

CSI-15K-T4001A-E CSI-17K-T4001A-E CSI-20K-T4001A-E CSI-23K-T4001A-E CSI-25K-T4001A-E



## **PV Inverter User Manual**

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## **All Rights Reserve**

This manual provides important safety information on relating to the installation, maintenance and usage of three phase PV inverters. Both users and professional installers must read these guidelines carefully and strictly follow these instructions. Failure to follow these instructions may result in death, serious injury or property damage.

Only qualified professionals and service personnel can do the installation and operation. Installers must inform endusers (consumers) about the aforesaid information accordingly.

This manual is only valid for the PV inverter types: CSI-15K-T4001A-E, CSI-17K-T4001A-E, CSI-20K-T4001A-E, CSI-23K-T4001A-E, CSI-25K-T4001A-E.

## **About This Manual**

The information contained in this manual is subject to change by CSI Solar Co., Ltd. without prior notice. CSI Solar Co., Ltd. gives no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information contained herein.

In the event of any inconsistency among different language versions of this document, the English version shall prevail. Please refer to our product lists and documents published on our website at: http://www.csisolar.com as these lists are updated on a regular basis.

## Limitation of Liability

CSI Solar Co., Ltd. shall not be held responsible for damages of any kind, including-without limitation-bodily harm, injury or damage to property, in connection with handling PV inverters, system installation, or compliance or non-compliance with the instructions set forth in this manual.

## Target Group

This document is intended for installers and users.

## **Symbol Conventions**

The Important instructions contained in this manual should be followed during installation, operation and maintenance of the inverter. They will be highlighted by the following symbols.

Symbol	Description
DANGER	Indicates a highly risky hazard that, if not avoided, will lead to fatality or severe bodily harm.
<u> </u>	Indicates a moderately risky hazard that, if not prevented, could result in fatality or severe
WARNING	bodily harm.
CAUTION	Indicates a low-risk hazard that, if not mitigated, could cause minor to moderate bodily harm.
NOTICE	Indicates a situation that, if not addressed, could result in damage to equipment or property.
Information	Indicates additional information, emphasized contents or tips that may be helpful, e.g. to help you solve problems or save time.

## 1 Safety

The design of the inverter is strictly based on international safety standards and the relevant device safety tests have been passed.

Before starting the work with the inverter, please read all the safety instructions and always observe them. Incorrect operation or work may result in:

- Injury or fatality to the operator or a third party
- Damage to the inverter and other property belonging to the operator or a third party. Detailed safety warnings and notes related to work will be clearly indicated at critical points throughout this manual.

#### Notice:

The safety instructions provided in this manual do not cover all possible precautions that should be taken. Therefore, it is crucial to consider the actual on-site conditions when performing any operations.

CSI Solar disclaims any liability for any damages resulting from the violation of the safety instructions outlined in this manual.

	PV strings, when exposed to sunlight, generate electrical power, which can result in potentially
	lethal voltages and electric shocks.
	· It's crucial to remember that the inverter operates on dual power. Electrical operators must
	don appropriate safety gear, including helmets, insulated footwear, and gloves.
DANGER	• Prior to handling DC cables, operators must utilize a measuring device to confirm the absence
	of voltage.
	Strictly adhere to all warnings on the PV strings and in its manual.

## 1.1 Utility Grid

Please follow the regulations related to the utility grid.

$\wedge$	Ensure all electrical connections comply with local and national standards.
	Connecting the inverter to the utility grid requires explicit permission from the utility grid
NOTICE	distributor company.

## 1.2 Inverter

Symbol	Description
	Always exercise caution to prevent electric shocks due to live voltage.
	Do not attempt to open the enclosure at any time, as unauthorized access voids warranty
DANGER	and may terminate the operating license.
•	To prevent inverter damage or personal injury, refrain from disconnecting PV connectors while
	the inverter is operational.
	Allow at least 5 minutes for internal capacitors to discharge. Verify the absence of voltage
WARNING	or current before removing any connector.
	Avoid touching hot components during operation to prevent burns. Only the DC switch is
	safe
CAUTION	to touch at all times.
	Only qualified personnel should perform country settings. Incorrect country settings may affect
	the normal operation of the inverter and lead to non-compliance with the certification
	requirements of that country.
	By interacting with the electronic components, there is a risk of causing damage to the
	inverter. Handling the inverter requires caution. Avoid unnecessary touching and wear a
	grounding wristband before interacting with any connectors to prevent damage.

