PV Smart Optimizer Product User Manual

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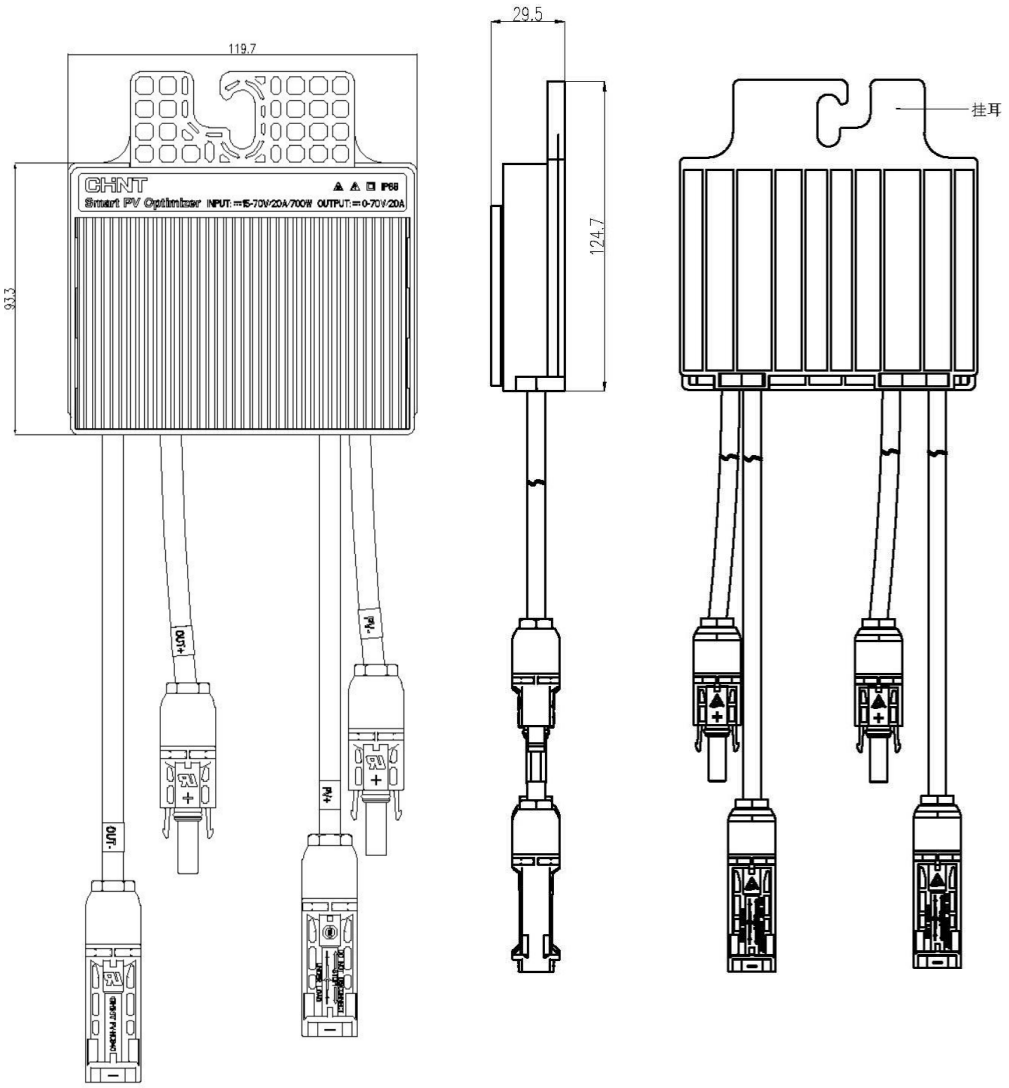
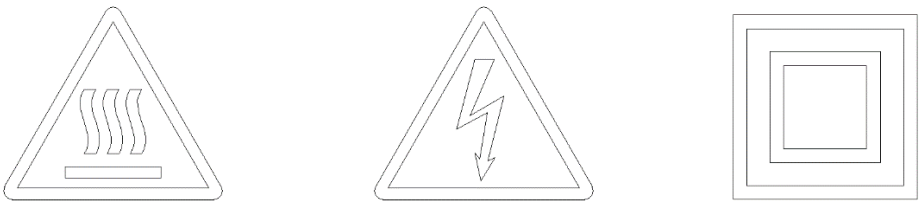
1. Product Introduction

