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## SPECIAL EDITION – PLUG CONNECTORS

Weeding out the counterfeits

Multi-Contact



STÄUBLI GROUP



An empty booth. Exhibitors who deliberately offer counterfeits have to be aware that their presence at exhibitions could be over sooner than they anticipate.

## A dangerous connection

**Plug connectors:** In the last few years, an increasing number of counterfeit plug connectors has appeared on the market. These counterfeits are not easy to recognize, but it pays off to be alert. The use of knock-offs can void the warranty and even cause a fire.

“Do you enjoy detective work, would like to live in Shanghai, and contribute to making photovoltaic systems safe? Then send us your application to become a member of our counterfeit team.” This could be the approximate wording of a job posting for TE Connectivity, formerly Tyco Electronics, a global manufacturer of junction boxes, solar cables, and plug connectors. It is the job of the counterfeit team, as TE Connectivity calls it, to detect counterfeit products from Asia. The team attends exhibitions and inspects prod-

uct samples, insertions, and brochures. Should the TE detectives find counterfeiters, they notify customs, law enforcement agencies, and law firms who ensure that the product pirates receive cease and desist orders or are prosecuted.

Not every manufacturer can afford a counterfeit team. However, many of the leading photovoltaic companies are faced with counterfeit products, especially plug connector manufacturers – above all, market leader Multi-Contact. Delivering cease and desist letters to other com-

panies at the Intersolar has become the norm for this manufacturer of MC3 and MC4 connectors. TE Connectivity’s attorneys also track down product pirates at the Intersolar. Established manufacturers try to protect their customers and plant operators this way, the attorneys point out. If customers and plant operators use counterfeit products, they risk voiding the warranty as well as reduced efficiency, short circuits, and fires.

## Imitation or pirate copy

For approximately six years, plug connector manufacturers have been faced with an increasing number of knock-off products. Solar expert Christian Keilholz has been following this trend. “Counterfeits and seemingly valid plug pairs are increasingly becoming a problem when it comes to photovoltaic plug connectors,” he confirms. He mentions that there are also counterfeit modules and substructures, but their occurrence is significantly lower.

Multi-Contact distinguishes between counterfeits, also called knock-offs or pirate copies, on the one hand, and imitations or permitted copies on the other hand. Counterfeits deliberately make customers believe that the product is original through the use of features such as the original name or logo. An imitation, on the other hand, may look very similar to the original, but is legal as long as the rights of the original manufacturer are not violated.

Attorney Ulrik Gollob from Munich, Germany, states: “Technically, copying is not prohibited per se. Only unfair copying is prohibited.” He explains that unfair copying involves a manufacturer violating the property rights of others, such as patents, utility models, designs, and trademarks, or a manufacturer violating the laws of fair competition through taking advantage of or damaging the reputation of another manufacturer, for example.

A company can apply for a patent for a new technical invention. According to the German Patent and Trade Mark Office, a patent grants the owner an exclusive right to the invention. The patent owner gains a geographically and temporally limited exclusive right to exploit his or her patent for a maximum of 20 years. Utility model protection is also available for technical inventions. In this case, however, it is registered without any prior review. The legitimacy is not verified until someone files a complaint. As such, utility model protection can be obtained more easily, faster, and at a lower cost than a patent. Utility model protection can be obtained for a maximum period of up to ten years.

In countries for which the manufacturer of the original has a patent or utility model protection, imitators are not allowed to advertise or sell their prod-



Photo: Multi-Contact

Examples from Multi-Contact: It is often quite difficult to distinguish counterfeits from originals. The company recommends verifying the authenticity of the products with the original manufacturer.

uct. Germany is the leading photovoltaic market and has a law against unfair competition. Needless to say that connector manufacturers are protecting their rights in Germany – if not through patents, then at least through utility model protection.

The goals of product pirates are obvious. They save research and development costs. They also profit from the reputation of the well-known manufacturer and can assume that the quality expectations associated with the original product through certificates, for instance, will transfer to their knock-offs. Product pirates further benefit from the already existing demand and thus save advertising costs – even more so when they can sell their products at a lower price due to inferior materials and workmanship, or when manufacturers of the original product do not have sufficient supply in times of booming markets.

