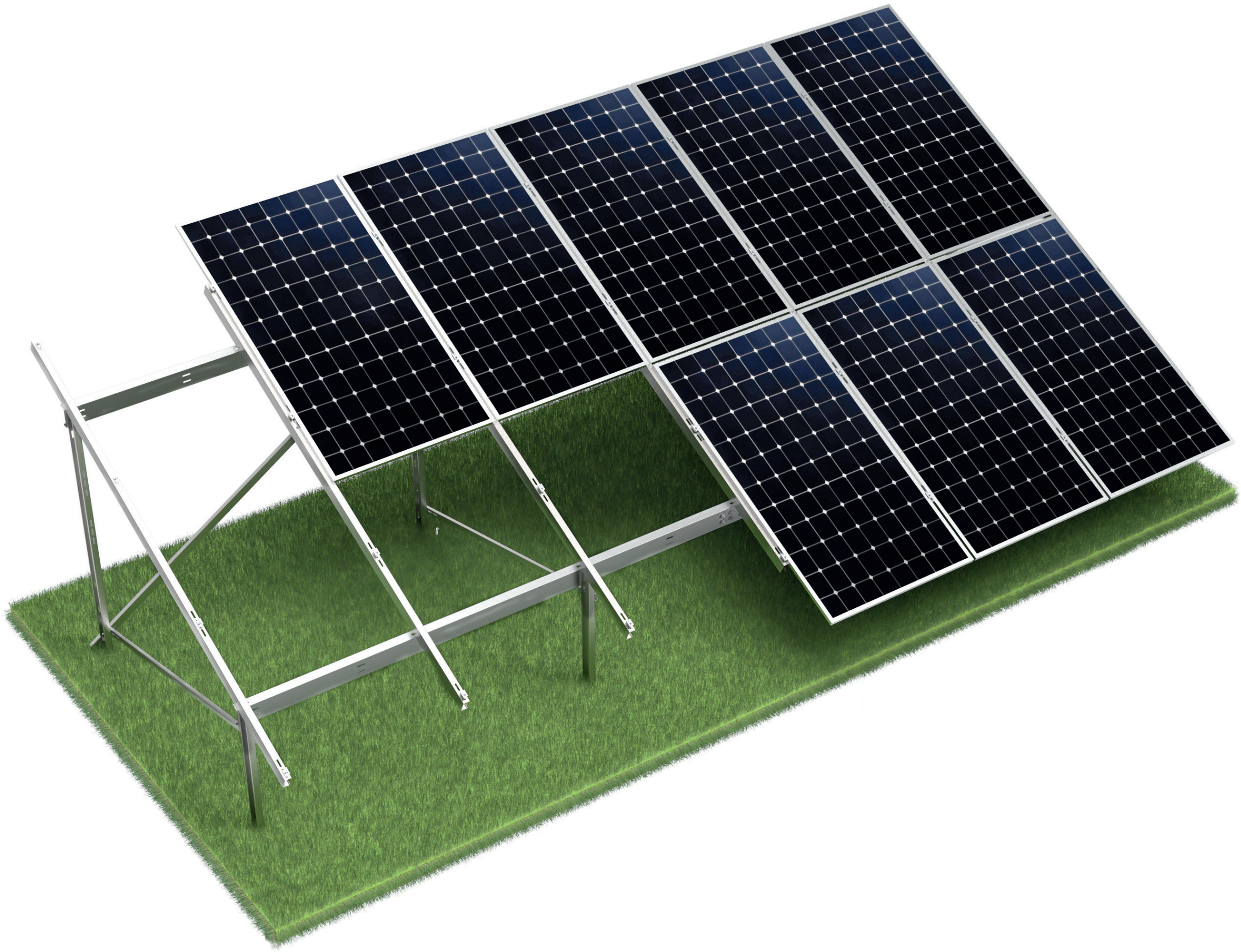
ASSEMBLY
INSTRUCTION

TWO-SUPPORT STRUCTURAL FRAME

EL-SUN KONSTRUKCJE



Max. module dimension:	**2300x1134 mm**
Location:	**I-III snow, I and III wind <300m asl.**

Instruction dated July 3, 2024, adapted to the calculator dated 26.06.2024 and later.

2P2VMBW

FREE-STANDING STRUCTURES

SGS · ISO 14001 LL-C (Certification) · ISO 9001 LL-C (Certification) · CE · 20 lat ORŁY POLSKIEJ PRZEDSIĘBIORCZOŚCI

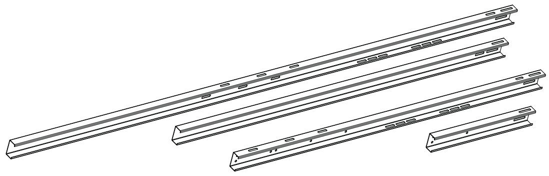
EL-SUN Sp. z o.o.
www.el-sun.pl
mail: biuro@el-sun.pl
tel.: +48 793 085 640

1 GROUPS OF ELEMENTS

Before starting the assembly, divide the steel elements into groups according to the table below. Verify with the order whether the quantity of elements is correct.

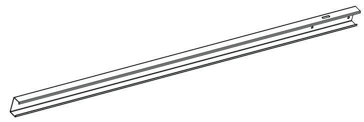
Posts

CODE	NUMBER	NAME	DESCRIPTION	LENGTH [mm]
SP	**P140C25**	Front post	C100x50x12	2500
ST	**P140C37**	Rear post	C100x50x12	3770
SP	**P154C20**	Front post to adapter	C93x43x13	2070
ST	**P154C08**	Rear post to adapter	C93x43x13	800



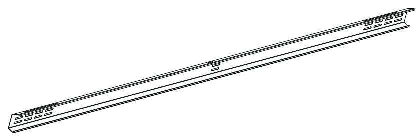
Post adapter

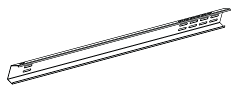
CODE	NUMBER	NAME	DESCRIPTION	LENGTH [mm]
SA	**P153C20**	Post adapter	C100x50x13	2000



Beams

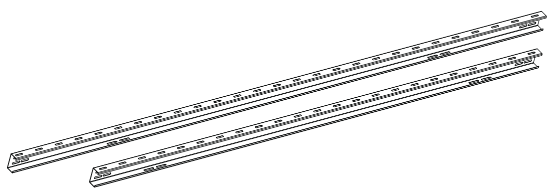
CODE	NUMBER	NAME	DESCRIPTION	LENGTH [mm]
R	**P118C26**	Beam 2 vertical bifacial	20V120x68x40x20	2660
R	**P119C26**	Beam 2 vertical bifacial	20V114x64x36x20	2660
R	**P120C26**	Beam 2 vertical bifacial	25V120x68x40x20	2660
R	**P121C26**	Beam 2 vertical bifacial	25V114x64x36x20	2660
R	**P122C26**	Beam 2 vertical bifacial	30V120x68x40x20	2660
R	**P123C26**	Beam 2 vertical bifacial	30V114x64x36x20	2660
R	**P118C14**	Beam 2 vertical bifacial	20V120x68x40x20	1400
R	**P119C14**	Beam 2 vertical bifacial	20V114x64x36x20	1400
R	**P120C14**	Beam 2 vertical bifacial	25V120x68x40x20	1400
R	**P121C14**	Beam 2 vertical bifacial	25V114x64x36x20	1400
R	**P122C14**	Beam 2 vertical bifacial	30V120x68x40x20	1400
R	**P123C14**	Beam 2 vertical bifacial	30V114x64x36x20	1400





