	INSTALLATION MANUAL **Confidential** HLPV12 1.5 axis Tracker Rev6.1

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Table of contents

1 Preface 4

1.1 General Information 4

1.2 Liability 4

2 Conventions Used 5

3 Important Safety Considerations 6

3.1 Installation Requirement and Conditions of Use 6

4 HeliosLite HLPV tracker description 7

4.1 HLPV Tracker Technical Specifications 7

5 Mechanical installation 8

5.1 Mandatory tools required for mechanical tracker installation 8

6 Transport 9

6.1 Required equipment 9

6.2 Dimensions and weights 9

7 Setting up the chassis structure 10

7.1 Material details 10

7.2 Installation 11

8 Steering arm assembly (Master tracker) 13

8.1 Material details 13

8.2 Installation 14

9 Steering arm assembly (Slave tracker) 21

9.1 Material details 21

9.2 Linkage rod installation 23

10 Pole structure assembly 27

10.1 Material details 27

10.2 Installation 27

11 Lifting tool assembly 31

11.1 Material details 31

11.2 Installation 31

12 Main Beam assembly 33

12.1 Material details 33

12.2 Installation 34

13 Module Support Assembly 43

13.1 Material details 43

13.2 Installation 44
14 PV Module installation 47
14.1 Material details 47
14.2 Installation 47
15 Lifting procedure 51
16 Electrical connection 56
16.1 Master connection 56
16.2 Tracker grounding 57
17 Summary of parts and appendix 58
17.1 Components 58
17.2 Annex 62

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1.4	30th November 2023	All	Minor corrections	E. Menard

1 Preface

1.1 General Information

This installation manual is provided for installers and operators of HeliosLite HLPV12 axis systems that are designed and commercialized by HeliosLite. This manual contains important electrical and mechanical safety instructions for operators who must follow the instructions given in this manual.

Please read this manual carefully before installing or maintaining HeliosLite HLPV12 tracker systems.

The orientation of the tracker given in this manual corresponds to an installation of the system at a site located in the Northern hemisphere. For an installation in the Southern hemisphere, the orientation of the tracker should be inverted.

The information contained in this manual may be revised, updated and supplemented at any time by HeliosLite without prior notice to any third party. Authorized users who previously received this manual may request current version of this manual by making a request to HeliosLite.

1.2 Liability

All the information described in this manual is the intellectual property of HeliosLite and this manual does not constitute any warranty, expressed or implied.

HeliosLite HLPV 1.5 axis systems must be installed by professional installers which have been trained by HeliosLite otherwise HeliosLite will not assume any responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with installation, operation, use or maintenance of the HeliosLite HLPV 1.5 axis systems.

2 Conventions Used

This manual uses the following hierarchy of danger, warning and caution notices, and notes to convey safety and noteworthy information.

Danger Notices

	**DANGER**

Dangers indicate a hazardous situation which, if not avoided, will result in death or serious injury.

Warning Notices

	**WARNING**

Warnings indicate hazardous situation which, if not avoided, could result in death or serious injury.

Caution Notices

	**CAUTION**

Cautions indicate a hazardous situation which, if not avoided, could result in minor or moderate injury.

Notes

	**NOTE**

Notes indicate items that are important to know about, but they are not as serious as danger, warning, or caution notices.

3 Important Safety Considerations

This section describes important safety instructions for HeliosLite systems. Make sure you read, follow and save these instructions. These instructions do not intend to cover every safety eventuality and do not replace any local or site-specific safety procedures. There is a potential for death, injury and/or equipment damage when installing, commissioning, and maintaining HeliosLite systems.

3.1 Installation Requirement and Conditions of Use

Install this system and equipment according to the following requirements:

- **Do not install this equipment without proper training**

	**WARNING**

Do not install, commission or troubleshoot HeliosLite System without proper training or relevant documentation conducted and provided by HeliosLite.

- **Exercise care around this equipment at all times**

	**WARNING**

Use proper lifting techniques when handling relevant components. Use proper equipment to protect against bodily injury.

			
Hard hat	Safety goggles	Appropriate shoes	Gloves

- **Do not install this equipment alone in an isolated site**

4 HeliosLite HLPV tracker description

4.1 HLPV Tracker Technical Specifications

Type	HLPV12
Tracking type	1.5 axis variable tilt and roll tracker for PV panels
Modules & kWp per tracker	12x60 cells or 12x72 cells panels. Mono or Bifacial.
Actuator protection class	IP 55
Tracking range	Tilt: +10° or +17°, Roll: -42° to +42°
Structure	Hot dip galvanized steel structure and Magnelis
Dimensions	Module frame H=6.0m, W=4.0m; Maximum system height < 4.0m
Maximum wind speed	Up to 110 km/h (10 min average) & 175 km/h (3s gust) measured at 10m
Operating temperature	-30 °C / + 70 °C
Codes & Standards	Eurocodes 1, IEC 62817, CE (in progress)
Warranty	10 years on structural components, 5 years on drive and control system

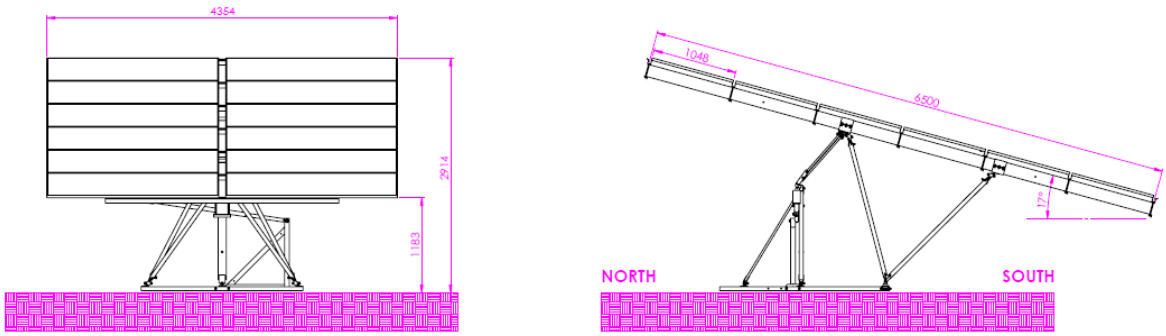


Figure 4-1 HLPV12 tracker main dimensions, back & side view in stow position

5 Mechanical installation

5.1 Mandatory tools required for mechanical tracker installation

Set of metric spanners	
▪ Size 18/19 for M12 hexagonal bolts & Nylstop nuts ▪ Size 24 for M16 hexagonal bolts & Nylstop nuts	
Racket wrench with metric sockets + electric impact wrench	
▪ Size 17 for M10 bolts ▪ Size 18/19 for M12 bolts ▪ Size 24 for M16 bolts	 
Torque wrench with preload table	
▪ Minimum torque : 50 N.m ▪ Maximum torque ≥ 230 N.m	
Hand grease gun	
	
Bubble level	
	
Drilling machine running on battery	
▪ Drill bit 9mm	
Ratchet strap (3m)	
▪	

Table 1 Installation tools required for installation

6 Transport

Descriptions of unloading and transport of HeliosLite HLPV12 tracker are contained in this chapter. Dimensions and weights are given in the next section to help site manager.

	WARNING

Site manager is responsible to the use of the right lifting equipment for unloading and transport on site.

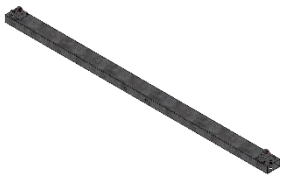
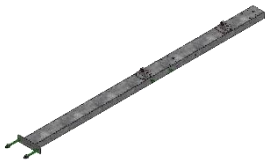
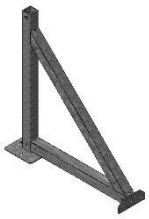
6.1 Required equipment

No specific lifting equipment is required for lifting. Three (x3) workers can move & install the entire tracker.

Nevertheless, lifting equipment for unloading is required.

6.2 Dimensions and weights

Dimensions and weights are described in the table below for the main sub-assemblies & parts. Details regarding packaging are given in the packing list.

	
East/West Beam Assembly for Tracker Base Main dimension: 2.0m Weight: Approx. 10.3 kg	North/South Beam Assembly for Tracker Base Main dimension: 2.0m Weight: Approx. 10,7 kg
	
Pole Structure - Tube Main dimension: 1.9m Weight: Approx. 4.3 kg	Actuator Mounting Support Main dimension: 1.0m Weight: Approx. 20.0 kg

	
Main Beam Main dimension: 6.5m Weight: Approx. 90.0 kg	Module Support Rail Main dimension: 2.9m Weight: Approx. 9.5 kg

7 Setting up the chassis structure

Installation of the chassis structure is described in this chapter.

This structure supports the pole structure and PV Modules array. Foundations used for this chassis structure are site-specific and need to be checked by HeliosLite before installation. Several anchoring solutions have been qualified by HeliosLite and the most cost-effective solution can be down selected depending on local site soil condition.

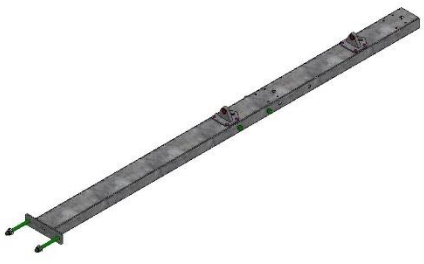
	NOTE

Always use grease on bolts to reduce friction coefficient during bolt tightening.

7.1 Material details

	NOTE

On the following pictures, the tracker was mounted in the Northern hemisphere with a tilt angle towards the South.

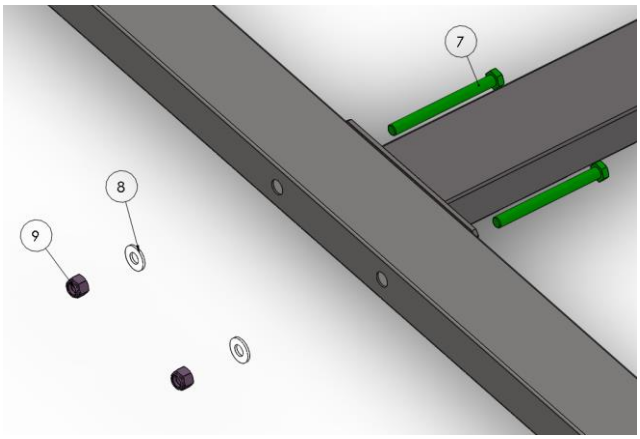
	
East/West Beam Assembly for Tracker Base **(x1)** Main dimension: 2.0m Weight: Approx. 10.3 kg	North/South Beam Assembly for Tracker Base **(x1)** Main dimension: 2.0m Weight: Approx. 10.7 kg

7.2 Installation

1. Mount one (x1) East/West beam and one (x1) North/South beam

Hardware required:

N°	Part Name	Material	Quantity	Type
7	Hex. Head Bolt	Galvanised Steel 8.8 Grade	2	ISO4014 M12x130
8	Plain washer	Galvanised Steel 8.8 Grade	2	ISO M12
9	Hex. Nut Nylstop	ZN Nickel	2	ISO7040 M12



Assembly quantity per tracker: x1

7: Hexagonal bolt / ISO4014 M12x130
8: Plain washer / ISO M12.
9: Self locking nut / M12

Bolted connection (x2)

- Insert 2x hexagonal bolt M12x130 with plain washer and nut opposite to its head
- Tighten bolts at the torque value. specified bellow:

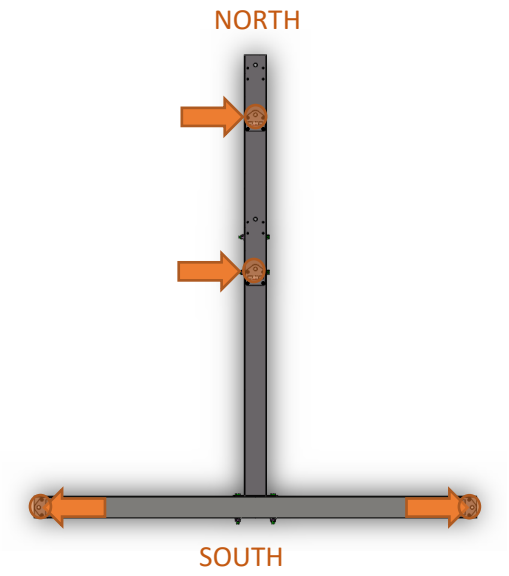
46 Nm
FASTENING TORQUE REQUIRED

VIDEO LINK: https://files.helioslite.net/doc/videos/7-ChassisStructure.webm

2. Mount chassis structure to anchoring points 1 / 2 / 3 / 4.

Hardware required:

Specific to anchor solution used.



Assembly quantity per tracker: x1

Anchor connection (x4) points indicated by arrows.

For anchor position, the best is to use the chassis as pattern to locate anchor position with steel bar, remove the chassis and install anchor selected at each position.

Tolerance regarding South orientation is +/- 2°.

Remark:
For concrete pad solution, it will be important to use a rubber band (width 100mm) to place under the chassis assembly. It will avoid direct contact between chassis in galvanized steel and concrete which can accelerate corrosion degradation.

8 Steering arm assembly (Master tracker)

The steering arm is a mechanical assembly which is specific to the cinematic of the HeliosLite HLPV 1.5 axis tracker systems. The module support assembly is connected to the tracker upper steering arm.

Definition:

Master tracker: Tracker equipped with a linear actuator
Slave tracker: Tracker connected to Master tracker with a linkage rod. No linear actuator need to be installed on a Slave tracker.

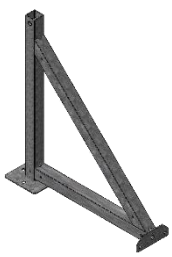
	NOTE

Always use grease on bolts to reduce friction coefficient during bolt tightening.

8.1 Material details

	NOTE

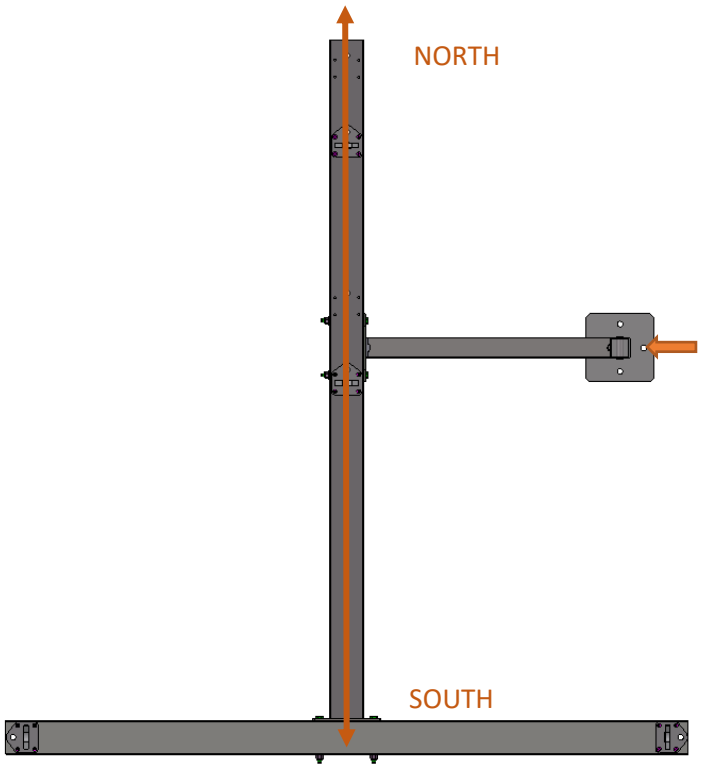
On the following pictures, the tracker is mounted in the Northern hemisphere with an inclination towards South.

