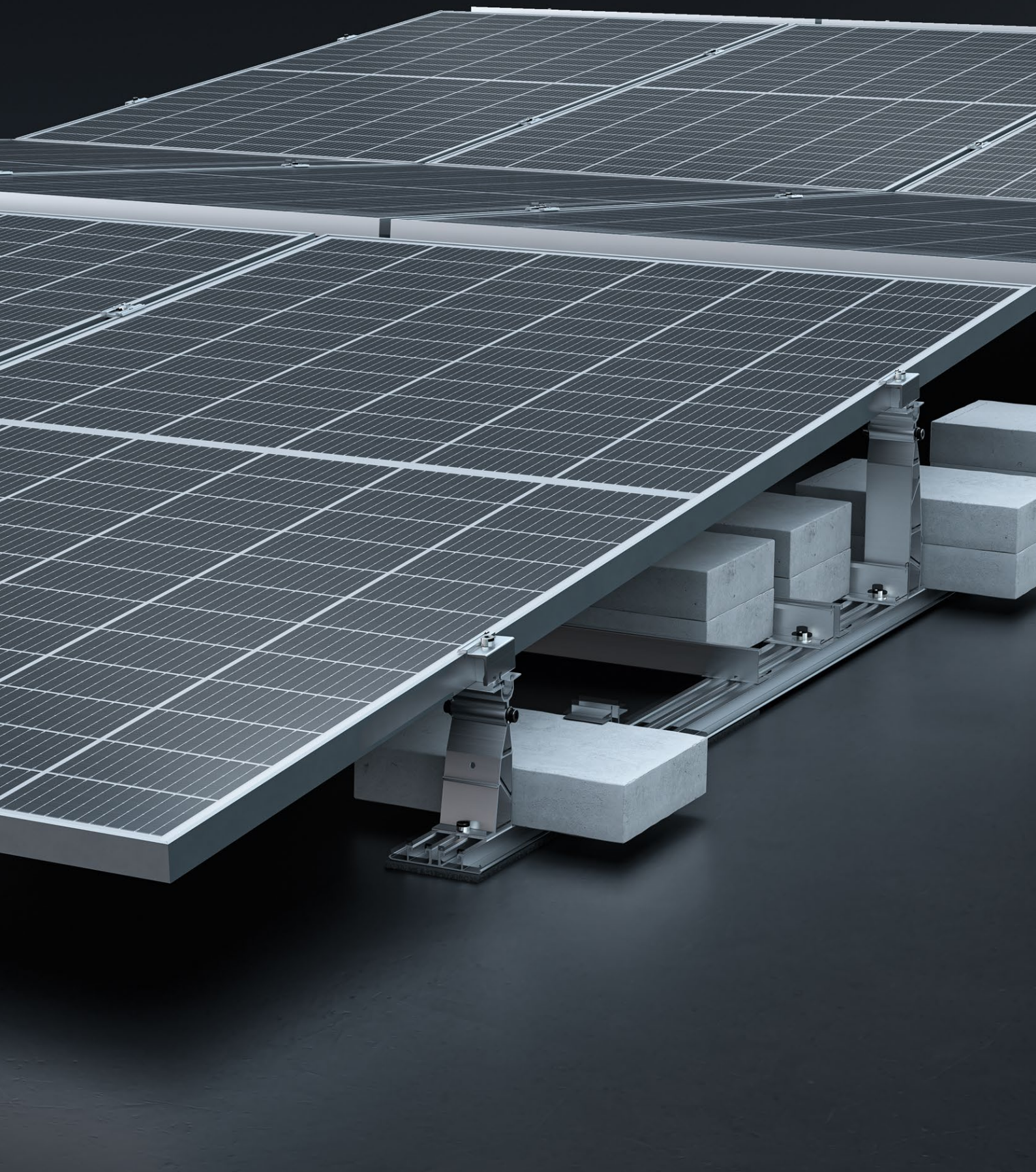
