



# **SL RACK**

# SL FAST FLAT

## **SL Fast Flat S**

## **SL Fast Flat EW**



**Product SL Rack Flat Roof System** 

SL Fast Flat **Type** 

**Project name** 

**Project number** 

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## 1. BASIC INFORMATION



For ease of reading, the generic masculine form is used throughout this manual. Unless otherwise stated, personal designations used in this installation and maintenance manual refer to all genders.

## 1.1. Important safety instructions

Before commencing any work, it is essential that you check the delivery note to ensure that the components are complete. Please read these installation instructions carefully before starting the installation and take note that all work must only be carried out by qualified and competent persons!

It is paramount to follow the module manufacturer's installation instructions.

Failure to observe the installation instructions, installation sequence and safety instructions, as well as the use of third-party components, will invalidate the manufacturer's guarantee, warranty and liability. This also applies to the installation instructions of the module manufacturer.

The system may only be used for the purpose described in this manual. Incorrect installation or failure to observe the safety and warning instructions may endanger yourself and others. Serious injury or considerable damage to property may result.

## 1.2. Manufacturer's responsibilities

According to the German Equipment and Product Safety Act (Geräte- und ProduktSafetysgesetz- GPSG), the manufacturer is obliged under public law to market only safe equipment. Market surveillance is carried out by the trade supervisory authorities of the federal states. If the equipment does not comply with the regulations when placed on the market, the labour inspectorate is entitled to complain.

CE marking is a prerequisite for the initial placing on the market (or putting into service) of products for which CE marking is required according to the following EU directives, namely in all participating countries of the European Economic Area (EEA).

The EEA comprises the EU Member States and the EFTA countries with the exception of Switzerland. This means that CE marking is not required when placing products on the market in Switzerland.

There are often special conformity markings, but the CE marking in accordance with the EU directives is recognised.

## 1.3. Contrator's responsibilities

According to the German Trade Association for Wood and Metal (BGHM Berufsgenossenschaft Holz und Metall), the contractor must appoint a responsible site supervisor to carry out a project-related risk assessment. His tasks include general instruction of the employees as well as workplace and activity-related instruction for the site. The main responsibility and liability for health and safety and compliance with health and safety regulations therefore lies with the contractor.

The contractor ensures that all parts of the instruction manual are kept within easy reach of the system at all times.

The contractor agrees to only allow persons to work on the system who

## 1. BASIC INFORMATION



- have read and understood all parts of the manual relevant to their work,
- are familiar with the basic regulations concerning safety at work, accident prevention and environmental protection
- and have been instructed in the safe handling of the system.

## 1.4. Training of installation personnel

Assembly and installation of the system should only be carried out by trained and authorised personnel. Electrical parts of the system may only be opened by a qualified electrician.

- Assembly and installation work may only be carried out by specialists trained for the respective activity.
- Due to their training and professional activities, they must be able to recognise hazards and risks that may arise from the respective activity.
- The responsibilities of the personnel must always be clearly defined before each activity.
- Personnel in training may only work on the system under the supervision of an experienced person.

#### 1.5. Operator's responsibilities

Before starting work, all users of the equipment (hoists, aerial work platforms, mini cranes, etc.) undertake to observe the basic safety and accident prevention regulations, the safety chapter and the instructions in this manual. They must also familiarise themselves with the operation and functionality of the machine before using it.



This chapter contains information on the safe use of the system described in this document.

## 2.1. Symbols and special emphasis

There is always a potential hazard when working on a PV system. This hazard cannot be eliminated by technical measures. We therefore use the following warning symbols when describing the various system components:

	Warning Failure to observe the instructions may result in <b>personal injury</b> .
$\triangle$	Warning Failure to follow the instructions may cause damage to the system.
4	Hazardous electrical voltage Potential hazard from high voltage.
<u>**</u>	Warning of obstacles and tripping hazards on the ground
	Warning of risk of fall from roof
	Warning of injury to the hands
	Warning of cuts
3-	Warning of risk of breakage if PV modules are stepped on
i	This symbol precedes instructions and useful information.



## 2.2. Mandatory signs in use

Wear a safety vest
Wear safety boots
Wear safety gloves
Wear a hard hat
Use safety goggles
Use a safety harness
Use respiratory protection

## 2.3. Safety Guidelines

The underlying safety guidelines govern the authorisation for use of the system and the resultant responsibility of the respective user.



#### 2.4. **Ensure qualified personnel**





## **WARNING**

## Inadequately qualified personnel can cause personal injury and damage to property.

The descriptions and instructions contained herein assume the knowledge of a trained specialist.

Only work on or with the system if you have

- received instruction on safe operation and
- have read and understood the contents of this manual.
- Failure to do so could endanger yourself and others.
- Observe the relevant accident prevention and environmental regulations at all times.

#### Never work on or with the system,

- if you are under the influence of alcohol,
- drugs or
- medication.

#### Only assemble and install the system,

- if you are a **trained specialist** for the respective activity. Descriptions and instructions for maintenance, servicing and repair work require the expertise of a trained specialist.
- Comply with the relevant accident prevention and environmental legislation.





## Danger due to electric current

The system works with high voltage.

- Never open electrical cabinets and terminal boxes unless you are a qualified electrici-
- Always have a qualified electrician check that no voltage is present before you start working on or near any part of the electrical equipment.

## The system's solar modules generate electricity as soon as they are exposed to sunlight.

Even modules that are not connected to a circuit generate voltage. A few percent of full sunlight is enough for the module to reach almost 100% voltage. If more than two solar panels are connected in series, life-threatening voltages can be generated! Furthermore, the risk of sparks forming between individual modules increases.



- Check the condition of the system's electrical equipment daily.
- **Never** work on or with the system if you notice any damage.
- In such a case, inform your supervisor and the maintenance personnel immediately.

## 2.5. Wearing of personal protevtive equipment



## **WARNING**



## Warning of moving, heavy and sharp parts

- Always wear a hard hat and safety shoes when working on or with the system.
- Also wear the personal protective equipment specified in the company regulations for your type of work.
- Follow your work instructions.





#### Warning of dangerous dusts and substances

- In addition, wear protective gloves, safety goggles and a respirator mask when you are
  - carrying out grinding and cleaning work,
  - work with cutting processes (drilling, sawing, abrasive cutting).
- Also observe the safety data sheets for the substances used.







#### Warning when working outdoors

 Wear a high-visibility vest when working on the grounds around the building or when working outside the building.





## 2.6. Securing the working environment





## Warning against using machines, tools and auxiliaries from third-party suppliers

• Observe the operating instructions for the machines, tools, auxiliary and lifting equipment necessary for installation, repair and maintenance.



## Warning of tripping hazards

 Placing items such as Basic Frames, Base Plates or ballast blocks on paths and walkways increases the risk of accidents for everyone.

#### Warning of fall hazard



• There is a risk of falling when working on the roof as well as when climbing on and off the roof. Always follow accident prevention regulations and use appropriate fall protection.

## 2.7. Installing safely



## 

#### Warning against unauthorised modifications

- Do not modify any part of the system unless you have obtained the manufacturer's written safety certificate.
- Use only original SL Rack spare parts or accessories expressly approved by the manufacturer



## 2.8. General information on intended purpose



#### WARNING!

Improper use of the system is prohibited and may result in serious injury or even death.

