Table of Contents
1. General Information .................................................................................................................................................. 4
  1.1. Short Description .................................................................................................................................................. 4
  1.2. Intended Use ......................................................................................................................................................... 4
  1.3. Copyright and Intellectual Property Rights ..................................................................................................... 4
  1.4. Safety Information ............................................................................................................................................... 5
  1.5. Obligation of the Plant Owner / Operating Company ....................................................................................... 7
  1.6. Commitment of the Personnel .......................................................................................................................... 7
  1.7. Training of the Personnel .................................................................................................................................... 7
  1.8. Additional Documents Relevant for the Mounting ............................................................................................. 8
2. Transportation, Loading and Unloading .................................................................................................................... 8
  2.1. Delivery of the components ................................................................................................................................ 8
  2.2. Preparing the delivery ............................................................................................................................................. 8
  2.3. Provide forklift trucks and hoisting equipment ................................................................................................. 9
  2.4. Check the scope of delivery .................................................................................................................................. 9
  2.5. Storage of the components ................................................................................................................................... 9
3. Technical data ............................................................................................................................................................. 10
  3.1. System description and properties .................................................................................................................... 10
  3.2. Rack tolerances .................................................................................................................................................... 10
  3.3. Systems overview ................................................................................................................................................ 11
  3.4. Components ......................................................................................................................................................... 12
    3.4.1. Strut assembly .................................................................................................................................................. 12
    3.4.2. Components of the strut assembly .................................................................................................................. 12
    3.4.3. Girder assemblies ............................................................................................................................................ 12
    3.4.4. Module-bearing rails ....................................................................................................................................... 13
    3.4.5. Purlin connector .............................................................................................................................................. 14
    3.4.6. Auxiliary equipment / accessories ................................................................................................................ 15
    3.4.7. Module clamping ........................................................................................................................................... 15
    3.4.8. Screws for Standard module clamps ............................................................................................................. 17
4. Mounting information .................................................................................................................................................. 18
  4.1. Terrain ................................................................................................................................................................. 18
  4.2. Foundation .......................................................................................................................................................... 19
    4.2.1. Pre-cast strip foundations .............................................................................................................................. 19
    4.2.2. Dimensioning and reinforcement ................................................................................................................ 19
    4.2.3. Preparation of the soil and positioning of the foundations ........................................................................... 19
  4.3. Tolerances regarding inclination and distortion (twist) .......................................................................................... 21
  4.4. Tools ...................................................................................................................................................................... 22
    4.4.1. Surveying, staking and aligning the foundations ........................................................................................... 22
    4.4.2. Rack mounting .............................................................................................................................................. 22
    4.4.3. Module mounting .......................................................................................................................................... 23
  4.5. Torque specifications ............................................................................................................................................. 23
    4.5.1. Bolted connections in the substructure ......................................................................................................... 23
    4.5.2. Fastening of the module clamps .................................................................................................................. 24
5. Assembly steps .......................................................................................................................................................... 25
  5.1. Providing the concrete foundations and mounting the strut assembly ............................................................... 25
  5.2. Mounting the girder assembly ............................................................................................................................ 27
  5.3. Mounting the module-bearing rails .................................................................................................................... 28
  5.4. Mounting the purlin connectors (optional) ......................................................................................................... 29
6. Module mounting and module clamping .................................................................................................................. 30
  6.1. Module mounting in case of horizontal (landscape) or vertical (portrait) module bearing ................................ 31
  6.2. Module mounting and clamping in case of combined module bearing ............................................................... 32
7. Disassembly and disposal ......................................................................................................................................... 33
8. Maintenance and care ................................................................................................................................................. 34
9. Warranty and liability .................................................................................................................................................. 34
1. General Information

1.1. Short Description

PvMax3 is a modular unit assembly system for the installation of ground-mount substructures in high-quality and efficient aluminum design. As the individual components have been optimized and structurally synchronized, a minimum system price is achieved. PvMax3 allows to use framed as well as unframed modules that can be mounted either in portrait or in landscape, or with the Schletter combined clamping system. It is also possible to mount additional accessories for the cable management or components for the internal potential equalization.

1.2. Intended Use

PvMax3 is a substructure for the mounting of photovoltaic modules. Any kind of different use that is not mentioned in these Mounting Instructions or an incorrect mounting (e.g. the utilization of components made by other producers or non-observance of tolerances specified here and/or exceeding the indicated loads) are considered as non-intended use and, thus, exclude any liability of the manufacturer.

The manufacturer accepts no liability for damage caused by failure to observe these Mounting Instructions.

1.3. Copyright and Intellectual Property Rights

The entire content of these Mounting Instructions is the intellectual property of Schletter GmbH and is subject to the German copyright law.

Any reproduction, editing, propagation, transfer to third parties - also in excerpts - and any kind of utilization beyond the limits of the copyright law must be approved in writing by Schletter GmbH. Schletter GmbH reserves the right to take legal action in case of infringements.

These Mounting Instructions are subject to change without notice.

All names of products stated in these Mounting Instructions are trademarks of Schletter Solar GmbH and are herewith recognized and acknowledged.

