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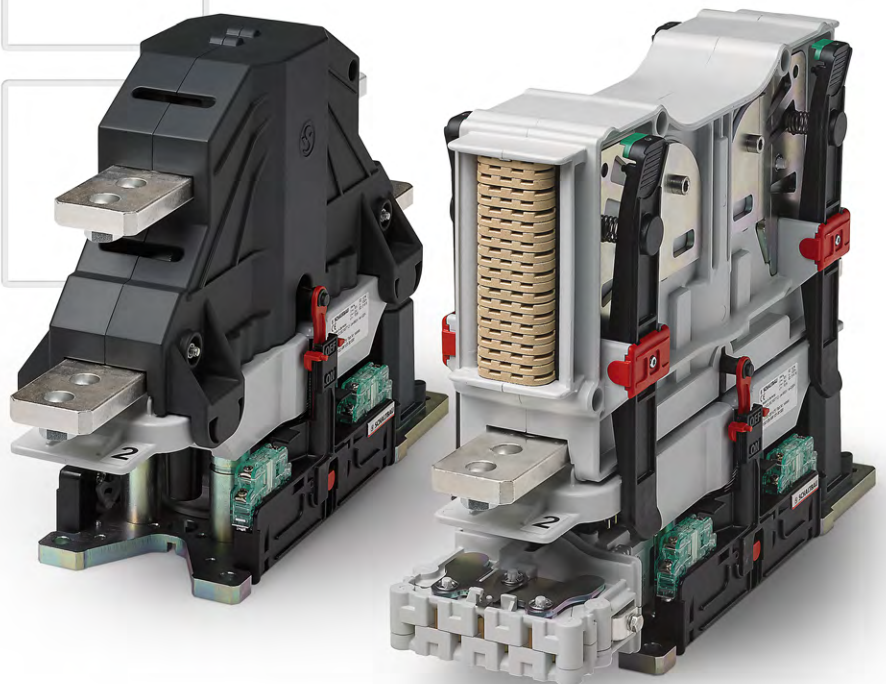
Contactors

CP Series

1 pole bi-directional high-voltage
contactors, disconnectors,
changeover switches for
DC and AC

Installation and
Maintenance Instructions

Manual C40-M.en



Document Revision History

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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 not observing (or only partly observing) the manual.

1.2 Conventions for this manual

This manual describes the installation, commissioning 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 instructions:

DANGER

Indicates a hazardous situation with a high level of risk which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation with a medium level of risk which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation with a low level of risk which, if not avoided, may result in minor or moderate injury.

NOTICE

Indicates a hazardous situation which, if not avoided, may result in property damage, such as service interruption or damage to equipment or other materials.



Refers to technical features and methods aimed at facilitating work or to particularly important information.

This manual refers to single pole bi-directional high-voltage contactors, disconnectors, changeover switches for DC and AC of the types:

Nominal Voltage U_n	Conventional thermal current I_{th}		
	600 A	1,200 A	2,000 A
1,500 V	CP1115/06	CP1115/12	CP1115/20
	CP2115/06	CP2115/12	CP2115/20
	CP3115/06	CP3115/12	
3,000 V	CP1130/06	CP1130/12	CP1130/20
	CP2130/06	CP2130/12	CP2130/20
	CP3130/06	CP3130/12	

The CP series devices can be configured as normally open/normally closed contactors, disconnectors or change-over switches. Depending on the configuration, the following abbreviations are used in this manual:

- NO = Normally Opened
- NC = Normally Closed
- CO = Change Over

Since the CP series devices offer a wide range of configuration options, not all possible configurations can be presented in this manual.

Even if the configurations shown do not correspond exactly to the present device, the installation and maintenance steps can be carried out identically as described in this manual.

2. General and security information

The contactors dealt with in this document are intended for use with high-voltage systems for special installations. They are designed and tested in compliance with the generally recognised state of the art. 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.

The operation, maintenance and installation instructions for the contactors must therefore be strictly followed.

Any uncertainties must be clarified and all queries must include details of the type of device and the serial number.

Only authorized and trained personnel are allowed to plan and carry out all mechanical and electrical installa-

tions, transport, commissioning, as well as maintenance and repair work. This applies to the observation of the general installation and safety regulations for high-voltage systems as well as the proper use of tools approved for this purpose. Electric equipment requires protection from moisture and dust during installation and storage.

2.1 Observing the instructions

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

2.2 User obligations

- ▶ Observe all applicable national provisions, all safety, accident prevention and environmental regulations as well as the recognized technical rules for safe and proper working.
- ▶ Carry out regular inspections of all protection and safety devices to see if they work properly.
- ▶ Work on electric equipment may only be performed by an expert or trained personnel working under the direction and supervision of an expert according to the applicable rules of electrical engineering.
- ▶ An expert is a person who can judge and recognise the possible dangers of the jobs commended to him based on his training, knowledge and experience and by knowledge of the appropriate regulations.
- ▶ Work on the contactors must only be carried out by staff who meets the requirements set out in this manual.
- ▶ Staff must be informed clearly about who is responsible for the maintenance of the contactors.
- ▶ After each installation work and after replacement of main contacts, contact bridge or after any other modifications, alterations or maintenance works, always perform complete checks according to these standards:
 - IEC 60077-2
 - 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 variety of applications.
- ▶ The contactors must only be used under operating conditions according to the technical specification and the instructions in this manual.

- ▶ None of the operating conditions defined in our catalogues **C40** in section "**Specification**", such as voltages, currents, ambient conditions, etc. may be changed.
- ▶ The contactors must only be used when all protective devices are present, have been installed properly and are fully operational.
- ▶ The contactors must not be contaminated with aggressive media.
- ▶ Contactors may not be used without further protective measures in potentially explosive atmospheres.
- ▶ The switching device meets the requirements of basic insulation. Make sure the frame or plate onto which the drive of the contactor is mounted is earthed in a shock and vibration resistant way.
- ▶ Do not use the contactor without properly mounted arc chute (if applicable).
- ▶ The contactor has unprotected live parts and carries labels that warn of the hazard. This caution must be observed and the labels must not be removed in any way.
- ▶ The required clearance of live parts to earth and other parts of the contactor is to be observed as well as the safety regulations of the applicable standards.
- ▶ Switching at maximum breaking capacity might require larger clearance! Do not hesitate to ask our advice for 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. when hitting the floor with some impact, can result in breakage, cracks and deformation. Always handle the contactors with care.
- ▶ Use the contactor only according to its intended use. Replace or repair damaged parts exclusively with original parts. Any other usage of or tampering with the contactors is considered contrary to its 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


NOTICE


The contactors are constructed for specific ambient conditions.


- ▶ Operate the contactors only according the ambient conditions, like temperature ranges, IP protection classes, degree of soiling, etc., as defined in our catalogue **C40** in section "**Specification**". The catalogue is available under: <https://www.schaltbau.com/en/media-library/>


3. Dangers and security measures


3.1 Electrical dangers

	<p>⚠ DANGER</p>
	<p>The contactors are high voltage switches. The touching of electrically conducting parts may result in serious injuries or even death!</p> <p>Energized parts are all metal parts belonging directly to one of the circuits or wires leading there. All other visible metal parts and wires may also be energized in the case of a failure.</p> <p>Before beginning any work on the contactors, always observe the following safety regulations:</p> <ul style="list-style-type: none"> ▶ Disconnect on all sides ▶ Ensure that it is not possible to reconnect unintentionally ▶ Clearly mark your work area ▶ Make sure that there is no voltage present ▶ Earth and short circuit the installation; this also includes the discharging of any capacitors in the main circuit ▶ Besides the main electric circuit, also disconnect additional and auxiliary circuits ▶ Cover or insulate adjacent energized parts ▶ Only an electrically skilled person may determine if there is no voltage present ▶ When the work has been concluded, proceed the other way round.


	<p>⚠ DANGER</p>
	<p>The contactors are equipped with a protective earth terminal. Without earth connection, metal parts and wires may be energized in the case of a failure. Risk of serious injuries or even death!</p> <ul style="list-style-type: none"> ▶ Make sure that the contactors are connected to earth. ▶ Make sure that the wire gauge of the earthing cables complies with the specific short circuit conditions.


	<p>⚠ DANGER</p>
	<p>In the case of a failure of the equipment;</p> <ul style="list-style-type: none"> ▶ don't use it anymore ▶ immediately contact the manufacturer.


	<p>⚠ DANGER</p>
	<p>Interventions in the equipment may cause serious impairments to the safety of men and constructions. They are not permissible and lead to an exclusion of liability and warranty.</p>


	<p>⚠ DANGER</p>
	<p>All checks and the replacement of components or groups of components may only be carried out by qualified personnel according to the instructions of Schaltbau. All spare parts must be parts delivered by or released by Schaltbau.</p>

3.2 Other dangers

	<p>⚠ WARNING</p>
	<p>Exclusively use the contactors for purposes as indicated in the specifications and data sheets. A wrong application can cause accidents and severe damages to persons!</p> <ul style="list-style-type: none"> ▶ The manufacturer doesn't take the responsibility for accidents which were caused by improper use of the product.

	<p>⚠ WARNING</p>
	<p>The contactor is heavy. Risk of injury and damage to the device.</p> <ul style="list-style-type: none"> ▶ Take care when handling the contactor. ▶ Always two or more persons are required to unpack, transport and install the contactor. ▶ When carrying the contactor always hold it on the base plate.

	<p>⚠ CAUTION</p>
	<p>The contactors may grow warm during operation and they may become hot depending on the ambient temperature and the conditions of use. Risk of burns!</p> <ul style="list-style-type: none"> ▶ Before beginning any work on the contactors make sure that the heated components have cooled down.

	<p>⚠ CAUTION</p>
	<p>The contactors contain sharp-edged parts. Risk of injury!</p> <ul style="list-style-type: none"> ▶ Use appropriate tools for installation and maintenance works on the contactors. ▶ Wear protective gloves when working with sharp-edged components.

3.3 Measures for avoiding damages and malfunctions

NOTICE

Aggressive fluids may damage the contactors.

- ▶ Make sure that the contactors are not exposed to aggressive fluids.

NOTICE

Improper handling of the contactors, e.g. when hitting the floor with some impact, can result in breakage, cracks and deformation.

- ▶ Make sure that the contactors are always used properly.
- ▶ Do not throw the contactors to the floor.
- ▶ Regularly sight-check the contactors for potential damages.
- ▶ Immediately replace damaged components.

NOTICE

The contactors contain strong (permanent) magnets. These magnets can attract ferromagnetic particles and may damage the contactors.

- ▶ Make sure that the contactors are installed at a location, where no ferromagnetic particles can be attracted..

NOTICE

The contactors contain strong (permanent) magnets. These magnets can destroy data on credit cards or similar cards.

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

NOTICE

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

- ▶ Make sure that the contactors are installed at a location, where no other components can be affected.

NOTICE

In the case of damage, wear and tear and/or soiling of the contactor components - in the form of a partial break, sharp edges and discoloured surfaces - the functional safety of the contactors is no longer guaranteed.

- ▶ Carry out regular visual checks to detect wear and tear and dirt.
- ▶ Immediately replace damaged parts.
- ▶ Immediately remove dirt without leaving any residues.
- ▶ Immediately replace parts with stubborn dirt.

NOTICE

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. Introduction

4.1 CP series – 1 and 2 pole bi-directional high-voltage contactors, disconnectors, changeover switches for DC and AC

Modular and compact switchgear for modern power converters

With the CP series Schaltbau is introducing once more an innovative concept to the switchgear market. The arc-handling is done exclusively by permanent-magnetic blowout. This patented technology ensures fully bi-directional breaking capability and a more compact design. By reducing dimensions and weight we save you valuable space.

For the first time the universal devices can be configured as NO/NC contactor, disconnector or changeover switch. This enables us to react flexibly to changing customer requirements. The high switching functionality and reliability ensure practical and cost effective operation.

The combination of innovative technology, compact design and high versatility makes the CP-power contactors particularly suitable for use in railway and industrial applications.

Thanks to its unique modular design, the new product family includes a variety of possible configurations catering to a wide range of applications.

4.2 Features

Innovative Design

- ▶ Available as NO/NC/CO contactor.
- ▶ DC bi-directional or AC up to 60 Hz max.
- ▶ Effective arc-handling – no critical currents and low wear of main contact system thanks to permanent-magnetic blowout
- ▶ High making capacity, also as disconnector and changeover switch
- ▶ Low total cost of ownership, modular and compact

Main contact system

- ▶ Conventional thermal current: 600 A/ 1,200 A/ 2,000 A
- ▶ Nominal voltage: 1.5 kV, 3 kV
- ▶ Double-break contacts
- ▶ 1 pole (NO/NC) and 2 pole (CO) versions

Easy maintenance:

- ▶ Toolless inspection of main contact tips (only applicable for NO/NC contactors with arc chamber)
- ▶ Toolless replacement of the arc chamber (only applicable for NO/NC contactors with arc chamber)

4.3 Applications

Main contactor, optional with pre-charging contactor and high-voltage discharging contact for:

- ▶ Traction converters
- ▶ Inverters for auxiliary equipment

Switchgear for various mobile and stationary applications

- ▶ Locomotives and multiple-unit trains
- ▶ Photovoltaic systems, wind turbines, cranes, welding systems, mining

Contactor for:

- ▶ Field circuits of motors
- ▶ Conventional resistor based traction units
- ▶ Activating the brake unit for DC drives
- ▶ Starter and compressor motors, solar cells

Switchgear for the configuration of electrical system

- ▶ Selection from among various energy sources
- ▶ Filter configuration for multisystem operations
- ▶ Connect/disconnect the DC link

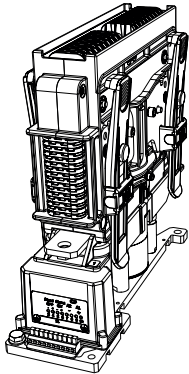
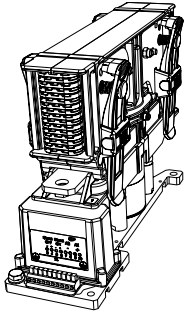
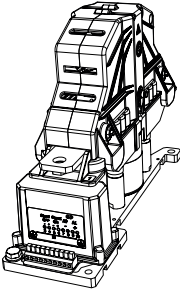
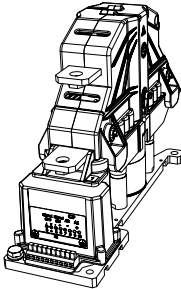
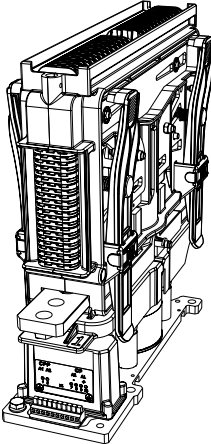
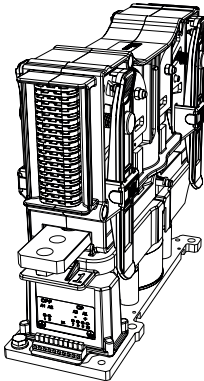
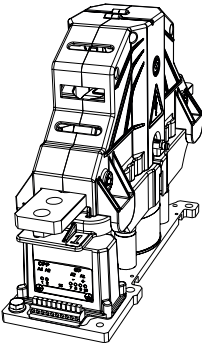
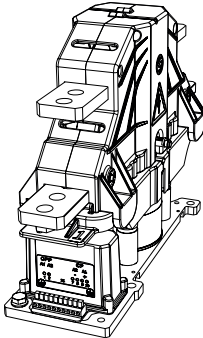
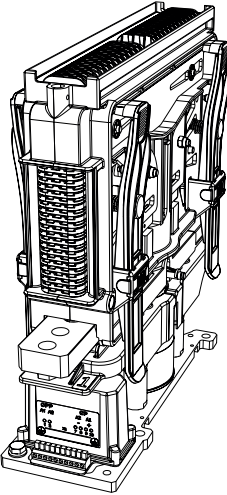
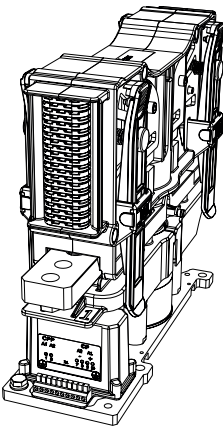
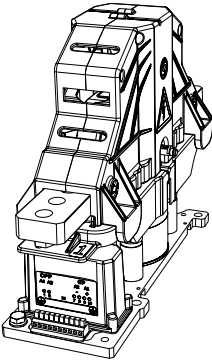
4.4 Technical information and material specification

For technical information, dimensions and material specifications, refer to our catalogue **C40**. The catalogue is available under:

<https://www.schaltbau.com/en/media-library/>

5. Description

5.1 Survey of the CP series (stock items)

Conventional thermal current I_{th}	NO/NC with large arc chamber	NO/NC with medium arc chamber	NO/NC without arc chamber (load-free)	CO without arc chamber (load-free)
600 A				
1,200 A				
2,000 A				---

The devices for 600 A, 1,200 A and 2,000 A differ optically mainly in the device dimensions and in the thickness of the main contacts.

However, if the illustrations on the following pages do not correspond exactly to the present device, the descriptions and illustrations are equally valid for the other device models (600 A, 1,200 A, 2,000 A).

