



## **User Manual of MI Series Micro Inverters**



**Xuzhou Tianzhiyuan New Energy Technology CO.,LTD.**

V1.0 English

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# 1 About Sumthor

## 1.1 Profile

Sumthor develops and manufactures PV grid-tied inverters and solar charge controllers with world leading-edge technology. Founded in Aug, 2013.

## 1.2 Product Frame

| Series                                    |
|-------------------------------------------|
| Mio- I series<br>1500TL/2000TL/3000TL     |
| Mio- I pro series<br>1500TL/2000TL/3000TL |
| Mio- I pro series<br>3680TL/4200TL/5000TL |
| Mio-III series<br>5000TL/7000TL/9000TL    |
| Mio-III series<br>15000TL/17000TL/20000TL |
| Mio-III series<br>25000TL/30000TL         |
| Mio-III series<br>100-500KTL              |
| Nio-CC series<br>900/1700/3300            |
| MI series<br>250/500                      |

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## 2 Information on this Manual

### 2.1 Validity

This manual describes the basic principle of MI micro inverters and its procedure for mounting, installation, maintenance, and other useful information.

This manual applies to the following micro inverters:

- MI 250/500

All manuals for the device and for the installed components must be stored in the immediate vicinity of the micro inverter and must be accessible at any time.

### 2.2 Purpose

This manual is intended for skilled persons. All the tasks which have caution symbols described in this manual must be performed by electrically skilled persons only.

User can refer to parts of this manual without caution symbols to use MI series micro inverter.

### 2.3 Symbols Used

The following types of safety messages and general information appear in this manual:

|                                                                                     |                                                                                                                |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
|  | <b>Danger</b> indicates a hazardous situation which, if not avoided, will result in death or serious injury.   |
| <b>Danger</b>                                                                       |                                                                                                                |
|  | <b>Warning</b> indicates a hazardous situation which, if not avoided, could result in death or serious injury. |
| <b>Warning</b>                                                                      |                                                                                                                |
|  | <b>Caution</b> indicates a hazardous situation, if not avoided, could result in minor or moderate injury.      |
| <b>Caution</b>                                                                      |                                                                                                                |

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### 3 Safety Instructions

The MI-250/500 micro inverter is designed and tested according to international safety requirements. 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.

- Before installation, check the unit to ensure absence 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 micro inverter 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 Overcurrent Protection Devices (OCPD).
- Only one photovoltaic module can be connected in the 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 when working.
- 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 Sumthor service representative.
- Liabilities arising from commercial components are delegated to their respective manufacturers.
- Anytime the inverter has been disconnected from the power network, use extreme caution, because some components can retain charge sufficient to create a shock hazard. Prior to touching any part of the inverter use care to ensure surfaces and equipment are at touch safe temperatures and voltage potentials before proceeding.
- Sumthor accepts No liability for damage from incorrect or careless operation.

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## 4 Introduction of Micro Inverter

This micro inverter system is the world's most technologically advanced inverter system with benefits of efficient, flexible, safe and reliable for use in utility-interactive applications.

This system is composed of a group of micro inverters that convert direct current (DC) into alternating current (AC) and feeds it into the electric grid. Different from systems that photovoltaic modules are subdivided into strings and controlled by one or several inverters, this system is built for the incorporation of a micro inverter for each photovoltaic module. Each micro inverter works independently of the others to guarantee maximum power of each photovoltaic module. This setup enables direct control over the production of a single photovoltaic module, consequently improving the flexibility and reliability of the system.

### 4.1 Explanation of Symbols

| Symbol                                                                              | Explanation                                                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|   | <b>CE mark:</b> The charge controller complies with the requirements of the applicable CE guidelines. |
|  | <b>CQC mark:</b> The inverter complies with the requirement of the NB32004.                           |