Schletter Solar GmbH is not liable for any damage of a product or consequential damage caused by the product that are due to improper handling.

First and foremost, Schletter GmbH is not responsible or liable for failures and faults that are caused by modifications made by the customer or other persons.

There is no claim for availability of previous designs and for the ability to retrofit delivered components to the respective latest state of the series.

Schletter Solar GmbH has made considerable efforts to make sure that these Mounting Instructions are free of errors and omissions.

Schletter GmbH takes no responsibility respectively liability for faults that may be part of these Mounting Instructions for example for direct or consequential damage that arise from placing these Mounting Instructions at your disposal.
1.4. Safety Information

Please read these Mounting Instructions carefully before starting the assembly and keep it in a safe place for further reference. Please observe and abide by the regional and national applicable standards, building regulations and accident prevention regulations.

Read and make sure you understand the safety and warning notes in these Mounting Instructions and always apply them according to the relevant conditions and type of operation!

This instruction manual contains guidelines and notices you have to observe in order to ensure your personal safety and to prevent physical injuries or damage to property. Such safety and warning notes are marked with a warning triangle. Depending on the kind and degree of danger, warning notices are displayed as follows:

**DANGER**
indicates that death or serious personal injury **will** result, if proper safety precautions are not taken.

**WARNING**
indicates that death or serious personal injury **can** result, if proper safety precautions are not taken.

**CAUTION**
indicates that minor personal injury may result, if proper safety precautions are not taken.

**DANGER**
due to operations with electricity. Electric power can lead to serious accidents and can cause serious injuries. Appropriate safety precautions are to be taken by all means.

**Securing the working area**
Before the start of construction, the building site must be inspected by a supervising person by sight check or using plans showing all supply lines (water, electricity, gas) in the relevant area. For this purpose, the position of all supply lines (water, gas, electricity, etc.) must be marked using marking paint and unstable ground and areas that are landslide-prone must be sealed off with stable barriers or warning signs.
We absolutely recommend to observe the following protective measures when mounting PvMax3:

- **Remember to wear high-visibility vests and safety shoes all the time**
- **Always wear ear protection when carrying out noisy work**
- **Always wear a hard hat when there might be falling objects or if you could hurt your head in some other way**
- **Wear protective gloves when working with sharp-edged components**
- **Wear respiratory protection when carrying out dusty work**
- **Wear safety glasses when carrying out grinding and cutting operations in order to avoid any danger to your eyes caused by flying liquids or parts (sparks, splinters)**

Apart from that, please consider the applicable rules and regulations on accident prevention and environmental protection that apply at the respective installation site as well as the work instructions and directives by the plant owner/operating company or at the place of operation.
1.5. Obligation of the Plant Owner / Operating Company

The plant owner ensures that all parts of these Mounting Instructions are readily available and handy at the plant.

The plant owner/operating company undertakes to only let people work at and in the striking distance of the plant who
• have read and understood the parts of the mounting instruction that are relevant for the respective operations,
• are familiar with the fundamental regulations on work safety, accident prevention and protection of the environment
• and have been instructed in the safe handling of the plant (training course).

Before starting any mounting works, the plant owner/operating company designates
• a supervising person and ensures that
• the construction site is inspected using plans showing all supply lines (water, electricity, gas) and thus
• the position of all underground supply lines and unstable ground without sufficient load-bearing capacities are
  marked properly or sealed off with barriers.

1.6. Commitment of the Personnel

Only people who give reason to expect that they will reliably do their job are allowed. Persons whose ability to react is
affected, for example by drugs, alcohol or medication, are NOT allowed.
• Every person that is involved in the mounting of PvMax3 must have read and understood these Mounting Instructions,
  especially chapter “1.4. Safety Information”, as well as all relevant chapters regarding the corresponding operations.
• These Mounting Instructions should always be kept available and easily accessible for all persons involved.
• Only trained and instructed qualified and certified personnel are allowed to execute the operations mentioned in this
  instruction manual.
• Personnel that still is to be trained may only mount the PvMax3 system under the supervision of an experienced person.

We recommend the operator to insist on a confirmation in writing in each case.

1.7. Training of the Personnel

These Mounting Instructions are addressed to certified personnel qualified in the areas of transportation and loading,
mounting, disassembly and disposal, having the following qualifications:
• The certified professionals must be capable of fulfilling the tasks they have been assigned with and must be able
  to realize and avoid dangers on the basis of their professional formation, experience, expertise and their specific
  knowledge of the relevant regulations.
• The certified staff members must have the required knowledge of the guidelines regarding safety, accident prevention and
  environmental protection, as well as of loading and unloading regulations that apply at the respective construction site.
• The certified professionals have the driving licenses required at the specific construction site to be able to drive site
  vehicles and operate construction machines.
1.8. Additional Documents Relevant for the Mounting

In addition to these Mounting Instructions, the following documents are required for the mounting of PvMax3:

- Reinforcement plan (optional)
- Blueprint drawing / general layout drawing
- Bill of materials / parts list
- Delivery note
- DIS unloading guidelines for transport in maritime containers
- General Terms and Conditions of Sale and Supply of Schletter GmbH
- Data sheet and instructions of the module manufacturer

2. Transportation, Loading and Unloading

**WARNING**

- Always wear protective equipment (safety shoes, hard hat, safety glasses, protective gloves and high-visibility vest) when unloading the components of the PvMax3 system.
- Besides also wear the personal protective equipment that is specified in your intra-company regulations for the respective activity.
- It is compulsory to monitor and supervise the complete unloading process.
- Do not step under suspended loads!
- Please make sure that there are no unauthorized persons in the danger area.

