ELECTRONIC CIRCUIT BREAKER
ELEKTRONISCHER SCHUTZSCHALTER

Date / Datum	31.07.2019
Created by / Erstellt von	Horn
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Contact information / Kontakt Information	Block Transformatoren-Elektronik GmbH Max-Planck-Straße 36-46 27283 Verden, Germany info@block.eu www.block.eu

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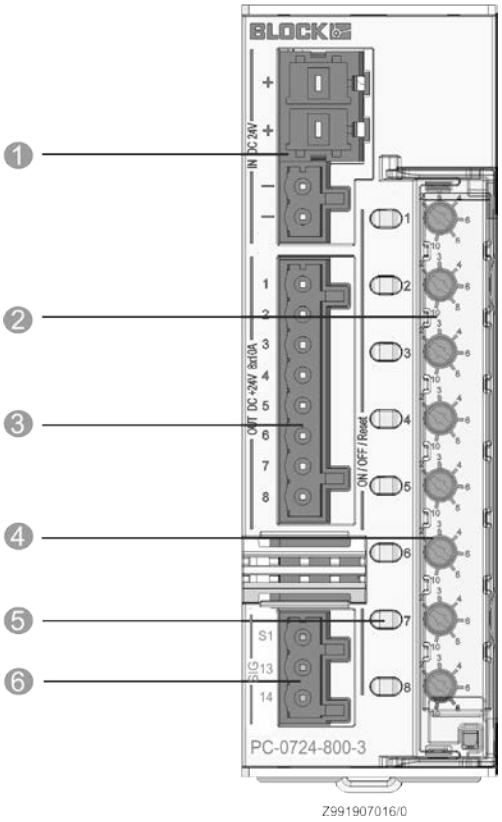
1. Product specification / Produkt Spezifikation

1.1 User elements / Bedienelemente



(1) DC input (+24 V and 0 V). The 0 V connection of the device merely serves to supply the internal electronic circuits.
Eingang (+24V und 0V). Der Anschluss 0V dient nur der Eigenversorgung des Schutzschalters.

(2) Sealed cover of the current-selector-switches.
Plombierbare Abdeckung der Stromwahlschalter.

(3) Outputs for connecting the load circuits. The 0 V of the loads must be supplied directly to the power supply by means of separate wiring.
Ausgänge zum Anschluss der Verbraucherkreise. Die 0V der Verbraucher sind über getrennte Leitungen direkt zur Stromversorgung zu führen.

(4) Current-selector-switches.
Stromwahlschalter

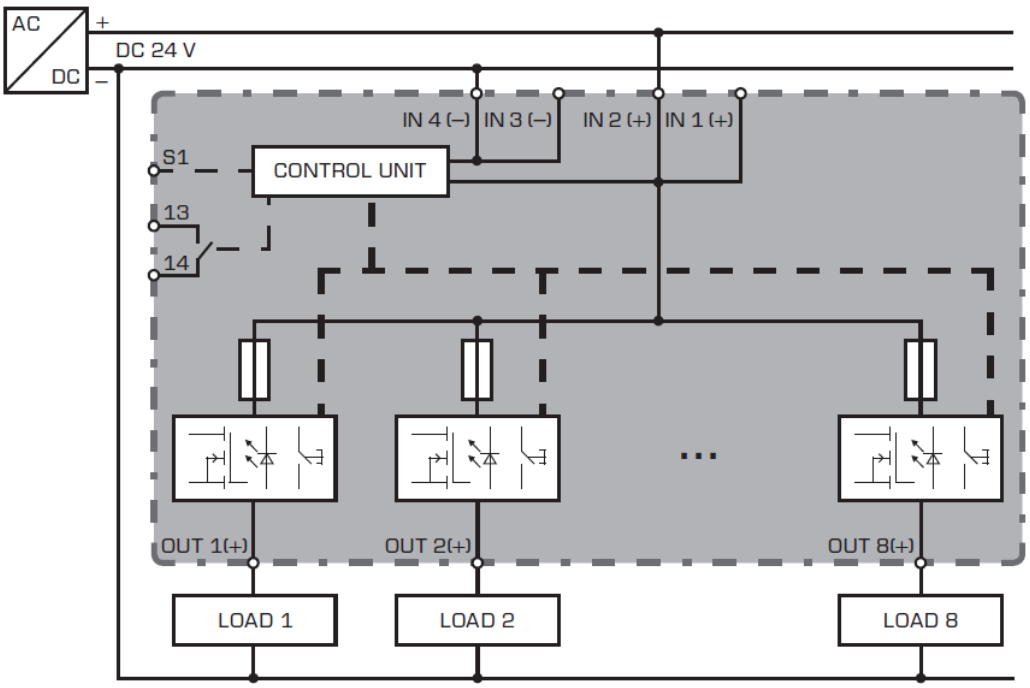
(5) Pushbuttons On/Off/Reset with integrated LED.
Taster An/Aus/Reset mit integrierter LED.

(6) Signal- and control contacts S1/13/14 / Signal- und Steuerkontakte S1/13/14

S1 = Reset-input (reset of tripped outputs, more information about S1 under 1.4)
S1 = Reset-Eingang (Wiedereinschalten von ausgelösten Ausgängen, mehr Information über S1 unter 1.4)

13/14 = potential-free signal output (open, if minimum one output is tripped or switched off manually)
13/14 = Potentialfreier Meldekontakt (Schließerkontakt geöffnet, wenn min. ein Ausgang ausgelöst oder manuell ausgeschaltet ist.

1.2 Block diagram / Blockschaltbild



1.3 Operating states, Signaling, Reactions / Operationsmodi, Signale, Reaktionen

	State / Description Betriebszustand / Beschreibung	Output Ausgang	LED	Signal output 13/14 Meldekontakt 13/14	Pushbutton pressed => go to… Tester wird gedrückt => Übergang nach…	Signal input S1 => go to… Steuereingang S1 => Übergang nach
Z0	Initialization[1)] Modulinitialisierung [1)]	off aus	off aus	opened offen	---	---
Z1	Output on, function OK Ausgang eingeschaltet, Funktion OK	on ein	green grün	closed geschlossen	Z3	---
Z2	Output current > rated current [2)] Ausgangsstrom >Nennstrom [2)]	on ein	green flashing grün blinkend	closed geschlossen	Z3	---
Z3	Output was switched off manually[3)] Ausgang ist manuell abgeschaltet [3)]	off aus	red rot	opened offen	Z1	---
Z4	Output was switched off automatically (over current), thermal relaxation active[4)] Ausgang ist auf Grund eines Überstromes abgeschaltet, thermische Entspannung aktiv [4)]	off aus	red flashing rot blinkend	opened offen	---	---
Z5	Output was switched off automatically (over current), thermal relaxation finished[5)] Ausgang ist auf Grund eines Überstromes abgeschaltet, thermische Entspannung ist beendet [5)]	off aus	orange flashing orange blinkend	opened offen	Z3	Z1 (through positive impulse >0,5s) Z1 (mittels Impuls >0,5s)
Z6	Error condition / Gerätefehler internal fuse blown *) internal memory error **) interne Sicherung ausgelöst *) interner Speicherfehler **) *) only affected channel **) all channels simultaneously *) nur betroffener Kanal **) alle Kanäle simultan	off aus	red flashing fast rot schnell blinkend	opened offen	---	---

1) After the initialization of the device the outputs are switched on (load dependent).
Nach Abschluss der Modulinitialisierung warden die Ausgänge lastabhängig eingeschaltet.

