

# 3

## Contactors

CP1115-06, CP1130-06

CP2115-06, CP2130-06

CP3115-06, CP3130-06

CP1115-12, CP1130-12

CP2115-12, CP2130-12

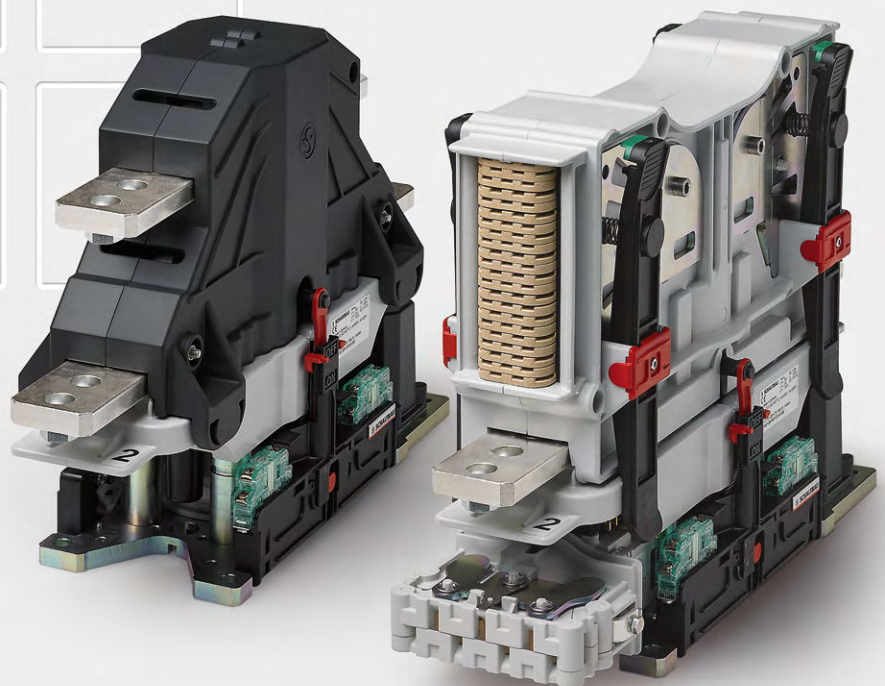
CP3115-12, CP3130-12

CP1115-20, CP1130-20

CP2115-20, CP2130-20

1 pole bi-directional  
high-voltage contactors,  
disconnect switches,  
changeover switches  
for DC and AC

C40.en






**CP series** 1 pole power contactors, disconnect switches or 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, disconnect 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.

**Features**

- 
**Innovative design**
  - Universally configurable as NO or NC contact, disconnect switch or changeover switch
  - DC bi-directional or AC up to 60 Hz max.
  - Effective arc handling – no critical current range and only reduced wear on the main contact system thanks to permanent magnetic blowout
  - High making capacity, also for disconnect switches and changeover switches
  - Modular, compact, low total cost of ownership (TCO)
- 
**Main contact system**
  - Conventional thermal current: 600 A, 1,200 A or 2,000 A
  - Nominal voltage: 1.5 kV or 3 kV
  - Double-break contacts
- 
**Easy maintenance**
  - Toolless inspection of main contact tips
  - Toolless replacement of the arc chamber






**Applications**

CP series

- 
**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**
  - Activation of traction units
  - Activation of brake choppers 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

**Normen**

CP series

- 
**IEC 60077-2**  
Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components; General rules
- 
**IEC 62497-1**  
Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment
- 
**IEC 62236-3-2**  
Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus
- 
**IEC 61373**  
Railway applications – Rolling stock equipment – Shock and vibration tests
- 
**IEC 60947-4-1**  
Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters

**Configuration** A product tailored to your needs

CP series

**Configure your preferred device:**

Maximum modularity – whether as a contactor, disconnect switch or changeover switch: The CP series offers countless variation options and is the perfect fit for your application. A scalable power interface in combination with different extinguishing chambers according to the

switching requirements make the switchgear universally applicable. In addition to various auxiliary switch groups, a high-voltage discharge contact and/or a precharging contactor can also be integrated.

CP series	Conventional thermal current up to:		600 A	1,200 A	2,000 A
<b>Contactor</b>	1x NO	CP1115/...	06 U <sub>n</sub> 1,500 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 1,500 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 1,500 V I <sub>th</sub> 2,000 A
	1x NO	CP1130/...	06 U <sub>n</sub> 3,000 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 3,000 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 3,000 V I <sub>th</sub> 2,000 A
	1x NC	CP2115/...	06 U <sub>n</sub> 1,500 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 1,500 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 1,500 V I <sub>th</sub> 2,000 A
	1x NC	CP2130/...	06 U <sub>n</sub> 3,000 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 3,000 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 3,000 V I <sub>th</sub> 2,000 A
<b>Disconnect switch</b>	1x NO	CP1115/...	06 U <sub>n</sub> 1,500 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 1,500 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 1,500 V I <sub>th</sub> 2,000 A
	1x NO	CP1130/...	06 U <sub>n</sub> 3,000 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 3,000 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 3,000 V I <sub>th</sub> 2,000 A
	1x NC	CP2115/...	06 U <sub>n</sub> 1,500 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 1,500 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 1,500 V I <sub>th</sub> 2,000 A
	1x NC	CP2130/...	06 U <sub>n</sub> 3,000 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 3,000 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 3,000 V I <sub>th</sub> 2,000 A
<b>Changeover switch</b>	1x CO	CP3115/...	06 U <sub>n</sub> 1,500 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 1,500 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 1,500 V I <sub>th</sub> 2,000 A
	1x CO	CP3130/...	06 U <sub>n</sub> 3,000 V I <sub>th</sub> 600 A	12 U <sub>n</sub> 3,000 V I <sub>th</sub> 1,200 A	20 U <sub>n</sub> 3,000 V I <sub>th</sub> 1,200 A

Pre-charging contactor 1x CPP1115/02, CP11xx-06 separately	High-voltage discharging contact 1x CPD1115/02	Auxiliary switches 2x S826	Auxiliary switches 2x S870 a1/b0	Pre-charging contactor 1x CPP1115/02, CP11xx-12 and CP11xx-20 integrated	Auxiliary switches 2x S870 a1/b0	Auxiliary switches 2x S826	High-voltage discharging contact 1x CPD1115/02
--	---	-------------------------------	-------------------------------------	---	-------------------------------------	-------------------------------	---

Find your ideal switching device and configure it as a normally open or normally closed contact, as a disconnect switch or changeover switch.

Switch	NO NC	600 A 1,200 A 2,000 A	1,500 V 3,000 V	monostable bistabile	NO contactor NC contactor	Breaking capacity <b>High</b> Breaking capacity <b>Medium</b> Breaking capacity <b>None</b>	<ul style="list-style-type: none"> <li>▶ Frequent switching of high loads</li> <li>▶ Frequent switching of low loads</li> <li>▶ For load-free switching only</li> </ul>
Disconnect	NO NC	600 A 1,200 A 2,000 A	1,500 V 3,000 V	monostable bistabile	Disconnect switch	Breaking capacity <b>None</b>	<ul style="list-style-type: none"> <li>▶ For load-free switching only</li> </ul>
Changeover	CO	600 A 1,200 A	1,500 V 3,000 V	monostable bistabile	Changeover switch	Breaking capacity <b>None</b>	<ul style="list-style-type: none"> <li>▶ For load-free switching only</li> </ul>

**Reliable, robust and economical**

CP series

Contactors of the CP series are designed for continuous currents up to 2,000 A. Among other features, the robust switchgear has a high making and breaking capacity and a high short-time withstand current. This ensures long operational reliability.

Depending on the application, there are different requirements for electromechanical components. The new DC contactors are very robust and by that able to withstand most shock and vibration requirements, EN 60077-2 is met anyway.

Ordering key

CP series

Example: **CP1130-20-A-CM-020**

Series, contact configuration

CP11	AC- and bi-directional DC NO contactor or disconnect switch, 1 pole
CP21	AC- and bi-directional DC NC contactor or disconnect switch, 1 pole
CP31	AC- and bi-directional DC CO contactor 1 pole

Nominal voltage

15	$U_n = 1,500\text{ V}$
30	$U_n = 3,000\text{ V}$

Conv. thermal current\*1

06	$I_{th} = 600\text{ A}$ : CP11... / CP21... / CP31... series.
12	$I_{th} = 1,200\text{ A}$ : CP11... / CP21... / CP31... series
20	$I_{th} = 2,000\text{ A}$ : CP11... / CP21... series

Arc chamber

A	High-efficiency ceramic arc chamber Breaking capacity: high Frequent switching of high loads
B	Efficient ceramic arc chamber Breaking capacity: medium Frequent switching of low loads
D	Cover cap main contact system breaking capacity: no load CO, disconnect switch

Magnetic drive

Coil voltage

A	$U_s = 24\text{ V DC}$
B	$U_s = 36 \dots 48\text{ V DC}$
C	$U_s = 72 \dots 110\text{ V DC}$

Coil design

M	Monostable (Standard)
N	Monostable with switching input for activation
B	Bistable with 2 switching inputs for activation*2

Pre-charging contactor\*1

---	0
CPP1115/02, 1 pole NO contactor, Coil voltage:	
$U_s = 24\text{ V DC}$	1
$U_s = 36\text{ V DC}$	2
$U_s = 48\text{ V DC}$	3
$U_s = 60\text{ V DC}$	4
$U_s = 72\text{ V DC}$	5
$U_s = 84\text{ V DC}$	6
$U_s = 96\text{ V DC}$	7
$U_s = 110\text{ V DC}$	8

Aux. switches, HV discharging contact: Mounting right

---	0
2x Snap-action switches S826, SPDT-DB, silver contacts, M3 screw-type terminals	1
2x Snap-action switches S826, SPDT-DB, gold contacts, M3 screw-type terminals	A
2x Snap-action switches S870, SPDT, silver contacts, M3 screw-type terminals	2
2x Snap-action switches S870, SPDT, gold contacts, M3 screw-type terminals	B
1x Snap-action switch S826, position front, SPDT-DB, silver contacts, M3 screw-type terminals	4
1x Snap-action switch S826, position rear, SPDT-DB, silver contacts, M3 screw-type terminals	5
1x CPD, High-voltage discharging contact	Z

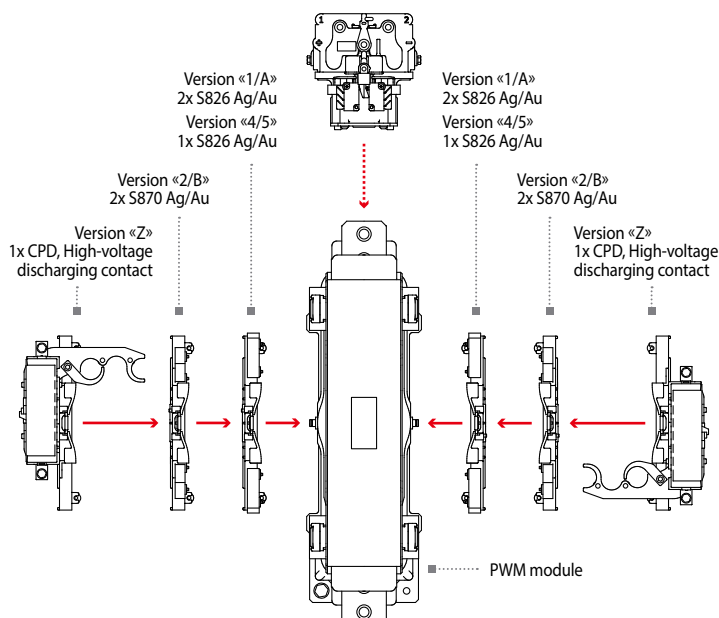
Aux. switches, HV discharging contact: Mounting left

---	
2x Snap-action switches S826, SPDT-DB, silver contacts, M3 screw-type terminals	1*2
2x Snap-action switches S826, SPDT-DB, gold contacts, M3 screw-type terminals	A*2
2x Snap-action switches S870, SPDT, silver contacts, M3 screw-type terminals	2
2x Snap-action switches S870, SPDT, gold contacts, M3 screw-type terminals	B
1x Snap-action switch S826, position front, SPDT-DB, silver contacts, M3 screw-type terminals	4*2
1x Snap-action switch S826, position rear, SPDT-DB, silver contacts, M3 screw-type terminals	5
1x CPD, High-voltage discharging contact	Z

Auxiliary switches  
HV discharging contact  
Mounting left

CPP1115/02  
Pre-charging contactor\*1

Auxiliary switches  
HV discharging contact  
Mounting right



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 variant:

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.

