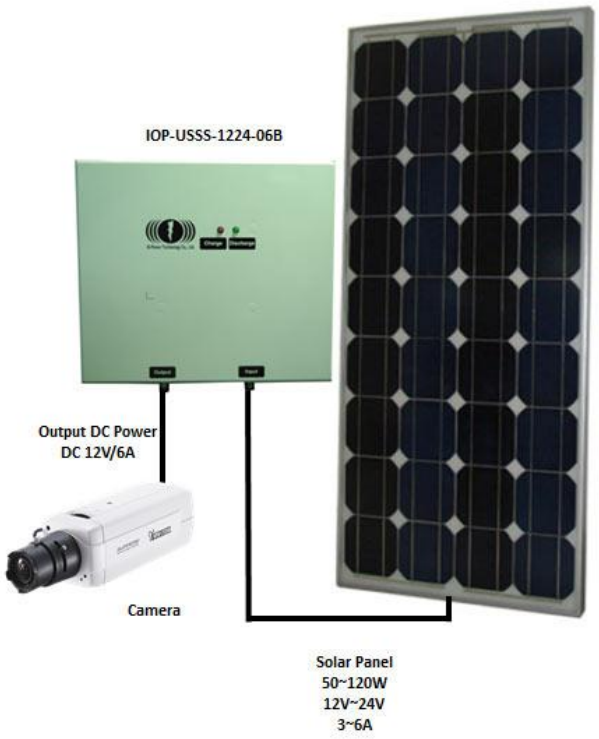
IO-Power Technology Co., Ltd 1F,No.100, Jinzhu Rd., North Dist., Hsinchu City 30053, Taiwan
勁電科技有限公司 台灣 新竹市北區金竹路 100 號 1 樓 Tel: +886-3-5429395 Fax: +886-3-5357297
http://www.io-power.com.tw www.io-power.com.cn e-mail: io-power@io-power.com.tw

IO-Power USSS-12V3556-OA Series

Cloudy-Solar Collection Model

Next Generation Online Type Solar Energy Collection Power Generation System



IOP-USSS-12V3556-OA Series

User Manual

IOP-USSS-1235-10B
IOP-USSS-1240-10B
IOP-USSS-1247-10B
IOP-USSS-1256-10B

EV.2.1_200202

Directory

Trademark and Copyright Notice

IOP-USSS-12V3556-OA series is Cloudy-Solar Collection Model online power voltage regulator power systems; IO-Power Technology Limited a registered trademark.

Product specifications and information referred to in this manual are for reference only, specification changes, without prior notice, please consult with agent or dealer before purchase latest product specification data.

About this manual

This manual discusses IO-Power Technology Cloudy-Solar Collection Model online power voltage regulator power systems, through the operation of the content of this article to address the problems of outdoor power-seizing.

This manual uses the following criteria to communicate instructions and information:

	C-LiFePO4 Lithium Batteries
	Readers' "attention". These attentions to include the special conditions referred to in this manual or use the recommendation and note references.
	Readers' "beware". In this case, readers can result in equipment damage or risks.
	Hazard. Means that there is a potential risk that can result in physical damage. Before using any equipment, please pay attention to the risks associated with the circuit, as well as familiar with standard practices required to prevent accidents from happening.

Bold: It means an important function and set of steps that require your attention.

Product Warranty

Housing Warranty

IOP-USSS-12V3556-OA series is Cloudy-Solar Collection Model online power voltage regulator and power systems, made of protection-grade iron material metal casing, complemented by professional antirust paint, suitable for indoor and outdoor harsh environments.

In accordance with the user manual to operate and use this product in non-human misuse case, buyer will have 2 year warranty guarantee.

Fully electronic micro processing control boards warranty

The IOP-USSS-12V3556-OA series adopts physical circuit safety protection design. It is designed as a control motherboard for on-line energy-collecting charging and discharging physical components.

The control motherboard can operate normally at -40℃ ~ 70℃.

The charging / discharging overcurrent protection current of the control board is 8A, and the over-temperature / high-temperature protection temperature is -40℃ / 70℃.

In accordance with the user manual to operate and use this product in non-human misuse case, buyer will have 2 year warranty guarantee.

Special M12 to Solar Connector Cable for wiring of warranty

Solar DC input voltage ranged DC 15V~28V, DC current 8A Max enter the maximum, access panels to match capacity to 40W~120W/8A, M12 to special Solar Connector Cable for connection to correspond with special connectors for solar panels.

