

Protecting - switching - monitoring Transportation



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Transportati

E-T-A

Engineering Technology

For over 70 years, E-T-A Elektrotechnische Apparate GmbH, with corporate headquarters in Altdorf near Nuremberg, has been successful in the global marketplace.

Today E-T-A is the market leader in the design and production of circuit breakers and protectors for equipment protection. From thermal circuit breakers to complex power distribution systems, you can buy everything from a single source, from your partner E-T-A. We help you select the suitable solution. For E-T-A, performance and customer service do not only mean selling product. We do not only offer professional advice regarding applications and suitable products, but we can also unite our industrial expertise with your application knowledge.

Our company motto "Engineering Technology" stands for superior solutions concerning the best possible deployment of electrical power. The safety of man and machine is at the centre of our plans, ideas and activities.

E-T-A is your partner for electro-mechanical, electronic and mechatronic products for protecting against the effects of overload and short circuit current.

We are not only a supplier of components, but we are a genuine service provider. We offer anything you need for your protection concept, from planning and design up to production. It is our goal not only to give you a solution, but with the best solution. So you can continue concentrating on your core business.

Innovations

Fit for the future means for E-T-A that we always try to be one step ahead of the state of engineering by one trendsetting

innovation. We have a great number internationally patented products, setting milestones in the market. This should remain so in the future. Therefore the subject of innovation is essential to us.

We press ahead with new product developments by working in interdisciplinary teams. In addition, our department »Innovation and Technology«, I&T in brief, realises innovative solutions up to the prototype state in a free environment. In order to exploit new technologies for E-T-A, we closely co-operate with renowned universities and research laboratories and support the E-T-A design work with new, often unconventional ideas.



Dr. Clifford Sell
Director
E-T-A Elektrotechnische Apparate GmbH

E-T-A for passenger cars

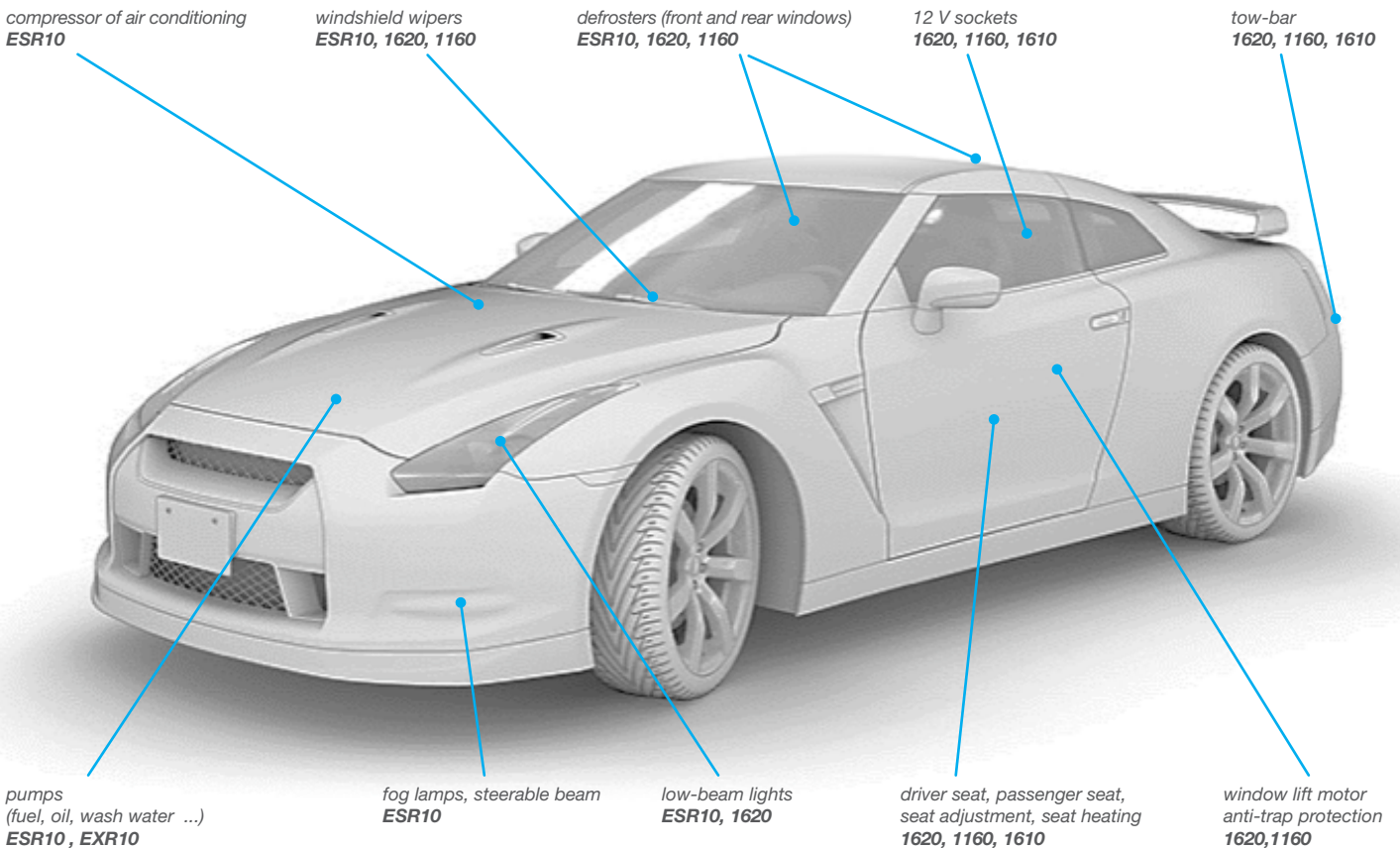
The »power train electrification« megatrend leads to a fast-paced change in the architecture of on-board electrical systems. Hybrid and electrical drive concepts have higher demands for protection solutions and relays. E-T-A specialises specifically in these applications and designs solutions for the vehicles of tomorrow. Our plug-in solid state relays are a good example of this trend or our 48 V protection solutions which are already available. We also design mechanical and hybrid switchgear in the HVDC range up to 1000 VDC in partnership with our customers.

We know our customers' requirements and support them with all the necessary tasks. We can run benchmark and system analysis and demonstrate solution approaches very quickly in our independent and accredited test laboratory.




We are the technological leader in 12 V and 24 V circuit breakers both for passenger cars and trucks. Interfaces such as the 12 V power outlet in a car are frequently protected by our circuit breakers to ensure reliable operation of a diverse range of devices.

E-T-A is also a leader in designing solid state relays. The E-T-A **ESR10 Micro relays** are installed in all applications where mechanical relays get too hot, consume too much power or fail prematurely due to excess mechanical strain.

E-T-A products increase fail safety and enhance vehicle uptime.



Components for the use in cars

	Unit	Properties	Customer benefits
	Solid state relay ESR10 Micro	<ul style="list-style-type: none"> - 30% less power loss - > 1,000,000 cycles - only 10mA holding current - silent operation 	<ul style="list-style-type: none"> - less complaints due to ten times longer endurance than electro-mechanical devices
	Circuit breakers 1160, 1610, 1620	<ul style="list-style-type: none"> - no replacement fuses required - autoreset or manual reset 	<ul style="list-style-type: none"> - high availability - reduced downtimes
	Solid state special and timer relays EXR10, ETR10	<ul style="list-style-type: none"> - huge functional scope including »ON delay« and »OFF delay« through μcontroller 	<ul style="list-style-type: none"> - smart functions without extra controlgear



E-T-A for trucks and buses

The requirements of availability and safety of vehicles for transportation of goods and passengers are constantly increasing. At the same time, the electrification degree rises, caused by new requirements of (partly) autonomous driving, electric mobility, fuel efficiency as well as connectivity and digitization.

E-T-A knows the special requirements of our customers and meets them with innovative products, solutions and comprehensive know-how.

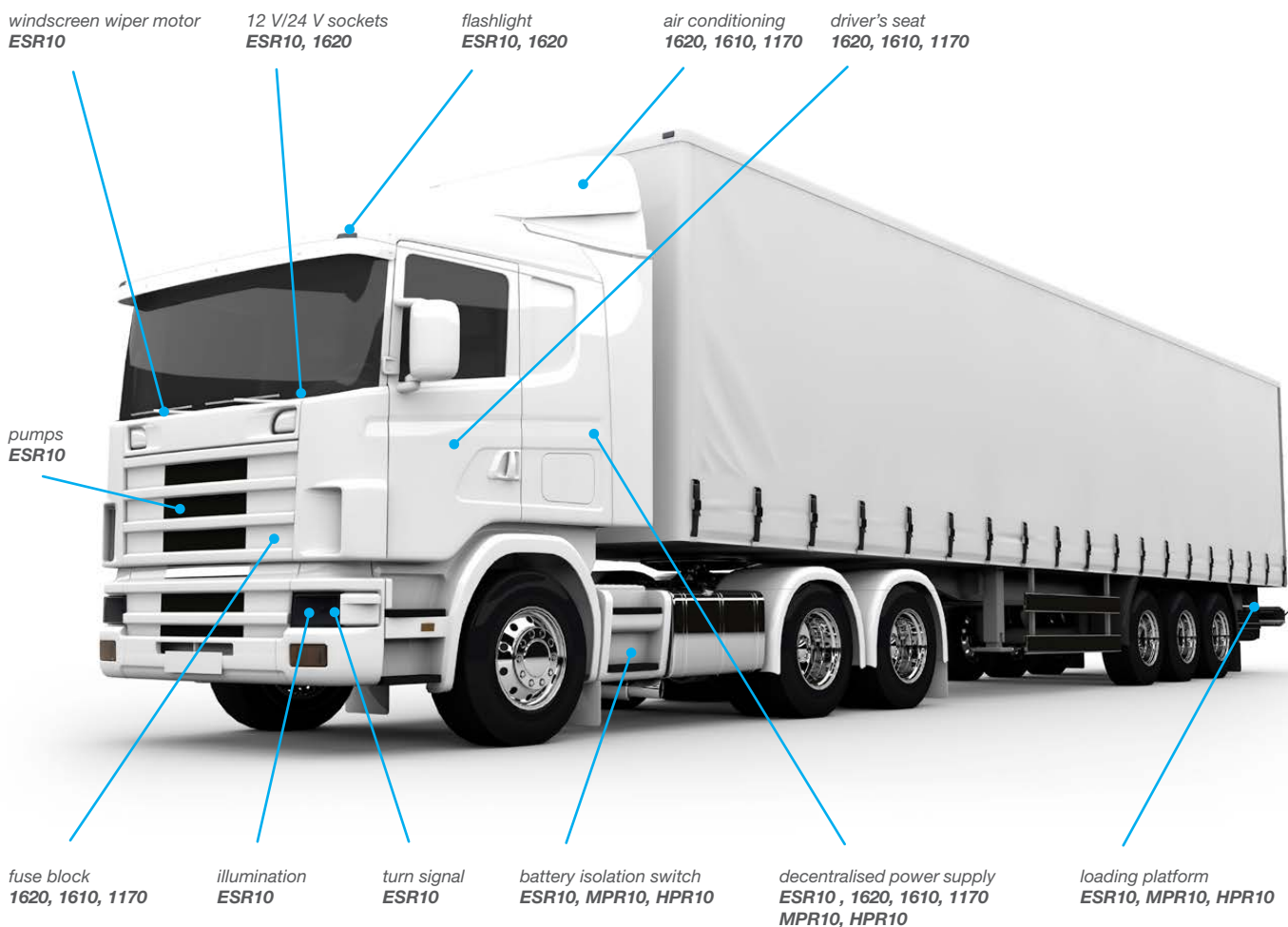
Thermal automotive circuit breakers enhance availability of trucks and buses. Previously, blade fuses were installed to protect load circuits and cables, but nowadays more and more circuit breakers are used. Particularly with regard to

variable loads which are hard to define, they have a clear edge over fuses. In the event of an overload trip, a fuse blows. A circuit breaker, as opposed to that, can automatically or manually be reset and ensures immediate availability as soon as the failure has been remedied. Replacement fuses are no longer needed.





