

HR 111

Auxiliary relays for power transmission and distribution



Data sheet
109066_en_00

© PHOENIX CONTACT 2020-03-16

1 Description

The auxiliary relays HR 111 is suitable for use in control and monitoring systems, where the requirements on the reliability of the electronics are high.

The auxiliary relays HR 111 ensures electrical isolation between auxiliary and control circuits. Despite its very high switching capacity, the relay only has a low power consumption.

For the **surface mounting** version, the connector plate of the HR 111 is snapped onto a DIN rail and wired using screw terminal blocks. You can secure this version with a screw.

In the **combination** version, several relays without cover are placed in an instrument housing and wired using screw terminal blocks.

The contact assignment and nominal voltage of the coil can be configured during ordering. You can find all applicable characteristics and connection assignments on the relay itself at delivery.

Table of contents

1	Description	1
2	Ordering data.....	2
3	Safety notes.....	2
4	Technical data	3
5	Device versions and mounting options	4
6	Design and method of operation.....	5
7	Installation	6
8	Connecting the conductors.....	6
9	Circuit diagrams.....	7
10	Options	7
11	Instrument housing	8
12	Content of the EU Declaration of Conformity	9
13	Order key.....	10



NOTE: Disconnect the power to the relay for all work on the device. Make sure that the supply voltage and signal voltages cannot be switched on again by unauthorized persons!



NOTE: This product has to be installed by an electrically skilled person.



Make sure you always use the latest documentation.
It can be downloaded at phoenixcontact.net/product/1131089.



This document is valid for the products listed in Section “Ordering data” on page 2.

2 Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Auxiliary relays - axial armature relay	HR 111	1131089-00	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
Connector plate (Makrolon fiberglass reinforced, black)	for HR 111 / MR 11 / MR 21	1113841-00	1
Instrument housing, 2 x 2 modules	96Q	1113855-00	1
Instrument housing, 3 x 3 modules	144Q	1113854-00	1
Blanking plate for instrument housing		1113848-00	1

Documentation

Description	Type	Order No.	Pcs./Pkt.
Instrument housing, 2 x 2 modules	96Q	1113855-00	
Instrument housing, 3 x 3 modules	144Q	1113854-00	

3 Safety notes

- Observe the national safety and accident prevention regulations.
- Disregarding these safety regulations may result in death, serious personal injury or damage to equipment.
- Prior to startup, read the installation notes and check the auxiliary relays for damage.
- Startup, mounting, modifications, and upgrades must be carried out by an electrically skilled person.
- Before carrying out any work on the auxiliary relays, disconnect the power.
- During operation, parts of the auxiliary relays may carry hazardous voltages.
- Protective covers must not be removed when operating electrical switching devices.
- When the auxiliary relays malfunction for the first time, replace it immediately.
- Repairs to the auxiliary relays may only be carried out by the manufacturer.
- Keep the operating instructions in a safe place.

Intended use

The auxiliary relays HR 111 is intended for use in industrial systems, for control and monitoring tasks.

4 Technical data

General data	
Maximum number of relay contacts	3
Dimensions (W x H x D) with base	39 mm x 53 mm x 116 mm
Mounting	DIN rail 35 mm
Degree of protection	IP40, connections IP00 (EN 60529)
Insulation coordination	250 V AC/DC (EN 60255-27)
Test voltage	2 kV, 50 Hz (EN 60255-27)
Permissible ambient temperature range	-5°C to +40°C
Relative humidity	5% ... 95%, condensation not permitted
Weight	320 g
Coil data	
Nominal voltage AC/DC (U_N)	12 V, 24 V, 30 V, 48 V, 60 V, 110 V, 125 V, 220 V, 230 V
Mains frequency	50 Hz or 60 Hz
Continuous overvoltage	$\leq 1.2 \times U_N$
Operate voltage	$\geq 0.75 \times U_N$
Power consumption with U_N - for direct voltage (DC)	1.5 W to 3.2 W
- for alternating voltage (with open magnetic circuit)	2.5 VA to 11.9 VA
- for alternating voltage (with closed magnetic circuit)	2.0 VA to 11.9 VA
Contact data	
Operating time (minimum pulse duration until the relay switches)	Approx. 25 ms
Reset time	Approx. 10 ms
Resetting ratio for direct voltage	3.3
Resetting ratio for alternating voltage	1.5
Switching voltage, overvoltage category 2	Up to 220 V DC or 230 V AC (EN 60255-27)
Pulse width of the wiper contacts	Approx. 60 ms (optional)
Contact rating (with 10^5 switches)	
Inrush current	≤ 10 A AC/DC
Continuous current	≤ 6 A AC/DC
Breaking current at 220 V DC	0.2 A at L/R = 40 ms
Breaking current at 230 V AC	4 A at $\cos \phi = 0.4$
Connecting cables	
Conductor cross section	Up to 4 mm ²
Torque of clamping screws	0.42 Nm