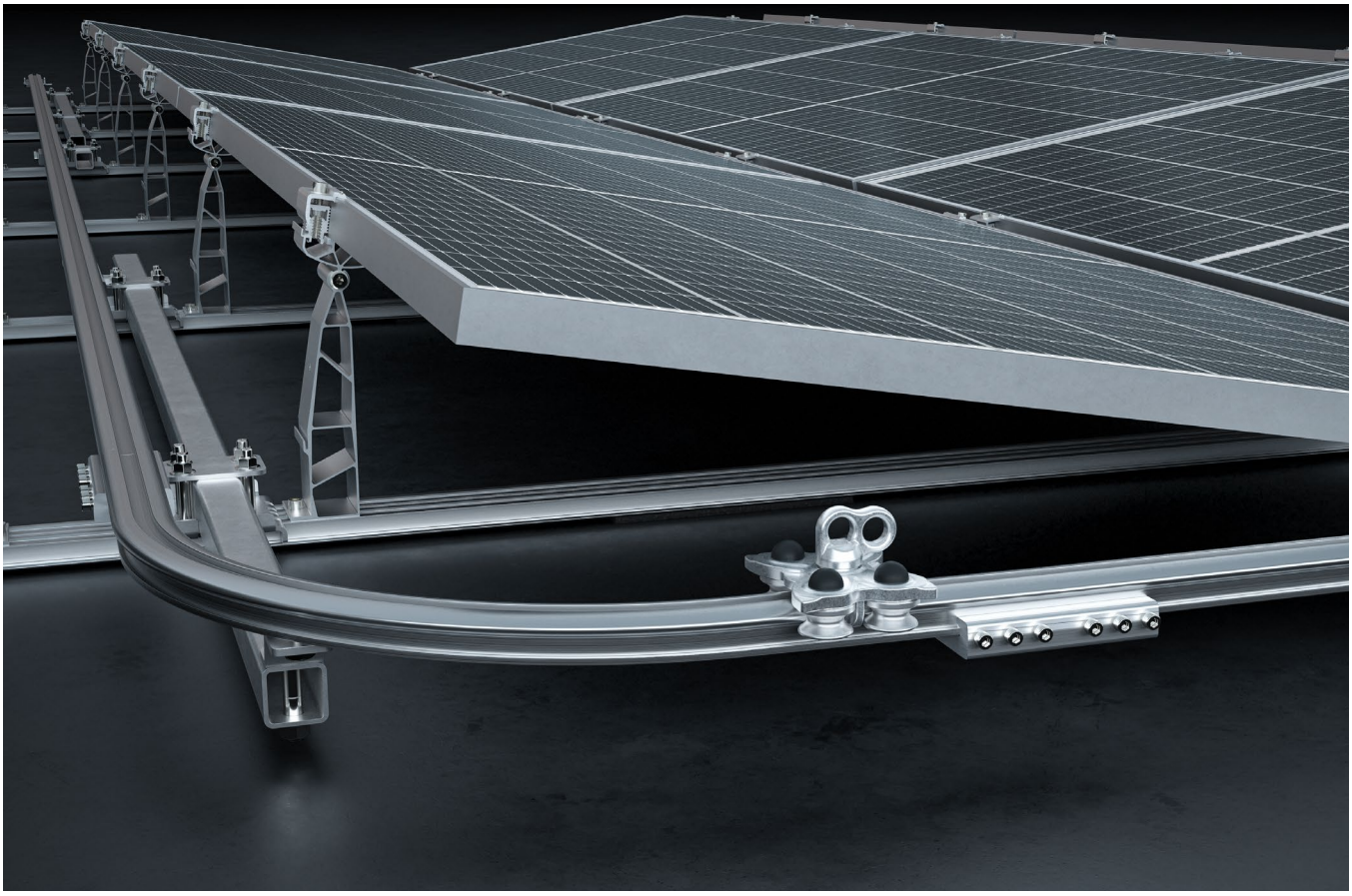


