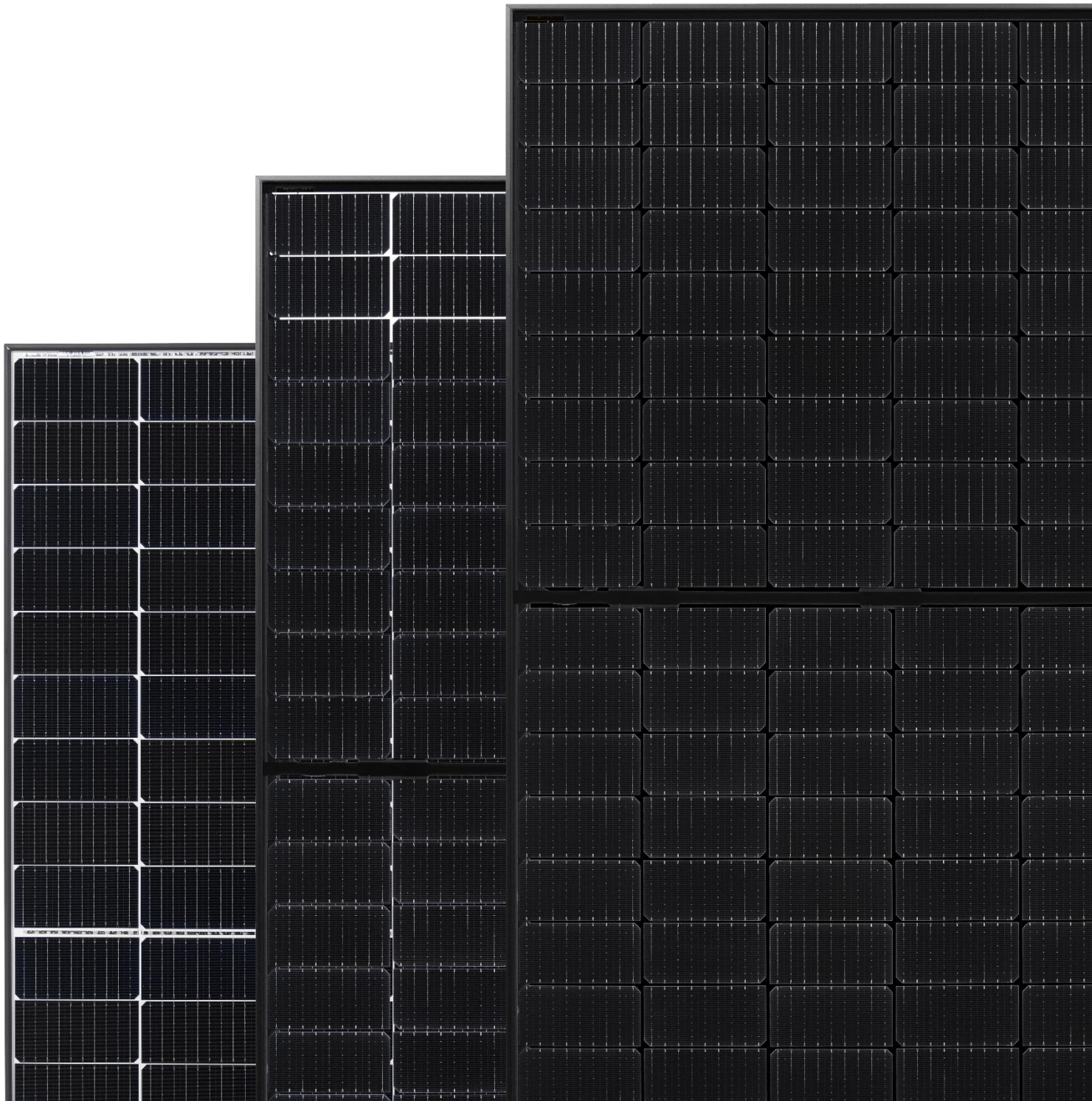
BAUER SOLARTECHNIK

High-Performace PV Panels

Installation Manual

for **BAUER** Solar Modules - V.3



Contents

Address **BAUER Solar Engineering GmbH**
Hinter der Mühl 2
55278 Selzen
Germany

01. GENERAL INFORMATION

The installation manual must be read carefully and understood before starting to mount, wire or operate BAUER solar modules.
The manual contains important safety information that must also be passed on to end users.
The installation and handling of photovoltaic modules requires in-depth expertise and therefore all work on a PV system may only be carried out by appropriately qualified and authorized specialists.