	
Lower Steering Arm with Coupling Support Assembly **(x1)** Main dimension: 1.1m Weight: Approx. 10.5 kg	Welded Reinforcement Beam **(x1)** Main dimension: 1.4m Weight: Approx. 3.2 kg
	
Coupling Ball + Support with nut **(x1)** Weight: 2.75 kg	Actuator Mounting Support **(x1)** Main dimension: 1.0m Weight: Approx. 20.0 kg

	
Linear Actuator **(x1)** Main dimension: 1.4m Weight: 12.5 kg	

8.2 Installation

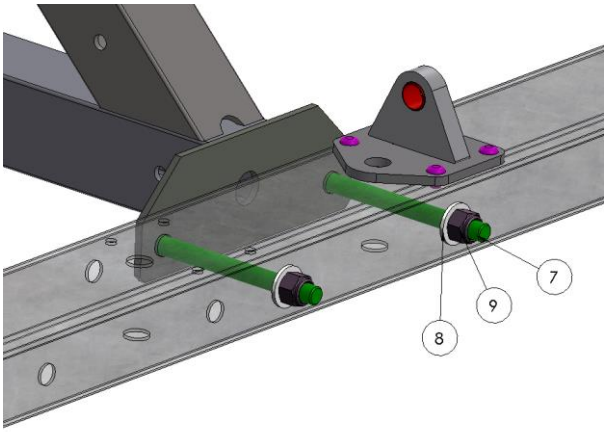
1. Connect lower steering arm & actuator mounting support to chassis structure to identify position of the 5th anchor for actuator support (orange arrow).

	**Assembly quantity per tracker:** x1 Anchor connection (x1) point indicated by arrows. For anchor position, the best is to use the actuator support temporary installed to locate anchor position with steel bar, remove the actuator support and install anchor. This operation is only required for **"master"** tracker unit (one actuator installed on tracker) but not for "**slave**" tracker.

2. Installation of steering arm & actuator mounting support

Hardware required:

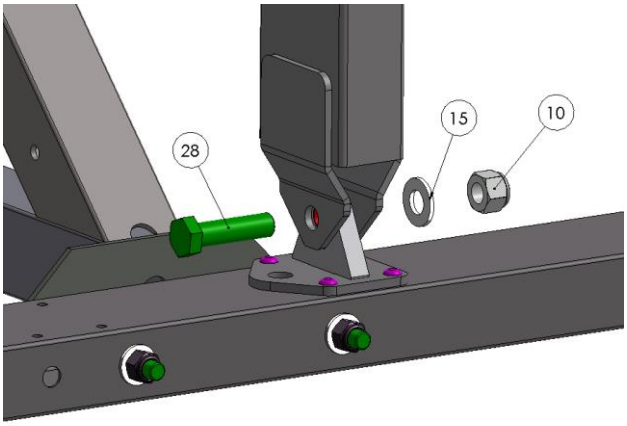
N°	Part Name	Material	Quantity	Type
7	Hex. Head Bolt	Galvanised Steel 8.8 Grade	2	ISO4014 M12x130
8	Plain washer	Galvanised Steel 8.8 Grade	2	ISO M12
9	Hex. Nut Nylstop	ZN Nickel	2	ISO7040 M12
10	Hex. Nut Nylstop	ZN Nickel	1	ISO7040 M16
15	Plain washer	Galvanised Steel 8.8 Grade	1	ISO M16
28	Hex. Head Bolt	Galvanised Steel 8.8 Grade	1	ISO4014 M16x60



7: Hexagonal bolt / ISO4014 M12x130
8: Plain washer / ISO M12.
9: Self locking nut / M12

- Insert actuator mounting support on the north side of second pivot support
- Insert 2x hexagonal bolt M12x130 with plain washer and nut opposite to its head
- Tighten at the torque value specified bellow:

46 Nm
FASTENING TORQUE REQUIRED



Assembly quantity per tracker: x1

10: Self locking nut / M16
15: Plain washer / ISO M16
28: Hexagonal bolt / ISO4014 M16x60

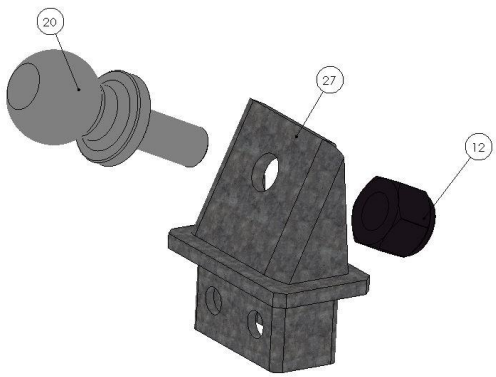
- Insert bolt M16x60 with plain washer and nut opposite to its head

CAUTION

Only snug-tight the M16 nut to permit free rotation of the lower steering arm around the pivot point.
This rotation is very important as required for the global tracker movement.

VIDEO LINK: https://files.helioslite.net/doc/videos/8-SteeringArm.webm

3. Insert hitch ball + support



Assembly quantity per tracker: x1

12: Self locking nut / M20
20: Hitch ball
27: Coupling support

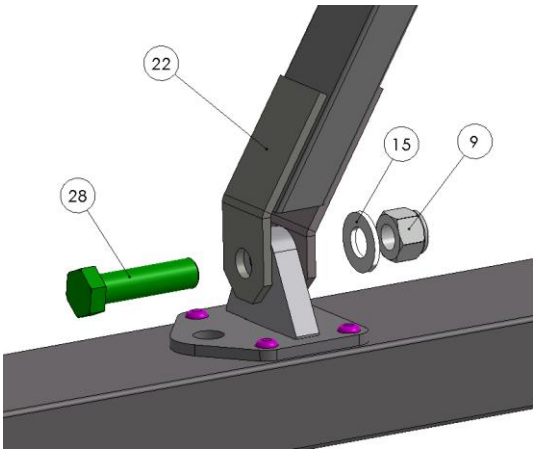
- Insert hitch ball
- Tighten nut M20 at the torque value specified below:

100 Nm
FASTENING TORQUE REQUIRED

4. Install reinforcement beam between lower steering arm and chassis structure

Hardware required:

N°	Part Name	Material	Quantity	Type
9	Hex. Nut Nylstop	ZN Nickel	1	ISO7040 M16
15	Plain washer	Galvanised Steel 8.8 Grade	1	ISO M16
28	Hex. Head Bolt	Galvanised Steel 8.8 Grade	1	ISO4014 M16x60



Assembly quantity per tracker: x1

9: Self locking nut / M16
15: Plain washer / ISO M16
22: Welded reinforcement beam
28: Hexagonal bolt / ISO4014 M16x60

- Position welded reinforcement beam
- Insert bolt M16x60 with plain washer and nut opposite to its head

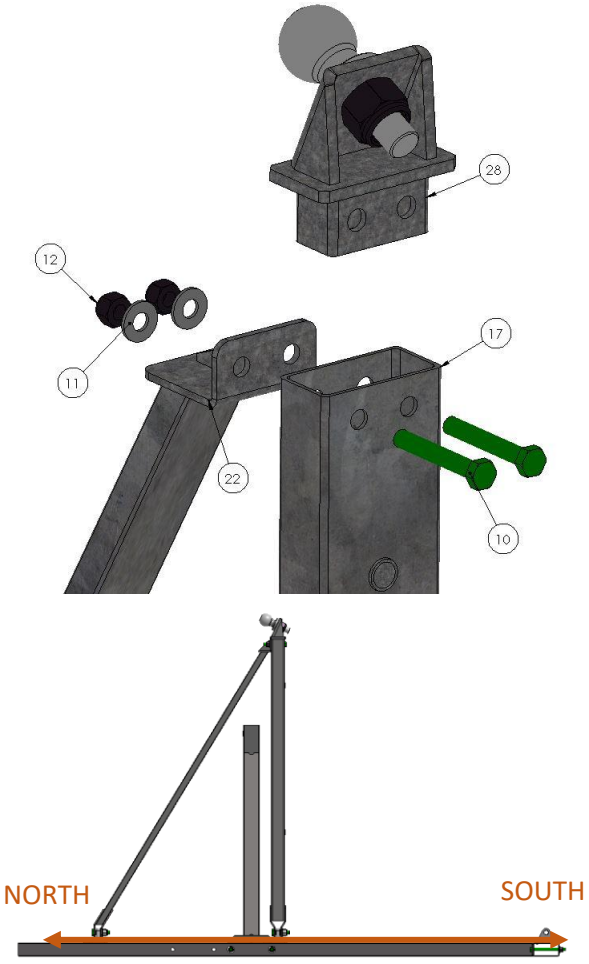
CAUTION

Only snug-tight the M16 nut to permit free rotation of the part around the pivot point. This rotation is very important as required for the global tracker movement.

VIDEO LINK: https://files.helioslite.net/doc/videos/8-ReinforcementSupport.webm

Hardware required:

N°	Part Name	Material	Quantity	Type
10	Hex. Head Bolt	Galvanised Steel 8.8 Grade	2	ISO4014 M12x80
11	Plain washer	Galvanised Steel 8.8 Grade	2	ISO M12
12	Hex. Nut Nylstop	ZN Nickel	2	ISO7040 M12



Assembly quantity per tracker: x1

10: Hexagonal bolt / ISO4014 M12x80
11: Plain washer / ISO M12
12: Self locking nut / M12
17: Lower Steering Arm
22: Welded reinforcement beam
28: Hitch ball + support

- Insert hitch ball + support with welded reinforcement beam
- Insert bolts M12x80
- Place one (x1) plain washer and one (x1) self-locking nut at its end
- Tighten nut M12 at the torque value specified bellow:

79 Nm
FASTENING TORQUE REQUIRED

WARNING

Hitch ball needs to be oriented to the North (see picture on the left)

VIDEO LINK: https://files.helioslite.net/doc/videos/8-HitchBallSupport.webm

5. Assembly overview after installing steering arm and actuator mounting support

	• Assembly overview at this stage

6. Linear actuator assembly

	NOTE

Prior to actuator assembly, actuator needs to be sent in park position using the master controller. Please refer to the "**quick start guide"** for further information to proceed. Actuator range has been configured in factory prior to shipment by actuator manufacturer.

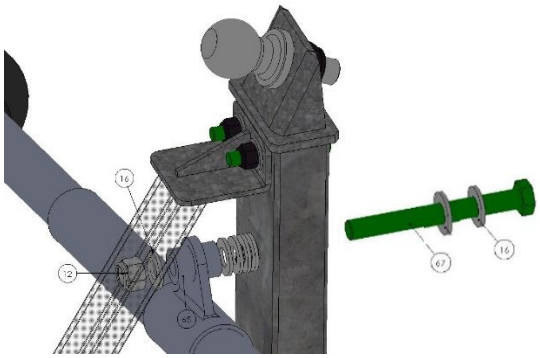
PROCEDURE:

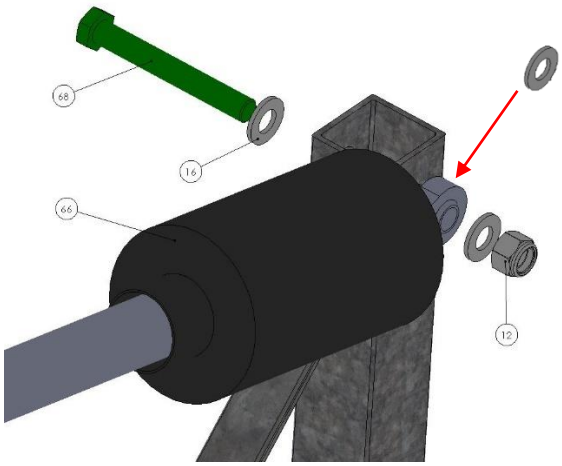
FULL-REVERSE => ZERO => PARK

Hardware required:

N°	Part Name	Material	Quantity	Type
12	Hex. Nut Nylstop	ZN Nickel	2	ISO7040 M16
16	Plain washer	Galvanised Steel 8.8 Grade	11	ISO M16
67	Hex. Head Bolt	Galvanised Steel 8.8 Grade	1	ISO4014 M16x140
68	Hex. Head Bolt	Galvanised Steel 8.8 Grade	1	ISO4014 M16x140

VIDEO LINK: https://files.helioslite.net/doc/videos/8-ActuatorInstallation.webm





12: Self locking nut / M16
16: Plain washer / ISO M16
65: Linear actuator mounting bracket
67: Hexagonal bolt / ISO4014 M16x140

- Install actuator mounting bracket first with (x1) hexagonal bolt (M16x140) with (2x) plain washer under head bolt, (5x) plain washer for spacer and (x1) plain washer under Nylstop nut

	CAUTION

Only snug-tight the M16 nut.

12: Self locking nut / M16
16: Plain washer / ISO M16
66: Linear actuator
68: Hexagonal bolt / ISO4014 M16x140

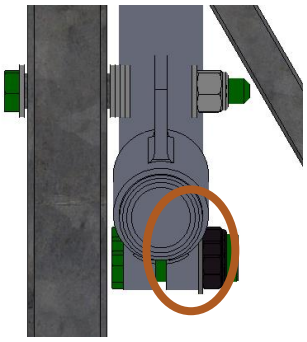
- Connect actuator's end rod to mounting support with one (x1) hexagonal bolt (M16x120)

	CAUTION

Only snug-tight the M16 nut.

Assembly quantity per tracker: x1

It is im portant to respect the orientation of the linear actuator as described on the left. The actuator end rod needs to be attached onto the actuator mounting support.