\*1 Pre-charging contactor:

- CP11xx-20: Integrated, factory mounting
- CP11xx-12: Integrated, factory assembly
- CP11xx-06: Separate, mounting on customer side

\*2 Only coil version bistable:

An auxiliary switch is required to monitor the switching status. Positions 1 or 5 are reserved for this, depending on whether the customer requires another auxiliary switch. The auxiliary switch on the left-hand side, rear position, is always permanently provided for monitoring the switching status and is not available to the customer.

**Specifications** 1-pole power contactors for AC and DC,  $U_n$  up to 3,000 V and  $I_{th}$  up to 600 A

CP series

Series		CP1115/06   CP1130/06	CP2115/06   CP2130/06	CP3115/06   CP3130/06
<b>Type of voltage</b>		DC (bi-directional), AC ( $f \leq 60$ Hz)	DC (bi-directional), AC ( $f \leq 60$ Hz)	DC (bi-directional), AC ( $f \leq 60$ Hz)
<b>Number of poles, configuration</b>		1x, SPST-NO 1 ——— 2	1x, SPST-NC 1 ——— 2	1x, SPDT-DB 1 ——— 2 3 ——— 4
<b>Electrical data according to IEC 60077-2</b>				
Nominal voltage	$U_n$	1,500 V   3,000 V	1,500 V   3,000 V	1,500 V   3,000 V
Rated operating voltage	$U_r$	1,800 V   3,600 V	1,800 V   3,600 V	1,800 V   3,600 V
Rated insulation voltage	$U_{Nm}$	3,000 V   4,800 V	3,000 V   4,800 V	3,000 V   4,800 V
Rated impulse withstand voltage	$U_{Ni}$	15 kV   25 kV	15 kV   25 kV	15 kV   25 kV
Pollution degree / Overvoltage category		PD3 / OV3	PD3 / OV3	PD3 / OV3
Switching overvoltages	@ $U_e = 1,800$ V / @ $U_e = 3,600$ V	< $3x U_{Nm}$	< $3x U_{Nm}$	0 V*2
Conventional thermal current	$I_{th}$	600 A*1	600 A*1	600 A*1
Component category		A2	A2	A4
Short-circuit making capacity	new/used contacts	4 kA / tbd*3	4 kA / tbd*3	4 kA / tbd*3
Rated operating current $I_e$	Arc chamber			
Operational frequency C1				
T2 = 15 ms, DC, $U_e = 1,800$ V	A / B / D	200 A / 200 A / 0 A*2	200 A / 200 A / 0 A*2	--- / --- / 0 A*2
T2 = 15 ms, DC, $U_e = 3,600$ V	A / B / D	200 A / 200 A / 0 A*2	200 A / 200 A / 0 A*2	--- / --- / 0 A*2
Rated short-circuit breaking capacity	Arc chamber			
T2 = 15 ms, DC, $U_e = 1,800$ V	A / B / D	900 A / 430 A / 0 A*2	900 A / 430 A / 0 A*2	--- / --- / 0 A*2
T2 = 15 ms, DC, $U_e = 3,600$ V	A / B / D	350 A / tbd*3 / 0 A*2	350 A / tbd*3 / 0 A*2	--- / --- / 0 A*2
T2 = 1 ms, DC, $U_e = 1,800$ V	A / B / D	4,600 A / 1,700 A / 0 A*2	4,600 A / 1,700 A / 0 A*2	--- / --- / 0 A*2
T2 = 1 ms, DC, $U_e = 3,600$ V	A / B / D	2,000 A / 500 A / 0 A*2	2,000 A / 500 A / 0 A*2	--- / --- / 0 A*2
$\cos\phi = 0,8$ , AC, $U_e = 1,800$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	4,000 A / 3,000 A / 0 A*2	4,000 A / 3,000 A / 0 A*2	--- / --- / 0 A*2
$\cos\phi = 0,8$ , AC, $U_e = 3,600$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	1,200 A / 600 A / 0 A*2	1,200 A / 600 A / 0 A*2	--- / --- / 0 A*2
$\cos\phi = 1$ , AC, $U_e = 1,800$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	6,000 A / 4,500 A / 0 A*2	6,000 A / 4,500 A / 0 A*2	--- / --- / 0 A*2
$\cos\phi = 1$ , AC, $U_e = 3,600$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	1,800 A / 1,100 A / 0 A*2	1,800 A / 1,100 A / 0 A*2	--- / --- / 0 A*2
Rated short-time withstand current $I_{cw}$	@ T < 100 ms	15 kA	15 kA	15 kA
Critical current range		none	none	--- *2
Design				
Contact material		AgSnO <sub>2</sub>	AgSnO <sub>2</sub>	AgSnO <sub>2</sub>
Terminals / Torque		1x M10 / 16 ... 20 Nm	1x M10 / 16 ... 20 Nm	1x M10 / 16 ... 20 Nm
<b>Auxiliary switches</b>				
Number max. (configuration)		4x max.*4 / 1x, S870 (a1) + 1x, S870 (b0) + 2x, S826*5 or 4x, S826		
Contact material		Silver, gold		
Switching capacity	SPDT-DB S826, silver contacts	AC-15: 230 V AC / 1.0 A	DC-13: 110 V DC / 0.5 A	} see catalogue D26.en
	SPDT-DB S826, gold contacts	AC-15: 230 V AC / 0.1 A	DC-13: 110 V DC / 0.1 A	
	SPDT S870, silver contacts	AC-15: 230 V AC / 1.5 A	DC-13: 60 V DC / 0.5 A	
	SPDT S870, gold contacts	AC-15: 230 V AC / 1.0 A	DC-13: 60 V DC / 0.5 A	
Terminals		Screw M3		
<b>Pre-charging contactor, high-voltage discharging contact</b>				
Pre-charging contactor, CPP1115/02	$U_{nm}$ $I_{th}$	1x, SPST-NO, $U_{Nm} = 3,600$ V @ PD2/OV2, $I_{th} = 200$ A, see catalogue C45.en		
High-voltage discharging contact, CPD	$U_{nm}$ $I_{th}$	1x, SPST-NC, $U_{Nm} = 3,600$ V, $I_{th} = 80$ A (only for CP1xxx and switching inverse to the main contact)		
	Making/breaking capacity	850 A / 250 A (T = 1 ms, DC)		
<b>Magnetic drive</b>				
Coil voltage/range (design)	$U_s$	24 / 36 ... 60 / 72 ... 110 V DC (mono or bistable with integrated PWM module)		
Control inputs (only coil version N, B)	$U_{st} / I_{st}$	8 ... 400 V / 1 mA (failsafe)		
Pollution degree / overvoltage category		PD3 / OV2		
Coil tolerance		-30 % ... +25 % $U_{SN}$		
Coil power dissipation	@ $U_s$ and $T_a = 20$ °C	Pull-in: 225 W max. @ 250 ms max. / hold: < 10 W		
Pull-in voltage	typical @ $T_a = 20$ °C	$U_s < 0.7 \times U_{SN}$		
Pull-in time	typical @ $T_a = 20$ °C	$\leq 160$ ms		
Drop-off voltage	typical @ $T_a = 20$ °C	$U_s \geq 0.1 \times U_{SN}$		
Drop-off time	typical @ $T_a = 20$ °C	$\leq 40$ ms		
Frequency of operation	@ $1.25 \times U_s$ and $T_a = 20$ °C	Mechanical: 240 operations/hour max. / electrical: 30 operations/hour max.		
Coil suppression		Integrated PWM module (electronic coil controller with suppressor diode)		
Coil terminal		Cage clamp		
<b>Degree of protection</b>		IP00		
<b>Mechanical endurance</b>	@ Coil design, Monostable Bistable	> 1 million operating cycles *6 > 200,000 operating cycles		
<b>Vibration / shock</b>	IEC 61373	Category 1, class B		
<b>Mounting position</b>		horizontal / vertical		
<b>Temperatures</b>	Operating temperature / Storage temperature Altitude / Humidity (EN 50125-1)	-40 °C ... +70 °C / -40 °C ... +85 °C < 2,000 m above sea level / < 75 % yearly average		
<b>Weight</b>	depending on configuration	approx. 6 ... 10 kg	approx. 6 ... 10 kg	approx. 12.2 kg



\*1 Ratings for IEC 60077-2; ratings for other standards on request.

\*2 Cover for main contact system, version "D"; breaking capacity: no load

\*3 On request

\*4 With high-voltage discharging contact, the number of auxiliary contacts is reduced to max. 2

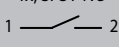
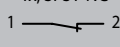
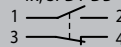
\*5 a1 and b0 according to IEC 60077-2 (auxiliary contact b0 "well open" or mirror contact for feedback circuits of safety-relevant control systems according to EN 13849-1)

\*6 The optional CPD contact limits the mechanical endurance to 600,000 operating cycles