Failure to follow the instructions in this manual may result in serious consequences ranging from property damage to minor injury or death.

Each module has the following information on the back in the form of labels:
name plate, describing the product type; rated power; rated current; rated voltage; open circuit voltage; short circuit current, according to the standard test conditions; and the maximum system voltage.

In addition, each module has a unique serial number and bar code. The labels have been permanently inserted on the inside of the modules before lamination and are visible from the front of the modules as well.
Removal or obliteration of labels is not permitted and violations will void any warranty.

02. SAFETY INSTRUCTIONS

CAUTION! Before you start mounting, wiring, maintaining or operating the modules, you should especially understand and read the safety instructions.
Direct current (DC) flows through the connectors of the solar modules when they are exposed to sunlight, other light sources or other power sources.

Whether the module is connected or not, serious injury and up to fatal consequences can occur.
The more modules are connected in series, the greater the so-called string open-circuit voltage and thus the greater the risk of injury.
The maximum permissible system voltage of the modules and that of the inverters must not be exceeded under any circumstances.
ATTENTION! The safety extra-low voltage range of 120V is usually always exceeded in this case.
Therefore, the assembly of the modules may only be carried out by instructed persons, while the wiring, connections and commissioning are reserved for electrical specialists only.
For the AC-side connection to the public supply network, the electrician must be licensed by the respective power supplier/network operator.
The respective technical connection conditions, in short TCC (TAB), must be considered.

For work on the roof, the corresponding protective measures of the accident prevention regulations, in short APR (UVV), must be observed (safety harness, protective scaffolding, etc.).
If necessary, barriers must be erected to protect against falling parts. The statics of the roof and building must also be checked before installation begins.
When installing solar modules, the relevant and local building regulations as well as the generally applicable rules of technology must always be observed. The following regulations, among others, must be considered closely for the installation and wiring of solar modules:

UVV (of the employers' liability insurance association)	***VDE 0105 T100***	***VDE 0185***
DN 18451	***DIN VDE 0126-1***	***DIN 18015***
DIN 18338	***DIN 1055***	***DIN 18382***
DIN 1055	***DIN VDE 0100***	

These listed standards are only a selection and do not claim to be complete and only apply to installation in Germany.
If the installation is carried out in other countries, the corresponding regulations and provisions of the local authorities must be observed.

SAFETY INSTRUCTIONS AT A GLANCE

- Remember at all times that the solar modules are under electrical tension and this can cause severe injuries, even death.
- Wear suitable protective clothing at all times (non-slip gloves and shoes, professional protective clothing, etc.).
- Remove all metal jewelry before beginning with the installation to avoid accidental contacts with current-carrying parts.
- Pay attention to the weather conditions. During rain or wind modules may not be installed. In moderate rain, morning dew or light wind, take appropriate safety measures to protect you, others and the modules.
- Children or unauthorized persons must be kept away from the installation site in any case.
- Use only electrically insulated tools to prevent the risk of electric shock.
- Do not use or install damaged components. Especially if the glass is damaged.

