HELIOMOTION

QUICK ASSEMBLY GUIDE

PV-6

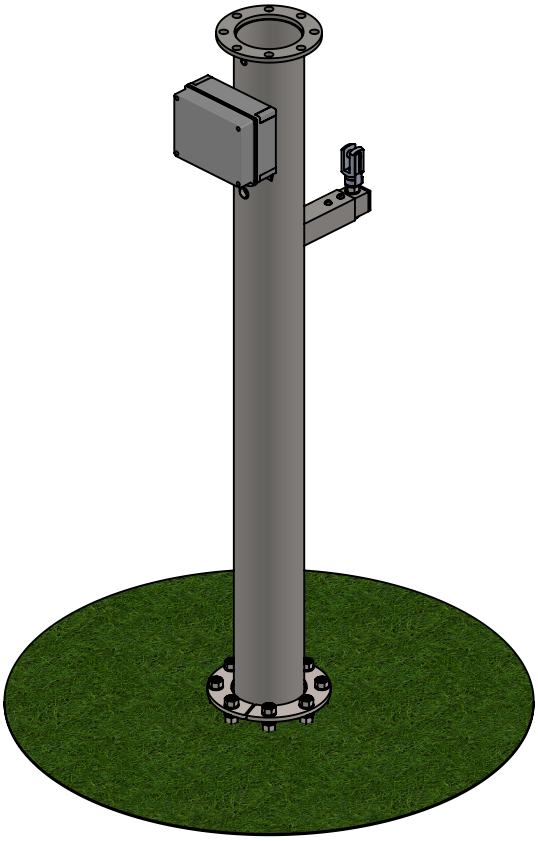
Bee Solar Tech

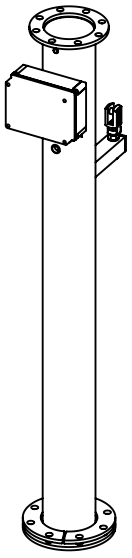
beesolartech.co.uk

heliomotion

June 2023, v3

PART 1 - FOUNDATION

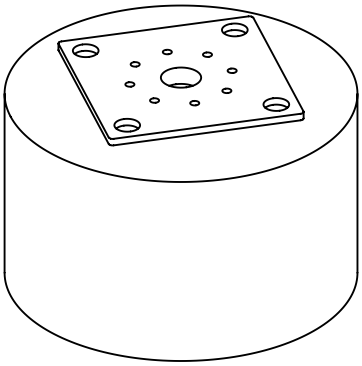




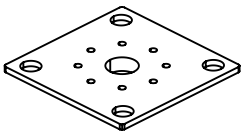
1x

Ground anchor foundation

1.1A



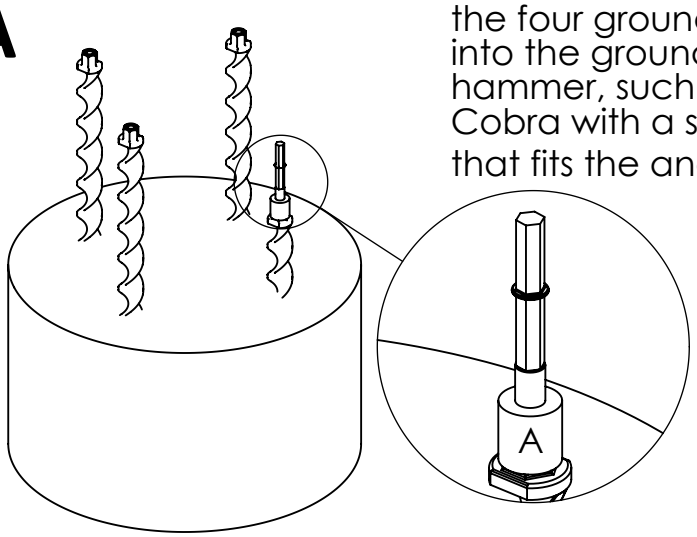
Place the base plate on level ground and use it as a template to mark the positions for the ground anchors.

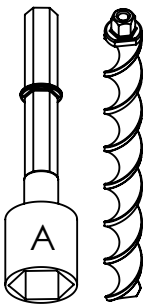


1x

1.2A

Remove the base plate and drill the four ground anchors vertically into the ground using a drill hammer, such as Atlas Copco Cobra with a stem adaptor (A) that fits the anchor.

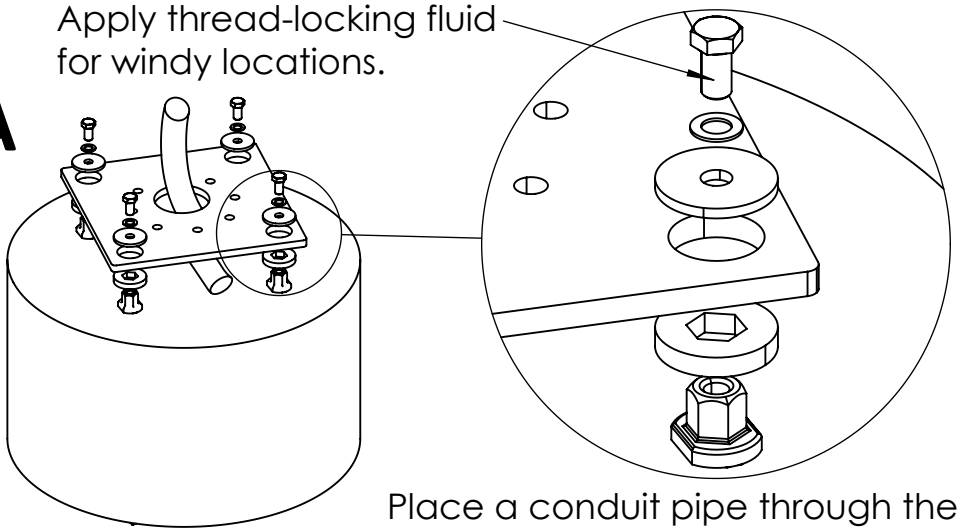


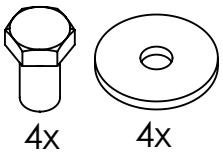


1x 4x

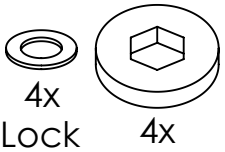
1.3A

Apply thread-locking fluid for windy locations.





4x 4x

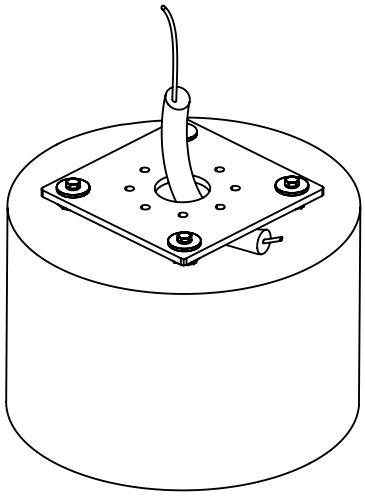


4x Lock washer 4x

Place a conduit pipe through the center hole. Dig a duct for the conduit if necessary for it to fit below the base plate.

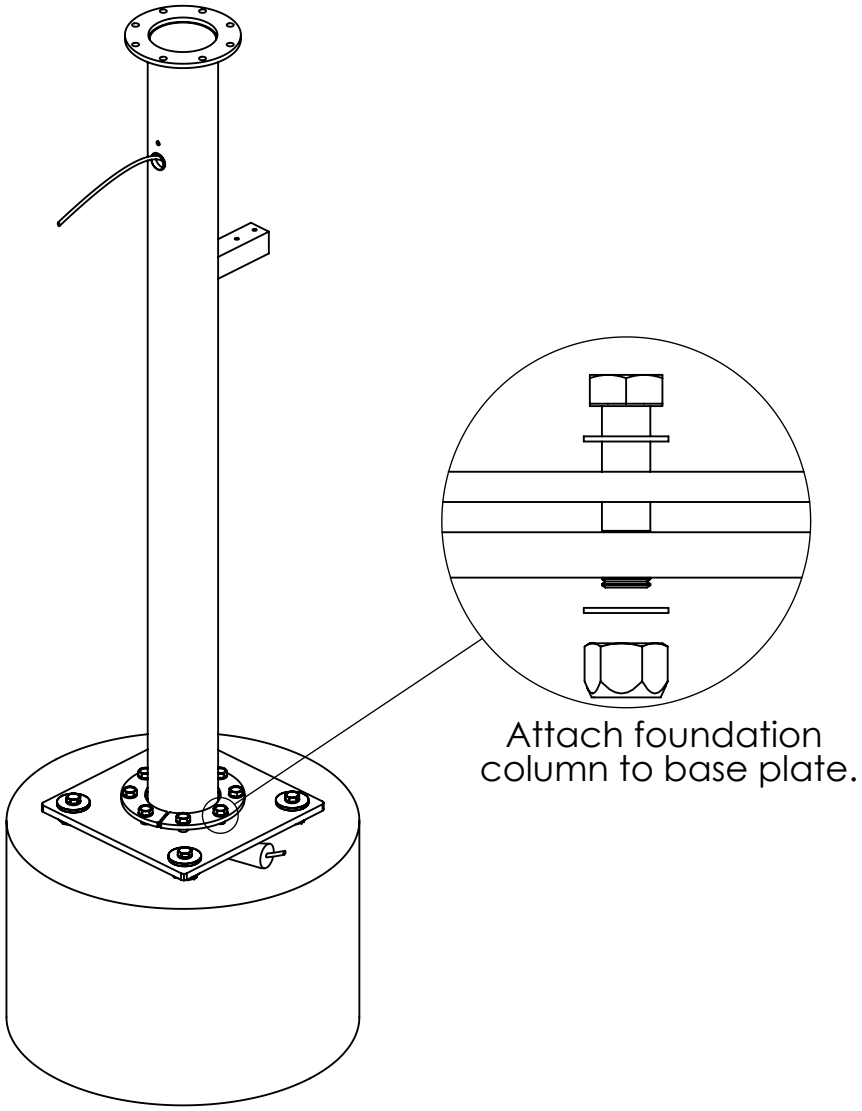
Ensure ground anchors align horitzontally using a spirit level. Then attach base plate using the fastening elements.

1.4A

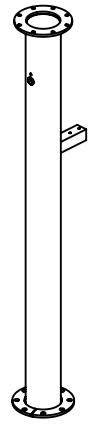


Pull a strong wire or the cable through the center hole of the base plate and out through the hole beneath the junction box on the foundation column.

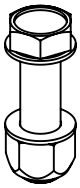
1.5A



Attach foundation column to base plate.