**Specifications** 1-pole power contactors for AC and DC,  $U_n$  up to 3,000 V and  $I_{th}$  up to 1,200 A

CP series

Series		CP1115/12   CP1130/12	CP2115/12   CP2130/12	CP3115/12   CP3130/12
Type of voltage		DC (bi-directional), AC (f ≤ 60 Hz)	DC (bi-directional), AC (f ≤ 60 Hz)	DC (bi-directional), AC (f ≤ 60 Hz)
Number of poles, configuration		1x, SPST-NO 	1x, SPST-NC 	1x, SPDT-DB 
<b>Electrical data according to IEC 60077-2</b>				
Nominal voltage	$U_n$	1,500 V   3,000 V	1,500 V   3,000 V	1,500 V   3,000 V
Rated operating voltage	$U_r$	1,800 V   3,600 V	1,800 V   3,600 V	1,800 V   3,600 V
Rated insulation voltage	$U_{Nm}$	3,000 V   4,800 V	3,000 V   4,800 V	3,000 V   4,800 V
Rated impulse withstand voltage	$U_{Ni}$	15 kV   25 kV	15 kV   25 kV	15 kV   25 kV
Pollution degree / Overvoltage category		PD3 / OV3	PD3 / OV3	PD3 / OV3
Switching overvoltages	@ $U_e = 1,800$ V / @ $U_e = 3,600$ V	< 3x $U_{Nm}$	< 3x $U_{Nm}$	0 V <sup>*2</sup>
Conventional thermal current	$I_{th}$	1,200 A <sup>*1</sup>	1,200 A <sup>*1</sup>	1,200 A <sup>*1</sup>
Component category		A2	A2	A4
Short-circuit making capacity	new/used contacts	6 kA / tbd <sup>*3</sup>	6 kA / tbd <sup>*3</sup>	6 kA / tbd <sup>*3</sup>
Rated operating current $I_e$	Arc chamber			
Operational frequency C1				
T2 = 15 ms, DC, $U_e = 1,800$ V	A / B / D	450 A / 450 A / 0 A <sup>*2</sup>	450 A / 450 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
T2 = 15 ms, DC, $U_e = 3,600$ V	A / B / D	400 A / 200 A / 0 A <sup>*2</sup>	400 A / 200 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
Rated short-circuit breaking capacity	Arc chamber			
T2 = 15 ms, DC, $U_e = 1,800$ V	A / B / D	2,000 A / 1,000 A / 0 A <sup>*2</sup>	2,000 A / 1,000 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
T2 = 15 ms, DC, $U_e = 3,600$ V	A / B / D	900 A / 140 A / 0 A <sup>*2</sup>	900 A / 140 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
T2 = 1 ms, DC, $U_e = 1,800$ V	A / B / D	3,000 A / 2,500 A / 0 A <sup>*2</sup>	3,000 A / 2,500 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
T2 = 1 ms, DC, $U_e = 3,600$ V	A / B / D	2,200 A / 800 A / 0 A <sup>*2</sup>	2,200 A / 800 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
$\cos\phi = 0,8$ , AC, $U_e = 1,800$ V (f = 16.7 / f ≤ 60 Hz)	A / B / D	tbd <sup>*3</sup> / 1,800 A / 0 A <sup>*2</sup>	tbd <sup>*3</sup> / 1,800 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
$\cos\phi = 0,8$ , AC, $U_e = 3,600$ V (f = 16.7 / f ≤ 60 Hz)	A / B / D	tbd <sup>*3</sup> / tbd <sup>*3</sup> / 0 A <sup>*2</sup>	tbd <sup>*3</sup> / tbd <sup>*3</sup> / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
$\cos\phi = 1$ , AC, $U_e = 1,800$ V (f = 16.7 / f ≤ 60 Hz)	A / B / D	tbd <sup>*3</sup> / 2,300 A / 0 A <sup>*2</sup>	tbd <sup>*3</sup> / 2,300 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
$\cos\phi = 1$ , AC, $U_e = 3,600$ V (f = 16.7 / f ≤ 60 Hz)	A / B / D	2,400 A / 1,400 A / 0 A <sup>*2</sup>	2,400 A / 1,400 A / 0 A <sup>*2</sup>	--- / --- / 0 A <sup>*2</sup>
Rated short-time withstand current $I_{cw}$	@ T < 100 ms	15 kA	15 kA	15 kA
Critical current range		none	none	--- <sup>*2</sup>
Design				
Contact material		AgSnO <sub>2</sub>	AgSnO <sub>2</sub>	AgSnO <sub>2</sub>
Terminals / Torque		2x M12 / 24 ... 30 Nm	2x M12 / 24 ... 30 Nm	2x M12 / 24 ... 30 Nm
<b>Auxiliary switches</b>				
Number max. (configuration)		4x max. <sup>*4</sup> / 1x, S870 (a1) + 1x, S870 (b0) + 2x, S826 <sup>*5</sup> or 4x, S826		
Contact material		Silver, gold		
Switching capacity	SPDT-DB S826, silver contacts SPDT-DB S826, gold contacts SPDT S870, silver contacts SPDT S870, gold contacts	AC-15: 230 V AC / 1.0 A AC-15: 230 V AC / 0.1 A	DC-13: 110 V DC / 0.5 A DC-13: 110 V DC / 0.1 A	} see catalogue D26.en } see catalogue D70.en
Terminals		AC-15: 230 V AC / 1.5 A AC-15: 230 V AC / 1.0 A	DC-13: 60 V DC / 0.5 A DC-13: 60 V DC / 0.5 A	
<b>Pre-charging contactor, high-voltage discharging contact</b>				
Pre-charging contactor, CPP1115/02	$U_{nm}$ / $I_{th}$	1x, SPST-NO, $U_{Nm} = 3,600$ V @ PD2/OV2, $I_{th} = 200$ A, see catalogue C45.en		
High-voltage discharging contact, CPD	$U_{nm}$ / $I_{th}$	1x, SPST-NC, $U_{Nm} = 3,600$ V, $I_{th} = 80$ A (only for CP1xxx and switching inverse to the main contact)		
	Making/breaking capacity	850 A / 250 A (T = 1 ms, DC)		
<b>Magnetic drive</b>				
Coil voltage/range (design)	$U_s$	24 / 36 ... 60 / 72 ... 110 V DC (mono or bistable with integrated PWM module)		
Control inputs (only coil version N, B)	$U_{St}$ / $I_{St}$	8 ... 400 V / 1 mA (failsafe)		
Pollution degree / overvoltage category		PD3 / OV2		
Coil tolerance		-30 % ... +25 % $U_{SN}$		
Coil power dissipation	@ $U_s$ and $T_a = 20$ °C	Pull-in: 225 W max. @ 250 ms max. / hold: < 10 W		
Pull-in voltage	typical @ $T_a = 20$ °C	$U_s < 0.7 \times U_{SN}$		
Pull-in time	typical @ $T_a = 20$ °C	≤ 160 ms		
Drop-off voltage	typical @ $T_a = 20$ °C	$U_s \geq 0.1 \times U_{SN}$		
Drop-off time	typical @ $T_a = 20$ °C	≤ 40 ms		
Frequency of operation	@ 1.25 x $U_s$ and $T_a = 20$ °C	Mechanical: 240 operations/hour max. / electrical: 30 operations/hour max.		
Coil suppression		Integrated PWM module (electronic coil controller with suppressor diode)		
Coil terminal		Cage clamp		
Degree of protection		IP00		
Mechanical endurance	@ Coil design, Monostable Bistable	> 1 million operating cycles <sup>*6</sup> > 200,000 operating cycles		
Vibration / shock	IEC 61373	Category 1, class B		
Mounting position		horizontal / vertical		
Temperatures	Operating temperature / Storage temperature Altitude / Humidity (EN 50125-1)	-40 °C ... +70 °C / -40 °C ... +85 °C < 2,000 m above sea level / < 75 % yearly average		
Weight	depending on configuration	approx. 10.8 ... 17.5 kg	approx. 10.8 ... 17.5 kg	approx. 14.5 ... 15.7 kg

 **SCHALTBAU**

\*1 Ratings for IEC 60077-2; ratings for other standards on request.

\*2 Cover for main contact system, version "D", breaking capacity: no load

\*3 On request

\*4 With high-voltage discharging contact, the number of auxiliary contacts is reduced to max. 2

\*5 a1 and b0 according to IEC 60077-2 (auxiliary contact b0 "well open" or mirror contact for feedback circuits of safety-relevant control systems according to EN 13849-1)

\*6 The optional CPD contact limits the mechanical endurance to 600,000 operating cycles

**Specifications** 1-pole power contactors for AC and DC,  $U_n$  up to 3,000 V and  $I_{th}$  up to 2,000 A

CP series

Series		CP1115/20   CP1130/20	CP2115/20   CP2130/20
<b>Type of voltage</b>		DC (bi-directional), AC ( $f \leq 60$ Hz)	DC (bi-directional), AC ( $f \leq 60$ Hz)
<b>Number of poles, configuration</b>		1x, SPST-NO 1 ——— 2	1x, SPST-NC 1 ——— 2
<b>Electrical data according to IEC 60077-2</b>			
Nominal voltage	$U_n$	1,500 V   3,000 V	1,500 V   3,000 V
Rated operating voltage	$U_r$	1,800 V   3,600 V	1,800 V   3,600 V
Rated insulation voltage	$U_{Nm}$	3,000 V   4,800 V	3,000 V   4,800 V
Rated impulse withstand voltage	$U_{Ni}$	15 kV   25 kV	15 kV   25 kV
Pollution degree / Overvoltage category		PD3 / OV3	PD3 / OV3
Switching overvoltages	@ $U_e = 1,800$ V / @ $U_e = 3,600$ V	< $3x U_{Nm}$	< $3x U_{Nm}$
Conventional thermal current	$I_{th}$	2,000 A*1	2,000 A*1
Component category		A2	A2
Short-circuit making capacity	new/used contacts	6 kA / tbd*3	6 kA / tbd*3
Rated operating current $I_e$	Arc chamber		
Operational frequency C1			
T2 = 15 ms, DC, $U_e = 1,800$ V	A / B / D	450 A / 450 A / 0 A*2	450 A / 450 A / 0 A*2
T2 = 15 ms, DC, $U_e = 3,600$ V	A / B / D	400 A / 200 A / 0 A*2	400 A / 200 A / 0 A*2
Rated short-circuit breaking capacity	Arc chamber		
T2 = 15 ms, DC, $U_e = 1,800$ V	A / B / D	2,000 A / 1,000 A / 0 A*2	2,000 A / 1,000 A / 0 A*2
T2 = 15 ms, DC, $U_e = 3,600$ V	A / B / D	900 A / 140 A / 0 A*2	900 A / 140 A / 0 A*2
T2 = 1 ms, DC, $U_e = 1,800$ V	A / B / D	3,000 A / 2,500 A / 0 A*2	3,000 A / 2,500 A / 0 A*2
T2 = 1 ms, DC, $U_e = 3,600$ V	A / B / D	2,200 A / 800 A / 0 A*2	2,200 A / 800 A / 0 A*2
$\cos\phi = 0,8$ , AC, $U_e = 1,800$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	tbd*3 / 1,800 A / 0 A*2	tbd*3 / 1,800 A / 0 A*2
$\cos\phi = 0,8$ , AC, $U_e = 3,600$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	tbd*3 / tbd*3 / 0 A*2	tbd*3 / tbd*3 / 0 A*2
$\cos\phi = 1$ , AC, $U_e = 1,800$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	tbd*3 / 2,300 A / 0 A*2	tbd*3 / 2,300 A / 0 A*2
$\cos\phi = 1$ , AC, $U_e = 3,600$ V ( $f = 16.7 / f \leq 60$ Hz)	A / B / D	2,400 A / 1,400 A / 0 A*2	2,400 A / 1,400 A / 0 A*2
Rated short-time withstand current $I_{cw}$	@ T < 100 ms	15 kA	15 kA
Critical current range		none	none
Design			
Contact material		AgSnO <sub>2</sub>	AgSnO <sub>2</sub>
Terminals / Torque		2x M12 / 24 ... 30 Nm	2x M12 / 24 ... 30 Nm
<b>Auxiliary switches</b>			
Number max. (configuration)		4x max.*4 / 1x, S870 (a1) + 1x, S870 (b0) + 2x, S826*5 or 4x, S826	
Contact material		Silver, gold	
Switching capacity	SPDT-DB S826, silver contacts SPDT-DB S826, gold contacts SPDT S870, silver contacts SPDT S870, gold contacts	AC-15: 230 V AC / 1.0 A AC-15: 230 V AC / 0.1 A AC-15: 230 V AC / 1.5 A AC-15: 230 V AC / 1.0 A	DC-13: 110 V DC / 0.5 A DC-13: 110 V DC / 0.1 A DC-13: 60 V DC / 0.5 A DC-13: 60 V DC / 0.5 A
Terminals		Screw M3	
<b>Pre-charging contactor, high-voltage discharging contact</b>			
Pre-charging contactor, CPP1115/02	$U_{nmv}$ $I_{th}$	1x, SPST-NO, $U_{nmv} = 3,600$ V @ PD2/OV2, $I_{th} = 200$ A, see catalogue C45.en	
High-voltage discharging contact, CPD	$U_{nmv}$ $I_{th}$ Making/breaking capacity	1x, SPST-NC, $U_{nmv} = 3,600$ V, $I_{th} = 80$ A (only for CP1xxx and switching inverse to the main contact) 850 A / 250 A (T = 1 ms, DC)	
<b>Magnetic drive</b>			
Coil voltage/range (design)	$U_s$	24 / 36 ... 60 / 72 ... 110 V DC (mono or bistable with integrated PWM module)	
Control inputs (only coil version N, B)	$U_{st} / I_{st}$	8 ... 400 V / 1 mA (failsafe)	
Pollution degree / overvoltage category		PD3 / OV2	
Coil tolerance		-30 % ... +25 % $U_{SN}$	
Coil power dissipation	@ $U_s$ and $T_a = 20$ °C	Pull-in: 225 W max. @ 250 ms max. / hold: < 10 W	
Pull-in voltage	typical @ $T_a = 20$ °C	$U_s < 0.7 \times U_{SN}$	
Pull-in time	typical @ $T_a = 20$ °C	$\leq 160$ ms	
Drop-off voltage	typical @ $T_a = 20$ °C	$U_s \geq 0.1 \times U_{SN}$	
Drop-off time	typical @ $T_a = 20$ °C	$\leq 40$ ms	
Frequency of operation	@ $1.25 \times U_s$ and $T_a = 20$ °C	Mechanical: 240 operations/hour max. / electrical: 30 operations/hour max.	
Coil suppression		Integrated PWM module (electronic coil controller with suppressor diode)	
Coil terminal		Cage clamp	
<b>Degree of protection</b>			
IP00			
<b>Mechanical endurance</b>			
@ Coil design, Monostable		> 1 million operating cycles *6	
Bistable		> 200,000 operating cycles	
<b>Vibration / shock</b>			
IEC 61373 Category 1, class B			
<b>Mounting position</b>			
horizontal / vertical			
<b>Temperatures</b>			
Operating temperature / Storage temperature		-40 °C ... +70 °C / -40 °C ... +85 °C	
Altitude / Humidity (EN 50125-1)		< 2,000 m above sea level / < 75 % yearly average	
<b>Weight</b>			
depending on configuration		approx. 12 ... 19 kg	approx. 12 ... 19 kg

