

3

Contactors

CL1115/02
CL1215/02
CL1315/02

1-, 2- and 3- pole
Medium-Power and
Pre-Charge contactors
for AC and DC

Installation and
maintenance instructions

Manual C25-M.en



Conventions for this Manual

To highlight particularly important instructions, the following symbols are used in this handbook.



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



DANGER refers to processes/operations which have to be followed exactly in order to avoid personal injuries.



CAUTION refers to processes/operations which must be followed to avoid damaging structural components, the system or other user materials.



WARNING refers to hazardous electrical voltages.

General legal notice

- CL1000 contactors must only be used under operating conditions according to the technical specification and the instructions in this manual.
- CL1000 contactors must only be used when all protective devices are present, have been installed properly and are fully operational.
- CL1000 contactors must not be converted or otherwise modified without prior consent of SCHALTBAU GmbH. Violations against this will result in the exclusion of liability on the part of the manufacturer.
- We reserve the right to make technical alterations without prior notice.
- For updated product information visit www.schaltbau-gmbh.com.
-
- Furthermore, we refer to our “General Terms and Conditions of Sale (GCS) for Goods and Services”.

Copyright notice

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Introduction

CL1015/02 contactors are medium power contactors for AC and DC applications. They can especially be used in standard converter configurations as pre-charge contactors. The design is based on Schaltbau contactor C295 with metallic splitter plates for arc breaking.

CL1015/02 P contactors have a permanent magnetic blow-out for DC operations. CL1015/02 X contactors without magnets are for AC operations.

- CL1015/02 contactors are designed for nominal voltages of 1,500 V.
- CL1015/02 contactors are designed for conventional thermal currents of 200 A.
- CL1015/02 contactors are available in 1-, 2-, and 3- pole versions.
- CL1015/02 contactors can be mounted horizontally and vertically.

CL1015/02 contactors have been designed and tested according to National and International Railway Standards. Due to their unique features they can also be used in a variety of industrial applications.

CL1015/02 contactors offer the following design-related advantages:

- Compact, rugged design
- Double-break contacts, cadmium-free contact tips
- 1-, 2-, and 3- pole versions
- Easy maintenance:
 - Easy inspection of main contact tips, easy replacement of main contacts
 - Easy replacement of complete arc chamber
- Magnetic drive system suitable for standard railway supply voltages and tolerances. No economy circuit required. Magnetic drive systems for industrial applications on demand.
- Insulation coordination:
 - Functional insulation for main circuit
 - Basic insulation between main circuit and protective earth
 - Reinforced insulation between main circuit and control circuit / main circuit and auxiliary circuits
- Long mechanical and electrical life
- No regular maintenance required. Inspection intervals and exchange of wear parts depending on specific application.

Safety information

Electrical hazards



CL1000 contactors are high-voltage switches. Getting into contact with conductive parts of the contactors can result in serious injury or even death!

Active parts are all piece parts associated with the main circuit. All metal parts visible may potentially become active under fault conditions. A respective label is attached to the contactor. This label must not be removed.

For safety reasons the contactors must be connected to earth. An earth terminal is provided for that purpose. The wire gauge must be observed according to the specific short-circuit conditions.



Before carrying out any inspection and maintenance work on CL1000 contactors, the contactors must be de-energized and in addition life wires made safe by earthing. If the environment has no disconnecting and earthing device, other suitable measures must be used to ensure that no voltage is present. Please make sure that any capacitors in the main circuit are discharged before touching main wires. We recommend securing the supply lines to prevent switching back on.

Safety notices



All inspections and the replacement of components may only be performed by qualified personnel and must be done according to Schaltbau specification.

All components which have to be replaced must be original components defined by Schaltbau.



During continuous operation the contactors will warm up. It is recommended to wait an appropriate time before starting any service and touch the contactors.

General application notes



CL1000 contactors are designed to be mounted in environments defined by pollution degree PD3 according to EN60077-1:

Pollution degree PD3

Conductive pollution or dry non-conductive pollution occurs which becomes conductive due to condensation which is to be expected.

Example: Indoor location not directly exposed to rain, snow and heavy dust.



CL1000 contactors for DC operation contain magnets for the permanent-magnetic blow-out. Make sure that these magnets do not attract any ferromagnetic particles into the contactors, either opened or closed.

These magnets may destroy data on credit cards or such.

During the short time of the switching-off operation strong magnetic fields are generated in the vicinity of the pole plates. They may affect other components close to the contactor.

