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Customer Magazine of E-T-A Elektrotechnische Apparate GmbH

E-T-A ENGINEERING TECHNOLOGY

Small, silent, lightweight

EPR10 electronic power relay offers silent and wear-free switching of high currents

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Impressum

Customer Magazine of E-T-A
Elektrotechnische Apparate GmbH

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That makes sense.

The protection of lives and values is at the centre of our activities.
It may seem a matter of course. Circuit protectors. Power distribution systems. Admittedly, they are genuine technical challenges. But do these products really have such a high priority? We at E-T-A know that there is only one possible answer to this question: »Yes!« Because E-T-A is always protecting. In everything we do, with each and every unit we supply and that our customers install in their applications.

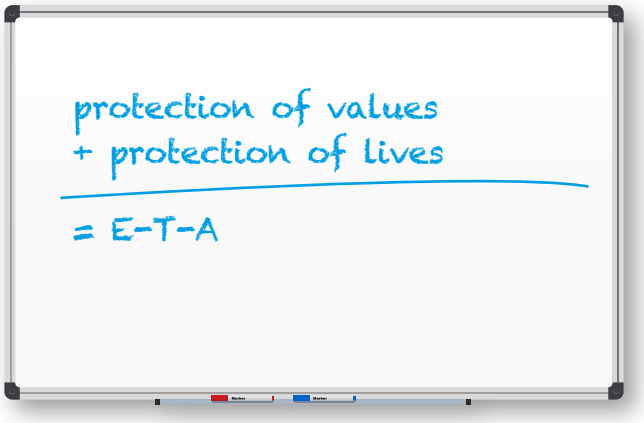
We protect man and machine against the catastrophic consequences of overcurrent and short circuit. We ensure that the current, without which our modern life is simply unthinkable, remains manageable. We ensure that it does not cause any damage in the event of a failure. This is also a matter of value protection. We ensure that the equipment and systems where our devices are installed do not get damaged. We ensure that they function and work constantly and that they are paid off in the end.

At the same time, one thing is always at the heart of our endeavours: **the protection of life.**

We make sure that all things equipped with our products are more reliable, more capable and above all safer. This is true for all kinds of equipment, be it a production line, a garden shredder, a truck or an aircraft. Our products are more than sophisticated electronic or electro-mechanical devices that must be installed because of their amazing features or because of a certain standard. Our products preserve human lives and protect people against injuries. And this is what makes us very proud. We know that you want to offer your customers the best possible solution. You'll manage even better by using E-T-A's superior quality solutions.

We hope we can support you with our products and make the world a little safer. **Please do not hesitate to get in touch. We look forward to speaking with you.**

Dr. Clifford Sell
Executive Committee
E-T-A Elektrotechnische Apparate GmbH



This is our equation to offer you customised solutions, tailored to your needs.

MPR10 power relay and 1170, 1610 and 1620 circuit breakers in utility vehicles

For the benefit of utility vehicles

Trends, topics and technologies will change the utility vehicles of the future. Customers' expectations keep changing and so do the legal requirements which keep getting more and more severe.

MPR10: *E-T-A's bistable power relay*

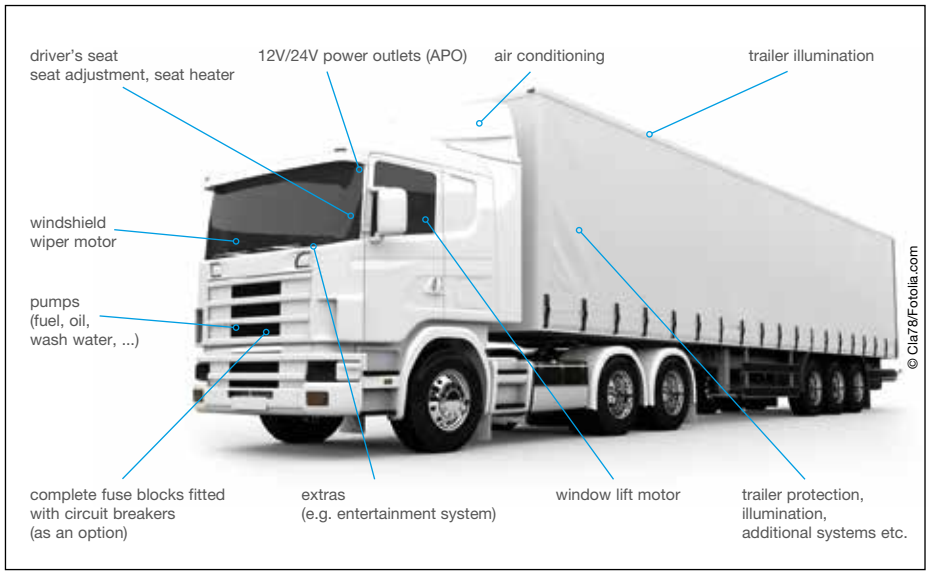
*Resettable circuit breaker models **1610, 1620** and **1170***

