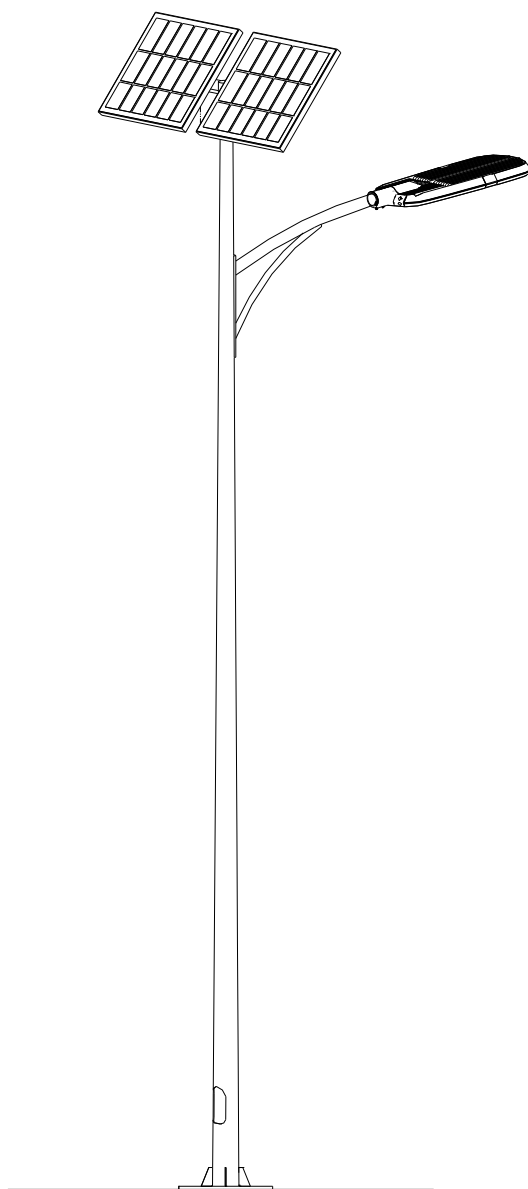




Solar LED Road Lighting System Mounting Instructions ---Underground solution--- (For new connectors) (V2.0)



Note:

Always ask Signify representative to get the latest version of this document with latest technical information along with new products.

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Important Safety Notice

The Signify mounting instructions must be strictly followed, else, the warranty will be void, and potential application, reliability, or safety issues may arise. The mounting instructions in this document is for the standard non-integrated solar road lighting system. If any deviations required (such as multi systems sharing pole/base/component, component change, wiring change, installation location change, drawing change, etc..) from this MI sheet according to special application, it is must to contact with Signify representative for special instructions. Otherwise, the deviation from the standard instructions may cause abnormal system operation or even dangerous situation, and void the warranty.

Important Safety Notice for battery:

The battery presents a risk of electrical shock and a high short circuit current. Only a qualified Signify service representative who is knowledgeable in batteries and the required precautions, is permitted to service the battery. Keep unauthorized personnel away from batteries.

Danger:

1. Do not short the battery terminals.
2. Do not operate the battery beyond published voltage, current and temperature limits.
3. Do not reverse connections(polarity) from the charger to the battery.
4. Do not incinerate, crush or disassemble the battery.
5. Do not over charge or over discharge the battery.
6. Do not dispose of the batteries in a fire, the batteries may explode.
7. Do not pierce the battery with a sharp object such as a needle.
8. Do not hit the battery with a hammer, step on it, throw it, or drop it to cause strong shock.
9. Do not use the battery if it has serious scars or deformation.
10. Stop using the battery if abnormal heat, odor, discoloration, deformation or any abnormal condition is detected.
11. If liquid leaking from the battery gets into your eyes, do not rub your eyes. Wash them well with clean water and see a doctor immediately.
12. Do not heat or throw the battery into a fire, water.
13. Never test the battery charge by shorting its +/- terminals.
14. Avoid any charge/discharge when moving batteries. Wear all appropriate safety clothing and equipment.

Caution:

1. The misuse of the battery could result in human injury and/or battery damage. In no event will Signify be responsible or liable for either indirect or consequential damage or injury that may result from the misuse of the battery.
2. Use tools with insulated gloves to avoid inadvertent shorts.
3. Verify circuit polarities before connecting.
4. Disconnect the charging source like PV, AC grid and load before connecting or disconnecting the battery.
5. Power connections must remain tight to avoid excessive heating from a loose connection.

Warning:

1. The solar lighting system contains batteries. Lack of preventative maintenance could reduce the battery's lifetime or even be dangerous. Check the application environment regularly (lighting performance, Shading on PV panel).
2. Failure to replace the battery before it becomes exhausted may cause the case to crack, possibly releasing electrolytes from the battery inside and resulting in secondary issues such as odor, smoke, and fire.
3. The battery must be properly maintained according to the "Trouble shooting & Maintenance" section in these mounting instructions. This is essential for the safety and reliability of the lighting system.

4. Do not dispose the batteries except through the channels in accordance with local, state and federal regulations.
5. Customer or pole provider must validate the final system shock test, vibration test, wind load test, snow load test and other reliability/safety testing including underground solution, on pole solution, All-in-One solution, PBC solution, LBC solution.
6. During transportation, keep the battery from acutely vibration, impacting, solarization, drenching.

Important Safety Notice special for LFP battery:

- For LFP batteries used in On-Pole solution/PBC solution/All-in-One solution/LBC solution, make sure the temperature of battery never exceeds 60°C at battery surface at any instance for safety reasons.
- Provide a duct from the battery chamber to the pole in case of the LFP battery.(Page 16).

Important Safety Notice special for PV panel:

- You can refer to Page 7 for PV panel bracket important requirement and validation-related statements, the type and quantity of mounting nuts/bolts should strictly follow the instructions given.
- You can refer to Page 8 for PV panel bracket diagram.
- Any breach of this guideline will result in Signify not having any liability.
- PV Panel has to be cleaned quarterly or whenever it is not performing well according to specifications, whichever is earlier. If not cleaned for more than 6 months, the dust/pollution on PV panel will affect battery life as the battery may remain discharged and won't get enough power to charge, voiding the battery warranty.

Important Safety Notice special for Charge Controller:

- You can refer to Page 27&28 for important guideline on the controller, please strictly follow the sequence of the connection.
For connection sequence: 1) Others, 2) Luminaire, 3) Battery, 3) PV panel.
For disconnection sequence: 1) PV panel, 2) Battery, 3) Luminaire, 4) others.
- For hybrid controller, make sure switch off the AC grid before the connection.
- For hybrid controller, after finishing system installation, If there is no AC grid input, the warranty will be breached, the battery's lifetime will be reduced, and the system's performance will be downgraded.
- For LFP battery, the NTC (Thermal Sensor) must be connected well, otherwise the battery will be damaged, potentially causing a dangerous situation.
- Disconnect all sources of power to the charge controller before installation.
- Please strictly follow the right connections as per connection diagram. Any reverse polarity and loose connection may lead to damage in solar CC, Any short circuit of any wire from the CC to any other components will also damage the CC.
- Every Charge Controller must be configured only after it is connected to the battery. For Parameters setting, please consult with Signify.
- Any breach of this guideline will result in Signify not having any liability.

Warranty and Performance Notice

The Signify Mounting Instructions must be strictly followed, otherwise, the warranty will be void and potential application, reliability, safety or battery performance issues may arise, including but not limited to the items below:

For the Battery

- Warranty conditions mentioned in warranty letter and/or MI sheet should be strictly followed.
- Operate the battery within published voltage, current and temperature limits mentioned in datasheet.
- NTC(Thermal Sensor) must be connected, otherwise, the warranty will be void. See the wiring diagram and battery installation drawing in subsequent pages of the MI and Datasheet.
- The battery CANNOT be over-charged by changing CC threshold or over-discharged by the increased load.
- Following the battery chamber design in Field System MI sheet with >200mm thick soil to keep the battery chamber temperature (Page 16).
For LFP battery, the battery chamber typical temperature should be between 0 and +45°C (Charging), -20°C ~ +45°C (Discharging), with a maximum peak +45°C ±5°C for 5 hours /day duration and a maximum of 3 months duration with the required DoD% as per battery warranty clauses or warranty letter.
- For storage, if the storage duration is more than 3 months for LFP battery, then the battery must have one complete charge and discharge cycle and charge cycle again. To use a long time stored battery in a solar system installation, the battery AH/Wh should be measured first. An estimate of battery Wh can be measured by known system power x no. of its working hours with the help of Signify solar charge controller discharge function at the indoor environment with the ambient temp between 20°C to 27°C. Keep storage temperature LFP -10°C ~ +35°C, the battery storage should not be more than 4 months to avoid warranty void.
- DO NOT change the load dimming profile in field without Signify authority.
- If PV panel is not clean, the PV panel output wattage will be reduced, and the battery will not get enough charging power, then the battery will be damaged after long period insufficient charging and warranty will be void.
- If any system component is found not connected or not maintained as per MI sheet, all warranties for PV, battery and CC will be void. (Page 27/28/32/33/34/35).
- For hybrid solution, if No AC power grid connected, the warranty of the battery & CC will be void. (Page 28)
- Any cutting of connector or cables of the battery or any other components will void the warranty.

For the PV panel

- Warranty conditions mentioned in warranty letter and/or MI sheet should be strictly followed.
- Operate the PV panel within published voltage, current and temperature limits mentioned in datasheet.
- The warranty does not apply to misuse, abuse, neglect, vandalism or accident, alteration, improper installation, repair or modifications that do not strictly follow the manufacturer's instructions or electrical spikes or surges, lightning, flood, fire, accidental breakage or other events outside signify's control.
- Any modification of location holes or improper mounting of PV frames will void the warranty.
- Improper maintenances will void the warranty.
- The PV Panel has to be cleaned quarterly or whenever it is not performing well according to specifications, whichever is earlier. If not cleaned for more than 6 months, the dust/pollution on PV panel will affect battery life as the battery may remain discharged and won't get enough power to charge, voiding the battery warranty.
- The PV panel should face south for the northern hemisphere and vice-versa; otherwise, the battery won't get enough power, and the warranty will be void (Pages 21/22).
- If there are tree shadings on the PV panel, please trim the trees to avoid shadings on the PV panels.
- Please follow the PV panel bracket design as per MI sheet ,(page 7/8/9/10), or the warranty will be void.
- Cutting the connectors and cables will void the warranty.
- Keep the PV panel frame grounded with a resistance value $\leq 0.5\Omega$ (mandatory for dry/desert area).

Warranty and Performance Notice

For the Charge Controller

- Warranty conditions mentioned in warranty letter and/or MI sheet should be strictly followed.
- Operate the charge controller within published voltage, current and temperature limits mentioned in datasheet.
- The warranty does not apply to misuse, abuse, neglect, vandalism or accident, alteration, improper installation, repair or modifications that do not strictly follow the manufacturer's instructions or electrical spikes or surges, lightning, flood, fire, accidental breakage or other events outside Signify's control.
- Any cutting of the components in the charge controller or the connectors and the cables will void the warranty.
- The temperature on the charge controller should never exceed the Tc point; otherwise, the warranty will be void.

For the System:

- The Field MI sheet for all components including CC, battery, PV panel and system should be strictly followed.
- Follow connection and disconnection method as mentioned in Page 27/28.
- The warnings given in page 17/18/21/23/25/26/27/28/30/33/34/35 are mandatory for safety and performance. The warranty will be void if not followed.

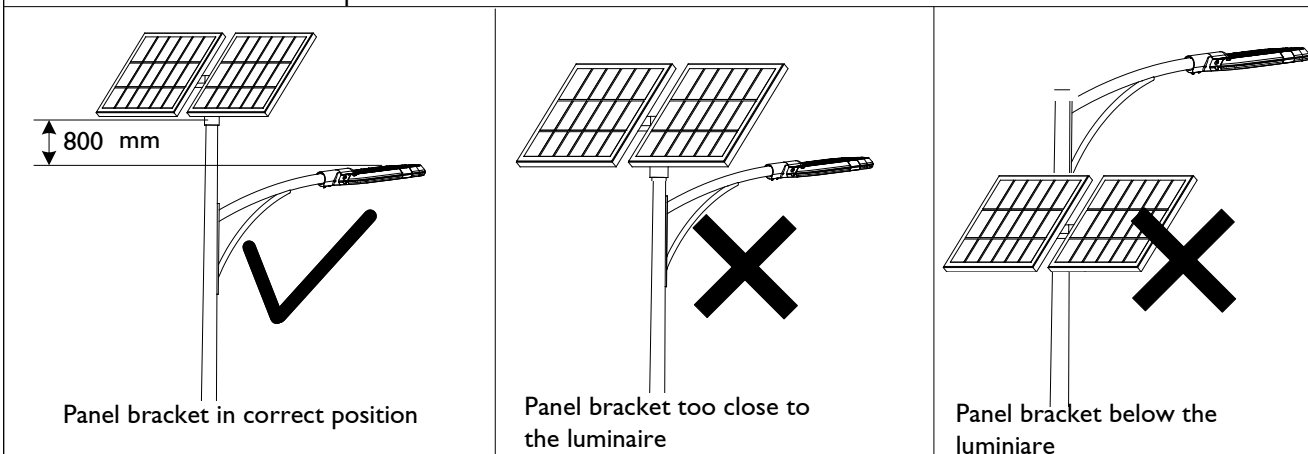
Abbreviation:

Abbreviation	Description
CC	Charge Controller
CCC	Combo Charge Controller
HCU	Hybrid Control Unit
IR	Infrared
OCU	Off-grid Control Unit
PV	Photo Voltaic
PSU	Power Supply Unit
BLE	Bluetooth Low Energy
RMU	Remote Monitoring Unit
MPPT	Maximum Power Point Tracking
LFP	Lithium Iron Phosphate
NTC	Negative Temperature Coefficient (Thermal sensor)
LA	Lead acid
AIO	All in One
PBC	PV panel + Battery + Controller integration
LBC	Luminaire + Battery + Controller integration
SRI	Solar Reflectance Index (SRI)

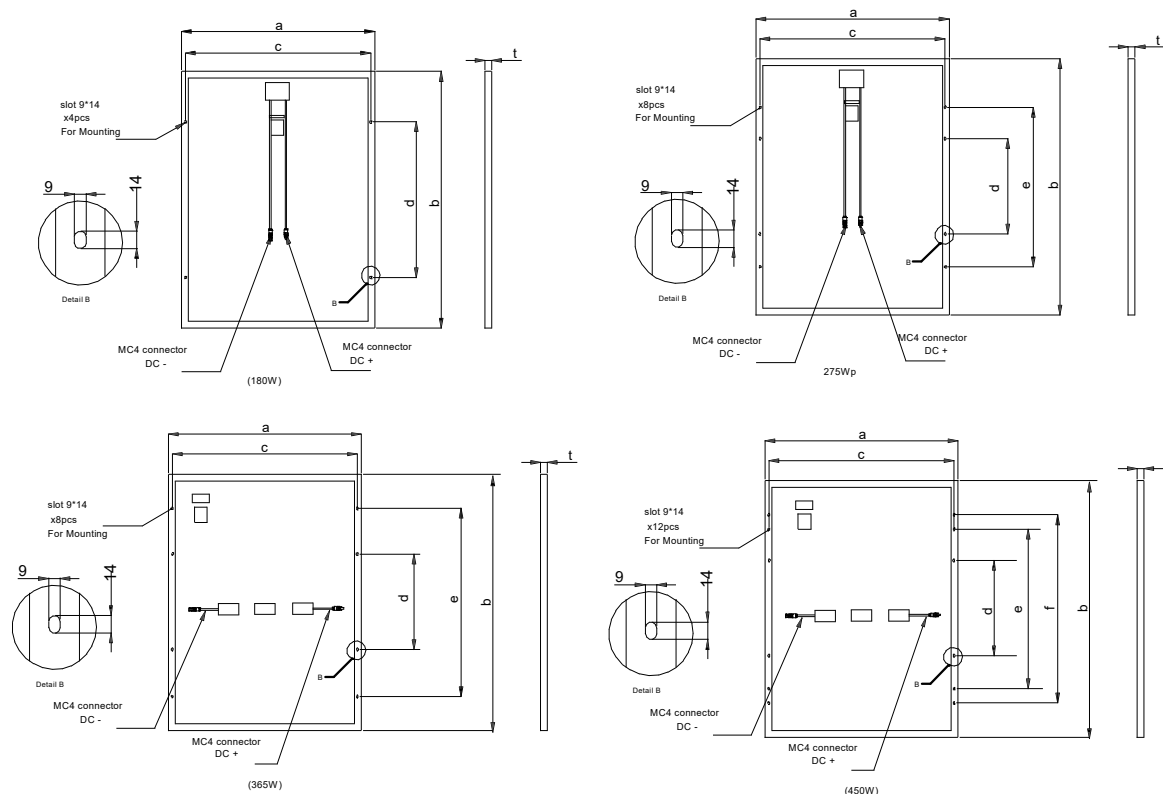
A---PV panel bracket requirements:

A1 PV Panel Position

The vertical distance from the bracket bottom to the luminaire arm must be more than 800 mm to avoid conflict between the PV panel and the luminaire.

