SCHALTBAU
Connect Contact Control

3

Contactors

C320 series

1 pole bi-directional DC
NO contactors for
1,000 amps

Catalogue C320.en

More information
schaltbau.com

C320 – 1 pole bi-directional DC NO contactors

Compact single-pole NO contactors for DC up to 1,800 volts rated insulation voltage. Making current up to 3,000 amps; conventional thermal current up to 1,000 amps; short-time current up to 4,500 amps.

The bidirectional DC contactors of the C320 series extend the application range of the successful C310 and C360 series. The compact devices switch even higher powers. With a rated short-circuit breaking capacity of up to 3,000 amps, the contactors are suitable for applications with high inrush currents. The devices can permanently conduct up to 1,000 amps – thanks to high contact forces with measurably less heating in the main contact system. In the event of a short circuit, as much as 4,500 amps may flow for one second without the contacts welding. This means that the contactor retains its full function in order to disconnect large powers when required, regardless of the direction of the current. This excellent breaking capacity is made possible by an efficient ceramic arc chamber with generously dimensioned air gaps.

Features

C320 series

Compact dimensions – high rated insulation voltage U_i up to 1,800 volts
All air clearances in the contact area are generously dimensioned. The rated insulation voltage is 1,800 volts.
The C320K/1000 is specified for rated operational voltages up to 1,500 volts. The C320S/1000 is suitable for rated operational voltages up to 60 volts and is significantly more compact.

High thermal continuous current I_{th} up to 1,000 amps
All versions of the C320 can carry up to 1,000 amps permanently. In addition, the series has a very high short-time current carrying capacity Icw up to a maximum of 4,500 amps. These values are achieved by optimised silver contacts, high contact forces and permanently extremely low contact resistances.

High making capacity I_{cm} up to 3,000 amps and an excellent breaking capacity
The C320 can switch on a current of up to 3,000 amps. A PWM controller regulates the coil current, ensures low-bounce switch-on and low holding power. The C320K/1000 handles high short-circuit currents and can switch off a current of 800 amps at 1,500 volts, for example. An efficient ceramic arc chamber makes this very good breaking capacity possible.

Low energy consumption and low heating thanks to sophisticated coil saving circuit
A PWM controller regulates the pull-in and holding current. This ensures a low-bounce switch-on, limits the power consumption in holding mode and significantly reduces the heating of the coil. In addition to flexible and power-saving control, this also increases the service life.

Full bidirectionality – safe disconnection of high powers
All versions of the C320 can reliably disconnect high currents and voltages, irrespective of the current direction. In the C320K/1000, these properties are achieved by the special arrangement of the blowout magnets and arc chamber as well as generously dimensioned air clearances in the contact area.

Auxiliary switches with mirror contact function
The C320 contactors can be equipped with up to four auxiliary switches, of which a maximum of two auxiliary switches can have mirror contact function according to IEC 60947-4-1, Annex F. Mirror contacts are required for the feedback circuits in safety controls. The mirror contact function means that the NC contact of the auxiliary contact cannot and must not be closed at the same time as the NO main contact.

Standards

C320 series

Contactors meet requirements for industrial applications to:

IEC 60947-4-1
Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor starters – Electromechanical contactors and motor starters.

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

UL 60947-4-1
Low-Voltage Switchgear and Controlgear – Part 4-1: Contactors and Motor-Starters – Electromechanical Contactors and Motor-Starters.

GB/T 14048.4
Low-Voltage Switchgear and Controlgear – Part 4-1: Contactors and Motor-Starters – Electromechanical Contactors and Motor-Starters.

Contactors meet requirements for railway applications to:

IEC 60077-2
Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components; General rules

IEC 61373
Railway applications – Rolling stock equipment – Shock and vibration tests

IEC 62497-1
Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment

Reliable, robust and economical

C320 series

Contactors of the C320 series are designed for continuous currents of 1,000 amps. The switchgear has both high making and breaking capacities, and a high short-time withstand current. This ensures high operational safety.

