

In the right direction!

The right circuit breaker in the car makes your customer happy.

Technological leadership. By tradition.
Protection solutions

3

One for all and all with one
E-T-A's 2210 - a true all-rounder

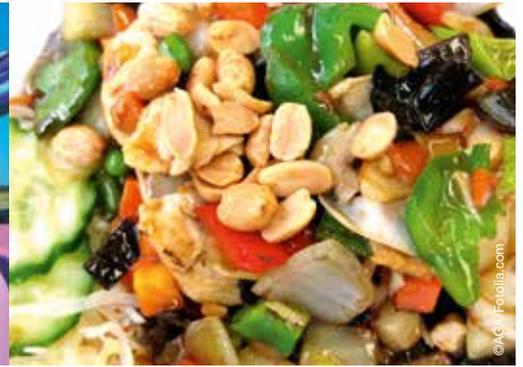
4-5

Selective load protection in a compact design
Flexible power distribution in the chemical industry

11

Electronic buses and hybrid buses take off in China
Solving challenging electronic set-ups with the E-T-A ESR10 micro

14



4-5 **One for all and all with one**
E-T-A's 2210 - a true all-rounder

6-7 **In the right direction!**
The right circuit breaker in the car makes your customer happy

15 **Typical Chinese:**
»Kung-Pao Chicken«

Contents

3 **Editorial**
Technological leadership. By tradition.

4-5 **One for all and all with one**
E-T-A's 2210 - a true all-rounder

6-7 **In the right direction!**
The right circuit breaker in the car makes your customer happy

8 **Interview**
Use of ESX10 electronic circuit protector in bottlepack systems

9 **Personnel**

10 **FAQ**
Frequently Asked Questions

11 **Good Practice**
Selective load protection in a compact design

12-13 **E-T-A solutions for many products**

14 **Electronic buses and hybrid buses take off in China**
Solving challenging electronic set-ups with the E-T-A ESR10 micro

15 **Culinary delights**
Typical Chinese:
»Kung-Pao Chicken«

Impressum

Customer Magazine of E-T-A
Elektrotechnische Apparate GmbH

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

Responsible:
Thomas Weimann

Layout:
E-T-A
Communications Department

Photos:
E-T-A, Cover: ©Aania/Fotolia.com,
Back: ©jenshagen/Fotolia.com,
©Rubberduck/Fotolia.com, ©Eaknarin/Fotolia.com

■ Technological leadership. By tradition.

The word “innovation” is widely used today. It is a modern term that many companies like to adorn themselves with. We think that E-T-A products go beyond short-lived buzz phrases.

We are proud of E-T-A ideas, and we have been for many decades. Besides our classic electro-mechanical models, you might also know our electronic overcurrent protection products. These devices have become vital in the DC 24 V protection sector. E-T-A offers a wide range of products and solutions - a truly comprehensive portfolio from a single source.

Did you know that E-T-A actually invented this entire product category? Before many users even knew why they had problems with the protection of their switch mode power supplies, E-T-A was able to present the first commercial solution almost twenty years ago. Since then, the product line has developed into a comprehensive portfolio that allows users to individually choose tailor-made protection solutions.

The E-T-A philosophy of new products reflects this situation very well. It is our goal to have products featuring engineering visions and technological passion, pre-eminently close to the market. These products protect lives and values of our customers or they simply make their work-life easier. We will not cease to strive for our goals and we will continue designing exciting solutions - and you are welcome to call them innovations. Or a world's first. Just like our EBU10-T, protecting loads on UPS systems. The QR code leads you directly to our product video.

If you plan to design a new product and don't want to run the risk of overcurrent protection issues, please talk to us! Together we will find the perfect protection solution. **We look forward to hearing from you.**

If you are interested in the EBU10-T, please view the short video:



Dr. Clifford Sell

Executive Committee

E-T-A Elektrotechnische Apparate GmbH

E-T-A's 2210 - a true all-rounder

■ One for all and all with one

The **2210 thermal-magnetic circuit breaker** has been one of E-T-A's most successful products for many years. It meets customer needs in a broad range of markets. And the success story continues. This is why E-T-A decided to launch an enhanced version of the 2210.