Technical data

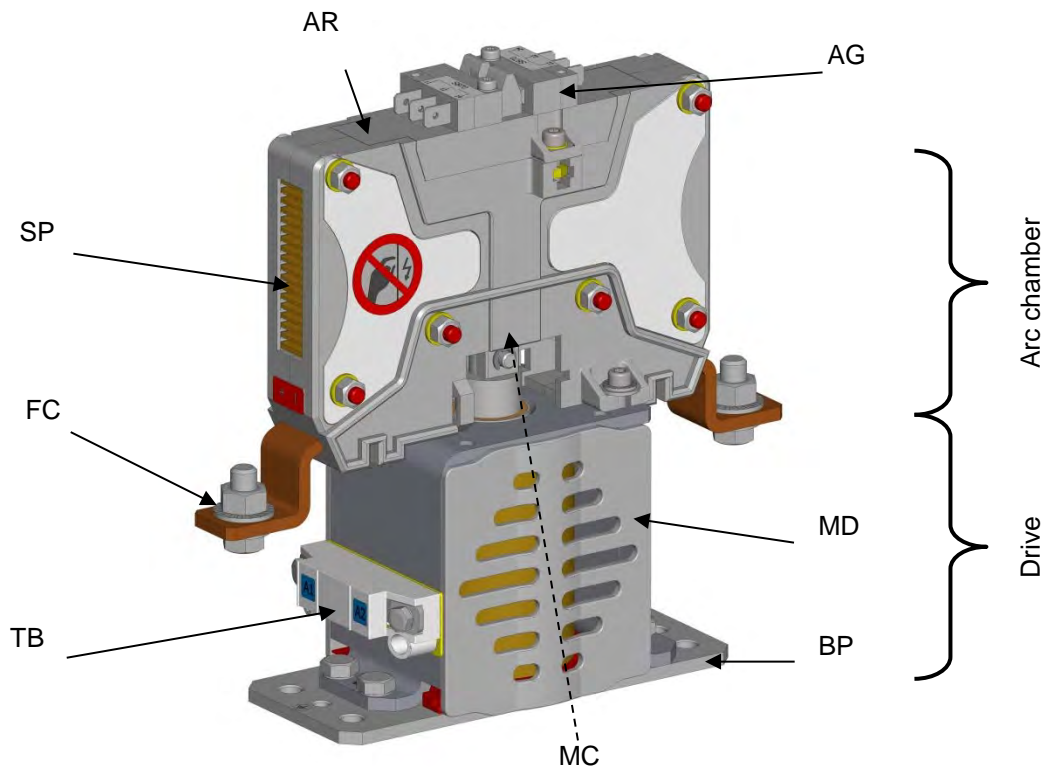
Refer to catalogue C25, data sheets and measured drawings.

Applied standards

Refer to catalogue C25.

EN60077-1: 2003-04	Railway applications - Electric equipment for rolling stock Part 1: General service conditions and general rules (IEC 60077-1:1999, modified)
EN 60077-2: 2003-04	Railway applications - Electric equipment for rolling stock Part 2: Electrotechnical components; General rules (IEC 60077-2:1999, modified)
EN 50124-1: 2010-11	Railway applications - Insulation coordination Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment
EN 61373: 2011-04	Railway applications - Rolling stock equipment Shock and vibration tests
EN 50125-1: 2010-11	Railway applications – Environmental conditions for equipment Part 1: Equipment on board rolling stock

Description



CL1015/02 contactors consist of two main parts:

- Drive:
 - Magnetic drive (MD) with base plate (BP); coil terminal block (TB) including the suppressor diode for overvoltage suppression
- Arc chamber:
 - Arc chamber (AR) with fixed contacts / main terminals (FC), splitter plates (SP) and auxiliary contacts (AG); not visible: moving contact bridge (MC).

Magnetic drive

- Magnetic drive (MD) with moving armature
 - Compact magnetic drive system for DC voltages.
 - Designed for standard railway supply voltages and tolerances. Standard nominal supply voltages are $U_s = 24\text{ V}$; $U_s = 36\text{ V}$; $U_s = 72\text{ V}$ and $U_s = 110\text{ V}$, tolerances from 70% up to 125% of U_s . Other nominal supply voltages are available on request.
 - Double-break moving contact bridge
- Coil terminal block (TB)
 - M3 terminals (Option: 6.3 x 0.8 mm fast-on terminals)
 - Polarity independent overvoltage protection device (Suppressor diode).



The value of the overvoltage limitation is part of the magnetic system and must not be changed or short-circuited by external means. It is explicitly stated that the use of diodes is prohibited for that purpose. Take care there is no such diode in the external control circuit.

- Base plate (BP)
 - 3 to 6 fixation holes depending on number of poles (some holes are compatible to the footprint of a competitor's product, but are not accessible comfortably. The Schaltbau footprint is designed for access from the top with regular screw drivers)
 - Earthing terminal
- The contactor should be mounted on a metal rack to provide a secure mounting as well as a heat sink for the magnetic drive.

Arc chamber

- Arc chamber (AC)
 - Permanent-magnetic blow-out system with magnets and pole plates for DC applications (Designation P or G)
 - No magnets for AC applications (Designation X)
 - Arc guidance plates
 - Splitter plates (SP) for arc extinction (brass for DC and steel for AC applications)
- Fixed contacts with main terminals (FC)
 - Screws M8 with Schnorr washer and nut
 - Minimum wire gauges for connecting cables or current bars must be observed.
 - Double-break contacts
- Auxiliary contacts (AG)
 - 2 switches S870 per pole
 - Standard: 2 switches per contactor
 - Option: 4 switches for 2-pole and 6 switches for 3-pole contactors
 - 6.3 x 0.8 mm fast-on terminals