The Chint Xinhui Photovoltaic Smart Optimizer is a revolutionary device designed to enhance the efficiency of photovoltaic systems. By independently configuring MPPT (Maximum Power Point Tracking) algorithms for each module, it accurately tracks the dynamic maximum power output of the modules in real-time, addressing power generation mismatches caused by shading, orientation differences, and uneven aging of modules. Under complex lighting conditions, it significantly improves system power generation efficiency and reduces the levelized cost of electricity (LCOE). The product is compatible with various application scenarios, including grid-connected, off-grid, and hybrid solar-storage systems, and supports diverse installation environments such as rooftop distributed systems, commercial and industrial power stations, andagrivoltaic systems. Featuring an IP68 protection rating and a wide operating temperature range (-30°C to +70°C), it ensures electrical safety while enhancing system revenue, making it an ideal solution for building efficient, intelligent, and reliable photovoltaic energy systems.

2.Dimensions



Front Side Back



Anti-scald warning label Electric shock warning label Reinforced insulation

Figure1 Smart Optimizer External Dimensions

3.Specifications

Table 1: Smart Optimizer Specifications

Product Model:		PV-SO1-700W	PV-SO1-600W	PV-SO1-500W
Input Parameters (Under STC conditions)	Maximum PV Module Power	700W	600W	500W
	Maximum Input Voltage	70Vdc		
	Operating Voltage Range	12.5-70Vdc		
	MPPT Voltage Range	15-70Vdc		
	Short-Circuit Current (Isc)	22A	19A	17A
	Maximum Input Current	20A	17A	15A
Output Parameters	Maximum Output Power	800W (at70°C ambient)*	700W (at70°C ambient)*	600W (at 70°C ambient)*
	Maximum Output Voltage	70Vdc		
	Maximum Output Current	20A	17A	15A
	Maximum MPPT Efficiency	> 99.6%		
	Weighted Efficiency	> 99.2%		
Environmental Parameters	Maximum System Voltage	1500Vdc		
	Operating Temperature	-30℃— +70℃		
	Storage Temperature	-40℃— +85℃		
	Relative Humidity	0%-100%		
	Protection Rating	IP68		
	Protection Class	II		
	Pollution Degree	PD3		
	Altitude	2000 米*		

Structural Parameters	Dimensions (excluding cables)	119.7*124.7*29.5
	Cable Length	Input≥600mm, Output≥1000mm(customizable)
	Connectors	MC4 compatible (customizable)
	nstallation Method	Module frame, PV racking
Standards and Regulations	Industry Standard	NB/T 42143 - 2018
	Safety Standards	NEC 2017 & 2020 (690.12); UL174; CSA C22.2 No. 330-23; IEC/EN62109-1
	EMC	IEC/EN 61000-6-1/-2/-3/-4

* At an ambient temperature of 70°C, the measured maximum output powers are 800W, 700W, and 600W respectively;

* Derating is required for altitudes exceeding 2000 meters;

