

Cover Story

Two Technologies – One Design:
Circuit Breaker 2216-S and
Electronic Circuit Protector REF16-S

Automotive Circuit Breakers

in ATO and MINI-Design

X808 – Fuse Replacement Solution

Increases Reliability & Safety



Innovation Counts

E-T-A Director
Carl Horst Poensgen
on E-T-A's increasing
innovative force



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Automotive Circuit Breaker
in miniature design



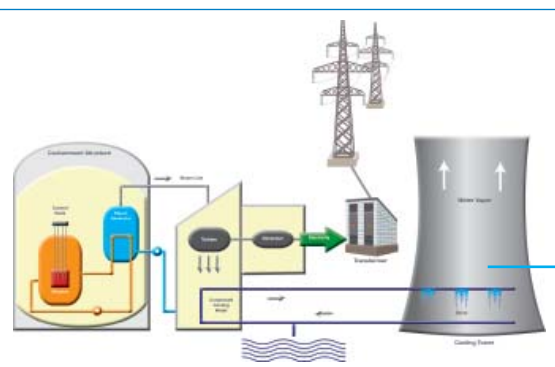
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E-T-A products



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Cover photo:
Circuit Breaker 2216-S and Electronic
Circuit Protector REF16-S

Impressum

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“If you stand still you will go backwards.” This old proverb from India reflects modern globalised economy astonishingly well. Especially medium-sized businesses like E-T-A cannot afford to stand still in a volatile world with ever faster changes. At the same time these requirements also hold a wealth of chances and opportunities. Companies having done their homework regarding innovation properly will be significantly more successful in the long run than competitors acting more conservatively.



In addition E-T-A has built up partnerships all over the world with major research institutes and universities with the goal to further increase our innovative force. A topical example is the co-operation contract with the Hong Kong Polytechnic University which is running for three years. Subject of the co-operation is the design

of a completely new current sensor based on a newly patented material.

This structure and these activities make us confident to be well-prepared for future developments so that we will be able to support our customers with powerful products in the long run.

If you want to learn more about our innovative activities or if you require detailed information and advice regarding a project or quotation, please do not hesitate to get in touch. We are looking forward to receiving your enquiries.

