

Cover Story

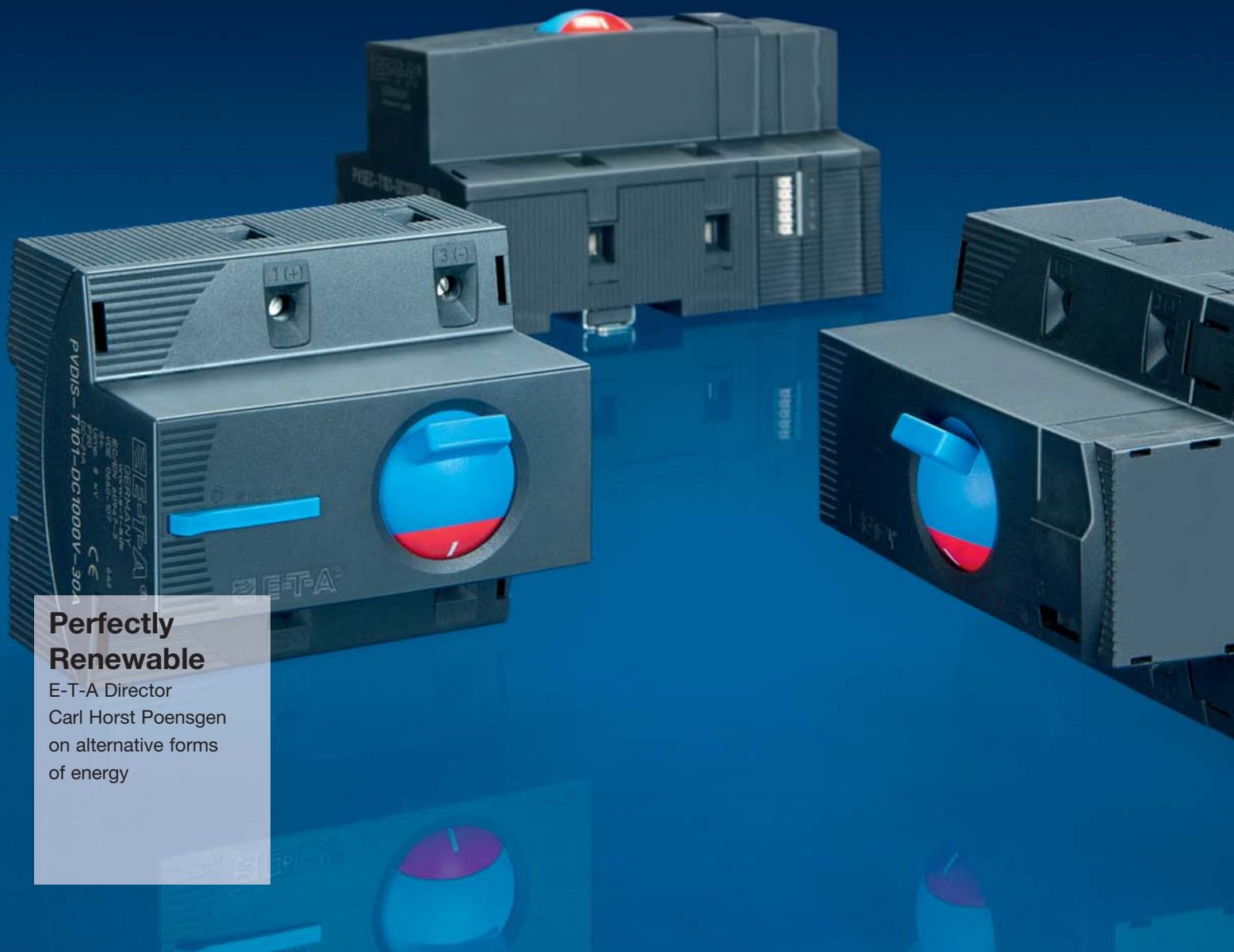
E-T-A enhances the safety
of your photovoltaic system

Conventional wiring is dead -

Long live today's modern power electronics

New low-cost circuit breakers

for equipment applications



Perfectly Renewable

E-T-A Director
Carl Horst Poensgen
on alternative forms
of energy



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Conventional wiring is dead -
long live today's modern
power electronics



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E-T-A enhances the safety
of your photovoltaic system



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All you ever wanted to know about
E-T-A products



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Typically Italian
"Osso Buco alla Milanese"

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E-T-A's new PV product group:
DC Disconnect for Photovoltaic Systems

Impressum

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The shift in energy production from traditional to alternative sources cannot be achieved effortlessly – experts predicted this from the start and now the entire population is beginning to understand it. Alternative energy discussions continue and we are seeing more and more people start to change their opinions on the overall success of these emerging technologies.



in America and Asia will continue to provide two-digit growth rates. Even as government aid declines, photovoltaics will remain a very attractive market.

