Electronic Relay with Extra Functions - EXR10

Description

The electronic relay EXR10 (Electronic eXtra Relay) is a solid state relay combining various extra functions in a single unit. These include:

- Solid state relay with diagnostic functions such as low voltage monitoring, wire break detection and current-proportional voltage output
- Electronic overcurrent protection

The relay fits into 4-pole or 7-pole standard automotive relay sockets to ISO 7588 (ISO Mini). It is suitable for system voltages of DC 12 V and DC 24 V (operating range DC 9...32 V) and can switch currents between 1 and 10 A.
For remote switching and protection of loads, two separate components had up to now often to be connected in the load circuit as a functional unit:

- An electro-mechanical relay or solid state relay which is powered via the control cable and then closes the circuit by means of the integral contact or power semi-conductor.
- An additional protective element (circuit breaker or fuse) providing line or equipment protection in the event of a failure.

The EXR10 combines diagnostic functions with overcurrent protection in a single component, thus minimising the number of connections in the circuit and reducing the failure risk. In addition the ETR10 is remotely resettable after overload tripping if an overload in the load path has caused the relay to switch off.

Applications

The EXR10 is suitable for all applications in DC 12 V and DC 24 V on-board electrical systems where magnetic valves, motors or lamps have to be switched and protected:

- Road vehicles (passenger cars, bicycles, trucks, buses, working vehicles and emergency cars, special vehicles)
- Construction vehicles and agricultural vehicles
- Rail vehicles
- Watercraft (ships, sailing boats, motor yachts etc.)
- Industrial process control and production technology

Features and Benefits

- Diagnostic functions regarding current, voltage or wiring can individually be adjusted to applications
- Plus-switching (positive control) solid state relay with high side switch (HSS) for load currents between 1 A and 10 A
- Integral protection against short circuit and overload in the load circuit
- Remotely resettable upon detection and disconnection of overcurrent by means of the protective function
- Silent switching
- Wear-free and robust design, insensitive to shock, vibration and dust (no mechanical contacts)
- Very low closed current and switching current consumption
- Fits into standard ISO Mini automotive relay sockets

EXR10

Technical data (25 °C)

Voltage supply LINE+		
System voltage	U_B	12/24 V DC
Operating voltage		9...32 V DC
Closed current[1)2)]	OFF	150 µA
Load circuit LOAD		
Load output		MOSFET, high side switching (HSS)
Load types		resistive, inductive and capacitive
Protective function		short circuit proof, overload protection temperature disconnection
Current rating	I_N	1...10 A
Short circuit current	$I_{K\ max.}$	70 A (I_N up to 10 A) L/R = 2ms 250 A (I_N from 15 A) L/R = 2ms
free-wheeling diode		integral
Voltage drop	$U_{ON\ max.}$	in mV (at I_N in A)

I_N	1	2	3	5	7.5	10
U_{ON}	50	55	60	80	90	110

Control input IN+		
Control voltage	ON OFF	8.5...32 V DC 0...5 V DC
Control current[1)]		1...10 mA (8.5 ... 32 V DC)
Rising edge		< 5 ms
Status outputs (optional)		
Outputs S1 and S2		MOSFET low side switch (LSS)
cont. current	$I_{S1,S2\ max}$	500 mA
Current-proportional output S3	U(I)	0...I_N: 0...5 V ± 0,5 V > I_N: 5...7 V
	PWM(I)	0...I_N: 0...75 % ± 7,5 % > I_N: 76...100 %
Cont. current	$I_{S3\ max}$	5 mA
General data		
Reverse polarity protection	control circuit	yes
	load circuit	no (due to free-wheeling diode)
Switching times[1)]	t_{ON}	4 ms
	t_{OFF}	4 ms
Temperature range		-40° C to +85° C
Degree of protection	enclosure	IP30 (not sealed) IP55 (sealed)
Dimensions	ISO Standard Mini	
plugged-in		30 × 30 × 40 mm
incl. contacts		30 × 30 × 51.6 mm
Mass[1)]	not sealed	25 g (I_N up to 10 A)

[1)] typically
[2)] with status outputs 300 µA

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Technical data (25 °C)

Tolerances	
Voltage values	± 2 %
Timer functions	± 1 %
Current values	± 0.1 x I_N

Tests

Humidity	9 cycles to DIN EN 60068-2-30:2006-06 max. 55 °C, 24 hrs cycle
Temperature change	30 cycles to DIN EN 60068-2-14:2009-01 min. temperature -40 °C, max. temperature +90°C
Protection class	DIN 40050:1980-07 DIN EN 60068-2-18:2001-10 sealed: IP55, unsealed: IP30
Vibration	Commercial vehicle, decoupled cab ISO16750-3:2012 test VII (with socket AK 595000011 and retaining clip AK595000031; vibration resistance depends on design, quality, age (number of push-in cycles), mounting position of the socket used and of the connecting cables)
Shock	ISO16750-3:2012 500 m/s^2, 6 ms, half-sine, 10 shocks per direction DIN EN 60068-2-27:2009 test Ea 25 g, 11 ms, halfsine, 10 shocks per direction
Corrosion	IEC 600068-2-52: 1996-10, severity level 3

Approvals

Authority	Approval mark	Regulation
KBA	E1	ECE R 10

Conformity

RoHS REACH CE

Order

We require two parts of information for a complete order, the type number of the base unit (hardware) and the selected functions (configuration of software).

The type number allows to have the relay optionally
- with or without overcurrent trip curve
- with 4-pin or 7-pin type socket
- with a current rating between 1 A and 10 A
- with or without environmental sealing for an enhanced IP protection degree

The configuration of the functions is implemented during production and cannot be changed afterwards.
Please select at least one function.

