

Product Name
POWER-TEC 10.4

Description	POWER-TEC 10.4
	<p>POWER-TEC 10.4 is a 4-channel electronic fuse (e-Fuse) load switch with independent overcurrent limit control and real-time output current indication. Each channel is separately protected so that overload or fault conditions on an individual load do not affect overall system reliability or function.</p> <p>The useful LED indicators show the output current and change from green to yellow (current within limit) to orange (current at limit) to red (overcurrent or short-circuit). A volt-free DC-OK output can be used to monitor system function. Each channel can also be switched ON or OFF to ease fault diagnostics or for maintenance.</p> <p>POWER-TEC 10.4 is available with 10 A maximum channel current and 150 % power boost for 5 s but can handle 150 % overload for up to 120 ms to avoid nuisance tripping. The channels power up in sequence to reduce the input inrush current with a pre-settable delay time. Under system overload conditions, the channels will disconnect the loads in reverse sequence, keeping essential functions running to the last.</p> <p>Output overload hiccup or tripping mode is adjustable by a switch.</p> <p>The e-Fuse has a high lifetime expectancy of >80.000 h / 40 °C and easy wiring with tool-less push-in and lever-release terminals. The input and output terminals are also paired to allow easy daisy chaining.</p>

Characteristics	
	Push-in connectors for tool-less wiring
	Start-Up delay adjustable by switch
	Individual switching for every channel
	Adjustable power limit & load indication by LED
	Individual ON/OFF and OCP limit for each channel
	Short circuit protection & power boost 150%/5s

	DC input UVLO protection
	DC-OK contacts with remote fault reset
	Overload priority channel protection
	Output hiccup or tripping mode adjustable by switch
	Easy daisy chaining of multiple modules
	Paired Input & output (+, -) connectors included
	3 year warranty

General Data	
Input voltage range	22-28 VDC
Nominal output voltage	24 VDC
Output channels	4
Output current per channel	10 A
Efficiency typ. ⁽¹⁾	98.6 %
Rated output power per channel	240 W

Note 1: Efficiency is tested at nominal input 24VDC, 100% load each output and +25°C ambient.

Basic characteristics (measured @ T _{AMB} = 25 °C, nom V _{IN} = 24 VDC, rated load, unless otherwise stated)				
Parameter	Condition	Min.	Typ.	Max.
Nominal input voltage			24 VDC	
Operating input range		22 VDC		28 VDC
Absolute max. input voltage	No damage to the device			28 VDC
Turn-on voltage			21.5 VDC	
Turn-off voltage	channel 1		17.5 VDC	
	channel 2		18.5 VDC	
	channel 3		19.5 VDC	
	channel 4		20.5 VDC	
Input current	nom. V _{IN} = 24 VDC			40.1 A
No load power consumption	nom. V _{IN} = 24 VDC		1.5 W	
Internal consumption			60 mA	
Nominal output voltage			24 VDC	
Nominal output current (per channel)	Nom. V _{IN} = 24 VDC		10 A	
Output current range (adjustable)	via potentiometer at each channel, % of nominal I _{out}	3.5 A		11.5 A
Voltage drop	input to output			250 mV
Minimum load		0 %		

Sequential switch-on delay	selectable via Dip-switch, refer to "DIP-Switch settings"	5 ms, 25 ms, 200 ms or 500 ms
Remote reset input ⁽²⁾	referred to input ground	yes, by applying 22-28 VDC
Ripple and Noise	20 MHz bandwidth	105 mVp-p
Maximum Capacitive Load		30 mF

Note 2: Do not connect remote reset input to hazardous voltages!

DIP-Switch Settings

DIP1: setting the overcurrent shutdown mode (ON = Latch off mode; OFF = Hiccup Mode)