The use of the system in accordance with its intended purpose is generally subject to the following guidelines:

- The system may only be used for its intended purpose and in accordance with the technical specifications. Any other use or use beyond this is considered to be improper.
- Use the system only under the installation, connection and operating conditions specified in this manual.
- Correct and safe operation of the system requires proper storage, transportation, installation and commissioning. Furthermore, the system needs to be carefully operated, maintained and serviced by qualified personnel.
- In addition, the operating instructions of any connected systems must be observed with regard to interfaces and signalling sequences.

## 2.9. Improper usage



#### Warning!

Improper use of the system is prohibited and may result in serious injury or even death

SL Fast Flat is designed exclusively for mounting PV modules. Any other use is not intended. This also includes non-compliance with the specifications in this installation manual. In such cases, SL Rack GmbH is not liable for any damage to property or personal injury of any kind and does not guarantee the correct functioning of the installed components.

For example, **improper use** of the **systems includes**:

- Usage of the system for purposes other than the intended ones.
- Shipping, installation and supply as well as interface connections, if performed under installation, connection and operating conditions other than those defined in this manual.
- The electric, pneumatic and hydraulic connection of individual modules which are separate from the system. Only the system as a whole may be connected and put into operation.
- The use of non-approved spare parts, non-approved accessories and additional modules.

## 2. SAFETY



- The system being operated, serviced or maintained by unqualified personnel.
- Opening of service doors (e.g. control cabinet) and/or removal of protective covers by unauthorised persons.
- Operation of the system when safety devices have been tampered with or have been removed.
- Non-compliance with the instructions in this manual.



## 3.1. Convention for safety instructions

The system has been designed and built following a risk analysis. The harmonised standards to be complied with and other technical specifications have been carefully selected. The system is thus state of the art and guarantees maximum safety.



However, only by taking all the necessary measures can this safety be achieved in practice. The planning of these measures and the supervision of their implementation are the responsibility of the system operator.

In particular, the operator must ensure that

- the system is only used for its intended purpose
- the system is operated only in perfect working order and, in particular, safety equipment is regularly checked for proper operation
- the necessary personal protective equipment is available and used by the operating, maintenance and repair personnel
- the installation manual is always available at the place where the system is installed, in a complete and legible state, and in good condition
- the system is operated, maintained and repaired only by suitably qualified and authorised personnel
- that is regularly instructed in all applicable health, safety and environmental matters and is familiar with the installation manual and in particular with the safety instructions contained therein
- all safety and warning notices on the system must not be removed and kept legible.



## 3.2. Emergency Response

A distinction must be made between an emergency in the area of the system, e.g. danger to persons present due to being pulled in, caught or ejected, and danger due to electrical voltage.

Falling and falling through pose the greatest danger to personnel. In an emergency, rapid rescue must be ensured. However, personnel can only ensure the rescue chain if they have been trained to deal with an emergency. Personal protective equipment must also be available for rescue.

Other emergencies may occur if the system catches fire.

#### Proceed as follows

- Rescue the casualty and remove them from the harness.
- Provide first aid
- If the system presents a danger (electrical voltage, fire), switch it off immediately using the EMER-GENCY OFF switch.
- Get yourself and others to safety.
- Report the fire.







SL Rack GmbH assumes no liability or warranty for defects and damage caused by failure to follow the instructions and specifications in this manual. In particular, SL Rack GmbH is not liable for damage resulting from

- incorrect or incomplete assembly and installation of the flat roof system SL Fast Flat
- structural changes or improper use of system components
- the use of third-party components in our flat roof system SL Fast Flat
- failure to comply with safety and maintenance regulations



Furthermore **General Terms and Conditions** shall apply.

#### Disclaimer of warranty and liability

The installation and maintenance instructions refer exclusively to the mechanical metal construction and its components supplied by SL Rack GmbH.

Non-system components of the photovoltaic system, such as modules, cables and connectors, inverters or electrical switch boxes are not covered by this installation and maintenance manual.

Warranty and liability claims for these components are excluded by SL Rack GmbH.

## 5. CORROSION PROTECTION



#### Galvanised steel on flat roofs

Steel, especially hot-dip galvanised steel, plays a significant role in many industries, including renewable energies. We have been building ground mount systems made of hot-dip galvanised steel for more than 25 years. We therefore want to use our experience in another field: flat roofs. On flat roofs, the steel is exposed to similar, sometimes milder conditions than with ground mount applications. We have therefore decided to use hot-dip galvanised steel also for flat roof applications with our SL Fast Flat. We set the corrosion level at C4 (see table) to give installers confidence in any environment. This means that our components are coated with ZM430, so you can expect a long service life.

#### **Contact Corrosion**

With SL Fast Flat the risk of contact corrosion between two metals is low and considered unproblematic. Should a system be installed near the coast or salt water, protective measures can be checked and initiated. To illustrate: Depending on the metal pairing (aluminium-zinc-hot-dip galvanized steel, for example Basic Frame – Mid Clamp), there is a difference in electrical potential of varying degrees. The greater the difference in this potential, the higher the corrosivity.

Metal Pairing	Atmosphere		Water		
	City	Industry	Ocean	Fresh Water	Salt Water
Aluminium - Hot-Dip Galvanized Steel	0	0 - 1	0 - 1	1	1 - 2

Legend:

0 = no significant corrosion of the metal pairing

This information is subject to case-by-case verification during project planning and is provided by SL Rack GmbH as a non-binding recommendation.

<sup>1 =</sup> slightly increased corrosion, but no protective measures recommended

<sup>2 =</sup> increased corrosion, insulating protective measures recommended

<sup>3 =</sup> severe contact corrosion, avoid metal pairing



#### Corrosion categories according to DIN EN ISO 12944-2 (with exposure)

Corrosiveness catego- ries	Corrosivity	Examples of typical surroundings	Thickness reduction after 1st year of installation		Recommen- ded zinc
corrosion stresses	·		Carbon steel	Carbon steel Zinc	
<b>C1</b> Insignificant	Very low Slight- ly aggressive Interior	Only heated indoor spaces, insulated buildings (≤ 60% r. h.)	≤ 1,3 µm	≤ 0,1 µm	No zinc coating
C2 Low	Low Moderately aggressive atmosphere, dry climate. Exterior/interior Mainly rural areas.		≤ 1,3 μm	≤ 0,1 µm	Z600
C3 Moderate Slight aggressive Exter or/interior		Rooms with high humidity and low air pollution. Urban and industrial atmo- sphere with moderate SO <sub>2</sub> pollution or temperate climate.	>25 – 50 μm	>0,7 – 2,1 μm	ZM310
<b>C4</b> Strong	hoch mäßig aggressiv außen/innen Swimming pools. Industrial atmosphere and coastal atmosphere with moderate salt load.		>50 – 80 μm	>2,1 – 4,2 μm	ZM430
C5 Very strong  sehr hoch aggressiv außen/innen con- densation ar mination. Industri		Environments with almost constant con- densation and heavy air contamination. Industrial atmosphere with high relative humidity and aggressive atmosphere.	>80 – 200 μm	>4,2 – 8,4 μm	ZM600

The values in the table above for the galvanizing thicknesses/methods, depending on the corrosivity category, are based on DIN 55928-8 ("Corrosion protection of steel structures by coatings and overlays; Part 8: Corrosion protection of load-bearing thin-walled components ") and are at least at the level of the standard.

