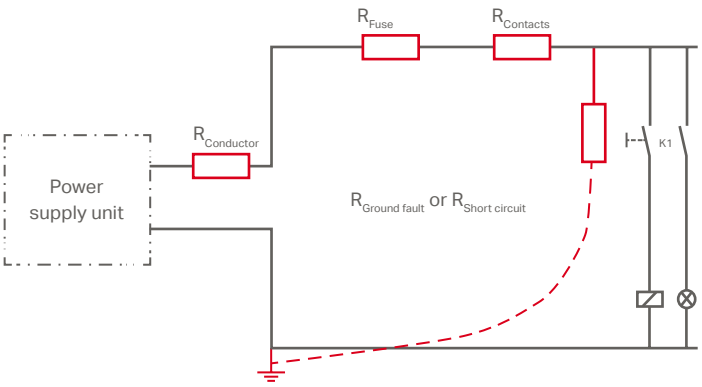
EPSITRON® – Electronic Circuit Breakers

Compact and Precise ECBs for DC Circuits

WHY SECONDARY-SIDE FUSE PROTECTION?

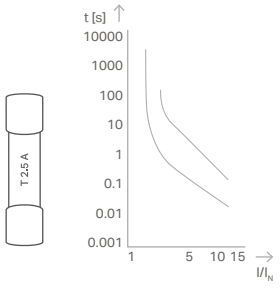
On the secondary side, switched-mode power supplies provide DC voltage to control circuit loads (e.g., controllers, operating panels, displays and auxiliary relays). These control circuits also call for wiring protection and if the load has no protective unit of its own, device protection as well. Furthermore, Machinery Directive EN 60204 requires the detection of hazardous ground faults in control circuits and switching off within five seconds.

The overcurrent protection in primary switched-mode power supplies reacts very quickly to overcurrents on the output side. Selective protection of individual current paths in the secondary circuit via fuses or conventional circuit breakers is often ineffective if the power supply cannot deliver a brief overcurrent.



Loop Impedance

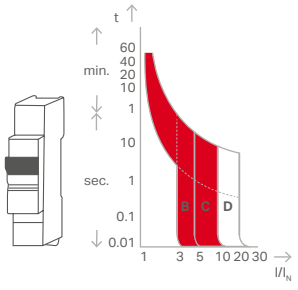
WHAT TYPES OF FUSE PROTECTION ARE THERE?



Thermal

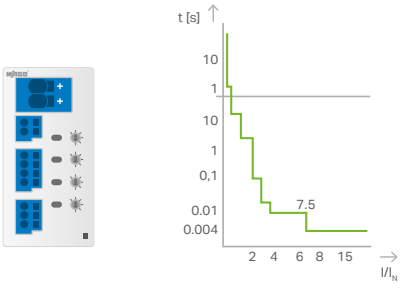
- Example: Low-voltage, high-power and DP fuses
- High overcurrents required for fast tripping
- In the example:
  10-fold overcurrent (related to the fuse nominal current):
  - Tripping within range 30 ms (best case) or 200 ms (worst case)

  Only 2-fold overcurrent:
  - Tripping within range 2 s (best case) or > 100 s (worst case)



Thermal and Magnetic

- Found in circuit breakers or motor protection switches
- High overcurrents required for fast tripping
- In the example:
  3 ... 5-fold overcurrent for B-characteristic and AC operation, additional DC safety factor 1.2 or 1.5
  - Thus, in the worst case scenario, a tripping current of 7.5 times the nominal current is necessary.