Characteristic curve for contact rating

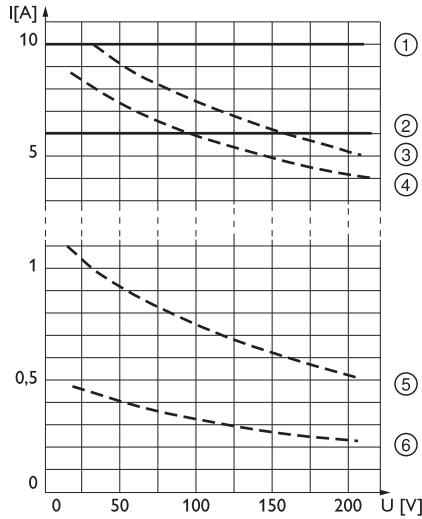


Figure 1 Characteristic curves

The diagram describes the permissible current as a function of the voltage.

The characteristic curves in the diagram are based on 10^5 switching operations of the relay contacts of the auxiliary relays HR 111.

- ① Inrush current AC/DC
- ② Continuous current AC/DC
- ③ Breaking current for ohmic AC load
- ④ Breaking current for inductive AC load, $\cos \varphi = 0.4$
- ⑤ Breaking current for ohmic DC load
- ⑥ Breaking current for inductive DC load, $L/R = 10 \text{ ms}$

5 Device versions and mounting options

There are two different basic designs for the auxiliary relays HR 111:

- “Auxiliary relays for surface mounting” on page 5
- “Auxiliary relays for combination mounting” on page 6

Each design is optimized for certain applications. All measurements are in mm.

6 Design and method of operation

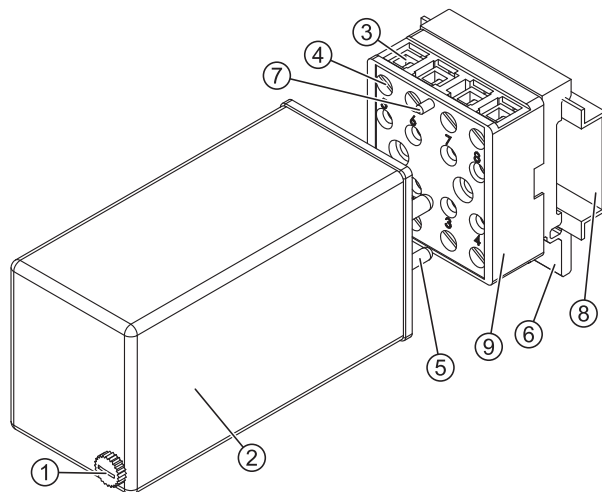
The auxiliary relays HR 111 has been designed as axial armature relay. The armature actuates all contacts simultaneously, without using levers. When de-energized, the armature is held in the rest position by contact springs. The transparent plastic housing ② protects the relay against touch and soiling.

The HR 111 is fitted with plug-in contacts ⑤ for fast and secure mounting.

The connection to the supply voltage and the signals is established using a matching connector plate ⑨ (surface-mounted version). With a screw connection, it is suitable for conductor cross sections up to 4 mm².