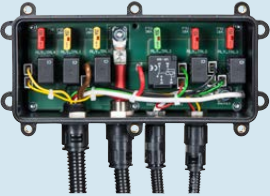
In addition E-T-A offers a range of solid state or hybrid relays as well as smart, programmable devices. These allow for instance flexible control of loads such as pumps and flasher sub-assemblies. A significantly higher switching resistance, lower power consumption and avoidance of switching noises help to avoid premature failures and overheating and to increase customer convenience at the same time. Selected products offer diagnostic and

monitoring functions such as current measurement, voltage monitoring and wire break monitoring. This significantly improves transparency in the event of a failure.

E-T-A products increase fail safety and enhance vehicle uptime.



Components for the use in trucks and buses

	Unit	Properties	Customer benefits
	Solid state relay ESR10	<ul style="list-style-type: none"> - robust design, long life span - low holding current - silent operation 	<ul style="list-style-type: none"> - less complaints due to ten times longer endurance than electro-mechanical devices
	Circuit breakers 1610, 1620, 1170	<ul style="list-style-type: none"> - no replacement fuses required - autoreset or manual reset 	<ul style="list-style-type: none"> - high availability - reduced downtimes
	Solid state special and timer relays EXR10, ETR10	<ul style="list-style-type: none"> - wide functional scope including ON delay and OFF delay through micro-controller 	<ul style="list-style-type: none"> - smart functions without extra controlgear
	Power relays MPR10, HPR10	<ul style="list-style-type: none"> - water and dust-proof to IP6K9K - low holding current - smart control (HPR10) 	<ul style="list-style-type: none"> - unrivalled reliability - reduced CO₂ emission - flexible application options
	System solutions such as decentralised intelligent power distribution systems	<ul style="list-style-type: none"> - perfect matching of the corresponding application - complete solutions for power distribution and protection 	<ul style="list-style-type: none"> - flexibility - reduced complexity - cost reduction



E-T-A for construction machinery, agricultural vehicles and forestry equipment

In construction, agriculture and forestry, the weather and other environmental influences such as dust, vibration and humidity play a large role. Any components in off-highway vehicles are therefore intensely used and exposed to harsh conditions, whether the machinery is used by professional private customers, service providers or in rental.

Therefore the maximum capability and performance of the technology used is essential. Today, with ever narrower time slots, rising production costs and permanent optimisation in all application areas, a maximally reliable protection of the working gear and its electrical loads is required.

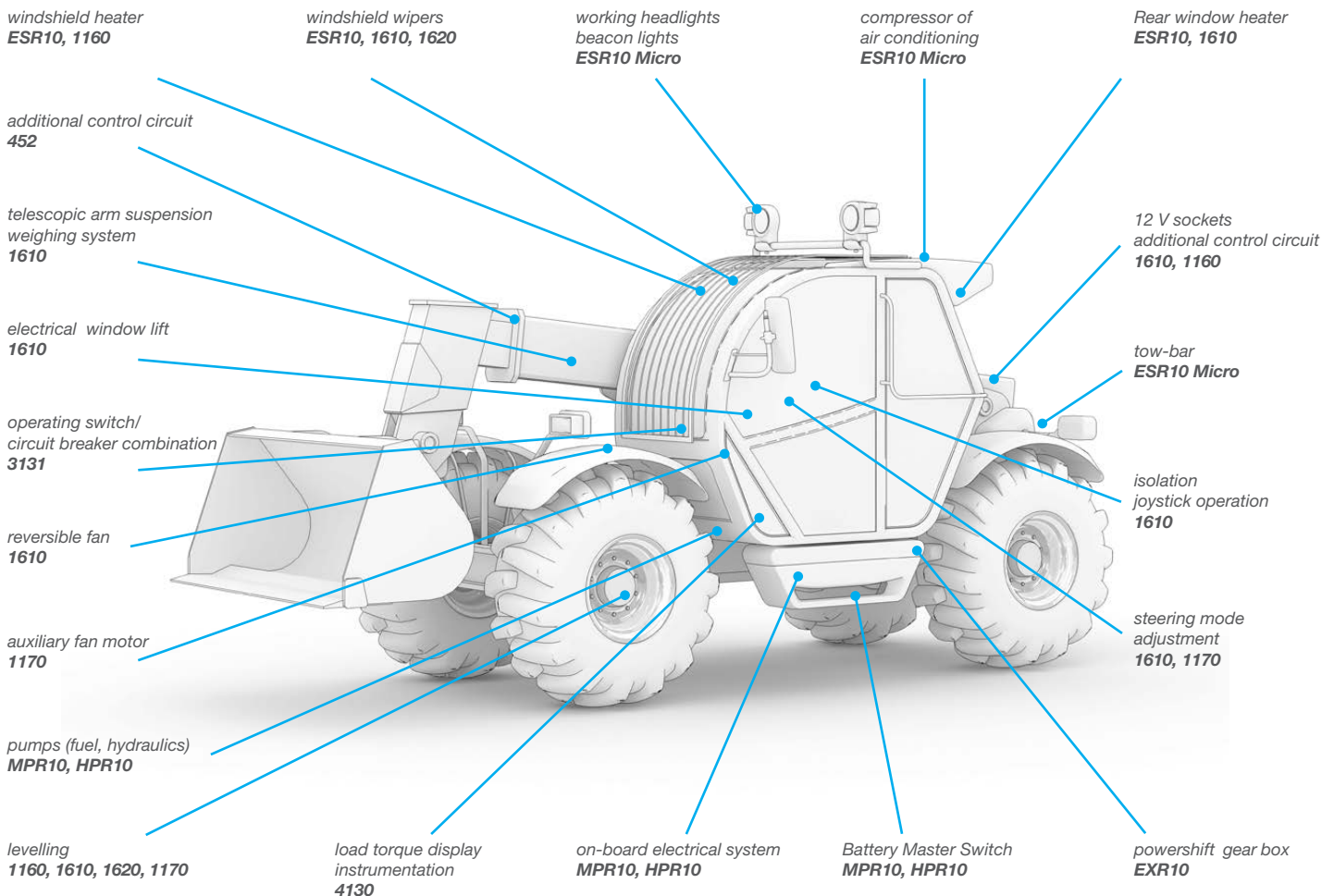
In agricultural vehicles and forestry equipment, technical defects can cause very high breakdown costs, particularly with self-propelling work machinery. In addition, the entire harvesting chain comes to a standstill and the quality of the harvest may significantly deteriorate in the event of a failure.

Considerable financial loss is imminent which could be avoided by using suitable technology.

E-T-A is the global innovation and market leader of protection against overcurrent in harvesters and special machinery and has been known for robust and extremely reliable products for decades.

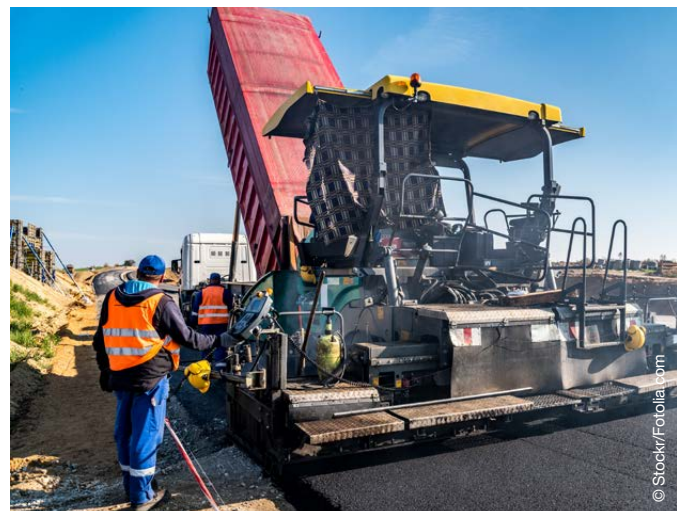
E-T-A products in construction machinery, agricultural vehicles and forestry equipment ensure professional solutions for the protection of electrical loads and powerunits. These include pumps, motors, air condition compressors or illumination in construction machinery, agricultural vehicles and forestry equipment.

E-T-A products increase reliability and enhance vehicle uptime.



Components for the use in construction machinery, agricultural vehicles and forestry equipment

	Unit	Properties	Customer benefits
	Solid state relay ESR10	<ul style="list-style-type: none"> - robust design, long life span - low holding current - silent operation 	<ul style="list-style-type: none"> - less complaints due to ten times longer endurance than electro-mechanical devices
	Circuit breakers 1610, 1620, 1170	<ul style="list-style-type: none"> - no replacement fuses required - autoreset or manual reset 	<ul style="list-style-type: none"> - high availability - reduced downtimes
	Solid state special and timer relays EXR10, ETR10	<ul style="list-style-type: none"> - wide functional scope including ON delay and OFF delay through micro-controller 	<ul style="list-style-type: none"> - smart functions without extra controlgear
	Power relays MPR10, HPR10	<ul style="list-style-type: none"> - water and dust-proof to IP6K9K - low holding current - smart control (HPR10) 	<ul style="list-style-type: none"> - unrivalled reliability - reduced CO₂ emission - flexible application options
	High performance circuit breakers 482, 483, 583	<ul style="list-style-type: none"> - trip free mechanism - snap-action mechanism - temperature compensation 	<ul style="list-style-type: none"> - maintenance-free - enhanced vehicle uptime - extreme reliability
	Rocker switch or rocker actuated circuit breaker 3131	<ul style="list-style-type: none"> - three-position switch - protective function optional - degree of protection IP65 - momentary switch operation optional 	<ul style="list-style-type: none"> - fit for universal use - robust design, protected against environmental influence



E-T-A for Aerospace

No other industry has stricter requirements with regard to safety than the aerospace industry. In the air it is of paramount importance that all loads and components are absolutely reliably protected, even under harshest environmental conditions. Cable protection of all redundant strings is of the essence.