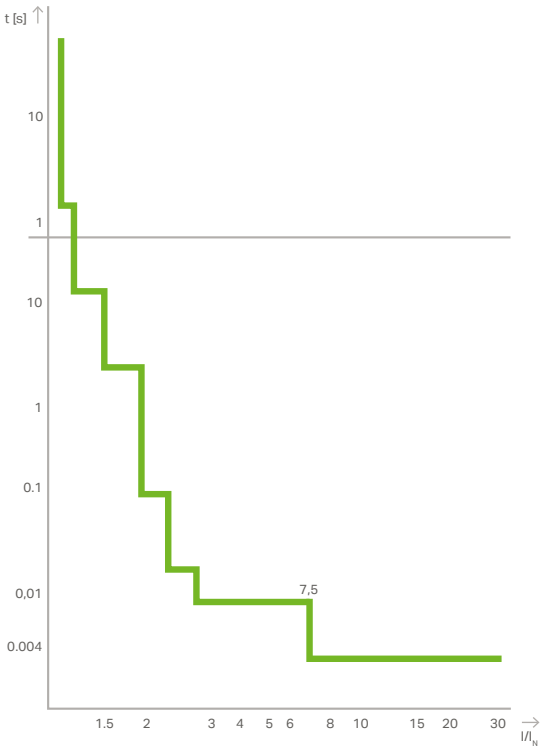
Electronic

- Ensure precision settings
- Reaction within a short time – even at low overcurrents
- Protection of long cable runs and small cross sections possible

DP fuse = Device protection fuse

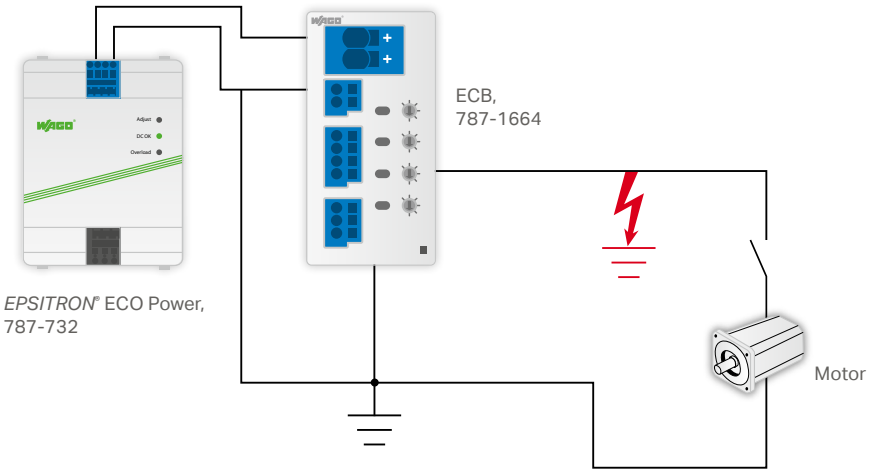
HOW DOES AN ECB FUNCTION?

The ECB verifies that the output current is greater than the nominal current. As soon as the output current exceeds the nominal current, the output is electronically switched off by a semiconductor switch. The trip time depends on the magnitude of the overcurrent. The measurement of the output current, processing and calculation of the tripping time, as well as actuation of the semiconductor switch are performed by a microprocessor that monitors one or more output channels. The corresponding tripping times can be taken from the graph on the right.