03. WARRANTY AND LIABILITY

BAUER Solar Engineering GmbH does not assume any liability for damages of any kind and without limitation, in particular for personal injuries, injuries or property damages, when handling BAUER solar modules (in connection with non-observance of these instructions contained in the manual). Basically, the respective valid General Terms and Conditions of the Company and the warranty conditions of Bauer Solar Engineering GmbH or Bauer Solar GmbH valid on the date of the order confirmation shall apply. Furthermore, warranty and liability claims are excluded if they are due to one or more of the following causes:

- Improper installation of the modules
- Improper handling of the modules
- Non-observance of the regulations and the generally applicable rules of technology
- Improper safety and protective devices
- Non-observance of the instructions in this manual

04. PLANNING INSTRUCTIONS

Environmental influences at the installation site can have a detrimental effect on the instantaneous performance of the system or even cause damage to the modules themselves.
The modules must not be exposed to the following loads:

- Concentrated light generated by artificial light, mirrors, etc.

- Highly flammable gases and vapors (e.g. gas stations, paint spraying equipment, gas containers)
- Open fire
- Aggressive or chemical emissions

- Extremely salty air (distance to the sea 500m)
- Extraordinary dust or dirt pollution

Solar Generator

Since a very high life expectancy of the modules can be expected, the roof condition should be checked.
All modules on an inverter must have the same orientation and the same inclination.
The entire generator field should be free of shading (note the lowest position of the sun in winter).
Even small partial shading by chimneys, dormers, antenna masts, trees, etc. can cause a considerable reduction in performance.

Inverter

Both transformerless inverters and inverters with transformers can be used.
It is essential to observe the planning notes in the installation and operating instructions of the inverter manufacturer.

Circuit Breaker

In Germany, the DC string lines may only be connected to the inverters via permitted isolators.
If the planned inverters do not have these isolators, string lines must be connected via external, permissible isolators.

05. UNPACKING AND STORAGE

If the modules are stored in an inconsiderate environment, additional precautions should be taken to prevent the connector plugs from being exposed to moisture or the modules from being exposed to sunlight before installation.
The modules must always be unpacked by two persons. Both hands should always be used when handling modules.
Do not place the module hard on a surface and be especially careful when placing the module on an edge.
Do not step on the modules and do not carry the modules upside down, this may cause small micro cracks which may affect the functionality of the module.
Do not place objects such as tools on the glass or the back and do not work on the packaging with sharp objects.
Only hold the modules by the frame and not by the junction box.

06. HANDLING OF MODULES

It is essential that you observe the following instructions for handling the modules:

- Store the PV module in the delivery package until installation.
- Do not create high pressure on the module surface and avoid bending forces, there is a risk of breakage.
- Do not step on the modules.
- Do not expose the modules to permanent oscillations or vibrations.
- Avoid concentrating sunlight on the module surface at all costs.
- The junction box(es) on the back of the module must not be opened.
- Avoid impact and shock loads on the glass.
- Do not pull on the connecting cables.

- Ensure that the solar connectors do not come into contact with water or moisture when storing and mounting the modules. This may cause oxidation.

- Do not immerse the modules in water.

- For modules with mounting frame, this must not be damaged or removed.

- Make sure that the connecting cables are not damaged by cuts or excessive bending.
- Do not damage or remove the name plate or serial number.
- If modules with an inclination of less than 15° are mounted, soiling of the modules is to be expected.
  Regular cleaning is recommended, but the glass must not be scratched or cleaned with chemical cleaners.

07. INSTALLATION AND MOUNTING SYSTEMS

BAUER modules are suitable for rooftop, façade and ground-mounted systems.
For mounting on roofs, please use only rustproof materials such as aluminum and stainless steel.

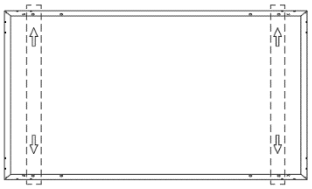
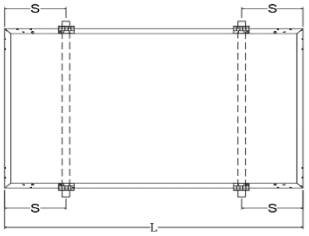
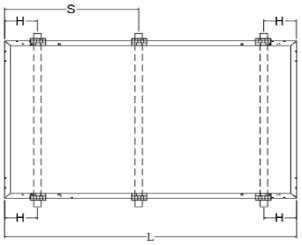
Preferably, you should only use mounting frames from manufacturers who can provide you with proof of the static load of their frames and who provide you with sufficient mounting instructions.

