

Overload Relays

Thermal Overload Relays

3RU11, 3RU21 up to 100 A,
CLASS 10



Description

The 3RU thermal overload relays up to 100 A are designed for current-dependent protection of applications with normal start-up conditions (see "Trip classes") against impermissibly high rises in temperature as a result of overload or phase failure (see "Phase failure protection"). An overload or phase failure causes the motor current to rise above the set rated motor current (see "Setting"). This current rise heats up the bimetal strips within the relay via heating elements which, in turn, operate the auxiliary contacts via a tripping mechanism due to their deflection (see "Auxiliary contacts"). These switch the load off via a contactor. The switch-off time is dependent on the ratio of tripping current to operational current I_e and is stored in the form of a tripping characteristic with long-term stability (see "Tripping characteristics"). The "Tripped" state is signalled by means of a switching position indicator (see "Indication of status").

Resetting takes place manually or automatically (see "Manual and automatic resetting") after a recovery time has elapsed (see "Recovery time").

The 3RU thermal overload relays are electrically and mechanically optimised to the 3RT contactors such that, in addition to individual mounting, they can also be directly mounted onto the contactors to save space (see "Design and mounting"). The main and auxiliary circuits can be connected in various ways (see "Connection"), including the use of Cage Clamp terminals. When the overload relay has been connected, it can be tested for correct functioning using a TEST slide (see "TEST function"). In addition to the TEST function, the 3RU thermal overload relay is equipped with a STOP function (see "STOP function").

For a wide variety of application possibilities for the 3RU thermal overload relay, please refer to the sections "Application", "Ambient conditions", "Overload relays in WYE-delta combinations" and "Operation with frequency converters".

The 3RU thermal overload relays can protect your loads from overload and phase failure. You must implement short-circuit protection (see "Short-circuit protection") by means of a fuse or circuit-breaker.

The 3RU thermal overload relays are environmentally friendly

(see "Environmental considerations") and comply with all the main international standards and approvals (see "Specifications" and "Increased safety type of protection EEx").

The accessories for the 3RU thermal overload relays have been designed on the principle that all requirements are covered by a small number of variants.

Application

The 3RU thermal overload relays are designed for the protection of three-phase and single-phase AC and DC motors.

If single-phase AC or DC loads are to be protected using 3RU thermal overload relays, all three bimetal strips should be heated. Therefore all main circuits of the relay must be connected in series.

Overload relays in WYE-delta combinations

When overload relays are used in WYE-delta combinations, it is important to note that only $1/\sqrt{3}$ of the motor current flows through the mains contactor. An overload relay mounted on the main contactor must be set to 0.58 times the motor current.

A second overload relay must be mounted on the star contactor if your load is also to be optimally protected in WYE operation. The WYE current is 1/3 of the rated motor current. The relevant relay must be set to this current.

