



## Save energy and reduce CO<sub>2</sub> emissions

Reduce fuel consumption with solid state relays



**An innovative company with tradition**

Seven decades of E-T-A

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**Slim, but powerful**

1110 thermal circuit breaker

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**Standard-compliant DC 24 V protection**

REX12 electronic circuit protector

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**Safety for awesome ceramics**

REX12D with IO link protects ceramic furnaces

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1110 thermal circuit breaker



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### Impressum

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# An innovative company with tradition

**Seven decades of E-T-A – practiced values and high-quality products for servicing our customers**

**If a company has been globally active for 70 years, it is a great opportunity to look back for a moment. E-T-A was founded in 1948 and with pride and humility, we can celebrate this special anniversary this year.**

We look back on seven decades of living company culture and a great number of successful innovations that were characterised by our goal to protect lives and values. Some of the products we designed massively influenced our markets. They included devices that always contributed to enhance the safety of our customers' products.

There have been many changes in E-T-A's 70-year-old history, but unwavering concentration on our customers has always been at the centre of our endeavours. It has always been an important factor for the successful development of E-T-A. All E-T-A employees are reliable partners, standing for a superior quality that supports our customers. It is our profound conviction that, based on a passion for engineering, when diverse people put forth their capabilities at E-T-A, they simply find better solutions, following our motto »Engineering Technology«.

Our long tradition will always be an incentive to go on writing the E-T-A success story. We want to offer products to our existing and future customers that will help them and that they can rely on. Our entire staff will always contribute to this goal, each as a part of the E-T-A team.

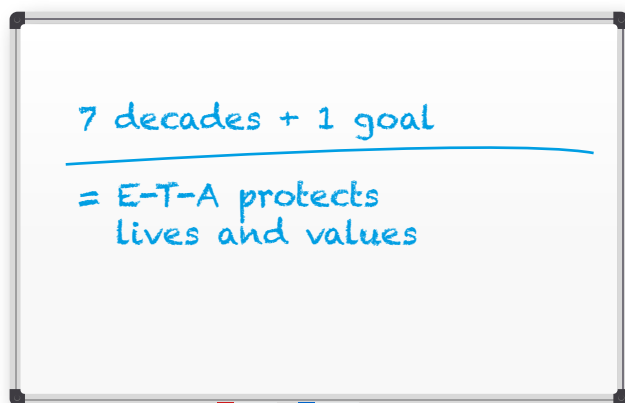
What can we do for you? Please get in touch. Or do you know of a certain project you wish to discuss with us? **We look forward to speaking with you.**



*Dr. Clifford Sell*

*Director of*

*E-T-A Elektrotechnische Apparate GmbH*



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

E-T-A's **1110** thermal circuit breaker

## ■ Slim, but powerful

In many machinery applications, fuses in closed vertical fuse holders still provide overcurrent protection. This is often because of the very low selling price of fuses. At first sight, this might seem like an advantage.

In reality, fuses have a lot of disadvantages:

- Replacement fuses must be on-hand
- A risk of choosing the wrong rating when replacing a fuse
- Testing the fuse is not possible (leads to destruction)
- Ageing of fuses may lead to nuisance tripping
- Risk of injury when resetting equipment while still in overcurrent mode
- A large number of components is required: Fuse + fuse holder + ON/OFF switch + wiring between switch and fuse holder
- Fuses are unprecise and unsuitable as overload protection in the event of moderate overcurrents up to two or three times rated current.

### E-T-A's 1110 – the perfect alternative

One of the major goals of design engineers today is to systematically reduce components. This is one of the major keys to designing cost-effective equipment.

Also, fewer components directly correlate to saving space. This allows engineers to design more compact products. In order to support design engineers in reducing components, E-T-A offers circuit breaker/switch combinations which combine overcurrent protection and an ON/OFF switch in a single device.

E-T-A recommends replacing closed vertical fuse holders with the **1110** circuit breaker/switch combination. It has a slim design and allows a 1:1 replacement without a complicated re-design of the equipment.

E-T-A's 1110 is a single pole protected circuit breaker with push-push operation for easy snap-in mounting and offers current ratings up to 16 A. The slim breaker also has a reliable trip-free mechanism and snap action mechanism, preventing contact wear, both of which increase the life span of the device.