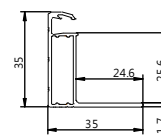


A2 Panel Specification



Note:

- Refer to next page (Page 8) for important notices of PV panel.
- All the mounting holes which are given by Signify on the PV panel must be fixed well.
- The description information and dimensions may be different due to PV technical development. You should ask Signify representative to get the newest list.
- For the PV panel types which not mentioned in this MI sheet, please refer to the Datasheet of the PV panel.



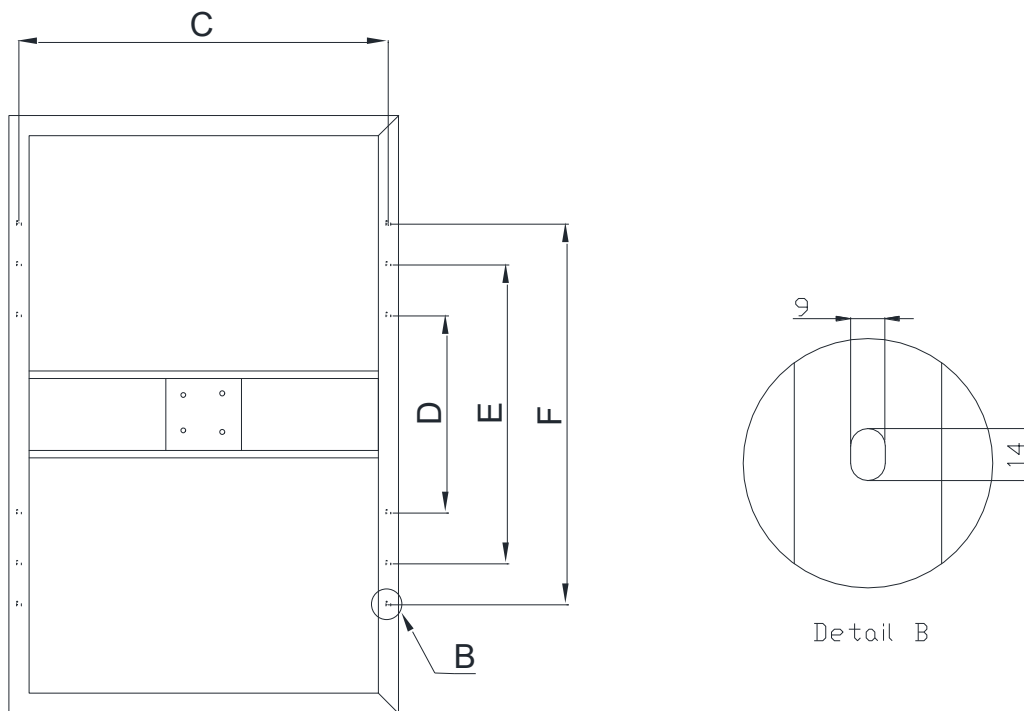
Frame section

12NC	SAP	Net Weight (kg)	a(mm)	b(mm)	c(mm)	d(mm)	e(mm)	f(mm)	t(mm)	Mounting holes size (mm)	Bolts/nuts/Flat washers/Spring washers
911401832703	Flat PV panel 180Wp 43V Topcon	10.5	1134	764	1084	400	NA	NA	35	9*14	M8(x4pcs)
911401832803	Flat PV panel 275Wp 43V Topcon	15.5	1134	1120	1084	400	740	NA	35	9*14	M8(x8pcs)
911401832903	Flat PV panel 365Wp 43V Topcon	20.5	1134	1485	1084	400	1033	NA	35	9*14	M8(x8pcs)
911401833003	Flat PV panel 450Wp 43V Topcon	26.2	1134	1903	1084	400	990	1451	35	9*14	M8(x12pcs)

- The PV panel bracket is not provided by Signify. It is designed and manufactured by a third party. The design can vary depending on their FEM calculation and material choices according to local, state, and federal regulations. The third party must validate the PV panel bracket strength through tests such as wind force test, snow load test, vibration test, shock test, and other reliability and safety tests.
- A full frame bracket surrounding the PV panel is required; a weak PV panel bracket may cause low PV panel performance due to micro cracks, or even safety accidents.
- The mounting hole dimensions on the bracket (C, D, E, F) must align with the mounting hole dimensions on the PV panel (c, d, e, f). Refer to A2. The hole size/shape on the bracket must be designed by the pole and bracket provider or customer according to FEM calculation, material choices, and fixing parts choices (proposed sizes and shapes are shown below).
- Any connection stress caused by a mismatch of holes between the PV panel bracket and the PV panel may cause stress to the panel and eventually lead to low PV performance due to micro cracks.
- Bolt fixing torque values should be defined by the installer based on the washers, bolts, and nuts used, and a torque wrench should be used to tighten them. All the mounting holes provided by Signify on the PV panel must be fixed properly.
- Bracket, Bolts, Nuts, Flat washers and spring washers must be anti-corrosion.

Remark: Third party can be customer, pole & bracket provider, installer etc.

Location of Holes on Bracket



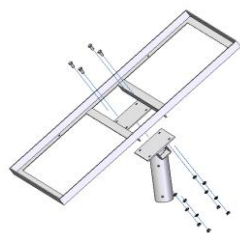
Each PV panel bracket design shall be validated by third party before putting whole system on the pole by applying:

- 1) Vibration test according to ANSI C136.31.
- 2) Shock test by applying two pulses half sine 11ms of 40g one after another resulting with no damage, no breakage, no opening of the product.
- 3) Region specific requirements/specifications must be validated within region/customer.

**Warranty will be
voided if not followed**

A4 PV Panel Bracket Diagram:

- A full frame bracket surrounding the PV panel is requested. The PV bracket/mounting support should cover rigidly and fully to all surfaces of the PV panel's integrated aluminum frame.
- All the mounting holes provided on the PV panel must be fixed well.
- If mounting and installation are done outside Signify, the mounting/installation safety, reliability should be validated by the respective supplier/customer.



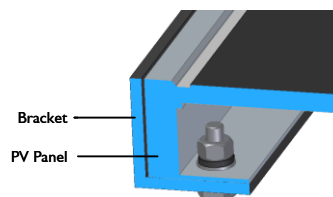
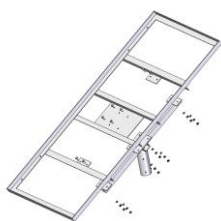
Single PV Panel

4pcs mounting holes on each PV panel



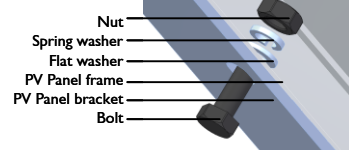
Single PV Panel

8pcs/12pcs mounting holes on each PV panel



Bracket

PV Panel



Nut

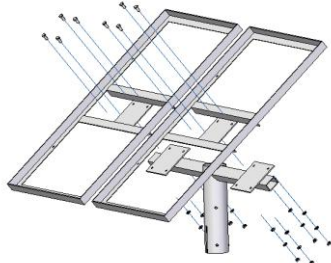
Spring washer

Flat washer

PV Panel frame

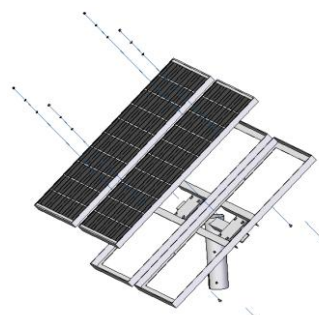
PV Panel bracket

Bolt



Dual PV Panels

4pcs mounting holes on each PV panel



Dual PV Panels

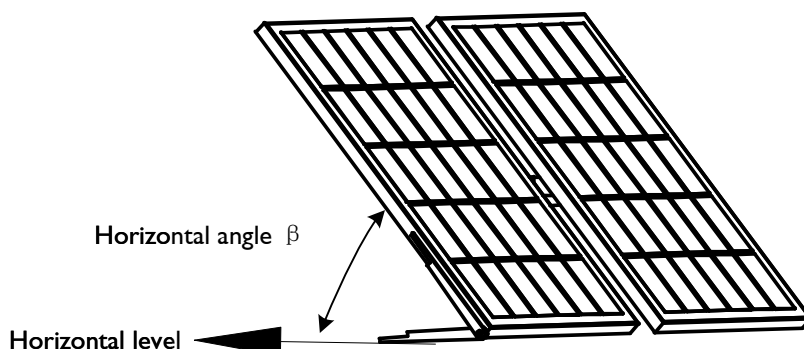
8pcs/12pcs mounting holes on each PV panel



(Pictures are for reference only)

A5 Panel Bracket Tilt Angle

The tilt (horizontal angle β) of the bracket must follow Signify's requirements to ensure the maximum amount of sunlight is gained. You can contact Signify representative to get it.

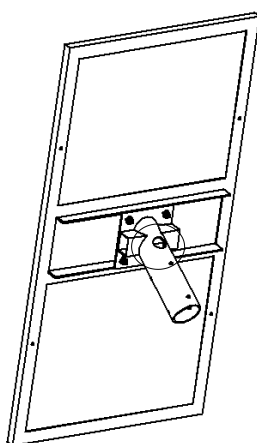
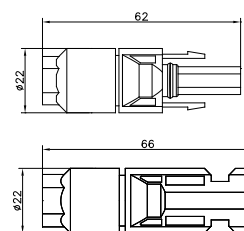


Warranty will be voided if not followed

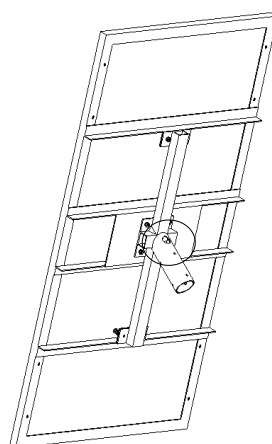
A6 Cable Entry Requirements on Bracket

1. The size of cable entry MUST NOT be less than $\varnothing 40\text{mm}$.
2. The bracket must be well grounded with the pole, with a resistance value $\leq 0.5\Omega$.
3. The type of cable entry may vary depend on bracket design. It must prevent rain from ingress and allow the cable connector to get through.
4. It is recommended to adopt a cover like below on the hole to avoid rain ingress.
5. A full frame bracket surrounding the PV panel is required.

Cable connector size: (MC4)



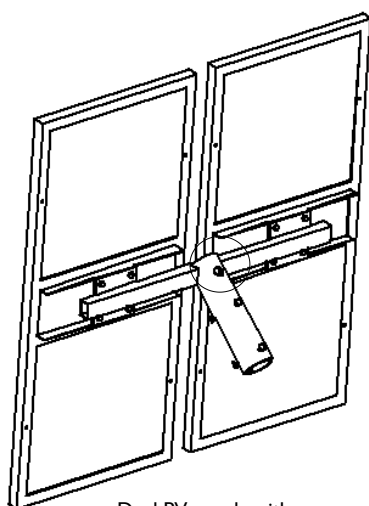
Single PV panel with
4pcs mounting holes



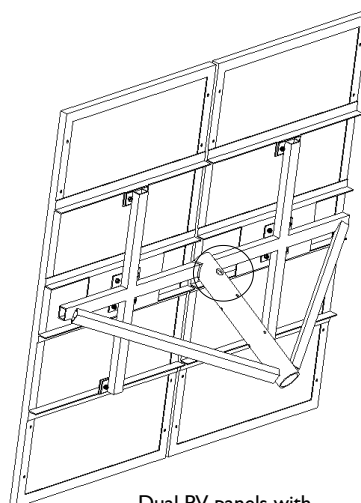
Single PV panel with 8pcs/
12pcs mounting holes



Hole cover



Dual PV panels with
4pcs mounting holes
on each PV panel



Dual PV panels with
8pcs/12pcs mounting
holes on each PV panel

**Warranty will be
voided if not followed**

Note:

The picture showing bracket fixing is for instruction only. They should be designed by customer or bracket provider.

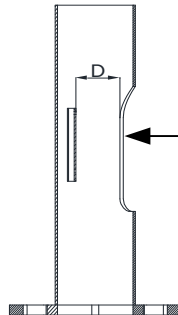
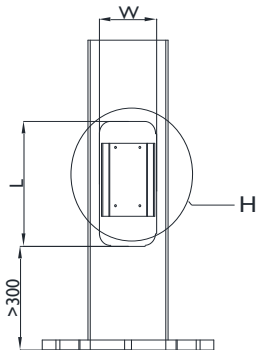
(Pictures are for reference only)

B---Pole requirements:

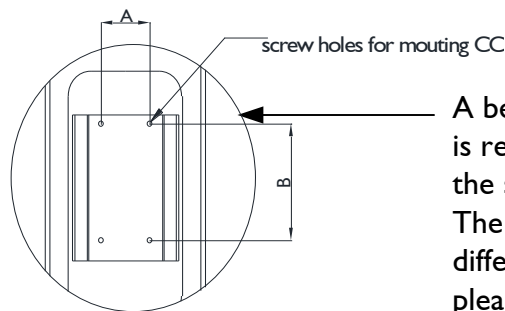
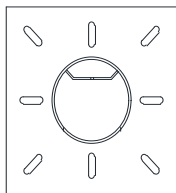
BI Service Hatch Requirements:

Remark: Third party can be customer, pole & bracket provider, installer etc.

The service hatch size may impact the pole strength. Therefore, the third party must base their FEM calculation and material choices according to local, state, and federal regulations to validate pole strength through tests such as wind force test, snow load test, vibration test, shock test, and other reliability and safety tests after assembling the respective PV panels, luminaires, and batteries (if they are using an on-pole solution, they should consider the battery as well).

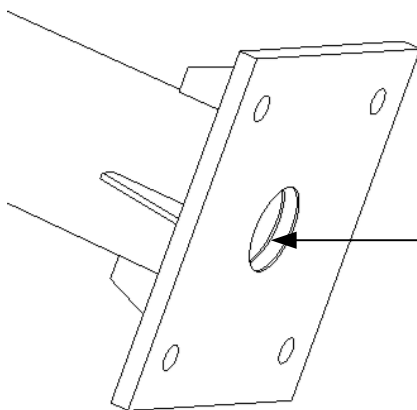


The service hatch dimensions must be fit for controller and battery (if the battery inside the pole) to put in easily. (Refer to the data sheet of Controller for detail dimensions)
The service hatch must be located over >300 mm from the ground.



Detail H

A beam or a sheet in the service hatch is required with screw holes for fixing the solar charge controller.
The screw holes quantity and size are different between different controllers, please refer to latest controller datasheet first for detail information.
Make sure the controller are fixed well after installation.



There must be a big hole ($\geq \text{Ø}70\text{mm}$) on the bottom to allow the battery power cables, ventilation tube and NTC(Thermal Sensor) cable get through.
(For Hybrid solution, the AC grid cables need getting in from this hole also.)

Note:

The pole fixing holes are for instruction only.
They should be designed by customer or pole provider.