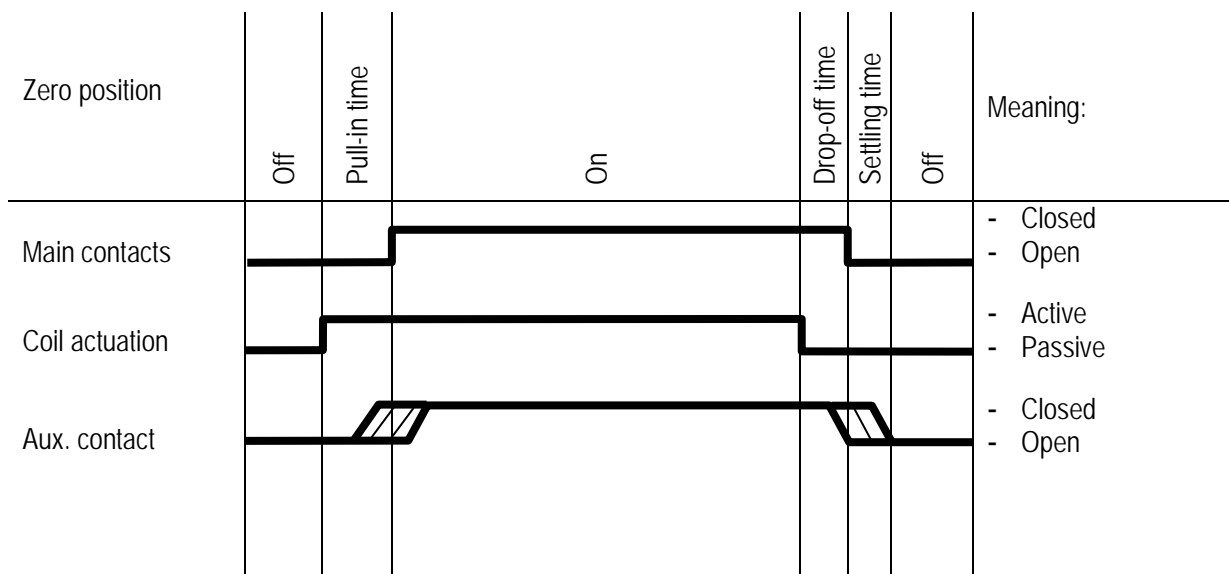
Functional description

The diagram below shows the switching states of the CL1015/02 contactors.

Typical values:

- Pull-in time: 80 ms
- Drop-off time: 20 ms

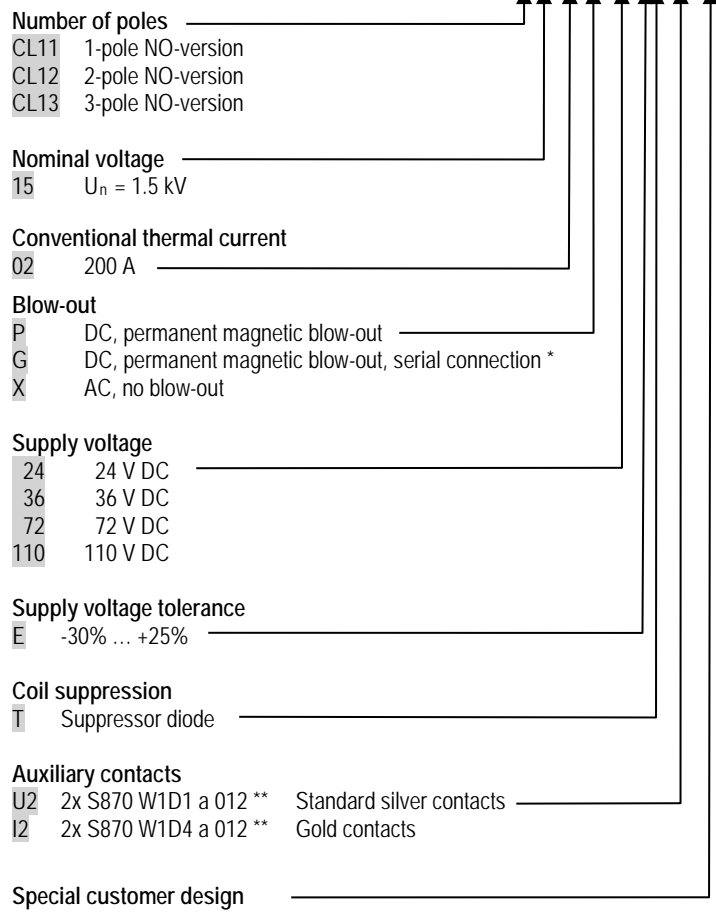
Note: The exact On/Off transition of the auxiliary contacts is not specified.



Order code

Example:

CL1115/02 P 110ET-U2 01



* for 2-pole contactors only
 ** refer to catalogue D70

Storage

Storage

Schaltbau recommends storing the contactors in the original packing box. The contactors should be stored in a dry and suitable place.

Return shipments

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

Installation

Unpacking and handling

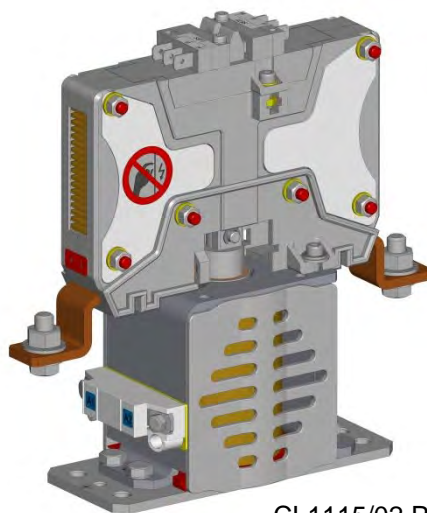
Before opening the packaging, perform a visual inspection for any signs that could indicate damage having occurred during transport (impacts, bumps, falling etc.).

Unpack the contactor and put it on the table in an upright position. Check the contactor for damage.