4. Installation Instructions

4.1 Installation

4.1.1 Horizontal Installation on Module Frame

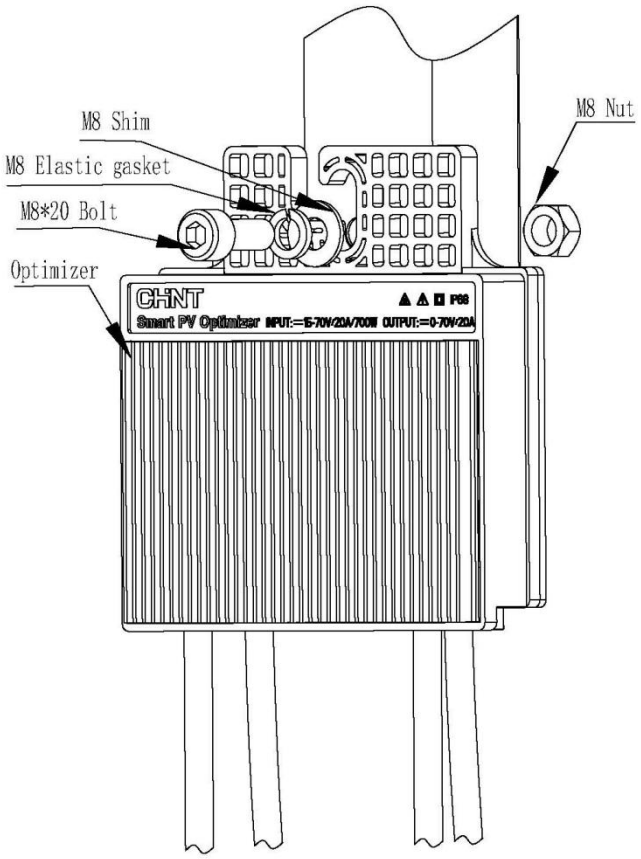


Figure 2 Horizontal Installation on Module Frame

The installation diagram is shown in Figure 2，with the following precautions：

1.Before installation, inspect that the optimizer cables are not damaged and connectors are intact.

2.Prior to installing the PV optimizer wiring harness, ensure it is disconnected from all connections.

3.During installation, ensure the input terminals of the PV optimizer wiring harness are correctly connected to the module output terminals. Ensure that cables have an

appropriate amount of slack; after installation, connected cables must not be under tension.

4.The assembly hardware (M8*20 bolt x1, flat washer x1, spring washer x1, M8 nut x1) must be procured by the user from a third party. Tightening requirement: the spring washer must be fully compressed.

5.This installation method is a recommended solution; the actual installation method for the product can vary.