Please observe all country-specific regulations and standards of the country of destination and its work instructions!

2.1. Delivery of the components

The delivery of the components for PvMax3 is carried out with an appropriate vehicle, for example

- truck/lorry or
- overseas container.

2.2. Preparing the delivery

- Provide a stable and drivable surface for the delivery.
- Please make sure that all access roads, manoeuvring and unloading areas are suitable for trucks (up to 40 tons) and can be used by forklift trucks and hoisting equipments.
- Ensure that loading/unloading and transport activities are carried out by trained and certified personnel only.
2.3. Provide forklift trucks and hoisting equipment

- Organize suitable forklift trucks and hoisting equipment to be available at the moment of delivery.
- Choose the suitable forklift trucks and hoisting equipment in cooperation with the site manager in charge.
- Make sure that the components, pallets and long items can properly be unloaded.
- Provide forklifts and hoisting equipment with different fork intervals or with adjustable forks.

2.4. Check the scope of delivery

The following shipping documents need to be verified on delivery:
- Delivery note
- Packing lists

We recommend to observe the following points when receiving the goods:
- Visual inspection of the delivered goods
- Check whether the supplied goods correspond to the delivery order
- Delivered quantity / comparison with packing lists and delivery note
- General condition of the goods
- Damages of the delivery
- Delivery documents

Claims as to defects by the customer shall require that he has complied with his duties of examination and notification of complaint contained in Sections 377, 381 of the German Commercial Code [HGB]. Defects discovered during incoming goods inspection or later shall be notified to Schletter GmbH in writing without undue delay. A notification shall not be unduly delayed if it has been made within two weeks; the timely dispatch of this notification shall be deemed sufficient to meet the deadline. Regardless of the obligation to inspect and notify, the customer shall notify Schletter of obvious defects (including delivery of the wrong product or in not enough quantity) within two weeks of delivery in writing; the timely dispatch of this notification shall also be deemed sufficient in this case to meet the deadline. A general right to return purchased goods is not granted.

Extract from the General Terms and Conditions of Sale and Supply of Schletter GmbH - download available at www.schletter.de/AGB_en

2.5. Storage of the components

The components will also be delivered in cardboard boxes on pallets. And there also are fragile and sensitive items among those components.
- Unload the items on firm and stable ground only.
- Protect all components against rain, snow, moisture and other weather conditions.
- Store the items in dry and well-ventilated storage buildings or tents.
- Never store components outdoors or covered by a plastic sheet only.

If you adhere to the hints above, you can prevent the goods from being damaged already before mounting.
3. Technical data

3.1. System description and properties

<table>
<thead>
<tr>
<th>System description</th>
<th>PvMax3 - unit assembly system for ground-mounted solar plants</th>
</tr>
</thead>
</table>
| Material           | • Module bearing rails: Aluminium, special rails of the S series  
|                    | • Girders: Aluminium, special rails of the BF series  
|                    | • Supports: Aluminium, RHP profiles  
|                    | • Bolts, nuts: A2-70, A4-80 |
| Structural dimensioning | • According to the current national standards (in Germany: DIN 1055, EC 1).  
|                    | • System structural analysis with data on foundation dimensioning and screw anchor recommendation based on the wind and snow loads that have to be considered |
| Characteristics of the structure | • Quick and easy assembly  
|                    | • Pre-assembled support structure  
|                    | • Wide spans, which reduce the number of required supports and foundations |
| Foundation         | • Concrete (The structural analysis of the system features specifications on reinforcement and dimensioning) |
| Module clamping    | • Framed and unframed modules  
|                    | • Combined module clamping possible  
|                    | • with standard clamps or Rapid+ clamps  
|                    | • Grounding clamps |

3.2. Rack tolerances

PvMax3 is always configured specifically for the wind and snow loads at the respective installation site. In the interest of economic efficiency, usually the maximum load-bearing capacity of the individual component is exploited. To achieve this, however, the racks must be mounted with the utmost precision. If there are significant deviations from the mounting plans, this can lead to structural overstress which in turn can lead to damage cases. Schletter GmbH will not assume any liability for such damages nor for any consequences thereof. Adherence to the specified tolerances is therefore essential to the structural safety of the rack.