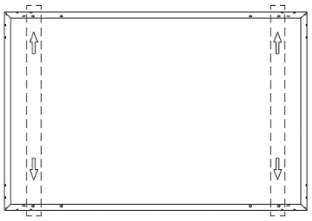
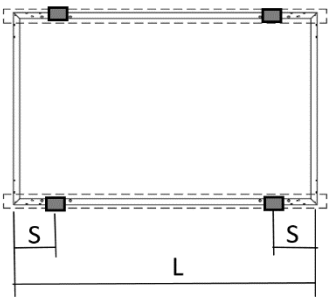
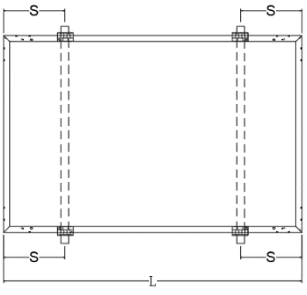
It is essential to read and understand these carefully.

It is imperative that the rail support system is aligned evenly, otherwise it can lead to distortion of the modules and thus breakage of the modules.
As clamps can loosen over time due to vibrations, the modules must be permanently secured against slipping.
Special anti-slip devices are available from substructure manufacturers for this purpose.

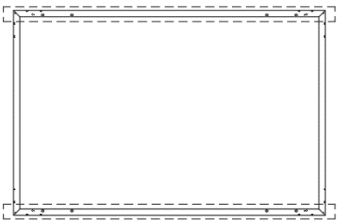
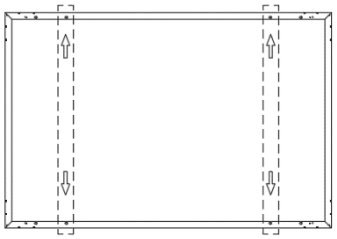
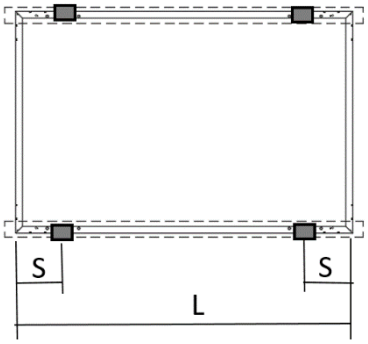
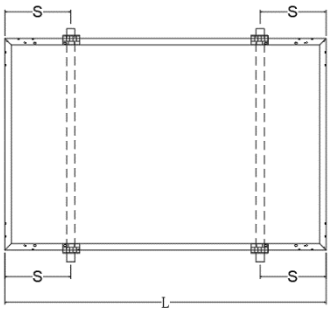
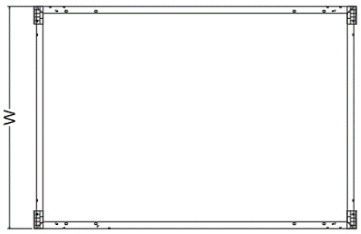
Each module must be fixed with at least 4 clamps (please note the maximum static load).
The modules can be mounted vertically as well as horizontally.