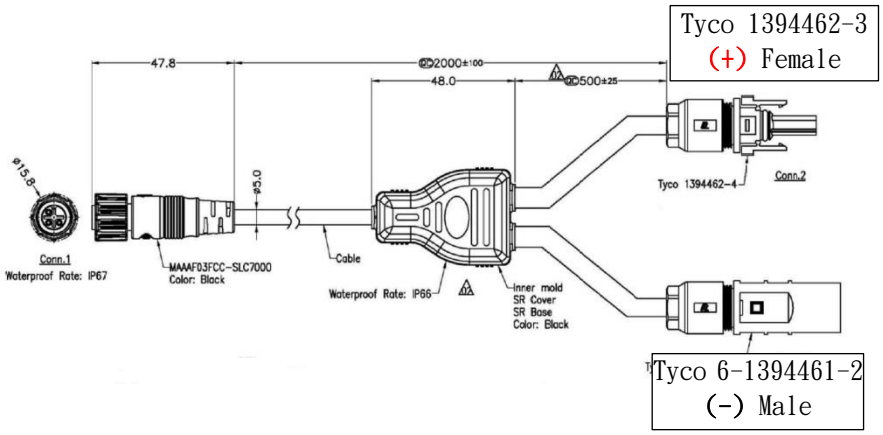
In accordance with the user manual to operate and use this product in non-human misuse case, buyer will have 1 year warranty guarantee for Solar Connector Cable wiring. (M12 to Solar Connector Cable is only rated IP65 waterproof protection. Please is place it in the power distribution box and do waterproof protection)

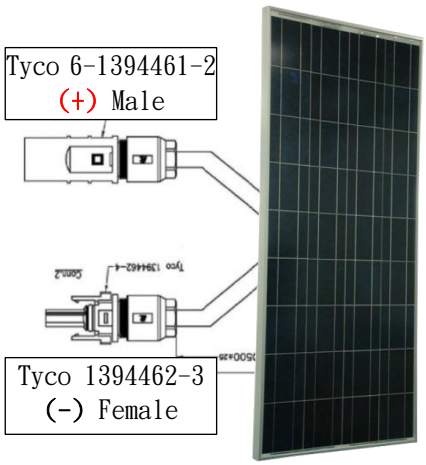
Tyco Connector

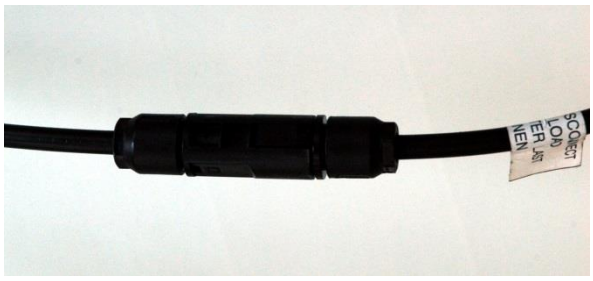
MC4 Connector

■ Please use “Tyco” Solar connector.

(Tyco) 6 – 13994461 - 2 Male (positive input) & (Tyco) 1394462 - 3 Female (negative input).

