

C801

1 pole bi-directional DC high-voltage interlock contactors with high current carrying capacity and extreme shock resistance for electric vehicles

Installation and maintenance manual

Document Revision History

Date	Rev. version	Description	Pages
2024-09-25	V1.0	1st edition	All

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Important basic information

Legal notes

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Conventions for this manual

This manual describes C801 single pole bi-directional DC high-voltage interlock contactors with high current carrying capacity and extreme shock resistance for electric vehicles.

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:

Symbol/signal word	Meaning	Possible consequences
 DANGER	Directly threatening danger	Death or severe injuries will result
 WARNING	Dangerous situation	Death or severe injuries may occur
 CAUTION	Dangerous situation	Slight or minor injuries may occur
 ATTENTION	Warning of possible property damage	Material damage to the system, assemblies or nearby property may occur
 INFO	Notes on technical features, methods for simplifying work or other information of particular importance	

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 of 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.

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!

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

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 **C801 catalogue** may be overridden. The C801 catalogue is available under: www.schaltbau.com
- 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.

Hazards and safety precautions

Electrical hazards

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.

- 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.

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 C801**. The C801 catalogue is available under: www.schaltbau.com

Other hazards

WARNING

Contactors must only be used for the purposes specified in the specifications and data sheets. Incorrect use can cause accidents and severe personal injury.

- The manufacturer will not be responsible for accidents arising from improper use of the product

CAUTION

During continuous operation the contactors may become hot. Risk of burns!

- Before beginning any checks or maintenance on the contactors ensure that the heated components have cooled down.

CAUTION

The contactors contain sharp-edged parts. Risk of injuries!

- Use appropriate tools for installation and maintenance work on the contactors.
- Wear safety gloves when handling sharp-edged components.

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

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.
-

C801 - 1 pole bi-directional DC high-voltage interlock contactors for electric vehicles

Features

Powerful electric vehicles usually use two battery banks, each with 400 volts, interconnected to form an 800 volt system in the drive train.

This ensures high performance while driving. Only a few 800 volt high-performance charging stations are available. However, interlock contactors enable 800 volt electric vehicles to charge quickly and easily at 400 volt charging stations. For this purpose, interlock contactors of the C801 series configure both battery banks during the charging process so that they are charged in parallel. The robust, durable contactors do not require inert gas and have a high current-carrying capacity.

A patented mechanical interlock system ensures extreme shock resistance during normal operation. This prevents uncontrolled closing of the main contacts and the possibility of a short circuit of both battery units in the event of a collision.

- Interlock contactor in the NO position with a patented mechanical locking and extremely high shock resistance prevents uncontrolled closing of the main contact system during normal operation. This significantly increases safety.
- Compact dimensions and a high rated insulation voltage U_i up to 1,000 volts with generously dimensioned air gaps in the contact area. The design is based on standard mounting geometries.
- High thermal continuous current I_{th} up to 250 amps and a high short-time withstand current rating I_{cw} up to 16,000 amps thanks to high contact forces and optimised contact geometry.
- Universal, flexible and resource-efficient - Schaltbau interlock contactors enable powerful 800 volt e-vehicles to charge quickly even at 400 volt charging stations. Special charging cables are not required. In addition, lower cross-sections can be selected for the copper wiring in the vehicle.

Standards

- **ISO 16750-3**
Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 3: Mechanical loads

Technical information and material properties

For technical information and material properties, refer to the corresponding data sheets and to our **C801 catalogue**. The C801 catalogue is available under: www.schaltbau.com

C801-250-G0Y... (external PWM control and suppressor diode to be implemented by customer)