5.2 Modular configuration options

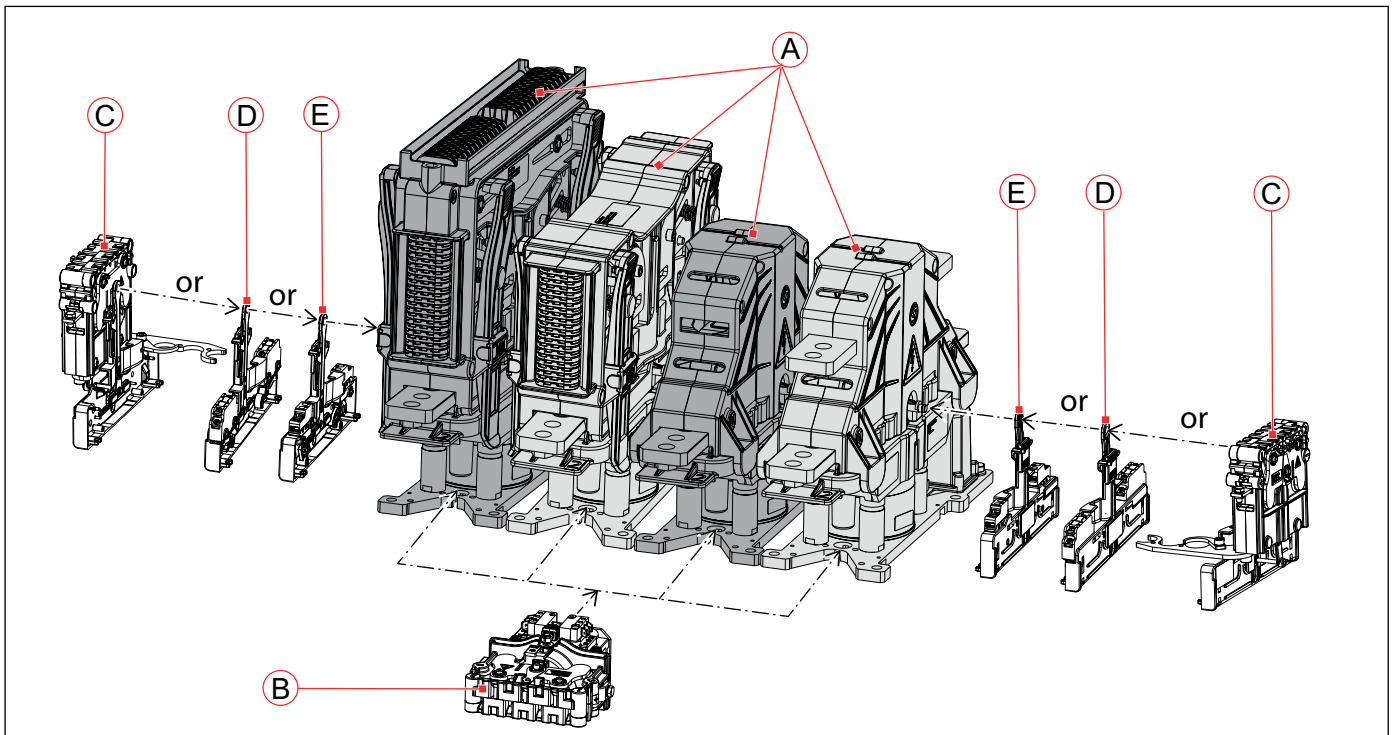


Fig. 1: CP series: Example of modular configuration options for 1,200 A and 2,000 A devices

- | | | | |
|---|--|---|---|
| A | Main Contactor/Disconnecter | C | High-voltage discharging contact (CPD) |
| B | Pre-charging contactor (CPP) to be mounted on the base plate of the main contactor | D | Auxiliary switch assembly 2x S826 |
| | | E | Auxiliary switch assembly 2x S870 a1/b0 |

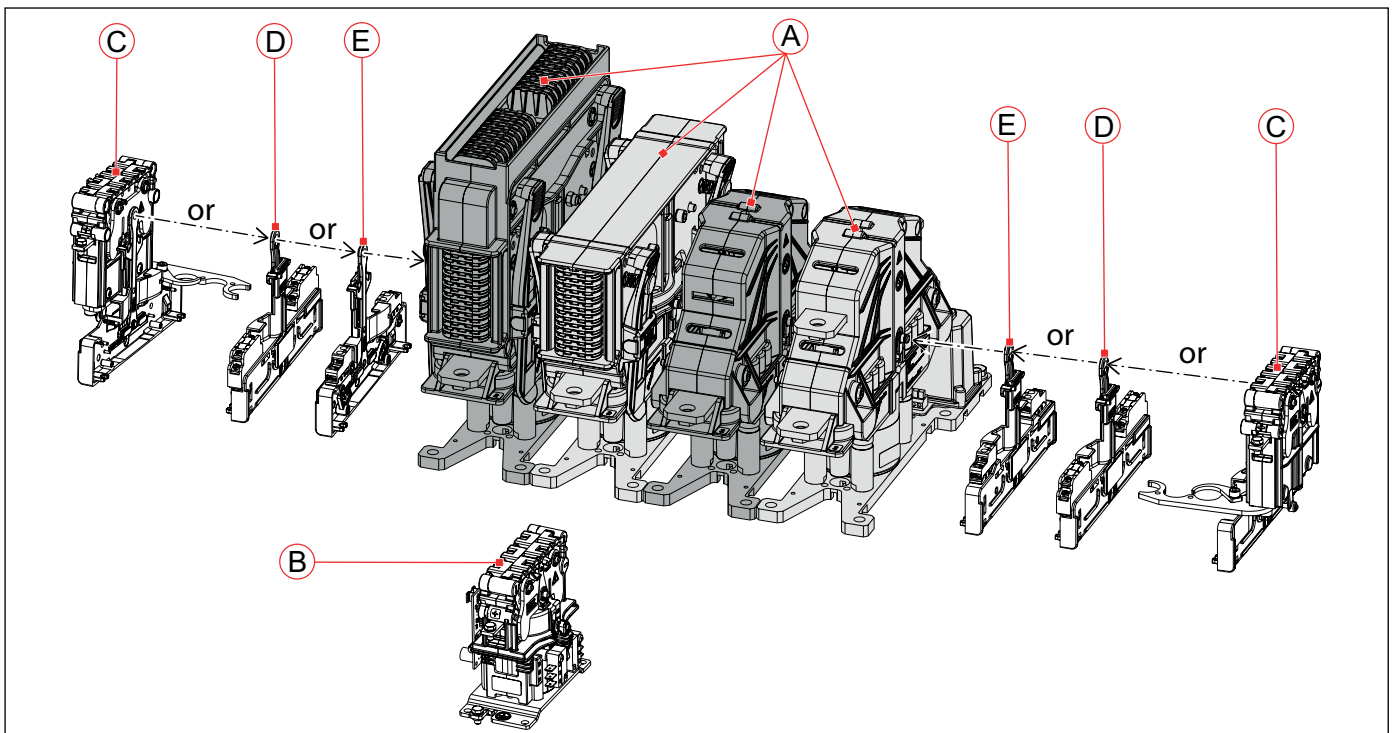


Fig. 2: CP series: Example of modular configuration options for 600 A devices

- | | | | |
|---|---|---|---|
| A | Main Contactor/Disconnecter | D | Auxiliary switch assembly 2x S826 |
| B | Pre-charging contactor (CPP) to be mounted at a separate mounting position next to the main contactor | E | Auxiliary switch assembly 2x S870 a1/b0 |
| C | High-voltage discharging contact (CPD) | | |

5.3 Configuration examples

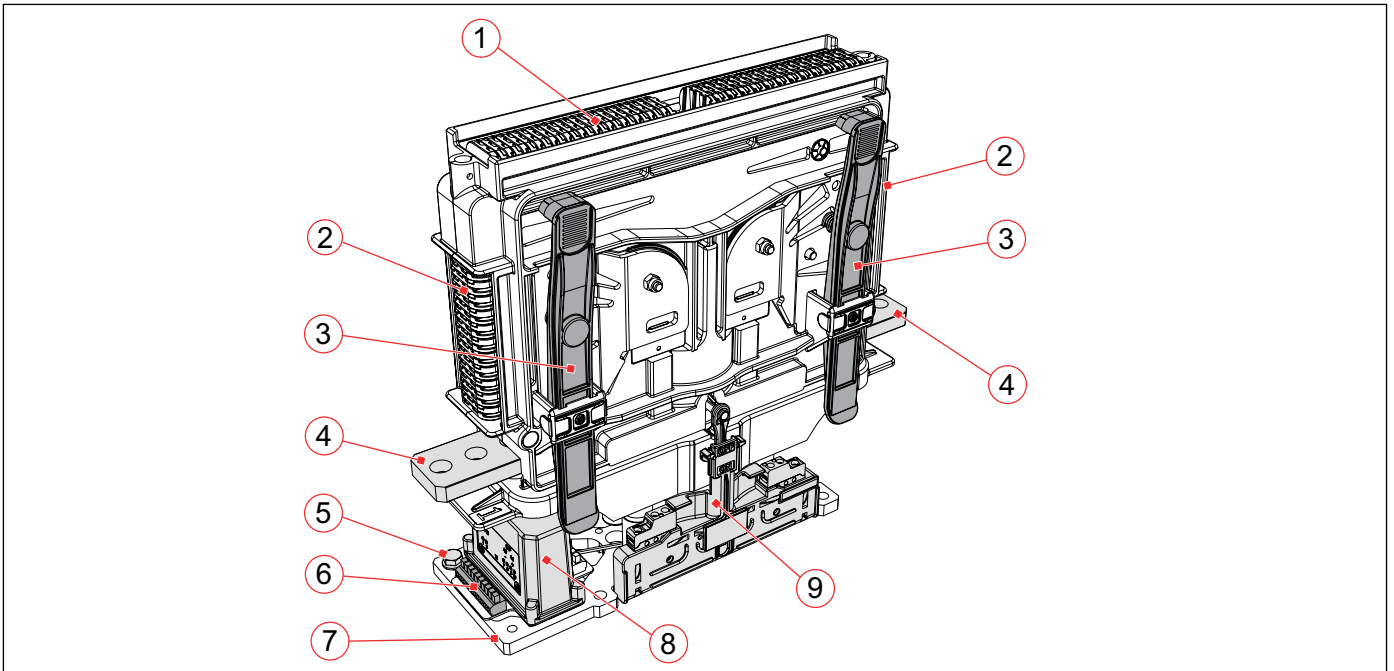


Fig. 3: CP series: Configuration example of NO and NC devices with high breaking capacity (large arc chamber)

- | | |
|---|---|
| 1 Upper arc chamber area | 7 Base plate |
| 2 Lateral arc chamber areas | 8 Economy circuit for coil |
| 3 Locking brackets 4x (to lock/unlock the complete arc chamber) | 9 Auxiliary switch assembly (on both sides) |
| 4 Main contact terminals | - 1x S870 (a1) + 1x S870 (b0) + 2x S826 |
| 5 Earth connection | - or 4x S826 |
| 6 Coil terminal (Wago 235) | - or high-voltage discharging contact |

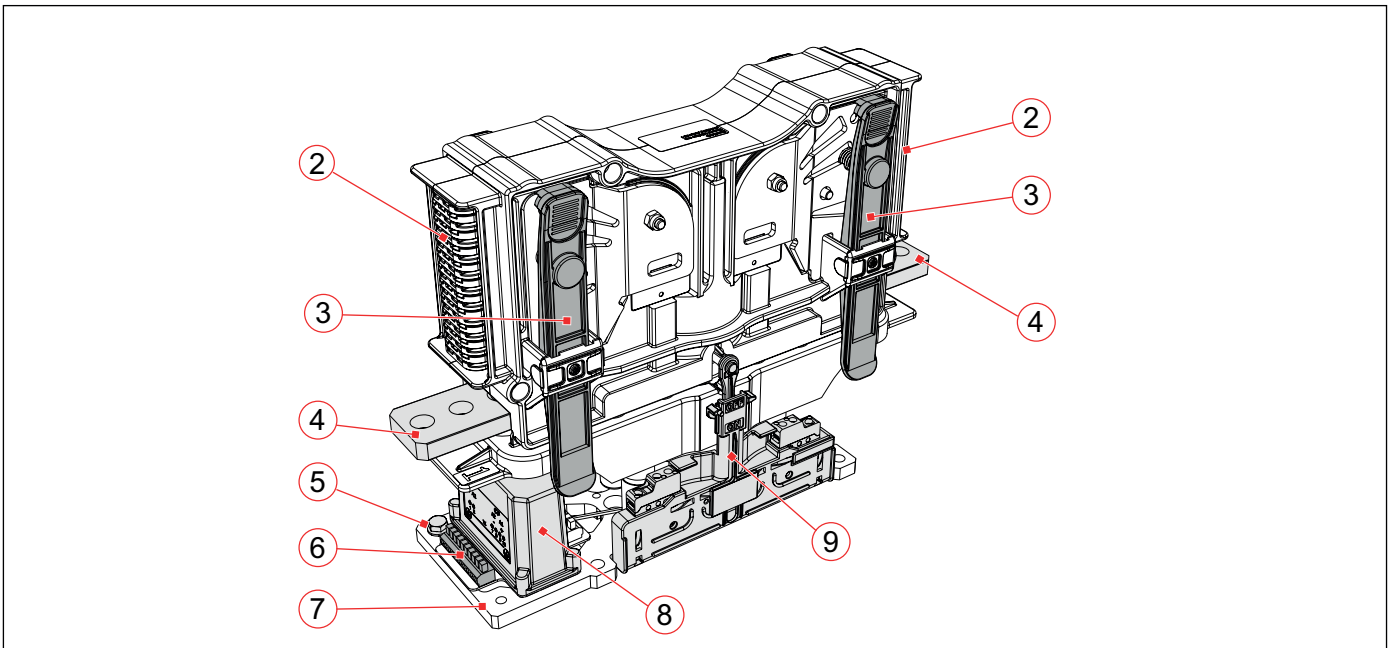


Fig. 4: CP series: Configuration example of NO and NC devices with medium breaking capacity (medium arc chamber)

- | | |
|---|---|
| 2 Lateral arc chamber areas | 7 Base plate |
| 3 Locking brackets 4x (to lock/unlock the complete arc chamber) | 8 Economy circuit for coil |
| 4 Main contact terminal | 9 Auxiliary switch assembly (on both sides) |
| 5 Earth connection | - 1x S870 (a1) + 1x S870 (b0) + 2x S826 |
| 6 Coil terminal (Wago 235) | - or 4x S826 |
| | - or high-voltage discharging contact |

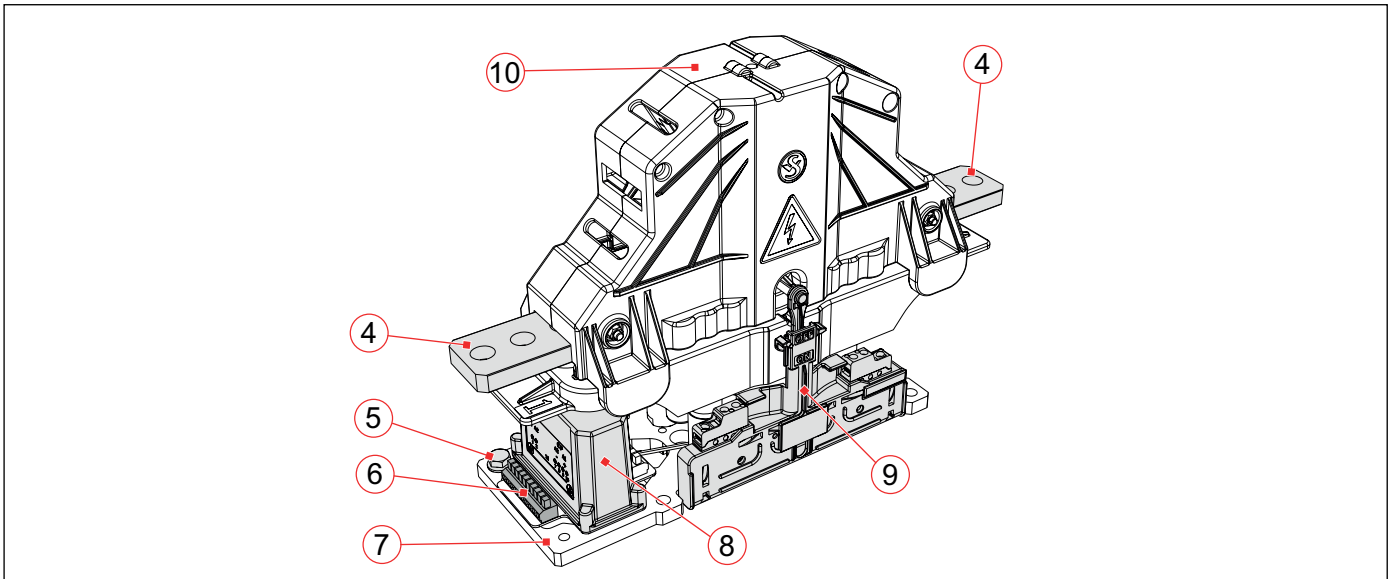


Fig. 5: CP series: Configuration example of NO and NC devices with load-free breaking capacity (no arc chamber)

- | | |
|---|---|
| <ul style="list-style-type: none"> 4 Main contact terminals 5 Earth connection 6 Coil terminal (Wago 235) 7 Base plate 8 Economy circuit for coil 9 Auxiliary switch assembly (on both sides) <ul style="list-style-type: none"> - 1x S870 (a1) + 1x S870 (b0) + 2x S826 - or 4x S826 - or high-voltage discharging contact | <ul style="list-style-type: none"> 10 Cover (Inspection of main contacts is not required for devices with load-free breaking capacity. The cover must therefore not be removed.) |
|---|---|