Pirate copies are especially prevalent in China, but not only there,” says Matthias Mack, Key Account Manager for Photovoltaics at Multi-Contact. He estimates that 80 percent of counterfeits come from China, ten percent from Taiwan, and the remaining ten percent from other countries, including Western and Eastern European countries. Chris Büchling, Application Engineer at TE Connectivity, identifies Asia as the “core region” for counterfeits, but is also familiar with knock-offs from the Middle East and Europe.

When manufacturers become aware of pirate copies, they are required to take action. This applies especially to electrical products which pose high safety risks. “Loose plug connectors pose a significant safety hazard because the high contact resistance can cause a fire. In the case of overly tight plug connectors, the plastic sheaths can break, dangerously exposing

the contacts,” expert Keilholz cautions.

Short circuits, fires, as well as electric shocks caused by exposed cables are the main risks associated with counterfeit connectors. Since the plug connectors carry electricity, inadequate connections can also decrease the efficiency of a plant, leading to reduced revenue. Should the plant come to a standstill, these losses can add up to considerable amounts, especially for large plants.

## Danger caused by water

Water penetration presents another risk. Through capillary action, it is possible for the water to move inside the cable toward the junction box. As a result, the module can fail or a short circuit or ground fault can be caused. Small amounts of liquid are referred to as moisture, which can lead to corrosion of the metal in the plug connector. Another risk is that the plastic or the metal of the original product are not compatible with the materials of the counterfeit product. “This can lead to undesired reactions up to and including signs of disintegration,” Büchling from TE Connectivity states. In summary, this means that pirate copies often do not have the characteristic properties of photovoltaic plug connectors. High-quality connectors are characterized by low electrical resistance, high water tightness, and very high durability.

## Plug compatibility

So-called “plug compatible” connectors also pose risks. These do not only include counterfeits and imitations, but also connectors which do not look similar to the original, but can still be plugged together with the original. Market leaders such as Multi-Contact and TE Connectivity strongly advise that their products must not be paired with third-party products, even if competitors label their



Multi-Contact acts immediately when counterfeits of their own connectors are detected at exhibitions. Once the culprit has been caught, all counterfeits have to be removed.

products as “plug compatible.” “Just because something fits together does not mean that it will actually work together,” Büchling states. Mack from Multi-Contact agrees. “Plug compatibility does not exist, at least not across different manufacturers,” he says.

Each plug connector has its own mating face and manufacturing tolerances which are very exact and can therefore only be achieved by the respective manufacturer. If the two parts of a plug connector pair do not fit perfectly together, as is the case with original products, it can lead to secondary damages. Büchling experienced such a case last year with a plant near the coast. The large plant had been connected for two years. After a year and a half, many of the supposedly plug compatible connectors, which the installer had attached to the ends of the module strings, were leaky. “They worked from an electrical standpoint. However, water and salty air were able to enter, which is why the metal corroded,” Büchling states. The plant came to a standstill and had to be retrofitted accordingly.

Manufacturers often face the accusation that their exclusion clauses make it hard for competitors to compete on a level playing field. Plant operators are therefore well advised to be aware of the importance of plug connectors for the electrical safety of a photovoltaic plant. Solar expert Keilholz agrees. “This is even more

relevant for outdoor plants because the plug connectors are exposed to weather conditions, are subject to long operating times, and can hardly be inspected. If a module manufacturer or installer uses counterfeits or supposedly plug compatible systems, they risk voiding the warranty. Multi-Contact therefore explicitly states: “Multi-Contact does not assume liability for unauthorized plug combinations with third-party products.” Therefore, the certifications which certain imitators advertise are misleading. It is true that testing institutes test cross connections, such as the combination with MC plugs. Herbert Becker from TÜV Rheinland explains, however, that certifications are only performed with the consent of both parties. Then the products need to pass all tests listed in European Standard EN 50521, Becker continues. However, TÜV Rheinland also offers specific tests just for the contact ability of cross connections, which do not include all tests required by the European Standard. “This, however, is not a certification, only a test,” Becker says. “It includes a test report that outlines which tests were passed. Not more and not less. It does not state that compatibility has been established.”

