Electronic Circuit Protectors RACPRO1 Series

Overview

The RACPRO1-4SP series are 4-channel electronic fuse (e-Fuse) load switches 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. 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 voltage-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.

Features

- Push-in connectors for tool-less wiring
- Start-up delay adjustable by switch
- Adjustable power limit & load indication by LED
- Individual ON/OFF and OCP limit for each channel
- Short circuit protection & power boost 150%/5s
- Easy daisy chaining of multiple modules
- Paired input & output (+, -) connectors included
- 3-year warranty

RACPRO1-4SP/24V/10A

Electronic Circuit Protectors RACPRO1 Series										
Part Number	Price	Current Limiting	Amperage Rating	Channels	Input Voltage	Output Voltage	NEC Class 2	Dimensions H x W x D mm [in]	Weight gram [lb]	Drawing Link
RACPRO1-4SP/24V/5A	$103.00	Yes	Adjustable 1.75-5.75A	4 independent	22-28 VDC	24 VDC nominal	Yes	110.2 x 72.0 x 61.9 [4.34 x 2.83 x 2.44]	250 [0.55]	PDF
RACPRO1-4SP/24V/10A	$118.00		Adjustable 3.5-11.5A				No	111.0 x 72.0 x 61.9 [4.37 x 2.83 x 2.44]		PDF

Electronic Circuit Protectors RACPRO1 Series												
Part Number	Input Cage Clamp				Push-in Output Terminal				Push-in Signal Reset Terminal *			
	Function	AWG	mm^2	Wire Stripping Length	Function	AWG	mm^2	Wire Stripping Length	Function	AWG	mm^2	Wire Stripping Length
RACPRO1-4SP/24V/5A	+Vin	24-8	0.25-6	12-13mm	-Vout	20-12	0.5-4	10-11mm	Signal	28-16	0.25-1.5	8-9mm
	-Vin				+ Vout							
RACPRO1-4SP/24V/10A	+Vin	18-4	0.75-25	18-20mm	-Vout							
	-Vin				+ Vout							

*** Do not connect to hazardous voltages.**
Ferrules are required for stranded wire.

Electronic Circuit Protectors
RACPRO1 Series

Specifications			
Part Number		***RACPRO1-4SP/24V/5A***	***RACPRO1-4SP/24V/10A***
Nominal Input Voltage		Typical 24 VDC	
Operating Input Range		Minimum 22 VDC	22 VDC - 28 VDC
Absolute Input Voltage		Maximum 28 VDC	
Turn-on Voltage		Typical 21.5 VDC	
Turn-off Voltage	***Channel 1***	Typical 17.5 VDC	
	Channel 2	Typical 18.5 VDC	
	Channel 3	Typical 19.5 VDC	
	Channel 4	Typical 20.5 VDC	
Input Current		Maximum 20.1A (5A Mode, nom. V_n = 24 VDC)	Maximum 40.1 A (nom. V_n = 24 VDC)
		Typical 14.87A (NEC Class 2 mode)	—
No Load Power Consumption		Typical 1.5 W (nom. V_n = 24 VDC)	
Internal Consumption		Typical 60mA	
Nominal Output Voltage		Typical 24 VDC	
Nominal Output Current (per Channel)		Typical 5A (5A Mode, nom. V_n = 24 VDC)	Typical 10A (nom. V_n = 24 VDC)
		Maximum 3.7 A (NEC Class 2 mode nom. V_n = 24 VDC)	—
Output Current Range (via potentiometer at each channel, % of nominal Iout)		1.75A to 5.75A (5A mode)	3.5A to 11.5A
		1.3A to 3.7A (NEC Class 2 mode, 22-26 VDC)	—
		1.3A to 3.3A (NEC Class 2 mode, > 26 VDC	—
Voltage Drop Input to Output		Typical 205mV (5A mode)	Maximum 250mV
		Typical 150mV (NEC Class 2 mode)	
Minimum Load		0%	
Sequential Switch-ON Delay		5ms or 200ms selectable via Dip-switch	5ms, 25ms, 200ms, or 500ms
Remote Reset Input [1]		Yes by applying 22-28 VDC (referred to input ground)	
Ripple and Noise		Maximum 105mVp-p (20 MHz bandwidth)	
Maximum Capacitive Load		Maximum 15mF	Maximum 30mF
Housing Material		Polycarbonate	
Agency Approvals		cURus QQJQ2.E224736, CE	

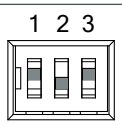
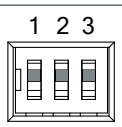
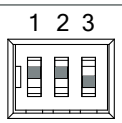
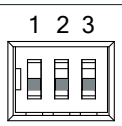
[1] **Do not connect remote reset input to hazardous voltages.**