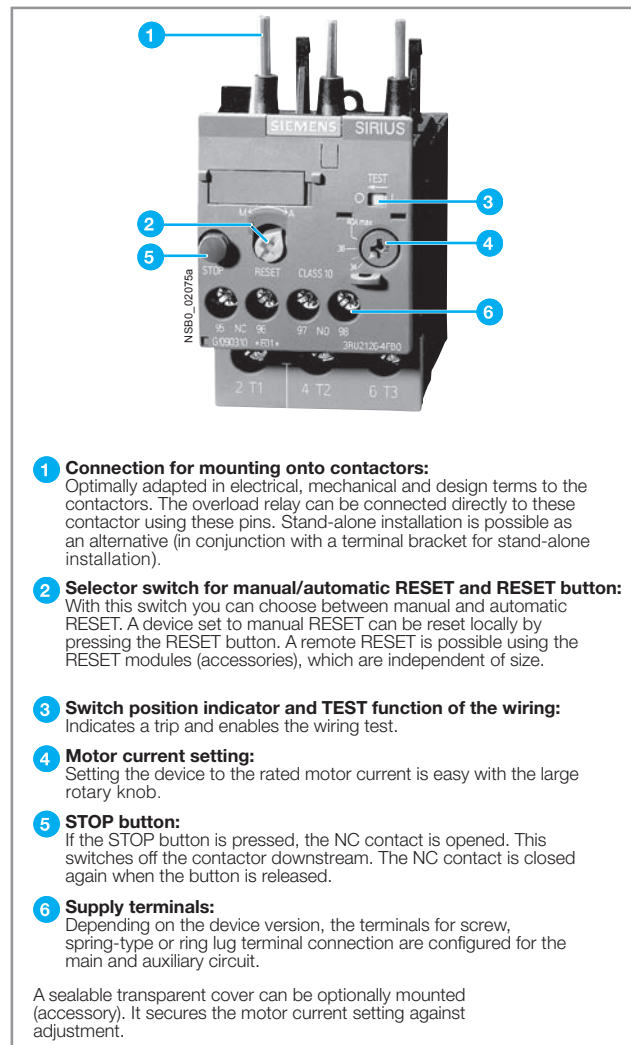
Control circuit

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

Ambient conditions

The 3RU thermal overload relays are temperature compensating according to IEC 60 947-4-1/DIN VDE 0660 Part 102 in the temperature range $-20\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$. For temperatures from $+60\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$, the upper setting value of the setting range must be reduced by a specific factor as given in the table below.

Ambient temperature in $^{\circ}\text{C}$	Reduction factor for the upper setting value
+60	1.0
+65	0.94
+70	0.87
+75	0.81
+80	0.73



- 1 Connection for mounting onto contactors:**
Optimally adapted in electrical, mechanical and design terms to the contactors. The overload relay can be connected directly to these contactor using these pins. Stand-alone installation is possible as an alternative (in conjunction with a terminal bracket for stand-alone installation).
- 2 Selector switch for manual/automatic RESET and RESET button:**
With this switch you can choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. A remote RESET is possible using the RESET modules (accessories), which are independent of size.
- 3 Switch position indicator and TEST function of the wiring:**
Indicates a trip and enables the wiring test.
- 4 Motor current setting:**
Setting the device to the rated motor current is easy with the large rotary knob.
- 5 STOP button:**
If the STOP button is pressed, the NC contact is opened. This switches off the contactor downstream. The NC contact is closed again when the button is released.
- 6 Supply terminals:**
Depending on the device version, the terminals for screw, spring-type or ring lug terminal connection are configured for the main and auxiliary circuit.

A sealable transparent cover can be optionally mounted (accessory). It secures the motor current setting against adjustment.

3RU21 26-4FB00 thermal overload relays

Trip classes

The 3RU thermal overload relay is available for normal start-up conditions in CLASS 10. For further details about trip classes, see "Tripping characteristics".

Tripping characteristics

The tripping characteristics show the relationship between the tripping time and the tripping current as a multiple of the operational current I_e and are specified for symmetrical three-pole and two-pole loading from cold.

The smallest current at which tripping occurs is called the limiting tripping current. In accordance with IEC 60 947-4-1/DIN VDE 0660 Part 102, this must lie within certain specified limits. The limits of the limiting tripping current lie, in the case of the 3RU11 thermal overload re-

lay for symmetrical three-pole loading between 105 % and 120 % of the operational current. Starting from the limiting tripping current, the tripping characteristic moves on to larger tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time-intervals within which the overload relay must trip with 7.2 times the operational current I_e for symmetrical three-pole loading from cold.