Support width  ± 150 mm  
Lateral cantilever of purlins  ± 100 mm  
Lower girder connection  ± 100 mm  
Upper girder connection  ± 100 mm  
Clearance between module and clamp  0.5 to 2 mm
3.3. Systems overview

Components

Concrete foundation  Strut assembly  Girder assembly  Module-bearing rail  PvMax3 base bracket  Girder to strut connector front  Girder to strut connector rear

Connection elements / fasteners

1 Hexagon head screw M10x25 DIN933, square nut M10, KlickIn click component for square nut M10 2 Hexagon head screw M12x80 DIN931 and flange nut M12 3 Hexagon head screw M12x100 DIN931, flange nut M12 and base clamp 4 Mounting clamp

Fig. 3.3.-1 (system visualisation)

Detail A

Fig. 3.3.-2 (detail A)

Detail B

Fig. 3.3.-3 (detail B)

Detail C

Fig. 3.3.-4 (detail C)
3.4. Components

3.4.1. Strut assembly

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>147007-001</td>
<td>PvMax3 strut assembly V55-D55-H55</td>
</tr>
<tr>
<td>147007-002</td>
<td>PvMax3 strut assembly V75-D75-H75</td>
</tr>
<tr>
<td>147007-003</td>
<td>PvMax3 strut assembly V55-D75-H75</td>
</tr>
<tr>
<td>147007-004</td>
<td>PvMax3 strut assembly V55-D75-H55 / V55-D55-H75</td>
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3.4.2. Components of the strut assembly

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<td>000011-126</td>
<td>PvMax3 Strut 55x55 front custom cut</td>
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<tr>
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<td>PvMax3 Strut 55x55 diag. custom cut</td>
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<tr>
<td>000011-128</td>
<td>PvMax3 Strut 55x55 rear custom cut</td>
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<td>PvMax3 Strut 75x55 front custom cut</td>
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<td>000011-130</td>
<td>PvMax3 Strut 75x55 diag. custom cut</td>
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<td>000011-131</td>
<td>PvMax3 Strut 75x55 rear custom cut</td>
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<tr>
<td>147004-001</td>
<td>PvMax3 front base bracket</td>
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<tr>
<td>147004-002</td>
<td>PvMax3 rear base bracket</td>
</tr>
<tr>
<td>147004-001</td>
<td>PvMax3 girder to strut connector front</td>
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<tr>
<td>147004-002</td>
<td>PvMax3 girder to strut connector rear</td>
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<tr>
<td>147005-000</td>
<td>PvMax3 base clamp</td>
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3.4.3. Girder assemblies

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### 3.4.3. Girder assemblies

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### 3.4.3. Girder assemblies

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### 3.4.4. Module-bearing rails

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<th>Part Number</th>
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<tbody>
<tr>
<td>124300-001</td>
<td>Module-bearing rail S0 - custom cut</td>
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<td>124301-001</td>
<td>Module-bearing rail S1 ext. - custom cut</td>
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<tr>
<td>124302-001</td>
<td>Module-bearing rail S1 int. - custom cut</td>
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<td>124303-001</td>
<td>Module-bearing rail S1.5 - custom cut</td>
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<td>124307-001</td>
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<td>124305-001</td>
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<td>Module-bearing rail S4 - custom cut</td>
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### 3.4.5. Purlin connector

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<tr>
<td>129300-000</td>
<td>Connector for module-bearing rail S0 kit</td>
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<td>129307-000</td>
<td>Connector for module-bearing rail S4 kit</td>
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</table>

### 3.4.6. Auxiliary equipment / accessories

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>964000-176</td>
<td>Paint zinc dust silver gray satin-gloss</td>
</tr>
<tr>
<td>943755-925</td>
<td>Screw 5.5x25 self-tapping JT3-6 A2</td>
</tr>
<tr>
<td>119015-000</td>
<td>Punched mounting tape 12x0.8 hole 5.2mm - 50m</td>
</tr>
<tr>
<td>135005-000</td>
<td>Grounding connector kit</td>
</tr>
<tr>
<td>149100-900</td>
<td>Grounding pin kit variable</td>
</tr>
<tr>
<td>149100-000</td>
<td>Grounding pin kit</td>
</tr>
<tr>
<td>128014-000</td>
<td>Interior cable duct pre-assembled custom cut</td>
</tr>
<tr>
<td>128014-001</td>
<td>Exterior cable duct left, pre-assembled custom cut</td>
</tr>
<tr>
<td>128014-002</td>
<td>Exterior cable duct right, pre-assembled custom cut</td>
</tr>
<tr>
<td>129012-010</td>
<td>Proklip2000-8 cable clip round duct M10</td>
</tr>
<tr>
<td>129012-002</td>
<td>Proklip2000-P round cable clip for the S design</td>
</tr>
<tr>
<td>129065-008</td>
<td>Proklip-Multi8</td>
</tr>
<tr>
<td>129065-010</td>
<td>Proklip-Multi10</td>
</tr>
<tr>
<td>129042-001</td>
<td>Proklip-F</td>
</tr>
<tr>
<td>129012-008</td>
<td>Proklip-S rectangular cable clip for M8 channel</td>
</tr>
<tr>
<td>129012-001</td>
<td>Proklip-Q</td>
</tr>
</tbody>
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## 3.4.7. Module clamping

