



Avoid-cross-mating

# Well connected

PES was delighted to speak to Guido Volberg, Senior Consultant Product Regulatory Affairs, at Stäubli Renewable Energy to find out more about the issues and challenges the PV industry is facing in terms of misinterpretation of test reports and false expectations regarding compatibility.

**PES:** Thank you for taking the time to speak with us Guido. We first spoke shortly after you joined Stäubli in 2020. How have things been progressing for you and the company since then?

**Guido Volberg:** Personally, things have been very interesting since joining Stäubli. The

renewable energy sector is progressing quite fast and particularly in the PV industry, the market development pace is very high. On the one hand, we are seeing the emergence of new names and, on the other, the strengthening of existing players.

Stäubli Renewable Energy is more than ever

committed to keeping up with this dynamic and is motivated to be a farsighted partner. Many things are happening in the regulatory area in particular, where we are very actively involved. Not least in order to fulfill our responsibility as the market leader for PV connectors.



**that could be problematic or even unsafe do you think?**

**GV:** We note that there is an expectation among market participants regarding the compatibility of connectors from different manufacturers. Another factor also plays a role here. The Stäubli MC4 PV connector was considered an industry standard by market participants after its market launch in 2002. But this is not correct. Because the MC4 is a protected trademark of Stäubli and not a definition in terms of design or technology. Unfortunately, there are also numerous copy cats in the market, which are technically and in terms of quality far less equal to our product design.

We also have to note that not all market participants are aware of the fact that the MC4 is not an industry standard and that there is no such thing as compatibility. Even though we have already done a lot of educational work in this regard in recent years. However, we must continue to intensify this work.

In addition, dangerous situations also arise when PV connectors from different manufacturers are mated, just because it appears to fit. What is not considered in these situations, is e.g. the functionality of the contact technology on the inside or the mutual influence of different plastic or metal alloys materials that cannot be seen.

So, to summarize, yes, there are shortcuts that can cause unsafe situations in PV plants.

**PES:** As you mention, one quite common error is the cross-mating of PV connectors from different manufacturers. Why is this a problem and what's the risk?

**GV:** I would like to briefly remind readers that the pluggable connection in a PV plant is expected to last reliably for more than 25 years. And these small PV connectors are transmitting very high currents and high voltages. Therefore, it is important that all elements of the plug and socket perfectly match and are designed for each other, to ensure constant low contact resistance.

On one hand, we can look at the outside where we have elements such as the insulation and the plug face. On the other hand, we have to consider the inside, where we have the metal parts of the contact technology. But as I mentioned, it cannot be assumed that what looks like a match from the outside will also be a seamless and reliable match on the inside.

This might cause technical issues, failures of connectors, loss of performance, downtimes of strings that connect the modules, and even downtimes of arrays and plants. The worst case is fire damaging the entire system, the environment, nature and also humans.

**PES:** As well as the potential for connector failures, power loss and the safety hazard, cross-mating could also have a negative impact on the return on investment and the

**cost of electricity (LCoE), is that right?**

**GV:** Definitely. Before a connector drops out, the contact resistance on the power carrying parts increases and the performance decreases. The operator will need time to go onsite and detect why there is a loss and where it occurred. The defective connection needs to be replaced. This is time consuming and the operator faces unexpected costs on top of missing revenue due to reduced performance. There might even be legal costs when it comes to clarifying liability regarding severe hazards and performance losses.

**PES:** Are there not test institutes commissioned to check combinations of PV connectors of different brands though?

**GV:** Yes, you are right, there are. But what standards are these tests based on? There isn't any standard for the testing of the combination of connectors of different manufacturers. These types of tests are solely being done based on the requirements by the commissioning customer. And by the way, if there was a technical compatibility of PV connectors, the respective products would need to be designed completely differently and would be much more expensive.

**PES:** And can these tests be relied on?

**GV:** No, because such one-time analysis is performed only on individual samples and such a test report from individual test results is not a certificate. It only describes the actual condition of the present sample.

As a consequence, it is misleading and dangerous to conclude based on such individual test reports a safe and long-term operation regarding the combination of PV connectors from different manufacturers in a PV system.

Besides the international established technical report IEC TR 63225, there are many other international studies showing that cross-mating different connector brands hugely increases the technical, but also legal risks in the PV plant.