2) The output is automatically deactivated in accordance with tripping-curves-characteristics, transition to Z4.
Der Ausgang wird gemäß Auslösekennlinie automatisch abgeschaltet, Übergang nach Z4.

3) The off-state is saved when power is turned off. The affected output can be switched on by pressing the push button.
Der Zustand jedes Ausgangs wird beim Ausschalten des Gerätes gespeichert.

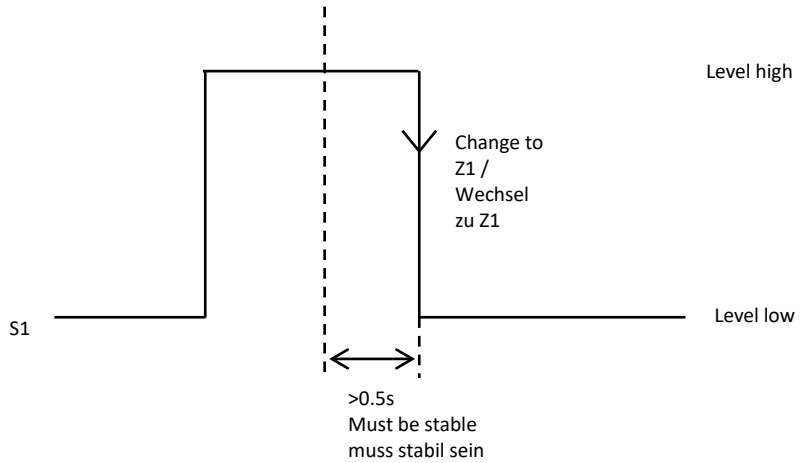
4) After a specific time interval (thermal relief) change to operational condition Z5. If the unit is switched off the remaining time is saved and will resume with the next switch on. This reliably prevents overloading if the unit is immediately switched back on.
Nach einer Wartezeit (thermische Entspannung) Übergang nach Betriebszustand Z5. Beim Ausschalten des Gerätes wird die restliche Wartezeit gespeichert und beim Wiedereinschalten abgewartet. Dadurch wird auch bei sofortigem Wiedereinschalten des Gerätes eine Überlastung der Schaltelemente zuverlässig verhindert.

5) The affected output can be reset by pressing the push button twice or through the falling edge of a positive impulse (>0,5s) on signal input S1. S1 will reset all tripped channels. Change to operational condition Z1. See Chapter 1.4 for more information about signal S1.
Der betroffene Ausgang kann durch zweimaligen Tastendruck oder über einen Impuls (>0,5s) an Signaleingang S1 wieder eingeschaltet werden, Übergang nach Betriebszustand Z1. Siehe Kapitel 1.4 für mehr Information über das S1-Signal.

1.4 Signal- and control contacts S1/13/14 / Signal- und Steuerkontakte S1/13/14

The electronic circuit breaker is equipped with three signal contacts.
Der elektronische Schutzschalter ist mit drei Signalkontakten ausgestattet.

The signal input S1 provides the possibility to reset each tripped output by placing a defined signal at the input. A change in signal status may only be made every 0.5 seconds. For shorter times no processing takes place.
Das Signal S1 bietet die Möglichkeit alle ausgelösten Ausgänge durch ein definiertes Steuersignal zurückzusetzen. Ein Statuswechsel kann nur alle 0,5 Sekunden durchgeführt werden, bei kürzeren Zeiten findet keine Verarbeitung statt.



A switching action only takes place synchronous to the flank of S1. Before the switching edge, the signal S1 must have been stable for at least 0.5 seconds. Otherwise there will be no reaction. So, maximum switching frequency is 1Hz at 50% duty cycle. The level at start-up can be high or low, a switching action takes place with a change of edge after earliest 0.5 seconds.
Die Schaltaktion findet synchon zur fallenden flanke von S1 statt. Vor der Schaltflanke muss Signal S1 für mindestens 0,5 Sekunden stabil sein, sonst erfolgt keine Reaktion. Damit ergibt sich eine maximale Schaltfrequenz von 1Hz mit 50% Tastverhältnis.

The potential-free contact 13/14 works as a group alarm message. If minimum one output is tripped or minimum one output is switched off manually, the group alarm contact is open.
Der potentialfreie Kontakt 13/14 arbeitet als Gruppenalarm. Wenn mindestens ein Ausgang ausgelöst oder manuell ausgeschaltet wurde, ist der Kontakt geöffnet.

1.5 Technical data / Technische Daten

	PC-0724-800-3
Input data **Eingangsdaten**	
Nominal input voltage Eingangsnennspannung	24V DC
Input voltage range Eingangsspannungsbereich	18 – 30 Vdc
Maximal residual ripple of supplied input voltage (peak to peak) Maximale Restwelligkeit der speisenden Eingangsspannung.	3 % (BW 20MHz) Note: If ripple voltage leads to current ripple (capacitive loads), it adds to the load current. The tripping current can be reached sooner in this case. Hinweis: Wenn die Restwelligkeit zu Stromspitzen führt (kapazitive Lasten), addieren sich diese zum Laststrom. Der Auslösestrom kann in diesem Fall schneller erreicht werden.
Required input voltage for turning on the outputs Erforderliche Eingangsspannung zum Einschalten der Ausgänge	19.5 V (±0.5V)
Maximum total input current Maximaler Dauerstrom des Modules	70 A
Maximum input current for each pole of the terminal Maimaler Dauerstrom je Klemmenpol	40 A
Suppressor Diode	33 V
Stand-by current @ 24V Leerlaufstrom @ 24V	55 mA
Power losses in stand-by mode @ 24V Leerlaufverlustleistung @ 24V	1.32 W
Terminals input Anschlüsse Eingang	WAGO Series 831, max. 10mm² (2 x “+”) WAGO Series 721, max. 2.5mm² (2x “-“)
Output data **Ausgangsdaten**	
Nominal output voltage Ausgangsnennspannung	24V DC
Nominal output current (adjustable) Ausgangsnennströme (einstellbar)	8x (2, 3, 4, 6, 8, 10 A)
Maximum voltage drop between input and output	200 mV @ 7 x 10 A
Initialization time	250 ms
Turn-on delay of outputs (load dependent) Zuschaltverzögerung der Kanäle (lastabhängig)	min. 50 ms / max. 5 s Note: The next channel is switched on if the previous channel falls below the nominal current within the delay time. Hinweis: Der nächste Kanal wird eingeschaltet, wenn der vorherige Kanal innerhalb der Verzögerungszeit unter Nennstrom fällt.
Waiting period after switch-off of an output (thermal relaxation) Short circuit (A) … overload (B) Wartezeit nach Abschaltung eines Ausgange (thermische Entspannung) Kurzschluss (A) … Überlast (B)	500 ms (A) … 20 s (B) Note: The length of waiting period is determined by previously experienced power loss at the transistor. The controller calculates a thermal model based on time-dependent counters. Hinweis: Die Zeitdauer der Wartezeit ist bestimmt durch die aufgetretene Verlustleitung am Transistor. Der controller berechnet die Zeit mit Hilfe eines thermischen Modelles.
Maximum power losses Maximale Verlustleistung	15,32 W @ 7 x 10 A