### Some typical applications:

- Equipment control
- Professional tools
- Industrial kitchenware
- Household appliances and garden tools

### Accessories:

Front or rear side IP64 rated protective cover for water splash protection





**type 1110**  
with push-push  
actuation

**type 1110** with front and rear  
side IP64 rated protective cover  
for water splash protection.

**1110 thermal circuit breaker/switch  
combination, single pole type**

- AC 250 V / DC 50 V
- 0.05...16 A
- Approvals: VDE, UL, CSA

**Approvals:**



## Your benefits

● **Cost reduction**

The **1110** replaces a single pole switch, a fuse holder and a fusible cut-out. All of this is provided in a single device. This makes purchasing logistics easier and helps significantly reduce material planning and storage costs.

● **Time savings**

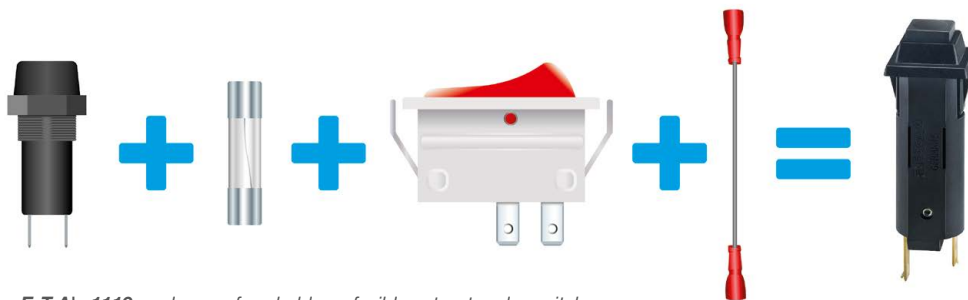
Mounting time is reduced because only a single component must be installed. In addition, wiring between the switch and fuse holder is eliminated.

● **Space savings**

The **1110** features space-saving integral overcurrent protection, leaving room to manoeuvre inside the equipment.

● **Increased overall reliability**

Fewer single parts also mean fewer possible failures. The E-T-A circuit breaker/switch combinations help you to consistently increase your products' reliability.



*E-T-A's 1110: replaces a fuse holder, a fusible cut-out and a switch as well as the wiring between switch and fuse holder*







*Reduce fuel consumption with **solid state relays**.*

## ■ Save energy – reduce CO<sub>2</sub> emissions

The limit values for carbon dioxide emissions are getting stricter and stricter globally. By 2020 the average emission of new cars will drop to 95 g/km in the European Union. For light commercial vehicles the target value is 147 g/km. For passenger cars this corresponds to a consumption of 4.1 litres petrol or 3.6 litres diesel.

These numbers are driving passenger car manufacturers to look for ways to further reduce fuel consumption and in turn carbon dioxide emissions. Even though there are no carbon dioxide emissions specifications for trucks yet, the European Commission is currently working on suitable models (Vecto) for reducing carbon dioxide emission. The manufacturers are also interested in a realistic model. The fuel consumption of a truck is the most critical competitive factor in the purchasing decision.

One approach to reduce fuel consumption is by reducing the energy requirements of the loads in the vehicle. Providing electrical power is one of the most expensive energy types in vehicles. Therefore, the goal is to switch off electrical loads as often as possible. A prime example is the automatic start-stop in modern cars. During the stop phase, not only is the engine off, but

also the engine fuel transfer pump and the air-conditioning compressor. To accomplish this, a relay must be able to switch constantly, very frequently, and quickly. Electro-mechanical relays quickly reach their limits in this type of application. An additional goal is to reduce the energy requirement of loads while driving. This is achieved by using switching elements with a low power consumption and low internal resistance values.

Conventional, electro-mechanical relays use a hold-on coil which must be permanently energized. This energy has to be provided by the battery or the generator through fuel. The efficiency factors of the generator and motor must be taken into consideration. A diesel motor has an efficiency factor of approximately 40 percent. The generator has an efficiency factor of approximately 50 percent. This leads to a loss of approximately 80 percent of the energy provided in the

diesel fuel (overall efficiency factor 40 % x 50 % = 20 %) which is transformed into electrical power. This makes it worthwhile to optimise even the smallest electrical loads.

