembly

Table 5- 22 Disassembling the terminal support (screw-type connection system)

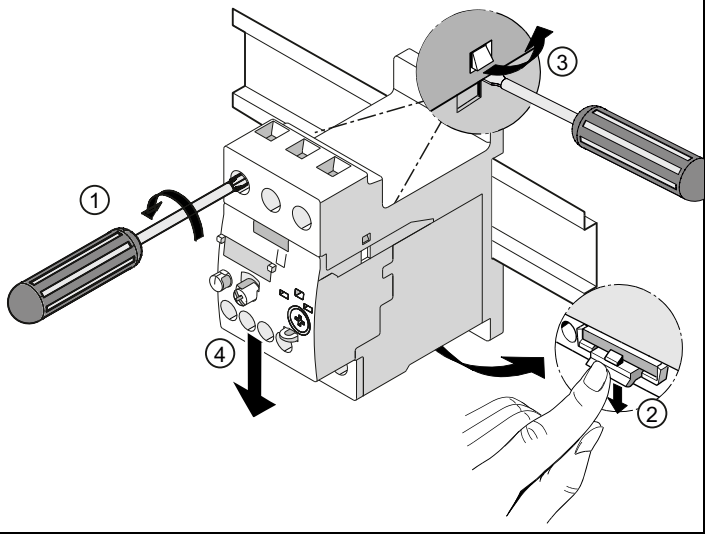
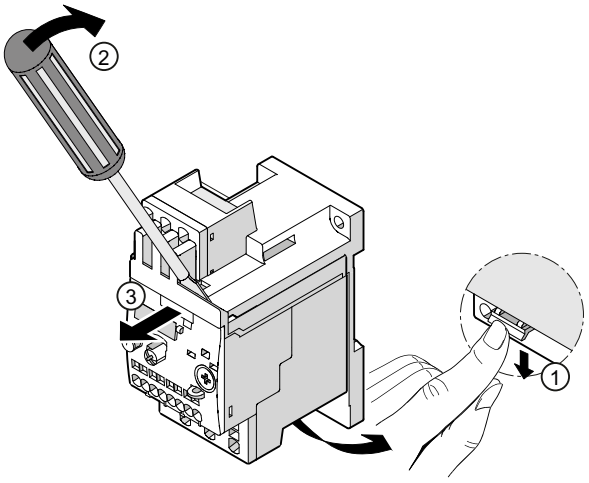
Step	Operating instruction	Figure
1	Undo the screws on the main conductor terminals.	
2	Release the overload relay by pushing down the clip on the underside of the terminal support.	
3	Use a screwdriver to dislodge the terminal support from the overload relay.	
4	Pull the overload relay down and away from the terminal support.	

Table 5- 23 Disassembling the terminal support (spring-loaded connection system)

Step	Operating instruction	Figure
1	Release the overload relay by pushing down the clip on the underside of the terminal support.	
2	Position the screwdriver on the terminal support as shown in the figure. Carefully dislodge the overload relay from the contactor.	
3	Pull the overload relay forward and away from the terminal support.	

5.9.3 Mechanical remote RESET (release slide)

5.9.3.1 Description

Preliminary observation: Mechanical remote RESET

A mechanical remote reset option is also available for thermal overload relays and solid-state overload relays. There are two options for the mechanical remote RESET:

- Release slide
- Cable release with holder for built-in overload relays which are hard to reach (Page 529)

Release slide

There is one release slide for thermal overload relays and one for solid-state overload relays; both are compatible for use with all sizes. The release slide with holder and former is used to activate the RESET from the control cabinet door; it is shortened to the required length. A pushbutton with extended travel and an extension plunger for compensation of the distance between the pushbutton and the relay's unlocking button are available for the release slide.

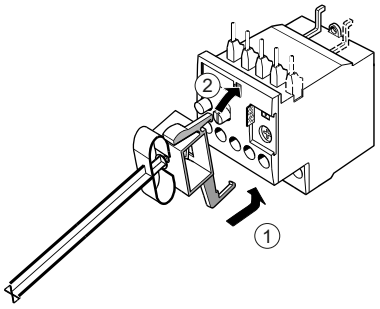
5.9.3.2 Mounting/Disassembly

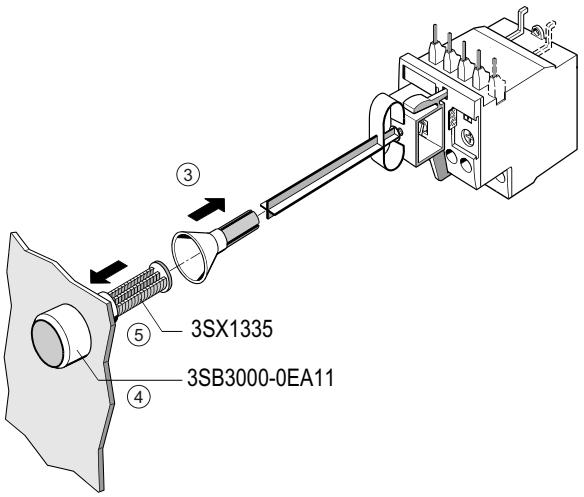
The figure below shows how the release slide, the holder, the former, and the pushbutton are mounted based on the example of a size S0 3RU21 thermal overload relay:

Prerequisite

Before the release slide can be mounted, the release slide and the optional extension plunger have to be shortened to the required length.

Table 5- 24 Mounting the release slide

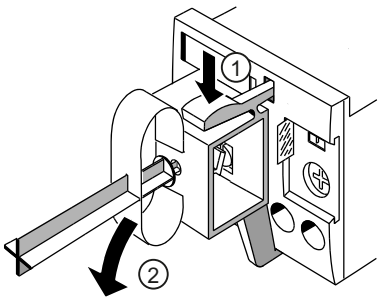
Step	Operating instruction	Figure
1	Attach the hook on the release slide to the designated opening on the overload relay.	
2	Fold the module up so that the locking latch snaps into the overload relay.	

Step	Operating instruction	Figure
3	Attach the former to the release slide.	
3	Fit the pushbutton (3SB3000-0EA11) in the front cover.	
4	(Optional) Attach the pushbutton to the extension plunger (3SX1335).	

Disassembly

The figure below shows how to disassemble the holder based on the example of the 3RU21 thermal overload relay:

Table 5- 25 Disassembling the release slide

Step	Operating instruction	Figure
1	Press the locking latch down.	
2	Tilt the module toward you and take it off the overload relay.	

5.9.4 Mechanical remote RESET (cable release)

5.9.4.1 Description

Preliminary observation: Mechanical remote RESET

A mechanical remote reset option is also available for thermal overload relays and solid-state overload relays. There are two options for the mechanical remote RESET:

- Release slide (Page 527)
- Cable release with holder for built-in overload relays which are hard to reach

Cable release (compatible for use with all sizes)

There is one cable release with holder for built-in overload relays which are hard to reach for thermal overload relays and another for solid-state relays; both are compatible for use with all sizes.