4.1.2 Vertical Installation on Module Frame

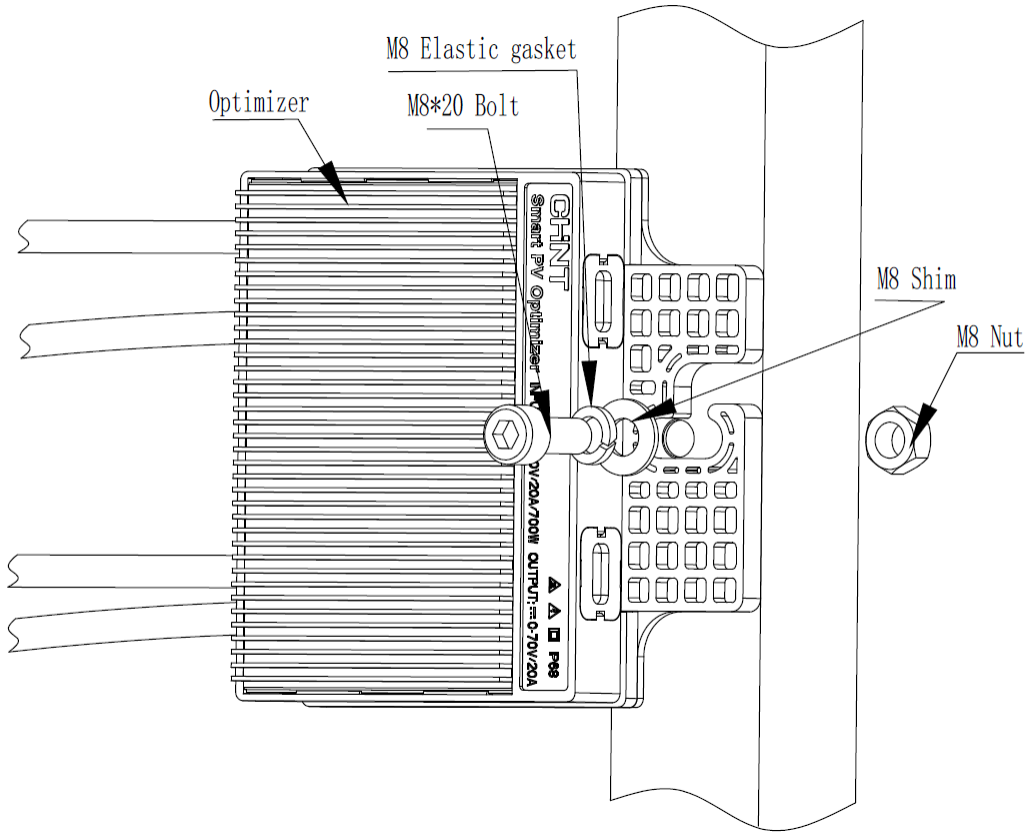


Figure 3 Vertical Installation on Module Frame

The installation diagram is shown in Figure 3，with the following precautions：

1.Before installation, inspect that the optimizer cables are not damaged and connectors are intact.

2.Prior to installing the PV optimizer wiring harness, ensure it is disconnected from all

connections.

3.During installation, ensure the input terminals of the PV optimizer wiring harness are correctly connected to the module output terminals. Ensure that cables have an appropriate amount of slack; after installation, connected cables must not be under tension.

4.The assembly hardware (M8*20 bolt x1, flat washer x1, spring washer x1, M8 nut x1) must be procured by the user from a third party. Tightening requirement: the spring washer must be fully compressed.

5.This installation method is a recommended solution; the actual installation method for the product can vary.

4.1.3 Racking Installation

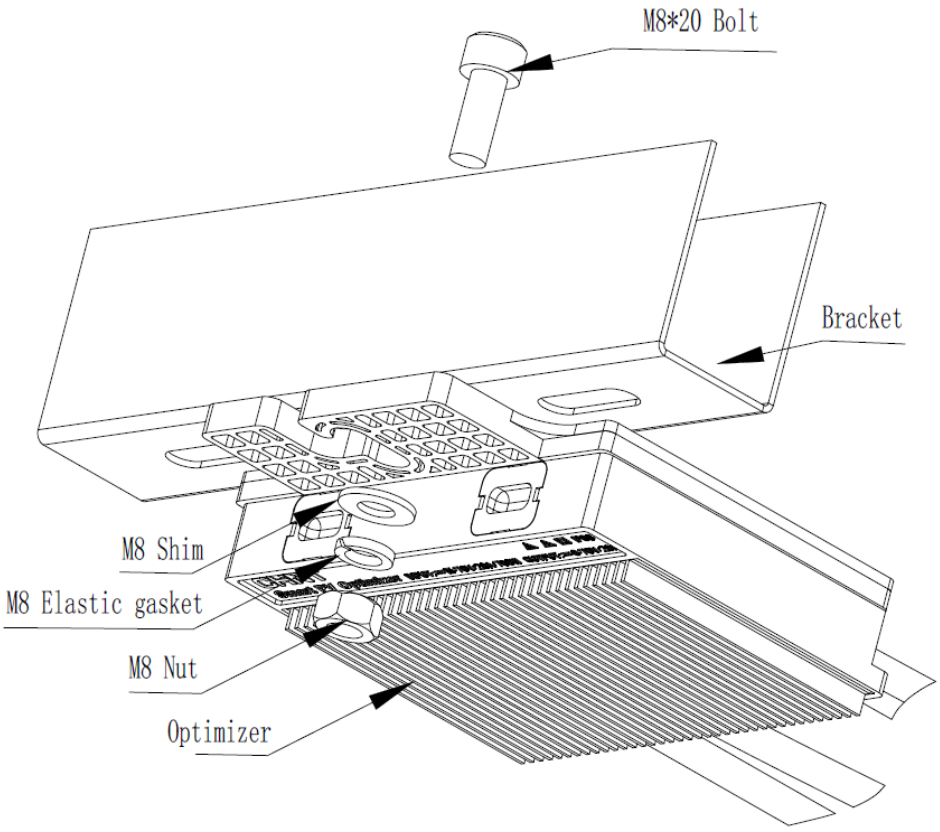


Figure 4 Racking Installation

The installation diagram is shown in Figure 4，with the following precautions：

1.Before installation, inspect that the optimizer cables are not damaged and connectors are intact.

2.Prior to installing the PV optimizer wiring harness, ensure it is disconnected from all connections.