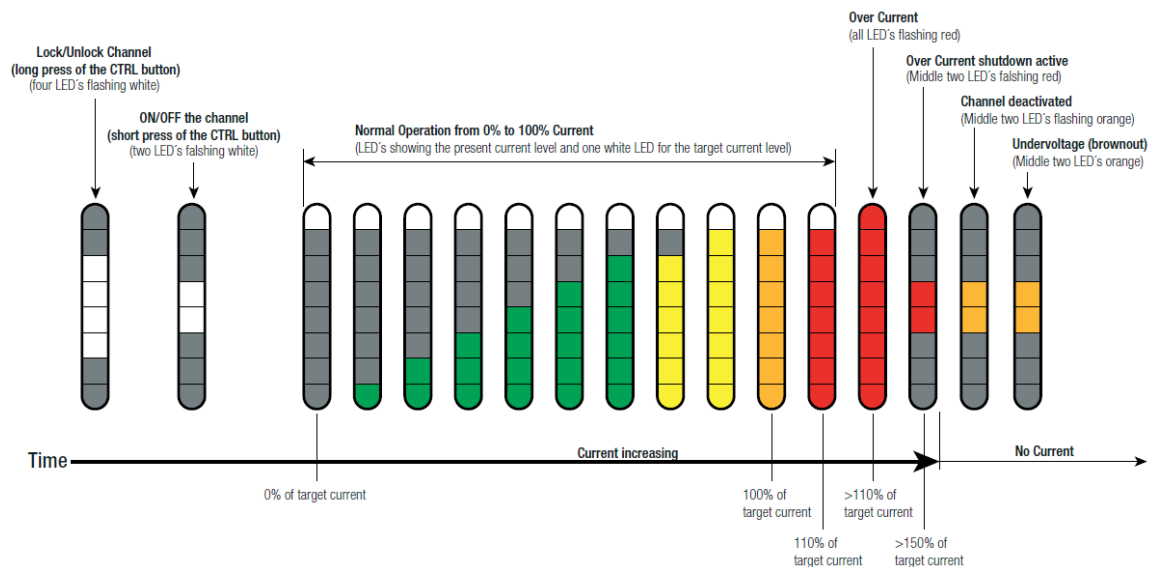
DIP2: setting the time delay from Channel [k+1] to Channel [k]

DIP3: setting the time delay from Channel [k+1] to Channel [k]

Description	DIP-Switch
Overcurrent shutdown hiccup mode 5 ms time delay	
Overcurrent shutdown latching 5 ms time delay	
Overcurrent shutdown latching 25 ms time delay	
Overcurrent shutdown latching 200 ms time delay	
Overcurrent shutdown latching 500 ms time delay	
Overcurrent shutdown hiccup mode 500 ms time delay	

Load Indication LED

8 LEDs/channel for displaying actual and target current or various status messages of the corresponding channel. Grey LEDs represent deactivated LEDs.



Actual current:

Colored LEDs indicate the actual current of 0-110% in relation to the set maximum current. In the picture above the target current is set to its maximum.

Power Boost:

During Operation in $>110\%$ and $<150\%$ Target Current Level the device stays in Overcurrent for about 5s before the Overcurrent shutdown gets active. If the 150% margin is surpassed (e.g. a short) the over current shutdown will get active after around 120ms.

Target current:

White LED indicates the maximum allowable current, which is set by the user via the potentiometer. In the above picture the target current is currently set at its maximum value, the nominal current per channel of the device.

Maximum current
(Over Current):

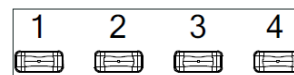
When actual current > target current, all LEDs from the corresponding channel flash red.

Channel deactivated:
Undervoltage:

When the channel is deactivated, the two middle LEDs flash orange. In the event of a brownout (undervoltage), the two middle LEDs light up orange, and the device attempts to automatically restart in a hiccup mode once the voltage is restored.

Control Button

Description	Function
Short press	ON/OFF the channel (during operation) or to restart in latching mode after a short circuit.
Long press (5 s)	Lock/Unlock the channel button



Load LED indications

Button lock after long press of the button:	If the button has been locked/unlocked the four middle LEDs indicate it by flashing white.
Button locked and interaction with the button:	If the button has been locked and the button is pressed for a short amount of time (e.g. to disable/enable a channel), the two middle LEDs indicate it by flashing white, but no action on the channel.