Efficiency (typ.) Wirkungsgrad (typ.)	> 99 % $\text{efficency [\%]} = 100 - \frac{\text{stand-by power loss} + \text{max. voltage drop} \times \text{number of channels} \times \text{max. current per channel}}{\text{number of channels} \times \text{max. current per channel} \times \text{supply voltage}} \times 100$	
Max. Turn-on capacity for each output @ measuring condition Maximale Lastkapazität je Ausgang @ Messbedingung	min. 63 mF @ 24 Vdc / 2.5 mm² / 2.5 m Note: The turn-on capacity depends on supply voltage and line impedance (length and diameter). The specified measuring conditions serve for better comparability. Cable length is from fuse output (+) to load (+). All other wiring (supply-fuse, supply-load) is low impedance. Hinweis: Die Einschaltkapazität ist abhängig von der Versorgungsspannung und Leitungsimpedanz (Länge und Durchmesser). Die angegebene Messbedingung sorgt für bessere Vergleichbarkeit.	
Internal output fuse for each output Integrierte Sicherungen pro Ausgang	15 A	
Maximum reverse feed Rückspeisefestigkeit	35 V .	
Parallel use of inputs Parallelschaltung von Eingängen	√	
Parallel use of outputs Parallelschaltung von Ausgängen	-	
Serial use of outputs Serienschaltung von Ausgängen	-	
Terminals outputs Anschlüsse Ausgänge	WAGO Series 721, max 2,5mm² (8 x “+“)	
Signaling **Signalisierung**		
Status display (for each output) LED (red, green, orange) Statusanzeige (pro Ausgang) LED (rot, grün, orange)	√	
Signal input S1 (reset) Signaleingang S1 (Reset)	-	DC 24 V Level high = min. 15 V, max. 30 V Level low = min. 0 V, max. 5 V
Potential-free signal output 13/14 (group alarm) Potentialfreiher Signalausgang 13/14 (Sammelmeldung)	-	13/14 = closed: Status OK 13/14= open: minimum one channel is tripped or switched off max. 58 VDC / 40 VAC, 100 mA, < 16 Ω
Terminals signalling Anschlüsse Schnittstelle	WAGO Series 721, max. 2,5 mm² (S1, 13, 14)	
Environment **Umwelt**		
Altitude Betriebshöhe	max. 2000m	
Storage temperature Lagertemperatur	-25 °C … +85 °C	
Operational temperature Umgebungstemperatur	-25 °C … +70 °C	
Convection cooling Konvektionskühlung	√	
Humidity, no condensation Luftfeuchte, nicht kondensierend	5 … 96 %	
For installation in Pollution Degree 2 environment Einsatz in Bereichen mit Verschmutzungsgrad 2	√	

Use Copper Conductors only, rated min. 75°C Zum Anschluss Kupferkabel mit min. 75°C verwenden	√
Derating	Max. output current per channel: 10A total current (all channels together): @ 40°C max 70A @ 50°C max 70A @ 55°C max 60A @ 60°C max 50A @ 70°C max 40A
Required minimum spacing (left/right) Erforderlicher Mindestabstand (seitlich)	0 mm
Required minimum spacing (over/under) Erforderlicher Mindestabstand (oben/unten)	20 mm
Insulation	
Withstand voltage Spannungsfestigkeit	500V DC for 1min. (between all terminals and DIN rail attachment)
General Data **Allgemeine Daten**	
Degree of protection acc. to IEC 60529 Schutzart nach IEC 60529	IP 20
Protection class acc. to EN 61140 Schutzklasse nach EN 61140	III
MTBF	>500.000h (EN/IEC 61709 (SN 29500); nonmobile and continuous operation, Tu=40°C)
Standards **Normen**	
Safety Sicherheit	EN 60950-1, EN 50178, EN/IEC 60204-1
EMC EMV	61000-6-2, EN 61000-6-3
Sefety extra-low voltage Schutzkleinspannung (SELV / PELV)	IEC 60364-4-41 (DIN VDE 0100-410)
CE acc. 2014/30/EU (EMC) CE gem. 2014/30/EU (EMV)	√
RoHS	2011/65/EU, 2015/863
Markings **Prüfzeichen**	
UL 2367	UL 2367 UL 2367 UL 2367 Special-purpose Solid-state overcurrent protectors, Component Recognition; UL category QVRQ2, E-File: E356250
UL 508	Listed for the use as Industrial Control Equipment; U.S.A. (UL 508) and Canada (C22.2 No. 14-10), E-File: E219022
DNVGL	DNV GL (Germanischer Lloyd) classified, Environmental category: C, EMC2
Measures and weights **Maße und Gewichte**	
Mounting on standard rail DIN EN 60715-TH35-15/7,5 Befestigung auf Normprofil-schine DIN EN 60715-TH35-15/7,5	√
Weight	0.4 kg

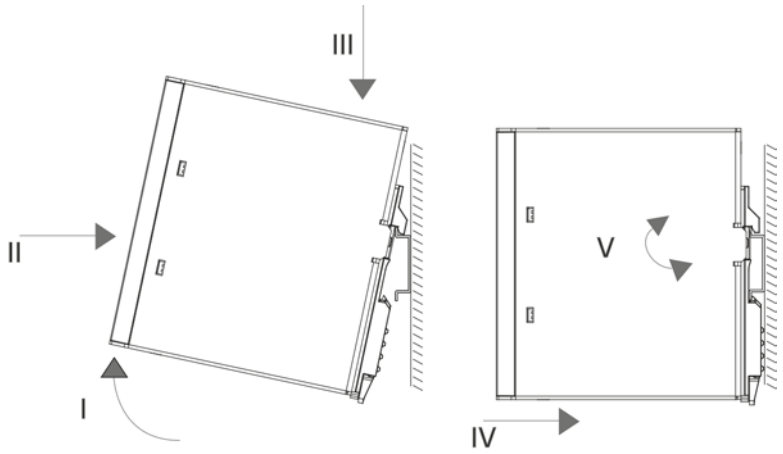
Dimensions (WxHxD) depth including TH35-7,5 and Terminals Maße (BxHxT)) Tiefe inklusive TH35 und Klemmen	42 x 127 x 150.5 mm
Conductor Cross sections WAGO Series 831 **Leiterquerschnitte WAGO Serie 831**	
Solid wire Eindrähtiger Leiter	0.5 … 10 mm² / 20 … 8 AWG
Stranded wire Feindrähtiger Leiter	0.5 … 10 mm² / 20 … 8 AWG
Stranded wire with ferrule Feindrähtiger Leiter mit Aderendhülse	0.5 … 6 mm²
Conductor Cross sections WAGO Series 721 **Leiterquerschnitte WAGO Serie 721**	
Solid wire Eindrähtiger Leiter	0.08 … 2.5 mm² / 28 … 12 AWG
Stranded wire Feindrähtiger Leiter	0.08 … 2.5 mm² / 28 … 12 AWG
Stranded wire with ferrule Feindrähtiger Leiter mit Aderendhülse	0.25 … 2.5 mm²
Stranded wire with ferrule Feindrähtiger Leiter mit isolierter Aderendhülse	0.25 … 1.5 mm²

