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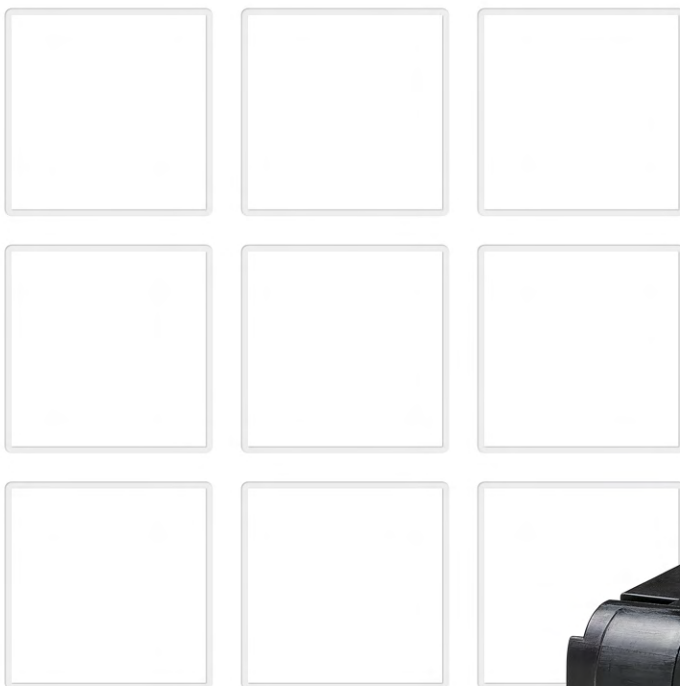
## Contactors

**C300 series**

**1 pole  
bi-directional DC  
NO contactors  
up to 500 amps**

**Installation and  
maintenance instructions**

**Manual C300-M.en**



**Document Revision History**

Date	Rev. version	Description	Pages
2023-03-21	V1.0	First issue	All

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# 1. Important basic information

## 1.1 Legal notes

Without prior written consent of SCHALTBAU GmbH, this manual is not allowed to be electronically or mechanically reproduced – as a whole or in parts – be distributed, changed, transmitted, translated into another language or used in any other way.

SCHALTBAU GmbH cannot be held liable for damage caused by non- or only partial observation of the manual.

## 1.2 Conventions for this manual

This manual describes the installation and maintenance of the contactors.

Cross references are presented in *bold italics*.

To highlight particularly important safety instructions and other information, the following symbols are used in this manual:

### ATTENTION

Indicates a possibly detrimental situation. If it is not prevented, assemblies, the system or property in its surroundings could be damaged.



Indicates technical features and methods to simplify working or indicates information of particular importance.

This manual describes single pole bi-directional DC NO contactors of the following types:

- C300-500-RXP... (top-hat rail mounting, integrated PWM)
- C300-500-GXP... (screw mounting, integrated PWM)

### DANGER

Indicates a directly threatening dangerous situation. Death or severe injuries will result if it is not prevented.

### WARNING

Indicates a possibly dangerous situation. Death or severe injuries may result if it is not prevented.

### CAUTION

Indicates a possibly dangerous situation. Medium or minor injuries may result if it is not prevented.

# 2. General and safety information

The contactors dealt with in this document are intended for use with electrical systems for special applications. They are designed and tested in compliance with generally accepted codes of practice. However, improper use, operation, handling, maintenance or tampering with electric equipment can cause serious or fatal injury to the user or others, and the appliance or other property can be damaged. Consequently, the operation, maintenance and installation instructions for the contactors must be strictly followed.

If anything is not clear, clarification must be sought with any queries stating the device type and the serial number.

Only authorised and trained personnel are allowed to plan and carry out all mechanical and electrical installations, transport, commissioning, as well as maintenance and repair work.

This applies to the observation of the general installation and safety regulations for electrical systems as well as the proper use of tools approved for this purpose. Electrical equipment requires protection from moisture and dust during installation, operation and storage.

## 2.1 Observing the manual

- ▶ All personnel must read and understand the instructions in this manual and adhere to them when working with the device.
- ▶ **Always adhere strictly to all safety instructions!**

## 2.2 Duties of the operating company

- ▶ Observe all applicable national regulations, all safety, accident prevention and environmental protection regulations as well as the recognised technical rules for safe and correct working.
- ▶ Regularly check all fitted protection and safety equipment for correct function.
- ▶ Work on electrical equipment must only be carried out by a qualified electrician or by instructed persons under the supervision and control of a qualified electrician in accordance with electrical regulations.
- ▶ A specialist is someone who, on the basis of their technical training, knowledge and experience as well as knowledge of the relevant regulations, is able to assess the work assigned to them and identify possible dangers.
- ▶ Work on the contactors must only be carried out by personnel who meet the requirements set out in this manual.
- ▶ Personnel must be clearly informed about who is responsible for the maintenance of the contactors.
- ▶ Always perform complete checks after any installation work and/or after any other conversions, alterations or maintenance, in accordance with the following standards:
  - EN/IEC 60077-2
  - EN/IEC 60947-4-1

## 2.3 Intended use

- ▶ The contactors have been designed and tested according to national and international standards. Due to their unique features they can also be used in a wide range of industrial applications.
- ▶ The contactors must only be used under operating conditions according to the technical specifications and the instructions in this manual.
- ▶ None of the conditions of use, such as voltages, currents or ambient conditions, defined in the corresponding technical data sheets or in our **C300 catalogue** may be overridden. The **C300 catalogue** is available under: [https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)
- ▶ The contactors may only be used when all protective devices are present, have been correctly installed and are fully operational.
- ▶ Contactors may not be used without other safety precautions in potentially explosive atmospheres and/or in aggressive media.

- ▶ The device contains unprotected live parts.
- ▶ The prescribed clearances relative to other live parts or earth and other parts must be complied with as well as the safety regulations of the applicable standards.
- ▶ Switching at close to the maximum breaking capacity may require increased minimum clearances! Do not hesitate to ask our advice in respect of any dimensioning.
- ▶ Coil suppression for reducing surges when the coil is switched off is optimally attuned to the contactor's switching behaviour. The existing opening characteristic must not be negatively influenced by parallel connection with an external diode.
- ▶ Improper handling of the contactors, e.g. impacts on the floor, may result in breakage, cracks or deformation. Always handle the device with care.
- ▶ Only use the contactors for the specified application and only with original parts. Any other usage of or tampering with the contactors is considered contrary to their intended use. No liability is assumed for damages and accidents caused due to non-compliance with the instructions in this manual or improper use of the contactors.

## 2.4 Ambient conditions


### ATTENTION

The contactors have been design for specific ambient conditions.


- ▶ Only operate the contactors in ambient conditions, such as temperature ranges, degree of soiling, etc., as defined in the corresponding data sheets and in our **catalogue C300**. The **C300 catalogue** is available under: [https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)


## 3. Hazards and safety precautions


### 3.1 Electrical hazards

	<b>⚠ DANGER</b>
	<p>The contactors are used for high voltage switching. Contact with live electrical parts can result in serious injuries or even death!</p> <p>Live parts are all metal parts belonging directly to one of the circuits or wires connecting to them. All other visible metal parts and wiring may also be live if a fault exists.</p> <p>Before starting any work on the contactors, always comply with the following safety rules:</p> <ul style="list-style-type: none"> <li>▶ Disconnect on all sides</li> <li>▶ Secure to prevent switching back on</li> <li>▶ Clearly identify the working area</li> <li>▶ Check that a voltage-free state exists</li> <li>▶ Earth and short circuit; this includes discharging any capacitors in the main circuit</li> <li>▶ Besides the main power circuits, also disconnect additional and auxiliary circuits</li> <li>▶ Cover or insulate adjacent live parts</li> <li>▶ The presence of a voltage-free state can only be clearly identified by a qualified electrician.</li> <li>▶ When the work has been concluded, follow the procedure in reverse.</li> </ul>

### 3.2 Other hazards

	<b>⚠ WARNING</b>
	<p>Contactors must only be used for the purposes specified in the specifications and data sheets. Incorrect use can cause accidents and severe personal injury.</p> <ul style="list-style-type: none"> <li>▶ The manufacturer will not be responsible for accidents arising from improper use of the product.</li> </ul>

	<b>⚠ CAUTION</b>
	<p>During continuous operation the contactors may become hot. Risk of burns!</p> <ul style="list-style-type: none"> <li>▶ Before beginning any checks or maintenance on the contactors ensure that the heated components have cooled down.</li> </ul>

	<b>⚠ CAUTION</b>
	<p>The contactors contain sharp-edged parts. Risk of injuries!</p> <ul style="list-style-type: none"> <li>▶ Use appropriate tools for installation and maintenance work on the contactors.</li> <li>▶ Wear safety gloves when handling sharp-edged components.</li> </ul>

### 3.3 Measures for avoiding damage and malfunctions

#### ATTENTION

Aggressive liquids may damage the contactors.