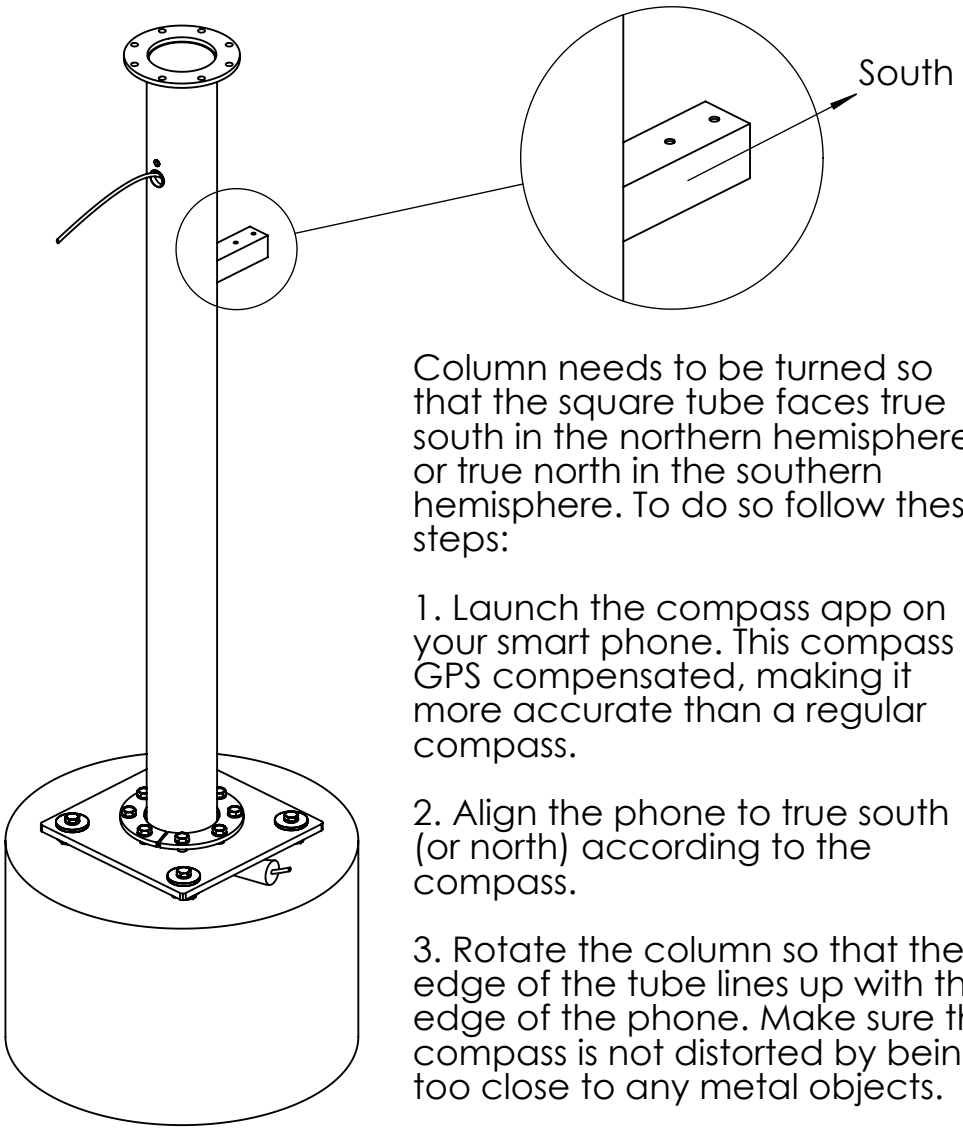


1x



8x

1.6A



Column needs to be turned so that the square tube faces true south in the northern hemisphere or true north in the southern hemisphere. To do so follow these steps:

1. Launch the compass app on your smart phone. This compass is GPS compensated, making it more accurate than a regular compass.

2. Align the phone to true south (or north) according to the compass.

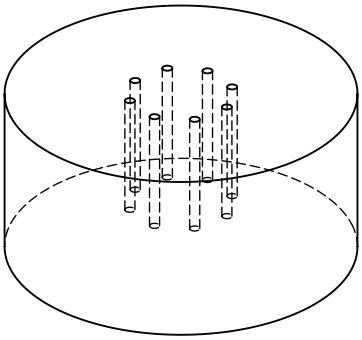
3. Rotate the column so that the edge of the tube lines up with the edge of the phone. Make sure the compass is not distorted by being too close to any metal objects.

4. Tighten bottom nuts to secure the column.

This alignment can be fine-tuned after the installation is complete and the tracker has turned towards the sun.

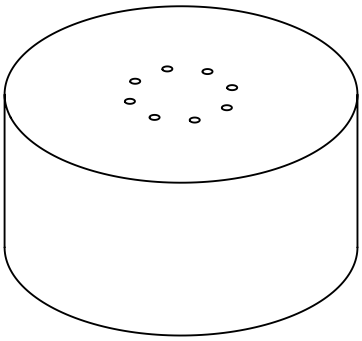
Bedrock foundation

1.1B



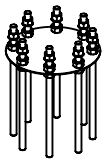
Drill eight holes vertically into the bedrock using the rod unit as a template. Make the holes 20 mm wide and 250 mm deep. Use compressed air to remove any debris and water from the holes to ensure a clean bonding surface.

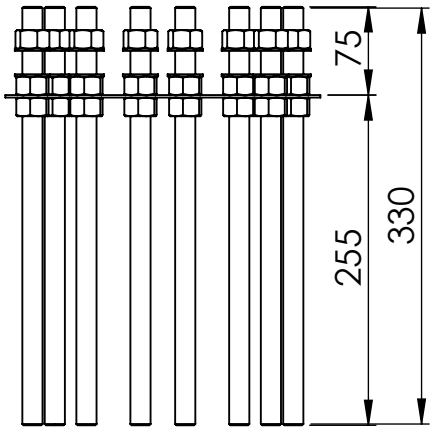
1.2B



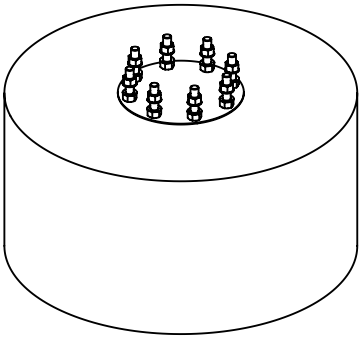
Make sure the rod unit fits well into the holes.

Rod unit





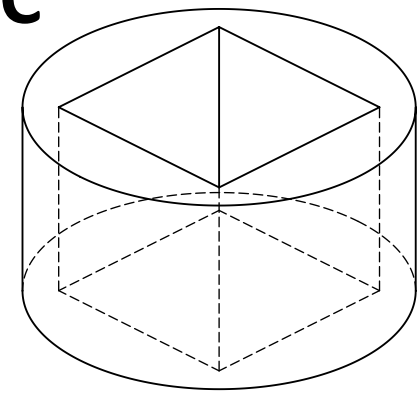
1.3B



Fill the holes 2/3 full with chemical anchor adhesive (400-500 ml). Push the rod unit into the holes and give the adhesive time to cure before continuing the assembly.

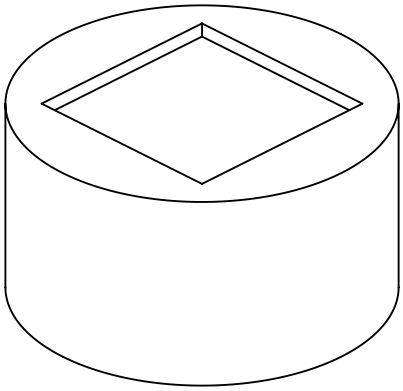
Concrete foundation

1.1C



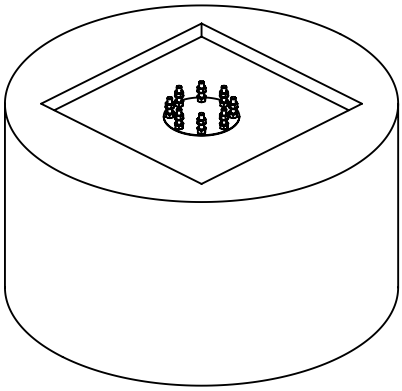
Make a hole for the concrete at your chosen location. The hole for a PV-6 should be at least 80x80 cm, 1 m deep (~600 liter).

1.2C



Fill the hole with concrete up to ground level.

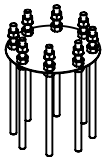
1.3C



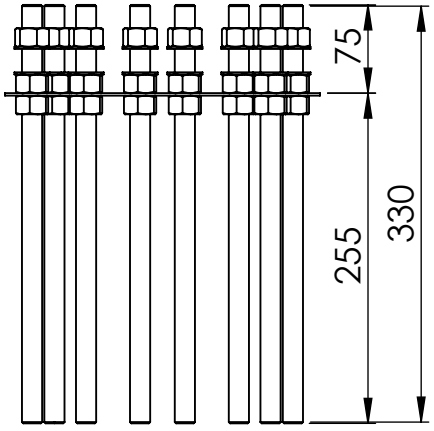
Push the rod unit into center of the concrete and let the flange rest on top of the concrete. Use a spirit level to align the flange horizontally.

Allow the concrete time to harden before assemling the remainder of the power plant.

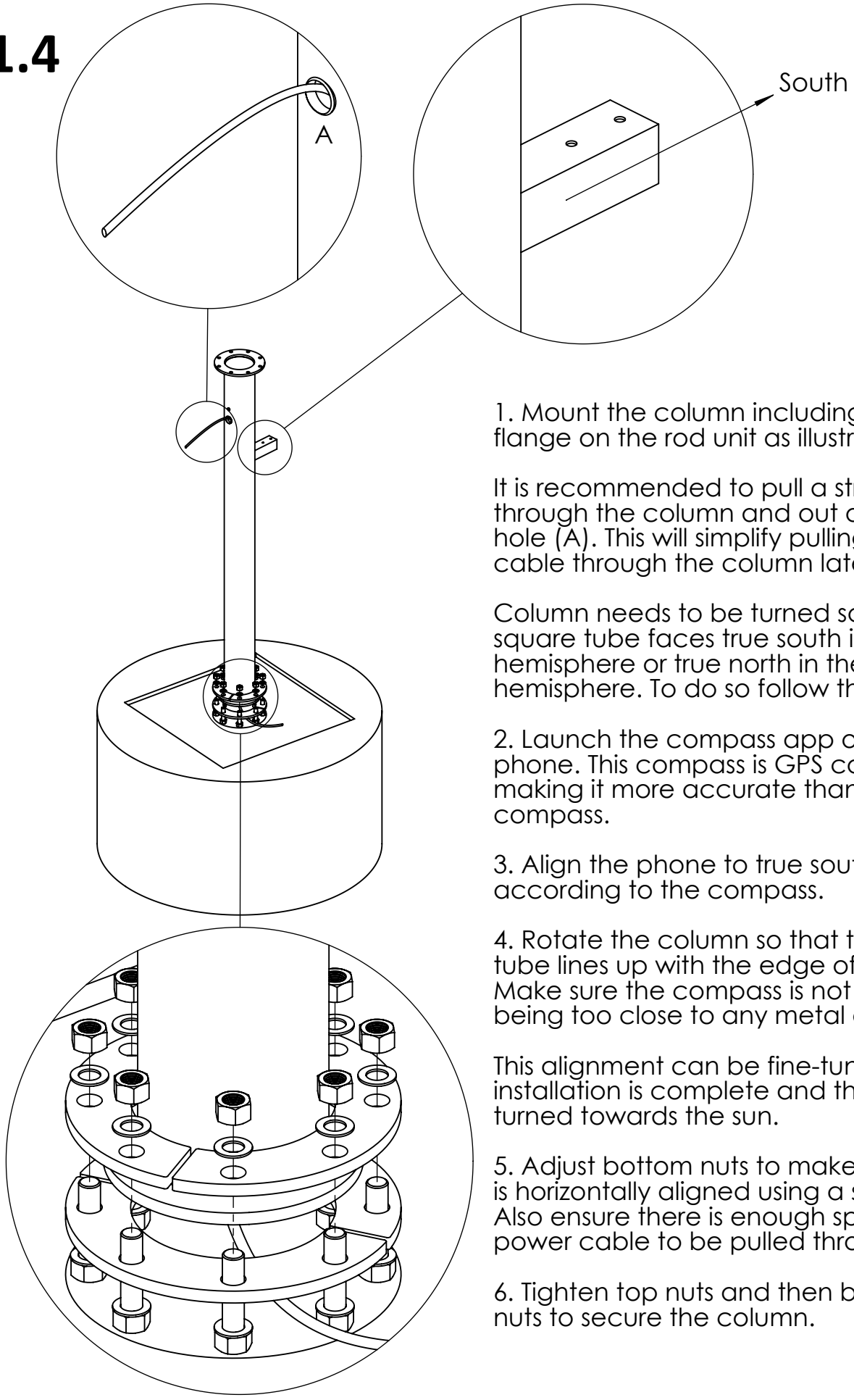
Rod unit



1x



1.4



1. Mount the column including the bottom flange on the rod unit as illustrated.

It is recommended to pull a strong wire through the column and out of the larger hole (A). This will simplify pulling the power cable through the column later.

Column needs to be turned so that the square tube faces true south in the northern hemisphere or true north in the southern hemisphere. To do so follow these steps:

2. Launch the compass app on your smart phone. This compass is GPS compensated, making it more accurate than a regular compass.