## 5 Technical Data

| Model                                                      | MI 250                                                                     | MI 500       |
|------------------------------------------------------------|----------------------------------------------------------------------------|--------------|
| Input Data(DC)                                             |                                                                            |              |
| Recommended input power (W)                                | 200~310                                                                    | (200~310) *2 |
| MPPT voltage range (V)                                     | 27-48                                                                      |              |
| Operating voltage range(V)                                 | 16-60                                                                      |              |
| Maximum input voltage (V)                                  | 60                                                                         |              |
| Maximum Input current (A)                                  | 10                                                                         |              |
| Output Data (AC)                                           |                                                                            |              |
| Rated output power(W)                                      | 250                                                                        | 500          |
| Rated output current (A)                                   | 1.09                                                                       | 2.17         |
| Nominal output voltage/range(V)                            | 230/200-270 <sup>1</sup> 240/211-264 <sup>1</sup> 208/183-229 <sup>1</sup> |              |
| Nominal frequency/range(Hz)                                | 50/45.5-54.5 <sup>1</sup> 60/57-62.5 <sup>1</sup>                          |              |
| Power factor (cos φ)                                       | >0.99                                                                      |              |
| Output current harmonic distortion (THDi)                  | < 3%                                                                       |              |
| Maximum Units per 20A Branch                               | 14                                                                         | 7            |
| Efficiency                                                 |                                                                            |              |
| Peak inverter efficiency                                   | 96.50%                                                                     |              |
| CEC weighted efficiency                                    | 96.00%                                                                     |              |
| Normal MPPT efficiency                                     | 99.90%                                                                     |              |
| Night time power consumption(mW)                           | <50                                                                        |              |
| Mechanical Data                                            |                                                                            |              |
| Ambient temperature range(℃)                               | -40 ~ +65                                                                  |              |
| Operating temperature range(℃)                             | -40 ~ + 85                                                                 |              |
| Dimension (WxHxD) (mm)                                     | 178×153×29                                                                 | 240×155×29   |
| Weight (kg)                                                | 1.5                                                                        | 2.5          |
| Enclosure rating                                           | Ip67 / NEMA6                                                               |              |
| Cooling                                                    | Natural convection- No fans                                                |              |
| Features                                                   |                                                                            |              |
| Communication                                              | Wireless                                                                   |              |
| Warranty (year )                                           | 15-25 years                                                                |              |
| <sup>1</sup> Volatage and frequency ranges can be extended |                                                                            |              |

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## 6 Instructions for Installation

### 6.1 Check the Packing

Check the outer packing if there is visible external damage. Contact your specialist dealer if anything is damaged or missing.

### 6.2 Checking Installation Environment

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.
- See Section 5 to check the environmental parameters to be observed (degree of protection, temperature, humidity, altitude, etc.)
- To avoid unwanted power derating due to an increase in the internal temperature of the inverter, do not expose it to direct sunlight.
- To avoid overheating, always make sure the flow of air 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.

### 6.3 Selecting the Installation Location

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 Micro-inverter underneath the photovoltaic modules so that they work in the shade. If this condition cannot be met, the inverter could undergo derating.

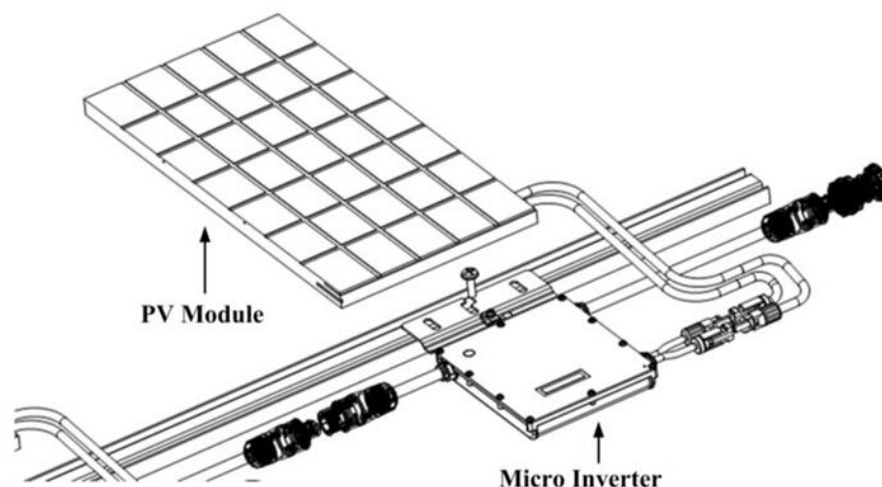


Figure1: Installation position of micro inverter

## 6.4 Installing the Micro Inverter

System schematic diagram is shown in the following:

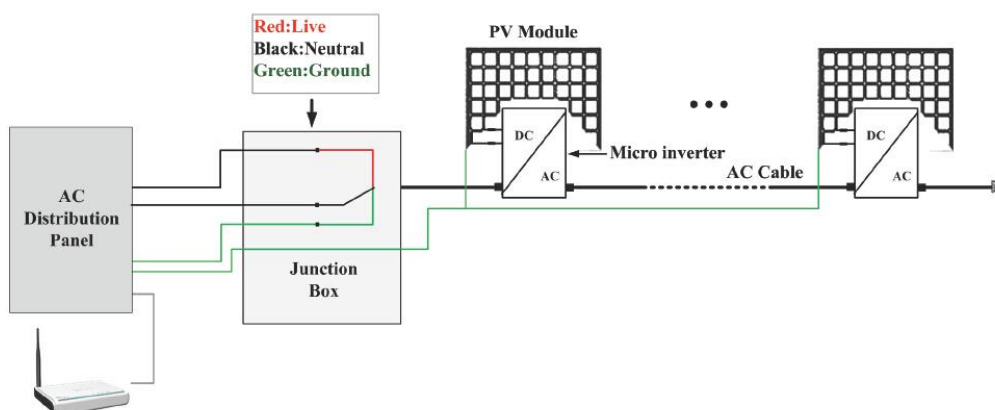


Figure2: 230Vac single phase

Assembly diagram can be seen in Figure3.

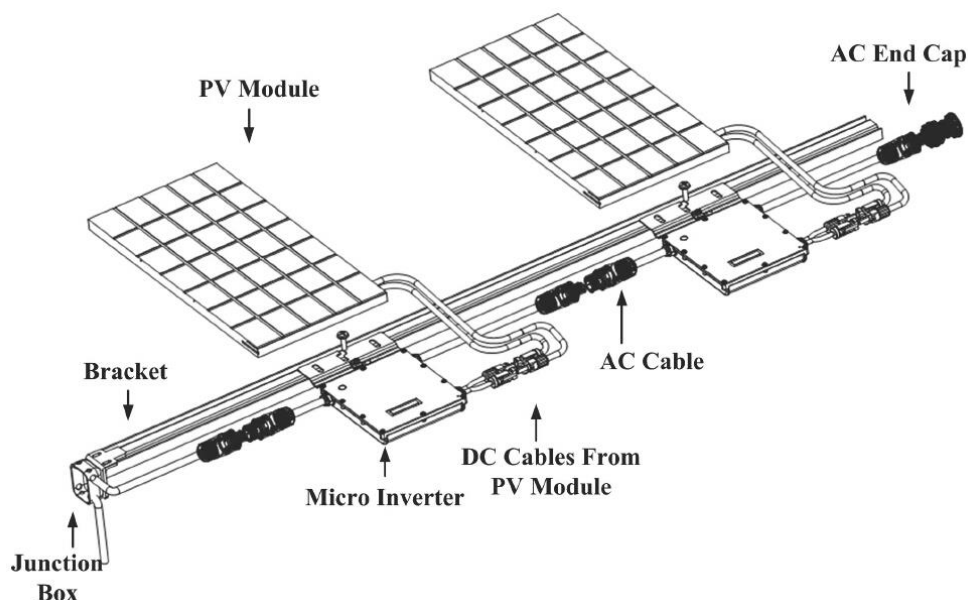


Figure4: Assembly Illustration

### Step1: Install Micro Inverter

Mark the approximate center of each photovoltaic module on the frame and install the micro inverter with the logo side facing downwards.

|                |                                                                                                                                         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                | Observe the certification documents concerning the maximum number of Micro- inverters permitted for installation at each cable section! |
| <b>Warning</b> |                                                                                                                                         |
|                | The micro inverter must be under the module, out of long-term exposure to direct sunlight or rain.                                      |
| <b>Caution</b> |                                                                                                                                         |

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**Step2: Connect AC Cable of Micro Inverter**

Connect the AC cable of the micro inverters. The connectors are coupled correctly when two clicks are heard.

