

# C320

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

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## C320 - 1 pole bi-directional DC NO contactors

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**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 per-

manently 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.

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### Features

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#### V2X-ready for bi-directional charging stations

Bi-directional contactors are required for the perfect interaction between electric vehicles and charging stations. These enable electric vehicles not only to charge, but also to feed electricity into the grid or use it for the domestic power supply.

#### Compact dimensions - high rated insulation voltage $U_i$ up to 1,800 volts

The rated insulation voltage is 1,800 volts. All clearances in the contact area are generously dimensioned. The C320K/1000 is specified for rated operating voltages of up to 1,500 volts. The C320S/1000 is significantly more compact and suitable for rated operating voltages up to 60 volts.

#### 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.

#### 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  $I_{cw}$  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.

#### 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.

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### Features

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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 50124-1

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

## Reliable, robust and economical

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 electro-mechanical 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

### C320K/1000 24E-BBBB

Series, contact configuration  
**C320** 1 pole NO contactor, DC bi-directional

Version  
**K**  $U_e = 1,500$  V DC, arc chamber  
**S**  $U_e = 60$  V DC, w/o arc chamber

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: Position, number, type

Position (see page 6)	1	2*	3	4*
<b>BBBB</b>	✓	✓	✓	✓
<b>BB00</b>	✓	✓	---	---
<b>00BB</b>	---	---	✓	✓
<b>0000</b>	---	---	---	---