Clamping zones

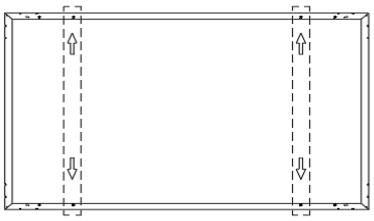
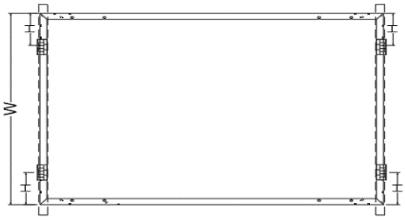
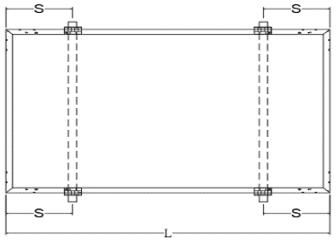
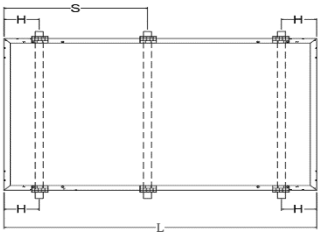
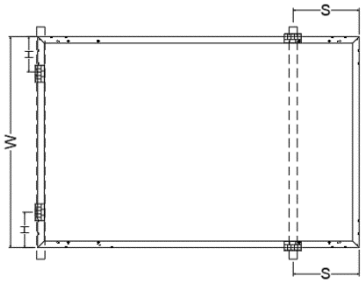
BS-XXX-120M10; BS-XXX-132M10; BS-XXX-144M10; BS-XXX-156M10 (Mono-facial single glass & Bifacial-dual glass)		
Installation method	**Outer four holes, mounting rails parallel the long frame**	**Outer four holes, mounting rails cross the long frame**
S Bolt installation		
Loading capacity	Load capacity / test load: 2400Pa - negative 2400Pa	Load capacity / test load: 5400Pa - negative 2400Pa
Installation method	**Mounting by four clamps, mounting rails cross the long frame**	**Mounting by six clamps, mounting rails cross the long frame**
Clamp installation		
Clamp position	(1/5L-50)<S<(1/5L+50)	(1/2L-80)<S<(1/2L-30);(1/6L-50)<H<(1/6L+50)
Loading capacity	Load capacity / test load: 5400Pa - negative 2400Pa	Load capacity / test load: 5400Pa - negative 3600Pa

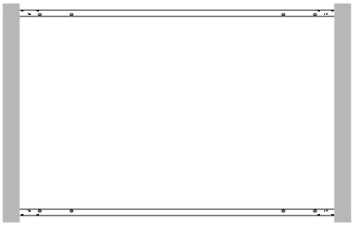
BS-XXX-132M12 (Mono-facial single glass & Bifacial-dual glass)		
Installation method	**Outer four holes (1400mm holes) mounting rails parallel the long frame**	**Outer four holes (1400mm holes) mounting rails cross the long frame**
Bolt installation		
Loading capacity	Load capacity / test load: 2400Pa - negative 2400Pa	Load capacity / test load: 5400Pa - negative 2400Pa
Installation method	**4 clamps, mounting rails parallel the long frame**	**4 clamps, mounting rails cross the long frame**
Clamp installation		

Clamp position	450mm≤S≤550mm	450mm≤S≤550mm
Loading capacity	Load capacity / test load: 2400Pa - negative 2400Pa	Load capacity / test load: 5400Pa - negative 2400Pa

BS-XXX-108M10 (Mono-facial single glass & Bifacial-dual glass)		
Installation method	**Inner four holes (1150mm holes) mounting rails parallel the long frame**	**Inner four holes (1150mm holes) mounting rails cross the long frame**
Bolt installation		
Loading capacity	Load capacity / test load: 2400Pa - negative 2400Pa	Load capacity / test load: 5400Pa - negative 2400Pa
Installation method	**Outer four holes (1400mm holes) mounting rails parallel the long frame**	
Bolt installation		
Loading capacity	Load capacity / test load: 2400Pa - negative 2400Pa	
Installation method	**4 clamps, mounting rails parallel the long frame**	**4 clamps, mounting rails cross the long frame**
Clamp installation		
Clamp position	390mm≤S≤490mm	390mm≤S≤490mm
Loading capacity	Load capacity / test load: 2400Pa - negative 2400Pa	Load capacity / test load: 5400Pa - negative 2400Pa
Installation method	**4 point corner clamping short side**	
Clamp installation		