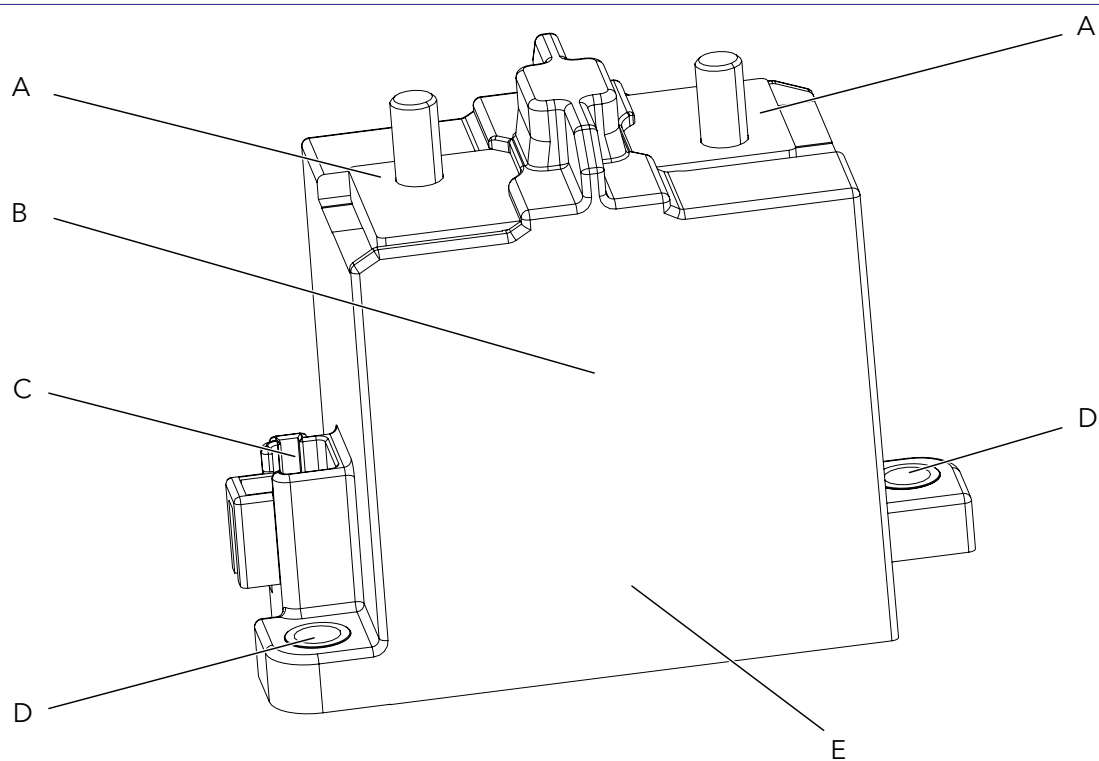


Fig. 1: C801-250-G0Y... (external PWM control and suppressor diode to be implemented by customer)

- | | | | |
|---|---|---|--|
| A | Main contact system
- Massive designed 1-pole contact system
- Connections thread M6, tightening torque: 6.8 ... 9.2 Nm | C | Coil connector: 2-pole connector with locking, connection for Yazaki 7283-1020 |
| B | Switching chamber
- Interlock in NO position: Patented mechanical interlock for extreme vibration and shock resistance | D | Two boreholes with overmoulded bushes for screw mounting with two M5 screws, tightening torque: 4.25 ... 5.75 Nm |
| | | E | Magnetic drive (behind the cover) |

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.

Unpacking

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.

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.
-

Installation

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 **catalogue C801**. The C801 catalogue is available under: www.schaltbau.com

Preparatory measures

- A suitable mounting plate with 2 mounting holes must be provided according to the following dimensional drawings (Fig. 2).
- 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 4.25 ... 5.75 Nm (for screws with property class 8.8).