The challenges associated with alternative energy sources are very clear but, at the same time, the effort of pushing these alternative sources is starting to pay off. In fact, 2012 was a record year for renewable energy in Germany.

E-T-A understands the global opportunity of this market and recently launched a new PV product line which is once again setting the pace in this market. E-T-A's PVDIS, PREM and PVSEC are all designed specifically for photovoltaic applications and offer either pure DC disconnect capability, a remote control feature or the ability to function as a fire fighter switch.

Perfectly renewable

According to the German Association of the Energy and Water Industry estimations, alternative energy sources covered one quarter of Germany's energy demand in the first half of 2012 with 67.9 billion kilowatt hours. Photovoltaics alone increased its contribution to 2012 alternative energy usage by 47 % and came in third overall with 5.3 %. Internationally, the boom is hardly on the wane. Analysts agree the alternative energy opportunities available

If you want to learn more about E-T-A or if you require detailed information or advice about an upcoming project, please do not hesitate to get in touch.

We look forward to working with you on your next design.



Carl Horst Poensgen

Executive Committee
E-T-A Elektrotechnische Apparate GmbH



At a glance - features and benefits of the *PowerPlex*® system

- Protection and control of electrical AC and DC loads
- Four Level Protection Concept (FLPC)
- Power management
- Tank and pump monitoring
- Integral diagnostic and monitoring functions
- Auto-configuration of replacement components

Enhanced flexibility through

- Quick installation
- Ease of configuration
- Reduced wiring and space requirements
- No centralised computer required
- Flexible arrangement of PowerPlex components
- Intelligent power distribution via well-proven CAN technology

More convenience through

- Modern colour displays and touch PCs
- *PowerPlex*® remote app
- Individual illumination concepts
- Timer control and scenarios
- Visual status indication of tanks, batteries and motor data

Conventional wiring is dead - long live today's modern power electronics

Imagine for a second if there were no field buses, in particular CAN. Increasing consumer demands in terms of convenience and safety are leading to more and more electrical loads in vehicles. Bus systems for power distribution, such as the E-T-A **PowerPlex**[®], are critical when it comes to reducing wiring time, production time and manufacturing costs.

Besides pure power distribution, data and control commands can be transmitted via the bus and trigger switching and alarm operations. Many operations can be automated or linked to certain conditions.

E-T-A **PowerPlex**[®] is designed specifically to meet the requirements of watercraft and special vehicles. It consists of various modules and control elements which are interconnected via CAN technology.

PowerPlex[®] allows the following:

- switching and monitoring of electrical loads
- individual illumination concepts
- power management
- time control and scenarios
- tank and pump monitoring

All system components are configured with the **PowerPlex**[®] configuration software which enables intelligent power distribution. It allows users to define, store and change individual power distribution, control and monitoring logics. By transmitting the configuration the intelligence is forwarded to the **PowerPlex**[®] components which communicate with each other accordingly.

A configured system does not require a centralised computer. If one **PowerPlex**[®]



The **PowerPlex**[®] TouchPC software allows customer specific operating and layout concepts and provides convenient control of the installed **PowerPlex** electrical system.

component fails, all others remain fully functional. Replacement devices are recognised automatically and are configured via the neighbouring modules.

Thanks to the **PowerPlex**[®] TouchPC software, modern operating elements can easily be configured and integrated. Custom design of the user interface is possible with any modern text editor. Similarly, the **PowerPlex**[®] configuration software does not require any programming knowledge. **PowerPlex**[®] will help all components of your system to communicate as you desire. You will be able to design the individual characteristics and gain a genuine competitive edge.

The **PowerPlex**[®] increases the benefits and reliability of the entire system, not

only for the end user but also the original equipment manufacturer (OEM), by offering visualisation of operating conditions and data measurement. Visual indication is possible for:

- tank levels, battery levels and motor data
- alarms of individual incidents and alarm lists
- data and information from third systems about SAE J1939 and NMEA 2000

When the Touch PC is connected to the Internet, it is possible to check, adjust and correct the functionality of the system remotely.