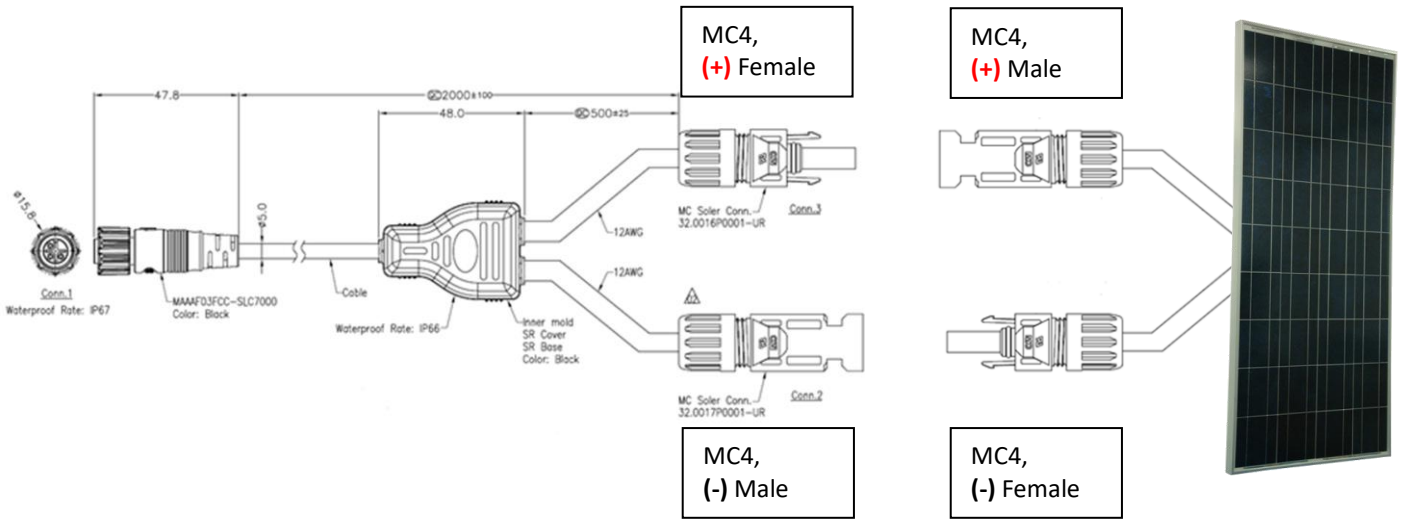






Note: You can contact with your Solar Panel supplier to replace use the Tyco Solar Connector.

■ Or Please use “MC4” Solar connector. MC4 (+) Male & (-) Female.



Note: You can contact with your Solar Panel supplier to replace use the MC4 Solar Connector.

C-LiFePO4 Lithium Batteries warranty

The IOP-USSS-12V3556-OA series are high- and low-temperature-resistant C-LiFePO4 Lithium batteries using the latest technology, supplemented by : Automatically detect battery status and perform abnormal voltage or faulty battery charging protection or battery low voltage zero power consumption protection.

Users operate in accordance with this instruction manual, and use this product under the conditions of non-human improper use and operating temperature defined by the specifications, will have a 1 year 500 times lithium iron battery charge and discharge operation warranty.

(Extend the warranty period and charge and discharge times 500 times, increase product warranty: 15% price increase per 500 times per year)

Attention of the Product storage

High and low temperature storage

The IOP-USSS-12V3556-OA series are high- and low-temperature-resistant C-LiFePO4 Lithium batteries using the latest technology. However, after the charge and discharge test before shipment, the system is in the green LED light to indicate the battery detection operation status.

The storage temperature between high and low temperature must be between 20°C ~ 35°C to keep the product safe and the normal operation of subsequent use.

Low-voltage storage

The IOP-USSS-12V3556-OA series are high- and low-temperature-resistant C-LiFePO4 Lithium batteries using the latest technology. However, after the charge and discharge test before shipment, the system is in the green LED light to indicate the battery detection operation status.

When the lithium iron battery is discharged to 11V + -3%, the low-voltage protection of the physical characteristics of the components will be activated. Therefore, users should periodically check the storage low-voltage condition to maintain the product storage safety and normal operation of subsequent use. If the green LED is not on, it means that the battery is in a low voltage state or has entered low voltage protection. Please charge it immediately; if the charging is invalid, please contact the dealer. The final protection discharge voltage of this series of products is 9V + -3%, and the maximum discharge protection voltage is 14.4V + -3%.

Regular maintenance of low voltage storage

The IOP-USSS-12V3556-OA series is stored in a low voltage and low power operating state. It is strongly recommended to start charging for the first time after obtaining the product. The charging time lasts at least 8 hours without interruption, and then every three months. The charging and maintenance of the voltage of the C-LiFePO4 Lithium battery is required, and the charging time lasts for at least 8 hours without interruption.

Activate the system

The IOP-USSS-12V3556-OA series uses low voltage and low power consumption to detect the operating status storage. When the voltage of the lithium iron battery is lower than 11V + -3%, the control electronic components will enter the shutdown state and wait for external power to input power for Start a system job.

When the external power source inputs power, the charge and discharge controller immediately performs the charging operation of the C-LiFePO4 Lithium battery and simultaneously performs the discharge management on the device side.

Special attention for the Product

IOP-USSS-12V3556-OA series adopts the latest technologies of high and low temperature resistance for C-LiFePO4 Lithium Batteries. The characteristics of C-LiFePO4 Lithium Batteries are very different from the lead-acid batteries and other types of batteries. C-LiFePO4 Lithium Batteries made by different manufacturers design different characteristics in product, including the operating voltage and operation current. This product uses C-LiFePO4 Lithium Batteries. Users shall pay more attention on list below:

1. Please use the product in accordance with the product specification data. Please do not remove or change this equipment without authorization of any of the main parts, so as to avoid the safe use of the extension of the problem.