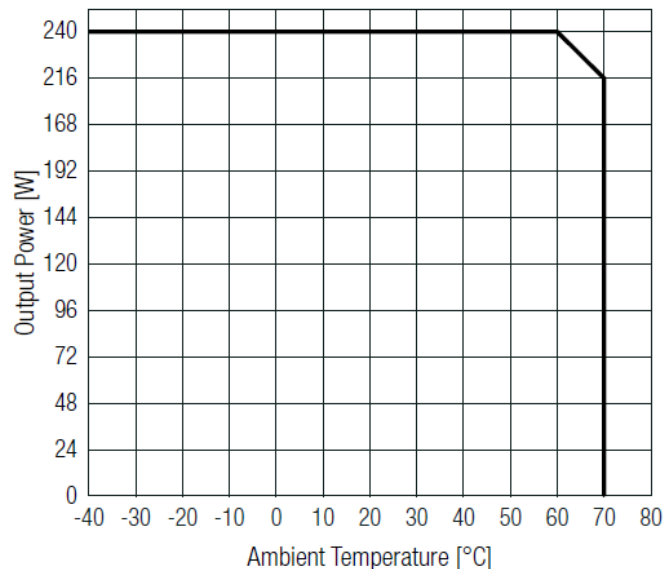
Protections (measured @ $T_{AMB} = 25\text{ °C}$, nom $V_{IN} = 24\text{ VDC}$, rated load, unless otherwise stated)

Parameter	Type	Value
Internal input fuse	per channel	T15 A, slow-blow
Short Circuit Protection (SCP)	selectable via Dip-switch, refer to „DIP-Switch settings“	latch off or hiccup mode
Over Voltage Protection (OVP)	SELV output	35 VDC, latch off
Return voltage immunity		35 VDC max.
Over Current Protection (OCP)	latch off or hiccup mode, selectable via Dip-switch; refer to „DIP-Switch Settings“	> 150 % of rated output current
Tripping characteristic	at short circuit	120 ms max.
		5s max. (at 150 % load)
Tripping delay		115 ms typ.
Class of equipment		Class III

Environment (measured @ T _{AMB} = 25 °C, nom V _{IN} = 24 VDC, rated load, unless otherwise stated)		
Parameter	Condition	Value
Operating ambient temperature range	@ natural convection (0.1 m/s), with derating	-40 °C to +70 °C
Operating altitude ⁽³⁾		5000 m
Operating humidity	non-condensing	5-95 % RH max.
Pollution degree		PD2
IP rating		IP20
Shock	according to IEC 60068-2-27 Fa	non-operating 15 G / 11 ms, 3 times (positive/negative) in all axis
Vibration	according to IEC 60068-2-6 Fc	non-operating 5 - 8.4 Hz @ 3.5 mm deflection 8.4 -150 Hz @ 2G, 10 cycles /axis(min-max-min); 1 octave/min
MTBF	according to EN/IEC 61709 (SN29500)	770 x 10 ³ hours
Design lifetime	T _{AMB} = 40 °C @ 100% Load	80 x 10 ³ hours

Note 3: Recognized by safety agency for safe operation up to 5000m. High altitude operation may impact the performance and lifetime

Derating Graph (per channel) (@ Chamber and natural convection 0.1 m/s)

