Sonnenstrom mit System

IBC SOLAR AG

MOUNTING STRUCTURE DESIGN (AND FAULTS) AT PHOTOVOLTAIC SYSTEMS

© IBC SOLAR, Dieter Miener, 10.12.2020

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CV Dieter Miener

- Team leader Technical Applications Engineers at IBC SOLAR AG´s Solutions International department
- **Certified Surveyor for Photovoltaic Sytems (TÜV Rheinland)**
- Energy Efficiency Representive (TÜV Rheinland)
- IBC SOLAR´s international technical expertise since 2010
- Background in mechanical as well as electric engineering

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WHY IS THE MOUNTING STRUCTURE SO IMPORTANT?

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That´s why:

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That´s why:

Collapse of mounting structure due to high wind suction loads in corner area

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That´s why:

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That´s why:

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That´s why … and that´s the difference:

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WHAT MUST THE MOUNTING STRUCTURE PROVIDE?

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Requirements from perspective of installer :

- Short installation time
- Low number of components
- Wide operational range
- Safety
- Longlivety
- Low maintenance effort

- **The installer wants to have low costs**

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Requirements from perspective of planner:

- Fast planning and ordering process
- No effort or surcharge for statical calculations
- Freedom of module selection and arrangement
- Versatility for all kind of underground / substructure
- Legal backup of his planning results

- **The planner wants to have low costs but mainly**

SAFETY

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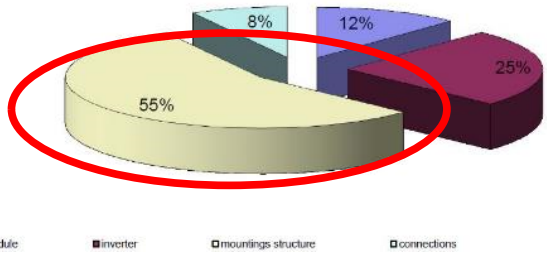
Costs vs. risks

- Percentage of mounting structure costs in PV system is rising with reduced module prices
  - 2010: 7 %
  - 2014: 15 %
  - 2020: **up to 30 %**

- **But the percentage of failure reasons in PV systems remains:**



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HOW CONVINCED WE ARE ABOUT OUR QUALITY?

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15 Years Combination Warranty

- Valid for IBC SOLAR labeled modules and mounting structures
- Uniqe backup for incidents caused by interaction of the components
- **You are safe for the major components of the PV system for 15 years!**

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WHAT THE DESIGNER AND INSTALLER HAS TO OBEY?

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What has to be obeyed?

- Despite today we are talking about mounting structures in particular, **TWO manuals** have to be obeyed always
  - **Manual of mounting structure**
  - **But manual of module too**
- **At products of different brands, instructions might be unclear or even contrary!**

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Typical faults

- Not every time the case is that clear:
  - „Warranty“ claim by Afghan customer because of module performance drop
  - Clamping done by washers only
  - **Warranty lost even for electric faults**
- **This certain case was especially easy for us, as no IBC SOLAR modules are in use but Suntechs…**

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Typical faults

The solar modules can be attached using clamps or alternatively directly on the assembly holes (position of assembly holes as shown on data sheet). If using assembly clamps, a surface pressure of 8.5–9.5 N/mm² must be maintained. We recommend using a clamp with 80 mm × 8 mm contact surface (IBC mounting clamp). The clamp screws (min. A2-70) should be tightened to approx. 15 Nm. Please do not damage the modules whilst doing this and ensure a proper connection between clamp and module.

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“Typical” faults

- No, a bullet impact is no warranty case…

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Typical faults

The solar modules can be attached using clamps or alternatively directly on the assembly holes (position of assembly holes as shown on data sheet). If using assembly clamps, a surface pressure of 8.5–9.5 N/mm² must be maintained. We recommend using a clamp with 80 mm × 8 mm contact surface (no C mounting clamps). The clamp screws (M8 A2-70) should be tightened to approx. 15 Nm. Please do not damage the modules whilst doing this and ensure a proper connection between clamp and module.