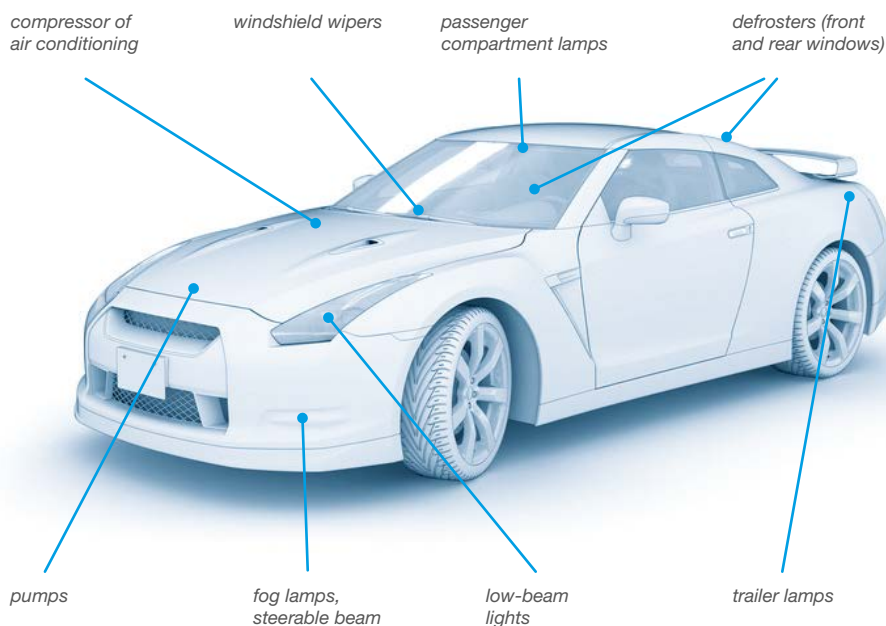
For switching elements, it means the holding current and power loss via the internal resistance should be as small as possible. These requirements can only be met with a different technology: solid state relays. These relays do not have any moving parts or electrical switching contacts. They also have a longer life-span compared with electro-mechanical relays because of the low internal resistance of only 1 mOhm and they are also subjected to significantly less temperature changes. All this requires much lower switching energy. Typically, the holding current of an electro-mechanical relay is 30 mA to up to 200 mA. A solid state relay, by contrast, only requires a control current of 10 mA. So, when replacing five



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electro-mechanical relays with solid state relays you can save almost 1 A of energy. This corresponds to approximately 0.3 g CO<sub>2</sub>/km. If CO<sub>2</sub> values exceed the limit, this emission would correspond to a penalty of €28.50, €5.70 per relay. Five solid state relays correspond only to 0.015 g CO<sub>2</sub>/km. The potential savings when using solid state relays are tremendous.

E-T-A continues to extend its portfolio of solid state relays. The micro relay design is available in 10 A or 17 A for 12 and 24 V. It can be used at high ambient temperatures, for example in the motor compartment, and there is also a 30 A (12 V) version available.



©arsdigital/Fotolia.com



Automotive Micro ISO relay (10 – 30 A)





**Karl Bühler,**  
Forwarding Manager

1610 and 1170 automotive circuit breakers in trucks

## ■ For trucks that are always on the road

Karl Bühler is the forwarding manager for an agricultural sales company in Southern Germany (Baden-Württemberg). The company operates approximately 400 trucks, including traction engines and dump trucks. These supply its customers with a range of agricultural products on tours lasting up to three days.

**Current:** What kind of vehicles do you use in your company?

**Karl Bühler:** We mainly use Daimler (Actros), but also MAN (TGX). We mostly lease our vehicles for five to six years. They travel about 100,000 km per year.

**Current:** How did you find out about E-T-A's automotive circuit breakers?

**Karl Bühler:** 20 years ago, my predecessor ordered trucks fitted with circuit breakers. He suggested to keep it like this to avoid unnecessary troubles. Additionally, I've had some bad experience myself with field choppers that were fitted with blade fuses. In the event of a failure we had to check all fuses one after the other with a test plug to identify the root cause. Quite

often the correct fuse was not on hand or it tripped again.