Signal switching via relay contacts is robust and reliable. The contacts have a low contact resistance, ensuring that only very low levels of exhaust heat are generated – even at very high continuous currents. Therefore, a separate cooling system is not required. When the contacts are open, the relay has a very high insulation resistance, and the reverse voltage in the switching path is therefore very high. You also benefit from immunity, thanks to the hysteresis behavior and robustness of the coil.

Auxiliary relays for surface mounting



- | | |
|-------------------------|-------------------|
| ① Screw | ⑥ Release lever |
| ② Housing | ⑦ Threaded pin |
| ③ Screw terminal blocks | ⑧ DIN rail |
| ④ Clamping screws | ⑨ Connector plate |
| ⑤ Contact pins | |

Figure 2 Surface mounting

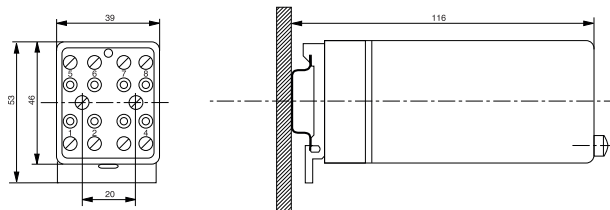


Figure 3 Dimensional drawing

1. Install the relay in a housing with at least IP54 protection (see IEC 60529). The housing provides protection against mechanical or electrical damage.

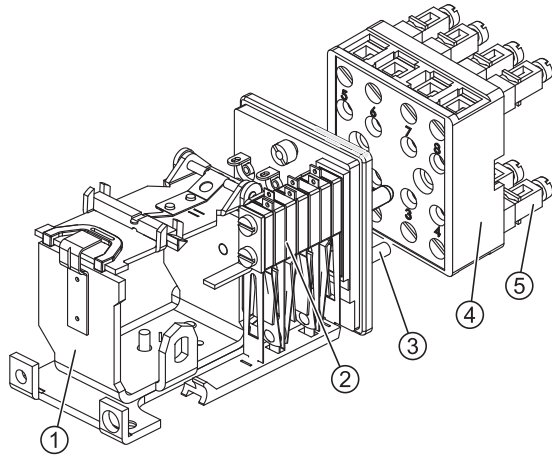


WARNING: Dangerous contact voltage!

You may only perform this work on the device if you are a qualified electrically skilled person. You have to be familiar with the necessary safety precautions.

2. During maintenance work, disconnect the relay from all effective power sources.
3. The supply voltage at the relay input and the switching voltage at the relay output can be hazardous (>30 V).
4. Snap the connector plate ⑨ onto a DIN rail ⑧. To do so, you have to press the release lever ⑥ toward the screw terminal block ③. The connector plate is mandatory for electric safety.
5. Wire the connector plate in accordance with your specifications.
The circuit diagram of your HR 111 version is affixed to the housing. The rating plate with connection data can be found on the relay body.
6. Plug the relay with its contact pins ⑤ into the connector plate intended for this purpose. The coding of the plug-in contacts prevents the relay from being plugged in incorrectly.
7. Use the screw ① to unfasten the housing ② of the relay body.
8. Secure the relay via the threaded pin ⑦ by means of the fastening nut of the relay body. Tighten the nut.
9. Use the screw ① to fasten the housing ② of the relay body. Tighten the screw.
10. To release the connector plate from the DIN rail, you have to press the release lever ⑥ toward the screw terminal blocks ③.

Auxiliary relays for combination mounting



- ① Relay body
- ② Relay contacts
- ③ Contact pins
- ④ Connector plate
- ⑤ Screw terminal blocks

Figure 4 Combination mounting

There are two housings with different sizes for combination mounting of the Auxiliary relays. For installation, refer to the documentation of this instrument housing (see “Documentation” on page 2).

The illustrated connector plate ④ with the screw terminal blocks ⑤ is a component of the respective instrument housing.