3. Align the phone to true south (or north) according to the compass.

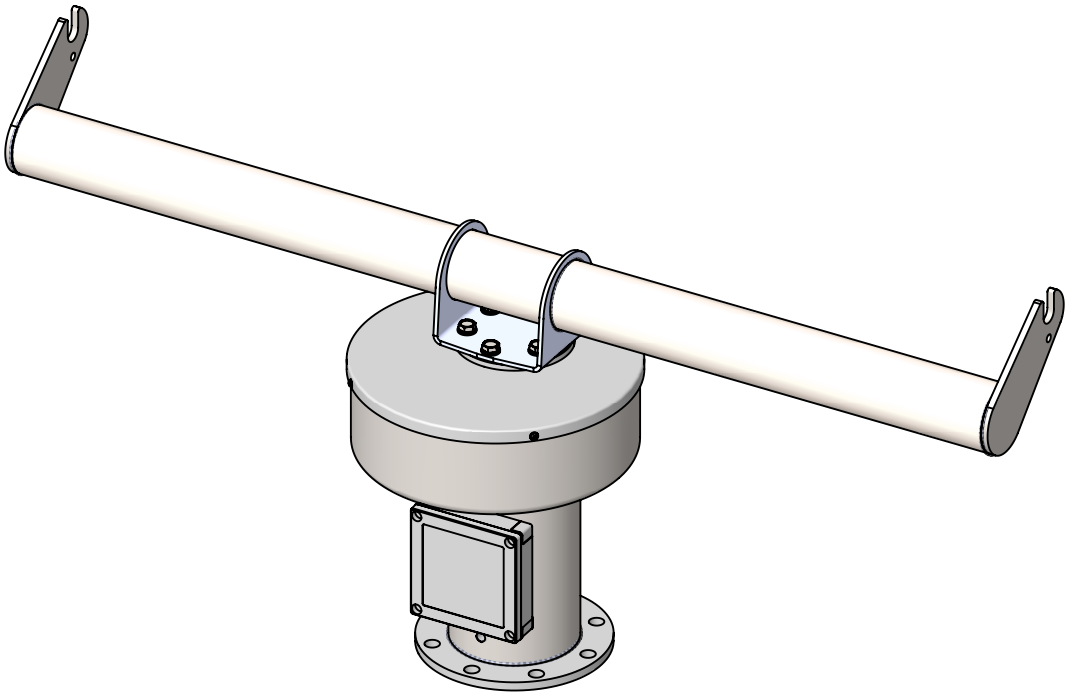
4. Rotate the column so that the edge of the tube lines up with the edge of the phone. Make sure the compass is not distorted by being too close to any metal objects.

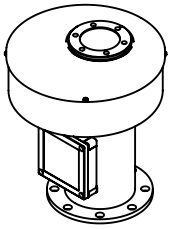
This alignment can be fine-tuned after the installation is complete and the tracker has turned towards the sun.

5. Adjust bottom nuts to make sure column is horizontally aligned using a spirit level. Also ensure there is enough space for the power cable to be pulled through later.

6. Tighten top nuts and then bottom nuts to secure the column.

PART 2 - COLUMN & TRACKER





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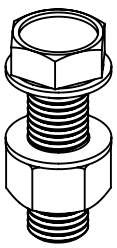
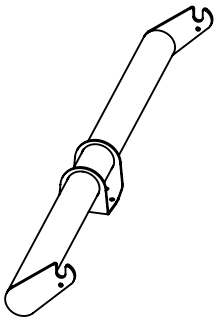
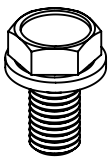