**Current:** What is your experience with circuit breakers?

**Karl Bühler:** Trouble-shooting and failure resolution is much easier with circuit breakers. You immediately see which breaker tripped and all you have to do is reset it. In many cases, the problem is already resolved. In addition, fuses always carry the risk that a replacement with the correct rating is not available. The driver has to choose the next higher rating. This may cause costly issues in the on-board electrical system.

**Current:** And what about the price: are circuit breakers an alternative to blade fuses?

**Karl Bühler:** They definitely are. We simply cannot afford to buy the cheapest solution. Vehicle uptime is our top priority. If a vehicle breaks down due to a small defect, the damage is much higher than the extra cost of the circuit breakers.

**Current:** What would happen if you switched from E-T-A circuit breakers to simple blade fuses?

**Karl Bühler:** I guess, I'd become rather unpopular with my drivers.

**Current:** Thank you for your time.



# PERSONNEL

»People are  
at the very  
centre of our  
daily work«

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



## Antonio Ruiz

In June 2017 Antonio Ruiz joined E-T-A's team in Spain as an Area Sales Manager. Located near Barcelona, he is responsible for our customers in Northern Spain. He has a strong technical background and a wealth of experience which makes him an ideal contact person for our customers. His goal is to win more and more customers for E-T-A solutions. His focus is on automation technology and transportation.



## Gerson Eisbrenner

In January 2018, Gerson took over his new role as Market Manager ConAg in Germany. During the two previous years, he worked as a Sales Engineer in North Rhine-Westphalia. Gerson is now responsible for customers in the construction machinery and agricultural vehicles industry sectors. His goal is to win manufacturers of construction machinery, agricultural and special vehicles as customers for E-T-A solutions. Besides automotive and high performance circuit breakers, he will focus on intelligent power systems.



## Oliver Kratsch

Oliver worked as an E-T-A Regional Sales Manager in the Hanover area since January 2015. In January 2018, Oliver, who is a skilled energy electronics engineer, took over as the Regional Sales Manager in North Rhine-Westphalia. His responsibilities cover the North-Western part of Lower Saxony and North Rhine-Westphalia. It is Oliver's goal to offer his customers the best possible support regarding E-T-A's entire product range. He is ready to design tailor-made protection solutions together with customers for their applications.



PERS  
ONN  
PERS  
ONN

# FAQ

## What do we have to keep in mind when switching DC inductive circuits?

In inductances, a magnetic field builds up or degrades as soon as the current changes which flows through the coil. With DC voltages, it happens in the rhythm of the frequency. With AC voltages, it happens every time someone switches the circuit on or off. This creates a voltage  $U_{\text{coil}}$  at the coil. It goes against the cause »current flow or not« (Lenz's law). Therefore, more aspects must be focused on when switching inductive circuits than purely resistive ones.

### What does the time constant $\tau$ mean in inductive circuits?

The time constant determines the duration for changes in the magnetic field. It is calculated from the resistance and inductance values. The time constant  $\tau$  equals inductance divided by total resistance (line and coil). As soon as the magnetic field is built up, only the resistance remains effective. The final value of the current results per Ohm's law  $I = U/R$ . Current rise happens according to an e function and, after a time, it has reached approximately 63 % of the final value. The value is completely reached after approximately  $5\tau$ .

### How can the energy in the coil be reduced?

Upon disconnection, the energy stored in the coil prevents an erratic change of current. There will be a high voltage spike which can destroy electronic switching elements. An ignition coil is a good solution.

### Why is a protective diode required?

In order to avoid a voltage spike, a diode is connected in parallel to the coil. Upon disconnection, it allows the current to continue flowing and suppresses the voltage spike. A protective diode like this is also called a free-wheeling diode (flyback diode).