This information is subject to case-by-case verification during project planning and is provided by SL Rack GmbH as a non-binding recommendation.

## 6. DESIGN AND INSTALLATION REQUIREMENTS



# Customised project planning of the flat roof system SL Fast Flat with regard to the building and location

Before planning the installation, a static calculation (proof of stability) in accordance with national standards is required to ensure that the roof and insulation can support the additional weight of the photovoltaic system, including ballast.

## 6.1. Required data for project design

Minimum requirements

#### 6.1.1. Local conditions:

- Proof of the load-bearing capacity of the roof.
- Information on the regional weather and environmental conditions (wind, rain, snow, seismic events, etc.).
- The route to the construction site must always be accessible with suitable means of transport (e.g. truck, telescopic loader, etc.) for installation, maintenance and repair.
- Check roof pitches.
- Check the roof for any obstacles such as dome lights, chimneys or other obstructions before designing the system.
- Obtain documentation on roof statics, insulation, lightning protection and drainage system.
- Obtain documentation on the roof covering (foil roof, bitumen roof, gravel roof).

#### 6.1.2. Ambient conditions:

- Check whether extreme temperature, air and environmental conditions are to be expected:
  - Temperatures of -20 °C or above +45 °C.
  - Severe temperature fluctuations.
  - Humidity below 10 % or above 90 %.
  - Harmful or flammable gases.
  - High air pollution from dust, sea air or metal particles.
  - Shocks or vibrations.
  - Locations with existing and expected shading.
  - Locations with a chemical or oil-contaminated environment.

## 6. DESIGN AND INSTALLATION REQUIREMENTS



#### 6.1.3. Special local conditions

- Determine whether the special ambient conditions listed below are to be expected. In such cases, electrical and electronic components may need to be specially protected:
  - Environments with static electricity.
  - Environments with strong magnetic fields.
  - Environments with possible radioactivity.
  - Proximity to power lines.

#### 6.1.4. Miscellaneous information



#### Warning!

Non-observance of the instructions can cause damage to the system.

The flat roof system SL Fast Flat is designed for installation on almost any flat roof.

The maximum roof pitch should not exceed 5°.

For steeper roof pitches, check on a case-by-case basis whether local anchoring or reinforced ballast is required on site. This must be considered at the design stage.

On steeper roofs or in unstable conditions, the racking system must be anchored to the building.



With its configurator Solar.Pro.Tool., SL Rack offers its customers a powerful tool for the complete design of flat and pitched roof systems. This tool can be used to generate a detailed parts list and a drawing prior to ordering and delivery. Furthermore, it is possible to obtain a customised project overview drawing for an additional charge (see Figure 7.4. Example SL Fast Flat). This shows all the required components and exact dimensions in different views, so that the items can be clearly allocated on the note of delivery with quantity and item number. Installation without prior designing it in the Solar.Pro. Tool will result in the loss of guarantee and warranty claims.

When planning the SL Fast Flat flat-roof system, the following points in particular must be observed:

- 1. Taking stock
- 2. Determination of the coefficient of friction
- 3. Compressive strength of the flat roof insulation
- 4. Further design information

#### 7.1. Overview

The condition of the existing flat roof must be determined on site.

The load-bearing reserves of the roof for the PV system must be provided by the building owner. The additional roof loads resulting from the PV system are designed, calculated and provided in the Solar. Pro.Tool.

It is advisable to carry out a proper survey of the supporting structure, the roof structure, the requirements for the existing building, their documentation and the resulting determination of preparatory repair or modernisation work.

It is advisable to consult appropriately specialised persons (architects, structural engineers) and roofers. Also consider the service life of your PV system and the durability of the roof waterproofing.



#### Warning



#### Warning of fall hazard

 There is a risk of falling when working on the roof as well as when climbing on and off the roof. Always follow accident prevention regulations and use appropriate fall protection.



Damage, loss of performance and even defects in the PV system and roof may result from inadequate preparation. SL Rack GmbH does not accept any liability in this respect.



## 7.2. Determining the Coefficient of Friction

The Coefficient of Friction is determined using our Coefficient of Friction Kit. Measurements must be documented in the Coefficient of Friction report in order to achieve full traceability and maximum accuracy.

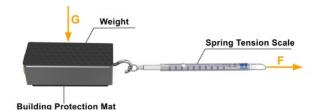


# Protocol Coefficient of Friction Instructions

When installing a flat roof system, it is crucial to ensure optimal positional stability. The objective is to calculate the optimal ballasting for the flat roof system, which ensures the safety of the system and keeps the amount of ballast within reasonable limits. Static friction plays a pivotal role in this process. The static friction depends on a number of factors, including the weight of the PV system and the friction between the flat roof surface and the building protection mats of the racking. The system weight includes the total weight of the modules, the racking, ballast, cables, inverters and grounding cables. The roofing material of a flat roof usually consists of bitumen or some type of foil. EPDM or building protection mats are inserted where the racking would touch the roofing material. These factors can be used to calculate the coefficient of friction, which can then be used to determine the optimum ballasting for the system.

#### How to determine the coefficient of friction

The coefficient of friction, also known as the friction coefficient (formula symbol  $\mu$ ), is a dimensionless measure for the frictional force in relation to the contact pressure between two bodies.



Tensile force, F [kg] Weight force, G [kg] Coefficient of friction, [µ]

 $F/G = [\mu]$ 

Weight force, G = 1 Kg

(Approx. 1 kg when using the enclosed weight and a building protection mat. Deviations are negligible.)

Example:

 $0.7 \text{ kg} / 1.0 \text{ kg} = 0.7 [\mu]$ 



# Protocol Coefficient of Friction

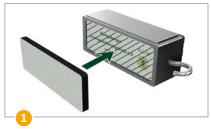
## **Test procedure**

## The following items are required for the test:

FLA Coefficient of Friction Measuring Kit, item no. 09500-50:

- Test weight with building protection mat permanently attached to the bottom
- Spring tension scale

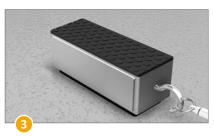
Make sure to choose the appropriate type of building protection mat for the respective project site.



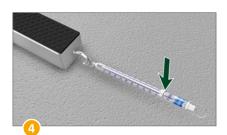
Insert the building protection mat into the recess provided on the weight.



Test weight ready for measurement.



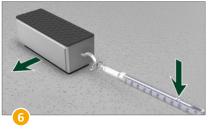
The combined weight of the building protection mat and test weight is 1.0 kg.



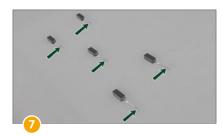
Ensure that the scale is set to "0" before each measurement.



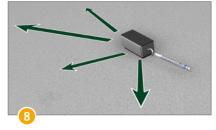
Pull the test weight with the spring tension scale transversely to the roof pitch.



Read off the tensile force in kg as soon as the test weight starts to slide (end position of the spring balance stop).



