User Manual

MICROINVERTER

(Model: MI-1000/MI-1200/MI-1500)

About Microinverter

This system is composed of a group of Microinverters that convert direct current (DC) into alternating current (AC) and feeds it into the public grid. The system is designed for the incorporation of one Microinverter for four photovoltaic modules. Each Microinverter works independently that guarantees the maximum power generation of each photovoltaic module. This setup enables user to control the production of a single photovoltaic module directly, consequently improving the flexibility and reliability of the system.

About the manual

This manual contains important instructions for the MI-1000/MI-1200 Microinverter and must be read in its entirety before installing or commissioning the equipment. For safety, only qualified technician, who has received training or has demonstrated skills can install and maintain this Microinverter under the guide of this document.

Other Information

Product information is subject to change without notice. User manual will be updated frequently, please refer to Hoymiles official website at www.hoymiles.com for the latest version.

Contents

1. Important Notes

1.1 Product Range

This manual describes the assembly, installation, commissioning, maintenance and failuresearch of the following model of Hoymiles Microinverter:

- MI-1000
- MI-1200
- MI-1500

Note: “1000” means 1000W, “1200” means 1200W, “1500” means 1500W.

1.2 Target Group

This manual is only for qualified technician, who has been trained or has demonstrated skills can install and maintain this Microinverter under the guide of this document for safety purpose.

1.3 Symbols Used

The safety symbols in this user manual are show as below.

Symbol	Usage
	**Indicates a hazardous situation that can result in deadly electric shock hazards, other serious physical injury, or fire hazards.**
	**Indicates directions which must be fully understood and followed in entirety in order to avoid potential safety hazards including equipment damage or personal injury.**
	**Indicates this points out that the described operation must not be carried out. The reader should stop, use caution and fully understand the operations explained before proceeding.**

2. About Safety

2.1 Important Safety Instructions

The MI-1000/MI-1200/MI-1500 Microinverter is designed and tested according to international safety requirements (IEC62109-1/-2, VDE4105, VDE0126, AS 4777.1 /.2& AS 3000). However, certain safety precautions must be taken when installing and operating this inverter. The installer must read and follow all instructions, cautions and warnings in this installation manual.

➢ All operations including transport, installation, start-up and maintenance, must be carried out by qualified, trained personnel.
➢ Before installation, check the unit to ensure free of any transport or handling damage, which could affect insulation integrity or safety clearances. Choose installation location carefully and adhere to specified cooling requirements. Unauthorized removal of necessary protections, improper use, incorrect installation and operation may lead to serious safety and shock hazards or equipment damage.
➢ Before connecting the Microinverter to the power distribution grid, contact the local power distribution grid company to get appropriate approvals. This connection must be made only by qualified technical personnel. It is the responsibility of the installer to provide external disconnect switches and Over current Protection Devices (OCPD).
➢ Only one photo voltaic module can be connected to one input of the inverter. Do not connect batteries or other sources of power supply. The inverter can be used only if all the technical characteristics are observed and applied.
➢ Do not install the equipment in adverse environment conditions such as flammable, explosive, corrosive, extreme high or low temperature, and humid. Do not use the equipment when the safety devices do not work or disabled.
➢ Use personal protective equipment, including gloves and eye protection during the installation.
➢ Inform the manufacturer about non-standard installation conditions.
➢ Do not use the equipment if any operating anomalies are found. Avoid temporary repairs.
➢ All repairs should be carried out using only qualified spare parts, which must be installed in accordance with their intended use and by a licensed contractor or authorized Hoymiles service representative.
➢ Liabilities arising from commercial components are delegated to their respective manufacturers.
➢ Anytime the inverter has been disconnected from the public network, please be extremely caution as some components can retain charge sufficient to create a shock hazard. Prior to touching any part of the inverter please ensure surfaces and equipment are under touch safe temperatures and voltage potentials before proceeding.
➢ Hoymiles accepts No liability for damage from incorrect or improper operation
➢ Electrical Installation & Maintenance shall be conducted by licensed electrician and shall comply with Local Wiring Rules

2.2 Explanation of Symbols

Symbol	Usage
	**Treatment** To comply with European Directive 2002/96/EC on waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility. Any device no longer required must be returned to an authorized dealer or approved collection and recycling facility.
	**Caution** Do not come within 8 inches (20cm) of the microinverter for any length of time while it is in operation.
	**Danger of high voltages** Danger to life due to high voltage in the microinverter.
	**Beware of hot surface** The inverter can become hot during operation. Avoid contact with metal surfaces during operation.
	**CE mark** The inverter complies with the requirements of the Low Voltage Directive for the European Union.
	**Read manual first** Please read the installation manual first before installation, operation and maintenance.