4x

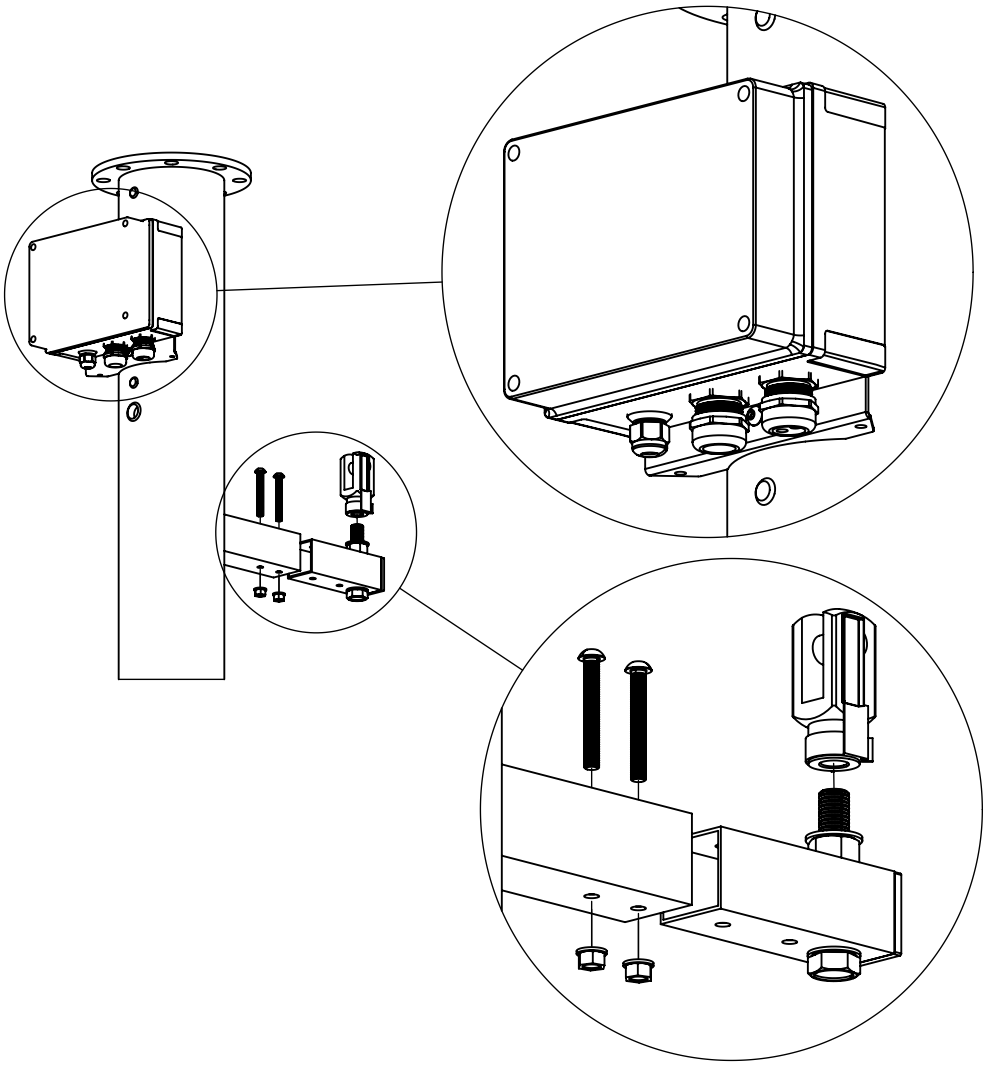


1x

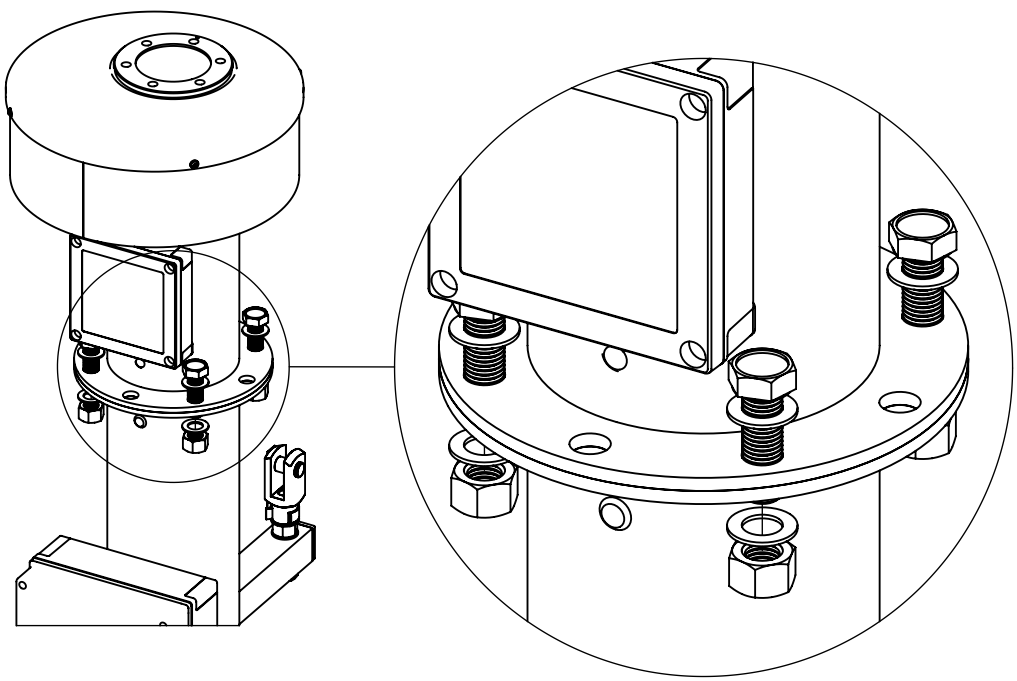


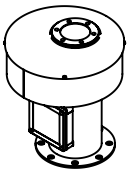
6x

2.1

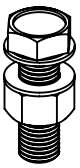


2.2



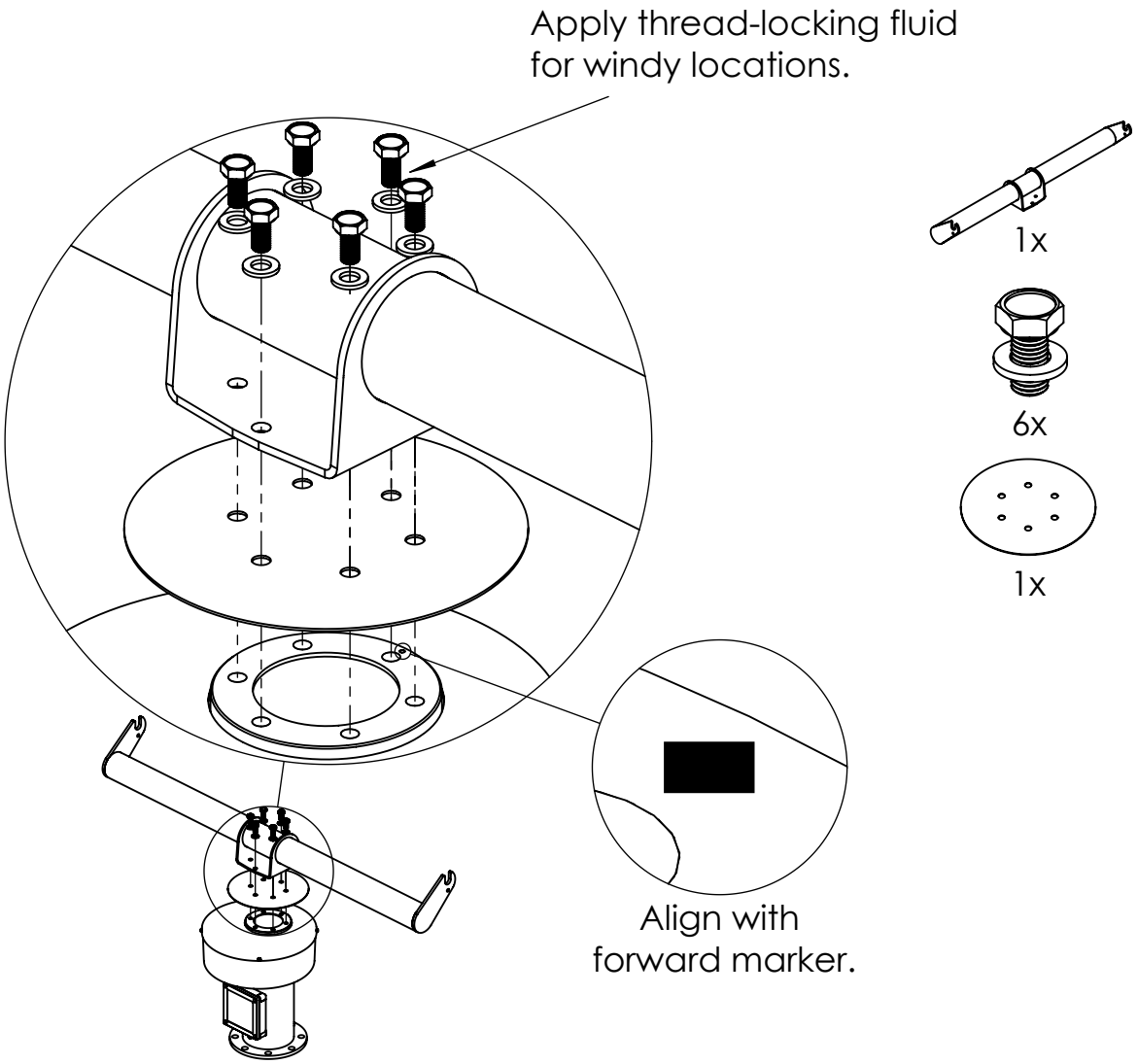


1x

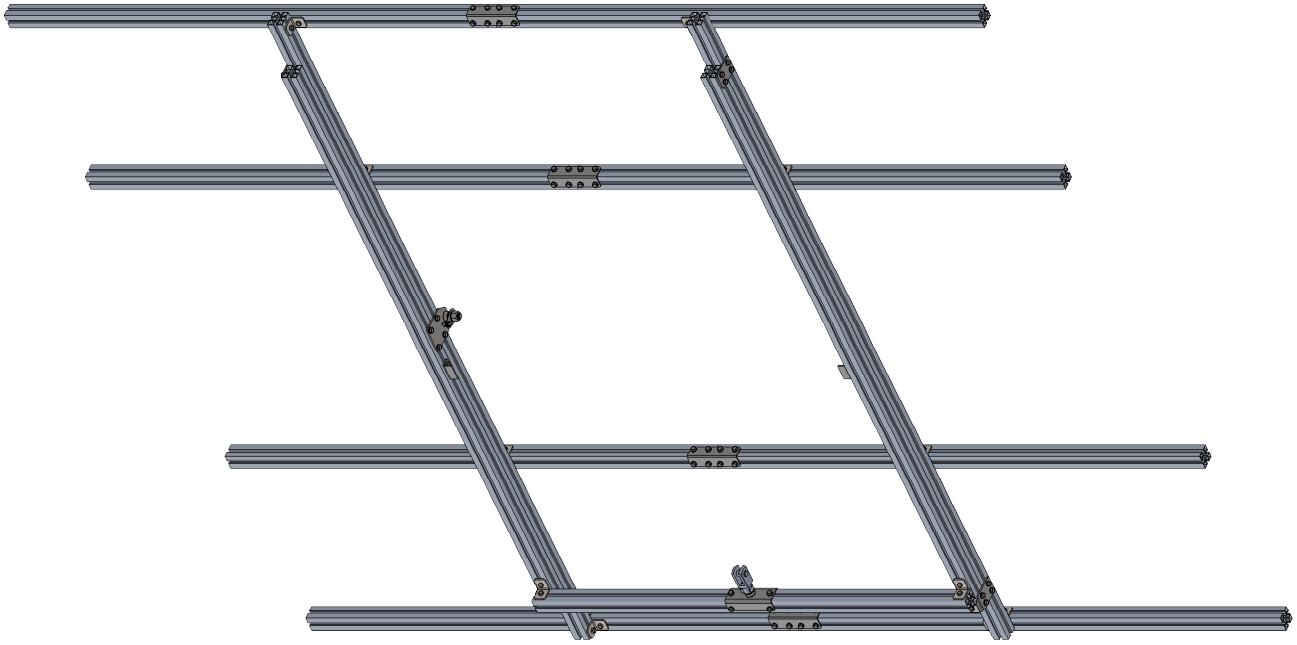


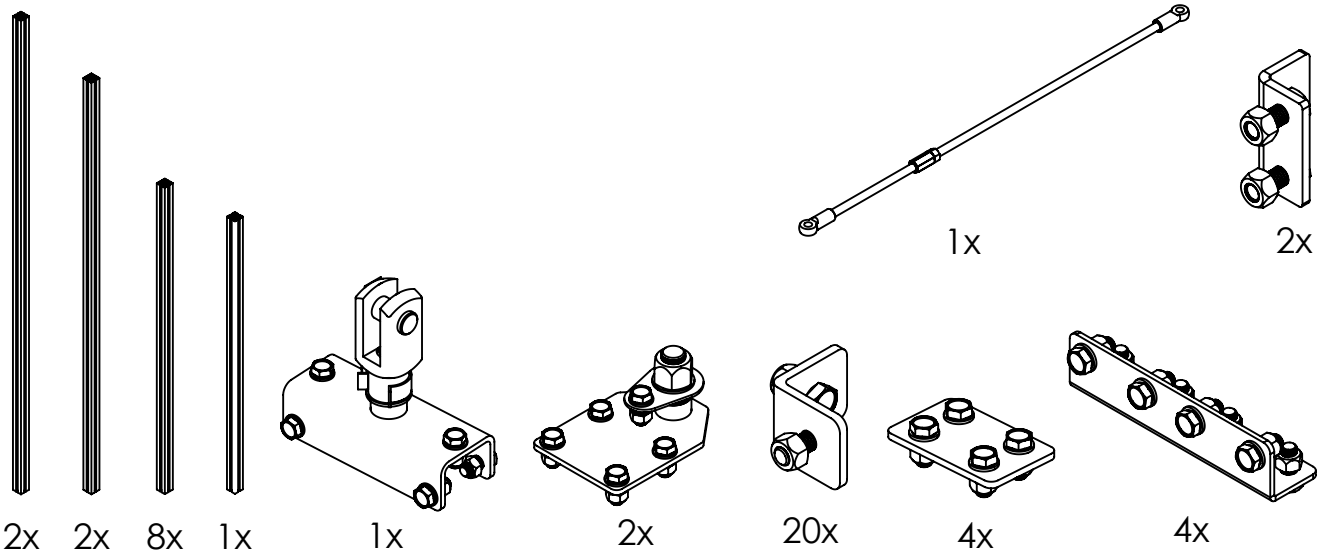
4x

2.3

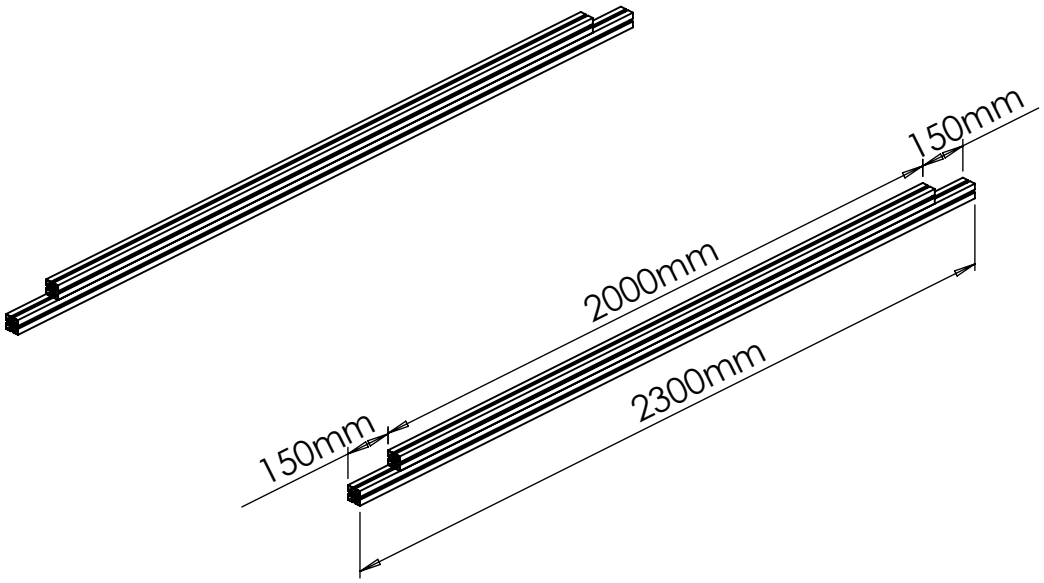

Apply thread-locking fluid
for windy locations.
1x
6x
1x
Align with
forward marker.