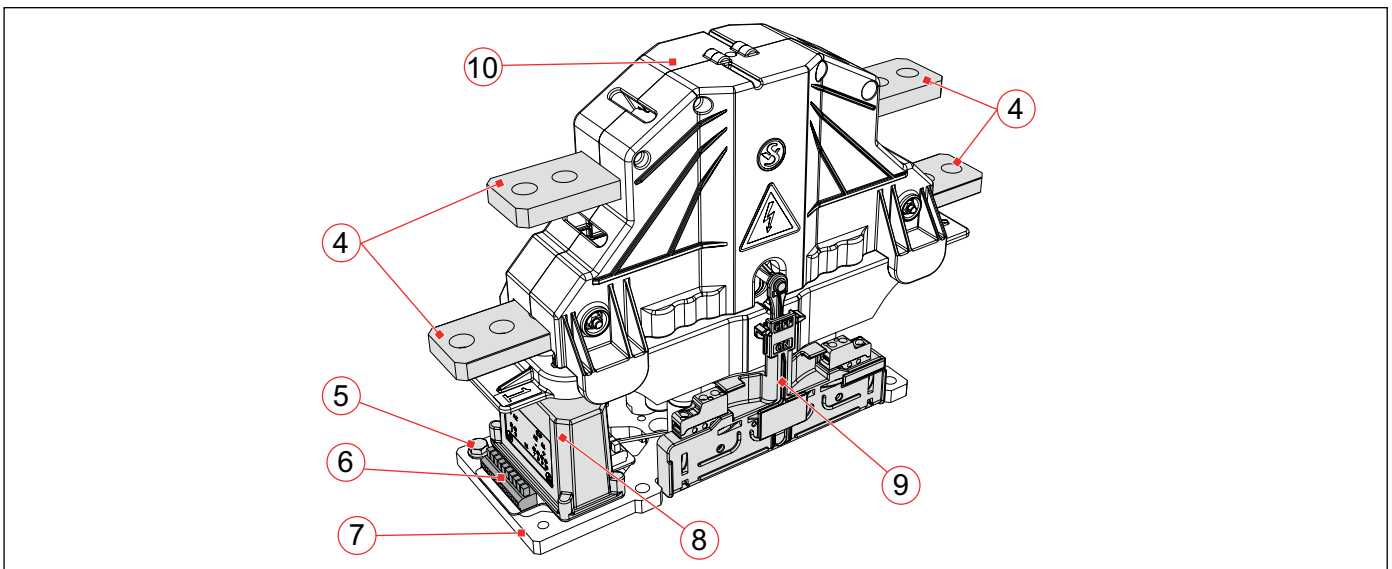


Fig. 6: CP series: Configuration example of CO devices with load-free breaking capacity (no arc chamber)

- | | |
|---|---|
| <ul style="list-style-type: none"> 4 Main contact terminals 5 Earth connection 6 Coil terminal (Wago 235) 7 Base plate 8 Economy circuit for coil 9 Auxiliary switch assembly (on both sides) <ul style="list-style-type: none"> - 1x S870 (a1) + 1x S870 (b0) + 2x S826 - or 4x S826 - or high-voltage discharging contact | <ul style="list-style-type: none"> 10 Cover (Inspection of main contacts is not required for devices with load-free breaking capacity. The cover must therefore not be removed.) |
|---|---|

6. Storage

NOTICE


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

- ▶ store it in its original packaging,
- ▶ store it in a dry and dust-free location.

Return shipments

Schaltbau recommends to keep the original packing box for any return shipments. If no original packing box is available care must be taken to pack the contactor in a way that prevents damage during shipment.

7. Unpacking and handling

	⚠ WARNING
	<p>The contactor is heavy. Risk of injury and damage to the device.</p> <ul style="list-style-type: none"> ▶ Take care when handling the contactor. ▶ Always two or more persons are required to unpack, transport and install the contactor. ▶ When carrying the contactor always hold it on the base plate.

7.2 Check parts for transport damage

NOTICE

If parts are damaged, the functional reliability of the contactor is no longer given.

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

7.1 Unpack the device

- ▶ Before opening the packaging, perform a visual inspection for any signs that could indicate damage having occurred during transport (impacts, bumps, falling etc.).
- ▶ If any signs indicate that the contactor has been subject to excessive shock influence do not install the contactor.
- ▶ Unpack the contactor with the help of a second person.
- ▶ When carrying the contactor always hold it at the base plate. Do not carry the contactor by holding it at the upper part.
- ▶ With the help of a second person, place the contactor in an upright position on a stable workbench or table.

8. Installation

8.1 Mounting positions

The contactors are designed for horizontal or vertical mounting. Examples of permissible mounting positions are presented in *Fig. 7* and *Fig. 8*. Even mounting positions suspended over head are permitted.

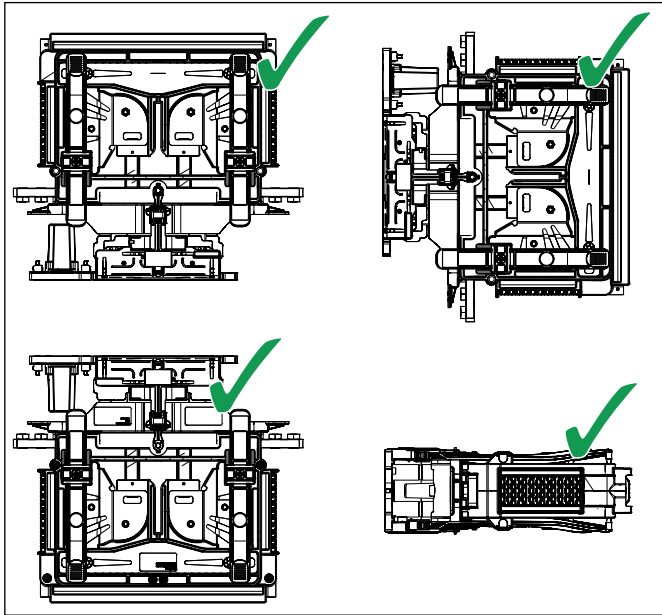


Fig. 7: Examples of permissible mounting positions - NO/NC devices

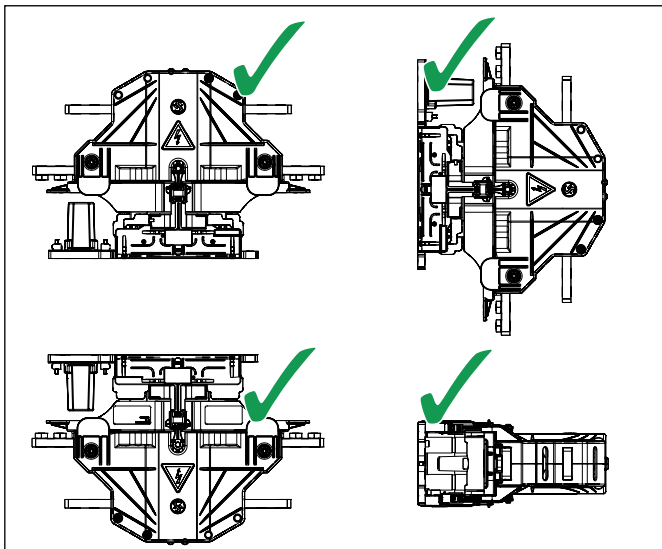


Fig. 8: Examples of permissible mounting positions - CO devices

8.1.1 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 *C40 catalogue*. The catalogue is available under: <https://www.schaltbau.com/en/media-library/>

8.2 Mechanical installation

8.2.1 Preparatory measures

- ▶ A suitable mounting frame or plate with 4 mounting holes must be provided for fastening of the contactor. See *Fig. 9* and *Fig. 10*.
- ▶ The mounting frame or plate must be solid enough to carry the weight of the device under shock and vibration conditions.
- ▶ 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 four M8 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 (and if applicable the nuts) must be strength class 8.8 or higher.
- ▶ The mounting screws must be tightened to the specified torque, which depends on the strength class (min. 8.8) of the screws/nuts used.

8.2.2 Required minimum clearance

NOTICE

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 live and earthed parts to avoid flashovers. These minimum clearances have been tested and specified in relation to the switching capacity of the contactors.

- ▶ The required minimum distances to all sides and upwards are given in the respective data sheets or can be found in our **C40 catalogue**. The catalogue is available under:

<https://www.schaltbau.com/en/media-library/>

8.2.3 Ventilation requirements

- ▶ Ensure sufficient ventilation, especially in the case of heavy arc switching. Allow the exchange of surrounding atmosphere to avoid the risk of flashovers and excessive corrosion.

8.2.4 Mounting holes

The mounting holes at the mounting frame or plate can either be

- threaded holes (for threaded screws)
- or through holes (for threaded screws and nuts).

Depending on the contactor type the dimensions and arrangements of the mounting holes are shown in **Fig. 9** and **Fig. 10**.

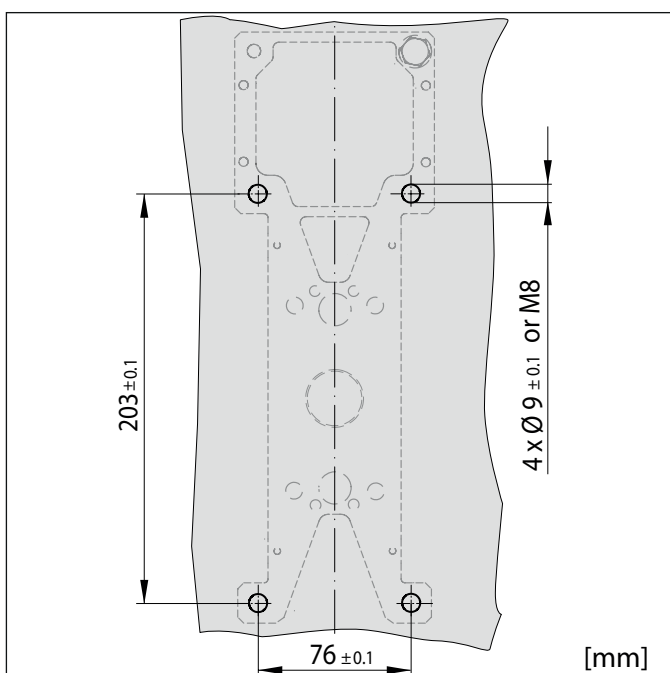


Fig. 9: Dimensions and arrangement of the mounting holes for devices with 600 A (not to scale)

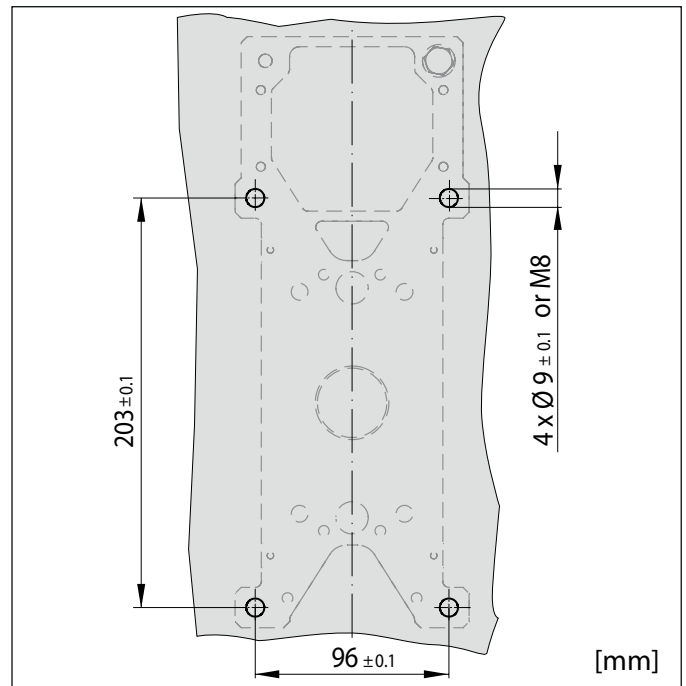




Fig. 10: Dimensions and arrangement of the mounting holes for devices with 1,200 A and 2,000 A (not to scale)

8.2.5 Safety

- ▶ The installation has to be carried out by qualified trained personnel.

⚠ DANGER	
	<p>The contactor meets the requirements of basic insulation. Without proper earthing connection, metal parts and wires may be energized in the case of a failure. Risk of serious injuries or even death!</p> <ul style="list-style-type: none"> ▶ Make sure that the mounting frame or mounting plate on which the contactor is mounted is earthed in a shock and vibration-proof way.

⚠ WARNING	
	<p>The contactor is heavy. Risk of injury and damage to the device.</p> <ul style="list-style-type: none"> ▶ Take care when handling the contactor. ▶ Always two or more persons are required to unpack, transport and install the contactor. ▶ When carrying the contactor always hold it on the base plate.

NOTICE

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

NOTICE

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.

8.2.6 Tools required

- Socket spanner set, hexagon nuts
- Open-ended spanner set
- Torque wrench

8.2.7 Installation procedure

- ▶ Make sure that the mounting surface on the mounting plate (3) or mounting frame and the bottom of the contactor are free from dirt and other contaminants (e.g. metal chips).
- ▶ Place the contactor (1) on the mounting plate (3) or the mounting frame provided with the mounting holes.
- ▶ Screw the contactor (1) to the mounting plate (3) or mounting frame using the 4 mounting screws (2).
 - If the mounting holes are designed as threaded holes, screw the screws with suitable screw locking elements directly into the prepared threads.
 - If the mounting holes are through holes, tighten the screws with suitable screw locking elements (on both sides) and nuts.
- ▶ Tightened the mounting screws to the specified torque, which depends on the strength class (min. 8.8) of the screws/nuts used.

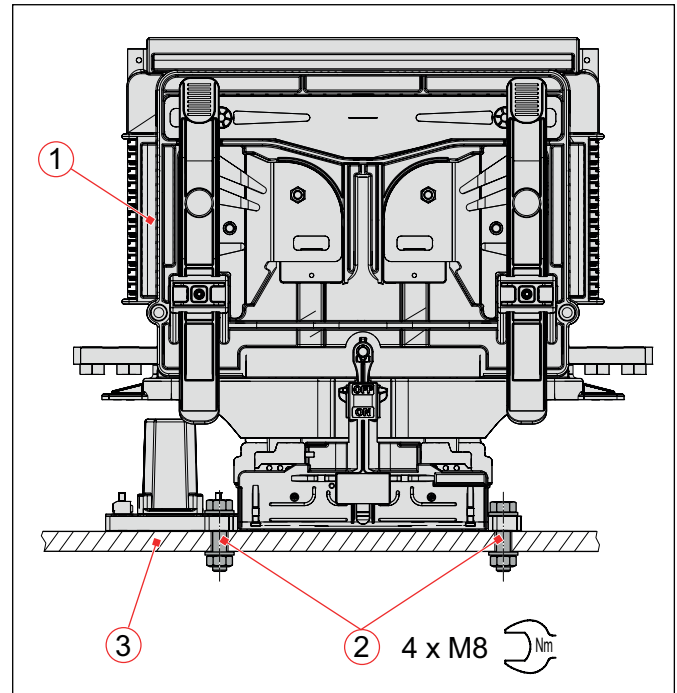


Fig. 11: Example for the installation of the device on a mounting plate or mounting frame (the figure shows a NO/NC device with large arc chamber)

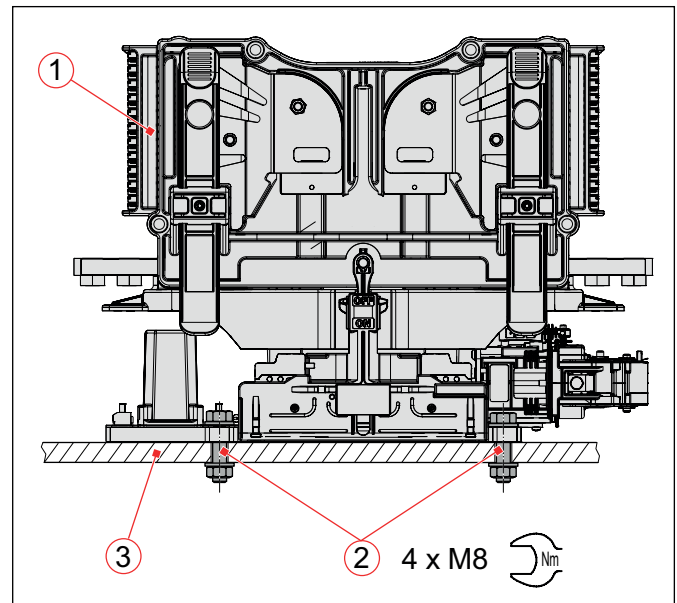


Fig. 12: Example for the installation of the device on a mounting plate or mounting frame (the figure shows a NO/NC device with medium arc chamber)

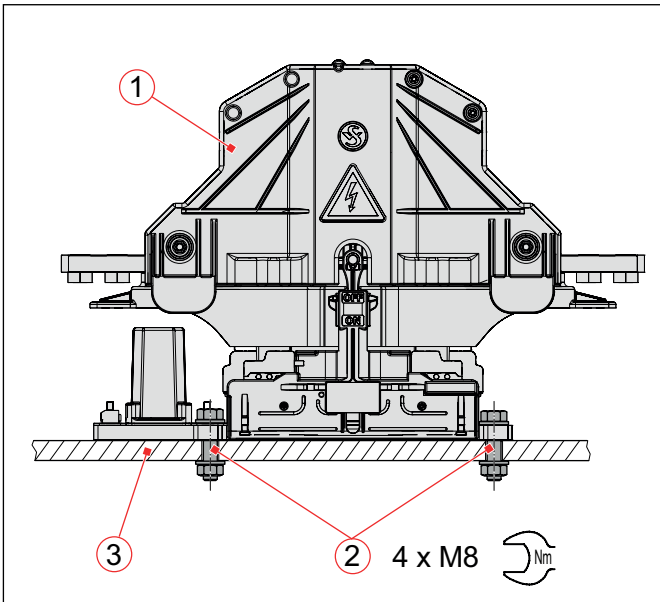


Fig. 13: Example for the installation of the device on a mounting plate or mounting frame (the figure shows a NO/NC device without arc chamber)

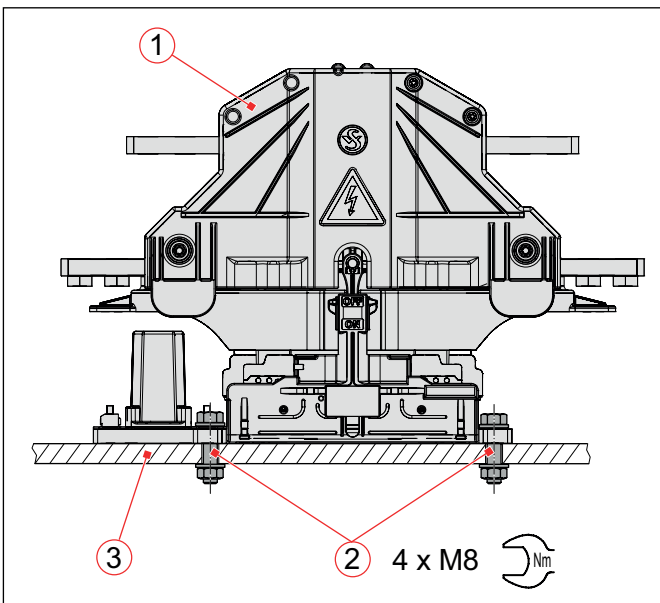


Fig. 14: Example for the installation of the device on a mounting plate or mounting frame (the figure shows a CO device without arc chamber)

8.3 Installation of the optional pre-charging contactor (CPP)

The optional pre-charging contactor (CPP) can be installed:

- with 1,200 A and 2,000 A devices either at the base plate of the main contactor or at a separate mounting position next to the main contactor using the available special mounting flange;
- with 600 A devices only at a separate mounting position next to the main contactor using the available special mounting flange.



