

Solarmotion superstate

Superstate Solarmotion solar tracker installation manual



superstate

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INTRODUCTION

Thank you for purchasing this solar tracking system by Superstate we will wholeheartedly provide first-class products and services to you.

This manual provides important information about constructing the necessary concrete foundation, and the assembly of the tracking mechanism. Be sure to retain this manual for future reference. Read it carefully & thoroughly **before** starting the installation. We accept no responsibility for your failing to follow these instructions. Use proper tools and follow good safe work practices to avoid injury during assembly.



Superstate Solar Tracker installed at Eneby Farm in Stallarholmen, Sweden

GENERAL TECHNICAL SPECIFICATIONS

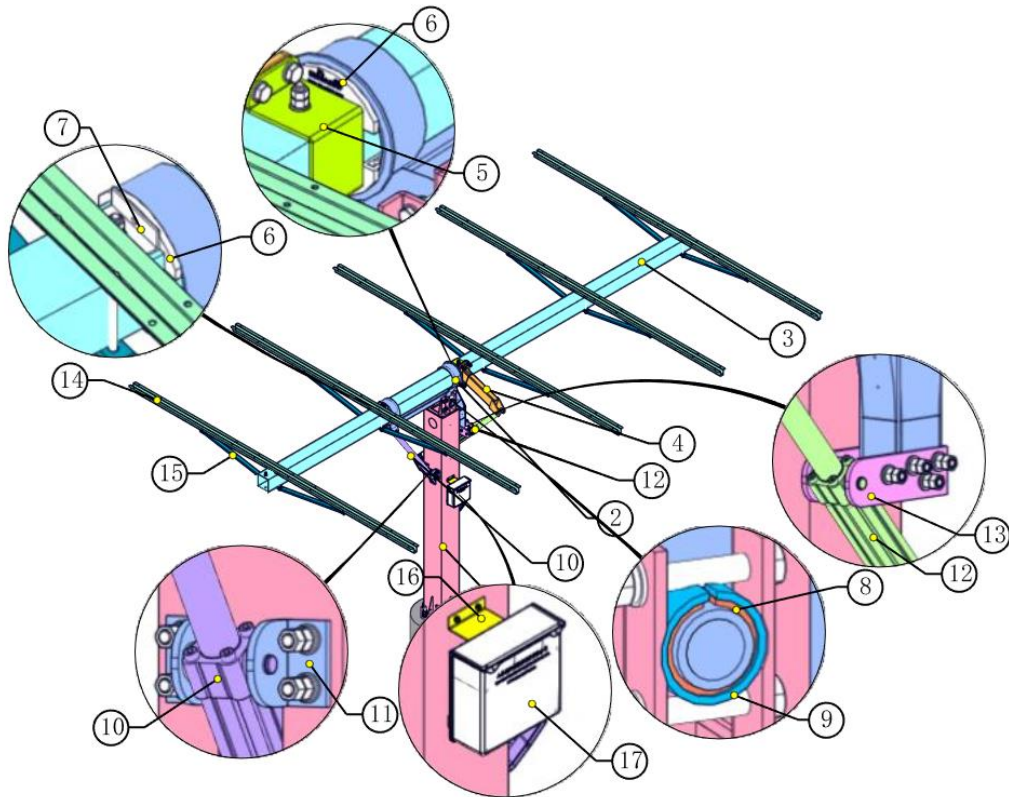
Item	Data
Control mode	Time + GPS
Average tracking accuracy	0.1 - 2.0 degrees (adjustable)
Gear motor	24V/1.5A
Output torque	5,000 N x M
Tracking power consumption	< 0.01 kWh/day
Azimuth angle tracking range	100 degrees
Elevation angle tracking range	50 degrees
Max. wind resistance in safety mode	> 40m/s
Max. wind resistance in working mode	> 24m/s
Material	Hot-dipped galvanized steel > 65µm
Working temperature	-40C - +75C
Certifications	CE, TUV



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Part I. Superstate Solar Tracking system structure chart



System structure chart

Main parts of Superstate Solar Tracking system

Item	Description	Weight (kg)	Total Weight	Dimensions (mm)	Quantity
1	Vertical pole	52.0	52.0	2400*200*200*2.5	1
2	L-shaped bracket	15.7	15.7	770*194*5	1
3	Center beam	39.9	39.9	120*120*4700*2.2	1
4	Swing arm	5.6	5.6	380*100*50*3.5	1
5	Swing arm fixing plate	2.2	2.2	212*110*120	1
6	Plastic bearing	0.2	0.8	φ120	4
7	Plastic bearing limit	0.25	0.5	36*50 angle steel	2
8	Plastic shaft sleeve	0.1	0.2	φ60*45	2
9	Steel shaft sleeve	0.4	0.8	70*5	2
10	Elevation linear actuator	8.0	8.0	L=940mm	1
11	Elevation linear actuator seat	0.45	0.9		2
12	Azimuth linear actuator	8.5	8.5	L=985mm	1
13	Azimuth linear actuator seat	0.9	1.8		2
14	Supporting beam	11.283	56.415	70*30*80*1.8*3750	5
15	Inclined strut	2.15	10.75	34*16*1.8*2200	5
16	Control unit seat	0.7	0.7		1
17	Control unit	1.0	1.0		1
Total			191.9		31

Part II. Connecting Screws and Clamps Details

Item	Specification	Quantity
S0	M22 double nuts, flat washer, spring washer	8 sets
S1	M14*160 bolt, double nuts, 2 flat washers, spring washer	2 sets
S2	M16*120 bolt, double nuts, 2 flat washers, spring washer	4 sets
S3	M16*60 bolt, double nuts, 2 flat washers, spring washer	4 sets
S4	M14*55 bolt, double nuts, 2 flat washers, spring washer, 2 plastic washers	4 sets
S5	M14*120 bolt, double nuts, flat washer, spring washer, 2 plastic washers	4 sets
S6	φ16*125 axis pin, flat washer, split pin, small plastic pipe	1 set
S7	φ16*80 axis pin, flat washer, split pin	1 set
S8	M12*160 bolt, double nuts, 2 flat washers, spring washer, middle clamp, rectangular plate	10 sets
S9	M12*30 bolt, nut, 2 flat washer, spring washer	11 sets
S10	M8*25 bolt, double nuts, 2 flat washers, spring washer	64 sets
S11	M5*19 self-tapping screw	8 sets

For 'double nuts', please fasten the first nut, then fasten the second nut.

Part III. Tools Required for Installation (Prepared by users)

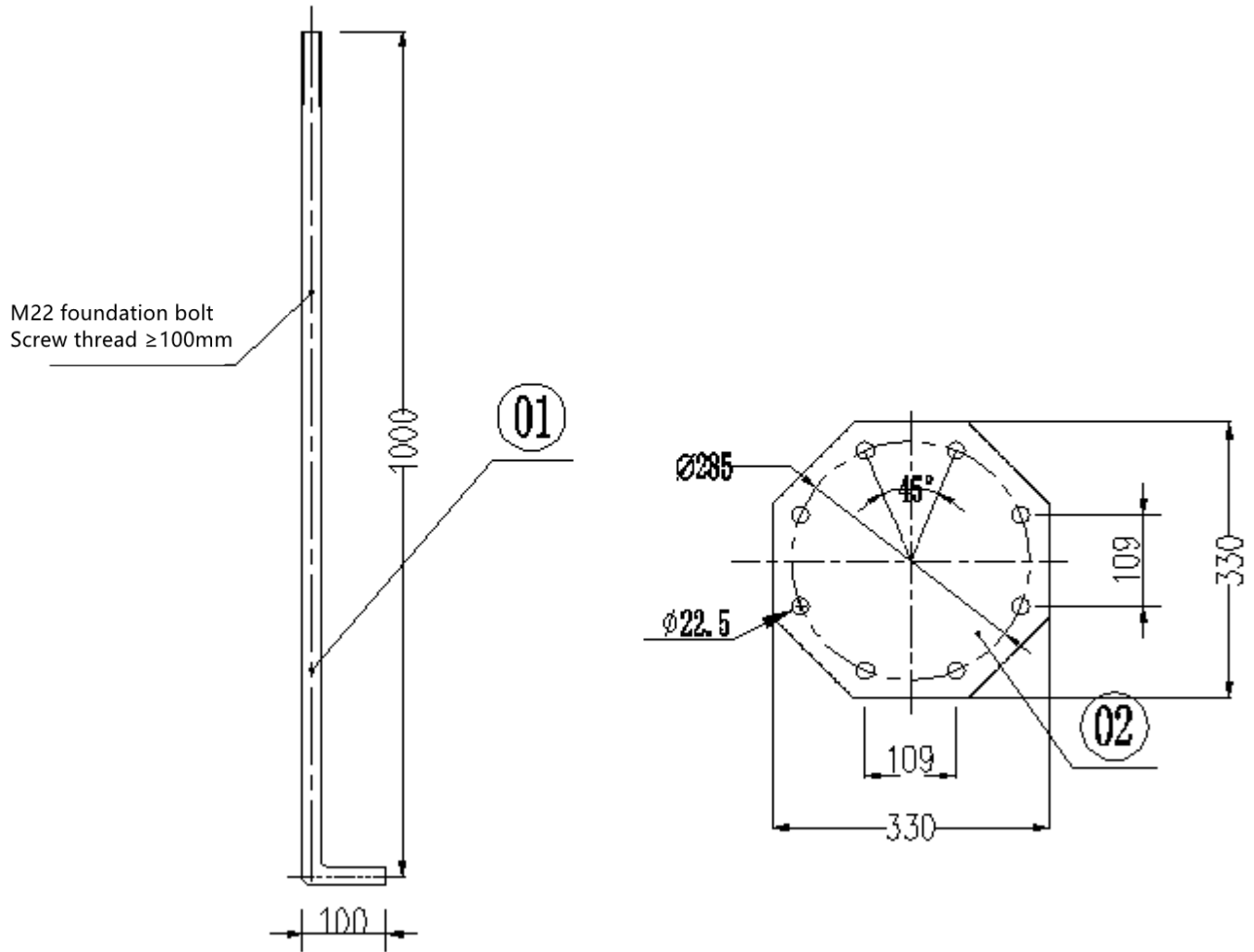
No.	Tools	Spec.	Quantity	Remarks
1	Open spanner	13/14	2	M8 screws
2	Open spanner	17/19	2	M12 screws
3	Open spanner	20/22	2	M14 screws
4	Open spanner	22/24	2	M16 screws
5	Open spanner	32/34	1	M22 screws
6	Adjustable spanner	10 Inch	2	Crescent adjustable wrench
7	Screwdriver	3#	1	Electric debugging (flat head or cruciform)
8	Rubber Hammer		1	Facilitate the installation
9	Double ladder or Scaffolding		2	or use small crane

