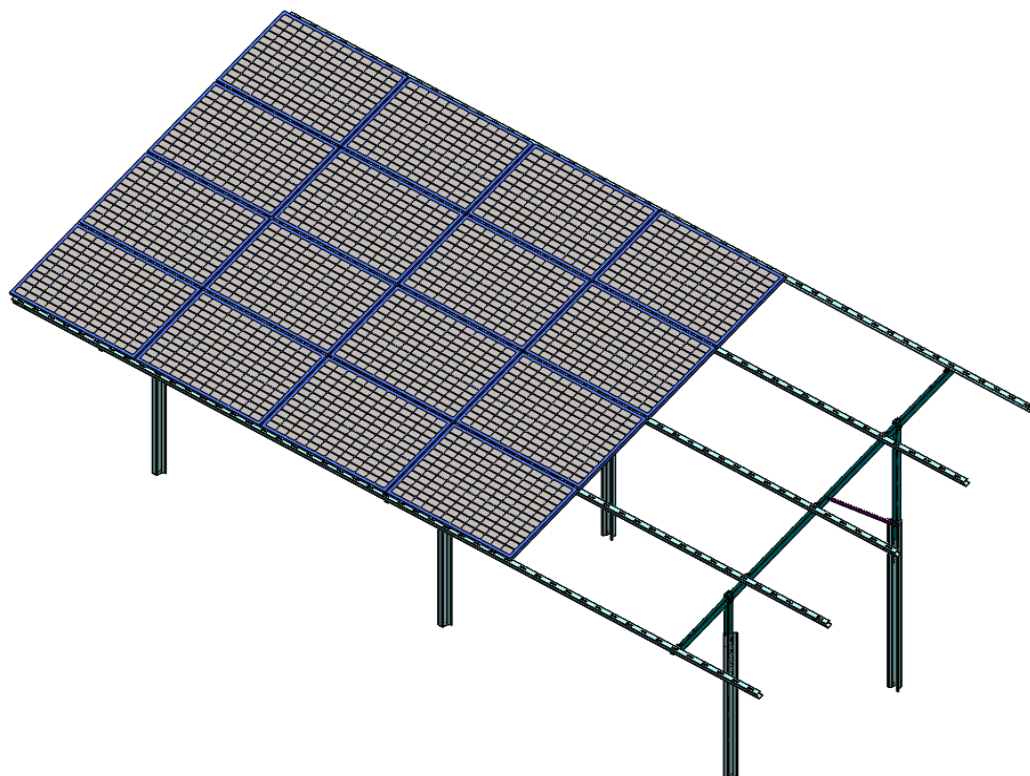


## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

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**All images are typical examples; please refer to project specific drawings.**

#### 1. General

The open area solar mounting frame ZM 2V, is to be used exclusively as a Photovoltaic assembly frame and is projected individually on the local conditions.

This includes a static according the local conditions to determining the cross sections, as well as a geotechnical certificate to regulate the pile driving deepness. It has to be rammed and assembled after the given planning documents.

The design adheres to the following standards:

- DIN 1055-4 Wind load
- DIN 1055-5 Snow and Ice loads
- EN 1991-1-3 Snow load (Eurocode 1)
- EN 1991-1-4 Wind load (Eurocode 1)

## Ground Mount Photovoltaic Mounting System ZM 2V

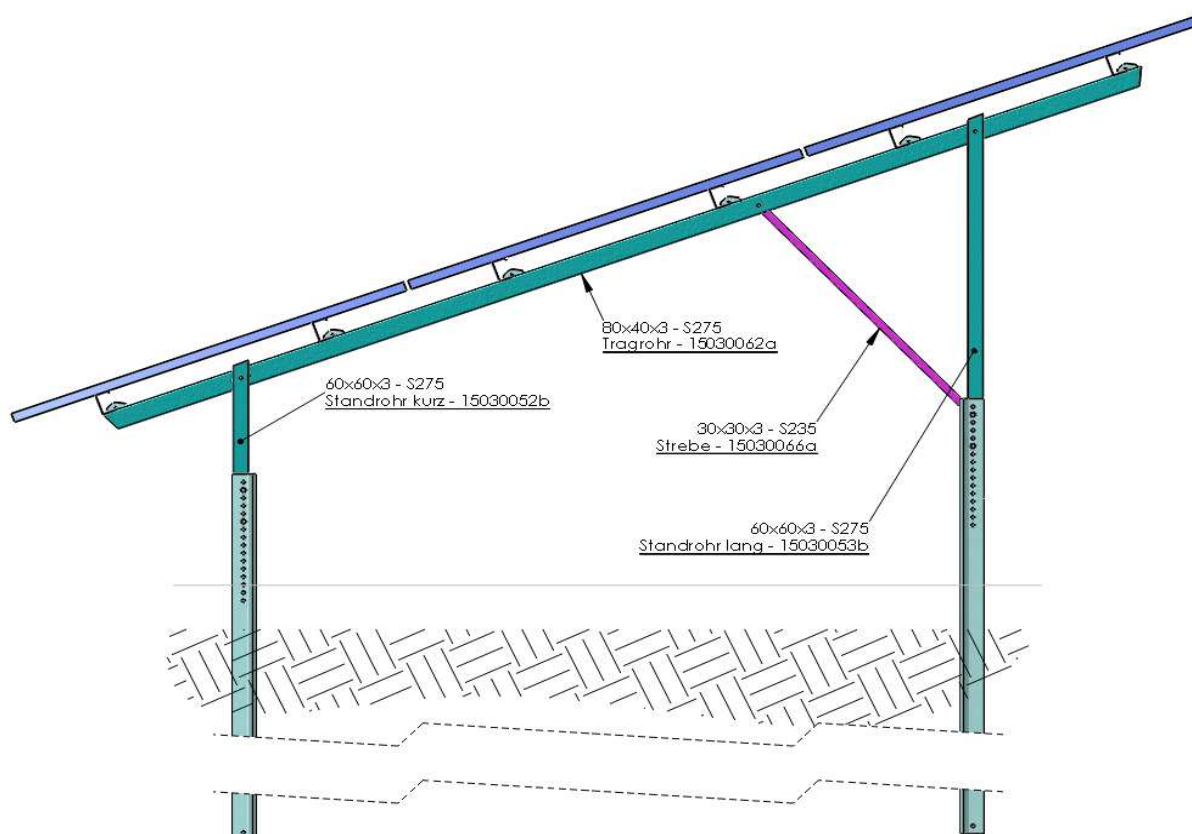
### Assembly Guide

#### 2. Design and Planning

Before delivery we prepare for every system overview drawings, table division and bolt part lists. These drawings and views show the dimensions, inclination, and position of each component as well as the joining means.