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“Typical” faults

- They are also not designed for operation or use in hazardous areas. These include, in particular, installations where the modules may come into contact with saltwater or where they could be partially or fully immersed in freshwater or saltwater e.g. on boats or buoys. The distance to the coast must be minimum 500 m. (For distances less than 500m, please contact IBC SOLAR AG)

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Typical faults

- Bridging of thermal gap

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“Typical” faults

s in-roof and other mounting systems for and minimal planning
ts. An in-roof solar PV system is ideal for a
ıvated roof as some of the cost of the
be offset against the saving from less roof
ir fitting time.

of mounting type is dependant on your roof
ıd your own personal preference but Segen
supply a top quality aluminium mounting
ı Schuco, one of the Europe’s leading
solar photovoltaic mounting equipment.

system installed onto a domestic property
/ be eligible for the feed-in tariff which is a
ich pays you for all the energy generated by your solar PV system irrespective of if you use that electricity

Advertisement for in-roof solutions…

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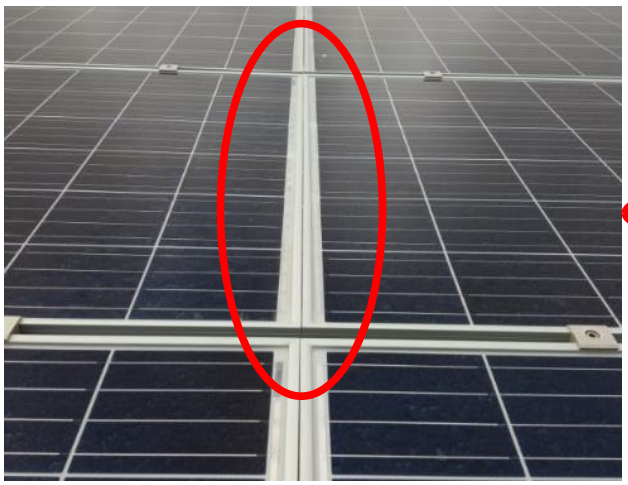
Typical faults



The distance between the individual modules must be at least 10 mm. linear expansion of the module frame, IBC SOLAR AG recommend between two modules to 20 mm.

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“Typical” faults

- Couldn´t find a manual for this one, sorry…

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Typical faults

nimum inclination angle of 5° in relation to horizontal. You
oo low as dirt can collect on the glass surface and become
n the module surface can cause shadowing on active solar
The maximum inclination angle must not exceed 75° in
refered inclination angel is on the afore mentioned range,

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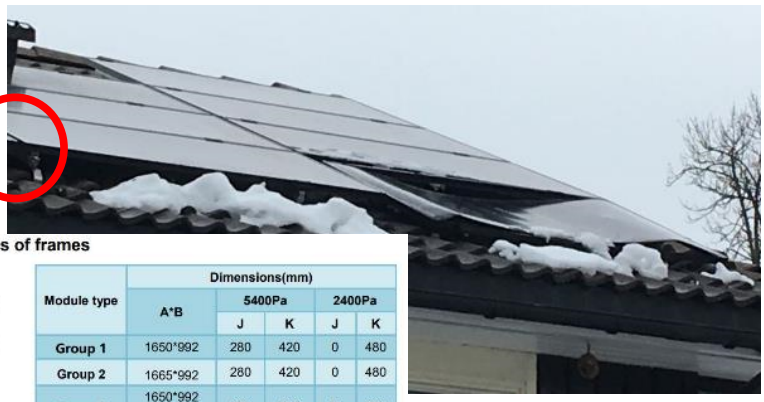
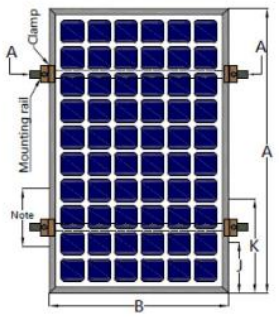
Typical faults



2.3.2.1 Fixation with clamps at long sides of frames



Module type	A*B	Dimensions(mm)			
		5400Pa		2400Pa	
		J	K	J	K
Group 1	1650*992	280	420	0	480
Group 2	1665*992	280	420	0	480
Group 3	1650*992 1665*1002	280	420	0	480
Group 4	1665*992 1684*1002	280	420	0	480
Group 5	1956*992	280	480	0	480
Group 6	1987*992	280	480	0	480
Group 7	1956*992 1979*1002	280	480	0	480
Group 8	1987*992	280	480	0	480

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Typical faults

- Sometimes even a third manual has to be obeyed!

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INDIVIDUAL APPROVAL:
ROOF HOOKS ON WOODEN ROOFS

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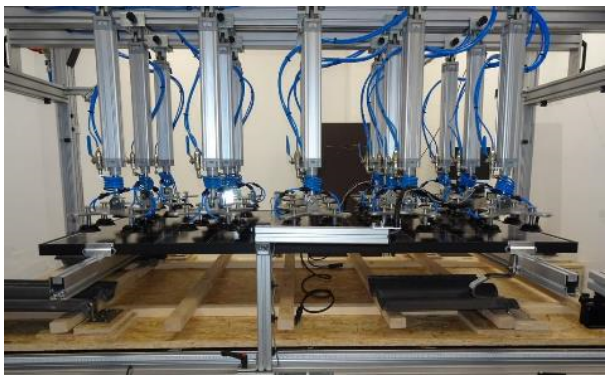
Testing of our Mammut hooks on wooden plates