Support profiles*

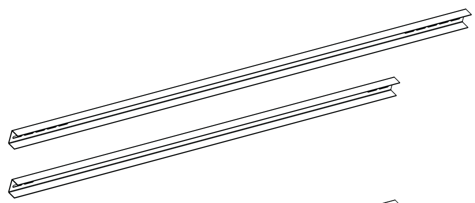
CODE	NUMBER	NAME	DESCRIPTION	LENGTH [mm]
P	**P156C40**	Support profiles	C100x50x12	4000
P	**P156C33**	Support profiles	C100x50x12	3300



**It can be used interchangeably with P141 group purlins... of the same lengths.*

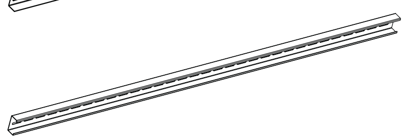
Braces

CODE	NUMBER	NAME	DESCRIPTION	LENGTH [mm]
ZTT	**P145C29**	Back-to-back brace	C60x35	2950
ZTP	**P131C23**	Back-to-front brace	C60x35	2400



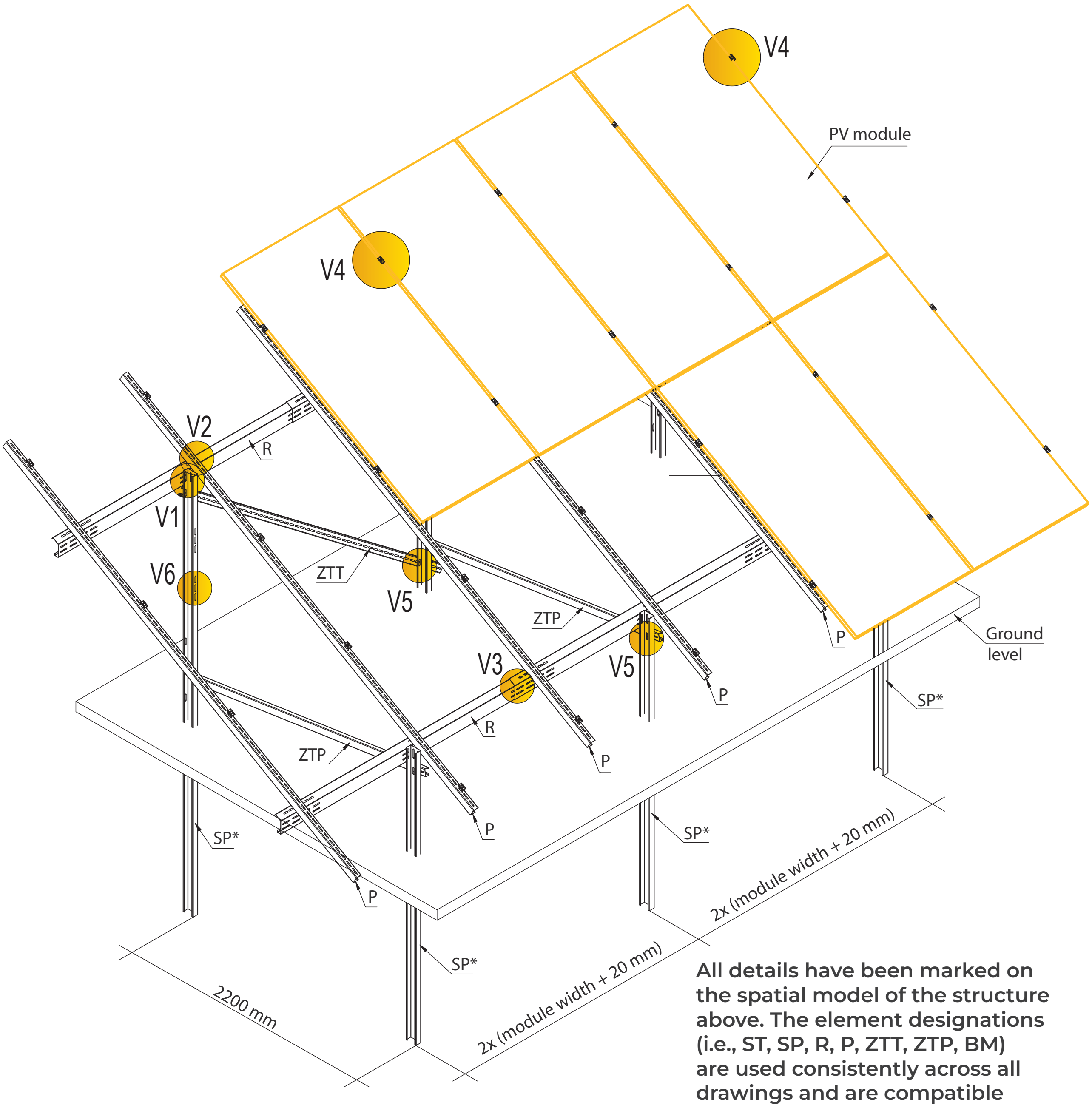
Mounting beams

CODE	NUMBER	NAME	DESCRIPTION	LENGTH [mm]
BM	**P139C33**	Mounting beam	C97x48x15	3300



2 SPATIAL MODEL OF THE STRUCTURE

Refer to the assembly instructions. In the model below, mounting details are marked with yellow circles and shown in detail on the following pages. Arrows indicate the locations of the individual elements from page 2. Pages 4-5 feature assembly drawings, followed by detailed mounting instructions.



All details have been marked on the spatial model of the structure above. The element designations (i.e., ST, SP, R, P, ZTT, ZTP, BM) are used consistently across all drawings and are compatible with each other.

Work sequence:

1. Lay out the posts according to the TOP VIEW – POST LAYOUT (SECTION C-C) – page 4.
2. Drive the posts into the ground as specified on pages 4-5.
3. Attach the beams to the posts following detail V1 and bolt them together according to detail V3.
4. Attach the purlins to the beams as per detail V2.
5. Attach the braces according to detail V5 in the plane shown on page 5.
6. Optionally, attach the mounting beams according to detail V6 in the plane shown on page 5.
7. Attach the modules and optionally install the grounding plates as per detail V4.

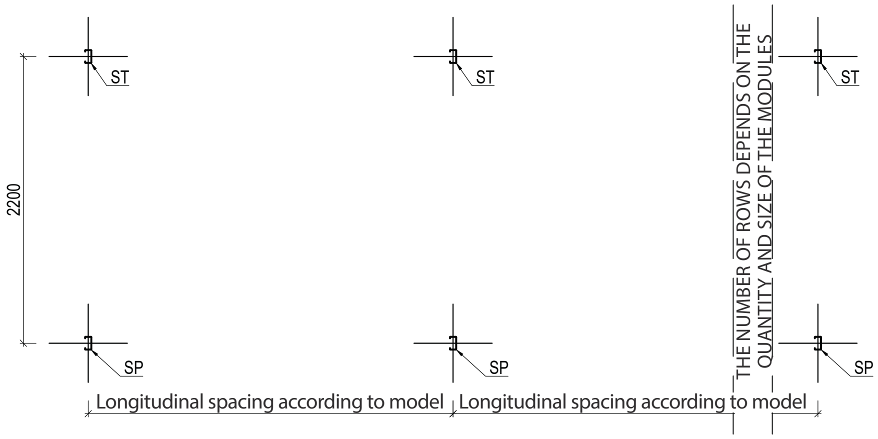
**Option to use an assembled post (assembly details in detail V7) or other types of foundations (optional solutions available upon special request).*

3 ASSEMBLY DRAWING (TOP VIEW OF THE STRUCTURE AND SOUTH VIEW)

Calculate the longitudinal spacing of the structure using the formula below. Then, orient all posts according to the drawing and mark their locations. Drive the posts to a minimum depth of 1.5 m. The depth of post insertion depends on the target tilt angle of the modules and soil conditions. During insertion, ensure the posts are vertically aligned. Post damage during insertion is not allowed; use a spacer if needed. Posts may be anchored in the ground using a pile driver.