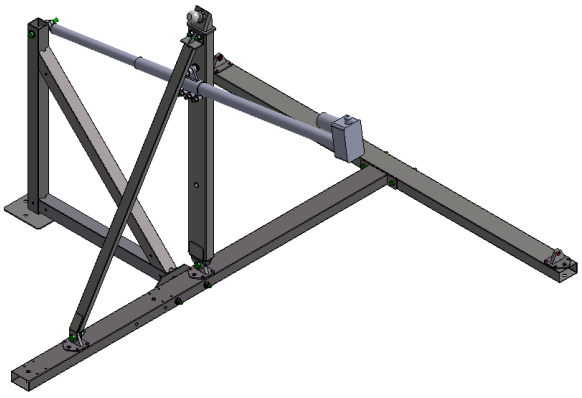


Check that head bolts of the bracket are facing steering arm

Check verticality of the steering arm with bubble level.

Untighten 3 bolts on the actuator bracket if necessary to adjust verticality of the steering arm.

7. Assembly overview after installing actuator



9 Steering arm assembly (Slave tracker)

When master controller is installed, second tracker installed in the same East-West row can be installed. We will define this tracker as a “Slave” tracker.

A linkage rod will connect the “Slave” unit to master unit.

	NOTE

Always use grease on bolts to reduce friction coefficient during bolt tightening.

9.1 Material details

	NOTE

On the following pictures, the tracker was mounted in the Northern hemisphere with an inclination towards the South.

	
Linkage Rod **(x1)** Main dimension: 7.6m Weight: Approx. 43 kg	End Cap **(x2)** Main dimension: 0.45m Weight: Approx. 4.5 kg

Distance between East-West tracker units (8.0m +/-0.03) is important and needs to be respect carefully.

For “Slave” tracker, **actuator and mounting support are not required**. Installation of “Slave” tracker is similar to “Master” tracker assembly **except for actuator installation and support**.

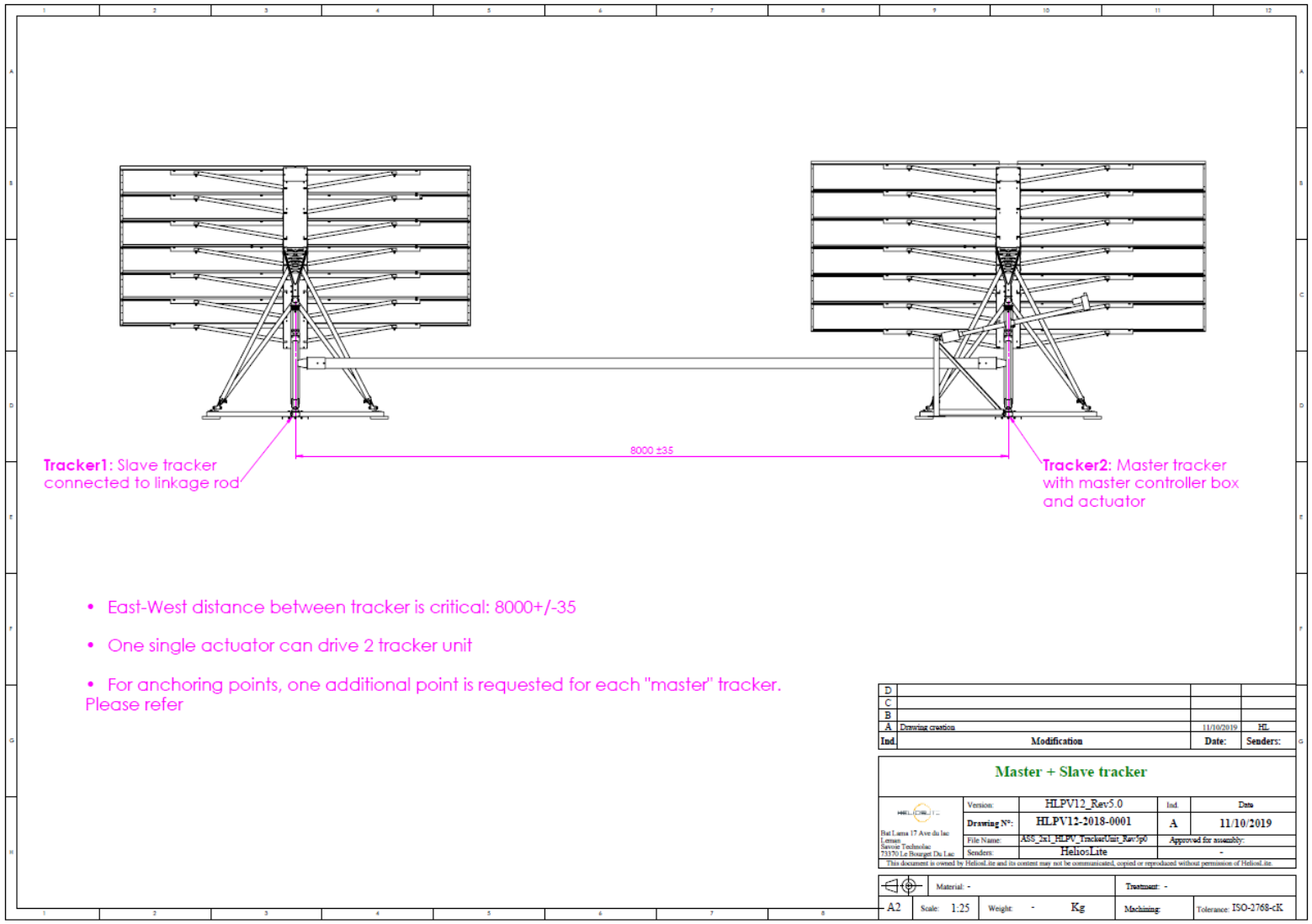


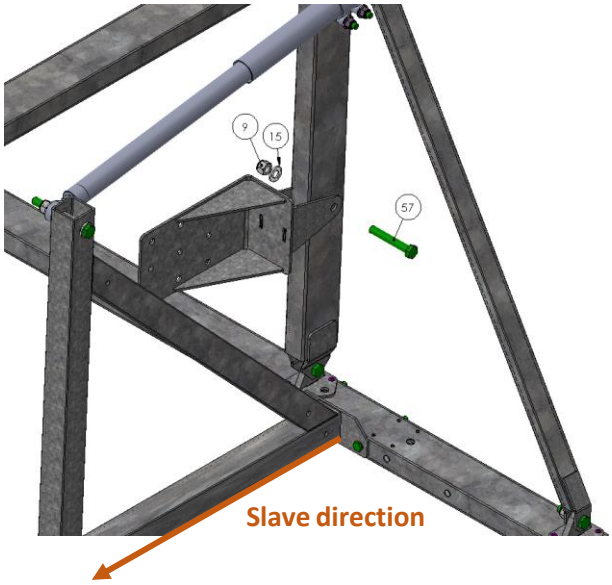
Figure 9-1 Critical Est-West distance between tracker units

9.2 Linkage rod installation

1. Connect end cap on “master” tracker

Hardware required:

N°	Part Name	Material	Quantity	Type
57	Hex. Head Bolt	Galvanised Steel 8.8 Grade	1	ISO4014 M16x100
15	Plain washer	Galvanised Steel 8.8 Grade	1	ISO M16
9	Hex. Nut Nylstop	ZN Nickel	1	ISO7040 M16



Assembly quantity per tracker: x1

- Insert end cap on vertical steering arm.
- Insert one (x1) bolt M16x100 with one (x1) washer and one (x1) Nylstop nut on the opposite side.

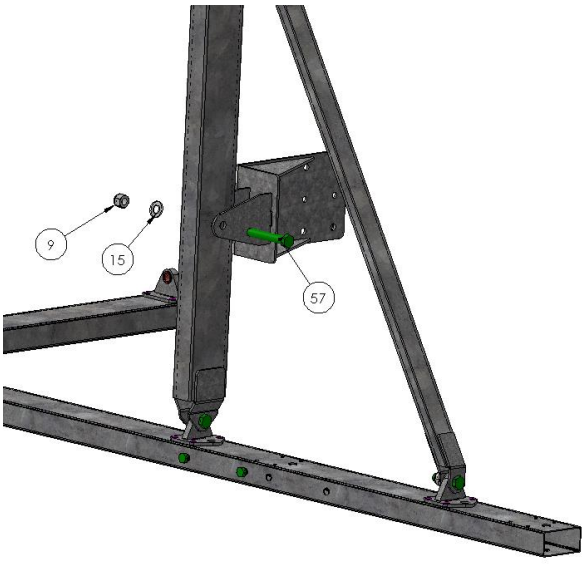
NOTE

Check verticality of the steering arm with bubble level.

CAUTION

Only snug-tight the M16 nut

VIDEO LINK: https://files.helioslite.net/doc/videos/9-LinkageRod.webm



Assembly quantity per tracker: x1

- Repeat this operation on the Slave tracker

CAUTION

Only snug-tight the M16 nut to permit free rotation of the lower steering arm around the pivot point.

This rotation is very important as required for the global tracker movement.

2. Insert Linkage rod on the “master” tracker side

Hardware required:

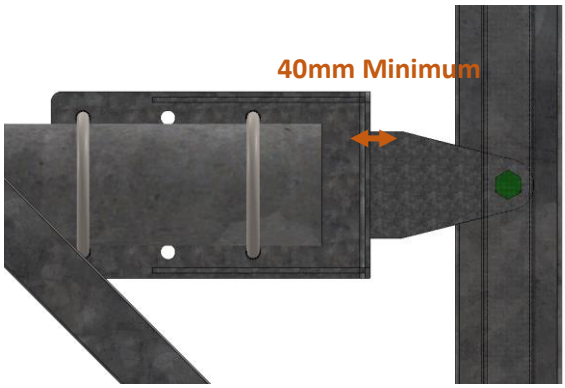
N°	Part Name	Material	Quantity	Type
2	TDBL screw	Steel Zinc plated	4	TDBL 10.6x23
8	Plain washer	Galvanised Steel 8.8 Grade	8	ISO M12
9	Hex. Nut Nylstop	ZN Nickel	8	ISO7040 M12

Assembly quantity per tracker: x1

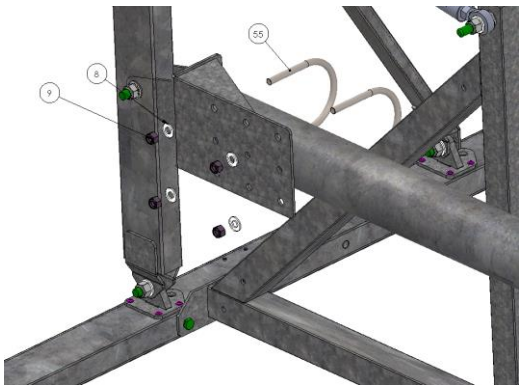
58: Linkage rod
53: End cap

- Insert linkage rod into the end cap

VIDEO LINK: https://files.helioslite.net/doc/videos/9-LinkageRod_SlaveMaster.webm

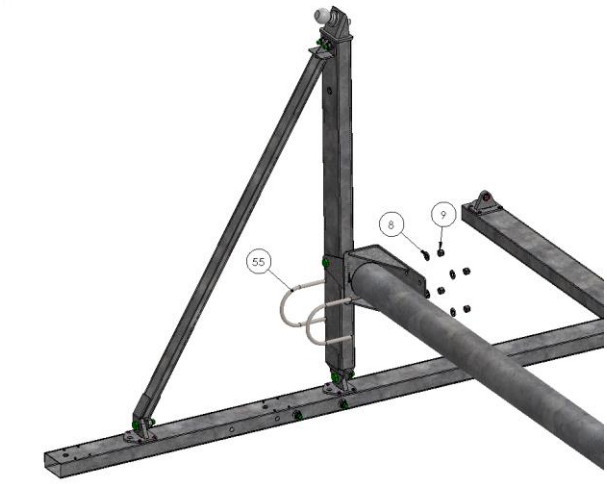


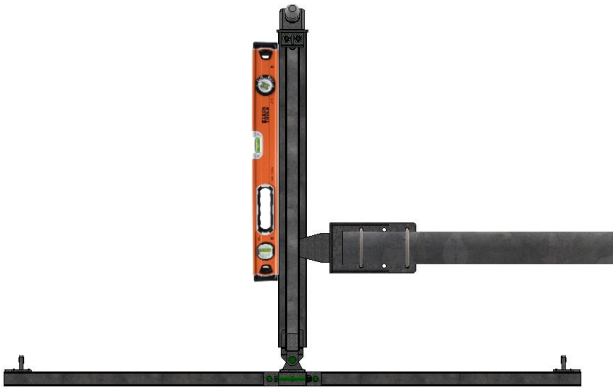
- Respect a minimum distance around 40mm for the linkage rod

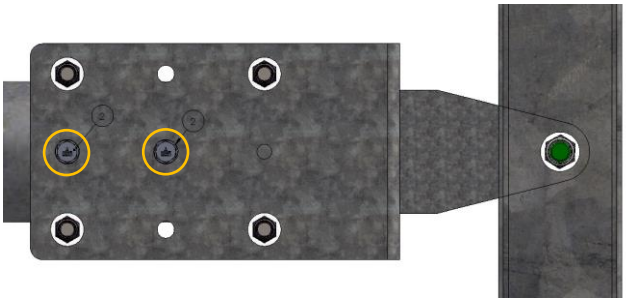


- Insert two (x2) U-bolt M2 with one (x1) washer and one (x1) Nylstop nut on the opposite side.
- Tighten to lock in position time to repeat this operation on the slave tracker.

3. Insert Linkage rod on the “slave” tracker side







Hypothèses: Composants I et II en acier S235, S280GD ou S320GD

V_{rk} (kN)		élément support t_{II} (mm)									
t_I (mm)		1,00	1,25	1,50	2,00	3,00	4,00	5,00	6,00	8,00	≥10,00
		Pré-perçage $d_{pd,II}$ = 9,0 mm				Pré-perçage dpd,II = 10,0 mm					
1,00	Pré-perçage idem support 9 / 10	2,96	3,57	4,17	5,38	5,38	5,38	5,38	5,38	5,38	5,38
1,13			4,13	4,72	5,90	7,08	7,08	7,08	7,08	7,08	7,08
1,25			4,72	5,30	6,46	8,79	8,79	8,79	8,79	8,79	8,79
1,50				6,48	7,62	9,91	12,20	12,20	12,20	12,20	12,20
1,75					8,63	10,30	12,20	12,20	13,50	13,50	13,50
2,00					10,00	11,20	12,40	12,40	14,80	14,80	14,80
3,00						13,80	15,60	15,60	19,20	22,80	22,80
4,00							21,40	21,40	21,40	22,80	22,80
5,00	Pré-perçage 12,0 mm					11,62	18,83	26,04	26,04	26,04	26,04
6,00						11,62	18,83	26,04	29,61	29,61	29,61
8,00						11,62	18,83	26,04	29,61	31,09	31,09
10,00						11,62	18,83	26,04	29,61	31,09	31,09
12,00						11,62	18,83	26,04	29,61	31,09	

Assembly quantity per tracker: x1

78: Linkage rod
80: End cap

- Insert linkage rod into the end cap
- Insert two (x2) U-bolt M2 with one (x1) washer and one (x1) Nylstop nut on the opposite side.