Part IV. Concrete Foundation

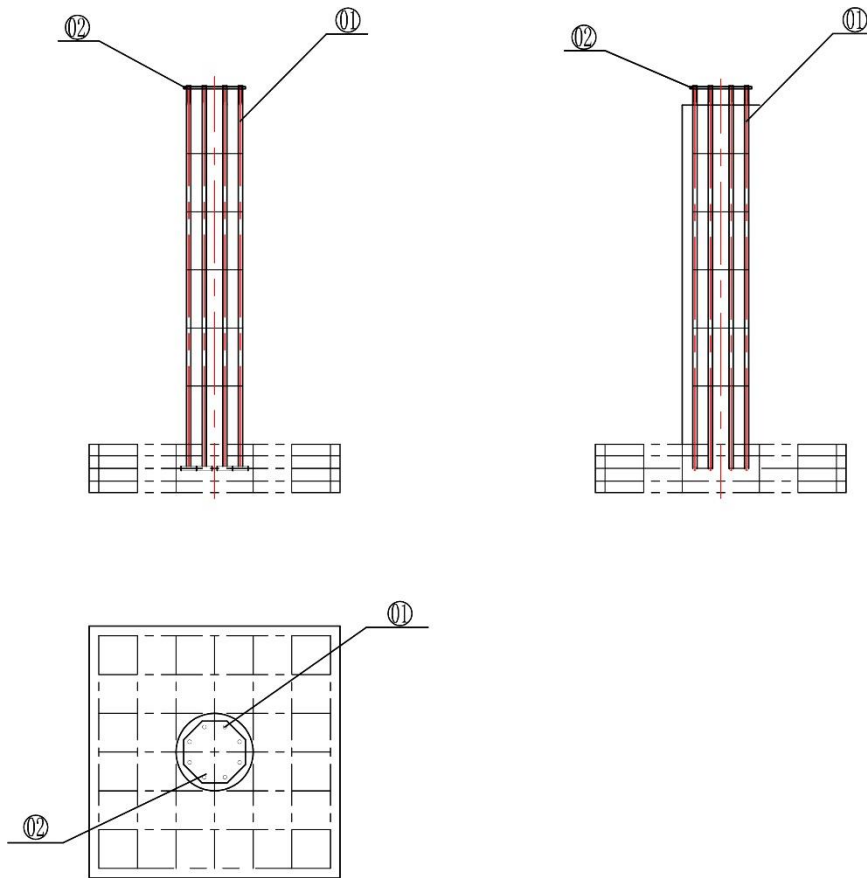
Materials Preparation

Marks	Description	Material	Quantity
01	Threaded rods and foundation bolt	M22	8
02	Fixture template	---	1
03	Foundation (above ground)	C30 concrete	---
04	Foundation (below ground)	C30 concrete	---

1. Make 8 foundation bolts 01, one foundation bolt fixture template 02 (using rigid material, only for positioning bolts, thickness is not important).

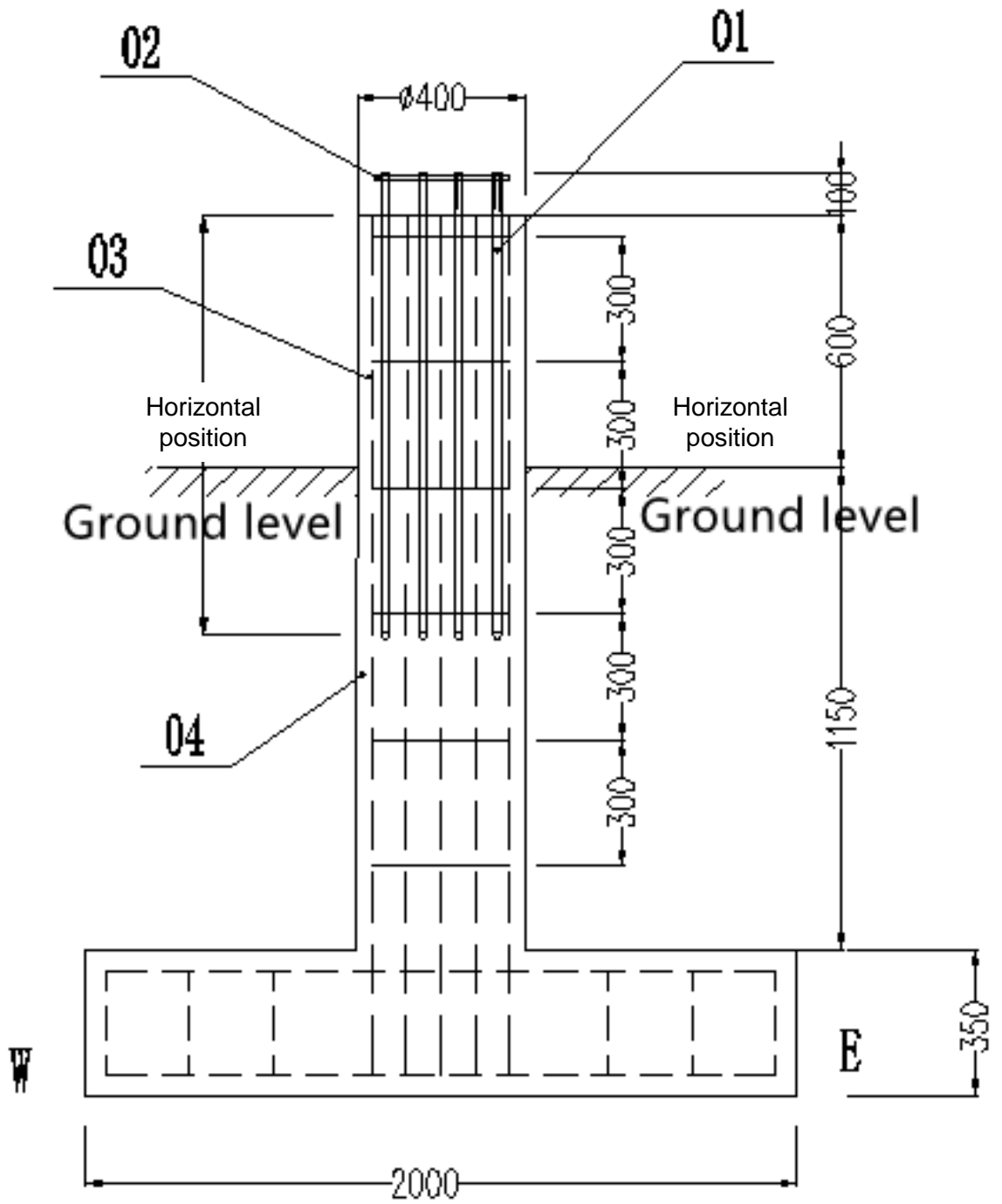


2. Position 8 foundation bolts 01 with the fabricated fixture template 02, secure the bolts to foundation threaded rods (using $\text{Ø}8$ threaded rods).