<table>
<thead>
<tr>
<th>Module height</th>
<th>Rapid clamp</th>
<th>Standard clamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm</td>
<td>---</td>
<td>130001-020</td>
</tr>
<tr>
<td>24 mm</td>
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<td>130001-024</td>
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<tr>
<td>28 mm</td>
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<td>130001-028</td>
</tr>
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<td>30 mm</td>
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<td>130001-030</td>
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<tr>
<td>31 mm</td>
<td>131001-031</td>
<td>130001-031</td>
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<tr>
<td>32 mm</td>
<td>131001-032</td>
<td>130001-032</td>
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<tr>
<td>33 mm</td>
<td>131001-033</td>
<td>---</td>
</tr>
<tr>
<td>34 mm</td>
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</tr>
<tr>
<td>35 mm</td>
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<td>36 mm</td>
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<td>37 mm</td>
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<td>38 mm</td>
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<td>39 mm</td>
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<td>---</td>
</tr>
<tr>
<td>40 mm</td>
<td>131001-040</td>
<td>300001-040</td>
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<tr>
<td>41 mm</td>
<td>131001-041</td>
<td>130001-041</td>
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<td>42 mm</td>
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<td>43 mm</td>
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<td>44 mm</td>
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<td>130001-044</td>
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<td>45 mm</td>
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<td>46 mm</td>
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<tr>
<td>47 mm</td>
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<td>48 mm</td>
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<td>49 mm</td>
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<tr>
<td>50 mm</td>
<td>131001-050</td>
<td>130001-050</td>
</tr>
<tr>
<td>51 mm</td>
<td>---</td>
<td>130001-051</td>
</tr>
</tbody>
</table>

The nuts and bolts of the Standard clamps are not included in the scope of delivery and must be ordered separately.

With big order quantities, clamps for other module thicknesses can be manufactured on request!

The Standard clamps are not pre-assembled when they are delivered. These clamps are combined with a hexagon socket head screw, a KlickIn click component and a square nut. The screws listed below can be used for that purpose:
### 3.4.8. Screws for Standard module clamps

<table>
<thead>
<tr>
<th>Name</th>
<th>Frame height in mm</th>
<th>Hexagon socket screw in mm</th>
<th>Hexagon socket screw M8x25 serrated DIN912 A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>943308-125</td>
<td>20</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>943308-130</td>
<td>24</td>
<td>30</td>
<td>Hexagon socket screw M8x30 serrated DIN912 A3</td>
</tr>
<tr>
<td>943308-135</td>
<td>28 - 30</td>
<td>35</td>
<td>Hexagon socket screw M8x35 serrated DIN912 A3</td>
</tr>
<tr>
<td>943308-120</td>
<td>31 - 35</td>
<td>20</td>
<td>Hexagon socket screw M8x20 serrated DIN912 A3</td>
</tr>
<tr>
<td>943308-125</td>
<td>36 - 40</td>
<td>25</td>
<td>Hexagon socket screw M8x25 serrated DIN912 A3</td>
</tr>
<tr>
<td>943308-130</td>
<td>41 - 45</td>
<td>30</td>
<td>Hexagon socket screw M8x30 serrated DIN912 A3</td>
</tr>
<tr>
<td>943308-135</td>
<td>46 - 51</td>
<td>35</td>
<td>Hexagon socket screw M8x35 serrated DIN912 A3</td>
</tr>
</tbody>
</table>
4. Mounting information

The PvMax3 system is customized for the respective installation site. The following indications are already needed during the planning process:

- Site boundaries
- Rights of way / easements (the building site must be accessible for vehicles at any time)
- Obstacles in the subsoil (pipes, subterranean cables, etc.)
- Weather conditions (wind, rain, snow, etc.)
- Conditions that may influence the building ground (seismic activities, erosion, etc.)
- Geotechnical reports about the topology of the site and the composition of the soil

When mounting the ground-mount system, we recommend:

- Keeping a clearly laid out and detailed daily construction report (site journal), where all daily work steps, employment of personnel and assembled components are exactly specified.
- Accurately checking and comparing the delivery notes with the delivered goods on the site.

4.1. Terrain

When planning the ground-mounted system, make sure that the ground slope is within the tolerances. In the following, the guiding values for a structurally safe solar plant are specified.

**Maximum admissible ground slope**

East-West: **10°**

Regarding the structural calculations, additional measures may be required (for example reinforcements)

North-South: **10°**

(depending on the condition of the slope, soil composition, rocks, etc.)

Installations on steeper slopes are only possible if special measures such as anchoring or excavations of the terrain are taken!

Fig. 4.1.-1 (ground slope)
4.2. Foundation

PvMax3 can basically be combined with all kinds of concrete foundations! Ground-mounted solar plants are often built on re-vegetated landfill sites or agricultural terrains of low quality with bad subsoil conditions. In such cases a foundation using posts at frost penetration depth mostly is not possible or not reasonable. Thus, a foundation on concrete blocks made of pre-cast concrete or cast-in-place concrete is recommended as a standard option. This kind of foundation is virtually always possible and very easy to carry out.

Other types of foundation on request!

Whether or not the subsoil is suitable for a certain type of foundation generally has to be determined on site in each case.