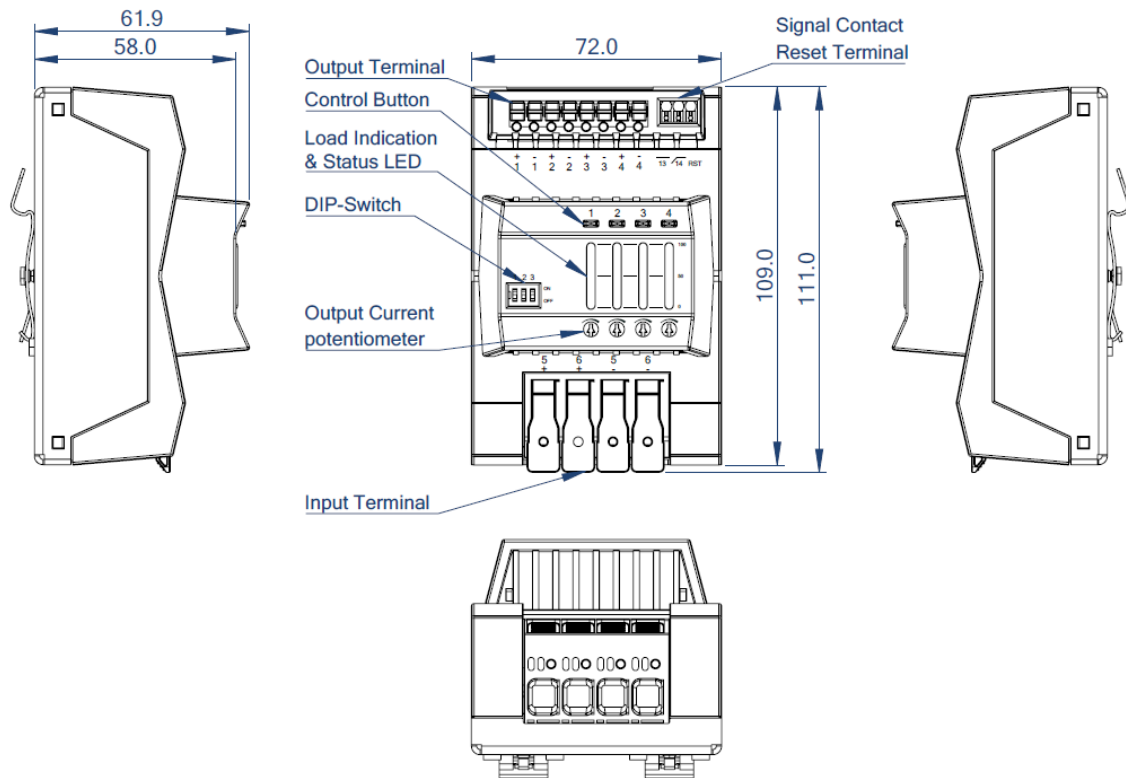


Safety & Certifications		
Certificate type (safety)	Report number	Standard
Audio/Video, information and communication technology equipment - Part 1: Safety requirements (CB)	24TH0298_62368-1_0	IEC62368-1:2018 3rd Edition
Audio/Video, information and communication technology equipment - Part 1: Safety requirements		EN IEC 62368-1:2020+A11:2020
Audio/Video, information and communication technology equipment - Part 1: Safety requirements	E224736-A6030-UL	UL62368-1:2019 3rd Edition
Audio/Video, information and communication technology equipment - Part 1: Safety requirements		CAN/CSA-C22.2 No. 62368-1-19 3rd Edition
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements (CB)	24TH0298_61010-1_0	IEC61010-1:2010+A1:2016 3rd Edition
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements		EN61010-1:2010+A1:2019
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 2-201: Particular requirements for control equipment (CB)	24TH0298_61010-2-201_0	IEC61010-2-201:2017 2nd Edition
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 2-201: Particular requirements for control equipment		EN IEC 61010-2-201:2018
RoHS2		RoHS 2011/65/EU + AM2015/863
EMC Compliance according to IEC/EN61000-6-2/6-3	Condition	Standard / Criterion
Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments		IEC/EN61000-6-2:2019
Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential area		IEC/EN 61000-6-3:2021
ESD Electrostatic discharge immunity test	Air: ±8kV; Contact: ±6kV	IEC61000-4-2:2008, Criteria A EN61000-4-2:2009, Criteria A

Radiated, radio-frequency, electromagnetic field immunity test	10V/m (80-6000MHz)	IEC/EN61000-4-3:2006+A2:2010, Criteria A
Fast Transient and Burst Immunity	DC-Input/Output Ports: $\pm 1\text{kV}$	IEC/EN61000-4-4:2012 Criteria A
Surge Immunity	DC-Input/Output Port: V(+) - V(-), DC-OK(13-14): $\pm 1\text{kV}$ V(+)-PE, V(-)-PE: $\pm 2\text{kV}$	IEC/EN61000-4-5:2014+A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10Vrms (0.15-80MHz)	IEC61000-4-6:2013, Criteria A EN61000-4-6:2014, Criteria A

Dimension & Physical Characteristics		
Parameter	Type	Value
Material	chassis	polycarbonate (UL94 V-0)
Dimension (HxWxD)		111.0 x 72.0 x 61.9mm 4.37 x 2.83 x 2.44 inch
Weight		250g 0.55 lbs

Dimension Drawing (mm)



Input Cage Clamp		
Function	AWG	mm ²
+V _{in}	18-4	0.75-25
-V _{in}	18-4	0.75-25
Wire stripping length: 18-20 mm		

Push-In Output Terminal ⁽⁴⁾		
Function	AWG	mm ²
-V _{out}	20-12	0.5-4
+V _{out}	20-12	0.5-4
Wire stripping length: 10-11mm		

Push-In Signal/Reset Terminal ⁽⁴⁾		
Function	AWG	mm ²
Signal	28-16	0.25-1.5
Do not connect to hazardous voltages		

Note 4: Use flexible (stranded wire) or solid cables with above wire cross-section is recommended. Use copper conductors designed for an operating temperature of at least 105°C.

