Installation and Operating Guide

Photovoltaik Module
Production Series AC

ENERGY FOR A BETTER WORLD



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1 INTRODUCTION

Thank you for choosing AXITEC ENERGY GMBH & CO. KG solar modules. With proper operation and maintenance, AXITEC ENERGY GMBH & CO. KG modules will provide you with clean and renewable solar electricity for years to come. This manual contains necessary installation, maintenance, and safety information. Keep this guide in a safe place for future reference.

Non-compliance with this installation instruction may result in property damage and/or physical injury. AXITEC ENERGY GMBH & CO. KG will not be liable for compensation of any loss or injury caused by this type of non-compliance.

AXITEC ENERGY GMBH & CO. KG reserves the right to make unannounced alterations to the design and/or technical specifications of its solar modules at any time. Therefore, only the datasheet current at the time of manufacture is definitive. It is therefore expressly recommended to ensure that the datasheets on hand represent the current status before placing an order. When performing assembly or other work on the solar modules, the datasheets and user information current at the time of manufacture of the relevant module are to be used for reference. The contents of older or newer documents may be incorrect due to interim product changes.

This version of “Installation & Operating Instructions” replaced all other before.

2 Codes and regulations

The mechanical and electrical installation of PV systems should be performed in accordance with all applicable codes, including electrical codes, building codes and electric utility interconnection requirements. Such requirement may vary for mounting location. Requirements may also vary with system voltage, and for DC or AC application. Contact local authorities for governing regulations.

3 General information

3.1 Product Identification

Each module has four labels

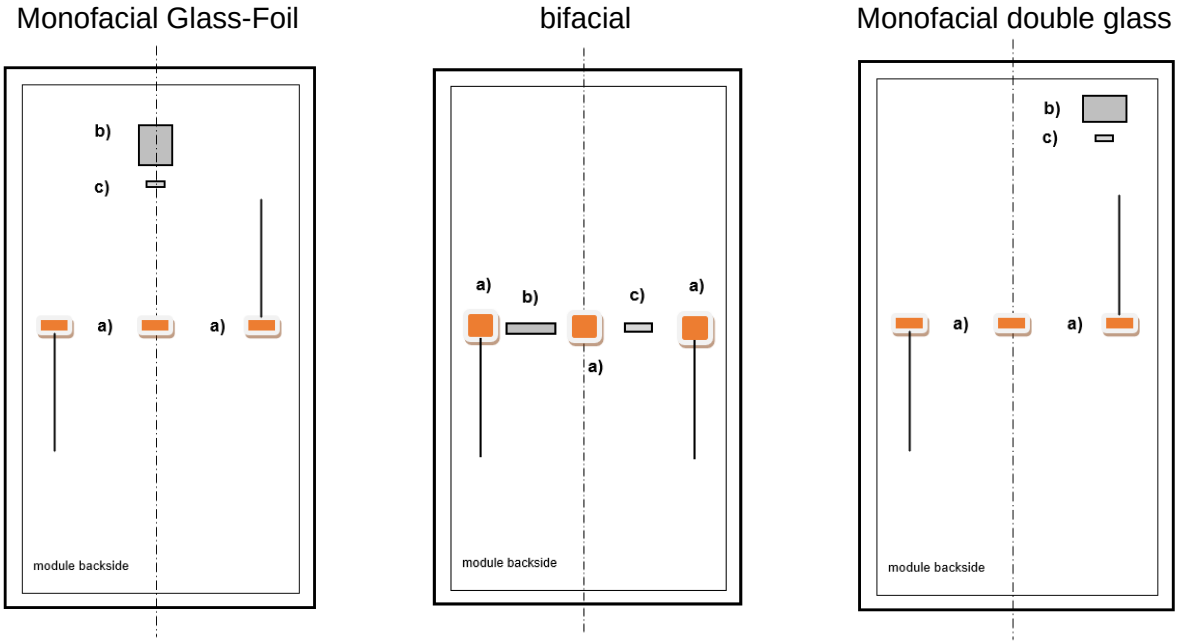
1x name plate:

Describes product type, nominal power, nominal current, nominal voltage, no-load voltage, short-circuit current (measured under standard test conditions (STC), the measurement tolerance is +/- 3%), weight, dimensions, etc. The maximum system voltage is 1000 or 1500 V DC, depending on the Modul type.