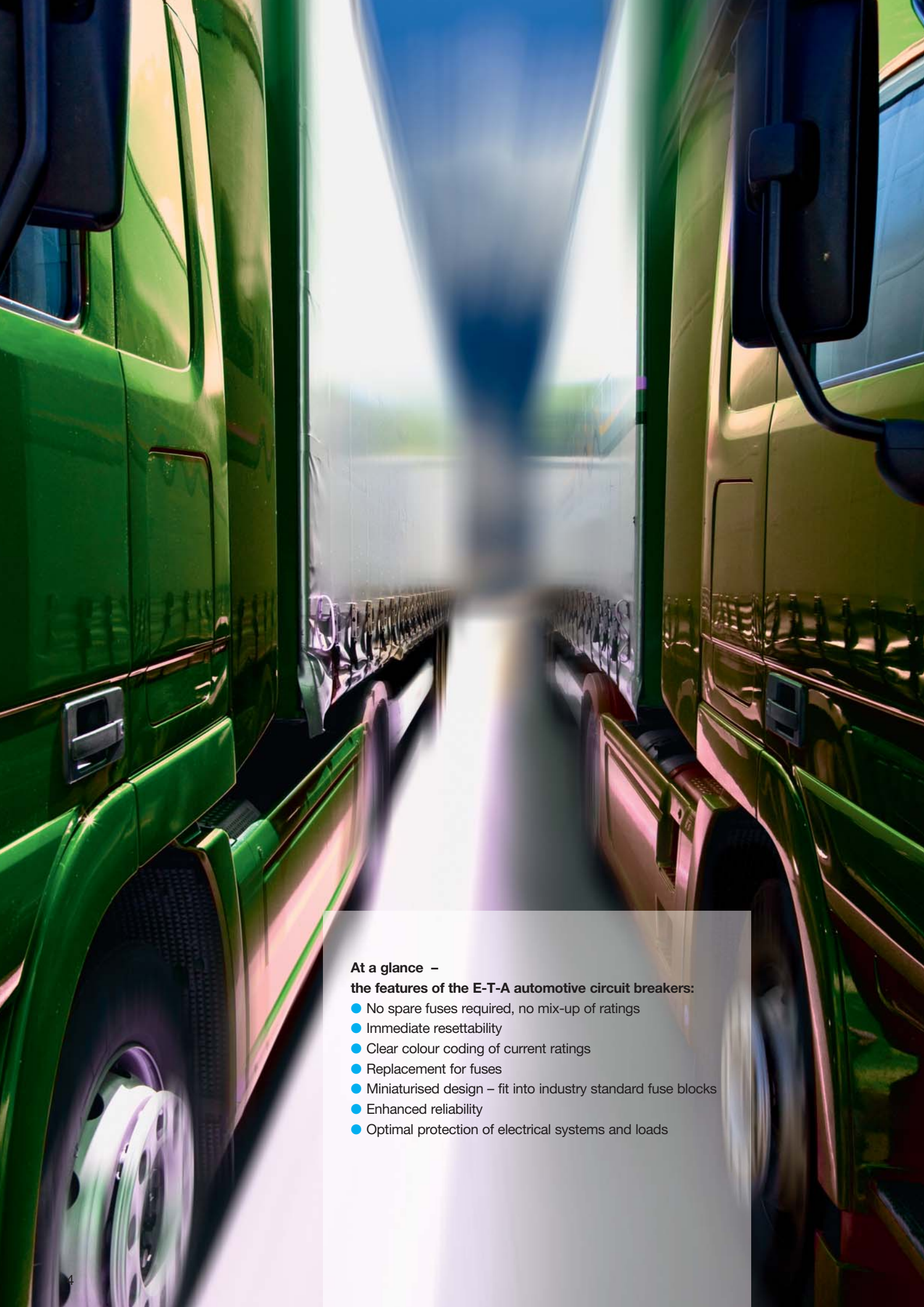
Innovation counts

E-T-A looks back on a long tradition of innovative initiatives and provides clearly defined surroundings for this field. A great team of Engineers is working in our Innovation and Technology Department. They look beyond their own nose and think outside the box, considering technologies beyond the present applications. Together with our Business Field Managers in the so-called Product Divisions they develop new products with innovative far-sightedness.

A handwritten signature in blue ink, appearing to read 'Poensgen', written in a cursive style.

Carl Horst Poensgen

Executive Committee
E-T-A Elektrotechnische Apparate GmbH



At a glance –

the features of the E-T-A automotive circuit breakers:

- No spare fuses required, no mix-up of ratings
- Immediate resettability
- Clear colour coding of current ratings
- Replacement for fuses
- Miniaturised design – fit into industry standard fuse blocks
- Enhanced reliability
- Optimal protection of electrical systems and loads

*E-T-A automotive circuit breakers
1160, 1610, 1620 and 1170
provide optimal protection of
on-board electrical systems and loads*

Automotive Circuit Breakers in miniature design

Many of us have experienced this: the fuse protecting the cigarette lighter in your car blows because you connected an excessive load. Although it happened only once and only for a short time, it blew the fuse and now you do not have the right replacement fuse available.

Over the past few years more and more mobile devices requiring a power supply are being used in cars. After connecting them to the vehicle input, we frequently see the failure described above. This is very annoying for both the driver and the vehicle manufacturer who might get the reputation of designing inadequately built cars.

E-T-A offers suitable miniature thermal automotive circuit breaker solutions for these applications. In the automotive sector you will find mostly thermal circuit breakers because of available overload monitoring and disconnection functions. Automotive circuit breakers provide automatic disconnection of electrical circuits or individual loads within seconds every time the maximum current rating in the monitored circuit is exceeded. An overload may occur if more current is required for activation than usual due to blocking or pollution.

The North American automotive standard organisation SAE defines three classes of automotive circuit breakers: autoreset, modified autoreset and manual reset. For the latter there is also a version with manual release button.

Autoreset

These breakers reset automatically. Contacts open in the event of an



E-T-A automotive circuit breakers type 1160, 1610, 1620 and 1170

overcurrent. After the tripping element has cooled down, it will automatically return to its original position.

Modified reset

These breakers are characterised by tripping in the event of a failure and subsequently staying in the open state as long as the load voltage is applied. Only after removing the voltage will the circuit breaker start the reset process.