Mounting holes

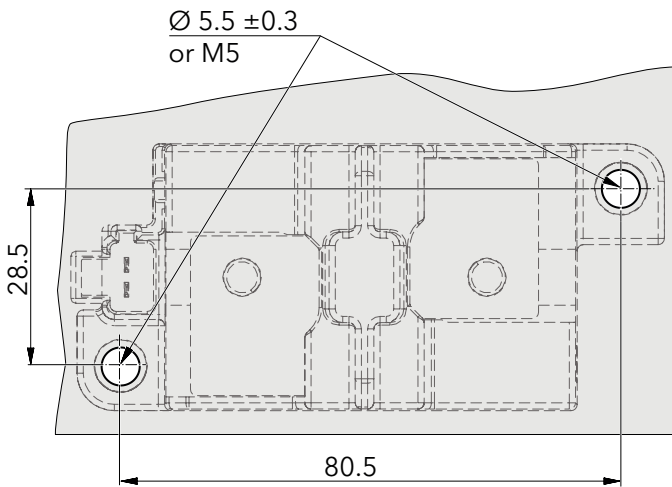


Fig. 2: C801-250-G0Y...: Dimensions and layout of mounting holes

Mounting orientations

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

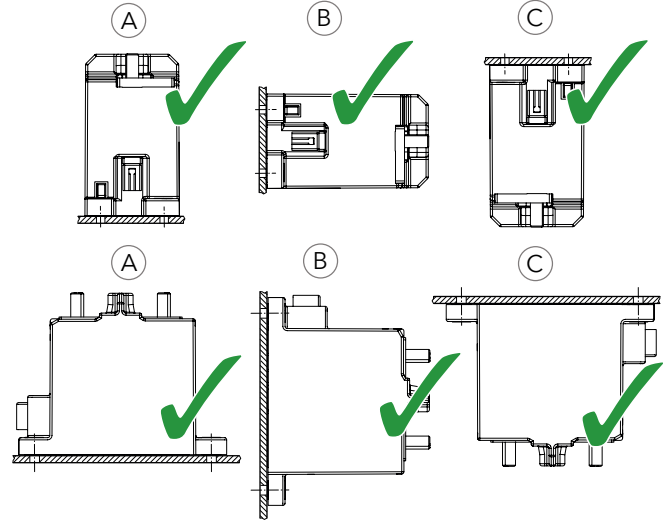


Fig. 3: C801-250-G0Y...: Examples of permissible mounting orientations

Safety

Installation must be performed by qualified trained personnel.

ATTENTION

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

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.

Installing the contactor

Tools required

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

Procedure

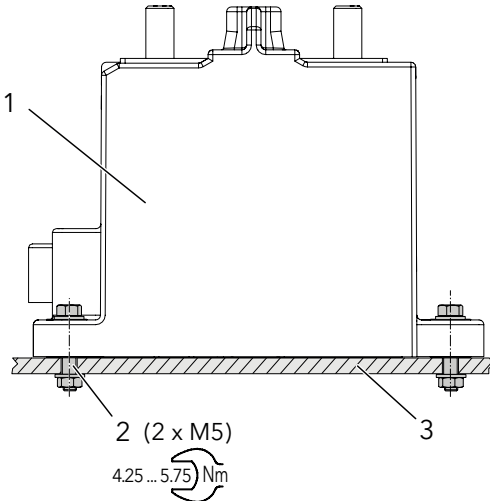


Fig. 4: C801-250-G0Y...: Installing the contactor on the mounting plate

1. Ensure that the contact surfaces on the mounting plate (3) are free from dirt and other contamination (e.g. metal chips).
2. 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!

3. Secure the contactor (1) with its base plate to the mounting plate (3) using 2 M5 mounting screws (2).
4. In designs with the mounting holes implemented as threaded holes, screw the mounting screws into the holes directly, not forgetting the washers.
5. In designs with through holes, fit the mounting screws and washers and tighten the screws using suitable screw locking elements and nuts.
6. Thighten the mounting screws (2) to a torque of 4.25 ... 5.75 Nm (for screws with property class 8.8).

Electrical connection

Electrical data and other technical specifications

For the power consumption of the magnetic drive system and electrical data as well as other technical specifications, refer to the respective data sheets and to our **C801 catalogue**. The C801 catalogue is available under: www.schaltbau.com

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 **C801 catalogue** and must be adhered to. The C801 catalogue is available under: www.schaltbau.com
- The connecting wires of the main power circuit must be fitted with appropriate ring terminals suitable for M6 terminal nuts.
- Schaltbau recommends Schnorr washers (or similar) to prevent the terminal nuts from coming loose.
- The main terminal nuts must be tightened to the specified torque of 6.8 ... 9.2 Nm (for nuts with property class 8.8).
- The connection for the coil drive system is made with a Yazaki connector. Consequently, the wires must be connected to a corresponding connector.
- For the power consumption of the coil drive system and the electrical data refer to our **C801 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

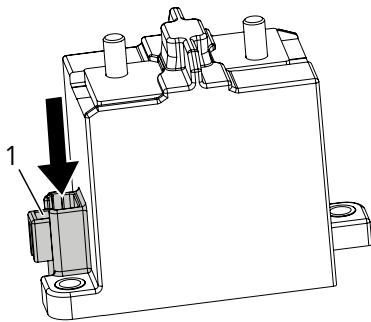
- Socket spanner set, hexagon nuts
- Open-ended spanner set
- Torque wrench
- Cable ties

Connecting the coil drive

The connection for the coil drive is made via the Yazaki 7283-1020 connector.