1.6 Factory initial setting / Werkseinstellung

When shipped, all channels are switched on. The current is set to the highest value for each channel.
Im Auslieferungszustand sind alle Kanäle eingeschaltet. Der Strom ist je Kanal auf den höchsten Wert eingestellt.

1.7 Mounting / Montage

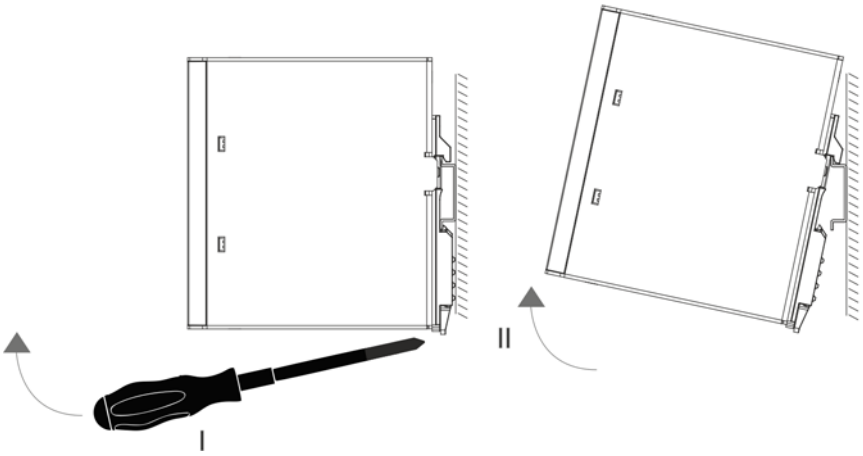
SNAP ON SUPPORT RAIL / AUF TRAGSCHIENE AUFRASTEN



I) Tilt the unit slightly rearwards
II) Fit the unit over top hat rail
III) Slide it downward until it hits the stop
IV) Press against the bottom front side for locking (click)
V) Shake the unit slightly to check the locking action

I) Gerätevorderseite leicht nach oben drehen
II) Auf Hutschiene aufsetzen
III) Bis zum Anschlag nach unten schieben
IV) Unten gegen die Befestigungsebene drücken (klick)
V) Leicht am Gerät rütteln, um Verriegelung zu prüfen

REMOVAL FROM DIN RAIL / DEMONTAGE VON TRAGSCHIENE



I) Locking tab with a screwdriver and pull down to open.
II) Unhook the device from DIN rail.

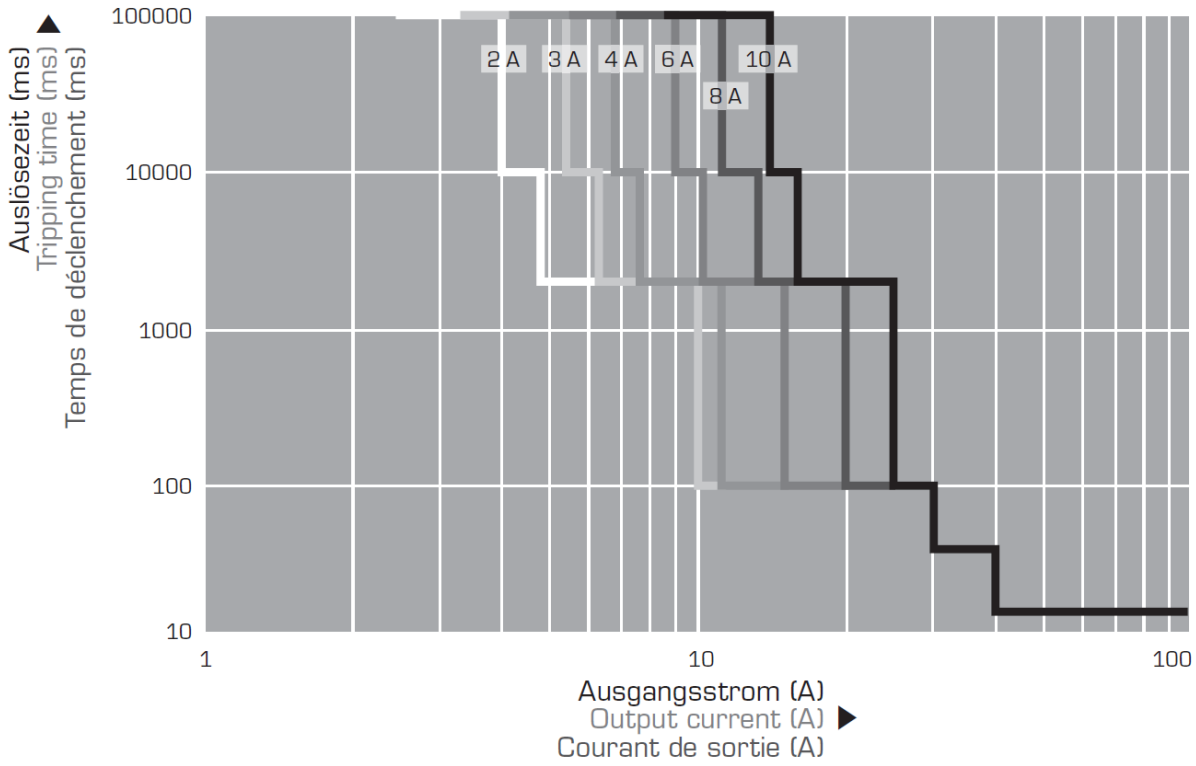
I) Verriegelungslasche mit Schraubendreher nach unten ziehen und öffnen.
II) Gerät aus Tragschiene aushängen.

1.8 Tripping characteristic / Auslösecharakteristik

Tripping time is controlled via microcontroller; frequency stability is ±6.5%.
Auslösezeiten sind gesteuert durch einen Mikrocontroller, Frequenzstabilität bei ±6.5%.