Note 5: Ferrules are required for flexible cables.

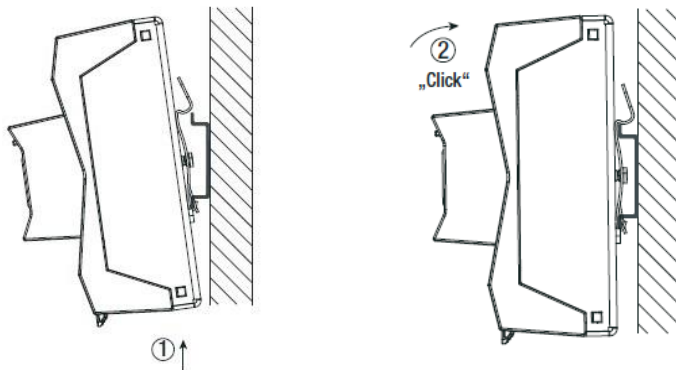
Installation

Mounting Instruction

Mounting Rail: Standard TS35 DIN Rail in accordance with EN 60715.

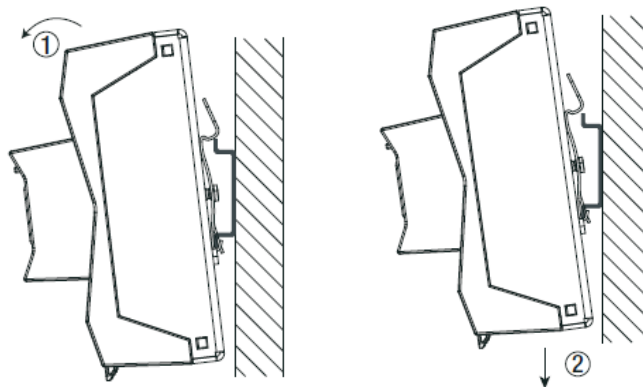
No space above, below and between the devices are required.

Mounting



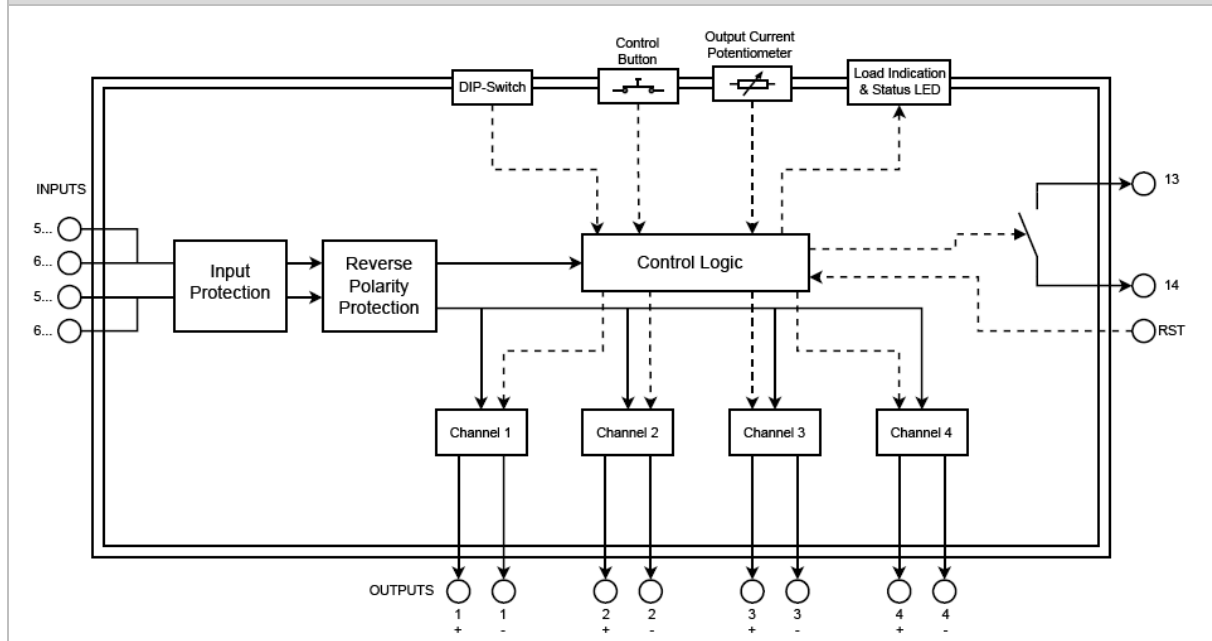
1. Place the device on the DIN rail with a slight downward tilt.
2. Tilt the device upwards until it reaches the upper part of the DIN rail. Snap the device into the DIN rail.