At a glance – the features of our PV product group

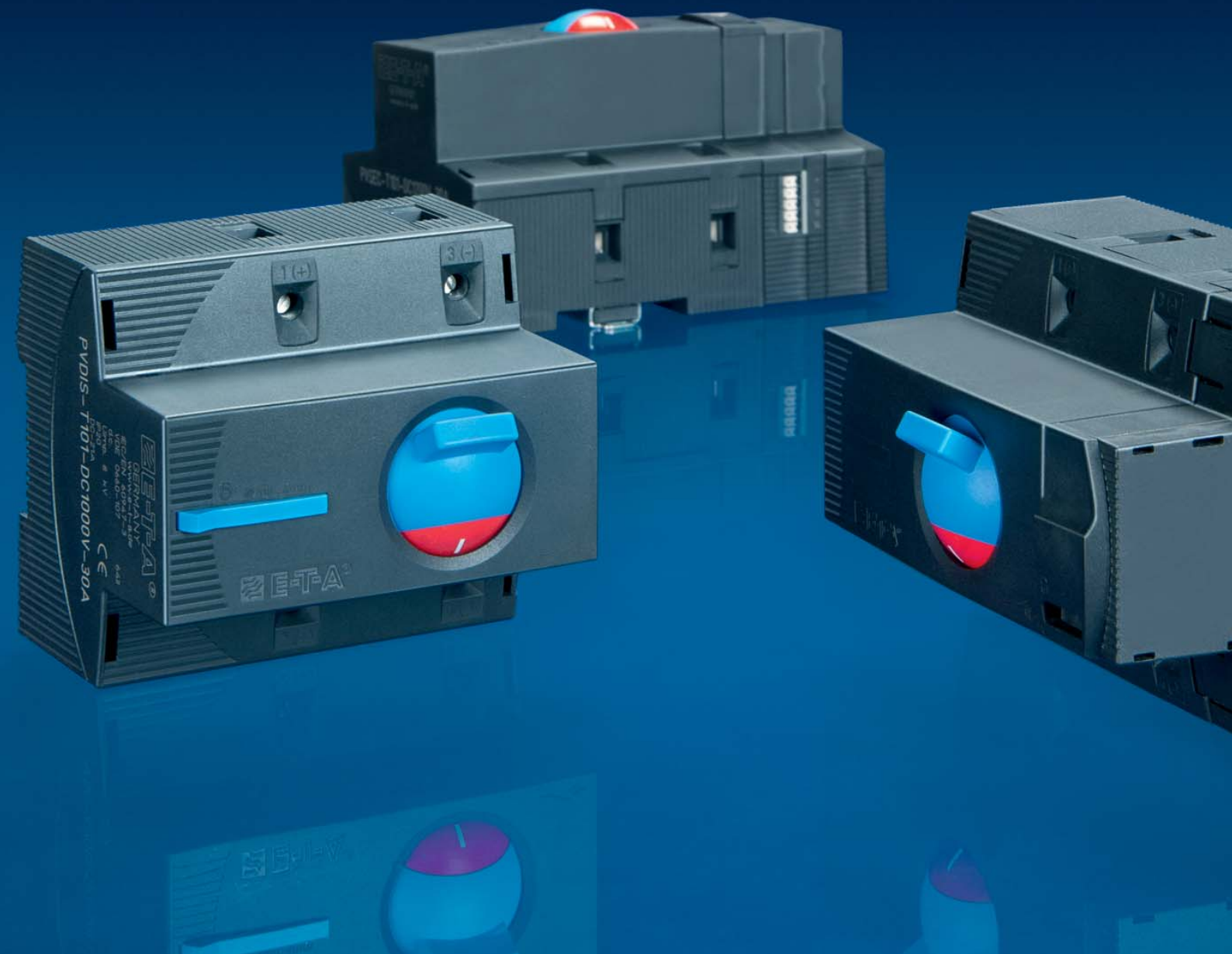
- Designed specifically for the photovoltaic market
- Reliable 2-pole disconnection up to max. DC 1000 V and 30 A
- Enclosure to DIN 43880 for rail mounting
- Lockable in OFF position

Type PVREM-...

- Double pole DC Disconnect with remote ON and OFF control module and auxiliary contact
- For operation from a centralised control room
- Available with arc detection module type PVREM-...-AF1

Type PVSEC-...