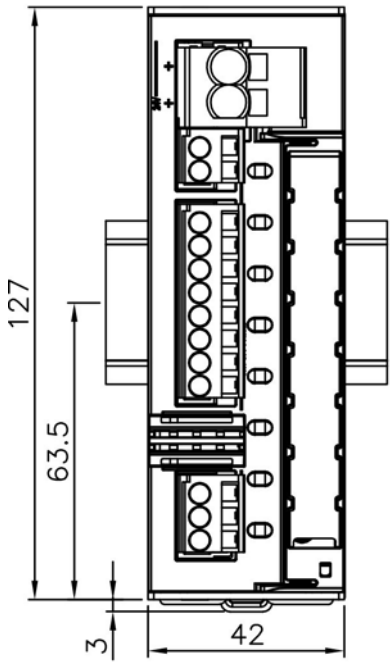
Current accuracy including thermal drift, measurement is calibrated at 10A / 25°C:
Messgenauigkeit des Stromes inclusive thermischer Drift, die Messung wird kalibriert bei 10A / 25°C:

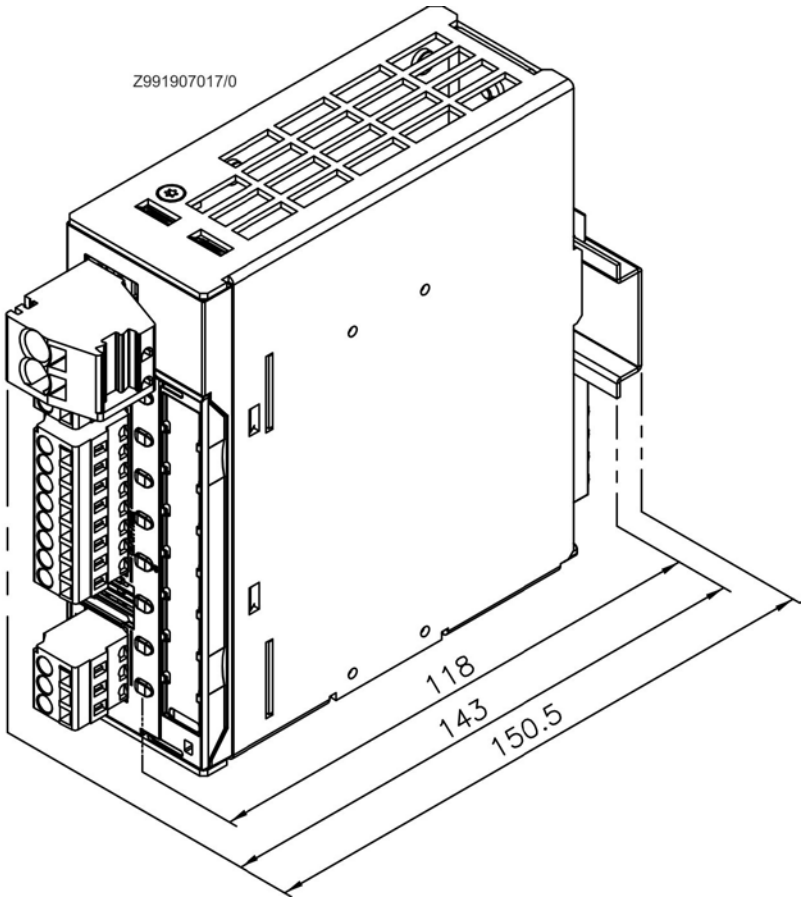
2A…3A:	±15%
3A…5A:	±10%
> 5A:	±5%



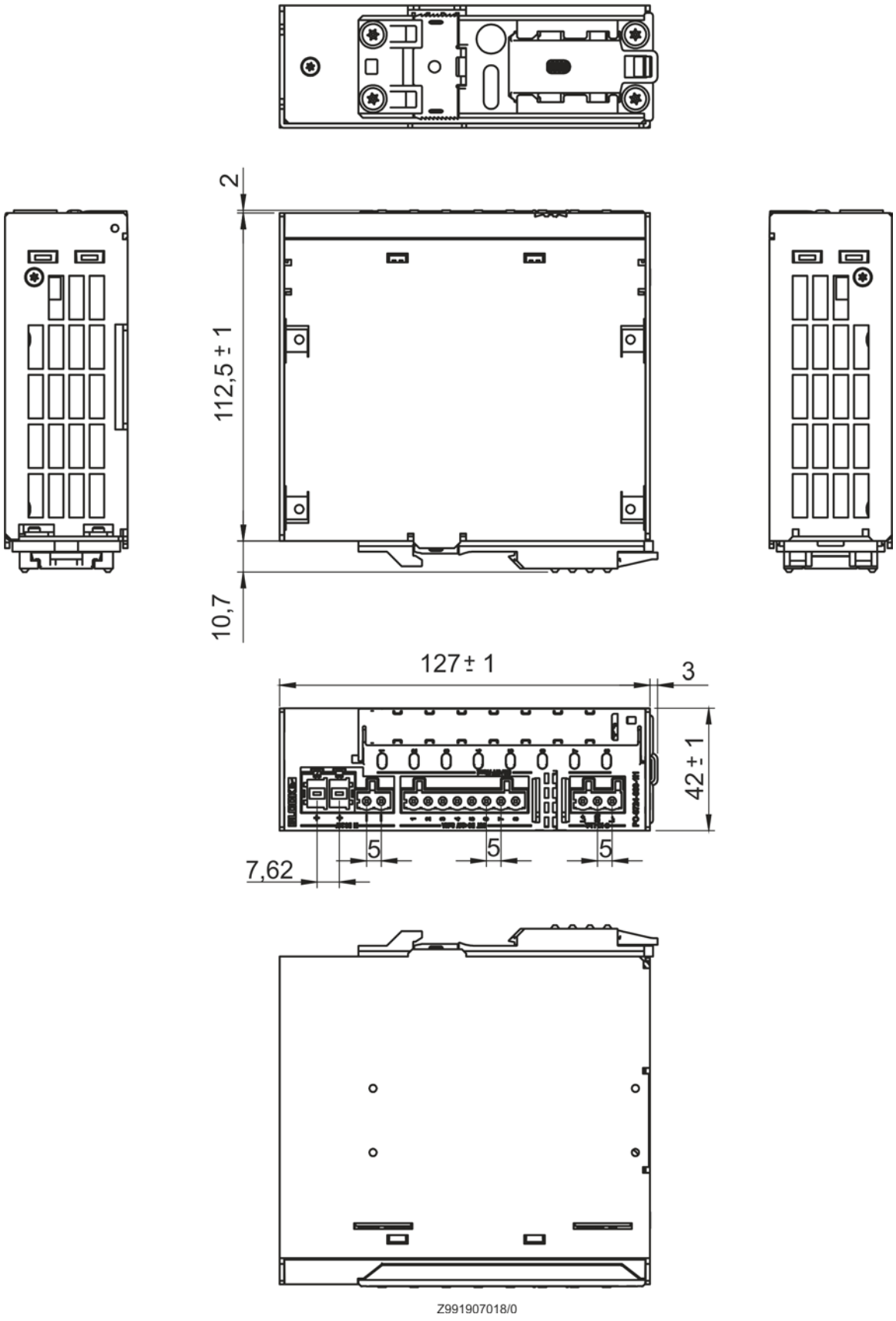
2. Size and construction / Abmessungen und Konstruktion