It is often difficult to detect knock-offs. “Counterfeits are characterized by the fact that they cannot easily be distinguished,” Mack says. Therefore, those

who know the original well are better off. Consequently, a customer can become suspicious due to a different feel or visual appearance of a product, for example when the plastic feels different or the black color of the plastic is more matte or shinier than the original. Poor workmanship can also be an indication, such as sharp edges or rounded corners. Other signs could be the logo or the traceability code, which is a sequence of letters and digits based on which the manufacturer can trace the production line of the connector. The pattern is always the same. In case of a legitimate suspicion, the manufacturer can achieve certainty through individual examinations.

### Recognizing knock-offs

This involves a look in the interior of a connector. The manufacturer checks whether its characteristic product features are indeed included. After all, production-related characteristics which consumers can recognize, but are difficult to imitate, offer the best protection against pirate copies for plug connector manufacturers.

For TE Connectivity, these characteristics are so-called 2-K materials. These are components which consist of two parts, but are manufactured simultaneously in one tool. One such component is the pinch ring in the Solarlok connector. A pinch ring is designed for strain relief of the cable and is combined with a seal against dust and water. “Furthermore, the machined, silver-plated contact is easy to distinguish from similar products as far as visual appearance and processability,” Büchling says. In TE’s connectors, the litz wire is being plugged into the contact rather than being inserted, Büchling explains. Therefore, when using crimping pliers, a craftsman would notice if something was wrong. The crimping pliers fit perfectly for TE contacts and connectors, but not for third-party products.

Multi-Contact counts on the MC-Multilam in the interior of the connector. The Multilam consists of numerous louvers. Each louver forms an independent current bridge with constant contact force and contact resistance. The Multilam is designed to increase the production capacity of a plant. According to Mack, only his company possesses the know-how to manufacture this component.

## Responsibilities of the installer

Consumers whose systems contain counterfeit or supposedly plug compatible connectors are entitled to the originals, as long as they were guaranteed in the sales contract. The installer has to take care of the exchange, which means that he has to pay for his trip to and from the customer, provide the materials, exchange the connectors, and compensate the customer for the loss in revenue.

Neither Multi-Contact nor TE Connectivity want to allege that installers deliberately use pirate copies. They see rather a need for education among this customer group. Matthias Mack from Multi-Contact estimates that the cost of a counterfeit product is approximately two-thirds of the typical market price. In the case of a rooftop system with a capacity of five to seven kilowatts, an installer could therefore save about 15 to 20 Euros. For this amount of money, an installer would not knowingly take the risk, Mack opines. Büchling also believes most installers in fact use counterfeits due to ignorance.

Pirate copies are consequently a much bigger problem for module manufacturers who use larger amounts. However, in Matthias Mack's opinion, these manufacturers "tend to be more aware." He attributes this to the awareness training provided by market leaders who conduct onsite trainings for module manufacturers and distributors, for instance. Expert Keilholz is less sympathetic. "Apparently many companies want to save every cent possible and are not aware of the consequences," he criticizes the increasing use of counterfeits and seemingly valid plug pairs.

To answer the question how customers can protect themselves, Mack advises "to go through life with your eyes open" and inquire whether the products are indeed original. Büchling emphasizes that consumers should only purchase from authorized distribution partners. In Germany, for example, there are only two distributors allowed to sell Solarlok plug connectors. In Europe, there are 20 altogether. In addition, TE Connectivity sells their product line through international catalogue distributors RS and Farnell. Büchling further states that customers can also safely purchase from well-known system vendors. "When you start purchasing online, that is when it becomes dangerous."