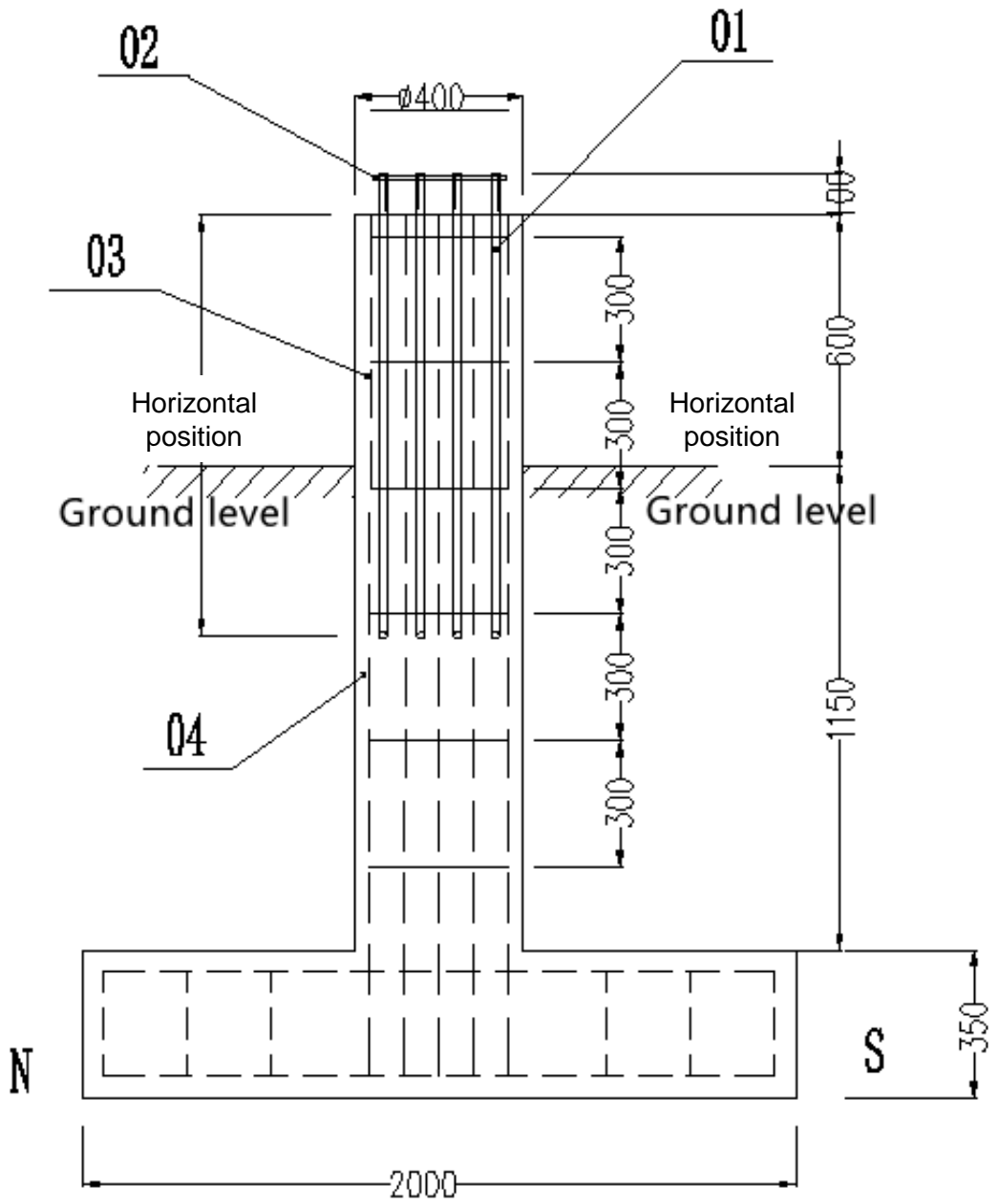


3. Confirm the east-west direction carefully, pour concrete foundation according to the dimensions shown in the following drawings, remove the fixture template 02 after the concrete is cured. The solar tracking system installation can be carried out only AFTER the concrete is thoroughly cured.

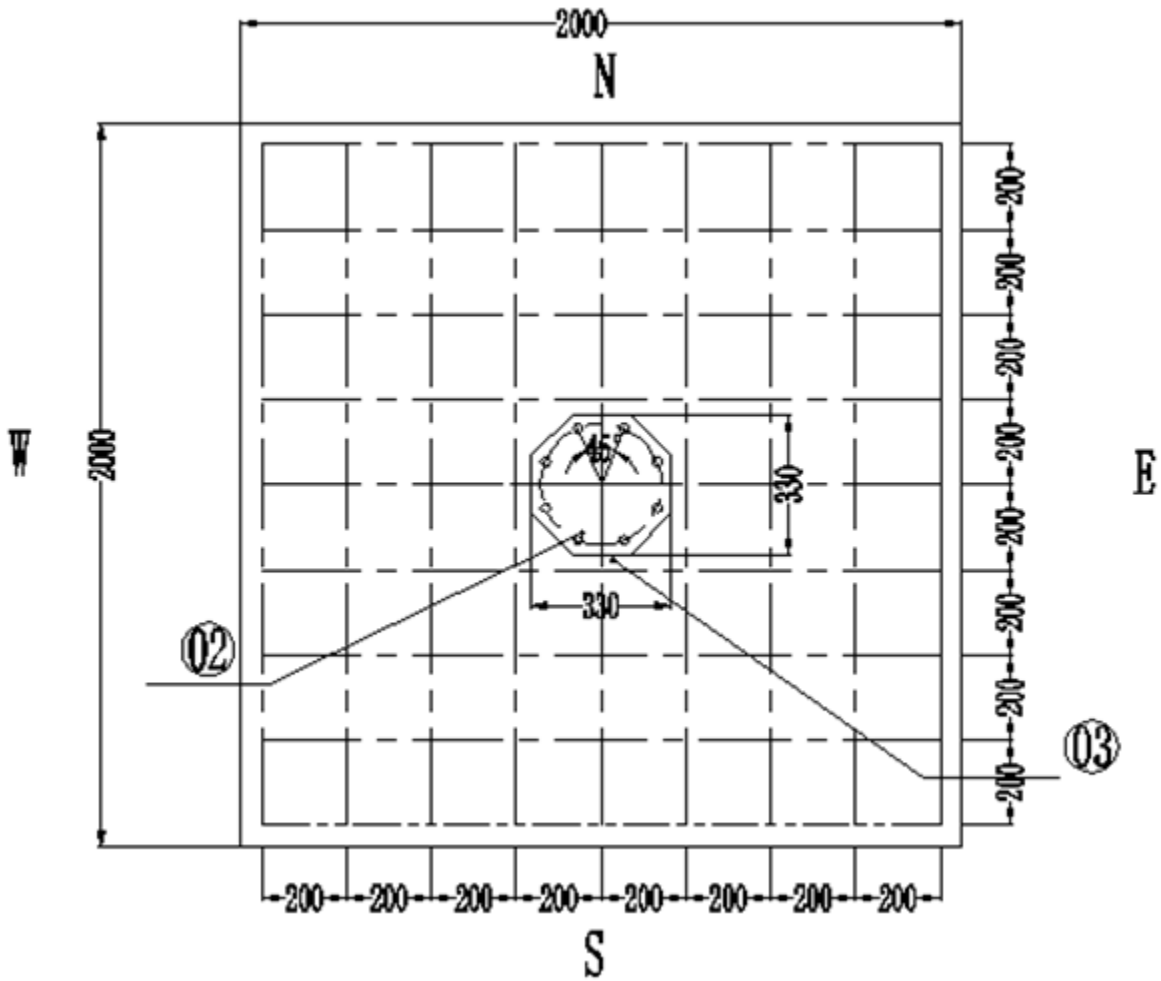
(Covering the poured concrete with a plastic sheet will make it stronger, because it will dry out slower from sun exposure.)



Foundation as viewed from the South



Foundation as viewed from the West



Foundation as viewed from Above

Note: Foundation above the ground should be more than 600 mm, exposed foundation bolts 01 thread at least 100 mm. In order to ensure the verticality of the tracking system pole, the top face of the foundation shall be leveling with the spirit level. The dimension and depth of the concrete foundation is just a guide, please design it for your local soil conditions and maximum wind speeds.

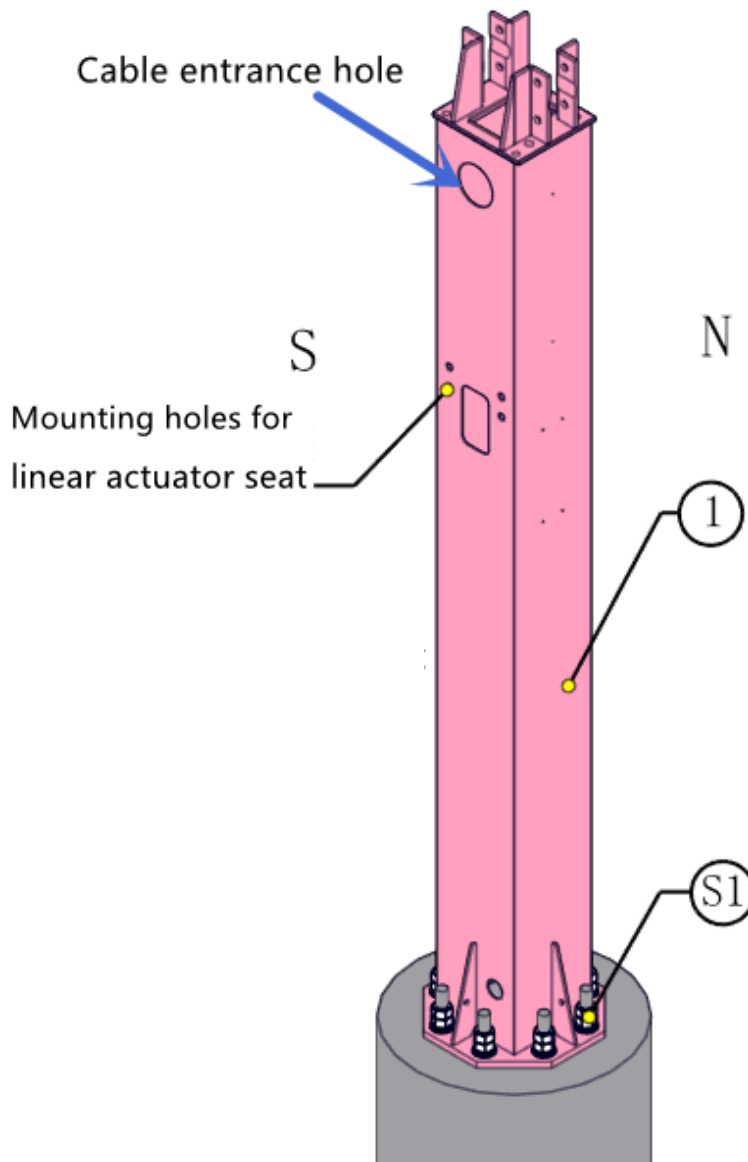
Φ40mm conduit for electrical wires can be planned into the concrete foundation, used for threading PV lines, controller power lines, etc.