In the aerospace industry, E-T-A has always been known for robust and extremely reliable products used in helicopters, executive jets and high-tech aircraft, but also in large passenger planes.

E-T-A offers high performance circuit breaker of superior quality, meeting all relevant aerospace standards. Renowned aircraft manufacturers rely on E-T-A's competence for decades. Successfully

passed heavy duty approval tests allow installation of our circuit breakers even in defence vehicles. Even at very high temperatures and extreme vibrations, these breakers trip reliably and minimise the risk of catastrophic cable fires.

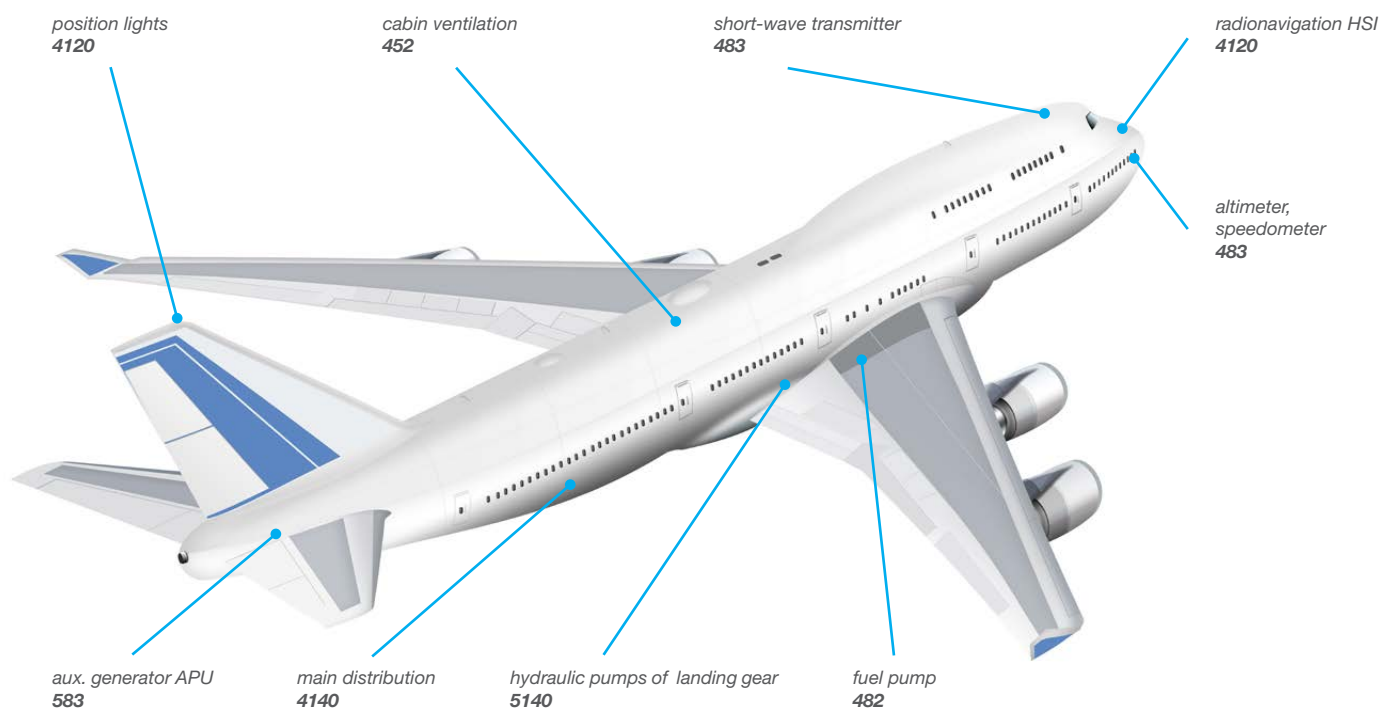
E-T-A knows the customers' requirements and we support them with the execution of the necessary tasks. At the same time E-T-A is pioneering, being one of the first manufacturers offering a sensor which can detect an arc by means of a sophisticated current-signal-analysis.

E-T-A circuit breakers are available in a wealth of variants for the most different applications, both in the AC and the DC range. Temperature compensation and explosion-proof design allow E-T-A

high performance circuit breakers to be installed in all areas of an aircraft - not only in the cockpit, but for instance also in the wheel well.

This is enabled by the extremely high vibration resistance of the circuit breakers.

E-T-A products offer unrivalled reliability even under harshest conditions.



Components for the use in aerospace

	Unit	Properties	Customer benefits
	High performance circuit breakers 482, 483, 583	<ul style="list-style-type: none"> - environmental conditions do not affect the trip behaviour - very high vibration resistance - long life span - two-chamber system 	<ul style="list-style-type: none"> - high reliability, even with unsteady environmental conditions - maintenance-free
	High performance circuit breakers 4140, 5140	<ul style="list-style-type: none"> - high vibration resistance - explosion-proof design - environmental conditions do not affect the trip behaviour 	<ul style="list-style-type: none"> - enhanced safety - unrivalled reliability
	High performance circuit breakers 452	<ul style="list-style-type: none"> - long life span - high rupture capacity - explosion-proof design 	<ul style="list-style-type: none"> - maintenance-free - enhanced safety - unrivalled reliability
	Control switch for flight simulators 9510	<ul style="list-style-type: none"> - extremely low trip currents - interchangeable button marking 	<ul style="list-style-type: none"> - energy-efficient - fit for universal use - real-life conditions in the simulator
	System solutions Plug-in type circuit breakers on pcb	<ul style="list-style-type: none"> - press-fit technology - modular design - reduced wiring time 	<ul style="list-style-type: none"> - weight savings - avoidance of wiring errors - ease of maintenance



E-T-A for rail vehicles

Reliability is one of the major aspects with regard to rail vehicles. In the end, vehicle uptime has top priority. Extremely high shock and vibration resistance as well as resistance against dirt and high ambient temperatures are indispensable.

For more than 40 years E-T-A offers products which are tailor-made to these requirements. Renowned railway engineering companies rely on E-T-A's competence for many years. The products are also being used in aerospace applications, an industry requesting unflinching superior quality at harshest environmental conditions. Personal public transport or special rail vehicles - E-T-A always offers the right solution. The product range comprises temperature

compensated circuit breakers, solid state remote power controllers and intelligent battery master switches.

Even at very high temperatures and extreme vibrations, these breakers trip reliably. They minimise fire risk as well as nuisance tripping and related downtimes of the vehicle.





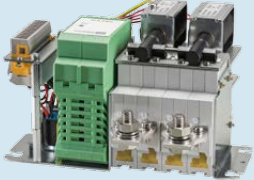
E-T-A products for rolling stock available in a range of variants and for all kinds of applications. E-T-A high performance circuit breakers can be used for AC and DC applications. Their temperature compensation and the V0 enclosure allow installation in all areas of the vehicle. The long life span of the E-T-A products means no need for maintenance and high

reliability. Remotely controllable battery master switches help the driver to save time in vehicle operation.

E-T-A products for rail vehicles ensure professional solutions for the protection of all loads in your vehicle.



Components for the use in rail vehicles

	Unit	Properties	Customer benefits
	High performance circuit breakers 4120	<ul style="list-style-type: none"> - shock and vibration resistant - temperature compensation - trip-free 	<ul style="list-style-type: none"> - device can be installed decentrally - high reliability - enhanced safety
	Battery isolation switch 437	<ul style="list-style-type: none"> - remote control - trip free mechanism - snap-action mechanism 	<ul style="list-style-type: none"> - more flexibility and time savings - enhanced safety - long life span
	Circuit breaker 8345	<ul style="list-style-type: none"> - insensitive to temperature changes - trip free mechanism - low contact wear 	<ul style="list-style-type: none"> - increased vehicle uptime
	Battery isolation switch E-1073	<ul style="list-style-type: none"> - low voltage detection - remote control - reverse polarity protection 	<ul style="list-style-type: none"> - enhanced vehicle uptime (protection against battery drain) - more flexibility and time savings - consequential damages are avoided
	Battery isolation switch SBG-437	<ul style="list-style-type: none"> - integral start-up unit - remote ON and OFF actuation - battery master switch with integral protective function 	<ul style="list-style-type: none"> - no downtimes caused by battery drain



E-T-A in

Transportation

- Automotive circuit breakers
- Solid state relays
- Power relays
- Battery isolation switches
- High performance circuit breakers
- Rocker-actuated circuit breakers



Safety inside - with E-T-A products

E-T-A products offer solutions for protecting, switching and monitoring in on-board electrical systems of vehicles, aircraft and rolling stock.

You find our innovative products in these markets in countless applications. They include passenger cars, high end trucks and ultramodern airplanes. Even the fastest train in the world is fitted with E-T-A products.

On the following pages we give you an overview of our product range. Our portfolio and its scope are globally unique. It allows to provide our customers with tailor-made solutions for their applications.

No wonder that our technology, which was proven a million times over, has brought us our customers' confidence and reliance. And this is what makes us very proud.

Stay in motion - to make things work.