An integrated electronic coil control ensures constantly reliable switching behaviour independent of the ambient temperature. In addition, the energy consumption and associated heat development is noticeably reduced when switched on.

Depending on the application, high demands are placed on electromechanical components. The new DC contactors are highly resistant to shock and vibration loads and meet the high requirements of ISO 16750-3 as well as those of IEC 61373.

Ordering key

C320 series

Example: **C320K/1000 24E-BBBB**

Series, contact configuration

C320	1 pole NO contactor, DC bi-directional

Version

K	1,500 V DC
S	60 V DC

Conv. thermal current

1000	I_{th} = 1,000 A

Coil voltage

24	U_s = 24 V DC Operating range 16 ... 36 V DC

Auxiliary switches, number / type

Position (see page 6)	1	2*	3	4*	
Snap-action switches S870 W1D1 t	✓	✓	✓	✓	BBBB
	✓	✓	---	---	BB00
	---	---	✓	✓	00BB
	---	---	---	---	0000

Coil design

Monostable with integrated PWM module	E

Note:

** with mirror contact function according to IEC 60947-4-1, annex F*

Presented in this catalogue are only stock items which can be supplied in short delivery time. For some variants minimum quantities apply. Please do not hesitate to ask for the conditions.

Special variants:

If you need a special variant of the contactor, please do not hesitate to contact us. Maybe the type of contactor you are looking for is among our many special designs. If not, we can also supply customized designs. In this case, however, minimum order quantities apply.

Applications

C320 series

Thanks to many years of experience and competence in developing electromechanical switchgear and the mastering DC arcs, Schaltbau has developed an innovative solution with new DC contactors that significantly simplifies applications with DC switching technology. Since the C320 series safely controls both current directions, the contactors are ideal for all applications involving energy recovery.

Typical applications are the use as main contactor in battery management systems of high-voltage vehicle batteries, in charging stations for e-mobility, in battery test stands, in DC circuits of inverters for photovoltaic systems or in rail vehicles as main contactor in traction and auxiliary converters or as isolating contactor in battery circuits.

E-mobility

- Electrical vehicles, hybrid vehicles and trolley busses
- DC charging station
- Battery test system

Rail vehicles

- Traction contactors for battery or hybrid vehicles
- Contactors for auxiliary converters for battery or hybrid vehicles
- Isolating contactors in battery circuits

Battery energy storage systems

- Grid stabilization and battery energy storages
- Regenerative systems in industrial plants
- Battery management systems
- Industrial energy storage systems

Photovoltaics

- DC switching in central inverters
- Electrical cabinet (combiner boxes)
- Industrial energy storage systems

Specifications C320K/1000 for U_e = 1,500 V DC, C320S/1000 for U_e = 60 V DC — C320 series