Part V. Installation of Superstate Solar Tracking system

5.1 Installation of Vertical Pole

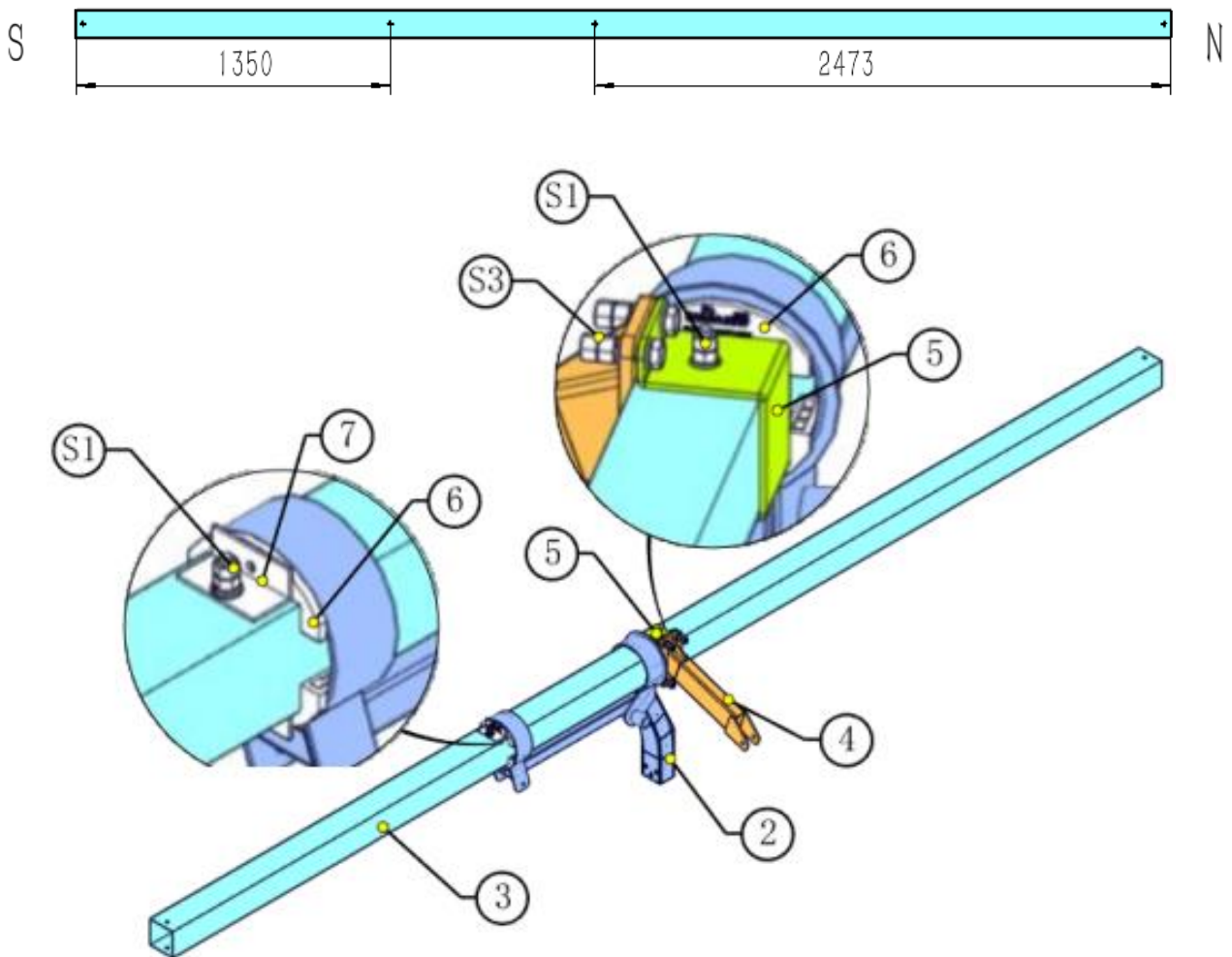
Put the vertical pole 1 on the concrete foundation, verify the orientation of the vertical pole 1 to ensure the side with linear actuator seat is facing South, then put on flat and spring washers, secure with hardware S0 (double nuts) to stabilize the vertical pole 1.

South means the direction of the geographical longitude lines, it can be confirmed with gyroscope or compass (need to amend the geomagnetic declination, different sites, difference geomagnetic declination).



5.2 Assembly of L-shaped bracket & Center beam

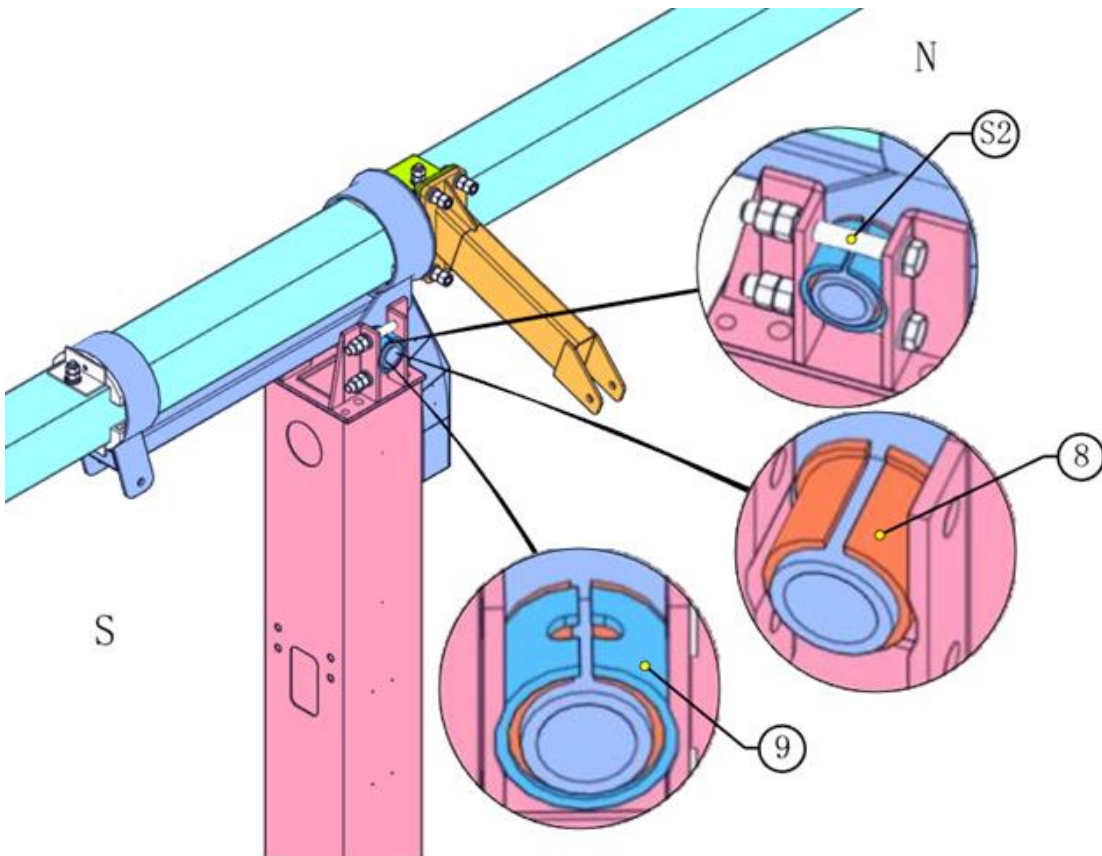
Put the center beam 3 into the L-shaped bracket 2, please pay attention to the direction of the center beam. Then put two plastic bearings 6 into the north hoop of the L-shaped bracket (insert the plastic bearings from the north side), then fix the swing arm fixing plate 5 onto the center beam with hardware S1, then fix the swing arm 4 onto swing arm fixing plate 5 with hardware S3 and put two plastic bearing 6 into the south hoop of the L-shaped bracket (insert the plastic bearing from the south side). Then use hardware S1 to fix the plastic bearing limit 7 on the center beam. Installer may need to knock the plastic bearing into the hoop with hammer, this is for reducing shaking space.