- Double pole DC Disconnect designed as a fire fighter switch with zero voltage release and auxiliary contact
- Automatic re-start after voltage disruption when no manual switching operation occurs
- Available with arc detection module PVSEC-...-AF1



E-T-A enhances the safety of your photovoltaic system

with the new PV product group

Reliability and endurance are critical factors in the photovoltaics (PV) industry. E-T-A's PVDIS DC Disconnect, designed specifically for photovoltaic applications, has already proven itself in the market. Due to its modular design, the powerful base unit can be adjusted to customers' requirements.

Significant growth in the PV industry can be attributed to the need to retrofit older systems and the increasing number of new system installations. This boom is also making it necessary for increased safety and reliability requirements. An essential part of every PV system is the DC Load Disconnect which is required by the DIN VDE 0100-712 standard which requires a load disconnecter on the DC side of a PV system. Normally these disconnects are installed directly in the power inverter or in its proximity. This means the DC lines on the side of the PV generator remain live during solar irradiation even when the DC Disconnect is switched off.

In order to reduce the conductive cable lengths to a minimum, it is recommended to install the DC Disconnect (with remote control and/or zero voltage release module) near the PV generator, for instance in the shielded outdoor area or directly below the cable outlet. This allows disconnection and reliable de-energisation of the DC cables throughout the entire building.

Fire fighter switches, which are the combination of a DC Disconnect and additional functions, have turned out to be extremely helpful in fire prevention and the resulting new requirements.



*Designed for photovoltaic applications:
DC Disconnects PVDIS-..., PVREM-... and PVSEC-...*

They allow both active support during fire fighting as well ongoing preventative system monitoring measures.

Contrary to the pure remote control function of the PVREM, the PVSEC enables disconnection of the system automatically in the event of mains or manual disconnection e.g. by means of an emergency switch or a fire alarm box. Even an interruption of the control cables [4] will lead to de-energising the DC cables. In the event of inadvertent voltage dips or ruptures on the mains side, motor actuation provides an automatic restart and smooth operation of the PV system.

E-T-A's version with integral arc fault detection does even more to provide fire prevention. This type of technology fully meets the rising safety and protection requirements and switches off before a hazard caused by DC arc faults arises in the PV system.

Explore Direct Current



Dr. Frank Gerdinand,
Division Innovation &
Technology at E-T-A

Decentralised generation of electrical energy in buildings is part of a European joint research project, called DCC+G. This project started in April 2012 and will run for three years with a total of 14 international

partners participating, including E-T-A. We talked to Dr. Frank Gerdinand from E-T-A's Innovation & Technology Division about the general purpose and goal of this project.



Photovoltaic system on E-T-A's roof

Current: What is the exact target of the DCC+G project?

Dr. Frank Gerdinand: Buildings represent the greatest single item in the total energy consumption scale with approx. 40 %. Consequently, savings in this sector will be extremely significant. Within a commercial building, heat pumps, fans and air conditioners, illumination and information technology are major energy consumers. All these components reach their highest efficiency when powered with a DC power supply. Conveniently the local energy providers, e.g. photovoltaic or wind power plants, also create DC current.

Current: DC Current? What does this imply?

Dr. Frank Gerdinand: A DC current grid in buildings avoids the repeated DC to AC conversion required in today's systems and as a result will help save energy.

Current: What is the approach of the DCC+G project?

Dr. Frank Gerdinand: The DCC+G project addresses strategic energy savings

challenges and the related reduction of CO₂ emissions in commercial buildings by exploring solutions for optimised DC power distribution at a voltage of 380 V.

Current: Who are the participants in this project?

Dr. Frank Gerdinand: Participants in the project, besides E-T-A GmbH, include Siemens, Philips, Infineon, Emerson, TU Delft, The University of Brno and The Fraunhofer Institut in Erlangen.

Current: What will E-T-A's contribution be?

Dr. Frank Gerdinand: E-T-A GmbH is responsible for designing intelligent DC switching systems and the protection concept of the power distribution systems. This requires the design of current-limiting, communication-capable switching devices, fault detection systems (e.g. AFD) and diagnostic systems for HVDC.

Current: Thank you for your time.

Jeremy Seah



In May 2012 Jeremy Seah became Area Director Asia Pacific and has since then been responsible for E-T-A's sales activities in Asia and Australia. Jeremy is a

graduated electrical Engineer and, after finishing his studies, worked for a number of international companies including: Eaton, Ingersoll Rand and ABB. Through his education and past experience, he brings a wealth of knowledge to E-T-A in terms of strategic planning, sales and marketing, human resources management and budgeting.