Manual reset

These breakers disconnect the circuit permanently in the event of an overload. Following disconnection, the breaker must be reset manually, ensuring the failure will not go unnoticed by the user. There is also a version with a manual release button which allows intentional mechanical disconnection, e.g. for maintenance purposes.

In Europe car manufacturers use both the ATO® and the MINI® design. Both terminal types are available from E-T-A with current ratings from 5 A to 30 A. Types 1610 and 1170 are suitable for use in ATO® sockets

while types 1620 and 1626 can be plugged into MINI® terminal blocks. All versions are available with autoreset or manual reset functionality and the 1620/1626 also offer the modified reset version.



*Safety and reliability for cars:
E-T-A automotive circuit breakers*

At a glance – circuit breaker 2216-S and electronic circuit breaker REF16-S

- space-saving design: 12,5 x 90 x 70 mm (W x H x D)
- consistent design allows easy and secure usability
- practical plug-in contacts
- adaptable for one-channel sockets 80plus and 81plus

2216-S

- current rating range: 0,5 ... 16 A
- multiple characteristic curves: fast, medium time lag and slow
- integrated signal contact (changer)

REF16-S:

- current ratings: 1 A, 2 A, 3 A, 4 A, 6 A (8 A and 10 A under way)
- electronic switch-off characteristic curve
- integrated current limitation avoids voltage drop under short-circuit conditions
- signal contact: opened or closed



Overcurrent protection for AC and DC control voltages

Two technologies – one design!

Circuit breaker **2216-S** and electronic circuit protector **REF16-S**

Only 12.5 mm wide and 70 mm deep, the slim design of the new 2216 circuit breaker and REF16-S electronic circuit protector significantly saves space, is attractively designed and provides clear arrangement in control cabinets.

The plug-in technology of the 2216 and REF16-S reduces wiring and installation time and increases the flexibility of electrical design and logistics. The new 2216-S is available as a single or double pole circuit breaker with integral auxiliary contact (changeover), ensuring reliable protection in control circuits up to AC 250 V/DC 50 V for all loads and their supply lines. The REF16-S is a single pole electronic circuit protector with a purely electronic trip characteristic. Its most significant feature is active current limitation for selective protection of load circuits powered by DC 24 V power supplies.

The 2216 and REF16-S have identical housings and terminal designs – allowing interchangeability between the products in control panel installations with the one-way terminal blocks 80plus (with screwless connectors) and the 81plus (with screw terminals). The 80plus socket is the first E-T-A terminal block with push-in technology for direct connection of supply lines. It allows direct connection without additional tools of rigid, flexible or compressed conductors.

Everything in view

In many control cabinets, mechanical and electronic overcurrent protectors are used side by side to protect the control voltage in the AC 230 V range and also on the



New: Circuit Breaker 2216-S and Electronic Circuit Protector REF16

DC 24 V level. The universal terminal block system for the 2216-S/REF16-S product range reduces purchasing and storage costs and offers maximum flexibility in every phase of the project. In addition, the consistent device design provides a clear structure while at the same time increases the ease and reliability of the operation.

Flexibility until the very last minute

Installation and wiring of the 2216 and REF16-S can be accomplished in seconds with the plug-in design. During the life of the control system, exchanging breakers due to changes in the protection necessary is easy thanks to the well-proven plug-in technology: simply pull out the breaker from the socket and plug in the new one. The breakers are hot-swappable and have an additional integral retaining bracket ensuring a tight fit which increases shock and vibration values.