The comprehensive 2210 portfolio is based on two product versions with different mounting methods and different termination. One is the **2210-S plug-in type** and the other is the **DIN rail-mountable 2210-T**. Both devices use the same mechanical platform and one of the major benefits is the small width of only 12.5 mm per pole, including the integral auxiliary contacts. Compared to standard MCBs, the 2210 offers 50 % space savings. In addition, project and material planning costs as well as inventory costs can significantly be reduced.

What are the typical applications of 2210?

The 2210-S plug-in type is used in combination with terminal blocks, power

distribution modules and customer-specific power distribution systems. These assemblies provide the user with a highly available system. Even when installing a large number of circuit breakers, these DC 24 V power distribution systems are clearly designed and easy for the end user to operate.

Customers with sophisticated automation applications greatly appreciate this quality. Applications include process control and power plant technology, plant engineering and car production as well as the infrastructure sector.

Thanks to the **front mounting option** via integral mounting nuts, the **2210-S**

is also suitable for other applications. Mechanically, it can easily be integrated into corresponding customer applications which include medical equipment or apparatus for laboratories as well as smaller construction machinery or compact robotic control units. In these applications, the **2210-S** serves as a circuit breaker on the supply side of the AC230/240V level and offers excellent user access.

In some industries, cost savings through space and weight reduction in electrical engineering are very important. For instance, railway manufacturers want to increase the number of seats so they prefer to buy electrical components that are as small as possible. The track-mountable



2210-T is ideal for this. It is extremely compact and at the same time powerful with current ratings up to 32A. It meets railway engineering requirements, ship building, special vehicles and other applications where space is at a premium. This is exactly the toe-hold of the current product improvements. Besides an improved design with modern, clearly legible laser-marking of the entire series, the vibration resistance values of the **2210-T** were adjusted to meet marine approval DNV GL. E-T-A has created a comprehensive solution for all applications requiring vibration resistance.



2210-S and 2210-T thermal-magnetic circuit breakers

Your benefits

- time savings with project planning and installation
- cost savings through smaller control cabinets
- reduction of alternatives because of global approvals



© dmitrimarua/Fotolia.com



© industrieblick/Fotolia.com



The right circuit breaker in the car makes your customer happy

■ In the right direction!

Load protection is a major factor when designing a car's on-board electrical system. Using circuit breakers here will protect your customers against annoying vehicle downtimes.

What are the loads that customers connect to their 12 V power outlet in the car?

Normally the 12 V socket is protected with 15 A or 20 A fuse. The exact maximum connection power is indicated in the instruction manual. However, some loads such as ice boxes, fan heaters, electric kettles or inverters require higher currents and thus cause the fuse to blow. The user replaces the fuse. Often he only starts getting suspicious in the event of a second or third failure. Only in very rare cases will he have another suitable replacement fuse. If he installs a higher rating, the cable or terminals will be overloaded, quickly causing an expensive need for service. A cable in the cable harness or a terminal can only be replaced by the manufacturer or an authorised repair shop.

You as a manufacturer are able to request the protective function by specifying circuit breakers. This eliminates overloading the connected load or the cable. There will be no customer complaints.

What circuit breaker rating do you have to choose to replace a fuse?

Maybe you ask yourself now which circuit breaker type you can use. Are the trip curves of a fuse and a circuit breaker identical? The answer is: No.

In a fuse there is a thin wire which burns through in the event of an overcurrent like the filament in a lightbulb. This wire ages over the years of operation. Therefore ageing needs to be considered when choosing the rating. Continuous load of a fuse is typically only 70 to 80 percent of the rated current. A circuit breaker,