As the Area Director of E-T-A Asia Pacific, Jeremy will focus on customer service and support in Asia Pacific, covering a great number of industries including automation and process control, electronics, marine applications, mining, telecommunications and others. He is leading a comprehensive sales network in the Asia-Pacific region and his major goal is to expand on the existing customer base by winning new customers and new projects and to increase E-T-A's market share in his territory.

Andreas Trampenau



Andreas joined E-T-A in October 2011 and is a member of the German sales force. Since he started working for E-T-A, he has already acquired a number

of new responsibilities and sales regions. Andreas now focuses on mechanical engineering, the automotive industry and the solar power industry, which has recently undergone considerable restructuring.

Andreas is a graduated Engineer for electronic components and, prior to joining E-T-A, operated a nearly identical sales territory for Weidmüller for many years. Based in his home office in Chemnitz, he will work on expanding the customer base and maintaining relationships with his existing customers – all of which will support him and E-T-A achieve sustained business success.

Alexander Nikiforov



In 2006 E-T-A decided to develop the market in Russia by establishing a representative office there to provide local customer service in this strategically important market.

Alexander Nikiforov was hired to attend to E-T-A customers not only in Moscow, where the office is located, but the entire Russian Federation.

Alexander has a doctoral degree in electrical engineering. Ever since the foundation in 2006, he has achieved an annual growth. Together with local partners he serves renowned companies from the transportation industry, the power plant sector and aerospace. On 1 June 2012 Alexander became the Head of the Russian Representative Office.



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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How does resistance change with impurity layers on the contact point?

If the micro contact point is covered by a thin impurity layer (see fig. in FAQ Current 1/2013), the following is valid for the impurity layer resistance R_F :

$$R_F = \frac{\sigma}{\pi \cdot a^2}$$

σ is an empirical property called skin resistance or specific tunnel resistance (reference value $\approx 4 \times 10^{-12} \Omega m^2$). Organic impurity layers have semi-conductive properties, therefore – though isolating – electrons can “tunnel” from one side to the other.

What is the cause of impurity layers?

Impurity layers can be caused by impurities in the air or by particles on the contact surfaces (production process, friction in a switching device, corrosion). One can basically distinguish between inorganic corrosion layers and organic polymeric layers.

What can we do to avoid formation of an impurity layer on the contact point?

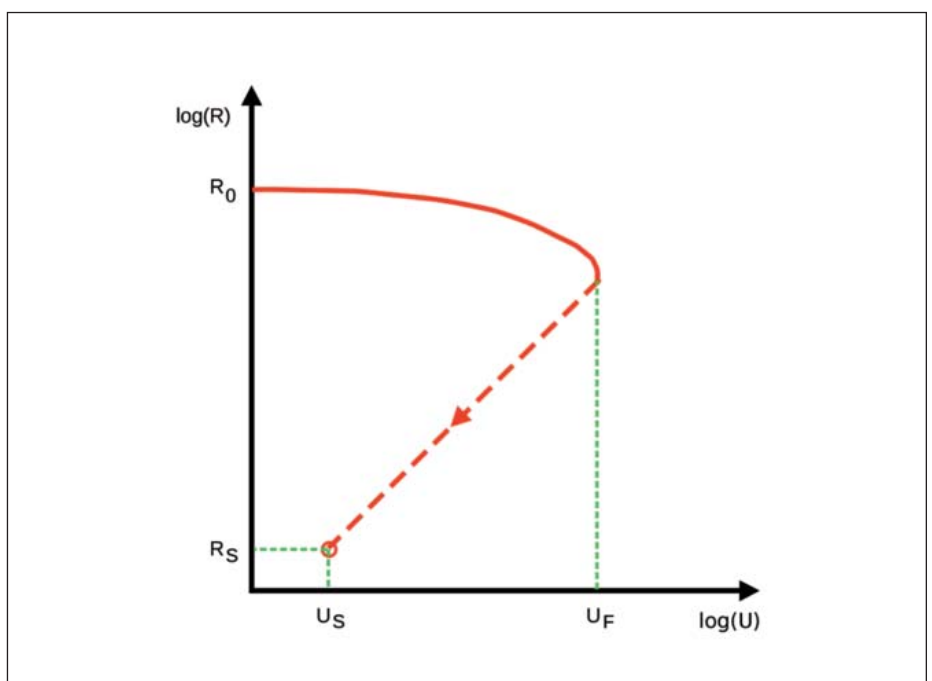
Generally switching devices should be stored in clean rooms which are not exposed to extreme changes in temperature or humidity. Air-conditioned rooms are preferable if at all possible. At any rate, mechanical switching devices must be stored in the closed condition as the a-spots are then hermetically sealed by the contact force and will therefore stay metallurgically clean.