A wealth of accessories

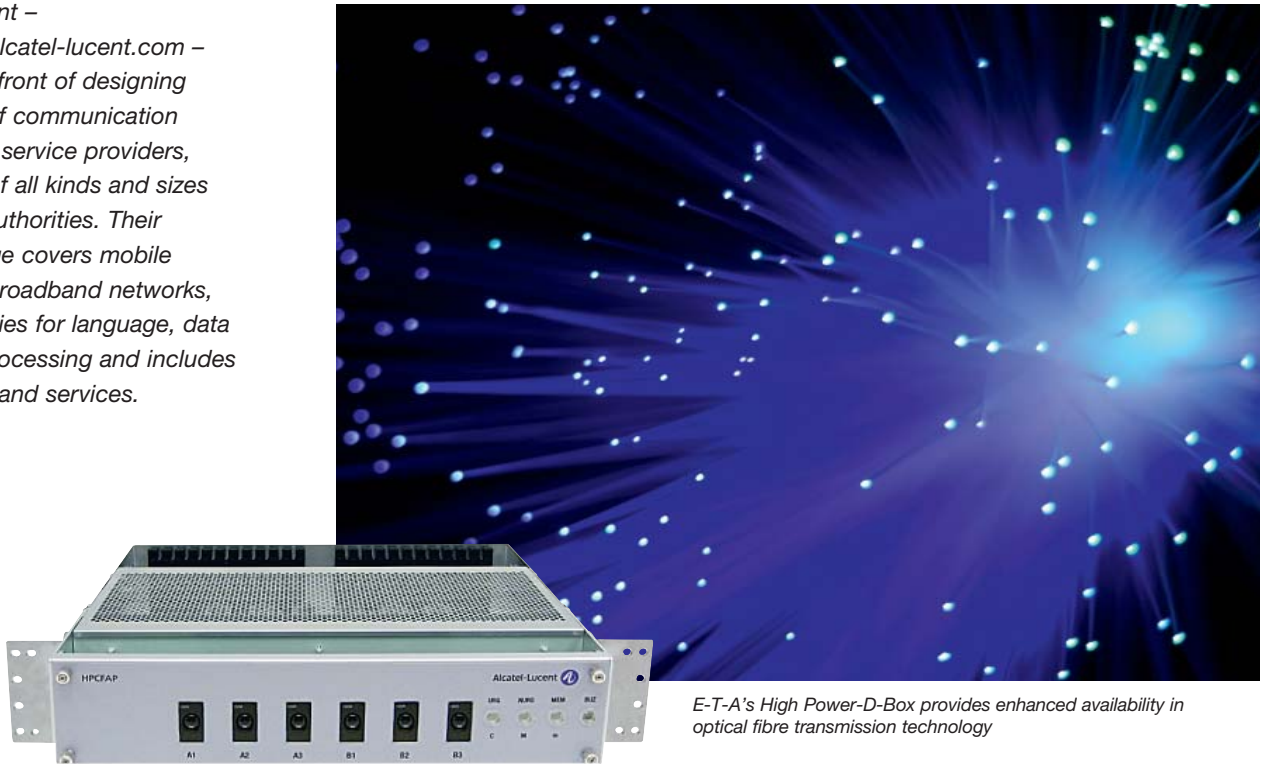
Accessories include various busbars, marking labels and coding pins. The current

rating of a slot can be coded individually with available coding pins. The use of coding pins makes it impossible to plug in a breaker with a higher rating and eliminates the chance of inadvertently using a device with an incorrect rating.

Speed of light

High Power-D-Box[®] with circuit breakers type 8345 and alarm unit for optical fibre transmission technology

Alcatel-Lucent – <http://www.alcatel-lucent.com> – is at the forefront of designing and selling of communication solutions for service providers, companies of all kinds and sizes and public authorities. Their product range covers mobile phone and broadband networks, IP technologies for language, data and video processing and includes applications and services.



E-T-A's High Power-D-Box provides enhanced availability in optical fibre transmission technology

Optical fibre transmission technology is used for high and very high transmission rates (upper Gigabit range up to 40 Gb/s) in the »backbone« (distribution network). It helps to cost-effectively overcome short distances between 2 km up to 80 km. To increase availability, reliability and service-friendliness of the optical systems, Alcatel-Lucent uses a High **Power-D-Box[®]** with circuit breakers **type 8345** with integral alarm unit which was designed by E-T-A following the requirements of Alcatel-Lucent.

We talked to Thomas Schneidereit, Project Manager Optical Networking Division of Alcatel-Lucent Deutschland AG, regarding the E-T-A products.

Current: How did you hear about E-T-A system solutions?

Thomas Schneidereit: We have been using E-T-A power distribution systems successfully for many years in all sectors

of transmission, exchange, access and mobile radio technology. Therefore we have a very close customer-supplier-relationship. E-T-A's experience with high power distribution on limited space, combined with compact temperature-insensitive circuit breakers, offering ratings up to 125 A, was a major reason for selecting E-T-A as a partner for our optical transmission systems.

Current: What are your experiences so far with E-T-A system solutions?