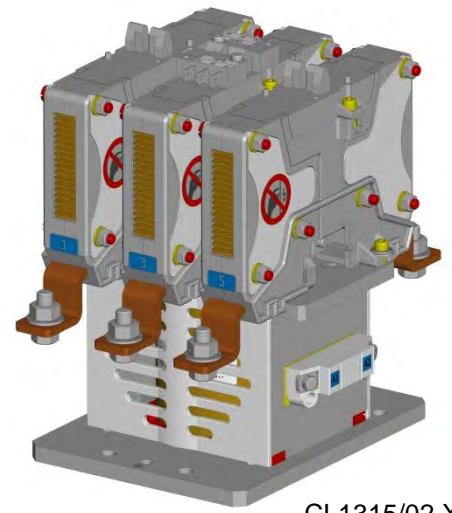
Make sure that you have received the correct contactors according to your order.



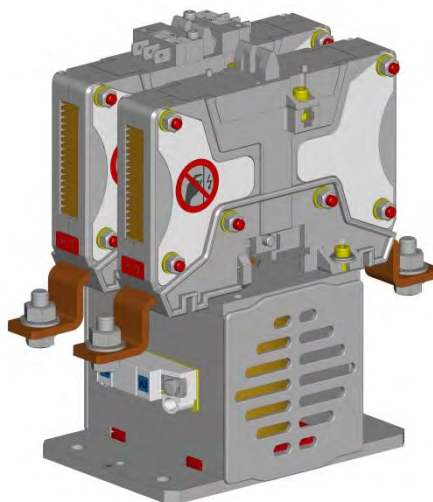
If the contactor has been subject to excessive shock influence (e.g. during transport) do not install the contactor.



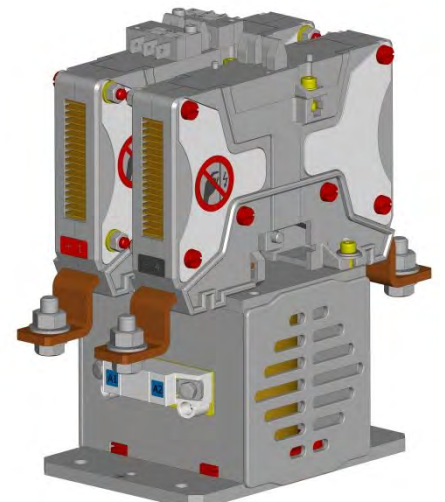
CL1115/02 P



CL1315/02 X



CL1215/02 P



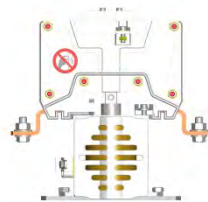
CL1215/02 G

Operating position

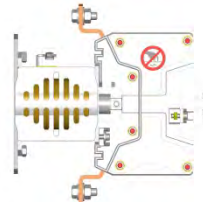
CL1015/02 contactors can be mounted in horizontal and vertical mounting positions.

In most cases, the contactors are mounted on mounting plates or mounting frames. They must be solid enough to carry the weight of the contactors under the shock and vibration conditions of the railway environment.

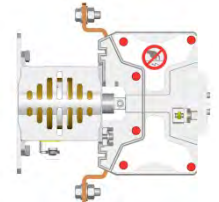
The contactors are fixed with 4 or more mounting screws, depending on the number of poles. The screws (and if applicable the nuts) must be steel grade 8.8. Schaltbau strongly recommends Schnorr-Washers (or similar) to secure the screws. The screws must be tightened with the rated torque permissible for the screws and the nuts.



Horizontal mounting position



Vertical mounting position 1



Vertical mounting position 2

Mechanical requirements

Device dimensions

Refer to the dimensioned drawings of the contactors.

Installation dimensions

Refer to the dimensioned drawings of the contactors.

Electrical requirements

The minimum clearances to earth or other components must be observed. Refer to the dimensioned drawings for details.

Switching electrical currents at high voltages will produce arcing and plasma might exit out of the arc chamber. It is essential to observe the minimum clearance to earth to avoid the risk of a flash-over. The minimum clearance has been tested and specified in relation to the switching capacity of the contactors.

For switching heavy loads allow a minimum time of app. 30 s between switchings. Allow a recovery time of at least 10 min after 3 heavy load switchings in succession.

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.

The minimum wire/current bars gauges for the main terminals and the earth terminal must be observed. Smaller gauges for the main terminals will reduce the rated thermal current. Smaller gauges for the earth terminal may produce a safety hazard.

Refer to catalogues for the power consumption of the magnetic drive system and the electrical data of the auxiliary switches.

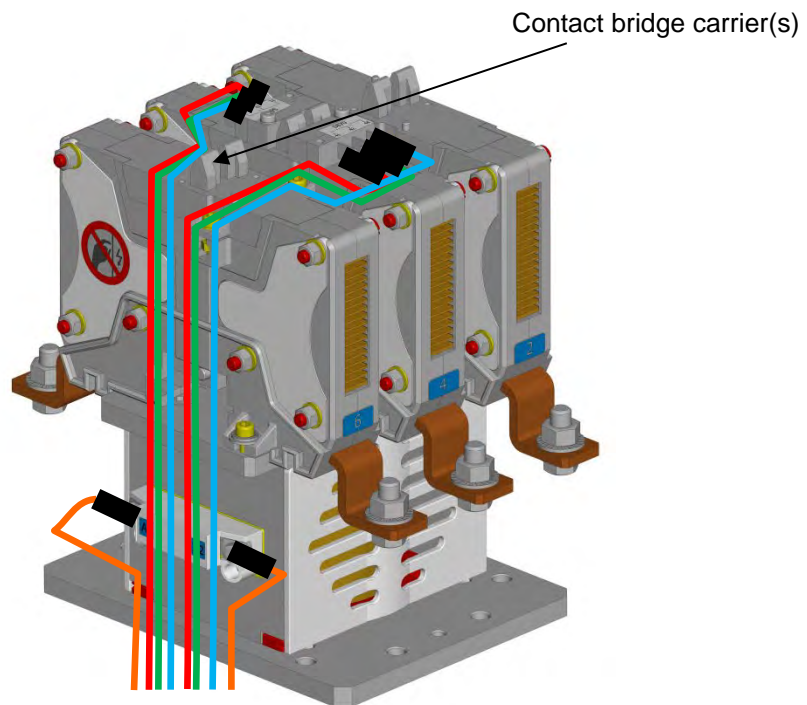
- C25 (Catalogue for Contactors CL1015/02)
- D70 (Catalogue for Snap Action Switches S870)