2. Do not proceed heating over 80°C or put it close to fire or keep it less than -40°C to directly cooling down. It might cause damages for electronic components and the batteries.

3. When the product housing is over 70°C, do not carry out charging and discharging operation to avoid danger.

4. Do not place this product in high humidity and put it into water or close to the highly volatile chemical solvents to avoid danger.

5. Installation and assembly connectors in accordance with product instructions, not adjacent to the wrong wire connection to avoid the danger.

6. Do not use hammer or other items to strike this product, trample on the battery, cause strong impact, or throw, drop this product to avoid danger.

7. Before using this product, any action to charge and discharge the battery of this product, please be sure to read the manual in detail and with care.

8. When the C-LiFePO4 Lithium Batteries is discharging and being discharged, please keep it away from other conductive objects.

9. When recycling the batteries, please be sure that the battery (+) (-), short circuit is isolated to avoid danger.

10. The C-LiFePO4 Lithium Batteries has a life cycle, when the battery life-cycle ends, please contact your seller to replace same battery.

11. Be aware of the abnormal heat, flame, shape, smell, color, and other abnormal conditions, please immediately discontinue your use of the product and contact the seller as soon as possible or contact IO-Power Technology company.

12. When erecting IOP-USSS-12V3556-OA series, if there is more space in the distribution box or patch box space license case, we recommend this product fixed inside the box, it will help to reduce this product at the risk of excessive high temperature operating temperature.

13. When erecting IOP-USSS-12V3556-OA series, if possible, we recommends that this product fixed to the Lee side, or not to be in the rain, it will help to reduce this product is too high or low humidity and rain water environments such as operational risks.

14. When erecting IOP-USSS-12V3556-OA series, if possible, we recommend this product fixed on the back of sunshine, or not to be shined, it will help to reduce the heat caused by excessive heat and sunshine to protect the product body and wiring from speeding-up aging from the environmental risks.

15. When erecting IOP-USSS-12V3556-OA series, even this products is rated IP66~IP67 of waterproof and dustproof grade, but for a sound safety for indoor and outdoor use, we suggest to

proceed professional waterproof protection. Using general PVC tape for waterproof with 2 levels can reach the effect of waterproof and dustproof.

Product Specification Selection Evaluation

Note: For product specifications, please refer to the company website:

- Chinese website: http://www.io-power.com.cn/Product%20Data%20Sheet.htm
- English website: http://www.io-power.com/Product%20Data%20Sheet.htm

A.Firstly to confirm the power consumption of the devices

Power consumption evaluation Description:

Usually, the current claimed on the device (EX: cameras) adapter is not the “actual power consumption” for normal working. We suggest asking the technical support from the Original-Design company for the actual power consumption for a precise evaluation.

The current claimed on the device (EX: cameras) adapter is usually for the transient current when starting the device. Therefore, it is usually much higher than its normal working power consumption. IOP-USSS-12V3556-OA series can support 12V/7A above of the starting large current discharging, so please calculate and evaluate with the normal working power consumption.

Load device power consumption Description:

1. IOP-USSS-12V3556-OA series product, the power consumption of the main control board: 0.5~1W/H (estimate as in 1W/H)
2. General surveillance cameras: 2.5~5W/H (estimate as in 3.6W/H)
3. Professional surveillance cameras for road surveillance, 3.5~6W/H (estimate as in 4.5W/H)
4. Infrared surveillance cameras, IR on: 4~8W/H (estimate as in 6W/H)
5. Professional infrared shield: 4~10W/H (estimate as in 6W/H)
6. Professional long-distanced IR projector: 8~12W/H (estimate as in 10W/H)
7. Video Server (analog to digital processor): 6~10W/H (estimate as in 8W/H)

8. Speed Dome Cameras: 8~12W/H (estimate as in 10W/H), with IR on, please add 6W/H (estimate as in 16W/H)
9. DVR with built-in 1 unit of 2TB Hard Disk drive: 8~14W/H (estimate as in 10W/H); plus 5W/H for 1 extra unit of hard drive
10. NVR with built-in 1 unit of 2TB Hard Disk drive: 8~14W/H (estimate as in 10W/H); plus 5W/H for 1 extra unit of hard drive
11. The network switches / hubs: 2~4W/H (estimate as in 3W/H)
12. Outdoor wireless equipment, normal RF output power:5~10W/H power consumption (estimate as in 8W/H); increased RF output power and MIMO-power consumption: 8~15W/H (estimate as in 12W/H); 1W high RF output power: 15~25W/H (estimate as in 22W/H)

Note1: Some devices have a fan for heat sink; please add the extra power consumption for the fan operation.
Note 2: Some devices have heater, please add the extra power for the heater operation.