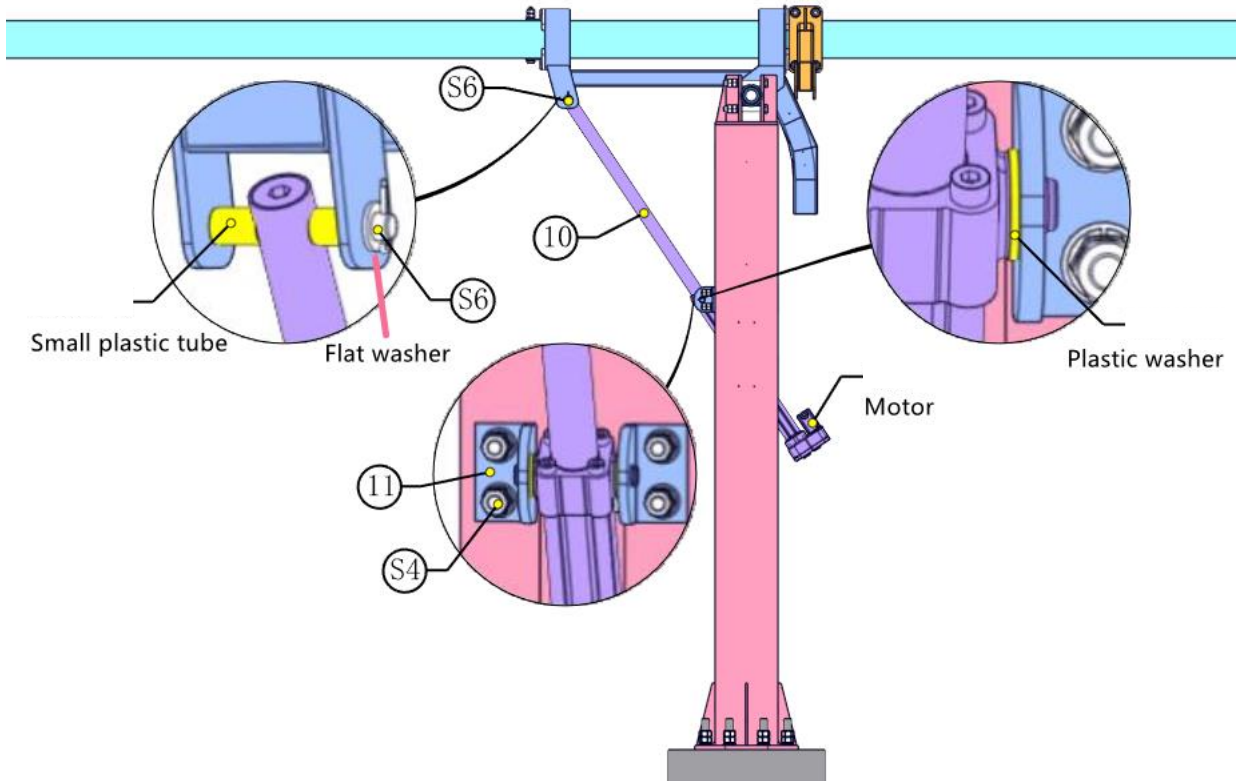
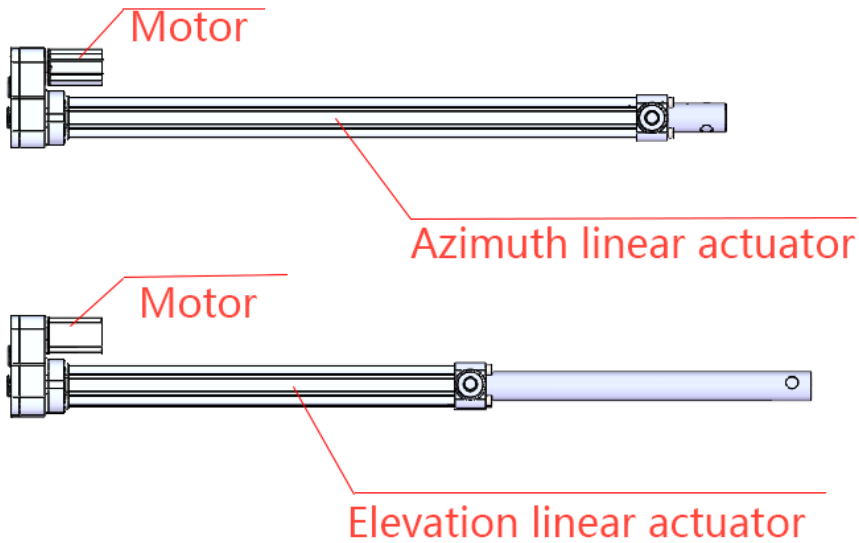
5.3 Installation of L-shaped bracket & Elevation linear actuator

Install two lower screws of hardware S2 onto the top of vertical pole 1, do not fasten it for the time being. Put the plastic shaft sleeve 8 into the steel shaft sleeve 9, both openings are in same direction. Then affix the L-shaped bracket 2 onto the vertical pole 1, put the plastic shaft sleeve and steel shaft sleeve onto the shaft of L-shaped bracket, the opening faces upwards, please pay attention to the direction of plastic shaft sleeve, then install the other two upper screws of hardware S2, tighten the four screws of hardware S2.

Note: Please pay attention to the direction of the L-shaped bracket 2!

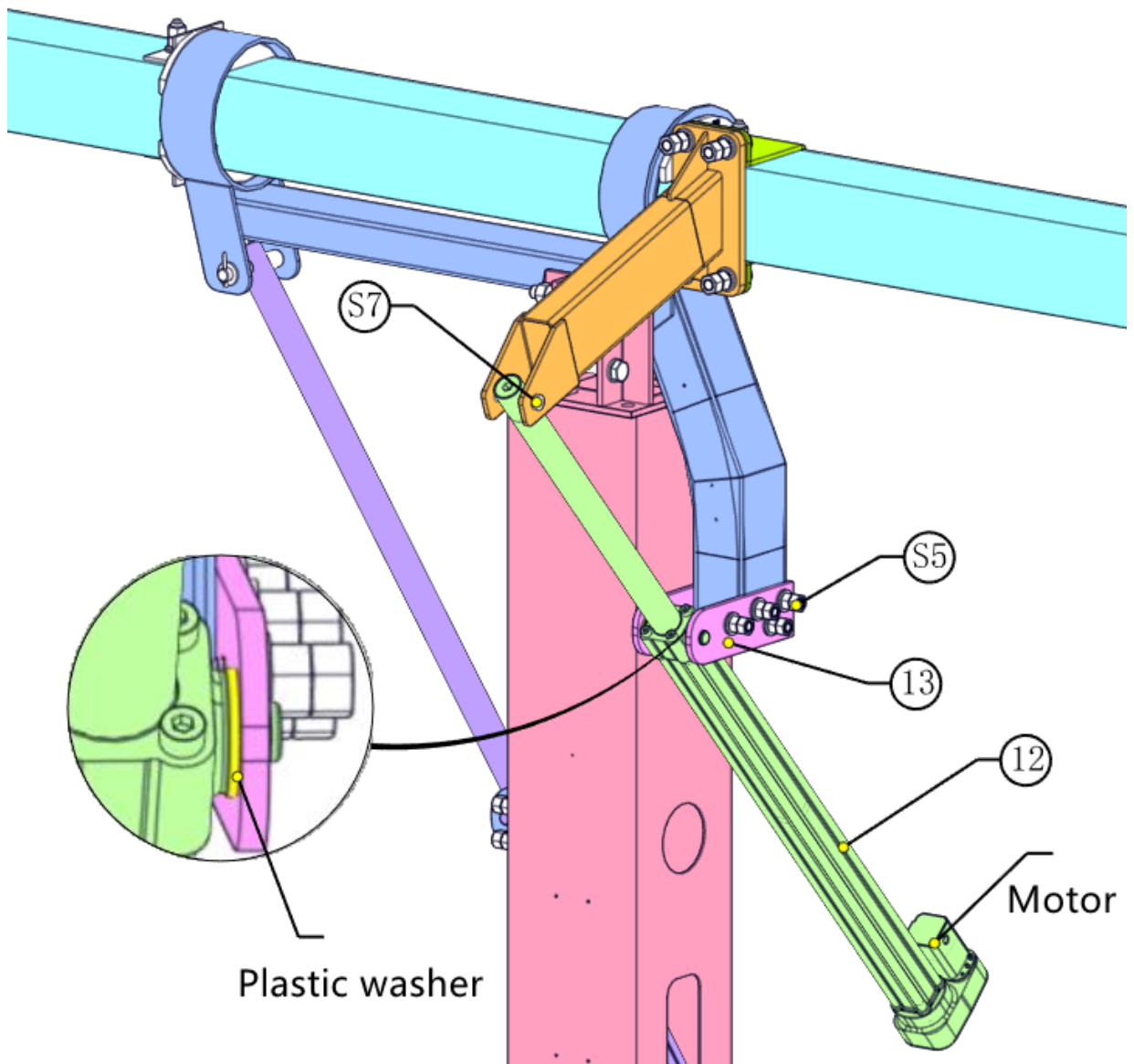


Fix elevation linear actuator 5 with vertical pole 1 with hardware S4 and elevation linear actuator seat 11. The motor is on top. Put the plastic washers of hardware S4 between the elevation linear actuator seat and elevation linear actuator. Fix elevation linear actuator 5 with L-shaped bracket with hardware S6, split the split pin. There are two kinds of linear actuators for each unit, do not mixture them up when installing.