- Install the respective instrument housing in a housing with at least IP54 protection in accordance with IEC 60529. The housing provides protection against mechanical or electrical damage.



WARNING: Dangerous contact voltage!
 Only qualified personnel are permitted to perform work on the HR 111. Each member of staff must be familiar with the necessary safety precautions.

- During maintenance work, disconnect the auxiliary relays from all effective power sources.
- The supply voltage and the voltage at the contacts can be hazardous (>30 V).
- Insert the relay into the appropriate instrument housing. Push in the relay until a definite resistance can be felt. Take particular care to keep the relay body straight when inserting it into the instrument housing. Avoid contact with other relay bodies! The instrument housing is mandatory for electric safety.
- The terminal blocks of the instrument housing always have to be equipped with touch protection.

- Wire the screw terminal blocks in accordance with your specifications.

7 Installation

For specific instructions on installing the individual device versions, refer to the respective sections:

- “Auxiliary relays for surface mounting” on page 5
- “Auxiliary relays for combination mounting” on page 6

8 Connecting the conductors

1. Strip the conductors to the specified length.
2. For flexible conductors, use ferrules in acc. with DIN 46228-4.
3. Insert the conductors into the screw terminal block as far as they will go.
4. Tighten the screws of all screw terminal blocks. Observe the specified torque. We recommend to also tighten the terminal points of screw terminal blocks that are not used.
5. If you want to connect more than one conductor per screw terminal block, check the specifications regarding the connection capacity. The specifications apply to the connection of two conductors of the same cross section and the same conductor type.
6. To open the screw terminal block and remove the conductor, release the clamping screw.

9 Circuit diagrams

The type of contacts are configured during ordering.

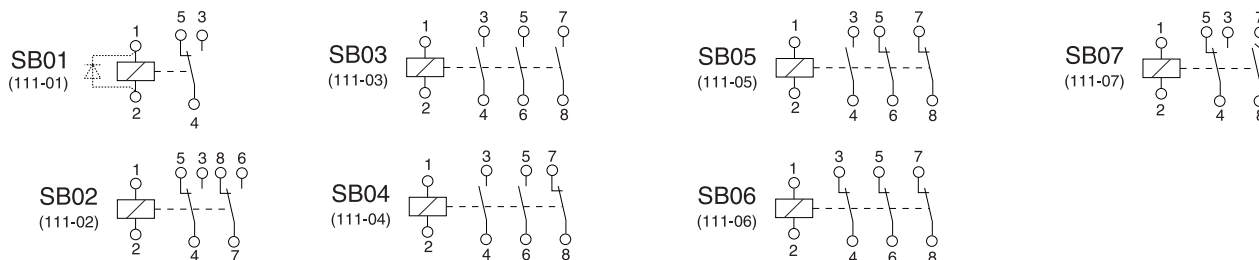


Figure 5 Possible circuit diagrams

The freewheeling diode of the DC voltage versions is optional.

10 Options

In addition to the options of using different relay contacts (see “Circuit diagrams” on page 7) and coil voltages, other options are also offered during ordering (see “Order key” on page 10).

Surface

For the **surface mounting** version, the connector plate of the HR 111 is snapped onto a DIN rail and wired using screw terminal blocks.

Combination

In the **combination** version, the HR 111 (without the plastic cover) is placed in an instrument housing and wired using screw terminal blocks.