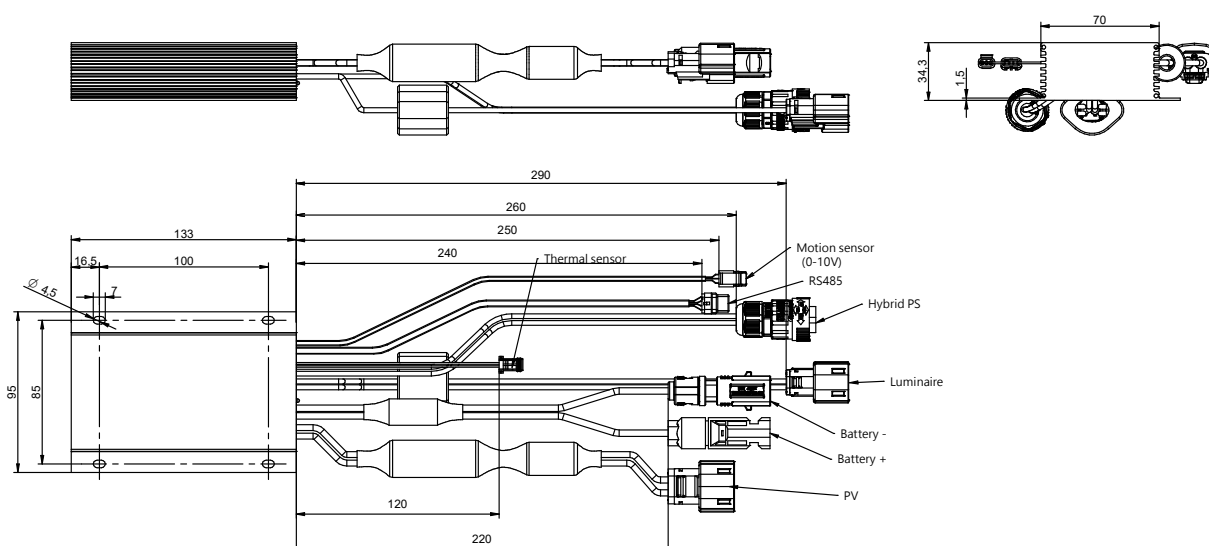
(Picture are for reference only)

Service Hatch Requirements:

B2

1. ZJS425 CC 380 24 RS AN SM VP PX EX SOLAR

Unit: mm

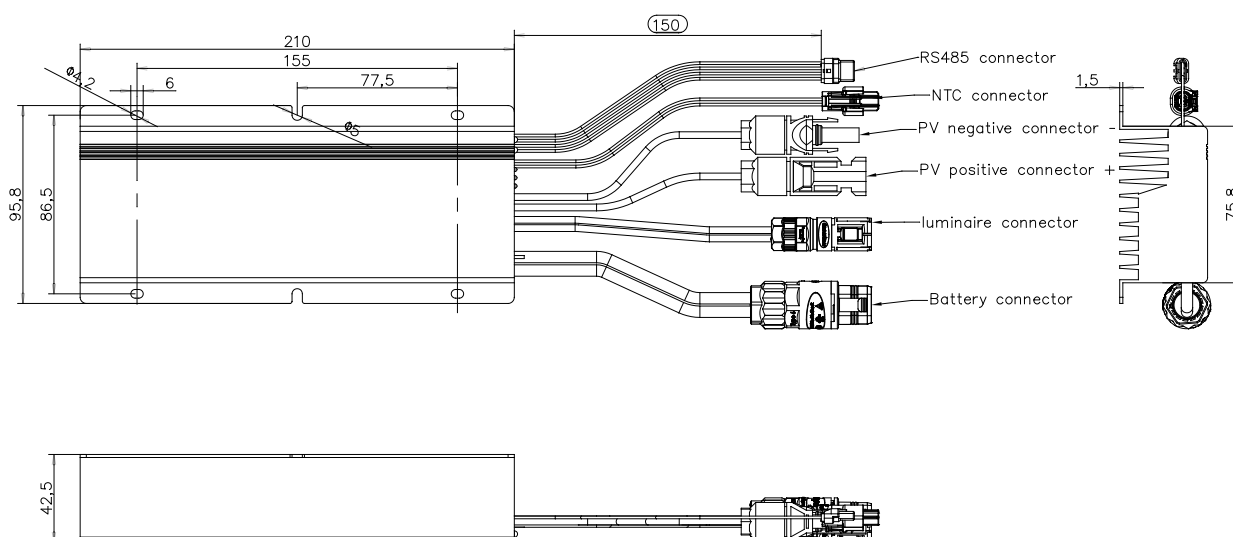


Note:

The Name/ Dimensions/connectors may be different due to controller technical development. You must ask Signify representative to get the newest Data sheet to avoid you are doing a wrong design.

2. ZJS403 CCC 600W 12/24V PX

Unit: mm



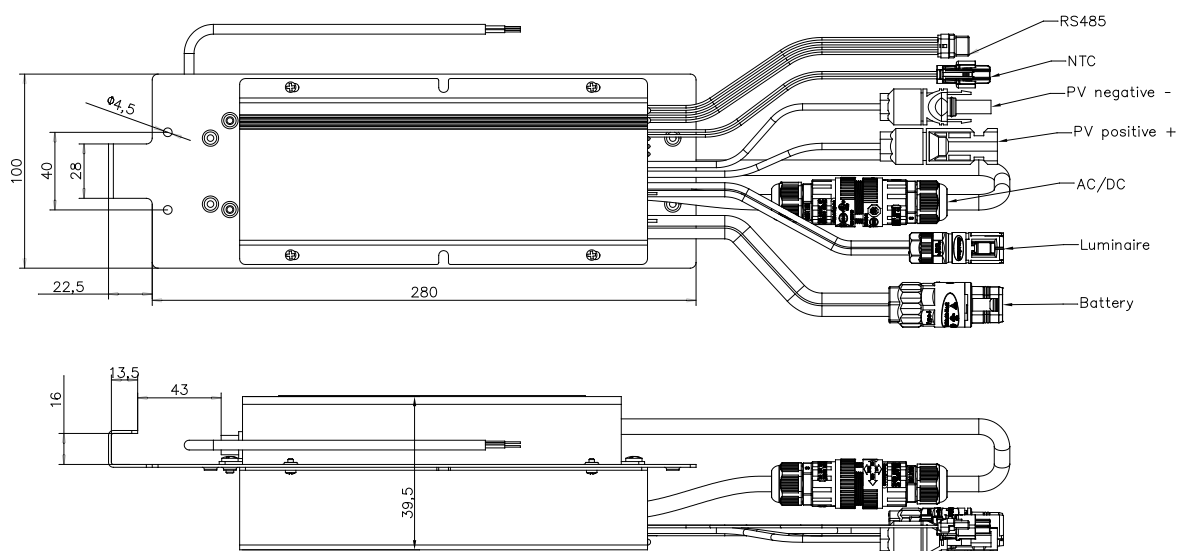
Note:

The Name/ Dimensions/connectors may be different due to controller technical development. You must ask Signify representative to get the newest Data sheet to avoid you are doing a wrong design.

Service Hatch Requirements:

3. ZJS403 CCC 600 12V/24V HYC 150W PX

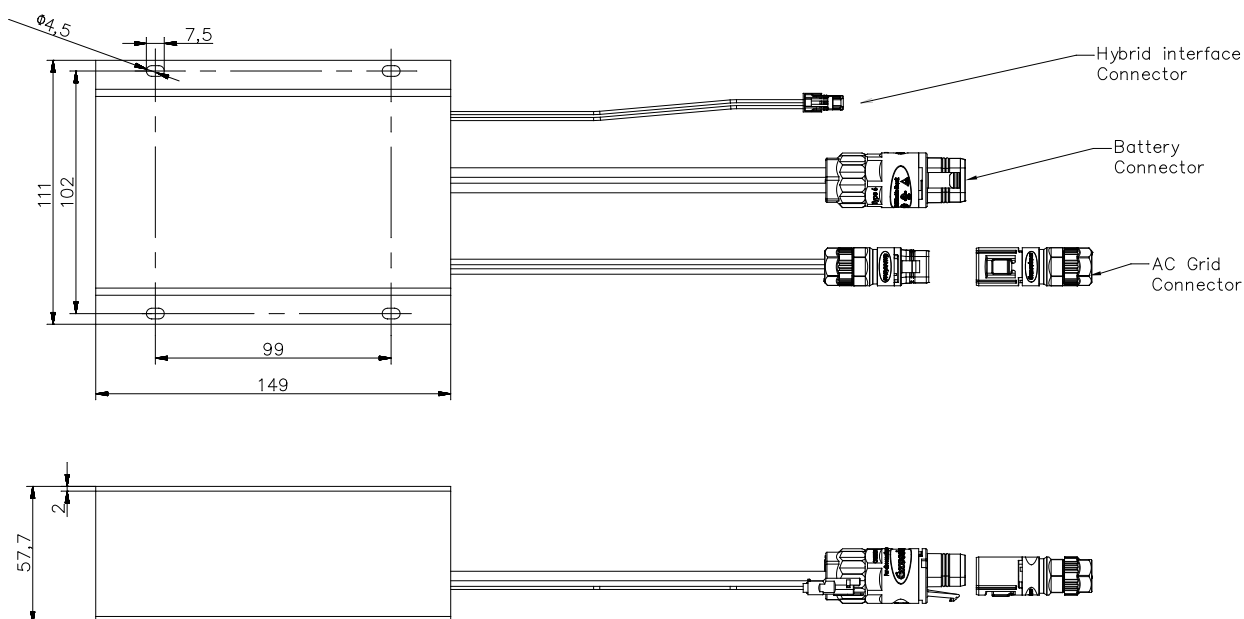
Unit: mm



Note:

The Name/ Dimensions/connectors may be different due to controller technical development. You must ask Signify representative to get the newest Data sheet to avoid you are doing a wrong design.

4. ZJS402 CCC 400Wp 24V PX (work together with ZJS425 CC 380 24 RS AN SM VP PX EX SOLAR)



Note:

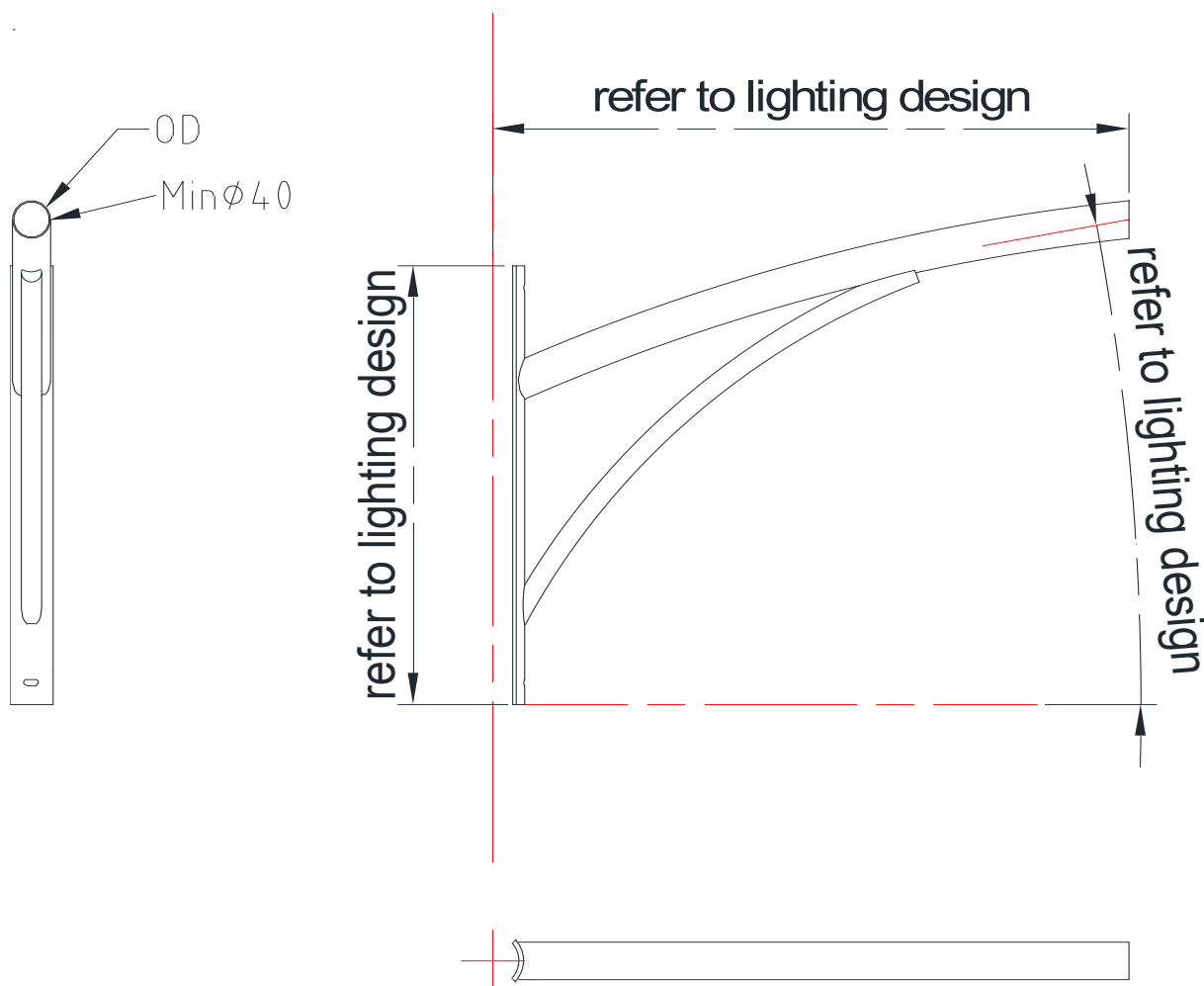
The Name/ Dimensions/connectors may be different due to controller technical development. You must ask Signify representative to get the newest Data sheet to avoid you are doing a wrong design.

Unit: mm

B3 Arm Requirement

Remark: Third party can be customer, pole & bracket provider, installer etc.

- The arm is not provided by Signify; it is designed and manufactured by a third party. The design can vary depending on customer requests, FEM calculation, and material choices according to local, state, and federal regulations. They must validate the strength through tests such as wind force test, snow load test, vibration test, shock test, and other reliability and safety tests.
- A weak arm may cause safety accident.



1. The inner diameter of the arm must be more than $\phi 40$ mm to allow luminaire connector get through.
2. The outer diameter of the arm "OD" must follow the luminaire mounting request according to luminaire MI sheet.
3. The bracket must be well grounded with the pole, with a resistance value $\leq 0.5\Omega$.

(Pictures are for reference only)

C---Foundation requirements:

The foundation is not provided by Signify; it is designed and constructed by a third party. The third party must be responsible for the reliability and safety. A weak foundation may cause a safety accident.

Remark: Third party can be customer, constructor, installer etc.

C1 The embedded duct is used for routing the ventilation tube and cables from chamber to pole.



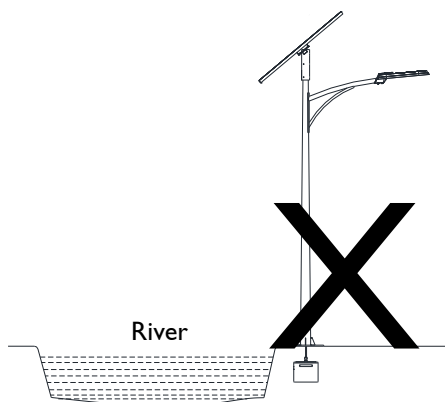
Material: PVC

Inner diameter: $\geq \varnothing 50\text{mm}$

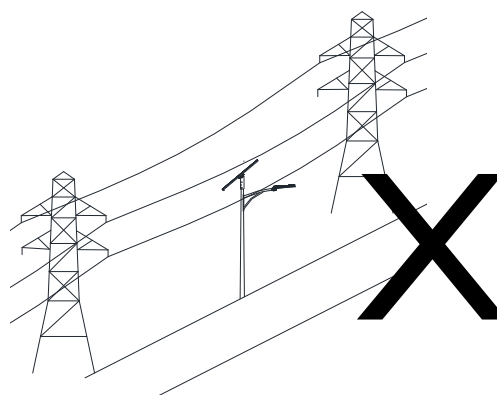
Remark:

The duct should not be blocked anywhere in its path and no wire joint or exposed copper should be allowed in gas vent tube.