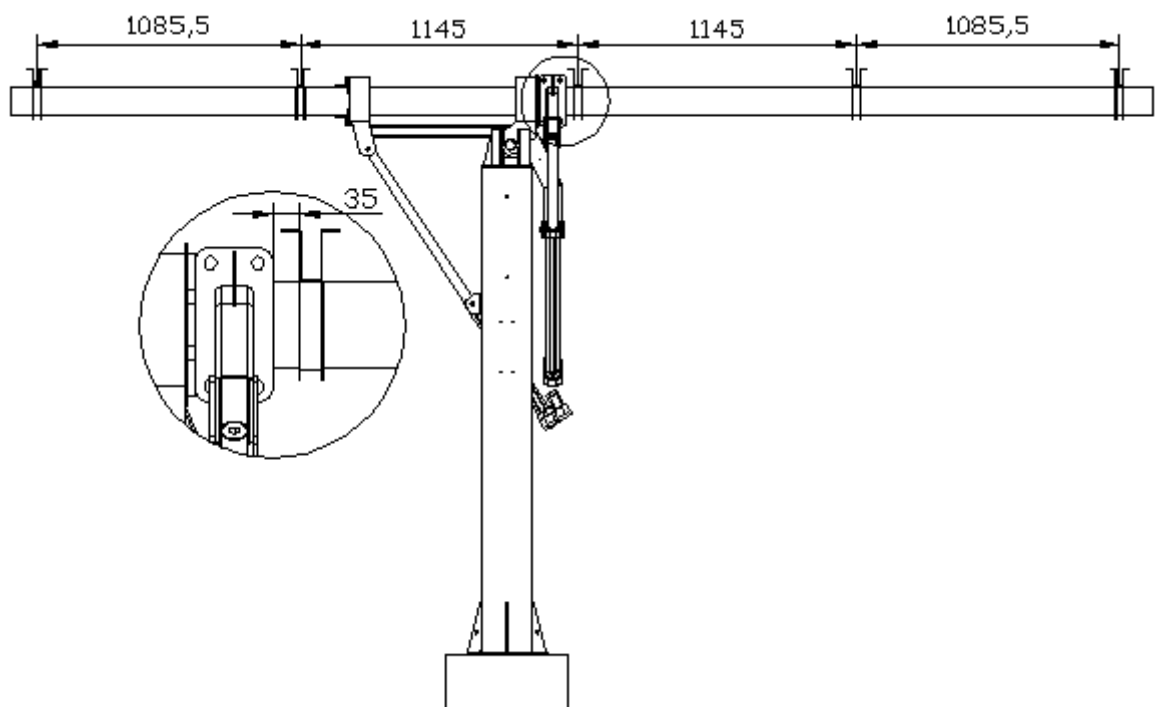
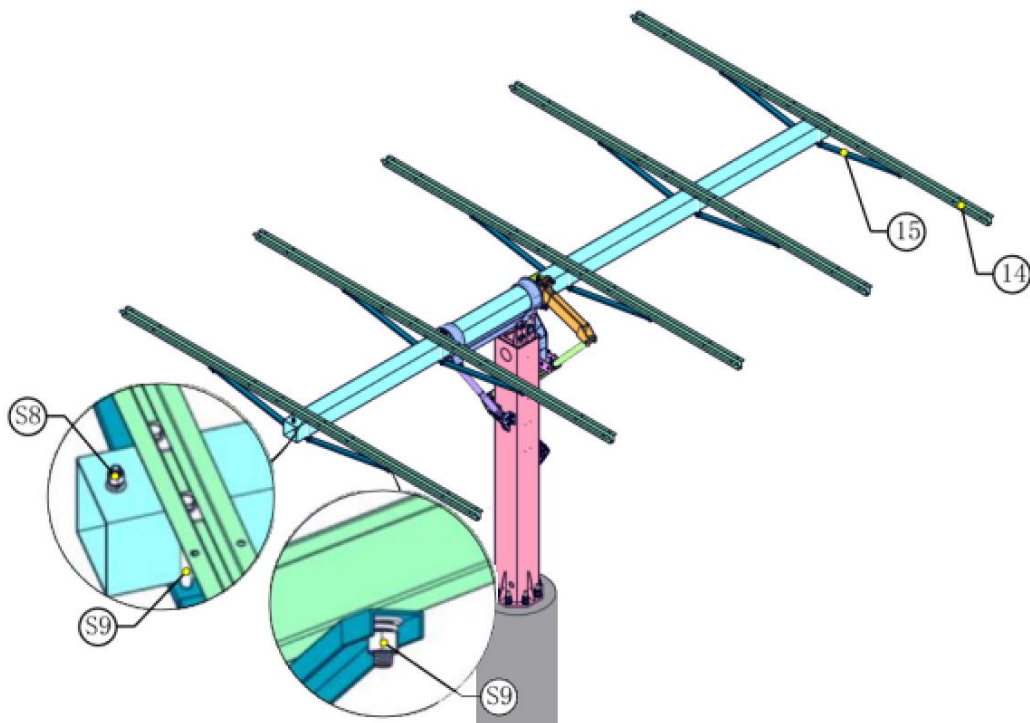
5.4 Installation of the Azimuth Linear Actuator

Fix the azimuth linear actuator 12 to L-shaped bracket 2 with azimuth linear actuator seat 13 and hardware S5. The motor is on top. The nuts of hardware S5 should be on the north side. Put the plastic washers of hardware S5 between the azimuth linear actuator seat and azimuth linear actuator. Fix azimuth linear actuator 12 to swing arm with hardware S7, the split pin of hardware S7 should at the south side of swing arm, split the split pin. Adjust the position of swing arm and swing arm fixing plate slightly, make the linear actuator at the center position of swing arm.



5.5 Installation of U-shaped Beam & Inclined strut

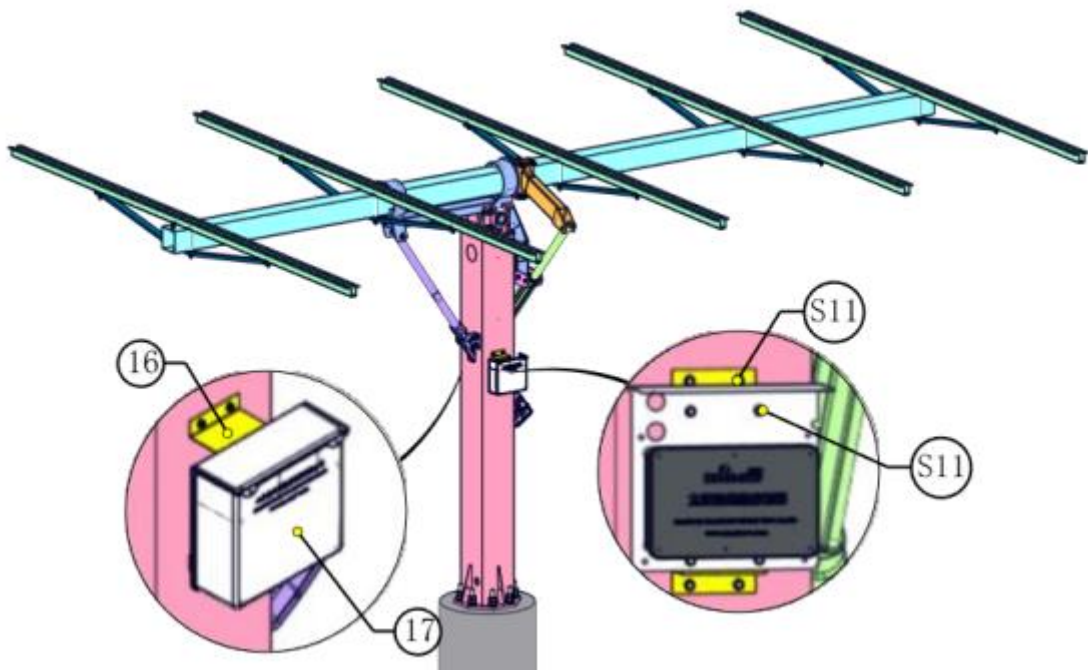
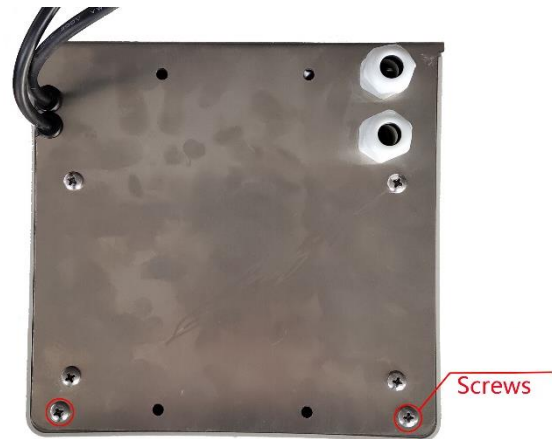
Fix the first supporting beams 14 and Inclined strut 15 at the north side of L-shaped bracket with hardware S8&S9, the rectangular plate of hardware S8 shall be inside the supporting beams, leave 35mm space between the supporting beam and plastic bearing limit (as shown in the drawing). Then install other supporting beams and Inclined strut as distance in following drawing. Then install a M12*30 bolt of hardware S9 at the south end of center beam for anti-slip purpose.



5.6 Installation of the Control Unit

Fix the control unit seat 16 on the east side of vertical pole with hardware S11, there are small holes on vertical for fixing control unit seat. Then open the plastic cover of control unit 17, fix the control unit 17 on the control unit seat with hardware S11. Fix the cover of control unit after the installation and wiring works.

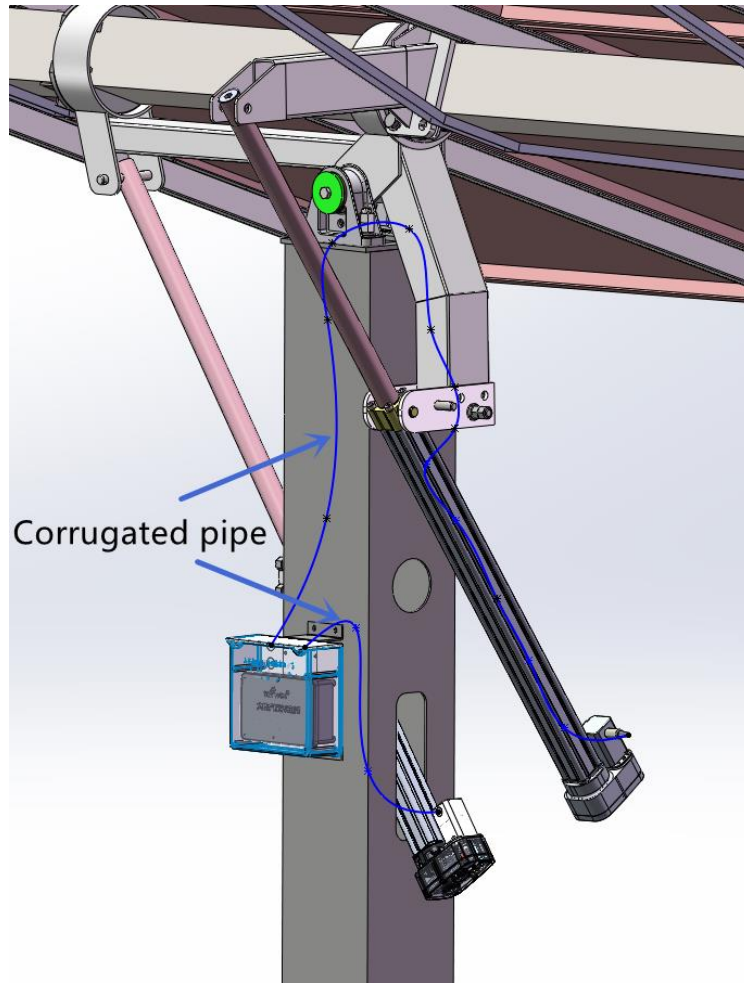
Installers can open the cover of the control unit by unscrew the four fixing screws in following drawings.