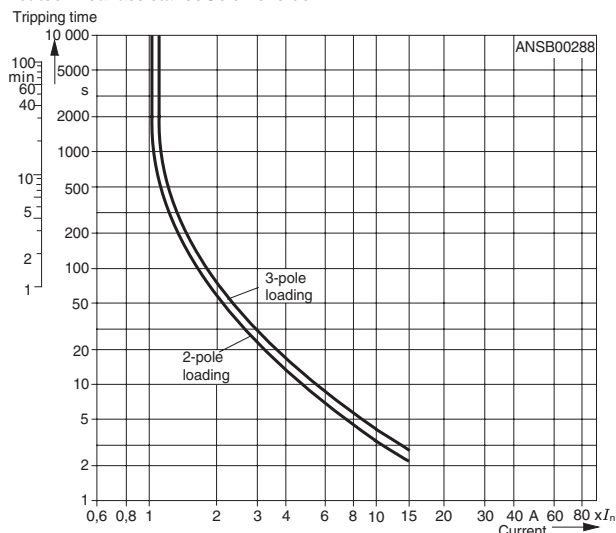
The tripping times are:

CLASS	Tripping times
10A	2 s to 10 s
10	4 s to 10 s
20	6 s to 20 s
30	9 s to 30 s



Description

This is the schematic representation of a characteristic. The characteristics of the individual 3RU thermal overload relays can be requested from Technical Assistance at the e-mail address: nst.technical-assistance@siemens.de



The tripping characteristic of a three-pole 3RU thermal overload relay (see characteristic for symmetrical three-pole loading from cold) is valid when all three bimetal strips are loaded with the same current simultaneously. If, however, only two bimetal strips are heated as a result of phase failure, these two strips would have to provide the force necessary for operating the release mechanism and, if no additional measures were implemented, they would require a longer tripping time or a higher current. These increased current levels over long periods usually result in damage to the consumer. To prevent damage, the 3RU thermal overload relay features phase failure sensitivity which, thanks to an appropriate mechanical mechanism, results in accelerated tripping according to the characteristic for two-pole loading from cold.

In contrast to a load in the cold state, a load at operating temperature has a lower heat reserve. This fact affects the 3RU thermal overload relay in that following an extended period of loading at operational current I_n , the tripping time reduces by about a quarter.

Phase failure protection

The 3RU thermal overload relays feature phase failure protection (see "Tripping characteristics") for the purpose of minimizing the heating of the load during single-phase operation as a result of phase failure.

Setting

The 3RU thermal overload relay is adjusted to the rated motor current using a rotary knob. The scale of the rotary knob is calibrated in Amperes.

Manual and automatic resetting

It is possible to switch between manual resetting and automatic resetting by depressing and rotating the blue button (RESET button). When manual resetting is selected, a reset can be performed directly on the device by pressing the RESET button. Remote resetting can be implemented by using the mechanical and electrical RESET modules from the range of accessories (see "Accessories"). When the blue button is set to Automatic RESET, the relay will be reset automatically.

A reset is not possible until the recovery time has elapsed (see "Recovery time").

Recovery time

After tripping due to an overload, it takes a certain length of time for the bimetal strips of the 3RU thermal overload relays to cool down. The relay can only be reset once it has cooled down. This time (recovery time) is dependent on the tripping characteristic and the level of the tripping current.

After tripping due to overload, the recovery time allows the load to cool down.

TEST function

Correct functioning of the ready 3RU thermal overload relay can be tested with the TEST slide. The slide is operated to simulate tripping of the relay. During this simulation, the NC contact (95-96) is opened and the NO contact (97-98) is closed whereby the overload relay checks that the auxiliary circuit is wired correctly. When the 3RU thermal overload relay is set to Automatic RESET, an automatic reset takes place when the TEST slide is released. The relay must be reset using the RESET button when it is set to Manual RESET.

STOP function

When the STOP button is pressed, the NC contact is opened and the series-connected contactor and therefore the load is switched Off. The load is reconnected via the contactor when the STOP button is released.

Status indication

The current status of the 3RU thermal overload relay is indicated by the position of the marking on the "TEST function/switching position indicator" slide. The marking on the slide is on the left at the "O" mark following a trip due to overload or phase failure and at the "I" mark otherwise.