3. About Product

3.1 About 4 in 1 unit

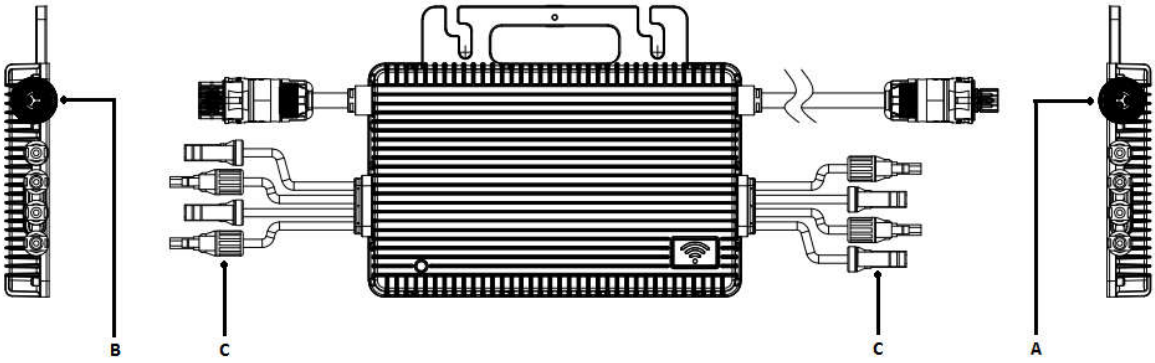
“The world’s First Single-phase Microinverter” designed for 4 solar panels with dual MPPTs with wide DC input operating voltage range(16-60V) and low start-up voltage (22V only).

Hoymiles 4 in 1 Microinverter MI-1000/MI-1200/MI-1500 is “The Best PowerDensity Microinverter” ever in solar industry with extremely light weight-only3.75KG including integrated DC&AC cables;3-phase wiring is also easy to be configured by Hoymiles 4 in 1 Microinverter for MW size commercial PV power stations(one of the world’s biggest Microinverter projects configured by Hoymiles Microinverter is 3.6MW).

3.2 Highlights

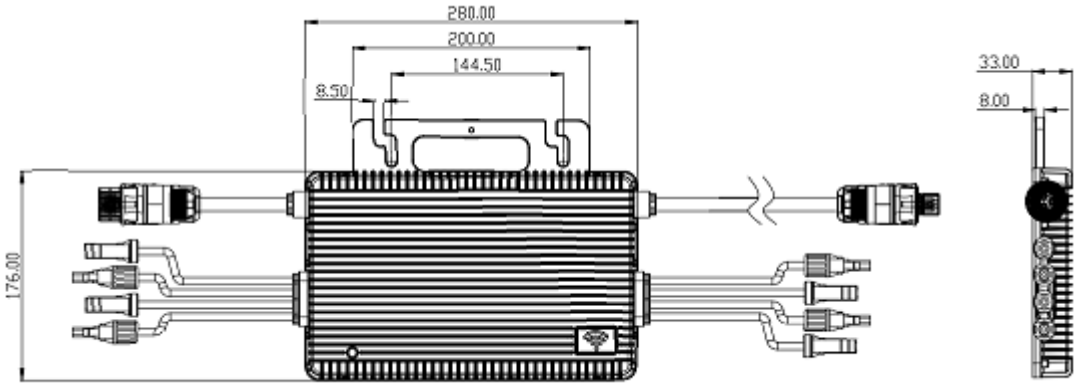
- Maximum output power up to 1000/1200/1500W; Adapted to 60 & 72 cells PV panels.
- Peak efficiency 96.60%; CEC weighted efficiency 96.50%.
- Static MPPT efficiency 99.80%; Dynamic MPPT efficiency 99.76% in overcast weather.
- High reliability: NEMA6 (IP67) enclosure; 6000V surge protection.

3.3 Terminals Introduction



Object	Description
A	AC Connector (male)
B	AC Connector (Female)
C	DC Connectors

3.4 Dimension



4. Function

4.1 Work Mode

Normal: Under this mode, Microinverter is operating normally and convert DC power into AC power to support the house loads and feed in to Public Grid.