Mechanical installation

- Clean the surface of the mounting plate and the base-plate of the contactor.
- Put the contactor on the mounting plate and secure with the appropriate screws using the correct tightening torque. Schaltbau strongly recommends Schnorr-Washers (or similar) to secure the screws.

Electrical installation of the auxiliary switches

- Connect the wires for the auxiliary contacts. For switches S870 no polarity must be observed. The terminal numbers of the switches (11, 12, 14; 21, 22, 24; ...). Bundle and fix the wires as shown in the schematically drawing below.
- Make sure that the wires do not obstruct the movement of the contact bridge carriers.
- Make sure that the control wires have sufficient distance to the main contacts and the openings of the arc chamber(s).



Electrical installation of the magnetic drive

- Connect the coil control wires to the coil terminal block using closed cable lugs for M4 screws. No polarity must be observed. Bundle and fix the wires as shown above.
- The coil is protected against excessive overvoltages (which will occur when the coil is switched off) by a bi-directional suppressor diode.



The value of the overvoltage limitation is part of the magnetic system and must not be changed or short-circuited by external means. It is explicitly stated that the use of diodes is prohibited for that purpose. Take care there is no such diode in the external control circuit.

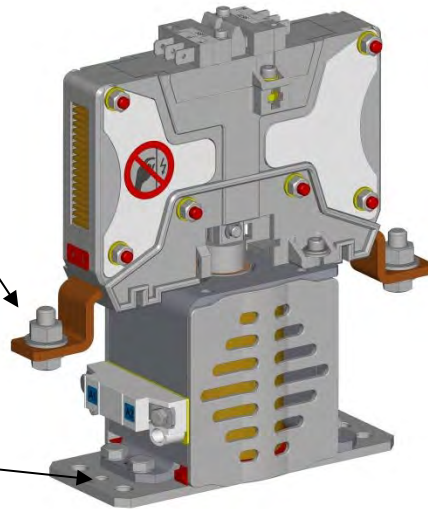
Electrical installation of the main circuit

- Connect the main cables or current bars with the screws, washers and nuts provided. The screws must be tightened with the rated torque permissible.
- Connect the earthing cable to the earth terminal with the appropriate screw. Schaltbau strongly recommends a Schnorr-Washer (or similar) to secure the screw.



Make sure the connection areas are free of corrosion.

Main terminals with
M8 screw, nut and
Schnorr washer



Earth connection

Commissioning

After installation the following checks are recommended:

- a) Check the protective earth
- b) Check the main connections
- c) Check the control connections
- d) Several activation and deactivation operations of the contactor without the main circuit active
- e) Check the function of the auxiliary contacts

Maintenance

CL1015/02 contactors are maintenance-free within the rated mechanical life time data. The electrical life data depend on the number of switchings under heavy load condition and vary for different applications. In normal use, this corresponds to a decade-long operating period.

Recommended regular service intervals

Checking activity designation	Checking interval
Optical inspection from outside	1x annually
Inspection of the main contacts	1x to 2x annually depending on application
Inspection of the auxiliary contacts	Every 2 years

Unscheduled service intervals



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



If the contactors are being used in particularly dirty environments, the checking intervals for the optical inspection 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.

Inspection activities

- **High voltage supply cables**

Check of the high voltage supply cables and the tightening torques of the fastening screws.

- **Earthing**

Check of the earth cable and the tightening torque of the fastening screw.