SCHALTBAU

\*1 Ratings for IEC 60077-2; ratings for other standards on request.

\*2 Cover for main contact system, version "D"; breaking capacity: no load

\*3 On request

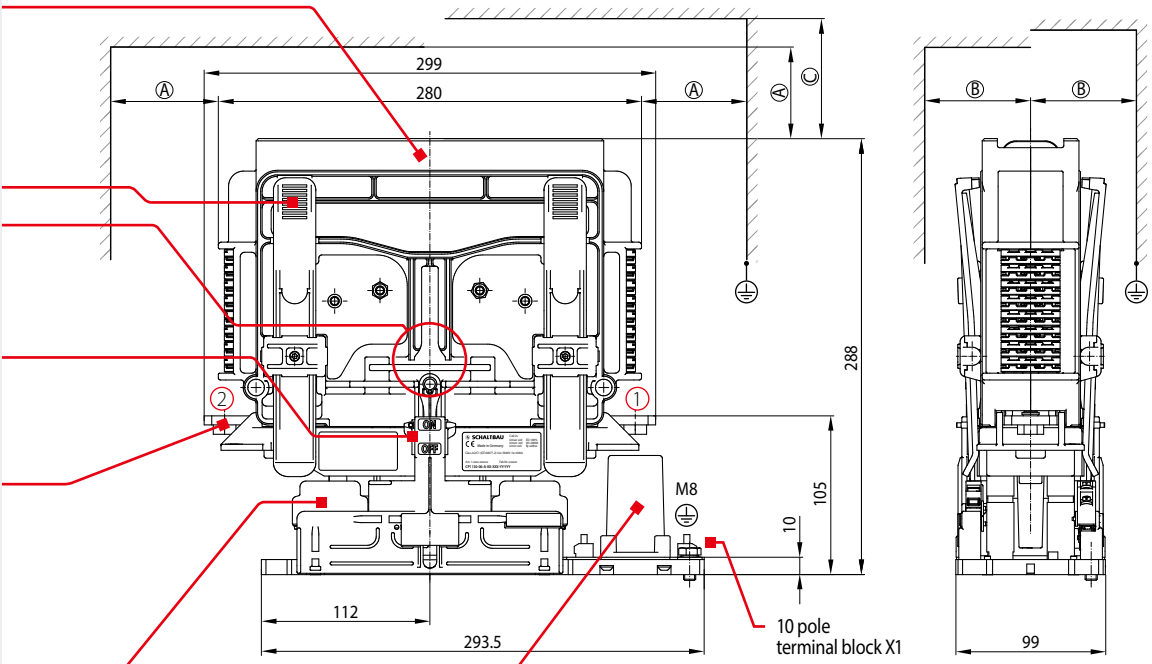
\*4 With high-voltage discharging contact, the number of auxiliary contacts is reduced to max. 2

\*5 a1 and b0 according to IEC 60077-2 (auxiliary contact b0 "well open" or mirror contact for feedback circuits of safety-relevant control systems according to EN 13849-1)

\*6 The optional CPD contact limits the mechanical endurance to 600,000 operating cycles

**Dimension diagram CP1115-06-A, CP1130-06-A** 1 pole SPST-NO |  $U_n = 1,500/3,000$  V |  $I_{th} = 600$  A | Breaking capacity: high  
**CP2115-06-A, CP2130-06-A** 1 pole SPST-NC |  $U_n = 1,500/3,000$  V |  $I_{th} = 600$  A | Breaking capacity: high

- High-efficiency ceramic arc chamber**  
Arc chamber with permanent-magnetic blowout. Configuration for frequent switching of high loads, "A" version
- Arc chamber interlock**
- Main contact system**  
SPST-NO: Version as NO contact, 1-pole  
SPST-NC: Version as NC contact, 1-pole
- Switching state indicator**  
ON: Main contact system switched on  
OFF: Main contact system switched off
- Main contact terminals**  
2x M10 screw, tightening torque 16 ... 20 Nm
- Pre-charging contactor CPP**  
1-pole NO contactor for precharging, mounting separately
- Auxiliary switches**  
2x Snap-action switches, silver- or gold-contacts, M3 screws
- Integrated PWM module**  
Electronic coil control with 10 pole terminal block



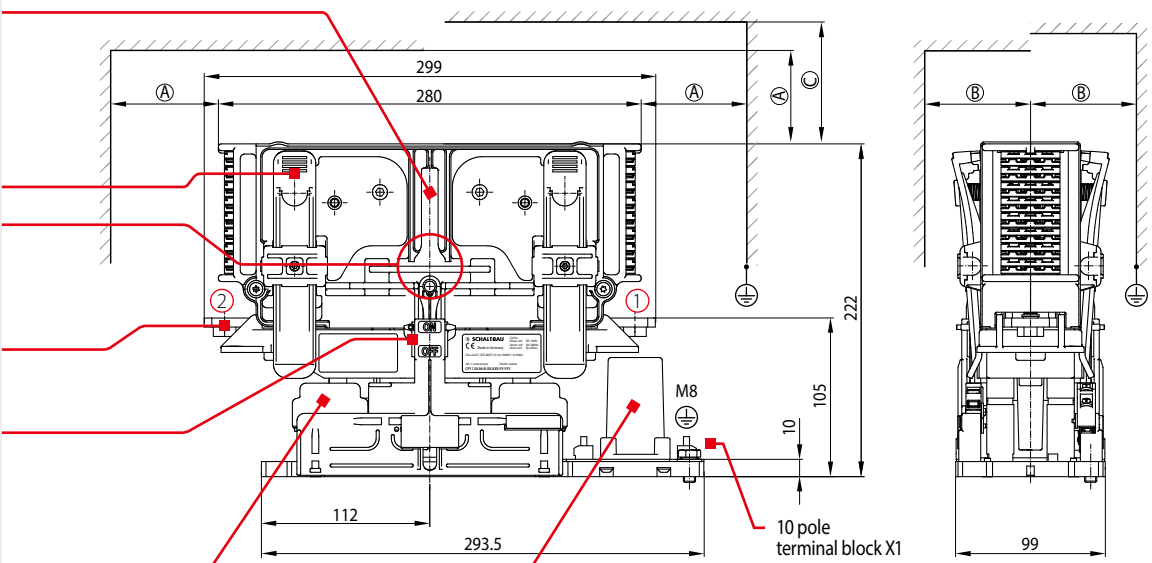
Minimum distances in [mm]

1	1	2	2	3
A	B	A	B	C
50	60	30	60	110

1) To earth potential, 2) To insulate parts, 3) For disassembly arc chamber

**Dimension diagram CP1115-06-B, CP1130-06-B** 1 pole SPST-NO |  $U_n = 1,500/3,000$  V |  $I_{th} = 600$  A | Breaking capacity: medium  
**CP2115-06-B, CP2130-06-B** 1 pole SPST-NC |  $U_n = 1,500/3,000$  V |  $I_{th} = 600$  A | Breaking capacity: medium

- Efficiency ceramic arc chamber**  
Arc chamber with permanent-magnetic blowout. Configuration for frequent switching of low loads, "B" version
- Arc chamber interlock**
- Main contact system**  
SPST-NO: Version as NO contact, 1-pole  
SPST-NC: Version as NC contact, 1-pole
- Main contact terminals**  
2x M10 screw, tightening torque 16 ... 20 Nm
- Switching state indicator**  
ON: Main contact system switched on  
OFF: Main contact system switched off
- Pre-charging contactor CPP**  
1-pole NO contactor for precharging, mount. separately
- Auxiliary switches**  
2x Snap-action switches, silver- or gold-contacts, M3 screws
- Integrated PWM module**  
Electronic coil control with 10 pole terminal block



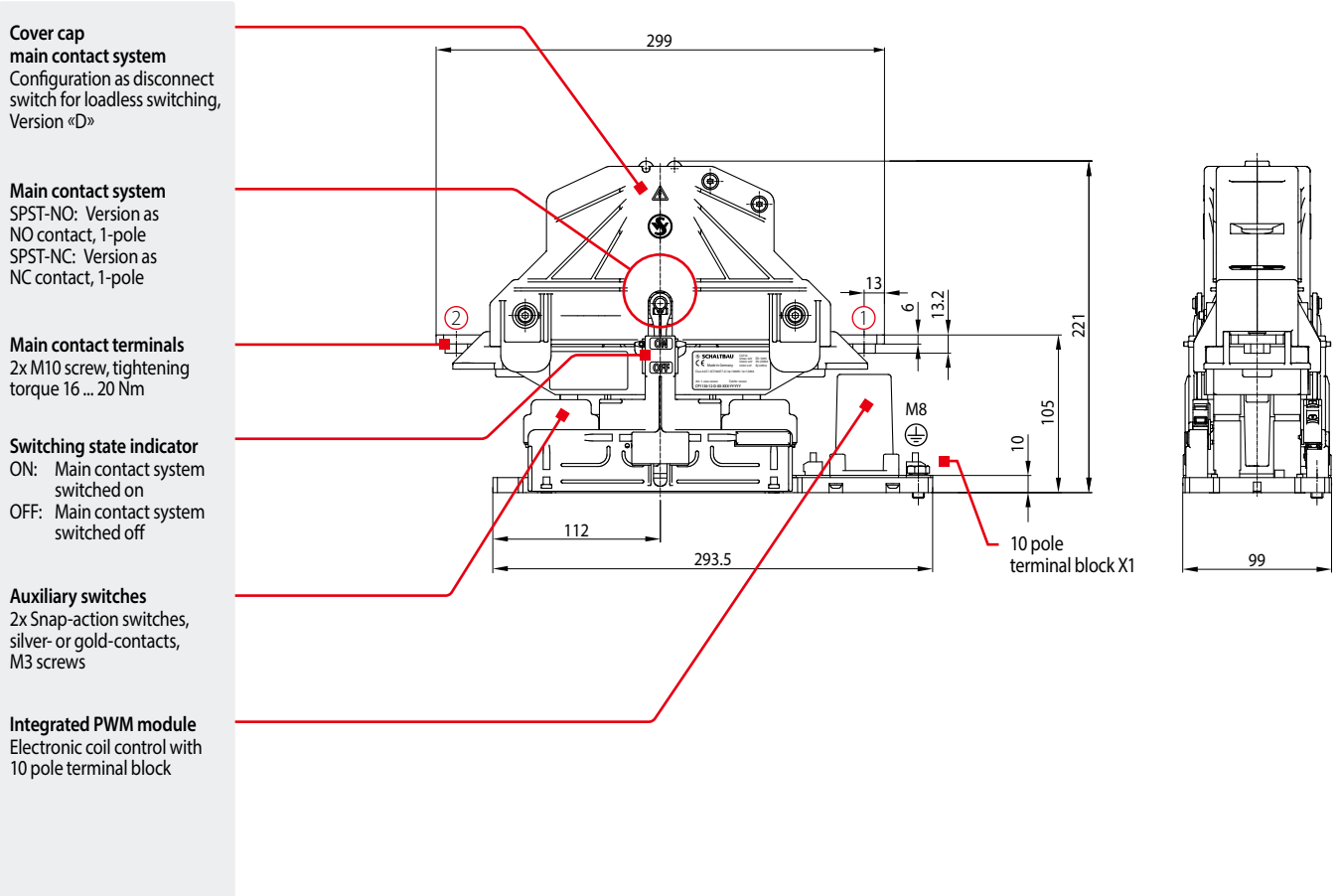
Minimum distances in [mm]