The front view shows the mounting plane for the front-to-back brace, the minimum overhang of the beam beyond the module at 50 mm, and the maximum overhang of the beam from the post axis at 1.25 m.

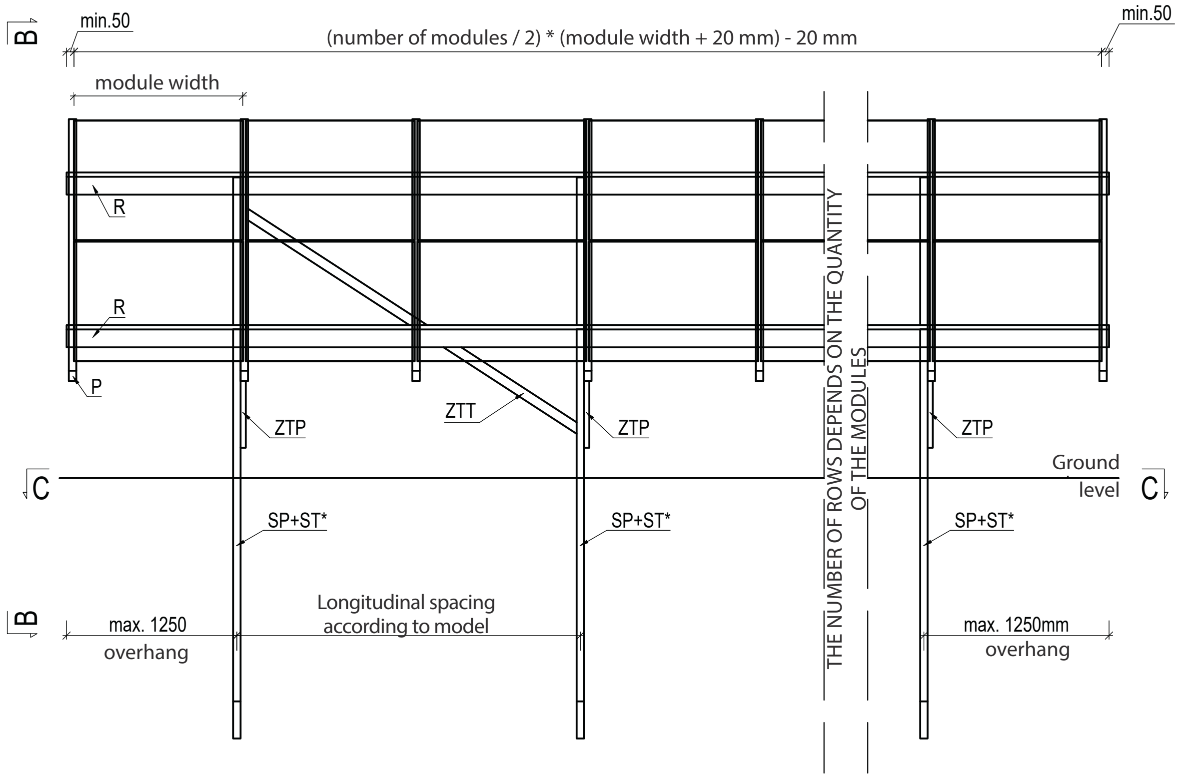
Top view – post arrangement (section)



Set all posts in the orientation shown in the drawing

LONGITUDINAL SPACING [mm] = 2 * (module width in mm + 20)

Front view – from the south (section A-A)



**Option to use a foldable post; assembly details can be found in Detail D7.*

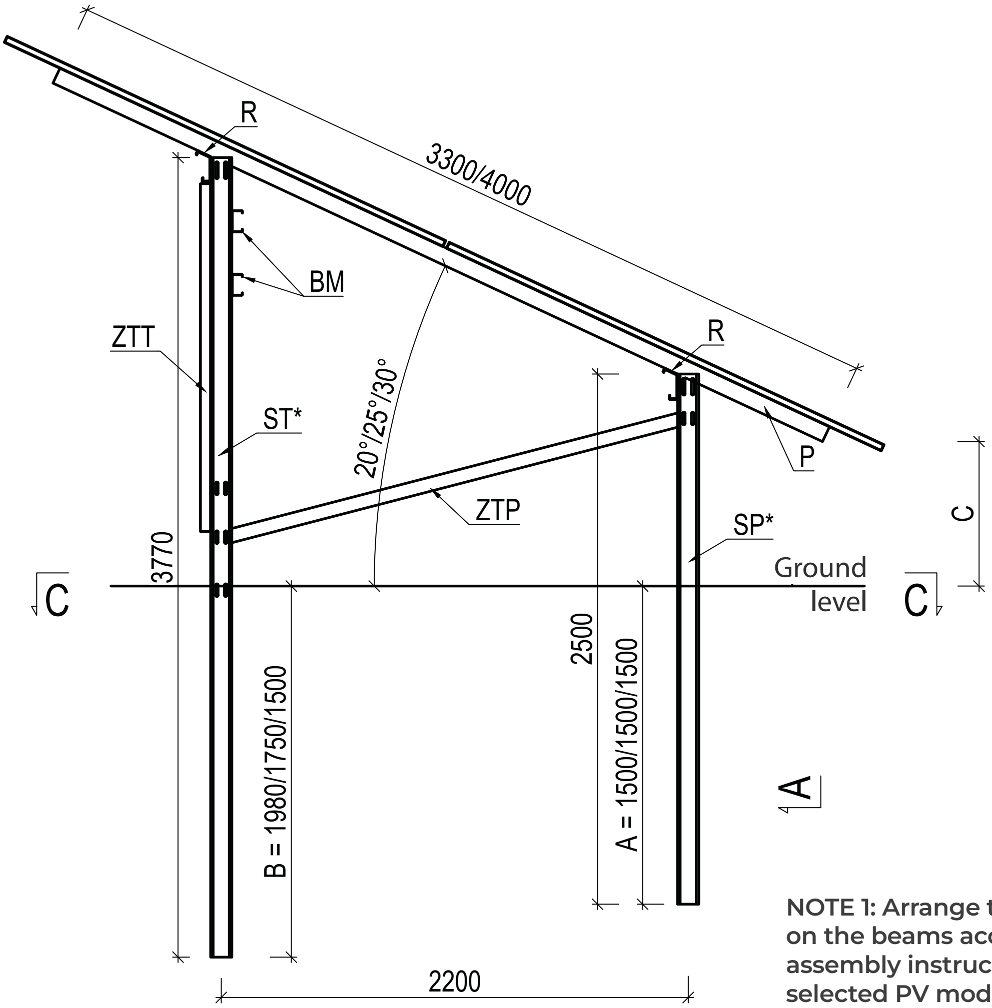
Variant: **2P2VMBW**

4 ASSEMBLY DRAWING (WEST VIEW OF THE STRUCTURE)

From the side view and Table 2, determine the post foundation depth based on the selected target tilt angle of the modules. The tilt angle of the modules is set by the beams chosen during the ordering process; it cannot be adjusted later.
The side view also shows the mounting planes for the BM (mounting beams) and the ZTT (braces).

Note: Due to the telescopic installation of the beams, the module plane may have a "wave" effect of approximately 2 mm across the width of the module after installation.

Side view – from the west (section B-B)



NOTE 1: Arrange the purlins on the beams according to the assembly instructions for the selected PV module.