What can we do to destroy possible impurity layers?

Impurity layers can be destroyed mechanically by contact dynamics, i.e. by tangential pushing movements and/or vertical pressing movements of the contact pieces during closing. Almost all E-T-A circuit breakers show this design characteristic. If products are put in the inventory for a longer period of time, they should be operated a few times without electrical load before using them in the intended application.

No fretting about “fritting”

Inorganic coating may additionally cause a process usually called fritting. With a low voltage applied across contaminated contacts, the resistance value will at first be very high. If the voltage is slowly increased, the resistance will slowly decrease. At a certain voltage, depending on the type and thickness of the contamination, the resistance will suddenly break down to a constant residual value. This phenomenon is called fritting (see illustration).



Fritting on a contaminated contact, resistance-voltage-curve $R(U)$

Energy saving made easy

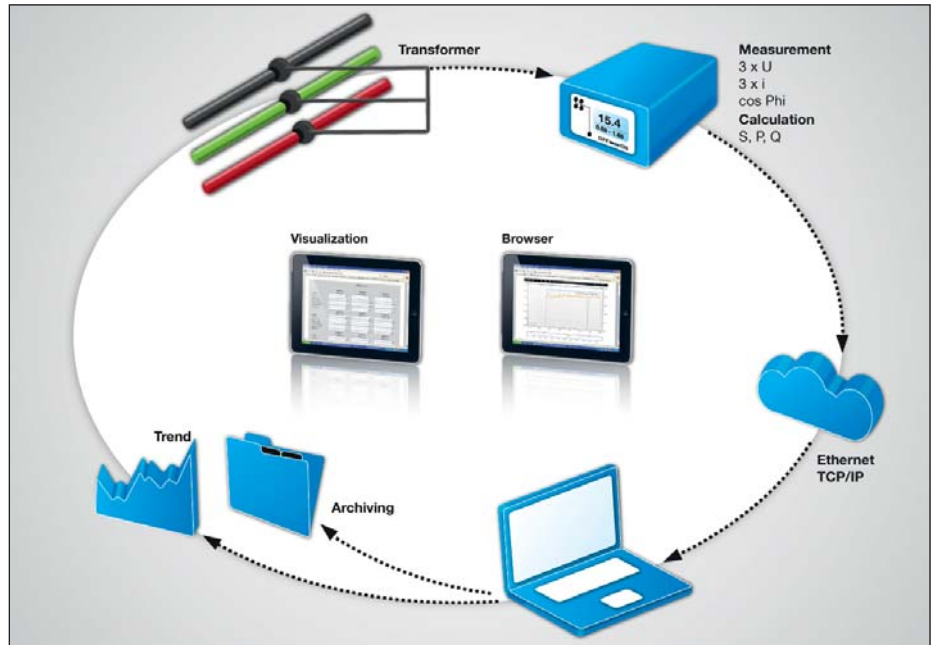
Energy data logging in modular power distribution systems



Dieter Arenz,
Head of the Division
Communication
& Systems at E-T-A

Saving energy is a relevant topic that concerns each and every one of us. Rising energy costs and steadily increasing power consumption requires immediate action. E-T-A was recently requested to design a straightforward, cost-effective

model for recording data consumption independent from other existing automation solutions.



Data logging and evaluation in a single unit

Plug-and-play for existing and new plants

Electrical power consumption is frequently the centre of attention when it comes to energy consumption recording. Corresponding measurements must be tracked and analyzed to identify where the major consumption areas are.

This is the ideal application for E-T-A's intelligent **Power-D-Box**[®]. As a genuine plug-and-play solution, it offers all functions required for data logging, saving and visualization as a modular system component, or in a 19" rack.

A ring core transformer is mounted upstream of the circuit for measurement and the intelligent **Power-D-Box**[®] provides the evaluation. Based on the recorded data, consumption values are calculated as active, reactive and apparent power. All values are stored and processed for visualisation. To eliminate the need for additional software recorded data can also be forwarded through a standard web browser for further processing.