- ▶ Ensure the contactors do not come into contact with corrosive liquids.

#### ATTENTION

Improper handling of the contactors, e.g. dropping on the floor, can result in breaks, cracks and deformation.

- ▶ Ensure the contactors are always handled correctly.
- ▶ Do not throw the contactors on the floor.
- ▶ At regular intervals perform a visual check of the contactors for possible damage.
- ▶ Immediately replace any damaged parts.

#### ATTENTION

Depending on the product type, contactors can contain permanent magnets. Such magnets can attract ferromagnetic parts resulting in damage to the contactors.

- ▶ Ensure that the contactors are installed in a location where it is not possible for them to attract any ferromagnetic parts.

#### ATTENTION

Depending on the product type, contactors can contain permanent magnets. These permanent magnets can destroy the data on the magnetic strips of credit or similar cards.

- ▶ Keep credit or similar cards away from the contactors.

#### ATTENTION

During switching off, strong electromagnetic fields are generated in the vicinity of the contactors. These may influence other components close to the contactors.

- ▶ Make sure that the contactors are installed in a location where no other components are affected.

#### ATTENTION

In the case of damage, wear and/or soiling of the contactors - in the form of a partial break, sharp edges and discoloured surfaces - the functional reliability of the contactors is no longer ensured.

- ▶ Visually inspect the contactors regularly to detect wear and soiling.
- ▶ Replace damaged parts immediately.
- ▶ Immediately remove any soiling without leaving any residues.
- ▶ Immediately replace any parts with persistent soiling.

#### ATTENTION

Detent-edged rings and detent-edged washers have a limited life time. After screws secured with detent-edged rings or detent-edged washers have been undone three times, the rings or washers must be replaced by new ones.

- ▶ Record the frequency of undoing of the screws in the work log.
- ▶ Replace detent-edged rings or detent-edged washers with new ones after the screws have been undone three times.

## 4. Product information

### 4.1 C300 – 1 pole bi-directional DC NO contactors

**Compact single-pole NO contactors for AC and DC up to 1,500 V rated insulation voltage. Making current up to 6,000 amps; conventional thermal current up to 500 amps; short-time current up to 6,000 amps.**

The bi-directional DC contactors C300 switch high power in the smallest space. With a making capacity of up to 6,000 amperes, the extremely compact series is suitable for applications with high inrush currents or high capacitances.

All versions can carry up to 500 amperes continuously. In the event of a short circuit, even 6,000 amperes may flow for 20 milliseconds without the contacts welding.

This means that the contactor retains its full function to separate large powers when required: up to 500 amperes and up to 1,500 volts – regardless of the direction of the current. This full bi-directionality is important for systems with a charging and discharging process, such as in battery storage or electric vehicles. Other typical applications are the DC circuit in inverters, combiner boxes in photovoltaic systems or the management of battery storage systems.

#### Features

- ▶ **Super-compact dimensions – high rated insulation voltage  $U_i$  up to 1,500 volts**  
Smallest dimensions – great performance! Nevertheless, all the air gaps in the contact area have been generously dimensioned. The rated insulation voltage is 1,500 volts.  
The arc chamber of the C300 is made of plastic. This is efficient and saves weight.
- ▶ **High thermal continuous current  $I_{th}$  of up to 500 amps**  
All versions of the C300 can permanently carry up to 500 amps – provided a sufficiently dimensioned connection cross-section of 300 mm<sup>2</sup>. The maximum ambient temperature for industrial applications is 85 °C. These excellent values are achieved through very high contact forces.
- ▶ **High making capacity  $I_{cm}$  of up to 6,000 amps**  
The C300 can switch on a current of up to 6,000 amps. High contact forces and burn-off resistant silver contacts favour the excellent breaking capacity.  
An integrated PWM controller regulates the coil current for all operating states, ensures low-bounce switching on and optimises the holding power.

- ▶ **High short-time withstand current rating  $I_{cw}$  of up to 6,000 amps**  
For 20 milliseconds, the C300 can carry a current of up to 6,000 amps without the contacts welding. This time is sufficient for the short-circuit protection to trip. The short-time current carrying capacity is supported by high contact forces and an optimised contact geometry.
- ▶ **Full bi-directionality – reliable disconnection of high performances**  
All versions of the C300 can reliably separate high currents and voltages when required, regardless of the direction of the current.  
These properties are achieved by the special arrangement of blowout magnets and arc chamber, burn-off resistant silver contacts, high contact forces and generously dimensioned air gaps in the contact area.
- ▶ **Auxiliary switch with mirror contact function**  
The C300 contactors have an integrated auxiliary contact with mirror contact function according to IEC 60947-4-1, annex F.  
Mirror contacts are required in feedback circuits of safety controls. The mirror contact function informs about the switching state and ensures that the NC contact of the auxiliary contact is not closed at the same time as the NO main contact.

#### Standards

- ▶ **IEC 60947-4-1**  
Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor starters – Electromechanical contactors and motor starters.
- ▶ **ISO 16750-3**  
Road vehicles – Environmental conditions and testing for electrical and electronic equipment – Part 3: Mechanical loads
- ▶ **UL 60947-4-1**  
Low-Voltage Switchgear and Controlgear – Part 4-1: Contactors and Motor-Starters – Electromechanical Contactors and Motor-Starters.
- ▶ **GB/T 14048.4** (in preparation)  
Low-Voltage Switchgear and Controlgear – Part 4-1: Contactors and Motor-Starters – Electromechanical Contactors and Motor-Starters.



## Reliable, robust and economical

Contactors of the C300 series are designed for continuous currents of 500 amps. The switchgear has both high making and breaking capacities, and a high short-time withstand current. This ensures high operational safety. An integrated electronic coil control ensures a constant and reliable switching behaviour independent of the ambient temperature. In addition, the energy consumption and associated heat development of the monostable design is noticeably reduced when switched on.

Dependent on the application, high requirements can be placed on electromechanical components. The new DC contactors are highly resistant to shock and vibration loads and meet the high requirements of ISO 16750.

## Application

**Due to many years of experience and expertise in the development of electromechanical switchgear and the control of DC arcs Schaltbau has developed an innovative solution with the new compact contactors that further simplify applications in DC switching technology.**

The compact switching device can be integrated especially in areas where there is no space for larger series. Since the C300 series can reliably switch in both directions of current, it is ideally suited for applications with energy recovery. In battery-powered and hybrid vehicles, the units can be used as main contactors directly in the Battery Disconnect Unit (BDU). Here, the C300 reliably ensures the galvanic isolation of both poles of the battery from the vehicle's powertrain in the event of a fault. Other areas of application for the C300 series are regenerative systems and DC charging stations or battery test benches. A further application for the use of bi-directional contactors of the C300 series are stationary energy storages. Batteries are charged and discharged regularly. For this purpose it is important that the contactors can switch off safely in both current directions.