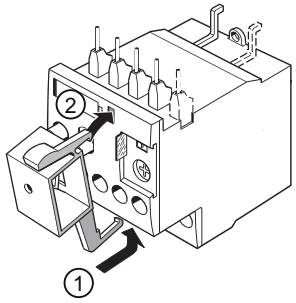
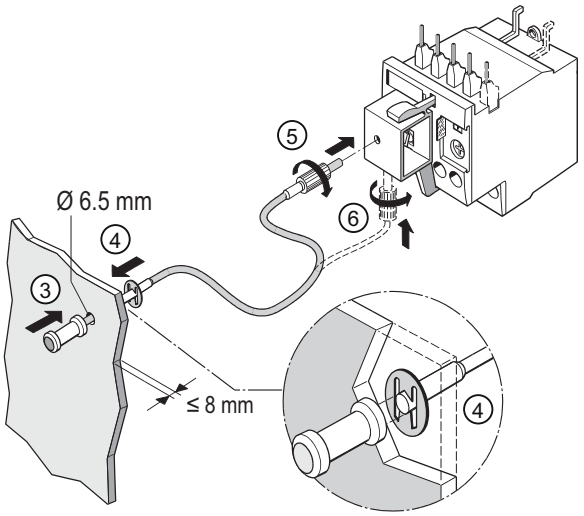
The cable is available in the following lengths:

- 400 mm and
- 600 mm

5.9.4.2 Mounting/Disassembly

The figure below shows how the cable release with holder is mounted based on the example of a size S00 3RU21 thermal overload relay:

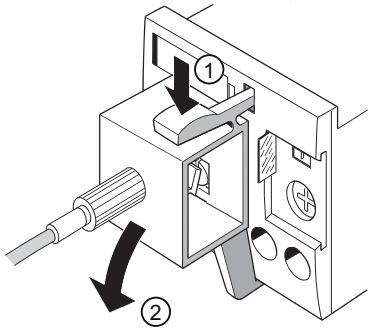
Table 5- 26 Mounting the cable release

Step	Operating instruction	Figure
1	Attach the hook on the release slide to the designated opening on the overload relay.	
2	Fold the module up so that the locking latch snaps into the overload relay.	
3	Fit the actuating element in the front cover.	
4	Attach the pushbutton to the former and the connection wire.	
5 / 6	Insert the cable release into the appropriate opening and turn to tighten.	

Disassembly

The figure below shows how to disassemble the holder for the cable release based on the example of the 3RU21 thermal overload relay:

Table 5- 27 Cable release disassembly

Step	Operating instruction	Figure
1	Press the locking latch down.	
2	Tilt the module toward you and take it off the overload relay.	

5.9.5 Module for electrical remote RESET (3RU21 only)

5.9.5.1 Description

Function

An electrical remote RESET module which is compatible for use with all sizes is available for the 3RU21 thermal overload relay. This module enables the overload relay to be reset electrically from the control room following tripping. The module's coil is dimensioned for an operating duration of 0.2 s to 4 s; maintained-contact operation is not permissible.

5.9.5.2 Connecting the remote RESET

Connection

The screw connections on the terminals of the electrical remote RESET module have the same format as the screw connections on the auxiliary contacts of the 3RU21 overload relay.

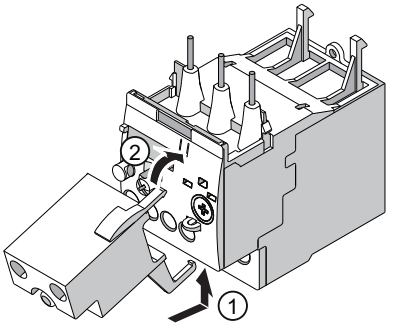
Table 5- 28 Connection data for the remote RESET

Operating range	The operating range of the coil is 0.85 to 1.1 x U_s
Power input	The power input of the electrical remote RESET module is: 80 V AC, 70 W DC
Switching frequency	60/h
Voltages	The electrical remote RESET module is available for the following voltages: • 24 to 30 V AC/VDC • 110 to 127 V AC/VDC • 220 to 250 V AC/VDC

5.9.5.3 Mounting/Disassembly

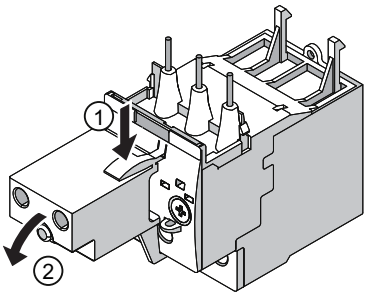
The figure below shows how to assemble the electrical remote RESET module based on the example of size S0.

Table 5- 29 Mounting the electrical remote RESET module on the thermal overload relay

Step	Operating instruction	Figure
1	Attach the hook to the designated opening.	
2	Fold the module up so that the locking latch snaps into the overload relay.	

Disassembly

Table 5- 30 Disassembling the electrical remote RESET module from the thermal overload relay

Step	Operating instruction	Figure
1	Press the locking latch down.	
2	Tilt the module toward you and take it off the overload relay.	

5.9.6 Sealable cover

5.9.6.1 Description

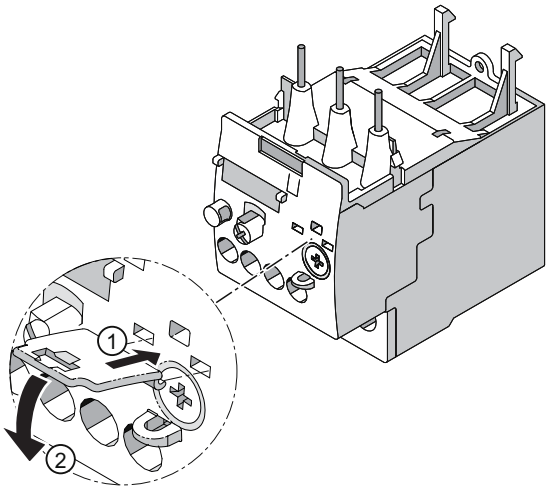
Sealable cover

There is one sealable cover for thermal overload relays and one for solid-state relays; both are compatible for use with all sizes. The 3RV2908-0P cover can be used as an accessory for 3RU2 thermal overload relays and 3RV2 motor starter protectors/circuit breakers (acc. to UL).

The sealable cover can be used to protect the rotary button for setting the rated motor current and the CO contact for the tripping classes (3RB31 only) against unauthorized manipulation.

5.9.6.2 Mounting

Table 5- 31 Mounting the sealable cover on the 3RU21 overload relay

Step	Operating instruction	Figure
1 / 2	Attach the hooks on the cover to the openings on the overload relay and fold the cover down.	

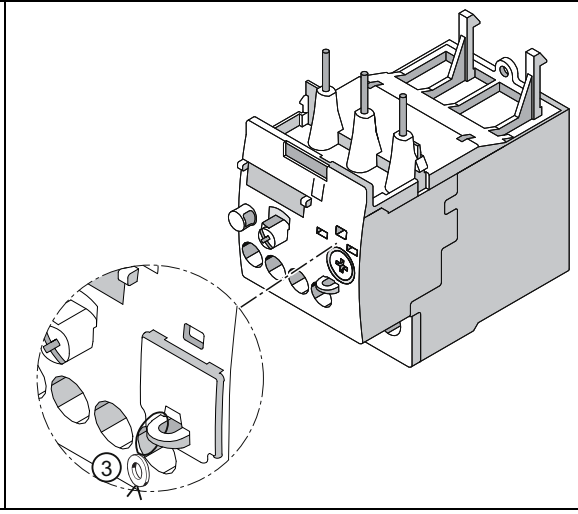
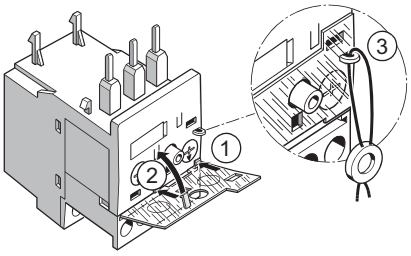
Step	Operating instruction	Figure
3	Seal the cover to secure it against unauthorized removal.	

Table 5- 32 Mounting the sealable cover on the 3RB30/3RB31 overload relay

Step	Operating instruction	Figure
1 / 2	Attach the hooks on the cover to the openings on the overload relay and fold the cover up.	
3	Seal the cover to secure it against unauthorized removal.	