Thomas Schneidereit: Very good. Integration levels and complexity in telecommunications equipment are constantly increasing. On the one hand this leads to very high rated currents and a very high power density for the application in question. On the other hand there is less and less space for cable management and protection of the components. The solution, which we designed in co-operation with E-T-A,

helped us to solve both problems. The 2U design is not only very compact, but also allows practical cable management.

Current: What is the major benefit in your opinion of the High **Power-D-Box[®]** design?

Thomas Schneidereit: This type of system solution helps us to achieve a standardisation with regard to protection in the optical fibre transmission. Based on the finely graded current ratings available with type 8345 and the compact design, we are able to use this type of solution for many of our applications, which is both user-friendly and cost-saving.

Current: Thank you for your time.

Bernd Bernecker



At the beginning of this year, Bernd Bernecker (32) has become Manager for indirect sales channels. He is responsible for the co-operation with all European representatives of E-T-A. He will support these companies with regard to customer service and order processing, covering all E-T-A products with regard to technical and commercial queries. During regular visits on site, he will also help the representatives to work on solutions for the customers in the corresponding countries.

Before this, Bernd had been Regional Sales Manager Asia Pacific and Assistant to the Board to Directors at E-T-A. While working in these positions, he had the opportunity to gain experience in developing market- and customer specific solutions and in closely co-operating with the local colleagues. He also managed a number of technical and commercial projects in Altdorf which helped him to build up a profound knowledge of our company structure and of our products, both ideal pre-conditions for competent customer service.

Markus Wiersch



Markus Wiersch (36) works as a Business Field Manager in the Division Industry, Energy & Equipment (IEE), taking care of the sector Energy and Environmental Engineering. Major focus of Markus' work is the conception and implementation of our sales and marketing strategies. In addition he attends to major key customers in the power plant industry in co-operation with our global sales organisation. Another

key aspect of his work is the business development in the sector of renewable energies such as photovoltaics and wind power.

He has a wealth of experience from his former jobs in aircraft engineering and mechanical engineering to bring to the design work of E-T-A products. He also completed an MBA degree which enables him to creatively respond to requests and challenges put forward to him by our customers and sales partners and to design innovative devices for overcurrent protection and system solutions.



Our FAQ pages are meant to intensify the dialogue between manufacturer and customers. They will deal with topics arising from practice and answer relevant questions as shortly as possible and as detailed as necessary.

Do you have any questions you need answer to?

Send it to us – we are looking forward to hearing from you.

E-T-A Elektrotechnische Apparate GmbH

Keyword: [Current FAQ](#)

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Switching at frequencies of 50 Hz plus (part 2)

What should be considered when using thermal circuit breakers?

There is a difference when we use thermal circuit breakers. Effects we described in our previous issue such as eddy current losses in ferrous bimetals will not occur here and are negligible. Therefore our thermal aircraft circuit breakers can be used with frequencies up to 1000 Hz without problems.

What do we have to consider when using thermal-magnetic (TM) and hydraulic magnetic (HM) circuit breakers?

It is principally not possible to use TM and HM circuit breakers for more than 100 Hz without modifying the magnetic circuit.

What must be observed when protecting the AC side of switch-mode power supplies?

When protecting the AC side of SMPS, there will be harmonic waves caused by system perturbations of the quickly switching electronics. This will lead to a significant temperature rise through eddy current losses in the iron core of the magnetic circuit. The photo shows the standard version of type 3600 (right) in such an application compared to a modified unit (left). The temperatures in the core are well over 100°C on the right side while barely exceeding ambient temperature on the left. The EN 61000 stipulates less strict limit values for the harmonic for devices