Table 2. Structure geometry depending on the tilt angle

ANGLE	DRIVING DEPTH [MM]		HEIGHT OF SUPPORT PROFILES BASE ABOVE GROUND [MM] – „C"	
	„B" ST	„A" SP	P156C33	P156C40
20°	1980	1500	~861	~741
25°	1750	1500	~829	~681
30°	1500	1500	~798	~622

**Option to use a foldable post; assembly details can be found in Detail D7.*

Variant: **2P2VMBW**

5 DETAIL OF CONNECTION BETWEEN POST ST/SP-BEAM R

V1

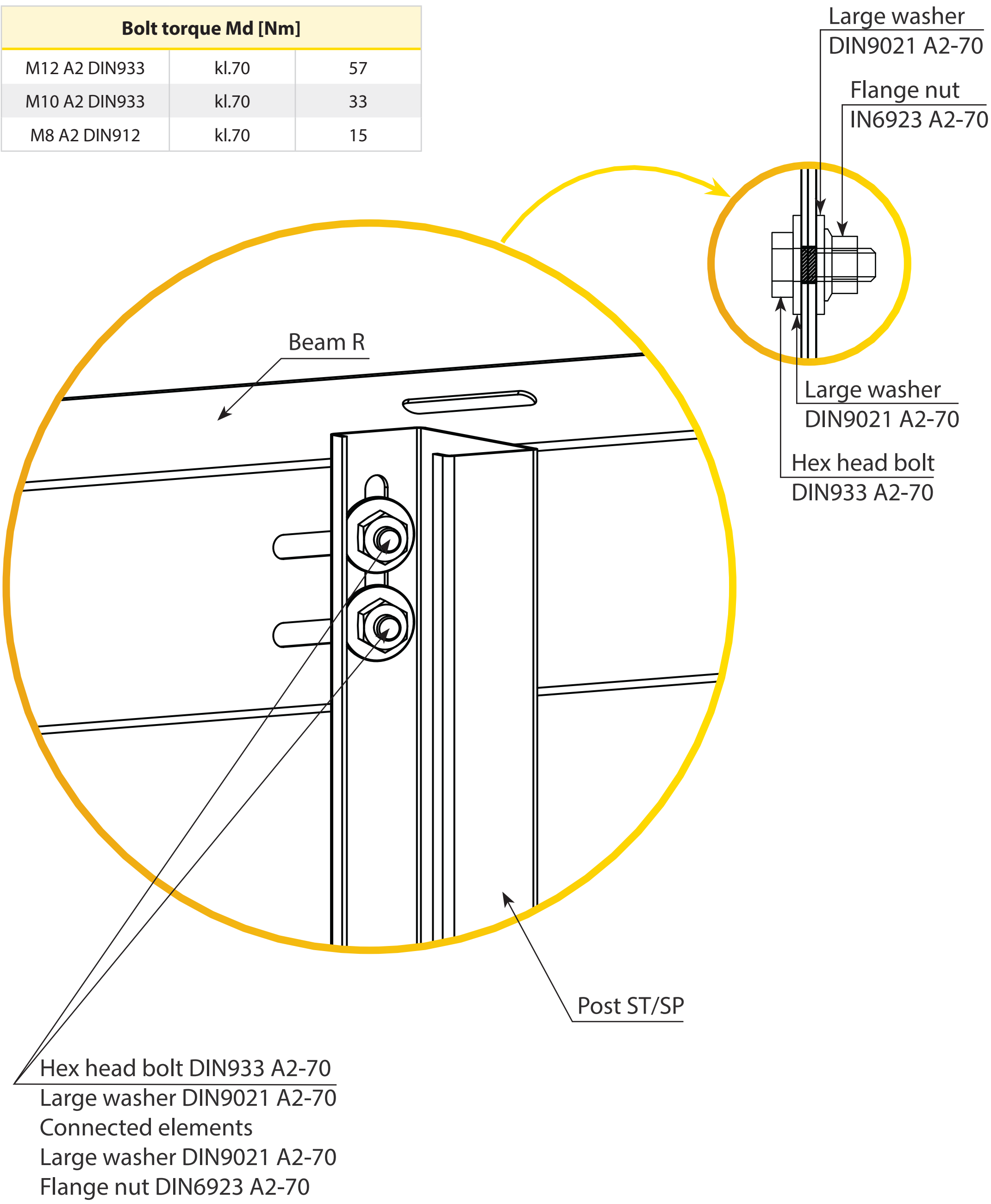
For one connection, you will need:

- 2x hex head bolt DIN933 A2-70
- 4x large washer DIN9021 A2-70
- 2x flange nut DIN6923 A2-70

To the correctly driven ST and SP posts, attach two uniformly assembled rows of beams on the north side. Since the beams connect telescopically, the top surface of the beams has a slight „wave" effect (about 2 mm across the module width). You can attach the beams to the posts according to the detail below and then bolt them together sequentially following detail V3, or alternatively, first bolt the entire row of beams together and then attach it to the row of front/rear posts. The second method is feasible only if there are enough installers available to lift, stabilize, and attach such long elements.

Align the two rows of beams so that their top flanges form a single plane. The torque values for tightening the bolts are provided in the table below.

Bolt torque Md [Nm]		
M12 A2 DIN933	kl.70	57
M10 A2 DIN933	kl.70	33
M8 A2 DIN912	kl.70	15



