



PROJECT HELIOS

USER MANUAL

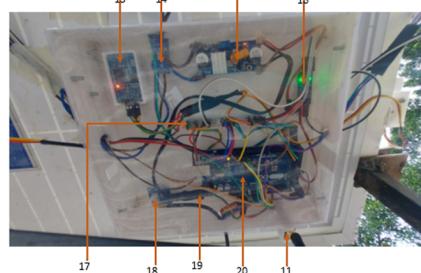
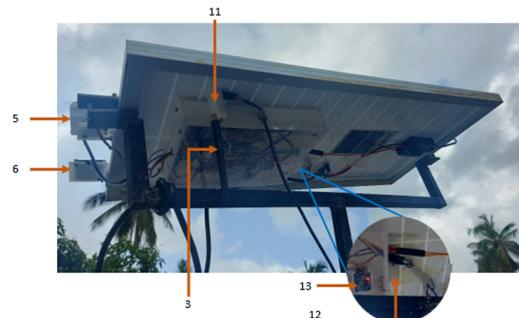
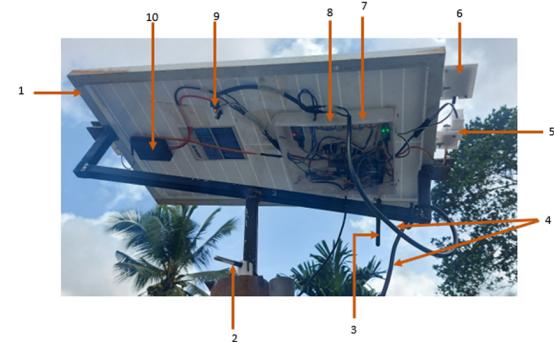


IoT Enabled Solar PV Monitoring System for Increased Efficiency

PROTOTYPE USER MANUAL

Project Helios aims to create an updated take on the Solar PV Monitoring system. Regardless of the scale of these systems, the ability to constantly monitor the systems will aid in effective decision making on the part of the user. We aim to provide accurate and up-to-date information about the solar panels using a collection of sensors, none of which are used all together in present systems.

1. Solar Panel – In this prototype design, we use only one solar panel. This is the main solar panel of the panel array. In a real implementation, every per panel array has a panel with the Solar Panel Controlling Unit.
2. DS18B20 Sensor (Waterproof Temperature Sensor) – Only one sensor uses for an entire solar farm. This sensor is used to collect data about environmental temperature.
3. External Antenna for NRF24L01 Module
4. Solar PV Output – This power line connects with the Solar PV Input in the Inverter Unit. This power line carries power generation of the solar panels to the Inverter Unit.
5. Dust Detection Unit – Every per panel array has this unit.
 1. Covered LDR Sensor
 2. Plastic Covering Plate
 3. Servo Motor
6. Snow & Raindrops Detection Sensor (Sensing Pad) – Only one sensor uses for an entire solar farm. Used to detect rainfall or snowfall.
7. Panel Controlling Unit Box – Number 13 to 20 components are included in this box.
8. Wire Connector – Panel power wires and Main Power line connection
9. Current Sensor – Every solar panel has this sensor to measure per panel ampere.
10. Panel Power Wire Connection Box
11. NRF24L01 2.4GHz Wireless Transceiver Module
12. DHT11 Sensor Module (Temperature and Relative Humidity)
13. DS3231 RTC Module
14. Voltage Sensor - Every solar panel has this sensor to measure per panel voltage.
15. Buck Converter (Step-Down) – Power supply for Arduino Mega
16. Snow & Raindrops Detection Sensor (Module)
17. 5V Power Supply – For sensors and actuator
18. DS18B20 Sensor (Module)
19. Arduino Mega Power Supply Input
20. Arduino Mega Board
21. Uncovered LDR Sensor – Our system uses this LDR sensor and the Covered LDR sensor to detect dust particles on the solar panel.