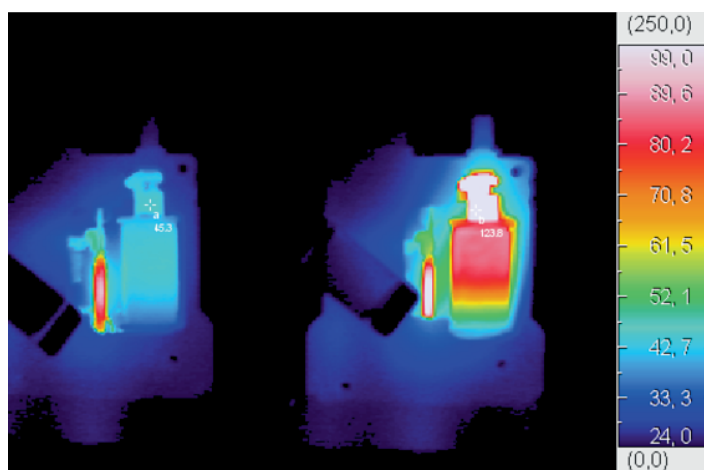
below 16 A rated current, therefore the lower performance range is particularly critical, especially when there is an overlapping effects of a bigger group of individual devices. It is common practice to protect track-mounted power supplies with an effective rated current of 1 to 2 A with a 10 A MCB, a procedure which protects the latter against excessive heat, but leaves the power supply practically unprotected on the AC side.

What must be observed when protecting the AC side of PV power inverters?

The amplitude values of the critical 3rd and 5th harmonic waves are in the percent range with state of the art transformer-free string inverters. Therefore it is possible to use standard devices.

Are there special versions of magnetic devices for use with higher frequencies?

We have developed solutions allowing the use of our magnetic devices with higher frequencies. Supply and demand will regulate the price and economic feasibility. In the event of such a special application, please do not hesitate to contact our specialists.



Type 3600 as an input protection on the AC side of a switch-mode power supply; modified version on the left, standard version on the right; ΔT between core and coil is 40K.

Solid State Remote Power Controllers

A success story ongoing!



Tobias Prem is an Application Specialist at E-T-A

the CE mark is required for all machinery and equipment.

Overcurrent protection, remote switching and circuit monitoring are major tasks required in almost every piece of electrical machinery or plant in the steel industry. According to the EC Machinery Directive 2006/42/EC



Solid State Remote Power Controller E-1072-128-DC24V-3A

Applications in the steel industry often require compliance with the EN 60204-1 "Safety of Machinery – Electrical Equipment of Machines" (VDE 0113 part 1) for frequently used ungrounded systems (IT networks). According to this standard, electrical safety of equipment must be ensured. Following para 9.4.3.1 »Ground Faults«, particularly in these IT systems all conductive parts, above all actuators (magnetic valves, magnetic brakes etc.), must feature double pole protection and double pole switching.

Long-standing E-T-A customers in the steel industry have used the following Solid State Remote Power Controllers for many years to provide power management functions in DC24V circuits:

- E-1071-073-DC 24 V-3 A
- E-1071-128-DC 24 V-3 A
- E-1071-353-DC 24 V-3/3 A

These relays meet the requirements of the EN60204-1 in terms of double pole disconnection of the load circuit in the event of a failure. However, they do not provide single or double pole ON or OFF switching

of the load output in normal circumstances. This is one reason why E-T-A designed the new SSRPC type E-1072-128-DC24V-3A, replacing E-1071-xxx. This product can also be used as a replacement for the SSRPCs E-1071-073, E-1071-128 and E-1071-353. Its compliance with the EN60204-1 has already revealed a number of new applications.

SSRPC type E-1072-128 is the ideal solution for...

- double pole switching of inductive actuators such as magnetic valves in machinery and systems
- monitoring electrical operability of these loads
- protecting cables of the load circuit
- status indication and visual signaling of load circuit failures (LEDs or button RED) via potential-free signal contacts
- double pole disconnection of the load circuit in the event of short circuit or manual disconnection.

Please do not hesitate to contact your local sales partner or our Application Specialist Tobias Prem (tobias.prem@e-t-a.de) in

the event of any queries regarding SSRPC E-1072-128-DC24V-3A. They will be pleased to be of assistance.



Replacing old by new: E-1072-128-DC 24 V-3A and E-1071-128-DC 24 V-3A

E-T-A solutions for many products

E-T-A offers tailor-made solutions for a wide range of industries and products. Here are some interesting examples.

Application: “Water Tower” Fire trucks
E-T-A type: 1616

Morita is Japan’s number one manufacturer of fire trucks. Each truck is tailor-made to customer’s needs. Morita recently selected E-T-A type 1616 for protection of on-board electrical circuits in its special fire truck called „Water Tower“, which is mainly used for fire fighting in chemical plants. The main reason for replacing the fuses they previously used with E-T-A’s 1616 circuit breakers is the reset capability. Although Morita normally used ATO fuses for load protection, their customers sometimes lost spare fuses or did not stock the required rating. Therefore resetability of a circuit breaker will significantly increase user convenience. There is a good chance that E-T-A will also be sourced for other Morita models.