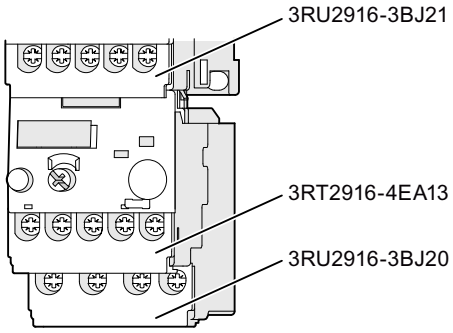
5.9.7 Covers for ring cable lug connections

5.9.7.1 Description

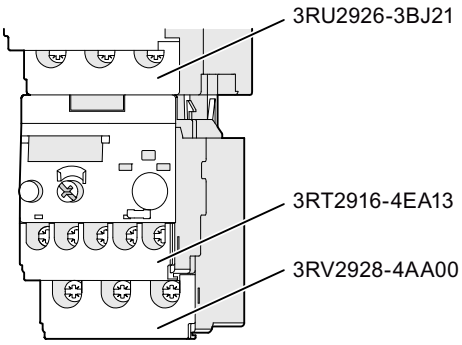
Function

Covers must be fitted to thermal overload relays with ring cable lug connection system to achieve finger-safety according to IEC 61140. Both line-side and output-side covers are available.

Additional covers are not required for devices with spring-loaded and screw-type connection systems.



Size S00, 3RU2116



Size S0, 3RU2126

5.10 Technical data

5.10.1 Performance features

5.10.1.1 General data

Table 5- 33 General data for 3RU21 and 3RB30/3RB31 overload relays

Feature	Description	3RU21	3RB30/3RB31
Sizes	• Are matched to the dimensions, connections and technical features of the other devices in the SIRIUS modular system (contactors, soft starters, etc.) • Permit the mounting of slim-line and compact load feeders in widths of 45 mm (S00), 45 mm (S0) • Make configuration easier	S00/S0	S00/S0
Seamless current range	• Allows straightforward and consistent configuration with one series of overload relays (for small to large loads)	0.11 to 40 A	0.1 to 40 A

5.10.1.2 Protection functions - overview

Table 5- 34 Protection functions supported by 3RU21 and 3RB20/3RB31 overload relays

Feature	Description	3RU21	3RB30/3RB31
Tripping in the event of overload	• Provides optimum current-dependent protection of loads against impermissibly high temperature rise due to overload	✓	✓
Tripping in the event of phase asymmetry	• Provides optimum current-dependent protection of loads against impermissibly high temperature rise due to phase asymmetry	✓	✓
Tripping in the event of phase failure	• Minimizes the temperature rise of the three-phase motor in the event of a phase failure	✓	✓
Protection of single-phase loads	• Enables single-phase loads to be protected	✓	--
Tripping in the event of ground fault by means of internal ground-fault detection (can be activated)	• Provides optimum protection of loads in the event of high-impedance faults to ground caused by moisture, condensation, damaged insulation, etc. • Eliminates the need for additional special equipemnt • Saves space in the control cabinet • Reduces wiring outlay and costs	--	✓ (3RB31 only)

5.10.1.3 Equipment

Table 5- 35 Equipment on 3RU21 and 3RB20/3RB31 overload relays

Feature	Description	3RU21	3RB30/3RB31
RESET function	• Enables manual or automatic resetting of the relay	✓	✓
Remote RESET function	• Enables remote resetting of the relay	✓ (by means of separate module)	✓ (3RB31 only with 24 V DC)
TEST function for auxiliary contacts	• Allows easy checking of function and wiring	✓	✓
TEST function for electronics	• Allows checking of the electronics	--	✓
Status display	• Indicates the current operating state	✓	✓
Integrated auxiliary contacts (1 NO + 1 NC)	• Allow the load to be disconnected in the event of an irregularity • Can be used to output signals	✓	✓

5.10.1.4 Configuration of load feeders

Table 5- 36 Configuration of load feeders 3RU21 and 3RB30/3RB31

Feature	Description	3RU21	3RB30/3RB31
Short-circuit-proof up to 100 kA at 690 V (in conjunction with the appropriate fuses or the appropriate motor starter protector)	• Provides optimum protection of the loads and operating personnel in the event of short circuits due to insulation faults or faulty switching operations	✓	✓
Electrical and mechanical matching to 3RT2 contactors	• Simplifies configuration • Reduces connection outlay and costs • Enables stand-alone assembly as well as space-saving direct mounting	✓	✓
Spring-loaded connection system for main circuit	• Enables fast connections • Ensures that connections are vibration-resistant • Enables maintenance-free connections	✓	✓
Spring-loaded connection system for auxiliary circuits	• Enables fast connections • Ensures that connections are vibration-resistant • Enables maintenance-free connections	✓	✓

5.10.1.5 Features of overload relays

Table 5- 37 Other characteristics of 3RU21 and 3RB30/3RB31 overload relays

Feature	Description	3RU21	3RB30/3RB31
Temperature compensation	• Allows the use of the relays without derating even at high temperatures • Prevents premature tripping • Allows compact control cabinet installation without clearance between the devices/load feeders • Simplifies configuration • Enables space to be saved in the control cabinet	✓	✓
High long-term stability	• Provides reliable protection of loads even after years under severe operating conditions	✓	✓
Wide setting ranges	• Reduce the number of variants • Minimize the engineering outlay and costs • Enable savings to be made where storage overheads, storage costs, and tied-up capital are concerned	--	✓ (1:4)
Tripping class CLASS 5	• Enables solutions for motors which start up very quickly and require special protection measures	--	✓ (3RB31 only)
Tripping class > CLASS 10	• Enable solutions for heavy-duty starting	--	✓
Low power loss	• Reduces power consumption (power consumption is up to 98% less than with thermal overload relays) and thus energy costs • Minimizes the temperature rise of the contactor and the control cabinet - in some cases this may eliminate the need for control cabinet cooling • Enables space to be saved through direct mounting on the contactor even at high motor currents (i.e. no heat decoupling is required)	--	✓
Intrinsic supply	• Eliminates the need for configuration and connecting an additional control circuit	--[1)]	✓
Variable setting of tripping classes (The required tripping class can be set dependent upon the prevailing starting conditions using a rotary switch.)	• Reduces the number of variants • Minimizes the engineering outlay and costs • Enables savings to be made where storage overheads, storage costs, and tied-up capital are concerned	--	✓ (3RB31 only)

[1)] As SIRIUS 3RU21 thermal overload relays work on the basis of the bimetal principle, they do not require a control supply voltage.

5.10.2 3RU21

5.10.2.1 General technical data

Table 5- 38 General technical data for 3RU21 overload relays

Type			**3RU21 16**	**3RU21 26**
Size			**S00**	**S0**
Width			**45 mm**	**45 mm**
Tripping in the event of			Overload and phase failure	
Tripping class according to IEC/EN 60947-4-1		CLASS	10	
Phase loss sensitivity			Yes	
Overload warning			No	
Resetting and recovery				
• Reset options following tripping			Manual, automatic, and remote RESET[1)]	
• Recovery time				
	- Automatic RESET	min	Depending on the level of the tripping current and the tripping characteristic curve	
	- Manual RESET	min	Depending on the level of the tripping current and the tripping characteristic curve	
	- Remote RESET	min	Depending on the level of the tripping current and the tripping characteristic curve	
Equipment				
• Display of operating state on device			Yes, by means of TEST function/switch position indicator slide	
• TEST function			Yes	
• RESET button			Yes	
• STOP button			Yes	
Safe operation of motors with "increased safety" explosion protection type				
• EC type examination certificate number according to Directive 94/9/EC			On request	
Ambient temperature				
• Storage/transport		°C	-55 ... + 80	
• Operation		°C	-40 ... + 70	
• Temperature compensation		°C	Up to 60	
• Permissible rated current at internal cubicle temperature				
	- Up to 60 °C	%	100 (current reduction is required above +60 °C)	
	- 60 °C to 70 °C	%	87	
Repeat terminals				
• Coil repeat terminal			Yes	Not required
• Auxiliary switch repeat terminal			Yes	Not required