PART 3 - FRAMEWORK

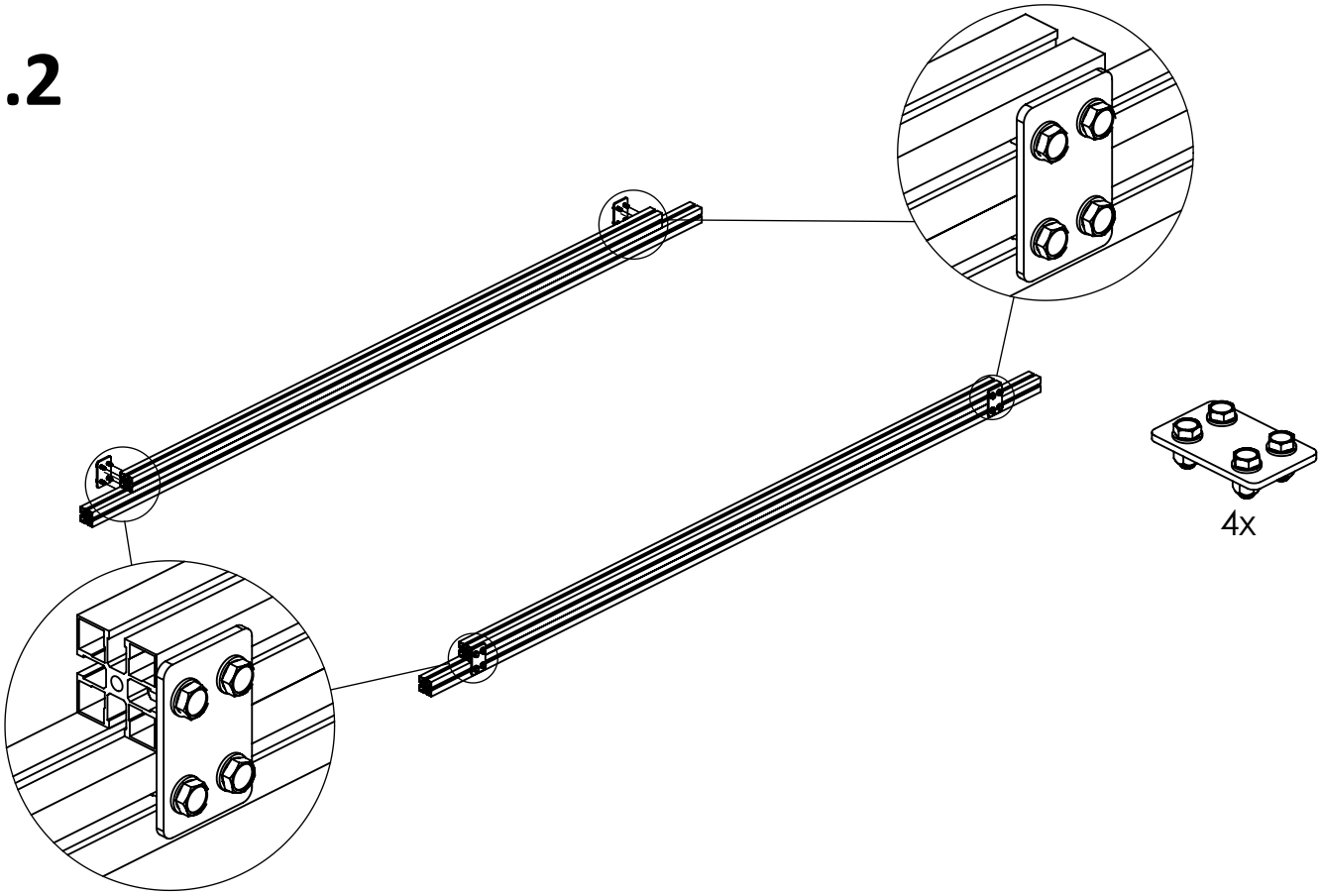




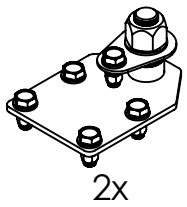
3.1

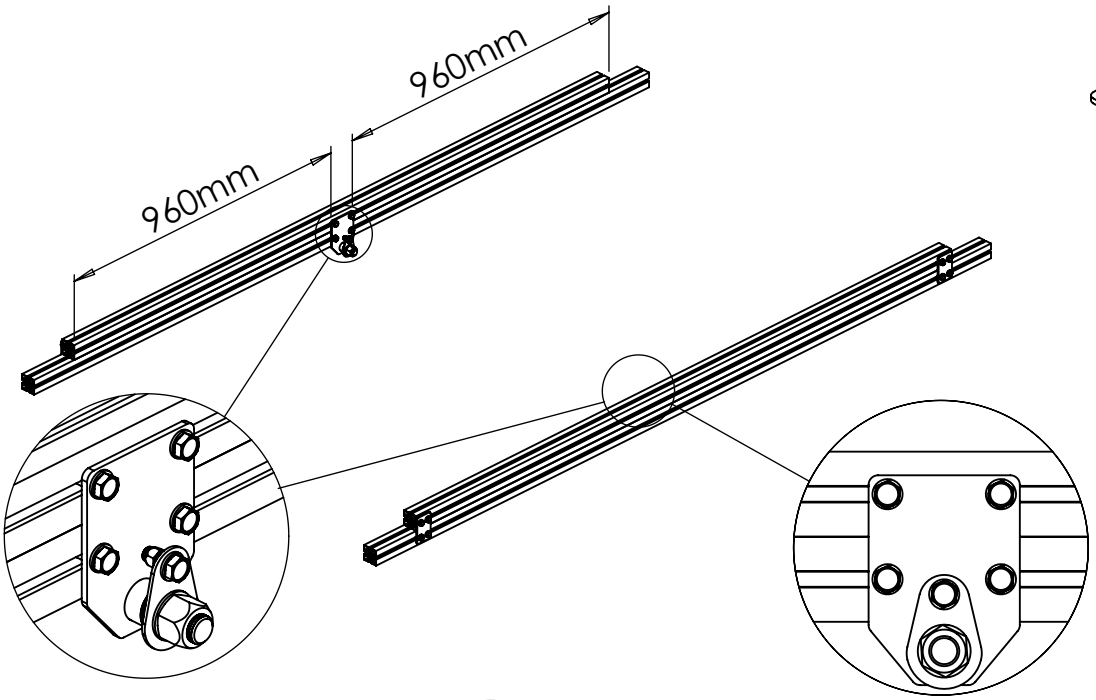


3.2

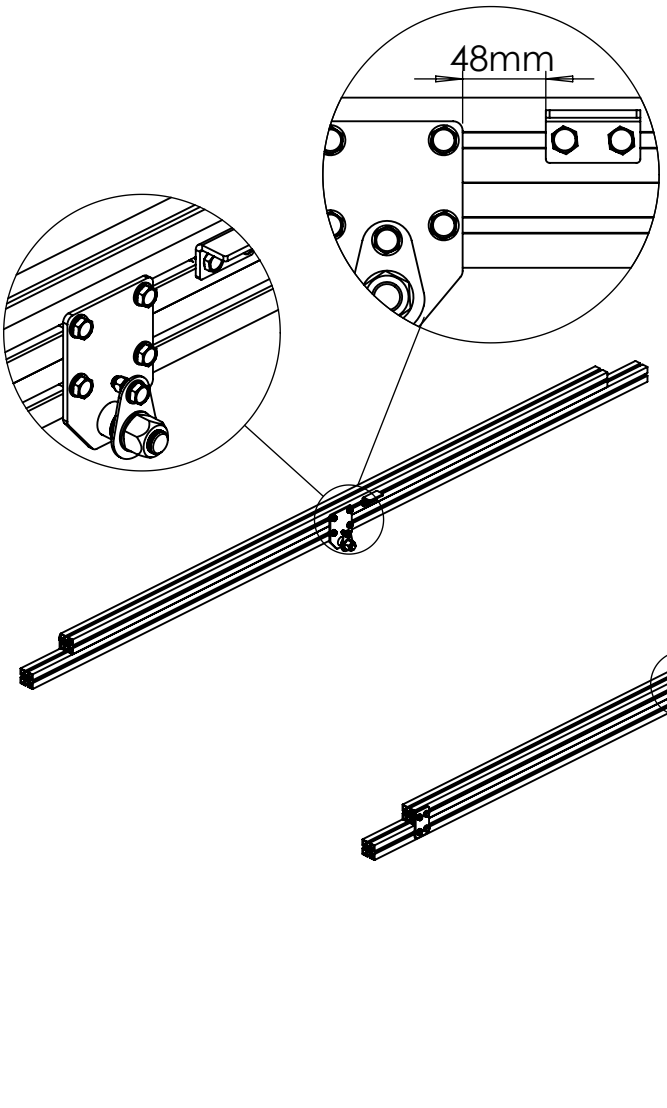


3.3

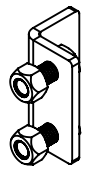




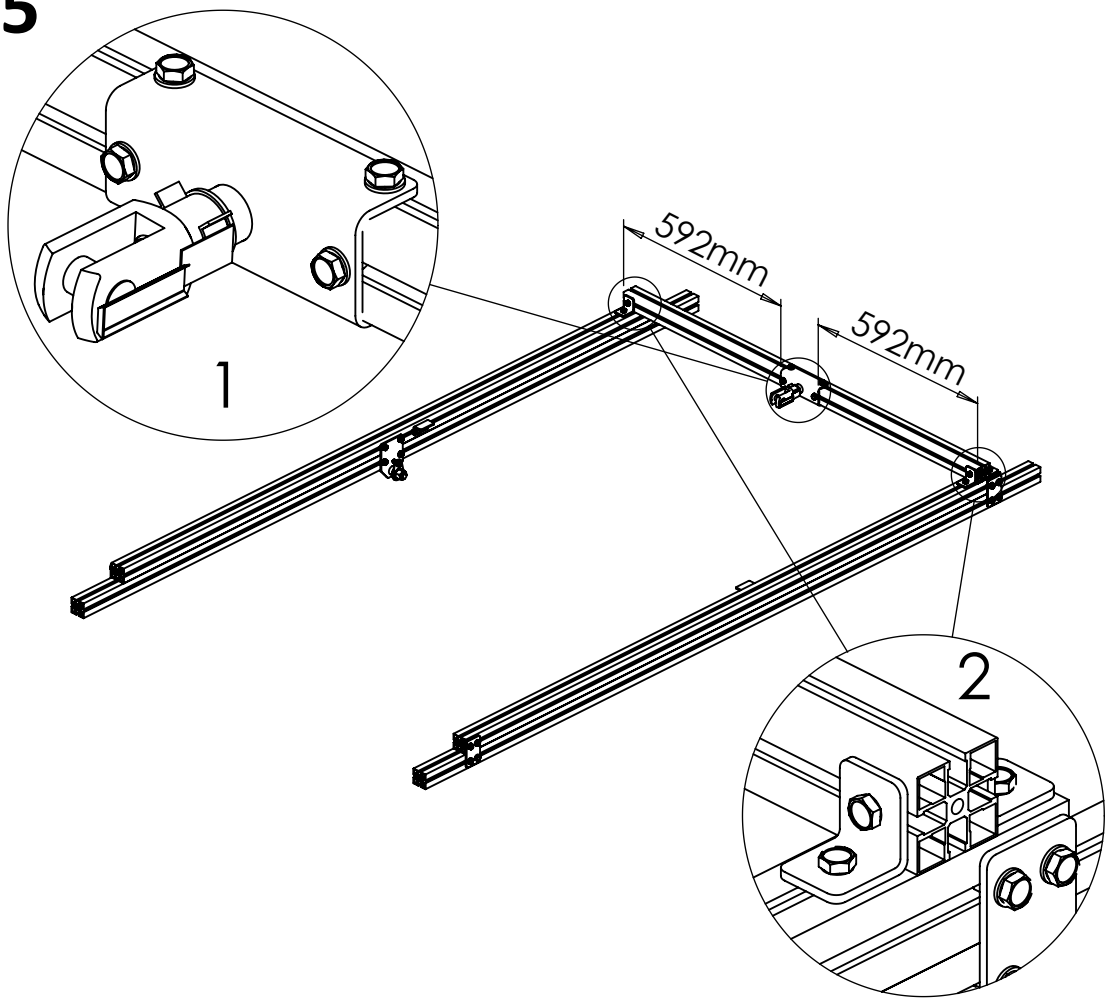
3.4

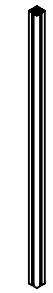


End stop

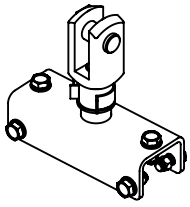


3.5




1x


4x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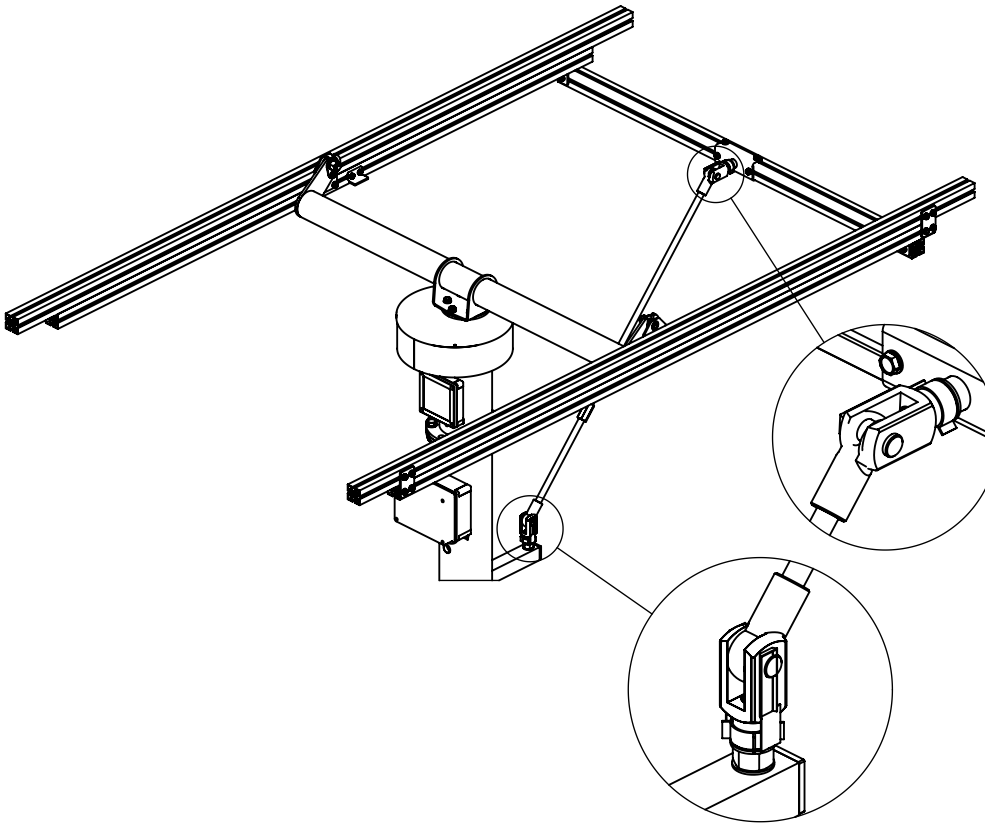
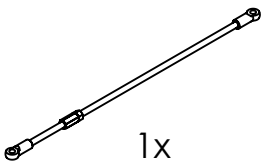
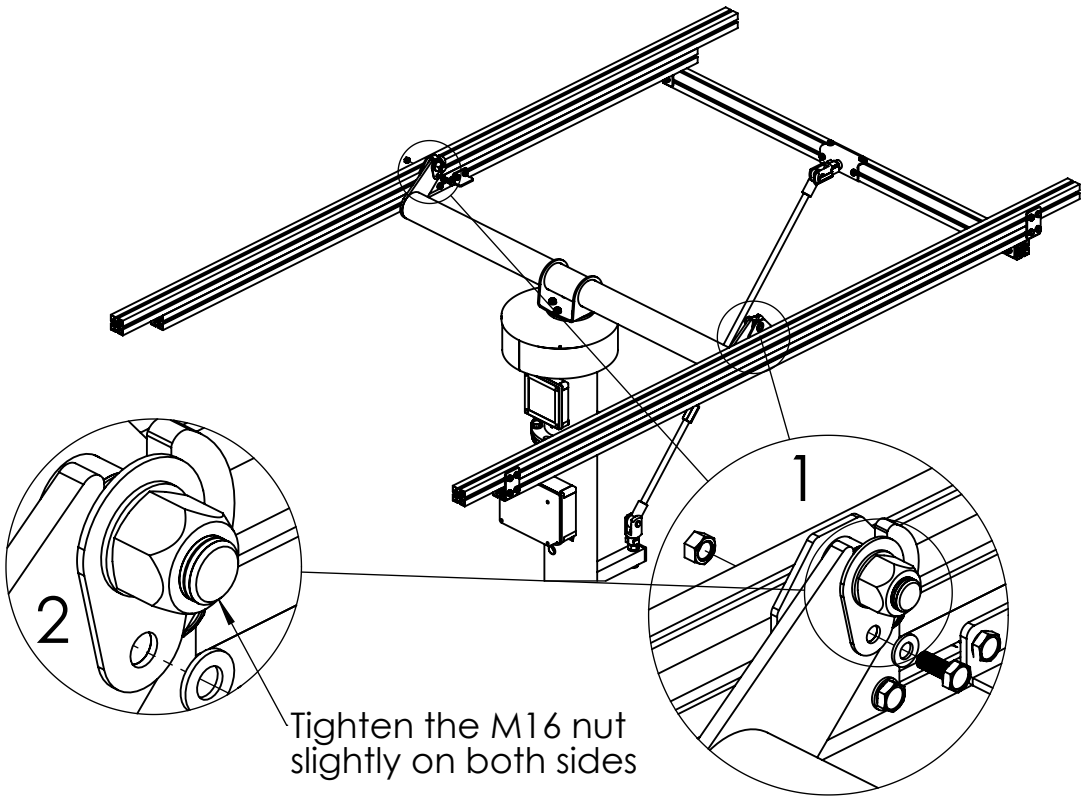
3.6