Read off the measurement results at several points on the surface of the array area, on both dry and wet surfaces.



Enter the measurement results of the high points, low points, corner, edge and centre areas of the surface.



#### **Protocol Coefficient of Friction**

## **Test procedure**



#### Note:

For each measurement, ensure that the unloaded scale is at zero. Use the building protection mat provided for the test. The combined weight of the protective mat and weight should be 1.0 kg.

The weight can be adjusted by adding additional weights or removing lead balls.



Before each measurement the scale has to be set to "O"

Here is a sample calculation to illustrate this:

The test weight weighs 1.0 kg.

The spring tension scale shows 0.70 kg before the weight moves.

F [indication on spring tension scale in kg]: G[test weight in kg] =  $\mu$  [coefficient of friction]

0.70 kg : 1.0 kg = 0.7

 $\mu = 0.7$ 

#### **Test log**

ROOF						
Roofing	Type of roofing	Age of roofing	Weight [G]			
manufacturer			Test weight [kg]			

MEASURED VALUES*	TENSILE FORCE F IN KG
Measuring point 1 – dry	
Measuring point 1 – wet	
Measuring point 2 – dry	
Measuring point 2 – wet	
Measuring point 3 – dry	
Measuring point 3 – wet	
Measuring point 4 – dry	
Measuring point 4 – wet	
Measuring point 5 – dry	
Measuring point 5 – wet	

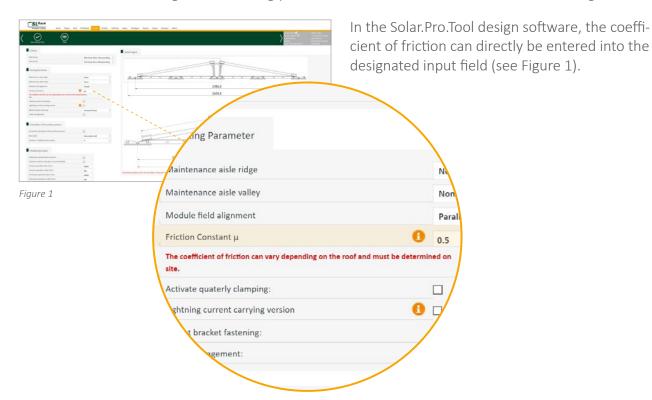
<sup>\*</sup> It is recommended that the number of measuring points be increased for larger roof areas. Then take the lowest value of all the measuring points and divide it by the weight of the test specimen.

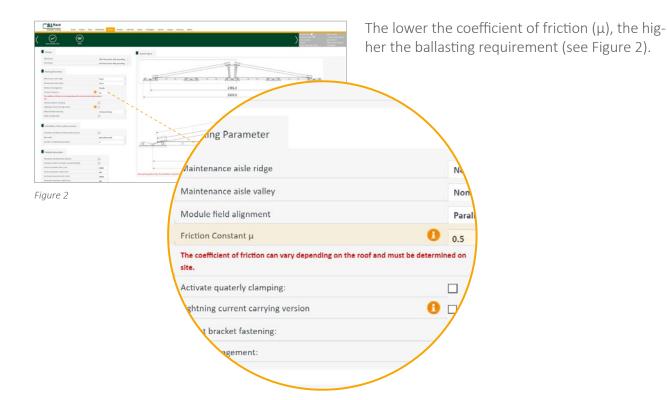


#### **Protocol Coefficient of Friction**

#### Measured values in the Solar.Pro.Tool

Please note the following when entering your measured values into our Solar.Pro.Tool design software:







## 7.3. Compressive strength of flat roof insulation



#### Warning!

Failure to follow the instructions can cause **damage to the system and the roof sealing**.

Before installation begins, the allowed compressive strength of the insulation must be determined on site. The compressive strength can be found in the manufacturer's data sheet. The compressive strength of the insulation indicates how much load the insulation can withstand without damage or loss of insulation. The values can be found on the manufacturer's website or in your design documentation. If there is no documentation on the compressive strength of the insulation, the worst case should be assumed

The actual compressive strength of the existing insulation may differ from the manufacturer's specification.

In order to distribute the load on the insulation as evenly as possible, the SL Fast Flat allows up to three additional Base Plates in two different sizes (100x200mm and 200x200mm) to be installed on a Basic Frame. Spreading the load over several feet reduces the compressive load on the insulation. SL Rack's Solar.Pro.Tool calculates the optimum number and position of Base Plates for your SL Fast Flat.



## 7.4. Additional design information



#### Warning!

Failure to observe the instructions can cause **personal injury.** 



#### Warning!

Failure to observe the instructions can cause damage to the system.

The SL Fast Flat should always be designed in close collaboration with trained professionals to ensure a professional and safe installation. The specific requirements of the different building categories and the relevant national building regulations must be considered. All relevant safety clearances, fire regulations and any escape route plans must also be carefully considered and adhered to. Sound planning that takes these essential aspects into account will not only ensure the safety of the project, but also its long-term stability and functionality. SL Rack GmbH supplies a checklist with each installation manual to help ensure that all aspects are taken into account at the design stage.

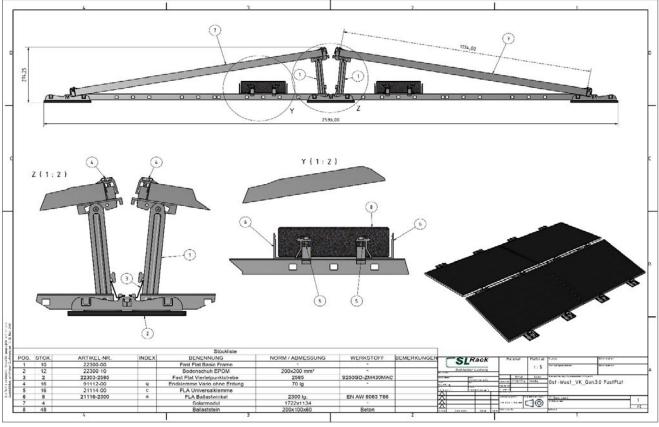


Figure 7.4. Example SL Fast Flat



SL Fast Flat is assembled on the roof from a number of different components. Depending on the version, a row of modules is made up of the following components at the time of delivery:

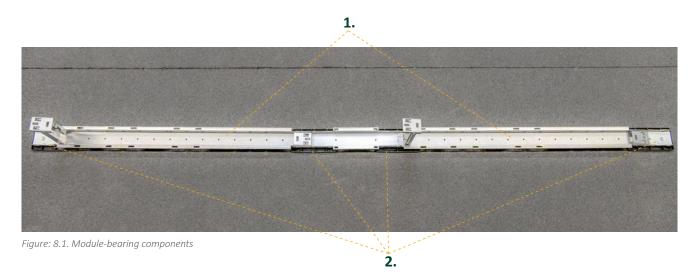
(SL Fast Flat is subject to continuous improvement and development. Therefore, the brochure may differ from the installation instructions).