3x serial number/barcode:

Each module has a unique serial number encoding, among other details, the year and month of manufacture. One serial number label is permanently fitted on the front below the glass, one Label with serial number and barcode is on the rear below / next to the type label and one with serial number and barcode is on the frame.





a) Junction Box b) Name Plate c) Serial Number

3.2 General Rules and Safety Precautions

Before the start of the installation of the PV system, the advice of the relevant authorities as well as the energy provider regarding regulations, guidelines and approval requirements must be obtained. These are to be followed during installation. All applicable local, regional and national statutory orders and regulations are to be observed.

An improper execution during installation or commissioning can result in personal injuries or damage to the modules.

It is advisable to provide for service access during project planning.

Protective goggles and safety shoes are to be worn at all times when performing the work. If applicable, observe the regulations and recommendations of the relevant trade associations or corresponding bodies. Work on the photovoltaic system must not be performed in rain, snow or wind. The glass surface and module frame can become hot when exposed to sunlight and there is a risk of burns. Use gloves, if applicable.

For safety reasons, defective modules must be replaced immediately.

The photovoltaic modules from AXITEC described herein meet the requirements of application class A, that is, dangerous voltage (IEC 61730: greater than 50 V DC or greater than 240 W; EN 61730: greater than 120 V DC) and systems with dangerous power output, where unrestricted accessibility is to be expected.

Solar modules generate DC voltage when exposed to sunlight. Any contact with 30 V or more DC voltage can be fatal.

Only connect solar modules with the same rated output current in series. When solar modules are connected in series, the total voltage is equal to the sum of the voltages of the individual solar modules. For the maximum system voltage for solar modules, please refer to the respective data sheet.

The modules must not be immersed in water.

Do not artificially bundle sunlight by means of mirrors, lenses or other devices onto the module.

If the modules are installed according to the instructions above, the system components must result in a proper operation of the modules. If the modules are not operated properly, the warranty or guarantee can become void or at least significantly limited.

Further information about modules from AXITEC can be found in the datasheets for the modules. The datasheets are available via the Internet at www.axitecsolar.com.

3.3 Fire Protection

For questions regarding building safety and prevention of fires on buildings please contact the relevant local authority.

If applicable, use earth fault switches or fuses in accordance with the specifications of the local authorities.

Do not use modules near devices or places where flammable gases may be formed.

In a roof installation, the module must only be mounted above a fireproof roof cover approved for this application.

Our modules comply with fire protection class C in accordance with IEC 61730-2. In each individual case, the customer must check separately that the relevant national and local fire protection regulations are observed and complied with when installing the modules. The installing company is always responsible for ensuring that the installation is carried out correctly and in accordance with regulations. It must also be ensured that the rear wall and the mounting surface are fully ventilated. Incorrect installation can lead to a fire hazard. To ensure the fire resistance of the roof, a distance of ≥ 10 cm between the module frame and the roof surface is recommended.

4 Installation Assembly Rules

4.1 Assembly Notes

It is recommended to remove the solar modules from the packaging only at the time of installation.

When stacking the solar modules, do not exceed the upper limit indicated on the packaging box.

Store the packaging box in a ventilated, rainproof and dry place before unpacking the solar modules.

The glass surfaces must not be damaged or scratched. In particular, the rear of the module must not be exposed to mechanical impacts (e.g. by sharp, hard objects).

Do not stand on the modules or module frames.

Check the plug and cable for integrity and correct installation.

The solar modules must not be installed under bending tension and the frame parts must not be twisted in themselves during assembly.

The solar module must not be compressed along its sides.

Modules must be handled with care during installation. Impacts to the front and rear or the edges can damage the modules.

For a roof assembly, ensure that the structural dimensions (consult a structural engineer, if applicable) of the roof are adequate for bearing the loads imposed by the photovoltaic system.

It is forbidden to make changes or repairs to the solar module (e.g. additional drilling in the module frame, removal of the type plate)!

To ensure adequate rear ventilation, a gap of at least 10 cm between the underside of the frame and the roof cladding is recommended.

Water drainage openings in the module frame must not be closed in any way. The mounting frame, too, must not obstruct them. The earthing holes provided only serve for the purpose of earthing the frame.