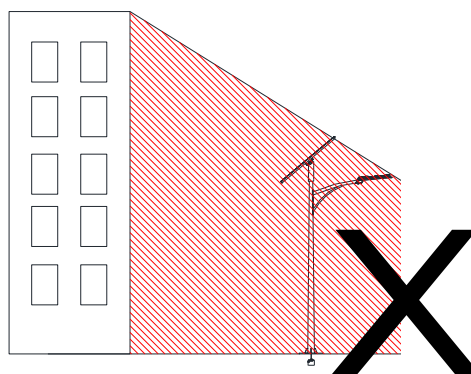
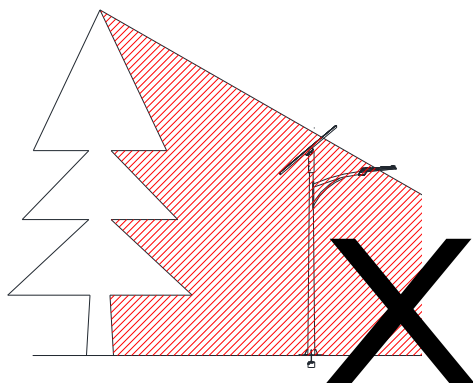
C2 The pole location must follow the design layout. The battery chamber must be positioned close to the foundation but avoiding some locations as pictured below.



Avoid locations close to water, flooded prone area and mud locations



Avoid locations close to AC grids



Avoid Locations in the shade of the trees or buildings

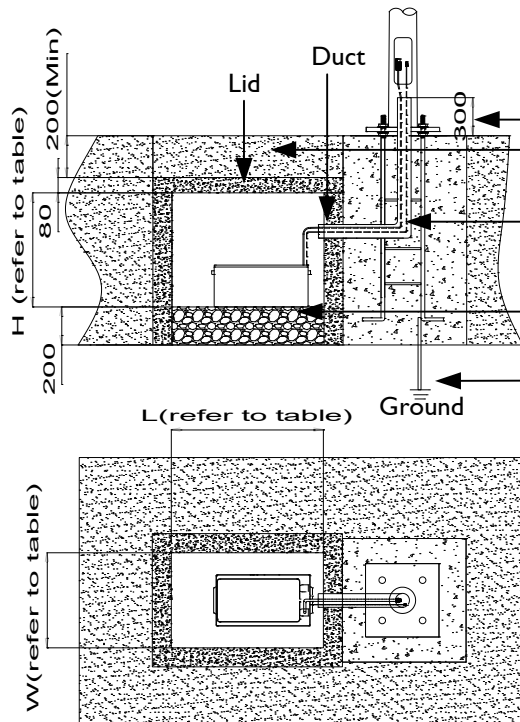
Warranty will be voided if
not followed

C3 Build the Foundation

LiFePO4 Battery

Note:

- For LFP battery, please make sure the battery chamber temperature is between
Charging (Day): 0°C ~ +45°C.
Discharging (Night): -20°C ~ +45°C.
Duration: Max. peak +45 °C +/-5°C for 5 hours /day and Max. for 3 months.
- please contact Signify local representative for a recommendation of the depth of the battery chamber if you can't meet above requirements, (customer should check local soil temperature curve dependent on the different depth) refer to page36 for more information. It should be within temperature limit of battery as given above.



The duct goes 300 mm above the ground.

MUST be a 200-300mm(Min) thickness backfill soil.

Keep the duct higher than the battery.

There **MUST** be a 200 mm layer of sand at the bottom for drainage. Concrete at the bottom of the battery chamber is **PROHIBITED**. Avoiding sharp things at the bottom to protect the battery.

The pole must be well grounded with a grounding resistance $\leq 10 \Omega$. (between pole/steel cage and ground)

12NC	SAP	Battery Size (mm)	Net Weight (kg)	Chamber Size/mm		
				L	W	H
9114 018 34303	ZJS603 60Ah 25.6V LFP UG Solar 5Y	307x168x212	12.9	600	400	600
9114 018 34403	ZJS603 75Ah 25.6V LFP UG Solar 5Y	307x168x212	15.2	600	400	600
9114 018 34503	ZJS603 90Ah 25.6V LFP UG Solar 5Y	484x170x241	36.4	700	400	600
9114 018 34603	ZJS603 105Ah 25.6V LFP UG Solar 5Y	484x170x241	40.8	700	400	600
9114 018 34703	ZJS603 120Ah 25.6V LFP UG Solar 5Y	522*238*218	22.6	800	500	600
9114 018 34803	ZJS603 135Ah 25.6V LFP UG Solar 5Y	522*238*218	24.8	800	500	600
9114 018 34903	ZJS603 150Ah 25.6V LFP UG Solar 5Y	522*268*222	27.7	800	500	600
9114 018 38403	ZJS603 165Ah 25.6V LFP UG Solar 5Y	522*268*222	29.9	800	500	600
9114 018 35003	ZJS603 180Ah 25.6V LFP UG Solar 5Y	522*268*222	32.2	800	500	600
9114 018 36003	ZJS603 60Ah 25.6V LFP UG Solar 8Y	307x168x212	12.9	600	400	600
9114 018 36103	ZJS603 75Ah 25.6V LFP UG Solar 8Y	307x168x212	15.2	600	400	600
9114 018 36203	ZJS603 90Ah 25.6V LFP UG Solar 8Y	484x170x241	36.4	700	400	600
9114 018 36303	ZJS603 105Ah 25.6V LFP UG Solar 8Y	484x170x241	40.8	700	400	600
9114 018 36403	ZJS603 120Ah 25.6V LFP UG Solar 8Y	522*238*218	22.6	800	500	600
9114 018 36503	ZJS603 135Ah 25.6V LFP UG Solar 8Y	522*238*218	24.8	800	500	600
9114 018 36603	ZJS603 150Ah 25.6V LFP UG Solar 8Y	522*268*222	27.7	800	500	600
9114 018 38503	ZJS603 165Ah 25.6V LFP UG Solar 8Y	522*268*222	29.9	800	500	600
9114 018 36703	ZJS603 180Ah 25.6V LFP UG Solar 8Y	522*268*222	32.2	800	500	600

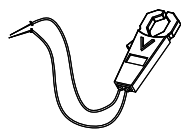
Warranty will be voided if not followed

Pictures are for reference only

D. Installation-----Battery

D1 Installation Preparation

The follow tools are necessary.



Multimeter/
DC Clamp
meters



Spanner



Electrical screw
driver



screw driver



Service hatch
door opening
tool



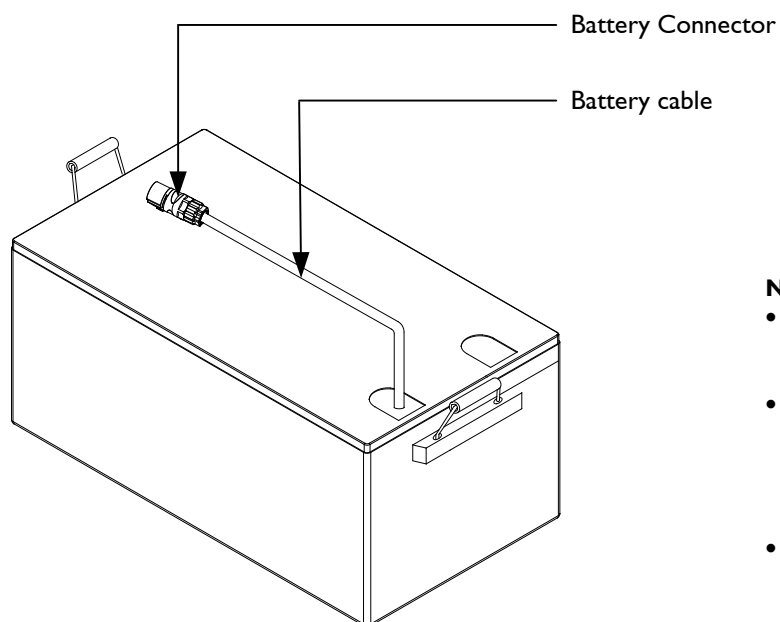
Insulating
gloves

Note:

The tools listed do not include items needed for pole installation and other construction work.

D2 Installation Preparation

LFP Battery inspection before installation



DC clamp meters

Notes:

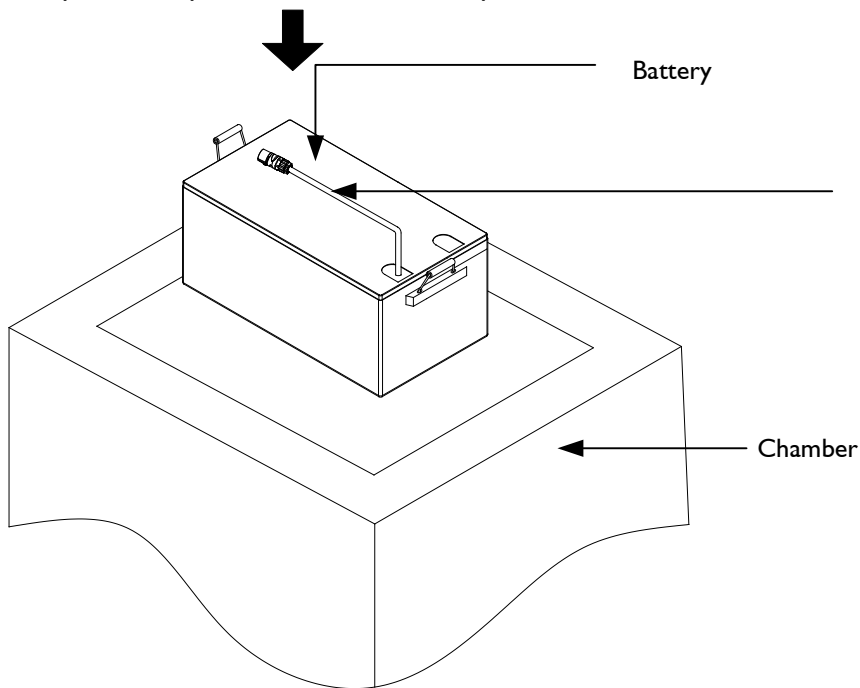
- The tightness and integrity of the battery should be checked before installation.
- Carefully check the battery voltage before installation to ensure it is more than 25V. If less than 25V, field charging is necessary to ensure proper working.
- The cables length are 3m.

Warning:

- Short circuit must be avoided at all times during the operation.

D3 Placing the Battery into Chamber

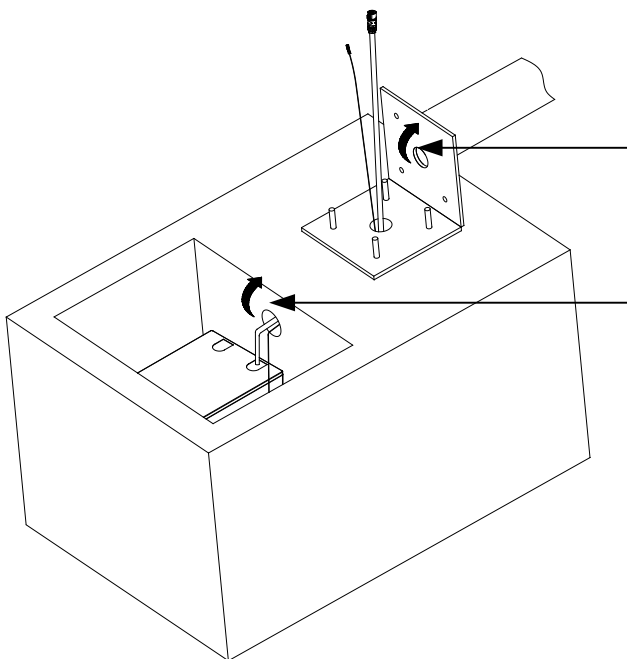
Lay the battery into the chamber carefully.



Warning:

- Prohibit pulling the power cables during installation and delivery.
- Protect the connectors, Avoid any soil, sand, water etc. get into the connectors.

D4 Laying Battery Subsystem Cables



1. Get Battery power cable and NTC cable through the embedded duct, put them into the pole from the pole bottom.

2. Put NTC(Thermal Sensor) sensor input near LFP battery

Warning:

- Avoid the cables being cut or broken by any sharp feature.
- Protect the connectors, Avoid any soil, sand, water etc. get into the connectors.

**Warranty will be
voided if not followed**

E. Installation: PV panel

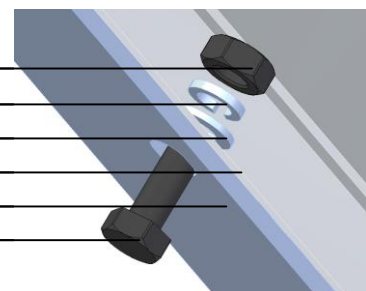
EI PV Panel Installation

(Pictures are for reference only)

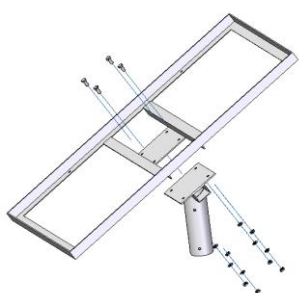
Note:

- A full frame bracket surrounding the PV panel is requested.
- All the mounting holes which are given by Signify on the PV panel must be fixed well.

Nut
Spring washer
Flat washer
PV Panel frame
PV Panel bracket
Bolt

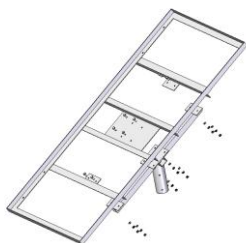
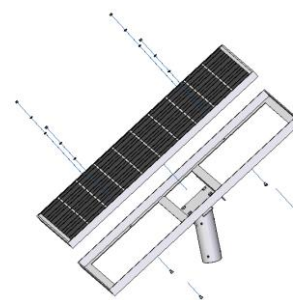


Warranty will be voided if not followed and safety concerns may arise.



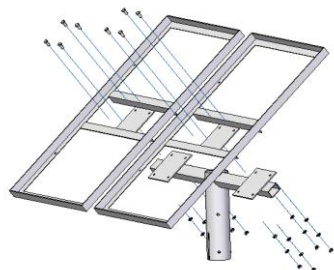
Single PV Panel

4pcs mounting holes
on each PV panel



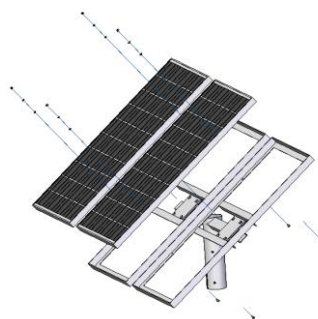
Single PV Panel

8pcs mounting holes
on each PV panel



Dual PV Panels

4pcs mounting holes
on each PV panel



Dual PV Panels

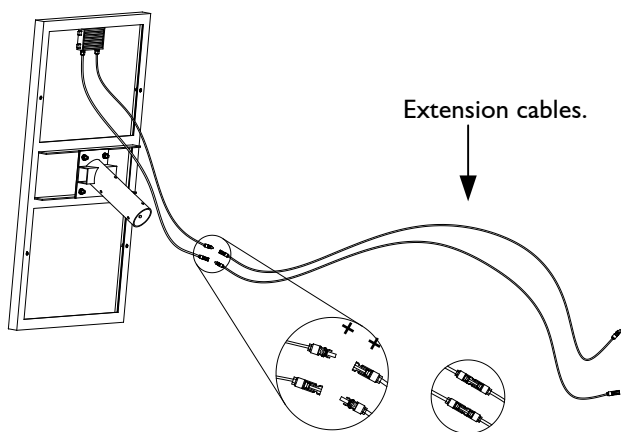
8pcs mounting holes
on each PV panel



E2 PV Panel Connection

(Pictures are for reference only)
(Take four holes PV panels as example)

Single PV Panel

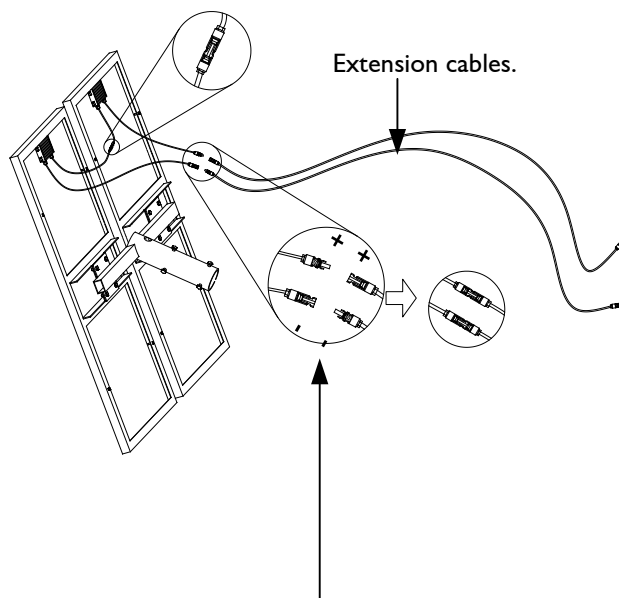


Extension cables.