Anti-reflux Control: Under this mode Microinverter's generation is limit base on the current house loads, there will be no extra power feed in to the Public Grid.

Stand By: There are several circumstance that Microinverter will stay in Stand by mode:

- The current condition is contradicted with Microinverter operating requirement.
- No house loads or the Export control value has been set as "0" on the DTU under the Anti-Reflux Control mode.

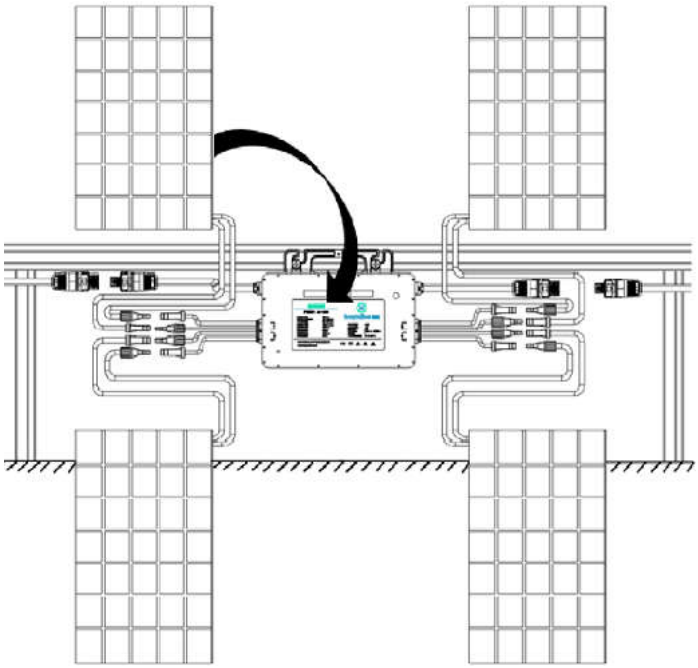
5. Installation

5.1 Accessories

Object	Description
A	AC Extension Cable
B	AC End Cable (Female) , 2m 12 AWG cable.
C	AC Female Connector
D	DC Male Connector
E	AC Male End Cap, IP67.
F	AC Female End Cap, IP67.
G	Screw, 2 pcs of M8*25 screws to tighten Microinverter on the frame.
H	AC/DC Connector Unlock Tool.
I	DC Extension Cable(optional)

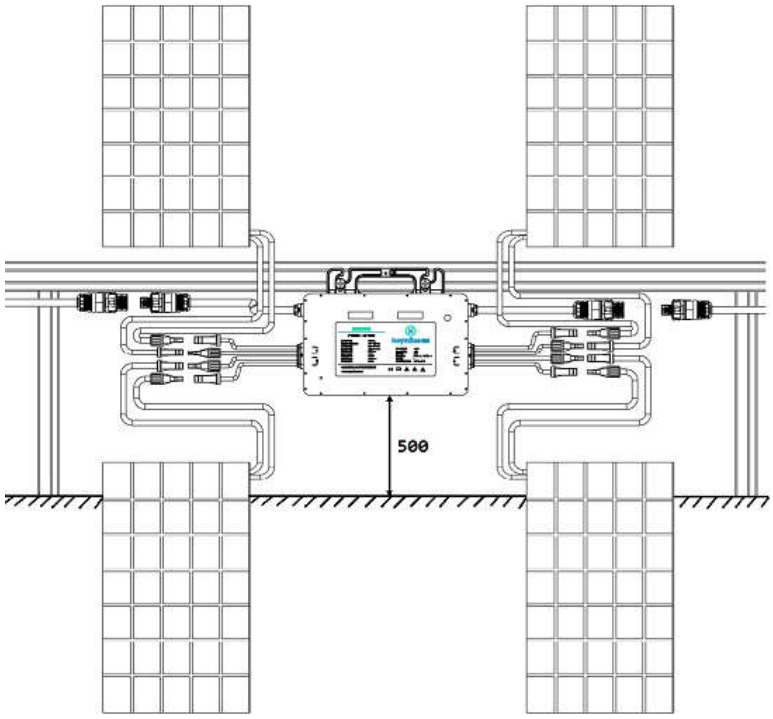
5.2 Installation Precaution

Please install the Microinverter and all DC connections under the PV module to avoiding direct sunlight, rain exposure, snow layup, UV etc.