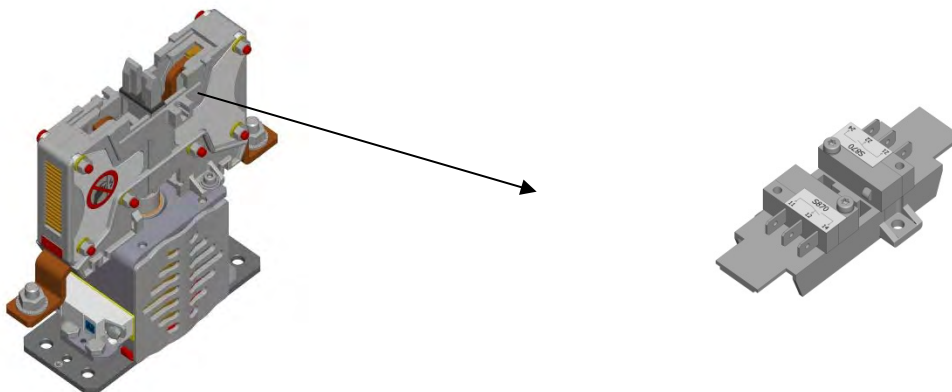
- **Cleaning**

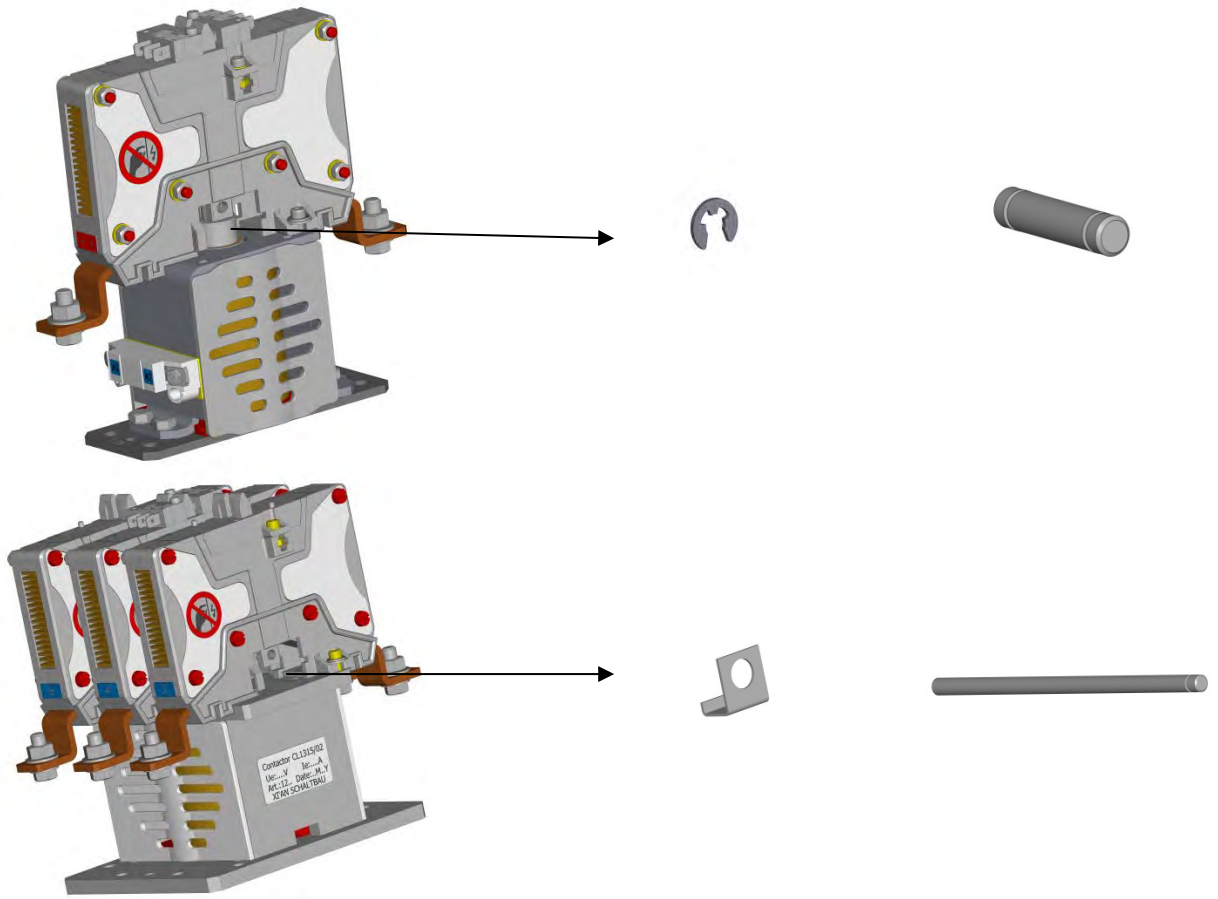
In case of excessive dirt the surface of the contactors should be cleaned.

- **Inspection of the main contacts**

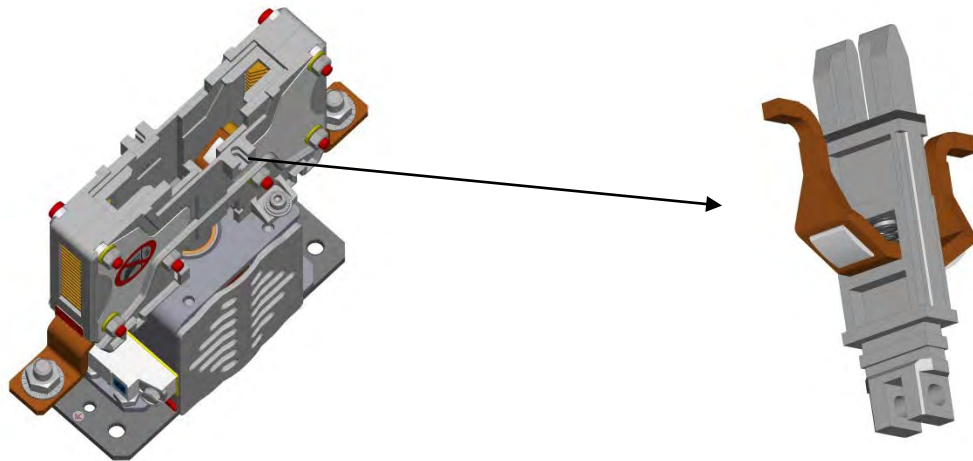
Remove the top cover (fixed with 2 Allen head screws M4).

Remove the clip for 2-pole and 3-pole contactors (circlip for 1-pole contactor) at one side and remove the rod connecting the armature. Use a small screw driver to remove the clips.