Intelligent Power-D-Box

In addition to logging and analyzing data the intelligent **Power-D-Box**[®], in connection with other system components in the E-T-A product range, provides load protection and power distribution. This all-in-one **Power-D-Box**[®] solution allows customers to efficiently meet the power management challenges of today and into the future!

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: Photovoltaic distribution boxes
E-T-A Type: PVSEC-...

For more than 100 years, Günther Spelsberg GmbH & Co. KG located in Schalksmühle, Germany, has been a major manufacturer of electrical installation material. They design and produce reliable and easy-to-install products such as junction and tapping boxes, small distribution boxes and versatile enclosure series as well as solutions for photovoltaic applications and maintenance of electrical performance in the event of fire.

Spelsberg's "PV Lifeline" product line, uses E-T-A's PVSEC... Fire Fighter Switch - which consists of a user unit (PVLE box) and a generator connection box with an integrated fire fighter switch. In the event of a fire, fire fighters can disconnect the current of the photovoltaic system with a flick of the wrist.



Application: Air Conditioning Systems for Buses
E-T-A Type: 2-5700

Coachair (formerly known as Sigma Coachair) is one of the world's leading manufacturers of air conditioning systems for coaches. Their headquarter location is in Sydney, Australia, while manufacturing and R&D were transferred to Kuala Lumpur in Malaysia.

For many years, Coachair has used E-T-A's 2-5700-IG1-K10-DD for overload and short circuit protection of the fan and the control board of its air conditioning systems.

The 2-5700 serves as a protective element and also acts as an ON/OFF switch which helps to reliably disconnect the system for maintenance and service purposes.

Additionally, using this breaker has reduced the need for keeping spares which is an important criterion for precise sizing of cable cross sections without the need of upsizing.



Applications

Application: UPS (Uninterrupted Power Supply)

E-T-A Type: 482, 4120

Advanced Technological Systems International (ATSI) specialises in the design and production of some of the most advanced power supply systems, particularly for use in very rugged conditions and at extreme temperatures. The ATSI RMHCPU-20 mains/battery critical power supply, a high power DC uninterruptible power supply (UPS), is one example of their capability. Designed for use in aggressive terrains, the UPS is contained within a 25 mm rugged armoured aluminium housing. The core design philosophy was to use only the very best components available on the market. To meet that objective, ATSI approached E-T-A Circuit Breakers for advice on specifying the ideal

high-performance circuit breakers for the conditions in which the units would be operating. To protect the UPS, and the mission critical equipment it is powering, from power surges the AC input, the DC generated input and the DC output are each protected by E-T-A's well proven and reliable circuit breakers for equipment (CBEs). The inputs are each protected by an E-T-A 482 CBE: the DC input uses a 50A version and the AC input uses a special order 15A AC version. The DC output is protected by a 20A E-T-A 4120 CBE.



Application: Floor Cleaners

E-T-A Type: 4130

For more than 80 years G. Staehle GmbH & Co KG, a family owned company, has designed and manufactured floor care cleaning equipment for professional use. Its equipment, commercially branded under Columbus, provides innovative cleaning machinery for professional house cleaners including: wet and dry vacuum cleaners, sweepers and single disk machines as well as spray extraction machines and automatic cleaners. Staehle uses E-T-A's robust and well-proven 50A 4130 high performance circuit breaker to protect the power nozzles on its ARA 80/BM100 ride-on sweepers. After a trip occurs due to a motor blockage, unlike a standard fuse, the circuit breaker can quickly be reset and the equipment is immediately available for use.



New low-cost circuit breakers for equipment applications

For many years the 1658 single pole resettable circuit breaker has been one of E-T-A's top sellers in its entire product offering. Major applications of the compact and robust circuit breaker are household, hobby and gardening equipment as well as professional tools and medical equipment, e.g. oxygen concentrators for long-term ambulant treatment.

Those who specify E-T-A's 1658 can easily and quickly reset the circuit breaker after tripping due to an overcurrent. The ability for the circuit breaker to be reset eliminates the lengthy and tedious process of replacing fuses so many engineers have come to know in the industry.

A new family member

The 1658 recently gained two new additions to the product family: the 1657 and 1659. The 1657 is slightly more compact than the 1658 making it suitable for applications with limited space availability. The 1659, on the other hand, is a bit bigger than the 1658 but features a wider range of current ratings. All three products are economically designed with a disk-type bimetal tripping element – which makes them ideal for high volume price-sensitive applications.