### ► E-mobility:

- Main contactor in electric vehicles, vehicles with
- hybrid drives and electric buses
- DC fast charging stations
- Battery test benches for the automotive industry

### ► Stationary applications:

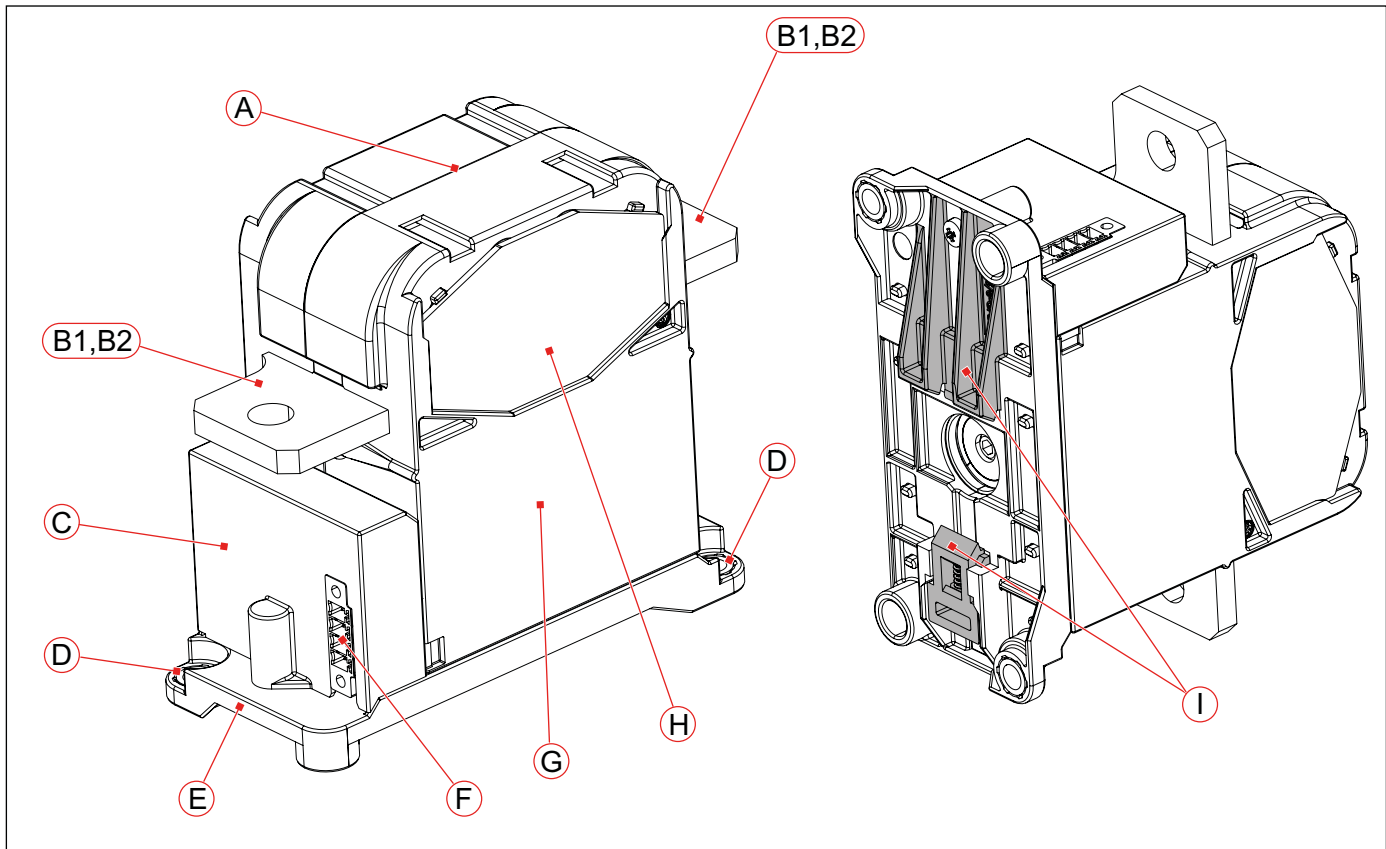
- Grid stabilization and battery energy storage
- Regenerative systems in industrial plants
- Battery management systems
- Photovoltaics and UPS

## 4.2 Technical information and material properties

For technical information and material properties, refer to the corresponding data sheets and to our *C300 catalogue*. The *C300 catalogue* is available under: [https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)

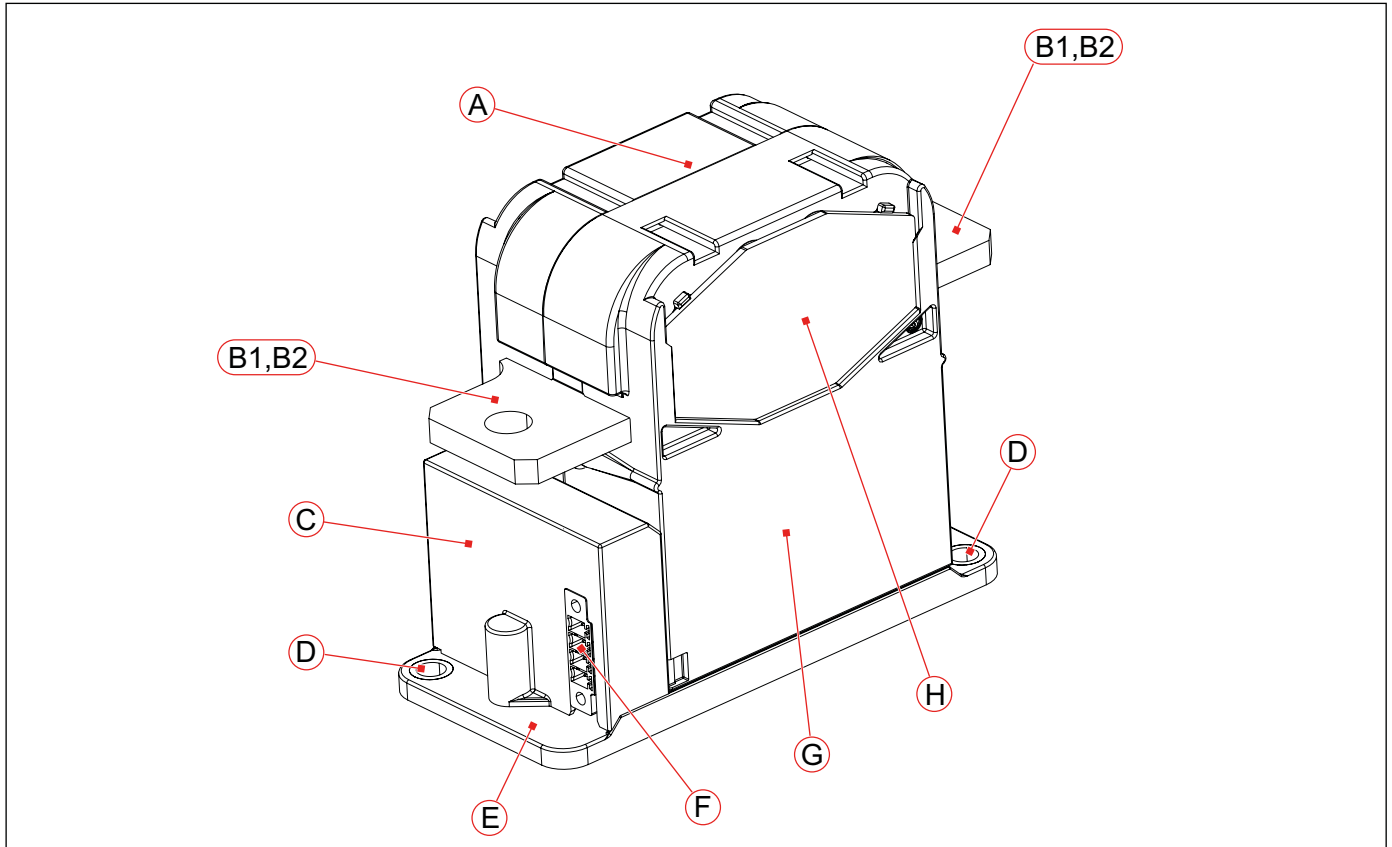
## 4.3 Overview

### C300-500-RXP... (top-hat rail mounting)



- A Arcing chamber with permanent magnetic blowing
- B1 Main contacts (C300-500-R0P): Thickness 5 mm, terminals with through holes 8.75 mm for M8, torque 10 ... 12 Nm
- B2 Main contacts (C300-500-R1P): Thickness 5 mm, terminals with press-fit nuts M6x1, torque 8 ... 10 Nm
- C Electronic coil controller
- D Two boreholes with press-fit bushes 5.5 mm for alternative screw mounting with two M5 screws, torque 5 ... 6 Nm.
- E Base plate
- F Phoenix connector with integrated PWM-Modul and integrated auxiliary contact NC with mirror contact function according to IEC 60947-4-1, annex F
- G Magnetic drive (behind the cover)
- H Permanent magnets
- I Top-hat rail mounting device

## C300-500-GXP... (screw mounting)



- A Arcing chamber with permanent magnetic blowing
- B1 Main contacts (C300-500-G0P): Thickness 5 mm, terminals with through holes 8.75 mm for M8, torque 10 ... 12 Nm
- B2 Main contacts (C300-500-G1P): Thickness 5 mm, terminals with press-fit nuts M6x1, torque 8 ... 10 Nm
- C Electronic coil controller
- D Two boreholes with press-fit bushes 5.5 mm for screw mounting with two M5 screws, torque 5 ... 6 Nm.
- E Base plate
- F Phoenix connector with integrated PWM-Modul and integrated auxiliary contact NC with mirror contact function according to IEC 60947-4-1, annex F
- G Magnetic drive (behind the cover)
- H Permanent magnets

## 5. Storage

### ATTENTION

Moisture and dust can damage the contactors. If the device is to be stored for a prolonged period of time:

- ▶ Store the device in its original packaging,
- ▶ Store the device in a dry and dust-free location.