2.1 Dimensional outline drawing / Maßzeichnung

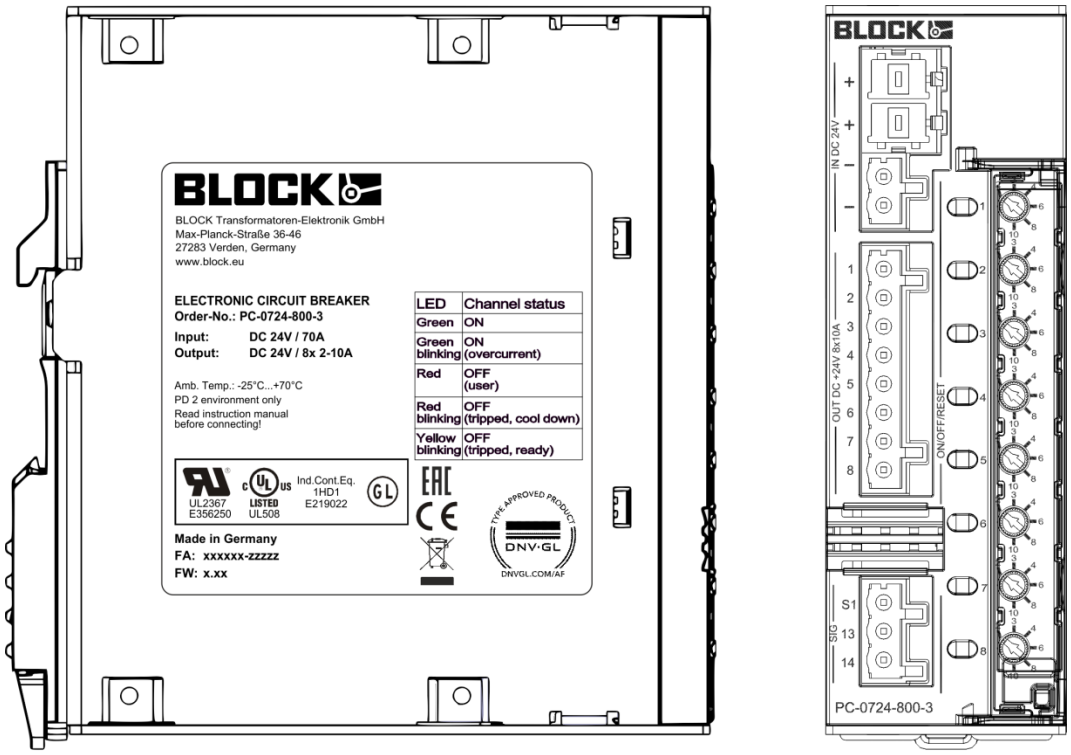




2.2 Structural drawing / Konstruktionszeichnung



2.3 Printing of product / Typenschilder



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3. UL Safety standards and related regulations / UL Sicherheitsnormen und zugehörige Bestimmungen

3.1 UL 508 Approval / UL 508 Zulassung

Hinweis: Die folgenden Auszüge aus dem UL-Reports nur in englischer Sprache!

3.1.1 Application standard
UL 508 (CSA22.2 No.14-10) Listing, UL Category NMTR/NMTR7, E219022

3.1.2 Ratings

Table 1

*Model No.	Voltage, Vdc	Number of outputs	Operational current rating per output, **1)**2)3)4)
PC-X7XX-xxx-yz**v**	12-48 Vdc	8	1.0 A
			2.0 A
			3.0 A
			4.0 A
			5.0 A
			6.0 A
			7.5 A
			8.0 A
			10.0 A

1) Total current depends on ambient temperature – see table 2 for details.

2) Each channel can be use to its max. current for resistive loads, but in total not more than specified per Table 2.

3) Each channel can be used to its max. current for resistive loads, but in total not more than specified per Model-No (see nomenclature breakdown below). **In case of adjustable trip ratings, up to 6 ratings can be selected for each output channel.**

4) **A unit with fixed trip ratings may have different trip ratings for each channel.**

Table 2 – max total currents

Model No.	Operating Ambient	Total Current
***PC-X7XX-xxx-yz**	**40°C**	**80A**
	50°C	**70A**
	60°C	**50A**
	70°C	**48A**

3.1.3 Nomenclature

e.g.	PC-	X7	XX-	xxx-	y	zv
	A	B	C	D	E	F

A : Product-Family - PC
B : Product-Identification - X7, where X = 0…8 Fixed or adjustable
C - Input Voltage – 12-48
D : Sum of total current (eg. 8x1A=080; 8x10A=800)
E : Current Ratings per Channel
y = 0 – 9 or blank
y = 0, 2, 4, 6: adjustable or fixed current ratings, Terminal **Type A**
y = 1, **3**, 5, 7: adjustable or fixed current ratings, Terminal **Type B**
F : ZV = 0 – 9 or blank or a – z, optional character to clarify product identification in cases of overlapping total currents.

3.1.4 Critical Components (excerpt)

Input terminal block **Type A** (**X2**) – R/C (XCFR2/8) PHOENIX CONTACT GMBH & CO KG, Types SPT 5-H-7.5, minimum rated 24-8 AWG, for copper conductors only, field wiring (FW-2), 300 V, **35 A**, 105°C. Provided on the Main PWB.
Alternate – Any (XCFR2/8), minimum rated 24-8 AWG, for copper conductors only, field wiring (FW-2), 300 V, 35 A, 105°C. Without changing the trace layouts of the printed wiring board.

Input terminal block **Type B** (**X2**) – R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO, Type 831-3102, 20-8 AWG, 600V, **42 A**, 105°C. Provided on the Main PWB.

Input Terminal Block **Type B** (**X3**) - R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO KG, Type 721-102, rated 300 V, **15 A**, 22-12 AWG, 105°C. Provided on the Main PWB.

Output terminal block **Type B** (**X4**) – R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO KG, Type 721-108, 22-12 AWG, 300V, **15 A**, 105°C. Provided on the Main PWB.

Signal terminal block **Type B** (**X5**) – R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO KG, Type 721-103, 22-12 AWG, 300V, **15 A**, 105°C. Provided on the Main PWB.

3.1.5 COA (conditions of acceptability)

No COA at listed products.