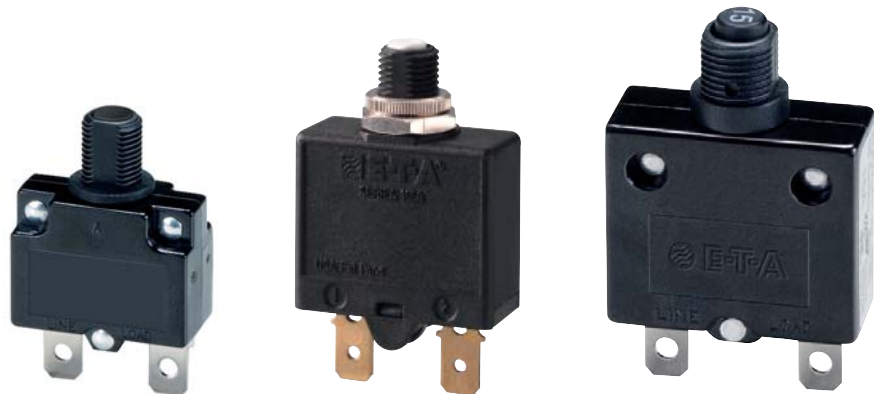
Typical application:

The 1658 in Ghibli Ride-on Scrubber Driers

For almost 10 years Ghibli SpA, a medium-sized manufacturer of professional cleaning machines located in Dorno (Lombardy), has used E-T-A's 1658 to protect the brush motors of its scrubber driers. The design team identified a blocked brush, most commonly caused by particles becoming jammed in the power nozzle, as the most frequent reason for an overcurrent in this type of equipment. By incorporating



When it comes to overcurrent protection, the Italian manufacturer of cleaning machines Ghibli fully relies on E-T-A products.



Type 1657
Current rating range:
5...20 A

NEW

Type 1658
Current rating range:
5...30 A

Type 1659
Current rating range:
5...50 A

NEW

the 1658 into the application, when an overcurrent occurs the circuit breaker will trip and prevent the brush motor from being damaged. After the cause of the stoppage is identified and resolved, the 1658 can easily be reset by pushing the button and the scrubber drier is immediately ready to use.

Typically Italian: »Osso Buco alla Milanese«

Italian osso buco, made with veal shanks, is a traditional braised Italian dish. Osso buco literally means “bone with hole” because of the hollow bone going through the shanks.

A creamy risotto Milanese is the classic accompaniment, and with good reason: its flavor perfectly goes with the tender shanks.



Ossobuco alla Milanese: a typical dish from the North of Italy

Directions for the osso buco

Season the veal shanks well with salt and pepper, dredge through some flour and shake off any excess. Slit the shanks with a sharp knife all around and put the meat into hot butter (no oil please!) in a pan. Cook the meat on each side until well browned. Add chopped onion, diced carrot and lemon zest.

When the meat is brown, add a glass of white wine slowly in small quantities, saute until wine is gone. Add tomato paste and beef stock and simmer over low heat for approximately one hour, basting the meat every 15 minutes or so. Finally add chopped parsley.

Directions for the risotto

Arborio rice is ideal for this risotto recipe. It is a starchy and short-grained rice which helps to thicken the liquid and the grains remain – typically Italian – “al dente”.

For 4 servings take 240 g rice, a chopped onion and some oil and put it all into a hot pan. Stir briskly with a wooden spoon

so that the grains are coated with the oil. Now add the white wine and cook while stirring until the liquid is fully absorbed. Add saffron and chicken stock. When the rice appears almost dry, add another ladle of stock.

Simmer for approx. 15 minutes while constantly stirring. Whenever the liquid has been absorbed, add another ladle of stock. As it cooks, you will see that the rice will take on a creamy consistency as it begins to release its natural starches.

Leave the rice to stand for one minute and then add salt, pepper, 40 g cold butter and 100 g grated parmesan cheese.

Serve together with the osso buco.

Enjoy.

Ingredients (4 servings)

Osso buco

- 4 slices of veal shanks, each 1 – 2 inches thick
- 1 onion
- 1 carrot
- 1 lemon
- ½ cup chopped fresh parsley
- 1 cup dry white wine
- 1 ltr beef stock
- 1 teaspoon tomato paste
- salt, pepper, flour

Risotto

- 60 g rice (Arborio) per serving
- 1 onion
- 1 cup dry white wine
- chicken stock
- 0.5 g saffron
- grated parmesan cheese