Variant: **2P2VMBW**

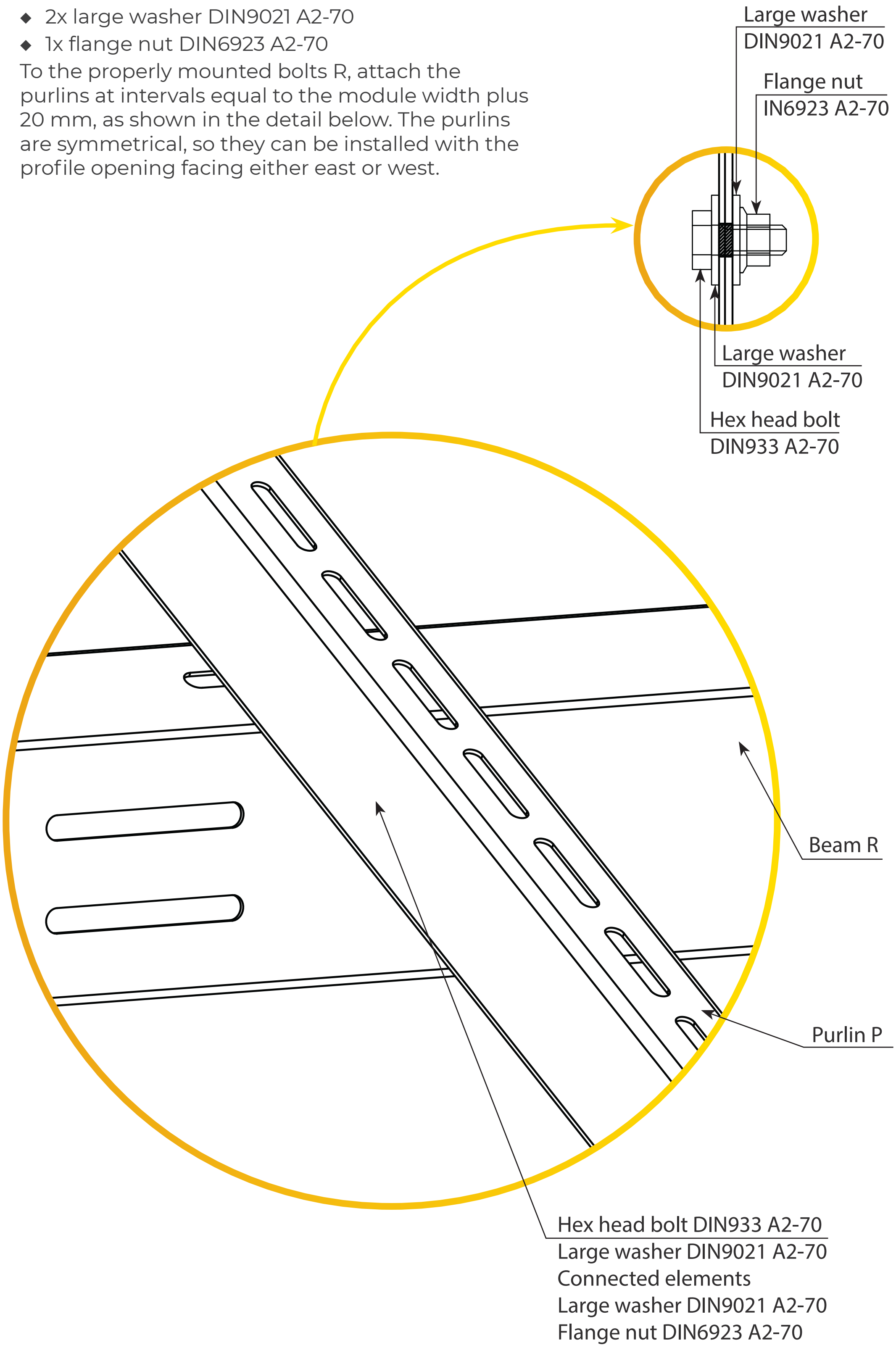
6 DETAIL OF CONNECTION BEAM R-PURLIN P

V2

For one connection, you will need:

- 1x hex head bolt DIN933 A2-70
- 2x large washer DIN9021 A2-70
- 1x flange nut DIN6923 A2-70

To the properly mounted bolts R, attach the purlins at intervals equal to the module width plus 20 mm, as shown in the detail below. The purlins are symmetrical, so they can be installed with the profile opening facing either east or west.



Variant: **2P2VMBW**

7 DETAIL OF CONNECTION BEAM R – BEAM R

V3

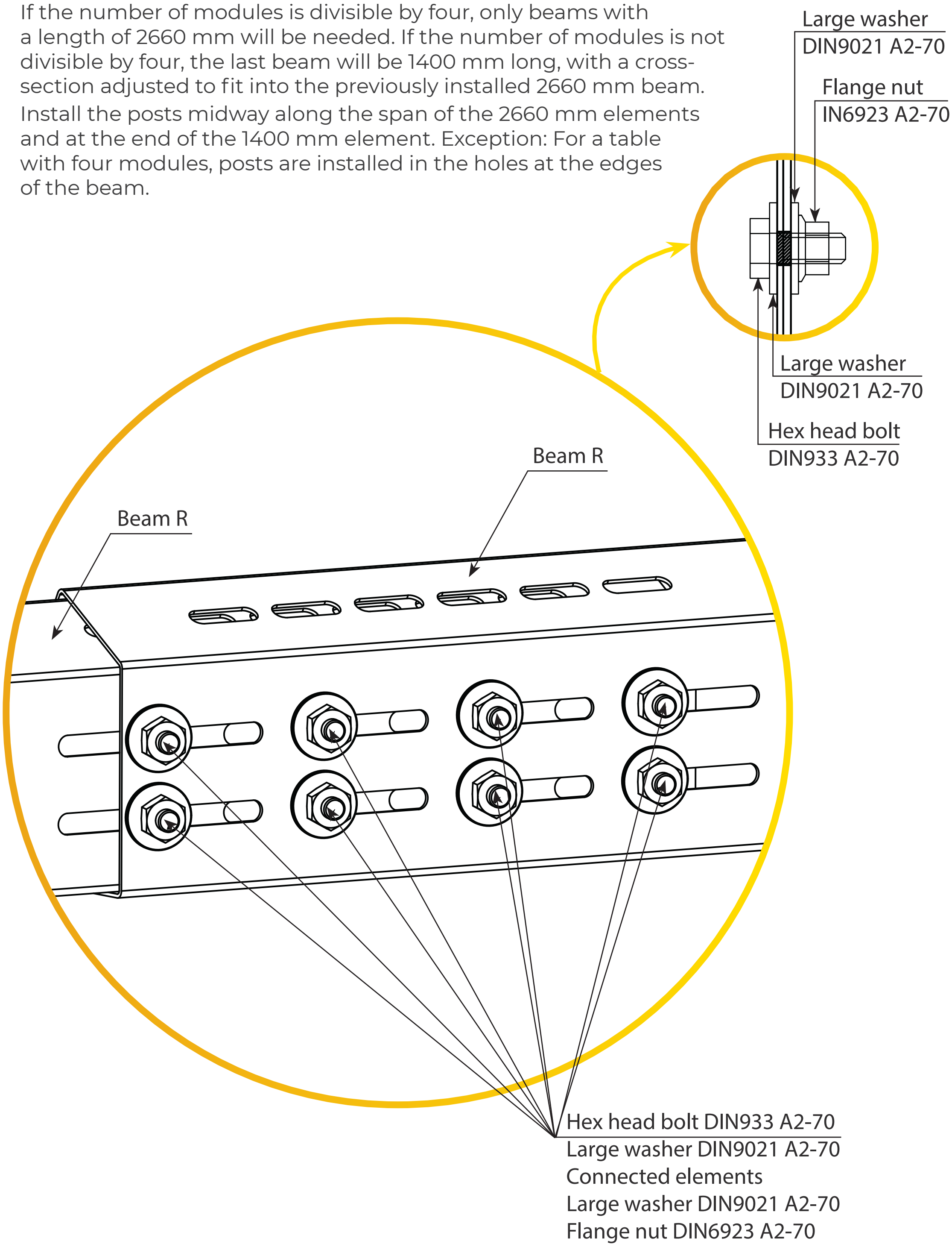
For one connection, you will need:

- 8x hex head bolt DIN933 A2-70
- 16x large washer DIN9021 A2-70
- 8x flange nut DIN6923 A2-70

Before bolting the beams together as shown in the detail below, align them carefully and arrange two identical rows of beams for each table. Begin each row with a 2660 mm-long element with a larger cross-section (V120x68x40), then insert a smaller cross-section element (V114x64x36) into it, alternating in this manner.

If the number of modules is divisible by four, only beams with a length of 2660 mm will be needed. If the number of modules is not divisible by four, the last beam will be 1400 mm long, with a cross-section adjusted to fit into the previously installed 2660 mm beam.

Install the posts midway along the span of the 2660 mm elements and at the end of the 1400 mm element. Exception: For a table with four modules, posts are installed in the holes at the edges of the beam.