Auxiliary contacts

The 3RU thermal overload relay is equipped with an NO contact for the tripped signal and an NC contact for switching off the contactor.

Connection

All the 3RU thermal overload relays have screw terminals for the main and auxiliary circuits. Once the box terminals have been removed from the main conductor connections of the overload relays of size S3, it is possible to connect busbars.

Alternatively the devices are available with either spring loaded or with ring lug terminals on both the control and the main terminals. For details of various connection possibilities, see the "Technical data" and "Selection and ordering data".

Design and mounting

The 3RU thermal overload relays are suitable for direct mounting on the 3RT contactors. They can also be mounted as single units if the appropriate adapters are used. For details of the mounting possibilities, see the "Selection and ordering data" and the "Technical data".

Operation with frequency converters

The 3RU thermal overload relays are suitable for operation with frequency converters. Depending on the frequency of the converter, a current higher than the motor current may have to be set due to the occurrence of eddy currents and skin effects.

Environmental considerations

The devices are manufactured taking environmental considerations into account and comprise environmentally-friendly and recyclable materials.

Specifications

The 3RU thermal overload relays comply with the requirements of:

- IEC 60 947-1/
DIN VDE 0660 Part 100
- IEC 60 947-4-1/
DIN VDE 0660 Part 102
- IEC 60 947-5-1/
DIN VDE 0660 Part 200
- IEC 60801-2, -3, -4, -5 and
- UL 508/CSA C 22.2.

The 3RU11 thermal overload relays are also safe from touch according to DIN VDE 0106 Part 100 and climate-proof to IEC 721.

Degree of protection "Increased safety" EEx

The 3RU thermal overload relay meets the requirements for overload protection of motors of the "Increased safety" type of protection EEx e IEC 50 019/
DIN VDE 0165, DIN VDE 0170, DIN VDE 171.
KEMA test certificate number Ex-97.Y.3235,
DMT 98 ATEX G001,
EN 50 019: 1977 + A1 ... A5,
Increased Safety "e". Appendix A, Guideline for temperature monitoring of squirrel cage motors during operation.

Accessories

For the 3RU thermal overload relay, there are:

- one adapter for each of the four overload relay sizes S00 to S3 for individual mounting
- one electrical remote RESET module for all sizes in three different voltage variants
- one mechanical remote RESET module for all sizes
- one cable release for all sizes for resetting inaccessible devices
- terminal covers

The accessories can also be used for the 3RB solid state overload relay.

Overload Relays

Thermal Overload Relays

3RU11, 3RU21 up to 100 A,
CLASS 10

• Revised •
09/30/14



Selection and ordering data

Features and technical characteristics

- Auxiliary contacts: 1 NO + 1 NC
- Manual/automatic RESET
- Switching position indication
- CLASS 10
- TEST function
- STOP button
- Phase failure sensitivity
- Sealable cover: optional in S00 & S0. Integrated in S2 & S3

Ordering information

- Replace the (••) with the letter Number combination from the Terminal types I table
- Replace the (††) with the letter Number combination from the Terminal types II table
- For description, [see page 3/8](#)
- For technical data, [see pages 3/12-3/15](#)
- For circuit diagrams, [see page 3/15](#)
- For dimension drawings, [see page 3/16-3/17](#).

•• Terminal Types I			†† Terminal Types II		
Type	Mounting Type	Ltr	Type	Mounting Type	Ltr
Screw	Direct to Contactor	B0	Screw	Direct to Contactor	B0
Screw ¹⁾	Stand Alone	B1	Screw ⁴⁾	Stand Alone	B1
Spring ²⁾	Direct to Contactor	C0	Spring ³⁾	Direct to Contactor	D0
Spring ¹⁾²⁾	Stand Alone	C1			
Ring Lug	Direct to Contactor	J0			



