

This Manual is mainly for the external photovoltaic optimizer independently developed and produced by Ningbo Deye Inverter Technology Co., Ltd.

- Purpose
- The purpose of this Manual is to provide readers with the product's detailed information and installation, operation and maintenance instructions.
- Reader orientation
- This Manual is suitable for professional technicians and users who install, operate and maintain the external optimizer.
- Use of manual
- Read this manual carefully before using this product and keep it in a place where operation and maintenance personnel can find it easily.
- Use of symbol
- The following symbols may be used in this Manual, please read them carefully for better use of this Manual.

"Danger" indicates a situation that has a **high potential risk and will result in death or serious injury if not avoided.**

"Warning" indicates a situation that has a **moderate potential risk and may result in death or serious injury if not avoided.**

"Caution" indicates a situation that has a **low potential risk and may result in moderate or minor injury if not avoided.**

"Attention" indicates a situation that has a **potential risk and may result in equipment failure or property loss if not avoided.**

1. Safety Instructions

To ensure the safe installation and operation of optimizer and reduce the risk of electric shock and equipment damage, the following safety precautions shall be strictly followed during operation and maintenance.

All installation operations must be completed by professional technicians. The professional technicians must:
1 Undergo specialized training;
2 Read this Manual completely and master the operation-related safety matters;
3 Be familiar with relevant safety specifications of the electrical system.

2. Product Description

2.1 External optimizer

The optimizer product features are as follows:

- The component-level maximum power point tracking can increase the power generation by 5% - 25%.
- Monitor the operation of each photovoltaic module in real time. Find problems in time and make accurate positioning.
- Use photovoltaic cable power line carrier communication, without additional communication cable.



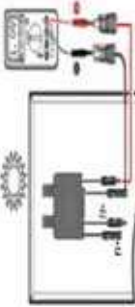
2.2 Composition of photovoltaic system

Photovoltaic system is that each photovoltaic module is installed with an external optimizer to achieve

Step 2. Fixed optimizer, insert the two metal clips at the top of the optimizer into the metal slots on the side of the component frame, as close as possible to the positive and negative terminals of the component power supply, as shown in figures b and c.



- b. Diagram of the location of the optimizer component
- c. Optimizer fixed diagram
- Step 3.** Connection of optimizer
- (1) Connect the optimizer input IN+ and IN- to the PV+ and PV- of the photovoltaic module junction box.
 - (2) Connect the positive probe of the multimeter to the positive output of the optimizer and the negative probe to the negative output. Check the voltage output of the optimizer (0.9V-1.1V), as shown in Figure d.



- (3) After installing a single optimizer, concatenate the outputs of the optimizer in sequence to form a string, as shown in Figure e.



Before connecting the string to the inverter, use a multimeter to measure the voltage at both ends of the string in the DC voltage range to see if it is normal $N \times (0.9V-1.1V)$.

3.2 Installation of optimizer concentrator

The optimizer concentrator supports up to 4 strings, and a single string can support up to 25 components (depending on the capacity of the inverter). For example, if the on-site inverter supports two string inputs, the optimizer concentrator only needs two strings connected to the PV inputs of the string and the inverter. The communication distance between the optimizer concentrator and the strings should not exceed 350m.

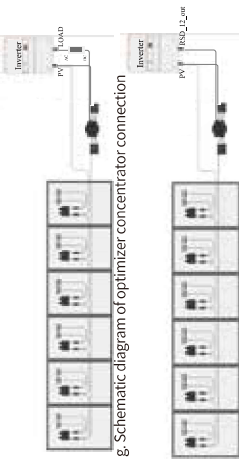
1. Tear off the QR code and remove the QR code label at the indicated position as shown in Figure f, and paste it in the designated area of the physical layout template.



- f. Schematic diagram of optimizer concentrator QR code tearing and pasting

2. Optimizer concentrator fixed
- The optimizer concentrator is equipped with built-in WIFI and powered by an adapter. It is necessary to consider the coverage of WIFI signals and the connection of AC power to the adapter.

3. Optimizer Concentrator Connection
- Connect the PV+ or PV- in the connected string sequentially through the string end of the optimizer concentrator and then connect it to the inverter, as shown in Figure g.
- If the machine has a rapid shutdown function, you can connect the inverter directly without using a power module, as shown in Figure h. If there is no shutdown function, follow the previous operation.



4. Check and Replacement

The following operations must be completed by trained professional technicians to avoid the risk of electric shock.

4.1 Check

Check whether the optimizer is abnormal by following the steps below:

- (1) To check whether the external optimizer is operated normally, measure the input current of optimizer with a clip-on ammeter. If there is input current, the optimizer is operated normally; if the input current of optimizer or module is abnormal.
 - (2) If the input current is 0, check whether the module is obviously damaged or seriously blocked. If it is obviously damaged, replace the module; if it is seriously blocked, remove the block.
 - (3) If module is normal, check the connected cables for disconnection. After disconnecting the input optimizer (the output line is disconnected first), measure the voltage of positive and negative output of module output line with a multimeter. If the voltage is normal, the line connection is normal; no voltage, check the line connection further to confirm the open-circuit contact.
 - (4) If the module and line connection are normal, the replacement of optimizer shall be considered.
- 4.2 Replacement**
- Replace the optimizer by following the steps below:
- (1) Shut down the inverter and disconnect it from corresponding string;
 - (2) Disconnect the output line of optimizer;
 - (3) Disconnect the input line of optimizer;
 - (4) Remove the original optimizer and install the new one;
 - (5) Connect the input line;
 - (6) Connect the output line;
 - (7) Connect the corresponding string to the later stage inverter;
 - (8) Restart the inverter;
 - (9) Test the input current of replaced optimizer with a clip-on ammeter to confirm repair.

5. Instructions to Applicable Scene

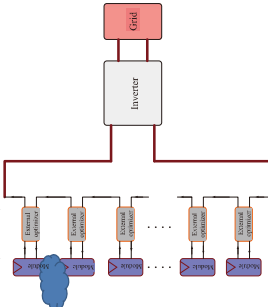
The external optimizer is suitable for various types of power stations, distributed and large-scale sun power stations; new power stations, reconstructive old power stations. In consideration of various situations, the installation methods are as follows.

5.1 One MPPT port with one string

5.1.1 Full installation

The photovoltaic system has various mismatches, such as shadow shading, inconsistent orientation, inconsistent aging, stain, glass fragments, ash accumulation, snow accumulation. It can be said that system without mismatch. The difference lies in the mismatch.

The full installation can solve various series (current) mismatch and recover losses caused by mismatch.



5.1.2 Installation of mismatched modules

If the mismatched modules of system are clear, it can be considered to install only on mismatched modules or solve series mismatch to save costs.

Instructions for installing mismatched modules:

- If module has the clear mismatch, such as shading, low effective illumination caused by orientation deviation, install on the module with clear mismatch;
- If the current value of module with low current in string is different due to the reconstruction and replacement of the old power station, install on the module with small current values.