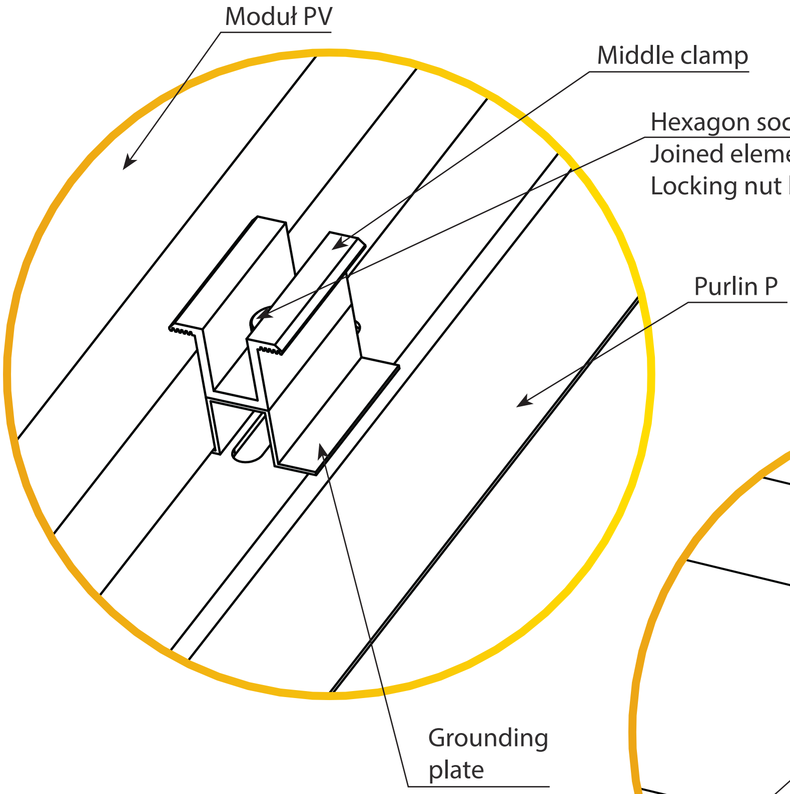
8

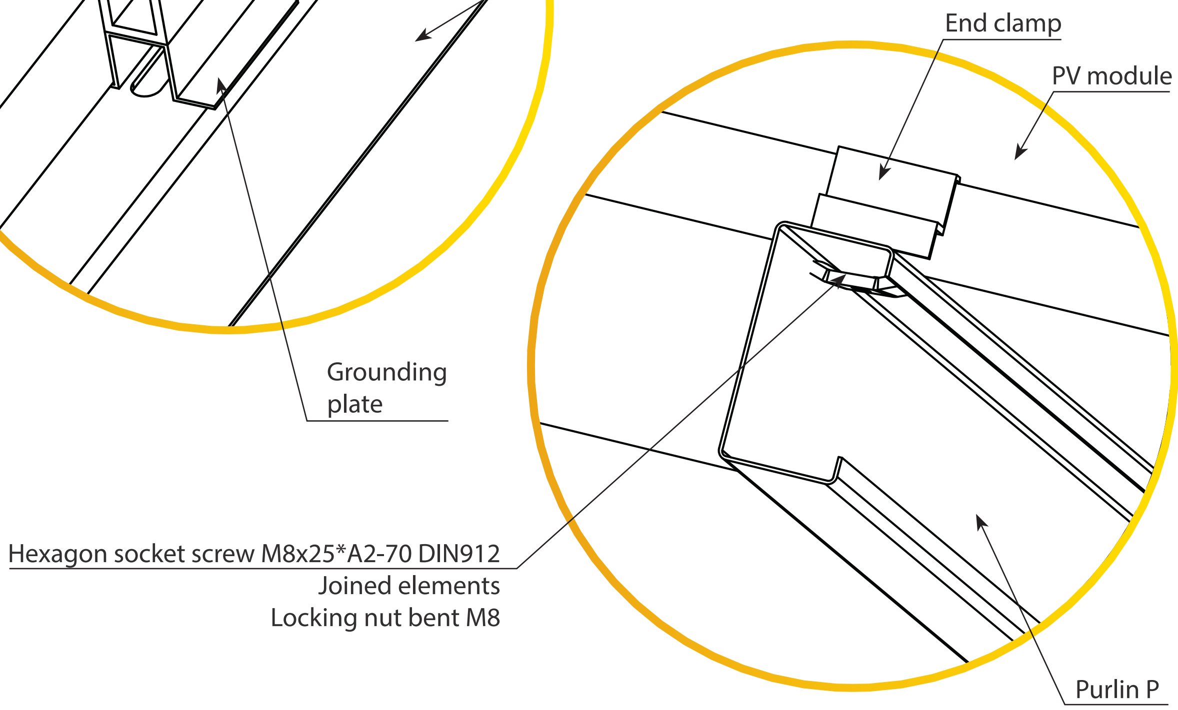
DETAIL OF CONNECTION PURLIN P-CLAMP (PV)

V4

For one connection, you will need:
- allen bolt M8x25** A2-70 DIN912R
- bracket with rivet nut for clamp

Before installing the modules, ensure that the support structure is assembled according to the assembly instructions, has the correct tilt, and is rigid. Review the installation instructions for the PV module. Check the PV module manufacturer's recommended torque for tightening Allen bolts/clamps. Verify whether the supplied clamps are compatible with the PV module being installed (color, height, and width of the clamp) and if the bolts are the correct length**. For modules with a black frame, always use grounding plates under every second middle clamp so that each module makes contact with at least one grounding plate. Grounding plates should be placed on the bracket with the rivet nut under the clamp/module. The support structure manufacturer allows only long-side mounting of the module. Clamps should not deform the frame, touch the glass surface, or cast shadows on the module. Modules should be installed in such a way that they rest freely on the structure across the entire contact area. The support structure manufacturer is not responsible for damage to modules during installation.





Variant: **2P2VMBW**

9

DETAIL OF THE CONNECTION: ST/SP – BACK-BACK BRACE/BACK-FORWARD

V5

For one connection, you need:
- 1x hexagon head screw DIN933 A2-70
- 2x widened washer DIN9021 A2-70
- 1x flange nut DIN6923 A2-70

To the rear posts on the north side (plane shown on page 5), attach the back-to-back braces using the most suitable holes, aiming to achieve the maximum possible span. Table 3 provides the required number of braces depending on the number of spans (spaces between posts), the specific span where the brace should be installed, and the direction/orientation for its installation.
In the perpendicular direction, attach the front-to-back braces from the east side, also using the most suitable holes on the front and rear posts.

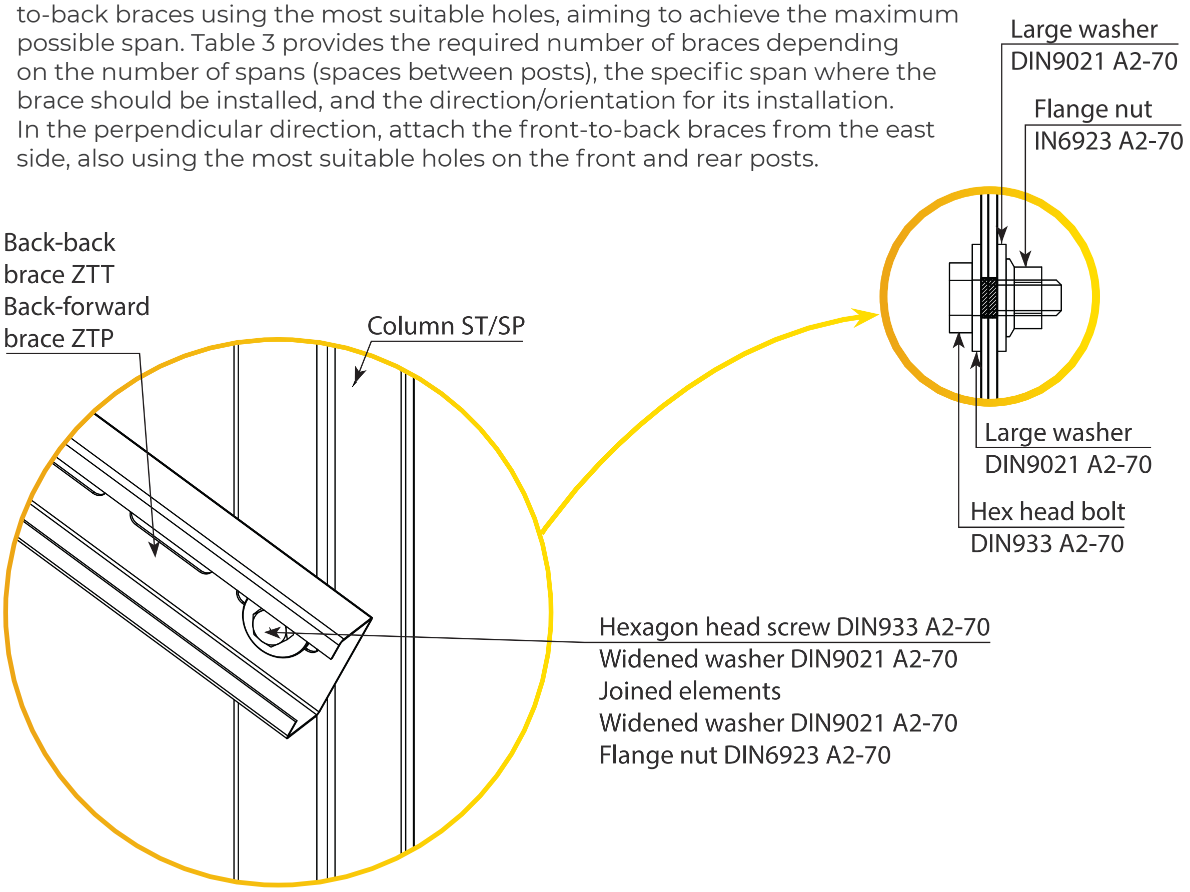
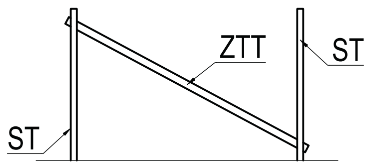