### What are effects of inductance on the contacts in an electro-mechanical relay?

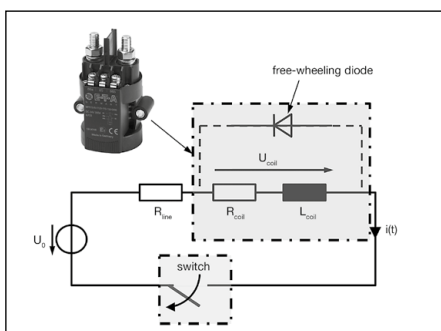
When mechanical switching contacts are present, the energy stored in the coil dissipates in a switching arc. Extinguishing such an arc becomes more difficult the higher the inductance  $L$  and the source voltage  $U_0$ . This also reduces the life span of the contacts because of the arc's thermal effects.

### What is the typical use of a power relay?

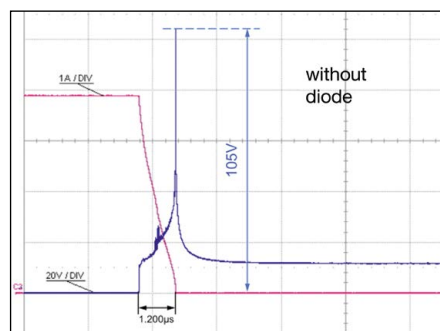
A typical application in an on-board electrical system is to use a power relay, e.g. MPR10 with a switching contact. Without a free-wheeling diode, an overvoltage of more than 100 V can be generated in a 12V on-board electrical system. E-T-A's MPR10 power relay features an integral free-wheeling diode. Loads in automotive applications are mostly inductive (electric magnets, relays, electric motors, suppressor chokes). On-board electrical systems with several voltage levels have integral DC/DC converters which form a capacitive load.



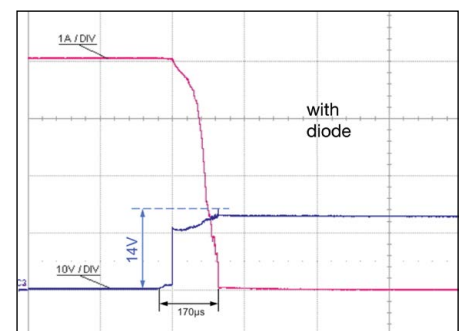
Our FAQ column discusses topical and practical subjects to support you in your daily work. Do you have any questions you need answer to? Send it to us – we are looking forward to hearing from you. **E-Mail: [faq@e-t-a.de](mailto:faq@e-t-a.de)**



Controlling an MPR10 power relay with a switch (e.g. relay contact)



Switch OFF, current and voltage at  $U_0 = 12\text{ V}$ , without free-wheeling diode



Switch OFF, current and voltage at  $U_0 = 12\text{ V}$ , with free-wheeling diode





Tobias Prem, Business Field Manager Automation & Process Control Division

REX12 electronic circuit protector

# DC 24 V protection in compliance with standards

Primary pulsed switch mode power supplies are critical for voltage supply in DC24V applications. We are constantly asked questions about the correct secondary protection when using these power supplies.

### How should you correctly protect DC 24 V switch mode power supplies both electronically and in compliance with relevant standards?

Circuits must be protected against over-current. According to DIN VDE 0113-1 clause 7.2.4, control circuits must be protected with overcurrent protection devices.

The DIN VDE 0100-530 (clause 533) standard lists approved overcurrent protection devices. For example, it includes blade fuses and MCBs. All protective devices listed there can physically isolate circuits.



fig. 1: the REX system

### When can we use electronic protection?

If electronic overcurrent protection, is used an overcurrent protection equipment to DIN VDE 0100-530 must be connected in series in addition to the electronic circuitry. It can also be included as a fail-safe element within the electronic fuse. It is required to rate the cable cross section in accordance with the current rating of the fail-safe element of the electronic fuse.

The REX12 electronic circuit protector (fig. 1) has therefore an integral fail-safe element – a blade fuse – that corresponds directly to the current rating of the electronic circuit protector. This means that the current rating of the protector and the rating of the fail-safe element are identical – a 4 A REX12 has a 4 A blade fuse to IEC 60127-4/2 and to UL248-14 (fig. 2).