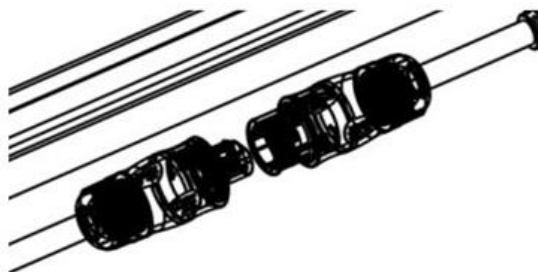


Figure5: Connect AC Cable of Micro Inverter

**Step3: Protecting Unused Ends**

The unused ends of the AC-TRUNK cable must be terminated with the proper end. Fit the appropriate AC-TRUNK END CAP on the unused ends of the AC-TRUNK cable.

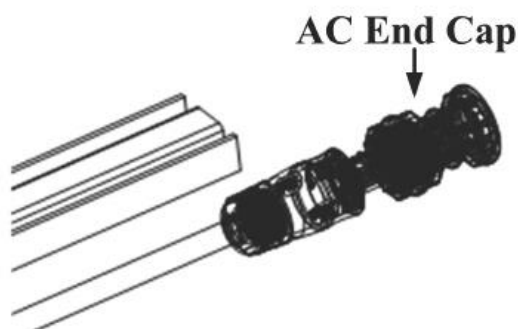


Figure6: Unused Ends

**Step4: Connecting AC-TRUNK Cables to Junction Box**

Connect the AC-TRUNK cables coming from the micro inverters to the junction box. Close the junction box after the wiring is complete. Ensure that the seal is tight.

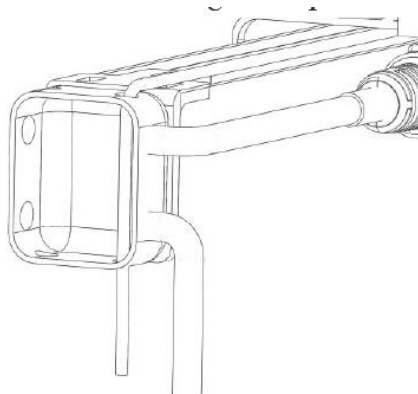


Figure7: Junction Box

|                                                                                   |                                                                                                                                         |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|  | To prevent electrical hazards, all the connection operations must be carried out with the equipment disconnected from the grid.         |
| <b>Warning</b>                                                                    |                                                                                                                                         |
|  | All the external connections to the insulated junction box (caps, adapters, etc.) must be made with securely-sealed Sumthor components. |
| <b>Warning</b>                                                                    |                                                                                                                                         |

Sumthor AC cables from the micro inverters have three conductors with different colors to identify the function of each conductor:

- Red: Live
- Black: Neutral
- Yellow-Green: Ground

|                                                                                    |                                                                                                                                                                                  |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Pay special attention and ensure not to reverse the phase with the neutral!                                                                                                      |
| <b>Warning</b>                                                                     | The installation technician is responsible for selecting a junction box with the appropriate dimensions and insulation.                                                          |
|  | The installation technician is responsible for selecting a cable running between the junction box and the load distribution panel with the appropriate length and cross section. |
| <b>Warning</b>                                                                     |                                                                                                                                                                                  |

#### Step5: Drawing System Map

Draw a map of the system, affixing the extra label that comes attached to each inverter, on the appropriate position on the diagram (found in the Appendix of this manual).

| Template for Map of Micro Inverter Installation                                     |   |                       |   |                                                                                                          |   |
|-------------------------------------------------------------------------------------|---|-----------------------|---|----------------------------------------------------------------------------------------------------------|---|
|  |   | Customer Information: |   | Please affix the extra label that comes from each inverter, on the appropriate position on this diagram. |   |
|                                                                                     | 1 | 2                     | 3 | 4                                                                                                        | 5 |
| A                                                                                   |   |                       |   |                                                                                                          |   |
| B                                                                                   |   |                       |   |                                                                                                          |   |
| C                                                                                   |   |                       |   |                                                                                                          |   |
| D                                                                                   |   |                       |   |                                                                                                          |   |
| E                                                                                   |   |                       |   |                                                                                                          |   |

Figure8: System Map

#### Step6: Install Photovoltaic Modules

Install the photovoltaic modules, and connect the DC cables of the modules to the corresponding DC input side of the Micro-inverter.