Series		C320K/1000	C320S/1000
Type of voltage **Main contacts, configuration**		DC, bi-direktional / AC, f ≤ 60 Hz 1x NO	
Electrical data according to IEC/UL 60947-4-1, GB/T 14048.4			
Rated operational voltage U_e		1,500 V	60 V
Rated insulation voltage U_i		1,800 V	1,800 V
Rated impulse withstand voltage U_{imp}		10 kV	10 kV
Pollution degree / Overvoltage category		PD3 / OV3	
Conventional free air thermal current I_{th}	T_a = 60° C (cross section)	1,000 A	1,000 A
Power dissipation per pole I_{th}	typ.	50 W	50 W
Pole impedance	typ.	50 µΩ	50 µΩ
Utilization category DC-1 Rated operational current I_e	IEC 60947-4-1, GB/T 14048.4	150 A @ U_e = 1,500 V DC	330 A @ U_e = 48 V DC
Utilization category DC-1 / DC general use Rated operational current I_e	UL 60947-4-1	80 A @ U_e = 1,500 V DC	330 A @ U_e = 48 V DC
Frequency of operation (operations per hour) I_e	DC-1	180 h^{-1}	360 h^{-1}
Rated short-time withstand current I_{cw}	t = 100 ms	4,500 A	
Additional electrical ratings of main circuit			
Conventional free air thermal current I_{th}	T_a = 60 °C (cross section) Terminal heating	1,000 A (600 mm^2) 55 K	
Rated short-circuit making capacity I_{cm}	(L/R = 0 ms)	3,000 A	
Breaking capacity / UL special use ratings	U_e = 1,500 V / I_e = 800 A / L/R = 0.15 ms U_e = 1,500 V / I_e = 450 A / L/R = 1 ms U_e = 1,000 V / I_e = 1,600 A / L/R = 0.2 ms U_e = 1,000 V / I_e = 1,300 A / L/R = 1 ms	30 operations 30 operations 30 operations 30 operations	--- --- --- ---
Breaking capacity	U_e = 60 V / I_e = 2,200 A / L/R = 1 ms	---	30 operations
Electrical endurance	U_e = 1,250 V DC / I_e = 120 A / L/R = 1 ms U_e = 60 V DC / I_e = 500 A / L/R = 1 ms	6,000 operations ---	--- 6,000 operations
Critical current range		None	None
Main contacts			
Contact material		$AgSnO_2$	
Terminals		2x M8	
Torque		6 ... 8 Nm	
Auxiliary contacts			
Number, configuration / contact material		4 max. snap-action switches S870 W1D1 t / silver	
Making / breaking capacity	Snap-action switch S870	AC-15: 230 V AC / 1.5 A DC-13: 60 V DC / 0.5 A	
Minimum voltage / current		24 V / 5 mA	
Terminals		Flat tabs 6.3 x 0.8 mm	
Magnetic drive (monostable)			
Rated control supply voltage U_s (Operating range) Pollution degree / Overvoltage category		24 V DC (16 ... 36 V DC) PD3 / OV2	
Coil power dissipation, max. (T_a = 20 °C / U_s)	Pull-in (0.2 s) / Holding power	95 W (24 V) / 11 W	
Frequency of operation (operations per hour, no load)	T_a = 20 °C / 60 °C	3,600 h^{-1} / 1,800 h^{-1}	
Pull-in time (T_a = 20 °C / U_s) / Drop-off time (T_a = 20 °C / U_s)	typ.	< 60 ms* / < 10 ms	
Coil suppression		integrated	
Coil terminals		2-pole screwless terminal block for solid and stranded conductors up to 2.5 mm^2 max.	
Mounting position		vertical / horizontal (not upside-down, see page 6, 7)	
Degree of protection	IEC 60529	IP00	
Mechanical endurance		1,000,000 operations	
Vibration	IEC 61373 / ISO 16750-3	Category 1, class B / profile VII	
Shock	IEC 61373 / ISO 16750-3	Category 1, class B / 20 g/6 ms	
Temperatures	Operating temperature / Storage temperature Altitude** / Humidity (IEC 62498-1)	–40 °C … +60 °C / –40 °C … +85 °C < 5,000 m above sea level / < 75 % rel. humidity, annual average	
Weight		2.7 kg	2.0 kg

* *Detection of the switching status via the auxiliary contacts from 120 ms onwards*
** *Greater warming is possible for altitudes ≥ 2,000 m a.s.l.*