Connect panel cables to extension cables.

Dual PV panels in Series Mode

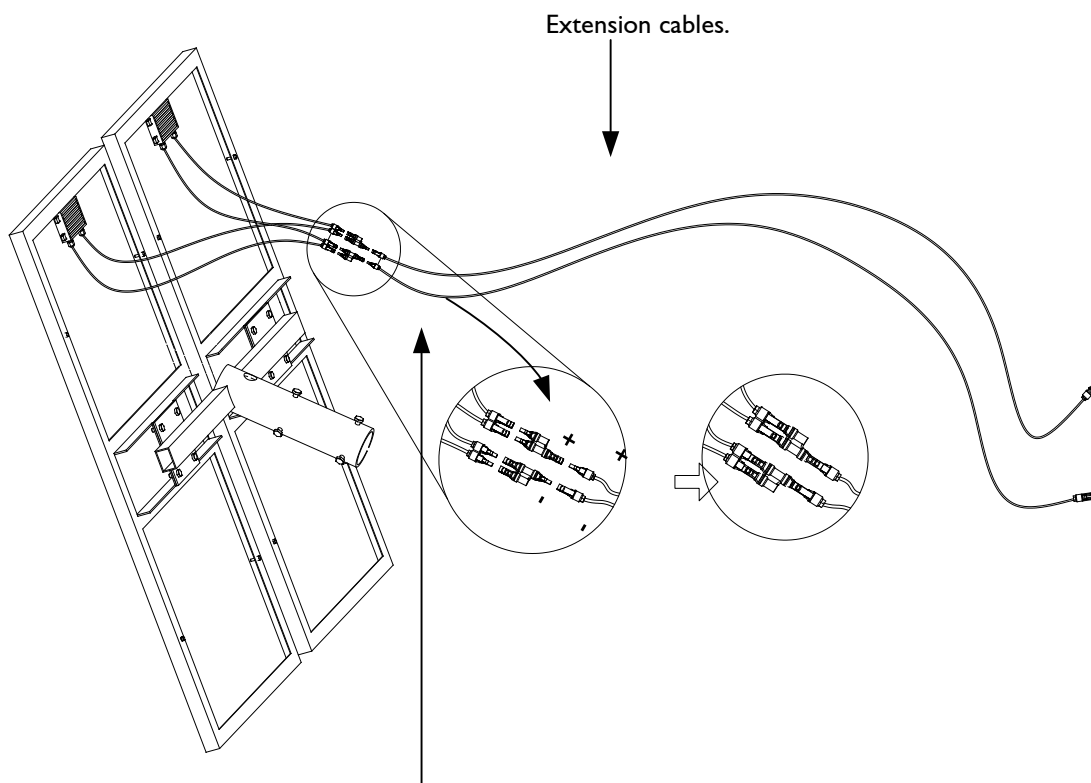
1. Connect one panel's positive terminal (MC4 Female) to the other panel's negative terminal (MC4 Male).



Extension cables.

2. Connect the rest panel cables to extension cables.

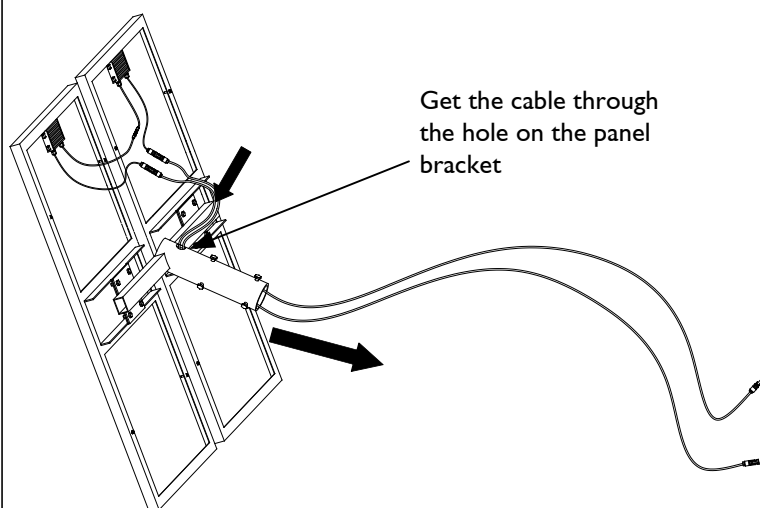
Dual PV Panels in Parallel Mode



Extension cables.

1. Connect PV panels positive terminals and negative terminals to the 2-to-1 connectors separately.
2. Connect the 2-to-1 connectors to extension cable.

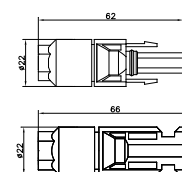
E3 Pull the Cable through the Panel Bracket



Warning:

- The hole size must be more than $\varnothing 40$ mm.
- Cutting the cable connector will void the warranty and may cause water ingress, cable short circuit, or even safety issues. (If the cable length is not long enough, an extension cable is available for order)
- Avoid any sharp feature cutting the cable or the warrant will be voided
- Protect the connector, Avoid any soil, sand, water etc. get into the connector.

Cable connector size:
(MC4)

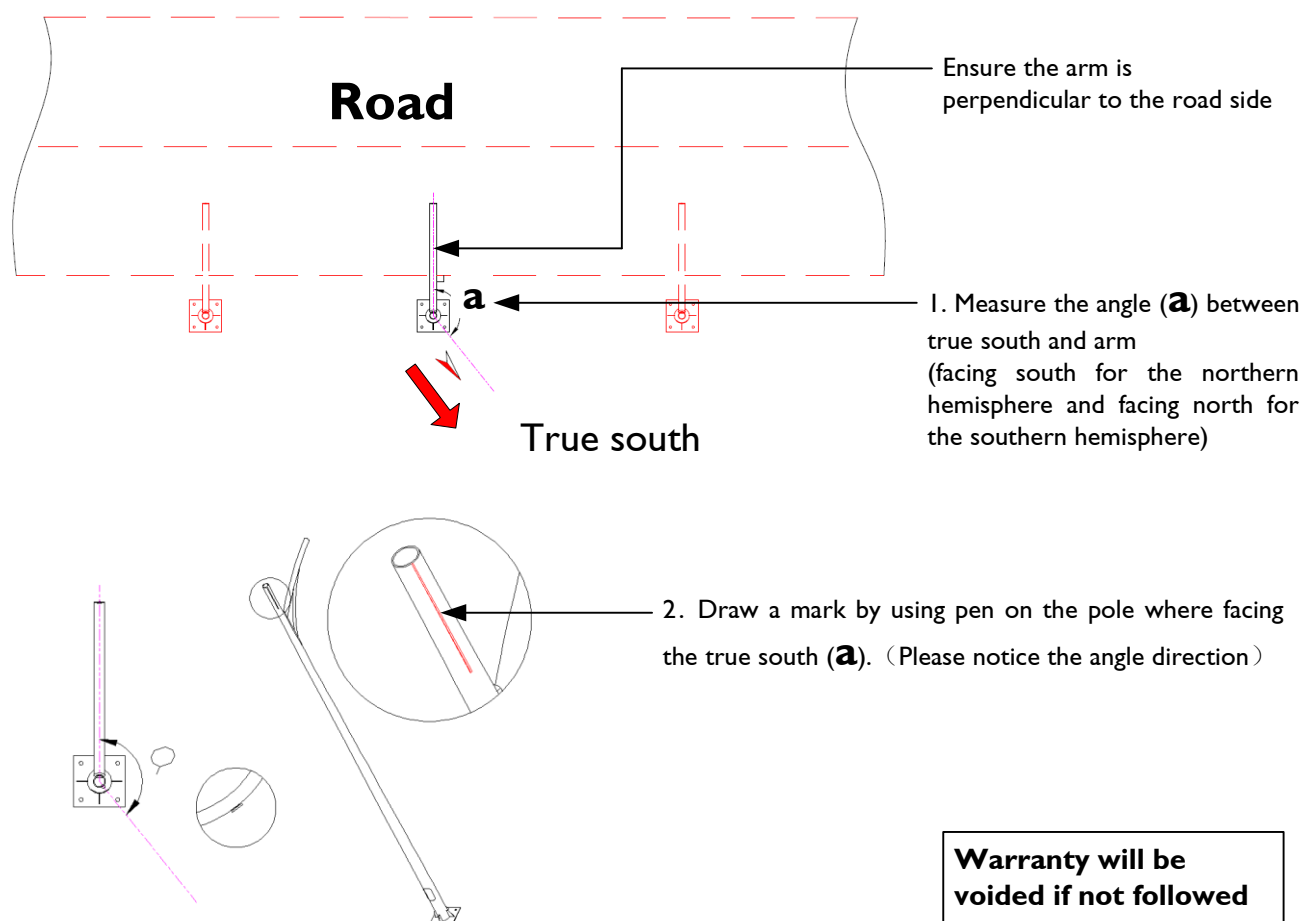


(Pictures are for reference only)

(Take dual PV panels in series as example)

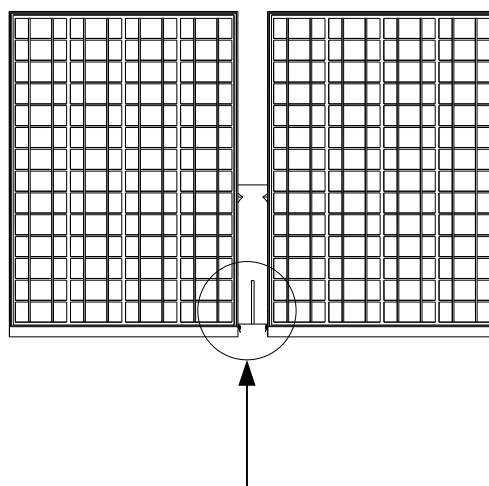
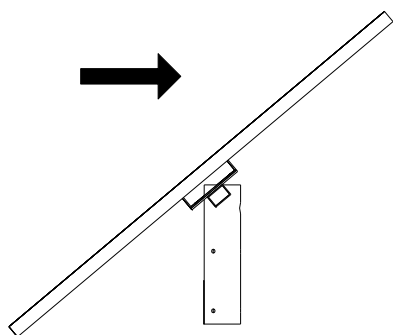
Note: The way of the cable goes into the bracket may be different depend on the actual design from customer or bracket provider.

E4 Mark the Angle between True South and Arm



Warranty will be voided if not followed

E5 Draw a Mark on the PV Panel Bracket

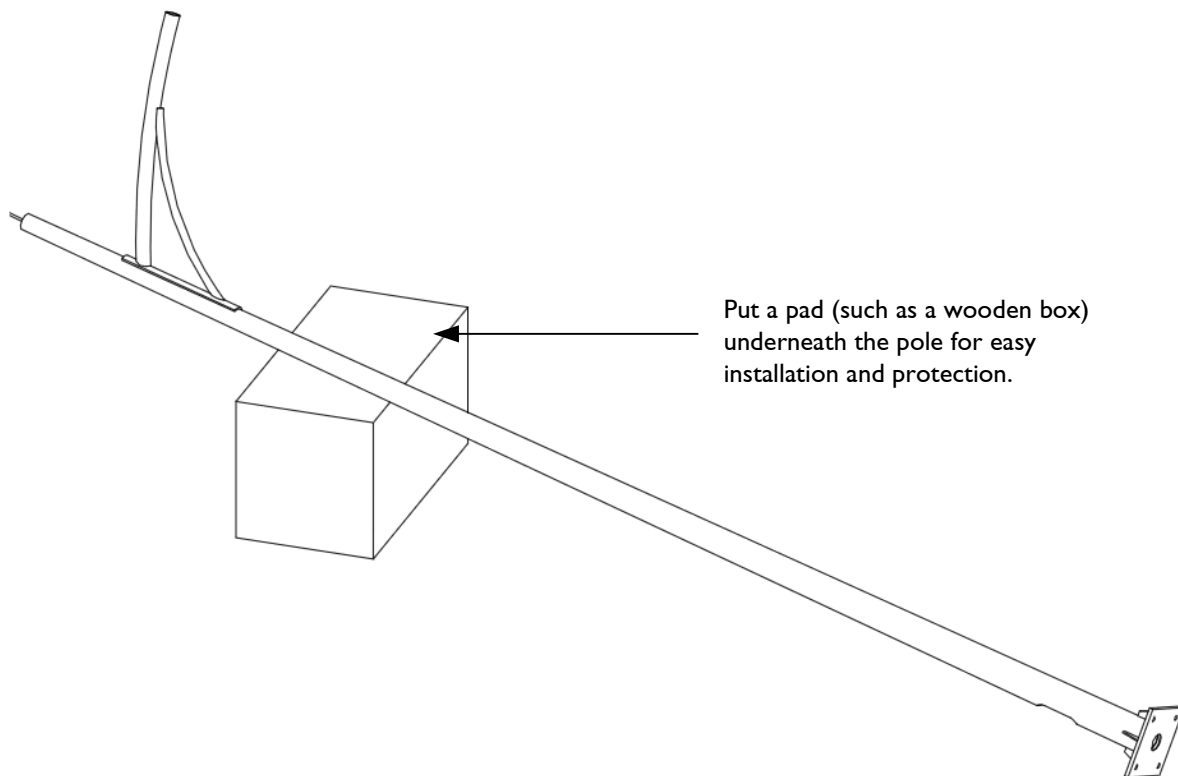


On the PV panel bracket, draw a mark on the side facing the panel

(Pictures are for reference only)

(Take dual PV panels in series as example)

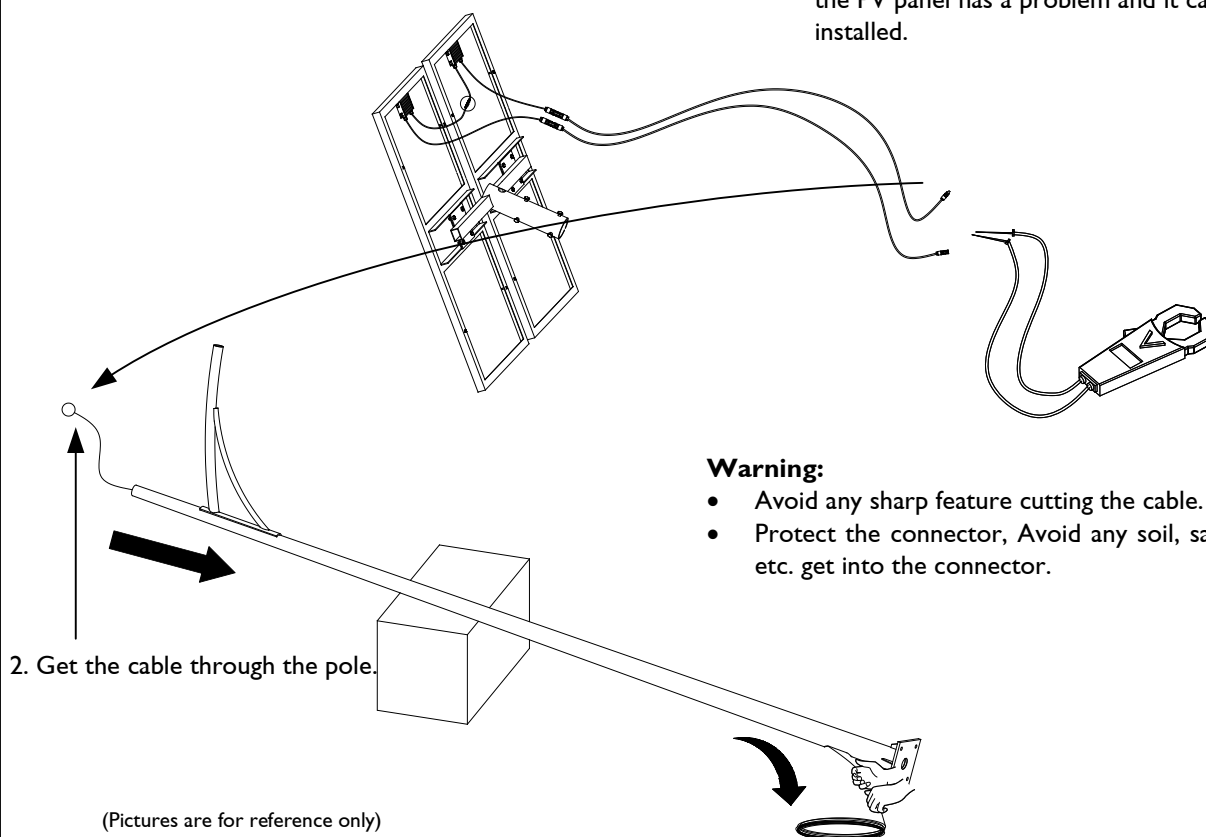
E6 PV Panel and Luminaire Fixation Preparation