5.7 Connect Control Unit Circuit Using A/C power supply

Connect azimuth motor cable (the long one) with the motor on azimuth linear actuator, connect elevation motor cable (the short one) with the motor on elevation linear actuator. Run A/C power from the back of the driving system and connect the two wires to the power connector. Use corrugated pipe and pipe clamp to fix the azimuth motor cable onto the vertical pole and L-shaped bracket, there are reserved small fixing holes on vertical pole and L-shaped bracket.





Corrugated pipe

Installers can connect the wind sensor (if equipped) to the connector of host control unit with wind sensor wire for wind protection purposes.



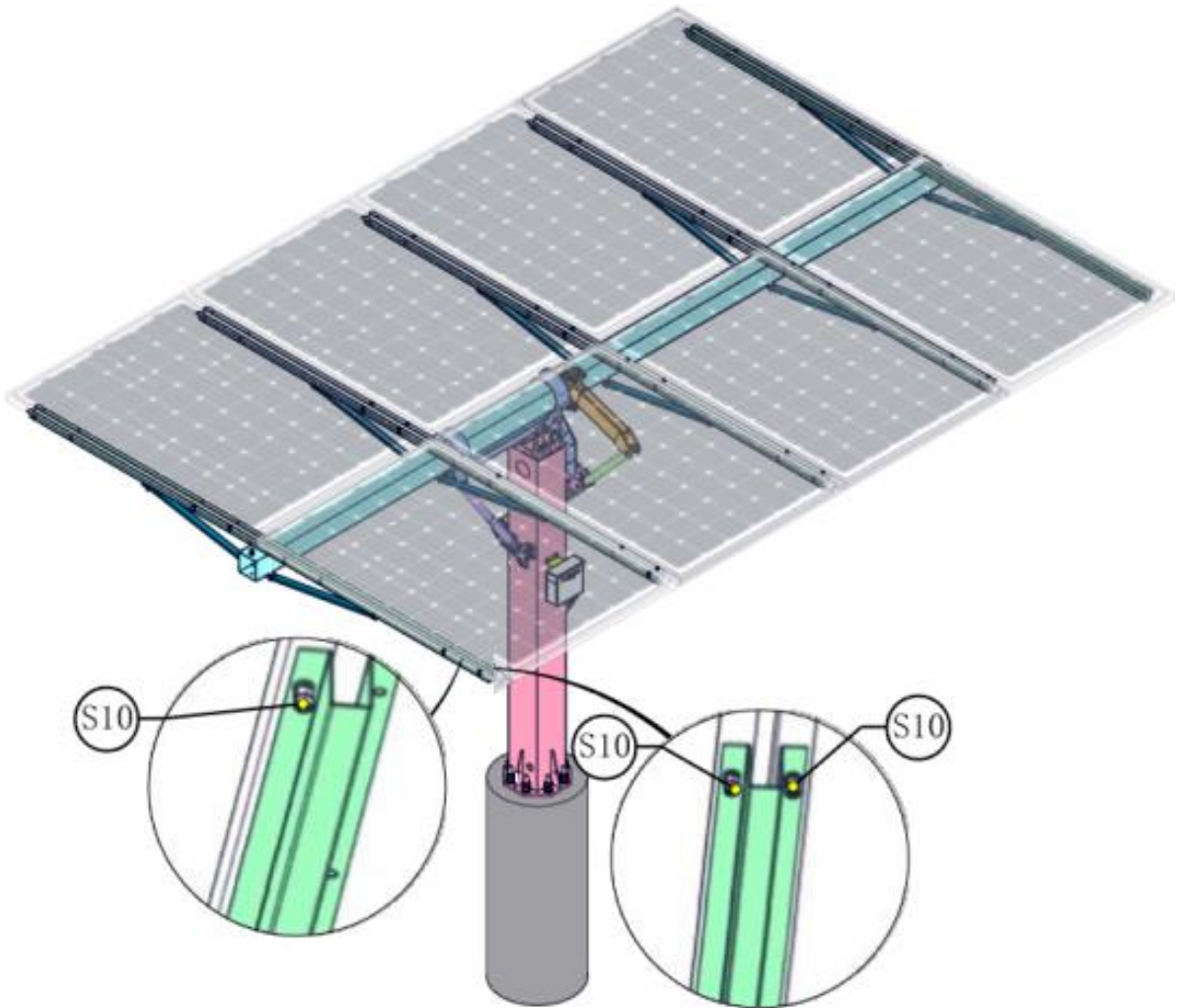
Wind sensor connector

5.8 Installation of Solar Panels

To facilitate the installation of solar panels, installers can supply power to the control unit, insert the controller panels on the control box, press manual button, then press confirm button, then press west button to adjust the structure close to the flat position in east-west, it will stop rotating by pressing west button again, then press north button to adjust the structure close to flat position (It can lean slightly to the south), it will stop rotating by pressing north button again. Cut off the power after the adjustment.



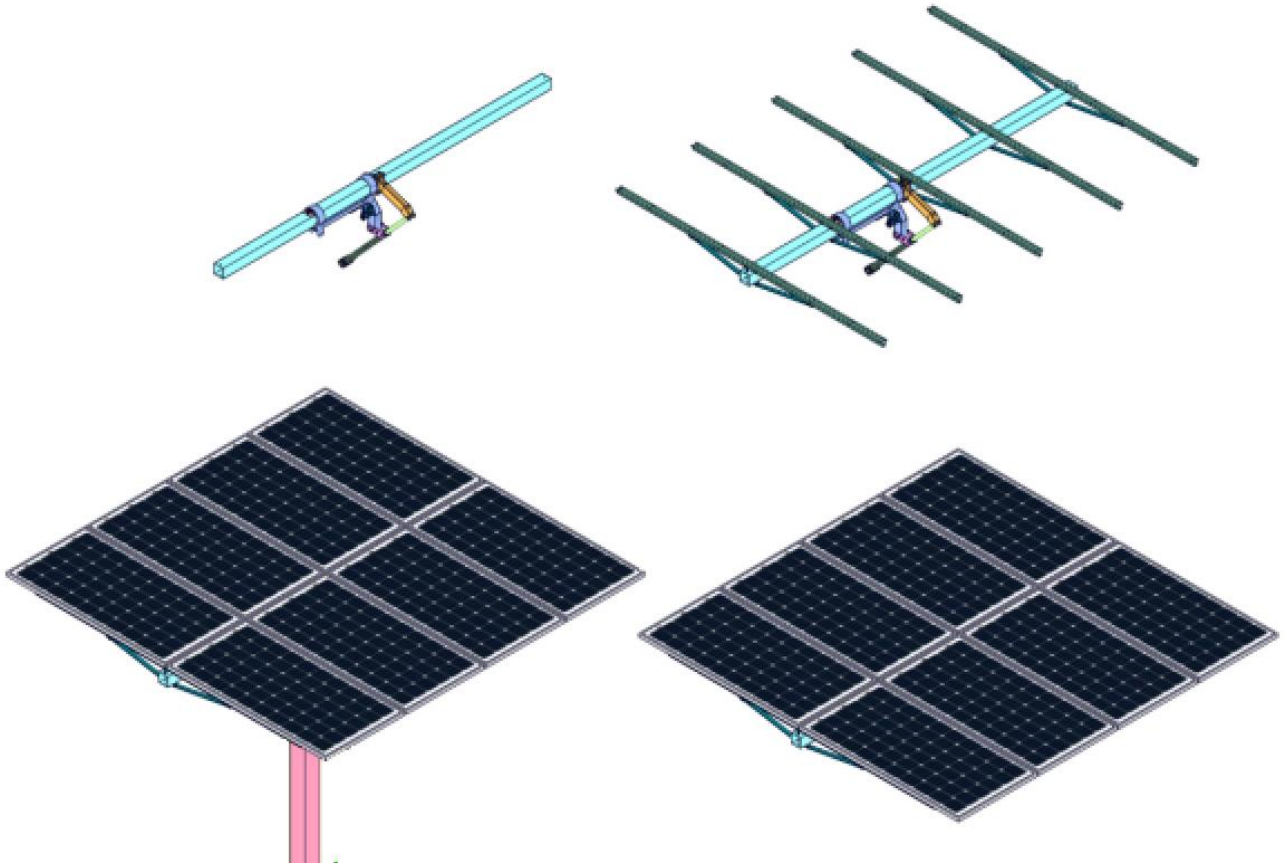
Fix all the solar panels to the supporting beam with hardware S10. Each solar panel is fixed by 6 points.



Note: After Finishing the installation of solar panels, please lock all of the connection screws. There are reserved connecting holes at the bottom of vertical pole for lightning protection grounding, please grounding the brackets properly according to PV power station grounding standard in your country.