Subject to change

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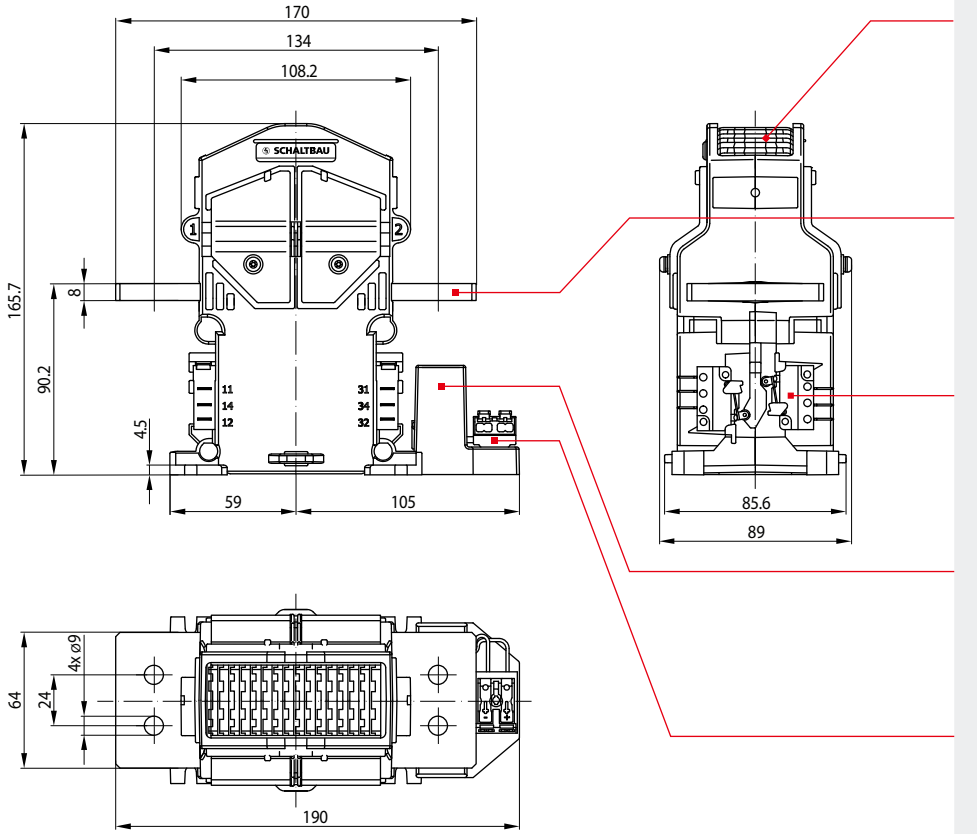
Dimension diagram C320K/1000, C320S/1000

Baureihe C320

- **Dimension diagram C320K/1000:**



Arc chamber main contact system
Highly efficient ceramic arc chamber with permanent magnetic blowout

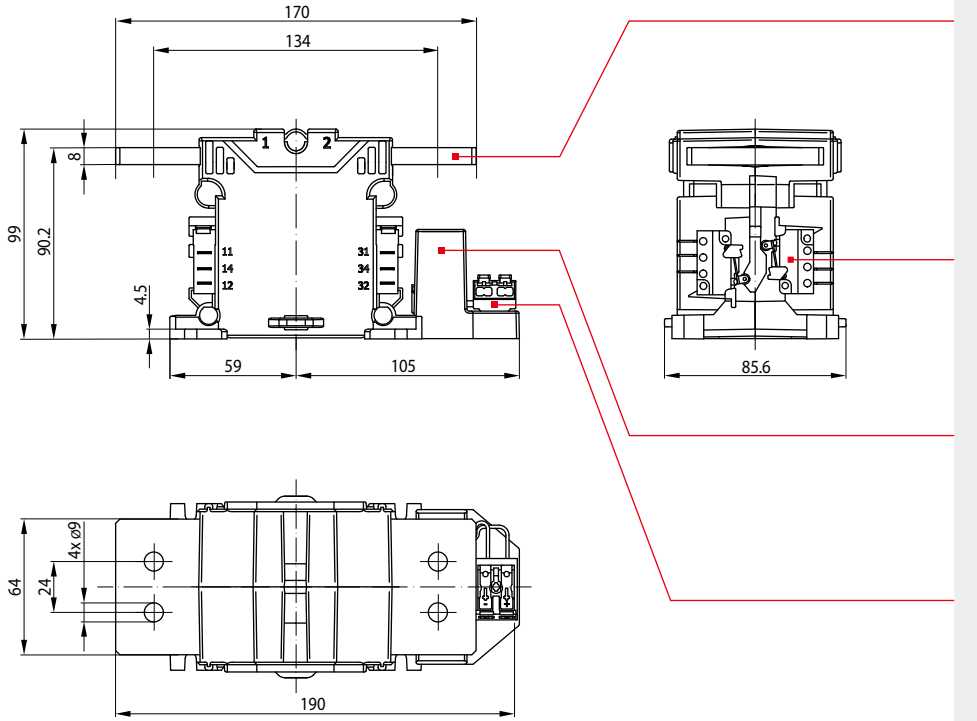
Main contact terminals
Holes for bolts M8,
Tightening torque 6 ... 8 Nm