B.Estimated DC UPS battery capacity calculation

Cloudy-Solar Energy power voltage regulator uses: suggest designing 3-5 days (72-120 hours)

C-LiFePO4 Lithium Batteries Capacity V.S. C Value of charging and discharging

(C Value definition: hours of battery capacity and discharge current rate, such as: 1Ah battery capacity, amps to 1 A, =1C discharges 1 hour)
Suggest for charging current should be less than 0.5C, the discharging current should be less than 0.2C, to extend battery service life and power stability.

EX: With 6 unit of infrared surveillance cameras (6W/H)

Cloudy-Solar Energy set power voltage regulator uses: 6W/H*6H*6units*110% =237.6W => 237.6W/12.8V =18.6Ah
Recommended model: IOP-USSS-1224-09B -- 297 WH (23.2Ah @ 12.8V)
with 130W solar panel 22~24V/7A
Discharging current and discharging C value: (6W*6)/12.8V =2.8A => 2.8A/23.2Ah =0.12C < 0.2C

Charging current and charging C value: (237.6W/4hr full charge)/12.8V =4.6A => 4.6A/23.2Ah =0.19C < 0.5C; 4.6A < Solar Panel 5A*95% =4.75A

EX: With 1 set of general surveillance camera(3.6W/H) and professional infrared shield (6W/H)

Cloudy-Solar Energy power voltage regulator uses:
3 day power consuming hours (Cloudy-Solar power AM 9:00~PM 4:00) =18+18+18=54 hours
5 days power consuming hours (wet weather from solar-powered AM 9:00~PM 4:00) =18+18+18+18+18=90 hours

3 days total power consumption: 9.6W*1Pcs*110%*54Hr = 570W = 44.5Ah
Recommended model: IOP-USSS-1247-10B -- 594 WH (46.4Ah @ 12.8V)
with 130W solar panel 22~24V/7A
Discharge current and discharge C value: 9.6W/12.8V = 0.72A => 0.72A/46.4Ah =0.015C < 0.2C
Charging current and charging C value: (594W/8hr full charge)/12.8V =5.8A => 5.8A/46.4Ah =0.12C < 0.5C; 5.8A < Solar Panel 7A*95% =6.65A

5 days total power consumption for general surveillance camera:
3.6WH*110%*90Hr=356W=27.8Ah
5 days total power consumption for Professional infrared shield:
6WH*110%*90Hr=594W=46.4Ah
Recommended model: IOP-USSS-1247-10B -- 594 WH (46.4Ah @ 12.8V) * 2 Sets
with 2 individual sets of 130W solar panel 22~24V/7A
Surveillance cameras (3.6WH)-- Discharge current and discharge C value:
3.6W/12.8V=0.28A=>0.28A/23.2Ah=0.012C<0.2C
Professional infrared shield (6WH)—Charge current and charge C value:
6W/12.8V=0.46A=>0.46A/23.2Ah=0.02C<0.2C
Surveillance camera 3.6WH & professional infrared shield 6WH – Charge current and charge C value: (594W/8hr full charge)/12.8V =5.8A => 5.8A/46.4Ah =0.12C < 0.5C; 5.8A < Solar Panel 7A*95% =6.65A

Note 1: Using C-LiFePO4 Lithium Batteries for supplying enough electricity for 3 years use may drop the capacity to 90~95%. To operate 3 years; please plus the battery aging compensation coefficient of 10%.
Note 2: The C-LiFePO4 Lithium Batteries voltage is 12.8V, different from lead-acid battery 12V. Therefore, C-LiFePO4 Lithium Batteries is 295.7W/12.8V =23.1Ah.