Type		**3RU21 16**	**3RU21 26**
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Degree of protection acc. to IEC 60529		IP20	
Touch protection acc. to IEC 61140		Screw connection and spring-loaded terminals: finger-safe Ring cable lug connection: finger-safe only with optional terminal covers	
Shock resistance with sine acc. to IEC 60068-2-27	g/ms	8 / 10	
Electromagnetic compatibility (EMC) - Immunity			
• Conducted interference suppression			
- Burst acc. to IEC 61000-4-4 (corresponds to severity 3)	kV	EMC immunity is not relevant in the case of thermal overload relays	
- Surge acc. to IEC 61000-4-5 (corresponds to severity 3)	kV	EMC immunity is not relevant in the case of thermal overload relays	
• Electrostatic discharge acc. to IEC 61000-4-2 (corresponds to severity 3)	kV	EMC immunity is not relevant in the case of thermal overload relays	
• Field-related interference suppression to IEC 61000-4-3 (corresponds to severity 3)	V/m	EMC immunity is not relevant in the case of thermal overload relays	
Electromagnetic compatibility (EMC) - Emitted interference		EMC immunity is not relevant in the case of thermal overload relays	
Resistance to extreme climates - Humidity	%	90	
Dimensions		See Dimension drawings (dimensions in mm) (Page 552)	
Installation altitude above sea level	m	Up to 2,000; above this, please contact us	
Mounting position		See Minimum clearances and mounting position (Page 508)	
Type of fixing		Direct mounting/stand-alone assembly with terminal support[2)]	

1) Remote RESET in conjunction with the appropriate accessory

2) For screw and snap-on mounting onto DIN rail TH 35

5.10.2.2 Main circuit

Table 5- 39 Technical data for the main circuit, 3RU21 overload relays

Type		**3RU21 16**	**3RU21 26**
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Rated insulation voltage U_i (pollution degree 3)	V	690	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated operational voltage U_e	V	690	
Type of current			
• DC current		Yes	
• AC current		Yes, frequency range up to 400 Hz	

Type		3RU21 16	3RU21 26
Size		S00	S0
Width		45 mm	45 mm
Current setting	A	0.11 to 0.16 to 11 to 16	1.8 to 2.5 to 34 to 40
Power loss per device (max.)	W	3.9 ... 6.6	3.9 ... 6
Short-circuit protection			
• With fuse without contactor		See "Selection and ordering data" in Catalog LV 1 N SIRIUS Innovations	
• With fuse and contactor		See the chapter titled "Motor starter protectors (Page 379)"	
Protective separation between main and auxiliary courrent paths acc. to IEC/EN 60947-1	V	440	

5.10.2.3 Conductor cross-sections main circuit

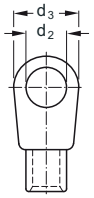
Table 5- 40 Technical data for the main circuit connection, 3RU21 overload relays

Type			3RU21 16	3RU21 26
Size			S00	S0
Width			45 mm	45 mm
Connection type			Screw connection	
• Connection screw			M3, Pozidriv size 2	M4, Pozidriv size 2
• Operating tool			∅ 5 to 6	∅ 5 to 6
• Tightening torque		Nm	0.8 to 1.2	2 to 2.5
• Conductor cross-sections (min./max.), 1-wire or 2-wire connection possible				
	- Solid	mm^2	2 x (0.5 to 1.5)[1] ; 2 x (0.75 to 2.5)[1] 2 x (0.5 to 4)[1]	2 x (1 to 2.5)[1] 2 x (2.5 to 10)[1]
	- Finely stranded with end sleeve (DIN 46228 Part 1)	mm^2	2 x (0.5 to 1.5)[1] 2 x (0.75 to 2.5)[2]	2 x (1 to 2.5)[1] ; 2 x (2.5 to 6)[1] ; max. 1 x 10
	- AWG cables, solid or stranded	AWG	2 x (20 to 16)[1] ; 2 x (18 to 14)[1] 2 x 12	2 x (16 to 12)[1] 2 x (14 to 8)[1]
Connection type			Spring-loaded connection	
• Operating tool			∅ 3.0 x 0.5 ∅ 3.5 x 0.5	
• Conductor cross-sections (min./max.)				
	- Solid	mm^2	1 x (0.5 to 4)	1 x (1 to 10)
	- Finely stranded without end sleeve	mm^2	1 x (0.5 to 2.5)	1 x (1 to 6)
	- Finely stranded with end sleeve (DIN 46228 Part 1)	mm^2	1 x (0.5 to 2.5)	1 x (1 to 6)
	- AWG cables, solid or stranded	AWG	1 x (20 to 12)	1 x (18 to 8)

Type		**3RU21 16**	**3RU21 26**
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Connection type		**Ring cable lug connection**	
Connection screw		M3, Pozidriv size 2	M4, Pozidriv size 2
Operating tool	mm	∅ 5 to 6	∅ 5 ... 6
Specified tightening torque	Nm	0.8 to 1.2	2 to 2.5
Usable ring cable lugs	mm	d_2[2)] = min. 3.2, d_3[2)] = max. 7.5	d_2[2)] = min. 4.3, d_3[2)] = max. 12.2
• DIN 46234 without insulating sleeve			
• DIN 46225 without insulating sleeve			
• DIN 46237 with insulating sleeve			
• JIS C2805 type R without insulating sleeve			
• JIS C2805 type RAV with insulating sleeve			
• JIS C2805 type RAP with insulating sleeve			

1) If two different conductor cross-sections are being connected to one clamping point, both cross-sections must be located in the range indicated. If identical cross-sections are used, this restriction does not apply.

2)



5.10.2.4 Auxiliary circuit

Table 5- 41 Technical data for the auxiliary circuit connection, 3RU21 overload relays

Type		3RU21 16	3RU21 26
Size		S00	S0
Width		45 mm	45 mm
Number of NO contacts		1	
Number of NC contacts		1	
Auxiliary contacts - Assignment		1 NO for the "tripped" signal; 1 NC for disconnecting the contactor	
Rated insulation voltage U_i (pollution degree 3)	V	690	
Rated impulse withstand voltage U_{imp}	kV	6	
Contact rating of the auxiliary contacts			
• NC with alternating current AC-14/AC-15, rated operational current I_e at U_e			
- 24 V	A	4	
- 120 V	A	4	
- 125 V	A	4	
- 230 V	A	3	
- 400 V	A	2	
- 600 V	A	0.75	
- 690 V	A	0.75	
• NO with alternating current AC-14/AC-15, rated operational current I_e at U_e			
- 24 V	A	3	
- 120 V	A	3	
- 125 V	A	3	
- 230 V	A	2	
- 400 V	A	1	
- 600 V	A	0.75	
- 690 V	A	0.75	
• NC, NO with direct current DC-13, rated operational current I_e at U_e			
- 24 V	A	1	
- 60 V	A	1)	
- 110 V	A	0.22	
- 125 V	A	0.22	
- 220 V	A	0.11	
• Conventional thermal current I_{th}	A	6	
• Contact reliability (suitability for PLC, 17 V, 5 mA)		Yes	