**By using slotted holes we designed a compact and variable system, allowing an adjustable inclination with a range of 20° to 25°. The numbers of holes in the posts counter inaccuracies of the driven post. This means every single assembly frame can easily be adjusted to the required position.**

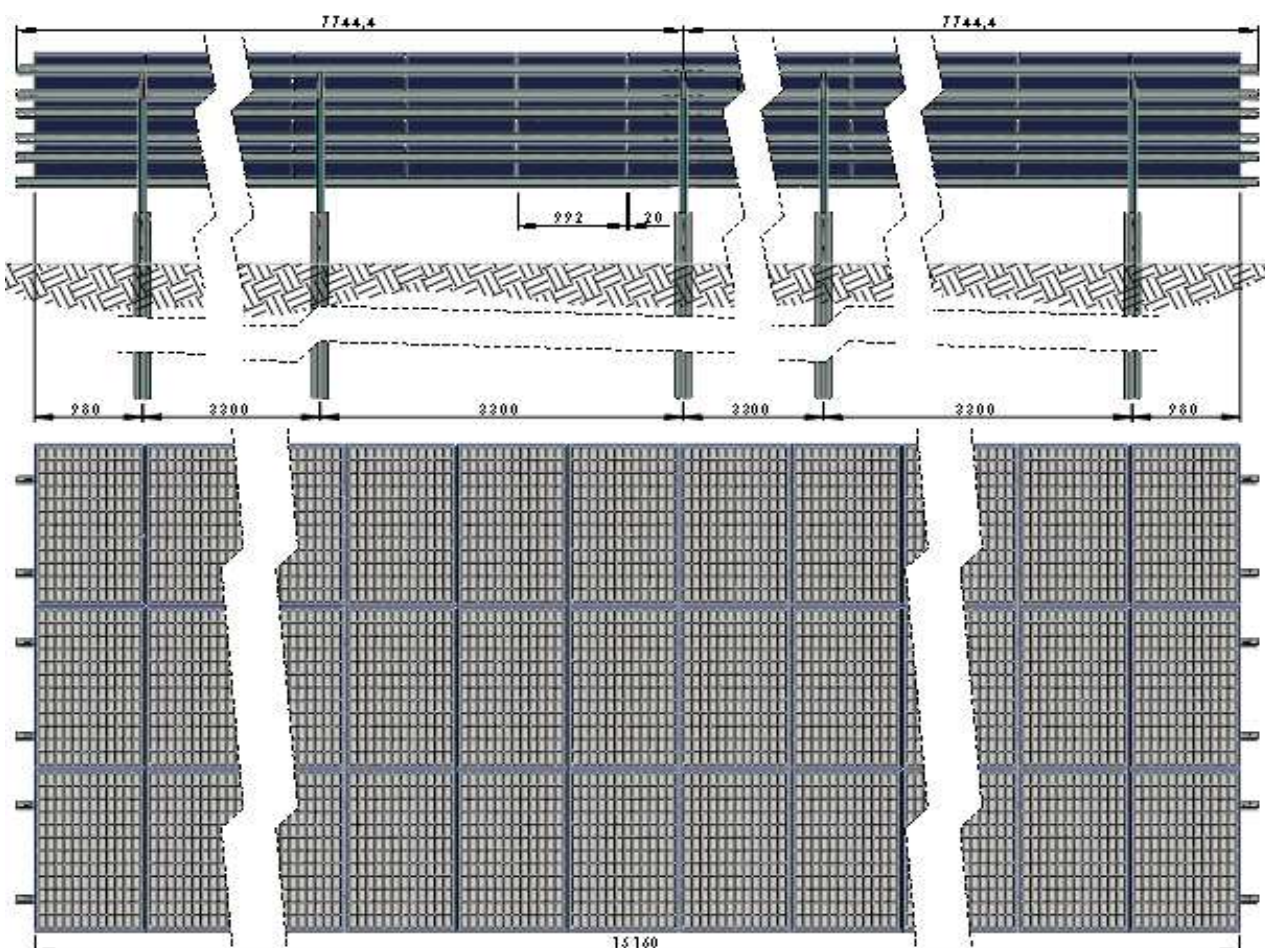
##### 2.1 Section View



##### 2.2 Example Table Design

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide



## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

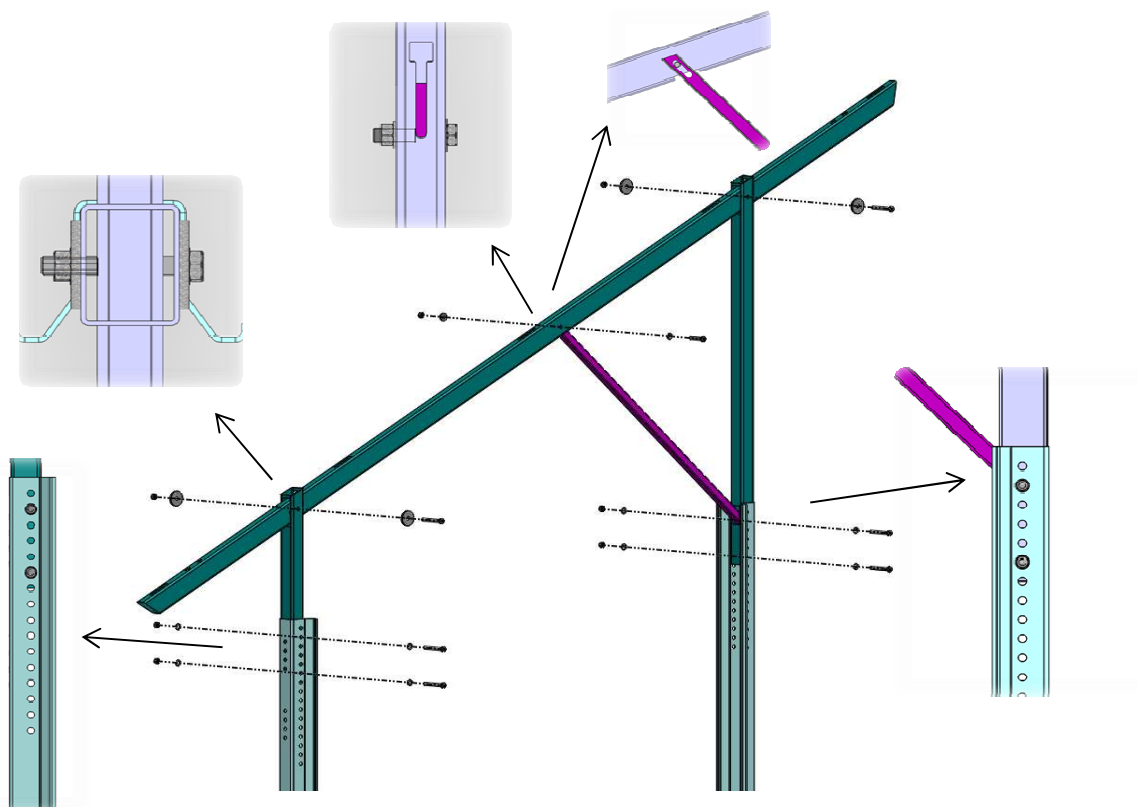
#### 3. Detailed Views

**Before starting assembly please read all safety guidelines. The PV mounting frames are made of hot-dip-galvanized steel, stainless steel, and aluminium components.**

##### Tools:

You need the following tools

- ring spanner (wrench) 13mm, 19mm, 32mm
- Allen wrench (Allen key) 5 mm, 6 mm





## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### 4. Post Driving