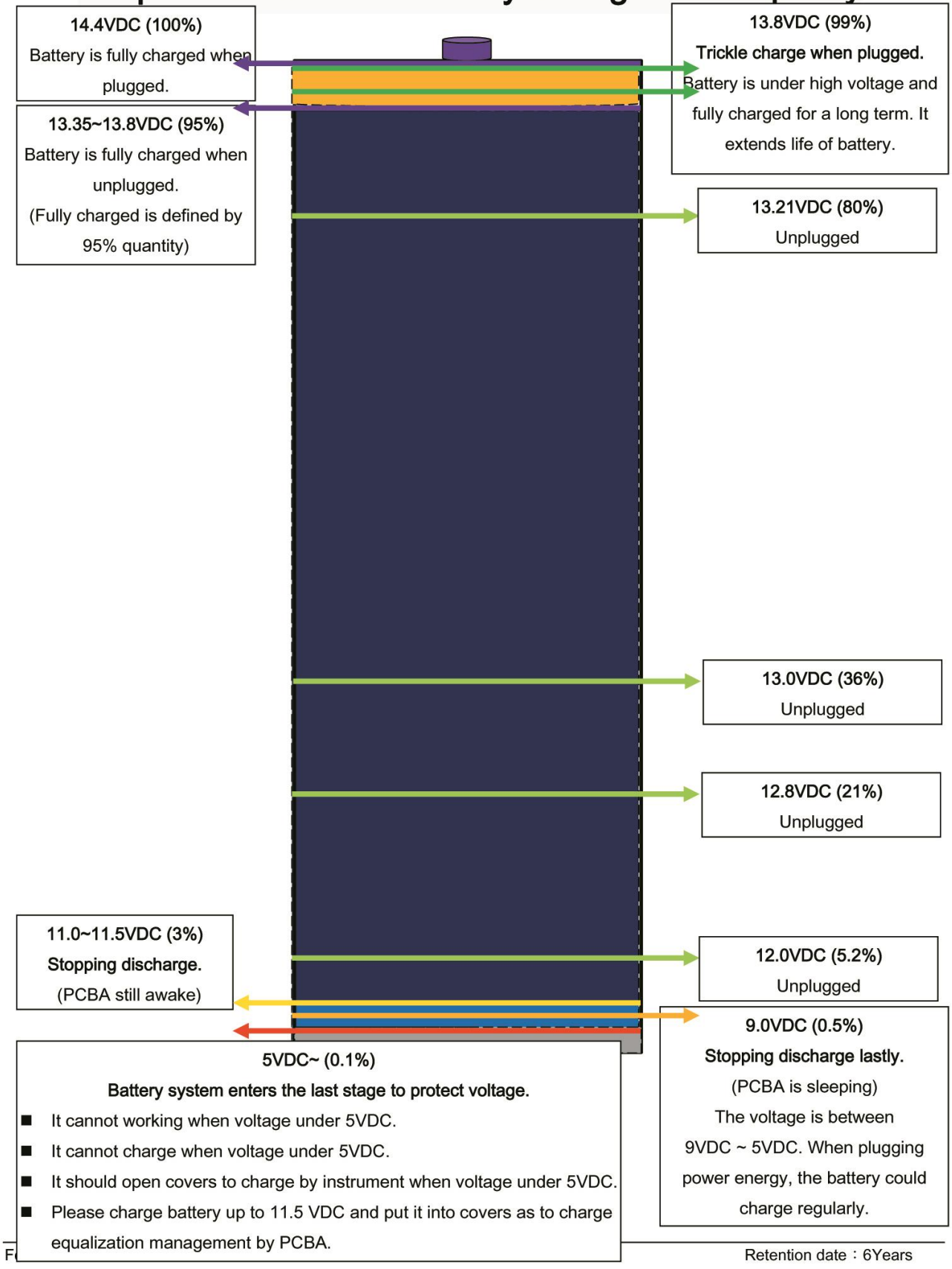
Note3: When designing the battery capacity for Solar-Energy DC UPS Power System, the designer needs to think about 1. How many rainy days in a series; 2. How many rainy days can the solar power system support the load devices in a series; 3. How long can the battery be fully charged..etc. To solve the continuous rainy or cloudy days, the designer may add another 20% or 30% of the battery capacity. The added capacity may not be charged in one day, but once the sun shows up in the next day, the battery can still be fully charged.

Consideration for environmental characteristics (for C-LiFePO4 Lithium Batteries)

Battery service life and service efficiency is influenced obviously by the factors below. Please take the factors in consideration:

1. Operating temperature: Lowest temperature shall be higher than -20°C, and highest temperature shall be lower than 60°C.
2. Discharge depth: Usually, the definition of full-charged battery state is at 95% capacity, @13.3V. When its voltage is @11V, the power capacity is about 2.13% left. Long-Term discharging deeply will speed up aging the batteries. Therefore, we suggest discharging 70%, and keeping 30% left, @ about 13V. It will obviously extend the battery service life.
3. The charging and discharging current: The recommended charging current should be less than 0.5C. And the recommended discharging current should be less than 0.2C. It will fully show the battery charging/discharging characteristics and performance. It can also extend the battery service life and slow down the battery aging.
4. Regularly re-charge the power: the self-discharging rate of C-LiFePO4 Lithium Batteries is much less than other batteries. Remaining in high voltage can extend battery service life and slow down battery aging.