⚠	**CAUTION**

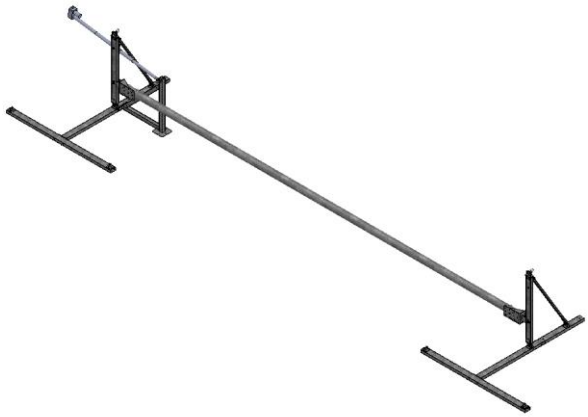
Check verticality of the steering arm before tightening

⚠	**CAUTION**

- To prevent issue if U-bolt get untighten, two (x2) TDBL screws need to be added on the master and slave tracker.

- Hole D12mm is already drilled on the end cap.
- Two (x2) counter drilling D9mm need to be done on master and slave tracker.
- Insert four (4x) nonut TDBL and tightened with **adequate setting tool and torque.**

4. Assembly overview after installing actuator



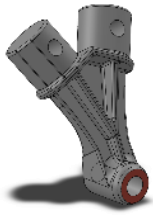
10 Pole structure assembly

The pole structure is the assembly which supports the tracker main beam assembly which supports the array of PV modules. The pole structure is connected to the tracker chassis structure.

	NOTE

Pole structure assembly can be done independently of tracker chassis structure assembly.

10.1 Material details

	
Pole Structure – Tube **(x4)** Main dimension: 1.9m Weight: Approx. 4.3 kg	Tube Linkage Connector **(x4)** Main dimension: 0.15m Weight: Approx. 1.6 kg

10.2 Installation

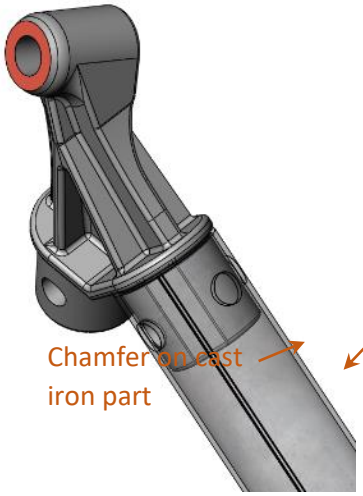
1. Insert four (x4) cast iron parts in four (x4) tubes D48.3 to mount pole structure assembly and insert bolt M12 for fixation.

	NOTE

Respect cast iron part indexation in order to obtain the right orientation of the holes at the end of each tube.

Hardware required:

N°	Part Name	Material	Quantity	Type
3	Hex. Head Bolt	Galvanised Steel 8.8 Grade	8	ISO4014 M12x80
4	Plain washer	Galvanised Steel 8.8 Grade	8	ISO M12
5	Hex. Nut Nylstop	ZN Nickel	8	ISO7040 M12



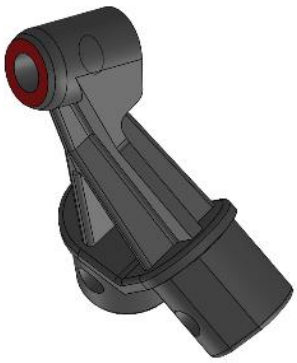
VIDEO LINK:
https://files.helioslite.net/doc/videos/10-PoleStructureDetails.webm

Assembly quantity per tracker: x1

	IMPORTANT NOTICE !

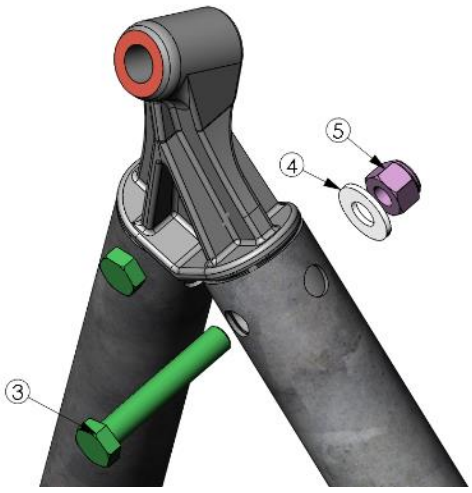
Use tube Ø48.3 internal weld bead as reference to insert cast iron part.

- Chamfer on the cast iron part needs to be aligned with tube weld bead in order to obtain the right orientation of the tube end holes
- Repeat this operation eight (x8) times to complete the assembly of the tracker pole structure.



- Red face of the cast iron part needs to be oriented to the external side of the pole structure assembly (orange arrows).

Total weight = 23 KG



3: Hexagonal bolt / ISO4014 M12x80
4: Plain washer / ISO M12.
5: Self locking nut / M12

TEMPORARY FASTENING ONLY

Bolted connection (x8)

Do not tighten the nuts at this stage in order to avoid extra stress during final tracker assembly.

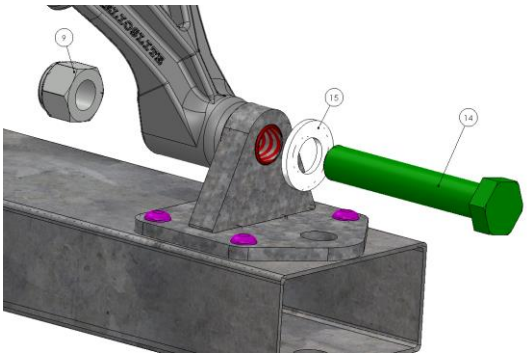
2. Final assembly of the tracker chassis structure.

Hardware required:

N°	Part Name	Material	Quantity	Type
14	Hex. Head Bolt	Galvanised Steel 8.8 Grade	2	ISO4014 M16x90
15	Plain washer	Galvanised Steel 8.8 Grade	2	ISO M16
9	Hex. Nut Nylstop	ZN Nickel	2	ISO7040 M16

VIDEO LINK: https://files.helioslite.net/doc/videos/10-PoleStructure_TrackerAssembly.webm

EAST SIDE



Assembly quantity per tracker: x1

Bolted connection (x1)

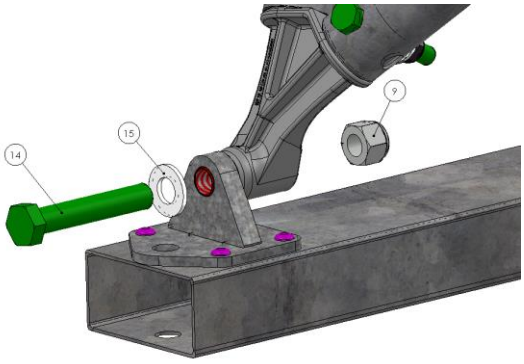
14: Hexagonal bolt / ISO4014 M16x90
15: Plain washer / ISO M16
9: Self-locking nut / M16

- Insert one (x1) hexagonal bolt (M16x90) and one plain washer under its head
- Snug-tight the bolt (M16 thread inside cast iron part)
- Add self-locking nut behind cast iron part for safety purpose

CAUTION

This rotation is very important as required for the global tracker movement

WEST SIDE



Bolted connection (x1)

14: Hexagonal bolt / ISO4014 M16x90
15: Plain washer / ISO M16
9: Self-locking nut / M16

- Insert one (x1) hexagonal bolt (M16x90) with one plain washer under its head
- Snug-tight the bolt (M16 thread inside cast iron part)
- Add self-locking nut for safety purpose

CAUTION

This rotation is very important as required for the global tracker movement

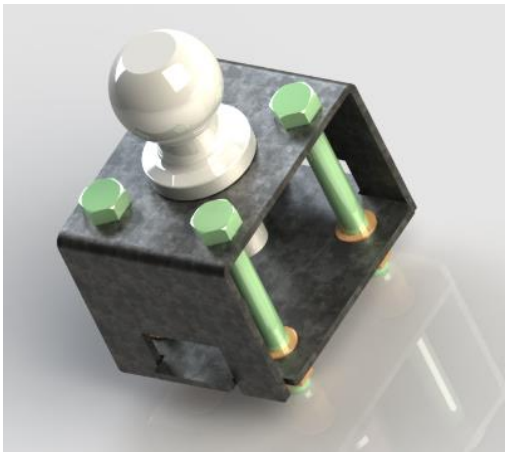
3. Assembly overview after pole structure assembly

	• Assembly overview at this stage

11 Lifting tool assembly

This lifting tool will be temporally mounted onto the steering arm reinforcement beam. It will be used during module support assembly to keep the tracker main beam assembly in a flat horizontal position in order to facilitate the installation of the PV modules.

11.1 Material details

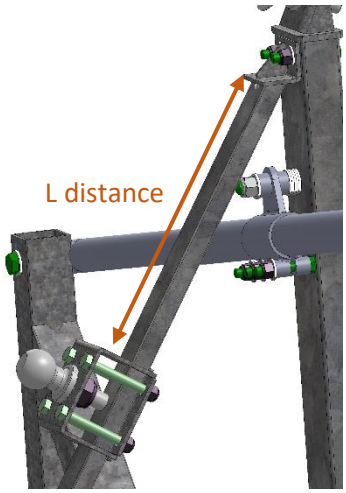
	
Ball mounting fixture for assembly **(x1)** Main dimension: 0.15m Weight: Approx. 2 kg	

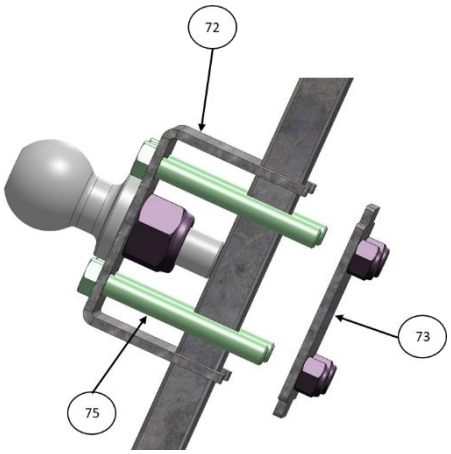
11.2 Installation

1. Mounting of the ball mounting fixture onto the steering arm reinforcement beam.

Hardware required:

N°	Part Name	Material	Quantity	Type
65	Hex. Head Bolt	Galvanised Steel 8.8 Grade	4	ISO4014 M12x110





Assembly quantity per tracker: x1

Bolted connection (x4)

72: Ball mounting fixture upper part
73: Ball mounting fixture bottom part
75: Hexagonal bolt / ISO4014 M12x110

- Position the ball mounting fixture:
  L=245mm for Tilt 15° config.
  L=XXmm for Tilt 10° config.
- Position the bottom plate under the reinforcement beam and tighten the four (x4) bolts (M12x110)

46 Nm
FASTENING TORQUE REQUIRED

VIDEO LINK: https://files.helioslite.net/doc/videos/11-LiftingToolAssembly.webm

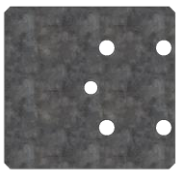
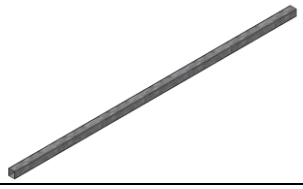
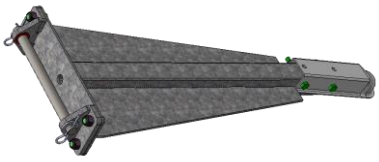
2. Assembly overview after ball mounting fixture assembly

- Assembly overview at this stage

12 Main Beam assembly

12.1 Material details

The module support is the assembly which supports the array of PV modules. It is connected to the pole structure and tracker upper steering arm.

	
Pivot support (North config.) **(x1)** Main dimension: 0.3m Weight: Approx. 4.1 kg	Pivot support plate (Top Config.)**(x2)** Main dimension: 0.3m Weight: Approx. 2.2 kg
	
Pivot support (South config.) **(x1)** Main dimension: 0.3m Weight: Approx. 3.3 kg	Pivot spacer plate **(x1)** Main dimension: 0.15m Weight: Approx. 0.8 kg
	
Main beam **(x1)** Main dimension: 6.5m Weight: Approx. 90.2 kg	Upper Steering Arm Assembly **(x1)** Main dimension: 0.85m Weight: Approx. 11 kg

Assembly advice for the main beam: It is advisable to lay the beam flat and place shims on each side on the beam and check that it is straight with a mason's rule. If you don't do this there may be some play and further assembly may be more complicated.

12.2 Installation

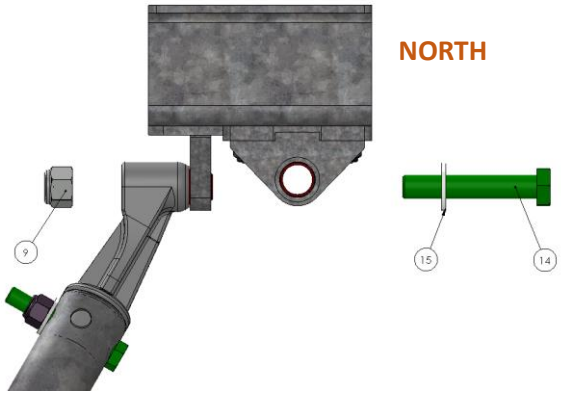
1. Install first the pivot support (North config.) main tracker beam pivot support at the North side of the pole structure assembly.

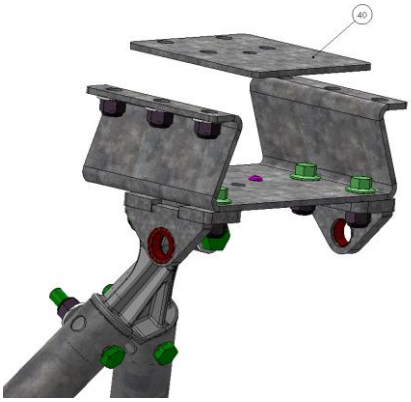
Hardware required:

N°	Part Name	Material	Quantity	Type
14	Hex. Head Bolt	Galvanised Steel 8.8 Grade	1	ISO4014 M16x90
15	Plain washer	Galvanised Steel 8.8 Grade	1	ISO M16
9	Hex. Nut Nylstop	ZN Nickel	1	ISO7040 M16

VIDEO LINK: https://files.helioslite.net/doc/videos/12-PivotSupport_SouthConfig.webm

NORTH SIDE





Assembly quantity per tracker: x1

Bolted connection (x1)

14: Hexagonal bolt / ISO4014 M16x90
15: Plain washer / ISO M16
9: Self-locking nut / M16

- Insert one (x1) hexagonal bolt (M16x90) with one (x1) plain washer under its head
- Tight the bolt (thread M16 inside cast iron part)
- Add self-locking nut for safety purpose
- Tight the nut M16

⚠	**CAUTION**

Only snug-tight the M16 nut to permit free rotation of the main beam pivot around the North-South axis.