Raising the roof on reducing liability risks

If planners and installers do not install PV systems correctly and cause damage as a result, they can be personally liable. Many of them are not really even aware of their responsibility. European Construction Products Regulation 305-2011 sets the guidelines for most construction products, but there's no clear standard for PV systems on flat roofs. Instead, the EN 1090 standard is used, which covers the manufacture and installation of steel and aluminium structures. However, as the CE labeling alone is not sufficient for installers to pass on liability, they must provide a structural analysis certificate and ensure proper installation following the installation instructions and any ballasting plans. AEROCOMPACT, with its leading design software AEROTOOL, supports PV system planners and installers with best-in class planning. Its ongoing training programs make sure planners and installers are up to speed on all safety requirements.

Planners and installers of photovoltaic systems have a critical responsibility to ensure the safe installation and operation of these systems. The consequences of failing to meet these responsibilities can be severe, with the potential for both civil and criminal liability. If proper components aren't used, or if installation guidelines are not followed accurately, the risks increase substantially.

In the case of PV systems, especially those installed on rooftops, any negligence can result in severe consequences. If modules or other components are not secured properly, they can fall, leading to significant property damage and, more alarmingly, personal injury. To mitigate these risks, installers must adhere to strict guidelines and industry standards. This includes ensuring that all components are certified and comply with relevant safety regulations, conducting thorough structural analyses, and following all installation instructions. Properly training personnel in safety practices, including fall protection and lightning



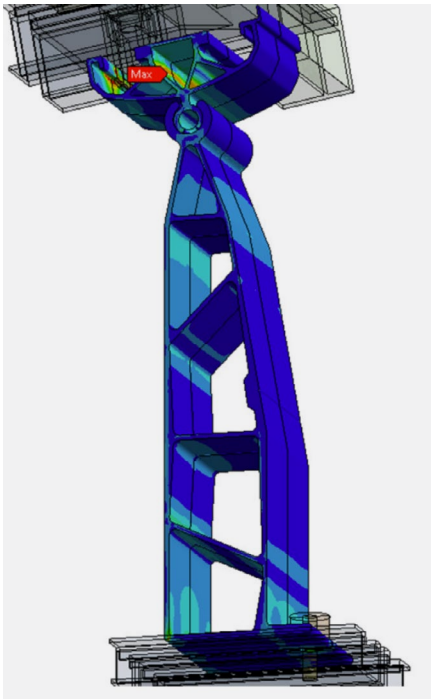
System-integrated fall protection with AEROTOOL's rail based PV mounting system SN2 for flat roofs

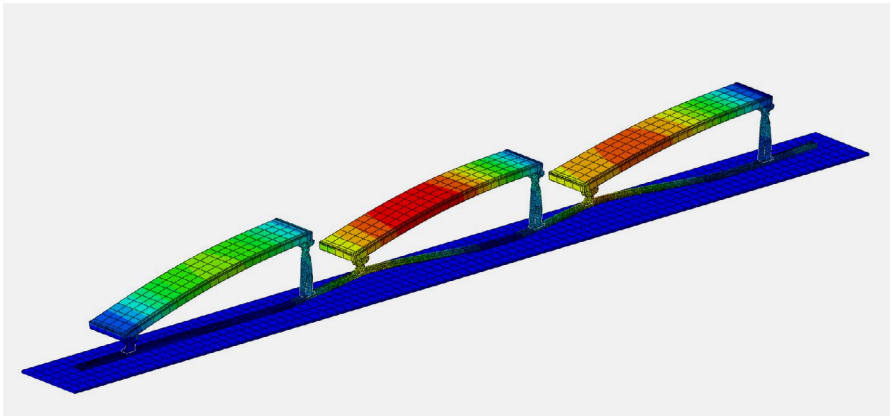
protection, is also crucial to prevent accidents.

Given the serious consequences of negligence in PV system installation, planning companies and installers must remain vigilant in following all safety protocols and regulatory requirements to protect both property and people.

When construction products are placed on the market, the process is regulated by the European Construction Products Regulation 305-2011, which specifies essential characteristics in harmonised standards. However, as there is currently no harmonised standard for photovoltaic systems on flat roofs, the EN 1090 standard is used, which regulates the manufacture and installation of steel and aluminium structures. On the basis of this standard, every manufacturer must provide a declaration of performance and label the product with the CE mark before placing it on the market.

However, CE labelling alone is not sufficient for installers to pass on liability in the event of damage. They must also have a structural analysis certificate and prove that they have installed the solar power system correctly and followed the installation instructions and any ballasting plans.





AEROCOMPACT also uses also the finite element method (FEM) to simulate the physical behaviour of its products and optimise their mechanical strength

Planning solar projects with AEROCOMPACT's leading digital engineering software AEROTOOL

Damage due to incorrect default settings

The problem with this is that, particularly for residential buildings, planning is not carried out anew each time, but the installation is always carried out in the same way. Reputable solar engineers and installation companies use a PV planning tool for each system, which, if the planning parameters are entered conscientiously, provides all the information required for installation and generates a structural analysis that can be taken from the project report.

In practice, however, many planners accept the default settings of the software or accept planning results that exceed the permissible utilisation of the components. This approach can lead to considerable damage, as many manufacturers dimension components with little margin for error, as weather events are becoming increasingly extreme and as the conditions on site can differ significantly in some cases. Planning software must take this into account and be operated correctly.

Cost optimisation matched with safety

For these reasons, AEROCOMPACT has set up an in-house research and standardisation department in Aachen, Germany, which is dedicated to applied research in the field of photovoltaic system statics.

The team works closely with AEROCOMPACT's in-house software department to continuously improve the AEROTOOL software. Compared to its competitors, AEROCOMPACTs engineers take a very consistent approach. Thanks to close collaboration between applied research and in-house software development, the company is able to strike an uncompromising balance between cost, optimisation and safety.

Check planning once again

The research results are first converted into mathematical algorithms. On this basis, the team then programs the optimiser, which works like a chess computer and further optimises the planning result for each specific project.