Auxiliary switches
2x or 4x snap-action switches S870, SPDT, flat tab 6.3 x 0.8 mm

Electronic coil controller
Permanently reliable switching behaviour regardless of ambient temperature, reduced energy consumption and less heat generation

Coil terminal
2 pole screwless terminal block for solid and stranded conductors up to 2.5 mm² max.

- **Dimension diagram C320S/1000:**



Main contact terminals
Holes for bolts M8,
Tightening torque 6 ... 8 Nm

Auxiliary switches
2x or 4x snap-action switches S870, SPDT, flat tab 6.3 x 0.8 mm

Electronic coil controller
Permanently reliable switching behaviour regardless of ambient temperature, reduced energy consumption and less heat generation

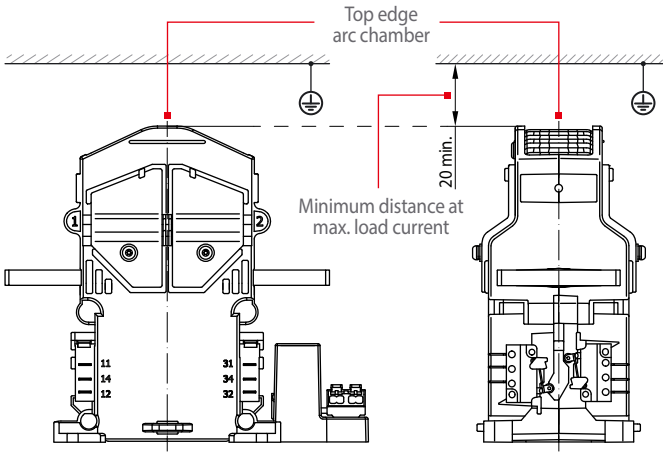
Coil terminal
2 pole screwless terminal block for solid and stranded conductors up to 2.5 mm² max.

Subject to change / Dimensions in mm

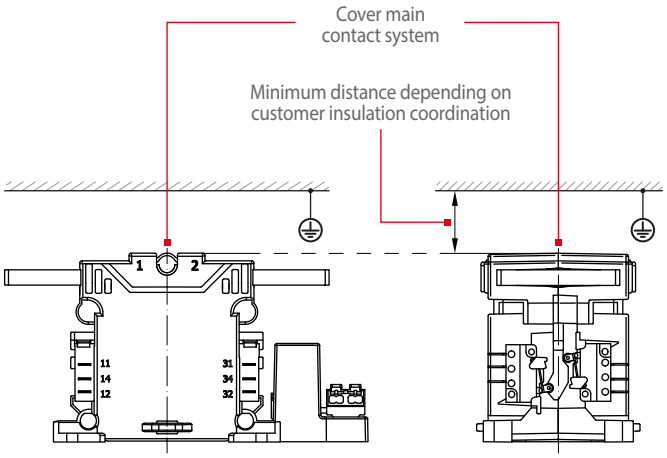
Minimum distances to magnetically active, live or earthed parts