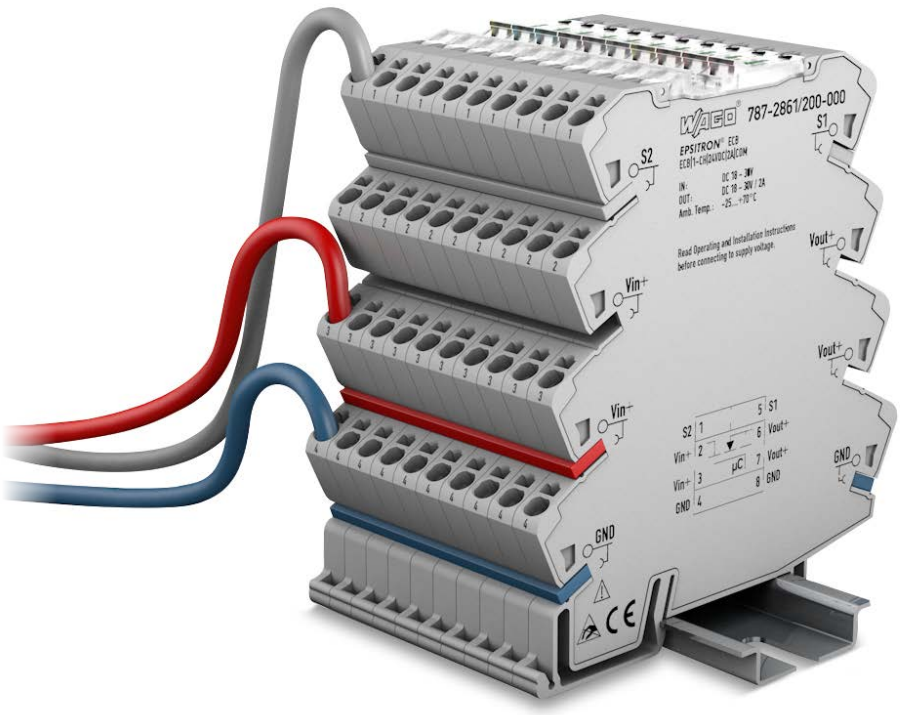
ECB ADVANTAGES

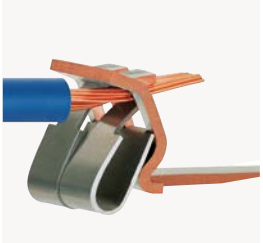
- Switch off secondary-side overcurrents and short circuits – even with long cable runs and small conductor cross-sections – precisely, quickly and repeatedly
- Selectivity, especially with ECBs having active current limitation
- Remote operation via digital input and output
- Readout functions (communication) through serial data transfer via digital input and output or IO-Link
- Advantageous installation size and width, for example, eight output channels in just 42 mm (1.653 inch) that saves more than 70% of installation space compared to miniature circuit breakers
- Nominal current assignable for each channel
- Satisfy EN 60204-1 requirements for dependably switching off ground faults after five seconds (see right)



EPSITRON® – ELECTRONIC CIRCUIT BREAKERS

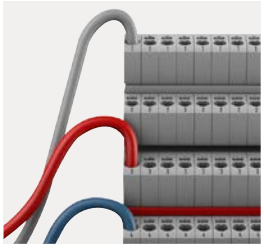
Single-Channel ECBs





Push-in CAGE CLAMP® Connection

- Terminate solid and ferruled conductors via Push-In CAGE CLAMP® Connections – no operating tool needed

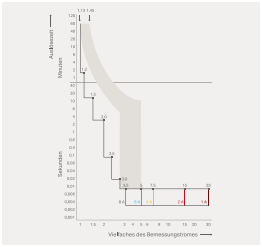


Easy Wiring

- Input potential up to 40 A via double connection
- Signal output can be commoned for up to 30 devices
- Total reset by commoning the signal inputs

Intuitive Status Indication

- Integrated, multi-color LEDs indicate the operating status of each channel
- Push/slide switch for switching on/off, as well as acknowledgement



Trip Characteristics

- Reliable, rapid, and precise disconnection in case of overcurrent or short circuit
- High switch-on capacities > 50,000 µF

Industry's Most Compact

- "True" 6.0 mm width maximizes panel space

Marking

- Device identification via WMB Markers or WAGO Marking Strips TOPJOB® S
- With devices color coded according to nominal current

Versatile Configuration Options

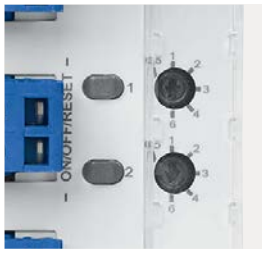
- Optional nominal current setting 1 … 8 A, in 1 A increments
- Seven different configuration options for the digital measurement output