What are utility vehicles?
These vehicles normally have a clearly defined purpose such as public transport, transportation of goods or they are multipurpose vehicles e.g. for the fire department or as municipal vehicles.

The global economy is constantly growing and freight transport volume will grow in its wake. More and more goods and people will be transported on the road. Long-distance coaches are a very good example in Germany. The number of long-distance bus lines alone has quintupled in the past few years because of the regulatory clearance. Technical complexity and reliability are the major challenges for manufacturers of utility vehicles. E-T-A products help to increase availability, serviceability and reliability of these vehicles.

How to avoid downtimes
A cheap disposable fuse made in the Far East can be replaced by the modern 1170, 1610 and 1620 resettable circuit breaker models. Although these parts will cost a few cents more, they will last the lifetime of a vehicle and they are resettable in the event of a failure. Reliability and availability are not only a matter of convenience, but they help to avoid downtimes of buses or trucks.

How to save energy
Energy savings and weight reduction anywhere in a utility vehicle are vital aspects, e.g. by using cables made of aluminium instead of copper or by using LED illumination instead of halogen. Even power relay models used in buses, trucks, construction machinery and agricultural vehicles help save energy. These power relays are used to disconnect the entire on-board electrical system. When using a monostable power relay, the energy consumption quickly adds up to 10 W



Circuit protection in utility vehicles

or more. Up to now, mostly monostable versions are being used, i.e. they are permanently energized. When starting the vehicle at the beginning of a work shift, it requires continuous duty of more than 10 W in service. Modern bistable power relays, such as E-T-A's MPR10, only require a short current pulse for switching ON or OFF. When estimating a value of 1g CO_2 emission per Watt, this amounts to 80g CO_2 during an 8-hour working day. In addition the relay is half the weight (<300 g). This makes it easier to reduce weight than a complex technology change from copper to aluminium.

All this illustrates the reliability of E-T-A components and solutions in modern utility vehicles.

Your benefits

Automotive circuit breakers

- No replacement fuses required
- Reduced downtimes because of immediate resettability
- Clear colour coding of the ratings
- Universal footprint
- Enhanced reliability in professional surroundings

Electro-mechanical power relays

- High current ratings up to 300 A
- Voltage levels 12V and 24 V
- Current peaks up to 2400 A
- Long life span
- Water-proof and dust-proof to IP67
- Weighing less than 300 g

EPR10 electronic power relay offers silent and wear-free switching of high currents

Small, silent, lightweight

Switching high currents fast, often and reliably, without having to think about wear: The **EPR10** (electronic power relay) easily meets these requirements and can switch up to 200 A (DC 24 V). It was designed for special vehicles, agricultural vehicles and construction machinery and it will still operate reliably under conditions where mechanical relays will fail.

Compared to mechanical relays, solid state relays can switch up to 10 times more often and are considered maintenance-free. The relays operate silently opening up a wealth of additional possibilities, be it in the passenger cabin or in inaccessible areas within the vehicle.

__EPR10__ electronic power relay switches up to 200 A (DC 24 V).

If your application requires physical isolation solid state relays are not the appropriate solution. However, E-T-A's MPR10 (Mechanical Power Relay) and HPR10 (Hybrid Power Relay) power relays are powerful alternatives.

Compared to mechanical relays in the 200 A rating class, the EPR device sets itself apart with its small weight and flat design. Solid state relays do not have any moving parts, therefore the printed circuit board is moulded with a superior quality sealing. This combination adds high-end protection to low weight. Also, the low holding power and low internal resistance provide reduced CO2 emissions.