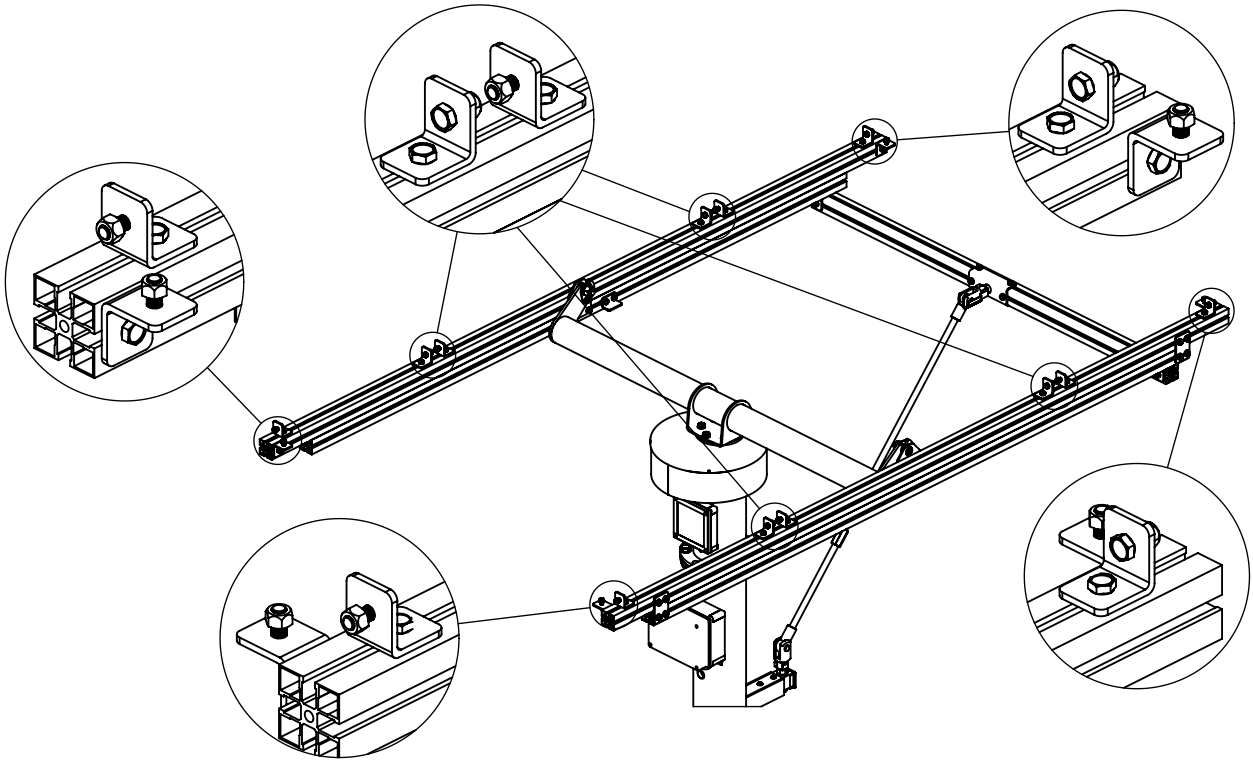



1x

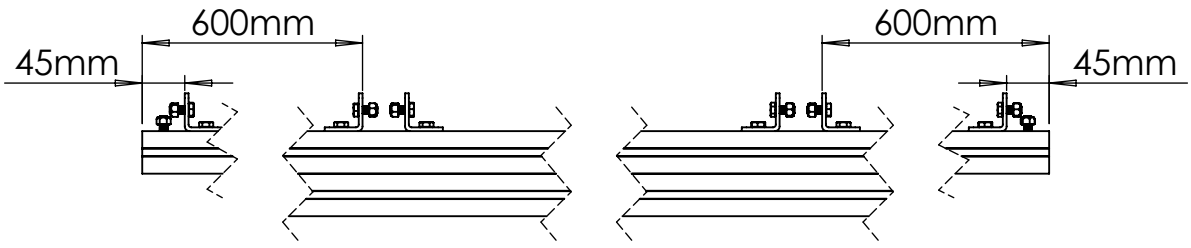
3.7


1
2
Tighten the M16 nut
slightly on both sides

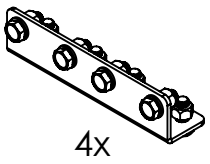
3.8

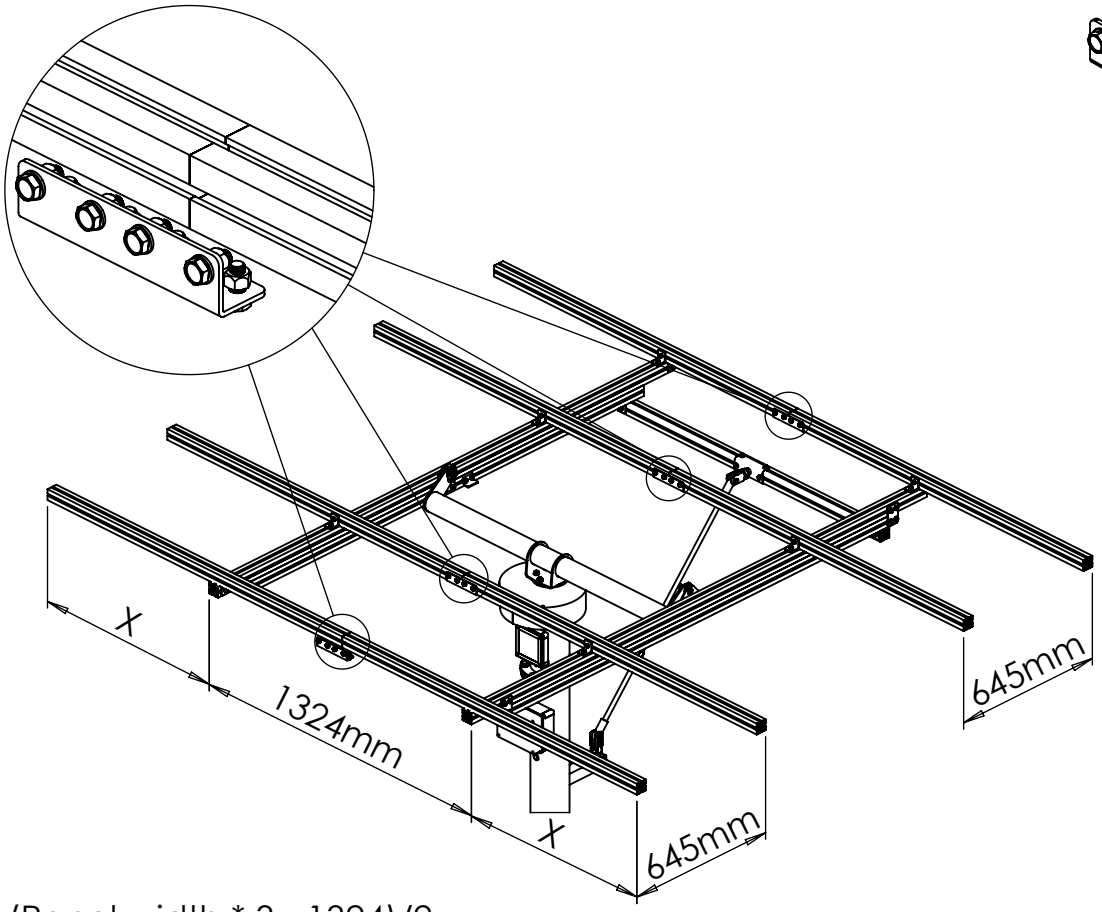


16x


600mm
45mm
600mm
45mm

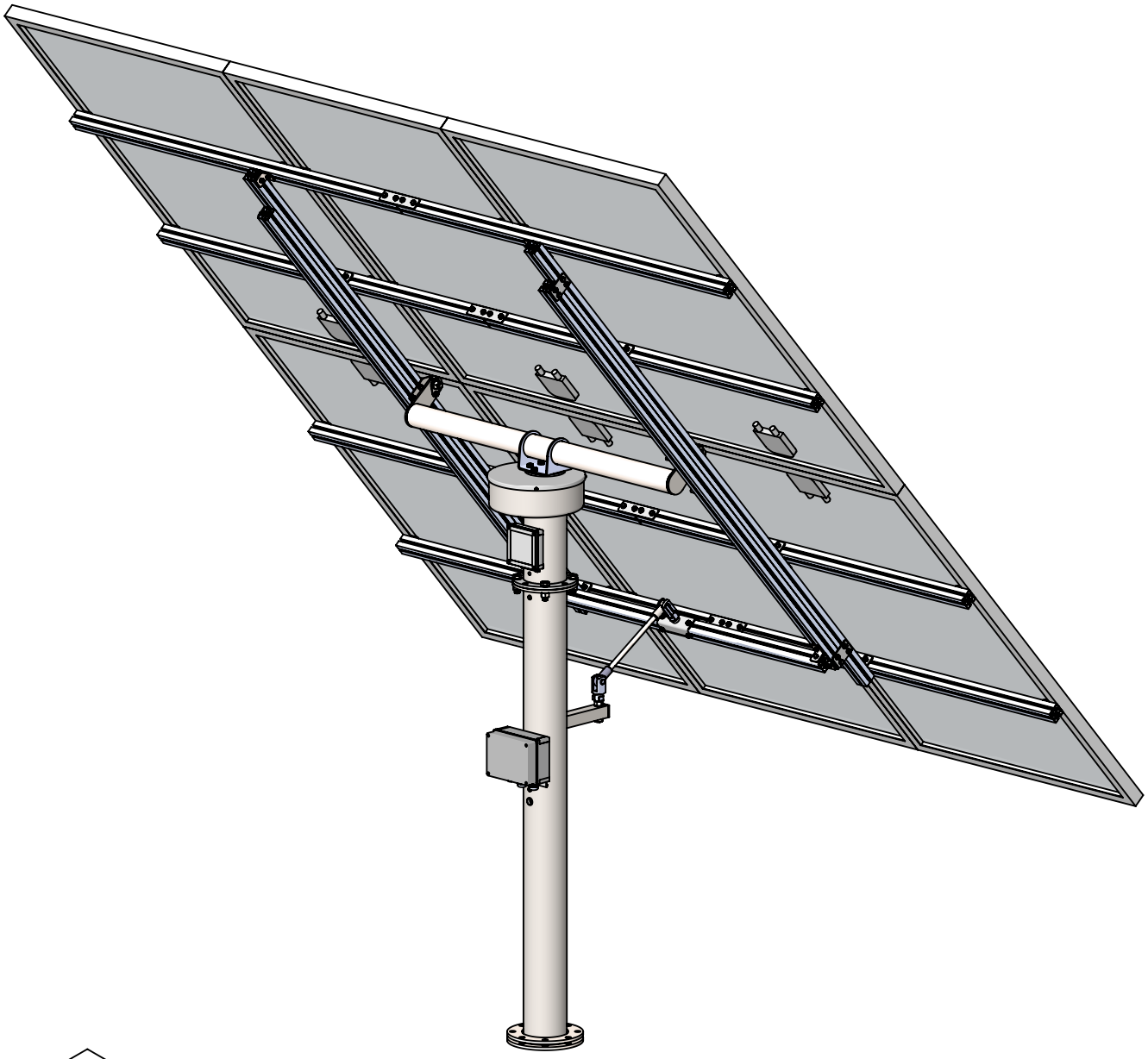
3.9

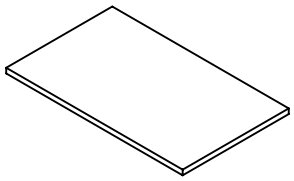




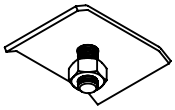
X = (Panel width * 3 - 1324)/2

PART 4 - PANELS



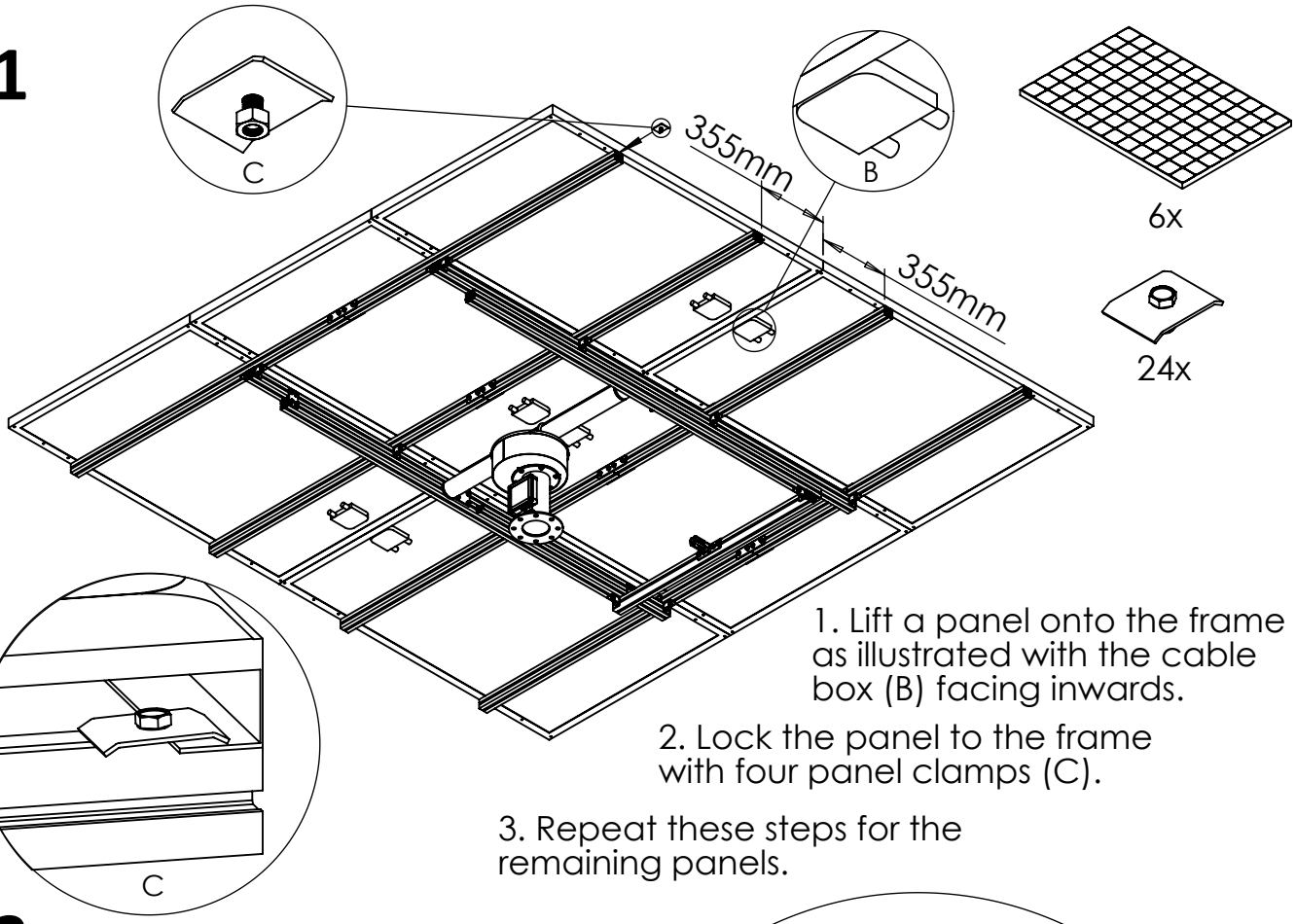


6x



24x

4.1

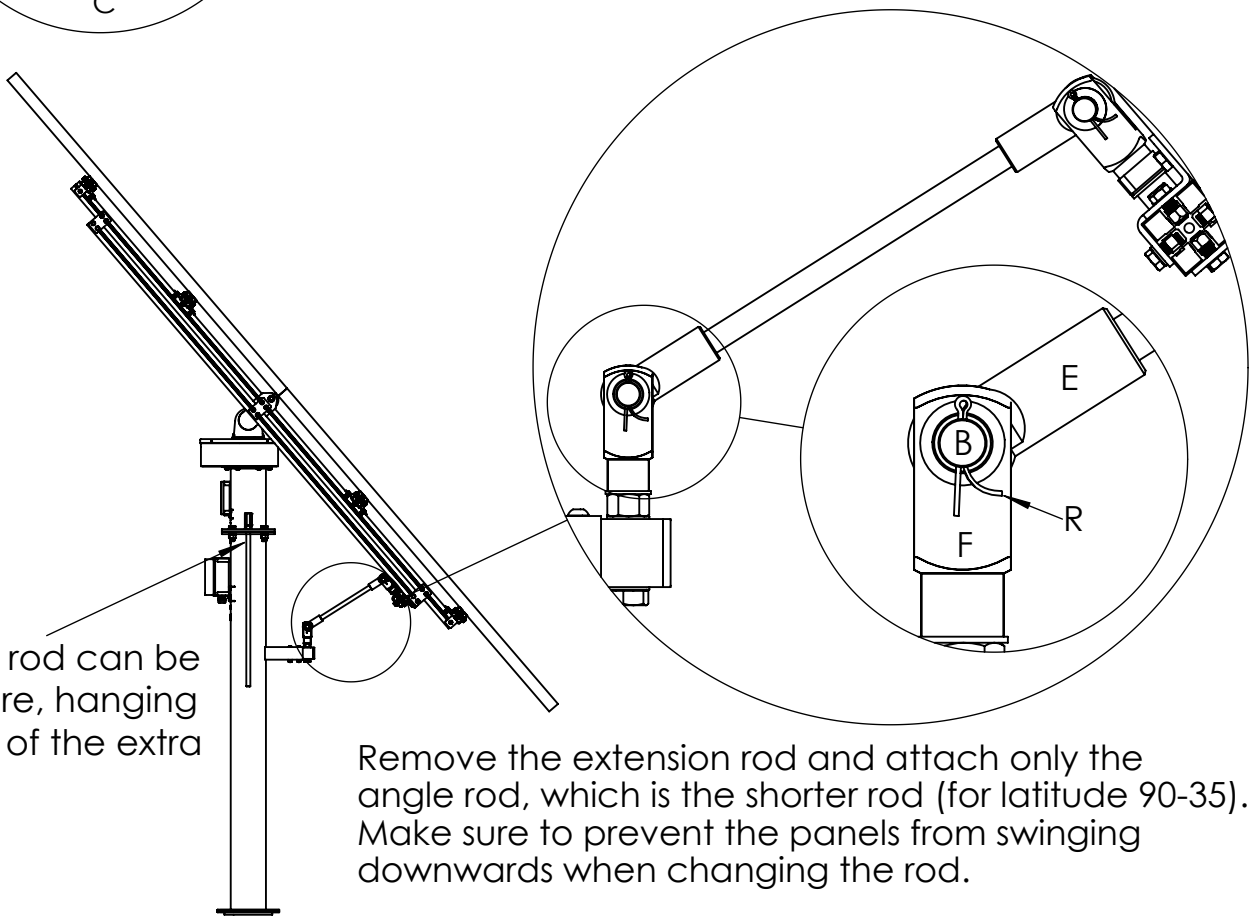


1. Lift a panel onto the frame as illustrated with the cable box (B) facing inwards.

2. Lock the panel to the frame with four panel clamps (C).

3. Repeat these steps for the remaining panels.

4.2



Extension rod can be stored here, hanging from one of the extra holes.

Remove the extension rod and attach only the angle rod, which is the shorter rod (for latitude 90-35). Make sure to prevent the panels from swinging downwards when changing the rod.