A separate installation and maintenance manual is available for CPP contactors. Also refer to this separate manual **C45-m**. Available for download at: <https://www.schaltbau.com/en/media-library/>

8.3.1 Installation of the CPP with 1,200 A and 2,000 A devices

On delivery, the CPP is mounted at the base plate of the main contactor as standard. The following installation steps are only necessary in case of a subsequent customer installation.

- ▶ With 1,200 A and 2,000 A devices position the CPP (2) at the base plate (3) of the main contactor.
- ▶ Screw in the 2 fixing screws (1).
- ▶ Tighten the 2 fixing screws (1) to a torque of 4 Nm.

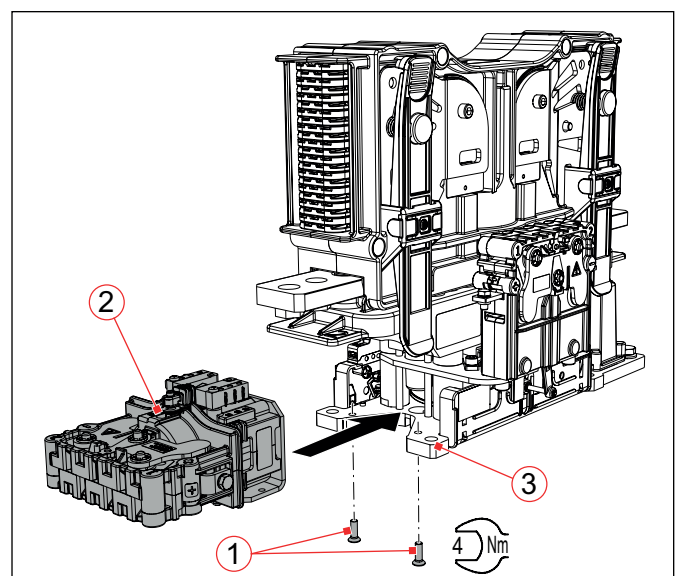


Fig. 15: 1,200 A and 2,000 A devices: Example for the installation of the CPP at the base plate of the main contactor

8.3.2 Installation of the CPP with 600 A devices

Preparatory measures

- ▶ With 600 A devices, 4 mounting holes at the mounting frame or plate must be provided to fasten the CPP.
- ▶ The mounting holes can be either:
 - threaded holes (for threaded screws)
 - or through holes (for threaded screws and nuts)
- ▶ Fastening of the CPP on the mounting frame or plate is performed using four 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 (and if applicable the nuts) must be strength class 8.8 or higher.
- ▶ The mounting screws must be tightened to the specified torque, which depends on the strength class (min. 8.8) of the screws/nuts used.

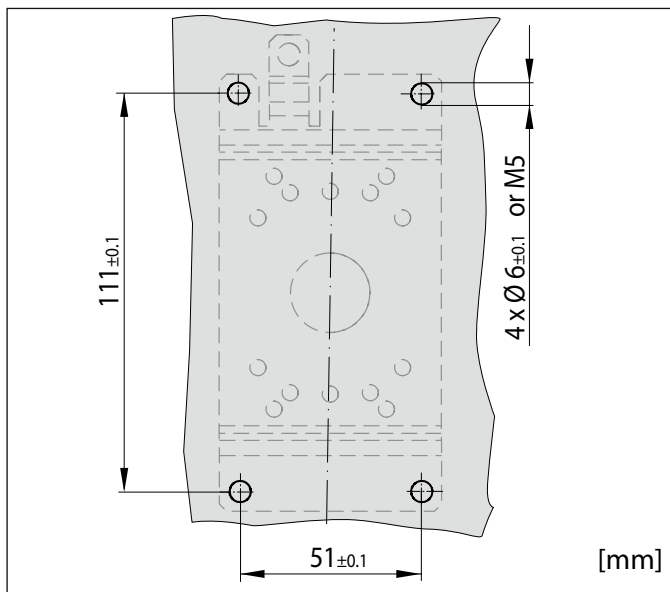


Fig. 16: Dimensions and arrangement of the mounting holes for the CPP (not to scale)

Installation procedure

- ▶ Ensure that the contact surfaces on the mounting plate (3) and the bottom of the CPP (1) are free from dirt and other contamination (e.g. metal chips).
- ▶ Position the CPP (1) on the mounting plate (3) which is provided with mounting holes.
- ▶ Screw the CPP (1) on the mounting flange to the mounting plate (3) using 4 mounting screws M5 including washers (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 to the specified torque, which depends on the strength class (min. 8.8) of the screws/nuts used.

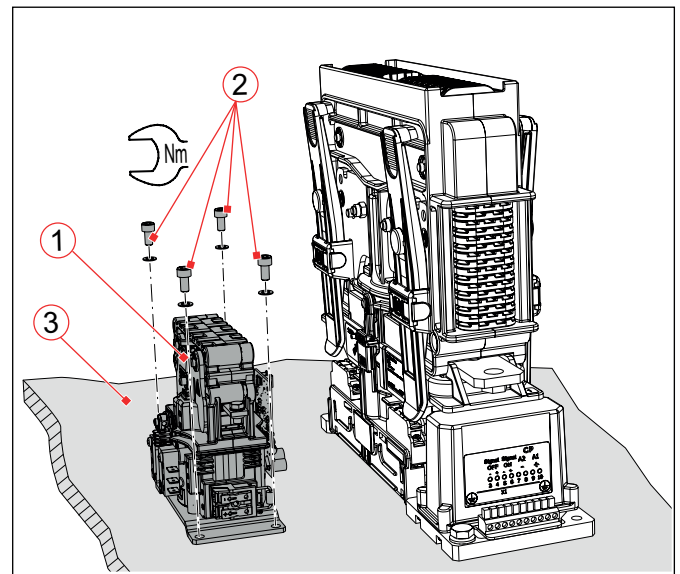


Fig. 17: 600 A devices: Example for the installation of the CPP at a separate mounting position next to the main contactor

8.4 Electrical Installation

The electrical data for the control power of the magnetic drive and for the auxiliary switches as well as further technical parameters can be taken from the corresponding data sheets or from our catalogue **C40**.



The catalogue is available under:

<https://www.schaltbau.com/en/media-library/>

8.4.1 Preparatory measures

- ▶ The minimum clearances to live and earthed parts are given in the corresponding data sheets or in our **C40 catalogue** and must be adhered to. The catalogue is available under: <https://www.schaltbau.com/en/media-library/>
- ▶ 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 live and earthed parts to avoid flashovers. These minimum clearances have been tested and specified in relation to the switching capacity of the contactors.
- ▶ For switching heavy loads allow a minimum time of 30 s between switchings. Allow a recovery time of at least 10 min after 3 heavy load switchings in succession.
- ▶ The earth connecting cable must be fitted with an appropriate ring terminal (for M8 terminal screw).
- ▶ Undersized conductor cross-sections for the earth connection may produce a safety hazard.
- ▶ The minimum conductor cross-sections for the main terminal connection and the earth connection must be observed.
- ▶ Schaltbau recommends busbars for the connection of the main terminals. The required cross-sections of the busbars depend on the application and must be determined by the plant operator.
- ▶ If connecting cables are used for the main power circuit, they must be selected taking into consideration the insulation class and the ambient conditions.
- ▶ The connecting cables of the main power circuit must be fitted with appropriate ring terminals (for M12 terminal screws).
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ The main terminal screws must be tightened to a torque of max. 30 Nm.
- ▶ The auxiliary switches are provided with screw terminals (M3). The control wires for the auxiliary switches must be stripped accordingly (if necessary, fit with appropriate wire end sleeves).
- ▶ The maximum permissible conductor cross-section of the auxiliary contact control wires is 1 mm² / AWG 18 stranded wire.
- ▶ The coil control connection is provided with a terminal strip with cage clamp terminals. The control wires for the coil connection must be stripped accordingly (if necessary, fit with appropriate wire end sleeves).
- ▶ For the power consumption of the magnetic drive system and the electrical data of the auxiliary switches refer to our catalogues:
 - **C40** (Catalogue CP series devices)
 - **D26** (Catalogue auxiliary switches S826)
 - **D70** (Catalogue auxiliary switches S870)

8.4.2 Safety

 DANGER	
	<p>The contactors are high voltage switches. The touching of electrically conducting parts may result in serious injuries or even death!</p> <p>Energized parts are all metal parts belonging directly to one of the circuits or wires leading there. All other visible metal parts and wires may also be energized in the case of a failure.</p> <p>Before beginning any work on the contactors, always observe the following safety regulations:</p> <ul style="list-style-type: none">▶ Disconnect on all sides▶ Ensure that it is not possible to reconnect unintentionally▶ Clearly mark your work area▶ Make sure that there is no voltage present▶ Earth and short circuit the installation; this also includes the discharging of any capacitors in the main circuit▶ Besides the main electric circuit, also disconnect additional and auxiliary circuits▶ Cover or insulate adjacent energized parts▶ Only an electrically skilled person may determine if there is no voltage present▶ When the work has been concluded, proceed the other way round.

NOTICE

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.

8.4.3 Tools required

- Socket spanner set hexagon nuts
- Open-ended spanner set
- Hex key set
- Set of POZIDRIV® cruciform screwdrivers
- Set of flat bladed screwdrivers
- Small cable ties

8.4.4 Connecting the auxiliary switches

The auxiliary switches (S870 and S826) are provided with screw terminals (M3). The control wires for the auxiliary switches must be stripped accordingly (if necessary, use appropriate wire end sleeves).

NOTICE

- ▶ The maximum permissible conductor cross-section of the auxiliary switches control wires is 1 mm² / AWG 18 stranded wire.
- ▶ Mechanically secure the control wires to minimise feedback effects of forces caused by the wires (e. g. shock, vibrations) acting on the terminals.
- ▶ Route the control wires (2) to the terminals of the auxiliary switches (1).
- ▶ Connect the control wires to the screw terminals of the auxiliary switches (1).
 - For the a1 and b0 contacts (auxiliary switches S870) no polarity must be observed.
 - For the general purpose contacts (auxiliary switches S826) the polarity must be observed).
- ▶ Tighten the terminal screws to the prescribed torque:
 - With S870 auxiliary switches: 0.7 - 0.9 Nm
 - With S826 auxiliary switches: 0.7 - 0.9 Nm
- ▶ Check the routing of the wiring. Wires must not be squeezed or bent.
- ▶ If applicable bundle and secure the wires using cable ties.

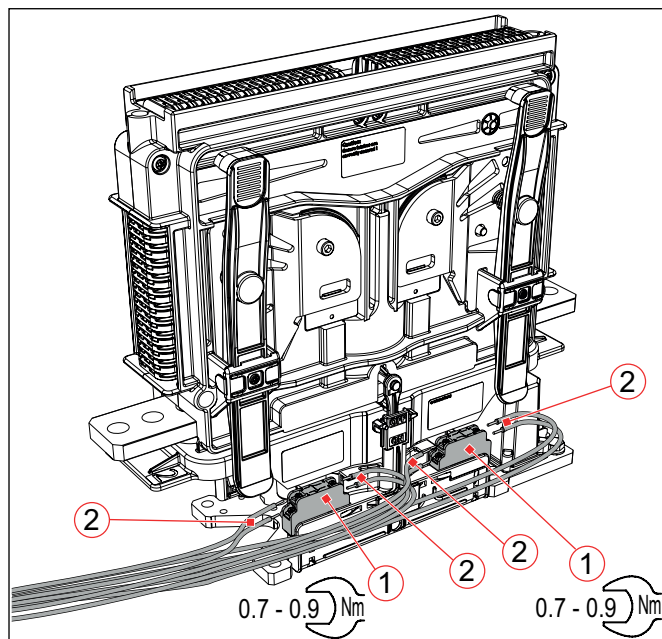


Fig. 19: Example for the connection of auxiliary switches S826

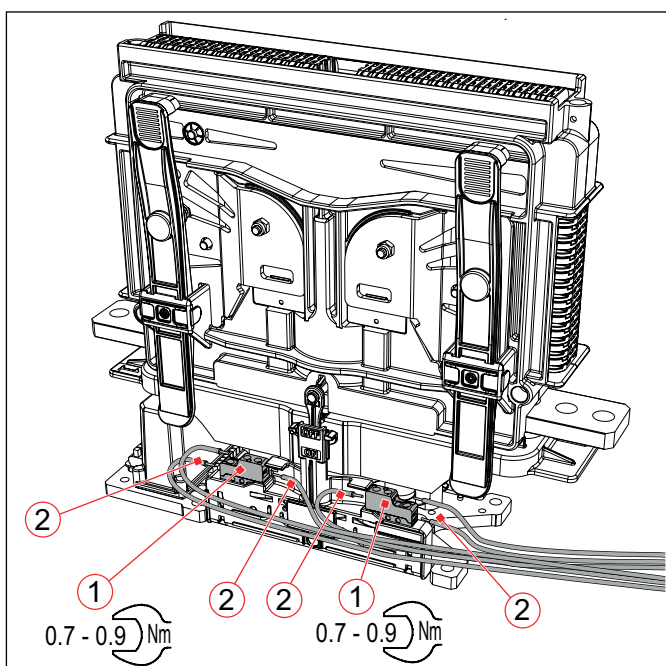


Fig. 18: Example for the connection of auxiliary switches S870

8.4.5 Connecting the coil terminals

The connection for the coil control is provided with a terminal strip with cage clamp terminals. The control wires for the coil connection must be stripped accordingly.

- ▶ Route the coil control wires (2) for the main contactor to the terminal strip (1).
- ▶ Connect the coil control wires (2) for the main contactor to the designated cage clamps according to the wiring diagram label (3) on the device.
- ▶ If the optional pre-charging contactor (CPP) is installed:
 - Route the coil control wires (4) for the CPP to the terminal strip (1).
 - Connect the coil control wires (4) for the CPP to the designated cage clamps according to the wiring diagram label (3) on the device.
- ▶ Check that the coil control wires are correctly installed and have the correct polarity.
- ▶ Check the routing of the wiring. Wires must not be squeezed or bent.
- ▶ If applicable bundle and secure the wires using cable ties.

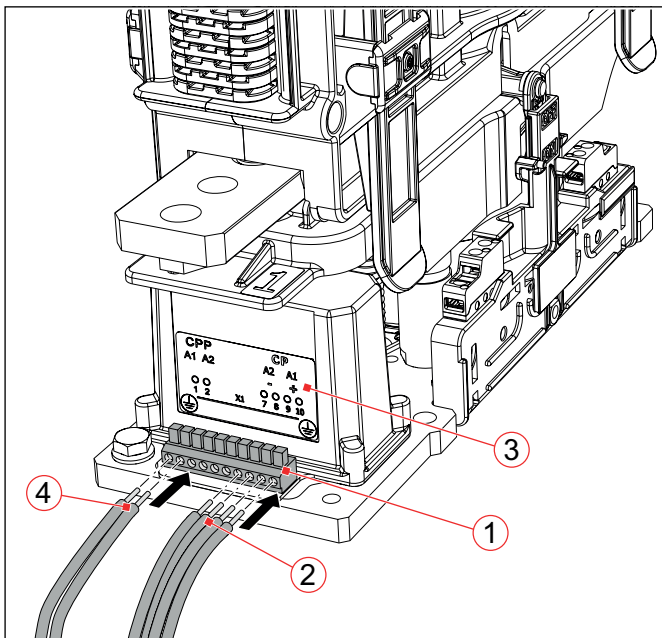


Fig. 20: Example for the connection of the coil terminals

8.4.6 Connecting the main contacts

Depending on the contactor type, the main circuit terminals are either fitted with one or two insert nuts or through holes.