EPSITRON® – ELECTRONIC CIRCUIT BREAKERS

2-, 4- and 8-Channel ECBs

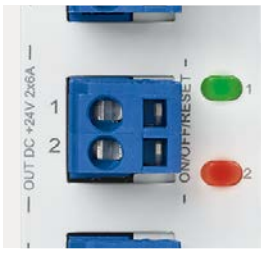
Pluggable CAGE CLAMP® Connection Technology

- Fast, vibration-proof, maintenance-free
- For solid, fine-stranded and ferruled conductors
- 100% protected against mismating
- With marking



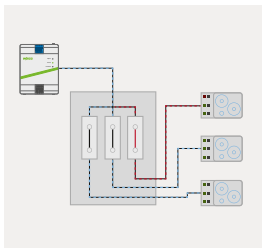
Rotary Switch

- Nominal current can be individually adjusted for each channel
- The setting is visible, even when no voltage is applied
- Transparent cover can be sealed and marked



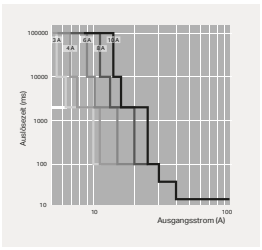
Intuitive Status Indication

- Each output channel has backlit buttons for switching on/off, as well as acknowledgement
- Integrated, multi-color LEDs indicate the operating status of each channel



Selective Immediate Deactivation

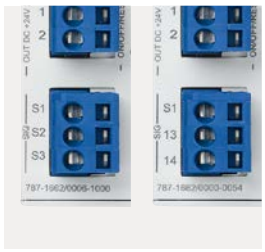
- If the upstream power supply overloaded and the voltage drops, the ECB immediately shuts down the responsible channel to avoid affecting parallel channels.



Trip Characteristics

- Reliable and precise disconnection in case of overcurrent or short circuit
- Nominal currents can be set separately for each channel
- Tripping time can be configured in defined increments
- Optional, active short circuit current limitation to 1.7 times the nominal current prevents a voltage drop in other current paths

*Only for 787-166x/xxxx-1xxx



Communication

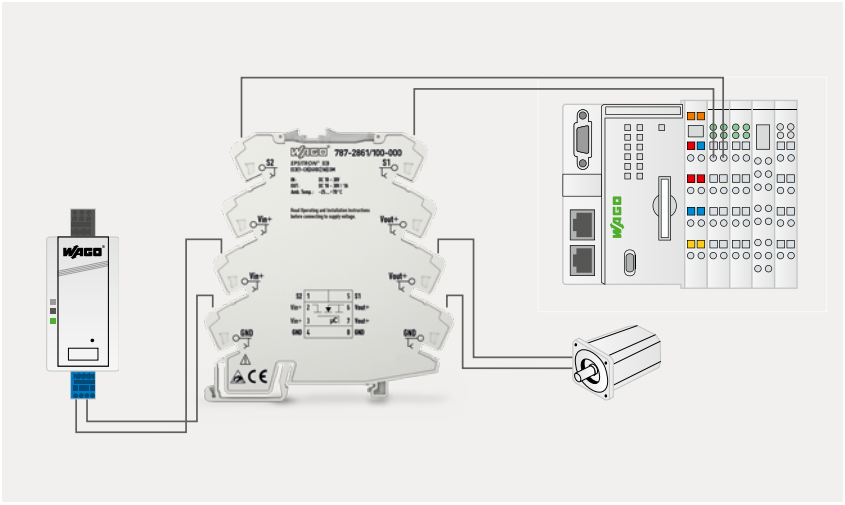
- 1.0: Both high-side and low-side switching digital inputs and outputs are available. There are also variants with potential-free signal output.
- 2.0: Using the Manchester pulse train, data can be read out of the device via digital inputs and outputs. For details, see page 8. Digital output S3 continues to serve as the sum signal for the tripped message.
- 3.0: IO-Link interface: In addition, the rated currents can be set via communication.