Release



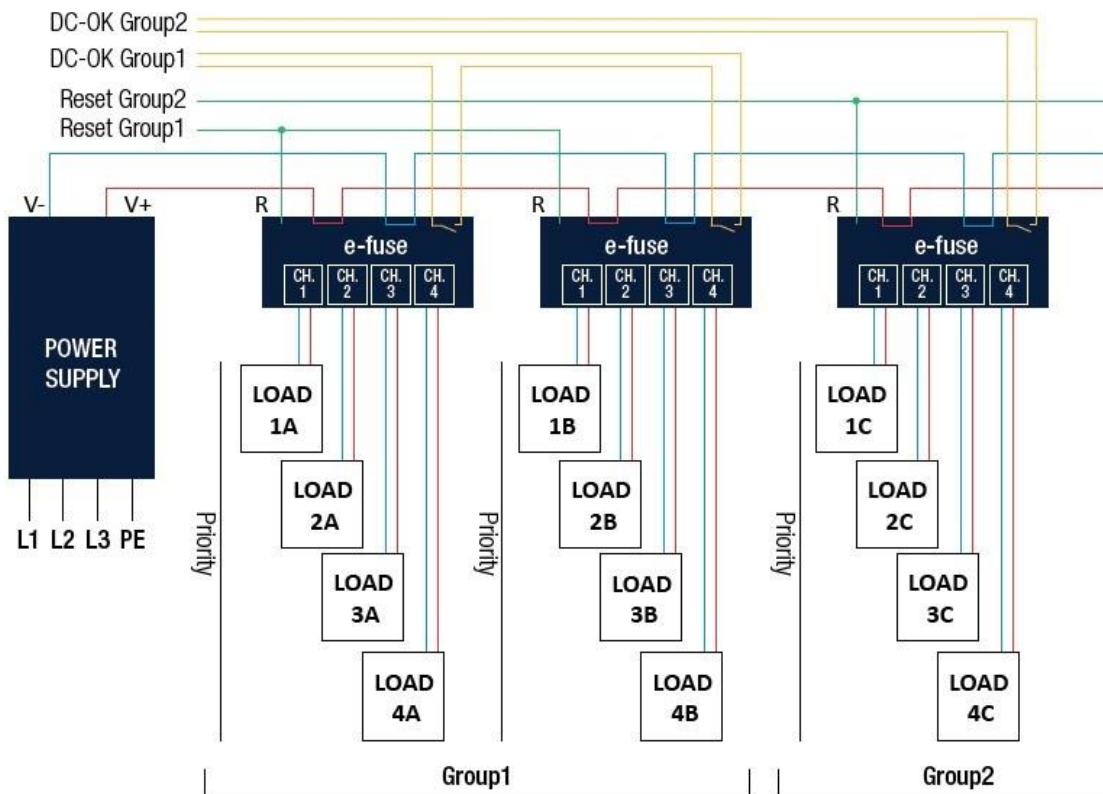
1. Press the upper part of the device forwards to release it from the rail.
2. Pull the device away from the DIN rail by pushing it down.

Block Diagram



Application Example

Daisy chaining of multiple modules



- Voltage-free relay contact for DC-OK signal (closed when all active channels are "OK", open in error mode (one channel or several channels switched off due to overload or UVLO))
- DC-OK can be connected in series with other e-fuse modules for group monitoring
- In latch mode, the e-Fuses can be switched on again by remote resets
- E-fuses therefore offer easy integration into all standard programmable logic controllers (PLC) and SCADA systems.

Packaging Information

Parameter	Type	Value
Packaging Dimension (LxWxH)	cardboard box	153 x 97 x 78mm
Packaging Quantity		1 pc
Storage Temperature Range		-40°C to +85°C
Storage Humidity	non-condensing	95% RH max.