### Return shipments

Schaltbau recommends retaining the original packaging for any return shipments.

If the original packaging is not available, care must be taken to pack the contactor in a way that prevents damage during shipment.

## 6. Unpacking

### 6.1 Unpacking the device

- ▶ Before opening the packaging, perform a visual inspection for any signs that could indicate damage having occurred during transport (impacts, bumps, dropping, etc.).
- ▶ If any signs indicate that the contactor has been subject to excessive impacts do not install it.

### 6.2 Check parts for transport damage

### ATTENTION

If parts are damaged, functional reliability of the contactor has been lost.

- ▶ Before installing, check all parts for possible transport damage.
- ▶ Do not install damaged parts.

## 7. Installation

### 7.1 Mounting

#### Dimensions/interfaces and further technical specifications

The dimensions and other technical specifications are given in the respective data sheets or can be found in our *C300 catalogue*. The *C300 catalogue* is available under: [https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)

#### Screw mounting

##### Preparatory measures

- ▶ A suitable mounting plate with 2 mounting holes must be provided according to the following dimensional drawings (*Fig. 1*).
- ▶ The mounting holes can be either:
  - threaded holes (for threaded screws)
  - or through holes (for threaded screws and nuts)
- ▶ Fastening of the contactors on the mounting plate is performed using 2 M5 mounting screws.
  - The length of the mounting screws must be determined dependent on the structural circumstances.
  - To secure the mounting screws so that they do not come loose, appropriate screw locking elements must be provided. Schaltbau recommends using Schnorr washers (or similar).
  - The mounting screws must be equipped with washers (resting on the device). Installation without washers is not permitted!
  - The mounting screws must be tightened to a torque of 5 ... 6 Nm (for screws with property class 8.8).

### Mounting holes

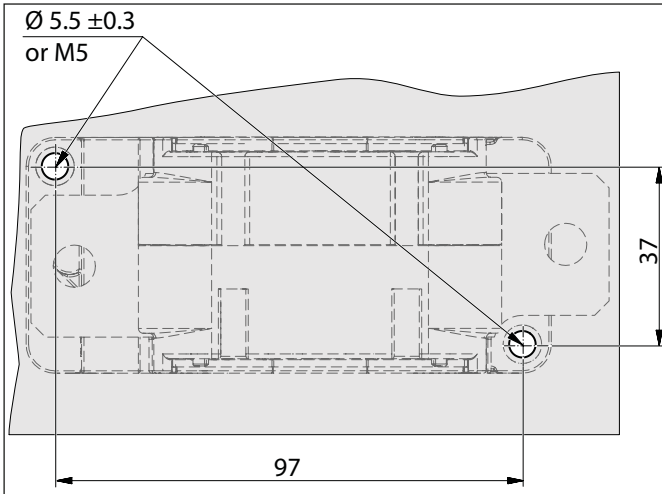


Fig. 1: C300-500-GXP... (screw mounting): Dimensions and layout of mounting holes

### Top-hat rail mounting

The contactor types C300-500-RXP... are intended to be installed by means of top-hat rail mounting.

#### Preparatory measures

- ▶ A suitable top-hat rail system must be provided, e.g. in a control cabinet.  
Top-hat rail mounting sets can be ordered from Schaltbau GmbH.

### Mounting orientations

#### Screw mounting versions

Contactors for screw mounting are designed for horizontal (A), vertical (B) or upside down (C) mounting, as shown for example in Fig. 2 and Fig. 3.

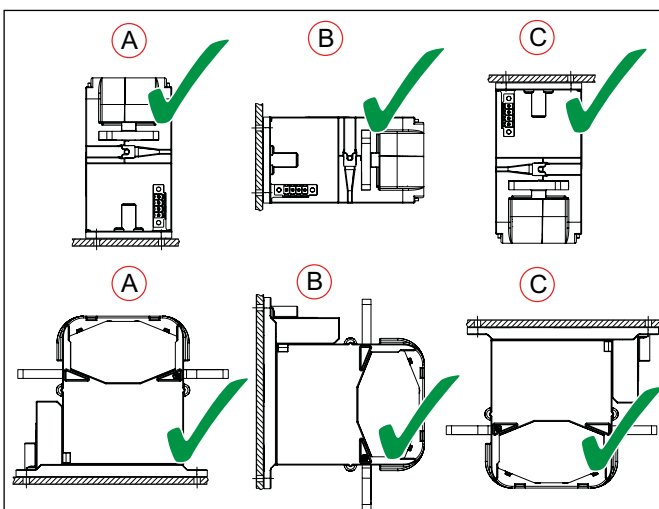


Fig. 2: C300-500 GXP: Examples of permissible mounting orientations (screw mounting)

### Top-hat rail mounting version

Contactors for top-hat rail mounting are designed for horizontal (A) or vertical (B) mounting, as shown for example in Fig. 3.

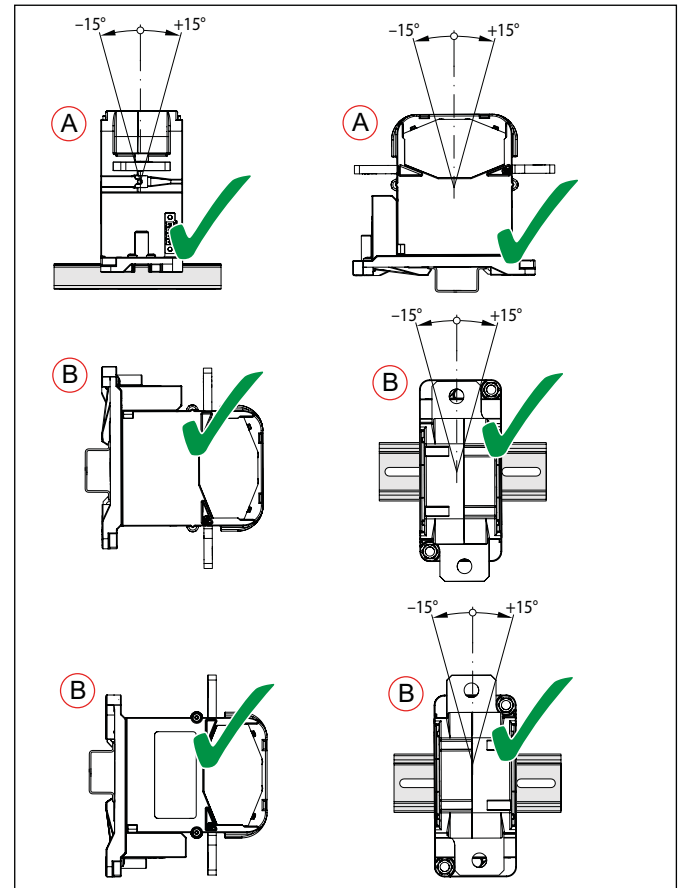


Fig. 3: C300-500 RXP: Examples of permissible mounting orientations (top-hat rail mounting)

Not permissible are mounting orientations hanging, overhead with top-hat rail on top (C) as well as with vertically arranged top-hat rail (D), as shown for example in Fig. 4.