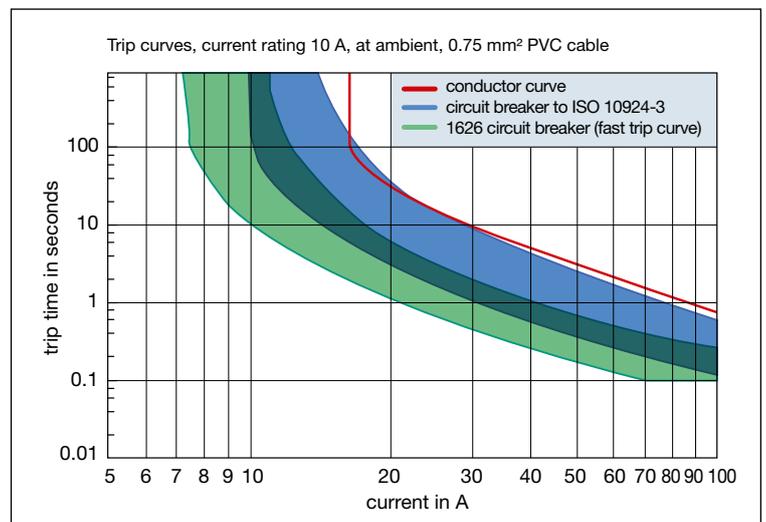
however, has a thermal bimetal. It heats up much slower and does not age.

E-T-A offers a range of automotive circuit breakers such as the 1170, the 1610 and the 1620 circuit breakers with a standardised trip curve to ISO standard 10924. In addition, there are circuit breakers with a faster trip curve for direct fuse replacement: 1176, 1616 and 1626. The latest version of the ISO 10924 standard also describes the behaviour of the faster trip curve. It recommends the use of this specific trip curve when replacing a fuse.

The chart shows two different trip curves. The red line shows the isothermal curve of a cable (conductor curve) optimised to have a low weight. It can now be seen that the standard trip curve to ISO standard



(blue) can come to the limits of the permissible temperature rise of the cable, depending on the cable size. The faster trip curve of type 1626 (green) reliably prevents that. Your requirements as a manufacturer: the circuit breaker will not yet trip at a max. continuous load of 70%, i.e. at 7 A. The load will work perfectly. Therefore, it is very important that cable and circuit breaker characteristics align with the customer requirements. We have the suitable solutions and will be happy to support you.



Type 1610

Type 1620

Type 1170



High-power loads for connection to 12 power outlet in cars



Use of **ESX10** electronic circuit protector in bottlpack systems

■ Compact protection for bottling systems

Rommel AG manufactures packaging machines and is the global market leader in aseptic bottling of liquids and semi-solid substances on “bottlpack” systems for the pharmaceutical, chemical and foodstuffs industry. The company has operations in more than 80 countries and has over 1800 people on the payroll. We talked to Markus Heidasch, Electrical Assembly Manager, about the use of E-T-A’s electronic circuit protectors.

Current: Mr Heidasch, how did you find out about E-T-A?

Markus Heidasch: Our systems are used all over the world. Unfortunately, the voltage supply around the world is not always as stable as in Europe. Because of this, we changed our DC24V supply from transformer power supplies to switch-mode power supplies. With this change, we had to take a closer look at our DC 24 V protection. After seeing a detailed presentation by an E-T-A sales person, we equipped a machine with an ESX10 circuit protector for testing purposes and immediately we were very satisfied with its performance

Current: What were the main reasons for you to use the E-T-A product?

Markus Heidasch: Besides the excellent price-performance-ratio we were

convinced by the option for a modular protection extension.

Current: What advantage does the E-T-A circuit protector offer your machine?

Markus Heidasch: The essential benefit for us was the compact size of 12.5 mm. It helps us save valuable space in our control cabinets. In addition, wiring is so uncomplicated with the busbars and jumpers. And last but not least: since we also sell our equipment in the US, we were very keen to use a product with UL approval.

Current: What is your experience so far?

Markus Heidasch: Our experience is only positive throughout. The E-T-A circuit breakers exactly meet our requirements and perform their task perfectly.

Current: Thank you for your time.



Electronic circuit protector **ESX10**

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.*



Stefan Hötzel

Stefan Hötzel joined the Industry, Energy & Equipment (IEE) Division as a Junior Product Manager in September 2016. During his studies as an industrial engineer, he worked as a student trainee and gathered professional experience in product management. At E-T-A, he is focussing on the best possible support of our sales force and customers regarding thermal circuit breakers such as 3120 for industries like medical equipment and professional tools.