The EPR offers unique benefits compared to standard solid state relays. E-T-A's understanding of overcurrent protection

prompted them to offer a protective function as an option. This version of the EPR10 will recognise an overcurrent (1.3 times rated current), will disconnect the circuit and indicate the failure via the auxiliary contact. All this is possible while requiring 80 % less space than conventional solid state relays. The idea behind this concept was to create as little heat as possible in the first place instead of dissipating it later. Up to eight power semi-conductors help keep internal resistance very low (see picture). Heat dissipation is reduced and can be done via the connecting cables. Therefore the EPR10 does not require a heat sink. In any application where space is at a premium, the EPR10 literally opens up a lot of free space.

One of the first successful applications was working trucks (special vehicles) in the USA. 12 V on-board electrical systems are standard in these vehicles. Therefore, the manufacturers often work with high currents to supply powerful loads. The EPR10 protects and controls the cooling systems and pumps. Particularly the availability of site vehicles and utility vehicles can be improved by using reliable solid state relays instead of mechanical relays. The major role of the EPR10 is reconnection and disconnection of powerful loads. The current only flows in one direction. This leads to a particularly good price-performance-ratio. E-T-A is also working on a separate version capable of reconnecting or disconnecting batteries.

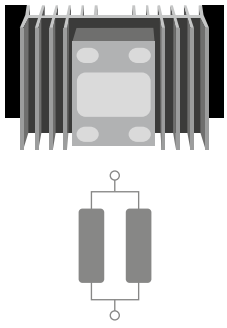
Your benefits

- 80 % less space required than similar conventional solid state relays
- Minimised maintenance costs
- Reduced CO_2 emissions through a very low holding current
- Flexibility in vehicle design through noiseless switching

At a glance - EPR10 electronic power relay

- Max. continuous current: 200 A at 24 VDC
- Max. switching frequency: 1 Hz
- Typical voltage drop: 85 mV
- Endurance: > 1,000,000 cycles
- Temperature range: -40 °C…+85 °C

Conventional solid state relay with heat sink



***2 semi-conductors** in parallel with **4.5 mΩ** internal resistance each*

This is why the EPR10 doesn't need a heat sink

***8 semi-conductors** in parallel with **1.7 mΩ** internal resistance each*

Michael Kettner,
responsible for design and sales

*Using **3120-...-PT** thermal circuit breaker in an electrofusion welding unit*

Expert welding

For more than 60 years ROTHENBERGER has manufactured innovative, technologically superior pipe tools and machines for sanitation, heating, air conditioning, refrigeration, gas and environmental technology. ROTHENBERGER is a preferred partner of professional users and offers complete solutions for all types of pipe installation. To increase process reliability ROTHENBERGER installs E-T-A circuit breakers in their ROFUSE TURBO socket welding machines. We interviewed Michael Kettner from ROTHENBERGER regarding the E-T-A products.

Current: How did you find out about E-T-A circuit breakers?

Michael Kettner: During the design phase of our electrofusion welding unit we concentrated on globally available components that would support our global market position and international appovals (UL, CSA, CE). A vital component within the design of the welding machine was a double pole circuit breaker and ON/OFF switch for front panel mounting, with IP54 protection class. After in-depth research we chose the E-T-A product because of its quality, functionality and global brand awareness. We selected the version with the new innovative PT connection technology.

Current: What was your experience with E-T-A circuit breakers so far?

Michael Kettner: We are highly satisfied with the business relationship with E-T-A and the products offered. Up to now we have not seen any problems, in terms of quality or procurement and logistics.

Current: What are the major benefits of the E-T-A circuit breakers?

Michael Kettner E-T-A's 3120-PT circuit breaker type combines switching and protecting functions within in one component which saves us parts and mounting time. The new innovative PT connection technology saves wiring time, provides protection against brush contact and ensures long-term stable conductor contacting. The 3120-PT also offers enhanced vibration resistance which is vital when the tools are used on construction sites under harsh conditions.

Current: Thank you for your time.

ROFUSE 400 TURBO in service

PERSONNEL

"People are at the very center of our daily work"

Therefore we are excited to introduce new colleagues, new jobs, new contact people at E-T-A on this page.

Barry Crowe

Barry Crowe joined E-T-A Circuit Breakers in November 2015 as the North American Market Manager for the Transportation Industry. Barry has a degree in Electrical Engineering and has more than 20 years of experience working with Global Players in all sectors of the transportation industry including: heavy duty truck, automotive, specialty vehicle, ATV, marine, military, and school and transit bus. Barry's deep understanding of the industry and its customers will enable him to drive product development and technological advances in circuit protection and power solutions for all types of vehicles.