Product Overview

Automotive circuit breakers

1160



- Type 2
- DC 12 V
- 12 ... 30 A
- IP54 enclosure
- For areas that are difficult to access
- SAE J553 standard
- Basic model

page 20-21

1610/1616



- Types 1, 3, and 3H
- DC 12/24 V
- 5 ... 30 A
- ATO design, fuse replacement
- SAE J553 standard
- Colour-coded housing cap (amp rating)
- Standard and fast trip curve

page 20-21

Solid state relays

ESR10 Micro 12 V



- DC 12 V
- 10 A, 17 A, 30 A
- ISO Micro relay socket
- Single pole make contact
- Double pole control
- Powerful solid state relay in Micro design
- > 1,000,000 cycles

page 24-25

ESR10 Micro 24 V



- DC 24 V
- 10 A, 17 A
- ISO Micro relay socket
- Single pole make contact
- Double pole control
- Extremely low holding current
- > 1,000,000 cycles

page 24-25

Power relays

MPR10



- DC 12/24 V
- 100 A, 200 A, 300 A
- Suitable for switching high current loads and for use as battery master switch
- Insensitive to water and dust (IP6K9K)
- Long life span and low power loss
- Bistable relay

page 28-29

HPR10



- DC 12/24 V
- 100 A, 200 A, 300 A
- Suitable for switching high current loads and for use as battery master switch
- Insensitive to water and dust (IP6K9K)
- Bistable relay combined with integral electronic control circuitry
- Intelligent control input (level or pulse controlled)
- ON or OFF delay

page 28-29

1620/1626



- Types 1, 2, 3 and 3H
- DC 12/24 V
- 5 ... 30 A
- MINI® fuse socket design - fuse replacement
- SAE J553 standard
- Colour-coded housing cap (amp rating)
- Standard and fast trip curve page 20-21

1170/1176



- Type 3H
- DC 12/28/48 V
- 3 ... 25 A
- Reset button
- Retaining clips for a tight fit
- SAE J553 standard
- High shock and vibration resistance
- Standard and fast trip curve page 20-21

ETR10/EXR10



- DC 12/24 V
- 1 ... 30 A
- Freely selectable time window for »ON Delay« and »OFF Delay«
- Optional overcurrent and short circuit protection
- Integral diagnostic functions
- Optional wire break detection
- Low voltage detection page 26-27

EPR10



- DC 12/24 V
- 75 A ... 200 A
- Solid state relay
- No heat sink required (80% space saving)
- Designed for a high number of switching cycles
- High reliability and functional reliability
- Robust design

page 30-31

Product Overview

Thermal high performance circuit breakers


4130



- AC 240 V/DC 50 V
- 20 ... 80 A
- Robust basic model
- Rupture capacity 800 A
- Long life span through snap action mechanism
- Positively trip-free mechanism

page 36-37

412/413



- DC 28 V
- **412:** 6 ... 35 A/**413:** 30 ... 90 A
- Automotive or aircraft trip curve available
- Rupture capacity 6 kA
- Long life span through snap action mechanism
- Positively trip-free mechanism

page 36-37

482




- AC 115 V (300-800 Hz)/DC 28 V
- 0.1 ... 50 A
- Extremely low ratings available
- Rupture capacity AC 1 kA/DC 6 kA
- Explosion-proof to VG95210
- Optional auxiliary contacts

page 36-37

Thermal-magnetic high performance circuit breakers


410/520/530



- AC 240 V/DC 110 V
- 7 ... 125 A
- Robust circuit breaker model with high rupture capacity
- Rupture capacity AC 5 kA/DC 10 kA
- A choice of trip curves available
- Long life span through snap action mechanism
- Optional auxiliary contacts

page 36-37


452



- DC 28 V
- 50 ... 100 A
- Robust circuit breaker for use in harsh conditions
- Rupture capacity 6 kA
- Long life span through snap action mechanism

page 36-37

446/447/449




- DC 28 V
- 30 ... 500 A
- Heavy duty circuit breaker for high amperages
- Rupture capacity 10 kA
- Various trip characteristics
- Integral remote trip and manual release button

page 36-37

Battery isolation switches


SBG-437



- DC 110 V
- 125 ... 240 A
- Compact battery isolation switch with start-up unit for rail applications
- Wide input voltage range 75 ... 150 V DC
- Integral remote ON and OFF actuation
- Misuse excluded

page 34-35

E-1073



- DC 24 V/DC 110 V
- 40 ... 240 A
- Compact battery isolation switch with additional functionalities
- Integral ON or OFF actuation
- Protection against total discharge of battery by way of undervoltage detection

page 34-35

4140/5140



- AC 115 V (300-800 Hz)/DC 28 V
- 20 ... 50 A
- Aircraft circuit breaker for increased requirements
- Rupture capacity AC 1.5 kA/DC 4 kA
- Temperature compensated
- Optional auxiliary contacts

page 36-37

4120



- AC 115 V (300-800 Hz)/DC 28 V
- 1 ... 25 A
- Aircraft circuit breaker for increased requirements
- Rupture capacity AC 2 kA/DC 6 kA
- Temperature compensated
- Optional auxiliary contacts
- Blade terminals optionally available

page 36-37

483/583



- AC 115 V (300-800 Hz)/DC 28 V
- 1 ... 35 A
- High-end circuit breaker for reliable use under harshest environmental conditions
- Rupture capacity AC 2.5 kA/DC 6 kA
- Two-chamber system, temperature compensation for a precise tripping characteristic
- Optional auxiliary contacts

page 36-37

Simulator switch

437



- DC 144 V
- 40 ... 240 A
- Extremely reliable circuit breaker for rail applications
- Rupture capacity AC 28 V 10 kA/ DC 180 V 2 kA
- Remote ON and OFF actuation
- Positively trip-free mechanism
- Optional auxiliary contacts

page 36-37

9510



- DC 24 V/DC 28 V
- Trip current < 170 mA
- Exact and fast magnetic trip
- Trip time < 25 ms
- Exchangeable marking inserts for simulation of different current ratings
- Optional auxiliary contacts

page 36-37

Circuit breaker/switch combination

3131



- DC 28 V
- 0.1 ... 20 A
- Reliable switching behaviour through trip-free mechanism
- Degree of protection IP66
- Snap-in mounting
- Wide range of rocker symbols

page 44-45

Automotive circuit breakers

1160, 1610/1616

1620/1626

1170/1176



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- Enhanced reliability
- Universal use
- Time- and cost-saving



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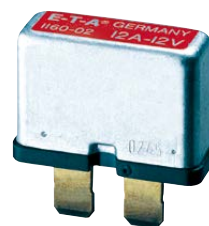
Type 1610-21



Type 1610-H2



Type 1610-92



Type 1160



Type 1170

Automotive circuit breakers

1160, 1610, 1620, 1170 – for universal use

Automotive circuit breakers

The extremely compact thermal automotive circuit breakers **1610** and **1620** and the powerful **1170** model are above all used in professional surroundings. They are ideally suited to all applications where reliability and availability around the clock are of the essence.

1616, **1626** and **1176** are identical in form and fit, but offer a faster trip curve. The terminal design corresponds to standard automotive blade fuses.

If a protective element has to be placed in a spot that is hard to access, a blade fuse should not be used. For such an application we recommend our autoreset types **1610-92**, **1620-1**, **1160** and **1620-2**. The SAE type 1 circuit breakers keep on resetting in cycles of a few seconds until the failure has been remedied, i.e. until the overload has been removed. The SAE type 2 circuit breakers **1160** and **1620-2** offer a modified autoreset function where the contacts are kept open for while – until power in the circuit was switched off for a certain time.

1170/1176 was designed especially for utility vehicles such as trucks, buses and agricultural and construction machinery. It offers comprehensive protection through snap-action mechanism, trip-free mechanism and a high rupture capacity of 400 A. The tease-free mechanism ensures switch-on operation without harmful arcs. The trip-free mechanism ensures reliable disconnection even with the reset button blocked. Its retaining clips provide a tight fit in the terminal block even in the event of shock and vibration. This circuit breaker is also suitable for use in 48 V on-board electrical systems.

Your benefits

- **Enhanced availability** because no replacement fuses are required
- **Universal use**, independent of socket or terminal block system
- **Time saving** - it cuts downtimes as it resets automatically after a failure

Application in the industries

- Passenger cars
- Trucks and buses
- Construction machinery
- Agricultural vehicles and forestry equipment
- Special vehicles



Machine uptime is paramount also in forestry

Technical data

- 12 V/24 V/48 V on-board electrical systems
- Colour coding of enclosure according to current ratings







Series 1620/1626

Reliable protection in all vehicle applications:
E-T-A automotive circuit breakers

Product Overview

Automotive circuit breakers

Type	1160	1610-92	1610-21	1610-H2
				

Working principle to SAE

SAE type	2	1	3	3H
Autoreset	●	●		
Modified reset	●			
Manual reset			●	●
Manual release				●

Special features

Trip free mechanism				
Snap-action mechanism			●	●
Version with fast trip curve (70 % curve)		1616-92	1616-21	1616-H2
Special features				

Technical data

Voltage rating	DC 12 V	DC 12 V	DC 12 V, DC 24 V	DC 12 V, DC 24 V
Operating voltage	9 ... 16 V	9 ... 16 V	9 ... 32 V	9 ... 32 V
Current ratings	12, 15, 20, 30 A	5, 7,5, 10, 15, 20, 25, 30 A	5, 7,5, 10, 15, 20, 25, 30 A	5, 7,5, 10, 15, 20, 25, 30 A
Holding current	< 0.6 A			
Switching cycles	≥ 300 (2xI _N)	≥ 300 (2xI _N)	≥ 300 (2xI _N)	≥ 300 (2xI _N)
Interrupting capacity	200 A (3x)	150 A (3x)	150 A (3x)	150 A (3x)
Max. short circuit current	2,000 A	2,000 A	2,000 A	2,000 A
Voltage drop	< 150 mV	< 150 mV	< 150 mV	< 150 mV
Degree of protection (cap)	IP54	IP54	IP30	IP30
Temperature range	-30 ... +60 °C	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C

Terminal design

2.8 mm (ISO 8820-3 type F)				
6.3 mm (DIN 72581 part 3)	●	●	●	●
Socket design compatible with	ATO™ design	ATO™ fuse holder	ATO™ fuse holder	ATO™ fuse holder



1	2	3	3H	3H
●	●			
	●			
		●	●	●
			●	●

				●
		●	●	●
1626-1	1626-2	1626-3	1626-3H	1176
Space-saving design	Space-saving design	Space-saving design	Space-saving design	Very high endurance through double contact system Retaining clips for a tight fit (shock, vibration)

DC 12 V	DC 12 V	DC 12 V, DC 24 V	DC 12 V, DC 24 V	DC 12 V, DC 24 V and 48 V
9 ... 14.5 V	9 ... 14.5 V	9 ... 29 V (32 V)	9 ... 29 V (32 V)	9 ... 60 V
5, 7.5, 10, 15, 20, 25, 30 A	5, 7.5, 10, 15, 20, 25, 30 A	5, 7.5, 10, 15, 20, 25, 30 A	5, 7.5, 10, 15, 20, 25, 30 A	3, 4, 5, 6, 7.5, 8, 10, 15, 20, 25 A
	< 0.3 A			
≥ 300 (2xI _N)	≥ 300 (2xI _N)	≥ 300 (2xI _N)	≥ 300 (2xI _N)	≥ 1,000 (2xI _N)
150 A (3x)	150 A (3x)	150 A (3x)	150 A (3x)	400 A (3x)
2,000 A	2,000 A	2,000 A	2,000 A	2,000 A
< 150 mV	< 150 mV	< 150 mV	< 150 mV	< 150 mV < 300 mV (I _N ≤ 5A)
IP50	IP50	IP40	IP40	IP40
-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C

●	●	●	●	●
Mini fuse™ blade-type fuses	Mini fuse™ blade-type fuses	Mini fuse™ blade-type fuses	Mini fuse™ blade-type fuses	ATO™ fuse holder

Solid state relays

ESR10 Micro

- High number of switching cycles
- High resistance against dust and vibration
- Silent switching



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ESR10 Micro 10 A



ESR10 Micro 17 A

Solid state relays

ESR10 Micro – silent, but robust

The **ESR10 Micro relays** rated **10 A**, **17 A** and **30 A** (DC 12 V) feature a compact Micro enclosure and are the most powerful automotive solid state relays of their kind. Regarding self-heating (-30 %), number of cycles (> 1,000,000), switching frequency or rugged design they easily outstrip their mechanical equivalents.

