1 General

1.1.1 Information

The TerraGrid steel system is customized for the respective installation site. A corresponding detailed structural analysis must be created to determine the required cross sections of the rails, as well as a geo-technical report to determine the required anchoring depth.

It is compulsory to create well-arranged and detailed documentation (site journal) where all daily work steps, employment of staff and assembled material are exactly specified.

Please remember that wrong deliveries or damaged components must be reported to Schletter immediately. If the mounting instructions are not adhered to or components made by other manufacturers are used, Schletter GmbH will not assume any liability for resulting damage or defects.

Only qualified personnel and accordingly trained staff is allowed to carry out mounting operations, drive building site vehicles and operate building machines!

Securing of 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.

When mounting the solar modules, the safety regulations and mounting instructions of the respective module manufacturer must be observed!

Due to production tolerances, there may be deviations from the dimensions specified in the overview drawing. The specialist company that carries out the mounting operations is responsible for the adaptation of these deviations within the admissible tolerances!

It is compulsory to wear safety 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 abrasive cutting operations in order to avoid any danger to your eyes caused by flying liquids or parts (sparks, splinters)
1.2. Planning

An accordant overview drawing is drawn up for each system before delivery. All defined measurements and the positions of the individual components and fasteners are displayed on these drawings. The respective torques are also listed in this instruction.

In the general layout drawing, the components are shown from various perspectives and defined by name. Thus, items, quantities and article numbers on the delivery note can be looked up.

Possible tolerance values that are to be considered for the mounting of the rack and the modules by the expert staff are also specified here!

⚠️ The tolerances specified here must not be exceeded!

1.3. 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.

⚠️ Pay regard to item 8 "Tolerances regarding terrain topography"!

Maximum admissible incline/slope
East - West: \(15°\)
Regarding the structural calculations, additional measures may be required (for example reinforcements)

Maximum admissible incline/slope
North - South: \(35°\)
Depending on the condition of the slope (soil composition, rocks, etc.)
1.4. Tools list

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

1.4.1. Defining the positions of the earth screw foundations and marking these positions

- 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
- Zinc dust primer
- Brush

1.4.2. Screwing-in of the foundations

- Hydraulic rotating motor with insertion adapter
- Water level

1.4.3. Rack mounting

- Torque wrench (30 Nm to 60 Nm)
- Wrench socket size 13
- Wrench socket size 16
- Wrench socket size 17
- Wrench socket size 18
- Wrench socket size 19
- Hammer
- Club hammer (to hold against the holding plates)
- Plastic tip hammer
- Angle meter - spirit level
- Measuring tape
- Mason’s lacing cord
- Cordless screw driver

1.4.4. Module mounting

- Mason’s lacing cord
- Measuring tape
- Possibly distance template for distances between the modules
- Cordless screw driver
- Wrench socket size 8 for cordless screwdriver
- Allen key size 6 / 40TX key
- Torque wrench (< 8 Nm)
- Allen key socket size 6 / 40TX bit for torque wrench
- Plastic tip hammer (for driving in the nails of the lay-in system)

⚠️ We recommend to use torque wrenches for all bolted connections. With quick rotation, there is an increased danger of "bolt blocking"!
2 Insertion of the earth screw foundations

2.1. Positioning

An overview drawing of the screw foundation and a foundation plan are required for the insertion of the foundations. Using a digital terrain model, a foundation plan is created specifying contour lines. Apart from that, the position and the dimensions of the piles are specified. The screwing in of the piles must be carried out by an expert company on the basis of the documents.

The respective position of the first and last pile of each row must be marked on the terrain with a wooden stake. If a row length exceeds 50 meters, additional markings (wooden stakes) must be used within the row.

![Example of a technical drawing with dimensioning of a screw foundation](image)

2.2. Mounting tolerances

- **Anchoring depth**: ± 100 mm
- **Inclination (East-West)**: ± 3°
- **Inclination (North-South)**: ± 3°
- **Height differences of the earth screw foundations within one row**: ± 30 mm
### 3 Rack overview

<table>
<thead>
<tr>
<th>Components</th>
<th>Fasteners</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Earth screw foundation</td>
<td>① Hexagon bolt M12x30, washer DIN9021 and Flange nut M12 DIN6923</td>
</tr>
<tr>
<td>2 Head assembly group</td>
<td>② Hexagon bolt M12x120, washer DIN9021 and Flange nut M12 DIN6923</td>
</tr>
<tr>
<td>3 Girder assembly group</td>
<td>③ Fastening device</td>
</tr>
<tr>
<td>4 Module-bearing rail</td>
<td></td>
</tr>
</tbody>
</table>
4 Mounting of the individual assembly group

4.1 Screwing-in of the foundations

In order to mount the racks at the same height, extensions can be fastened to the earth screws to even out ground height differences.