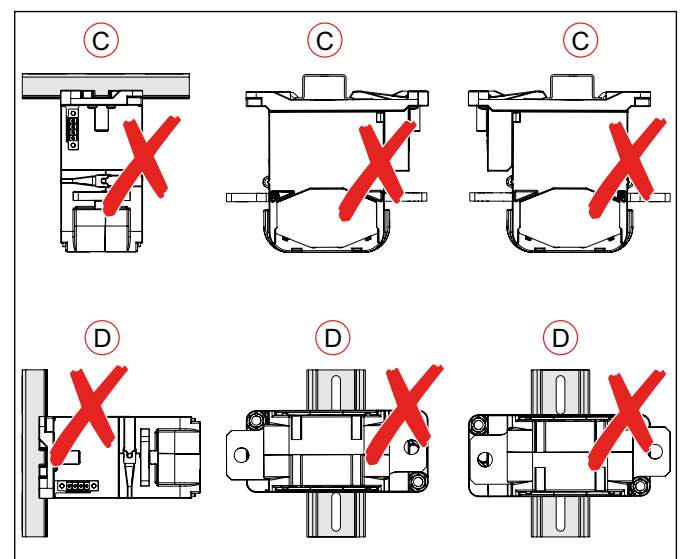


Fig. 4: Examples of non-permissible mounting orientations (top-hat rail mounting)

## Required minimum clearances

- ▶ Switching of high voltage currents produces electric arcs and it is possible that plasma will escape from the openings of the arcing chambers. Therefore, it is extremely important to maintain the minimum clearances to ground/earth and the bus bars to avoid flashovers.

### Minimum clearances

A minimum clearance from magnetic or magnetised parts is required on all sides and above for C300-500 contactors. See *C300 catalogue*.

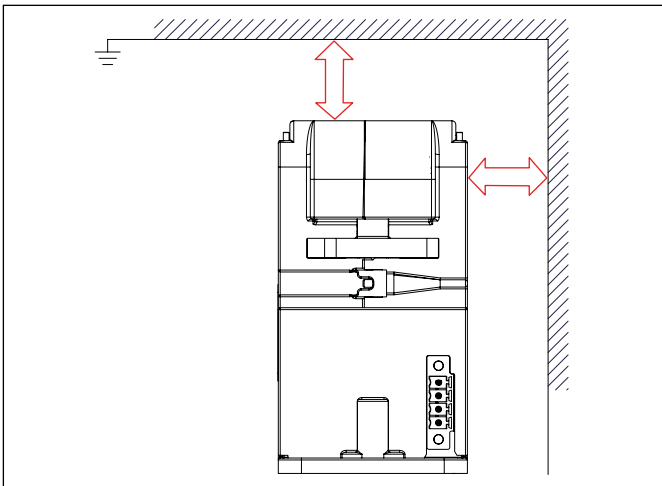


Fig. 5: C300-500 GXP: Minimum clearance required from magnetic and earthed components. Clearances see *C300 catalogue*.

## Ventilation requirements

- ▶ Ensure sufficient ventilation in the installation area, especially when disconnecting heavy loads. This allows the plasma to be dissipated more quickly to reduce the risk of flash-overs and corrosion.

## Safety

- ▶ Installation must be performed by qualified trained personnel.

## ATTENTION

Detent-edged rings and detent-edged washers have a limited life time. After screws secured with detent-edged rings or detent-edged washers have been undone three times, the rings or washers must be replaced by new ones.

- ▶ Record the frequency of undoing of the screws in the work log.
- ▶ Replace detent-edged rings or detent-edged washers with new ones after the screws have been undone three times.

## ATTENTION

When installing, ensure that no dirt can get into the contactor as a result of surrounding building activities.

## Installing the contactor (screw mounting)

### Tools required

- ▶ Socket spanner set, hexagon nuts
- ▶ Open-ended spanner set
- ▶ Torque wrench
- ▶ Hex key set

### Procedure

Ensure that the contact surfaces on the mounting plate (3) are free from dirt and other contamination (e.g. metal chips).

- ▶ Position the contactor (1) on the mounting plate (3) which is provided with mounting holes.

### ATTENTION

- ▶ The mounting screws M5 (2) must be equipped with washers (resting on the device). Installation without washers is not permitted!
- ▶ Secure the contactor (1) with its base plate to the mounting plate (3) using 2 M5 mounting screws (2).
  - In designs with the mounting holes implemented as threaded holes, screw the mounting screws into the holes directly, not forgetting the washers.
  - In designs with through holes, fit the mounting screws and washers and tighten the screws using suitable screw locking elements and nuts.
- ▶ Tighten the mounting screws (2) to a torque of 5 ... 6 Nm (for screws with property class 8.8).

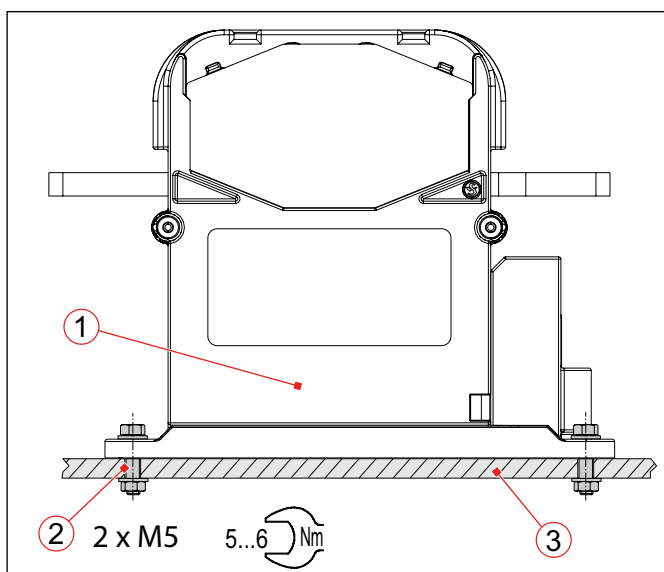


Fig. 6: C300-500 GXP: Installing the contactor on the mounting plate

## Installing the contactor (top-hat rail mounting)

### Mounting on top-hat rails with 10 mm height

- ▶ Angle the contactor by about 15° and hook it onto the top-hat rail (1) with the fixed catch (2).
  - Make sure that the top-hat rail (1) engages completely in the fixed catch (2).
- ▶ With a lever movement, push the lower part of the contactor housing towards the top-hat rail (1) until the movable catch (3) engages on the top-hat rail.
- ▶ Check that the contactor is firmly engaged on the top-hat rail (1).

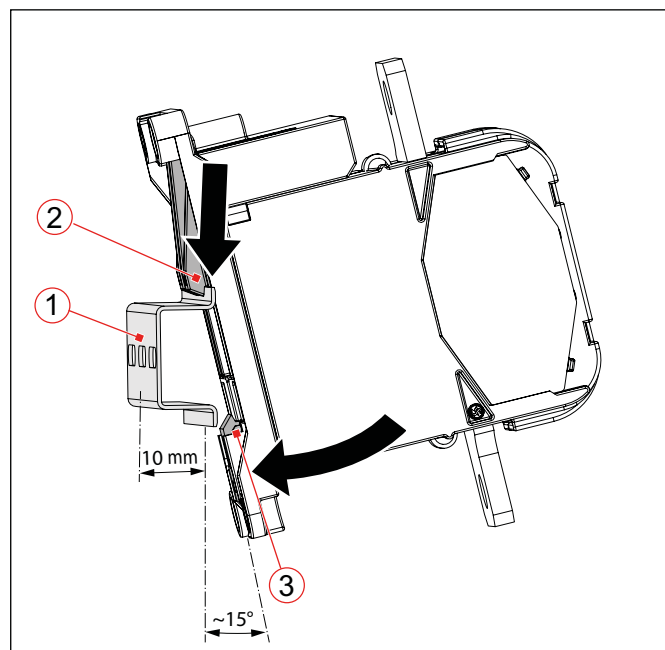


Fig. 7: C300-500 RXP: Mounting the contactor on top-hat rails with 10 mm height

### Mounting on top-hat rails with 7.5 mm height

#### Tools required

- ▶ Slotted screwdriver

#### Procedure

- ▶ Insert a slotted screwdriver into the opening (4) of the movable catch (3).
- ▶ Pull down and hold the movable catch (3) with a lever movement of the screwdriver.
- ▶ First hook the contactor onto the top-hat rail (1) with the movable catch (3).
- ▶ Then hook the contactor onto the top-hat rail (1) with the fixed catch (2).
- ▶ Release the movable catch (3).
  - Make sure that both the movable (3) and the fixed catch (2) are fully engaged on the top-hat

rail (1).