They do not have moving parts or wearing electrical contacts so that environmental conditions such as shock or vibration can hardly affect their performance. The printed circuit board is protectively coated, the relays can optionally be sealed so that this still increases robustness with regard to humidity and dust.

Based on their semi-conductor technology, these relays operate absolutely noiselessly. Particularly in the interior of a car, this feature increases convenience significantly. Relocating a “clicking” relay into the motor

compartment is no longer required. For DC 24 V applications, the **ESR10 Micro 10 A** and **17 A** (DC 24 V) complete our portfolio.

All relays are equally suitable for switching inductive, capacitive or lamp loads. Power consumption in the control circuit is significantly lower than with mechanical relays. This has a positive effect on the CO₂ emissions. Even a small reduction on the electrical side can cause a measurable effect due to the unfavourable efficiency factor of generator and combustion engine.

Your benefits

- **Maintenance-free**, because the design is highly insensitive to environmental influences
- **Long life span**, because the semi-conductor technology allows faster and frequent switching operations than a mechanical system
- **Freedom of design** through 30 % less self-heating of the power distribution system

Application in the industries

- Compressor of air conditioning
- Electrical vacuum pump for the braking system of hybrid and electric vehicles



The **ESR10 Micro** solid state relay ensures unrivalled vehicle uptime “without a sound”, e.g. also in trucks.



ESR10 Micro 30 A

Technical data

- DC 12 V
- 10 A, 17 A, 30 A
- ISO Micro relay socket
- Single pole make contact
- Double pole control
- Powerful solid state relay in Micro design
- > 1,000,000 cycles

Silent operation in all vehicle applications:
Solid state relays

Solid state special and timer relays

ETR10, EXR10

- A comprehensive library of functionalities
- High flexibility through individual configuration
- High reliability



EXR10

Solid state special and timer relays

ETR10 and EXR10 – for individual configuration

The **ETR10** and **EXR10** smart control devices offer intelligent functionalities even without controlgear. Modern controlgear offers a wealth of functionalities and options. However, there are always functions which must be available even if the ignition is off or when the ignition key was removed. Our smart control devices closed this gap, tailor-made to customer's needs. Just access our online configurator and E-T-A will build a tailor-made device.

These multi-functional relays also use semiconductor technology and are superior to their electro-mechanical equivalents with regard to technical performance data. Besides optional overcurrent and short circuit protection they also offer wire break detection and ON and/or OFF delay. Undervoltage detection, which triggers loads shedding in the event of battery voltage falling below a certain value, is a favourite option.

Your benefits

- **Reduction of system costs** through integration of several functions in a smart relays without changing the previous design
- **High reliability** through a robust design, resistant against dust and vibration
- **Flexible use** through numerous combination options which allow customised configuration online
- **Ensuring uptime** by shutting down convenience functions before the battery runs too low to still start the motor

Application in the industries

- After-run of the exhaust aftertreatment
- After-run of step tread illumination in modern public transit buses It has to remain on for a certain while although the driver has already removed the ignition key.
- Disconnection of convenience functions in coaches in the event of the battery voltage running low



Convenience functions are paramount in modern coaches. They can now be implemented even without modification of the controlgear.



ETR10

Technical data

- DC 12/24 V
- 1 ... 30 A
- Freely selectable time window for »ON Delay« and »OFF Delay«
- Optional overcurrent and short circuit protection
- Integral diagnostic functions
- Optional wire break detection
- Low voltage detection

Intelligent control for all vehicle applications:
Solid state relays

Power relays

MPR10, HPR10

- Low energy consumption
- High availability



MPR10

Power relays

MPR10, HPR10 – a high-current solution

The **MPR10** and **HPR10** single pole power relays were designed for switching high current loads and for disconnecting the battery from the on-board electrical system. Both units are available with a range of mounting methods and protection degree IP67. They are optimally protected against water and dust ingress. Therefore they are an excellent choice for demanding applications in utility vehicles.

The **MPR10** is a bistable relay, i.e. a short current impulse is only required for the switching operation. Permanent magnets help to keep the contact reliably closed at no load.

The **HPR10** relay is the hybrid version, it combines a relay with an integral electronic control unit. This electronic circuitry ensures intelligent activation of the bistable electro-mechanical mechanism. Activation can be pulse controlled or level controlled, if requested also with timer functions such as ON or OFF delays in the range of seconds to hours.

For an intelligent battery management, the **HPR10** also provides undervoltage or overvoltage monitoring with the option of automatic load shedding. Both versions of the power relays can be used in DC 12 V and DC 24 V on-board electrical systems.

Your benefits

- **Reduction of CO₂ emission** through significantly reduced holding current and low weight compared to conventional relays
- **High availability** through reliable and robust design, high resistance against water and dust ingress

Application in the industries

- Trucks and buses
- Construction machinery
- Agricultural vehicles and forestry equipment
- Special vehicles



In many truck applications, high current loads have to be switched: **MPR10** and **HPR10** can do that.



HPR10

Technical data

- Rated voltage 12 V/24 V onboard electrical systems
- Current ratings 100 A/ 200 A/ 300 A
- Water and dust protected to IP6k9k

Power relays for switching high current loads:
MPR10 and HPR10 single pole power relays

Electronic Power Relay

EPR10

- Higher endurance
- Up to 80 % less installation space
- Overcurrent protection and short circuit protection optional



Electronic Power Relay

EPR10 – high performance, compact design

The **EPR10** relay proves that electronic relays are a powerful alternative to mechanical relays even for high current ratings (200 A). The **EPR10** is equally suitable for switching inductive, capacitive and lamp loads.

The carefully balanced parallel connection of high-end semi-conductors provides a very low internal resistance and only minimal power loss. A heat sink is therefore not required and this enables the flat and compact design.

The pcb holding the power electronic circuitry is completely sealed and thus protected against dust, vibration and

humidity. Maintenance work is reduced significantly.

Your benefits

- **High endurance** of the entire system due to longer life span compared to mechanical relays
- **Freedom of design** due to 80 % less volume compared to conventional solid state relays.
- **Reduced system complexity** through optionally available overcurrent and short circuit protection. No blade fuses required

Application in the industries

- Trucks and buses
- Construction machinery
- Agricultural vehicles and forestry equipment



Solid state relays are an important alternative also in bus applications - even at high current ratings

Technical data

- Rated voltage DC 12 V/DC 24 V
- Current ratings EPR10-P (with protective function) 75 A ... 200 A
- Solid state relay for high continuous currents
- 80 % less installation space
- Low holding current
- Low internal resistance



Electronic power relay **EPR10**

Maintenance-free solid state relay for high continuous currents:
EPR10 electronic power relay

Product overview

Relays



		EXR10	ETR10	ESR10 Micro 10 A
Specification	ISO 7588 socket, ISO Maxi			
	ISO 7588 socket, ISO Mini	●	●	
	ISO 7588 socket, ISO Micro			●
	Screw terminals			
	Micro controller	●	●	
	Power MOSFETs			
	PROFETs	●	●	●
	Working principle	HSS	HSS	HSS
	On-board network voltage 12 V			●
	On-board network voltage 24 V			●
	On-board network voltage 12 V/24 V	●	●	
	Max. operating voltage [V]	32	32	16 or 32
	Max. continuous current [A]	30	30	10
	Holding power at 12 V [W]	0.024	0.024	0.102
	Holding power at 24 V [W]	0.096	0.096	0.215
	Typical voltage drop at max. cont. current [mV]	140	140	75
	Typical closed current [μA]	150 or 300	150 or 300	8
	Max. switching current [A] (inductive)	250	250	60
	Max. temperature range [°C]	-40 ... 85 °C	-40 ... 85 °C	-40 ... 105 °C
Number of cycles with max. continuous current	>1,000,000	>1,000,000	>1,000,000	
Max. switching frequency [Hz] at max. continuous current	10	10	200	
Degree of protection	IP53	IP53	IP53	
Functions	Silent operation	●	●	●
	Overcurrent detection and disconnection (analogue electronic circuitry)	●	●	
	Short circuit detection and disconnection (analogue electronic circuitry)	●	●	
	Feedback on actual current flow	●	●	
	Wire break detection	●	●	
	ON delay	●	●	
	OFF delay	●	●	
	Low voltage detection	●		
input	Level control	●	●	●
	Pulse control	●	●	
	Parameterisable control filter	●	●	
	Automatic reset upon standard condition (low voltage detection)	●		
	Reset after overload or short circuit current disconnection through OFF or reset operation	●	●	
	Parameterisable re-start interlock (time slot can be specified)	●	●	
outputs	Signal of group fault (voltage level)	●	●	
	Signal of group fault (LED)			
	Control signal (voltage level)	●	●	
	Control signal (LED)			
	Parameterisable frequency output	●	●	
	Parameterisable output of a pulse	●	●	



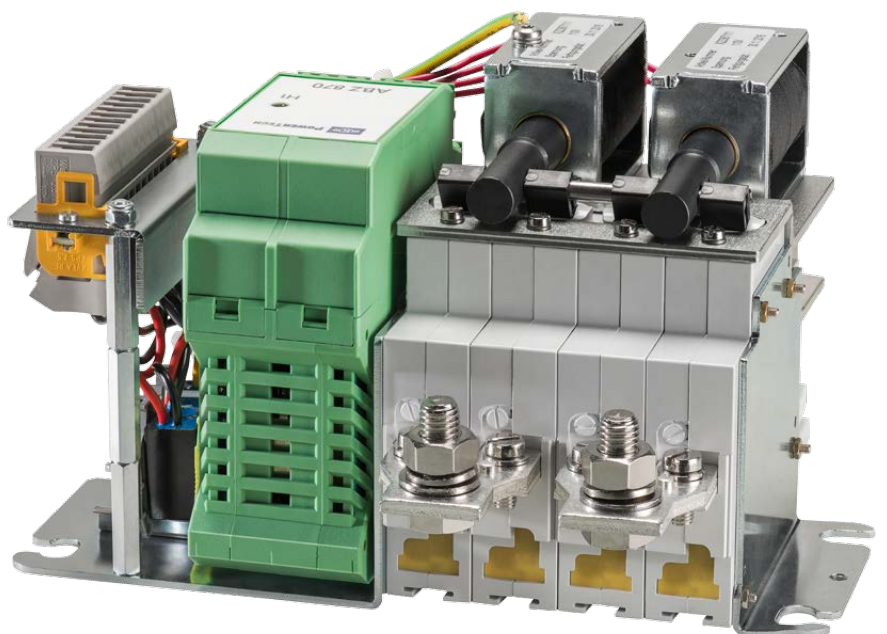
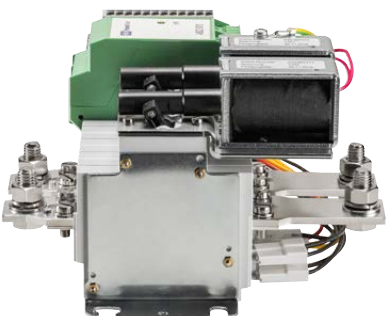
ESR10 Micro 17 A	ESR10 Micro 30 A	EPR10	HPR 10	MPR 10
●	●			
		M 8	M 8/M 10	M 8/M 10
		●	●	
HSS	HSS	HSS	electro-mechanical	electro-mechanical
●	●		●	●
●			●	●
16 or 32	16	36	16 or 32	16 or 32
17	30	200	300	300
0.102	0.102	0.030	0.0 (bistable)	0.0 (bistable)
0.215	n.a.	0.096	0.0 (bistable)	0.0 (bistable)
75	50	85	175	175
8	5	2	300	0
100	100	260	300	300
-40 ... 85 °C	-40 ... 85 °C	-40 ... 85 °C	-40 ... 85 °C	-40 ... 85 °C
>1,000,000	>1,000,000	>1,000,000	>50,000	>50,000
100	100	1	1	1
IP53	IP53	IP56	IP67/IP6k9k	IP67/IP6k9k
●	●	●		
		●		
		●		
			●	
			●	
			●	
●	●	●	●	●
			●	
			●	
		●		
		●		
			●	