The figures show contactor types with main contacts with two insert nuts each.

Proceed in the same way for contactors with one insert nut, but omit the second terminal screw.

Proceed in the same way for contactors with through boreholes, but use additional screw locking elements (nuts and washers) to counter the terminal screws.

NOTICE

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

NOTICE

- ▶ Make sure that according to the insulation class there is sufficient clearance between the main connections and the pole plates.

Main contact connection with busbars

For devices with arc chamber, the installation of busbars with 2 terminal screws is easier if the arc chamber is removed in advance.

- ▶ Remove the arc chamber if applicable, see chapter "9.3.1 Replacing the complete arc chamber unit".
- ▶ Route the busbars (4) to both main contacts (1).



If the busbars are very stiff, the use of compensating angles (7) is recommended. In this way tolerances can be allowed for in all three planes.

- ▶ Depending on the installation situation, use additional connecting bars (2) or compensating angles (7) if necessary.
- ▶ Connect the busbars (4) to the connecting bars (2) or angled connecting bars (6) using appropriate screws (5), Nuts (6) and washers.
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ Connect the connecting bars (2) or compensating angles (7) to the main terminals (1) using the terminal screws (3) and washers.
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ Tighten the terminal screws (3) to a torque of 24 - 30 Nm.
- ▶ Reinstall the arc chamber if applicable, see chapter "9.3.1 Replacing the complete arc chamber unit".

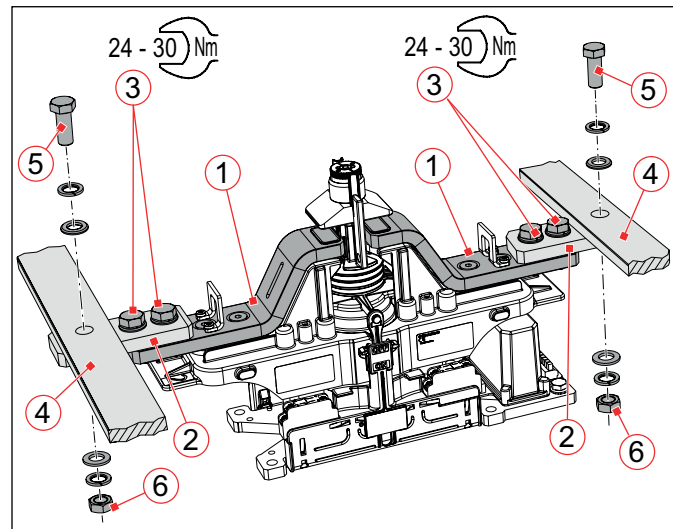


Fig. 21: Example for the connection of the main circuit with busbars (4) and connecting bars (2)

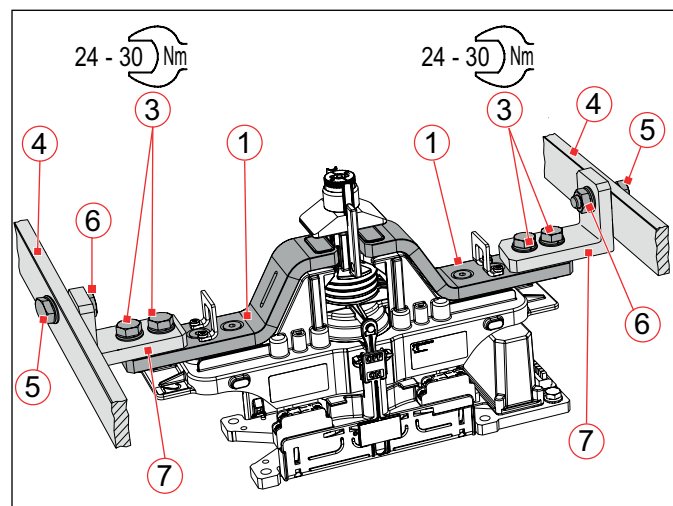


Fig. 22: Example for the connection of the main circuit with busbars (4) and compensating angles (6)

Main contact connection with cables

The connecting cables of the main power circuit must be fitted with appropriate ring terminals (for M12 terminal screws).

NOTICE

▶ If connecting cables are used for the main power circuit, they must be selected taking into consideration the insulation class and the ambient conditions.

- ▶ Route the cables (2) to both main contacts (1).
- ▶ For devices with insert nuts screw the ring terminals (2) in place using the terminal screws (3) and suitable screw locking elements.
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ For devices with through boreholes use additional nuts and washers (6) to counter the terminal screws.
- ▶ Tighten the terminal screws (3) to a torque of 24 - 30 Nm.

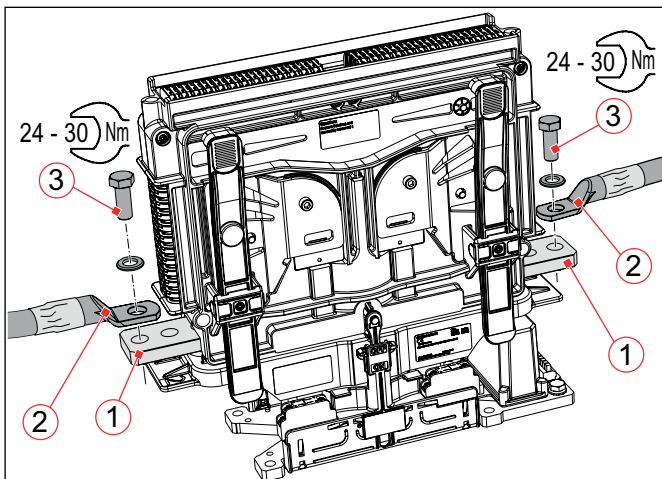


Fig. 23: Example for the connection of the main circuit with one cable (2) on each side

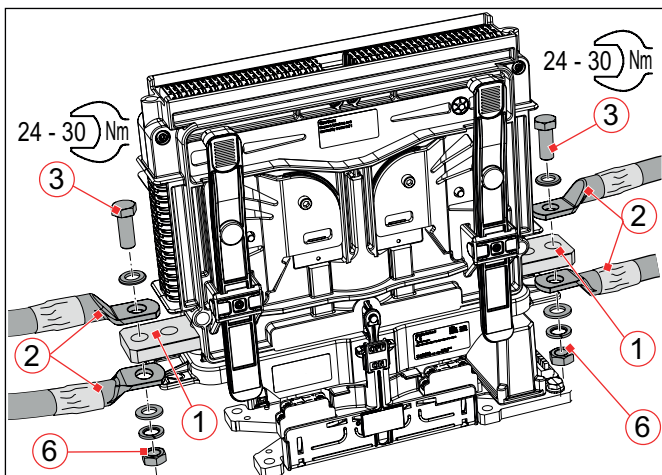


Fig. 24: Example for the connection of the main circuit with two cables (2) on each side

8.4.7 Connecting the earth terminal

The earth connecting cable must be fitted with an appropriate ring terminal (for M8 terminal screw).

- ▶ Route the earth connecting cable (1) to the earth terminal (3).
- ▶ Screw the ring terminal (1) in place using the earth terminal screw (2) and suitable screw locking elements.
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ Tighten the earth terminal screw (2) to a torque of 8 - 10 Nm.

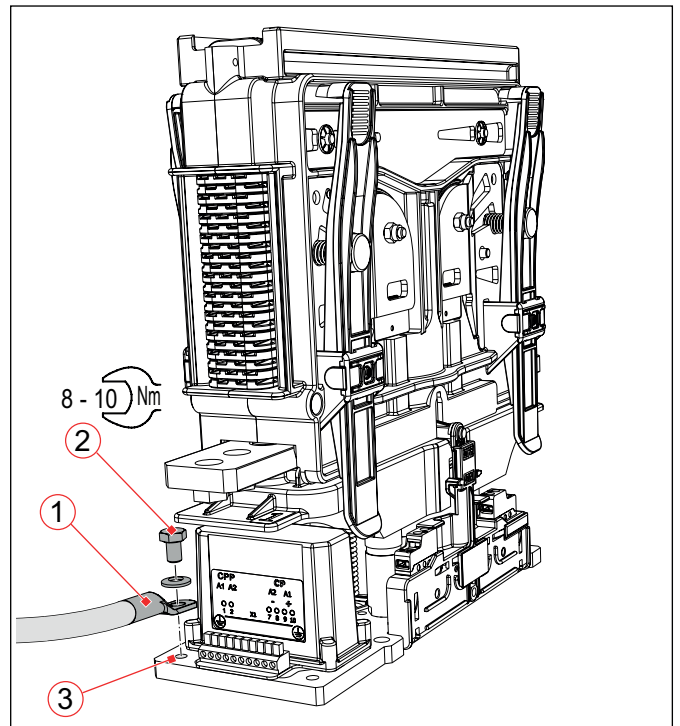


Fig. 25: Connecting the earth terminal

8.4.8 Connecting the optional pre-charging contactor (CPP)



A separate installation and maintenance manual is available for CPP contactors. Also refer to this separate manual **C45-m**. Available for download at: <https://www.schaltbau.com/en/media-library/>

The cables for the optional CPP must be fitted with appropriate ring terminals (for M5 terminal screws).

- ▶ Route the cables (3) to the contact terminals (2) of the CPP (1).
- ▶ Screw the ring terminals (3) in place using the terminal screws (4) and suitable screw locking elements.
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ Tighten the terminal screws (4) to a torque of 4 - 5 Nm.

With 600 A devices only.

- ▶ Connect an earthing cable (6) to the earth terminal which is provided on the mounting flange of the CPP.
- ▶ Screw the ring terminal of the earthing cable (6) in place using the terminal screw (7) and suitable screw locking elements.
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ Tighten the earth terminal screw (7) to a torque of 4 - 5 Nm.

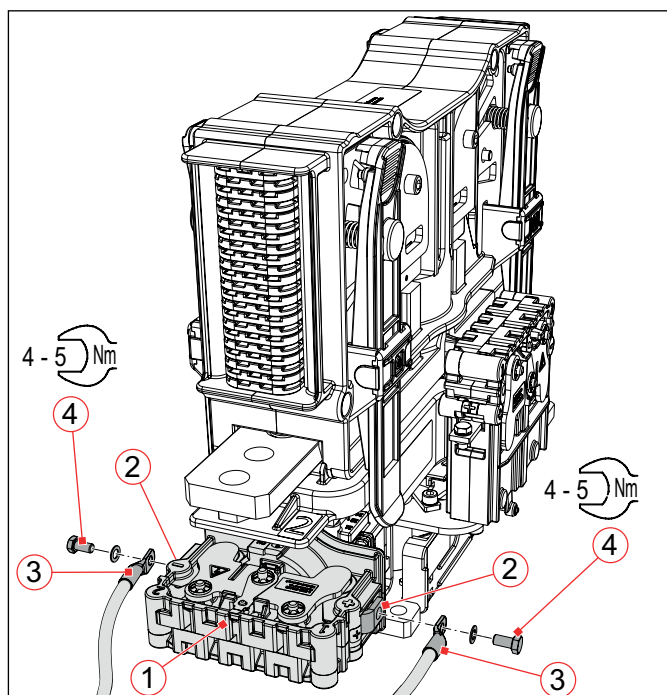


Fig. 26: With 1,200 A and 2,000 A devices: Connecting the optional pre-charging contactor (CPP) mounted on the base plate of the main contactor

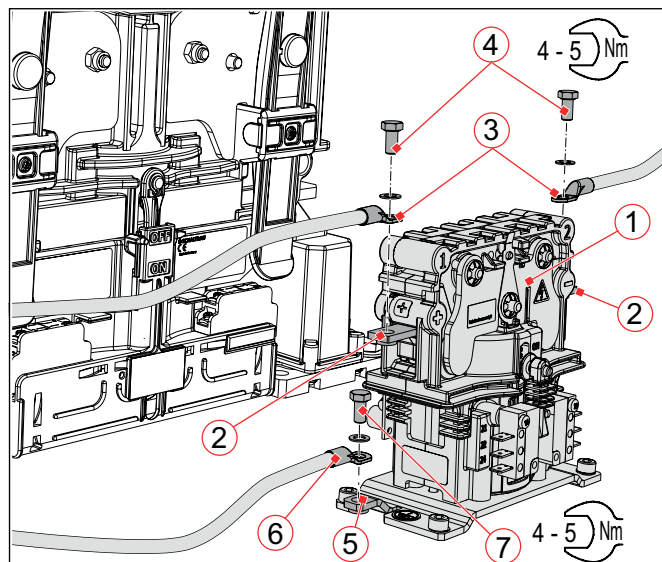


Fig. 27: With 600 A devices: Connecting the optional pre-charging contactor (CPP) mounted at a separate mounting position next to the main contactor

8.4.9 Connecting the optional high-voltage discharging contact (CPD)

The cables for the optional CPD must be fitted with appropriate ring terminals (for M5 terminal screws).

- ▶ Route the connecting cables (3) to the contact terminals (2) of the CPD (1).
- ▶ Screw the ring terminals (3) in place using the terminal screws (4) and suitable screw locking elements.
 - Schaltbau recommends using Schnorr washers (or similar).
- ▶ Tighten the terminal screws (4) to a torque of 4 - 5 Nm.

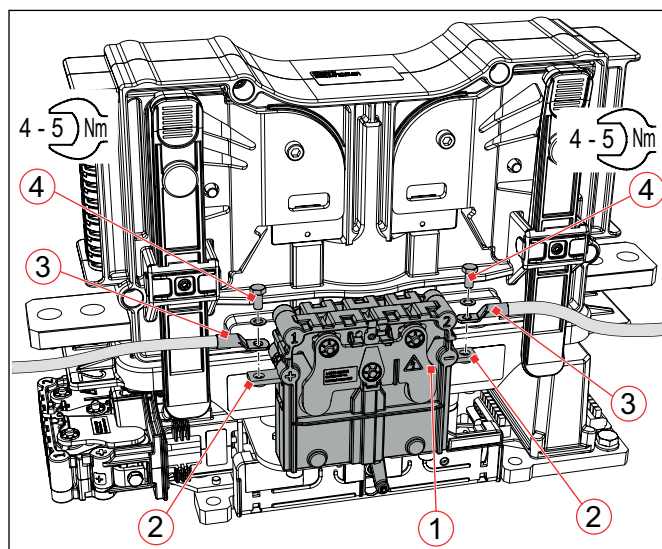


Fig. 28: Connecting the optional high-voltage discharging contact (CPD)

8.5 Checks



After the installation, perform the following checks:

- ▶ Check that the contactors are correctly installed on the mounting plate or mounting frame and tightly screwed in place.
- ▶ Check that the connecting cables or busbars are correctly installed and fit tightly at the main contacts.
- ▶ Check that the control wires of the coil terminals are correctly installed and have the correct polarity.
- ▶ Check that the control wires are correctly connected to the auxiliary switches.
- ▶ Check the correct assignment and function of the auxiliary switches using a continuity tester.
- ▶ Check that the earthing cable is correctly installed and fits tightly at the earthing terminal.
- ▶ Ensure that the arc chambers are latched securely (only for devices with arc chambers).
- ▶ Switch the contactor several times without electric load in the main circuit.
- ▶ Check the pull-in and drop-off voltage based on the Schaltbau specifications. See catalogue **C40**. The catalogue is available under:
<https://www.schaltbau.com/en/media-library/>
- ▶ 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

9. Maintenance

Note the expert knowledge which is essential for carrying out maintenance work, mentioned in chapter “2. General and security information”.

9.1 Safety

 DANGER	
	<p>The contactors are high voltage switches. The touching of electrically conducting parts may result in serious injuries or even death!</p> <p>Energized parts are all metal parts belonging directly to one of the circuits or wires leading there. All other visible metal parts and wires may also be energized in the case of a failure.</p> <p>Before beginning any work on the contactors, always observe the following safety regulations:</p> <ul style="list-style-type: none"> ▶ Disconnect on all sides ▶ Ensure that it is not possible to reconnect unintentionally ▶ Clearly mark your work area ▶ Make sure that there is no voltage present ▶ Earth and short circuit the installation; this also includes the discharging of any capacitors in the main circuit ▶ Besides the main electric circuit, also disconnect additional and auxiliary circuits ▶ Cover or insulate adjacent energized parts ▶ Only an electrically skilled person may determine if there is no voltage present ▶ When the work has been concluded, proceed the other way round.

9.2 Preventive maintenance

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



9.2.1 Intervals for regular checks

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

Checks	Interval
Visual inspection of the contactor from outside	▶ 1x per year
Inspection of the main contacts, both fixed and movable contacts (this check is only required for devices with arc chamber, not permissible for devices without arc chamber)	▶ 1x to 2x per year
Inspection of the auxiliary switches	▶ Every 2 years

If the contactors are operated in particularly dirty environments, the checking intervals for visible inspections should be shortened, because dirt can impair the insulation clearances and there is therefore the possibility of a shorter service life or an operational fault.

Extraordinary services need only be carried out if there has been a significant and extraordinary recorded number of switchings under fault conditions.

 DANGER	
	<p>When damages on the contactor, high voltage cables, busbars or earthing cables are visible, the safety of the contactor is no longer guaranteed.</p> <ul style="list-style-type: none"> ▶ Immediately give damaged contactors to corrective maintenance. ▶ Immediately replace all damaged components with new components.

NOTICE

Detent-edged rings and detent-edged washers have a limited life time. After 3 times opening of screws secured with detent-edged rings or detent-edged washers, the rings or washers must be replaced by new ones.