4.2.1. Pre-cast strip foundations

As a standard, strip foundations are put under the supports (continuous strips parallel to the module rows are also possible). The weight of the foundations has to be dimensioned in such a manner that the wind loads are compensated by the foundation weight only (see structural analysis).

4.2.2. Dimensioning and reinforcement

The dimensioning of the foundations is carried out according to the structural analysis (by all means do specify the load parameters - especially the wind loads!). The foundations have to be reinforced by the concrete builder according to the loads that have to be considered.

4.2.3. Preparation of the soil and positioning of the foundations

Before setting up the PvMax3 system, the terrain must be prepared for the positioning of the concrete foundations. Please consider that individual sub-racks that are part of one rack are not parallel to the subsoil beneath them. Thus, the foundations have to aligned correctly. This alignment must be maintained for all the racks in order to avoid “terracing” that would lead to shades on individual racks.

**WARNING**

- Only use construction machines and site vehicles that comply with local safety requirements and which ensure protection of health and safety when used as intended.
- Secure the work area by taking appropriate measures and make sure that there are no unauthorized persons in the work area of the construction machines.
- See to it that persons who are performing earthworks are protected by personal protective equipment (PPE), such as high-visibility vest, safety shoes and hard hat.

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Schletter Solar GmbH – Alustraße 1 – 83527 Kirchdorf

Mounting Instruction PvMax3 | 2016.10 V.005

19
**NOTICE**
If the terrain structure is too uneven, soil has to be removed and the terrain has to be graded, if necessary.

**Fig. 4.2.3.-1** (removing soil and grading the terrain structure)

**NOTICE**
The concrete foundations must be aligned flush on a gravel bed. The rack can only be installed properly, if all foundations are correctly aligned and at the same level.
*Maximum height tolerance within the foundations: ± 30 mm.*

**Fig. 4.2.3.-2** (aligning the concrete foundations on a gravel bed)

**NOTICE**
Also when using a cast-in-place foundation, make sure that the foundations are cast up to the same height.

**Fig. 4.2.3.-3** (flush height cast-in-place foundation)
4.3. Tolerances regarding inclination and distortion (twist)

Twist of the support on the concrete foundation

\[ \pm 2^\circ \]

Fig. 4.3.-1 (twisting of the support)

Inclination of the concrete foundation (East-West)

\[ \pm 2^\circ \]

Fig. 4.3.-2 (east-west tilt of the concrete foundation)
4.4. Tools

In the following, the tools that are usually required for mounting the PvMax3 system are listed. Additional tools that are required for special cases (for example encasing the foundations in concrete) are not listed here.

NOTICE

For the assembly of the PvMax3 system, please exclusively use the tools recommended. If you use tools that are not intended for this purpose, the rack can be damaged and the structural safety of the plant could thus be endangered!

We recommend using torque wrenches for all bolted connections. With fast rotary motions, there is an increased danger of "jamming / bolt blocking"!

4.4.1. Surveying, staking and aligning the foundations

- Measuring tapes (100 m)
- Line pins (about 20 pieces)
- Mason's lacing cord
- Club hammer
- Wooden stakes
- Color spray (for ground marking etc.)
- Permanent marker
- Spirit level
- Shovel
- Chains / straps to lift the foundations

The selected fasteners (for example screw anchors/dowels) must be appropriate for the fastening forces that are specified in the structural analysis! The customer has to add an accordant structural verification to the documents. The fasteners are NOT included in the scope of delivery!

4.4.2. Rack mounting

- Torque wrench (30 Nm to 60 Nm)
- Wrench socket size 17
- Wrench socket size 19
- Hammer
- Angle meter (goniometer) - spirit level
- Measuring tape
- Mason's lacing cord
- Cordless screw driver
- Drill hammer with drill
- Air pump for blowing out the drill holes
4.4.4. Module mounting

- Mason’s lacing cord
- Measuring tape
- Possibly distance template for clearance between the modules
- Cordless screw driver
- Size 8 socket for cordless screwdriver
- Size 6 hexagon socket wrench / 40TX key
- Torque wrench (< 8 Nm)
- Size 6 hexagon socket wrench / 40TX bit for torque wrench

4.5. Torque specifications

### 4.5.1. Bolted connections in the substructure

<table>
<thead>
<tr>
<th>Name</th>
<th>Tightening torque (MA-Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw anchor (dowel) acc. to structural analysis Washer</td>
<td>Pay regard to manufacturer specifications!</td>
</tr>
<tr>
<td>Hexagon head screw M12x120 DIN931 A2 Flange nut M12 serrated DIN6923 A4</td>
<td>56 Nm</td>
</tr>
<tr>
<td>Hexagon head screw M10x80 DIN933 A2 GMC Flange nut M10 serrated DIN6923 A4</td>
<td>56 Nm</td>
</tr>
<tr>
<td>Hexagon head screw M10x30 DIN933 A2 GMC Flange nut M10 serrated DIN6923 A4 Washer 10.5 DIN7349 A2</td>
<td>33 Nm</td>
</tr>
<tr>
<td>Hexagon head screw M10x25 DIN933 A2 GMC Square nut M10 DIN557 A4 KlickIn click component for nut M10</td>
<td>33 Nm</td>
</tr>
</tbody>
</table>
### 4.5.2. Fastening of the module clamps