3.During installation, ensure the input terminals of the PV optimizer wiring harness are correctly connected to the module output terminals. Ensure that cables have an appropriate amount of slack; after installation, connected cables must not be under tension.

4.The assembly hardware (M8*20 bolt x1, flat washer x1, spring washer x1, M8 nut x1) must be procured by the user from a third party. Tightening requirement: the spring washer must be fully compressed.

5.This installation method is a recommended solution; the actual installation method for the product can vary.

4.2. Wiring

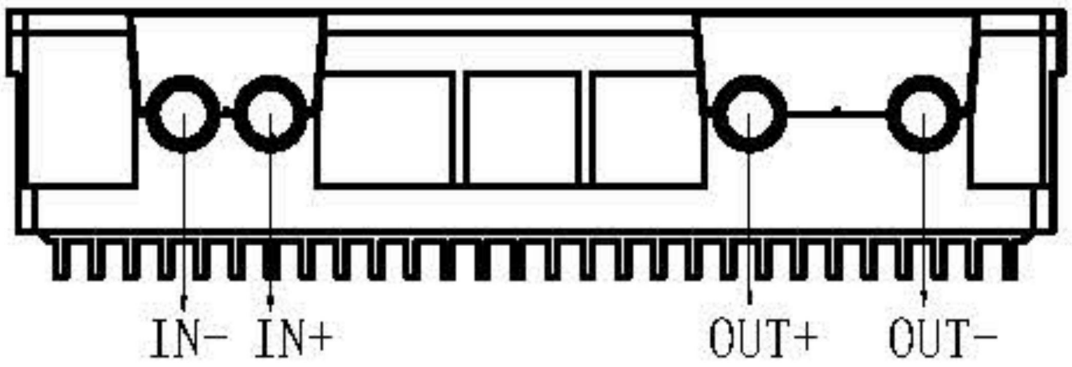


Figure 5 Input/Output

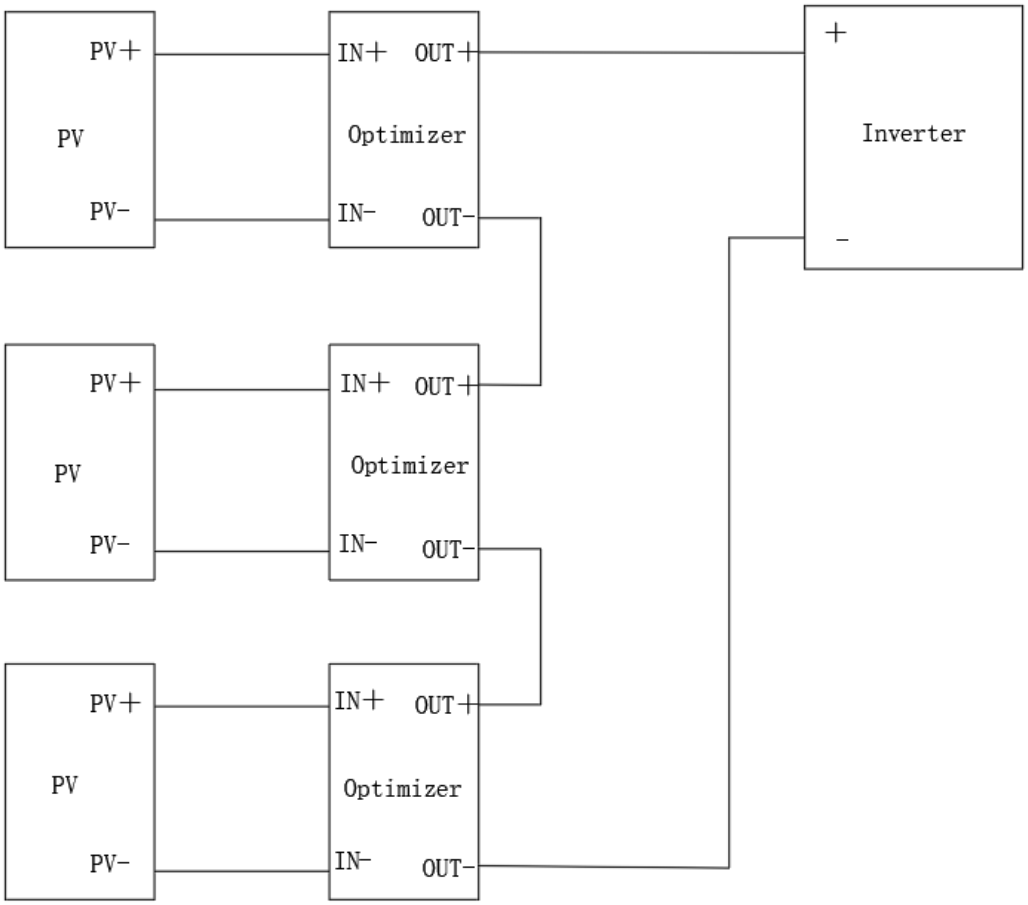


Figure 6 Electrical schematic diagram

Table 2 Connection Instructions Table

Identifier	Input/Output	Wiring Description
PV+ or IN+	Input Positive	Connect to the positive output terminal of the PV module
PV- or IN-	Input Negative	Connect to the negative output terminal of the PV module
OUT+	OUT+ Output Positive	Connect to the positive terminal of the inverter or series-connected optimizer
OUT-	Output Negative	Connect to the negative terminal of the inverter or series-connected optimizer

The wiring steps are as follows:

1) Disconnect the inverter from the PV strings and wait for 5 minutes before proceeding with subsequent operations;

2）Read and record the open-circuit voltage (Voc) of the PV module:

Before connecting the optimizer, use a multimeter (positive probe to PV module output positive, negative probe to PV module output negative) to measure and record the open-circuit voltage of a single PV module.

3）Connect the optimizer and PV module according to the diagram and instructions:

After connecting a single optimizer to a single PV module, use a multimeter to check for connection abnormalities.

Connect the multimeter's positive probe to the optimizer's output positive and the negative probe to the optimizer's output negative.

Measure the output voltage of the optimizer and assess according to Table 3. If the voltage equals the open-circuit voltage of the single PV module, the connection is considered normal.