3RU2116-1GB0



3RU2116-1GC0



3RU2126-4NB0



3RU1136-4EB1



3RU1146-4DB0

Thermal Overload Relays up to 40A Frame Size S00 and S0 ••

Setting Range	Order No.	Setting Range	Order No.	Weight approx. (screw/spring) kg
A		A		
Frame Size S00: For mounting directly to 3RT201 contactors or for stand-alone installation				
0.11 - 0.16	3RU2116-0A••	1.4 - 2	3RU2116-1B••	0.13/0.15
0.14 - 0.2	3RU2116-0B••	1.8 - 2.5	3RU2116-1C••	
0.18 - 0.25	3RU2116-0C••	2.2 - 3.2	3RU2116-1D••	
0.22 - 0.32	3RU2116-0D••	2.8 - 4	3RU2116-1E••	
0.28 - 0.4	3RU2116-0E••	3.5 - 5	3RU2116-1F••	0.13/0.15
0.35 - 0.5	3RU2116-0F••	4.5 - 6.3	3RU2116-1G••	
0.45 - 0.63	3RU2116-0G••	5.5 - 8	3RU2116-1H••	
0.55 - 0.8	3RU2116-0H••	7 - 10	3RU2116-1J••	
0.7 - 1	3RU2116-0J••	9 - 12.5	3RU2116-1K••	0.13/0.15
0.9 - 1.25	3RU2116-0K••	11 - 16	3RU2116-4A••	
1.1 - 1.6	3RU2116-1A••			
Frame Size S0: For mounting directly to 3RT202 contactors or for stand-alone installation				
1.8 - 2.5	3RU2126-1C••	11 - 16	3RU2126-4A••	0.16/0.22
2.2 - 3.2	3RU2126-1D••	14 - 20	3RU2126-4B••	
2.8 - 4	3RU2126-1E••	17 - 22	3RU2126-4C••	
3.5 - 5	3RU2126-1F••	20 - 25	3RU2126-4D••	
4.5 - 6.3	3RU2126-1G••	23 - 28	3RU2126-4N••	0.16/0.22
5.5 - 8	3RU2126-1H••	27 - 32	3RU2126-4E••	
7 - 10	3RU2126-1J••	30 - 36	3RU2126-4P••	
9 - 12.5	3RU2126-1K••	34 - 40	3RU2126-4F••	

Thermal Overload Relays up to 100A Frame Size S2 and S3 ††

Setting Range	Order No.	Setting Range	Order No.	Weight approx. (screw/spring) kg	
A		A			
Frame Size S2: For mounting directly to 3RT103 contactors⁴⁾					
5.5 - 8	3RU1136-1H††	18 - 25	3RU1136-4D††	0.32	
7 - 10	3RU1136-1J††	22 - 32	3RU1136-4E††		
9 - 12.5	3RU1136-1K††	28 - 40	3RU1136-4F††		
11 - 16	3RU1136-4A††	36 - 45	3RU1136-4G††		
14 - 20	3RU1136-4B††	40 - 50	3RU1136-4H††	0.55	
Frame Size S3: For mounting directly to 3RT104 contactors⁴⁾					
18 - 25	3RU1146-4D††	45 - 63	3RU1146-4J††		
22 - 32	3RU1146-4E††	57 - 75	3RU1146-4K††		
28 - 40	3RU1146-4F††	70 - 90	3RU1146-4L††	0.55	
36 - 50	3RU1146-4H††	80 - 100 ⁵⁾	3RU1146-4M††		

- 1) Not available for size S0 3RU212 with current setting range below 14 A.
- 2) Size S00 and S0: main and auxiliary conductor terminals are spring-type.
- 3) Size S2 S3 auxiliary terminals are spring-type only. Main conductor terminals are screw.
- 4) 3RU Overloads in S2 and S3 frame are available preassembled with a terminal bracket for standalone mounting. S2 and S3 overloads can also be customer assembled to the terminal bracket (see Accessories).