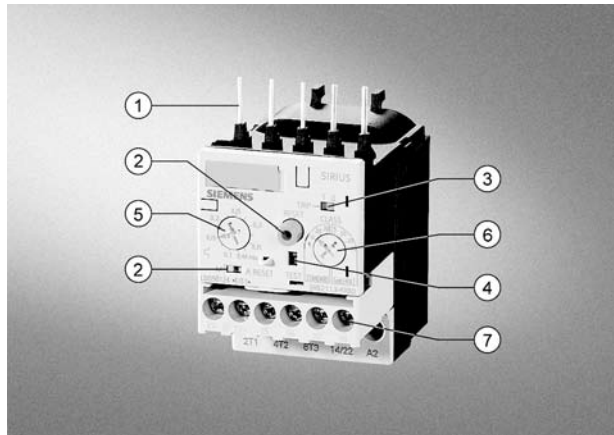




Overview



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

The 3RB20 and 3RB21 solid-state overload relays up to 630 A with internal power supply have been designed for inverse-time delayed protection of loads with normal and heavy starting (see [Function](#)) against excessive temperature rise due to overload, phase unbalance or phase failure. An overload, phase unbalance or phase failure result in an increase of the motor current beyond the set motor rated current. This current rise is detected by the current transformers integrated into the devices and evaluated by corresponding solid-state circuits which then output a pulse to the auxiliary contacts. The auxiliary contacts then switch off the load by means of the contactors control circuit. The break time depends on the ratio between the tripping current and set current I_e and is stored in the form of a long-term stable tripping characteristic (see [Characteristic Curves](#)).

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

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

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

Application

Industries

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

Application

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

The 3RU11 thermal overload relay or the 3RB22/3RB23 solid-state overload relay can be used for single-phase AC loads. For DC loads the 3RU11 thermal overload relays are available.

Ambient conditions

The devices are insensitive to external influences such as shocks, corrosive environments, ageing and temperature changes.

For the temperature range from -25 °C to $+60\text{ °C}$, the 3RB20/3RB21 solid-state overload relays compensate the temperature according to IEC 60947-4-1.

The 3RB20/3RB21 solid-state overload relays are suitable for the overload protection of explosion-proof motors with "increased safety" type of protection EEx e according to ATEX guideline 94/9/EC. The relays meet the requirements of EN 60079-7 (Electrical apparatus for potentially explosive atmospheres – Increased safety "e").

The basic safety and health requirements of ATEX guideline 94/9/EG are fulfilled by compliance with

- EN 60947-1
- EN 60947-4-1
- EN 60947-5-1
- EN 60079-14

EU type test certificate for Group II, Category (2) G/D under application. Number on request.

Accessories

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

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

Overload Relays

3RB2 Solid-State Overload Relays

SIRIUS



3RB20, 3RB21 for
standard applications

Design

Device concept

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

Mounting options

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

Connection technique

Main circuit

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

Auxiliary circuit

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

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

Overload relays in contactor assemblies for Wye-Delta starting

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

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

Operation with frequency converter

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

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



Function

Basic functions

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

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

Control circuit

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

Short-circuit protection

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

Trip classes

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

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

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

Phase failure protection

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

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

Setting

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

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

Manual and automatic reset

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

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

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

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

Recovery time

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

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

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

TEST function

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

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

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

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

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

Self-monitoring

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

Display of operating status

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

Auxiliary contacts

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