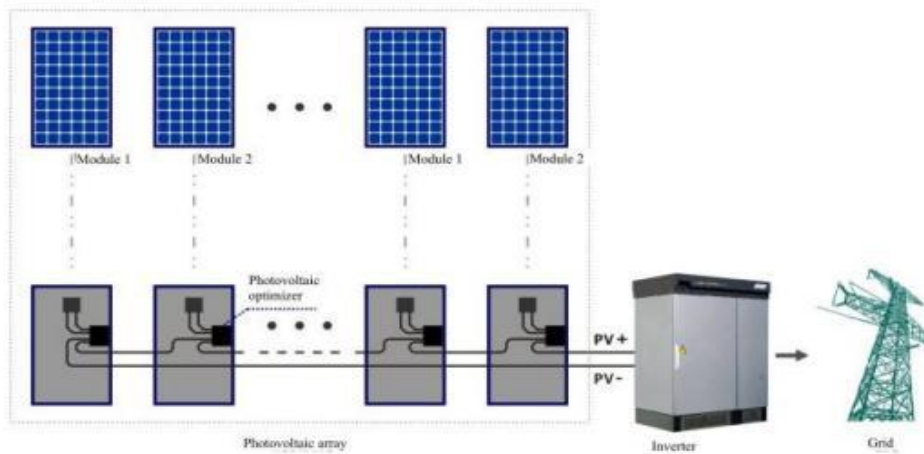


# Photovoltaic Smart Optimizer

## Solar optimizer

### 1. Composition of photovoltaic system


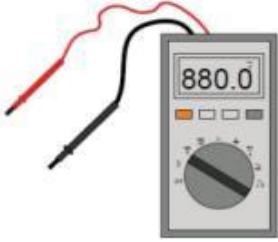


The difference between the photovoltaic system installed with external optimizer and the ordinary photovoltaic system is that each photovoltaic module is installed with an external optimizer to achieve module-level MPPT. The input of external optimizer is connected to output of module. The output of optimizer replaces the output of module in series to form the string, which is merged into later stage inverter or combiner box.



### 2. System Installation Instructions

#### 2.1 Preparation of tools

The following tools will be used for installation, check and replacement:

	
<p>Cross screwdriver (cross pattern-M4)</p>	<p>Multimeter (maximum voltage range of 1500Vdc)</p>
	
<p>Clip-on ammeter (maximum current range of 100A dc)</p>	<p>MC4 connector spanner</p>

Read all instructions and warnings of this Manual and warning signs on inverter and module array before installation.



Shut down the inverter and disconnect it from module array before installation.



Before installation, confirm that the output current, voltage and power of photovoltaic module are matched with external photovoltaic optimizer.

**Step 1.** Shut down the inverter and disconnect it from module array

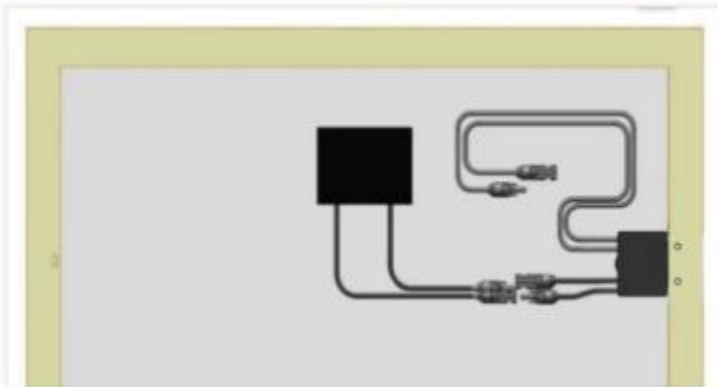
Before the installation of optimizer, make sure that inverter is shut down and disconnected from the module array.

**Step 2.** Install the optimizer to module frame.

Place the external optimizer into module frame in the direction shown in the figure, clip the buckle into module frame directly.

**Step 3.** Connection of input line

The line marked with "IN" on the housing of external optimizer is the input line, which is connected to the output line of module.