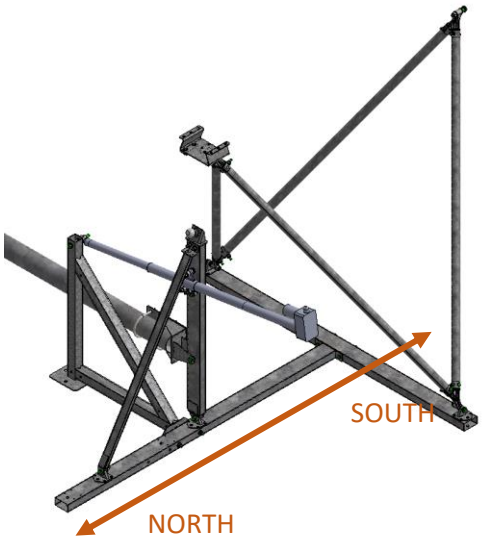
This rotation is very important as required for the global tracker movement.

⚠	**CAUTION**

Flange of the bushing (in red) needs to be in contact with cast iron part.

- Insert spacer plate (40) to avoid contact between main beam and rivet head.

2. Assembly overview after installing the Northern main tracker beam pivot support



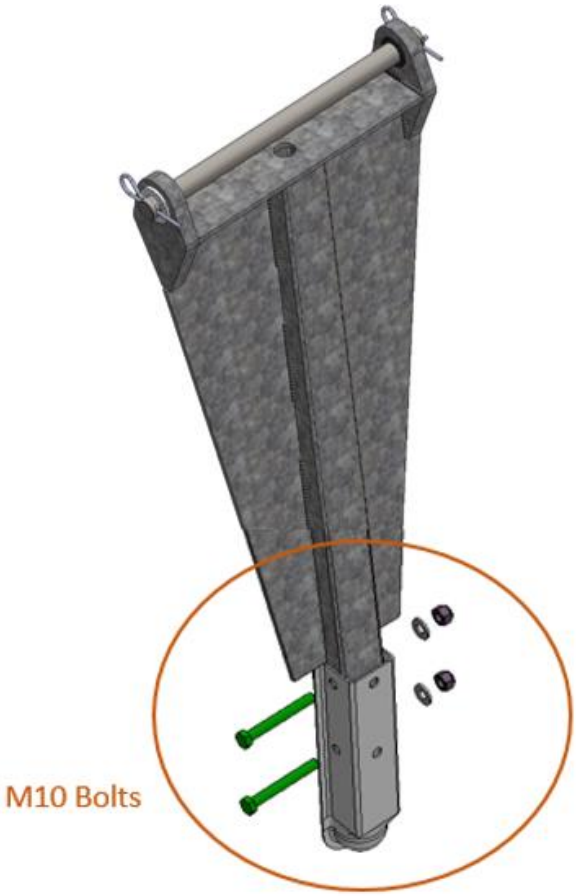
- Assembly overview at this stage

3. Pre-assembly of the upper steering arm

Hardware required:

N°	Part Name	Material	Quantity	Type
	Hex. Head Bolt	Galvanised Steel 8.8 Grade	2	ISO4014 M10x80
	Plain washer	Galvanised Steel 8.8 Grade	2	ISO M10
	Hex. Nut Nylstop	ZN Nickel	2	ISO7040 M10

VIDEO LINK: https://files.helioslite.net/doc/videos/12-UpperSteeringArmAssembly.webm



Assembly quantity per tracker: x1

Bolted connection M10 (x2)

Hexagonal bolt / ISO4014 M10x80
Self-locking nut / M10
Plain washer / ISO M10

- Insert the hitch connector at the end of steering arm
- Insert two (x2) hexagonal bolt (M10x80)
- Insert one (x1) plain washer and one (x1) self-locking nut opposite to the head.
- Tighten the nut M10 at required torque value.

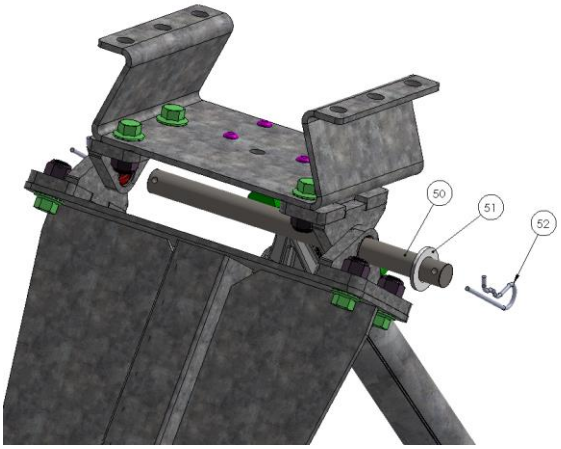
46 Nm
FASTENING TORQUE REQUIRED

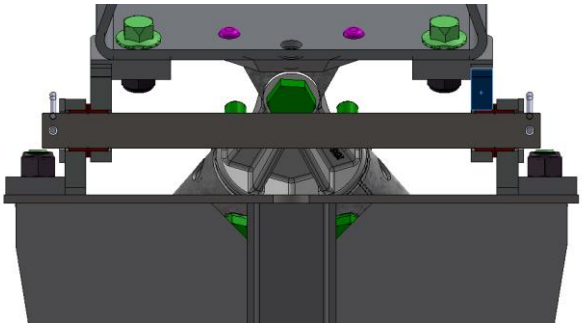
4. Attach the upper steering arm to the **North tracker beam pivot support** and connect it to the ball mounting fixture

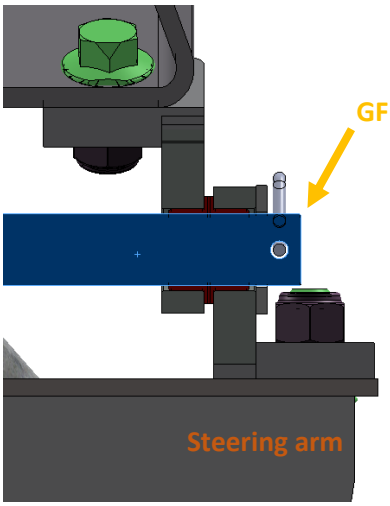
Hardware required:

N°	Part Name	Material	Quantity	Type
50	Top Steering Shaft	Stainless Steel	1	
51	Plain washer	Galvanised Steel 8.8 Grade	2	ISO M20
52	Beta Pin	Stainless Steel	2	

VIDEO LINK: https://files.helioslite.net/doc/videos/12-UpperSteeringArm_GlobalAssembly.webm



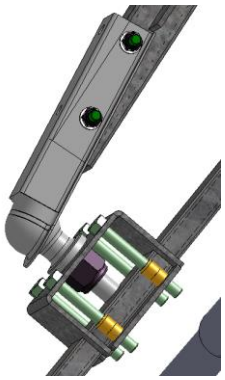




Assembly quantity per tracker: x1

50: Shaft of top steering arm
51: Plain washer / ISO M20
52: Beta pin D

- Connect the upper steering arm with the D20 shaft to the tracker main beam pivot support
- Add one (x1) plain washer M20 and one (x1) Beta Pin D4.5 on each side
- Connect coupling connector to the ball of the mounting fixture



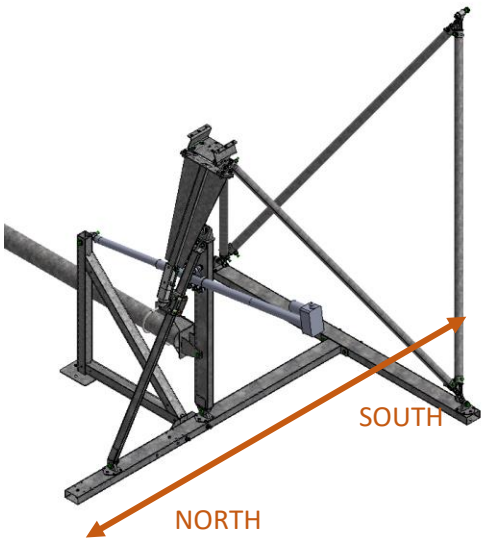
IMPORTANT NOTICE !

Rotation along East-West & North-South axis will be blocked.

CAUTION

Flange of the bushing GFM2023-11 (in red) needs to be facing as presented below

5. Assembly overview after installation of the tracker upper steering arm

	• Assembly overview at this stage

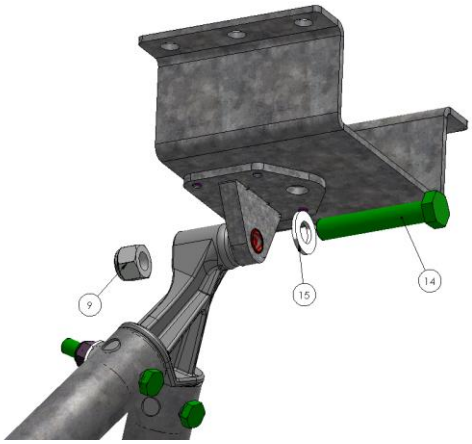
6. Install the second pivot support (South config.) main tracker beam pivot support at the South side of the pole structure assembly.

Hardware required:

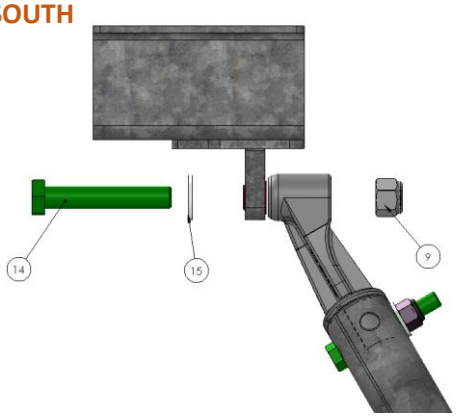
N°	Part Name	Material	Quantity	Type
14	Hex. Head Bolt	Galvanised Steel 8.8 Grade	1	ISO4014 M16x90
15	Plain washer	Galvanised Steel 8.8 Grade	1	ISO M16
9	Hex. Nut Nylstop	ZN Nickel	1	ISO7040 M16

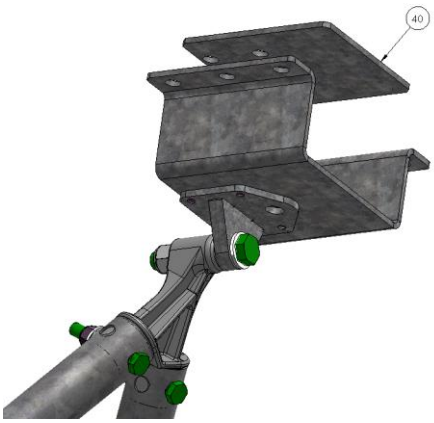
VIDEO LINK: https://files.helioslite.net/doc/videos/12-PivotSupport_NorthConfig.webm

SOUTH SIDE



SOUTH





Assembly quantity per tracker: x1

Bolted connection (x1)

14: Hexagonal bolt / ISO4014 M16x90
15: Plain washer / ISO M16
9: Self-locking nut / M16

- Insert one (x1) hexagonal bolt (M16x90) with one (x1) plain washer under its head
- Tight the bolt (thread M16 inside cast iron part)
- Add self-locking nut for safety purpose
- Tight the nut M16

⚠	**CAUTION**

Only snug-tight the M16 nut to permit free rotation of the main beam pivot around the North-South axis.

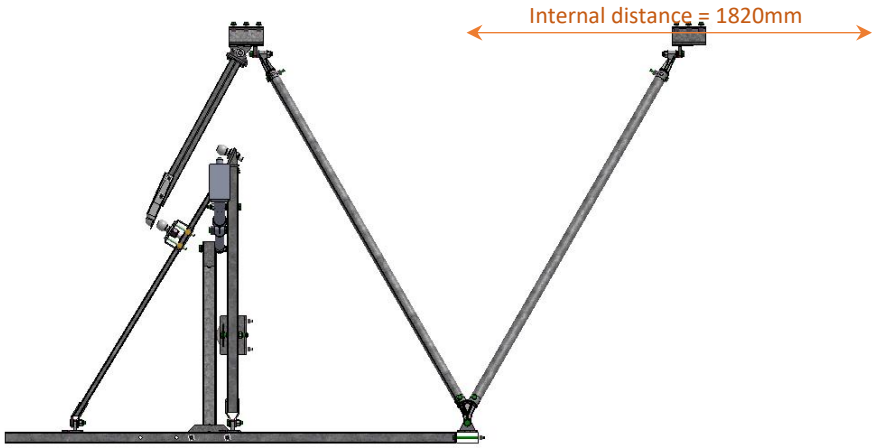
This rotation is very important as required for the global tracker movement.

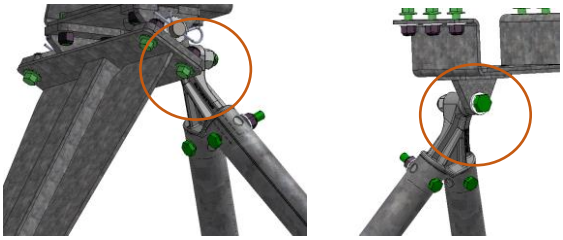
⚠	**CAUTION**

Flange of the bushing (in red) needs to be in contact with cast iron part.

- Insert spacer plate (40) to avoid contact between main beam and rivet head.

7. Install the main beam on the U parts by adjusting the position from the South side as described below.





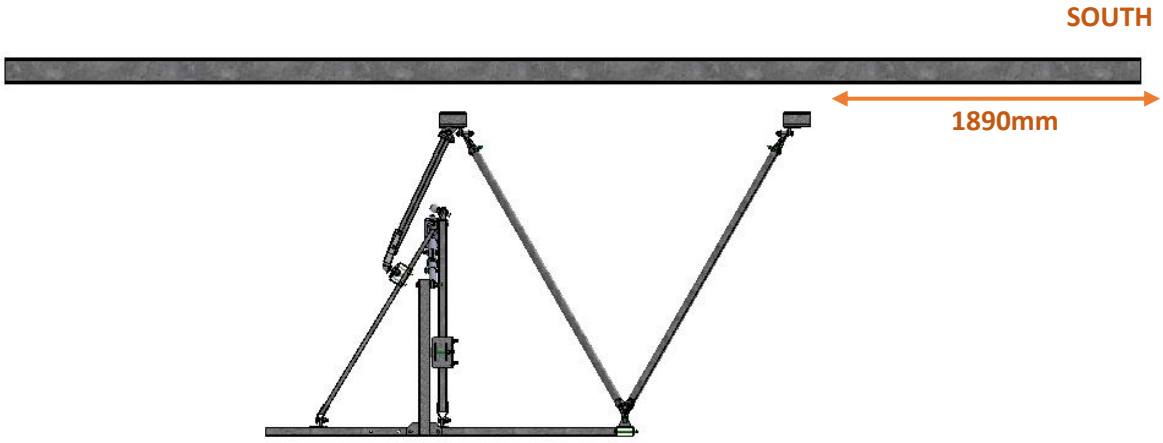
Prior to main beam installation, the internal distance between the two pivots supports needs to be adjusted to 1820mm. A ratchet strap connected to the two can iron part can be used for this action.