Battery isolation switch

SBG-437

E-1073

- Increased vehicle uptime
- Compact und flexible design
- Enhanced reliability



Battery isolation switch SBG-437

Battery isolation switches

SBG-437 and E-1073 – for unrivalled reliability

The **SBG-437** battery isolation switch is available with an integral start-up unit in various compact versions. The start-up units ensure reliable and durable operation in a wide input voltage range (75 V – 150 V DC). Vehicle uptime is considerably improved, even after long downtimes. These circuit breakers unite a remotely controllable bistable ON/OFF switch with a reversible fuse on a thermal-magnetic basis. For the ON or OFF operation, only a short switch impulse is required. In stable end positions, no drive system energy is consumed. At the same time an operating error is reliably excluded. The ballast ensures that the switching coils are not damaged, even if the momentary switch is pushed down for a longer period of time.

The **E-1073-437** battery isolation switch does not only serve for protection and disconnection of the main battery of

a vehicle, but it also unites some vital additional functions within one unit:

- High performance circuit breaker for battery and cable protection in the event of overload and short circuit
- Manual main switch for ON and OFF operation
- Remote control via switch or momentary switch
- Undervoltage monitoring with status output
- Auxiliary contacts (e.g. for disconnection of the generator)
- Active reverse polarity protection of the entire on-board electrical system

E-T-A's **E-1073** is suitable both for applications in road vehicles as well as in rail vehicles. Its use as a multi-functional device saves a number of additional components and it saves space and wiring time. In addition it ensures optional remote control and convenient operation from the driver's cabin.

Your benefits

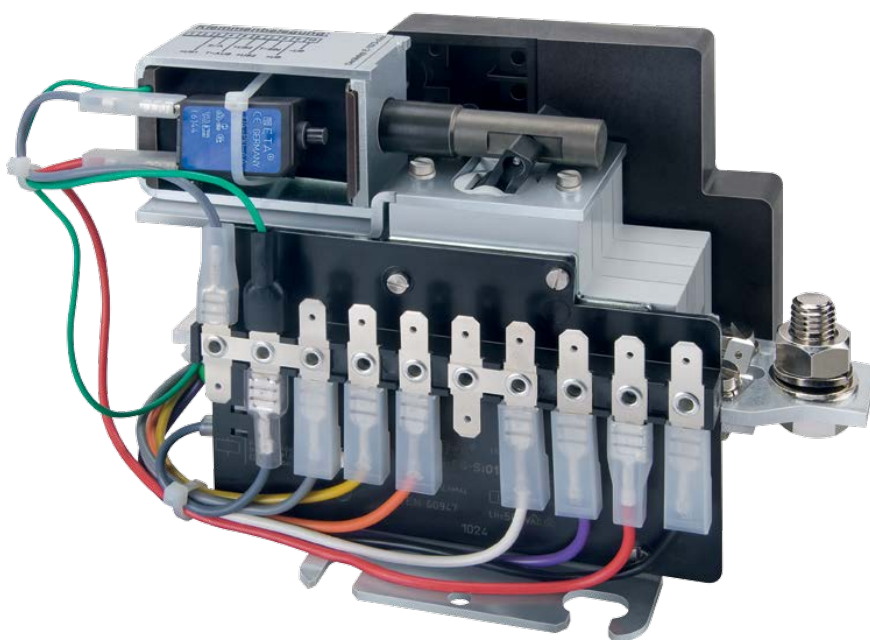
- **Enhanced vehicle uptime** even after long downtimes
- **Space saving design** and increased flexibility
- **Enhanced safety** – no misuse possible

Application in the industries

- Rail vehicles
- Trucks and buses



E-T-A battery isolation switches also enhance uptime and reliability of rail vehicles.



Battery isolation switch E-1073

Technical data

- Voltage rating
12 V DC/24 V DC/110 V DC
- Current rating range 80-240 A
- Remote ON and OFF actuation
- Low voltage detection
- Single or double pole
- Wide input voltage range - through start-up unit

Reliable, flexible, secure:
Battery isolation switches E-1073 and SBG-437

High performance circuit breakers

482, 483, 4120,
4140, 452, 412, 413,
4130, 446, 410, 437

Simulator switch

9510



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- Reliability through rugged design
- Enhanced reliability
- Maintenance-free



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© pedrosalar/Fotolia.com

Simulator switch



Type 9510



Type 482



Type 483



Type 4120



Type 4140



Type 412



Type 413



Type 4130

Thermal high performance circuit breakers

E-T-A high performance product range – top performers in a rugged design

No other industry sets higher standards with regard to safety than the aerospace industry. But also on the ground, the requirements concerning components to be built into rail vehicles, construction machinery and agricultural vehicles are extremely demanding. Reliability is at the very top of the agenda here because vehicle uptime has top priority. Our high performance circuit breakers exactly meet these requirements.

Superior quality and robust design allow use under harshest environmental conditions. Even at very high temperatures and extreme vibrations or shock, these breakers trip reliably. The risk of catastrophic cable fires is minimised. Renowned aircraft manufacturers qualified these products. In addition they meet the requirements of all relevant aerospace standards. E-T-A circuit breakers have also been approved for heavy duty applications.

The high performance portfolio covers a current rating range from 0.1 A to 100 A at DC 28 V or at up to AC 200 V (400 Hz). The breakers are single pole and double pole thermal or thermal-magnetic circuit breakers with an extremely high interrupting capacity. Auxiliary contacts are optionally available.

Trip characteristics from fast to delayed to choose from. V0 enclosures provide uncompromised safety in the air and on the ground. The unique design of the E-T-A circuit breakers with temperature compensation allows installation of these products in all areas of an aircraft or vehicle, because the trip time stays constantly the same even at extreme temperatures.

The additional function of a so-called tease-free snap-action mechanism (abrupt contact closing to avoid contact welding) ensures a high endurance of these circuit breakers and absolutely no need for maintenance. The trip-free mechanism provides additional safety. A white indicator ring on the push buttons clearly shows the tripped condition of the breaker.

Some of our high performance circuit breakers are also available with blade terminals. They can be plugged onto printed circuit boards and can easily be put in or removed and exchanged.

Optional auxiliary contacts provide a clear indication of the faulty path in the event of a failure as well as a matching group signalling. This increases transparency significantly.

The **9510 simulator switch** for use in flight simulators completes this E-T-A portfolio. This switch with an extremely low “trip current” copies the operating mode of a circuit breaker in a power-saving and reliable way. Interchangeable marking inserts allow professional training under real conditions without additional efforts and without high current flow.

Your benefits

- **Enhanced safety** through trip-free mechanism, explosion proof design to VG 95210 and V0 enclosure
- **High reliability**, because temperature compensation ensures a constant trip moment even under the most different ambient temperatures
- **Resilience and enhanced machine uptime**, because nuisance tripping is reliably prevented due to high shock and vibration resistance
- **No need for maintenance**, because the snap-action mechanism minimises contact wear and significantly increases the endurance of the circuit breaker

Application in the industries

- Aerospace
- Construction machinery and agricultural vehicles
- Rail vehicles

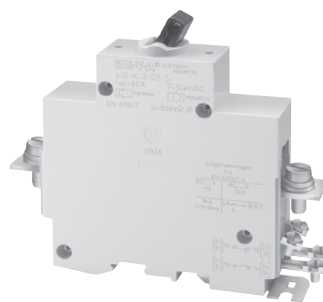
Thermal-magnetic high performance circuit breakers



Type 452



Type 446



Type 410



Type 437

Robust design, high interrupting capacity:
E-T-A high performance circuit breakers

Product overview

High performance circuit breakers

Type	4130	412/413	482	4140/5140
				

Description	Thermal circuit breaker	Thermal circuit breaker	Thermal circuit breaker	Thermal circuit breaker 4140: single pole 5140: three-pole
Business field	ConAg	Aerospace, ConAg, Rail	Aerospace, ConAg, Rail	Aerospace

Voltage

Voltage rating	AC 240 V, DC 50 V	DC 28 V AC 115 V (400 Hz) upon request.	AC 115 V (300-800 Hz), DC 28 V	AC 115 V (300-800 Hz), 3 AC 200 V (300-800 Hz), DC 28 V
-----------------------	-------------------	-----------------------------------------------	-----------------------------------	---------------------------------------------------------------

Rated current

Current rating range	20 ... 80 A	412: 6 ... 35 A 413: 30 ... 90 A	0.1 ... 50 A	20 ... 50 A
Auxiliary contact	-	-	0.5 A, DC 28 V	0.5 A, DC 28 V
Rupture capacity	800 A	6,000 A	6,000 A	4140: 4,000 A 5140: 2,000 A

General data

Endurance	See data sheet max. 500 of cycles	412: 4,000 cycles at $2 \times I_N$ 413: 2,000 cycles at $1 \times I_N$	10,000 cycles mechanical 5,000 cycles at $1 \times I_N$	5,000 cycles mechanical 2,500 cycles at $1 \times I_N$
Ambient temperature	-30 ... 60 °C	-55 ... 75 °C	-55 ... 75 °C	-55 ... 125 °C
Approvals	IEC/EN60934, UL 1077, C22.2	UL1077, C22.2, TL 5925	UL 1077, C22, VG 95345	Airbus EN 3662-005 Airbus EN 3662-005

Functions

Snap-action mechanism	●	●	●	
Trip free mechanism	●	●	●	●
Explosion-proof to VG95210			●	
Temperature compensated				●
Two-chamber system				
Optional auxiliary contacts			●	●
Remote control				
Remote trip				
Various trip characteristics available		●		
Terminal design and accessories		●	●	●