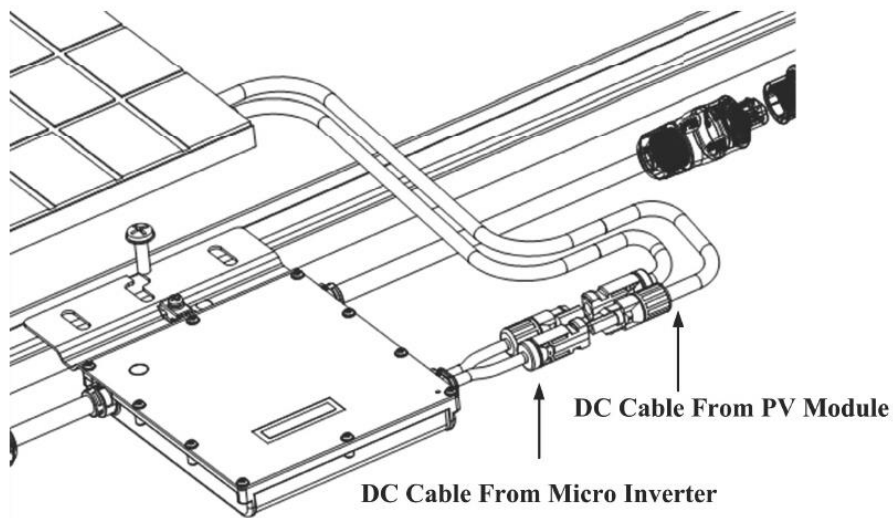


Figure9: Connect DC Cables

|                                                                                     |                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p>The recommended installation needs keeping the micro inverters underneath the photovoltaic modules, so that the micro inverters can operate in the shade. Direct sunlight may cause damage to the micro inverters.</p> |
| <b>Warning</b>                                                                      |                                                                                                                                                                                                                           |
|  | <p>Each module must be connected to the micro inverters with a DC cable having a length of less than 3m.</p>                                                                                                              |
| <b>Warning</b>                                                                      |                                                                                                                                                                                                                           |

#### Step7: Install CDD

Install the CDD (Concentrator Data Device) and commission.

## 7 Maintenance and Cleaning

### 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.
- DO NOT 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 micro inverter or make any internal repairs! In order to preserving the integrity of safety and insulation, the micro inverters are not designed to allow internal repairs! |
| <b>Danger</b>                                                                       |                                                                                                                                                                                                             |
|  | 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.                                                             |
| <b>Warning</b>                                                                      |                                                                                                                                                                                                             |
|  | 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.                 |
| <b>Warning</b>                                                                      |                                                                                                                                                                                                             |
|  | For cleaning, DO NOT use rags made of filamentary material or corrosive products that may corrode parts of the equipment or generate electrostatic charges.                                                 |
| <b>Warning</b>                                                                      |                                                                                                                                                                                                             |
|  | Avoid temporary repairs. All repairs should be carried out using only genuine spare parts.                                                                                                                  |
| <b>Warning</b>                                                                      |                                                                                                                                                                                                             |

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## **8 Storage and Dismantling**

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.

## Appendix

Template for Map of Micro Inverter Installation

|                                                                                   |   |                              |   |                                                                                                                 |   |
|-----------------------------------------------------------------------------------|---|------------------------------|---|-----------------------------------------------------------------------------------------------------------------|---|
|  |   | <b>Customer Information:</b> |   | <b>Please affix the extra label that comes from each inverter, on the appropriate position on this diagram.</b> |   |
|                                                                                   | 1 | 2                            | 3 | 4                                                                                                               | 5 |
| A                                                                                 |   |                              |   |                                                                                                                 |   |
| B                                                                                 |   |                              |   |                                                                                                                 |   |
| C                                                                                 |   |                              |   |                                                                                                                 |   |
| D                                                                                 |   |                              |   |                                                                                                                 |   |
| E                                                                                 |   |                              |   |                                                                                                                 |   |