Danilo Esposito

Danilo Esposito joined the E-T-A Italy team in autumn 2015 as the Area Manager for the central Italian region Lazio – where the capital Rome is located. His strong technical background combined with an intensive training phase makes Danilo a competent and highly qualified sales person to support E-T-A's numerous customers in this region. It is Danilo's goal to develop tailor-made protection solutions in close co-operation with his customers for their applications.

Jörg Schäfer

Jörg Schäfer is a member of the German sales force covering the West Germany region since autumn last year. He was trained as an electronics specialist for electrical energy equipment and he is also a certified engineer in power electronics. He has many years of experience as a technical sales person. It is Jörg's goal to offer the best possible service and advice to the customers in his sales territory about the E-T-A product range. His responsibility and sales territory includes parts of Hesse, Rhineland-Palatinate and parts of North Rhine-Westphalia.

FAQ

Electric mobility - a major trend in the automotive and utility vehicle industry

»HVDC on-board electrical systems«

What are the most important questions regarding this topic?

Our FAQ column discusses topical and practical subjects to support you in your daily work. Do you have any questions you need answer to? Send it to us - we are looking forward to hearing from you.
E-Mail: faq@e-t-a.de

Is there a difference between high voltage and High Volt?
These are fundamentally different voltage ranges which are commonly mixed up due to their similar names. High voltage lines work with AC voltages from 60kVac to 110kVac. By contrast, high volt is a term from the automotive industry and covers voltages from 60Vdc to 1000 Vdc. Most electric cars work with a system voltage of 420Vdc. There are already specifications for 470Vdc, 650Vdc and 850Vdc.

Why are designers leaning towards ever higher voltages?
The driving experience in an electric vehicle is determined by the power available to the electric motor. The lower the system voltage, the more current has to flow. However, a high current requires large cable cross sections, a lot of copper and thus a heavy cable harness. If the system voltage is higher, you can have better acceleration with the same current and the same weight. For this reason, prominent car manufacturers are already working on super sports cars with an 850Vdc system voltage.

Does a high volt relay work with the same working principle as a 12 V or 24 V relay?
No, electric cars mostly use relays that have a switching chamber filled with an inert gas. This hermetically sealed chamber is necessary to quench the arc via the gas, as the arc releases an enormous energy of 450Vdc. A standard relay could not interrupt the arc. The arc would continue burning even with open contacts. Also, the use of inert gas for arc fault extinction will only work if the gas does not ooze over time.

As a reliable alternative, E-T-A has designed an HV relay system working without a protective atmosphere. Here the arc is separated and quenched in an arcing chamber.

Is an electric car more dangerous than a car with a gas-operated engine?
All major automobile association experts are quite certain: An electric vehicle is not more dangerous. Electric cars pass comprehensive crash tests. This is mainly because of their special safety philosophy. HV relays are normally monostable. As soon as the supply voltage is switched off, the relay will open the circuit and disconnect the battery from the on-board electrical system. In the event of an accident, disconnection of the battery will be initiated together with the activation of the airbag. Before the possible damage of the vehicle can reach the HV electrical network, the battery will already be disconnected. In addition, the battery is protected in a special enclosure.