Thermal circuit breaker	Thermal circuit breaker 483: single pole, 583: three-pole	Thermal-magnetic circuit breaker 410: single pole 520: double pole 530: three-pole	Thermal-magnetic circuit breaker	Thermal-magnetic circuit breaker 446: fast trip curve 447: medium delay curve 449: delayed trip curve	Thermal-magnetic battery isolation switch
Aerospace, Rail	Aerospace, Rail	Rail	Aerospace, ConAg, Rail	ConAg	Rail

AC 115 V (300-800 Hz), DC 28 V	AC 115 V (300-800 Hz), 3 AC 200 V (300-800 Hz), DC 28 V	AC 240 V, 3 AC 500 V, DC 110 V	DC 28 V	DC 28 V	DC 144 V
--------------------------------	---------------------------------------------------------	--------------------------------	---------	---------	----------

1 ... 25 A	1 ... 35 A	7 ... 125 A	50 ... 100 A	446: 30 ... 400 A 447: 100 ... 400 A 449: 125 ... 500 A	40 ... 240 A
0.5 A, DC 28 V	0.5 A, DC 28 V	6 A, AC 240 V 1 A, DC 110 V	–	10 A	6 A at 28 V 0.2 A at 180 V
6,000 A	6,000 A	10,000 A	6,000 A	10,000 A	10,000 A (DC 28 V)

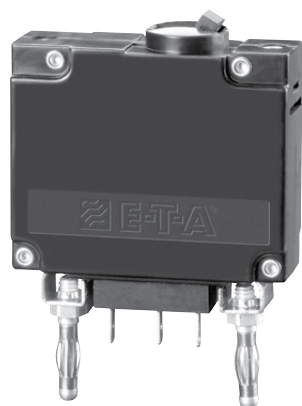
20,000 cycles mechanical 5,000 cycles at 1 x I _N	20,000 cycles mechanical 10,000 cycles at 1 x I _N	20,000 cycles mechanical 10,000 cycles at 1 x I _N	2,500 cycles at 1 x I _N	2,000 cycles mechanical 1,000 cycles at 1 x I _N	3,000 cycles at 240 A, 180 V DC 10,000 cycles at 240 A, 28 V DC
-55 ... 125 °C	-55 ... 125 °C (≤ 15 A) -55 ... 90 °C (> 15 A)	-40 ... 60 °C	-55 ... 75 °C	-55 ... 75 °C	-40 ... 60 °C
UL 1077, VG 95345 et al., MS 3320 Airbus EN 2995-004/-005	VG 95345 et al., LN29887, AS14154, Airbus EN 2995-004/-005	UL 1077, C22.2	UL 1077, C22.2, VG 95345 et al., TL 5925-001	UL 1077, C22.2, VG 95345 et al.	–

	●	●	●	●	●
●	●	●	●	●	●
●	●		●		
●	●				
●	●	●			●
					●
					●
		●			●
●	●	●			●

Hydraulic-magnetic circuit breakers

8335, 8340-F, 8340-G, 8340-T, 8345

- Overcurrent and short circuit protection independent of ambient temperature
- Extreme high resistance to shock and vibration
- No derating of rated current



Type 8335



Type 8340-G



Type 8340-F

Hydraulic-magnetic circuit breakers

8335, 8340-F, 8340-G, 8340-T, 8345 – unsusceptible to temperature changes, resistant against shock and vibration

The 8335, 8340-G, 8340-T and 8345 hydraulic-magnetic circuit breaker types are particularly suitable for rail applications and other vehicle applications with high temperatures- and vibration values because they feature a very robust trip mechanism and high resistance to vibrations.

The hydraulic-magnetic working principle is based on an iron core within an air-core coil, which is placed moveable in a tube filled with hydraulic oil. Only if the overcurrent is applied long enough and the core has been drawn entirely into the centre of the coil, the magnetic field will trip the mechanism. The oil used will always behave identically in a temperature range of -40° to +85° C.

Hence the characteristic curve remains nearly unchanged, i.e. temperature compensated. By varying the oil viscosity, the trip curve of the circuit breaker can exactly be adjusted. In this product group E-T-A offers with products with push-pull actuation and with an actuator toggle.

Your benefits

- **Maximum safety** through temperature-independent overcurrent and short circuit protection
- **High reliability** of the entire system through very high resistance against shock and vibration
- **Effective utilisation** of space in the control cabinet because the devices can be mounted side-by-side without mutually influencing the trip curve.

Application in the industries

- Construction machinery and agricultural vehicles
- Rail vehicles
- Special vehicles



Type 8345



Type 8340-T



In rail vehicles we often see harsh conditions for the protective elements. Hydraulic-magnetic circuit breakers are equal to the task.

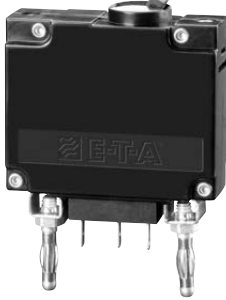
Technical data

- 1 ... 125 A
- 1 ... 3 poles in a single device
- Remote control optional for ON and OFF operation
- Remote trip module optional
- Optional auxiliary contacts
- A wealth of design and mounting options

Temperature-independent overcurrent protection:
Hydraulic-magnetic circuit breakers

Product overview

Hydraulic-magnetic circuit breakers

Type	8335	8340-F	
			

Mounting

Flange mounting	●	●	
Threadneck			
Rail mounting			
Toggle actuation	●	●	
Rocker actuation	●		

Technical data

Current rating range (DC 80 V)	1 ... 50 A	0.02 ... 50 A	
Rupture capacity UL1077 (80 V DC 50 A)	1,500 A	3,500 A	
Rupture capacity UL1077 (240 V AC 30 A)	1,500 A	3,500 A	
Versions for 80 V DC (current ratings see data sheet)	●	●	
Versions for 110 V DC (current ratings see data sheet)			
Versions for 250 V AC (current ratings see data sheet)	●	●	
Max. no. of current paths per device	3	4	

Add-on modules

Auxiliary contacts	●	●	
Remote actuation			
Remote trip			
Water splash covers			
Actuator guard			

Approval logo

VDE EN60934	●	●	
UL 1077	●	●	
UL 1500 (based on UL 1077)	●		
UL 489A	●		
UL 489			
CCC	●	●	



		●
●		
	●	
●	●	●

0.02 ... 50 A	0.02 ... 50 A	1 ... 125 A
3,500 A	3,500 A	10,000 A
3,500 A	3,500 A	5,000 A
●	●	●
		●
●	●	●
4	4	4

●	●	●
		●
		●
●		●
	●	●

●	●	●
●	●	●
●	●	
		●
●	●	●

Rocker actuated circuit breaker

3131

- Reduction of system costs
- Integral overload protection
- Weather-proof version



Type 3131

Rocker-actuated circuit breaker

3131 - circuit breaker/switch combination

The **3131** rocker circuit breaker is attractive combination of ON/OFF switch and integral overcurrent protection. The attractively styled rocker with soft-touch surface offers a smooth, but well-defined switching behaviour. A wealth of circuit breaker types and options offers maximum flexibility and allows tailor-made solutions for the most demanding applications.

The integral overcurrent protection obviates the need of fuse holders or additional space-consuming circuit breakers. This enhances the design and reduces wiring and mounting efforts. Operation is intuitive and straightforward at the same time. If the circuit breaker trips, the rocker snaps back into the OFF position. The integral trip-free mechanism ensures disconnection even if the rocker movement is blocked. This makes the **3131** a first choice product also for construction machinery and agricultural

vehicles, but also for special vehicles, trucks and buses. Various rocker colours, legends and illumination versions offers a wealth of design options. There is even a three-position switch (without overcurrent protection) available in the same design - for a seamless and elegant panel appearance.

Your benefits

- **Reduction of system costs** through combining a switch and a circuit breaker
- **Additional safety** through integral overload protection
- **Enhanced safety** through resettability after remedy of a failure without the tedious fuse exchange
- **Additional ruggedness** for the entire system through a weather-proof version with integral water splash protection, featuring protection degree IP66

Application in the industries

- Construction machinery
- Agricultural and forestry equipment
- Special vehicles



Offers unrivalled safety under harshest environmental conditions: **3131** rocker-actuated circuit breaker

Technical data

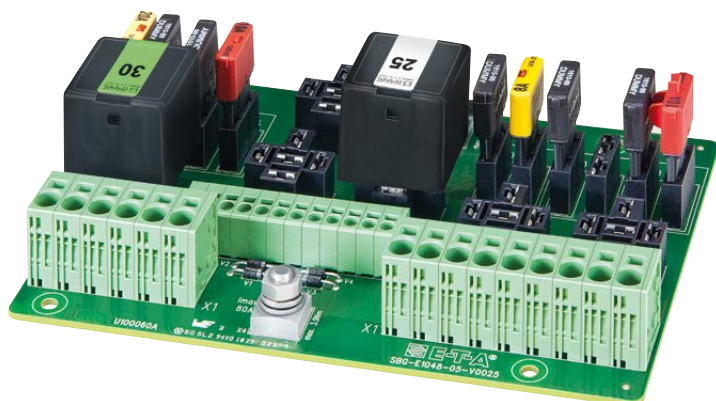
- DC 28 V
- 0.1 ... 20 A
- single pole
- VDE, UL

Elegant combination of circuit breaker and overcurrent protection: **3131** rocker-actuated circuit breaker

Automotive technology

System solutions

- Individually matched hardware, software and mechanical components
- Complete protection solutions even with small series
- Short project run times
- Reduced complexity
- Space savings
- Plug & play



Power distribution system V0025



Power distribution system V0101

System solutions

From a single component to decentralised power distribution

E-T-A system solutions provide you with flexible and intelligent systems - planned and supplied from a single source. They comprise tailor-made complete solutions for power distribution and protection. They can be monitored and controlled to CAN J1939 standard and they can be connected with other vehicle components via CAN or LIN communication.

These solutions are designed for the voltage levels DC 12 V, DC 24 V, DC 48 V, DC 400 V, AC 230 V, AC 400 V and for a range of current ratings.

The compact pcb technology allows extremely space-saving use of the **E-T-A Power Board Modules**.

For individual mounting requirements the E-T-A modules offer adapter solutions from an artless metal brackets up to enclosure types with high protection degrees

In addition E-T-A manufactures customer-specific solutions on single-board printed circuit boards. Low-resistive press-fit technology is used for high-current terminal contacts on the pcb.

This ensures the internal resistance to be as low as possible, even with high current ratings in a range up to 300 A. The superior quality of the press-fit technology ensures an extremely solid connection and a continuously well monitored process.