The optimiser not only takes into account different snow and wind loads, but also country-specific standards, building-related factors and load-bearing capacities. Depending on the ballast, static verifications, wind and snow loads etc., the AEROTOOL then selects the appropriate components in a modular and cost-optimised manner.

The PV plannings are then checked. For this purpose, AEROCOMPACT has set up its own 'Verification Engineering' department. The verification engineers are part of the software development process and are responsible for approving the defined statics in the software's programmed code.

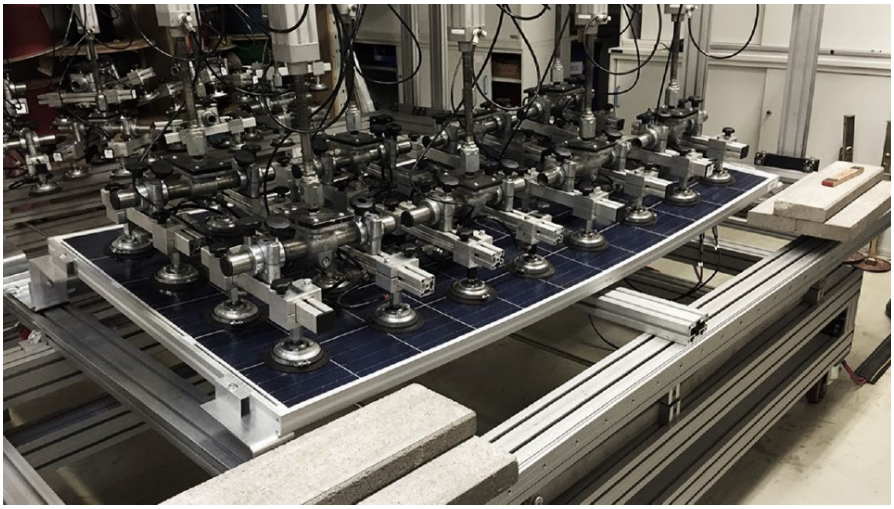
On this basis, the software quality department programmes the test automation, which automatically checks and ensures the validity of the static application every night. Every newly implemented feature is checked by this unique test automation.

Prepared for everything

AEROCOMPACT's aim is to cover all eventualities. To ensure that this works, AEROCOMPACT regularly collects feedback from its customers. From this, it earns which requirements its customers are confronted with and defines further improvements to its own software on this basis.

Because the company is continuously developing AEROTOOL, planners have more options with this system. For example, they can split the loads in the event of a load limit and, if necessary, place additional anchors to further reduce the ballast.

The flat roof system SN2 from AEROCOMPACT alone has five different ballast positions. Because the software development department calculates the optimum solution for every situation, it is able to deliver competitive results without compromising on safety.



Training for software operation

However, the AEROTOOL also offers a wide range of setting options. This allows planners to optimise their design and plan a system even on difficult roofs or in challenging situations. In order to fulfil the complex requirements, AEROCOMPACT has set up a software support team available to customers at all times. In addition, new licence holders are given comprehensive onboarding training.

Integrated lightning protection for optimum space utilisation

The external lightning protection is planned by specialised experts. However, the solar system should also be integrated. The manufacturers of the substructures ensure that the system is integrated into the lightning protection system and is capable of withstanding lightning currents. To integrate a PV plant into the lightning protection system, it must be able to withstand a current of 50,000 amperes. If air-termination rods are to be mounted directly on a substructure, the system must be capable of withstanding 100,000 amperes of lightning current. AEROCOMPACT has successfully tested its SN2 flat roof system for this requirement.

As the cross-sections of our system are more than sufficient and meet the requirements of the applicable lightning protection standard, no further modifications are required. The external lightning protection experts only need to create a connection from the mounting system to the existing lightning protection. They can do this easily and conveniently using a specially developed clamp and an aluminium wire or an equivalent clamp. However, the tightening torque of 10 Newton metres must be observed.

Protecting installers from falling

Another important issue is fall protection. This can be implemented in various ways, but must be effective. If it is integrated into the mounting system, the space on the roof can be better utilised. AEROCOMPACT works closely with Innotech from Austria to achieve this.

With this solution, installers and planners can choose between a rail-based and a cable-based version. While cable-based securing is cheaper, the rail-based version offers more flexibility. It is important that sufficient ballast, at least four modules or 600 to 800 kilograms per module field, is available. In the case of very low wind loads, additional ballasting would then be required if necessary. This prevents a person from falling to the ground.

Proper installation of PV systems is critical to avoid liability issues and ensure safety. AEROCOMPACT's AEROTOOL software and comprehensive training support planners and installers in achieving high-quality results with no compromise in safety.

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