4.2 Site selection

Marine and mobile applications are generally excluded. Floating installations only after consultation with AXITEC.

If the modules are assembled near the sea, a minimum distance of 500 m to the coastline must be ensured.

Solar modules must not be installed above 2,000 metres above sea level, unless otherwise specified on the data sheet.

Glare caused by modules cannot be ruled out. Modules must therefore not be installed in locations where glare could pose a potential risk.

The load to be expected on the modules at the location must not exceed the approved loads, depending on the type of installation (see 5. Mechanical installation) and the module types.

The modules must be installed in an environment in which it is ensured that the operating temperature range will not exceed or fall below -40°C to +85°C. Sufficient air circulation behind the modules should particularly be ensured in hot environments.

All shading of the module array is to be avoided. The modules must not be permanently shaded (including partial shading, spot shading, uniform shading or uneven shading). It must be ensured that there is no partial shading by weeds and other vegetation. Permanent shading means that the cells are continuously shaded over a longer period of time, e.g. when modules are installed behind a pipe, a chimney, a tree, etc. If a defect (e.g. a hot spot) is caused by improper installation of a module in the shade or by poor maintenance, the warranty is void. The power loss in fully or partially shaded cells leads to power loss, reduced yield and can lead to localized overheating, which in turn can have a negative effect on the service life of the modules. Permanent shading can lead to accelerated ageing of the encapsulation material and cause thermal stress on the bypass diodes. If modules are nevertheless installed in such shaded areas, optimizers are required at module level (MLPE).

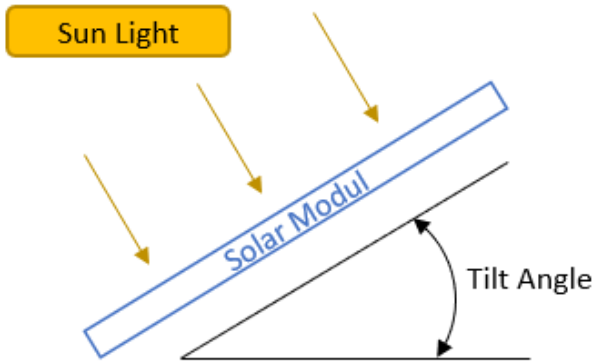
4.3 Alignment

The solar modules are suitable for installation both with their long side up and their short side up. (see 5. Mechanical installation).

The modules are to be mounted in such a way that melt- and rainwater can run off freely and that the module will not be constantly wet.

To increase the yield of the rear side of bifacial modules, shading by the substructure should be avoided as far as possible. A substrate with a high albedo and an increased distance between the module and the substrate also have a positive effect on the energy yield of bifacial modules.

Tilt angle



A module inclination of at least 10° is recommended. If the module inclination is less than 7.5°, sufficient cleaning must be ensured. Building regulations must be observed (in Germany maximum 75°).

Depending on the angle of inclination, the solar modules provide a different yield. The optimal tilt angle depends on the location and the azimuth of the solar modules.

All solar modules connected in series should be oriented the same way for optimal energy yield.