Guido Volberg

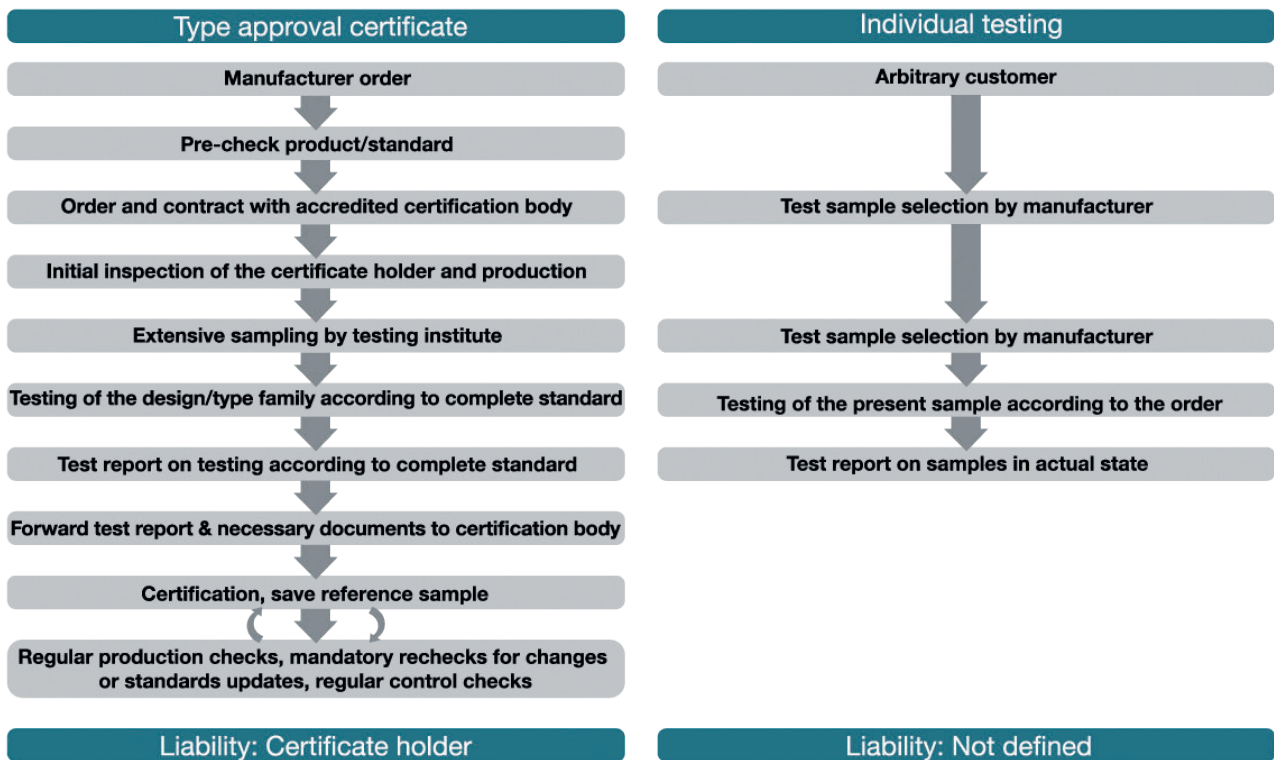
**PES:** So, for Stäubli the focus is on electrical connectors for the solar industry, of course. As the PV market grows, is it a concern that there remain no established standards for connector design and technology in the field of photovoltaic?

**GV:** We have established standards in the PV industry, product standards such as IEC 62852:2014 + A1:2020 or UL6703 and installation standards IEC 62548 or IEC 60364-7-712. These standards were written for connectors of the same type or type family from one manufacturer. They refer to the tested connection of socket and plug within a type family and not to the respective individual parts of a connector.

So, based on these existing standards the notified bodies or accredited certification institutes are signaling the tested and certified safety and quality of a type series of products for long-lasting operation in a PV plant.

**PES:** What challenges do you see this presenting? Are shortcuts being taken





The difference between type approval certificate and individual testing

There are internationally recognized type approval certificates that are issued by accredited certification institutes or notified bodies. These certificates report the tested safety and quality of an entire type series. They include, beside the safety tests, a vast range of other aspects that are inspected, such as the production process, the handling of the respective raw materials and also the quality management of the respective manufacturer.

This comprehensive testing is repeated at regular intervals and is performed on extensive sample quantities, usually selected by the expert of the institute. This procedure ensures a consistent quality of the products.

There is a difference between a type approval or design certificate and an individual test report as shown in the table above.

**PES: Are these individual tests open to misinterpretation that PV connectors of different manufacturers would be a safe and long-term connection?**

**GV:** The difference between the procedure for individual tests and type approval certificate is quite evident, that these individual tests can't make a statement on safe and reliable long-term performance. Basically, a reputable testing institute will make a clear statement about this in the test result. It should do everything possible to ensure that test reports on individual tests of cross-connections do not lead to false statements that are used deceptively or fraudulently.

However, sometimes we have the impression that such individual test results are misinterpreted on purpose.

**PES: And the testing institute isn't liable? Is it the installer who is ultimately responsible for damage and malfunctions?**

**GV:** Absolutely. The test institutes have noted a disclaimer and are not liable. The same goes for the manufacturer as its products are not being used as described in their intended use. A bankable manufacturer excludes the combination with third-party products.

**PES: Is there a legal risk involved in cross-mating too?**

**GV:** Ignorance does not protect from responsibility. The party who caused the damage can be held responsible. In fact, there have already been such legal cases highlighted in the media.

**PES: How can Stäubli assure its customers that its products are quality and worth investing in?**

**GV:** Stäubli has always and will continue to point out that the Stäubli MC4 PV connectors are not to be mated with connectors of different manufacturers. And further, there is only one original MC4 PV connector; MC4 is not a generic term.

As a bankable partner, we are absolutely committed to improving the safety of PV installations and we stick to the valid rules and standards. We will therefore continue to raise awareness and provide more active information through as many channels as possible.

**PES: How do you see this market developing over the next year or so? Do you think official standards will come?**

**GV:** The creation of such a product specification is a very demanding, complex task that has to take into account a wide variety of parties with diverting interests.

In addition, it is difficult to design in compatibility in all directions in the small size of a PV connector and to keep the costs for its production low. Just imagine, that a PV connector in general has to be designed and produced to transfer the high power and to withstand harsh environments outdoors, resist salt spray, high solar irradiation, strong rain and humidity, high temperatures and perform at altitudes sometimes over 200 m above sea level. All these challenges have to be considered. It is doubtful that bankable connector manufacturers would buy-in to such a concept.

Basically, if we manage to achieve more awareness that there is no compatibility for PV connectors, this aspect could be taken into account at the very beginning of a project, in the planning stage.

**PES: And for Stäubli in particular, what are your plans for the remainder of 2022?**

**GV:** Stäubli Renewable Energy can rely on more than 25 years of experience in the PV industry and will use this broad expertise to invest in product enhancements and the development of comprehensive product and service solutions. We will strengthen our partnerships in the PV industry and enhance our activities to create awareness for the importance of the small components in the PV system by addressing all levels involved in a PV project.

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