Module-bearing components	Connecting components	Hardware/ accessories	Deflectors/ballasting
<ul> <li>Basic Frame (Item no. 22300-00)</li> <li>Base Plate EPDM - 200x200 mm (Item no. 22300-10) or Base Plate PVC - 100x200 mm (Item no. 22300-20)</li> </ul>	<ul> <li>Spacer         (Item no. 22300-220/ -390/-700)</li> <li>FLA Universal Clamp         (Item no. 21114-00)</li> <li>Quarter-Point Strut*         (Item no. 22303-2585)</li> </ul>	<ul> <li>Self-tapping screw (Item no. 93155-25)</li> <li>Lightning Protection Clamp Top (Item no. 91518-00)</li> <li>Cable Clip (Item no. 22300-41)</li> </ul>	<ul> <li>Ballast Bracket (Item no. 21116-2300)</li> <li>Wind Deflector (Item no. 22301-2595)</li> <li>Wind Deflector light (Item no. 22302-2595)</li> </ul>

<sup>\*</sup>for east-west system

- **Before commencing installation**, check all parts that have been supplied.
- Report any incorrect deliveries and/or damaged components to SL Rack GmbH immediately.

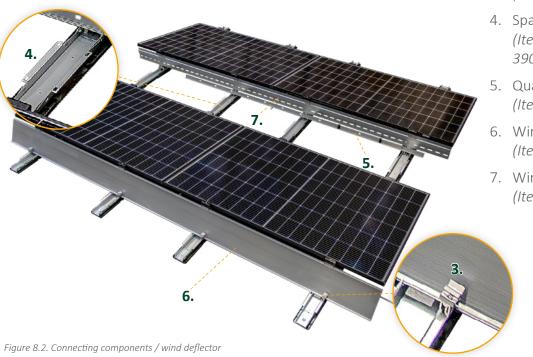
## 8.1. Module-bearing components



- 1. Basic Frame (Item no. 22300-00)
- 2. Base Plate EPDM 200x100 mm (Item no. 22300-20)



## 8.2. Connecting components / wind deflector



- 3. FLA Universal Clamp (Item no. 21114-00)
- 4. Spacer (Item no. 22300-200/-390/-700)
- 5. Quarter-Point Strut (Item no. 22303-2585)
- 6. Wind Deflector (*Item no. 22301-2595*)
- 7. Wind Deflector light (Item no. 22302-2595)

## 8.3. Ballasting

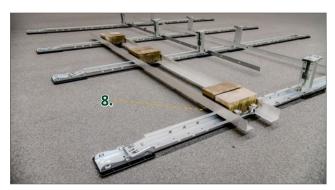


Figure.: 8.3. Ballasting

8. Ballast Bracket (Item no. 21116-2300)



## 8.4. Hardware / accessories



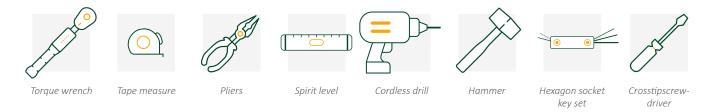
- 9. Lightning Protection Clamp Top (Item no. 91518-00)
- 10. Self-tapping screw (Item no.93155-25)
- 11. Cable Clip (Item no. 22300-41)

## 8.5. Assembly instructions

SL Fast Flat is built on continuous Basic Frames. First, the Base Plates are placed underneath the Basic Frames. These also serve as connection from Basic Frame to Basic Frame. The solar modules rest on the top and bottom of the Basic Frame and are secured with module clamps. Depending on the type of system (south or east/west) and ballast requirements, wind deflectors may need to be installed.



The following tools are typically required for installation.



## 9.1. Maesuring Basic Frames

- Tape measure (100 m)
- Pavers to fixate the Mason's cord (approx. 10 pcs.)
- Mason's cord
- Waterproof pen
- Kit to determine coefficient of friction

## 9.2. Racking installation

- Trestle for easier assembly while standing
- Protractor spirit level
- Tape measure
- Mason's cord
- Jig/mounting aid
- Torx 40 bit
- Cordless drill
- Hexagon socket 8 mm

#### 9.3. Module installation

- Mason's cord
- Tape measure
- Optionally, spacer for distance between modules
- Cordless drill
- Torx 40 bit
- Digital torque wrench (< 4-12 Nm)
- Torx 40 bit for torque wrench







#### Warning



## Warning of fall of heavy parts in case of handling errors:

- Always wear safety shoes, a safety helmet, safety goggles, safety gloves and a high-visibility vest when unloading racking components.
- In addition, wear the personal protective equipment specified in your company's internal regulations for the job.
- Follow your work instructions.
- Never stand under lifted loads.
- Make sure that unauthorised persons are not able to enter the danger zones.

















#### Please also consider the following:

Additional applicable documents contain important information, instructions and safety precautions for transport and loading. They also apply to these instructions, but are project specific and cannot be reproduced in full in this document.

- The enclosed Solar.Pro.Tool project report contains specific information on structural and ballast requirements which must be complied with.
- Check all parts that have been delivered.
- Immediately report wrong deliveries and/or damaged parts to SL Rack GmbH.

#### **Delivery of components**

SL Fast Flat racking parts / components are delivered by

- truck or
- container, 20 '(approx. 6 meters) or 40 '(approx. 12 meters)



#### **Preparing for delivery**

- Prepare a firm and drivable surface for the delivery to take place.
- Make sure that
  - access roads
  - manoeuvring areas and
  - unloading areas

are passable by trucks and can be used by forklifts and lifting equipment.

#### Having forklifts and lifting equipment ready

- Ensure that forklifts and lifting equipment are available.
- For the time of delivery, arrange for suitable forklifts and lifting equipment.
- Agree on the selection of the appropriate forklifts and lifting equipment with the responsible site manager.
- Ensure that components, pallets and long pieces can be properly unloaded.
- Provide forklifts and lifting equipment with different fork spacing or adjustable forks.
- Note that components, pallets and bundles have the following weights and dimensions:
  - Weights up to 1,500 kg
  - Lengths up to 6.00 m
  - Width/overhang up to 1.20 m
  - Height up to 1.20 m

#### Have trained personnel available

- Ensure that only trained personnel carry out loading and transport operations.
- When selecting personnel, take into account the requirements of the DIS Unloading Guidelines.



#### **ATTENTION**

#### Storing components safely

Components are also delivered in cartons on pallets.

- Unload the components only on a firm and stable surface.
- Protect components from environmental influences like frost and rain.

This will prevent damage before installation.



## 11.1. Measuring the Basic Frames

- Strictly follow the instructions given in the assembly plans and the specified sequence of steps.
- Mark the positions of the Basic Frames and align them accordingly.
- Measure both diagonals and align them to create a right-angled structure.
- The flat roof system SL Fast Flat is a unique system with a total of four different module mounting options.
- The SL Rack Quarter-Point Strut (item no. 22303-2585) can be used as a mounting aid (see 12. Installation).

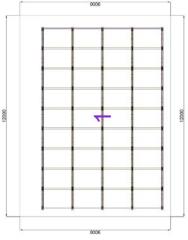


Figure 11.1. Measuring the Basic Frames

## 11.2. Comply with required distances



#### Warning!

Failure to follow these instructions may result in damage to the system.

The individual module rows are positioned to minimise shading from each other when facing south, for example. It is therefore important to keep the module row spacing exactly as planned using appropriate spacers. This is to avoid shading due to differences in spacing.