Major trend: electric mobility

Jens Heveker,
Market manager for the Chemical Industry

Reliable supply and protection of processes and loads

An elaborate modular system

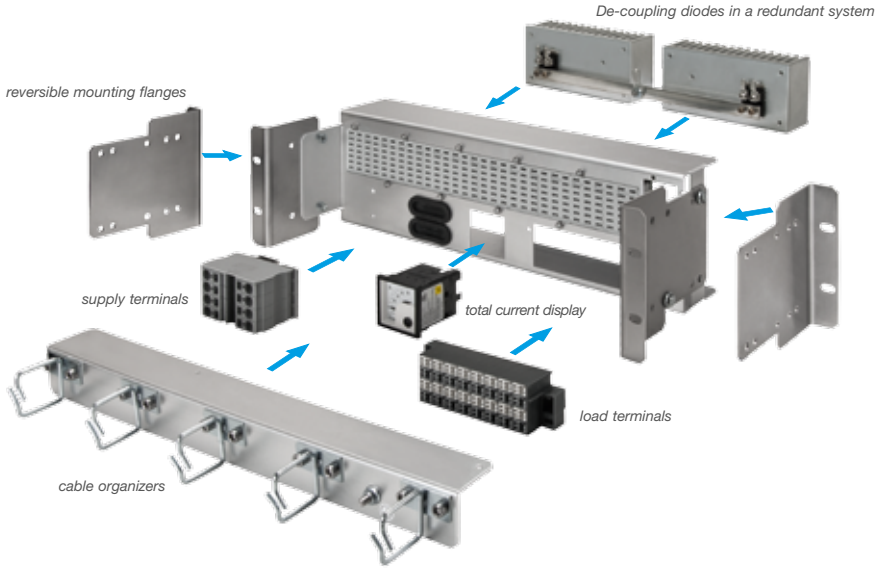
Production processes in the chemical industry are often very complex. Sometimes an interruption can damage parts of the plant or even destroy them. The complex production process control units are often supplied with DC 24 V. But also the loads in the field, which are often connected with very long cables, must be supplied and reliably protected in the event of a failure.

E-T-A offers various solutions for these applications. In order to optimise the space requirement, E-T-A partners with its customers to design 19" rack solutions based on modular systems (**PDB** = **P**ower **D**istribution **B**ox). Alternatively, the system can be mounted on a mounting plate in the control cabinet by turning the mounting brackets by 180° - in a 19" frame (**PDM** = **P**ower **D**istribution **M**odule). Therefore, the user only has to stock and document a single system for several applications.

E-T-A is also seeing customers move away from 19" racks with a closed front plate and turn to systems that can entirely be connected from the front. The supply lines are connected to the supply terminals (e.g. also redundantly), are protected against brush contact, and the loads are connected via terminal blocks with spring-loaded terminals. This also allows the minus pole of the load to be directly connected with these connection elements – making an additional, external terminal block with the corresponding cable arrangement unnecessary.

Each individual load circuit is protected with electronic circuit breakers that can easily be plugged in from the front of the panel. They can directly be replaced or retrofitted without having to remove and re-assemble a front plate. Modifications or adjustment of ratings and size of the protection is still possible during start-up of the system.

*The power distribution system **S627** supplies and protects control units in chemical plants.*



Power distribution with redundant supply - schematic diagram

E-T-A solutions for many products

E-T-A offers tailor-made developments for all industries and products.

Here are some interesting examples.

E-T-A type used: *1170*

E-T-A supplies safety for fire brigade in Altdorf

The newest fire fighting vehicle for the voluntary **fire brigade** in **Altdorf** is equipped with E-T-A circuit breakers. The vehicle for exchangeable platforms is completely fitted with 1170 circuit breakers.

Swap-body trucks become incredibly versatile with various wheel containers. Logistics, decontamination, environmental protection, radiation protection, hazardous goods or Incident Command - these vehicles are suitable for a wide range of possible applications. Depending on the incident or application, the exchangeable platforms allow connection of different loads to the on-board electrical system of the tractive unit. Loads such as lamps, pumps or winches must be available and ready for use at any time. But what will happen if a winch is blocked? The fuse will blow and the fireman drives to the next gas station to get a replacement fuse? Or will he happen to have it with him? That's not necessary with E-T-A's 1170 circuit breaker. A well-trained fireman will fix the blockage and reset the circuit breaker immediately on site – not jeopardising the rescue operation. All this emphasises the reliability of E-T-A's components and solutions for modern multi-purpose vehicles.