4）After all optimizers and PV modules are connected, connect the optimizer outputs in series as shown in the diagram and instructions.

Use a multimeter to measure the string voltage and assess according to Table 4. If the string voltage equals the sum of the open-circuit voltages of the PV modules, the connection is considered normal.

Table 3 Voltage determination table

Measured Voltage	Value Assessment	Cause	Corrective Action
Open-circuit Voltage	Normal	Wiring normal	No action required
No Voltage	Abnormal	Optimizer input voltage abnormal	1.Verify that the optimizer is correctly wired; if not, refer to the wiring diagram to ensure proper connections. 2. Confirm that the PV module's open-circuit voltage (Voc) exceeds 15 V. If the Voc is below 15 V, postpone the connection until sufficient sunlight is available. 3.If the issue persists, please contact the installer for further assistance

Table 4 Voltage determination table

Measured Voltage	Value Assessment	Cause	Corrective Action
String Open-circuit Voltage	Normal	Wiring normal	No action required
No Voltage	Abnormal	String voltage abnormal	When sunlight is sufficient, perform the following: 1. Use extension cables for optimizer output; check if extension cables are correctly made (one end positive connector, another end negative connector). 2. Check if the string is correctly connected in series to the inverter or if there is an open circuit in the string. 3. If the fault persists, please contact the installer for further assistance.

5. Instruction Manual

Table 5 Different types of input/output tables

Model	Input	Output
PV-SO1-700W	15-70V/20A/700W	0-70V/20A
PV-SO1-600W	15-70V/17A/600W	0-70V/17A
PV-SO1-500W	15-70V/15A/500W	0-70V/15A

1. Optimizer input voltage must not exceed the rated input voltage.
2. Optimizer current must not exceed the rated current.
3. PV connectors connected to the optimizer should comply with GBT 33765-2017 and relevant certifications.
4. All operations on the equipment must be performed by trained and qualified professional electrical technicians. Operators should be fully familiar with the

composition and working principles of the entire PV grid-connected power generation system and relevant standards in the country/region of the project.