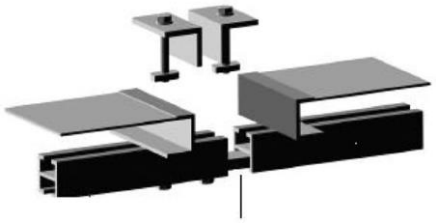
Clamp position	Starting directly at the outer edge of the module on the short frame side in the length of the clamp	
Loading capacity	Load capacity / test load: 1600Pa - negative 1600Pa	

BS-XXX-108M10 (Mono-facial single glass & Bifacial-dual glass)			
Installation method	**Inner four holes (1150mm), mounting rails cross the long frame**	Installation method	**Clamp mounting on short side of frame and rails perpendicular to the long side frame**
Bolt installation		Clamp installation	
		Clamp position	0<H<1/4W
Loading capacity	Load capacity / test test load: 5400Pa - negative 2400Pa	Loading capacity	Load capacity / test load: 2400Pa - negative 1600Pa
Installation method	**Mounting by four clamps, mounting rails cross the long frame**	**Mounting by six clamps, mounting rails cross the long frame**	
Clamp installation			
Clamp position	(1/5L-50)<S<(1/5L+50)	(1/2L-80)<S<(1/2L-30);(1/6L-50)<H<(1/6L+50)	
Loading capacity	Load capacity / test load: 5400Pa - negative 2400Pa	Test load: 5400Pa - negative 3600Pa	
Installation method	**Two clamps on the long side and two clamps on the short side of frame. Rails run perpendicular to the long side frame.**	**4 point corner clamping short side**	
Clamp installation			
Clamp position	(1/4L-50)<S<(1/4L+50), (1/4W-50)<H<(1/4W+50)	Starting directly at the outer edge of the module on the short frame side in the length of the clamp	
Loading capacity	Load capacity / test load: 2400Pa - negative 2400Pa	Load capacity / test load: 1600Pa - negative 1600Pa Note: Increase to 1800 / 1800 Pa test load with BAUER stronger frame for M10T-54/B54 possible.	
Installation method	**Long side in-rail installation**	**Short side in-rail installation**	

In-rail installation		
Loading capacity	Test load: positive 5400Pa, negative 2400Pa Design load: positive 3600Pa, negative 1600Pa	Test load: positive 2400Pa, negative 1600Pa Design load: positive 1600Pa, negative 1067Pa

The substructure is subject to a temperature- dependent change in length.
The maximum rail length in each case can be found in the installation instructions of the substructure manufacturer. If this length is exceeded, appropriate length extenders must be used.
To enable length compensation, it must be ensured that the module rows end before the length extender and start again afterwards.

CAUTION: Do not mount any modules directly on the linear expander.



General requirements:

- Ensure that the module installation mode and bracket system can fulfil the expected load. This is the required warranty to be provided by the installer of the bracket. The installation bracket system must be tested and inspected by an external testing centre with static mechanical analysis capacity in accordance with local national or international standards.
- The module bracket must be made of durable, corrosion-resistant and UV-resistant materials.
- The modules must be firmly fixed to the bracket.
- In places with heavy snow accumulation, use higher brackets so that the lowest point of the modules is not shaded by snow for a long time. Also, set the lowest point of the modules high enough to avoid shading vegetation and forests or damage caused by sand and stones.
- If modules are installed on brackets parallel to the roof or wall, the minimum distance between the module frame and the roof/wall must be 10 cm, which facilitates air circulation and accelerates the drainage of condensation or moisture.
- Make sure that the building is suitable for the installation before installing modules on the roof. In addition, you must seal properly to prevent leaks.
- The module frames may exhibit thermal expansion and cold contraction, so the frame distance between two neighbouring modules must be at least 10 mm.
- Ensure that the back of the modules does not come into contact with brackets or building structures that can penetrate the inside of the modules, especially if the module surface is subjected to pressure.
- The maximum static load transmitted by the module is: 2400 Pa on the rear side and 5400 Pa / 2400 Pa on the front side, depending on the installation type of the module (see installation method below). The load described in this manual applies to the bearing load / test load.
- Note: Based on the installation requirements according to IEC61215, the corresponding maximum design load must be taken into account in the calculation.