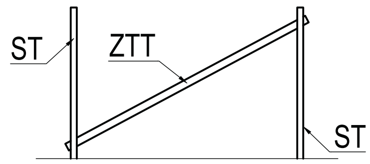
Table 3. Location and orientation of back-back braces

NUMBER OF SPANS	NUMBER OF BRACES	SPAN WITH BRACE AND ORIENTATION
1-2	1	any span (any orientation)
3	1	middle (any)
4-6	2	1st (to the left) + last (to the right)
7-9	3	1st (to the left) + 5th (any) + last (to the right)
10-11	4	1st (to the left) + 4th (to the right) + 7th (to the left) + last (to the right)
>11	4	1st (to the left) + 5th (to the right) + 9th (to the left) + last (to the right)

Left orientation (view from the front)



Right orientation (view from the front)



Variant: **2P2VMBW**

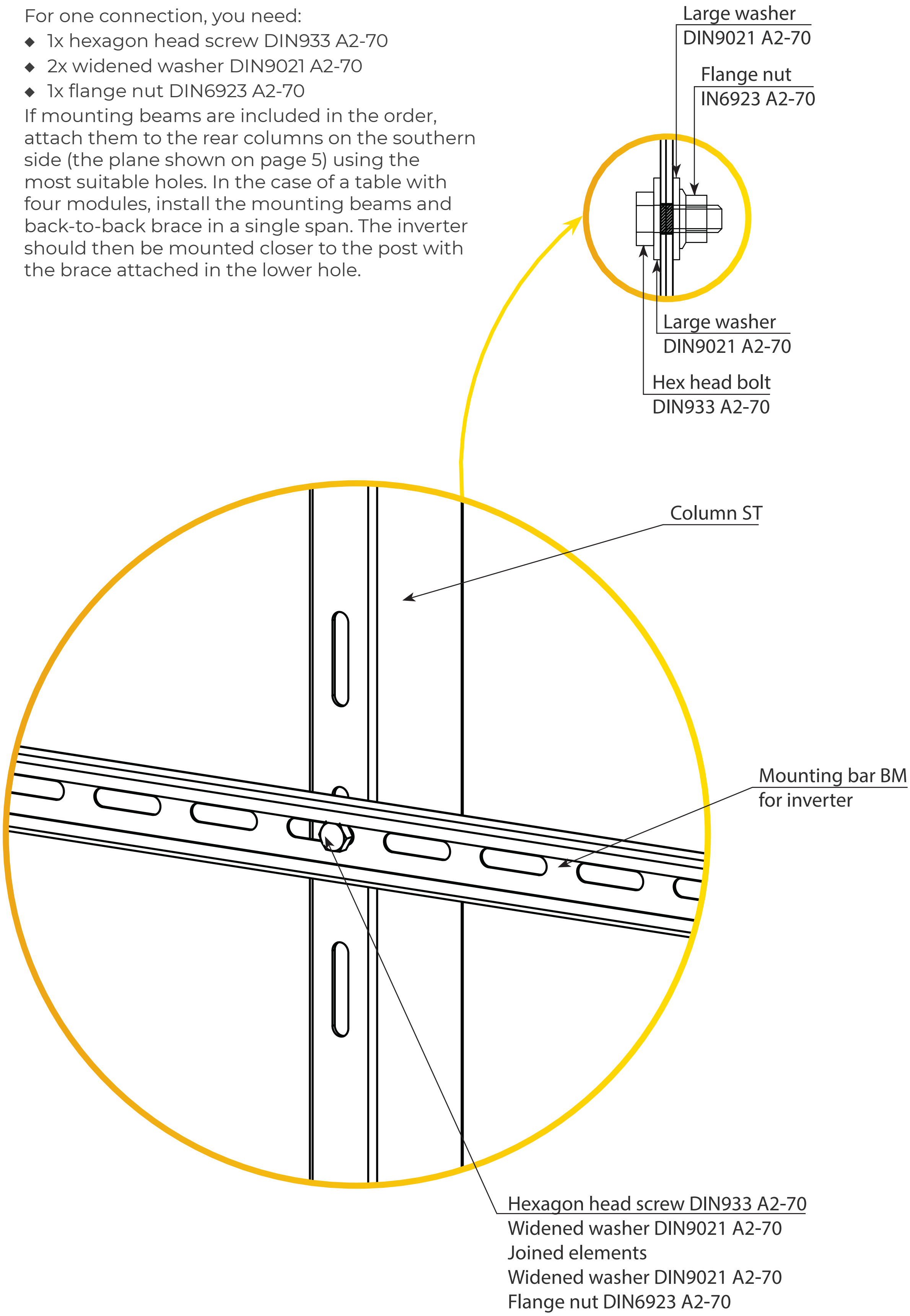
10 DETAIL OF THE CONNECTION: COLUMN ST – MOUNTING BEAM

V6

For one connection, you need:

- 1x hexagon head screw DIN933 A2-70
- 2x widened washer DIN9021 A2-70
- 1x flange nut DIN6923 A2-70

If mounting beams are included in the order, attach them to the rear columns on the southern side (the plane shown on page 5) using the most suitable holes. In the case of a table with four modules, install the mounting beams and back-to-back brace in a single span. The inverter should then be mounted closer to the post with the brace attached in the lower hole.