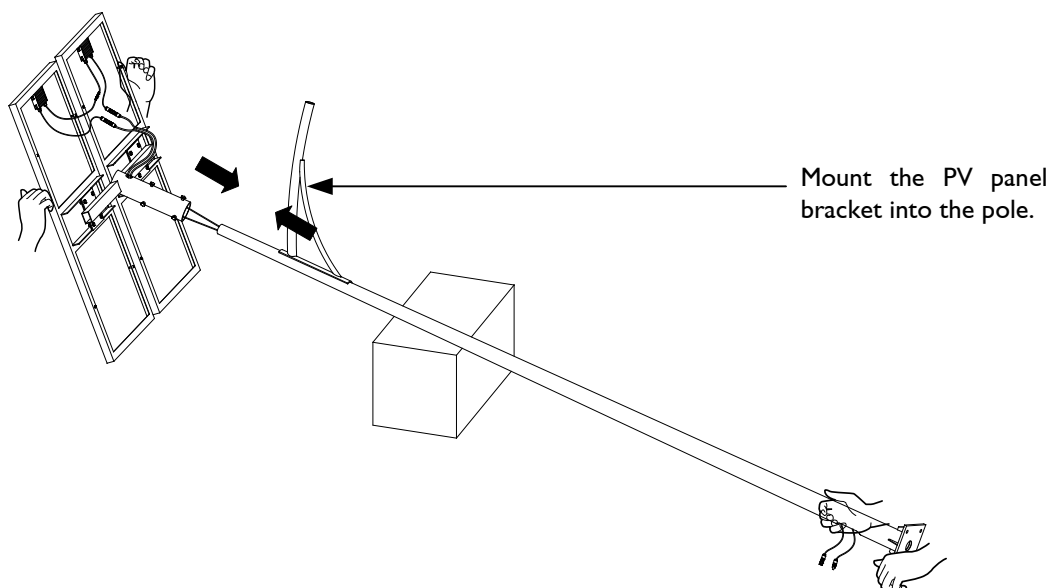
(Pictures are for reference only)

E7 Test Voltage of PV Panels and Lay the Cable

1. Make sure the PV panels are under sunlight and it is not covered by anything or shadow in daytime. Measure the voltage of the PV Panels and ensure the value is within 10Vdc-50Vdc. If the value is less than 10Vdc or above 50Vdc, the PV panel has a problem and it cannot be installed.



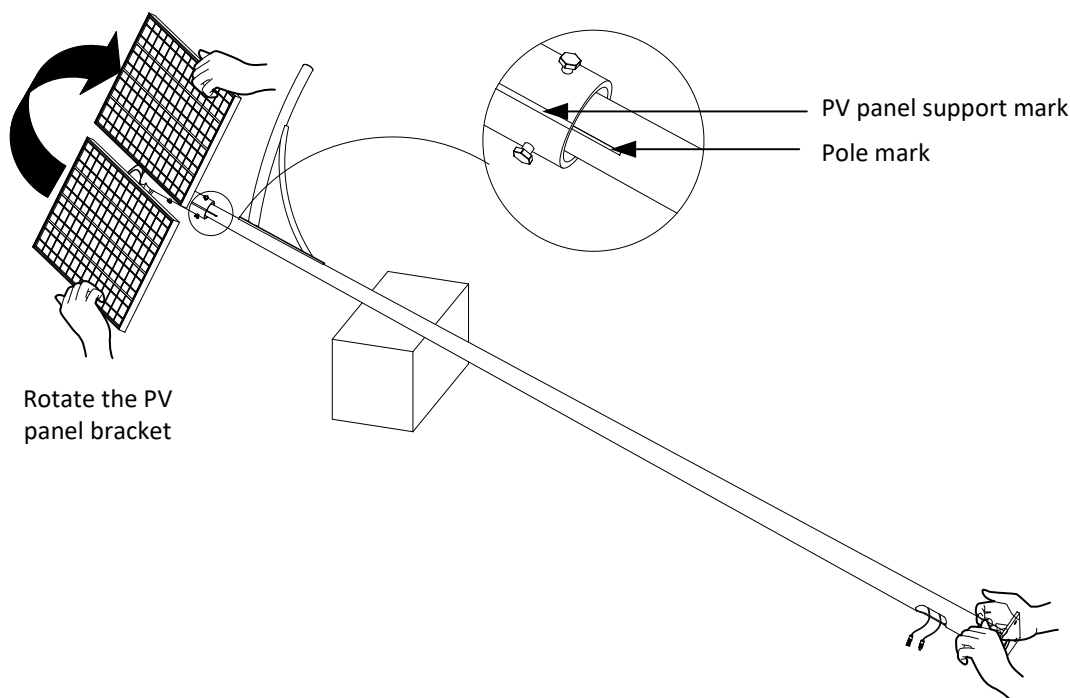
E8 Mount the PV Panel Bracket



(Pictures are for reference only)

E9 Adjust the PV Panel Angle

Adjust the PV panel bracket and align the marks on the PV panel bracket and pole.



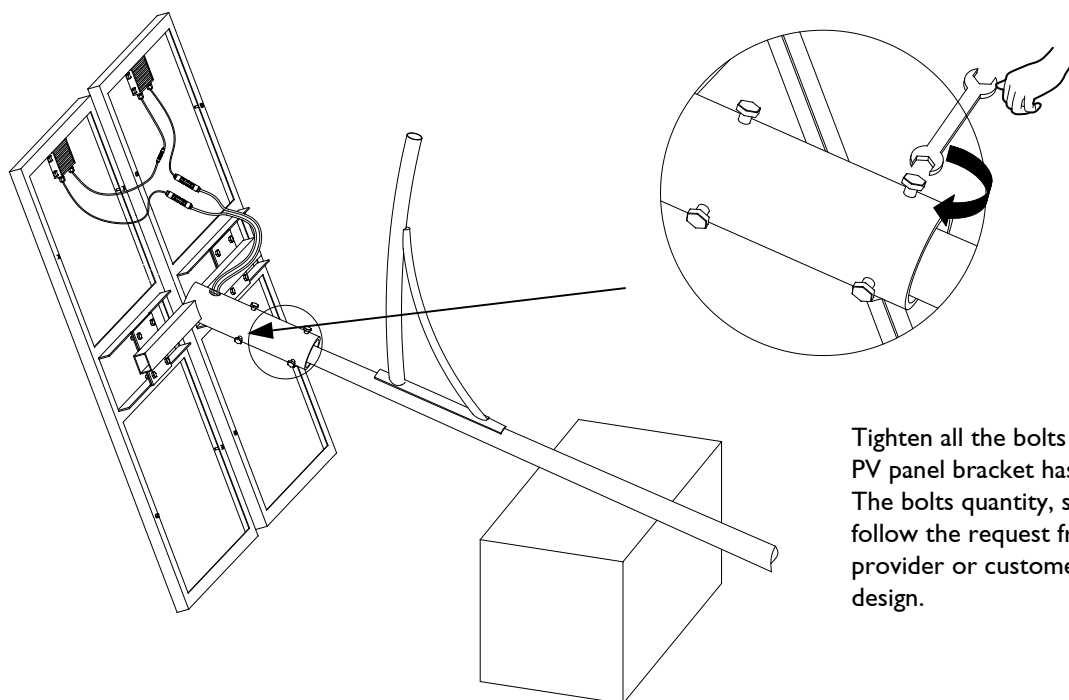
Rotate the PV panel bracket

(Pictures are for reference only)

(Take dual PV panels in series as example)

Safety concerns may arise if not followed.

E10 Affix the PV Panel Bracket



Tighten all the bolts and make sure the PV panel bracket has been Affixed. The bolts quantity, size and torque must follow the request from the bracket provider or customer depend on their design.

(Pictures are for reference only)

(Take dual PV panels in series as example)

Safety concerns may arise if not followed.

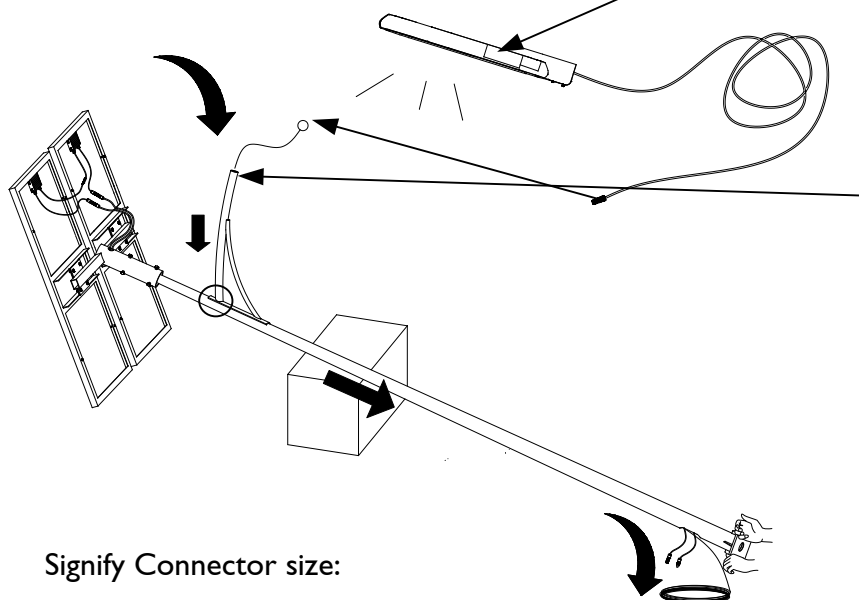
F. Installation-----Luminaire

F1 Mount Luminaire

(Take dual PV panels in series as example)

(Pictures are for reference only)

It is recommended to check the luminaire, connector, and wire appearance before installation.



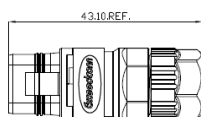
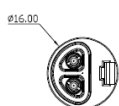
Get the luminaire cable through the pole.



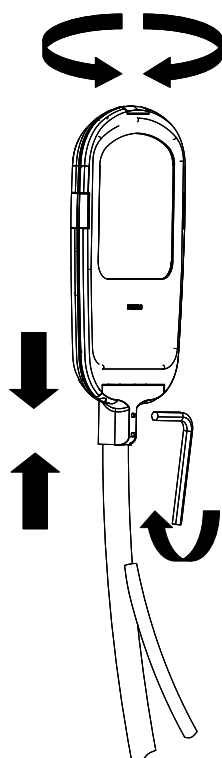
Warning:

1. Make sure that the cable connector can pass through the narrowest part of the pole (more than $\Phi 40\text{mm}$).
2. Cutting the cable connector results in voiding the warranty and may cause water ingress, cable short circuit, or even safety problems.
3. Avoid any sharp feature cutting the cable, or the warranty will be voided.
4. Protect the connector, Avoid any soil, sand, water etc. get into the connector.

Signify Connector size:

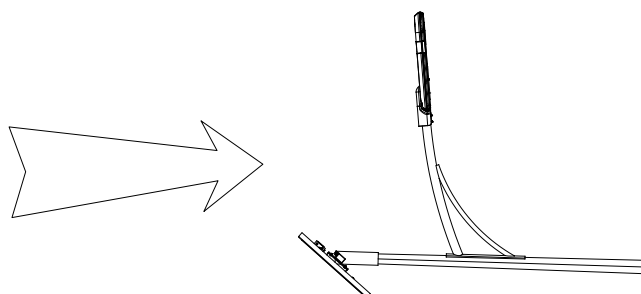


F2 Luminaire Fixation



Mount the luminaire and adjust the installation angle to make sure It is unbiased. Tighten screws.

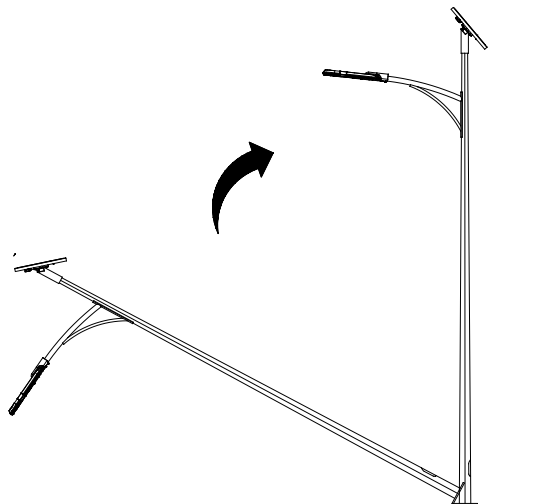
(The fixing torque request is different depend on the different luminaire, please follow the luminaire MI.)



G. Installation----Pole and Controller System

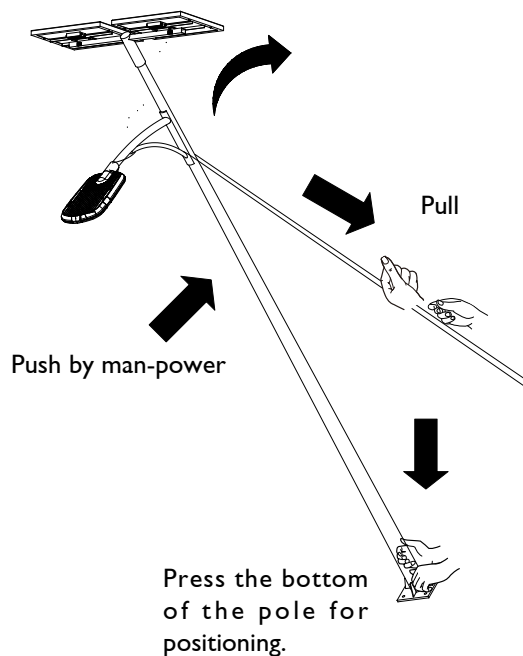
(Dual PV panels as example)

GI Erect the Pole



Pictures are for reference only

Solution 1: By man-power



Note:

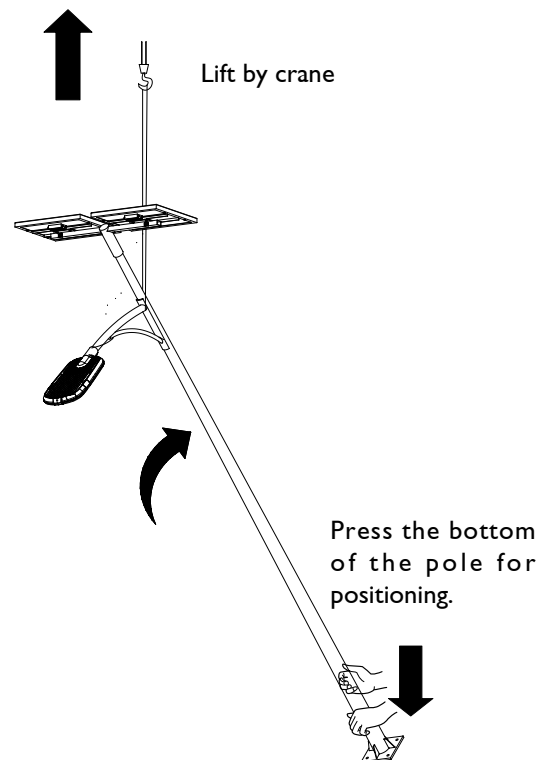
Whoever installs the system takes full responsibility for safety.

Pictures are for reference only

Solution 2: By crane



Warning: Be careful that the luminaire and PV panel don't hit the crane arm.



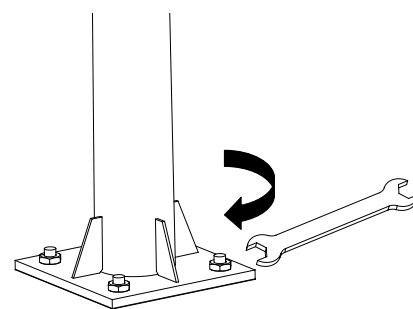
Note:

Whoever installs the system takes full responsibility for safety.

Pictures are for reference only

Affix the pole

All bolts need to be fixed, the quantity, size and torque must follow the request from pole provider or customer depend on their design.