Electronic Circuit Protectors RACPRO1 Series

DIP Switch Settings:

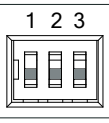
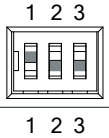
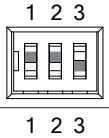
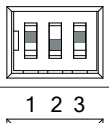
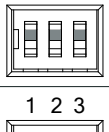
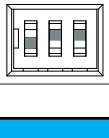
RACPRO1-4SP/24V/5A

DIP1: Setting the overcurrent shutdown mode
(ON=Latch off mode; OFF=Hiccup mode)
DIP2: Setting the time delay
(ON=200ms; OFF=5ms) from Channel [k+1] to Channel [K]
DIP3: Setting the device mode
(ON-5A mode; OFF=NEC Class 2 mode

	DIP-Switch
Overcurrent shutdown latching 5ms time delay Device in 5A mode	
Overcurrent shutdown latching 200ms time delay Device in 5A mode	
Overcurrent shutdown latching 200ms time delay Device in NEC Class 2 mode	
Overcurrent shutdown latching 5ms time delay Device in NEC Class 2 mode	
Overcurrent shutdown hiccup mode 5ms time delay Device in NEC Class 2 mode	

RACPRO1-4SP/24V/10A

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 device mode
from Channel [k+1] to Channel [K]

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

Protections		
Parameter	***Type***	***Value***
Interrupt Input Fuse	Per Channel	T15A, 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 maximum
Over Current Protection (OCP) (latch off or hiccup mode, selectable via Dip-switch; refer to DIP-SWITCH SETTINGS)	5A and 10A mode; >5s	110-150% of rated Output Current (RACPRO1-4SP/24V/5A only)
	5A mode; 100ms typical	>150% of rated Output Current
	NEC Class 2; 100ms typical >110% of rated Output Current	>110% of rated Output Current (RACPRO1-4SP/24V/5A only)
Tripping Characteristic	At short circuit	120ms maximum
	5A mode	5s maximum (at 150% load) (RACPRO1-4SP/24V/5A only)
	NEC Class 2 mode	5s maximum (at 150% load) (RACPRO1-4SP/24V/5A only)
Tripping Delay	—	115ms typical
Class of Equipment	—	Class III

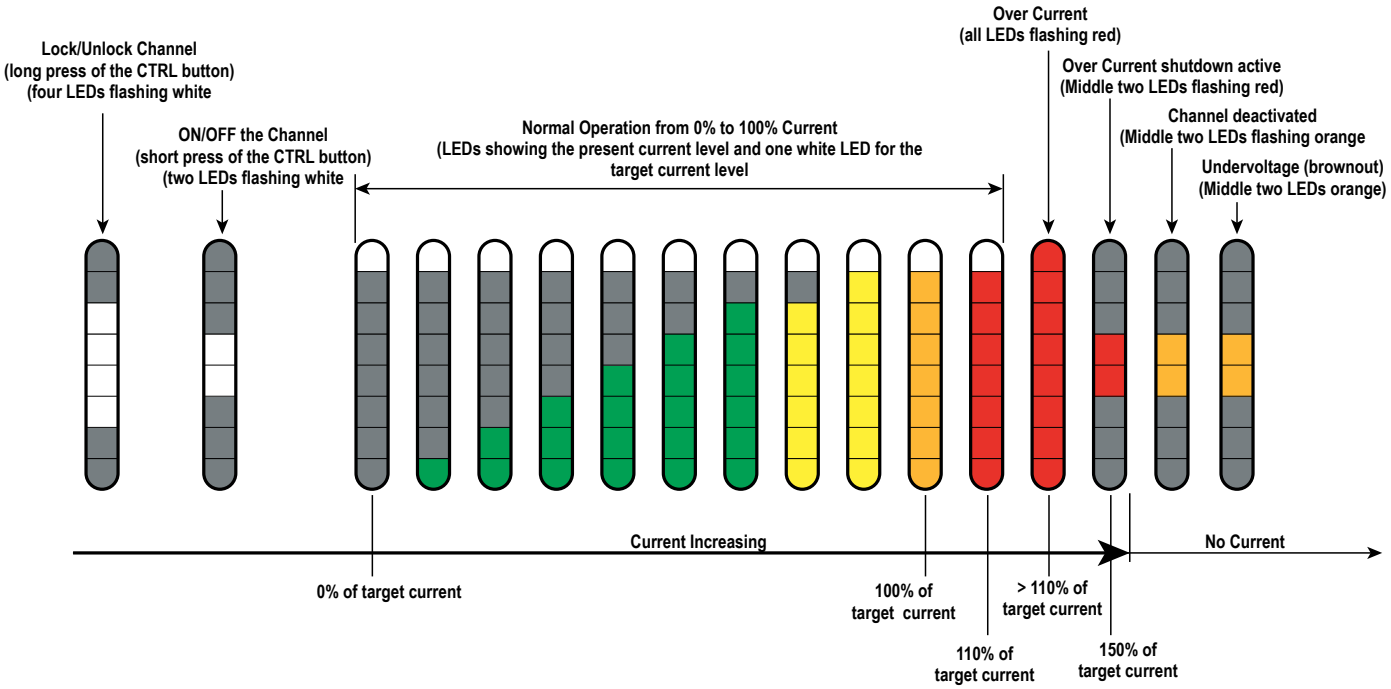
Measured @ T_{AMB}= 25°C, nom VIN= 24 VDC, rated load, unless otherwise stated.