The following functions are available:
- pulse or level control with filtering (10 ms to 5 min)
- control signal
- ON and/or OFF delay (100 ms up to 45 d)
- pulse output, retriggerable or with pulse abortion function
- blinking (frequency and pulse duty factor selectable)
- overcurrent characteristic curve with two points defined by
  - current (I_{trip1}, 1.0...1.5 x I_N, ± 10 %; I_{trip2} 2...4 x I_N, ± 20 %)
  - time (t_{trip1}, 100...500 ms, 10 %; t_{trip2} 10...50 ms, ±20 %)
- reset lock-out (1 s to 10 min)
- overload error memory
- overcurrent signal
- undervoltage detection (9...30 Voc, ON or OFF condition) with filtering (1 s...179 s) and disconnection as well as status indication
- wire break detection (in ON and/or OFF condition) with wire break indication

For details of the functions listed above and of the type number please visit out website[1] or see our product configurator[2] or contact your responsible sales person.

[1] www.e-t-a.de/relay_configurator

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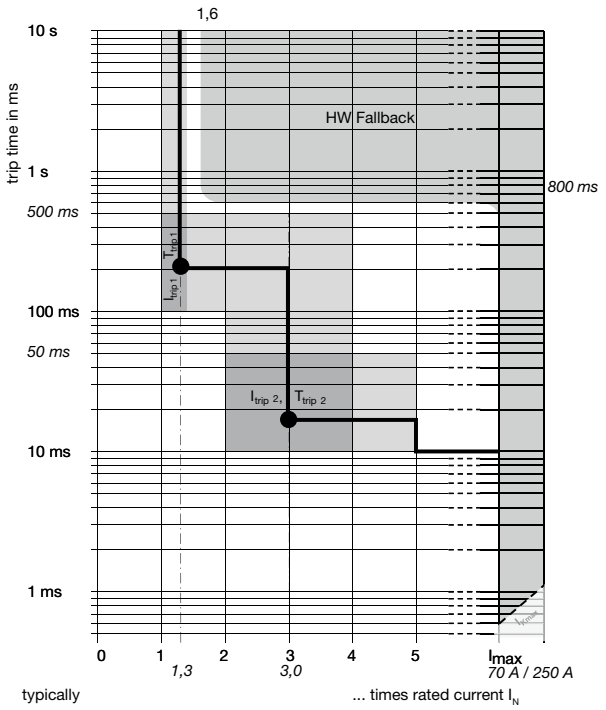
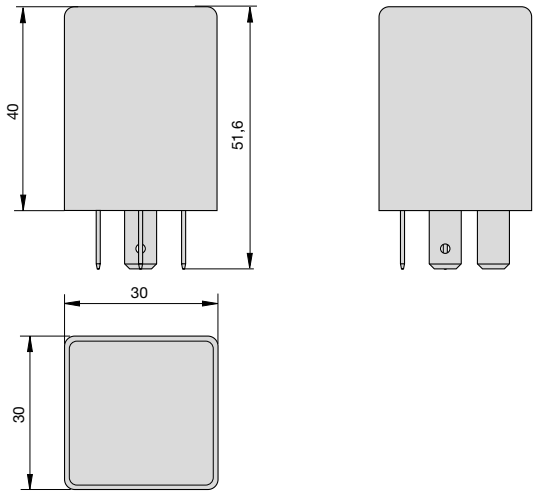
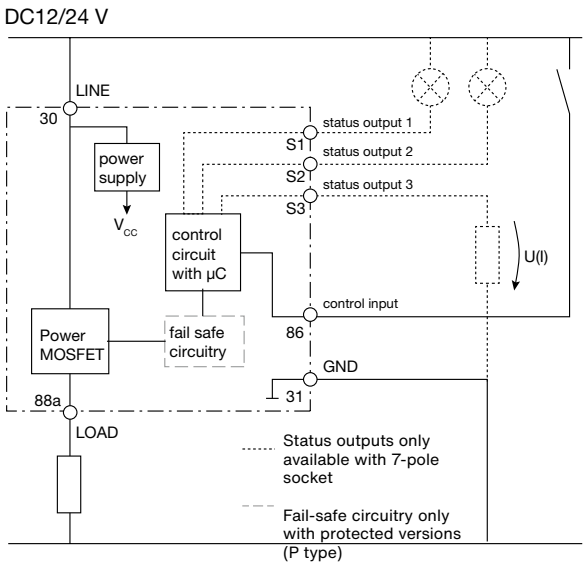
Time/current characteristic (T_{amb} = 25 °C)



Dimensions



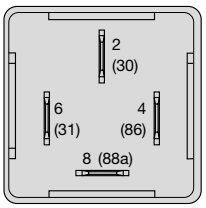
Schematic diagram



Pin assignment

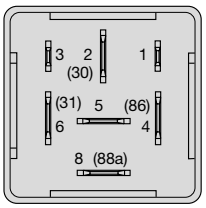
4-pin version

LINE	30	2
LOAD	88a	8
GND	31	6
IN	86	4



7-pin version

LINE	30	2
LOAD	88a	8
GND	31	6
IN	86	4
S1	S1	1
S2	S2	3
S3	S3	5



S1 activation signal
S2 diagnosis and overcurrent signal
S3 present load currrent U(I) or PWM(I)

Pin assignment is in accordance with ISO 7588
Pins 2, 4, 5, 6 and S3 – blade terminals 6.3 x 0.8
Pins 1 and 3 – blade terminals 2.8 x 0.8
Pin denomination as per DIN 72552.

All dimensions without tolerances are for reference only. E-T-A reserves the right change specifications at any time in the interest of improved design, performance and cost effectiveness, the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.

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