SCHALTBAU
Connect Contact Control

3

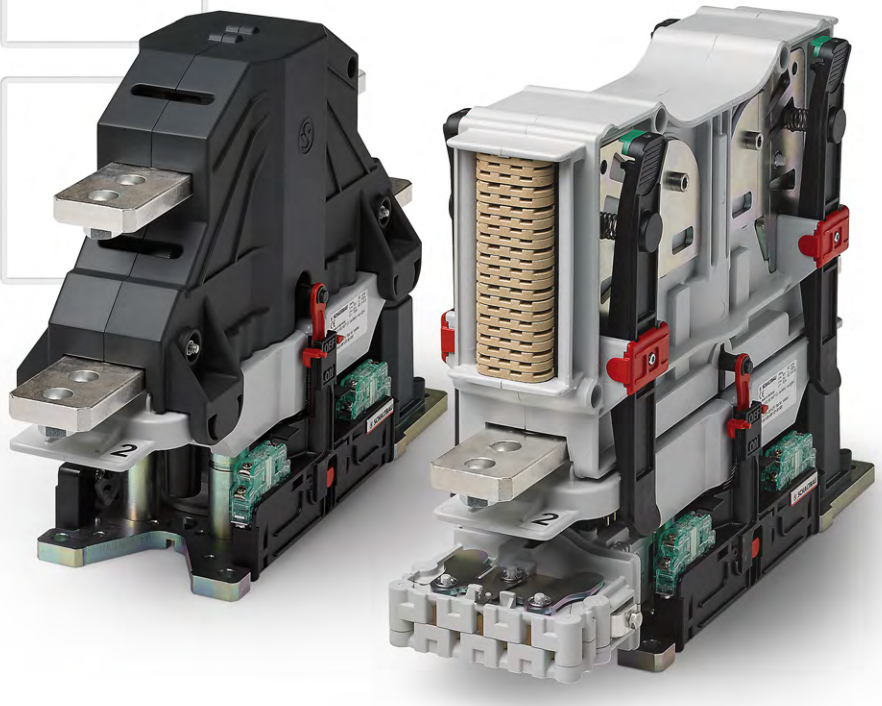
Contactors

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

Date	Rev. Level	Description	Pages
2020-07-20	V1.0	Initial version	all
2021-04-12	V1.1	Modi cation of torque values General adaptations	7, 10, 22, 24-26, 30, 33-35, 40, 41

Content

1. Important basic information 4
   - 1.1 Legal notes 4
   - 1.2 Conventions for this manual 4
2. General and security information 4
   - 2.1 Observing the instructions 5
   - 2.2 User obligations 5
   - 2.3 Intended use 5
   - 2.4 Ambient conditions 6
3. Dangers and security measures 6
   - 3.1 Electrical dangers 6
   - 3.2 Other dangers 7
   - 3.3 Measures for avoiding damages and malfunctions 8
4. Introduction 9
   - 4.1 CP series – 1 and 2 pole bi-directional high-voltage contactors, disconnectors, changeover switches for DC and AC 9
   - 4.2 Features 9
   - 4.3 Applications 9
   - 4.4 Technical information and material speci cation 9
5. Description 10
   - 5.1 Survey of the CP series (stock items) 10
   - 5.2 Modular con guration options 11
   - 5.3 Con guration examples 12
6. Storage 14
7. Unpacking and handling 14
   - 7.1 Unpack the device 14
   - 7.2 Check parts for transport damage 14
8. Installation 15
   - 8.1 Mounting positions 15
     - 8.1.1 Dimensions/interfaces and further technical speci cations 15
   - 8.2 Mechanical installation 15
     - 8.2.1 Preparatory measures 15
     - 8.2.2 Required minimum clearance 16
     - 8.2.3 Ventilation requirements 16
     - 8.2.4 Mounting holes 16
     - 8.2.5 Safety 16
     - 8.2.6 Tools required 17
     - 8.2.7 Installation procedure 17