3.1.6 COC

CERTIFICATE OF COMPLIANCE

Certificate Number	20170314-E219022
Report Reference	E219022-20130725
Issue Date	2017-MARCH-14
Issued to:	BLOCK TRANSFORMATOREN-ELEKTRONIK GMBH Max-Planck-Strasse 36-46 27283 Verden GERMANY
This is to certify that representative samples of	POWER CIRCUIT AND MOTOR-MOUNTED APPARATUS USL, CNL – Open Type Devices, Special-purpose Solid-state over-current switches, Model PC, followed by any number from 0 to 8, followed by any number from 12 to 48, followed by a three-digit number from 080 to 800, may be followed by any number from 0 to 9, may be followed by any optional character such as a number from 0 to 9 or any letter from a to z.
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL 508 : STANDARD FOR INDUSTRIAL CONTROL EQUIPMENT CSA C22.2 NO. 14-13 : INDUSTRIAL CONTROL EQUIPMENT
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Bruce Mahrenholz, Director North American Certification Program

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3.2 UL 2367 Approval / UL 2367 Zulassung

3.2.1 Application standards

UL 2367 Recognition, UL Category QVRQ2, E356250

3.2.2 Ratings

Table 1

Model No. 1)	Input voltage, Vdc	Number of outputs	Operational current rating per output, 2)3)4)5)
PC-X7XX-xxx-yzv	24-48 Vdc	8	1.0 A
			2.0 A
			3.0 A
			4.0 A
			5.0 A
			6.0 A
			7.5 A
			8.0 A
			10.0 A

1) PC-X7XX-xxx-0 and PCX7XX-xxx-2 are limited to total current of 70A maximum.
2) Total current depends on ambient temperature – see table 2 for details.
3) Each channel can be use till its max. current, but in total not more than specified per model no.
4) Operational Current Rating max 6 settings out of table above per output.
5) For fixed channel - settings, operational currents can be mixed up in one unit.

Table 2 – max total currents

Model No.	Operating Ambient	Total Current
PC-X7XX-xxx-yzv	40°C	80A
	50°C	70A
	60°C	50A
	70°C	48A

3.2.3 Nomenclature

e.g.	PC-	X7	XX-	xxx-	y	zv
	A	B	C	D	E	F

A : Product-Family - PC
B : Product-Identification - X7, where X = 0…8 Fixed or adjustable
C - Input Voltage – 12-48
D : Sum of total current (eg. 8x1A=080; 8x10A=800)
E : Current Ratings per Channel
y = 0 – 9 or blank
y = 0, 2, 4, 6: adjustable or fixed current ratings, Terminal **Type A**
y = 1, **3**, 5, 7: adjustable or fixed current ratings, Terminal **Type B**
F : ZV = 0 – 9 or blank or a – z, optional character to clarify product identification in cases of overlapping total currents.

3.2.4 Critical Components (excerpt)

Input terminal block **Type A** (**X2**) – R/C (XCFR2/8) PHOENIX CONTACT GMBH & CO KG, Types SPT 5-H-7.5, minimum rated 24-8 AWG, for copper conductors only, field wiring (FW-2), 300 V, **35 A**, 105°C. Provided on the Main PWB.
Alternate – Any (XCFR2/8), minimum rated 24-8 AWG, for copper conductors only, field wiring (FW-2), 300 V, 35 A, 105°C. Without changing the trace layouts of the printed wiring board.

Input terminal block **Type B** (**X2**) – R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO, Type 831-3102, 20-8 AWG, 600V, **42 A**, 105°C. Provided on the Main PWB.

Input Terminal Block **Type B** (**X3**) - R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO KG, Type 721-102, rated 300 V, **15 A**, 22-12 AWG, 105°C. Provided on the Main PWB.

Output terminal block **Type B** (**X4**) – R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO KG, Type 721-108, 22-12 AWG, 300V, **15 A**, 105°C. Provided on the Main PWB.

Signal terminal block **Type B** (**X5**) – R/C (XCFR2/CSA Certified) WAGO KONTAKTTECHNIK GMBH & CO KG, Type 721-103, 22-12 AWG, 300V, **15 A**, 105°C. Provided on the Main PWB.

3.2.5 COA (conditions of acceptability)

For use only in (or with) complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

1. These devices are a network of solid-state integrated circuits and electrical spacings within the device are not specified.

2. These devices are entirely electronic in nature and are also equipped for manual operation or reset.

3. These devices are designed to trip within the curve characteristics provided by the manufacturer.

4. The terminals of these devices have been evaluated for field-wiring. The connection suitability shall be determined in accordance with the end use application.

5. These devices have not been subjected to Tests for Telecom applications and their suitability for connection to telecommunication networks with outside plant connections should be determined in the end-use.

6. These devices were evaluated with respect to continuous current operation at the current levels shown in the electrical ratings section of this report.

7. These devices are intended for use in load circuits of switch mode power supplies or transformers having an isolated secondary supplying 24-48VDC.

8. These devices were evaluated in an ambient indicated on page 1. Suitability for use in a higher ambient has not been determined.

9. The outputs of these devices are not intended to be interconnected.

10. These devices have only been evaluated for supplementary overcurrent protection of secondary circuits supplied by the load side of a transformer, power supply, or battery, and have not been evaluated for branch-circuit protection.

11. These devices have been subjected to environmental conditionings with respect to the following conditions (per UL 2367):
    Shipping and Storage #
    Thermal Cycling
    Endurance
    Abnormal
    # Temperature Range: -30 to +70°C

12. These devices have been investigated as electronic overcurrent protective devices in accordance with the requirements contained in the standard for Solid State Overcurrent Protectors, UL 2367, First Edition.

13. Models containing Type A terminal (y=0 or 2) are limited to total input current of 70 A maximum. This limitation does not apply to Models containing Type B terminals (y=1 or 3)

For use only in (or with) complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

3.2.6 COC

CERTIFICATE OF COMPLIANCE

Certificate Number	20161214-E356250
Report Reference	E356250-20130302
Issue Date	2016-DECEMBER-14
Issued to:	BLOCK TRANSFORMATOREN-ELEKTRONIK GMBH MAX-PLANCK-STRASSE 36-46 27308 VERDEN GERMANY
This is to certify that representative samples of	COMPONENT - SPECIAL-PURPOSE SOLID-STATE OVERCURRENT PROTECTORS See Addendum Page for Models/Product
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL 2367 - Standard for Solid-state Overcurrent Protectors.
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

The UL Recognized Component Mark generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark: , may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions.

Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/about/ul/locations/

Page 1 of 2

CERTIFICATE OF COMPLIANCE

Certificate Number	20161214-E356250
Report Reference	E356250-20130302
Issue Date	2016-DECEMBER-14

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Models/Product:

Special-purpose Solid-state overcurrent protectors Model PC-X7XX-xxx-yzv,

NOMENCLATURE BREAKDOWN:

e.g.	PC-	X7	XX-	xxx-	y	zv
	A	B	C	D	E	F

A - Product-Family - PC

B - Product-Identification - X7, where X = 0...8

C - Input Voltage – 24-48

D - Sum of total current (eg. 8x10A=80)

E - y = 0 – 9 or blank

y = 0, 2, 4, 6: adjustable or fixed current ratings, Terminal Type A
y = 1, 3, 5, 7: adjustable or fixed current ratings, Terminal Type B
y = 2, 4: Optional solid state relay signal
y = 3, 5: Optional solid state relay signal

F – z, v = 0 – 9, a - z or blank

Note:

B = mandatory character to identify setup

F = optional character to clarify product identification.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

4. DNVGL Approval / DNVGL Zulassung

DNV·GL

TYPE APPROVAL CERTIFICATE

Certificate No:
TAA00001S5
Revision No:
1

This is to certify:

That the Electrical Measuring and Protection Relay

with type designation(s)
PM series, PC series

Issued to
Block Transformatoren-Elektronik GmbH
Verden, Germany

is found to comply with
DNV GL rules for classification – Ships, offshore units, and high speed and light craft

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Type	Temperature	Humidity	Vibration	EMC	Enclosure
PM series	**D**	**B**	**A**	**A**	**A (IP20)**
PC series	**D**	**B**	**A**	**A**	**A (IP20)**

Issued at **Hamburg** on **2018-04-04**
This Certificate is valid until **2023-04-03**.
DNV GL local station: **Bremerhaven**

Approval Engineer: **Holger Jansen**

for **DNV GL**

Joannis Papanuskas
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Form code: TA 251 Revision: 2016-12 www.dnvgl.com Page 1 of 3

Job Id: **262.1-028416-1**
Certificate No: **TAA00001S5**
Revision No: **1**

Product description

Electronic Circuit Breaker PowerMini – Series (PM) and PowerCompact – Series (PC)

The electronic circuit breaker distributes and monitors the load current over several current circuits. Overloads and short circuits on an output are reliably recognized. In case of short circuits or longer overloads on the output of a channel, the affected circuit will be shutdown.

Nominal input voltage: 12Vdc, 24Vdc or 48Vdc
Nominal output voltage: 12Vdc, 24Vdc or 48Vdc
3 signal contacts:

S1:	12V-48V	– input (On/Off/Reset)
S2 or 13:	12V-48V	– output (Status output channels or relay summation message for tripped outputs, short circuit proof)
S3 or 14:	12V-48V	– output (Summation meassage for tripped outputs or relay summation message for tripped outputs, short circuit proof)

S1 and S2 could be used for information exchange with a PLC by using the Manchester-Code based on IEEE 802.3.
Status display (for each output): LED (red, green, orange)
2 different connection types: Variant A = push-in connection
Variant B = Wago plug-connection

Nomenclature aa-bcdd-xxx-yzv

aa: Product family	PM:	Power Mini
	PC:	Power Compact
b: Product-Identification	0,1,3:	trip current adjustable
	1:	no current measurement via communication interface
	2:	fix trip current
	3:	trip current only adjustable via communication interface
c: Characteristic	7:	no current limitation
	8:	current limitation
dd: Input/output voltage	12:	12 Vdc (only for c = 7)
	24:	24 Vdc (c = 7 or 8)
	48:	48 Vdc (only for c = 7)
xxx: Current	Sum of total current of all channels written in 0,1A (e.g. 80A = 800)	
y: Optional	0-9 or blank	
	0, 2, 4, 6:	adjustable or fixed current ratings, Terminal Type A
	1, 3, 5, 7:	adjustable or fixed current ratings, Terminal Type B
	2, 4, 6:	optional solid state relay signal or overlapping total currents
	3, 5, 7:	optional solid state relay signal or overlapping total currents
z: Optional	0-9, a-z or blank:	Minor changes not related to electrical ratings
v: Optional	0-9, a-z or blank:	Minor changes not related to electrical ratings

Application/Limitation

When the hardware is used in applications to be classed by DNV GL, documentation for the actual application is to be submitted for approval by the manufacturer of the application system in each case. Reference is made to DNV GL RU SHIP Pt.4 Ch.9 Sec. 1.

Job Id: **262.1-028416-1**
Certificate No: **TAA00001S5**
Revision No: **1**

Type Approval documentation

Tests carried out

Applicable tests according to Class Guideline DNVGL-CG-0339, Edition November 2016.

Marking of product

The products to be marked with:

- manufacturer name
- device name
- order number

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE

5. EU-Declaration of Conformity / EU-Konformitätserklärung

EU-Konformitätserklärung ***EU – Declaration of Conformity***	BLOCK

Dokument-Nr. / Monat . Jahr: *Document-No. / Month . Year:*	KS-140050/ 02 . 2019
Hersteller: *Manufacturer*	BLOCK Transformatoren-Elektronik GmbH
Anschrift: *Address*	Max-Planck-Straße 36-46, D-27283 Verden (Aller)
Produktbezeichnung: *Product Description*	Elektronische Schutzschalter / Solid-State Overcurrent Protectors Series: PC or PM Types: PM-xyzz-zzz-x or PC-xyzz-zzz-z x can be 0,1,2,3 or 9 y can be 7 or 8 z can be any number

Das vorstehend bezeichnete Produkt und die ggf. im Anhang „Varianten" aufgelisteten Produkte stimmen mit den Vorschriften der folgender Europäischen Richtlinien und deren Änderungsrichtlinien überein:
The designated product and if available any variations listed in the annex are in accordance with the following European directives and their amendments:

Nummer: *Number*	2014/30/EU (2014/30/EU)	Richtlinie des Rates zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit *Council Directive on the harmonization of the laws of the Member States relating electromagnetic compatibility*
	2011/65/EU	Richtlinie 2011/65/EU des europäischen Parlamentes und des Rates vom 8. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten *Directive 2011/65/EU of the european parliament and oft he council of 8 June 2011 on the restriction oft he use of certain hazardous substances in electrical and electronic equipment*

Für die Beurteilung der Übereinstimmung wurden folgende Normen herangezogen:
For evaluating the accordance of the designated product(s) with the above mentioned directive(s) the following standards have been used:

EN 61000-6-2 + AC EN 61000-6-3 + A1 EN 50581	Ausgabedatum: *Date of Issue*	2005+2006 2007+2011 2012

Jahr der Anbringung der CE - Kennzeichnung nach den Richtlinien 2014/30/EU (2014/30/EU) und 2011/65/EU (bis auf Widerruf) *Year of attaching of CE-Mark according to directives 2014/30/EU (2014/30/EU) and 2011/65/EU (subject to withdrawl)*	CE	19

Aussteller: *Issuer*	BLOCK Transformatoren-Elektronik GmbH Max-Planck-Straße 36-46, D-27283 Verden (Aller)

Ort, Datum: *Place, Date:*	Verden, 06.02.2019	Rechtsverbindliche Unterschrift: *Legally binding Signature*	BLOCK Transformatoren-Elektronik GmbH Max-Planck-Straße 36-46 27283 Verden Udo L. Thiel - Geschäftsführer -

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation / unseres Hauptkataloges sind zu beachten.
This declaration certifies the conformity with the designated directives, but contain no assurance of attributes. The safety notice of the delivered product documents / our main catalogue are to be observed.