Graph of C-LiFePO4 Battery Voltage and Capacity



Retention date：6Years

Product Installation Instructions

Click the Solar Energy joint (please do an extra waterproof protection)

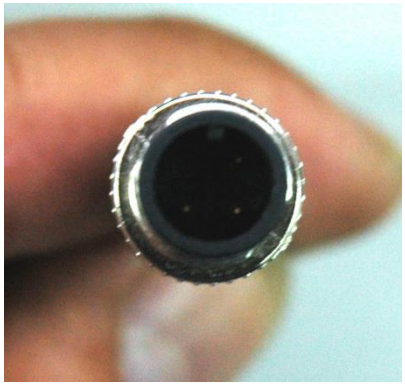
CAUTION This product series uses Tyco Patent connector. (TYCO) 1394462-4 (Male) & Tyco. 6-13994461-2 (Female) solar energy joint

When you purchase solar panels, please be sure to advise the supplier for Tyco patented joints.

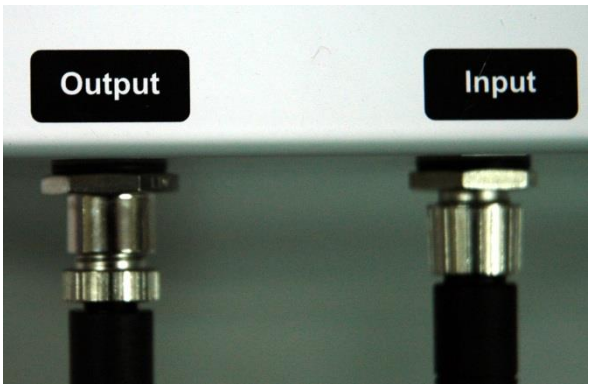
DC M12 Male to DC M12 Female for input

Take aim at M12 Male and plug in M12 Female and spin to tighten the connectors (please do an extra waterproof protection)

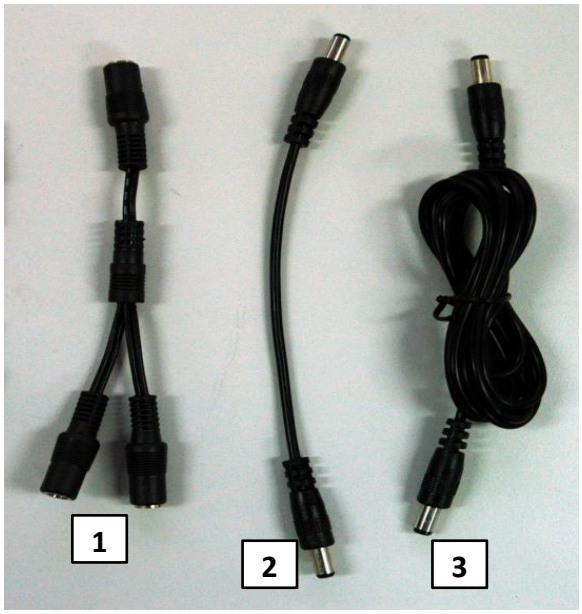
DC M12 Female to DC M12 Male for output



Take aim at M12 Female and plug in M12 Male and spin to tighten the connectors (please do an extra waterproof protection)



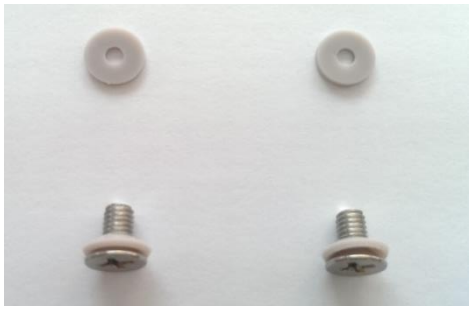
DC Extend Connector / DC Extend Cable



1. 1 DC Female to 2 DC Female 15cm (Female to Female, 1 to 2 extended distribution connector)
2. 1 DC Male to 1 DC Male 18.8cm (Male to Male, extended short cable)
3. 1 DC Male to 1 DC Male 150cm (Male to Male, extended long cable)

Mounting instructions

Firstly, put the waterproof rubber gaskets on the screws



Then set the screw, through another set of waterproof rubber gaskets, on the stainless steel bracket

Finally, screw the bracket tight into the screw holes in the bottom side of the housing

Pole fixation

Suggest using stainless steel cable belt to pass through the stainless steel fixing brackets on either side of the hole, and then fix the belt tightly to poles or garden lamp posts or street light lay … etc.