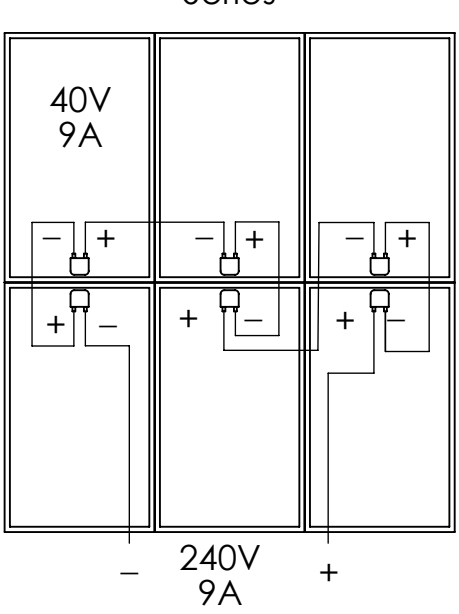
Leave both fork joints (F) and one of the clevis eye mating pieces (E) unscrewed half a turn to allow for full range of movement.

Make sure to bend both retaining pins (R) so that the fork joint bolts (B) are held in place.

4.3

Have the electrician connect the PV cables together according to application. Standard applications are shown below.

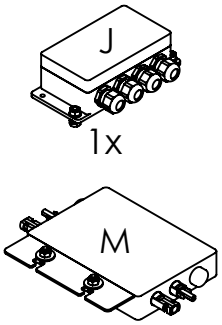
String inverter
Grid-tied string inverters generally supports a high voltage PV input. Therefore, all 6 panels are typically connected in series when using a string inverter.

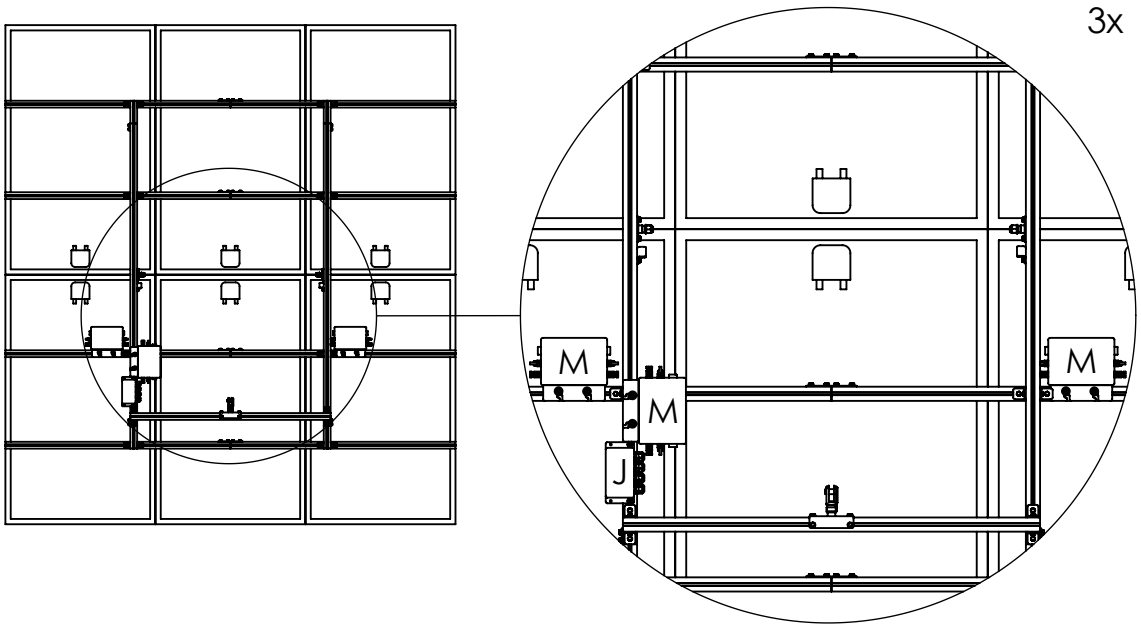


If solar PV optimisers are used, make sure to attach them to the panels in a way that does not cause an imbalance for the framework. It needs to be easy to tilt the framework in both directions.

The string inverter must not be mounted on the framework.