When installing, connect the input line of optimizer first, then connect the output line.

When removing, disconnect the output line first, then disconnect the input line.

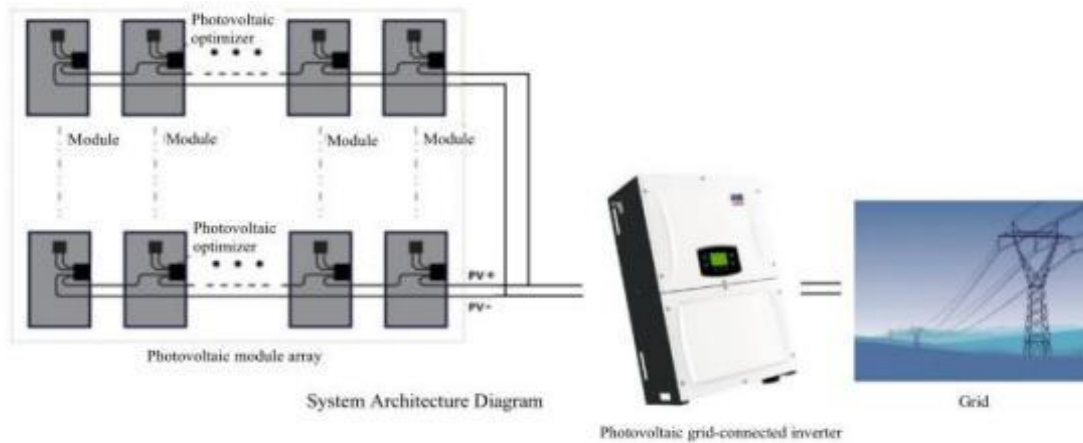
**Step 4.** Connect output lines to form string

After connecting the input lines, connect the output lines in series to form a string. The positive and negative connectors of string shall be connected to the later stage inverter or combiner box.



**Step 5. Merge the string into inverter**

After confirming that the entire string is connected correctly, merge the string into the later stage inverter or combiner box.

**Step 6. Turn on the inverter**

After confirming that the system is connected correctly, turn on the inverter.

## 3. Check and Replacement



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

### 3.1 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 clip-on ammeter. If there is input current, the optimizer is operated normally; if the input current is 0, the 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 line of optimizer (the output line is disconnected first), measure the voltage of positive and negative connectors of module output line with a multimeter. If the voltage is normal, the line connection is normal; if there is 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.

### 3.2 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.

## 4. Instructions to Applicable Scene

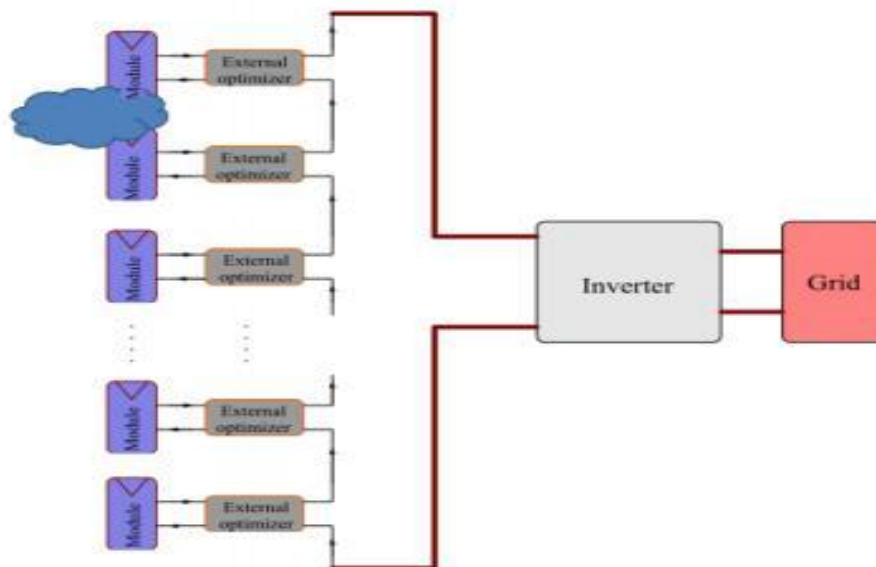
The external optimizer is suitable for various types of power stations, distributed and large-scale surface power stations; new power stations, reconstructive old power stations. In consideration of various mismatch situations, the installation methods are as follows.