Snap-action switches  
 S870 W1D1 t

Coil design  
**E** Monostable with integrated PWM module

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

**Note:** 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

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 systems

### Battery energy storage systems

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

### Rail vehicles

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

### Photovoltaics

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

## Specifications - C320K/1000 for $U_e = 1.500 \text{ V DC}$ , C320S/1000 for $U_e = 60 \text{ V DC}$

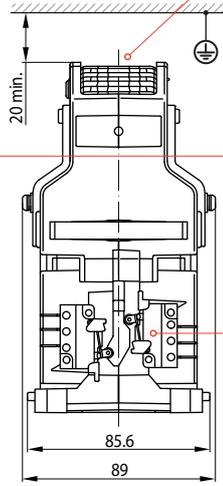
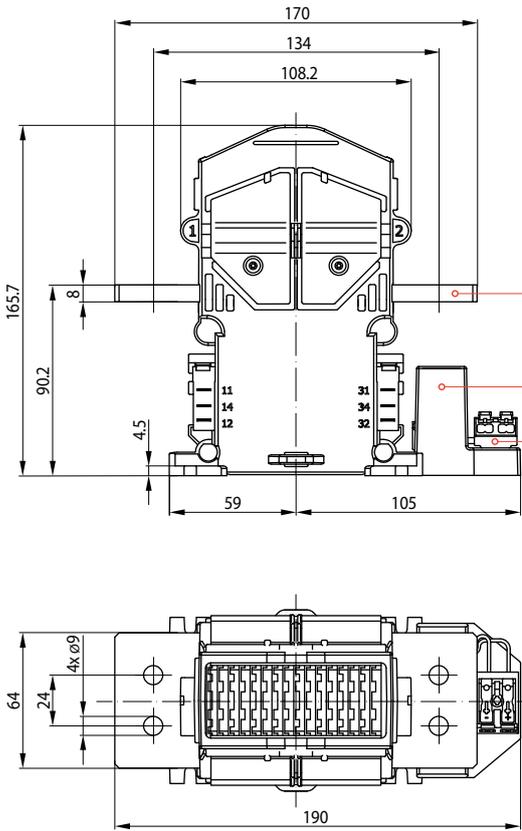
Series		C320K/1000	C320S/1000
Type of voltage		DC, bi-direktional / AC, $f \leq 60 \text{ Hz}$	
Main contacts, configuration		1x NO	
<b>Electrical data according to IEC/UL 60947-4-1, GB/T 14048.4</b>			
Rated operational voltage $U_e$		1,500 V	60 V
Rated insulation voltage $U_i$		1,800 V	1,800 V
Rated impulse withstand voltage $U_{imp}$		10 kV	10 kV
Pollution degree / Overvoltage category		PD3 / OV3	
Conventional free air thermal current $I_{th}$	$T_a = 60^\circ \text{ C}$ (cross section)	1,000 A (600 mm <sup>2</sup> )	1,000 A (600 mm <sup>2</sup> )
Power dissipation per pole $I_{th}$	typ.	50 W	50 W
Pole impedance	typ.	50 $\mu\Omega$	50 $\mu\Omega$
Utilization category DC-1			
Rated operational current $I_e$	IEC 60947-4-1, GB/T 14048.4	150 A @ $U_e = 1,500 \text{ V DC}$	330 A @ $U_e = 48 \text{ V DC}$
Utilization category DC-1 / DC general use			
Rated operational current $I_e$	UL 60947-4-1	80 A @ $U_e = 1,500 \text{ V DC}$	330 A @ $U_e = 48 \text{ V DC}$
Frequency of operation (operations per hour) $I_e$	DC-1	180 h <sup>-1</sup>	360 h <sup>-1</sup>
Rated short-time withstand current $I_{cw}$	t = 100 ms	4,500 A	
<b>Additional electrical ratings of main circuit</b>			
Conventional free air thermal current $I_{th}$	$T_a = 60^\circ \text{ C}$ (cross section) Terminal heating	1,000 A (600 mm <sup>2</sup> ) 55 K	
Rated short-circuit making capacity $I_{cm}$	(L/R = 0 ms)	3,000 A	
Breaking capacity / UL special use ratings	$U_e = 1,500 \text{ V} / I_e = 800 \text{ A} / L/R = 0.15 \text{ m}$	30 operations	---
	$U_e = 1,500 \text{ V} / I_e = 450 \text{ A} / L/R = 1 \text{ ms}$	30 operations	---
	$U_e = 1,000 \text{ V} / I_e = 1,600 \text{ A} / L/R = 0.2 \text{ ms}$	30 operations	---
	$U_e = 1,000 \text{ V} / I_e = 1,300 \text{ A} / L/R = 1 \text{ ms}$	30 operations	---
Breaking capacity	$U_e = 60 \text{ V} / I_e = 2,200 \text{ A} / L/R = 1 \text{ ms}$	---	30 operations
Electrical endurance	$U_e = 1,250 \text{ V DC} / I_e = 120 \text{ A} / L/R = 1 \text{ ms}$	6,000 operations	---
	$U_e = 60 \text{ V DC} / I_e = 500 \text{ A} / L/R = 1 \text{ ms}$	---	6,000 operations
Critical current range		None	None
<b>Main contacts</b>			
Contact material		AgSnO <sub>2</sub>	
Terminals		2x M8	
Torque		10 ... 12 Nm	
<b>Auxiliary contacts</b>			
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	
<b>Magnetic drive (monostable)</b>			
Rated control supply voltage $U_s$ (Operating range)		24 V DC (16,8 ... 30 V DC)	
Pollution degree / Overvoltage category		PD3 / OV2	
Coil power dissipation, max. ( $T_a = 20^\circ \text{ C} / U_s$ )	Pull-in (0.2 s) / Holding power	120 W (24 V) / 11 W	
Frequency of operation (operations per hour, no load)	$T_a = 20^\circ \text{ C} / 60^\circ \text{ C}$	3,600 h <sup>-1</sup> / 1,800 h <sup>-1</sup>	
Pull-in time ( $T_a = 20^\circ \text{ C} / U_s$ ) / Drop-off time ( $T_a = 20^\circ \text{ C} / U_s$ )	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 <sup>2</sup> 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	-40°C ... +60°C / -40°C ... +85°C	
	Altitude** / Humidity (IEC 62498-1)	< 5,000 m above sea level / < 75 % rel. humidity, annual average	
Approvals		     	
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  $\geq 2,000 \text{ m a.s.l.}$

\*\*\* Sporadic contact openings possible at shocks  $\geq 30\text{g}/6\text{ms}$ , no position change

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 10 ... 12 Nm

**Auxiliary switches**

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

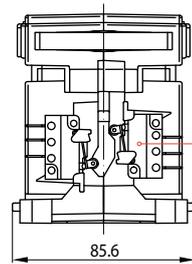
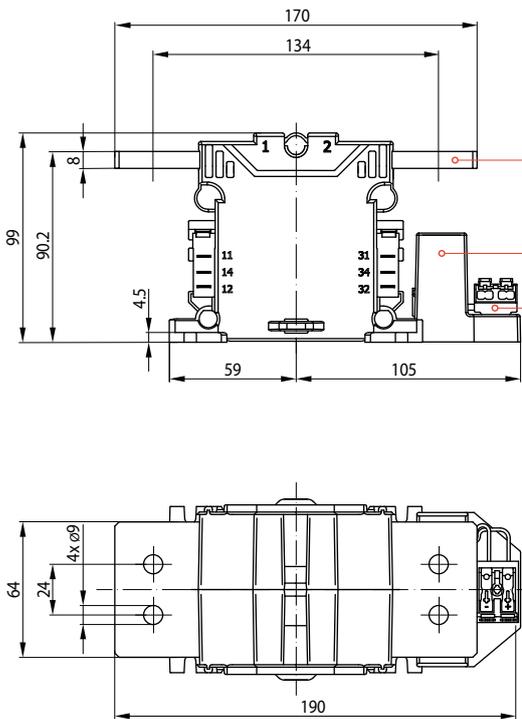
**Electronic coil controller**

Permanently reliable switching behaviour re-  
gardless of ambient temperature, reduced en-  
ergy consumption and less heat generation

**Coil terminal**

2 pole screwless terminal block for  
solid and stranded conductors  
up to 2.5 mm<sup>2</sup> max.