1	1	2	2	3
A	B	A	B	C
50	60	30	60	110

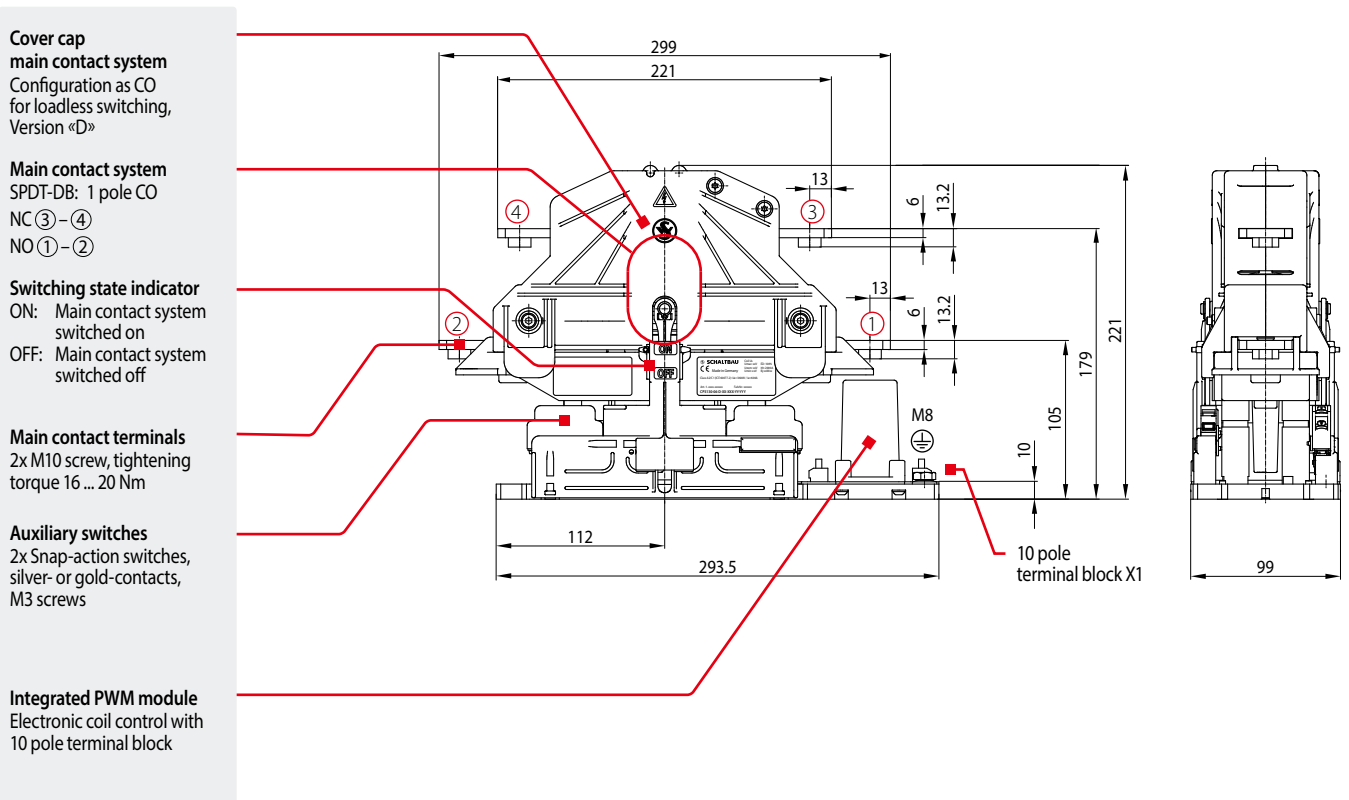
1) To earth potential, 2) To insulate parts, 3) For disassembly arc chamber



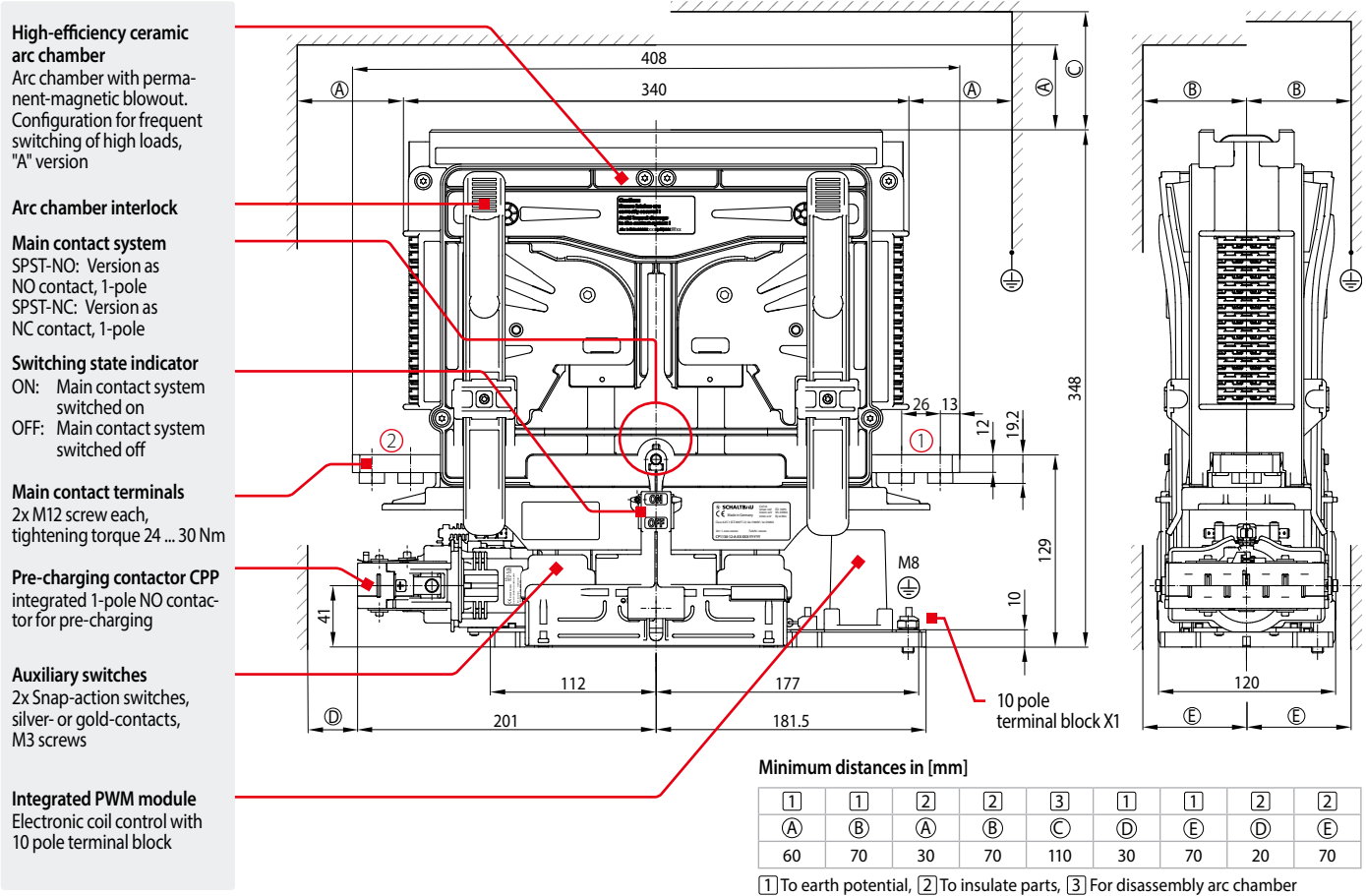
**Dimension diagram CP1115-06-D, CP1130-06-D** 1 pole SPST-NO | Un = 1,500/3,000 V | Ith = 600 A | Breaking capacity: none  
**CP2115-06-D, CP2130-06-D** 1 pole SPST-NC | Un = 1,500/3,000 V | Ith = 600 A | Breaking capacity: none



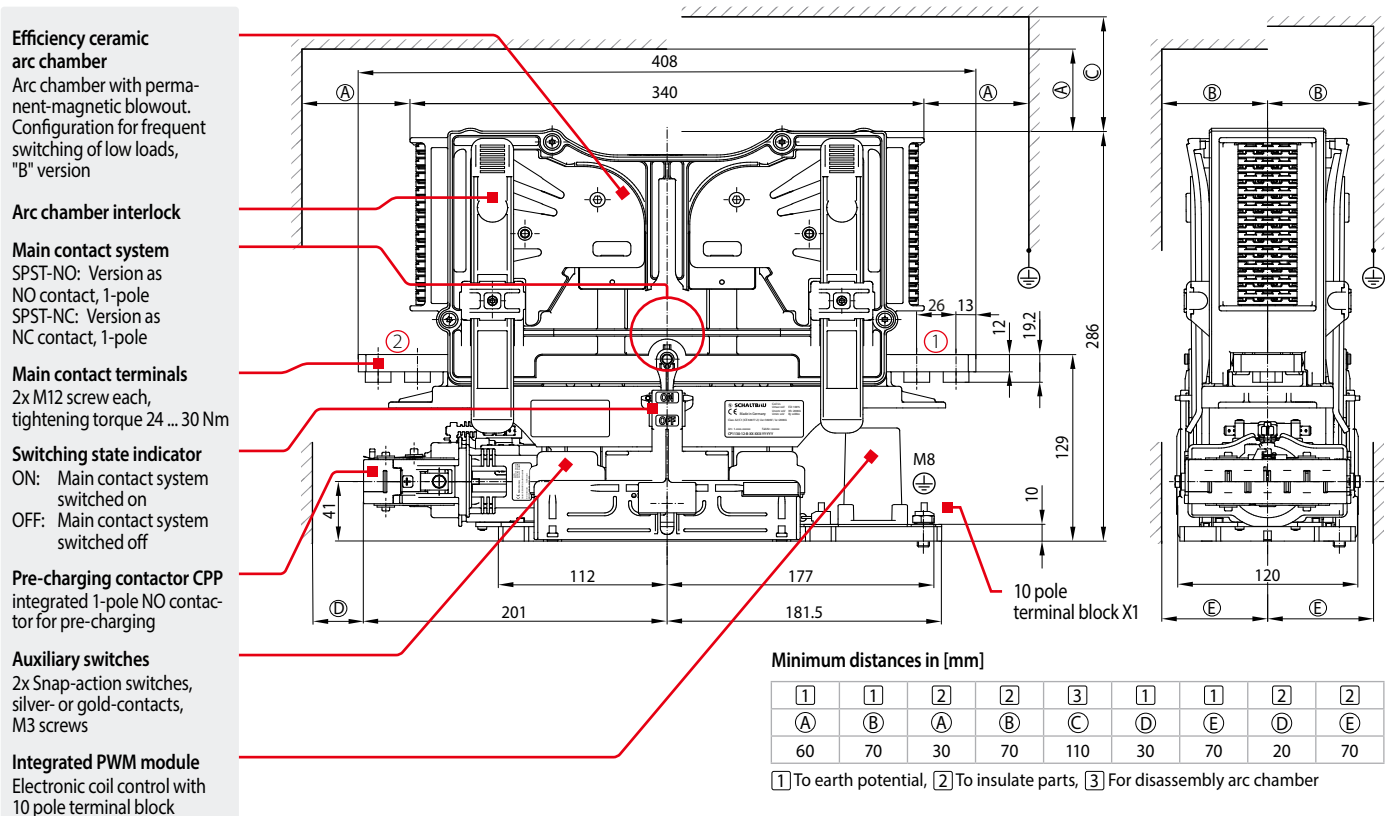
**Dimension diagram CP3115-06-D, CP3130-06-D** 1 pole SPDT-DB | Un = 1,500/3,000 V | Ith = 600 A | Breaking capacity: none