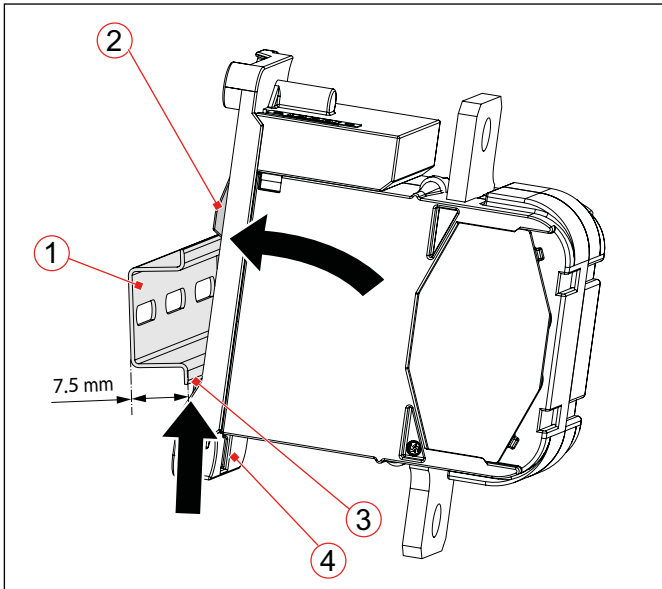


Fig. 8: C300-500 RXP: Mounting the contactor on top-hat rails with 7.5 mm height

### Dismounting from top-hat rails with 10 mm height

#### Tools required

- ▶ Slotted screwdriver

#### Procedure

- ▶ Insert a slotted screwdriver into the opening (4) of the movable catch (3).
- ▶ Pull down the movable catch (3) with a lever movement of the screwdriver and simultaneously fold the contactor housing away from the top-hat rail (1).
- ▶ Lift the contactor off the top-hat rail (1).

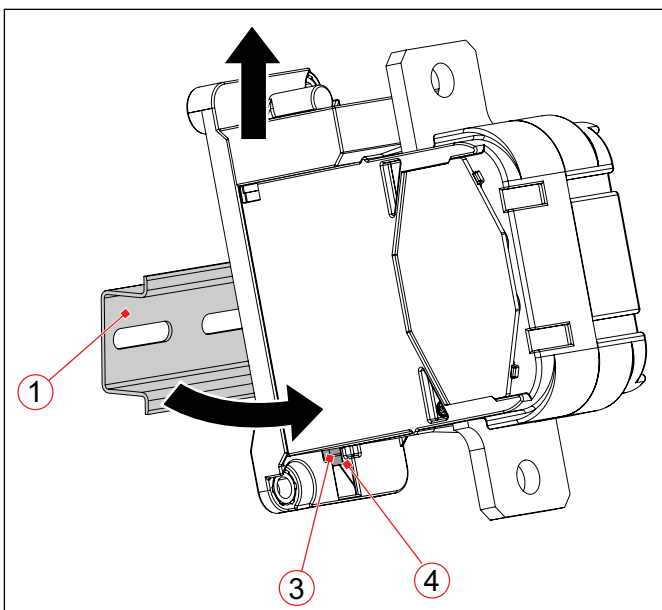


Fig. 9: Dismounting the contactor from top-hat rails with 10 mm height

### Dismounting from top-hat rails with 7.5 mm height

#### Tools required

- ▶ Slotted screwdriver

#### Procedure

- ▶ Insert a slotted screwdriver into the opening (4) of the movable catch (3).
- ▶ Pull down and hold the movable catch (3) with a lever movement of the screwdriver.
- ▶ Push the contactor upwards and unhook it from the top-hat rail with the fixed catch (2).
- ▶ Remove the contactor downwards.

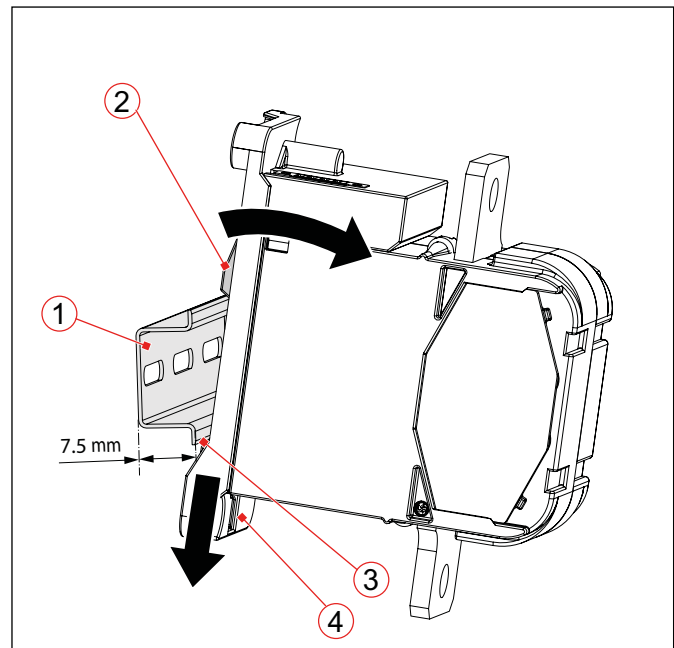


Fig. 10: Dismounting the contactor from top-hat rails with 7.5 mm height



## 7.2 Electrical connection

### Electrical data and other technical specifications

For the power consumption of the magnetic drive system and electrical data of the auxiliary switches as well as other technical specifications, refer to the respective data sheets and to our *C300 catalogue*.

The *C300 catalogue* is available under:

[https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)

### Preparatory measures

- ▶ Connection of the main power circuit can be implemented with wires or busbars.
- ▶ The minimum conductor cross-sections for the main terminal connection must be observed.
- ▶ If connecting wires are used, they must be selected taking into consideration the insulation class and the ambient conditions.
- ▶ The minimum conductor cross-sections for the connecting wires are given in our *C300 catalogue* and must be adhered to.  
The *C300 catalogue* is available under:  
[https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)
- ▶ The connecting wires of the main power circuit must be fitted with appropriate ring terminals
  - for main contacts without press-fit nuts: suitable for M8 terminal screws
  - for main contacts with press-fit nuts: suitable for M6 terminal screws
- ▶ Schaltbau recommends Schnorr washers (or similar) to prevent the terminal screws from coming loose.
- ▶ The main terminal screws must be tightened to the specified torque:
  - for main contacts without press-fit nuts: 10 ... 12 Nm (for screws with property class 8.8)
  - for main contacts with press-fit nuts: 8 ... 10 Nm (for screws with property class 8.8)

- ▶ The connection for the auxiliary switch and the coil drive system is made with a Phoenix connector. Consequently, the control wires must be connected to a corresponding connector.
- ▶ The maximum permissible conductor cross-section of the auxiliary switch control wires is 1.5 mm<sup>2</sup>/ AWG 16 stranded wire.
- ▶ For the power consumption of the coil drive system and the electrical data of the auxiliary switch refer to our C300 catalogue.

## Safety

### DANGER

The contactors are used for high voltage switching. Contact with live electrical parts can result in serious injuries or even death!

Live parts are all metal parts belonging directly to one of the circuits or wires connecting to them. All other visible metal parts and wiring may also be live if a fault exists.

Before starting any work on the contactors, always comply with the following safety rules:



- ▶ Disconnect on all sides
- ▶ Secure to prevent switching back on
- ▶ Clearly identify the working area
- ▶ Check that a voltage-free state exists
- ▶ Earth and short circuit; this includes discharging any capacitors in the main circuit
- ▶ Besides the main power circuits, also disconnect additional and auxiliary circuits
- ▶ Cover or insulate adjacent live parts
- ▶ The presence of a voltage-free state can only be clearly identified by a qualified electrician.
- ▶ When the work has been concluded, follow the procedure in reverse.

### ATTENTION

Detent-edged rings and detent-edged washers have a limited life time. After screws secured with detent-edged rings or detent-edged washers have been undone three times, the rings or washers must be replaced by new ones.

- ▶ Record the frequency of undoing of the screws in the work log.
- ▶ Replace detent-edged rings or detent-edged washers with new ones after the screws have been undone three times.