- ▶ Record the frequency of screw opening in the work log.
- ▶ After 3 times opening of screws, replace detent-edged rings or detent-edged washers by new ones.

9.2.2 Regular check activities

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

Component	Visual inspection	Measures
High voltage cables or busbars	Check for: <ul style="list-style-type: none"> ▶ dirt ▶ damage or wear ▶ corrosion ▶ broken cables, ring terminals ▶ damaged insulation ▶ damaged busbars ▶ kinked or crushed cables ▶ loose or missing fastening elements ▶ correct torque of the terminal screws 	In case of faults: <ul style="list-style-type: none"> ▶ remove any existent dirt ▶ replace damaged cables or ring terminals immediately ▶ remove corrosion and replace corroded parts ▶ replace damaged busbars immediately ▶ tighten loose fastening elements and replace missing fastening elements immediately ▶ tighten the terminal screws with the rated torque
Earthing cable/strap and ring terminal	Check for: <ul style="list-style-type: none"> ▶ dirt ▶ damage or wear ▶ corrosion ▶ broken cable/strap, ring terminals ▶ damaged insulation ▶ kinked or crushed cable/strap ▶ loose or missing fastening elements ▶ correct torque of the earthing terminal screw 	In case of faults: <ul style="list-style-type: none"> ▶ remove any existent dirt ▶ replace a damaged earthing cable/strap or damaged ring terminals immediately ▶ remove corrosion and replace corroded parts ▶ tighten loose fastening elements and replace missing fastening elements immediately ▶ tighten the earthing terminal screw with the rated torque
Contactors/base plate mounting	Check for: <ul style="list-style-type: none"> ▶ loose or missing fastening elements 	In case of faults: <ul style="list-style-type: none"> ▶ tighten loose fastening elements and replace missing fastening elements immediately ▶ fix a loose contactor

Component	Visual inspection	Measures
Arc chambers (only for devices with arc chamber)	<p>Check for:</p> <ul style="list-style-type: none"> ▶ dirt ▶ damage or wear ▶ penetrations, holes in the arc chamber housing wall ▶ broken ceramic plates ▶ correct and firm seating of the entire arc chamber unit on the magnetic drive assembly ▶ correctly engaged locking brackets 	<p>In case of faults:</p> <ul style="list-style-type: none"> ▶ remove any existent dirt ▶ if the housing is damaged or heavily worn, replace the complete arc chamber unit, refer to section „9.3.1 Replacing the complete arc chamber unit“ ▶ if there are holes in the housing walls, replace the complete arc chamber unit, refer to section „9.3.1 Replacing the complete arc chamber unit“ ▶ if there are broken ceramic plates in the arc chambers, replace the complete arc chamber unit, refer to section „9.3.1 Replacing the complete arc chamber unit“ ▶ adjust the arc chamber unit in correct position and firm seating ▶ check that the locking brackets are securely engaged
Main contacts (both, fixed contacts and movable contact bridge) (only required for devices with arc chamber, not permissible for devices without arc chamber)	<p>To check the main contacts, the arc chamber unit must first be removed, refer to section „9.3.1 Replacing the complete arc chamber unit“.</p> <p>The main contacts are then accessible and can be checked for:</p> <ul style="list-style-type: none"> ▶ damage or wear ▶ traces of combustion residue (slight soot deposits permitted) <p>A certain level of experience is required to assess the state of the contacts. Even after a few load switching cycles, to a lay user the contacts appear worn and the surroundings fouled. Replacement of the contactor is only necessary after more than 70% of the contact material is burnt off.</p> <p>Also refer to section „9.3.2 Checking the main contacts“</p>	<p>In case of faults:</p> <ul style="list-style-type: none"> ▶ if more than 70% of the contact material is burnt off, replace the main contacts <p>Refer to sections</p> <ul style="list-style-type: none"> - „9.3.3 Replacing the contact bridge“ - „9.3.4 Replacing the fixed contacts“
Auxiliary switch assembly	<p>Check for:</p> <ul style="list-style-type: none"> ▶ dirt ▶ damage or wear ▶ signs of short circuits <p>The auxiliary switches are visible for a simple optical inspection from the outside</p> <p>Under normal working conditions (no short circuit switching) the life time of the auxiliary switches exceeds those of the contactors.</p>	<p>In case of faults:</p> <ul style="list-style-type: none"> ▶ replace the complete auxiliary switch assembly, refer to section „9.3.5 Replacing the auxiliary switch assembly“
Magnetic drive unit Economy circuit for coil	<p>Check for:</p> <ul style="list-style-type: none"> ▶ dirt ▶ damage or heavy wear ▶ damage to the economy circuit or magnetic drive unit due to operation with impermissible, too high coil voltage 	<p>In case of faults:</p> <ul style="list-style-type: none"> ▶ if damaged or heavily worn, replace the complete magnetic drive unit ▶ if the economy circuit is defective, replace the complete magnetic drive. The fixed contacts and the contact bridge from the defective device can still be used

9.3 Corrective maintenance

The contactors are maintenance-free within the rated mechanical life time. The electrical life time depends on the number of switchings under heavy load conditions and may vary for different applications. In normal use, this corresponds to a decade-long operating period. However, in case of permanent heavy load switchings, failures, short-circuit switchings or in similar cases corrective maintenance may be necessary.

	⚠ WARNING
	<p>The use of unsuitable parts can lead to accidents and serious personal injury due to malfunctions.</p> <ul style="list-style-type: none"> ▶ Only use original spare parts! ▶ Do not combine single parts from different contactors!

9.3.1 Replacing the complete arc chamber unit

Safety

	⚠ DANGER
	<p>Before beginning any work on the contactors, make sure that</p> <ul style="list-style-type: none"> ▶ there is no voltage present, ▶ all safety regulations are fully observed. ▶ Refer also to section „Dangers and security measures“ on page 6.

Spare parts required

- Arc chamber complete, see chapter “10. Spare parts”

Tools required

- No tools required.

Removing the arc chamber unit

- ▶ Press and hold the 4 locking brackets at the top towards the unit (1) so that they release from the locking knobs (3) at the bottom.
- ▶ Remove the complete arc chamber unit (2) upwards from the magnetic drive unit (4).

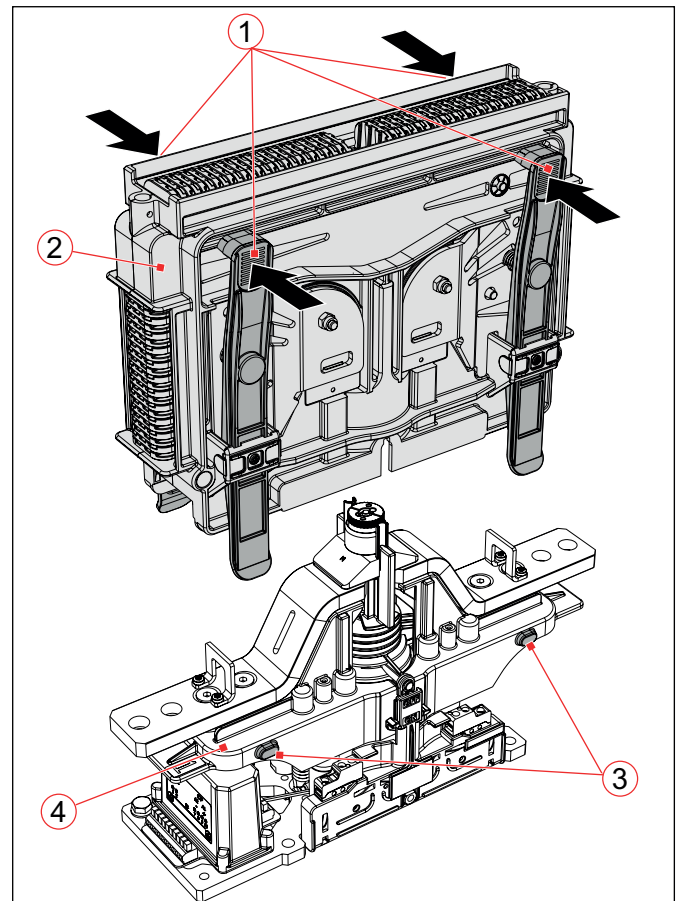


Fig. 29: Remove and install the arc chamber unit (large arc chamber)

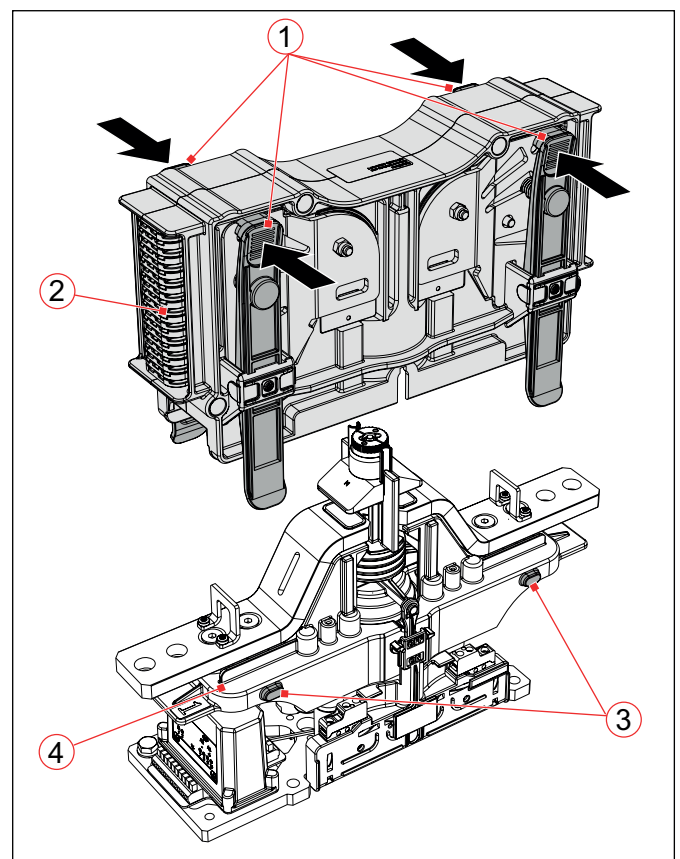



Fig. 30: Remove and install the arc chamber unit (medium arc chamber)

Installing the arc chamber unit

(refer to Fig. 29 and Fig. 30)

	⚠ WARNING
	<p>An improperly locked arc chamber can lead to accidents and serious personal injury due to malfunction.</p> <ul style="list-style-type: none"> ▶ Make sure that the arc chamber is securely locked.

NOTICE
<p>An improperly locked arc chamber leads to malfunctions and can destroy the contactor.</p> <ul style="list-style-type: none"> ▶ Make sure that the arc chamber is securely locked.


- ▶ Press and hold the 4 locking brackets at the top towards the unit (1).
- ▶ Place the complete arc chamber unit (2) on the magnetic drive unit (4).
 - Make sure that the locking brackets (1) at the bottom engage with the locking knobs (3) on the magnetic drive unit (4).
- ▶ Release the locking brackets (1).
 - The 4 locking brackets (1) have green markings on the upper side. After snapping these 4 locking brackets into place (correct seating), the green markings must be completely visible.
- ▶ Check that the arc chamber unit (2) is securely locked to the magnetic drive unit (4).

9.3.2 Checking the main contacts

This check is only required for devices with arc chamber, but not for devices with load-free breaking capacity. The cover of devices with load-free breaking capacity must not be removed.

If the main contacts need to be replaced, always replace all contacts (the moving bridge and the fixed contacts).

Safety

	⚠ DANGER
	<p>Before beginning any work on the contactors, make sure that</p> <ul style="list-style-type: none"> ▶ there is no voltage present, ▶ all safety regulations are fully observed. ▶ Refer also to section „Dangers and security measures“ on page 6.

Tools required

Suitable measuring tool to measure the minimum coating of contact material, e.g. feeler gauge, Vernier calliper.

Preliminaries

- The connecting cables or busbars of the main contacts are disconnected, see “8.4.6 Connecting the main contacts”.
- Only for contactor types with arc chamber: The arc chamber unit is removed, see “9.3.1 Replacing the complete arc chamber unit”.

Checking the main contacts for wear and tear

- ▶ Check the main contacts for damage, wear and tear, as well as traces of burn-off (slight soot deposits permitted). In doing so check both,
 - the contacts (1) at the fixed main contacts (3)
 - and the contacts (2) at the contact bridge (4).
- ▶ If the loss of contact material is more than 70%, replace the fixed contacts (3) and the contact bridge (4). See
 - “9.3.3 Replacing the contact bridge”
 - “9.3.4 Replacing the fixed contacts”
- ▶ If the main contacts are not damaged and not heavily worn, re-install the arc chamber unit. See “9.3.1 Replacing the complete arc chamber unit”

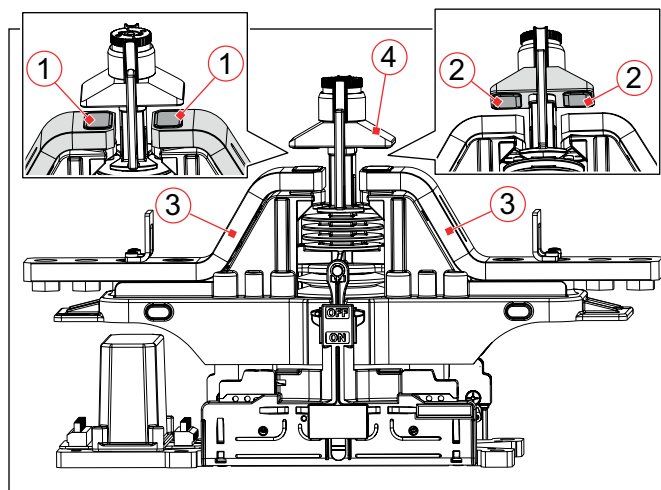



Fig. 31: NO/NC contactors only – check the main contacts

9.3.3 Replacing the contact bridge

The contact bridge only needs to be replaced for devices with arc chamber, but not for devices with load-free breaking capacity. The cover of devices with load-free breaking capacity must not be removed.

If the main contacts need to be replaced, always replace all contacts (the moving bridge and the fixed contacts).

Safety

	<p>⚠ DANGER</p>
	<p>Before beginning any work on the contactors, make sure that</p> <ul style="list-style-type: none"> ▶ there is no voltage present, ▶ all safety regulations are fully observed. ▶ Refer also to section „Dangers and security measures“ on page 6.

Spare parts required

- Contact bridge assembly
See chapter „10. Spare parts“.

Tools required

- Torque wrench

Preliminaries

- The connecting cables or busbars of the main contacts are disconnected, see “8.4.6 Connecting the main contacts”.
- For contactors with arc chambers: The arc chamber unit is removed, see “9.3.1 Replacing the complete arc chamber unit”.

Removing the contact bridge

- ▶ Unscrew the spring sleeve (1) by hand.
- ▶ Remove the spring (2) and the spring support (3).
- ▶ Remove the contact bridge (4).
- ▶ Dispose of the old parts 1 to 4.
- ▶ Continue with the replacement of the fixed contacts, see section “9.3.4 Replacing the fixed contacts”.

Installing the contact bridge

The new contact bridge assembly consists of spring sleeve (1), spring (2), spring support (3) and contact bridge (4). Use only the new parts 1 to 4.

- ▶ Slide on the new contact bridge (4).
- ▶ Attach the new spring support (3).
- ▶ Insert the new spring (2) into the new spring support (3).

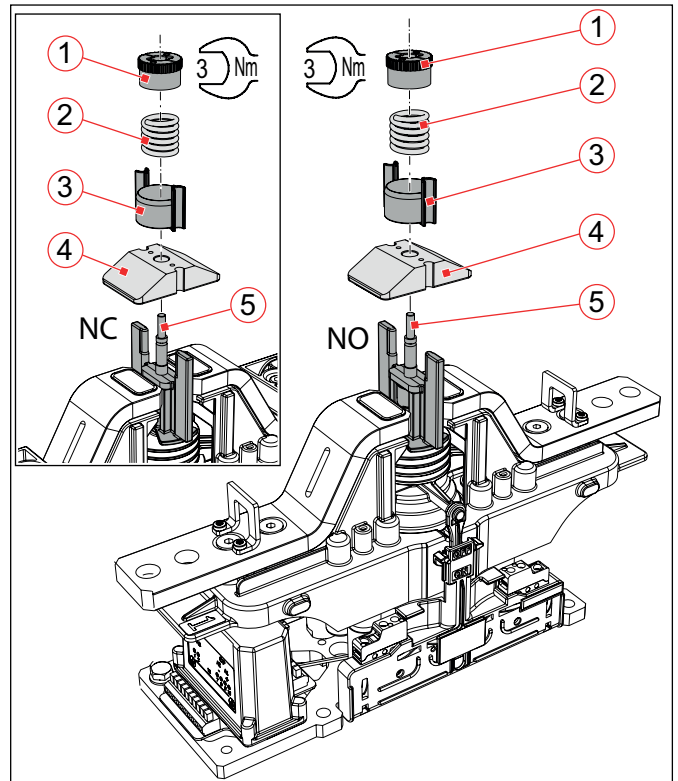


Fig. 32: NO/NC contactors with arc chambers – remove and install the contact bridge

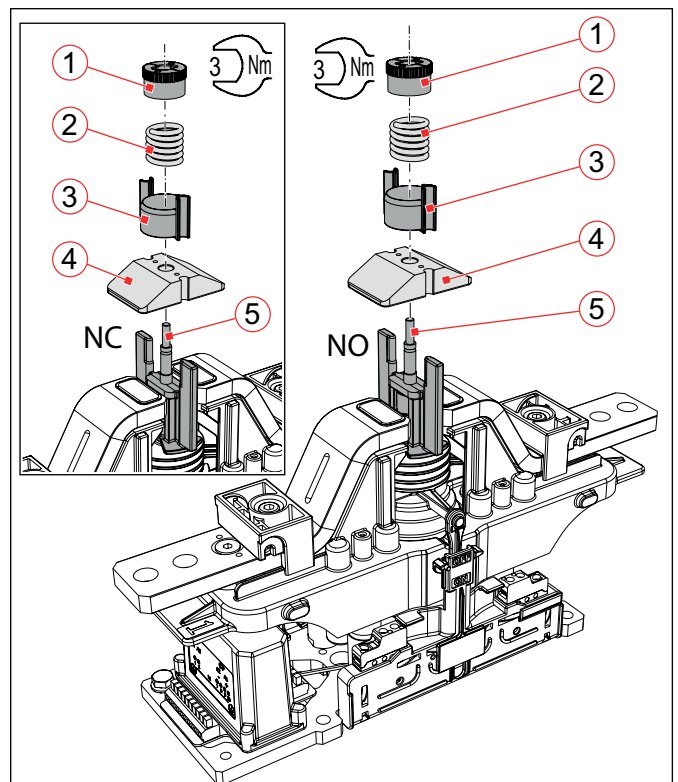


Fig. 33: NO/NC contactors with cover only – remove and install the contact bridge

- ▶ Screw the spring sleeve (1) by hand onto the thread of the switch rod (5) until it is flush with the switch rod. Tightening torque: 3 Nm.