5.3 Space Distance Required

Please install the Microinverter at least 500mm above the ground/roof. Please contact with Hoymiles Tech. engineer if there is any special circumstance.



5.4 Preparation

Installation of the equipment is carried out based on the system design and the place in which the equipment is installed.

- The installation must be carried out with the equipment disconnected from the grid (power disconnect switch open) and with the photovoltaic modules shaded or isolated.
- Referring to the Technical Data to make sure the environmental conditions fit the microinverter's requirement (degree of protection, temperature, humidity, altitude, etc.)
- To avoid power derating due to an increase in the microinverter internal temperature, do not expose it to direct sunlight.
- To avoid overheating, always make sure the air flow around the inverter is not blocked.
- Do not install in places where gasses or flammable substances may be present.
- Avoid electromagnetic interference that can compromise the correct operation of electronic equipment.

When choosing the position of installation, comply with the following conditions:

Install only on structures specifically conceived for photovoltaic modules (supplied by installation technicians).

Install Microinverter underneath of the photovoltaic modules to make sure it works in the shadow. If this condition cannot be met, might trigger the inverter production derating.

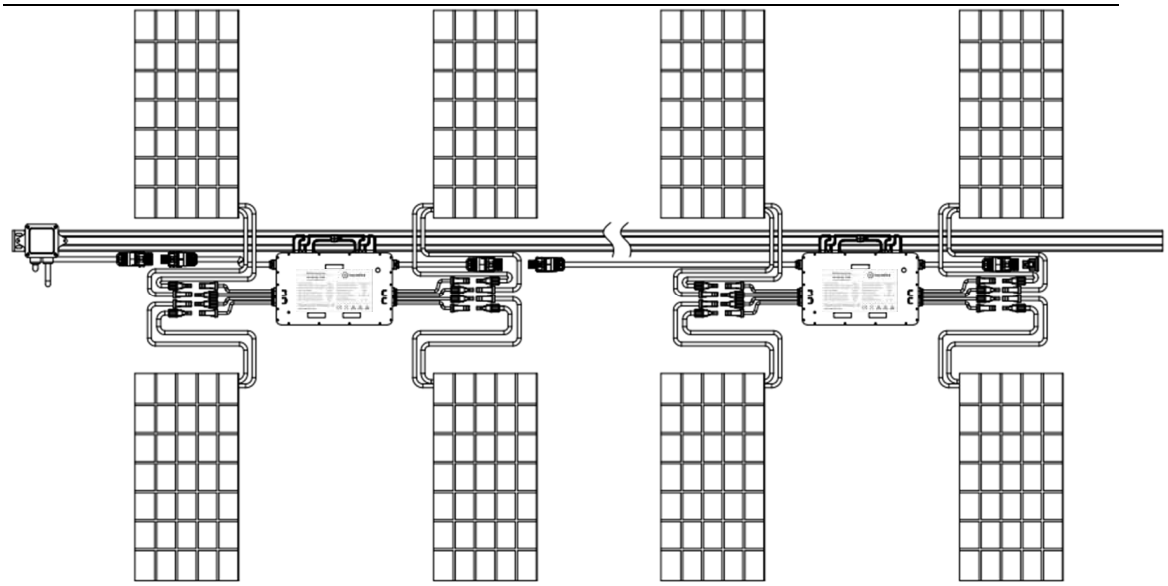


Fig.1 InstallationPosition of Microinverter

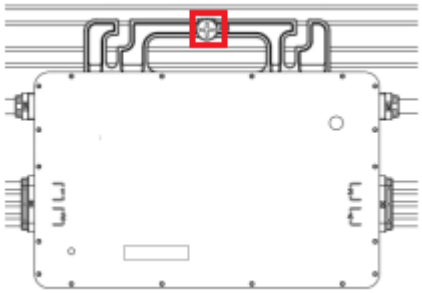
5.5 Installation Steps

Step 1. Install Microinverter

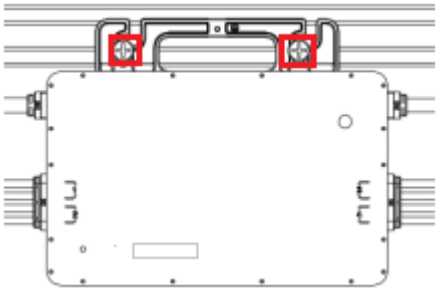
a.Mark the approximate center of each panel on the frame.

b. Install the Microinverter shown as below two methods. The silver cover side should be up.