Type		**3RU21 16**	**3RU21 26**
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Short-circuit protection			
• With fuse			
- Operating class gL/gG	A	6	
- Quick-response	A	10	
• With miniature circuit breaker (C characteristic)	A	6[2)]	
Protective separation between auxiliary current paths acc. to IEC/EN 60947-1	V	440	
CSA, UL, and UR rated data			
Auxiliary circuit – Switching capacity		B600, R300	

1) On request

2) Up to I_k≤ 0.5 kA; ≤ 260 V

5.10.2.5 Conductor cross sections, auxiliary circuit

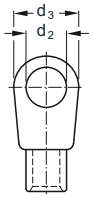
Table 5- 42 Technical data for the auxiliary circuit connection, 3RU21 overload relays

Type		**3RU21 16**	**3RU21 26**
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Connection type		**Screw connection**	
• Connection screw		M3, Pozidriv size 2	
• Operating tool	mm	∅ 5 to 6	
• Tightening torque	Nm	0.8 to 1.2	
• Conductor cross-sections (min./max.), 1-wire or 2-wire			
- Solid	mm^2	2 x (0.5 to 1.5)[1)]; 2 x (0.75 to 2.5)[1)]	
- Finely stranded with end sleeve (DIN 46228 Part 1)	mm^2	2 x (0.5 to 1.5)[1)]; 2 x (0.75 to 2.5)[1)]	
- AWG cables, solid or stranded	AWG	2 x (20 to 16)[1)], 2 x (18 to 14)[1)]	
Connection type		**Spring-loaded connection**	
• Operating tool	mm	∅ 3.0 x 0.5. ∅ 3.5 x 0.5	
• Conductor cross-sections (min./max.)			
- Solid	mm^2	2 x (0.5 to 2.5)	
- Finely stranded without end sleeve	mm^2	2 x (0.5 to 1.5)	
- Finely stranded with end sleeve (DIN 46228 Part 1)	mm^2	2 x (0.5 to 1.5)	
- AWG cables, solid or stranded	AWG	2 x (20 to 14)	

Type		3RU21 16	3RU21 26
Size		S00	S0
Width		45 mm	45 mm
Connection type		Ring cable lug connection	
Connection screw		M3, Pozidriv size 2	
Operating tool	mm	∅ 5 to 6	
Specified tightening torque	Nm	0.8 to 1.2	
Usable ring cable lugs	mm	d_2[2] = min. 3.2, d_3[2] = max. 7.5	
• DIN 46234 without insulating sleeve			
• DIN 46225 without insulating sleeve			
• DIN 46237 with insulating sleeve			
• JIS C2805 type R without insulating sleeve			
• JIS C2805 type RAV with insulating sleeve			
• JIS C2805 type RAP with insulating sleeve			

1) If two different conductor cross-sections are being connected to one clamping point, both cross-sections must be located in the range indicated. If identical cross-sections are used, this restriction does not apply.

2)



5.10.3 3RB30/3RB31

5.10.3.1 General technical data

Table 5- 43 General technical data for 3RB30/3RB31 overload relays

Type			**3RB30 1., 3RB31 1.**	**3RB30 2., 3RB31 2.**
Size			**S00**	**S0**
Width			**45 mm**	**45 mm**
Tripping in the event of			Overload, phase failure, and phase asymmetry + ground fault (3RB31 only)	
Tripping class acc. to IEC/EN 60947-4-1		CLASS	3RB30: 10 / 20, 3RB31: Select from 5, 10, 20, and 30	
Phase loss sensitivity			Yes	
Overload warning			No	
Resetting and recovery				
• Reset options following tripping			Manual, automatic, and remote RESET (depending on the version)	
• Recovery time				
	- Automatic RESET	min	approx. 3 min	
	- Manual RESET	min	Immediately	
	- Remote RESET	min	Immediately	
Equipment				
• Display of operating state on device			Yes, via switch position indicator slide	
• TEST function			Yes, electronics can be tested by pressing the TEST button/ auxiliary contacts and wiring of control circuit are tested by moving the switch position indicator slide/ self-monitoring	
• RESET button			Yes	
• STOP button			No	
Explosion protection – safe operation of motors with "increased safety" explosion protection type				
• EC type examination certificate number conforming to Directive 94/9/EC (ATEX)			PTB 09 ATEX 3001 II (2) GD	
Ambient temperatures				
• Storage/transport		°C	-40 ... +80	
• Operation		°C	-25 ... +60	
• Temperature compensation		°C	+60	
• Permissible rated current				
	- At internal cabinet temperature 60 °C	%	100	100[1)]
	- 70 °C	%	On request	

Type		**3RB30 1., 3RB31 1.**	**3RB30 2., 3RB31 2.**
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Repeat terminals			
• Coil repeat terminal		Yes	Not required
• Auxiliary switch repeat terminal		Yes	Not required
Degree of protection acc. to IEC 60529		IP20	
Touch protection acc. to IEC 61140		Finger-safe	
Shock resistance with sine acc. to IEC 60068-2-27	g/ms	15 / 11[2)]	
Electromagnetic compatibility (EMC) - Immunity			
• Conducted interference suppression			
- Burst acc. to IEC 61000-4-4 (corresponds to severity 3)	kV	2 (power ports), 1 (signal ports)	
- Surge acc. to IEC 61000-4-5 (corresponds to severity 3)	kV	2 (line to ground), 1 (line to line)	
• Electrostatic discharge acc. to IEC 61000-4-2 (corresponds to severity 3)	kV	8 (air discharge), 6 (contact discharge)	
• Field-related interference suppression to IEC 61000-4-3 (corresponds to severity 3)	V/m	10	
Electromagnetic compatibility (EMC) – Emitted interference		Severity B acc. to EN 55011 (CISPR 11) and EN 55022 (CISPR 22)	
Resistance to extreme climates - Humidity	%	95	
Dimensions		See Dimension drawings (dimensions in mm) (Page 552)	
Installation altitude above sea level	m	Up to 2,000	
Mounting position		Any	
Type of fixing		Direct mounting/stand-alone assembly with terminal support	

1) Permissible rated current in the case of heavy-duty starting S0 at 10 to 40 A:
- CLASS 20, I_{emax} = 32 A,
- CLASS 30, I_{emax} = 25 A

2) Signaling contact 97/98 in "tripped" position: 4/11 g/ms

5.10.3.2 Main circuit

Table 5- 44 Technical data for the main circuit, 3RB30/3RB31 overload relays

Type		**3RB30 1., 3RB31 1.**	**3RB30 2., 3RB31 2.**
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Rated insulation voltage U_i (pollution degree 3)	V	690	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated operational voltage U_e	V	690	
Type of current			
• DC current		No	
• AC current		Yes, 50/60 Hz ± 5%	
Current setting	A	0.1 to 0.4 to 4 to 16	0.1 to 0.4 to 10 to 40
Power loss per device (max.)	W	0.05 ... 0.2	
Short-circuit protection			
• With fuse without contactor		See "Selection and ordering data" in Catalog LV 1 N SIRIUS Innovations.	
• With fuse and contactor		See the chapter titled "Motor starter protectors (Page 379)"	
Protective separation between main and auxiliary current paths acc. to IEC/EN 60947-1 (pollution degree 2)	V	690[1)]	

[1)] For grounded networks, otherwise 600 V

5.10.3.3 Conductor cross-sections main circuit

Table 5- 45 Technical data for the main circuit connection, 3RB30/3RB31 overload relays