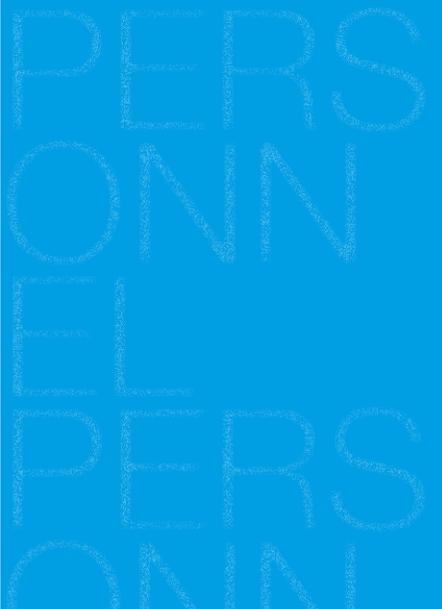
Kamal Al Tabaa

In September 2016, Kamal Al Tabaa joined the Industry, Energy & Equipment (IEE) Division as a Business Field Manager. He studied at the University of Damascus to become an Electrical Engineer, his main focus was energy (distribution and protection) and design of electrical systems. He has more than 20 years of professional experience in the sectors of power engineering and electrical engineering, mostly with regard to protective systems, overvoltage protection and lightning protection. It is his goal to continuously develop the markets in Eastern Europe, France and the UK, concentrating on thermal circuit breakers for equipment protection in industries like medical equipment and professional tools.



Michael Massa

In November 2016, Michael Massa assumed the position of Transportation Business Field Manager for construction vehicles and agricultural machinery. Michael has an engineering degree in agricultural sciences and has more than 20 years of experience in sales and marketing of "off-highway-vehicles". It is his goal to support and inspire E-T-A customers worldwide with tailor-made E-T-A solutions that will increase the reliability and performance of construction vehicles and agricultural machinery.



FAQ

General protection of on-board electrical systems in cars / selectivity

“The technological evolution of protection for on-board electrical systems in cars (part 1)“



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

On-board electrical systems in cars are seeing a technological change. In addition to traditional 12V there are 48V and high voltage networks for electric or hybrid cars. The on-board electrical system is considered the heaviest component in a car's electrical network with growing complexity. Aluminium cables help reduce weight in the event of larger cross sections and also contribute to a positive carbon footprint which is getting more and more important in automotive engineering. The protection of on-board electrical systems has to be revisited with these aspects in mind.

What are the challenges of protecting a car's on-board electrical system?

The optimisation totals for the entire network and thus for the protection concept are in a triangle made up of costs, environmental sustainability and engineering. For the protective elements, this may mean a reduction of mounting time and weight (aluminium as a conductor material), low power loss in operation (energy efficiency) and reliable technical solutions for higher voltages (detection and elimination of arc faults) so as to achieve a high supply reliability.

Line protection or equipment protection - what is more important in the on-board electrical system?

The primary goal of protection in the electrical network is the protection of the lines against fire caused by overloads.

At the same time, the connected loads are also protected against overload and short circuit. The characteristic curves of the protective elements must be adjusted to the temperature rise curves of the various cables, both for the current and for the energy (I^2t value). Only when simultaneously considering the dynamic characteristics of the various loads, will the best possible protection of the on-board electrical system be obtained.

How does a cable's thermal behaviour change in a wiring bundle?

A cable within a bundle has a higher stationary stress tolerance than a freely laid-out conductor. This has to be taken into account when selecting the protection rating by choosing the suitable current rating.

How should the dynamic load behaviour and a cable's thermal characteristics be coordinated?

The behaviour of many loads in automotive applications is highly dynamic, i.e. we can exclude operation at constant rated conditions for many loads (example: automatic windows). The relatively long time constants for the temperature rise of cables allow reduction of the cross section, which requires a precise specification of the protection.