5 Mechanical installation

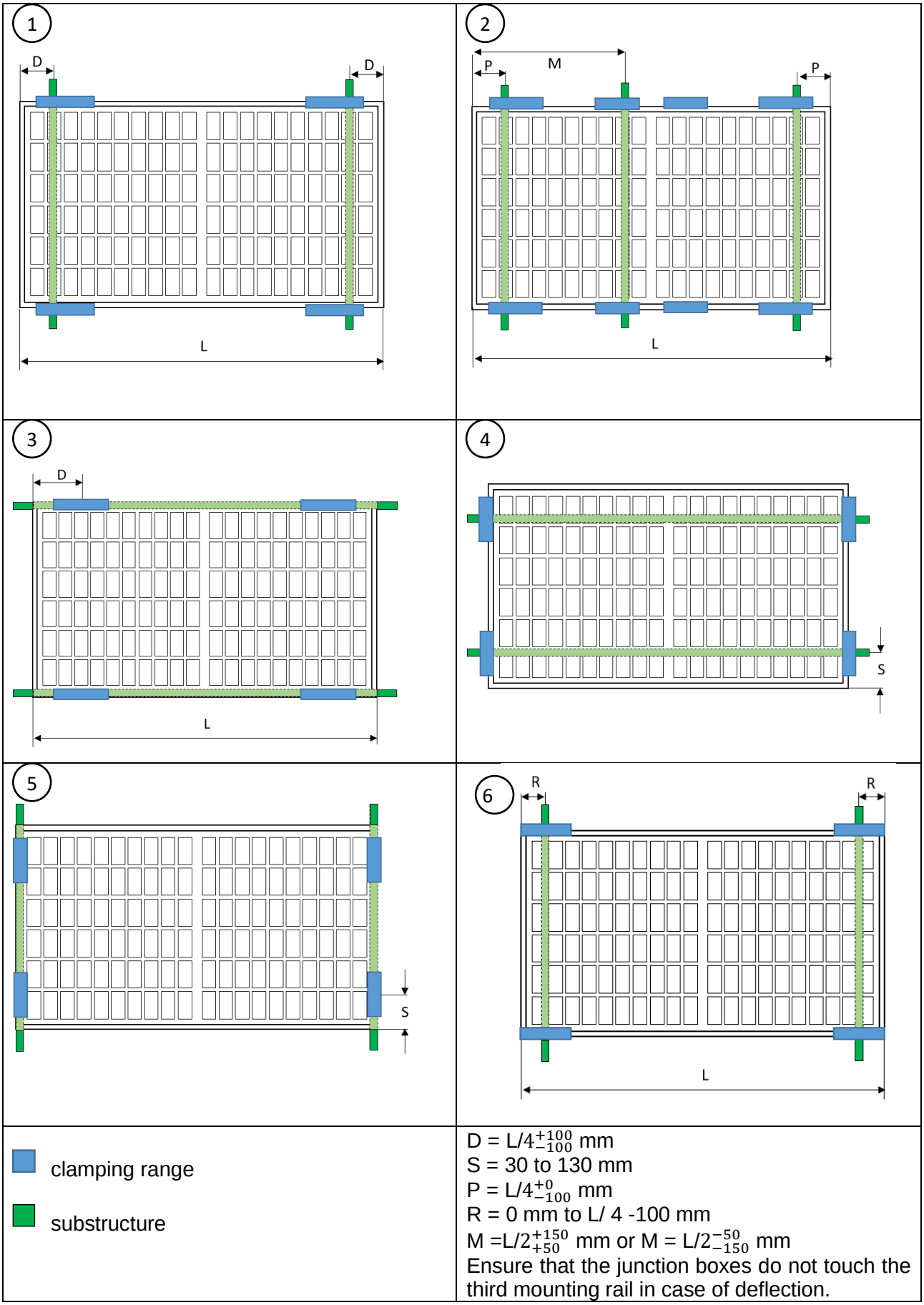
The modules must be mounted with a minimum distance of 5 mm to the next module.

Struts, mounting clamps, screws and other fixing elements must be commercially available and corrosion-free. In particular, the fixing elements must be designed in accordance with the local wind and snow loads.

5.1 Installation with clamps

When using mounting clamps, the solar modules are to be mounted on the struts in at least four locations on opposite sides. The clamps must be positioned inside the mounting zone.The module must be securely fixed. The clamps must not be in contact with the front glass or deform the frame in any way. Avoid shading effects from the clamps and mounting system.

It is recommended to use a clamp with a length of at least 40 mm. Avoid shading by the clamp. The maximum tightening torque for the mounting clamps can be obtained from the manufacturer of the clamps.


1
D
D
L
2
P
M
P
L
3
D
L
4
S
5
S
6
R
R
L
clamping range
substructure
D = L/4$^{+100}_{-100}$ mm
S = 30 to 130 mm
P = L/4$^{+0}_{-100}$ mm
R = 0 mm to L/ 4 -100 mm
M =L/2$^{+150}_{+50}$ mm or M = L/2$^{-50}_{-150}$ mm
Ensure that the junction boxes do not touch the third mounting rail in case of deflection.