Type			3RB30 1., 3RB31 1.	3RB30 2., 3RB31 2.
Size			**S00**	**S0**
Width			**45 mm**	**45 mm**
Connection type			**Screw terminals with box terminal**	
• Connection screw			M3, Pozidriv size 2	M4, Pozidriv size 2
• Operating tool			∅ 5 to 6	∅ 5 to 6
• Tightening torque		Nm	0.8 to 1.2	2 to 2.5
• Conductor cross-sections (min./max.), 1-wire or 2-wire				
	- Solid	mm^2	2 x (0.5 to 1.5)[1)] ; 2 x (0.75 to 2.5)[1)] 2 x (0.5 to 4)[1)]	2 x (1 to 2.5)[1)] 2 x (2.5 to 10)[1)]
	- Finely stranded with end sleeve	mm^2	2 x (0.5 to 1.5)[1)] 2 x (0.75 to 2.5)[1)]	2 x (1 to 2.5)[1)] ; 2 x (2.5 to 6)[1)] ; max. 1 x 10
	- AWG cables, solid or stranded	AWG	2 x (20 to 16)[1)] 2 x (18 to 14)[1)] 2 x 12[1)]	2 x (16 to 12)[1)] 2 x (14 to 8)[1)]
Connection type			**Spring-loaded connection**	
• Operating tool			∅ 3.0 x 0.5 and ∅ 3.5 x 0.5	
• Conductor cross-sections (min./max.)				
	- Solid	mm^2	1 x (0.5 to 4)	1 x (1 to 10)
	- Finely stranded without end sleeve	mm^2	1 x (0.5 to 2.5)	1 x (1 to 6)
	- Finely stranded with end sleeve (DIN 46228 Part 1)	mm^2	1 x (0.5 to 2.5)	1 x (1 to 6)
	- AWG cables, solid or stranded	AWG	1 x (20 to 12)	1 x (18 to 8)

[1)] If two different conductor cross-sections are being connected to one clamping point, both cross-sections must be located in the range indicated. If identical cross-sections are used, this restriction does not apply.

5.10.3.4 Auxiliary circuit

Table 5- 46 Technical data for the auxiliary circuit connection, 3RB30/3RB31 overload relays

Type			3RB30 1., 3RB31 1.	3RB30 2., 3RB31 2.
Size			S00	S0
Width			45 mm	45 mm
Number of NO contacts			1	
Number of NC contacts			1	
Auxiliary contacts - Assignment			1 NO for the "tripped" signal; 1 NC for disconnecting the contactor	
Rated insulation voltage U_i (pollution degree 3)		V	300	
Rated impulse withstand voltage U_{imp}		kV	4	
Contact rating of the auxiliary contacts				
• NC with alternating current AC-14/AC-15, rated operational current I_e at U_e				
	24 V	A	4	
	120 V	A	4	
	125 V	A	4	
	250 V	A	3	
• NO with alternating current AC-14/AC-15, rated operational current I_e at U_e				
	24 V	A	4	
	120 V	A	4	
	125 V	A	4	
	250 V	A	3	
• NC, NO with direct current DC-13, rated operational current I_e at U_e				
	24 V	A	2	
	60 V	A	0.55	
	110 V	A	0.3	
	125 V	A	0.3	
	250 V	A	0.11	
• Conventional thermal current I_{th}		A	5	
• Contact reliability (suitability for PLC, 17 V, 5 mA)			Yes	
Short-circuit protection				
• With fuse operating class gL/gG		A	6	

Type		3RB30 1., 3RB31 1.	3RB30 2., 3RB31 2.
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Ground-fault protection (3RB31 only)		The information refers to sinusoidal fault currents at 50/60 Hz	
• Tripping value I_{Δ}		> 0.75 x I_{motor}	
• Operating range I		Lower current setting < I_{motor} < 3.5 x upper current setting	
• Response time t_{trip} (in steady-state condition)	s	< 1	
Integrated electrical remote reset (3RB31 only) Connection terminals A3, A4		24 V DC, max. 20 mA for approx. 20 ms, thereafter < 10 mA	
Protective separation between auxiliary current paths acc. to IEC/EN 60947-1	V	300	
CSA, UL, and UR rated data			
Auxiliary circuit – Switching capacity		3RB30: B600, R300; 3RB31: B300, R300	

5.10.3.5 Conductor cross sections, auxiliary circuit

Table 5- 47 Technical data for the main circuit connection, 3RB30/3RB31 overload relays

Type		3RB30 1., 3RB31 1.	3RB30 2. 3RB31 2.
Size		**S00**	**S0**
Width		**45 mm**	**45 mm**
Connection type		**Screw connection**	
• Connection screw		Pozidriv, size 2	
• Operating tool		∅ 5 to 6	
• Tightening torque	Nm	0.8 to 1.2	
• Conductor cross-sections (min./max.), 1-wire or 2-wire			
- Solid	mm^2	1 x (0.5 to 4); 2 x (0.5 to 1.5)	
- Finely stranded with end sleeve	mm^2	1 x (0.5 to 2.5); 2 x (0.5 to 1.5)	
- AWG cables, solid or stranded	AWG	2 x (20 to 14)	
Connection type		**Spring-loaded connection**	
• Operating tool		∅ 3.0 x 0.5	
• Conductor cross-sections (min./max.), 1-wire or 2-wire connection possible			
- Solid	mm^2	2 x (0.25 to 1.5)	
- Finely stranded with end sleeve	mm^2	2 x (0.25 to 1.5)	
- Stranded	mm^2	2 x (0.25 to 1.5)	
- AWG cables, solid or stranded	AWG	2 x (24 to 16)	

5.11 Dimension drawings (dimensions in mm)

Note

All dimensions are specified in mm.

5.11.1 Dimension drawings for 3RU21 thermal overload relays

3RU2116-..B0 (S00)

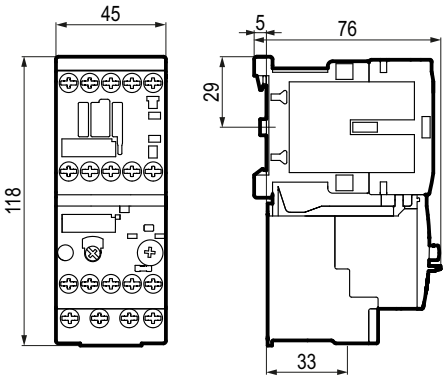


Figure 5-7 3RU2116-..B0

3RU2116-4.B1 (S00)

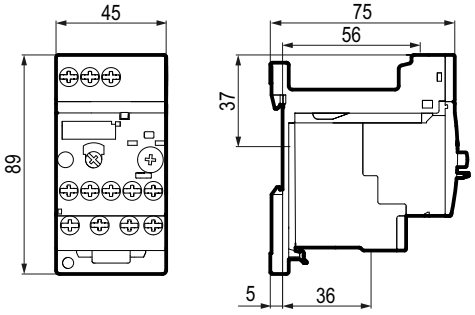


Figure 5-8 3RU2116-4.B1

3RU2116-..C0 (S00)

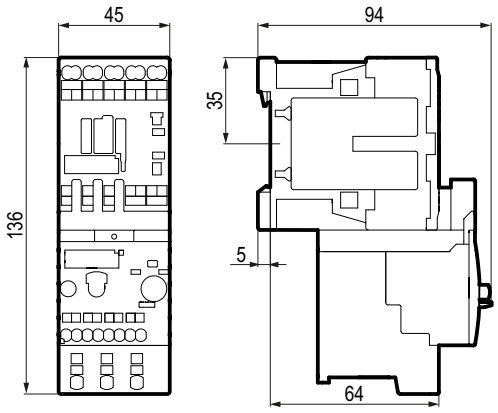


Figure 5-9 3RU2116-..C0

3RU2116-..C1 (S00)