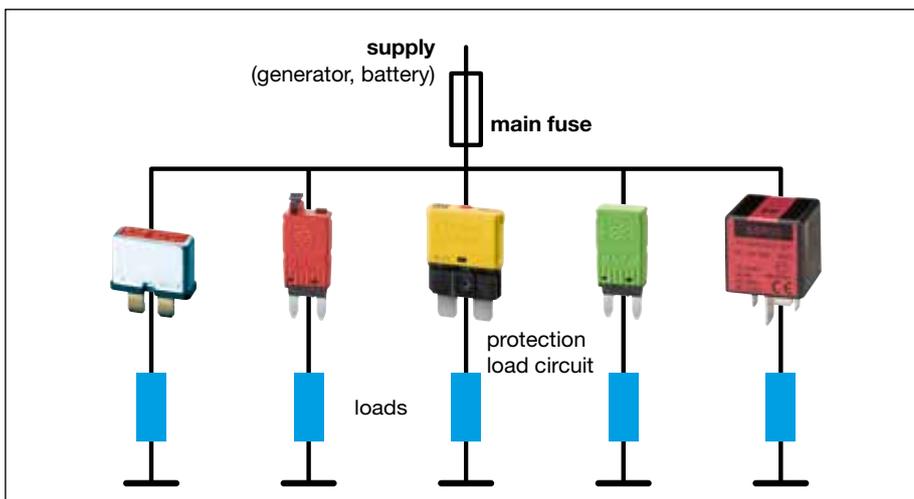
What are the relevant standards for protecting automotive electrical networks?

The following test standards define the requirements of blade fuses and circuit breakers for motor vehicles and describe the pertinent tests:

- ISO 8820 Fuse links and ISO 10924 Circuit Breakers
- SAE J1284 Blade Type Electric Fuses and SAE J553 Circuit Breakers (national standards for the North American area)

In addition there are special company standards and delivery instructions.

Selectively protected automotive network with supply and sub-distributions





Dieter Arenz,
Application Specialist in the
Communications & Systems Division

The major problem of large-scale plants in the chemical industry are the very long and thin lines (often a few hundred metres and typically with a cross section of only 0.5 to 1.5 mm²) to the 24V loads in the field. If standard thermal-magnetic circuit breakers are used for protection, they will not trip in the event of a short circuit because of the high cable resistance. **ESS30** electronic circuit breakers with physical isolation are the solution to the problem, ensuring selective trip in a wide range.

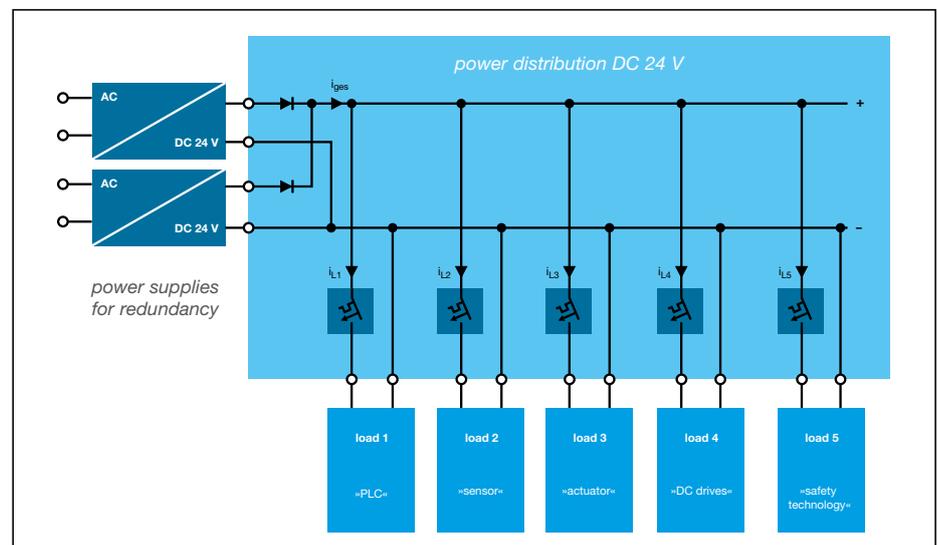
These plug-in type components are the centrepiece of the compact **PDM power distribution systems** which were especially designed for the use in chemical plants. They allow protection of 24 to 30 channels in a compact distribution box with a width of 483 mm (19") and a height of 133 mm (3U). The variable design allows installation on the rear wall of the control cabinet or, by turning the mounting flanges to the front, in a 19" rack. Large terminals up to 25 mm², a redundant supply typical of a chemical plant and load terminals for plus and minus are placed easily accessible on the front. Integral diodes de-couple the redundant supply feed up to 80 A.