Dimension diagram C320S/1000



**Main contact terminals**

Holes for bolts M8,  
Tightening torque 10 ... 12 Nm

**Auxiliary switches**

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

**Electronic coil controller**

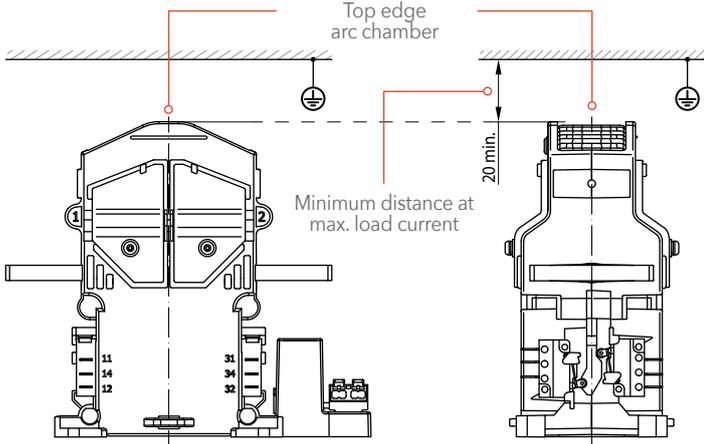
Permanently reliable switching behaviour re-  
gardless of ambient temperature, reduced en-  
ergy consumption and less heat generation

**Coil terminal**

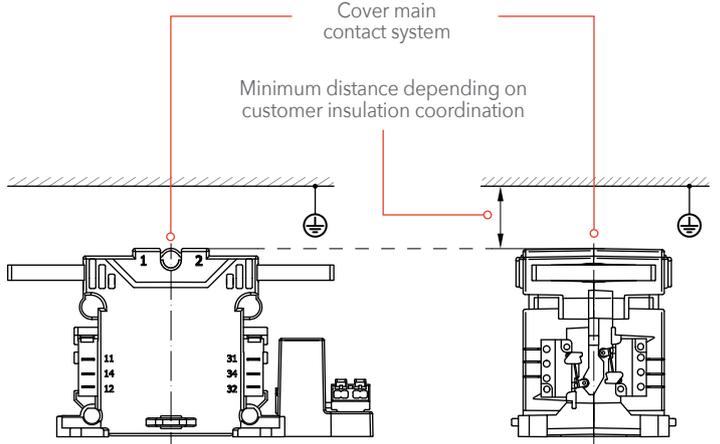
2 pole screwless terminal block for  
solid and stranded conductors  
up to 2.5 mm<sup>2</sup> max.