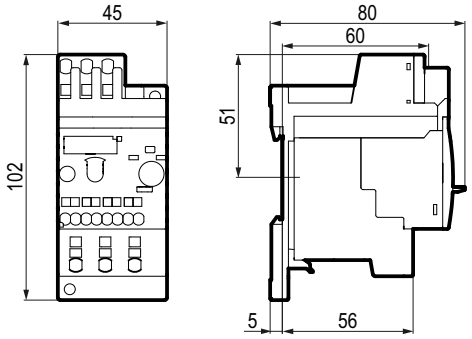
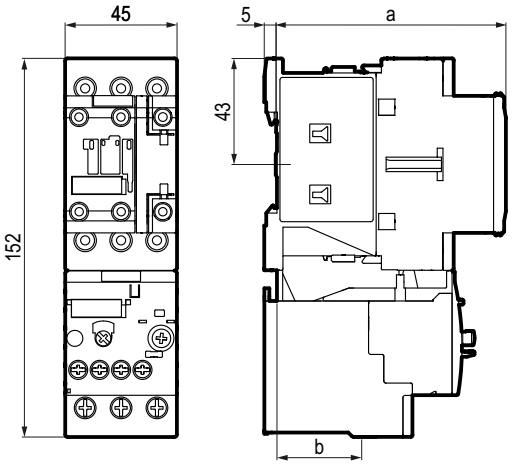


Figure 5-10 3RU2116-..C1

3RU2126-..B0 (S0)



a AC: 92; DC: 102

b AC: 34; DC: 44

Figure 5-11 3RU2126-..B0

3RU2126-4.B1 (S0)

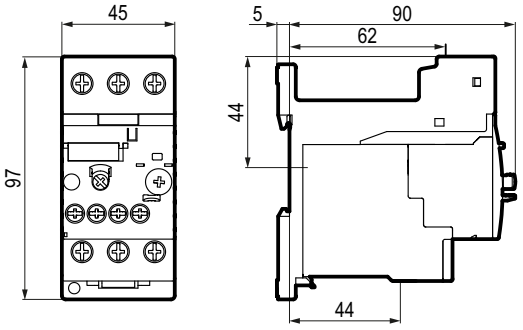
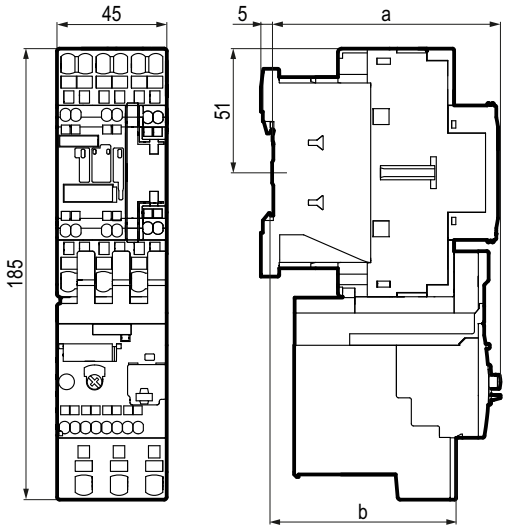


Figure 5-12 3RU2126-4.B1

3RU2126-..C0 (S0)



a AC: 93; DC: 103

b AC: 76; DC: 86

Figure 5-13 3RU2126-..C0

3RU2126-4.C1 (S0)

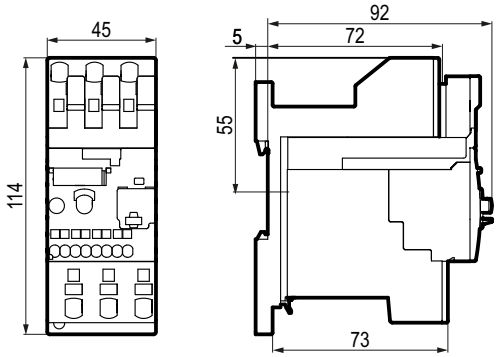


Figure 5-14 3RU2126-4.C1

5.11.2 Dimension drawings for 3RB30/3RB31 solid-state overload relays

3RB3.1.-..B0 (S00)

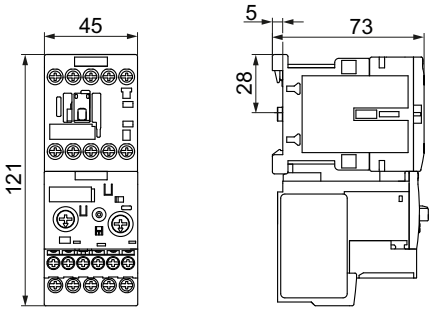


Figure 5-15 3RB3.1.-..B0

3RB3.1.-..B0 and 3RU2916-3AA01 (S00)

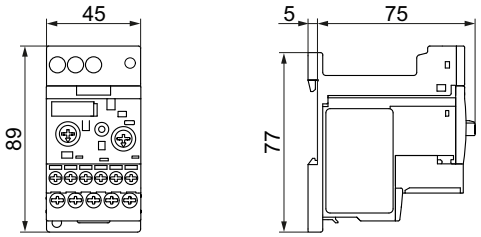


Figure 5-16 3RB3.1.-..B0 and 3RU2916-3AA01

3RB3.1.-..E0 (S00)

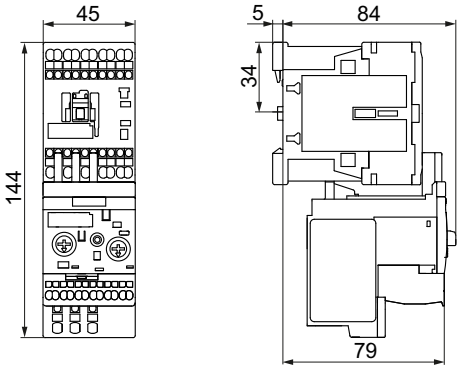


Figure 5-17 3RB3.1.-..E0

3RB3.1.-..E0 and 3RU2916-3AC01 (S00)

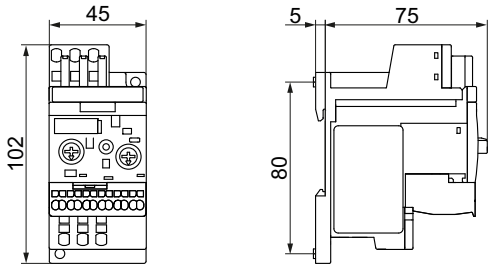
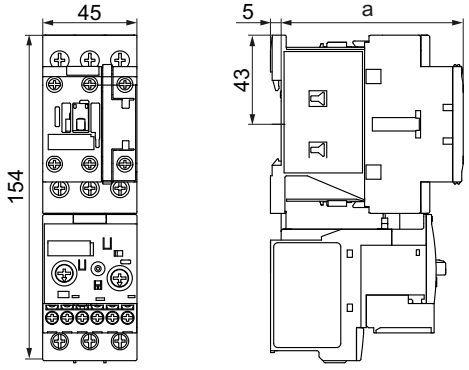


Figure 5-18 3RB3.1.-..E0 and 3RU2916-3AC01

3RB3.2.-..B0



a AC: 87; DC: 97

Figure 5-19 3RB3.2.-..B0

3RB3.2.-..B0 and 3RU2926-3AA01 (S0)

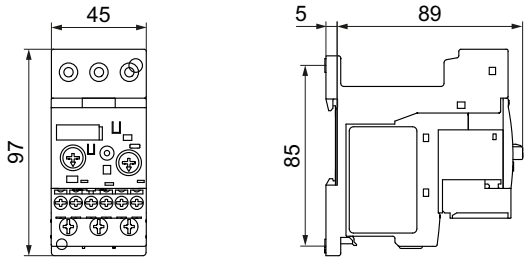
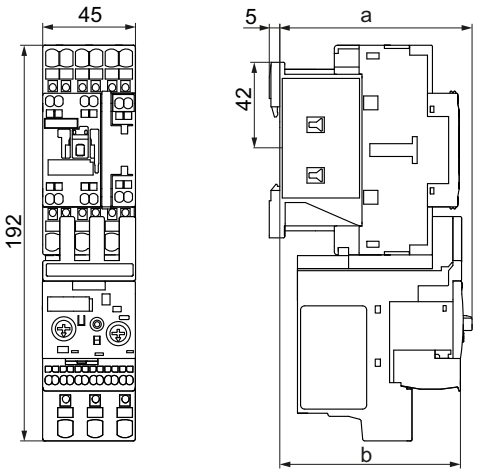