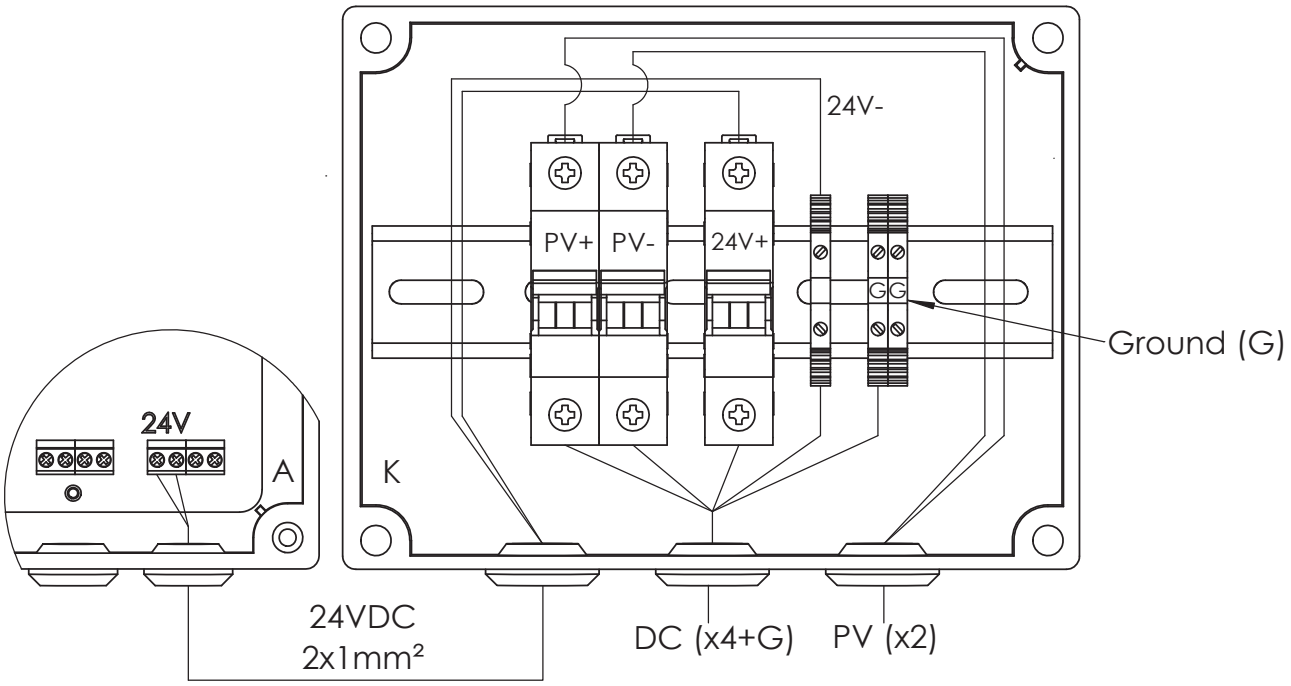
Microinverter
Grid-tied microinverters typically have 1, 2 or 4 PV inputs. Mount the microinverters (M) and a junction box (J) similar to the illustration below, so that they are easy to connect to the panels.

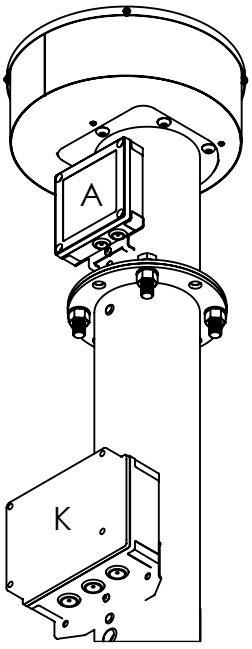




5. Connection to inverters

5.1 Grid-tied system with string inverter





If the string inverter and 24VDC transformer is placed away from the solar installation the junction box (K) can be wired as shown above.

If the string inverter is placed on the column of the solar installation the 24VDC transformer can be added to the outdoor junction box (K) along with AC breakers.

5.1 Grid-tied system with string inverter

1. Acquire an armoured DC cable long enough to reach from the junction box (K) on the column to the grid-tied solar inverter. The cable needs four wires (PV+, PV-, 24V+ & 24V-) plus a surrounding shield. Please consult your electrician for the exact cable to use according to local code requirements.

2. Wire the cable from the junction box (K) to the fuse box. A strong string can be used to pull the cable up through the bottom of the column and out of the hole beneath the junction box. It is recommended to pull underground sections through a cable duct. The duct needs to be burried so that the top of the duct is 35 cm below ground. If the cable runs over bedrock it needs to be protected by a strong hose (or a metal U-profile).

3. Make sure that all cable sections above ground are properly attached and protected so the cable cannot be accidentally moved or damaged. Sections coming out of the ground need to be protected by for example a metal U-profile.

4. Fill out and attach the included self adhesive warning labels. These labels need to be provided near the solar installation, the fuse box, and the utility meter, to indicate the presence of on-site generation and the placement of the AC switch.

Contact a certified electrician and have them inspect the installation and carry out the remaining tasks.

1. Make the electrical connections as illustrated on the previous page.

2. Connect the DC cable to a junction box near the inverter and from there connect PV+ and PV- to the inverter.

3. Mount the 24V transformer in the junction box and connect it to 24V+ and 24V- from the DC cable.

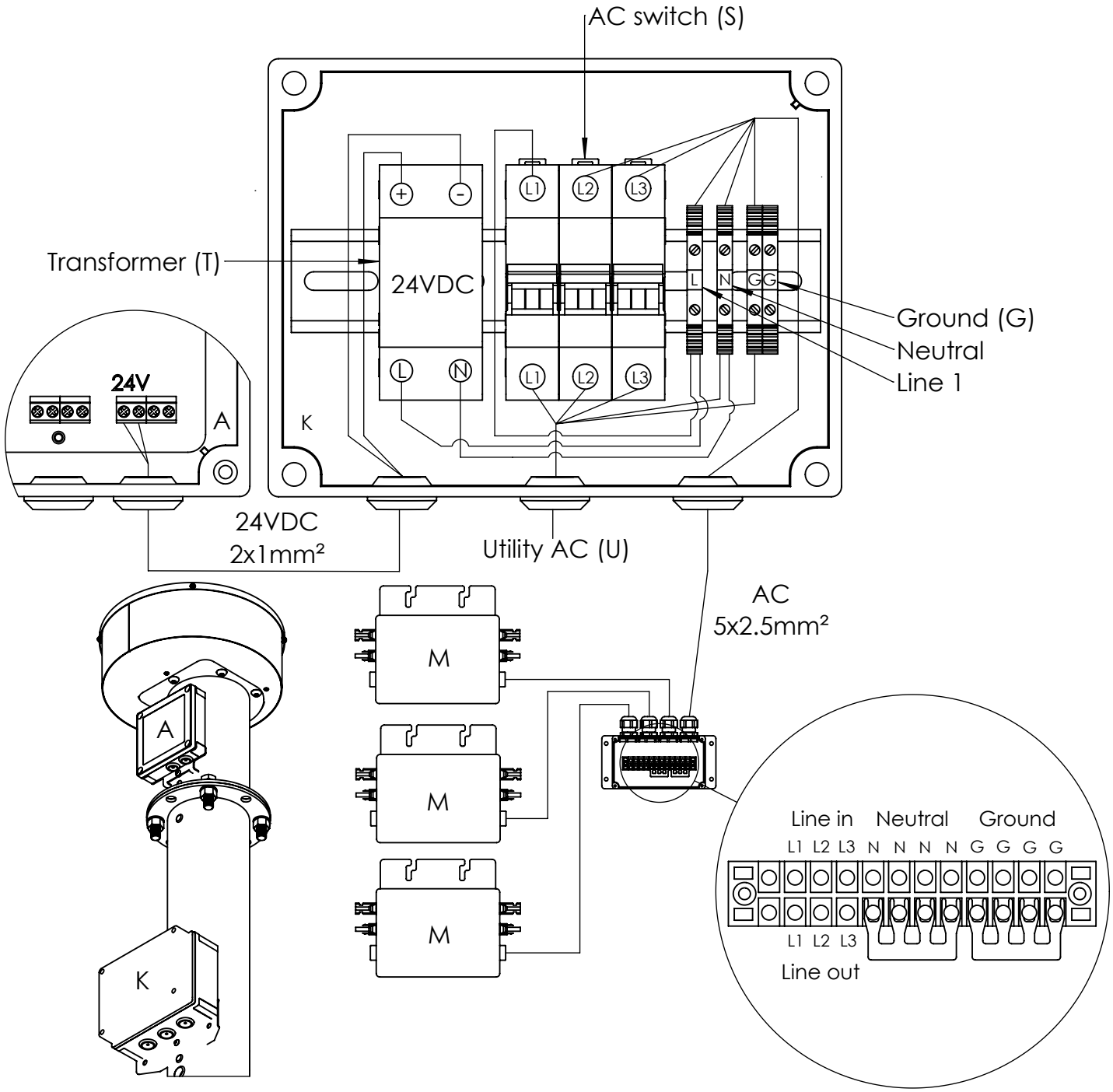
4. Connect the AC side of the transformer to AC through a breaker.

5. Turn on the AC breaker for the transformer and the corresponding DC breaker in the junction box on the column to turn on the solar tracker. It takes a few minutes for the tracker to find a GPS signal before it start to track the sun.

6. Make sure the inverter is properly installed. Turn on the AC switch for the inverter and the DC switch for the solar panels in the junction box on the column.

7. Check the inverter manual to make sure the correct status lights are lit on

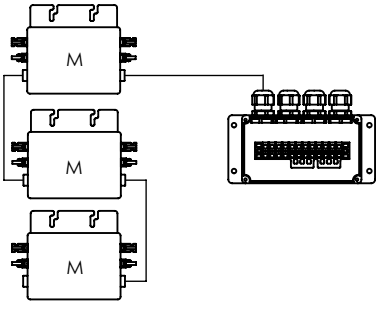
5.2 Grid-tied system with microinverters



The PV solar panels, microinverter (M) and utility AC (U) must be connected by a certified electrician. However, preparation work may be done by a layman as long as local code requirements are followed.

AC wires must be at least 1.5mm² thick and use an outdoor cable. Be mindful of the AC labels and wire colors: Neutral (N) is blue, Phase 1 (L1) brown, Phase 2 (L2) black, Phase 3 (L3) gray and ground (G) green-yellow.

If using a 1-phase system the electrical wiring can be simplified by connecting the microinverters together as illustrated here.



5.2 Grid-tied system with microinverters

1. Acquire an outdoor underground AC cable long enough to reach from the junction box (K) on the column to the nearest fuse box. A 1-phase system needs a cable with two wires plus a surrounding shield (1-phase cable), whereas a 3-phase system needs a cable with four wires plus the shield (3-phase cable). The thickness of the wires should be at least 2.5mm² for cable lengths up to 40 meter or 6mm² for cable runs up to 100 meter. Indoor cable sections can use an indoor cable of the same size and with the same number of conductors. Please consult your electrician for the exact cable to use according to local code requirements.

2. Wire the cable from the junction box (K) to the fuse box. A strong string can be used to pull the cable up through the bottom of the column and out of the hole beneath the junction box. It is recommended to pull underground sections through a cable duct. The duct needs to be burried so that the top of the duct is 35 cm below ground. If the cable runs over bedrock it needs to be protected by a strong hose (or a metal U-profile).

3. Make sure that all cable sections above ground are properly attached and protected so the cable cannot be accidentally moved or damaged. Sections coming out of the ground need to be protected by for example a metal U-profile.

4. Fill out and attach the included self adhesive warning labels. These labels need to be provided near the solar installation, the fuse box, and the utility meter, to indicate the presence of on-site generation and the placement of the AC switch (S).

Contact a certified electrician and have them inspect the installation and carry out the remaining tasks.

1. Make the electrical connections as illustrated on the previous page.

2. Connect the AC cable to the selected phase(s) through fuse(s) in the fuse box.

3. Connect the solar panels to the PV input terminals of the microinverters.

4. Turn on the AC switch (S) in the junction box to power the inverter(s) and solar tracker. It takes a few minutes for the tracker to find a GPS signal before it start to track the sun.

5. Check the status lights on the inverter(s). When a solar panel is connected its LED becomes red. When the AC side is connected and powered the LED starts blinking red. Grid feed-in starts after about 30 seconds during sunshine indicated by the LED either blinking green (optimizing output) or being continously green (output optimized).