The post-driving has to be done by a specialist company with suitable post driving rigs. They need to create a piling plan according to the table layout. To this plan all V-Post must be driven. Post length and foundation depth are given for each project.

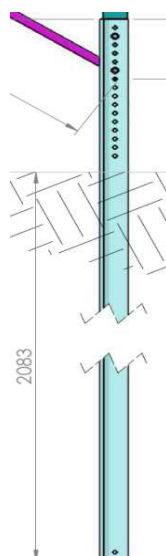
##### Pre-treatment of the V-Post

We recommend coating the area between ground and air level of each post with an additional protective coat. The additional protective coat should be painted before ramming about 20cm below the earth surface line and up to 15cm above the earth surface. We recommend as coating material PHARMOL: 2K Acrylan-ESL

##### Treatment of the V-Post After Driving

The top of the V profile has to be painted after ramming, to protect against surface damage due to the pile driving. It has to be painted approx. 3cm from the top of the profile with the coating material PHARMOL Acrylan-ESL.

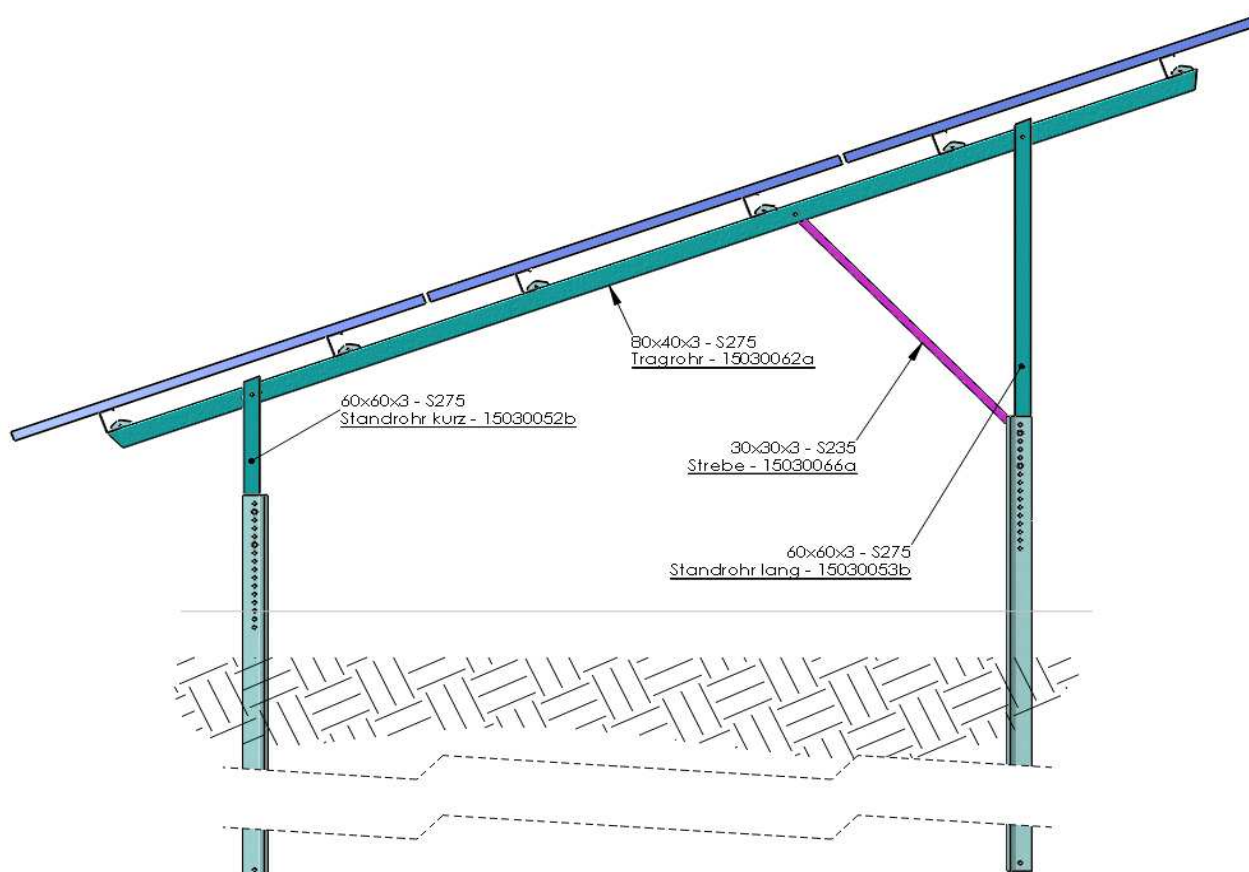
In the case of aggressive soils being found in the geological survey the posts can be powder coated, albeit at an additional cost.



## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

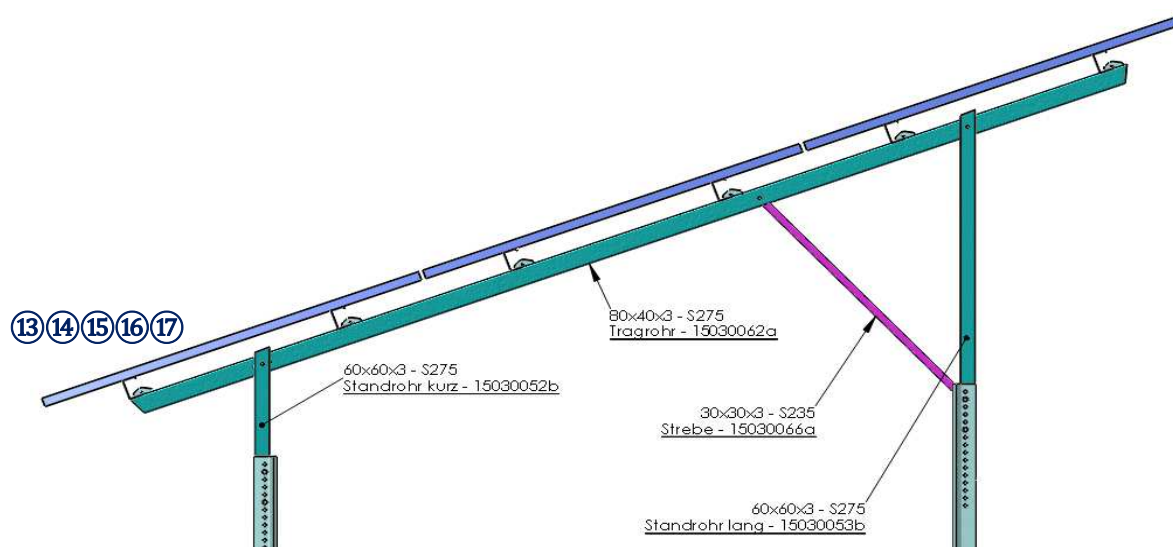
#### 5. General Overview



Pos.	Pieces	Number	Description
1	1	15030042a	Main Tube Short 850mm, 60x60x3
2	1	15030043a	Main Tube Long 1480mm, 60x60x3
3	1	15030045a	Inclined Tube 4136mm 80x40x3
4	1	15000109a	V Post 1800mm
5	1	15000110a	V Post 2100 mm
6	1	15030047a	Brace 1075mm, 30x30x3
7	1	4012312060	Hex Bolt HDG DIN 931, M 12 x 60
8	1	4012734912	Washer HDG DIN 7349 M12 13x30x6
9	7	4012734912	Hex Nut HDG M12 DIN 934-8
10	6	4012093412	Hex Bolt HDG DIN 931, M 12 x 90
11	9	4012312090	Washer HDG DIN 125 13x24x2,5
12	4	M12 DIN 440	Washer HDG

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide



Pos.	Pieces	Number	Description
13	5	15000103a	Clamp for c-rail
14	5	4010408031	Hex Bolt HDG DIN 933, M8x30
15	5	4010012508	Washer VA DIN 125, M8
16	5	2500101865	Threaded plate M8, VA stainless
17		15000117a	C-rail 90x60x20, 9908mm

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### 6. Post to Main Tube Assembly

The vertical main tubes (Pos. 1 and Pos. 2) need to be bolted to V Post (Pos. 4 and Pos. 5).

Fasteners: Pos. 9, Pos. 10, Pos. 11

Pos.	Pieces	Number	Description
1	1	15030042a	Main Tube Short 850mm, 60x60x3
2	1	15030043a	Main Tube Long 1480mm, 60x60x3
4	1	15000109a	V Post 1800mm
5	1	15000110a	V Post 2100 mm
9	7	4012093412	Hex Nut HDG M12 DIN 934-8
10	6	4012312090	Hex Bolt HDG DIN 931, M 12 x 90
11	9	4012012512	Washer HDG DIN 125 13x24x2,5



## Ground Mount Photovoltaic Mounting System ZM 2V

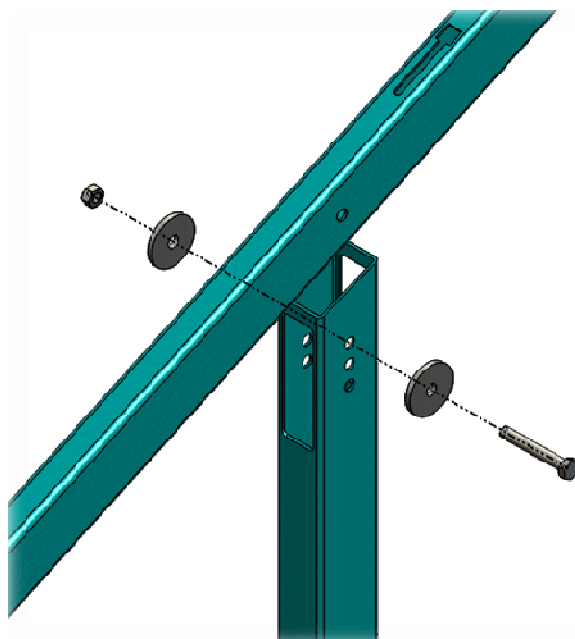
### Assembly Guide

#### 7. Assembly Supporting Tube

The inclined tube (Pos. 3) needs to be inserted into the recesses of the main tubes (Pos. 1 and 2). Fasteners: (Pos. 13, Pos. 12, Pos 10).