Electronic Circuit Protectors
RACPRO1 Series

Load Indication LED

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

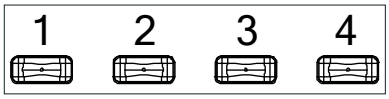
Gray LEDs represent deactivated LEDs.



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 it's 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 110ms.
For the NEC Class 2 Variant: Here the device won't have any power boost behavior and thus by exceeding the ~110% margin the over current shutdown will get active after about 110ms. (So the Step where all LEDs are flashing red wont happen here) RACPRO1-4SP/24V/5A only
Target current: White LED indicates the maximum allowable current, which is set by the user via the potentiometer. In 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: When the channel is deactivated, the two middle LEDs flash orange.
Undervoltage: 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

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



Load LED Indication

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.

Electronic Circuit Protectors
RACPRO1 Series

Environmental		
Parameter	***Condition***	***Value***
Operating Ambient Temperature	At natural convection (0.1 m/s)	-40 to 70°C [-40 to 158°F]
Operating Altitude	—	Recognized by safety agency for safe operation up to 5000m High altitude operation may impact the performance and lifetime
Operating Humidity	Non-condensing	5-95% RH max.
Pollution Degree	—	PD2
IP Rating	—	IP20
Shock	According to IEC 60068-2-27 Fa (non-operating)	15G/11ms, 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 -150Hz @ 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

Measured @ T_{AMB}= 25°C, nom VIN= 24VDC, rated load, unless otherwise stated.

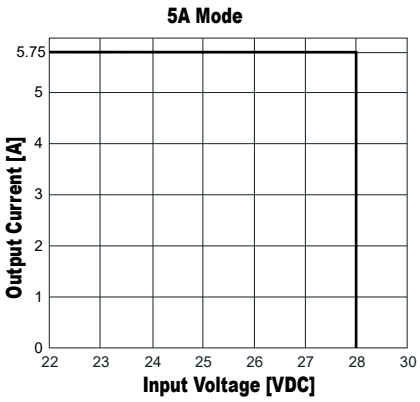
Safety & Certifications		
Certificate Type (Safety)	***Report Number***	***Standard***
Audio/Video, information and communication technology equipment - Part 1: Safety requirements (CB)	24TH0298_62368-1_0	IEC62368-1:2018 3rd Edition
Audio/Video, information and communication technology equipment - Part 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 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

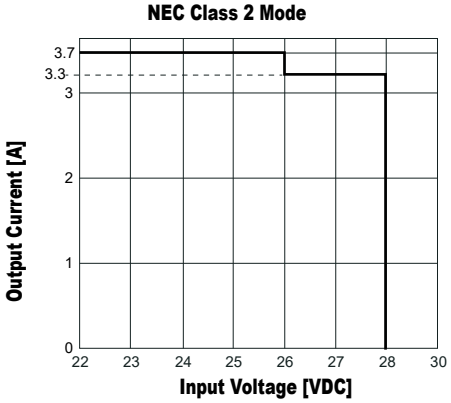
EMC Compliance According to IEC/EN61000-6-2/6-3		
Certificate Type (Safety)	***Condition***	***Standard / Criterion***
Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments	—	IEC/EN61000-6-2:2019
Electromagnetic compatibility (EMC) - Part 6-3: 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: ±1kV	IEC/EN61000-4-4:2012 Criteria A
Surge Immunity	DC-Input/Output Port: V(+) - V(-), DC-OK(13-14): ±1kV V(+)-PE, V(-)-PE: ±2kV	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