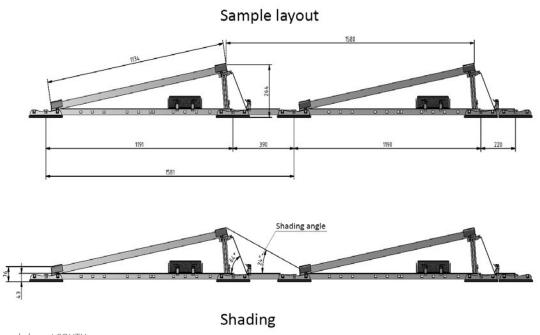


Figure 11.2. Sample layout SOUTH



## 12.1. Installation SOUTH system



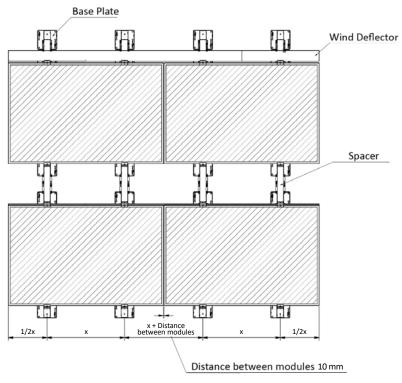


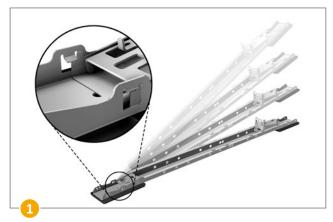
Figure 12.2b Measurements SL Fast Flat SOUTH, quarter-point/green-zone clamping



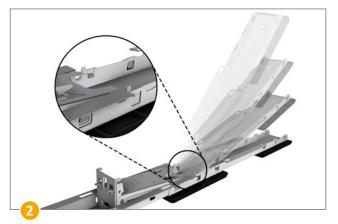
## 12.1. Installation SOUTH system







Insert the Base Plate into the Basic Frame as illustrated. There will be audible locking when the Base Plate fully engages with the Basic Frame.

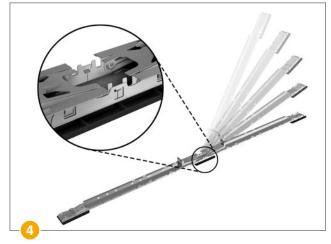


To connect the Basic Frames, the South system utilizes spacers in order to reduce shading; the length depends on the Solar.Pro.Tool's calculations.



Depending on the ballast and the coefficient of friction, it may be necessary to add additional Base Plates. Add Base Plates according to the Solar.Pro.Tool's specifications.

**Note:** Up to three additional Base Plates may be installed per Basic Frame.



Install the Base Plates on the **eaves side** and connect the Basic Frames using the spacers.

**Note:** Before connecting the Basic Frames, ensure that they are correctly aligned. With the south system, they are all aligned in one direction.



## 12.1. Installation SOUTH system







Correct assembly results in a continuous rail of Basic Frames.



Installation with corner clamping: The centre distance of the Basic Frames is the module dimension (x) + 22 mm.

These specifications already include the tolerances for the coefficient of thermal expansion.



# Installation with quarter-point/green zone clamping:

X = Determine the clamping location according to the module manufacturer's manual

X + 22 mm

Transfer the length dimension X from the module, + 22 mm to the Quarter-Point Strut and install it on the Basic Frame as illustrated.

**Note:** It is paramount to install the Quarter-Point Strut when clamping at the quarter-point/green zone.



Insert the Quarter-Point Strut into the Basic Frame and fold up the Ridge Adaptor.

When installing the system without the Quarter-Point Strut, simply fold up the Ridge Adaptor without additional parts.



### 12.2. Installation EAST-WEST system



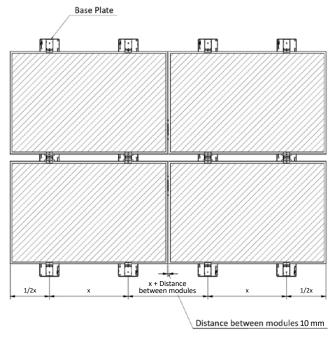


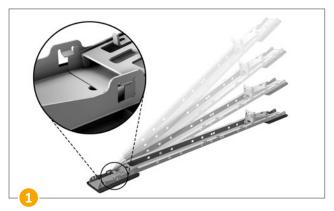
Figure 12.2b Measurement EAST-WEST



### 12.2. Installation EAST-WEST system



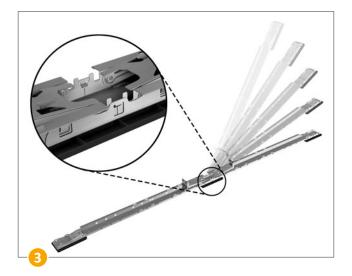




Insert the Base Plate into the Basic Frame as illustrated. There will be audible locking when the Base Plate fully engages with the Basic Frame.



Depending on the ballast and the coefficient of friction, it may be necessary to add additional Base Plates. Add those at the designated spots on the Basic Frame.



Insert the Base Plate into the Basic Frame as illustrated. There will be audible locking when the Base Plate fully engages with the Basic Frame.

**Attention:** In the EAST-WEST system the Ridge Adaptors face each other.



**Installation with corner clamping:** The center distance of the Basic Frames is the module dimension (x) + 22 mm.

These specifications already include the tolerances for the coefficient of thermal expansion.



### 12.2. Montage OST/WEST-System







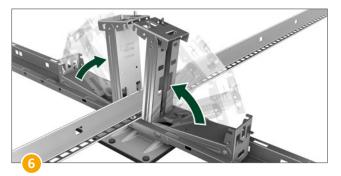
## Installation with quarter-point/green zone clamping:

X = Determine the clamping location according to the module manufacturer's manual

X + 22 mm

Transfer the length dimension X from the module, + 22 mm to the Quarter-Point Strut and install it on the Basic Frame as illustrated.

**Attention:** It is paramount to install the Quarter-Point Strut when clamping at the quarter-point/green zone



In order to fixate the strut, hook the holes into the lugs in the Basic Frame and now fold up the Ridge Adaptor, which automatically clamps the strut.

When installing the system without the Quarter-Point Strut, simply fold up the Ridge Adaptor without additional parts.

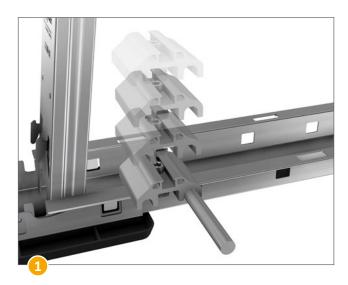


### 12.3. Lightning protection





Please refer to the Lightning Protection data sheet for information on the connection to the lightning protection system.



Press the Lightning Protection Clamp Top (item no. 91518-00) into the front reccess of the Basic Frame. After installing the round wire (8 or 10 mm in diameter) tighten the screw of the clamp with a torque of 10 Nm.

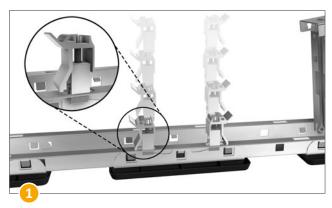
**Attention:** See Lightning Protection data sheet for installation instructions.