Inclination
North-South and East-West

Insert the screw foundations into the ground using an accordingly aligned cord. After that, check the inclination of the foundations!

1 Insert the extension into the earth screw foundation

2 Adjust the height of the extension as required.

3 Fasten the extension to the earth screw foundation using a M12 bolt and a M12 nut.

4 Completely assembled earth screw foundation
4.2. Mounting of the head assembly group on the screw foundation

⚠️ When mounting, always consider the tightening torque specifications

Tighten the head assembly group loosely with a M12x120 DIN933 hexagon head screw, a washer DIN125 and a flange nut M12 DIN6923 (the head assembly group on the foundation must still be moveable)

4.3. Mounting of the girder assembly group

Join the girder assembly group to the head assembly groups

⚠️ Always fasten the bolted connection by turning the bolt head! Do not turn the nut, just hold it!
⚠️ Check the torques of all screws!

Fasten the girder assembly group with a hexagon bolt M12x30 DIN933, a washer DIN9021 and a flange nut M12 DIN6923 through the middle pre-drilling of the steel head.
4.4. Mounting of the module-bearing profiles (rails)

- Please note that the purlin must be at a 90° angle to the girder! The distances between purlins must be observed as specified in the drawing!
- In order to avoid deformations caused by tension, it has to be made sure that the purlins rests completely on the girder when they are mounted!

4.5. Mounting of the connectors (optional)

- Use the pre-drilled holes to screw the connectors to the purlins!

4.6. With horizontal module arrangement or vertical and horizontal module arrangement at the same time, mount a module clamp adapter (optionally also with vertical arrangement of the modules)

- Check the inclination of the girder (see technical overview drawing) and correct it using the multiple drillings of the steel head, if required.

- Insert the purlin into the pre-assembled fastening plates

- Fasten the connector to the purlins, using four M12x30 bolts, DIN 9021 washers and four M12 flange nuts

- Clip the module clamp adapter onto the Z-purlin at the indicated points

- Use the multiple drillings in the steel head to adjust the height level or soil unevenness.
5 Module mounting and module clamping

The modules are mounted according to the drawing using the module clamps that are part of the delivery and are fastened to the module-bearing rails using end clamps and middle clamps. For this purpose, the clamps are attached onto the rail or the module clamp adapter and are fastened with screws.

The distance between modules can deviate from the standard value. The standard distance is **23 mm** on the clamped side and **5 - 10 mm** (on the unclamped side (according to the specifications in the technical drawing; specifications by the module manufacturer are considered)

- **When mounting the modules, observe the clamping points specified by the module manufacturer!**
- **Make sure that the distance from the module to the clamp is at least 0.5 mm and not more than 2 mm!**
  (= distance between module and module clamp, see picture on the right)
5.1. Module clamping with vertical module arrangement

When mounting the modules, the module clamp screws must be tightened with a torque of 8 Nm!

Optionally, the vertical module mounting can also be carried out in combination with the module clamp adapter and Rapid 2+ or Standard clamps.

5.2. Module clamping with horizontal module arrangement

Attach the Rapid 2+ or Standard clamp on the module clamp adapter and fasten it with a tightening torque of 14 Nm.

5.3. Module clamping with horizontal and vertical module arrangement at the same time

Attach the Rapid 2+ or Standard clamp on the module clamp adapter and fasten it with a tightening torque of 14 Nm.