Method 1: Secure with 1 screw



Method 2: Secure with 2 screws



c. Tighten the screw and fix the inverter on the frame (for method 2 only).

Observe the certification documents concerning the maximum number of Micro-inverters permitted for installation at each cable section!

The Microinverter must be under the module, out of long-term exposure to direct sunlight or rain.

Step 2. Connect AC Cables of Microinverter

a.Plug the AC connector of the first microinverter into the connector of the second microinverter, and so for the rest, to form a continuous AC branch circuit.

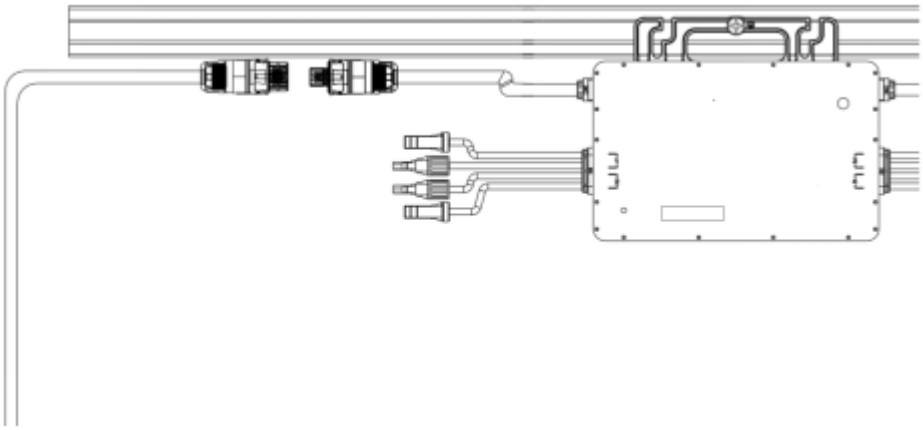
b. Install the AC End Cap on the open AC connector of the last microinverter in the AC branch circuit.

Step 3. Connect AC End Cable

a. Connect the AC Female connector on the side of AC End cable to the adjacent Microinverter's AC Male connector.

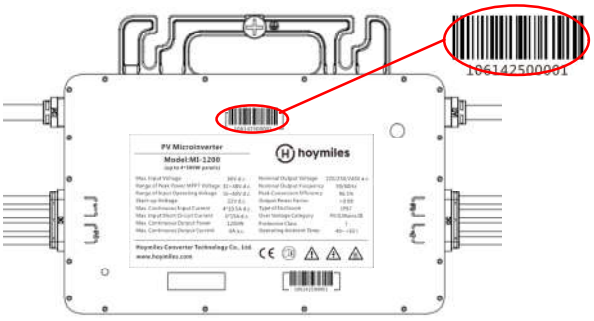
b. Connect the other side of the AC End Cable to the distribution box, and wire it to the local grid network. Close the distribution box after the wiring is completed.

Note: Brown Wire: L Blue Wire: N Yellow/Green Wire: Ground



Step 4. Create an Installation Map

a. Peel the removable serial number label from each microinverter(The position of the label is shown as below).



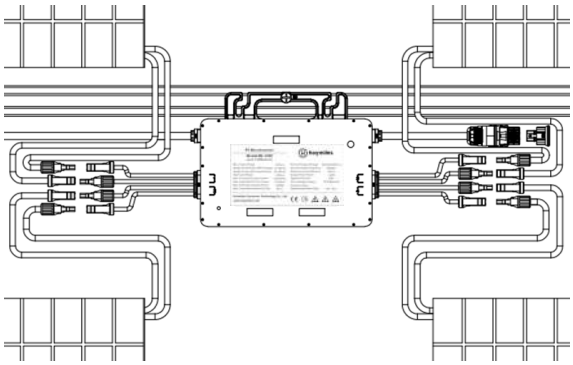
b.Affix the serial number label to the respective location on theinstallation map (Please refer to the appendix for the installation map).

N S E W (circle one)	Panel Group: Azimuth: Tilt: Sheet___of___		Customer Information:					DTU Serial Number:			hoymiles			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	1	3												
B	2	4												
C														
D														

Step 5. Connect PV Modules

a. Mountthe PV modules above themicroinverters.

b. Connect the PV modules' DC cablesto theDCinputsideofthemicroinverter.



The recommended installation need to keep the Microinverter underneath the photovoltaic modules, so that the Microinverters can operate in the shadow. Direct sunlight exposure may effect on the performance as well as the lifetime to the Microinverter.