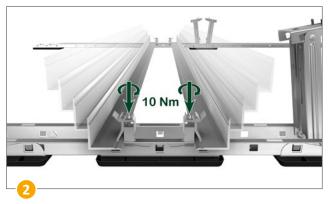


### 12.4. Ballasting

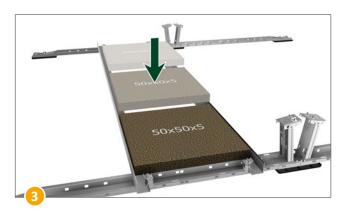


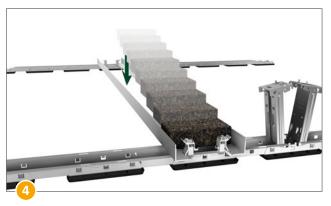
### 12.4.1. Ballasting with Ballast Brackets





Press the Universal Clamps into the basic frame as shown. Then slide the Ballast Brackets sideways under the Universal Clamps and tighten the screw with a torque of 10 Nm.





Place the required number of ballast blocks (as per Solar.Pro.Tool) into the Ballast Brackets. The Ballast Brackets can accommodate ballast blocks with a width of 20-50 cm.

### 12.4.2. Ballasting without Ballast Brackets





You can place the ballast blocks directly into or onto the Basic Frame as shown, if the Solar.Pro.Tool calculation indicates that no Ballast Bracket is required.



### 12.5. Cable Management



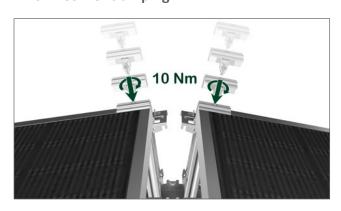
Press the Cable Clip into the recess provided on the Ridge Adaptor or on the Quarter-Point Strut. Insert the cables and close the Cable Clip.

**Attention:** The Cable Clip can hold up to one MC4 plug as well as 5 additional cables.

### **12.6.** Module clamp installation – all systems

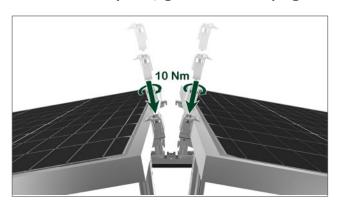


### 12.6.1. Corner clamping



Press the mid or end clamp Vario into the recess on the Ridge Adaptor. Slide the module underneath and tighten the clamp with 10 Nm.

### 12.6.2. Quarter-point / green zone clamping



Press the mid or end clamp Vario into the recess on the Ridge Adaptor. Slide the module underneath and tighten the clamp with 10 Nm.



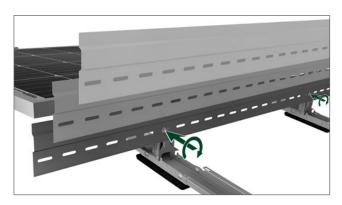
### 12.7. Installation Wind Deflector







### 12.7.1. Installation Wind Deflector light for all systems



Place the Wind Deflector light in the retaining lugs and fixate it with the screw.

**Attention:** It is only necessary to install a Wind Deflector light in a EAST-WEST system in case of an obstruction. The Solar.Pro.Tool. provides the exact calculations for these instances.

### 12.7.2. Installation Wind Deflector for all systems



Hook the Wind Deflector into the Ridge Adaptor. Fasten the Wind Deflector with the Universal Clamp.

**Attention:** If the Wind Deflector is installed at the edge of the array, an additional spacer is required.

## 13. LIGHTNING PROTECTION SYSTEM



Please refer to the Lightning Protection data sheet for information on the connection to a lightning protection system.





SL Fast Flat is certfied to DIN EN 62561







### Warning



### Risk of contusions and impacts from transport vehicles during unloading

- Secure the unloading area extensively.
- Wear personal protective equipment when unloading.

### Beware of sharp-edged surfaces and protruding profile ends at head level

 Always wear safety shoes, a safety helmet, safety goggles, safety gloves and a high-visibility vest when carrying out any assembly work.

This will protect you from impact and cuts.

• Ensure that unauthorised persons cannot enter the hazardous areas















#### **Electrical hazards**

When solar panels are exposed to light, they generate electricity. All cables from the modules are live and cannot be switched off.

The risk of sparking and fatal electric shock is greatly increased, especially in solar installations with a large number of connected modules.

In the event of insulation damage to cables or connectors, even the solar racking can be exposed to electricity.

- Only allow installation and assembly work to be carried out by qualified electricians.
- Observe all safety instructions provided by your module or inverter manufacturer and only use insulated, anti-static tools.

## 14. INSTALLING MODULES





### **Installation instructions**

- Always follow the module manufacturer's installation instructions.
- In case they are not available, it is your responsibility to obtain these from the module manufacturer.

Depending on the moudule type, SL Rack GmbH offers various mounting solutions.



### **SL Rack GmbH**

Münchener Straße 1 D-83527 Haag i.OB

Phone: <u>+49 8072 3767- 0</u> Email: <u>info@sl-rack.com</u> Web: <u>www.sl-rack.com</u>







### **Electrical hazards**



The system uses high voltage.

- **Never** open the control unit or other electrical equipment unless you are a **qualified** electrician.
- Inform your qualified electrician if electrical work is necessary.
- In damp conditions, do not carry out electrical installation work.
- Comply with all applicable regulations and safety requirements.
- Keep unauthorised persons out of the work area.



### 13.1. Connecting the control box

- Check if the on-site conditions have been met.
- Have the system's control box connected by a qualified electrician.



As photovoltaic systems have no moving parts, they are generally very low maintenance. However, to ensure system safety and efficient yield performance, it is recommended that all installed system components are visually inspected at regular intervals and that bolted connections are checked.

### 14.1. Visual inspection

The position of the system should be checked particularly after a storm or hurricane as, depending on the pitch of the flat roof, the gusts of wind and the downwards force may cause the system to shift. Check the position of the ballast blocks against the ballast plan. Check that the EPDM pads are correctly positioned. Check the Base Plates for loose parts, check the cables for breakage and check the plug connections. Inspect the modules for obvious damage. If the visual inspection reveals that bolted connections are no longer properly tightened, a mechanical inspection is required.

### 14.2. Mechanical inspection

A mechanical inspection of the system is only necessary if the visual inspection has revealed technical problems or damage.

Check the bolts on the racking using a torque wrench. Tighten the bolts to the torque specified by the manufacturer. If this is not possible, the bolts must be replaced. All important bolt connections are listed under ,Check Points'.

In accordance with DIN 18914 it must be ensured that 50% of the intended preload is present. This is checked by setting the torque wrench to 50% of the tightening torque.

If the bolt cannot be loosened, the test is successful. A torque wrench in accordance with DIN EN 6789 must be used (indicating torque wrench or trigger torque wrench). The tightening torque is based on VDI 2230.

A maintenance interval of 12 months is recommended.