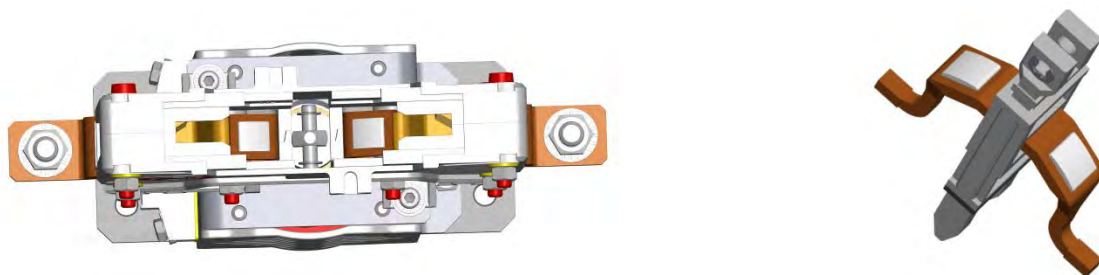




Pull out the contact holder for each pole.



Inspect the main contact tips (both fixed and movable contacts).

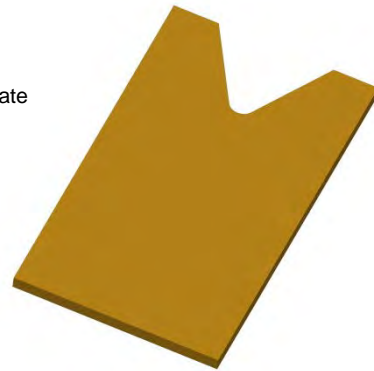


It requires some experience to evaluate the state of the contacts. Even after only a few switchings under load the contacts look used and “dirty” for the inexperienced eye. Contacts need only to be replaced if the wear of the contact tips is more than 70%.

Inspect the splitter plates for wear. If the splitter plates are damaged the complete arc chamber must be replaced.



Splitter plate

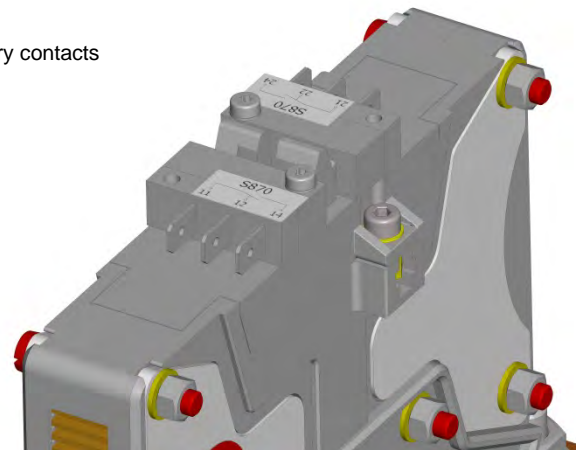


Replace the moving contact holders. Insert the rod and secure it with the clip. Reassemble the top cover using the 2 M4 screws/washers/nuts (2-3 Nm).

- **Inspection of the auxiliary contacts**

The auxiliary switches are mounted on the top and are visible for a simple optical inspection from the outside (housings are clean and do not show signs of short-circuits etc.). Under normal working conditions (no short circuit switching) the life time of the auxiliary switches exceeds those of the contactors.

Auxiliary contacts



Spare parts, replacement of parts

The contactors are maintenance-free. There is therefore no general provision for replacing components during its service life.

However, in case of permanent heavy load switchings, of failures, of short-circuit switchings or in similar cases spare parts are offered by Schaltbau.



Only original spare parts are to be used as a replacement



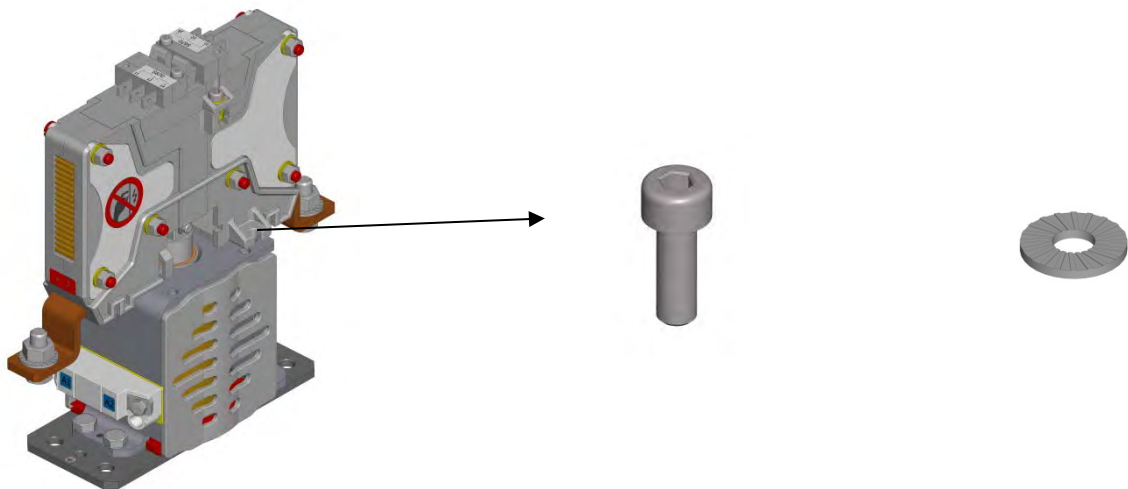
AR AC CL1015/02
CL1015/02, Arc chamber AC set (SB P/N: 1-2757-336205)
(incl. 2x M4 mounting screws/washers and a set of numbered labels)