The length of the DC cable that connecting the Microinverter and module need to be less than 3m.

Step 6. Energize the System

a. Turn on the AC breaker for the branch circuit.

b.Turn on the main AC breakerfor the house. Your system will start to generate power about two-minute wait time.

Step 7. Monitoring System Set Up

Refer to the DTU User Manual or the DTU Quick Install Guide to Install the DTU and Set up Monitoring System.

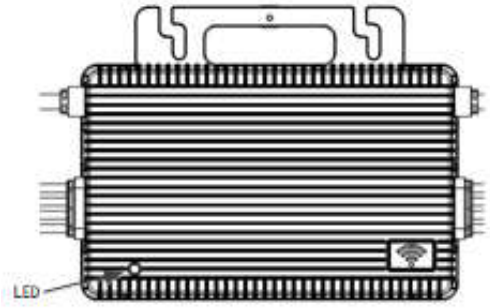
6. Troubleshooting

6.1 Troubleshooting List

Status Code	Solution
01	Please contact your installer.
02	Please contact your installer.
03	Waiting for AC voltage recover, if the code appears frequently please contact your installer to check the AC wiring.
04	Please Contact your installer, and provide Panel specs.
05	Please contact your installer to check the DC side installation and PV configuration.
06	Please contact your installer.
07	Please check the am temperature and installation environment.
08	Waiting for AC voltage recover, if the code appears frequently please contact your installer to check the AC wiring.
09	Waiting for AC frequency recover, if the code appears frequently please contact your installer.
10	Please try firmware upgrade.
12	Please try reboot or firmware upgrade.
13	Please try reboot or firmware upgrade.
14	Please contact your installer.
15	Waiting for AC voltage recover, if the code appears frequently please contact your installer.
16	Please contact your installer.
20	Please try firmware upgrade.

6.2 Status LED Indicator

The LED flashes six times at start up. All green flashes indicate normal start up.



- ✓ Flashing Slow Green(2s gap): Producing power and communicating with DTU.
- ✓ Flashing Fast Green (4s gap): Producing power and not communicating with DTU.
- ✓ Flashing Red(1s gap): Not producing power ACgrid invalid (Voltage or frequency out of range).
- ✓ Flashing Red (always): GFDI Fault.The LED will remain red and the fault will continue to be reported by the DTU.

6.3 On-site inspection (For qualified installer only)

To troubleshoot an inoperable microinverter, follow the steps in the order shown.

1. Verify the utility voltage and frequency are within ranges shown in the in appendix Technical Data of this microinverter.

2. Check the connection to the utility grid. Verify utility power is present at the inverter in question by removing AC, then DC power. Never disconnect the DC wires while the microinverter is producing power. Re-connect the DC module connectors and watch for five short LED flashes.

3. Check the AC branch circuit interconnection between all the microinverters. Verify each inverter is energized by the utility grid as described in the previous step.

4. Make sure that any AC breaker are functioning properly and are closed.

5. Check the DC connections between the microinverter and the PV module.

6. Verify the PV module DC voltage is within the allowable range shown in appendix Technical Data of this manual.

7. If the problem persists, please call Hoymiles customer support.

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- ➢ Do not try to repair the microinverter. If the troubleshooting fails, please return it to the factory for replacement.

6.4 Routine Maintenance

- ➢ Only authorized personnel are allowed to carry out the maintenance operations and are responsible to report any anomalies.
- ➢ Always use the personal protective equipment provided by the employer when carry out the maintenance operation.

- During normal operation, check that the environmental and logistic conditions are correct. Make sure that the conditions have not changed over time and that the equipment is not exposed to adverse weather conditions and has not been covered with foreign bodies.
- Don't use the equipment if any problems are found, and restore the normal conditions after the fault removed.
- Conduct an annual inspection on various components, and clean the equipment with a vacuum cleaner or special brushes.

Do not attempt to dismantle the Microinverter or make any internal repairs! In order to preserving the integrity of safety and insulation, the Microinverters are not designed to allow internal repairs!

The AC output wiring harness (AC drop cable on the Micro- inverter) cannot be replaced. If the cord is damaged the equipment should be scrapped.

Maintenance operations must be carried out with the equipment disconnected from the grid (power switch open) and the photovoltaic modules obscured or isolated, unless otherwise indicated.