**Please check the angle of the inclined tube.**

Pos.	Pieces	Number	Description
1	1	15030042a	Main Tube Short 850mm, 60x60x3
2	1	15030043a	Main Tube Long 1480mm, 60x60x3
3	1	15030045a	Inclined Tube 4136mm 80x40x3
9	1	4012734912	Hex Nut HDG M12 DIN 934-8
10	7	4012093412	Hex Bolt HDG DIN 931, M 12 x 90
12	9	DIN 440	Washer HDG



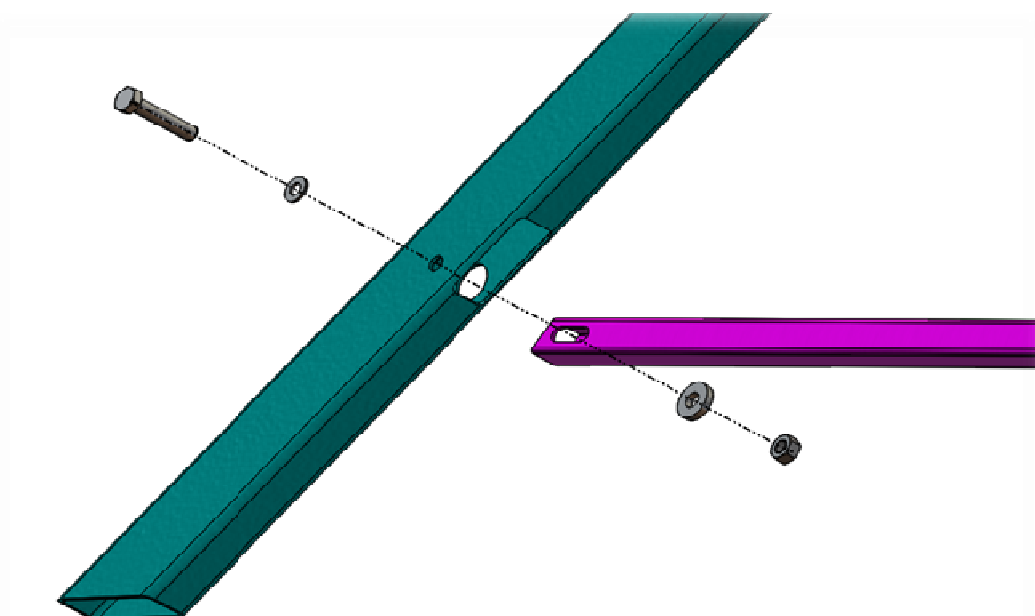
## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### 8. Brace Assembly

Assemble brace (Pos. 6) to inclined tube (Pos.3) and to main tube (Pos. 1 and Pos.2). Insert the brace into the dedicated recesses and fasten with fixings to main tube. Fasteners:

**Pos. 7; Pos. 8; Pos. 9, Pos. 11**



Pos.	Pieces	Number	Description
3	1	15030045a	Inclined Tube 4136mm 80x40x3
6	1	15030047a	Brace 1075mm, 30x30x3
7	1	4012312060	Hex Bolt HDG DIN 931, M 12 x 60
8	1	4012734912	Washer HDG DIN 7349 M12 13x30x6
9	7	4012093412	Hex Nut HDG M12 DIN 934-8
11	9	4012012512	Washer HDG DIN 125 13x24x2,5

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### Pos. 9; Pos. 10; Pos. 11



Pos.	Pieces	Number	Description
1	1	15030042a	Main Tube Short 850mm, 60x60x3
2	1	15030043a	Main Tube Long 1480mm, 60x60x3
4	1	15000109a	V Post 1800mm
5	1	15000110a	V Post 2100 mm
9	1	4012734912	Hex Nut HDG M12 DIN 934-8
10	7	4012093412	Hex Bolt HDG DIN 931, M 12 x 90
11	6	4012312090	Washer HDG DIN 125 13x24x2,5

**Fine adjustment of support frame, check angle of the inclined tube and tighten all fixings.**

**Please adhere to the following torques:**

- **M8 (A2-70 / A4-70): 12-15 Nm (C-Rail to Inclined Tube)**
- **M8 (A2-70 / A4-70): 20 Nm (C-rail connector)**
- **M12 (8.8): 65 Nm Braces**
- **M12 (8.8): 40 Nm Connection V-post to main tube**

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### 9. Assembly panel supporting rail (C-rail)

Preassembly of the rail clamp (Pos 13, 14, 15, 16) (pre-assembly possible) and insert into the keyholes, on the inclined tube (No. 3).

Then mount the rails on, insert into the preassembled clamp, adjust by using the provided assembly jig and observe the cantilever (individually according to the assembly table layout).

#### Note for Panel Assembly in Portrait Mode:

Alignment of C-rails must be checked to ensure the rails and the positions of the slotted hole are square to each other (see section 9.2)

Finally tighten the screws.

The panel support rails (C-rail) need to be painted at the cut edges with protective zinc coating. Depending on row and table layout, C-rails need to be cut to length on site and protective zinc coating applied to the cut edges.

#### Assembly C-rail connector:

Please assemble the C-rail connector as illustrated with the surface face down.

Fastener:

- 6 x M8 x 20
- 6 x M8 screw nut
- 12 x M8 washer DIN 125



**CAUTION:** Please tighten the 2 bolts in the bottom ① of the rail before fastening the 4 bolts ② at the back of the rail.