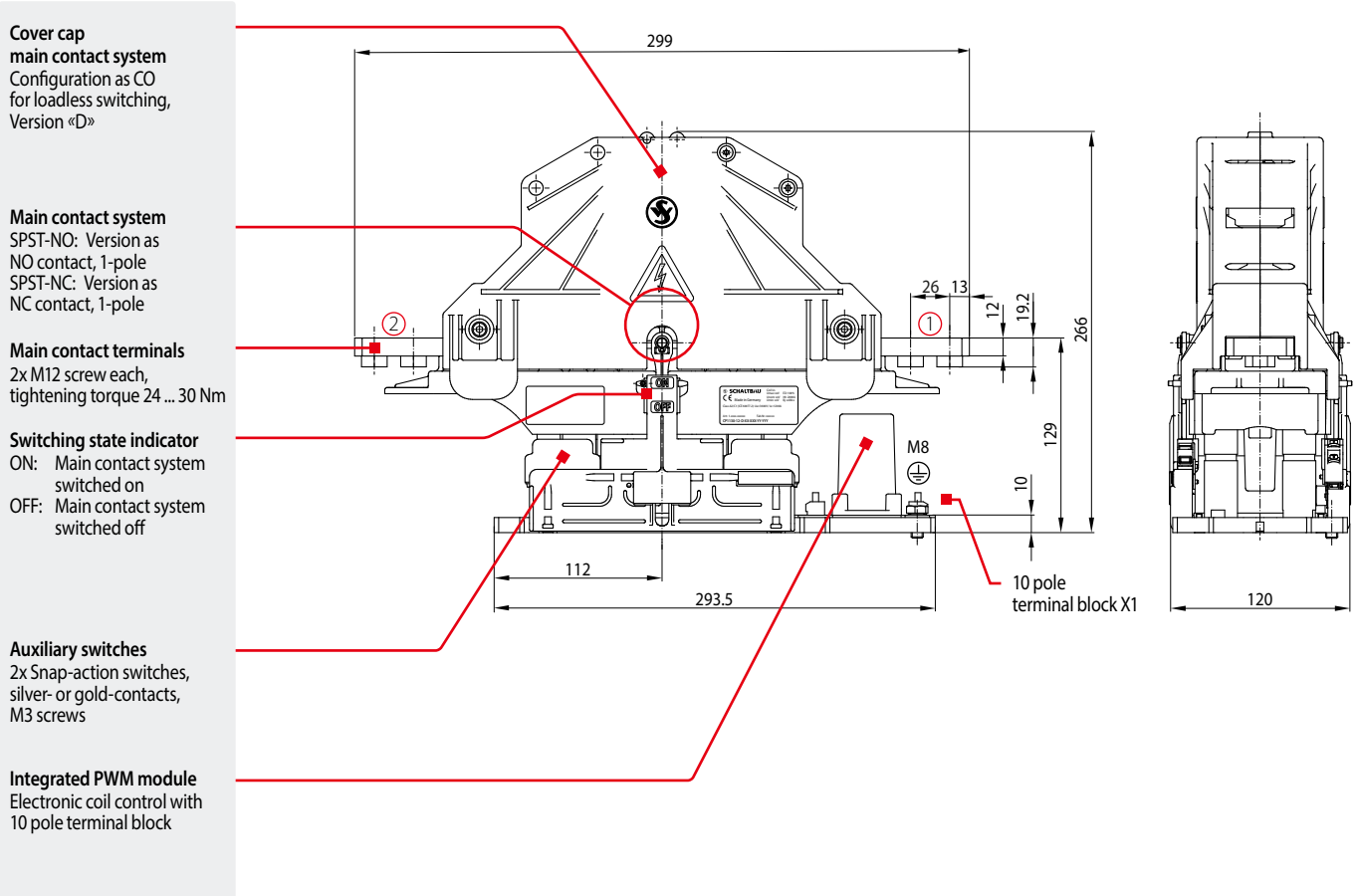
**Dimension diagram CP1115-12-A, CP1130-12-A** 1 pole SPST-NO |  $U_n = 1,500/3,000$  V |  $I_{th} = 1,200$  A | Breaking capacity: high  
**CP2115-12-A, CP2130-12-A** 1 pole SPST-NC |  $U_n = 1,500/3,000$  V |  $I_{th} = 1,200$  A | Breaking capacity: high



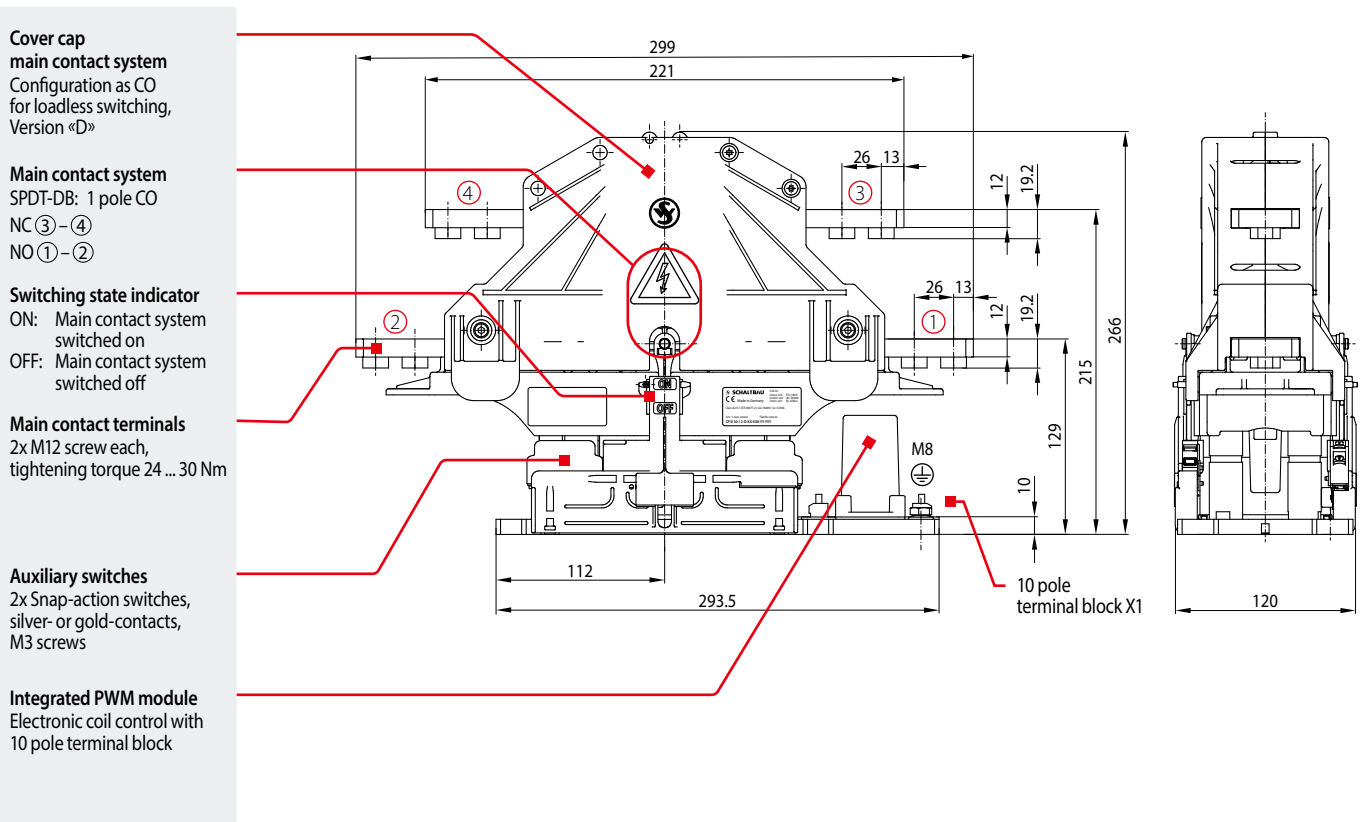
**Dimension diagram CP1115-12-B, CP1130-12-B** 1 pole SPST-NO |  $U_n = 1,500/3,000$  V |  $I_{th} = 1,200$  A | Breaking capacity: medium  
**CP2115-12-B, CP2130-12-B** 1 pole SPST-NC |  $U_n = 1,500/3,000$  V |  $I_{th} = 1,200$  A | Breaking capacity: medium