### 4.1 One MPPT port with one string

#### 4.1.1 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 there is no system without mismatch. The difference lies in the mismatch.

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



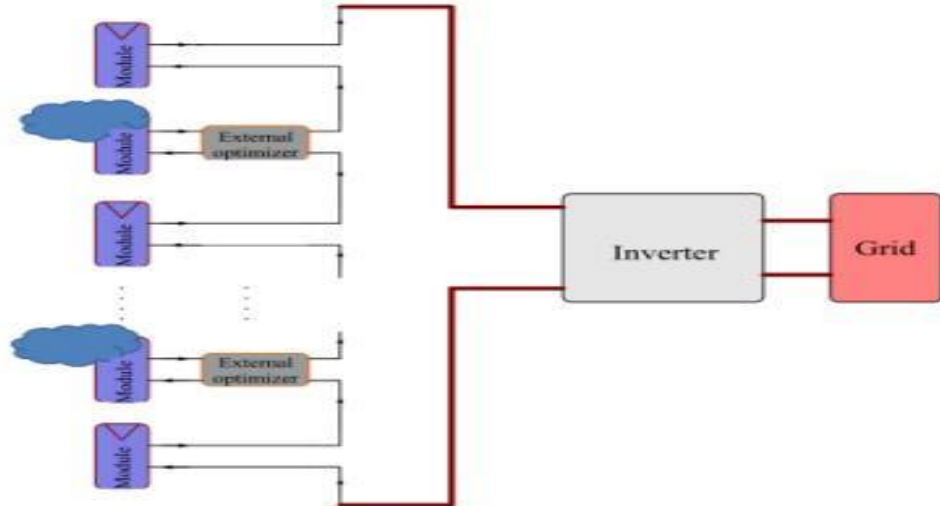
#### 4.1.2 Installation of mismatched modules

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.



**Risk of installation on mismatched module only:**

The mismatch of other modules cannot be solved. When the judgment of system mismatch is not accurate, for example, some modules are seriously mismatched due to damage while there is no obvious mismatch on the surface, because the optimizer is not installed, this module will cause great loss to the power generation of system.

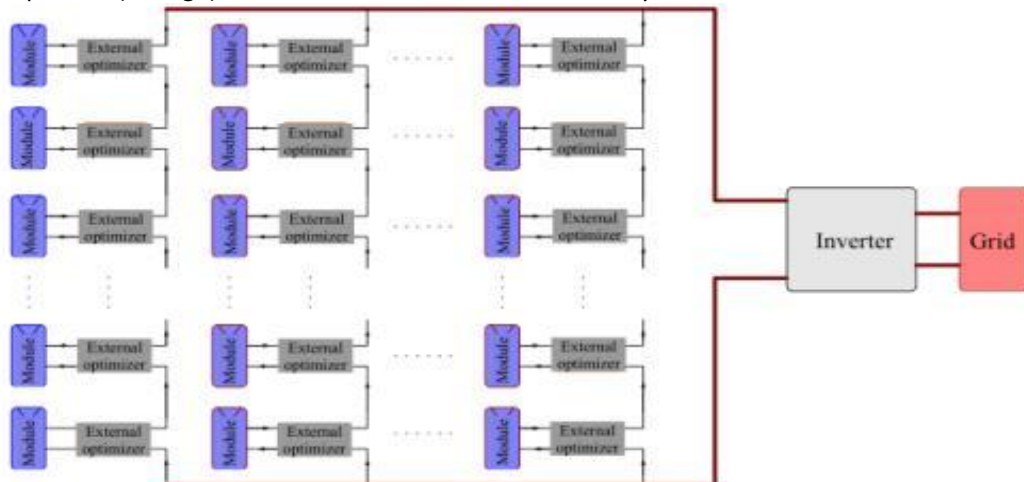
The mismatch is not fixed and will change with time, environment and conditions. If the installation is based on current mismatch, the mismatch changes after a period of time, the mismatch cannot be solved effectively.