## Tools required

- ▶ Socket spanner set, hexagon nuts
- ▶ Open-ended spanner set
- ▶ Torque wrench
- ▶ Continuity tester
- ▶ Cable ties

## Connecting the coil drive and auxiliary switch

The connection for the coil drive and auxiliary switch is made via the Phoenix connector.

### Connection with Phoenix connector:

A connector type FMC 1,5/4-STF-3,5 (Phoenix Part-No. 1966114) is required to connect the coil and the auxiliary switch.

For the pin assignment refer to our *C300 catalogue*. The *C300 catalogue* is available under:

[https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)

For wiring the connector, see the manufacturer's assembly instructions, available under

[www.phoenixcontact.com](http://www.phoenixcontact.com)

### Procedure

- ▶ Plug the Phoenix connector into the counterpart (1) on the contactor.

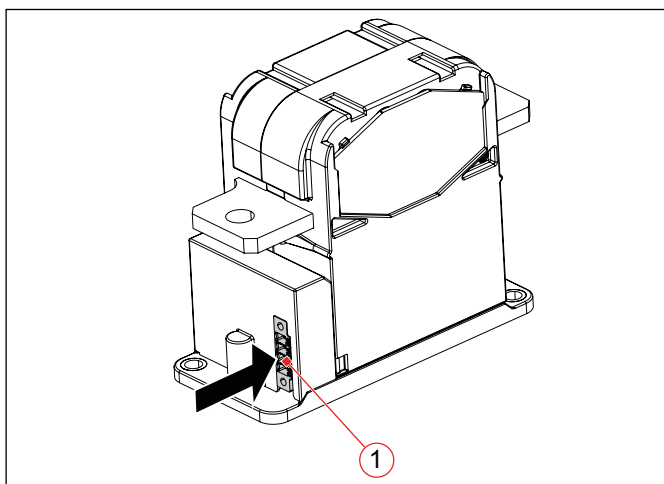


Fig. 11: Connecting the coil drive and auxiliary switch with the Phoenix connector.

## Connecting the main contacts

### ATTENTION

Ensure that the connection points for the main contacts are free from corrosion.

### Connection example using wires

The connecting wires of the main power circuit must be fitted with appropriate ring terminals.

- for main contacts without press-fit nuts: suitable for M8 terminal screws
- for main contacts with press-fit nuts: suitable for M6 terminal screws

Examples for the connection with wires are shown in Fig. 12 and Fig. 13.

- ▶ Route the pre-assembled connecting wires to both main contacts (4).

For main contacts without press-fit nuts:

- ▶ Screw the ring terminals (3) from above to the main contacts (4) using the terminal screws (1), nuts (5) and suitable screw locking elements (2).
  - Schaltbau recommends using Schnorr washers (or similar).
- ▶ For main contacts without press-fit nuts tighten the terminal screws (1) to a torque of 10 ... 12 Nm

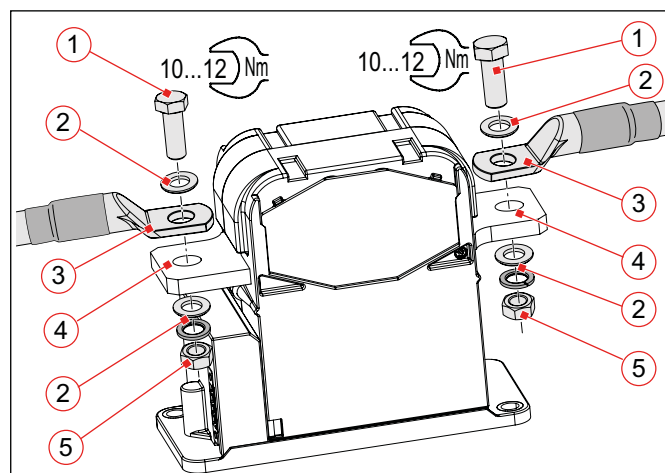


Fig. 12: C300-500 GXP without press-fit nuts: Connecting the main contacts (connection example using wires)

For main contacts with press-fit nuts:

- ▶ Screw the ring terminals (3) from above to the existing press-fit nuts (6) on the main contacts (4) using the terminal screws (1) and suitable screw locking elements (2).
- Schaltbau recommends using Schnorr washers (or similar).
- ▶ For main contacts with press-fit nuts (6) tighten the terminal screws (1) to a torque of 8 ... 10 Nm

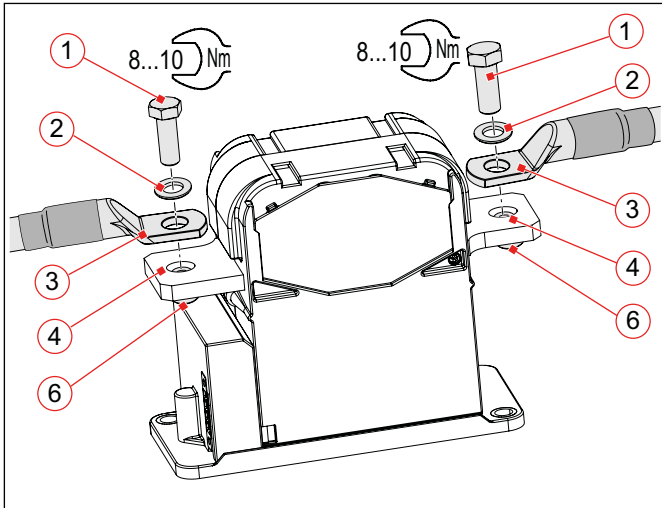


Fig. 13: C300-500 G1P with press-fit nuts: Connecting the main contacts (connection example using wires)

### Connection example using busbars

As an alternative to connection using wires, the main power circuit can be connected with busbars. Examples for the connection with busbars are shown in Fig. 14 and Fig. 15.

- ▶ Route the busbars (3) to both main contacts (4).

For main contacts without press-fit nuts:

- ▶ Screw the busbars (3) to the main contacts (4) using the terminal screws (1), nuts (5) and suitable screw locking elements (2).
- Schaltbau recommends using Schnorr washers (or similar).
- ▶ For main contacts without press-fit nuts tighten the terminal screws (1) to a torque of 10 ... 12 Nm.

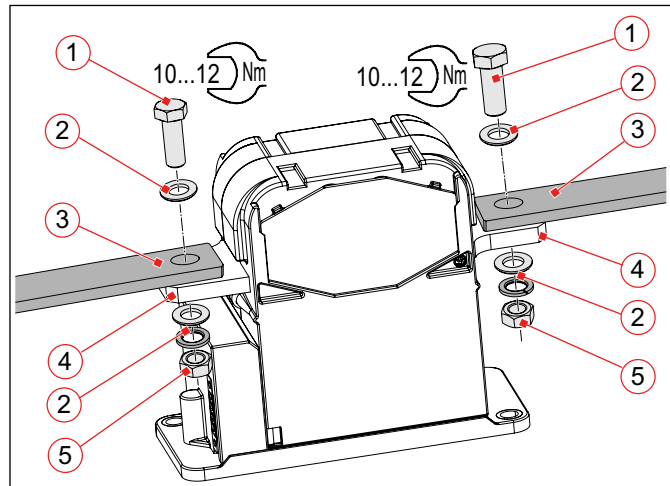


Fig. 14: C300-500 G0P without press-fit nuts: Connecting the main contacts (connection example using busbars)

For main contacts with press-fit nuts:

- ▶ Screw the busbars (3) from above to the existing press-fit nuts (6) on the main contacts (4) using the terminal screws (1) and suitable screw locking elements (2).
- Schaltbau recommends using Schnorr washers (or similar).
- ▶ For main contacts with press-fit nuts (6) tighten the terminal screws (1) to a torque of 8 ...10 Nm.