Module clamps for vertical module mounting

<table>
<thead>
<tr>
<th>Module height</th>
<th>Steel clamp</th>
<th>Rapid clamp*</th>
<th>Standard clamp*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>End clamp left</td>
<td>Middle clamp</td>
<td>End clamp right</td>
</tr>
<tr>
<td>20 mm</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>24 mm</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>28 mm</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>30 mm</td>
<td>144912-030</td>
<td>144910-001</td>
<td>144911-030</td>
</tr>
<tr>
<td>31 mm</td>
<td>144912-031</td>
<td>144910-001</td>
<td>144911-031</td>
</tr>
<tr>
<td>32 mm</td>
<td>144912-032</td>
<td>144910-001</td>
<td>144911-032</td>
</tr>
<tr>
<td>33 mm</td>
<td>144912-033</td>
<td>144910-002</td>
<td>144911-033</td>
</tr>
<tr>
<td>34 mm</td>
<td>144912-034</td>
<td>144910-002</td>
<td>144911-034</td>
</tr>
<tr>
<td>35 mm</td>
<td>144912-035</td>
<td>144910-002</td>
<td>144911-035</td>
</tr>
<tr>
<td>36 mm</td>
<td>144912-036</td>
<td>144910-002</td>
<td>144911-036</td>
</tr>
<tr>
<td>37 mm</td>
<td>144912-037</td>
<td>144910-002</td>
<td>144911-037</td>
</tr>
<tr>
<td>38 mm</td>
<td>144912-038</td>
<td>144910-003</td>
<td>144911-038</td>
</tr>
<tr>
<td>39 mm</td>
<td>144912-039</td>
<td>144910-003</td>
<td>144911-039</td>
</tr>
<tr>
<td>40 mm</td>
<td>144912-040</td>
<td>144910-003</td>
<td>144911-040</td>
</tr>
</tbody>
</table>
Module clamps for horizontal module mounting

<table>
<thead>
<tr>
<th>Module height</th>
<th>Rapid clamp*</th>
<th>Standard clamp*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>End clamp</td>
<td>Middle clamp</td>
</tr>
<tr>
<td>20 mm</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>24 mm</td>
<td>---</td>
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<tr>
<td>28 mm</td>
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<td>131012-000</td>
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<td>31 mm</td>
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<tr>
<td>50 mm</td>
<td>131010-050</td>
<td>131012-001</td>
</tr>
<tr>
<td>51 mm</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

* in combination with module clamp adapter

The nuts and bolts of the standard clamps are not included in the scope of delivery and are delivered 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 socket head screw, a KlickIn click component and a square nut. The screws listed below can be used for that purpose:

<table>
<thead>
<tr>
<th>Frame height</th>
<th>Suitable socket head screw mm</th>
<th>Item number</th>
<th>Module name</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>25</td>
<td>943308-125</td>
<td>M8x25 socket head screw with serrated flange</td>
</tr>
<tr>
<td>24</td>
<td>30</td>
<td>943308-130</td>
<td>M8x30 socket head screw with serrated flange</td>
</tr>
<tr>
<td>28-30</td>
<td>35</td>
<td>943308-135</td>
<td>M8x35 socket head screw with serrated flange</td>
</tr>
<tr>
<td>31-35</td>
<td>20</td>
<td>943308-120</td>
<td>M8x20 socket head screw with serrated flange</td>
</tr>
<tr>
<td>36-40</td>
<td>25</td>
<td>943308-125</td>
<td>M8x25 socket head screw with serrated flange</td>
</tr>
<tr>
<td>41-45</td>
<td>30</td>
<td>943308-130</td>
<td>M8x30 socket head screw with serrated flange</td>
</tr>
<tr>
<td>46-51</td>
<td>35</td>
<td>943308-135</td>
<td>M8x35 socket head screw with serrated flange</td>
</tr>
<tr>
<td>129010-008</td>
<td></td>
<td></td>
<td>KlickIn click component</td>
</tr>
<tr>
<td>943914-008</td>
<td></td>
<td></td>
<td>Square nut M8, V4A</td>
</tr>
</tbody>
</table>

6 Components list

- 1 Earth screw foundation
  
  **143009-xxx** Earth screw foundation (xxx according to the length of the foundation)

Extension of the earth screw foundation

according to structural specifications
Steel head

142500-017 TerraGrid galvanized steel head

Girder assembly group (optionally pre-assembled)

consisting of:

144YXX-ZZZ* 1x girder custom cut
* varying depending on girder assembly:
XX: Number of installed modules
Y: System type
ZZZ: H or V arrangement

144999-006 *x FS Uno/Duo fastening plate
943612-030 *x Bolt M12x30 DIN 933 A2
943912-012 *x Flange nut M12 DIN 6923 A4
943922-012 *x Washer large M12 DIN 9021 A2
* variable depending on girder assembly

Girder assembly groups for vertical module arrangement

144301-000 FS Duo girder assembly 1V custom cut
144302-200 FS Duo girder assembly 2V custom cut
144303-200 FS Duo girder assembly 3V custom cut
144304-200 FS Duo girder assembly 4V custom cut