⚠	**CAUTION**

Sufficient number of people (minimum 3) on site will be required to lift and install the main beam (Total weight = 90 KG). **For safety reason it will be better to use forklift for this step.**

Position of the main beam from the SOUTH Side

It will be also important to mark the center of the main beam. **Half distance is 3250mm.**

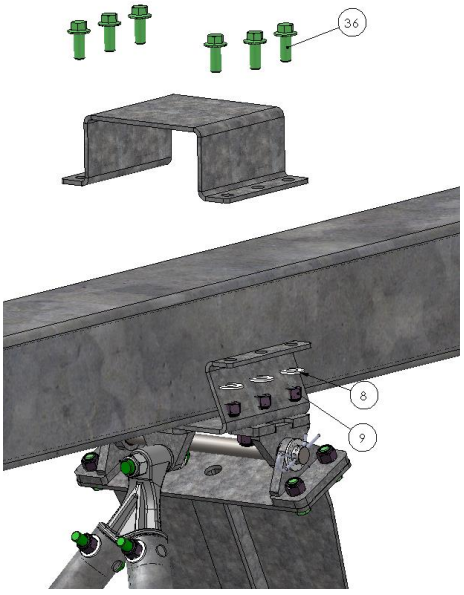


Hardware required:

N°	Part Name	Material	Quantity	Type
8	Plain washer	Galvanised Steel 8.8 Grade	12	ISO M12
9	Hex. Nut Nylstop	ZN Nickel	12	ISO7040 M12
36	Screw Tensilock	ZN Nickel	12	ISO4017 M12x30

VIDEO LINK: https://files.helioslite.net/doc/videos/12-MainBeamAssembly.webm

SOUTH SIDE



NORTH SIDE

Bolted connection (x6)

36: Screw Tensilock / ISO4017 M12x30
8: Plain washer / ISO M12
9: Self-locking nut / M12

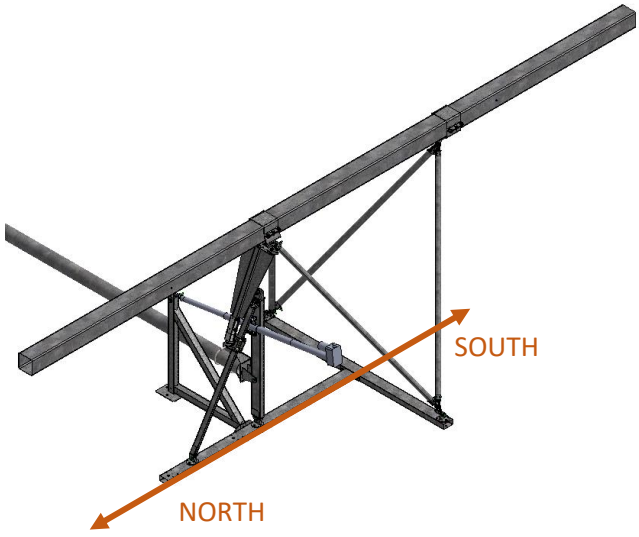
- Insert six (x6) screw tensilock (M12x30)
- Insert six (x6) plain washer M12 and six (x6) Nylstop nut M12 at the opposite side
- Tight the nuts M12 at the required torque value

79 Nm
FASTENING TORQUE REQUIRED

Repeat this operation for the NORTH side.

8. Assembly overview after installing the main beam

	• Assembly overview at this stage

13 Module Support Assembly

13.1 Material details

The module supports are the rails used to support the array of PV modules. It is installed on the main beam.

	
Module support rail **(x7)** Main dimension: 2.9m Weight: Approx. 9.6 kg	Bottom fixation support **(x7)** Main dimension: 0.21m Weight: Approx. 0.4 kg
	
Support rail U fixation **(x7)** Main dimension: 0.18m Weight: Approx. 0.5 kg	Platine de renfort (x7) Dimension principale : 0.25m Poids : Environ 0.31 kg

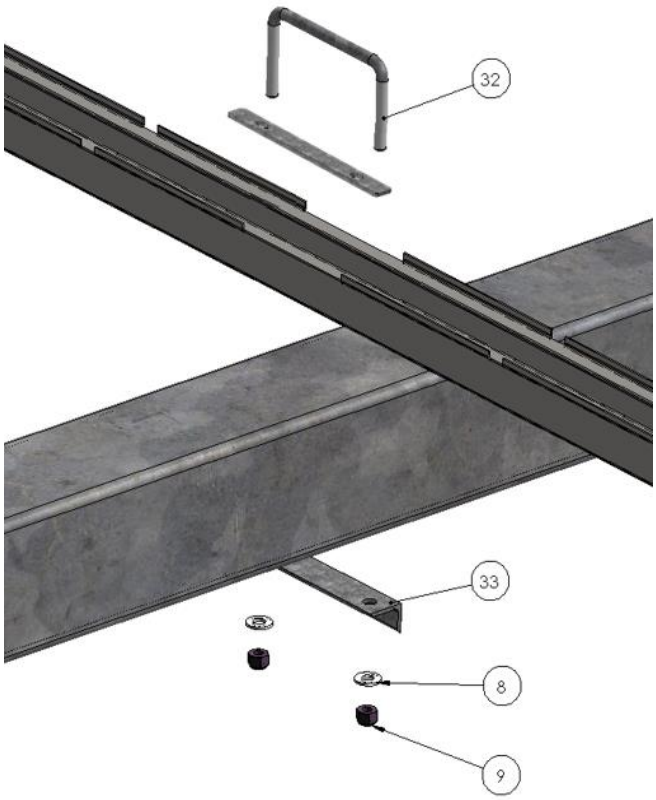
13.2 Installation

Hardware required:

N°	Part Name	Material	Quantity	Type
8	Plain washer	Galvanised Steel 8.8 Grade	14	ISO M12
9	Hex. Nut Nylstop	ZN Nickel	14	ISO7040 M12

1. Installation of center module support rail

VIDEO LINK: https://files.helioslite.net/doc/videos/13-Module_Support_Assembly.webm



Assembly quantity per tracker: x7

11: Plain washer ISO M12
12: Hex. Nut Nylstop ISO7040 M12

- Insert U bolt (32) through the module support rail
- Place the module support rail at the center of the main beam
- Insert two (x2) washers M12 and two (x2) Nylstop nuts M12

CAUTION

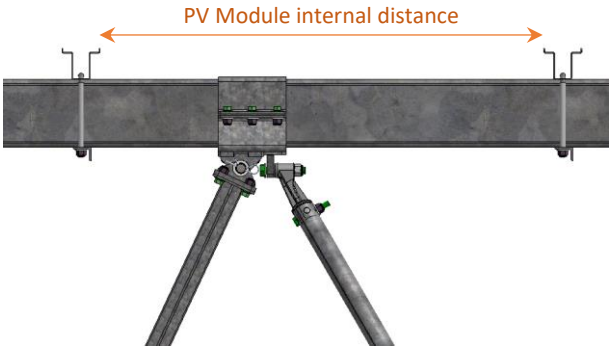
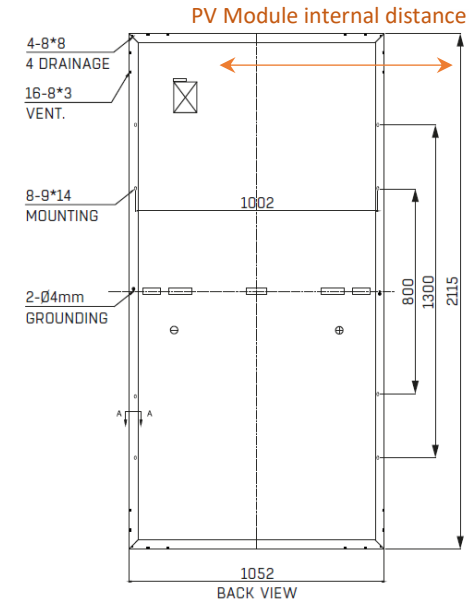
- Check the perpendicularity between the module support rail and main beam
- Tight the nuts M12 at the required torque value

46 Nm
FASTENING TORQUE REQUIRED

2. Assembly overview after assembly of the module support rails.

	• Assembly overview at this stage

3. Repeat the operation for the six (x6) remaining module support rails.

 	• For the six (x6) remaining module support rails on each side of the central one, pre-tightened Nylstop nuts to allow translation movement of the rails during PV module installation.

	• Assembly overview at this stage

14 PV Module installation

14.1 Material details

HeliosLite tracker HLPV12 can support twelve (x12) modules 60 or 72 cells, Mono or Bi-facial. PV modules installed in a landscape configuration.

	
PV Module 60 or 72 cells **(x12)**	

14.2 Installation

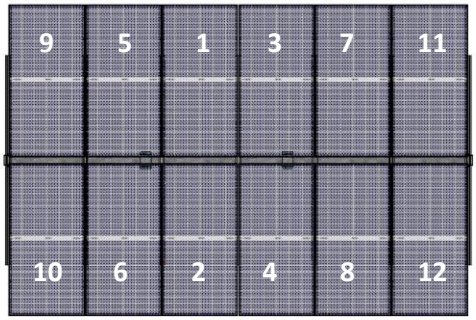
1. Insert PV Module on top of PV module support rails by following indications below

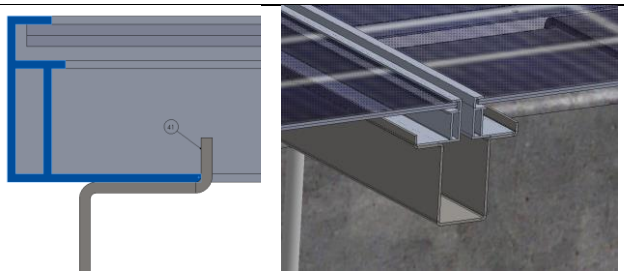
Hardware required:

N°	Part Name	Material	Quantity	Type
18	ARaymond Cinch Wide	Magnelis	48	

VIDEO LINK: https://files.helioslite.net/doc/videos/14-PV_Module_Installation.webm

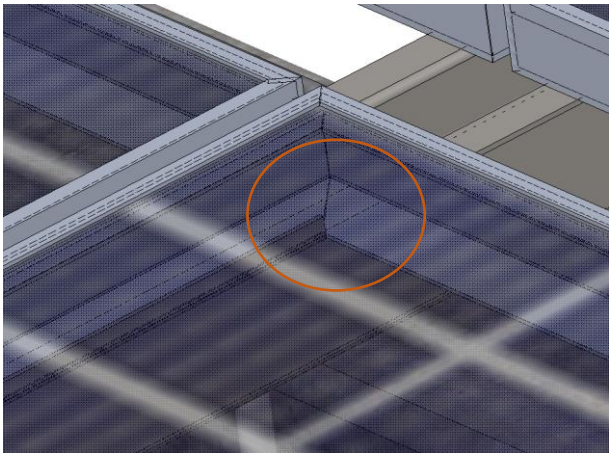
- Start with central module and then continue as described below to avoid tracker unbalance.

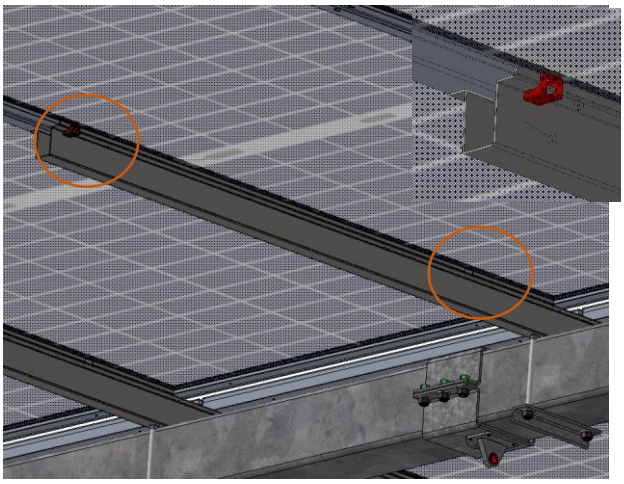




1st reference for PV module assembly:

- Lip of the aluminium frame of PV module needs to be in contact with PV module support rail (see pictures on the left)

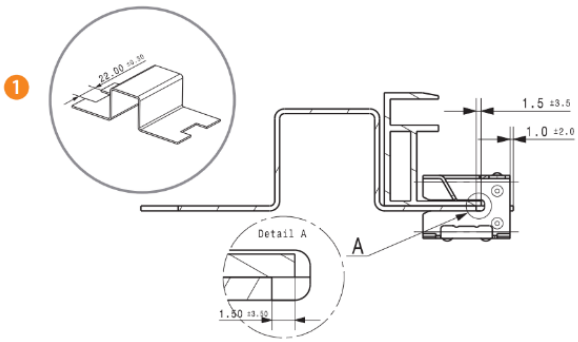




Physical contact with the aluminium frame

VIDEO LINK:
https://files.helioslite.net/doc/videos/14-PV_Module_Clip_Installation.webm

PowAR CINCH™



2nd reference for PV module assembly:

- On module width, the lip of Aluminium frame of PV module needs to be in contact with vertical face at the center of the PV module support rail.

Remark: For bifacial module, back face of PV module are shifted from the main beam to avoid shadow projection.

- With these 2 references PV module position is fully defined.

- When the PV module is correctly inserted and aluminium frame in contact with PV module support rails as described above, the ARaymond clips can be inserted.
- Use four (x4) Cinch per module to fix each module to the support rails. ARaymond clips positions are defined by specific windows on module support rail (see picture on the left).

IMPORTANT NOTICE !