- We fixed a sample module on our load test table and put load on it



- **Result: We can approve the use of the hook on even wooden surfaces, but with special screws only (in portfolio now)**

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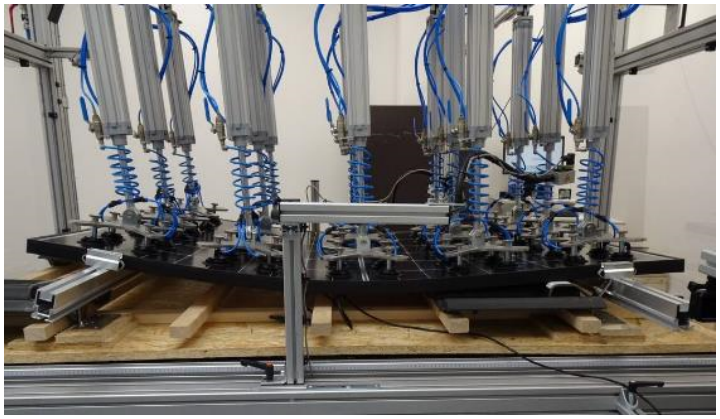
Testing of our Mammut hooks on wooden plates

- We even did „overkill“ loads to the test arrangement



- **You must exceed your boundaries in order to define them!**

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TYPICAL FAULT EXAMPLE: FLAT ROOF SYSTEM

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What has to be obeyed?

- Module data sheets can be misleading, because they do not care about the mounting structure
- Example:

Mechanical Loading	
Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa

- First: Only „test load“ is mentioned, for „design load“ you have to deduct factor 1.5
- **Mounting instruction is reducing the values even more for various mounting variants**

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What has to be obeyed?

- The module on our load test table, **load within the restrictions of manual**:

- **Problem: Most probably no visible damage after snow has melted, but significant cell damages (micro cracks) nevertheless!**

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HOW ABOUT A WARRANTY CLAIM OF YOUR END CUSTOMER?

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How about a warranty claim?

- **End customer is blaming you about poor yield of system, maybe after first winter**
  - You are driving out and look for the fault – 500 € gone easily
  - Your customer is pissed (excuse my language), his insurance might look for recourse
  - You will have to change the modules
- **You try to claim warranty at module producer**
  - Have fun with Chinese hotline
  - You have the obligation to proove the snow load value
  - Producer will blame the way of corner mounting and direct you to mounting structure supplier
- **You try to claim recourse at mounting structure manufacturer**
  - He will tell you that he is not responsible for the module at all
  - Maybe he will send you replacement for a few broken clamps
- **Worst issue: You will have to provide a solution for the future!**

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BY THE WAY: TRANSPORT OF MODULES

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Transport of modules

- Everything typically is fine as long as modules are in pallet box

- **Problems start at single module or small batches, unpacked from pallet box**
  - Transport in or on top of cars
  - Transport at non-suspended trailers



- **In difference, manual handing faults are usually visible!**

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HOW IBC SOLAR MAKES SURE THAT OUR MOUNTING STRUCTURES WILL STAND THE LOADS?

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The mounting structure must stand …

wind

and snow

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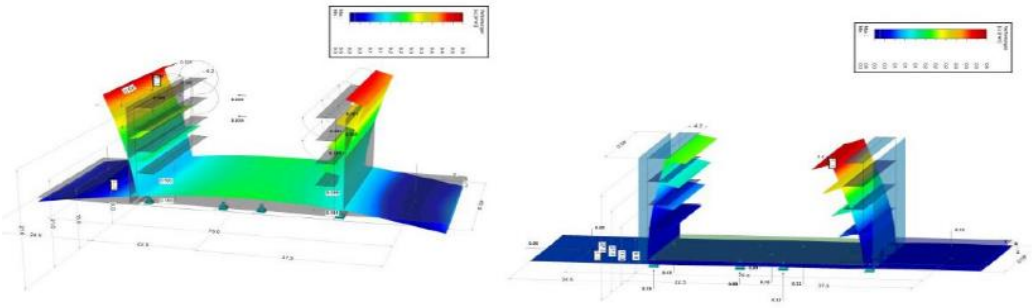
Step 1: German engineering