Application: Network Analyzers
E-T-A type: 1410-L2

Agilent is the world’s premium measurement company. This machine is suitable for full performance characterization of passive and active components, including: antennas, high-rejection filters, and high-power amplifiers. Since 1960s, Agilent Technologies RF/Microwave network analyzer has enabled the evaluation of high frequency components and how they are designed. The two main reasons why Agilent in Japan specified E-T-A’s 1410 circuit breaker are:



its international approvals (UL and VDE) as they are selling the analyzers worldwide and the reset functionality of the circuit breaker. In the past, Agilent used fuses for protection of the analyzer but, in the event of fuse blowing, many customers replaced the fuse with an unsuitable rating which left the analyzer unprotected from further faults. Agilent decided to replace the fuses with circuit breakers because after detection and remedy of the failure, the device can be switched on again.



Applications

Application: Airships

E-T-A type: 452 and 3130

GEFA-Flug, located in Aachen, is the manufacturer of Airships which are unrivalled when it comes to advertising in the air. No matter if it is at a sporting or a cultural event, airships are an absolute head-turner. GEFA-Flug's business is built on 30 years of experience in the industry and an uncompromising sense of quality - making them the global market-leader for hot-air-airships. They rely on E-T-A's 452 thermal-magnetic high performance circuit breakers for protection of the electrical systems because of its high rupture capacity and extremely

reliable trip behaviour which ensures safety aboard. The airships intended for night flights are also fitted with E-T-A's 3130 thermal circuit breakers to protect the interior lighting and the landing lights.



Application: Tire Production Machinery

E-T-A type: ESX10-T

Karl Eugen Fischer GmbH Maschinenfabrik is the global market leader in cord cutting lines for the tire industry. Their client list includes all renowned tire manufacturers in the world. Fischer also produces steel processing machines. Their product range covers cutting machinery from CNC-controlled press brakes as well as combination angle shears and fully automatic cutting lines to guillotine shears and special gap frame press brakes. For protection of the DC 24 V load circuits of their machinery Fischer use our electronic circuit protectors ESX10-T. The ESX10-T provides: active electronic current limitation in the event of a short circuit, overload disconnection of 1.1 times rated current and reliable selective load protection independent of cable cross sections and lengths - all of these features reduce equipment downtime and stoppage.



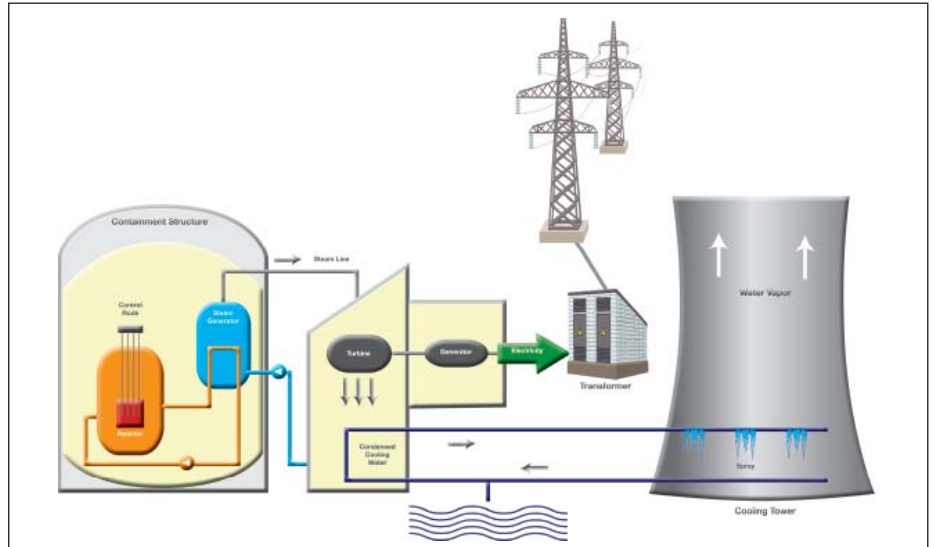
X808 - Fuse Replacement Solution Increases Reliability & Safety

According to the World Nuclear Association, there are over 440 commercial nuclear power reactors in over 33 countries - providing approximately 14% of the world's electricity. This article provides a brief introduction to nuclear power generation, existing circuit protection practices and E-T-A's most recent design to increase the reliability and safety of a DCS control system.