For cleaning, Do not use rags made of filamentary material or corrosive products that may corrode parts of the equipment or generate electrostatic charges.

Avoid temporary repairs. All repairs should be carried out using only genuine spare parts.

7. Sample Wiring Diagram

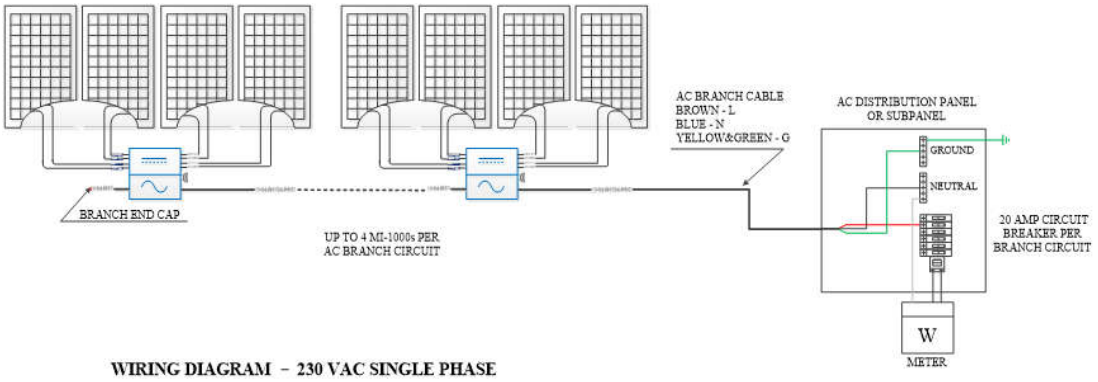

Fig.2SinglePhase Wiring Diagram

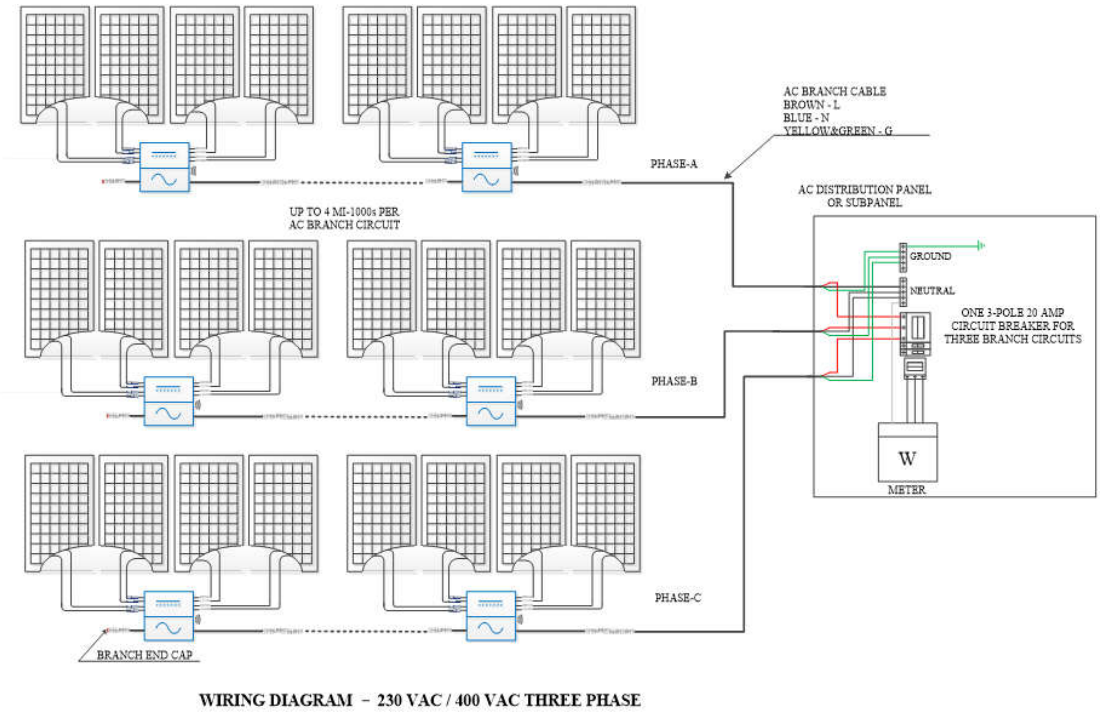

Fig.3 Three phase wiring diagram

DTU connects the power production of each microinverter. If the asymmetry current is going to exceed 16 A, DTU will send stop signal to one or more microinverters to let the asymmetry current lower than 16A.