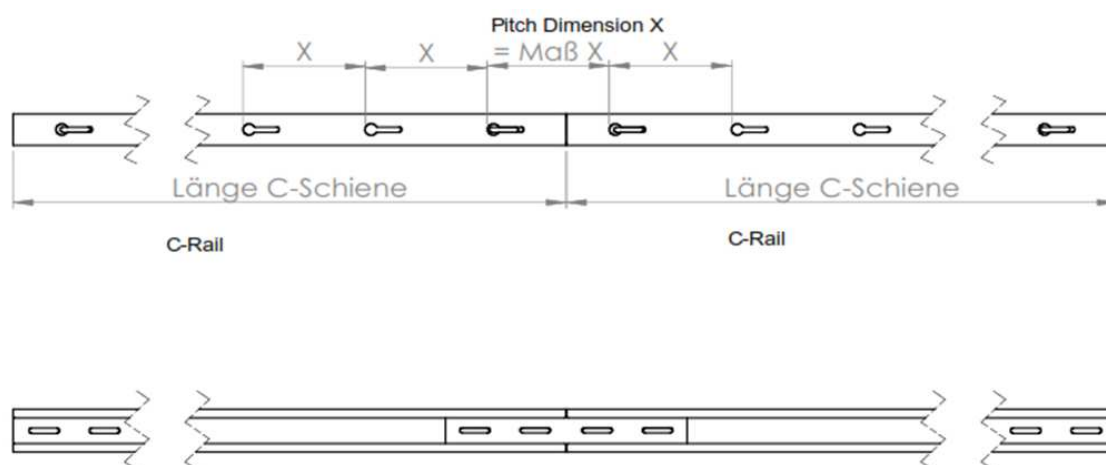


## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### 9.1. Connection of C-Rails

When connecting the C-Rail with 6 bolts (see section 9) to each other please make sure that the rails are square to each other and that the pitch (dimension X) between the key holes is repeated over the connection points.



#### 9.2. Squaring of the Rail Joints

When mounting the modules in portrait mode the rail joint of the superimposed C-rails must always be aligned square to the keyhole.

For rows where modules are installed 50m or more, without a 20cm gap between the strings, we provide a jig to align the rails to each other.

As you can see in the images, the distance from keyhole to keyhole is critical. The jig needs to be set to this distance and this distance needs to be transferred rail to rail across the rail joint.

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

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## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

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#### 10. Panel assembly

- **by direct screw connection in the panel frame**

Each panel will be screwed with suitable joining means (individually according the panel type) directly by the panel frame and slots on the C- panel supporting rail (Pos. 2)

- **There are different ways of fixing the panel to the frame, these options are shown on the next page(s)**

#### **General note:**

The distance between the modules is 19mm. Should the fastening of the panels with the clamps in the keyholes become impossible due to uneven terrain or due to tolerances occurring in the rail lengths and module dimensions, the following mounting solutions should be considered:

- **Alignment of the rails to each other - see point 9.2**
- **Use of 13mm wide panel clamps**
- **Use of 22mm wide panel clamps**
- **Use of two end clamps in the same keyhole**
- **Use of two end clamps in the same keyhole Module mounting with latch bracket (see section 10 - Panel Assembly with Fixing Bracket)**

**Caution: The gap between side of the clamp and the side of the panels should not exceed 2mm on each side.**

**All stainless steel fittings need to be lubricated to guarantee an easy installation.**

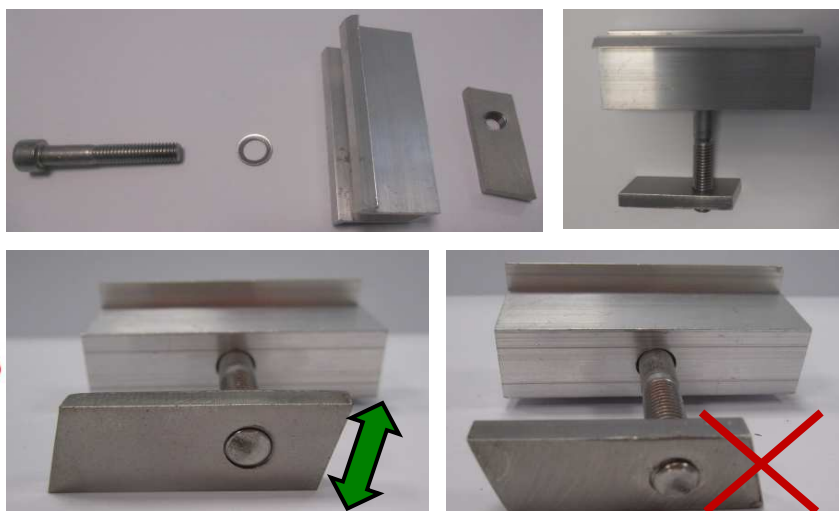
<b>The fitting instructions and safety guidelines from the panel manufacturer must be adhered to.</b>
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## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### Assembly aluminium panel clamp:

- ① Hexagon socket screw M8x45 VA stainless steel / (or M8x35, M8x40, M8x50)
- ② Schorr-U-Washer M8
- ③ Aluminium-panel clamp
- ④ Threaded plate M8, stainless steel



**Please note the clamping torque. Tighten screw only with a cordless screwdriver or by hand. Please do not use impact wrench.**

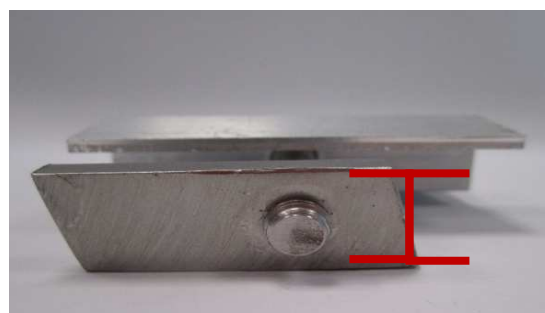


## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### Assembly aluminium panel-termination fitting:

- ① Hexagon socket screw M8x45 VA stainless steel / (or M8x35, M8x40, M8x50)
- ② Schorr-U-Washer M8
- ③ Aluminium panel-middle clamp
- ④ Threaded plate M8, stainless steel



**Please note the clamping torque. Tighten screw only with a cordless screwdriver or by hand. Please do not use impact wrench.**

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### Assembly Aluminium Panel Clamp with Spacer H50:

- ① Aluminium panel-middle clamp
- ② Socket head hex screw M8x45 VA stainless steel
- ③ Schorr-U-Washer M8
- ④ Plastic spacer with nut M8 H50

#### Assembly Aluminium Panel Clamp with Spacer H40:

- ① Aluminium panel-middle clamp
- ② Socket head hex screw M8x35 VA stainless steel
- ③ Schorr-U-Washer M8
- ④ Plastic spacer with nut M8 H40



**Please note the clamping torque. Tighten screw only with a cordless screwdriver or by hand. Please do not use impact wrench.**

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### Panel mountings with counter bracket:

- ① Hexagon socket screw M8x45 VA stainless steel / (or M8x35, M8x40, M8x50)
- ② Schorr-U-Washer M8
- ③ Aluminium panel-middle clamp
- ④ Counter bracket hdg
- ⑤ Self-locking-nut



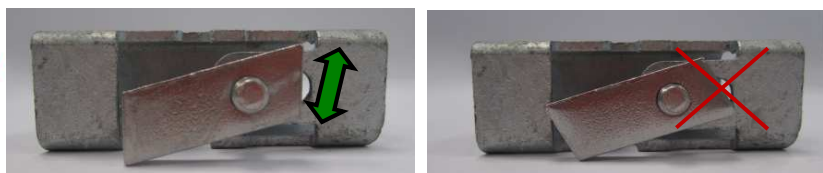
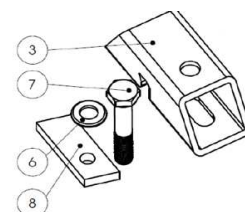
**Please note the clamping torque. Tighten screw only with a cordless screwdriver or by hand. Please do not use impact wrench.**

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### Assembly clamp for C-rails:

- ③ Clamp for C-rails
- ⑦ Hexagon screw M8x50 VA stainless steel (DIN 931)
- ⑥ U-washer M8, 8,4x16x1,6, VA stainless steel (DIN 125)
- ⑧ Threaded plate M8, stainless steel



**Please note the clamping torque. Tighten screw only with a cordless screwdriver or by hand. Please do not use impact wrench.**



## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

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#### 11. Anti-theft protection device

We don't recommend fastening balls into the hexagon bolts for the anti-theft protection device. It may cause damage to the panels.

Possible solution for anti-theft protection

- Glue panel clamps with PATTEX™ special glue (1 component heavy duty glue with Silvan Polymer

#### 12. Grounding

For grounding we recommend a hot dip galvanised grounding cable to EN ISO 1461.

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### 13. Wind Brace

If a wind brace is required to stiffen up the construction the following assembly notes should be adhered to.

The bolts at the main tubes need to be inserted with the threads opposing each other. The chain needs to be fixed to the main tubes next to each other (north end) so the cross. Fix the ring nut to the existing hex bolts, without the M12 nut. Please fix one end of the chain with the rod strainer to the ring nut, use a shackle on the other end and tighten the chain.



The wind bracing needs to be checked for tension about two weeks after installation. If necessary adjust the turnbuckle by hand. Please do not over tighten the chain! For maintenance, please check in regular intervals the tension of the chain. (Annually)

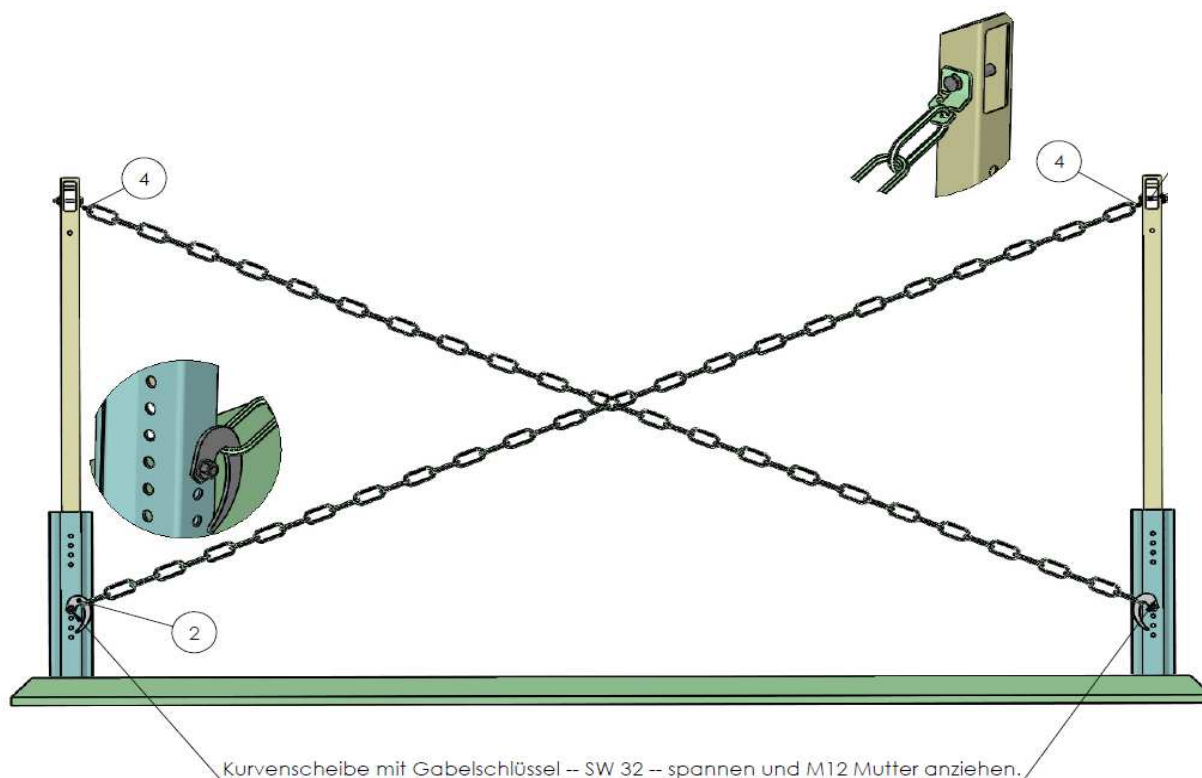
The wind brace cannot be fitted in sections where the rails are joined together.