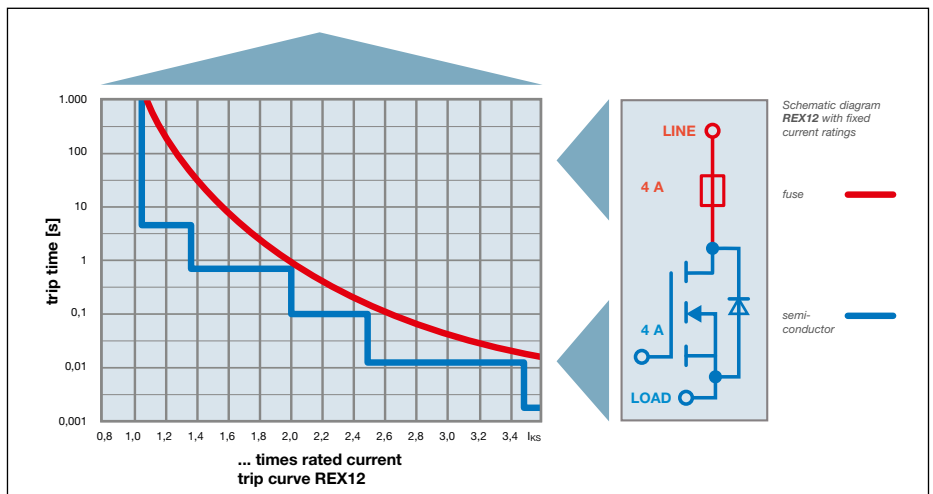


fig. 2: time/current characteristics of the combination of electronic circuitry and fail-safe element.

Thus the REX12 is the only circuit protector in the world that not only meets UL508 and NEC Class2 requirements, but also the requirements of cable protection to EN60204-1.



Line protection to EN 60204-1

NEC Class2 to UL1310 up to 4 A

## 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: 9510*

## ■ Aiming high

### New components for professional flight simulators

**SIMTEQ BV**, located in the Netherlands, manufactures components and systems for civil flight simulators used for professional pilot training. Its high-end simulator technology is very well-known, however SIMTEQ BV is still a comparatively young supplier in the industry.

In order to professionally prepare pilots to fly the Airbus A320 SIMTEQ BV designed a new simulator. It mimics the aircraft cockpit even down to the smallest detail. For this model, SIMTEQ BV chose E-T-A's 9510 flight simulator switch. The 9510 meets the requirements for flight simulators and also corresponds to the devices used in the A320 cockpit. A particularly important detail for SIMTEQ BV

was that all simulator switches in the cockpit should have an auxiliary contact. However, this version of the 9510 was not available at that time. Therefore, E-T-A started a special design project upon receipt of the enquiry in March 2017. In October 2017, E-T-A supplied the first functional samples to SIMTEQ BV. The 9510-Si completes E-T-A's portfolio of devices fit for use in flight simulators.



*E-T-A type used: 9510*





**E-T-A type used:** *Circuit breaker/switch combination 3120-F7*

## ■ A perfect match of style and function

**SCHMITZ u. Söhne GmbH & Co. KG**, located in Wickede in Germany, manufactures medical technical furniture. It is a medium-sized business, managed by the third and fourth generation of owners whose success is based on highly innovative products.

They build gynaecological and urological examination chairs and use E-T-A's 3120 circuit breaker/switch combination as ON/OFF switch. E-T-A's 3120 series also protects against damages caused by overheating in the event of overcurrents.

In March 2017, SCHMITZ was officially listed as a »Hidden Champion«. The Chamber of Commerce in Hellweg-Sauerland included SCHMITZ on the list of official world market leaders. And with good reason! SCHMITZ's examination chairs do not only feature unrivalled functionality, but also attractive styling

and design. Appealing colours and soft, round shapes are used to reduce the patients' fear of examinations. In order to limit mounting and wiring efforts, SCHMITZ decided to use E-T-A's 3120 circuit breaker/switch combination. Thanks to its dual function – ON/OFF switch and overcurrent protection in a single device – it helps significantly reduce the number of components required. In addition, the double pole protected and double pole switching version of the 3120 meets all requirements of DIN EN 60601-1 for electrical medical apparatus.



*E-T-A type used: 3120-F7*



REX12D with IO link protects ceramic furnaces

## Safety for awesome ceramics

**SYSTEM GROUP** is an international company with six business units, nine production facilities in Italy, China, USA and Russia and more than 40 sales offices worldwide.