- All our IBC Topfix and AeroFix/AeroFlat components are designed by our own engineering team in our German headquarters
- Extensive computer-aided load simulation are part of the design process
- **You can be sure that everything fits together perfectly**



suction load TRAPEZOIDAL CLAMP pressure load

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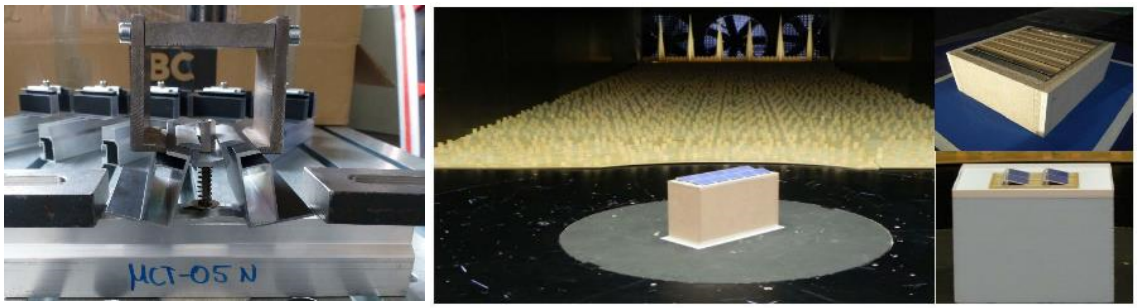
Step 2: Extensive prototype testing and certification

- All components are tested, both by us and independent institutes, including even destructional testing and wind channel tests
- All components have got German building certification (exceeds EU law by far)
- **You can be sure that you can rely on the strength of the products**



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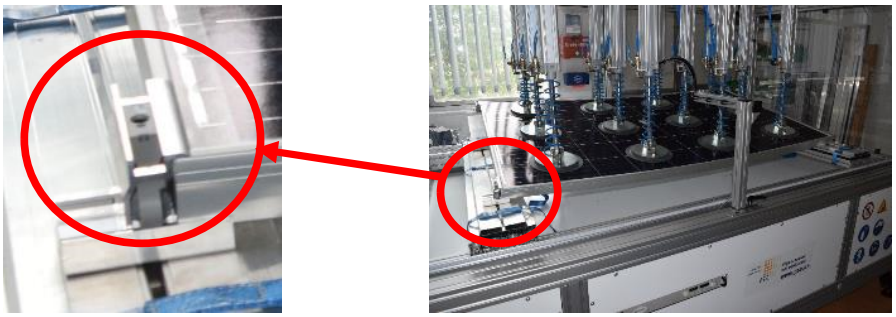
Step 3: Testing in combination with PV modules

- On our own load test bench in our test lab, we have the possibility to check the interaction between mounting structure and PV modules
- Such testing is NOT mandatory for mounting structure producers, no law for it at all
- **That´s what you need: In the end you have to install modules, not structures**



How will this clamp behave when load is bending the module?

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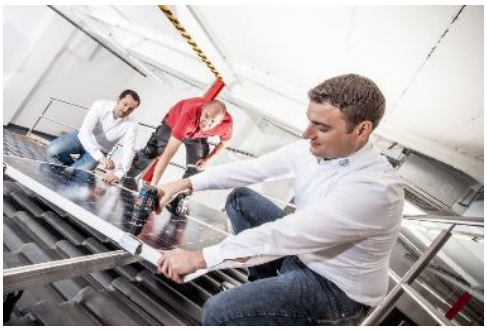
Step 4: Permanent quality control and improvement

- Incoming goods controls according to automotive standards
- Feedback of more than 1000 worldwide partners is used for design improvements
- **You get always the proper structure for all applications**



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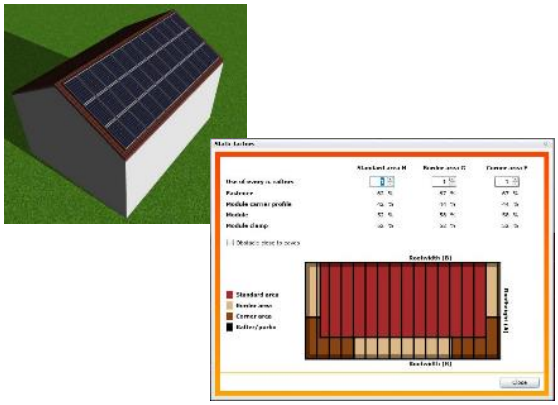
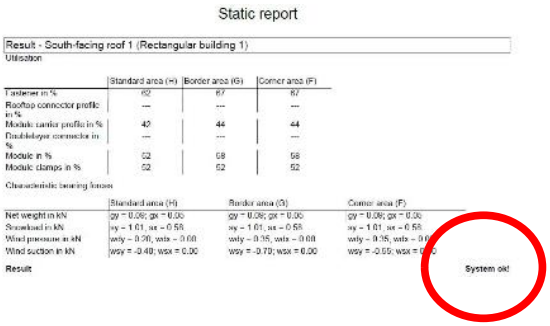
Step 5: Comfortable system design with PVManager

- Easy design of complete system, with BoM down to the tiniest screw
- Including statical and ballasting calculation reports, without any surcharge
- **PVManager provides you with fitting and legally safe system designs**





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