5. Read this document thoroughly before installing the equipment to understand product information and safety precautions. Equipment damage caused by failure to store, install, and use the equipment according to this document and the inverter user manual is not covered by the equipment warranty.
6. Ensure that the DC connectors of the power optimizer and the corresponding mating connectors are of the same model or manufactured by the same company. If models are different or not from the same manufacturer, the DC connector manufacturer must provide a connector compatibility report and a third-party external laboratory (TUV, VDE, or Bureau Veritas) report. Using other incompatible DC connector models may lead to severe consequences, and equipment damage caused thereby is not covered by the warranty.
7. Cables connected to the optimizer must comply with relevant certification standards and have a cross-sectional area of at least 4 mm^2.
8. The optimizer input connects to the PV module junction box, and the output connects to an adjacent optimizer or inverter. Reverse connection of input and output cables is prohibited, as it may cause damage to the optimizer.
9. Optimizer storage environment temperature: -40℃ to +85℃, humidity: 0%-100%.
10. Optimizer operating conditions must meet the requirements of the specification parameters. Equipment damage caused by use beyond operating conditions is not covered by the equipment warranty.
11. Maximum system voltage: DC 1500V.
12. Insulated tools must be used when installing the equipment. For personal safety, wear personal protective equipment (PPE).
13. When the optimizer is not connected to other equipment, connect the optimizer's OUT+ to IN+ and OUT- to IN- to prevent water ingress into the terminals.
14. Troubleshooting

As shown in Table 6:

Table 6 Fault Handling Form

Fault Description	Cause of Fault	Corrective Action
Optimizer has no output	Optimizer input overvoltage	Check if the optimizer input module open-circuit voltage specification exceeds 70V.
	Optimizer internal temperature too high	1. Check if the optimizer installation location has good ventilation and if the ambient temperature exceeds the maximum allowable ambient temperature range. If ventilation is poor or ambient temperature is too high, improve its ventilation and heat dissipation conditions. 2. If ventilation and ambient temperature are normal, contact the installer.
	Internal fault in the optimizer	Contact the installer.
	Optimizer output backfeed	1. Check if the optimizers are used in parallel; this optimizer is limited to series connection only. 2. If the fault persists, contact the installer.
	Optimizer output voltage abnormal	When sunlight is sufficient, perform the following: 1. Use extension cables for optimizer output; check if extension cables are correctly made (one end positive connector, another end negative connector). 2. Check if the string is correctly connected to the inverter or if there is an open circuit in the string. 3. If the fault persists, contact the installer.

6. Maintenance Instructions

6.1. Maintenance Items

1. Regularly check if the fixing screws of the optimizer are loose and tighten if necessary.
2. Regularly check if input and output connectors are loose.
3. Measure the output voltage of the string and individual optimizers for abnormalities, referring to section 4.2.
4. Check if the optimizer and cables are damaged.

6.2. Replacing the Optimizer

1. If system modifications are required, including adding, removing, or replacing optimizers, adjusting the physical position of optimizers, or modifying the string connection to the inverter input, first turn off the DC and AC switches at the inverter bottom, Wait for 5 minutes before performing any changes to avoid personal injury.
2. Install the new optimizer and connect cables correctly.
3. Measure to ensure correct connection.
4. Power on the inverter.

7. Product Information Statement

The product functionalities, technical parameters, operating instructions, and illustrative descriptions provided in this manual are compiled based on the latest knowledge available during the product development phase. In line with our ongoing product optimization and technological innovation strategies, the Company reserves the right to modify and improve product designs, software algorithms, and service content without prior notice.

The test data, performance metrics, and application cases mentioned in this manual

reflect interim results obtained under specific testing environments. Actual outcomes may vary depending on usage scenarios, and such information shall not constitute legally binding quality commitments.

Users are advised that iterative updates to product functionalities may result in temporal discrepancies between the manual content and the latest product specifications. It is recommended to regularly visit the official website (http://www.chintxhpv.com) to access the most up-to-date technical documentation. This document serves only as a user guide, all statements, information, and recommendations in the document do not constitute any express or implied warranty.

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