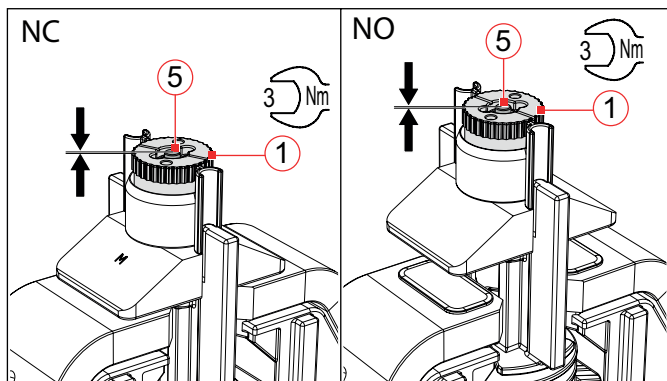


Fig. 34: NO/NC contactors – spring sleeve (1) and switch rod (5) must be flush

9.3.4 Replacing the fixed contacts

The fixed contacts only need to be replaced for devices with arc chamber, but not for devices with load-free breaking capacity. The cover of devices with load-free breaking capacity must not be removed.

Safety

	<p>⚠ DANGER</p>
	<p>Before beginning any work on the contactors, make sure that</p> <ul style="list-style-type: none"> ▶ there is no voltage present, ▶ all safety regulations are fully observed. ▶ Refer also to section „Dangers and security measures“ on page 6.

Spare parts required

- Set of main contacts, see chapter „10. Spare parts“.

Tools required

- Hexagon socket wrench set
- Set of torx bits
- Socket wrench set
- Open-end wrench set
- Torque wrench

Preliminaries

- The connecting cables or busbars of the main contacts are disconnected, see “8.4.6 Connecting the main contacts”.
- For contactors with arc chambers: The arc chamber unit is removed, see “9.3.1 Replacing the complete arc chamber unit”.

Removing the fixed contacts

NO/NC contactors with arc chambers:

- ▶ Unscrew and remove the two screws (1) on both sides.
- ▶ Remove the fixed contacts (2).
- ▶ For 600 A devices, additionally remove the bracket (3).

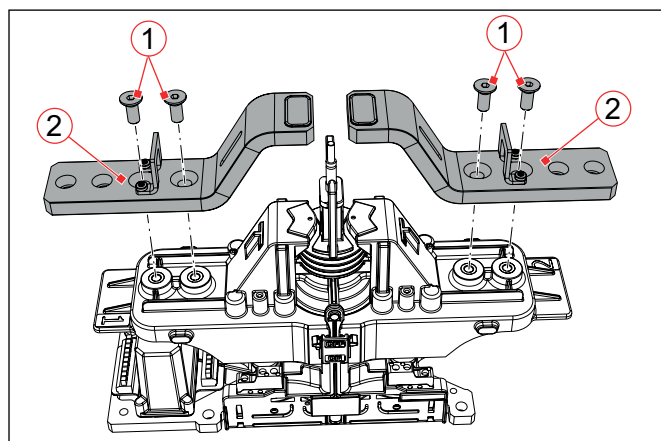


Fig. 35: 1,200 A and 2,000 A NO/NC contactors with arc chambers – remove the fixed contacts

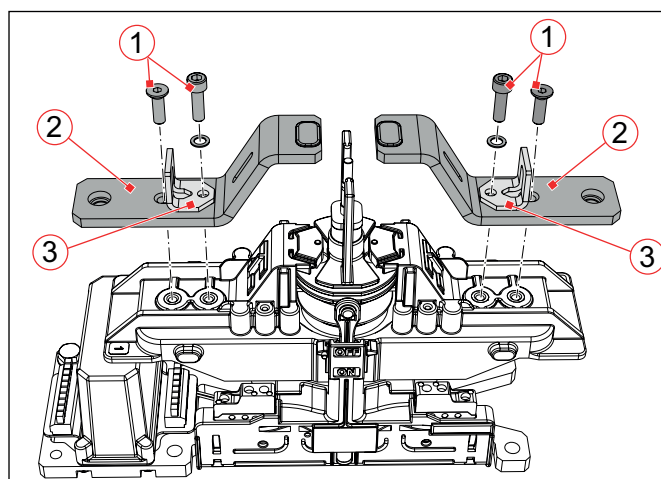


Fig. 36: 600 A NO/NC contactors with arc chambers – remove the fixed contacts

Installing the fixed contacts

NO/NC contactors with arc chambers:

- ▶ Place the new fixed contact (2) on the contact carrier surface.
- ▶ Push the fixed contact (2) towards the centre of the magnetic drive as far as it will go.
- ▶ Make sure that the fixed contact on the contact support side is tightly in touch with the contact carrier surface.
- ▶ Tighten the fixed contact with the two screws:
 - First tighten the inner screw (1a).
 - Then screw in the outer screw (1b).
- ▶ For 600 A devices, place the bracket (3) on the fixed contact as shown in **Fig. 38** and screw on the bracket together with the fixed contact using the screw (1a) and the washer.
- ▶ Tighten both screws to the specified torque:
 - For 1,200 A and 2,000 A devices with 12 Nm.
 - For 600 A devices with 7 Nm.
 - First tighten the inner screw (1a), then the outer screw (1b).
- ▶ To install the second fixed contact (2) repeat the steps above.

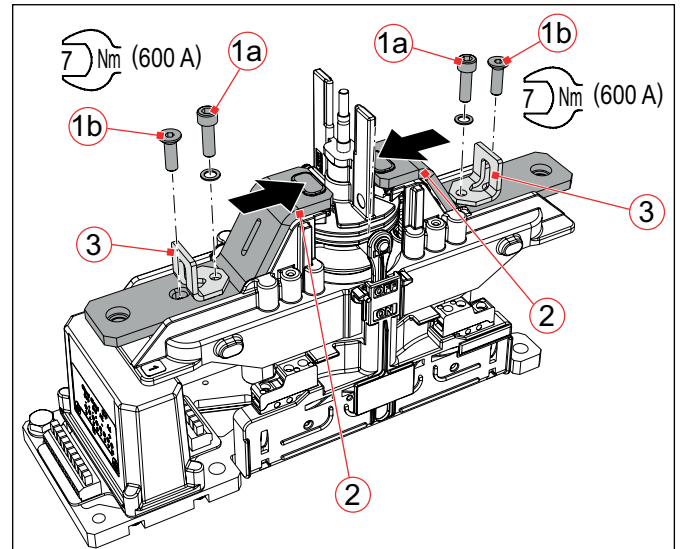


Fig. 38: 600 A NO/NC contactors with arc chambers – install the fixed contacts

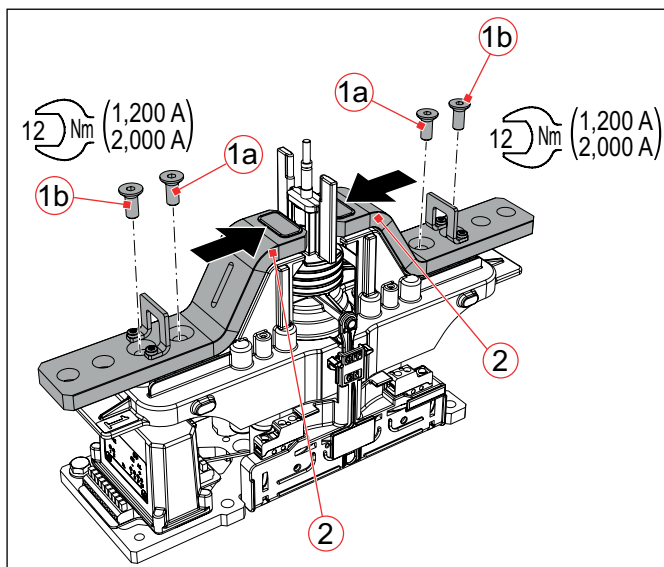



Fig. 37: 1,200 A and 2,000 A NO/NC contactors with arc chambers – install the fixed contacts

9.3.5 Replacing the auxiliary switch assembly

Safety

	⚠ DANGER
	Before beginning any work on the contactors, make sure that
	<ul style="list-style-type: none"> ▶ there is no voltage present, ▶ all safety regulations are fully observed.
	<ul style="list-style-type: none"> ▶ Refer also to section „Dangers and security measures“ on page 6.

Spare parts required

- Auxiliary switch assembly 2x S826
 - Auxiliary switch assembly 2x S870 a1/b0
- See chapter “10. Spare parts”

Tools required

- Hexagon socket wrench set
- Circlip pliers (external)
- Torque wrench

Preliminaries

- The CP main contactor is completely dismantled from the mounting frame or plate, see “8.2 Mechanical installation”.
- The control wires at the auxiliary switches are disconnected, see “8.4.4 Connecting the auxiliary switches”.

Removing the auxiliary switch assembly

Remove the auxiliary switch assembly on both sides.

On the right hand side:

- ▶ Remove the shaft circlip (1).
- ▶ Unscrew the 2 fixing screws (2).
- ▶ Pull the actuating arm from shaft (7) and remove the auxiliary switch assembly (3).

On the left hand side:

- ▶ Remove the shaft circlip (4) from the auxiliary switch shaft.
- ▶ Unscrew the 2 fixing screws (5).
- ▶ Pull the actuating arm from shaft (7) and remove the auxiliary switch assembly (6).

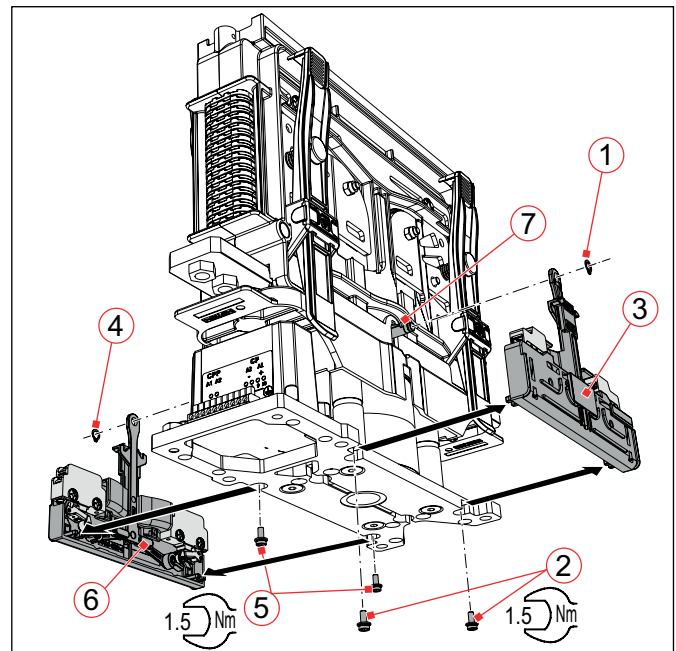


Fig. 39: NO/NC contactors – replace the auxiliary switch assembly

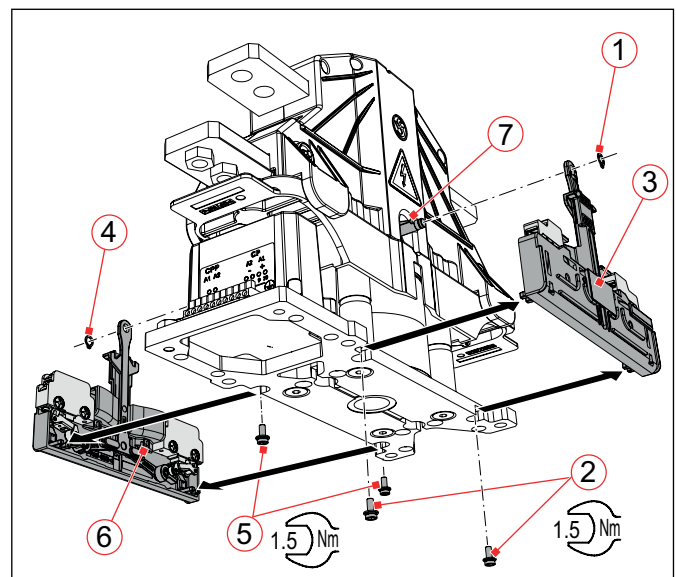


Fig. 40: CO contactors – replace the auxiliary switch assembly

Installing the auxiliary switch assembly

Install the auxiliary switch assembly on both sides.

On the right hand side:

- ▶ Position the new auxiliary switch assembly (3) and connect the actuating arm to the shaft (7).
- ▶ Screw in the 2 fixing screws (2).
- ▶ Tighten the 2 fixing screws (2) to a torque of 1.5 Nm.
- ▶ Install the shaft circlip (1) in the groove on the shaft (7).


On the left hand side:

- ▶ Position the new auxiliary switch assembly (6) and connect the actuating arm to the shaft (7).
- ▶ Screw in the 2 fixing screws (5).
- ▶ Tighten the 2 fixing screws (5) to a torque of 1.5 Nm.
- ▶ Install the shaft circlip (4) in the groove on the shaft (7).


On both sides (right and left):

- ▶ Reconnect the control wires to the auxiliary switches, see "8.4.6 Connecting the main contacts".

9.3.6 Replacing the optional pre-charging contactor (CPP)

	<p>A separate installation and maintenance manual is available for CPP contactors. Also refer to this separate manual <i>C45-m</i>. Available for download at: https://www.schaltbau.com/en/media-library/</p>
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Safety

	<p>⚠ DANGER</p>
<p>Before beginning any work on the contactors, make sure that</p> <ul style="list-style-type: none"> ▶ there is no voltage present, ▶ all safety regulations are fully observed. ▶ Refer also to section „Dangers and security measures“ on page 6. 	

Spare parts required

Pre-charging contactor (CPP), see chapter "10. Spare parts"

Tools required

- Set of torx bits
- Torque wrench

Preliminaries

- The CP main contactor is completely dismantled from the mounting frame or plate, see "8.2 Mechanical installation".
- The cables at the pre-charging contactor (CPP) are disconnected, see "8.4.8 Connecting the optional pre-charging contactor (CPP)".

Removing the pre-charging contactor (CPP)

With 1,200 A and 2,000 A devices

- ▶ Unscrew the 2 mounting screws (2).
- ▶ Remove the CPP (1).

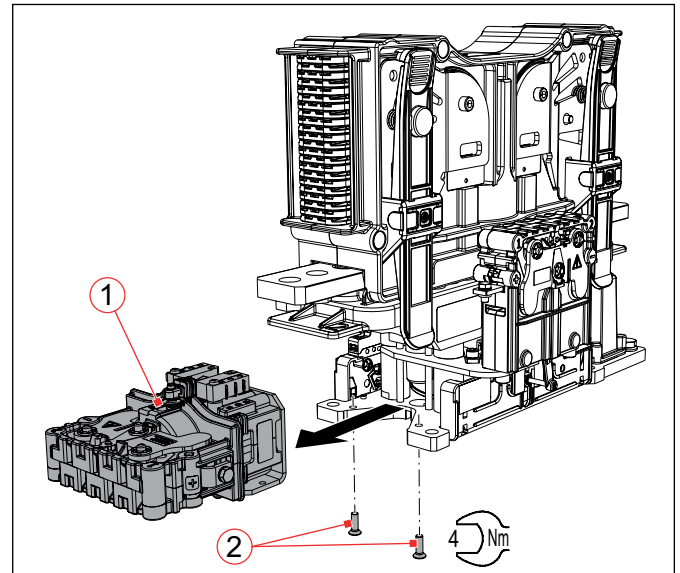


Fig. 41: With 1,200 A and 2,000 A devices: Replace the pre-charging contactor (CPP) mounted on the base plate of the main contactor

With 600 A devices

- ▶ Unscrew the 4 mounting screws (2) on the mounting flange of the CPP (1).
- ▶ Remove the CPP (1).