## 4.2 One MPPT port with multiple strings

### 4.2.1 Full installation

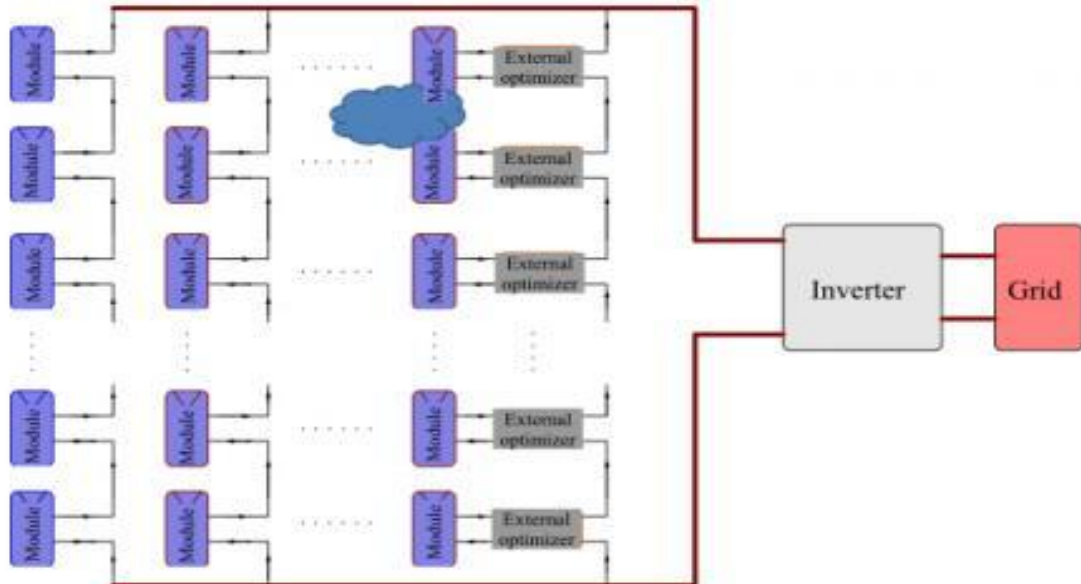
If one MPPT port of the photovoltaic system has multiple strings, there will be series mismatch and parallel mismatch in the system. The most effective method is full installation.

The full installation in array corresponding to one MPPT port can solve series (current) mismatch and parallel (voltage) mismatch to recover losses caused by mismatch to the full extent.



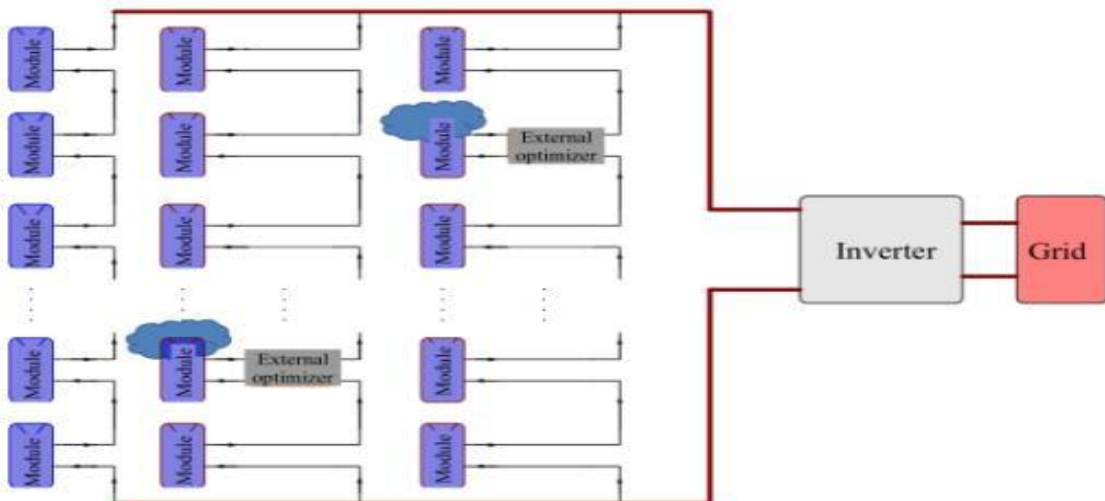
### 4.2.2 Installation of mismatched string