Each branch should provide a 20A circuit breaker, but no need for central protection unit.

8. Decommissions

8.1 Decommissions

Disconnect the inverter from DC input and AC output; remove all connection cable from the Microinverter; remove the Microinverter from the frame.

Please pack the Microinverter with the original packaging, or use the carton box that can afford 5kg weight and can be fully closed if the original packaging is no longer available.

8.2 Storage and Transportation

Hoymiles packages and protects individual components using suitable means to make the transport and subsequent handling easier. Transportation of the equipment, especially by road, must be carried out by suitable ways for protecting the components (in particular, the electronic components) from violent, shocks, humidity, vibration, etc. Please dispose the packaging elements in appropriate ways to avoid unforeseen injury.

It is the customer's responsibility to examine the condition of the components transported. Once receiving the Microinverter, it is necessary to check the container for any external damage and verify receipt of all items. Call the delivering carrier immediately if damage or shortage is detected. If inspection reveals damage to the inverter, contact the supplier, or authorized distributor for a repair/return determination and instructions regarding the process.

The Microinverter storage temperature is -40-85℃.

8.3 Disposal

- If the equipment is not used immediately or is stored for long periods, check that it is correctly packed. The equipment must be stored in well-ventilated indoor areas that do not have characteristics that might damage the components of the equipment.
- Take a complete inspection when restarting after a long time or prolonged stop.
- Please dispose the equipment properly after scrapping, which are potentially harmful to the environment, in accordance with the regulations in force in the country of installation.

9. Technical Data

Model	MI-1000	MI-1200	MI-1500
Recommended input power (W)	310	380	470
MPPT voltage range (V)	27~48	32~48	36~48
Start-up voltage (V)	22	22	22
Operating voltage range (V)	16~60	16~60	16~60
Maximum input voltage (V)	60	60	60
Maximum input current (A)	10.5	10.5	11.5

9.1 DC Input

Model	MI-1000	MI-1200	MI-1500
Rated output power (W)	1000	1200	1500
Rated output current (A)	4.35@230V a.c, 4.16@240V a.c, 4.81@208V a.c,	5.21@230V a.c, 5@240V a.c, 5.77@208V a.c,	6.52@230V a.c, 6.25@240V a.c,7.21@208V a.c,
Nominal output voltage/range (V)	230/180-275 [1]240/211-264 [1] 208/183-250 [1]	230/180-275 [1] ,240/211-264 [1],208/183-250 [1]	230/180-275 [1] ,240/211-264 [1],208/183-250 [1]
Nominal frequency/range (Hz)	50/45-55 [1], 60/55-65[1] 60/58-62 [1]	50/45-55[1] , 60/55-65[1]60/58-62[1]	50/45-55[1] ,60/55-65[1] 60/58-62 [1]
Power factor	>0.99	>0.99	>0.99
Output current harmonic distortion	<3% /<5%	<3% /<5%	<3% /<5%
Maximum Units per Branch	4@230V a.c, 4@240V a.c, 3@208V a.c	3@230V a.c, 3@240V a.c, 3@208V a.c	3@230V a.c, 3@240V a.c, 3@208V a.c

9.2 AC Ouput

Model	MI-1000	MI-1200	MI-1500
Peak inverter efficiency	96.60%	96.60%	96.60%
CEC weighted efficiency	96.50%	96.50%	96.50%
Nominal MPPT efficiency	99.80%	99.80%	99.80%
Night time power consumption (mW)	<50	<50	<50

9.3 Efficiency, Safety and Protection

9.4 General Data

Model	MI-1000	MI-1200	MI-1500
Ambient temperature range (℃)	-40 ~ +65	-40 ~ +65	-40 ~ +65
Operating temperature range (℃)	-40 ~ +85	-40 ~ +85	-40 ~ +85
Dimensions (W×H×D mm)	280×176×33	280×176×33	280×176×33
Weight (kg)	3.75(including 1.9m AC cable)	3.75(including 1.9m AC cable)	3.75(including 1.9m AC cable)
Enclosure rating	IP67	IP67	IP67
Cooling	Natural convection – No fans	Natural convection – No fans	Natural convection – No fans
Communication	Wireless	Wireless	Wireless
Design Life	>25 Years	>25 Years	>25 Years

Appendix 1:

Installation Map