Marking

- Device identification via WMB Markers or WAGO Marking Strips TOPJOB® S
- Label individual channels via marking strips that can be inserted into the rotary switch cover from the outside

COMMUNICATION

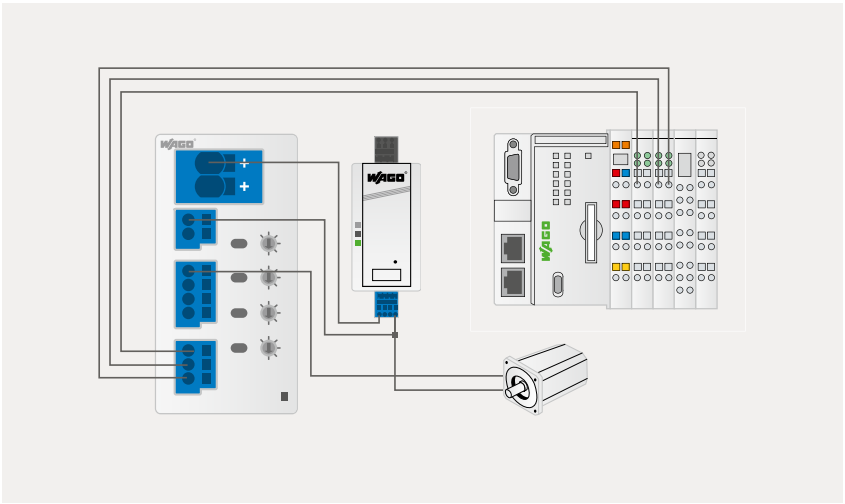
Electronic Circuit Breakers (ECBs)



Communication 1.0
Digital Signaling (S/P/LS)

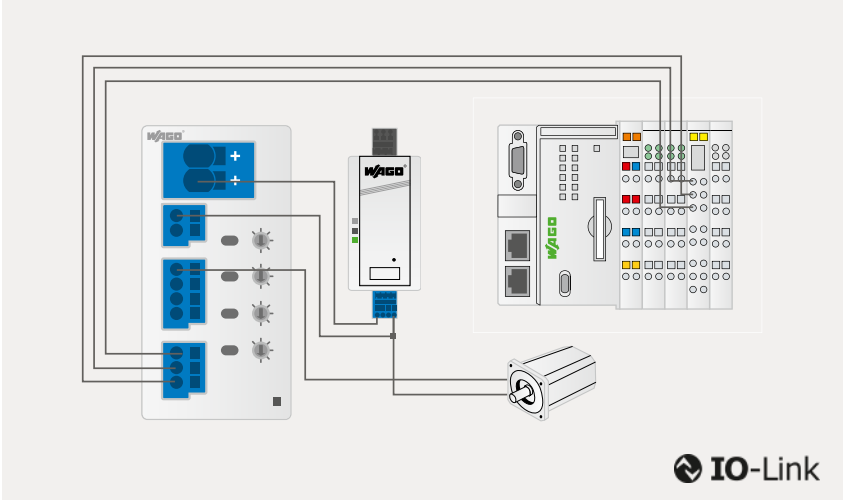
The electronic circuit breaker can be reset via a digital control signal. The 787-2861 ECB can also be switched on and off via this signal.

A digital output signal indicates the status of the channel or the sum of the channels for 787-166x. For some devices this signal is potential-free (P) or low-side switching (LS).



Communication 2.0
Manchester Protocol (M)

The PLC transmits a coded pulse pattern to control input S1. The ECB synchronizes itself automatically. The current status of all output channels is transmitted back simultaneously via signal output S2. The edge change is interpreted as high or low. For each channel, both status, voltage and current values can be transmitted individually.