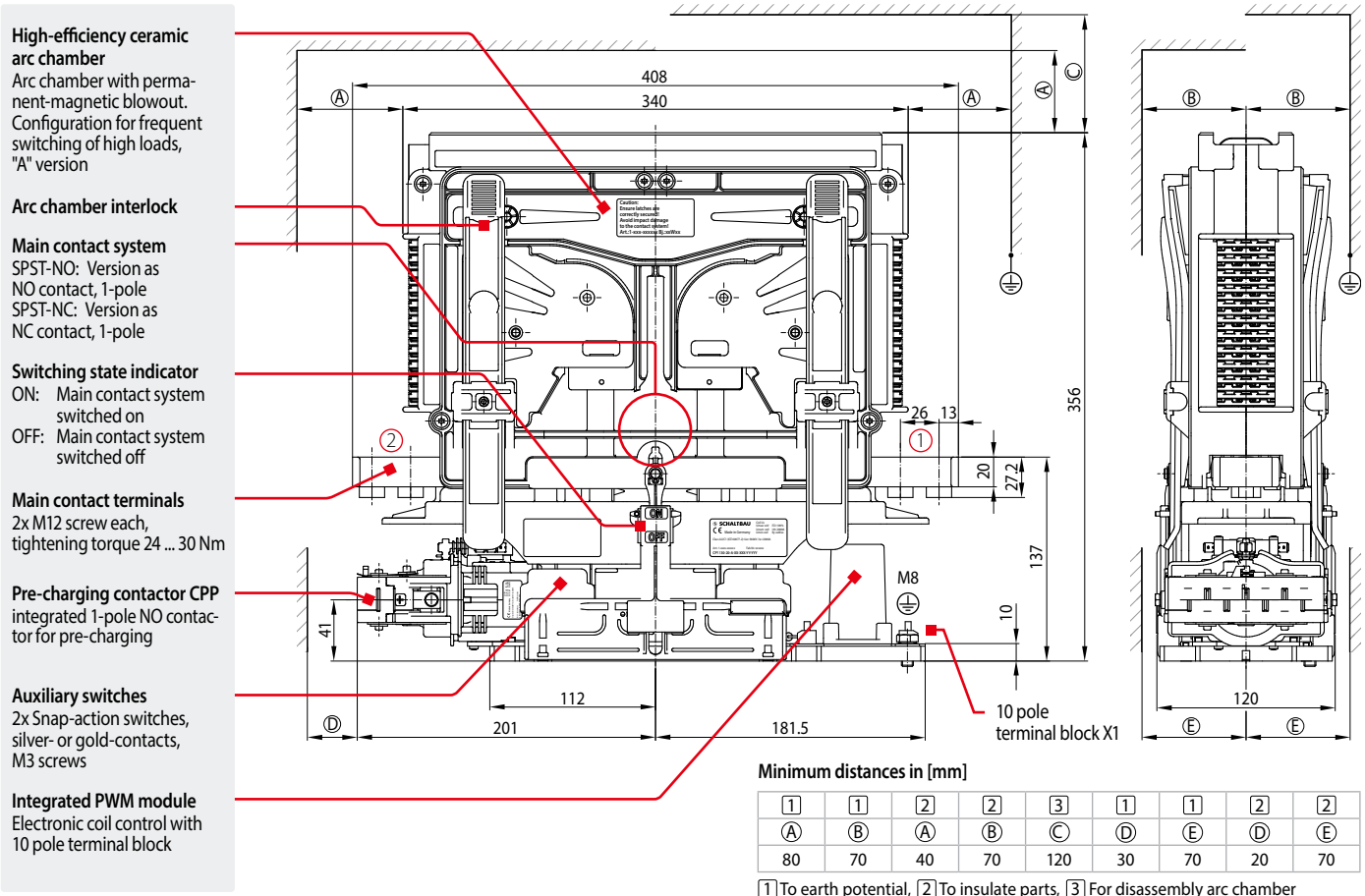
**Dimension diagram CP1115-12-D, CP1130-12-D** 1 pole SPST-NO |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 1,200\text{ A}$  | Breaking capacity: none  
**CP2115-12-D, CP2130-12-D** 1 pole SPST-NC |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 1,200\text{ A}$  | Breaking capacity: none



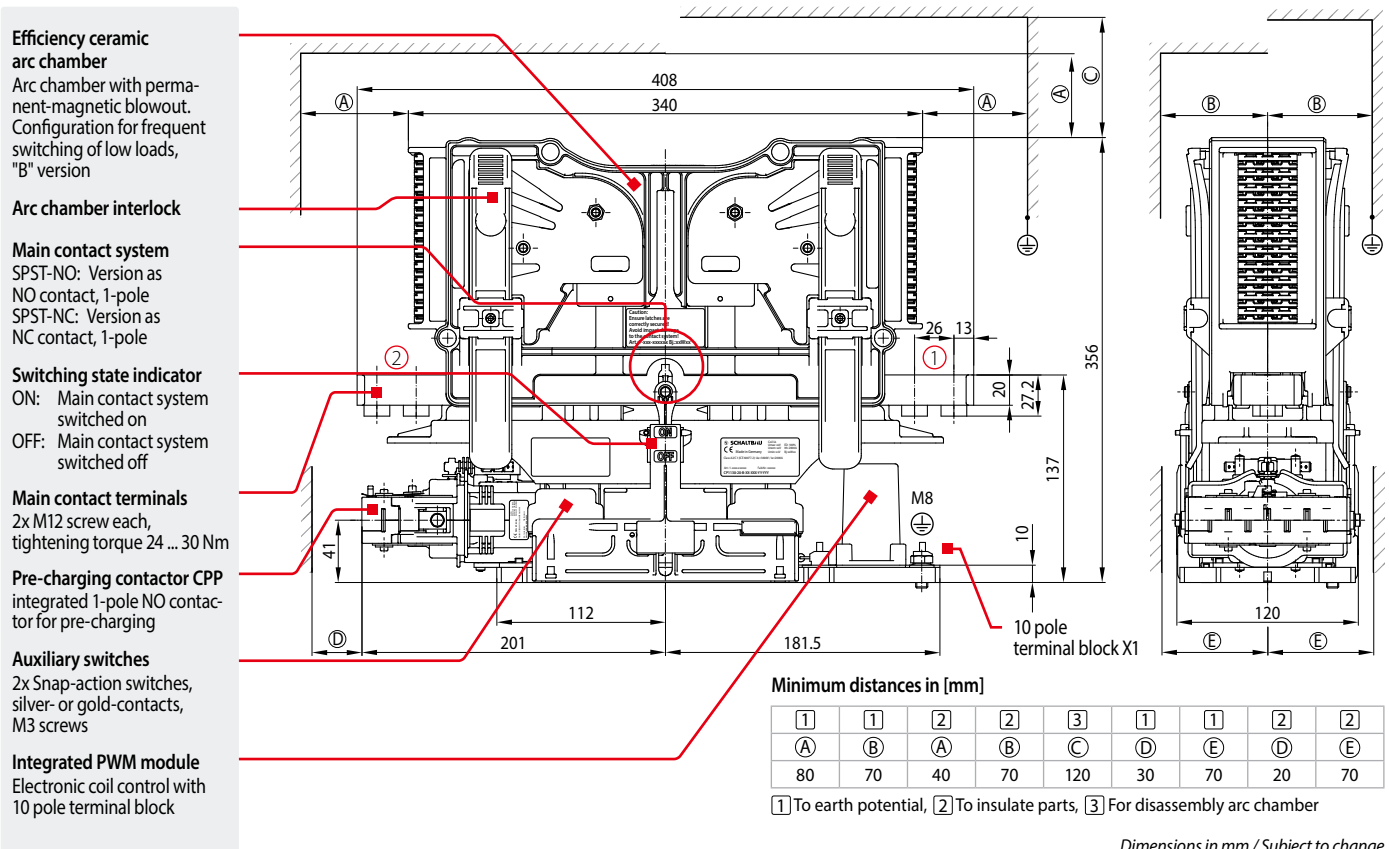
**Dimension diagram CP3115-12-D, CP3130-12-D** 1 pole SPDT-DB |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 1,200\text{ A}$  | Breaking capacity: none



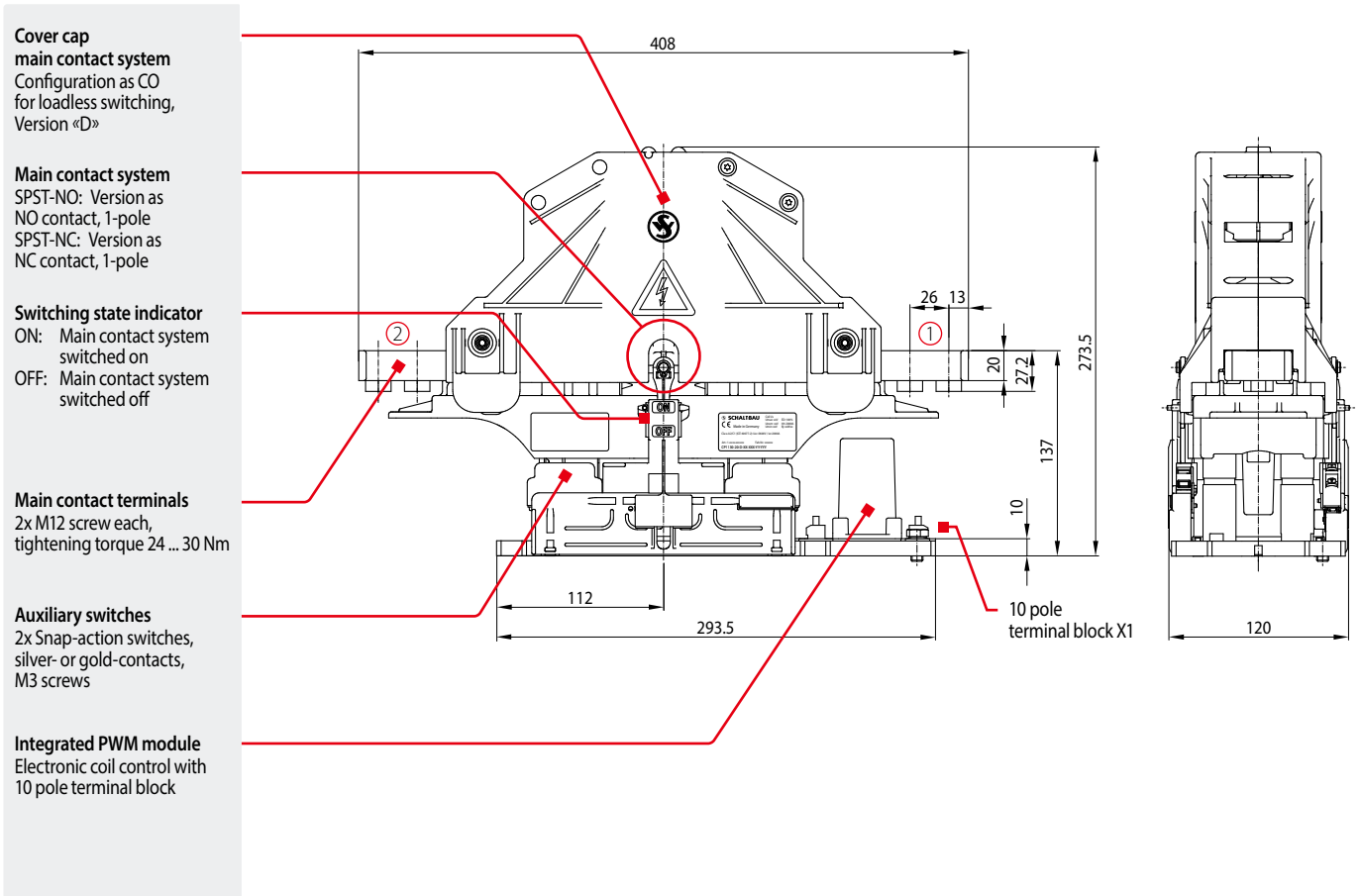
**Dimension diagram CP1115-20-A, CP1130-20-A** 1 pole SPST-NO |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 2,000\text{ A}$  | Breaking capacity: high  
**CP2115-20-A, CP2130-20-A** 1 pole SPST-NC |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 2,000\text{ A}$  | Breaking capacity: high



**Dimension diagram CP1115-20-B, CP1130-20-B** 1 pole SPST-NO |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 2,000\text{ A}$  | Breaking capacity: medium  
**CP2115-20-B, CP2130-20-B** 1 pole SPST-NC |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 2,000\text{ A}$  | Breaking capacity: medium



**Dimension diagram CP1115-20-D, CP1130-20-D** 1 pole SPST-NO |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 2,000\text{ A}$  | Breaking capacity: none  
**CP2115-20-D, CP2130-20-D** 1 pole SPST-NC |  $U_n = 1,500/3,000\text{ V}$  |  $I_{th} = 2,000\text{ A}$  | Breaking capacity: none



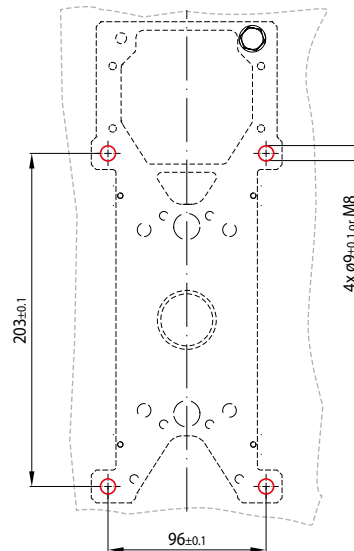
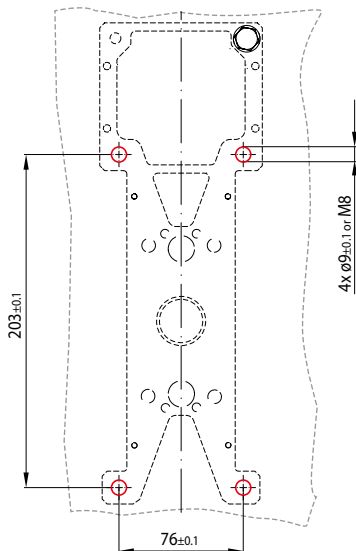
**Mounting holes**

CP series

The mounting holes for mounting frames or mounting plates can be either tapped holes for threaded screws or through holes for threaded screws and nuts.