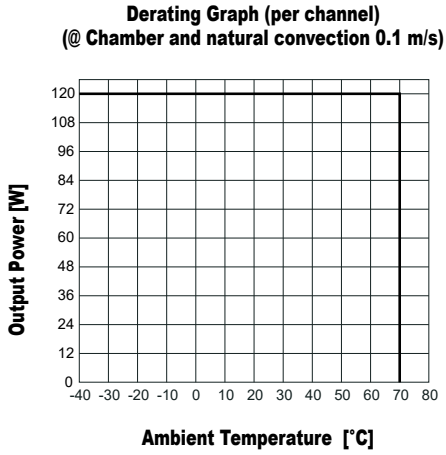
Electronic Circuit Protectors RACPRO1 Series

RACPRO1-4SP/24V/5A

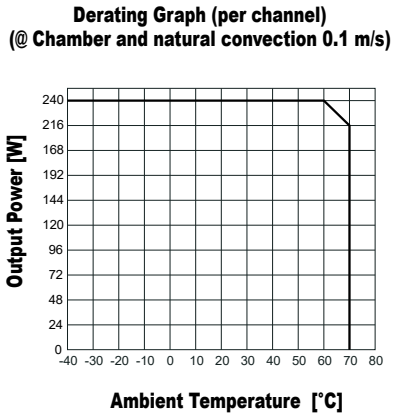
Output Current vs. Input Voltage





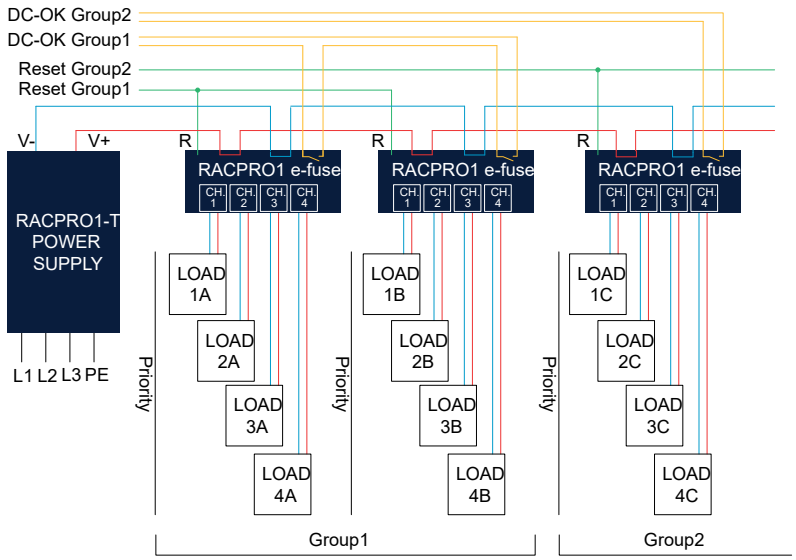


RACPRO1-4SP/24V/10A



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 UVL)
- 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
- RECOM e-fuses therefore offer easy integration into all standard programmable logic controllers (PLC) and SCADA systems

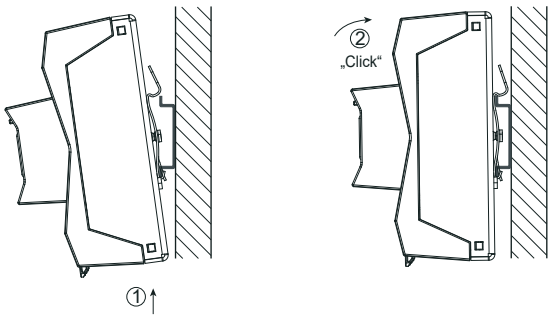
Electronic Circuit Protectors
RACPRO1 Series

Installation

Mounting Instruction

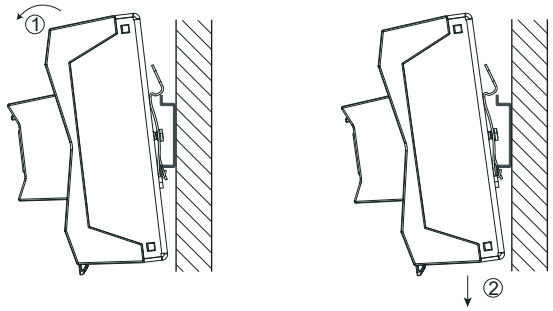
Mounting rail: Standard 35mm DIN rail in accordance with EN60715.

No space above, below, and between the devices is 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 DIN rail.
2. Pull the device away from the DIN rail by pushing it down.

Block Diagram