Fastener:

Pos.	Pieces	Number	Description
-		4020000018	Steel chain
2	2	2500102508	!!! Text nicht vorhanden !!!
4	2	2500102509	!!! Text nicht vorhanden !!!
2	2	4012412035	Hex Bolt HDG DIN 933, M12x35
2	2	4012093412	Hex Nut HDG M12 DIN 934-8
2	6	4012012512	Washer HDG DIN 125, M12, 13x24x2,5

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide



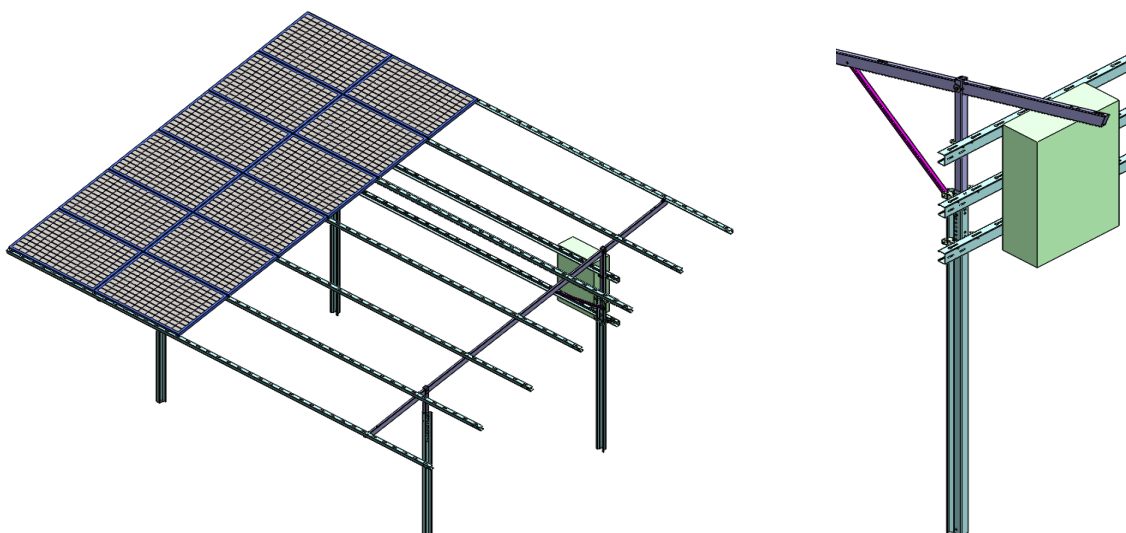
## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

#### 14. Inverter/Junction Box Brackets

C-rails are clamped onto two main tubes. C-rails need to be cut to length on site and the ends must be coated with a zinc protective layer.

Onto these rails you can fix inverters/junction boxes etc. Please respect the manufacturer's instruction and the overall weight.



**Example**

**The clamps can be pre-assembled.**





## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

**Position the plates and nuts on the main tube and into the c-rail as required and clamp down**



Pos.	Pieces	Number	Description
1	m	2500101060	C-rail HDG 75x55
2	1	4001000424	Small Plate
3	2	2500101940	Large plate M12
4	2	4012012512	Washer HDG DIN 125, M12, 13x24x2,5
5	2	4012312120	Hex bolt HDG DIN 931, M12x120
6	2	4012692312	Serrated Nut HDG DIN 6923, M12

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

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#### 15. Safety Guidelines

We recommend reading carefully the following information, because they are very important for a correct installation of the system. Please follow them and get informed about the health and safety regulations of other site components.

- Please observe all notes in the operating instructions for all works on the PV solar plant. Assembly, repairs and maintenance has to be carried out by certified and qualified personal.
- The valid regulations and safety guidelines need to be followed.

#### **Some regulations need to be respected.**

- BGV A 1 – General regulations
- BGV A 2 – Electrical plants and Equipment
- BGV C 22 – Construction work
- PPE and health and safety regulations are to be adhered to according to the local regulations and laws.

#### **DIN / EN Standards need to be respected.**

- DIN 18299 – General regulations for construction work of every kind.
- DIN 18360 – Metal construction work, locksmith

#### **Conservation / Environmental**

- The whole system is completely recyclable, as it is made of high quality, reusable components.

#### **Maintenance regulations**

- All bolted connections on the mounting system must be checked at least once a year.
  - This has to be checked in regular intervals.
- All rod strainers have to be checked at least once a year. This has to be checked in regular intervals.

## Ground Mount Photovoltaic Mounting System ZM 2V

### Assembly Guide

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#### Product liability (-exclusion)

- The assembly company is responsible for the correct execution for the assembly.
- The Zimmermann PV Stahlbau GmbH & Co. KG is not liable for any damages caused from disregard of the assembly instructions and the safety guidelines, as well as by not material-appropriate use of our products.
- Construction in a proximity of less the 2km to the sea need to be request separately, as additional protections against corrosion are necessary.
- Our instructions, our project-related plan documents and the general approved standards and principles of the system are valid for the assembly and use of the products delivered by us. The assembly is to be performed in general by specialists.

**Part of our product is the technical documentation. All general Terms and Conditions apply (retrievable at [www.pv-stahlbau.de/en/](http://www.pv-stahlbau.de/en/)).**