8.3 Installation of the optional pre-charging contactor (CPP) 18
8.3.1 Installation of the CPP with 1,200 A and 2,000 A devices 18
8.3.2 Installation of the CPP with 600 A devices 19
8.4 Electrical Installation 20
8.4.1 Preparatory measures 20
8.4.2 Safety 21
8.4.3 Tools required 21
8.4.4 Connecting the auxiliary switches 22
8.4.5 Connecting the coil terminals 23
8.4.6 Connecting the main contacts 24
8.4.7 Connecting the earth terminal 25
8.4.8 Connecting the optional pre-charging contactor (CPP) 26
8.4.9 Connecting the optional high-voltage discharging contact (CPD) 26
8.5 Checks 27
9. Maintenance 28
9.1 Safety 28
9.2 Preventive maintenance 28
9.2.1 Intervals for regular checks 28
9.2.2 Regular check activities 29
9.3 Corrective maintenance 31
9.3.1 Replacing the complete arc chamber unit 31
9.3.2 Checking the main contacts 32
9.3.3 Replacing the contact bridge 33
9.3.4 Replacing the fixed contacts 34
9.3.5 Replacing the auxiliary switch assembly 36
9.3.6 Replacing the optional pre-charging contactor (CPP) 37
9.3.7 Replacing the optional high-voltage discharging contact (CPD) 38
9.4 Checks 39
10. Spare parts 40
10.1 Pre-charging contactor (CPP) 40
10.2 High-voltage discharging contact (CPD) 40
10.3 Auxiliary switch assembly 40
10.4 Arc chamber complete 40
10.5 Main contacts 40
10.6 Contact bridge assembly 40
10.7 Magnetic drive complete (without main contacts) 40
11. Technical Data 41
12. Disposal 41

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, commisioning 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 CP2115/06 CP3115/06	CP1115/12 CP2115/12 CP3115/12	CP1115/20 CP2115/20
3,000 V	CP1130/06 CP2130/06 CP3130/06	CP1130/12 CP2130/12 CP3130/12	CP1130/20 CP2130/20

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

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

Since the CP series devices o er a wide range of con guration options, not all possible con gurations can be presented in this manual.
Even if the con gurations shown do not correspond ex actly 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 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.

The operation, maintenance and installation instructions for the contactors must therefore be strictly followed.
Any uncertainties must be clari ed 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 sta 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 sta who meets the requirements set out in this manual.
- Sta 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 modi cations, 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 speci cation and the instructions in this manual.
- None of the operating conditions de ned in our catalogues C40 in section “Speci cation“, 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 o is optimally attuned to the contactor‘s switching behaviour. The existing opening characteristic must not be negatively in uenced by parallel connection with an external diode.
- Improper handling of the contactors, e.g. when hitting the oor 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 tamper ing 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 speci c ambient conditions.

- Operate the contactors only according the ambient conditions, like temperature ranges, IP protection classes, degree of soiling, etc., as de ned in our catalogue C40 in section “Speci cation“. The catalogue is available under: https://www.schaltbau.com/en/media-library/

3. Dangers and security measures

3.1 Electrical dangers

DANGER

The contactors are high voltage switches. The touching of electrically conducting parts may result in serious injuries or even death!
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.
Before beginning any work on the contactors, always observe the following safety regulations:

- 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.

DANGER

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!

- Make sure that the contactors are connected to earth.
- Make sure that the wire gauge of the earthing cables complies with the speci c short circuit conditions.

DANGER

In the case of a failure of the equipment;

- don‘t use it anymore
- immediately contact the manufacturer.

DANGER

Interventions in the equipment may cause serious impairments to the safety of men and construc tions. They are not permissible and lead to an exclusion of liability and warranty.

DANGER

All checks and the replacement of components or groups of components may only be carried out by quali ed personnel according to the instructions of Schaltbau. All spare parts must be parts de livered by or released by Schaltbau.

3.2 Other dangers

WARNING

Exclusively use the contactors for purposes as indicated in the specications and data sheets. A wrong application can cause accidents and severe damages to persons!

- The manufacturer doesn‘t take the responsibility for accidents which were caused by improper use of the product.

WARNING

The contactor is heavy. Risk of injury and damage to the device.

- 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.

CAUTION

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!

- Before beginning any work on the contactors make sure that the heated components have cooled down.

CAUTION

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

- 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 uids may damage the contactors.

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

NOTICE

Improper handling of the contactors, e.g. when hitting the oor 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 oor.
- 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 o , strong electromagnetic elds are generated in the surroundings of the contactors. These may in uence other components close to the contactors.

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

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

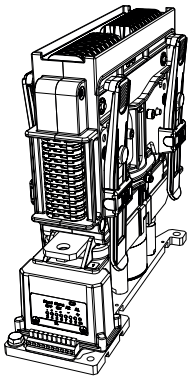
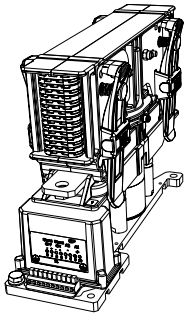
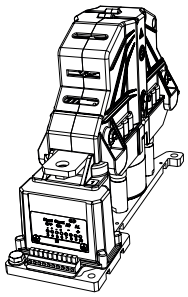
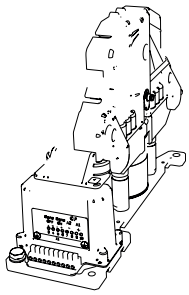
Switchgear for the configuration of electrical system

- 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