LAMGEA presses the material without a mould, so the slab is able to expand and release any internal tension.

The new press manufactured by SYSTEM CERAMICS, one of the six business units, is called »LAMGEA«. It introduces a completely new way of ceramic production, without a mould and with no format limits. This means freedom of expression, design and aesthetics.

LAMGEA produces big slabs standard atomised powders compliant with UNI1441, annex 10545, in sizes up to 4800 x 1600 mm. Depending on the intended use of the product, the customer can choose the required thickness between 3 and 30 mm. The LAMGEA system lays powder directly on the belt without special trolleys (single and multi-load). This makes the pressing process even easier.

LAMGEA presses the material without a mould, so the slab is able to expand

and release any internal tension. When it comes out of the kiln, the shape of the slab is completely regular without any gauge defects. LAMGEA has up to 50,000 tons of power with a nominal force of 420 kg per cm<sup>2</sup>. A rectangular hydraulic piston transmits the force across the whole surface of the slab. During the entire process, the LAMGEA press relies on E-T-A's REX12 system. It completely meets the customer's requirements thanks to its features such as IO link communication and adjustable current ratings (REX12D-TE2-100-DC24V-1A-10A).

The REX12 system provides a range of information. With this information, Beckhoff 3D visualisation software creates status indication of various machine parts. It makes the LAMGEA system absolutely ready for industry 4.0. Supply, control and protection of the logics and I/Os on the



Electronic circuit protector type REX12D-TE2-100-DC24V-1A-10A

DC 24 V level are ensured by E-T-A's REX12D compact and flexible electronic protection system.



# CULINARY DELIGHTS

*Typically Italian:*

## »Spaghetti alla carbonara«

*Anyone relishing in Italian food and also liking food in general will love »Spaghetti carbonara«. This dish is quite typical in Italian cuisine: easy to cook, but extremely delicious!*

### Directions

Boil a large saucepan of water, add 3 to 4 tsps of salt. Add the spaghetti to the boiling water and cook at constant simmer until »al dente«.

Smash the garlic with the blade of a knife, just to bruise it. Finely chop the pancetta. Drop butter in a frying pan and fry the pancetta with the garlic. Finely grate both cheeses and mix them together. Beat the eggs in a medium-sized bowl and season with a little freshly ground black pepper. Mix most of the cheese in with the eggs, keeping a handful back for sprinkling over later.

Once the garlic has imparted its flavour, take it out with a fork and discard. When the pasta is ready, lift it from the water and put it in the frying pan with the pancetta, adding a shot of olive oil. Finally put pasta and pancetta into the bowl with the eggs. Mix well until all the spaghetti is coated. Never pour the eggs into the frying pan. The residual heat from the pasta is sufficient to perfectly cook the eggs. Sprinkle with remaining cheese and a grating of black pepper.

**Preparation time:** 20 minutes

### Ingredients for 4 servings:

- 360 g Spaghetti
- sea salt
- olive oil
- 200 g pancetta (Italian bacon)
- some butter
- 2 eggs and 1 egg yolk
- 50 g pecorino cheese
- 50 g parmesan

**Buon appetito!**



*Typically Italian:  
»Spaghetti alla Carbonara«*





Photo: © KraussMaffei

**REX12 – the select compliance with the machinery directive**

## The REX system – Your all-in-one solution

Consisting of three components – **supply, overcurrent protection and power distribution** – the **REX12 system** revolutionises the DC 24 V level.

- **Increases machine uptime** – through clear failure detection, high transparency and remote diagnosis
- **Provides flexibility** through ease of assembly or disassembly, modular design and convenient adjustment
- **Saves 50 % time** – through innovative and flexible connection technology
- **Saves cost** – no further accessories required
- **Saves space** – because each module is only 12.5 mm wide

 **IO-Link**

 **Modbus-RTU**



Line protection to EN 60204-1

**NEC** Class2 to UL1310

Talk to us! We look forward to consulting you.

[www.e-t-a.de/cude2-18](http://www.e-t-a.de/cude2-18)

Visit our booth at the  
IAA Utility Vehicles  
from 20 - 27 September 2018  
hall 11, stand G15



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