C320 series

- **C320K/1000**



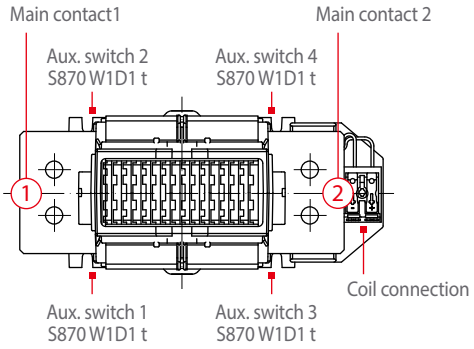
- **C320S/1000**



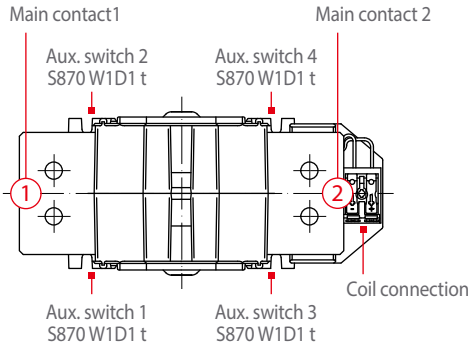
Circuit diagram

C320 series

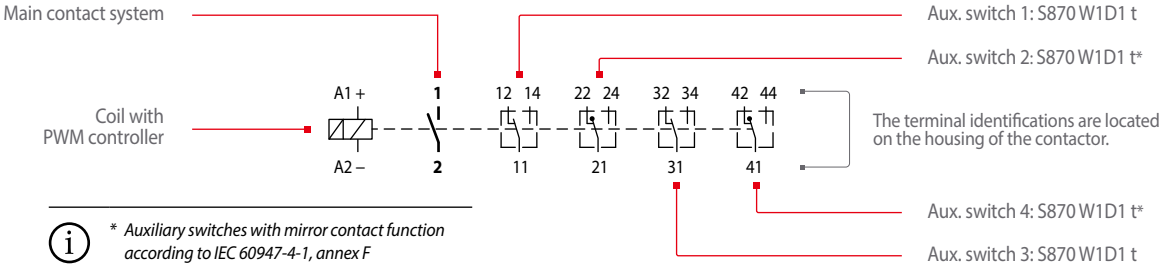
- **C320K/1000**



- **C320S/1000**



- **Circuit diagram**

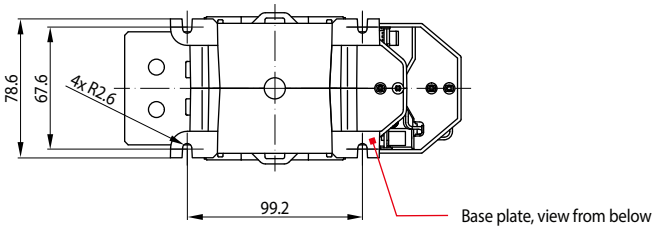


* *Auxiliary switches with mirror contact function according to IEC 60947-4-1, annex F*

Mounting holes

C320 series

- **C320K/1000, C320S/1000**



The contactors are mounted on a suitable mounting plate with four M5 screws.