Girder assembly groups for horizontal module arrangement

144301-000 FS Duo girder assembly 1H custom cut
144302-100 FS Duo girder assembly 2H custom cut
144303-100 FS Duo girder assembly 3H custom cut
144304-100 FS Duo girder assembly 4H custom cut
144305-100 FS Duo girder assembly 5H custom cut
144306-100 FS Duo girder assembly 6H custom cut

Module-bearing rail (custom cut)

144901-001 FS Uno/Duo purlin
144999-003 FS Uno/Duo fastening device
Module clamp adapter

**144919-050**  FS steel module clamp adapter kit (incl. drill screw)

Module-bearing rail - connector (optional)

**144999-008**  FS Uno/Duo purlin connector Gen2 kit

**consisting of:**

- **000014-577**  1x FS Uno/FS Duo purlin connector Gen2
- **943922-012**  2x washer large M12 DIN9021 A2
- **943612-030**  3x hexagon head bolt M12x30 DIN933 A2
- **943912-012**  4x flange nut M12 serrated DIN6923 A4

Auxiliary equipment / accessories

**964000-176**  Zinc dust silver-grey satin-finished

- **149023-001**  Cable fastener 1.0 - 3.0 mm, guidance at the top
- **149023-002**  Cable fastener 1.0 - 3.0 mm, guidance at the side
- **149023-003**  Cable fastener 3.0 - 6.0 mm

- **144999-009**  FS Uno/FS Duo cable fastener for purlin
- **144999-010**  Cable conduit

7 Torque specifications

7.1. Bolted connections in the substructure

<table>
<thead>
<tr>
<th>Picture</th>
<th>Name</th>
<th>Tightening torque (MA-Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Hexagon head bolt DIN933 - M12x30 A2, Flange nut DIN6923 - M12 A4, Washer, large DIN9021 - M12 A2" /></td>
<td>Hexagon head bolt DIN933 - M12x30 A2 GMB, Flange nut DIN6923 - M12 A4, Washer, large DIN9021 - M12 A2</td>
<td>56 Nm</td>
</tr>
<tr>
<td><img src="image.png" alt="Hexagon head bolt DIN931-1 - M12x120 A2, Flange nut DIN6923 - M12 A4, Washer, large DIN9021 - M12 A2" /></td>
<td>Hexagon head bolt DIN931-1 - M12x120 A2 GMB, Flange nut DIN6923 - M12 A4, Washer, large DIN9021 - M12 A2</td>
<td>56 Nm</td>
</tr>
</tbody>
</table>
7.2. Fastening of the module clamps

<table>
<thead>
<tr>
<th>Picture</th>
<th>Name</th>
<th>Tightening torque (MA-Nm)</th>
<th>Type of module arrangement</th>
</tr>
</thead>
</table>
| Standard module clamps | Socket head screw DIN4762 - M8 (20 - 35 mm)  
KlickIn click component for nut M8  
Square nut DIN557 A4 - M8 | 14 Nm | H and V in combination with module clamp adapter |
| Steel module clamps | Socket head screw DIN912 A2 - M8 (25 - 45 mm) | 8 Nm | V |
| Rapid 2+ module clamps | TX-drive stud screw A2 GMB - M8 (42.5 - 55 mm) | 14 Nm | H and V in combination with module clamp adapter |

Always fasten the bolted connection by turning the bolt head! When checking the prestress 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.

8 Tolerances regarding terrain topography

Individual Schletter racks are not parallel to the subsoil below them. Height differences of the subsoil under a rack can be equalized with the earth screw foundations and extensions of the earth screw foundations. Please already align the earth screw foundation with a cord in the course of screwing it into the ground. The tolerance of the anchoring depth is ±100 mm (see picture).
9 Tolerances regarding rack mounting

Schletter mounting racks for ground-mounted solar plants are always custom-dimensioned to withstand the wind and snow loads at the respective location. In the interest of economic efficiency, usually the maximum load-bearing capacity of the individual components 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 will not assume any liability for such damage cases. 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

*Please consider that the height tolerances of the earth screw foundations on subsoils with integrated geo-membranes (for example on landfill sites) depend on the depth the membrane is placed at. Any damage to the membrane must be avoided.

In the event of deviation, this must be communicated to Schletter immediately!