<table>
<thead>
<tr>
<th>Name</th>
<th>Tightening torque (MA-Nm)</th>
<th>Module arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexagon socket screw DIN4762 M8 (20 - 35 mm) KlickIn click component for nut M8 Square nut DIN557 M8 A4</td>
<td>14 Nm</td>
<td>H, V and Kombi</td>
</tr>
<tr>
<td>TX stud screw M8 A2 GMC (42.5 - 55 mm)</td>
<td>14 Nm</td>
<td>H, V and Kombi</td>
</tr>
</tbody>
</table>

Always fasten the bolted connection by turning the bolt head! When checking the pre-stress of the bolts, it has to be considered that constraints and frictional forces can lead to a loss of clamping force. This was taken into consideration when the tightening torques were determined. When a bolted connection is checked, it must not loosen when 50% of the specified tightening torque is applied.
5. Assembly steps

5.1. Providing the concrete foundations and mounting the strut assembly

The concrete foundations are provided according to project-specific requirements either in pre-cast concrete blocks or cast-in-place concrete. Please observe all the information provided by the manufacturer as to the handling of the material or the pre-cast elements and abide by the safety regulations!

**CAUTION when handling concrete**
- Irritant - Avoid contact with skin and eyes! Wear adequate protective equipment (PPE), such as protective gloves and eye and face protection.
- In case of spray applications, a suitable respirator mask (half mask respirator) is to be used!

**WARNING when handling precast foundations**
- Use appropriate auxiliary devices to move heavy loads.
- Never walk under suspended loads and do not stay in the turning radius of the lifting vehicle!
- Ensure that the loads are properly and professionally fastened to guarantee a safe transport.
- Only move the lifting vehicle on sufficiently compacted terrain and in adequate distance from overhead power lines or other obstacles.

**NOTICE**
The selected fasteners (e.g. screw anchors/dowels) must be appropriate for the fastening forces that are specified in the structural analysis! For this purpose, a corresponding data sheet has to be added to the documents.

The required fasteners are NOT included in the scope of delivery!
1. Please refer to the rack drawings to determine the positions of the base brackets and pre-drill as indicated there.

2. Insert the fasteners into the pre-drilled holes as specified in the manufacturer information.

3. Position the strut assembly onto the fasteners and fasten using nuts.
5.2. Mounting the girder assembly

**CAUTION**
- Wear adequate protective equipment, especially a hard hat, when mounting the girder assembly!
- Secure all parts that need to be fastened against slipping!
- Use appropriate auxiliary devices to handle heavy loads and ask your co-workers for help!
- Keep the work area clean to avoid falls!
- Never walk under suspended loads and secure objects and tools against falling down.

1. Insert the KlickIn click component and square nut into the screw duct of the girder where the strut joints are to be attached. For each side of the girder:
   - 4 KlickIn click components
   - 4 square nuts

   ![Fig. 5.2.-1 (inserting the KlickIn click components and square nuts)](image)

2. Place the girder assembly onto the girder to strut connector.

   ![Fig. 5.2.-2 (placing the girder assembly)](image)
3. Feed the hexagon head bolts through the pre-drilled holes of the girder to strut connector into the KlickIn click components and square nuts and fasten. For each side of the girder:

- 4 hexagon head bolts M10x25 DIN933

5.3. Mounting the module-bearing rails

**NOTICE**

The module-bearing rail must be mounted at a 90° angle to the girder! The distances between purlins must be observed as specified in the drawing!

The pre-assembled distances between the mounting clamps on the girder assembly are not always as required according to the general layout drawing. It is essential that you check these distances before mounting the module-bearing rails in order to avoid problems when it comes to mounting the modules. Please again check the distances after you have mounted the module-bearing rails.

---

Distance between the module-bearing rails

Check the 90° angle (at all junction points)
1. Loosen the mounting clamps

2. Place the module-bearing rail onto the girder, between the mounting clamps

3. Position the mounting clamps onto the edge of the module-bearing rail and fasten according to the torque specifications

Fig. 5.3.-2 (loosening the mounting clamps)
Fig. 5.3.-3 (swiveling in the module-bearing rail)
Fig. 5.3.-4 (fastening the mounting clamps)

5.4. Mounting the purlin connectors (optional)

1. Shift one half of the purlin connector into the module-bearing rail and fasten with a self-drilling screw. Then slide the second module-bearing rail onto the connector and again fasten with a self-drilling screw.

Fig. 5.4.-1 (mounting the purlin connector)
6. Module mounting and module clamping

**Solar modules are third party components that are not included in the scope of delivery of the PvMax3 substructure.** Schletter GmbH thus points out that the safety notices and mounting instructions of the module manufacturer are to be observed. And please also note the notices given in these Mounting Instructions when mounting the photovoltaic modules!