E-T-A type: 1170

E-T-A type used: *2210-S and 2210-T*

A compact distribution

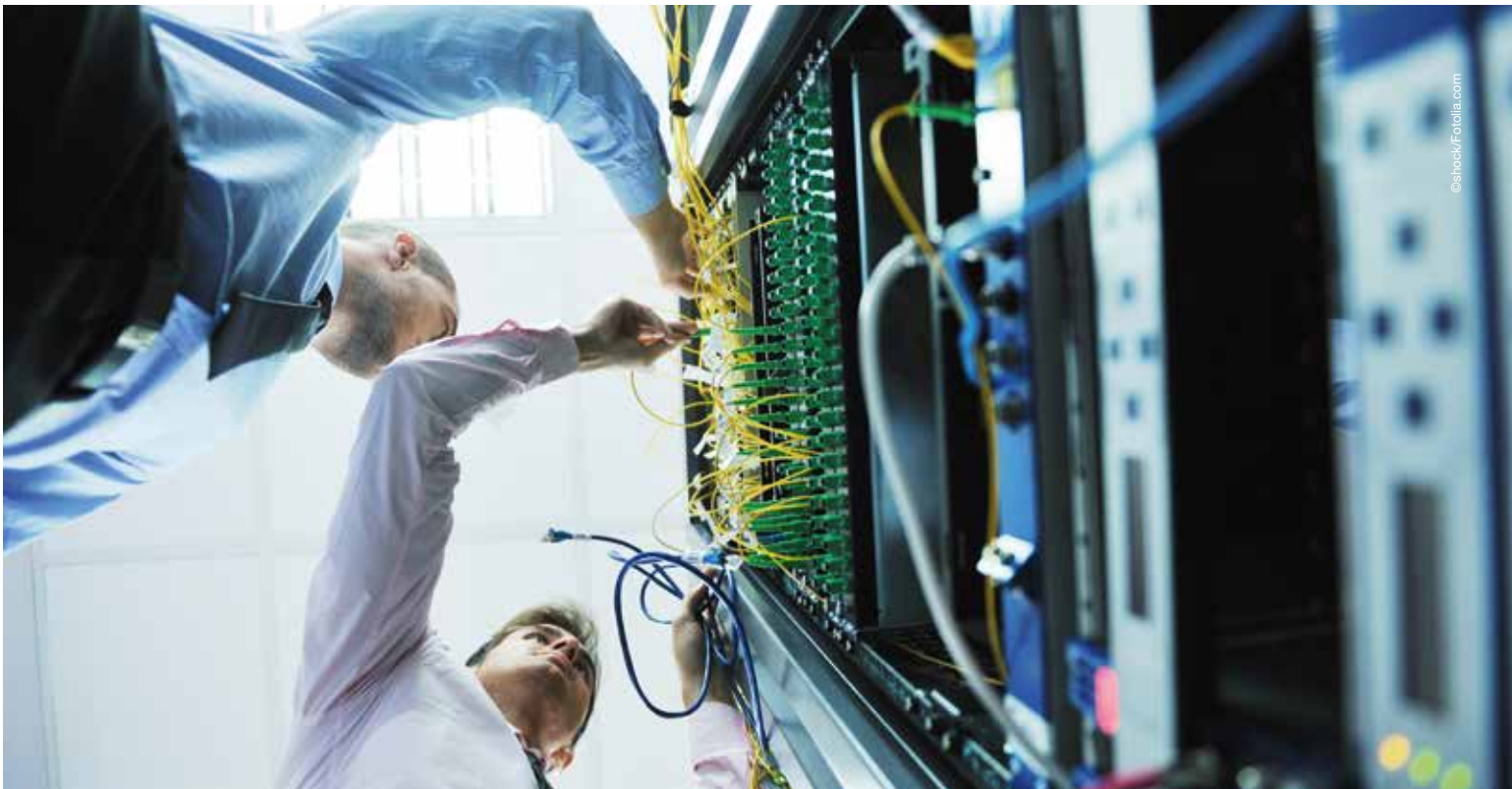
GÖPEL electronic designs and produces innovative electrical and optical measuring and test technology as well as test and inspection systems for electronic components, populated printed circuit boards and industrial and automotive electronic systems. They are one of the world's major providers in this industry.

Göpel builds NV400 power distributers for automotive test systems. The power distribution unit is powered with 400 V AC and up to 32 A and serves for the main power supply of electrical loads on the AC network. One Schuko outlet, one Neutrik PowerCon socket (optional), and 13 IEC power sockets (all for 230V) as well as one Winsta System female for 400 V are mounted to connect the loads.

Göpel selected E-T-A's **2210** circuit breaker for reliable overcurrent protection. For input protection, they use the rail-mounted version **2210-T** rated to 32 A and the plug-in type version **2210-S**, which are mounted from the front, to protect the individual output circuits. The **2210's** very small width, only 12.5 mm per pole including auxiliary contacts, helps achieve the very compact design of the NV400 power distribution unit.