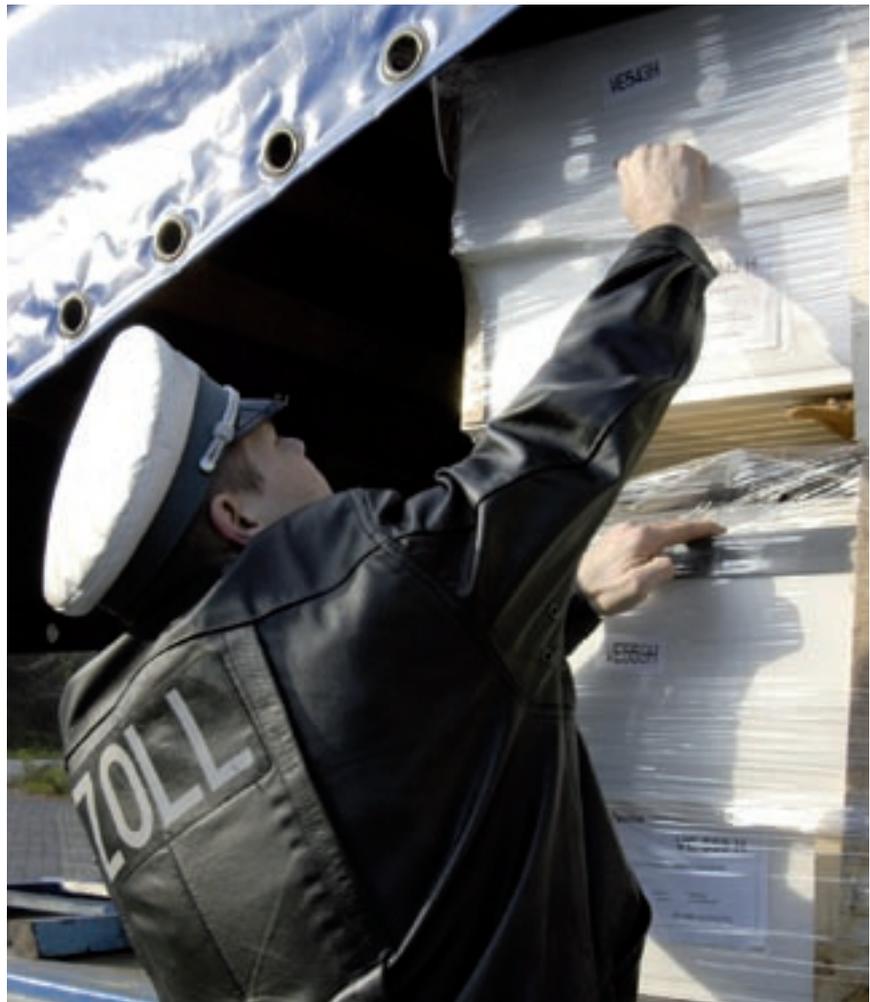


Photo: Zoll Deutschland

If product piracy is suspected, customs has to investigate and secure possible counterfeits.

In order to protect consumers, manufacturers have to observe the market and act immediately once they detect counterfeits. At exhibitions, for instance, this means that the manufacturer of the original has to request that the product pirates remove the counterfeit product samples and any related promotional material. "You have to give companies a chance to correct their offense on their own," states Serge Bosshard who is in charge of counterfeits at Multi-Contact. He explains that a company has three hours to do this.

Therefore, the first day of an exhibition is the most important day for the attorneys of the plug connector manufacturers. They search the halls for counterfeits, collect evidence, and advise the vendors of their offense. Should the vendors refuse to act accordingly, the next step is a cease and desist order. Through summary proceedings, the manufacturer of the original requests the issuance of a preliminary injunction from the district court, which is delivered by a bailiff at the

exhibition. The competitor then has to remove the respective products from their booth, but can continue to exhibit their other products.

Four Chinese companies had to deal with Multi-Contact at this year's Intersolar. "Two of them removed the products from their booths themselves. In the case of the other two companies, the regional court in Munich first had to issue a preliminary injunction and the bailiff had to confirm delivery of the document," Bosshard reports. His job also includes visiting the companies to whom he delivered cease and desist orders in previous years.

"They have learned something. They did not exhibit the copies again," he states happily. Nevertheless, he is not optimistic just because of this. "The number of counterfeits is not decreasing, but rather increasing." Given this, Multi-Contact is currently considering whether to send two observers to the exhibition next year. ♦ Ina Röpcke



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