Communication 3.0
IO-Link (I)

Via an IO-Link interface implemented in COM3, both status, voltage and current values can be transmitted individually for each channel. The nominal current of the output can also be configured via this interface if the device's rotary switch is set accordingly.

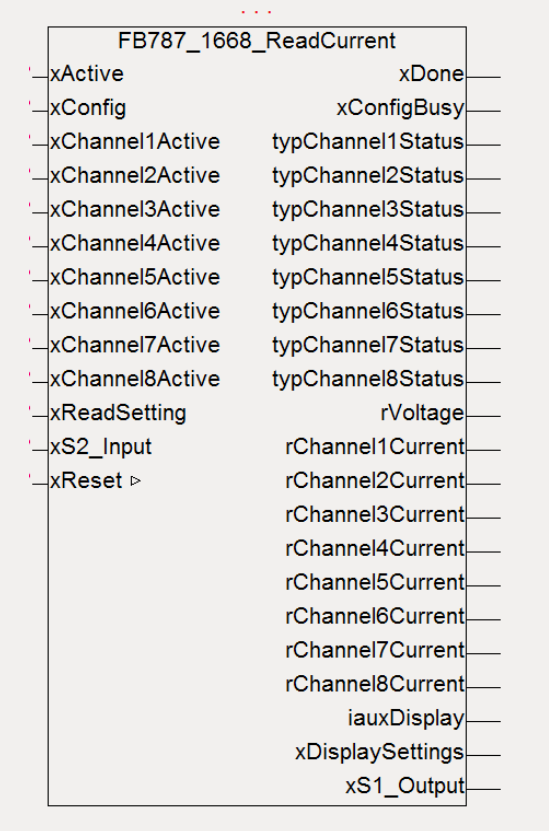
The IO-Link cyclic communication is much faster compared to the Manchester protocol.

S = Signal
LS = Low-side switching signal
P = Potential-free signal
I = IO-Link protocol
M = Manchester protocol

Function blocks for ECB monitoring that use the WAGO-I/O-SYSTEM, or different control systems, are available for free.

EPSITRON® Series ECBs have digital inputs and outputs that provide communication via the Manchester protocol.

All channels can be diagnosed and switched remotely independently of each other.



Transmission of:

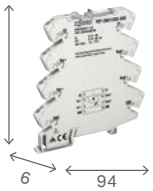
- State per channel
- Current output current
  (only for 787-166x/xxxx-1xxx and 787-166x/xxxx-xx8x)
- Nominal current setting per channel
- Input voltage
- Power on/off and reset per channel
- Nominal current setting
  (only for 787-166x/xxxx-xx8x)

Available Function Blocks:

- CODESYS
- Siemens S7/TIA Portal
- Schneider
- Rockwell
- Mitsubishi (pending)

EPSITRON® – ELECTRONIC CIRCUIT BREAKERS

Product Overview – ECBs



■ yes □ pending
[1] NEC Class 2
S = Signal
LS = Low-side switching signal
P = Potential-free signal
I = IO-Link protocol
M = Manchester protocol

Further information on ECBs' communication options can be found on pages 8/9.