Power distributer NV400

E-T-A types: 2210-S and 2210-T



Power distribution system on pcb with 482 circuit breaker

»High Power« in local traffic

NTL (New TL) manufactures innovative solutions for public transport. In particular, they supply systems for tramways on wheels. In French these systems are called »tramway sur pneumatiques« (tramway on pneumatic tires) and they are part of a public transport system originally from France where bidirectional trolley buses drive on separate trails and are permanently track-guided via a centrally placed guiding track.

Pcb-based E-T-A power distribution systems implement "High Power" on the board

This design allows NTL to combine the advantages of a rail vehicle with those of a wheel vehicle, e.g. a small turning radius that requires less space. Equally, the vehicles are able to go up steeper hills and construction costs are low. Unlike trolley bus systems, the exact track guidance reduces the amount of space required.

These tramways are ideal for areas with difficult route planning conditions that require a high capacity of a tramway. Up to now, the vehicles were fitted with conventional fuses with a very sophisticated and complex wiring system, i.e. the E-T-A system solution provides a compact design and very clearly laid-out load connection and cable management system.

NTL vehicles have enhanced performance due to E-T-A products. The whole system is based on a printed circuit board realising the power distribution in a central electrics unit. Main feed of the pcb is directly behind the power relay which disconnects the battery from the vehicle. Max. supply feed at the input is 300 A. The load distribution is protected by 482 plug-in type circuit breakers. The protection of the individual loads is based on the vehicle type (between 30A and 60A) and can be selected on site during installation. The load cable connection technology, which is easy to install and competitively priced, consists of M4 and M5 terminal studs with ring cable lugs.

Three major benefits of E-T-A's system technology:

- Compact design based on a pcb with thick copper and maximum current density
- Simplified and compact cable management through pcb technology
- Variable and optimal contact system through spring-loaded terminals accommodating the circuit breaker.

482 circuit breaker type

If the vehicle requires changes or enhancements, it is very easy to remove the entire power distribution board (as a pcb system) and replace it with an upgraded version. This allows NTL to adjust their vehicles to a new version with central electrics at a very low cost.

CULINARY DELIGHTS

Typically French:

»Cassoulet«

»Cassoulet« is a stew originating from the Languedoc in the South of France. As with every traditional dish, there are innumerable variations how to cook it, but white beans are essential as well as various sorts of meat.

The Cassoulet requires patience because it is cooked for several hours at a rather low temperature in the oven. The crust created by the baking process will repeatedly be stirred in. Traditionally a good cassoulet is said to have seven crusts.

Directions

Cover beans with water and soak overnight. Drain the beans, cover with fresh, slightly salted water, bring to a boil and simmer until the beans are just tender, about 1 1/2 hours.

In the meantime cut garlic and onions into fine cubes and sweat in goose fat. Add tomato purée and 200 ml of boiling water from the beans and simmer for approx. 25 minutes. Meanwhile, drain the beans and stir in the garlic-onion-tomato mixture. Then brown the meats one after the other: First brown the pork shoulder in the goose fat and remove from pan. Now sear the bacon and bratwurst and finally the ham in the pan. Season carefully with salt and pepper.

Put all ingredients in layers in a large, earthenware casserole, the “Cassole”: Start with the ham, add beans and bacon cubes, put meat cubes and bratwurst on top. Add chicken stock and wine, cover with rusk crumbs and freshly ground pepper and simmer in the oven at 160 °C for two to three hours. During that time a golden brown crust will form which is stirred in several times (seven times!). Serve hot in the Cassole with white bread and red wine!

Ingredients for 4 - 6 servings:

- 500 g boneless pork shoulder, cut into cubes
- 250 g smoked bacon
- 750 g pork sausages (bratwurst)
- 100 g raw ham, cut in stripes
- goose fat
- 1 kg white beans
- 2 large onions
- 5 garlic cloves
- 2 tbsp tomato purée
- ¼ l dry white wine
- ¼ l chicken stock
- 1 handful of rusk crumbs
  salt, pepper

Skilfully coupled

User-friendly – that's exactly what it is:
The new electronic circuit protector **REX12-T.**

A smart design helps you combining single-channeled devices at record speed and **no tools or accessories required.** It all adds up to a tailor-made DC 24 V protection for your system.

Electronic protection by means of the REX12-T:

- saves time and cost through ease of mounting
- is the ideally rated fail-safe element
- provides transparent planning

Talk to us! We look forward to consulting you.
www.e-t-a.de/cu_e3-16

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