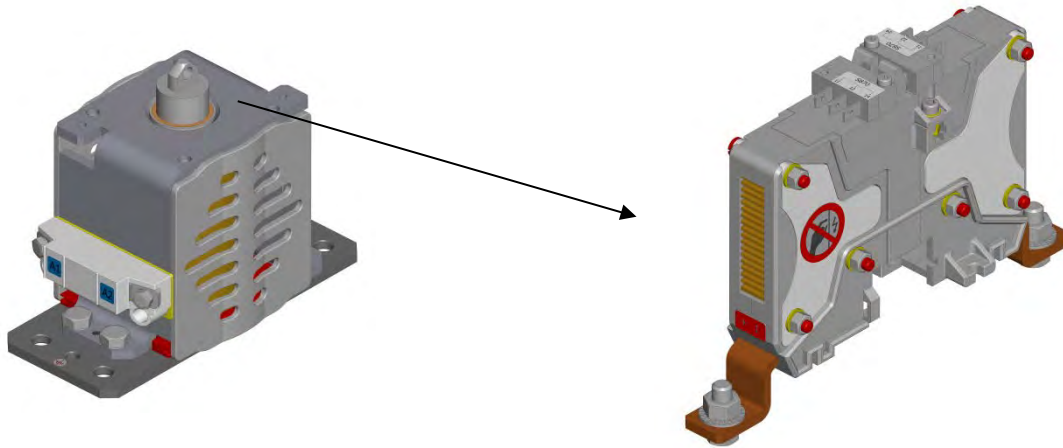
AR DC CL1015/02
CL1015/02, Arc chamber DC set (SB P/N: 1-2757-336206)
(incl. 2x M4 mounting screws/washers and a set of numbered labels)

Main contacts

If the main contacts have to be replaced all 4 contacts must be replaced (the moving bridge and the 2 fixed terminals). Schaltbau recommends replacing the complete arc chamber, since in most cases the splitter plates have to be replaced as well. The disassembly of the arc chamber and the replacement of the fixed contacts and the splitter plates are only advisable for experienced personnel and special tools.

- Disconnect the main cables/current bars
- Disconnect the control wires
- Dismount the contactor.
- Remove the clip for 2-pole and 3-pole contactors (circlip for 1-pole contactor) at one side and remove the rod connecting the armature and the moving contact holder(s). Use a small screw driver to remove the clips (refer to the maintenance section for details).
- Remove the arc chamber(s) (fixed with 2 Allen head screws M4). Note the terminal numbers and in case of DC arc chambers the polarity (blue or red label).





- Mount the new arc chamber(s), maximum torque 2-3 Nm. Make sure to observe the polarity in case of DC arc chambers (blue or red label on the same side as before). Remount the rod and it secure with the clip.
- Attach the terminal number labels. The replacement arc chambers are marked with neutral labels. A set of common numbered labels is part of the spare part set.
- Replace the auxiliary switches (fixed with 1 self-cutting screw) if necessary.
- Test the replacement arc chambers. Push the contact carrier(s). The carrier(s) must be moved up and down easily.
- Remount the contactor.
- Reconnect the control wires
- Reconnect the main cables/current bars

Auxiliary contacts

If the auxiliary switches have to be replaced all switches should be replaced.

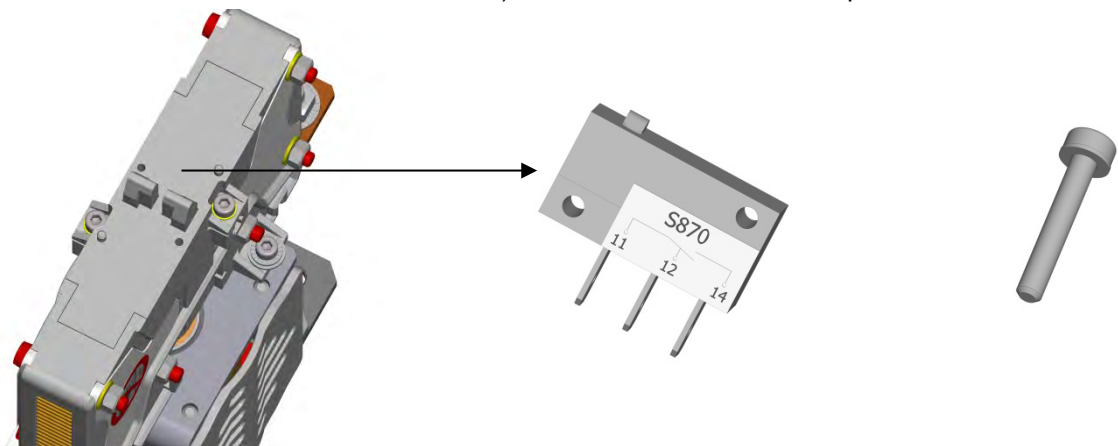


Only original spare parts are to be used as a replacement



AS CL1015/02
CL1015/02, Auxiliary switch set (SB P/N: 1-1570-303427)
(incl. 1x self-cutting screw/washer and a set of numbered labels)

- Disconnect the control wires from the auxiliary switches.
- Remove the auxiliary switches (fixed with 1 self-cutting screw/washer). Note the terminal numbers prior to removal.



- Replace with new auxiliary switches (maximum torque 1-2 Nm)
- Attach the terminal number labels at the same location as before. A set of common numbered labels is part of the spare part set.
- Reconnect the control wires to the auxiliary switches.

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