Dimensions in mm / Subject to change

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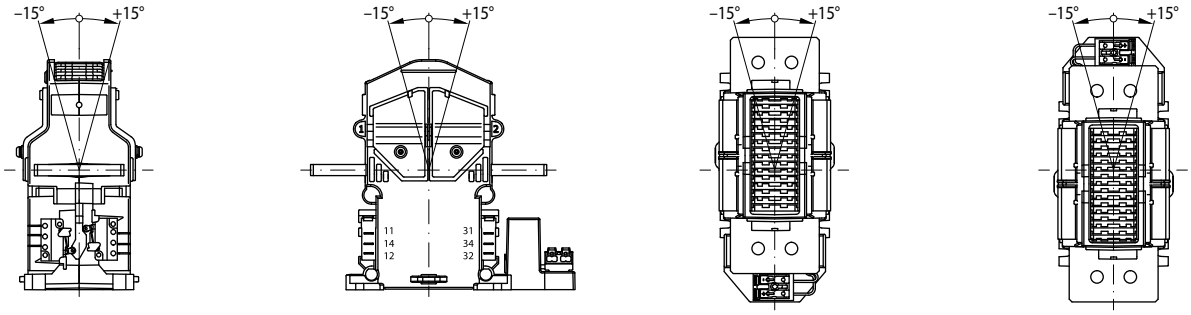
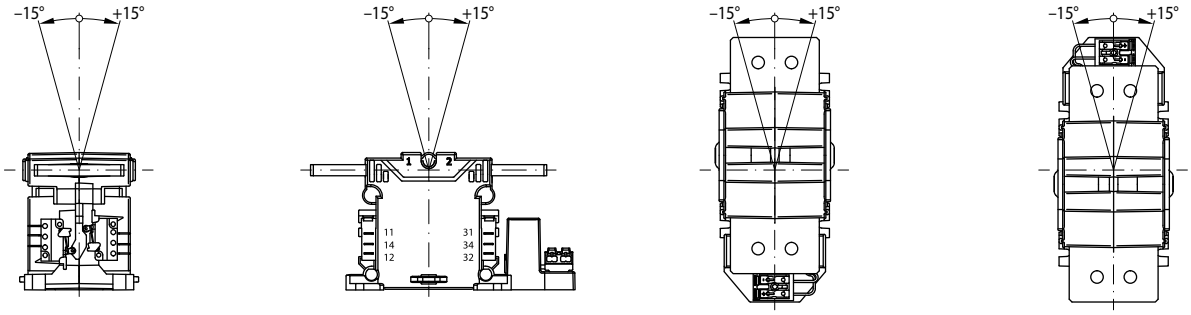
Mounting instructions

C320 series

- **C320K/1000**



- **C320K/1000**



Horizontal assembly
«Table mounting»

Vertical assembly
«Wall mounting»

The contactors can be mounted horizontally or vertically on a prepared mounting plate. Mounting positions hanging upside down are not allowed!

Maintenance and safety instructions

C320 series

Maintenance:

- C320 series contactors are basically maintenance free.
- Make regular in-depth visual inspections once or twice a year.

For detailed maintenance, safety and mounting instructions please refer to our operating manuals C320-M.en!

Safety instructions:

- The device must be used according to the intended purpose as specified in the technical documentation. You are obliged to observe all specifications depending on operating temperature, degree of pollution etc. that are relevant to your application.
- Without further safety measures the contactors are not suited for use in potentially explosive atmospheres.
- In case of malfunction of the device or uncertainties stop using it any longer and contact the manufacturer instantly.
- Tampering with the device can seriously affect the safety of people and equipment. This is not permitted and leads to an exclusion of liability and warranty.
- Coil suppression for reducing surges when the coil is switched off is optimally attuned to the contactors switching behaviour. The existing opening characteristic must not be negatively influenced by parallel connection with an external diode.
- Contactors running permanently may heat up. So make sure that the contactor has sufficiently cooled down before you start any inspection or maintenance work.
- When installing contactors with magnetic blowout make sure to do it in such a way that no magnetizable parts can be attracted by the permanent magnets that are also capable of destroying all data of swipe cards.
- In general, strong electromagnetic fields can be generated in the area around the contactors. These can influence other components in the area of the contactors.
- Improper handling of the contactor, e.g. when hitting the floor with some impact, can result in breakage, visible cracks and deformation.

Defective contactors or parts (e.g. arc chambers, auxiliary switches) must be replaced immediately!

For a detailed list of all safety instructions see here: schaltbau.info/safety3en!

Schaltbau GmbH

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

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with compliments:

IRIS Certification

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

Schaltbau GmbH ISO 14001 certified since 2002

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

Schaltbau GmbH ISO 9001 certified since 1994

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

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