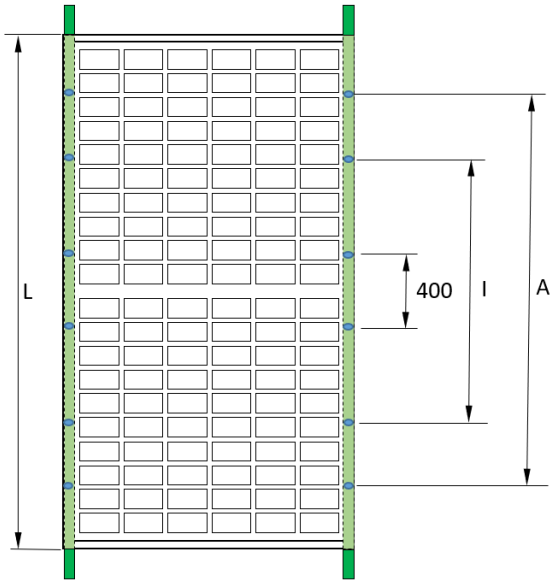
Design loads* (pressure / suction) for the permissible installation variants

Module size L [mm] W [mm] H [mm]	Mounting variant				
	(1) (3)	(2)	(4)	(5)	(6)
1680 - 1800 990 - 1134 30 - 35	3600/1600 Pa	3600/1600 Pa	1600/1600 Pa	1200/1200 Pa	1200/1200 Pa
1762 - 1800 1134 30 Glass thickness 2x2,0mm	3600/1600 Pa	3600/1600 Pa	2000/1600 Pa	2000/1600 Pa	2000/1600 Pa
1950 - 2279 990 – 1134 30 - 35	1600/1600 Pa	3600/1600 Pa	-	-	-
2380 - 2384 1133 - 1305 30 - 35	1600/1600 Pa	3600/1600 Pa	-	-	-
Alpine Modules 1766-2324 1154 35	5600/4400 Pa	5600/4400 Pa	-	-	-

*tested with 1.5 times higher test load perpendicular to the module plane

5.2 Mounting using the mounting holes

Instead of mounting clamps, the modules can also be attached to the substructure using the mounting holes located in the frame (long module side). The mounting screws must be alternately fastened to the struts at at least four points.



Mounting hole	Screw	recommended Tightening torque
14*9 mm	M8	12,5 Nm - 18 Nm
10*6,5 mm	M6	8 Nm – 12Nm
10*7 mm	M6	8 Nm – 12Nm

Design loads* (pressure / suction) for mounting with mounting holes

Module size L [mm] W [mm] H [mm]	Mounting variant		
	Inner 4 holes (I)	outer 4 holes (A)	400 mm holes
1680 - 1800 990 - 1134 30 - 35	3600 Pa / 1600 Pa	1600 Pa / 1600 Pa	-
1950 - 2279 990 – 1134 30 - 35	1600 Pa / 1600 Pa	1600 Pa / 1600 Pa	1200 Pa / 1200 Pa
2380 - 2384 1133 - 1305 30 - 35	1600 Pa / 1600 Pa	1600 Pa / 1600 Pa	1200 Pa / 1200 Pa

*tested with 1.5 times higher test load perpendicular to the module plane

5.3 Mounting with insertion systems

Individual approvals can be requested for insertion systems if no approval is available from the insertion system manufacturer.

6 Electrical installation

The electrical connection of the individual solar modules to each other and the connection to the inverter must be made using the connectors of the same type pre-mounted on the solar modules. The cables must not be used as carrying aids or bent and must not be installed under tensile stress. Only use special solar cables and suitable connectors that comply with the local specifications at the installation site.

Connector model name	Allowable mating connector model name
PV-KST4 / PV-KST4-EV02 / PV-KST4-EV02A (STAEUBLI Multi- Contact)	PV-KST4 / PV-KST4-EV02 / PV-KST4-EV02A (STAEUBLI Multi- Contact)
PV-JM608	PV-JM608

Only certified solar cables may be used for earthing and connecting the modules (e.g. EN 50618 or IEC 62930 approved). The recommended minimum cross-section of the cable is 4 mm² (#12 AWG) and they must be heat-resistant up to at least 90°C. The minimum bending radius is 5x the cable diameter.

Secure the cable to the mounting system with UV-resistant cable ties and avoid direct sunlight on the cables.

Cables and connectors must not rest on the roof cladding and must not lie in the water-bearing plane.