Pictures are for reference only

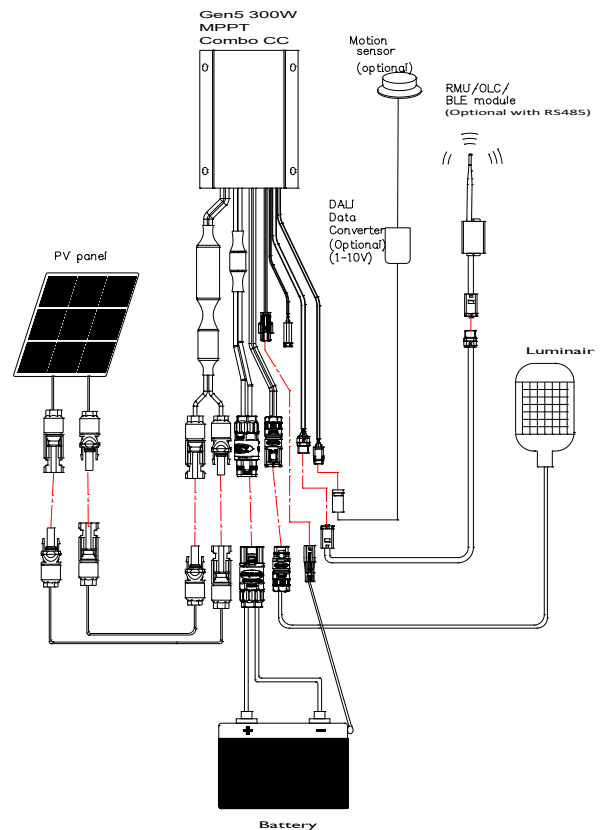
1. Connect NTC (Thermal Sensor) from battery to Combo CC.
2. Connect the RMU to the Combo CC. (Optional)
3. Connect the luminaire to the Combo CC first.
4. Connect the Battery to the Combo CC, Please note the positive and negative.
5. Connect the PV panel to the Combo CC.

Notes:

- Due to Controller updating, the controller dimensions and connector types may be different, please refer to respective component latest Datasheet/DIG for more and final details/instructions.
- Bleeder resistor can be required inside the luminaire where it is Class 2 or Class III system.
- For Disconnection sequence:
1) PV panel, 2) Battery, 3) luminaire, 4) others

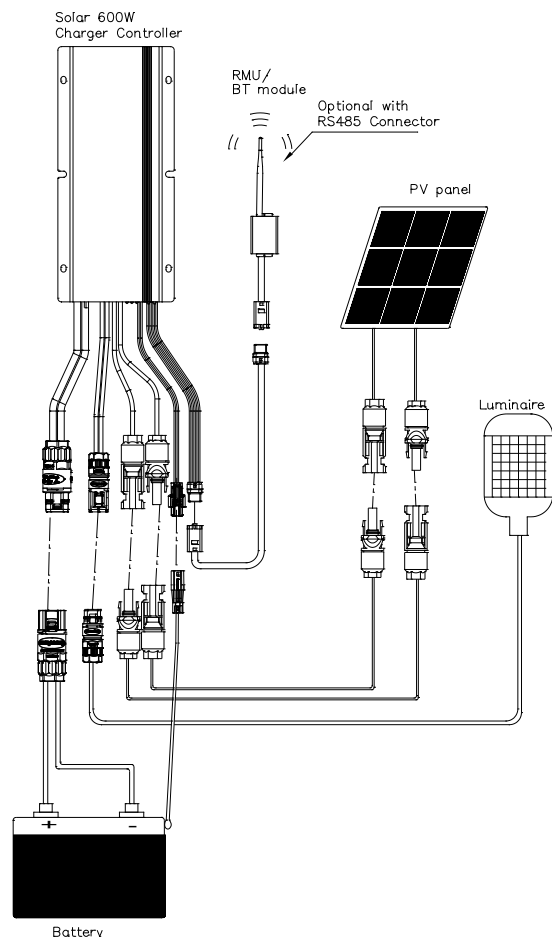
**Warning:**

- The NTC (Thermal Sensor) must be connected well, otherwise the battery will be damaged, potentially causing a dangerous situation.



System Connection---

ZJS403 CCC 600W 12/24V PX



1. Connect NTC (Thermal Sensor) from battery to Combo CC.
2. Connect the RMU to the Combo CC. (Optional)
3. Connect the luminaire to the Combo CC first.
4. Connect the Battery to the Combo CC, Please note the positive and negative.
5. Connect the PV panel to the Combo CC.

Notes:

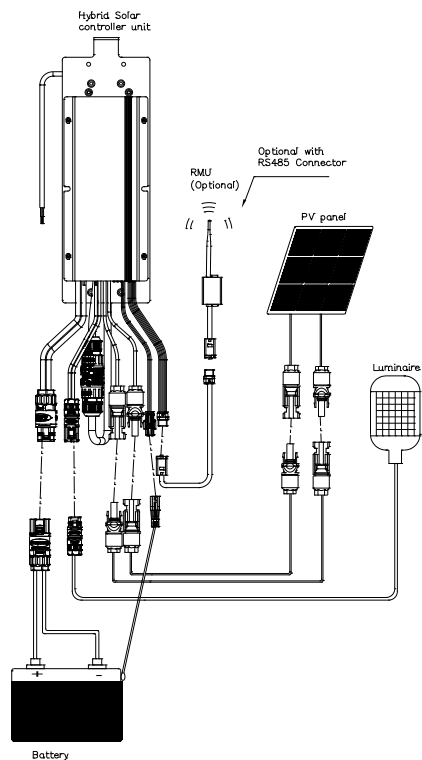
- Due to Controller updating, the controller dimensions and connector types may be different, please refer to respective component latest Datasheet/DIG for more and final details/instructions.
- Bleeder resistor can be required inside the luminaire where it is Class 2 or Class III system.
- For Disconnection sequence:
1) PV panel, 2) Battery, 3) luminaire, 4) others.

**Warning:**

The NTC (Thermal Sensor) must be connected well, otherwise the battery will be damaged, potentially causing a dangerous situation.

System Connection---

ZJS403 CCC 600 12V/24V HYC 150W PX



Switch off the AC grid before the connection.

1. Make sure the AC grid is switch off.
2. Connect NTC (Thermal Sensor) from battery to HCU.
3. Connect the RMU to the Combo CC. (Optional)
4. Connect the PSU to the HCU First.
5. Connect the luminaire to the HCU.
6. Connect the Battery positive cable to HCU.
6. Connect the Battery negative cable to HCU.
7. Connect the PV panel to the HCU.
8. Connect the AC grid to the Hybrid charge controller.
9. Switch on the AC grid.

Notes:

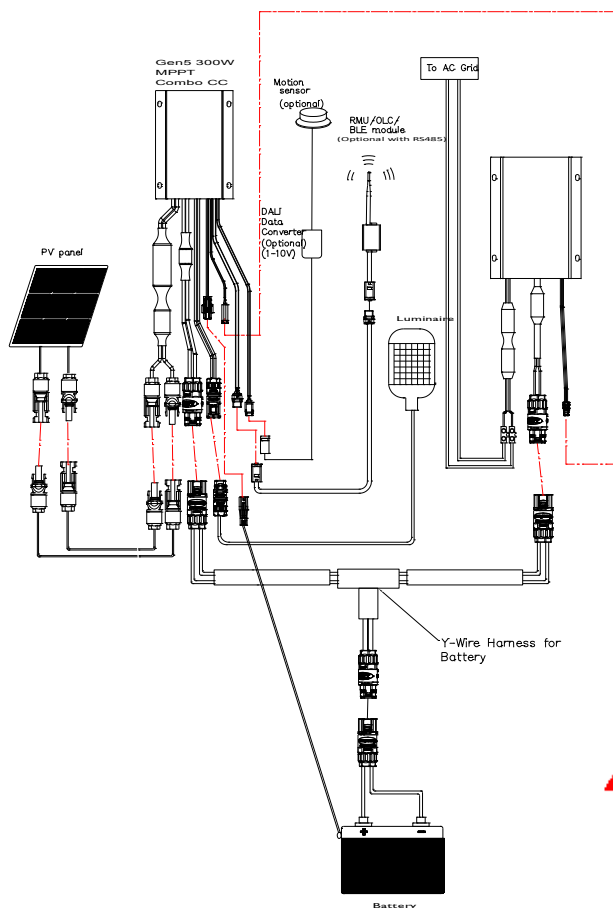
- Due to Controller updating, the controller dimensions and connector types may be different, please refer to respective component latest Datasheet/DIG for more and final details/instructions.
- Bleeder resistor can be required inside the luminaire where it is Class 2 or Class III system.
- For Disconnection sequence:
1) Switch off AC and disconnect AC, 2) PV panel, 3) Battery, 4) luminaire, 5) others

Warning:

- If there is no AC connection, the warranty will be voided, the battery's lifetime reduced, and the system's performance will be downgraded.
- The NTC (Thermal Sensor) must be connected well, otherwise the battery will be damaged, potentially causing a dangerous situation.

System Connection---

ZJS425 CC 380 24 RS AN SM VP PX EX SOLAR + ZJS402 HYC 150W 24V PX



Switch off the AC grid before the connection.

1. Make sure the AC grid is switch off.
2. Connect NTC (Thermal Sensor) from battery to Combo CC.
3. Connect the RMU to the Combo CC. (Optional)
4. Connect the luminaire to the Combo CC first.
5. Connect the Battery positive cable to "Y-harness 2 to 1" and then connect it to the Combo CC and Hybrid charge controller,
6. Connect the Battery negative cable to "Y-harness 2 to 1" and then connect it to the Combo CC and Hybrid charge controller,
7. Connect the PV panel to the Combo CC.
8. Connect Hybrid signal cable to combo CC.
9. Connect the AC grid to the Hybrid charge controller
10. Switch on the AC grid.

Notes:

- Due to Controller updating, the controller dimensions and connector types may be different, please refer to respective component latest Datasheet/DIG for more and final details/instructions.
- Bleeder resistor can be required inside the luminaire where it is Class 2 or Class III system.
- For Disconnection sequence:
1) Switch off AC and disconnect AC, 2) PV panel, 3) Battery, 4) luminaire, 5) others

Warning:

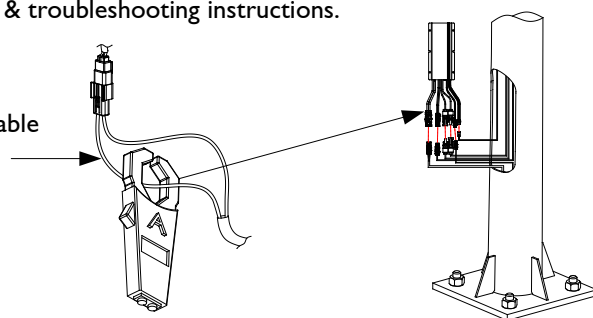
- If there is no AC connection, the warranty will be voided, the battery's lifetime reduced, and the system's performance will be downgraded.
- The NTC (Thermal Sensor) must be connected well, otherwise the battery will be damaged, potentially causing a dangerous situation.

G3 System Testing

if there is separate trouble shooting /test document /guide available then consider that document superseding these test & troubleshooting instructions.

After installing during the daytime, use a clip-on current meter to test the charge current. If sunlight is normal, a current value above 0.5A means the charge loop is fine. Disconnect the PV panel and wait for 10 minutes. If the luminaire turns on, it means that the discharge loop is fine (you can also use hand-held terminal testing system).

PV panel cable (black)

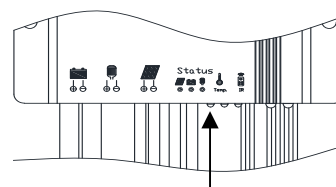


For reference only

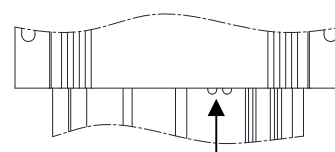
600W OCU MPPT Combo CC

LED indicators:

Indicators	Status	Descriptions
	Steady on	Solar panel connected (between 0-Dawn volt, but not charging)
	Flash (0.5/0.5s)	Equal or Boost charging for 2 hours
	Slow flash (0.5/2s)	Float or lithium battery charging after 2 hours of boost charging
	Quick flash (0.1/0.1s)	MPPT charging
	Steady on	Battery works properly
	Off	Over charge protection with persistence time of 30 seconds
	Quick flash (0.1/0.1s)	Battery low voltage disconnection
	Slow flash (0.5/2s)	Battery voltage is low
	Steady on	Load is on, load is set to 0% light level or time is set to 0%
	Off	Work normal
	Slow flash (0.2/5s)	Load open circuit
	Flash (0.5/0.5s)	Over temperature (Internal temperature of the controller) with persistence time of 60 seconds
	Slow Flash (2/2s)	Abnormal external temperature
	Quick flash (0.1/0.1s)	Load short circuit or over current protection



LED indicators



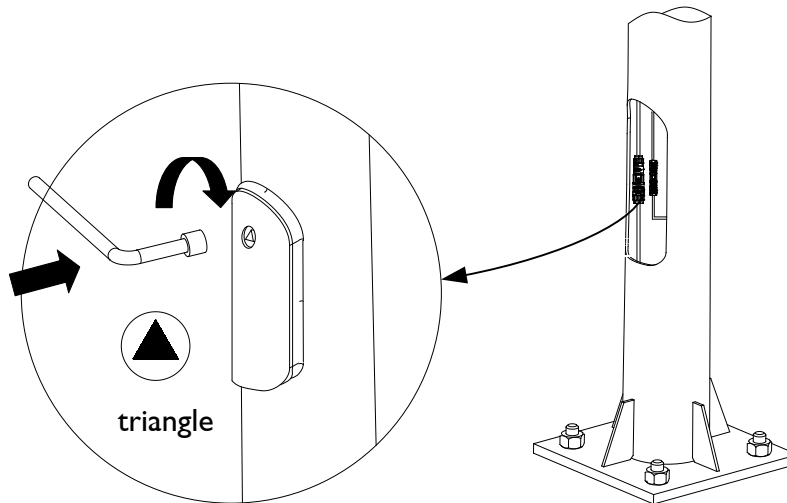
LED indicators

Gen5 Hybrid Global CC 380W

Indicators	Status	Description
2 LEDs	LED Blinking 1 Sec ON/off	Battery Charging
	LED Blinking 0.5 Sec ON/off	Normal Charging
	No Indication	Battery Discharging/LED Load ON
	Red LED ON for 800mSec and Off for 5 Sec	Battery Deep Discharge cut off
	Both LED Green/Orange & Red blinking @ 1 sec rate	Any fault in system
	Red LED solid ON	Valid hybrid PS availability
	Red and Green alternate LED blink @ 200msec intervals	hybrid PS undervoltage/overvoltage
	Red LED Blink @ 200msec	Load running on Hybrid PS

Note: The indicator quantity and LED phenomena are different between different controllers, For more detail information, please refer to latest data sheet of the respective Solar charge controller.
Consider CC datasheet final for indication over this document if datasheet is available.

G4 Close the Service Hatch



Anti-theft solution depending on customer needs.

Pictures are for reference only

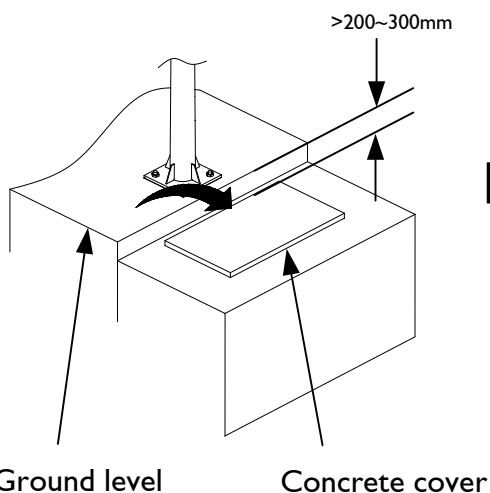
G5 Backfilling

Warranty will be
voided if not followed

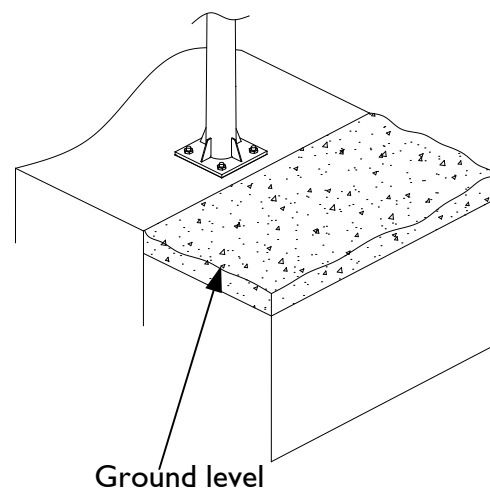


Warning: Burying the battery into
soil directly is not allowed.