Part VI. Crane Hoisting

If there is small crane equipped at the installation site, including the L-shaped bracket, azimuth linear actuator, frames and solar panels can be assembled in advance, then hoist it onto vertical pole 1 directly, then following previous steps of 5.3 to fix the L-shaped bracket and elevation linear actuator.



Part VII. Control Unit Debugging



Supply the A/C power to all of the driving systems in one project, the controller will automatically start after 5 minutes, and the host control unit will download GPS data automatically (need about 1 - 10 minutes), then the system will rotate to east or west and hit the angle limit position, then it will rotate to north or south and hit the angle limit position, then it will wait for a while and go to the right position automatically. The slave driving systems will follow the movement of host driving system.

Part VIII. Daily Operation and Maintenance – Important!

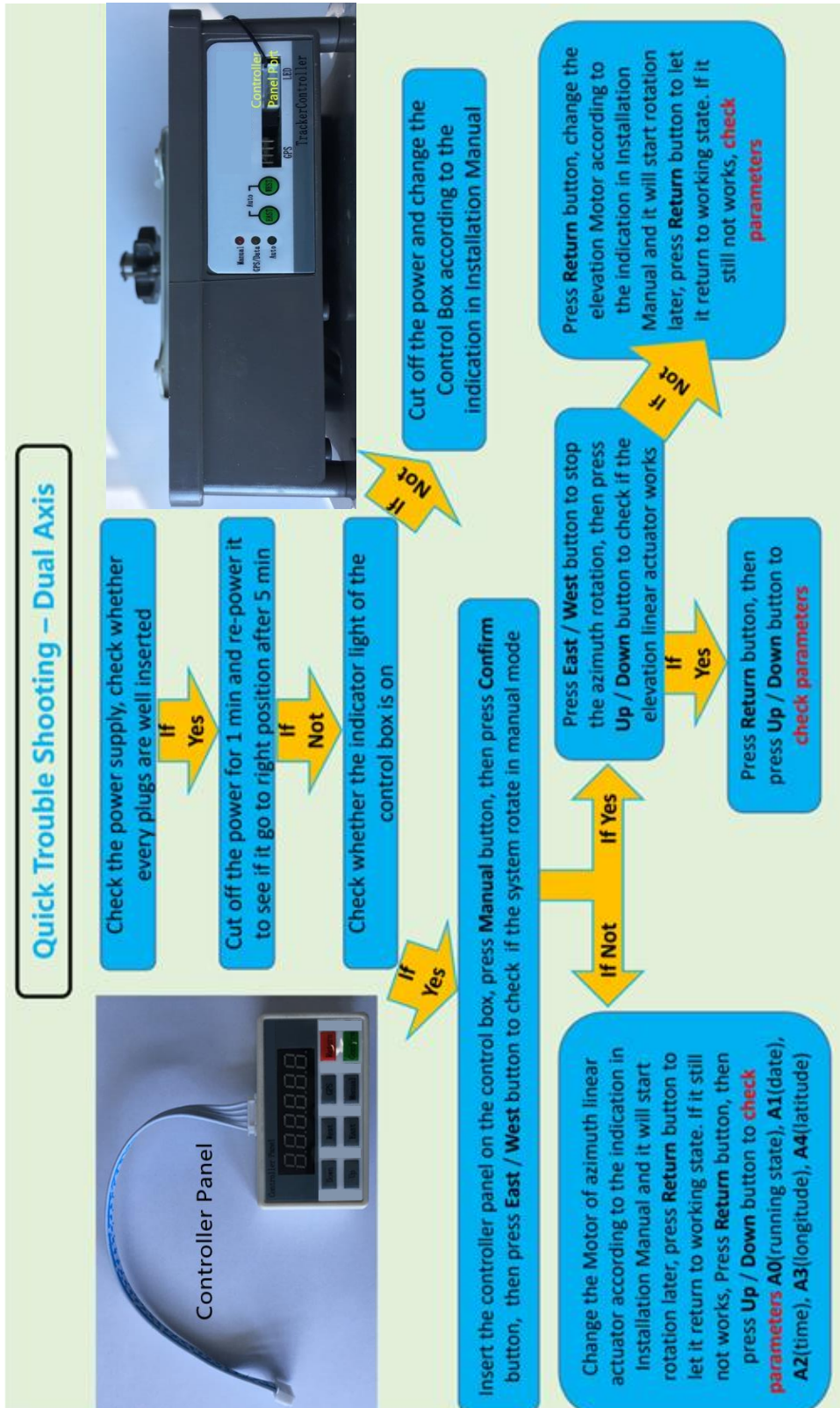
8.1 Regular inspection and maintenance

1. In order to discover potential errors in a timely manner, and to improve the system operation reliability, regular inspection shall be done once every six months.
2. After bad weather like strong winds or heavy snow, maintenance personnel should make a general check of the Solar Tracker and repair it in time if there is any damage.

8.2 Inspection items and problem treatment

Item	Inspection content	Solutions
Bolts and nuts	Check whether bolts and nuts were loosened	If bolts and nuts were not well fastened during the installation, or loosened due to strong winds, maintenance personnel need to re-fasten it.
Clamps	Check if clamps were deformed or loosened	If clamps was loosened because the screws were not well fastened, there is a need to re-fasten the screws. If clamps were deformed, there is a need to replace it.
Solar panels	Check whether the solar panels are flat	If the solar panels are not flat and this is caused by structural distortion, there is a need to rectify the distortion, or replace some parts. If it was caused by loosed screws, there is a need to re-fasten or replace the screws.
Brackets	Check whether there is any crack or rust problem	If there is rust, there is a need to use abrasive paper for rust removing, then spray epoxy zinc-rich primer or other antifouling paint for protection. If cracks appear, consult with Superstate for a solution
Wire connection in the driving box	Check whether the wire connection has loosened	If there is a loosened wire connection, there is a need re-connect it or replace the plugs.

Part IX. Quick Trouble Shooting



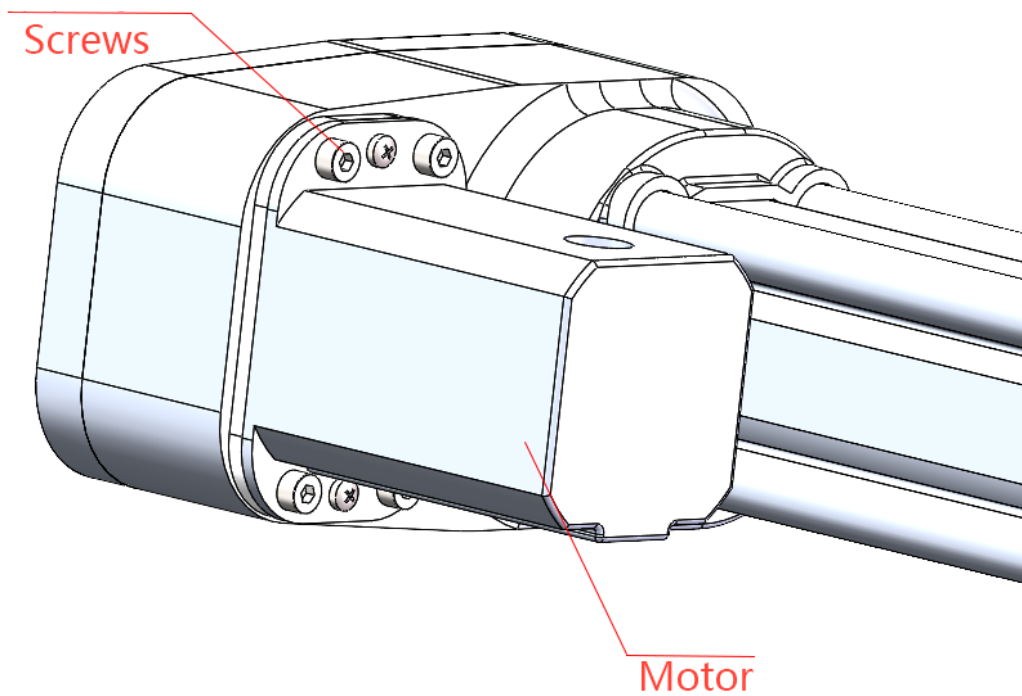
For situations not easily to be diagnosed and solved, please contact Superstate.

Part X. Spare Parts Replacement

Note: Cut off the power supply before replacement. If using PV power directly supply, disconnect all the connectors at input and output terminal of junction box or four-way connector. If using A/C power supply, cut off the A/C power switch.

10.1 Gear motor replacement

Unplug the gear motor plug, unscrew four fixing screws, take off the gear motor, then fix a new gear motor with fixing screws, plug in the motor plug.



10.2 Control box replacement

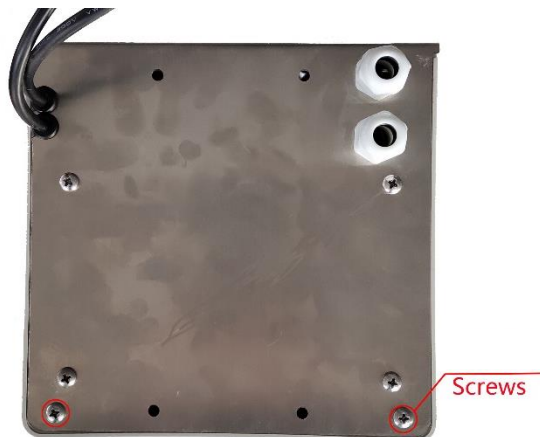
Unscrew the four fixing screws in following drawings, take off the cover on control box.



Disconnect all the plugs on control box, including power connector and motor cables.



Unscrew the four fixing screws as following drawing, take off the control box. Then fix a new control box with the fixing screws, and connect all plugs as before, fix the cover on control box.



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