The electrical installation and commissioning must only be carried out by a qualified electrician who knows the relevant standards and regulations for the use and assembly of solar modules. Our operating instructions do not enable persons lacking the mentioned knowledge to assemble the solar module.

Modules must not be operated under short-circuit conditions.

Disconnecting the module connections during operation can result in light arcs (break sparks) and therefore in a hazard for people and equipment. Do not insert any objects into the plugs and sockets!

6.1 Electrical design

Connect the max. number of modules that corresponds to the voltage specifications of the devices used in the system. The modules (in accordance with protection class II) must not be operated with a higher voltage than the permitted system voltage. The specifications can be found in the datasheet of the modules or in the datasheet of the relevant inverters. Please ensure that the cables are installed and fixed in such a way that, in particular, the plug-in connections do not lie in a water-carrying plane.

All connected electrical components must be designed for the maximum operating voltage of the system.

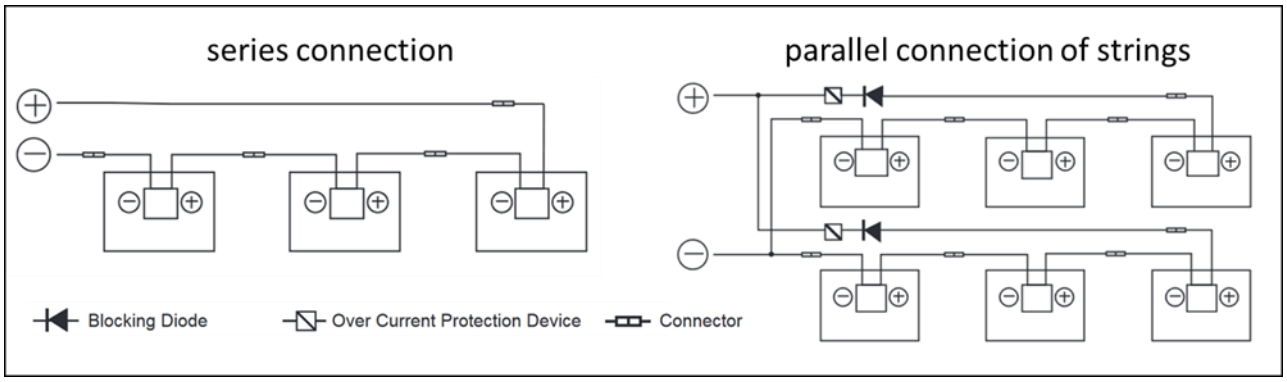
Due to special environmental conditions, a module may supply a higher current and/or voltage than specified under the standardised test conditions. When designing PV systems, the values for Isc and Uoc should be multiplied by a factor of 1.25 to determine the nominal values for components such as, e.g., cabling, fuses and inverters which will be connected to the output of the modules.

To determine the maximum possible number of modules per string, the open-circuit voltage at the lowest temperature must be considered:

$U_{system,max} \geq N \times U_{OC,STC}[1 + \beta_{Uoc} \times (\vartheta_{min} - 25)]$
$N = number\ of\ seriell\ modules;$
$\beta_{Uoc} = temperature\ coefficient\ of\ U_{oc};$
$\vartheta_{min} = minimum\ temperature\ at\ location$

The specified protection classes are to observed, however, the minimum compliance required is IP65. Ensure a gapless connection when connecting the plug-in connectors.

For a series connection, only modules with the same current rating should be used, and for a parallel connection, only modules with the same voltage rating should be used. Modules can be connected in series by connecting the positive connection of one module to the negative connection of the next module.



Suitable overcurrent protection measures (e.g. string cut-out) are required for the parallel connection of the modules. It must be ensured that the specified capacity regarding the return current IR of the datasheet will not be exceeded. If there are more than two parallel strings, string fuses and string diodes must be used.

Only use special solar cables and suitable plugs. Attach the cables to the mounting system using UV-resistant cable ties and avoid exposing the cables to direct sunlight.

In order to reduce voltages caused by lightning strikes, the surface area of all conductor loops must be as small as possible. Modules shall be installed in such a way that sufficient air circulation will be possible to prevent an overheating of the modules and components.