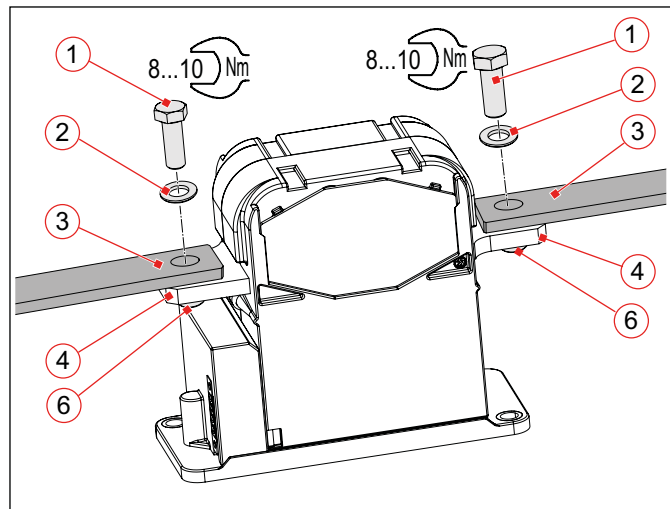


Fig. 15: C300-500 G1P with press-fit nuts: Connecting the main contacts (connection example using busbars)

## 7.3 Checks


After the installation, perform the following checks:

- ▶ For screw mounting: check that the contactors are correctly installed on the mounting plate and tightly screwed in place.
- ▶ For top-hat rail mounting: Check that the contactors are correctly engaged on the top-hat rail.
- ▶ Check that the connecting wires or busbars are correctly installed and fit tightly at the main contacts.
- ▶ Check that the control wires of the coil terminals are correctly installed to the external connector and have the correct polarity.
- ▶ Check that the control wires of the auxiliary switches are correctly installed to the external connector. Check the correct assignment and function of the auxiliary switches using a continuity tester.
- ▶ Switch the contactor several times without activating the main power circuit.
- ▶ Check the pull-in and drop-off voltage based on the Schaltbau specifications. See **C300 catalogue**.
- ▶ Check the routing of the wiring. Wires must not be squeezed or bent. If applicable bundle and secure wires using cable ties.
- ▶ After every installation or after maintenance, check the contactor for correct operation in accordance with the following standards:
  - EN/IEC 60077-2
  - EN/IEC 60947-4-1

## 8. Maintenance

Note the expert knowledge which is essential for carrying out maintenance work, referred to in chapter "2. General and safety information".

### 8.1 Safety

	<b>⚠ DANGER</b>
	<p>The contactors are used for high voltage switching. Contact with live electrical parts can result in serious injuries or even death! Live parts are all metal parts belonging directly to one of the circuits or wires connecting to them. All other visible metal parts and wiring may also be live if a fault exists. Before starting any work on the contactors, always comply with the following safety rules:</p> <ul style="list-style-type: none"> <li>▶ Disconnect on all sides</li> <li>▶ Secure to prevent switching back on</li> <li>▶ Clearly identify the working area</li> <li>▶ Check that a voltage-free state exists</li> <li>▶ Earth and short circuit; this includes discharging any capacitors in the main circuit</li> <li>▶ Besides the main power circuits, also disconnect additional and auxiliary circuits</li> <li>▶ Cover or insulate adjacent live parts</li> <li>▶ The presence of a voltage-free state can only be clearly identified by a qualified electrician.</li> <li>▶ When the work has been concluded, follow the procedure in reverse.</li> </ul>

### 8.2 Preventive maintenance

Contactors of the C300 series are maintenance-free within the rated mechanical life time. The electrical life time depends on the number of switching cycles under heavy load conditions and may vary for different applications. In normal use, this corresponds to a decade-long operating period.


#### Intervals for regular tests/checks

To ensure the correct function and a prolonged operational life span of the contactors, the following checks and maintenance must be regularly performed.

Test/check	Interval
External visual inspection of the contactor	▶ 1x per year

If the contactors are operated in a particularly dirty environment, the visual checks should be performed at shorter intervals. Dirt can impair the clearance and creepage distances, which can result in a shorter service life or to a malfunction.

Extraordinary checks need only be carried out if there has been a significant and extraordinarily high recorded number of switching cycles under short-circuit conditions.

	<b>⚠ DANGER</b>
	<p>If damage to the contactor, wires or busbars is visible, the safety of the contactor is no longer guaranteed.</p> <ul style="list-style-type: none"> <li>▶ Immediately replace a damaged contactor.</li> <li>▶ Immediately replace damaged components such as wires, cable lugs or busbars.</li> </ul>

<b>ATTENTION</b>
<p>Detent-edged rings and detent-edged washers have a limited life time. After screws secured with detent-edged rings or detent-edged washers have been undone three times, the rings or washers must be replaced by new ones.</p> <ul style="list-style-type: none"> <li>▶ Record the frequency of undoing of the screws in the work log.</li> <li>▶ Replace detent-edged rings or detent-edged washers with new ones after the screws have been undone three times.</li> </ul>

## Regular tests/checks

All of the maintenance activities that may be carried out on the contactors by skilled personnel are listed below.

Component	Tests/checks	Measures
Wires/busbars	Check for: <ul style="list-style-type: none"> <li>▶ damaged wires, cable lugs</li> <li>▶ damaged insulation</li> <li>▶ damaged busbars</li> <li>▶ kinked or crushed wires</li> <li>▶ loose or missing fastening elements</li> <li>▶ correct tightening torque of the terminal screws</li> </ul>	In case of faults: <ul style="list-style-type: none"> <li>▶ immediately replace damaged wires or cable lugs</li> <li>▶ immediately replace damaged busbars</li> <li>▶ tighten loose fastening elements immediately, replace missing fastening elements</li> <li>▶ tighten the terminal screws to the rated torque</li> </ul>
Contactor housing	Check for: <ul style="list-style-type: none"> <li>▶ dirt</li> <li>▶ loose or missing fastening elements</li> <li>▶ penetrations, holes in the housing wall</li> <li>▶ damage or wear</li> <li>▶ broken ceramic arcing plates (only for C300K)</li> </ul>	In case of faults: <ul style="list-style-type: none"> <li>▶ remove any dirt that may be present</li> <li>▶ tighten loose fastening elements immediately</li> <li>▶ replace missing fastening elements</li> <li>▶ tighten a loose contactor immediately</li> <li>▶ if the contactor housing is damaged or heavily worn replace the entire contactor</li> </ul>
Main contacts	Check for: <ul style="list-style-type: none"> <li>▶ damage or wear</li> <li>▶ traces of combustion residue</li> </ul>	In case of faults: <ul style="list-style-type: none"> <li>▶ if the main contacts are damaged or heavily worn replace the entire contactor</li> </ul>

## 8.3 Corrective maintenance

The contactors are maintenance-free. Therefore there is no general requirement to replace parts during its service life.

If damage to the contactor is visible or malfunctions occur, immediately replace the entire contactor.

## 9. Technical data

Technical data and information on the material properties for the contactors of the C300 series are given in our *C300 catalogue*.

Schaltbau products are subject to continual improvement. Therefore, the product information in catalogues, data sheets, etc. may change at any time. Therefore, only the latest version of a catalogue is valid at any time – downloads available under:

[https://www.schaltbau.com/media/C300\\_en.pdf](https://www.schaltbau.com/media/C300_en.pdf)

## 10. Disposal

This product is designed for exclusive professional use by commercial companies. The owner is responsible for ensuring an environmentally sound disposal of this product at the end of its working life.

This product or parts of it may not be disposed of with other household waste.

To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this product or parts of it from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

Please observe all local regulations and recommendations for the disposal, recycling or environmentally friendly processing of the parts and materials that have been used or replaced during installation, operation, and maintenance tasks.

At the end of the product's useful life ensure environmentally sound disposal of the product according to the legal regulations and requirements for electrical and electronic waste equipment in your country.

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## Electrical Components and Systems for Railway Engineering and Industrial Applications

### Connectors

- Connectors manufactured to industry standards
- Connectors to suit the special requirements of communications engineering (MIL connectors)
- Charging connectors for battery-powered machines and systems
- Connectors for railway engineering, including UIC connectors
- Special connectors to suit customer requirements

### Snap-action switches

- Snap-action switches with positive opening operation
- Snap-action switches with self-cleaning contacts
- Snap-action switch made of robust polyetherimide (PEI)
- Snap-action switch with two galvanically isolated contact bridges
- Special switches to suit customer requirements

### Contactors Emergency disconnect switches

- Single and multi-pole DC contactors
- High-voltage AC/DC contactors
- Contactors for battery powered vehicles and power supplies
- Contactors for railway applications
- Terminal bolts and fuse holders
- DC emergency disconnect switches
- Special contactors to suit customer requirements

### Electrics for rolling stock

- Equipment for driver's cab
- Equipment for passenger use
- High-voltage switchgear
- High-voltage heaters
- High-voltage roof equipment
- Equipment for electric brakes
- Design and engineering of train electrics to customer requirements