In order to turn nuclear fission into electrical energy, nuclear power plant operators must control the energy given off by enriched uranium and allow it to heat water into steam. The steam drives a turbine that generates electricity, and then is connected to an electrical power grid. The controls for this process are highly sophisticated; with redundant Distributed Control computer systems attached to between 5,000 to 10,000 I/O points providing all of the monitoring and control devices.

Many of the field I/O devices utilize a variety of fuse types, from slow-blow to fast-acting to meet catastrophic short circuit and overload protection needs. The use of fuses is mainly because of the upfront cost of using: DIN rail, thermal or thermal-magnetic circuit breakers. This is not the rule across the entire control system; some devices are designated as critical circuits or devices that require an appropriate means of recovery in the case of a failure.

Recently, E-T-A worked with a global leader in nuclear power plant control to provide an acceptable and affordable solution to replace fuse block assemblies within a DCS control architecture for all field I/O devices. The main requirement was to be able to disconnect within 100 milliseconds, at not more than 3 times rated current.



E-T-A offers enhanced safety for the protection of power plants



Power distribution and overcurrent protection: E-T-A's X808

E-T-A first introduced was a fast-acting thermal circuit breaker however during temperature testing the product had too many nuisance trips within the allowable temperature window.

E-T-A then designed a DIN rail mounted power distribution solution utilizing the 808 single pole magnetic circuit breaker plugged into a Printed Circuit Board (PCB). This solution is immune to temperature swings in the cabinet and disconnects in the same amount of time as a standard fuse. Now the DCS is protected with technology that

provides: a visible indication of failure, is resettable and safeguarded against substituting an incorrect replacement.

Although the cost of the final solution is higher than a fuse, the nuclear power plant control engineers found the safety of the power plant, the environment and the population within proximity of the plant worth the investment.

Typically American: “Pizza Chicago Style”

*In the United States, there is a clear divide between those who love deep dish Chicago Style pizza and those who crave traditional New York style pizza. New York style pizza has a thin crust and is a great on-the-go meal because you can easily buy a slice, fold it in half and eat it while walking. On the other hand, a traditional deep dish Chicago style pizza looks more like a pie than a pizza – with a thick buttery crust topped with cheese and then covered in a thick layer of tomato sauce. Beware, no hands allowed – grab a knife and fork and **Buon appetito – Chicago Style!***



Golden and crispy: Pizza Chicago Style

Directions

In a mixer combine the water and the yeast and allow the yeast to dissolve. Add the remaining ingredients except for the cornmeal and begin to mix the dough using a dough hook on low speed. Once a ball is formed mix on medium speed for 1 to 2 minutes until the dough becomes elastic and smooth. Remove from the mixer and place in a bowl coated with olive oil. Allow the dough to rest for approximately 4 hours. Once the dough is rested, place on flat surface and dust with some flour.

Preheat oven to 425 degrees F. In a deep baking dish or deep dish pizza pan,

spread the dough using your fingers at the bottom of the pan and make sure to have enough dough to come up the sides of the pan approximately 1/2-inch high.

Begin by placing a layer of the mozzarella cheese on the bottom of the crust. Add the tomato sauce and all of the toppings. Place in the oven for 30 to 40 minutes until golden and crispy.

Serve pizza straight from the oven to the table.

© Recipe courtesy Marc Malnati, Lou Malnati's Pizzeria, Chicago, Illinois

Chicago Style Deep Dish Pizza

Ingredients

Pizza dough:

- 16 ounces water
- 1/8-ounce yeast
- 1/2-ounce salt
- 2 pounds bread flour
- 1/4 cup olive oil
- 1/4 cup cornmeal

Toppings:

- 2 cups tomato sauce, jar or homemade
- 2 cups shredded mozzarella
- 1/2 cup sliced mushrooms
- 1/2 cup spinach, shredded
- 1/2 cup grated Romano
- 1/2 cup sliced pepperoni
- 1/2 cup grated Parmesan