The group signalling provides a signal over all channels for external evaluation in the event of a circuit breaker having tripped. The plug-in design of the circuit breakers ensures a flexible system configuration and later changes of current ratings or system extensions can be carried out even with the system running. An integral cable management system significantly simplifies the horizontal arrangement of supply and load lines.

Flexible power distribution in the chemical industry

Selective load protection in a compact design

Many load circuits, long load lines, maximum availability - these are the requirements of the chemical industry regarding a power distribution and protection system for DC 24 V.



Schematic diagram of the power distribution with redundant supply and de-coupling diodes



*Plug-in type **ESS30** electronic circuit breaker for selective load protection with long load lines*



*Redundant »PDM« for **ESS30** circuit breakers*

E-T-A type used: Circuit Breaker/Switch Combination 3120

E-T-A solutions for many products

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

Here are some interesting examples.

Extremely robust

The well-established Japanese company **Consec Co. Ltd.** manufactures professional core drilling machines for demanding applications on construction sites. The robust machines easily drill into asphalt pavement and natural stone. Reinforced concrete is not a problem either. Overload protection in these machines is accomplished by the 3120 circuit breaker/switch combination with ON/OFF functionality.

Professional machines have to meet special requirements regarding overcurrent protection: There must be a clear distinction between hazardous and non-hazardous overloads. For instance, if the overload lasts for a very short time and its height is limited, there must be no disconnection. However, in the event of higher or more prolonged overloads, the motor needs to be protected against damage by disconnecting it in time from the supply voltage. This helps to avoid nuisance

tripping. In other words: The machine is disconnected only in the event of a really hazardous overcurrent. This increases machine uptime significantly. In the event of overcurrents - e.g. with blocked drive motor - the integral trip bimetal of the ON/OFF switch provides reliable and professional overload protection. Consec selected a version with water splash cover - making the **3120** circuit breaker/switch combination optimally protected against water and dust ingress.



Core drilling machine
Consec SPJ-123C



3120 circuit breaker/switch
combination with water
splash cover



E-T-A type used: 4230

■ Provides protection for batteries and chargers

Chloride Batteries South East Asia (established 1958) is a part of the battery manufacturing group Exide Industries India. CBSEA is a leader in the automotive and industrial battery market throughout the Asia Pacific region.

Its manufacturing range covers automotive batteries, electric forklift batteries, DC power backup for telecom, power and the oil & gas sectors, miners cap lamps, railway signalling and train lighting and even submarine batteries. CBSEA is leading the market in the area of traction batteries and chargers being preferred by a large number of OEMs worldwide.

E-T-A's 4230-T is used on a project whenever CBSEA requires a traditional miniature circuit breaker to protect a battery, a charger or the system environment. The **4230** was chosen due to its wide range of configurations and the typical C and D curves that are available. Also, the device has the most important approvals from both UL and IEC. Thus, the 4230 does not only meet the

standard requirement of "cable protection" as a Miniature Circuit Breaker for AC applications, but is also tested and approved for individual protection of equipment in AC as well as DC applications. Finally, CBSEA appreciates the quality, the reliability as well as the availability of the **4230**.

While the products are sold under the well-known Chloride & Exide brands in the ASEAN region, in all other parts of the world, the batteries and chargers are recognised under the global brand, CEIL.



E-T-A Type: 4230



Solving challenging electronic set-ups with the E-T-A **ESR10 micro**

Electronic buses and hybrid buses take off in China

Xiamen Golden Dragon Bus Co. Ltd. develops and produces medium to large sized buses in China. A new generation of environmentally-friendly buses using electronic and hybrid technologies is soon to be launched in China.



E-T-A's **ESR10 Micro** solid state relay provides safety for the new bus generation of Xiamen Golden Dragon Bus.