The following points must be taken into consideration at any event:
- Photovoltaic modules are electrical devices. They must be treated carefully!
- Impacts, kicks, shocks or vibrations must be avoided.
- It is not allowed to put loads on the modules (trespassing, storing of items, etc.).
- Scratches or dirt on the module surface must be avoided.
- It is not allowed to pull or tear at the module cables. Do not heavily bend the module cables.

The module clamping is carried out according to the project planning (portrait, landscape or combined module arrangement). The distance between modules can deviate from the standard value.

**Standard value:**
- **clamped side** 23 mm
- **side without clamping** 5 - 10 mm

(according to the specifications in the technical drawing; specifications by the module manufacturer are considered)

**Clearance (= distance between module and module clamp) of**
- **min. 0.5 mm**
- **max. 2 mm**

must be observed (module abuts on the spacer notches).

**Tolerance from module front edge to ground level**
- **± 50 mm**

The M8 hexagon socket screws of the module clamps must be tightened to a torque of 14 Nm unless otherwise specified by the manufacturer!

Observe the clamping points specified by the module manufacturer!

Please note the data sheet of the photovoltaic module provided by the manufacturer to verify the clamping points.
6.1. Module mounting in case of horizontal (landscape) or vertical (portrait) module bearing

The modules are fastened to the module-bearing rails using standard clamps or Rapid2+ clamps:

1. Insert the module clamp into the click channel (duct) of the module-bearing rail.

![Fig. 6.1-1 (clicking in the module clamp)](image)

2. Push the module to the clamp (observing the clearance!)

![Fig. 6.1-2. (pushing/sliding the module to the clamp)](image)

3. Fasten hexagon socket screw with a torque of 14 Nm

![Fig. 6.1-3. (fastening the hex socket screw)](image)
6.2. Module mounting and clamping in case of combined module bearing

Combination of vertical (portrait) and horizontal (landscape) module clamping:

Clamping at the long side of the module to the upper and lower module-bearing rail.

Clamping at the short side of the module to the inner module-bearing rail.
7. Disassembly and disposal

**DANGER**
- The plant operates with high voltage.
- Please abide by all instruction manuals and safety guidelines provided by the manufacturer of the modules or of electrical components before putting the plant out of operation.
- The plant may only be disconnected from the power supply provided on site by a certified electrical technician.

**WARNING**
- Always wear protective equipment (safety shoes, hard hat, safety glasses, protective gloves and high-visibility vest) when disassembling the PvMax3 components.
- And make sure that no unauthorized persons can enter the danger area.
- Do not step under suspended loads!

- We recommend to wait for the confirmation by a certified electrical technician regarding the correct decommissioning of the plant before starting the disassembly of the PvMax3 system.
- Have an accordingly trained and certified professional disassemble the plant in transportable units.
- Observe all information and instructions provided in these Mounting Instructions.
- Also make these Mounting Instructions available to the personnel that is in charge of the disassembling operations.
- Ensure that the disassembling operations are performed exactly in reverse order of the mounting steps.

**Faulty waste disposal can lead to environmental damage.**
*With regard to the environment it is recommended to dispose of recyclable materials in an appropriate manner.*

**Properly dispose of components**
- Separate the materials steel, plastics, electric scrap, aluminium, stainless steel, copper, brass, etc.
- Dispose of the components in accordance with the local regulations
8. Maintenance and care

We recommend as follows:

**INSPECTION OF THE PLANT**
- after exceptional weather conditions (storm, heavy snowfall or rain, etc.)
- after natural convulsions (earthquake, landslip, settlements, etc.)

**MAINTENANCE OF THE PLANT**
- Cleaning of the modules
- Verification of the bolted connections
- Check of the plant regarding corrosion
- Maintenance of the access roads and walkways

**CORRECTIVE MAINTENANCE OF THE PLANT**
after detecting damages on the racks or earth movements (for example removing corrosion, replacement of faulty components, detection of unfastened bolted connections, etc.)

9. Warranty and liability

Generally, the customer is responsible for the proper mounting and installation of the PvMax3 system.

**Exclusions**
Guarantee, warranty and liability claims against the manufacturer Schletter GmbH in case of injury to persons or material damage shall be excluded if they result from one or several of the causes listed below:

- Non-observance of the Mounting Instructions and/or maintenance instructions in combination with a warranty extension
- Any use other than the intended use of the PvMax3 system or faulty operation
- Incorrect mounting, maintenance or repair
- Operation with spare or equipment parts that are faulty or have not been approved by the manufacturer
- Unauthorized constructional modifications or manipulation of the PvMax3 system or its equipment or components
- Utilization of components made by other manufacturers (third party components)
- Neglect or non-observance of the prescribed maintenance and/or testing and inspection intervals

The customer exclusively shall bear the costs for damage or consequential damage that is due to one or several of the causes mentioned above.

The Mounting Instructions as well as the maintenance instructions in combination with a warranty extension refer exclusively to the mechanical metal structure supplied by Schletter GmbH.

Components of the solar plant like modules, cables and plug connectors, inverters or electric switch boxes are not part of these parts of the Mounting Instructions and thus are exempt from warranty and liability by Schletter GmbH.

Material damage to objects that are not included in the scope of delivery are generally excluded from any liability.