- CP11xx-06, CP21xx-06, CP31xx-06 series

- CP11xx-12, CP21xx-12, CP31xx-12 series,  
CP11xx-20, CP21xx-20, CP31xx-20 series

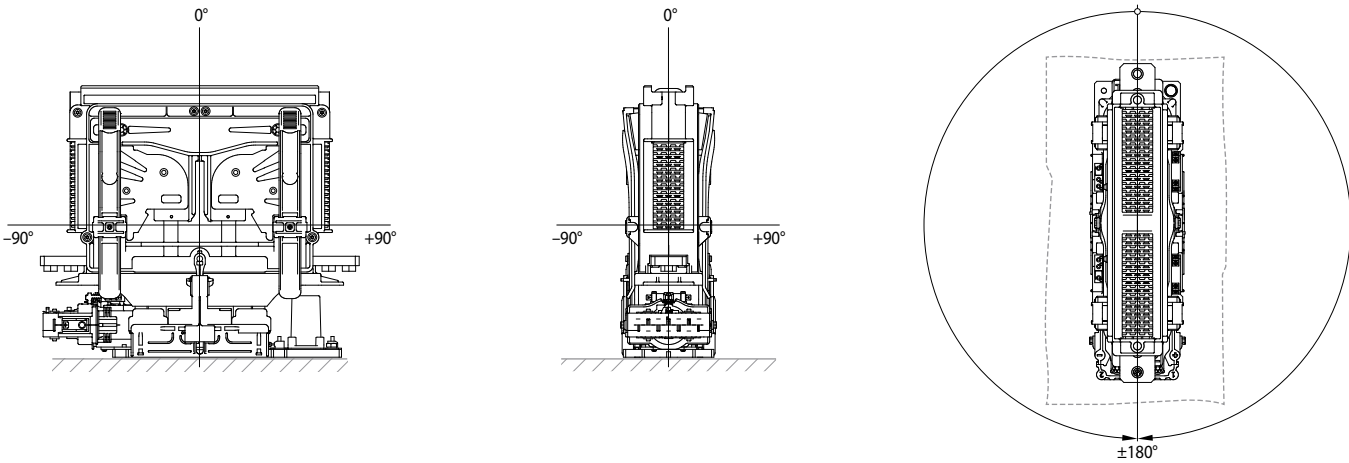


**Minimum clearances:**  
The minimum distances to earth potential or to insulating parts specified in the dimension diagrams must be observed!



Mounting instructions CPxxx-xx-A, CPxxx-xx-B

CP series



**i** The contactors can be mounted horizontally or vertically on a prepared mounting plate. Further mounting positions upon request.

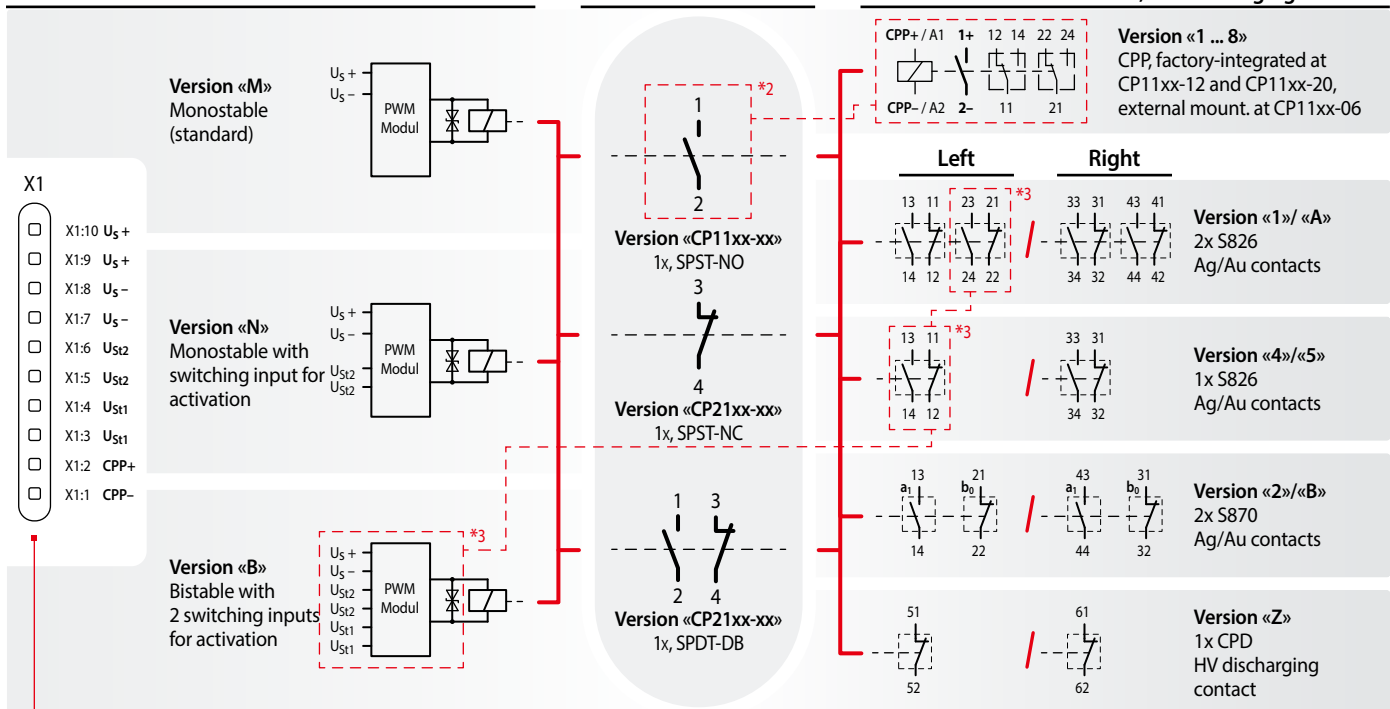
Circuit diagram

CP series

Magnetic drive: Coil design, terminals

Main contacts

Pre-charging contactor, aux. contacts, HV discharging contact\*1



**Terminal block «X1»**  
10x cage clamp terminal, pin assignment depends on configuration on the configuration

X1:10	Coil terminal $U_c+$
X1:9	Coil terminal $U_c+$
X1:8	Coil terminal $U_c-$
X1:7	Coil terminal $U_c-$
X1:6	Version «N»: control input enable $U_{St2+}$ Version «B»: control input close $U_{St2+}$
X1:5	Version «N»: control input enable $U_{St2-}$ Version «B»: control input close $U_{St2-}$
X1:4	Version «B»: control input open $U_{St1+}$
X1:3	Version «B»: control input open $U_{St1-}$
X1:2	Pre-charging contactor coil terminal $U_c+$ *4
X1:1	Pre-charging contactor coil terminal $U_c-$ *4

\*1 All auxiliary contacts and the high-voltage discharging contact are shown for the variants normally open and changeover contactor variants. For the NC contactor, the designations have been adapted accordingly due to the inverse control (not shown here).

\*2 Wiring of coil connections X1:1 and X1:2 only if precharging contactor integrated. The option applies to make contactors CP11xx12 and CP11xx-20 and saves mounting effort. The precharging contactor is included with the CP11xx-06 NO contactors and must be mounted by the customer.

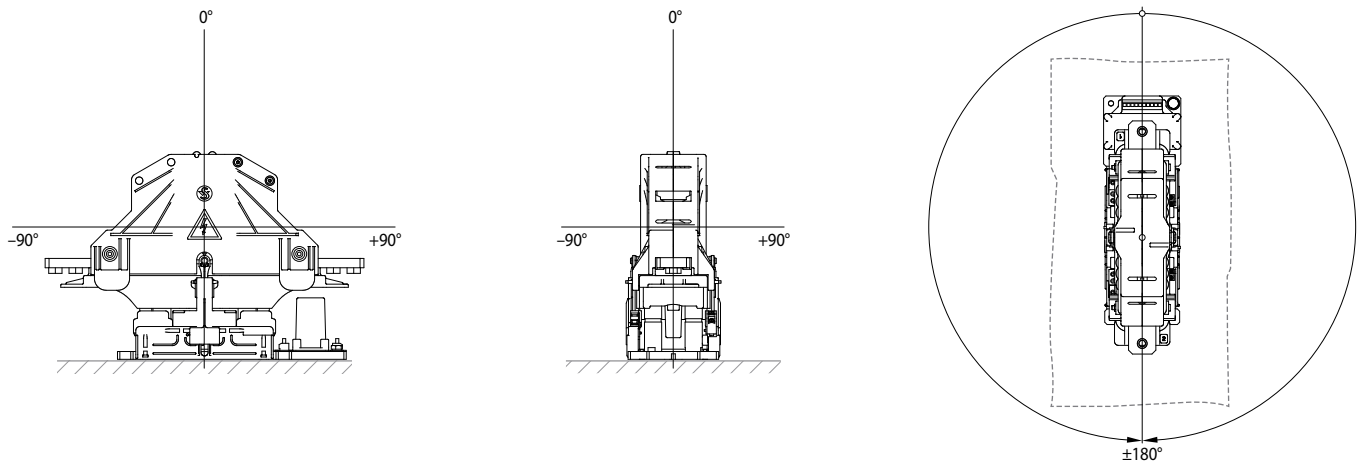
\*3 Wiring of switching inputs X1:5 and X1:6 only for bistable coil versions «B». An auxiliary contact S826 is additionally required for monitoring the switching state (version «1» or «5»). This auxiliary contact is not available on the customer side.

\*4 Wiring only if precharging contactor CPP integrated

**i** **Note:**  
Coil control and auxiliary contacts can optionally be led out via a separate connector. We will also be pleased to supply customer-specific versions if the corresponding number of units is available. Please contact us!

**Mounting instructions** CPxxx-xx-D

CP series



The contactors can be mounted horizontally or vertically on a prepared mounting plate. Further mounting positions upon request.

**Maintenance and safety instructions**

CP series

**Maintenance:**

- CP 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  
 ➔ [C40-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.
- Strong electromagnetic induction caused when switching off can influence other components installed near the contactor.
- 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!

# Schaltbau GmbH

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

Schaltbau GmbH  
Hollerithstrasse 5  
81829 Munich  
Germany



Phone +49 89 9 30 05-0  
Fax +49 89 9 30 05-350  
Internet [www.schaltbau.com](http://www.schaltbau.com)  
e-Mail [contact@schaltbau.de](mailto:contact@schaltbau.de)

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