08. GROUNDING, LIGHTNING AND FIRE PROTECTION

Proper grounding of the PV-system is subject to the responsibility of the installer.
Use ground fault circuit interrupters and fuses as required by local authorities. The installation of the photovoltaic system does not necessarily require the installation of a building lightning protection system. In any case, you should obtain the relevant information from a specialist company for lightning protection technology.
In principle, the following applies: If the building already has an existing lightning protection system, the photovoltaic system must also be integrated.
Country-specific regulations must be observed here.
If the PV system is included in a lightning protection system, all metallic components of the PV system and the substructure (module frame, subframe, bracket, etc.) must be connected to the lightning protection system. For this purpose, all metal parts are electrically conductively connected to each other and connected to the building equipotential bonding rail by means of grounding cables of at least 16mm^2. Use a stainless-steel screw for the grounding.

To ensure a low-resistance ground connection, do NOT dispense with a toothed washer, as this will penetrate the anodized layer of the module frame.
The connecting cable from module to module must have a minimum cross-section of 4mm^2.
To prevent corrosion, the screw, nut and toothed lock washer must be made of stainless steel.

If you have any questions regarding guidelines and regulations for construction safety and fire protection on buildings, please contact the responsible local authority. Do not use modules near equipment or in locations where flammable gases may be generated.

09. WIRING

Plan the entire cabling very carefully. Too small cross-sections lead to cable losses, which directly affect the yield of the plant AND can lead to overheating (fire hazard!).
Therefore, please use only cables with a cross- section of at least 4mm^2. In order to avoid yield reductions due to power losses, the cable cross-sections must be calculated exactly.
The permissible current carrying capacity of the cables must not be exceeded under any circumstances, as this can lead to strong heating and even cable fire. Please observe the applicable guidelines and regulations.
Only weatherproof, UV-resistant and short-circuit-proof solar cables may be used for cabling the solar generator.
Fuses and switching elements on the generator side must be designed for the corresponding voltages and be suitable for direct current.

CAUTION! Do NOT pull or plug contacts under load. Only modules of the same type may be connected together.

Series Circuit

To increase the voltage, several modules can be connected in series to form a string.
Here, the maximum DC voltage of the inverter and the maximum voltage of the modules must not be exceeded.
Please refer to the data sheets or the type plate on the back of the module for this information.
Connect the plus plug of one module to the minus plug of the other module.
The string lines to the inverters are then connected to the first and the last module.

Parallel Connection

For optimum utilization of the inverter, it may be necessary to connect several strings in parallel.
Please observe the maximum power of the respective inverter.
If more than three strings are connected in parallel, string diodes (blocking diodes) or DC fuses must be connected in each string to protect the modules against excessive reverse currents.
In some inverters, fuse sockets are already provided in the inverter for this purpose.

10. MAINTENANCE AND CLEANING

The photovoltaic system is generally maintenance-free. Nevertheless, we recommend a regular inspection of the system (for function, visual inspection of the wiring and signs of damage and glass breakage) in order to be able to promptly detect and rectify any operating faults.
Normally, the system is kept clean by rainwater run-off.
However, if there is any soiling due to heavy dust, bird droppings, pollen or other contaminants, the modules can be cleaned with water and a soft cleaning cloth or ponge. Water with as little lime as possible should be used, and only mild soaps.

You must NOT treat the modules with abrasive or chemical cleaners. Always wear rubber gloves when cleaning to protect yourself from electrical charge.
If you need to remove snow from the modules, use a soft brush to do so.

Please do not make any modifications to the solar system components themselves.
Also, when maintaining and cleaning the system, please always make sure that the modules are not subjected to any pressure loads. Under no circumstances should you walk on the modules.

11. PV DISPOSAL

The photovoltaic modules must NOT be disposed of with regular household waste.
Defective or old solar modules must be recycled as electronic waste according to WEEE guidelines.
WEEE-Reg.-No. DE55338746