Xiamen Golden Dragon Bus Co., Ltd is a joint venture company established in 1992 in China. The company specializes in developing, manufacturing and selling buses and commercial vehicles. They run three production plants with approximately 4.000 employees capable of an annual output capacity of more than 40.000 buses. The portfolio consists of city buses, intercity buses, mini buses, special vehicles and vans. The current buses are mostly based on Diesel engines, future bus generations will take advantage of electric and hybrid engine technologies.

For these next generation buses, Xiamen Golden Dragon Bus is using E-T-A's **ESR10 Micro solid state relay**. The current charging station infrastructure in China either uses 12 VDC or 24 VDC. In order to facilitate a reliable charging process across provinces, the buses need to have a rear electrical box that is capable of both voltage ratings. E-T-A's **ESR10 Micro solid state relay** covers a voltage range from 9VDC up to 32 VDC and

therefore solves this challenge. Each bus is equipped with two input relays that ensure reliable switching during the charging of the vehicle. **The ESR10 Micro** stands out in comparison to standard mechanical micro relays with its long lifetime since the electronic design eliminates contact wear. In addition, not only resistive loads, but also inductive loads can be operated in a reliable way without any performance limitations. Moreover, electronic switching is obviously noiseless.

The buses from Xiamen Golden Dragon use the trade mark of "Golden Dragon" as one of the top 10 bus brands in China. So far, the buses have been exported to nearly 40 countries and regions in Asia, the Middle East, Africa, South America and they are tapping into the European market. The company is a part of King Long, one of the largest bus manufacturers in China. We are curious, when we will see the first Golden Dragon buses in Europe with E-T-A technology inside.



ESR10 Micro solid state relay



GOLDEN DRAGON

*Xiamen Golden Dragon relies
E-T-A technology for enhanced safety*

CULINARY DELIGHTS

Typical Chinese:

»Kung-Pao Chicken«

This is a famous Sichuan dish that allegedly was named after a governor of the Ch'ing dynasty.

This administration official must have had a fondness for peanuts, without which this dish is not imaginable.

Directions

Cut the meat in bite-sized cubes. Mix ingredients for marinade with meat cubes, always stir in one direction. Allow to stand for 15 – 30 minutes. For preparation of the sauce, stir soy sauce and chili sauce, vinegar, sugar, starch and stock. Heat up the wok, pour in the oil and swirl around. Stir-fry chillies, garlic and ginger briefly until the flavour develops. Add the meat, stir for one minute with a spatula, then drizzle rice wine from the side. Add green onions and stir-fry for another 30 seconds. The meat is almost done now. Add the prepared sauce and stir until it thickens. Finally, fold in the peanuts, remove from heat and serve immediately while hot. Serve with rice.

Ingredients:

- 350 g chicken breast
- 4 tbsp of peanut oil or corn oil
- 2 – 3 dried red peppers or chillies (seeds removed, chopped into pieces)
- 2 garlic cloves, cut diagonally into thin slices
- 5 thin slices of fresh ginger
- 1 tbsp of rice wine or medium dry sherry
- 3 green onions, cut into rings
- 50 g roasted peanuts

For the marinade:

- 1 pinch of salt
- 2 tsp light soy sauce
- 2 tsp of rice wine or medium dry sherry
- 1 tbsp corn starch
- 1 egg white (slightly whipped)

For the sauce:

- 1 tbsp dark soy sauce
- 1 – 2 tbsp chili sauce
- 2 tbsp rice wine vinegar
- 2 tsp sugar
- 1 ½ tsp corn starch
- 6 tbsp clear stock



Typical Chinese
»Kung-Pao Chicken«



Thermal circuit breaker/switch combinations

Two in one:



Protecting and switching within one device!
E-T-A offers a range of thermal overcurrent circuit breakers plus ON/OFF functionality.

- **Reduced inventory and storage costs:**
Replaces switches, fuseblocks and inserts for blade fuses
- **Tremendous time savings:**
Never change a fuse again - just reset it!
- **Reduced mounting and wiring time:**
Only a single component! Load terminals with push-in technology!
- **Space-saving design:**
Integral overcurrent protection even with installation in limited space
- **Enhanced overall reliability:**
Less single components mean less error sources.

Talk to us! We look forward to consulting you.
www.e-t-a.de/cu_e2-17



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