Your benefits

- **Reduction of complexity** through intelligence and power distribution within a single module
- **Enhanced reliability** and user convenience through CAN communication and ease of connection to the vehicle's bus
- **Significant space savings** compared to single components

Application in the industries

- Construction machinery
- Agricultural machinery
- Trucks and buses
- Special vehicles
- Platform manufacturers for small transporters, trucks and trailers



In special vehicles **E-T-A system solutions** offer safety in very narrow spaces.

Press-fit technology ensures a very low contact resistance.



Technical data

- Voltage ratings:
12 V DC, 24 V DC, 48 V DC,
400 V DC, 230 V AC, 400 V AC
- Power distribution on pcb with press-fit technology
- A choice of various adapter solutions and housing versions
- Communication via CAN or LIN

Individual, flexible and smart:
E-T-A system solutions for vehicles

Technical Information



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- Basics and application examples



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Thermal overcurrent circuit breaker (TO)

The trip time of thermal circuit breakers depends on the height and duration of the overload current. The higher the overcurrent, the faster the bimetal will reach its defined tripping temperature. In the event of a low overload it will take longer until the required disconnection of potentials takes place. Thermal circuit breakers are recommended for all applications where an overload is expected. They are the ideal solution for protecting loads such as motors, transformers, magnetic valves, on-board electrical systems and low voltage lines.

Thermal-magnetic circuit breakers (TM)

The protective function of thermal-magnetic circuit breakers is achieved by combining temperature and magnetic force. The thermal element of the circuit breakers

provides protection in the event of an overload with a delayed trip characteristic. The magnetic part responds without delay to high overload and short circuit currents and disconnects the faulty circuit within only a few milliseconds. These circuit breakers are well suited for telecommunications, process control and similar applications requiring precision performance.

Magnetic circuit breakers (MO)

Circuit breakers with a magnetic trip characteristic trip extremely fast. In the event of a short circuit the faulty circuit will be interrupted nearly without delay. The magnetic system of the breaker is the sole tripping element. As tripping depends on the time curve of the magnetic force and thus also on the magnetic field, the trip limit is influenced by the shape of the

current characteristic (AC/DC). Magnetic circuit breakers are largely unsusceptible to temperature fluctuations. This operating principle is ideally suited to protect any application with a higher risk of short circuit.

Hydraulic-magnetic circuit breakers (HM)

A well-proven design of solenoid coil with optional hydraulic delay provides tripping that is highly tolerant to changes in ambient temperature. A wide range of performance characteristics is available in single, double and three pole configurations. The magnetic part responds without delay to high overload and short circuit currents and disconnects the faulty circuit within only a few milliseconds.

Operating modes of automotive circuit breakers (to SAE J 553)

Type I (autoreset):

Reset is effected automatically (autoreset). The circuit breaker opens the contact because of an overcurrent. After the trip element has cooled down, it will reset automatically.

Type II (modified autoreset):

The circuit breaker trips in the event of a failure, but remains in the open condition as long as the load voltage is still applied. Only after removal of the voltage will the circuit breaker start the reset process.

Type III (manual reset):

In the event of an overload these breakers open the circuit permanently. As the breaker has to be closed manually afterwards, it is ensured that the user notices the failure.

Type III H (manual reset with manual release facility):

As an extended version of type III there is a version with manual release button which offers the possibility to switch off mechanically, e.g. if maintenance or service is required.

Snap-action mechanism

The snap-action mechanism used in many E-T-A products ensures that the contact closing speed is independent of the speed of operation of the actuator (push button rocker, toggle e.g.) The moving contact is retained until the actuator causes a defined force to act in the closing direction of the contacts. Once this force is exceeded, the mechanical retention is overcome allowing the contacts to snap closed (tease-free mechanism). The closing speed is a function of this force alone. Snap action mechanisms eliminate contact welding upon switching on to sustained short circuits and minimise the risk of contact wear over the life of a circuit breaker.

Trip-free mechanism

Reliable switching behaviour of E-T-A circuit breakers is ensured by the trip-free mechanism (positively trip-free). The circuit breaker trips reliably in the event of an overcurrent even when the actuator (push button, toggle or rocker) is blocked.

Auxiliary contacts

A part of our circuit breaker range offers auxiliary contacts. These electrically separate low current contacts can be included for use with alarm and control switching circuits.

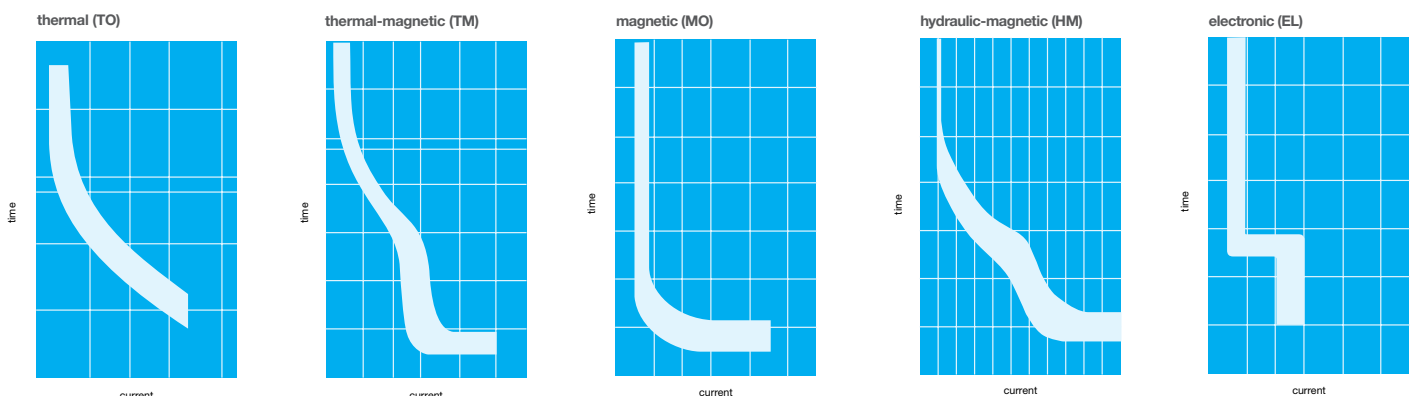
Typical internal resistance values

The internal resistance values shown are typical values for new devices. They may change through storage, life-span or overcurrent. Deviating internal resistance values do not affect the protective function of the circuit breaker.

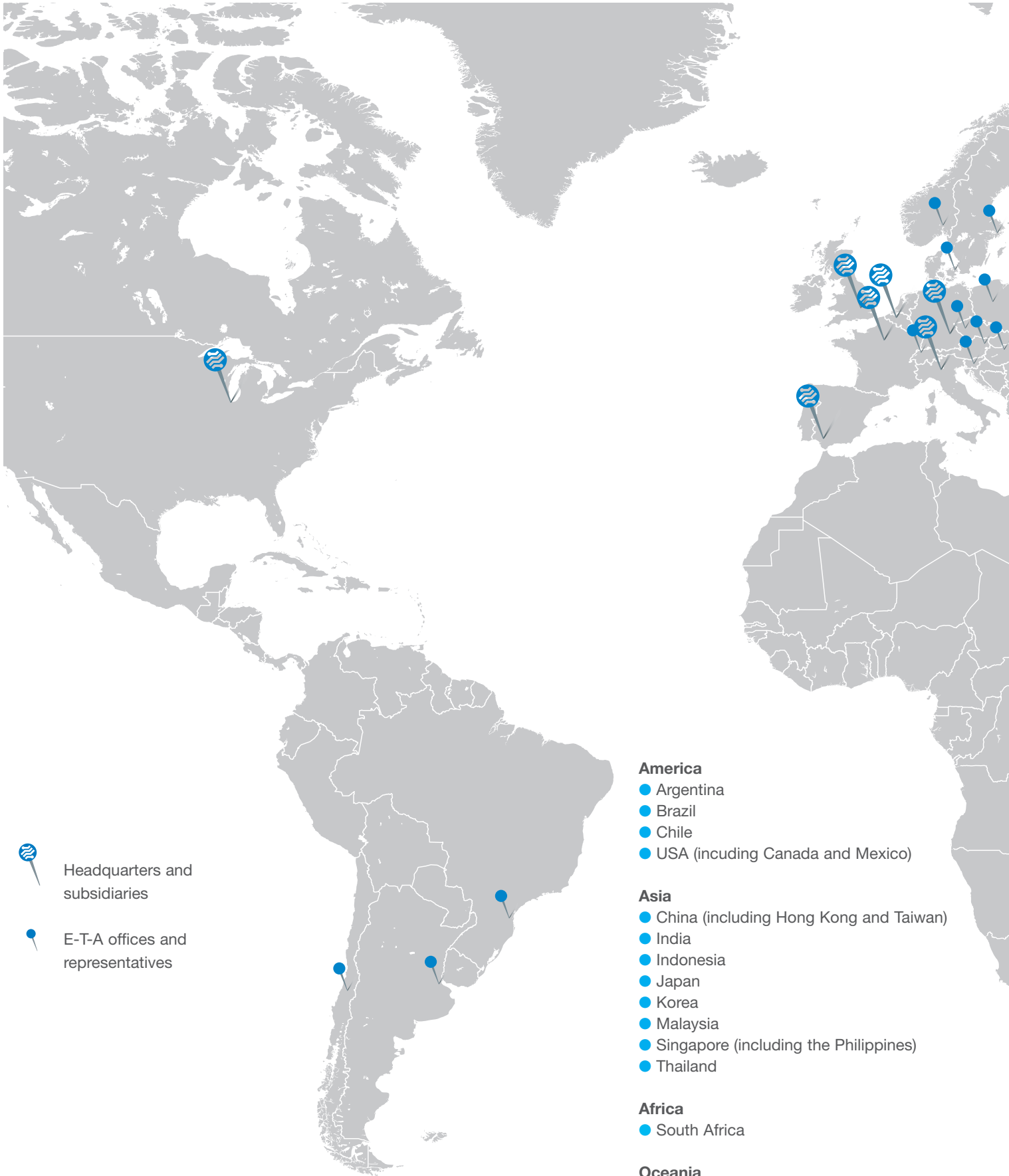
Accessories for circuit breakers, circuit protectors and system solutions

E-T-A offers a comprehensive range of accessories completing our product portfolio. It includes add-on modules for zero-voltage release or auxiliary contact function as well water splash covers, terminal blocks, sockets, busbars, retaining clips, jumpers and many more. For detailed information please see the individual technical data sheets of our products (www.e-t-a.de), section "Accessories". For further details on our products please visit www.e-t-a.de

Typical time/current characteristic curves



E-T-A – a globe-spanning network



For information on our global network please visit: www.e-t-a.de/contact



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E-T-A Elektrotechnische Apparate GmbH
Industriestraße 2-8 · 90518 ALTDORF
GERMANY
Phone: +49 9187 10-0 · Fax +49 9187 10-397
E-Mail: info@e-t-a.de · www.e-t-a.de