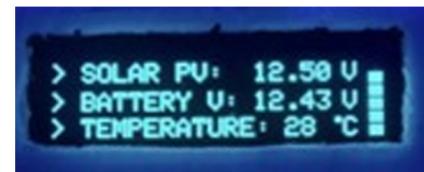
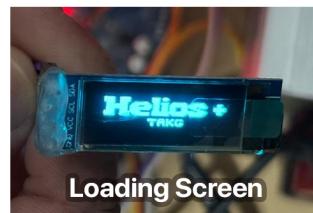
Parameter Table

Model	Helios+ V1.0
Maximum input power	600W
Peak power tracking voltage	12V System < 25V
Min / max starting voltage	12V System < 25V
Maximum DC short-circuit	30A
Maximum input operating current	30A
Output Data	12V System
Peak power output	500W
Rated output power	500W
Rated output current	5A
Rated voltage range	210V – 220V AC
Rated frequency range	45Hz – 50Hz
Power Factor	> 99%
Max unit per branch circuit	2pcs (Single Phase)
Output Efficiency	12V System
Static MPPT efficiency	99.5%
Maximum output efficiency	95%
Nighttime power consumption	< 2W
THD	< 5%
Exterior & Feature	
Ambient temperature range	-35°C to +60°C
Dimensions (L × W × H)	402mm x 202mm x 101mm
Weight	1.2kg
Waterproof rating	- (This Inverter is Only for Indoor use)
Cooling	Self-cooling (Cooling Fan Included)
Communication Mode	Serial Communication with Edge Computer
Power transmission mode	Reverse transfer, load priority
Monitoring System	Web Browser / 128 x 32 OLED Display
Electromagnetic Compatibility	–
Grid disturbance	Off Grid System
Grid detection	Off Grid System

Notes

- Please connect the inverter following the operation instruction shown above. If have any question, please contact with relative persons.
- Non-professionals do not disassemble. Only qualified personnel may repair this product.
- Please install inverter in the low humidity and well-ventilated place to avoid the inverter over-heating, and clear around the inflammable and explosive materials.
- When using this product, avoid children touching, playing, to avoid electric shock.
- Connected solar panels, battery, or wind generators DC input DC power supply cable.

LED Display

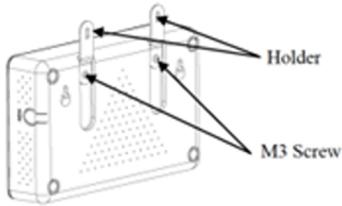


Buffer

3 second--- "Beep" sound, 3 second while device

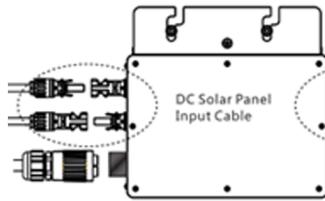
Step 1

Installation for fixed the inverter on the M3 holder with the screws attached is as following



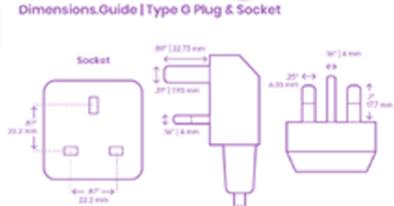
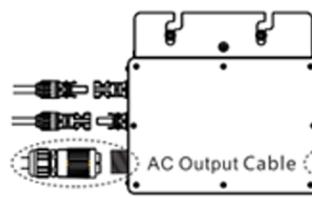
Step 2

Connect the DC terminal of the solar to the inverter positive to positive, negative to negative. Shown below:



Step 3

Plug to AC power line. Show below:



Step 4

Plug the AC output line to main AC cable;

Step 5

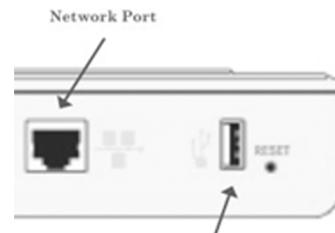
Repeat the first step to the third step to complete the installation of micro inverters;

Step 6

Finally, please connect the AC main cable to the utility grid.

Step 7

Connect to inverter to internet



PROJECT HELIOS

Internet Connection

There are two different approaches to connecting the ECU to the Internet:

- Direct CAT5 network connection to a broadband router.
- Wireless connection to a wireless broadband router

Direct CAT5 Connection

1. Make sure the CAT5 cable is connected to the network port on the bottom of the inverter.
2. Connect the CAT5 cable into a spare port on the broadband router.