1. Close the lid of
battery chamber



2. Backfill the soil and Restore
the ground to its original
appearance



Anti-theft solution depending on customer needs.

Pictures are for reference only

H. Troubleshooting & Maintenance

HI, Troubleshooting

Fault Table

Fault name	Comments	Troubleshoot
Battery Over Voltage	The battery is overcharged, faulty, or got disconnected during charging, or there is rust on battery terminals.	Disconnect the battery and check separately as per the battery design in the guide.
Battery Under Voltage	The battery is discharged, or the battery is too old.	Battery charging is required or battery replacement.
Battery Over temperature	High ambient temperature or incorrect placement of Battery NTC (Thermal Sensor).	Check battery NTC (Thermal Sensor) or ambient temperature.
Battery Low Temperature	Low ambient temperature or incorrect placement of Battery NTC (Thermal Sensor).	Check battery NTC (Thermal Sensor) or ambient temperature.
Load Short Circuit	LED wires are shorted.	Check LED Connections.
Load Disconnect	LED wires are open or broken, or there are luminaire issues or LED string issues.	Check LED Connections.
Battery Not connect	Battery wires are not connected, there is rust on battery terminals, there is a fault inside the battery due to cell discharge, or the battery cut off in LFP.	Check battery Connection or battery wiring.
PV over voltage	A higher rating panel is connected to the system.	Panel rating should as per CC datasheet.
Hybrid PS undervoltage/overvoltage	The connected hybrid PS output voltage is out of acceptable range of the CC.	Disconnect the Hybrid PS and verify its output voltage at open circuit and full load conditions using DMM. Replace Hybrid PS, if required. Hybrid PS rating should as per CC datasheet.

Note: Applicable only incase of PC software/Mobile App is available with CC provided .If any fault visible in software/Application then above diagnosis may be carried out.

Troubleshooting Table

Symptom	Root Cause	Solution
No charge current at sunny daytime	Battery is full.	check the battery voltage.
	Panel connection wrong.	check the PV panel connection.
	disconnection between PV panels and CC.	check the CC PV terminal connection if loose or if the wrong polarity.
	disconnection between battery and CC.	check the CC battery terminal connection if loose or if the wrong polarity.
LED load off at night	disconnection between CC and LED load.	check the CC LED load terminal connection if loose or the wrong polarity.
	The PV panel is under another lighting source.	check if any other lighting source irradiated on the PV panel.
	disconnection between battery and CC.	check the CC battery terminal connection if loose or the wrong polarity.
	battery voltage is too low.	check the battery voltage.
LEDs are glowing at a lower intensity	The dimming step is wrong.	check the parameters set in the CC.
	Dimming is active.	RTE, flexT, Interact remote mode, motion sensor, hybrid mode, etc. might be active to dim the LED power.
LED load keeps on/off at night	LEDs are damaged.	Check LED board, if faulty replace it.
	The PV panel is under another lighting source.	check if any other lighting source is irradiating on the PV panel.
LED Load ON during daytime	CC failed.	check the indicator on the CC.
	disconnection between PV panels and CC.	check the CC PV terminal connection if loose or if the wrong polarity.
	Panel connection wrong.	check the PV panel connection.
	The PV panel is under the shade or the dark cloudy weather.	check if the PV panel is covered by some objects or if there is not enough light on the PV panel due to the cloudy or the rainy weather.

Notes

- If encounter any abnormal situation or failure, please immediately contact Signify representative. Do not try to repair system by yourself to avoid any damage to the system and injury to people.
- For more detail solutions, please check respective Datasheet/DIG of PV panel, Battery, Controller.
- If there is separate trouble shooting /test document /guide available then consider that document superseding these test & troubleshooting instructions.
- All faults /diagnosis may not be available in one CC type.

H. Troubleshooting & Maintenance

H2 Maintenance

Maintenance

Panel

- The PV panel has to be cleaned quarterly or whenever it is not performing well according to specifications, whichever is earlier. If not cleaned for more than 6 months, the dust/pollution on the PV panel will affect battery life as the battery may remain discharged, unable to get enough power to charge, and the battery warranty will be void. (The frequency of PV panel cleaning largely depends on the location, local pollution, and climatic events such as storms, typhoons, or when the panels are covered with sand, soil, or bird droppings).
- In heavy dust areas, it is required to clean the solar module regularly (possibly once a quarter or even more frequently) with a damp towel to guarantee optimum performance of the solar panel.
- Do not use any type of solvent for cleaning or not to put too much pressure on the module while cleaning.
- Check if there are trees shadings on the PV panel, if yes, please trim the trees to avoid the shading on the PV panels.

Battery

- If any abnormal symptom occur, the battery may be need maintenance. Following the checkpoints and tests below:
- Check local abnormal climates condition, rainy days, flood events, storm etc..
- Check for any loose connections, visually inspect the terminal joints for rust, check for damage signs on connectors or terminals, and check if water has entered the connector.
- Check the cleanliness of the battery and for any cracks or damage.
- Measure and record ambient temperature in battery chamber and the case temperature on battery.
- Measure and record total voltage and float current of battery.
- Conduct a discharge test (10H rate) with the actual load to check the battery's health.

LiFePO4 battery(LFP) Storage:

- Battery as chemical product cannot be stored for >6 months time.
- The battery should be preserved at the clean dry environment within -10°C ~ +35°C temperature.
- Storage time: The battery is charged in ex-work condition (as per the required law of dangerous goods or UN38.3). To ensure battery performance, do not exceed the storage time as defined below:
 - 10°C to 25°C, up to 6 months. (The battery should be recharged every 3 months)
 - 10°C to 35°C, up to 3 months. (The battery should be recharged every 3 months)
 - 10°C to 45°C, up to 1 month. (The battery should be recharged every 1 months)
- If the storage duration is more than 3 months, the battery must undergo one complete charge and discharge cycle and then be charged again. To use a long-stored battery in a solar system installation, the battery AH/Wh should be measured first. An estimate of battery Wh can be done by multiplying the known system power by the number of its working hours with the help of the Signify-provided solar charge controller discharge function in an indoor environment at an ambient temperature between 0°C and 35°C.

Maintenance after the Warranty

- Refer to the LFP battery datasheet for charge/discharge current rate of battery.
- Refer to the PV panel, Solar charge controller and hybrid datasheets for more detailed information.
- Use only compatible solar off-grid and hybrid charge controllers. Any unauthorized connection of charge controller of any type may result injury to person or explosion in the battery.
- If you need a external battery chargers for LFP 25.6V ,please contact to Signify authorized person or service center.

Replacement

- If the battery capacity is less than the rated capacity of 50% or as per warranty statement and conditions for remaining capacity or end of life, it is required to be replaced with a new one to comply with the designed system requirement.
- Please use proper type, size, number and ratings based on the system design during replacing the batteries.

Warning

- The recycling of used batteries should strictly follow local laws and regulations. It is forbidden to handle the battery as normal garbage for disposal.
- Do not open, short circuit, or mutilate batteries as injury may occur.
- Do not put the battery into a pool.
- Never move the battery by pulling the cables of the battery.
- Handle the panel and the battery with great care during installation and transportation.
- Installation is highly recommended during the day. The controller system needs sunlight input to activate for normal working status. Any system installed at night may not light up properly on the first night. The system will work normally on the second night.
- If the LiFePO₄ battery voltage is lower than 13.5V for 12V system, and 27V for 24V system, you must to recharge the battery before installation to ensure proper working.
- Improper maintenance will shorten the LFP battery service life or decrease the service performance and void the warranty.

H. Troubleshooting & Maintenance

H4. Battery replacement

Warning

Always follow the generally accepted safety procedures for handling batteries. It is vitally important that you observe the precautions recommended in this manual.

YOU SHOULD BE TRAINED IN HANDLING, INSTALLING, OPERATING AND MAINTAINING BATTERIES BEFORE YOU WORK ON REPLACING A BATTERY.

You **MUST** understand the risk of working with batteries and **BE PREPARED** and **EQUIPPED** to take the necessary safety precautions. If not, contact Signify service.

- **ALWAYS** wear protective clothing and use nonconductive or insulated tools when working with the battery.
- **Remove** all jewelry that could produce a short circuit.

In case of **SKIN CONTACT** with sulfuric acid misting, **IMMEDIATELY**

1. **REMOVE** contaminated **CLOTHING**
2. **SPLASH** the area **THOROUGHLY** with **WATER**
3. Get **MEDICAL ATTENTION**, if required.

In case of **EYE CONTACT** with sulfuric acid misting, **IMMEDIATELY**

1. **SPLASH THOROUGHLY** for at least 15 minutes with large amounts of **WATER**.
2. Get **MEDICAL ATTENTION**, if required.

Important

If you have ANY question concerning safety when working with the battery, contact your local Signify sales/service representative to clarify any of the noted safety precautions and ask for professional service.

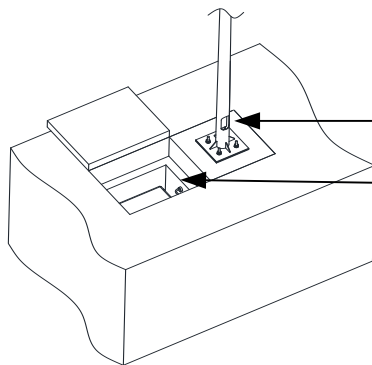
If there is separate troubleshooting/test document/guide available, then consider that document superseding these test & troubleshooting instructions.

H. Troubleshooting & Maintenance

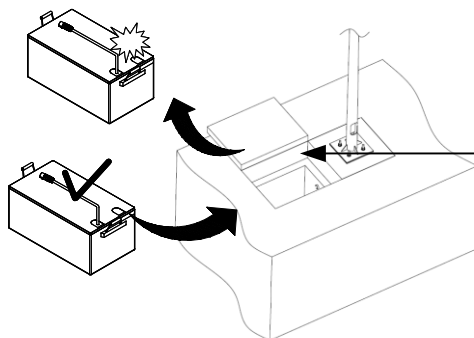
Battery replacement

Warning: The battery presents a risk of electrical shock and a high short circuit current. The Signify mounting instructions must be strictly followed, otherwise, potential application, reliability, or safety issues may arise. Contact your local Signify service if the instructions cannot meet special field conditions. Only a qualified Signify service representative who is knowledgeable in batteries and the required precautions is permitted to service the battery. Keep unauthorized personnel away from batteries.

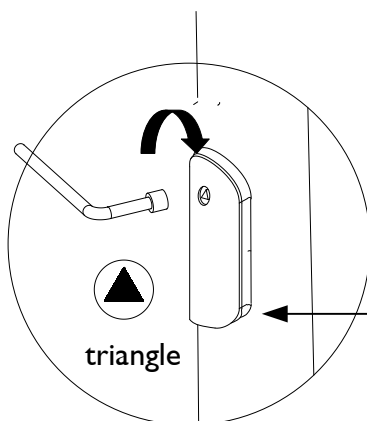
Warning: For Hybrid system, please Switch Off AC grid first before any operation.



1. Open the serve hatch.
2. Open the lid of the battery pit.
3. Disconnect the system following below sequence:
1) PV panel, 2) Battery, 3) luminaire, 4) others.
4. Carefully pull out the battery cable.



5. Take out the old battery and replace the new one.
If the old battery has the IP6X rated, then ensure the new battery has the same or above IP6X rating.
6. Carefully thread the new battery cable through the embedded duct into the pole.
7. Connect all the cables (following the connection diagram on Pages 27/28).



8. Lock the service hatch and restore the ground to its original appearance

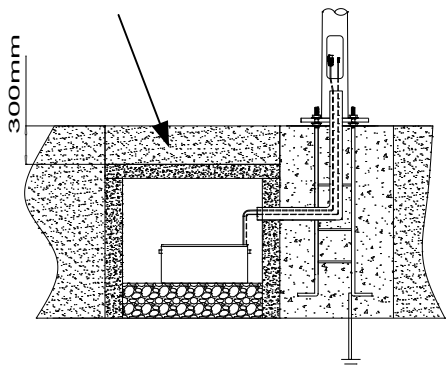
I. Attachment: Battery chamber

If the battery chamber temperature can't meet the requirements in Page 6, please contact Signify local representative for a recommendation of the depth of the battery chamber, (customer should provide local soil temperature curve depend on the different depth).

Here are some recommendations to keep the battery chamber temperature:

Soil should be the first preference and high SRI paint should only be used in case of non-availability of soil.

1. Increase the soil thickness from 200mm to above 300mm.



3. If no soil to cover the chamber, you can use the reflective paint with Solar Reflectance Index (SRI)>80 to paint the concrete for insulating the heat:



Note:

1. You can refer the link as a reference to find the similar paint:

https://www.alibaba.com/product-detail/Anti-UV-Heat-Insulation-Coating-Waterproof_1600940005887.html?spm=a2700.galleryofferlist.normal_offer.d_title.62031cc6ZqDx55

Product Parameter

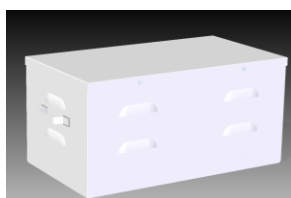
- Product name: Heat insulation and water proof paint
- Material: Modified acrylic polymer
- Appearance: Liquid viscous paint
- Usage amount: 2mm thickness, 2kg/m²
- Construction method: brush, roll, scrape
- Drying time: Surface dry for 1 hour, fully dry for 24 hours.
- Service life: 10-20 years
- Shelf life: 12 months



2. For the LFP battery on-pole solution where ambient >45°C:
a: The battery box must be painted white to reflect the sunlight.
b: Put the thermal insulation sheet(glass fiber material) on all sides including top side (>20mm)inside the battery box.
c: Louvers are must on the battery box for air flowing.
d: The insulation sheet must be cut on air vent to allow air passage.



(b)



(c)

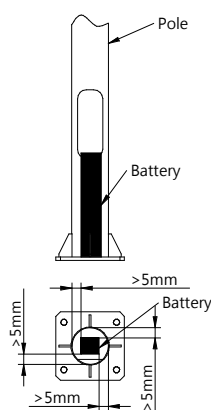
You can refer the link as a reference to find the similar thermal insulation sheet:

https://www.alibaba.com/product-detail/Best-Thermal-Glasswool-Material-Price-Fire_1601089864664.html?spm=a2700.galleryofferlist.normal_offer.d_title.49dc13a0ZiMcB

2. All six faces of the lid should be painted, side faces should be covered with soil, and the top surface should be level with the ground.
3. Paint should be done in 2~3 layers of coating ensuring 2~3mm thickness of paint.
4. Paint should be maintained or repainted in case of chipping or damage. If required, maintain by repainting over time.

4. For in-pole solution:

1. The battery surface should not touch the metal pole, good to have minimum 5mm clearance from pole to battery surface.
2. Keep NTC(Thermal Sensor) sensor input near LFP battery & connected to CC



5. Samples of local soil temperature curve depending on the different depth.

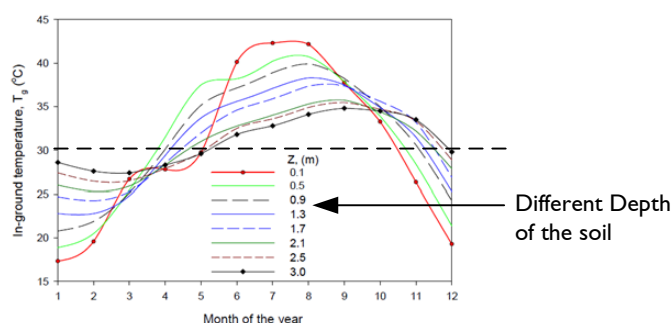


Figure 2. Annual variation of the measured in-ground temperature, T_g (based on the monthly average values), at different depths.

Different depth soil temperature diagram of Riyadh KSA in every month.

(Source: <https://www.mdpi.com/journal/energies>)

Change list

[illegible]