## Minimum distances, deflection shields, mounting holes

### C320K/1000

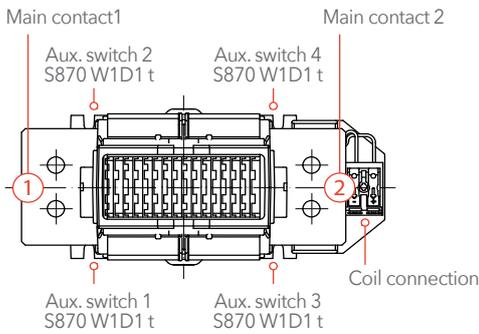


### C320S/1000

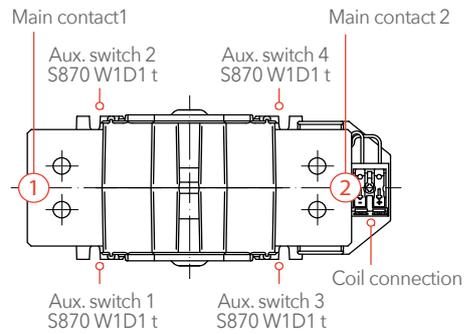


## Circuit diagram

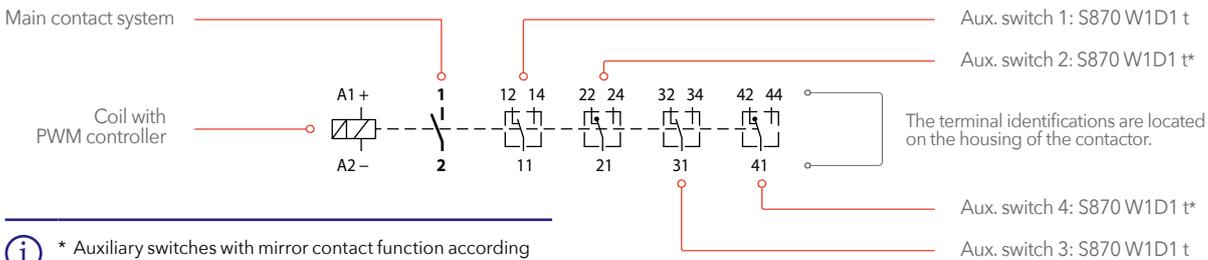
### C320K/1000



### C320S/1000



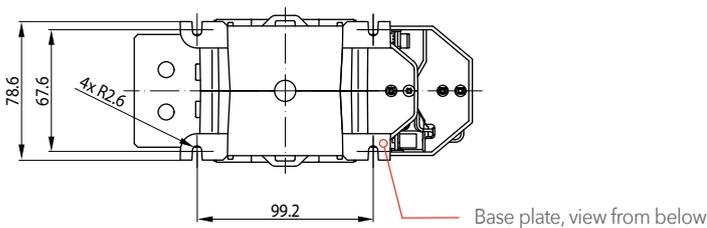
## Circuit diagram



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

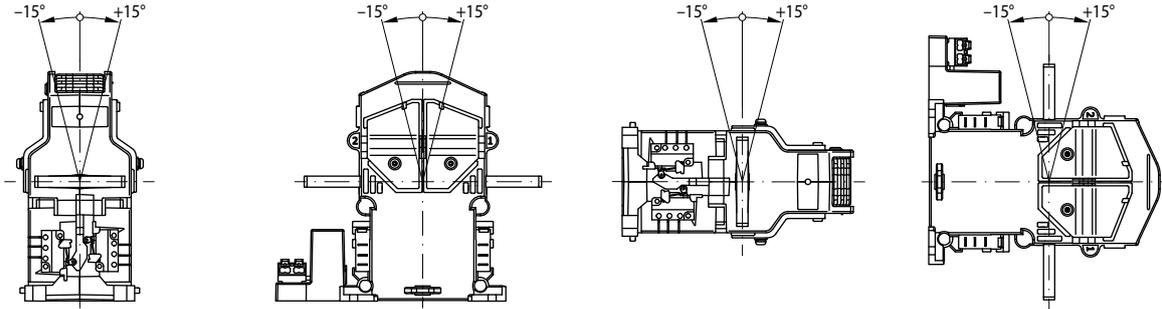
## Mounting holes

### C320K/1000, C320S/1000

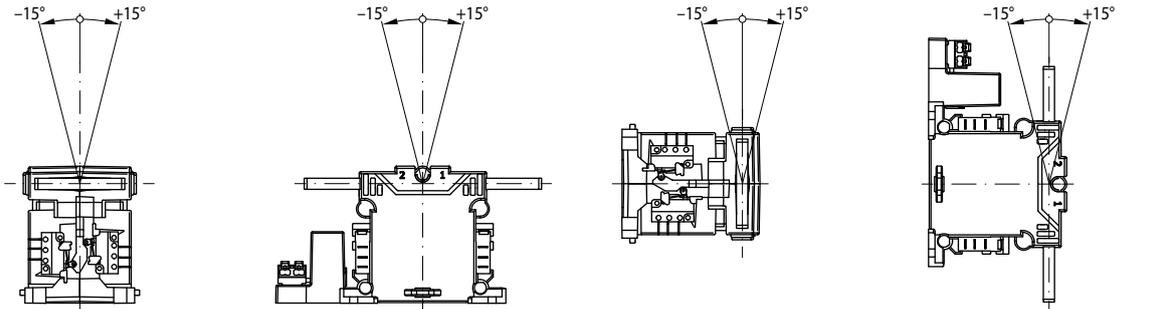


**i** The contactors are mounted on a suitable mounting plate with four M5 screws.

### C320K/1000



### C320S/1000



Horizontal assembly  
«Table mounting»

Vertical assembly  
«Wall mounting»

**i** 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

### Maintenance:

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

### 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.



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

- 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!](http://schaltbau.info/safety3en!)

## 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](http://www.schaltbau.com).