For wiring the corresponding connector, see the connector manufacturer's assembly instructions.

For the pin assignment refer to our **catalogue C801**. The C801 catalogue is available under: www.schaltbau.com



1. Plug the wired connector into the counterpart (1) on the contactor.

Fig. 5: C801-250-G0Y...: Connecting the coil drive

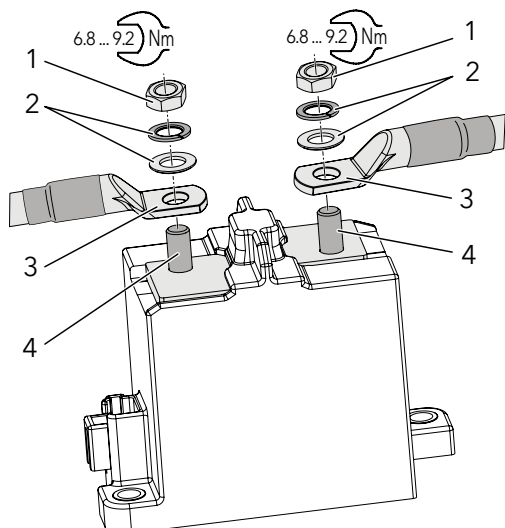
Connecting the main contacts

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 suitable for M6 terminal screws.



1. Route the pre-assembled connecting wires to both main contacts (4).
2. Screw the ring terminals (3) to the threaded bolts (4) on the main contacts using the M6 terminal nuts (1) and suitable screw locking elements (2). Schaltbau recommends using Schnorr washers (or similar).
3. Tighten the terminal nuts (1) to a torque of 6.8 ... 9.2 Nm.

Fig. 6: C801-250-G0Y...: 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.

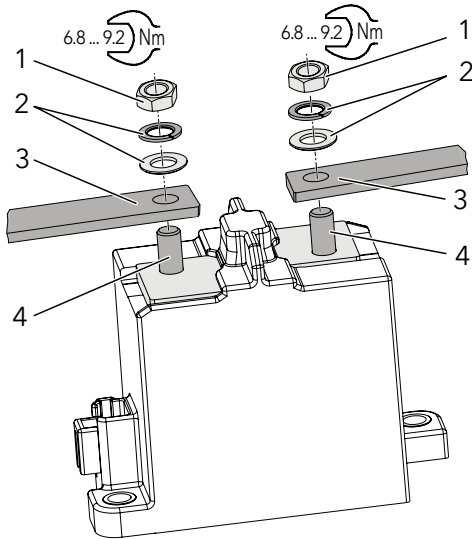


Fig. 7: C801-250-G0Y...:Connecting the main contacts (connection example using busbars)

1. Route the busbars (3) to both main contacts (4).
2. Screw the busbars (3) to the threaded bolts (4) on the main contacts using the M6 terminal nuts (1) and suitable screw locking elements (2). Schaltbau recommends using Schnorr washers (or similar).
3. Tighten the terminal nuts (1) to a torque of 6.8 ... 9.2 Nm.

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.
- 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.
- 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 **C801 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.

Maintenance

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

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.

Preventive maintenance

Contactors of the C801 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.

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

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.

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.

DANGER

If damage to the contactor, wires or busbars is visible, the safety of the contactor is no longer guaranteed.

- Immediately replace a damaged contactor.
- Immediately replace damaged components such as wires, cable lugs or busbars.

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.

Regular tests/checks

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

Technical Data

Technical data and information on the material properties for the contactors of the C801 series are given in our **C801 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: www.schaltbau.com

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.

We enable electrification for a sustainable future

Schaltbau is a global technology leader specializing in contactors, connectors, switches, and electrical devices.

As pioneers of electrification, Schaltbau has been championing safety on rail for generations. Building on nearly a century of rail experience, with our sub-brand Eddicy we also create future-oriented products and solutions with the highest standards of safety and reliability to switch, connect, control and protect DC applications in energy and e-mobility.

Headquartered in Germany, Schaltbau has a worldwide presence with 12 production and sales sites on all major continents.

Find out more on www.schaltbau.com.