Figure 5-20 3RB3.2.-..B0 and 3RU2926-3AA01

3RB3.2.-..E0 (S0)



a AC: 93; DC: 103

b AC: 88; DC: 98

Figure 5-21 3RB3.2.-..E0

3RB3.2.-..E0 and 3RU2926-3AC01 (S0)

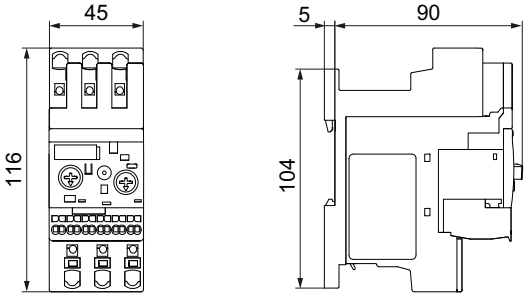


Figure 5-22 3RB3.2.-..E0 and 3RU2926-3AC01

5.12 Circuit diagrams

Internal circuit diagrams

You can find the internal circuit diagrams for SIRIUS Innovations products online in the image database (www.siemens.com/lowvoltage/bilddb).

Enter the order number of the device in the "Order number" field and, in the "Type of object" selection menu on the left-hand side, select "Unit wiring diagram".

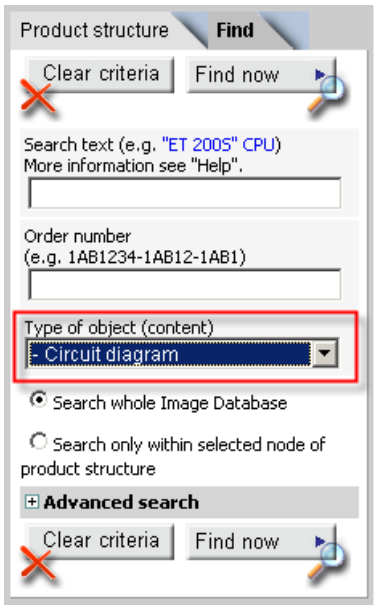


Figure 5-23 Image database

Internal circuit diagrams for 3RU21

3RU2116-..B., 3RU2116-..J.

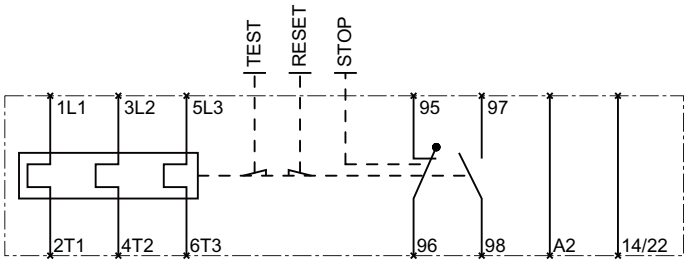


Figure 5-24 Thermal overload relay, screw-type and ring cable lug connection systems, S00

3RU2116-..C.

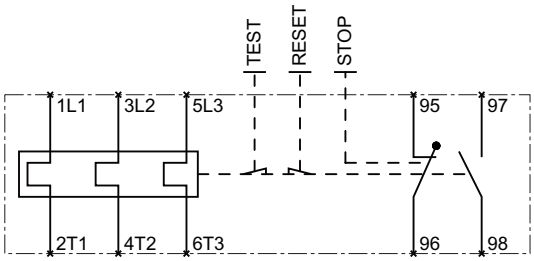


Figure 5-25 Thermal overload relay, spring-loaded connection system, S00

3RU2126-....

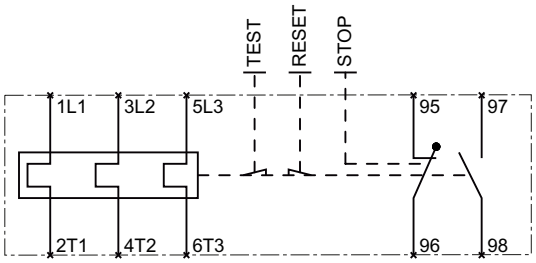


Figure 5-26 Thermal overload relay, S0

Internal circuit diagrams for 3RB30

3RB3016-..B.

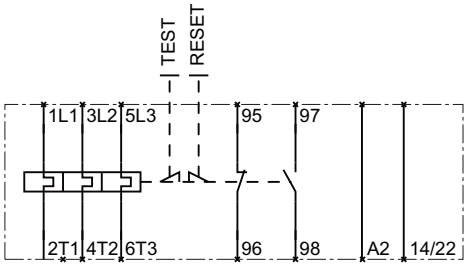


Figure 5-27 3RB30 solid-state overload relay, screw-type connection system, S00

3RB3016-..E.

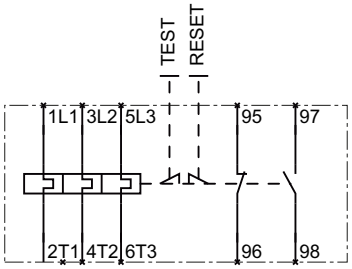


Figure 5-28 3RB30 solid-state overload relay, spring-loaded connection system, S00

3RB3026-....

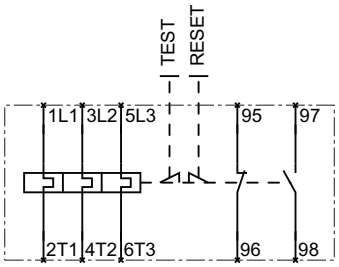


Figure 5-29 3RB30 solid-state overload relay, S0

Internal circuit diagrams for 3RB31

3RB3113-..B.

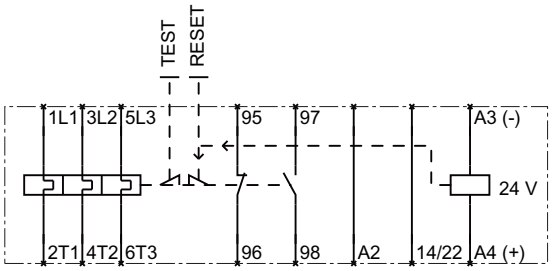


Figure 5-30 3RB31 solid-state overload relay, screw-type connection system, S00

3RB3113-..E.

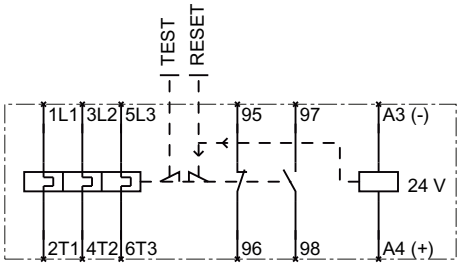


Figure 5-31 3RB31 solid-state overload relay, spring-loaded connection system, S00

3RB3123-....

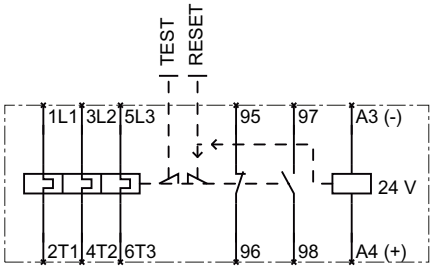


Figure 5-32 3RB31 solid-state overload relay, S0