Freewheeling diode

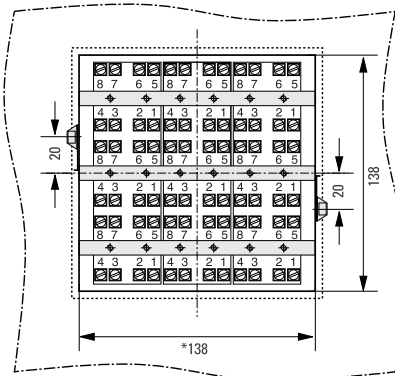
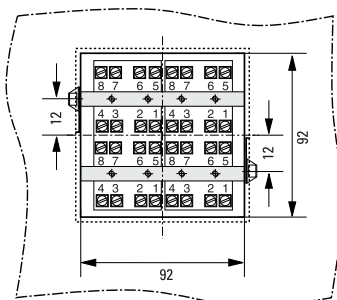
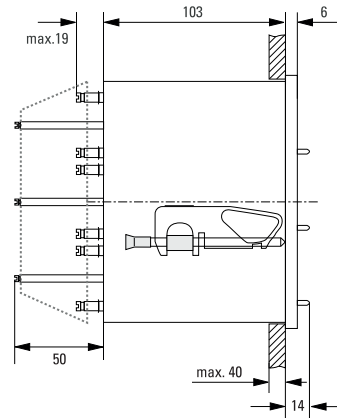
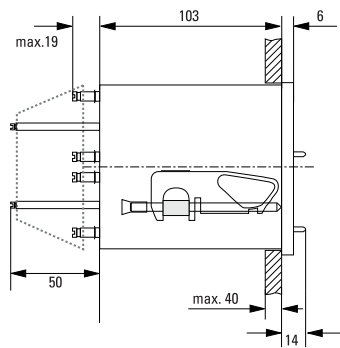
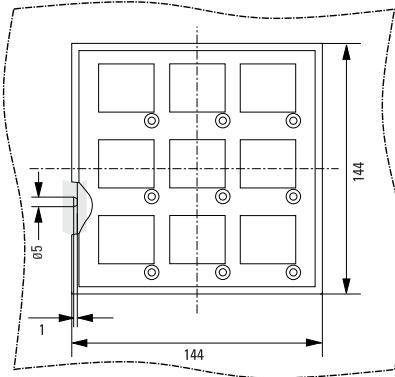
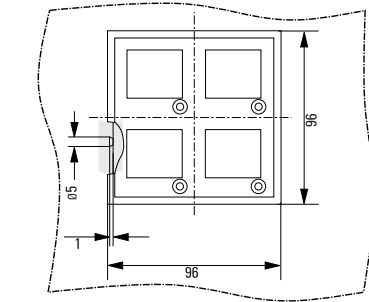
The freewheeling diode is used as protection against over-voltage when switching off a relay coil for direct voltage. To this end, a diode (type GP02-40 [4000 V]) is connected in parallel in the reverse direction.

Wiper contact

A wiper contact (e.g. circuit diagram **SB07** on page 7) supplies a single pulse with a duration of 60 ms at the output as a reaction to a pulse at the input.

11 Instrument housing

During installation, you have to establish a low-impedance connection between the PE connection of the instrument housing and the protective ground (PE).



Instrument housing, 2 x 2 modules (96Q)

To install the instrument housing, use a cutout of $92^{+0.8}$ mm \times $92^{+0.8}$ mm in the front panel.

Instrument housing, 3 x 3 modules (144Q)

To install the instrument housing, use a cutout of $138^{+0.8}$ mm \times $138^{+0.8}$ mm in the front panel.

12 Content of the EU Declaration of Conformity

The above-mentioned products are in conformity with the essential requirements of the following directives:

2011/65/EU RoHS Directive
2014/35/EU Low Voltage Directive

13 Order key

The purpose of this order key is only to enable reading of an existing order number.

Order No.	Relay type	Current type and design	Input voltage	Circuit diagram	Freewheeling diode
1131089	22 (HR 111)	90 (DC, surface)	2 (12 V)	01 (SB01)	FD (with diode)
		91 (AC, surface)	3 (24 V)	02 (SB02)	00 (without diode)
		94 (DC, combi)	4 (30 V)	03 (SB03)	
		95 (AC, combi)	5 (48 V)	04 (SB04)	
			6 (60 V)	05 (SB05)	
			7 (110 V)	06 (SB06)	
			8 (125 V)	07 (SB07)	
			9 (220/230 V)		



Note: With this order key, you can decipher the entire order number. Certain options of the key are mutually exclusive. You can find the available options in the e-shop at phoenixcontact.net/product/1131089.