Wireless Connection

Wireless Connection Using the internal Wi-Fi capabilities of the inverter:
Join the Wi-Fi to the site's LAN via the inverter's wireless functionality



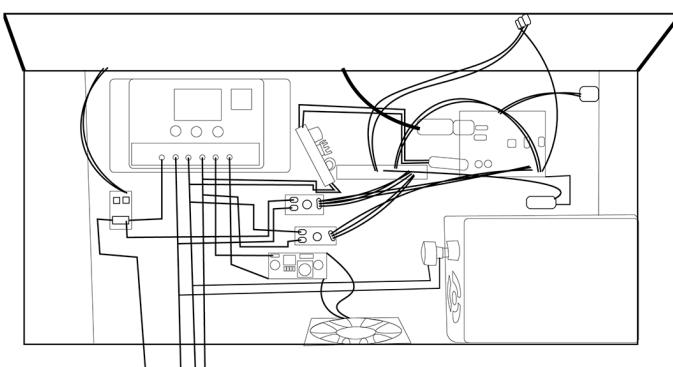
Power Up Inverter

1. Make sure the power cable is correctly connected to the power connection port on the bottom of the inverter
2. Plug the power cable into a dedicated standard AC electrical outlet.

WARNING: Make sure to use a dedicated outlet for the inverter. Do NOT plug any other devices into the same outlet as the inverter.

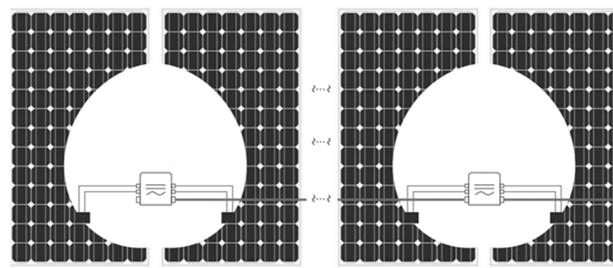
WARNING: Do NOT plug the inverter into a power strip, surge protector, or uninterruptable power supply (UPS). The surge suppression and/or filtering on these sorts of devices will substantially diminish PLC performance

Inverter Unit



Add Up For Per Array

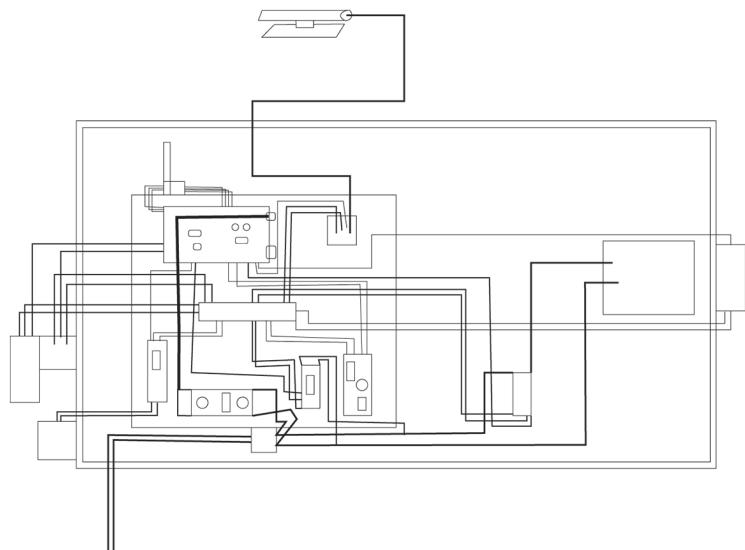
1. Turn off the System and remove Ac power cable
2. Add new panel and set sensors on Grid



Monitoring System Operating Instructions

1. The first time the inverter is powered up it is going to "192.168.1.31" and display the available Wi-Fi network IP, as well as the internal LAN IP Address.
2. Please enter the password of your network
3. After entering the wi-fi password, the inverter will remain in the normal working and "beep" sound

Per Array Controlling Unit



Edge Computer