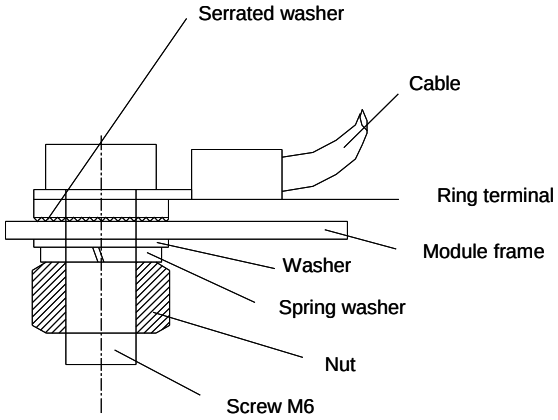
6.2 Bypass diode

The junction boxes of the half-cell modules each contain a bypass diode connected in parallel to the cell string. In case of shading, the diode can bypass the affected part of the module and thus protect it from excessive heating and reduce power losses of the entire system. Partial shading should nevertheless be avoided. Note that the bypass diode is not the overcurrent protection device.

If the diode is defective, the installer or system maintenance supplier must contact Axitec. Please do not attempt to open the module junction box yourself.

Each module contains 3 bypass diodes.

6.3 Grounding



The modules are to be grounded according to the country-specific requirements and laws. If a lightning protection system is already present or intended to be installed on the building, the PV system is to be integrated into the protection concept against direct lightning strike. If a transformerless inverter is used, equipotential bonding may be prescribed in accordance with the inverter manufacturer's specifications. Country-specific laws must be observed.

Earthing of the modules shall only be carried out at the locations on the frame profile specified for this purpose via an earth cable that is connected electrically conductive with the frame.

Country-specific standards are to be adhered to.

7 Maintenance and Cleaning

7.1 Maintenance

It must be ensured that there is no partial shading by weeds and other vegetation.

We recommend regular inspections:

- Regularly check the module for signs of damages and glass breakage
- Check that all electrical connections are secure and free of corrosion
- Check that the cables are undamaged
- Check that the mounting system is securely attached and firm

The most common causes for a low energy yield are:

- Improper or faulty wiring
- Burned-out fuses or triggered power switches
- Shading of the modules by trees, masts or buildings
- Failure of the inverter
- Improper maintenance and cleaning
- Build-up of dirt on the modules
- Unsuitable angle of inclination or alignment of the modules

7.2 Cleaning

If the solar modules are sufficiently inclined (≥ 15°), cleaning them is generally not necessary (self-cleaning by rain). If they are installed at a shallow angle and/or there is a lot of dirt/dust, cleaning from time to time can be helpful to maintain a high energy yield.

Cleaning a photovoltaic system carries the risk of electric shock and damage to modules and other components. Therefore, we recommend cleaning only to trained personnel who are familiar with the risks of applying water to electrical components and have personal protective equipment. There is an increased risk of electric shock if modules are damaged. Inspect the modules before cleaning. To reduce the risk of electric shock, the system should be shut down and cleaning should be performed in low sunlight.

Requirement for cleaning process:

- Do not dry clean the modules.
- Rainwater or tap water with a total hardness of less than 75 mg/L can be used for cleaning.
- If running water is not sufficient to remove heavy soiling, use a soft, non-conductive sponge or similar tool. If necessary, a non-abrasive, non-caustic, mild glass cleaner may be used to aid in the cleaning process. Residues of the cleaner must be rinsed off with sufficient running water.
- Do not use a high-pressure cleaner or brush the back of the modules.
- It is forbidden to stand or walk on the modules.
- The difference between the module temperature and the water temperature must not exceed 20 K.

8 Disclaimer

These installation and assembly instructions apply to generally common systems. All specifications are provided without warranty. AXITEC Energy GmbH & Co. KG does not guarantee the modules' fitness for use or function in case of any deviation from the notes contained in this user information. Because the adherence to this user information and the conditions and methods of the installation, the operation, the use and the maintenance of the modules cannot be controlled or monitored by AXITEC Energy GmbH & Co. KG. AXITEC Energy GmbH & Co. KG accepts no liability for damages caused by any use other than the intended use, faulty installation, operation, use or maintenance.

Furthermore, any liability for violations of patent rights or violations of other rights of third parties arising from the use of the modules