The claw of the PV module clip must be positioned on the top side to enter into physical contact with the module aluminum frame for grounding purpose

WARNING

- Check that distance between aluminium module frame and module rail support is consistent with ARaymond specifications

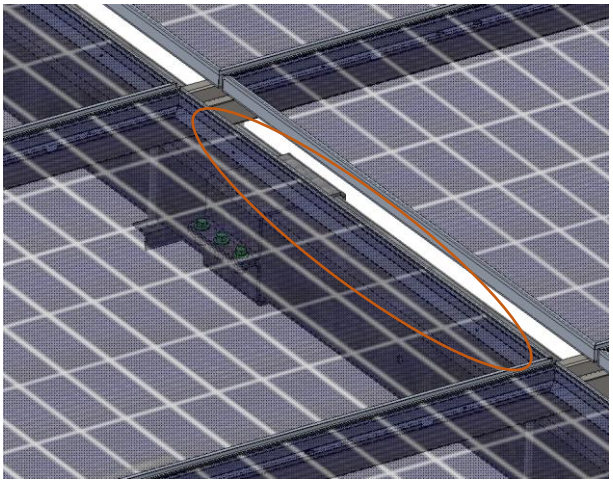
IMPORTANT NOTICE !

powAR-Cinch is certified for PV module grounding (CEI 60349-1:2004 8.2.4.1)

2. PV cable routing

Hardware required:

N°	Part Name	Material	Quantity	Reference
	Edge clip	Magnelis steel	12	51632001



Assembly quantity per tracker: x12

- These edge clips are used for PV cable routing. 2 cables can be routed in parallel.
- The lip of the aluminium frame width of PV module can be used to support PV modules cables with one (x1) cable clip.

15 Lifting procedure

	**WARNING**

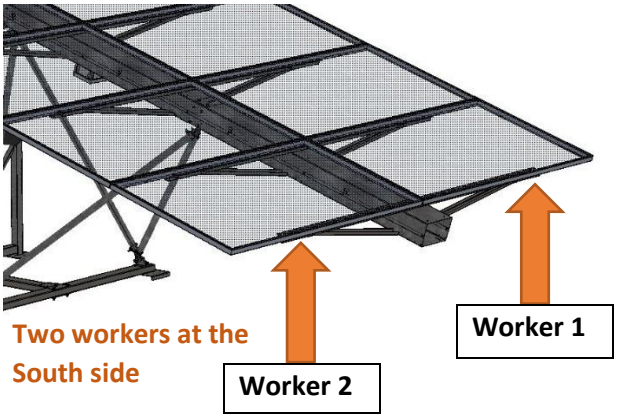
Use proper lifting techniques when handling relevant components. Use proper equipment to protect against bodily injury.

			
Hard hat	Safety goggles	Appropriate shoes	Gloves

	**WARNING**

Check that all bolts are tightened before lifting

For final lifting, the tracker must be perfectly balanced, with the same number of PV modules installed on both sides of the main tracker beam. A **minimum** of three (x3) workers are required to perform the final follower lifting operation. We advise you to be 5 people so that everything goes well. This lifting operation **should not be carried out manually** if there is too much wind on the site.



- Two workers must be positioned at the Southern side of the tracker to support the main beam assembly during the lifting procedure (~15 – 20 KG)

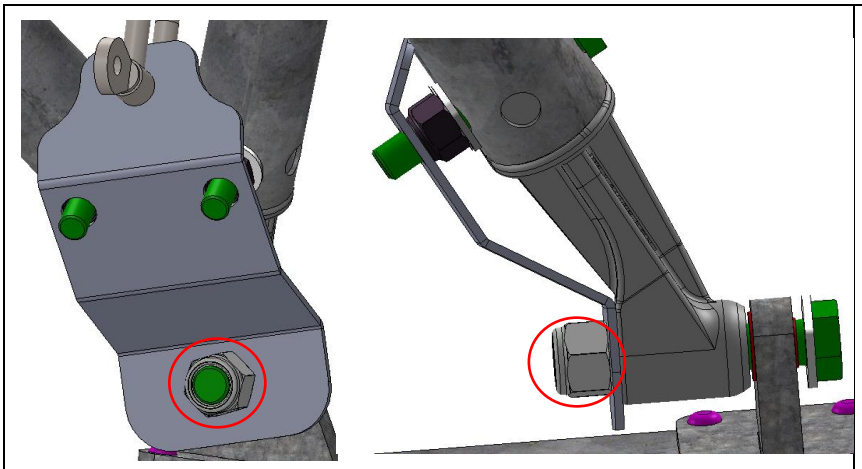
- A second worker must be positioned next to the steering arm to disconnect and reconnect the coupling connector

WARNING

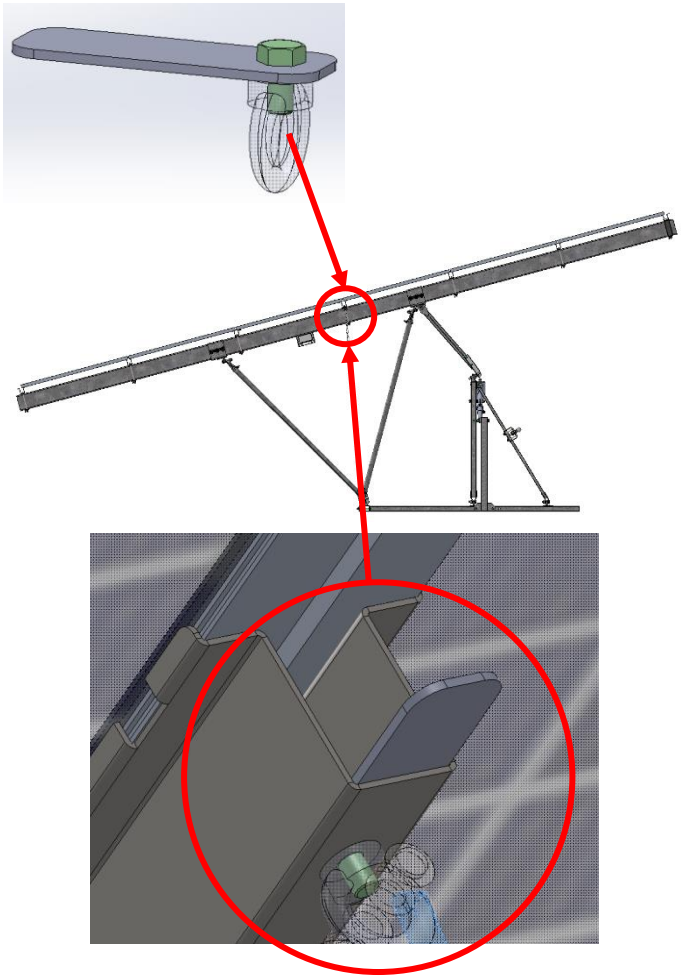
Never push directly on module frame. Always use tracker structure to push tracker system.

- The third worker should disconnect the coupling connector from the ball mounting fixture, ask the other workers to slowly lower the front side of the tracker main beam and then re-connect the coupling connector to the ball located at the top side of the tracker lower steering arm.

Installation of the locking system to block the rotation of the main beam of the tracker during the tilting operation:

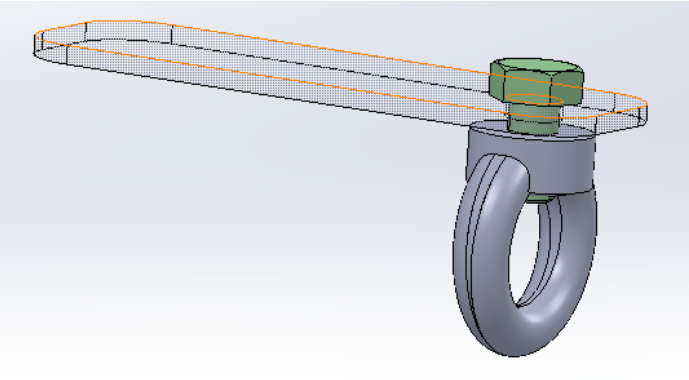


Install the 2 securing plates of the clamping system on the 2 lower castings of the tracker mast. To install these tie-down plates, it is necessary to completely unscrew the nut located on the bottom bolt of the mast, insert the plate into the 3 holes and then screw this nut back on.

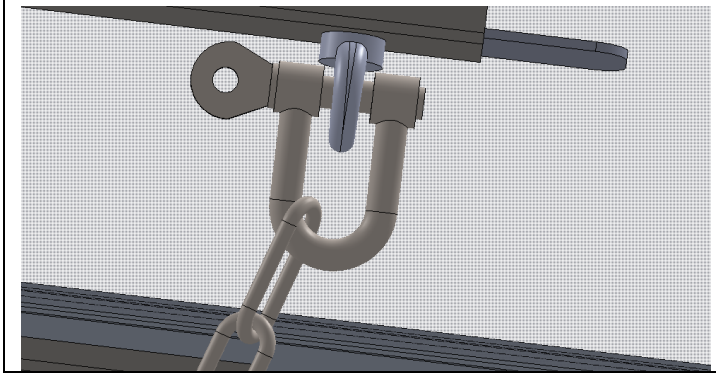


Then install the two upper plates of the locking system in the holes located at two ends of the support rail located in the middle of the main beam of the tracker.

Make sure to position the longest side of this plate towards the outside so that handling is easier.



Once the platen bolt is correctly inserted into the hole in the rail, hand-tighten an eye nut onto this bolt.



Once the eye nuts are in place on the 2 plates, attach the chains of the clamping system to each eye using shackles.

The lower end of each chain of the locking system is equipped with a tensioner. Attach the turnbuckles to the 2 tie-down plates of the clamping system using 2 shackles.

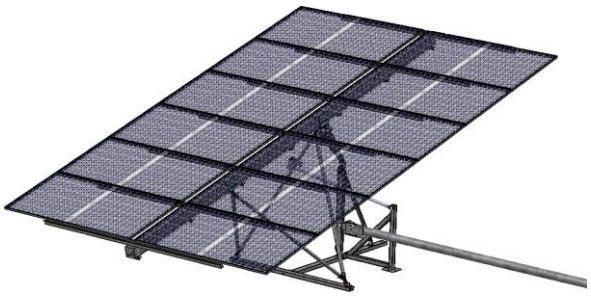
Adjust the position of the 2 tensioners to slightly tension the 2 chains of the clamping system.

The rotation of the tracker is temporarily blocked by this locking system to be able to carry out the tilting operation of the tracker in good safety conditions.

Once you have completed the tracker tilting operation, it is necessary to remove all parts of the locking system.

Don't forget to then put back in place the 2 locking nuts of the lower pivot points of the tracker.

1. Assembly overview after lifting.

	• Assembly overview at this stage • Check that arrow is facing the **[OK]** range after final connection 

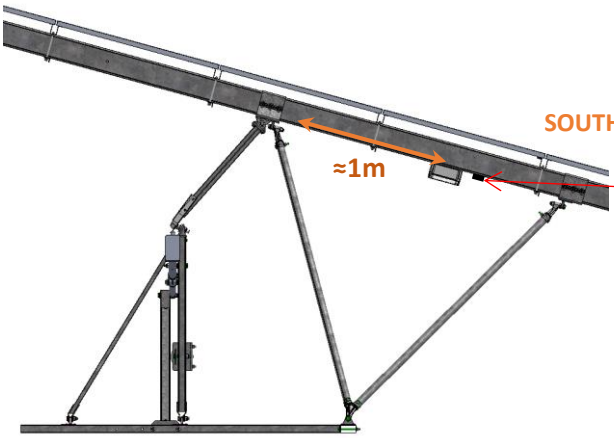
16 Electrical connection

16.1 Master connection

1. Master controller box fixation onto the “master” tracker.

Hardware required:

N°	Part Name	Material	Quantity	Type
	Fibox wall mount set	-	2	FP 10674
	Self-Powered Master (SPM)	-	1	SPM
	Self-drilling screws	Steel	4	
	Self-tapping screws	Steel	4	



- Install four (x4) wall mount set at the back of SPM enclosure

- Fix the control box support plate to the underside of the tracker main beam using 4 self-drilling screws. This support plate must be attached at a distance of ~1m from the upper pivot point of the main beam of the tracker.

- Install the SPM control box onto this support plate with four (x4) self-tapping screws.

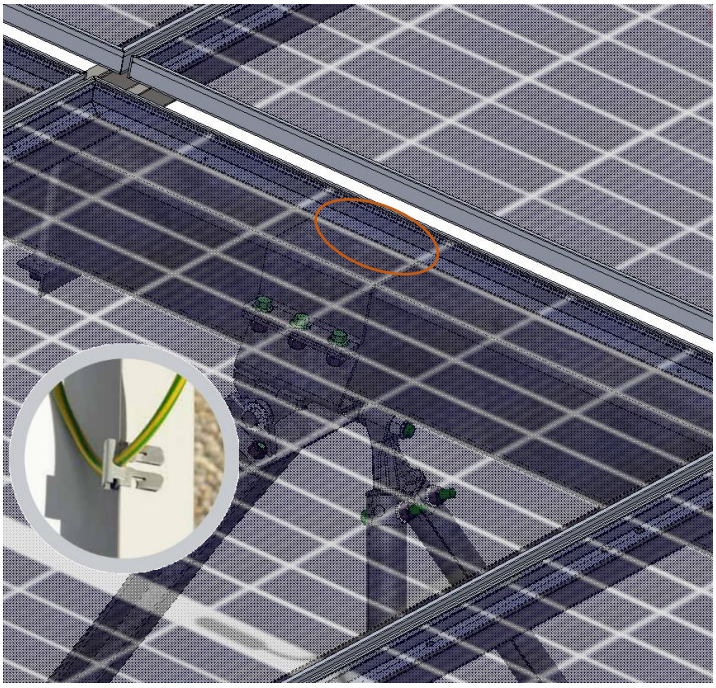
⚠	**WARNING**

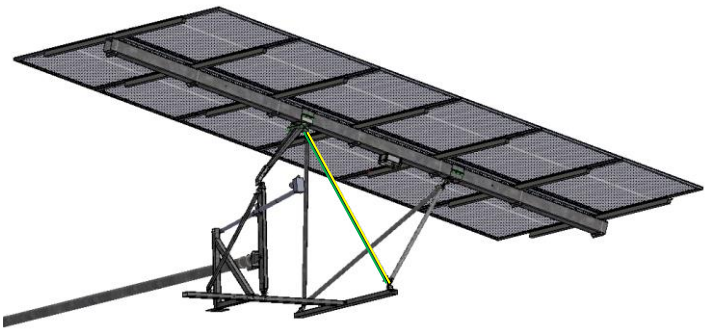
ORIENT THE MC4 CONNECTORS TOWARD THE GROUND (SOUTH SIDE)

16.2 Tracker grounding

Hardware required:

Part Name	Material	Quantity	Type
Grounding cable	Copper	3m	6mm² flexible grounding copper wire
Rayvolt Grounding Clip	Steel C67S – Zinc Tin Alloy	1	220492006
Grounding Lug	Tin plated copper	1	TE 35665





- Connect one end of the grounding copper wire to the PV module Aluminium frame above Northern pivot support with a Rayvolt grounding clip.
- Rout the grounding copper wire along one of the North tube of the tracker pole structure.
- Connect the lower end of the grounding copper wire to a grounding rod.
- Depending on local grounding codes and the electrical conductivity of the soil, the threaded shank of a foundation anchor may be used as a suitable grounding point.
- If the tracker is installed on a concrete slab, connect the cable to an earth stake driven into the ground to a depth of at least 1m.