When only part of strings in one MPPT port array has clear mismatch and other strings have no obvious mismatch, it is allowed to install the mismatched strings only. In this way, the series mismatch in this string can be solved and the losses of power generation can be recovered to a certain extent, but the parallel mismatch cannot be solved.



### 4.2.3 Installation of mismatched module

When only part of modules in an array has clear mismatch, it is allowed to only install the modules with clear mismatch. In this way, the mismatch can be solved to a large extent at the lowest cost, so as to recover losses of power generation.



## 5.Product Specification

### 5.1 P6401 460W

Technical Data P6401 460W					
Input parameters	Maximum input power	460W	Conversion efficiency	Peak conversion efficiency	99.50%
	Operating voltage range	7~60V		Power consumption@5A	0.9W
	MPPT voltage range	7~60V		Power consumption@8A	1.4W
	Maximum input current	15A		Power consumption@12A	2.9W
	Over-current protection value	18A		Power consumption@15A	4.5W
	Over-temperature protection value	150°C		Dimension	105*105*20
Output parameters	Maximum output current	15A	Installation specificatio	Weight	500g
	Output Voltage Clamp	42V		Cable	4mm <sup>2</sup> 100*2 at input terminal 70*2 at output terminal
				Connector	Compatible with MC4
	Maximum system voltage	1500V		Operating temperature	-40°C - +85°C
				Protection rating	IP68
Design standards	Designed life	30-year	Function	Standard items	Optimization/ long string of voltage limiting/ no hot spots

### 5.2 P6402 600W

Technical Data P6402 600W					
Input parameters	Maximum input power	600W	Conversion efficiency	Peak conversion efficiency	99.50%
	Operating voltage range	7~60V		Power consumption@5A	0.9W
	MPPT voltage range	7~60V		Power consumption@8A	1.4W
	Maximum input current	15A		Power consumption@12A	2.9W
	Over-current protection value	18A		Power consumption@15A	4.5W
	Over-temperature protection value	150°C		Dimension	105*105*20
Output parameters	Maximum output current	17A	Installation specificatio	Weight	500g
	Output Voltage Clamp	42V		Cable	4mm <sup>2</sup> 100*2 at input terminal 70*2 at output terminal
				Connector	Compatible with MC4
	Maximum system voltage	1500V		Operating temperature	-40°C - +85°C
				Protection rating	IP68
Design standards	Designed life	30-year	Function	Standard items	Optimization/long string of voltage limiting/ no hot spots

### 5.3 P6403 800W

Technical Data P6403 800W					
Input parameters	Maximum input power	800W	Conversion efficiency	Peak conversion	99.50%
	Operating voltage range	7~60V		efficiency	
	MPPT voltage range	7~60V		Power consumption@5A	0.9W
	Maximum input current	20A		Power consumption@8A	1.4W
	Over-current protection value	28A		Power consumption@12A	2.9W
	Over-temperature protection value	150°C		Power consumption@15A	4.5W
Output parameters	Maximum output current	20A	Installation specificatio	Dimension	105*105*20
				Weight	500g
	Output Voltage Clamp	42V		Cable	4mm <sup>2</sup>
				Connector	Compatible with MC4
	Maximum system voltage	1500V		Operating temperature	-40°C - +85°C
				Protection rating	IP68
Design standards	Designed life	30-year	Function	Standard items	Optimization/ long string of voltage limiting/ no hot spots