Variant: **2P2VMBW**

11

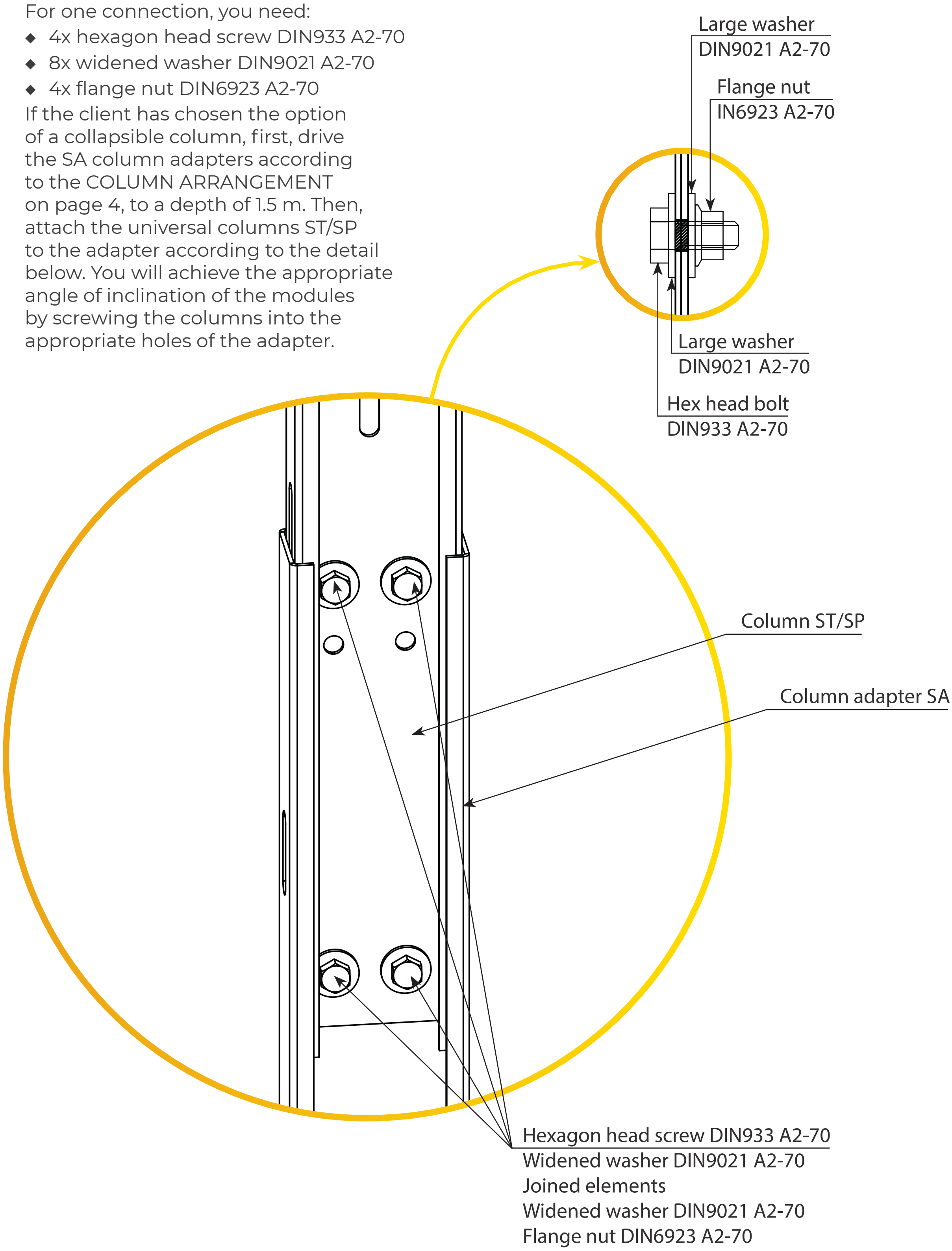
DETAIL OF THE CONNECTION: COLUMN ADAPTER SA – COLUMN SP/ST

V7

For one connection, you need:

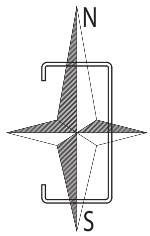
- 4x hexagon head screw DIN933 A2-70
- 8x widened washer DIN9021 A2-70
- 4x flange nut DIN6923 A2-70

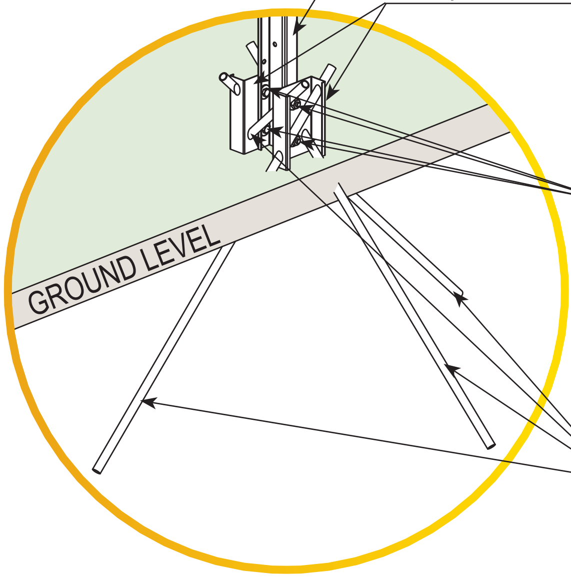
If the client has chosen the option of a collapsible column, first, drive the SA column adapters according to the COLUMN ARRANGEMENT on page 4, to a depth of 1.5 m. Then, attach the universal columns ST/SP to the adapter according to the detail below. You will achieve the appropriate angle of inclination of the modules by screwing the columns into the appropriate holes of the adapter.



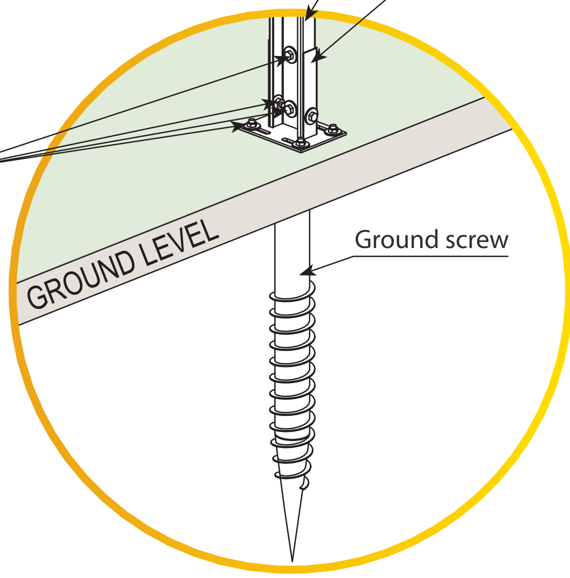
11 OPTIONAL TYPES OF FOUNDATIONS

Orientation of steel posts

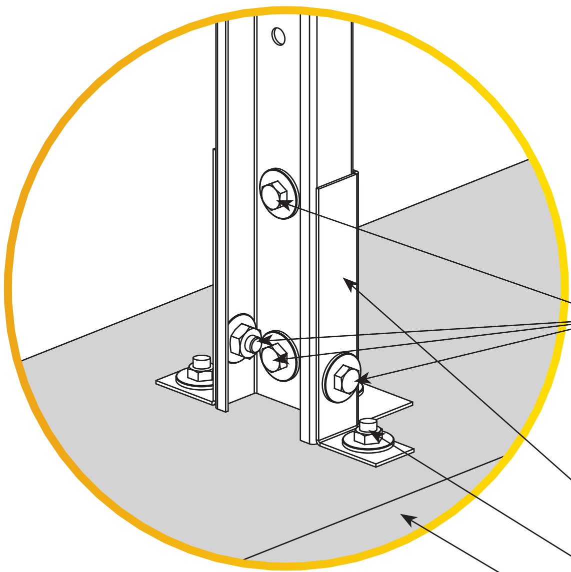




Root system



Ground screw system



Anchored system

12 GENERAL INFORMATION REGARDING THE INSTALLATION OF THE STRUCTURE

- Before installation, ensure that the substrate is stable and suitable for safely mounting the structure.
- Carry out the installation according to the instructions, without modifying the structure.
- Exercise special caution during transportation, installation, inspections, and disassembly of the structure, and keep the workspace clean.
- Please note that this manual presents only basic recommendations for the installation and operation of the selected system. It does not constitute an installation design and cannot replace one. The responsibility for choosing the appropriate mounting system and its components rests with the installers. The manufacturer of the mounting system is not responsible for the correct use or installation of these elements.
- Since the installation of the system may involve damaging the structure of elements, such as corrosion-resistant coatings or insulation of the surfaces to which it is mounted, careful planning of the installation is essential. EL-SUN is not liable for the quality or security of the connections between the system and the building or ground, nor for any damages, deterioration of functionality, or loss of warranty for these elements.
- Damaged elements of the structure must be promptly replaced, both during use and upon detecting faults during inspections.
- Inspections should be conducted according to the warranty conditions and also after any instance where wind speed exceeds the design value.
- The use of the structure is prohibited if it is not used for its intended purpose, if it is on defective or unstable ground, or if it is damaged or incomplete.