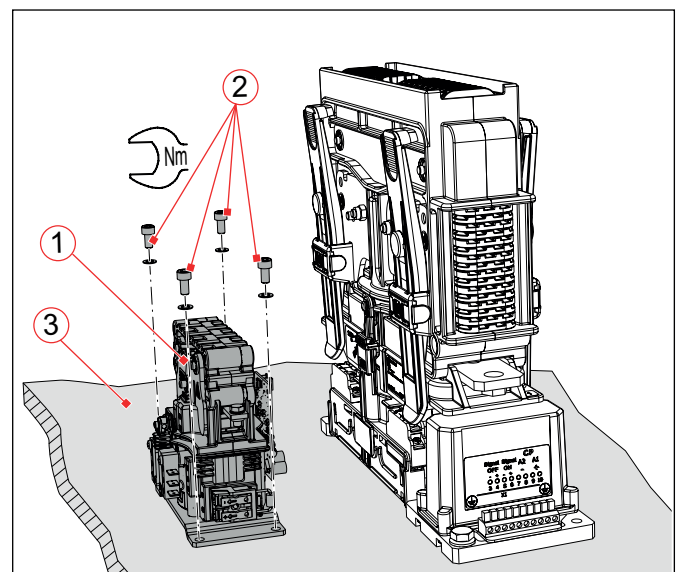


Fig. 42: With 600 A devices: Replace the pre-charging contactor (CPP) mounted at a separate mounting position next to the main contactor

Installing the pre-charging contactor (CPP)

With 1,200 A and 2,000 A devices


- ▶ Position the new CPP (1) on the base plate of the main contactor.
- ▶ Screw in the 2 fixing screws (2).
- ▶ Tighten the 2 fixing screws (2) to a torque of 4 Nm.
- ▶ Reconnect the cables to the CPP (1), see "8.4.8 Connecting the optional pre-charging contactor (CPP)".

With 600 A devices

- ▶ Ensure that the contact surfaces on the mounting plate (3) and the bottom of the CPP (1) are free from dirt and other contamination (e.g. metal chips).
- ▶ Position the new CCP (1) on the mounting plate (3)
- ▶ Screw the CCP (1) on the mounting flange to the mounting plate (3) using 4 mounting screws M5 including washers (2).
- ▶ Tighten the mounting screws to the specified torque, which depends on the strength class (min. 8.8) of the screws/nuts used.
- ▶ Reconnect the cables to the CPP (1), see "8.4.8 Connecting the optional pre-charging contactor (CPP)".

9.3.7 Replacing the optional high-voltage discharging contact (CPD)

Safety

	<p>⚠ DANGER</p>
	<p>Before beginning any work on the contactors, make sure that</p> <ul style="list-style-type: none"> ▶ there is no voltage present, ▶ all safety regulations are fully observed. ▶ Refer also to section „Dangers and security measures“ on page 6.

Spare parts required

High-voltage discharging contact (CPD), see chapter "10. Spare parts"

Tools required

- Set of torx bits
- Hexagon socket wrench set
- Circlip pliers (external)
- Torque wrench

Preliminaries

The cables at the high-voltage discharging contact (CPD) are disconnected, see "9.3.7 Replacing the optional high-voltage discharging contact (CPD)".

Removing the high-voltage discharging contact (CPD)

- ▶ Remove the shaft circlip (1).
- ▶ Unscrew and remove the two screws (2) including washers.
- ▶ Remove the CPD (3).

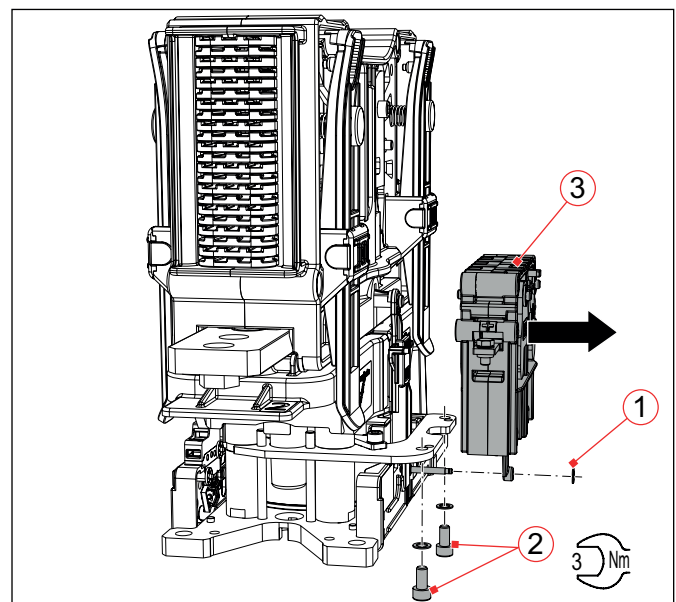


Fig. 43: NO/NC contactors – remove the high-voltage discharging contact (CPD)

Installing the high-voltage discharging contact (CPD)

- ▶ Position the new CPD (3).
- ▶ Connect the actuating arm to the shaft.
- ▶ Screw in the two screws (2) including washers and tighten them to a torque of 3 Nm.
- ▶ Install the shaft circlip (1) in the groove on the shaft.
- ▶ Reconnect the cables to the CPD (3), see “8.4.9 Connecting the optional high-voltage discharging contact (CPD)”.

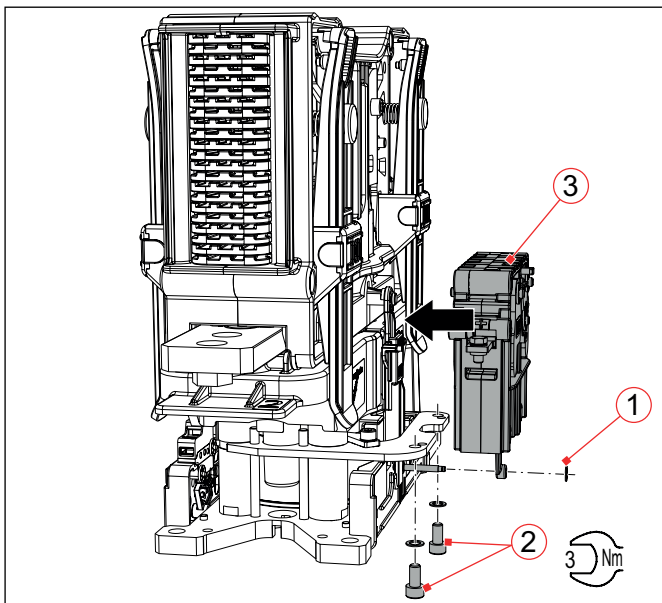


Fig. 44: NO/NC contactors – install the high-voltage discharging contact (CPD)

9.4 Checks

After the maintenance work, perform the following checks:

- ▶ Check that the contactors are correctly installed on the mounting plate or mounting frame and tightly screwed in place.
- ▶ Check that the connecting cables or busbars are correctly installed and fit tightly at the main contacts.
- ▶ Check that the control wires of the coil terminals are correctly installed and have the correct polarity.
- ▶ Check that the control wires are correctly connected to the auxiliary switches.
- ▶ Check the correct assignment and function of the auxiliary switches using a continuity tester.
- ▶ Check that the earthing cable is correctly installed and fits tightly at the earthing terminal.
- ▶ Ensure that the arc chambers are latched securely (only for devices with arc chambers).
- ▶ Switch the contactor several times without electric load in the main circuit.
- ▶ Check the pull-in and drop-off voltage based on the Schaltbau specifications. See catalogue **C40**. The catalogue is available under: <https://www.schaltbau.com/en/media-library/>
- ▶ 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

10. Spare parts



Important!

Depending on the type of contactor, different types of spare parts must be used. When ordering spare parts, always specify the precise type and article number of the contactor. You can find this data on the rating plate.

10.1 Pre-charging contactor (CPP)

Quantity	Spare part, designation
1	CPP 24 V
1	CPP 36 V
1	CPP 48 V
1	CPP 60 V
1	CPP 72 V
1	CPP 84 V
1	CPP 96 V
1	CPP 110 V

10.2 High-voltage discharging contact (CPD)

Qty	Spare part, designation
1	CPD

10.3 Auxiliary switch assembly

Qty	Spare part, designation
1	Auxiliary switch assembly 2x S826
1	Auxiliary switch assembly 2x S870 a1/b0

10.4 Arc chamber complete

Qty	Spare part, designation
1	Size 1: 600A-4MW Size 2+3: 1,200/2,000 A - 10MW
1	Size 1: 600A-2MW Size 2+3: 1,200/2,000 A - 5MW

10.5 Main contacts

Qty	Spare part, designation
1	NO/NC devices 600 A: Set of main contacts
1	NO/NC devices 1,200 A: Set of main contacts
1	NO/NC devices 2,000 A : Set of main contacts

10.6 Contact bridge assembly

Consisting of spring sleeve, spring, spring support and contact bridge, see also *Fig. 32* and *Fig. 33* on page 33

Qty	Spare part, designation
1	NO devices 600 A: Contact bridge assembly
1	NO devices 1,200 A: Contact bridge assembly
1	NO devices 2,000 A: Contact bridge assembly
1	NC devices 600 A: Contact bridge assembly
1	NC devices 1,200 A: Contact bridge assembly
1	NC devices 2,000 A : Contact bridge assembly

10.7 Magnetic drive complete (without main contacts)

Qty	Spare part, designation	NO	NC	CO
1	Magnetic drive complete 24 V DC			
1	Magnetic drive complete 36 V DC ... 48 V DC	M	N	B
1	Magnetic drive complete 72 V DC ... 110 V DC	M	N	B
1	Magnetic drive complete 220 V DC / 230 V AC	M	N	B

M = monostable (on via supply voltage)

N = monostable (on via separate control input)

B = bi-stable

11. Technical Data

Technical data and information for the contactors of the CP series contactors are given in our *C40 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/en/media-library/>

12. 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.

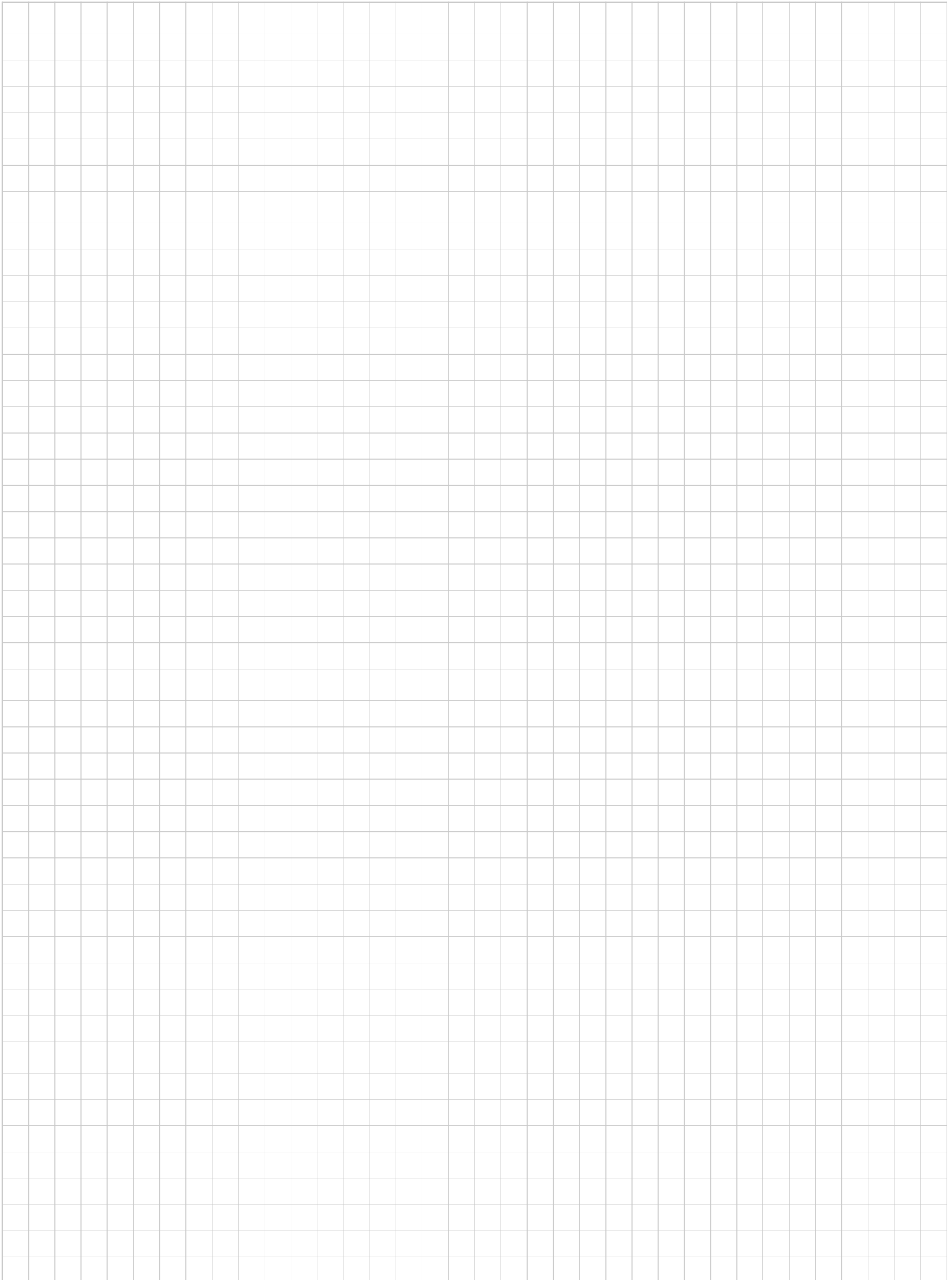
This product or parts of it may not be disposed with other household wastes.

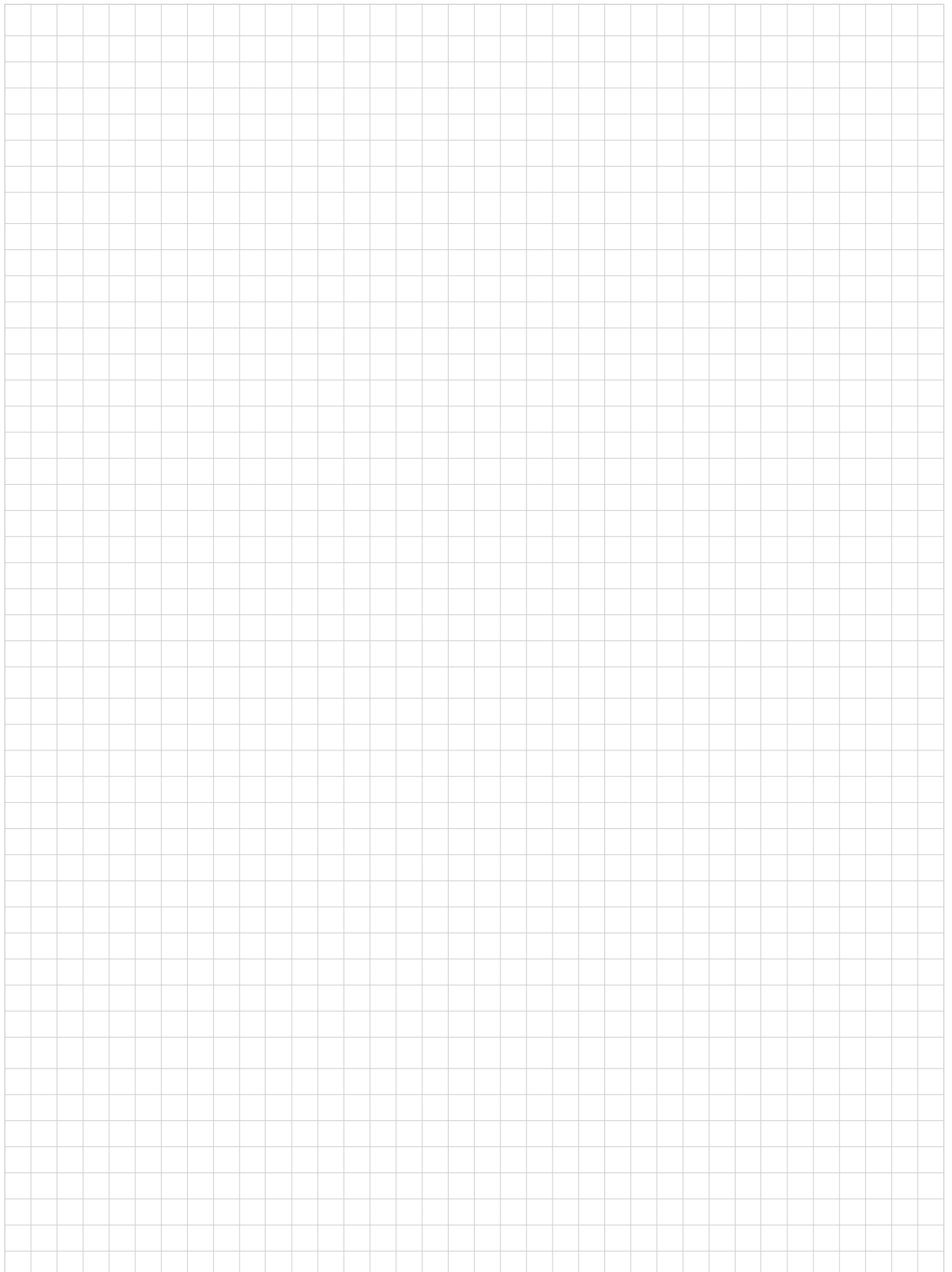
To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this product or parts of it from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

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.

Notes





Schaltbau GmbH

For detailed information on our products and services visit our website – or give us a call!

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with compliments:



The production facilities of Schaltbau GmbH have been IRIS certified since 2008.



Certified to DIN EN ISO 14001 since 2002. For the most recent certificate visit our website.



Certified to DIN EN ISO 9001 since 1994. For the most recent certificate visit our website.

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