Input/Output					Approvals				Dimensions and Environmental Conditions				
Nominal input/output voltage [VDC]	Output channels	Nominal output current [ADC]	Communication	Active current limitation	UL 61010	UR 2367	cULus 508	GL	Width [mm]	Height [mm]	Length [mm]	Ambient temperature [°C]	Item Number
	1	1	S		□	□		□	6	97.8	94	–25 … +70	787-2861/100-000
	1	2	S		□	□		□	6	97.8	94	–25 … +70	787-2861/200-000
	1	4	S		□	□		□	6	97.8	94	–25 … +70	787-2861/400-000
24	1	6	S		□	□		□	6	97.8	94	–25 … +70	787-2861/600-000
	1	8	S		□	□		□	6	97.8	94	–25 … +65	787-2861/800-000
	1	1 … 8	S		□	□		□	6	97.8	94	–25 … +70	787-2861/108-020
	2	2 … 10	M			■	■	■	45	115.5	90	–25 … +70	787-1662
	2	2 … 10	P			■	■	■	45	115.5	90	–25 … +70	787-1662/000-054
24	2	3.8 LPS	M	■		■	■	□	45	115.5	90	–25 … +70	787-1662/004-1000[1]
	2	0.5 … 6	M	■		■	■	■	45	115.5	90	–25 … +70	787-1662/006-1000
	2	1 … 6	M			■	■	■	45	115.5	90	–25 … +70	787-1662/106-000
	4	2 … 10	M			■	■	■	45	115.5	90	–25 … +70	787-1664
	4	2 … 10	M			■	■	■	45	115.5	90	–25 … +70	787-1664/000-004
	4	2 … 10	P			■	■	■	45	115.5	90	–25 … +70	787-1664/000-054
	4	2 … 10	N				■		45	115.5	90	–25 … +70	787-1664/000-011
	4	1 … 10	I			□	□	□	45	115,5	90	–25 … +70	787-1664/000-080
24	4	3.8 LPS	M	■		■	■	□	45	115.5	90	–25 … +70	787-1664/004-1000[1]
	4	0.5 … 6	M	■		■	■	■	45	115.5	90	–25 … +70	787-1664/006-1000
	4	1 … 6	M			■	■	■	45	115.5	90	–25 … +70	787-1664/106-000
	4	1 … 6	N				■		45	115.5	90	–25 … +70	787-1664/106-011
	4	2 … 12	M	■		■	■	□	45	115.5	90	–25 … +70	787-1664/212-1000
	4	0.5 … 6	P	■		■	■	□	45	115.5	90	–25 … +70	787-1664/006-1054
	8	2 … 10	M			■	■	■	42	142.5	127	–25 … +70	787-1668
	8	2 … 10	M			■	■	■	42	142.5	127	–25 … +70	787-1668/000-004
	8	2 … 10	P			■	■	■	42	142.5	127	–25 … +70	787-1668/000-054
24	8	1 … 10	I			□	□	□	42	142.5	127	–25 … +70	787-1668/000-080
	8	0.5 … 6	M	■		■	■	■	42	142.5	127	–25 … +70	787-1668/006-1000
	8	1 … 6	M			■	■	■	42	142.5	127	–25 … +70	787-1668/106-000
	8	0.5 … 6	P	■		■	■	□	42	142.5	127	–25 … +70	787-1668/006-1054
12	4	2 … 10	M			■	■	■	45	115.5	90	–25 … +70	787-1664/000-100
	2	2 … 10	P			■	■	□	45	115.5	90	–25 … +70	787-1662/000-250
48	4	2 … 10	M			■	■	□	45	115.5	90	–25 … +70	787-1664/000-200
	4	2 … 10	P			■	■	□	45	115.5	90	–25 … +70	787-1664/000-250
48	8	2 … 10	M			■	■	□	45	142.5	127	–25 … +70	787-1668/000-200
	8	2 … 10	P			■	■	□	42	142.5	127	–25 … +70	787-1668/000-250

Model Code Key:

787-xx6a/bbcc-defg

EPSITRON® Series

Design

ECB

Number of Channels

Lower nominal current (0: 0.5 A; 1: 1 A; 2: 2 A)

Upper nominal current (04: 3.8 A; 06: 6 A; 08: 8 A; 12: 12 A)

With (1) active current limitation

Nominal voltage (0: 24 VDC; 1: 12 VDC; 2: 48 VDC)

(5) with (0) potential-free contact;

(2) settable single-channel variant; (8) IO-Link

Configuration (0: standard; 4: with group message “tripped” and “switched off;” 5, 6: customer specification

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0888-0160/9015-6901 - EPSITRON ECB FLYER 1.1 US - 03/2018-00 - Printed in Germany - Subject to design changes