# 14.2.1. Check points – module bearing components

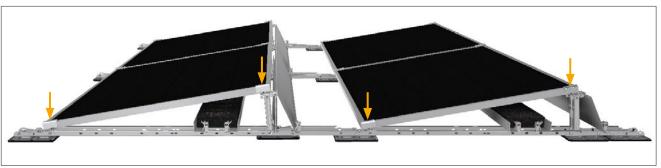




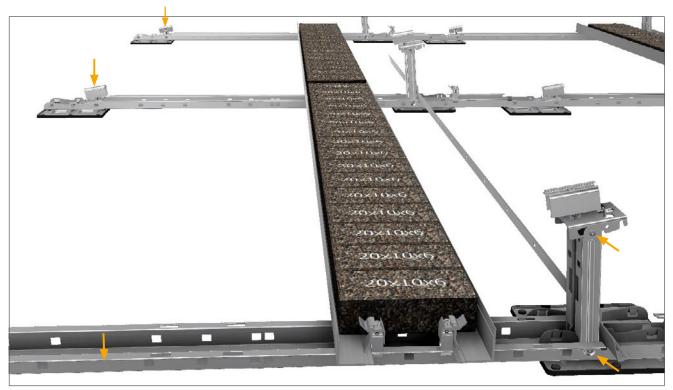








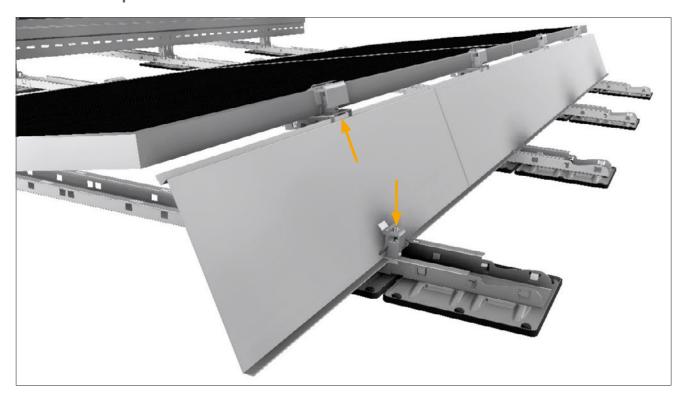
14.2.2. Checking position and condition of Base Plates and ballasting as well as inspection for corrocion.



Check for corrosion on the Basic Frame at rivet points and bottom rail.



### 14.2.3. Check points wind deflectors





## **TEST PROTOCOL**



Check point	Result	Measure/comment	Inspector	Signature
Visual check				
Check point module bearing components				
Location of ballast				
Check point wind deflector				
. Maintenance on (date):				
Check point	Result	Measure/comment	Inspector	Signature
Visual check				
Check point module bearing components				
Location of ballast				
Check point wind deflector				
		'	,	'
. Maintenance on (date):				
Check point	Result	Measure/comment	Inspector	Signature
Visual check				
Check point module bearing components				
Location of ballast				

## **TEST PROTOCOL**



4. Maintenance on (date):				
Check point	Result	Measure/comment	Inspector	Signature
Visual check				
Check point module bearing components				
Location of ballast				
Check point wind deflector				
5. Maintenance on (date):				
Check point	Result	Measure/comment	Inspector	Signature
Visual check				
Check point module bearing components				
Location of ballast				
Check point wind deflector				
		,		
6. Maintenance on (date):				
Check point	Result	Measure/comment	Inspector	Signature
Visual check				
Check point module bearing components				
Location of ballast				
Check point wind deflector				
				1





### 15.1. Decommissioning

- Shut down the system in accordance with the operating and maintenance instructions.
- If you do not have the operating and maintenance instructions at hand, obtain written confirmation that the system has been properly shut down.
- Have the system disassembled into transportable parts by the manufacturer or a trained specialist.
- Observe all information, notes and instructions in this installation manual.
- Make this installation manual available to the dismantling personnel.
- Dismantle the system in exactly the reverse order of assembly.





### Beware of sharp-edged surfaces and protruding profile ends at head level

 Always wear safety shoes, a safety helmet, safety goggles, safety gloves and a high-visibility vest when carrying out any assembly work.

This will protect you from impact and cuts.

- Ensure that unauthorized persons cannot enter the hazardous areas.
- Do not stand under lifted loads.













### **DANGER**

### **Electrical hazards**

The system uses high voltage.

• Never open the control unit or other electrical equipment unless you are a qualified electrician.

### Disconnecting the switch box

- Have the on-site fuses switched off/removed.
- Only a qualified electrician should disconnect the switch box from the on-site power supply.



### Module disassembly

The solar modules in the system generate electricity instantly when exposed to sunlight. If a large number of solar modules are connected, there is an additional risk of sparking between the modules.

### Keep this in mind during disassembly.

### Safely dispose of components

- Separate
  - steel
  - plastics
  - electrical scrap
  - aluminum
  - stainless steel
  - copper
  - glass
- Dispose of the components in accordance with local regulations or
- return the components to the manufacturer.

### Electronic scrap

- Never dispose of electronic scrap in your domestic waste.
- Only dispose of electronic waste in the designated collection containers provided by your waste disposal company.



## 16. Complementary documents (project design)

- 16.1. Basic Frame plan
- 16.2. Drawings and Layouts
- 16.3. Individual Solar.Pro.Tool. project report including drawings



### 16.4. Checklist SL Fast Flat

The following checklist is designed to help you check important points prior to the installation of SL Rack's flat roof system SL Fast Flat. Do not proceed to install until the checklist has been fully completed. Any irregularities found before, during or after installation must be documented and rectified immediately. SL Rack GmbH will not be liable for any damage as a result of non-compliance with the checklist.

Check point	Yes	No	Comment
Has the roof pitch been checked?  If the roof pitch is greater than 5°, additional anchoring is required			
Have roof drains been considered during the design stage?  The drains on the flat roof must not be blocked by Base Plates.			
Have fire safety regulations been observed?  Depending on the building class, a fire protection report may be required.			
Are the distances from fire protection equipment complied with?  If there are exhaust vents or SHEVS (smoke and heat exhaust systems) on the flat roof, these must be taken into account.			
Has the structural engineer determined the load reserve?  The PV system's additional load on the roof must be considered.			
Have you determined the coefficient of friction?  If you have not tested the coefficient of friction, you should assume μ 0,3.			
Has the compressive strength of the insulation been determined and tested?  The insulation must be able to withstand the additional weight of the PV system as well as snow and wind loads.			
Has the roof covering been inspected?  Renovation/cleaning must be carried out beforehand in the event of damage or soiling			
Is the distance to the building edge maintained?  The distances specified in the building regulations must be adhered to.			
Does the design consider maintenance aisles?  Make sure that work can still be carried out after the PV installation.			
Have you considered the SL Fast Flat installation manual?  Installation is impossible without them.			
Installation manual for the module being used.  Installation is not possible without a valid data sheet.			



16.4. Checklist SL Fast Flat	
Notes:	



16.4. Checklist SL Fast Flat	
Notes:	
Unterschrift Auftraggeber	Unterschrift Auftragnehmer
Datum, Ort	Datum, Ort



### 16.5. Revisions

Index	Date	Comment
		I .



### 16.5. Revisions

Index	Date	Comment





SL Rack **YouTube** 



SL Rack
Online ordering
system



SL Rack **Website** 



Contact us for your personal offer:

### **SL Rack GmbH**

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www.sl-rack.com

Subject to technical changes and printing errors.

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