Wall fixation

Drill two holes on the wall, and put plastic plugs into the holes. And then screw the self-tapping stainless screws in. Finally, go through the stainless steel fixing brackets on either side of the holes, pressing down and keep the product fixed.

Product Use Instructions

External power input description

IOP-USSS-12V3556-OA series uses solar cell DC power input, voltage ranged DC 15V~28V with DC current 8A Max. The suitable solar panels are ranged 40W~120W/4~8.5A. The PCBA execute battery charging and discharging management. At the same time, it provides DC 11.5V~DC 14.4V to the load devices, such as surveillance cameras, DVR/NVR host, infrared projector……etc.

DC power output description

IOP-USSS-12V3556-OA series, built-in charge and discharge physical circuit element controller, adopts on-line uninterruptible circuit design, online real-time discharge through iron lithium battery, provides DC 11V ~ DC 14.4V power to load equipment , Such as surveillance cameras, DVR / NVR hosts, infrared projectors, etc.

When the iron lithium battery is discharged to 11V + -3%, the built-in charge and discharge physical circuit element controller will automatically perform low-voltage stop discharge protection. The final protection discharge voltage of this series of products is 9V + -3%, and the maximum discharge protection voltage is 14.4 V + -3%.

Recovery after low-voltage-discharge-termination instruction

IOP-USSS-12V3556-OA series, built-in charge and discharge physical circuit element controller. When the lithium iron battery discharge reaches 11V + -3%, it will start the low voltage stop discharge protection, and restore the external power input after DC power charging. The processing controller will wait for the voltage of the C-LiFePO4 Lithium battery to rise to 12.8V + -3% before discharging the load. (It usually takes 10 ~ 30 minutes, depending on the charging current)

C-LiFePO4 Lithium Batteries charging

IOP-USSS-12V3556-OA series adopts the latest technologies of high and low temperature resistance of C-LiFePO4 Lithium Batteries. It is very different from the other types of battery, like lead-acid batteries, deep cycle lead-acid batteries, and lithium ion battery characteristics. Besides, the different C-LiFePO4 Lithium Batteries products characteristics made by different manufacturers are also different both in voltage and current.

IOP-USSS-12V3556-OA series charging mode and charging voltage is as below:

Battery Charge Mode	CCP/CVP MCU Control
Battery Charge Voltage	14.4V +- 3%
Battery Charge Float Voltage	13.6V +- 3%
Battery Cut-off Discharge Voltage	11V +- 3%
Battery Final Cut-off Discharge Voltage	9V +- 3%

When shipped, the green LED light is constantly on, indicating that the battery is in a normal voltage condition.

If the green LED is not on, it means that the battery is in a low voltage state or has entered low voltage protection.

Please charge it immediately; if the charging is invalid, please contact the dealer.

IOP-USSS-12V3556-OA series uses C-LiFePO4 Lithium Batteries, different voltage values the remaining power capacity is as follows (no load voltage): +-5%

Voltage(V)	Capacity (%)	Voltage(V)	Capacity (%)	Voltage(V)	Capacity (%)
14.10	100.00%	13.16	70%	12.60	13.72%
14.00	99.95%	13.13	65%	12.40	8.88%
13.80	99.85%	13.10	60%	12.20	7.14%
13.60	99.55%	13.08	55%	12.00	6.15%
13.40	98.80%	13.05	50%	11.80	5.38%
13.32	95%	13.03	45%	11.60	4.72%
13.28	90%	13.00	39.18%	11.40	4.14%
13.24	85%	12.98	35%	11.20	3.63%
13.20	78.55%	12.94	30%	11.00	3.15%
13.19	75%	12.80	21.40%	7.20	0.00%

LED Display

1. When shipped, the green LED light is constantly on, indicating that the battery is in a normal voltage condition.
2. If the green LED is not on, it means that the battery is in a low voltage state or has entered low voltage protection, please charge it immediately; if the charging is invalid, please contact the dealer.
3. Plug in the 12VDC load-side equipment, and the hardware detects the load side and requires that the voltage is within the specified range, then output the power immediately.
4. Input solar DC power: The red light is constantly displayed, indicating that the power has been input.
5. The higher the input solar power voltage, the brighter the red LED light.