17 Summary of parts and appendix

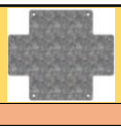
17.1 Components

	Picture	SUPPLIER	DESIGNATION	DESCRIPTION	MATERIAL	QTY. FOR A SINGLE TRACKER	QTY. FOR 2 TRACKERS WITH 1 LINKAGE ROD - Rev6,0
2. Upper Steering Arm		WINTERHOFF	684001 RULQUIN	Coupling connection	ZN Nickel	1	2
		Standard Fastener	SCREW HM10x80	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	WASHER M10	ISO 7089	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	Nut Nysltop M10	NFE 25409	Zinc Nickel Type P8	2	4
		Standard Fastener	Beta Pin	4mm diameter	Stainless Steel A2	2	4
		Standard Fastener	WASHER M20	ISO 7089	Hot Dip Galvanized or GEOMET500	2	4
3. Bottom steering arm		RULQUIN	684002 RULQUIN	Coupling ball	ZN Nickel	1	2
		Standard Fastener	SCREW HM12x80	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	SCREW HM16x60	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	WASHER M12	ISO 7089	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	WASHER M16	ISO 7089	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	Nut Nysltop M12	NFE 25409	Zinc Nickel Type P8	2	4
		Standard Fastener	Nut Nysltop M16	NFE 25409	Zinc Nickel Type P8	2	4
4. Pole structure		Standard Fastener	SCREW HM12x80	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	8	16
		Standard Fastener	SCREW HM16x90	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	4	8
		Standard Fastener	WASHER M12	ISO 7089	Hot Dip Galvanized or GEOMET500	8	16
		Standard Fastener	WASHER M16	ISO 7089	Hot Dip Galvanized or GEOMET500	4	8
		Standard Fastener	Nut Nysltop M12	NFE 25409	Zinc Nickel Type P8	8	16
		Standard Fastener	Nut Nysltop M16	NFE 25409	Zinc Nickel Type P8	4	8
5. Main beam assembly		Standard Fastener	WASHER M12	ISO 7089	Hot Dip Galvanized or GEOMET500	26	52
		Standard Fastener	Nut Nysltop M12	NFE 25409	Zinc Nickel Type P8	26	52
		Standard Fastener	SCREW TENSILOCK M12x30	ISO 4017 Class 8,8	ZN Nickel	12	24
6. Actuator assembly (without bracket)		Standard Fastener	SCREW HM12x110	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	4	8
		Standard Fastener	WASHER M16	ISO 7089	Hot Dip Galvanized or GEOMET500	11	22
		Standard Fastener	Nut Nysltop M16	NFE 25409	Zinc Nickel Type P8	2	4
		Standard Fastener	SCREW HM16x140	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	2	4

7. Linkage Rod		Standard Fastener	WASHER M12	ISO 7089	Hot Dip Galvanized or GEOMET500	0	8
		Standard Fastener	Nut Nysltop M12	NFE 25409	Zinc Nickel Type P8	0	8
		Standard Fastener	SCREW HM16x100	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	0	1
		Standard Fastener	WASHER M16	ISO 7089	Hot Dip Galvanized or GEOMET500	0	1
		Standard Fastener	Nut Nysltop M16	NFE 25409	Zinc Nickel Type P8	0	1
		SFS INTEC (FR)	SFS INTEC 10,6x23	SFS INTEC	Steel	0	4

8. Actuator Support		Standard Fastener	WASHER M12	ISO 7089	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	Nut Nysltop M12	NFE 25409	Zinc Nickel Type P8	2	4
		Standard Fastener	SCREW HM12x130	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	2	4
9. Chassis base		Standard Fastener	WASHER M12	ISO 7089	Hot Dip Galvanized or GEOMET500	2	4
		Standard Fastener	Nut Nysltop M12	NFE 25409	Zinc Nickel Type P8	2	4
		Standard Fastener	SCREW HM12x130	ISO 4014 Class 8,8	Hot Dip Galvanized or GEOMET500	2	4
10. PV module installation		ARAYMOND	PowAR Cinch Wide (with or without locking feature)	Clips Araymond	MAGNELIS	48	96
		ARAYMOND	Edge clip		MAGNELIS	12	24

ITEM NO.	PART VIEW SCHEMA DE LA PIECE	Drawing N° N° de Plan	Description Description	Material Matière	Treatment Traiteme	Plate thickness épaisseur	Rev. Number	QTY. FOR A SINGLE TRACKER QTE POUR UNE	Weight [kg]
1000 - Module Support									
2		HLPV12-2020-14	Module Support Rail	S350 / YS310	agnelis ZM3	2	D	7	9,56
3		HLPV12-2020-14	Support Rail U Fixation	s 8,8 Equiva	G - EN-ISO-1	-	B	7	0,47
4		HLPV12-2020-15	Bottom Fixation support	S235 / YS240	G - EN-ISO-1	L Section - 40x25x4mm	C	7	0,42
5		LPV12-2020-15	Top Rail Reinforcement Plate	S235 / YS240	G - EN-ISO-1	5	A	7	0,31
6		HLPV12-2020-16	Pivot Support Plate (Top Config.)	S235 / YS240	G - EN-ISO-1	5	C	2	2,16
7		HLPV12-2020-16	Pivot Support Plate Bottom (North Config.)	S235 / YS240	G - EN-ISO-1	5	B	1	2,46
8		HLPV12-2020-16	Pivot Spacer Plate	S235 / YS240	G - EN-ISO-1	5	C	2	0,81
9		HLPV12-2020-17	Pivot Support Plate (Bottom Config.)	S235 / YS240	G - EN-ISO-1	5	D	1	2,16
10		HLPV12-2020-18	Pivot Support for Steering Arm	S350 / YS310	G - EN-ISO-1	-	C	1	2,15

11		HLPV12-2020-12(	SPM Controller Mount Plate	S350 / YS310	G - EN-ISO-1	1	A	1	0,29
2000 - Pole Structure									
10		HLPV12-2018-21(	Cast Iron Part (Machined)	EN-GJS-500-7 EN-GJS-400-15 EN-GJS-400	G - EN-ISO-1	-	A	4	1,57
11		HLPV12-2018-22(	Pole Structure - Tube	S235 / YS240	G - EN-ISO-1	2	A	4	4,35
3000 - Steering Arm									
12		HLPV12-2020-31	Welded Main Beam - Lower Steering Arm	S235 / YS240	G - EN-ISO-1	5mm + Hollow section 100x50x4	C	1	10,49
13		LPV12-2018-31	Welded Reinforcement Beam Lower Steering Arm	S235 / YS240	G - EN-ISO-1	Hollow section 50x25x3	C	1	4,7
14		HLPV12-2018-31	Lower Steering Arm - Coupling Ball Support	S235 / YS240	G - EN-ISO-1	Hollow section 80x40x5	B	1	1,28
15		HLPV12-2020-33(	Upper Steering Arm Assembly - Tilt17°	S235 / YS240	G - EN-ISO-1	-	B	1	9,9
16		LPV12-2020-34(	Top Steering Shaft	316L	tainless Stee	-	B	1	0,78
4000 - CHASSIS STRUCTURE									
17		HLPV12-2018-41	North/South Beam for Tracker Base	S235 / YS240	G - EN-ISO-1	Hollow section 100x50x2	D	1	9,51
18		HLPV12-2018-42	East/West Beam for Tracker Base	S235 / YS240	G - EN-ISO-1	Hollow section 100x50x2	D	1	9,21
19		HLPV12-2018-43(	Pivot Support for Chassis Base **CHANGE TO WELDED ASSEMBLY**	S350 / YS310	G - EN-ISO-1	6-14	C	6	0,54
20		HLPV12-2020-45(	Actuator Mounting Support	S235 / YS240	G - EN-ISO-1	-	B	1	20,1

9000 - LIFTING TOOL									
24		HLPV12-2018-91(	Lifting Tool (Rivkle, Nuts, Bolts are included)	S235 / YS240	G - EN-ISO-1	5	B	y to be defined per project	
								TOTAL WEIGHT	271
OPTIONAL PARTS									
1		HLPV12-2020-11(	Half Main Beam 3,0m for Mechanical Ass.	S235 / YS240	G - EN-ISO-1	3mm	B	1	41,54
2		HLPV12-2020-11	Half Main Beam 3,5m for Mechanical Ass.	S235 / YS240	G - EN-ISO-1	3mm	B	1	48,48
3		HLPV12-2020-15	Reinforcement Module Support Rail	S350 / YS310	agnelis ZM3	2mm	B	7	3,32
4		HLPV12-2020-19	Main Tracker Connection Plate	S235 / YS240	G - EN-ISO-1	5mm	C	2	3,11

List of parts required per master controller						
Picture	**Qty per master**	**Item**	**Note**	**Manufacturer / Distributor**	**Ref manufacturer**	**Ref Distributor**
	**1**	Self Powered Master (SPM) controller		HeliosLite	HL-SMP-R04	
	1	End 1: 12-05AMMM-SL7000 (IP67), End 2: 12-05AFFM-SL7000 (IP67), L=3M, Cable Specification: UL20549		Amphenol LTW	HLPV-M12BUS-3M	
List of parts required per additional tracker						
Picture	**Qty per tracker**	**Item**	**Note**	**Manufacturer / Distributor**	**Ref manufacturer**	**Ref Distributor**
	**1**	Potted motor driver board		HeliosLite	HL-MD-X.X	
	1	End 1: 12-05AMMM-SL7000 (IP67), End 2: 12-05AFFM-SL7000 (IP67), L=10M, Cable Specification: UL20549		Amphenol LTW	HLPV-M12BUS-10M	
	**1**	M12 T connector		Amphenol LTW	SS-050505-FMF-TS001	
	**1**	Araymond Rayvolt grounding clip		ARaymond		240-492
	**3m**	Flexible 6 mm² insulated copper grounding wire H07V-K	3m per tracker unit	SolarHertz		4010
	**1**	Œillet à sertir, TE Connectivity, série SOLISTRAND, Non-isolé, Contacts plaqués Etain, M16 (5/8), 8 AWG,		Radiospares		795-2153
	**16**	Clips for attaching PV module cables		ARaymond		51632001

17.2 Annex

Guide de serrage contrôlé (suite)

μ = 0.15 *tableau de serrage pour visserie noire ou zinguée, lubrification sommaire (état de livraison) (μ=coefficient de frottement MOYEN)*

ISO 272			Classe de qualité boulonnerie acier ISO898-1													
			5,6		5,8		6,8		8,8*		9,8**		10,9		12,9	
d mm	ISO mm	mm	Cs	Fo	Cs	Fo	Cs	Fo	Cs	Fo	Cs	Fo	Cs	Fo	Cs	Fo
1,6**	0,35	3,2	0,075	234	0,105	327	0,120	374	0,160	499	0,180	561	0,235	732	0,275	857
2**	0,40	4	0,159	388	0,222	544	0,254	621	0,339	829	0,381	932	0,498	1 217	0,582	1 424
2,5**	0,45	5	0,330	648	0,463	907	0,529	1 036	0,705	1 382	0,793	1 555	1,04	2 030	1,21	2 375
3	0,50	5,5	0,57	972	0,80	1 362	0,91	1 556	1,21	2 075	1,38	2 335	1,79	3 048	2,09	3 567
4	0,70	7	1,30	1 685	1,83	2 359	2,09	2 696	2,78	3 594	3,16	4 044	4,09	5 279	4,79	6 178
5	0,80	8	2,59	2 759	3,62	3 862	4,14	4 414	5,5	5 886	6,27	6 626	8,1	8 645	9,5	10 116
6	1	10	4,49	3 891	6,2	5 448	7,1	6 226	9,5	8 302	10,84	9 334	14,0	12 194	16,4	14 269
8	1,25	13	10,9	7 145	15,2	10 003	17,4	11 432	23	15 242	26,34	17 146	34	22 388	40	26 198
10	1,50	16	21	11 379	30	15 930	34	18 206	46	24 275	52	27 313	67	35 655	79	41 724
12	1,75	18	37	16 594	52	23 231	59	26 550	79	35 401	90	39 835	116	51 995	136	60 845
14	2	21	59	22 789	83	31 905	95	36 463	127	48 618	143	54 570	187	71408	219	83 563
16	2	24	93	31 385	130	43 939	148	50 216	198	66 955	224	75 422	291	98 340	341	115 079
18	2,5	27	128	38 123	179	53 373	205	60 998	283	83 746			402	119 454	471	139 787
20	2,5	30	182	49 039	254	68 655	291	78 463	402	107 941			570	153 657	667	179 811
22	2,5	34	250	61 326	350	85 857	400	98 123	552	134 806			783	192 157	917	224 865
24	3	36	313	70 616	438	98 863	500	112 986	691	155 489			981	221 266	1 148	258 928
27	3	41	463	93 042	649	130 259	741	148 868	1 022	204 577			1 452	291 534	1 700	341 157
30	3,5	46	628	113 045	880	158 263	1 005	180 872	1 387	248 811			1 969	354 209	2 305	414 500
33	3,5	50	854	141 009	1 195	197 412	1 366	225 614	1 884	310 343			2 676	441 828	3 132	517 033
36	4	55	1 096	165 409	1 534	231 573	1 754	264 655	2 418	363 974			3 435	518 282	4 020	606 501
39	4	60	1 424	198 910	1 994	278 474	2 279	318 257	3 139	437 669			4 463	623 253	5 223	729 339
42**	4,5	65	1 760	227 588	2 464	318 624	2 816	364 141	3 872	500 694			5 515	713 110	6 453	834 491
45**	4,5	70	2 203	266 613	3 085	373 258	3 525	426 580	4 847	586 548			6 903	835 386	8 079	977 579
48**	5	75	2 659	299 530	3 722	419 342	4 254	479 248	5 849	658 966			8 330	938 528	9 748	1 098 277
52**	5	80	3 425	359 684	4 795	503 558	5 480	575 495	7 335	791 306			10 731	1 127 011	12 558	1 318 843
56**	5,5	85	4 270	415 172	5 978	581 240	6 832	664 275	9 394	913 378			13 379	1 300 871	15 656	1 522 296
60**	5,5	90	5 306	485 416	7 428	679 583	8 490	776 666	11 673	1 067 916			16 625	1 520 971	19 455	1 779 860
64**	6	95	6 382	548 969	8 935	768 556	10 212	878 350	14 041	1 207 731			19 998	1 720 102	23 402	2 012 885

Figure 17-1 Torque wrench guide

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