Warning Label

Symbol	Description
	Hot surfaces! Risk of burns due to hot components!
	Disconnect the inverter from all the external power sources before service!
	Danger to life due to high voltage!
	Time need to discharge stored energy in the capacitors.
	Grounding
	Direct Current (DC)
$\sim$	Alternating Current(AC)

## 1.3 Skills of Qualified Personnel

All installations should be performed by qualified personnel. They should have:

- Training in the installation and commissioning of the electrical system, as well as dealing with hazards.
- Knowledge of the manual and other related documents.
- Knowledge of the local regulations and directives.

## **2 Product Introduction**

#### 2.1 Intended Usage

The inverter is a transformer-less three-phase PV grid-connected inverter, which is an integral component in the PV power system.

This document involves the following product models:

CSI-15K-T4001A-E, CSI-17K-T4001A-E, CSI-20K-T4001A-E, CSI-23K-T4001A-E, CSI-25K-T4001A-E.

The inverter is designed to convert the DC power generated from the PV modules into grid-compatible AC power and feed the AC power to the utility grid. The intended usage of the inverter is illustrated in the figure bellow.



A) PV string; B) Inverter; C) AC distribution box/cabinet; D) Transformer station; E) Utility grid FIG. 2-1 Inverter application in PV power system



The inverter can be used in the power grid types shown in the figure below.



FIG 2-2 Power grid types supported by the inverter.

## **2.2 Product Introduction**

#### 2.2.1 Appearance and dimension



- A. LED Indicator
- B. DC Disconnect Switch
- C. PV Input Connectors
- D. Cable Communication Ports (Optional)

F. AC Output Connectors

- G. External Grounding Point

FIG 2-3 Product dimensions and main parts

#### 2.2.2 LED Indicator Panel

As an HMI, the LED indicator panel on the front of the inverter indicates the present working state of the inverter.

Description	Indicator Light Status	Blinking Frequency	
Waiting	Green light blinking	Power-on mode: 1s on, 1s off	
waiting		Self-test mode: 300ms on, 300ms off	
Normal	Green light steady on	/	
Error	Red light steady on	/	
Pending safety	Tri-color light	100	
regulation setting	blinking alternately	Tooms	

## 2.3 Circuit Diagram

As shown in FIG 2-4., the device has multiple MPPTs to maximize the yield by tracking the input power from different PV strings. DC power is converted into grid-compatible AC power using an inverter circuit followed by an AC filter and AC relay for safe connection and disconnection from the grid. To protect the device from overvoltage, it has SPDs in the AC and DC side.



FIG 2-4 Product topological diagram

## 2.4 Function Description

The main functions of the inverter are listed below:

1) Conversion function

Converts DC power into AC power.

2) Data storage

Parameters such as running information and error records are logged in the inverter and the CSI Platform.

3) Parameter configuration

Various inverter parameters can be set via the App to optimize performance and meet the grid connection requirements.

4) Communication

The inverter uses a standard RS485 communication interface, which is used to establish communication with monitoring devices for uploading data to monitoring platform.

After a communication connection is established, users can view inverter information or set inverter parameters using the Smart Energy platform.

5) Protection Function

The protective functions are integrated in the inverter, including anti-island protection, LVRT/ZVRT, DC reversed polarity protection, AC short circuit protection, leakage current protection, DC overvoltage/overcurrent protection.

6) AFCI (optional\*)

After activating the AFCI function, the inverter in real-time will detect whether there is a fault arc in the DC circuit between photovoltaic modules and between photovoltaic modules and inverters. Once a fault arc occurs, the inverter will immediately send an alarm signal via monitoring system and cut off the fault circuit, effectively preventing safety hazards such as fires caused by the arc.

7) PID recovery function (optional)

After enabling the PID, the voltage of all PV modules to ground is positive (greater than 0).



FIG 2-5 PID functional system diagram

\* Available by default for EMEA region



Before activating the PID recovery function, please be aware of the requirements for the voltage polarity of different structural types of PV modules to the ground. If uncertainties arise, it is advisable to consult the PV module manufacturer or refer to the appropriate user manual for guidance.
The PID recovery function may malfunction or potentially cause harm to the PV modules if the voltage scheme utilized for PID protection/recovery does not align with the specifications of the PV modules.

Anti-PID function

When the inverter is running, the Anti-PID function module rises the potential between the negative pole of the PV array and the ground to a positive value, to suppress the PID effect.



Make sure the inverter is applied to an IT system before enabling the anti-PID function.

#### PID recovery function

When the inverter is not running, the PID module will apply inverse voltage to PV modules, to restore the degraded modules.



• If the PID recovery function is enabled, it only works at night.

• After the PID recovery function is enabled, the voltage of the PV string to ground is 500Vdc by default, and the default value can be modified through the App.

## 3 Unpacking and Storage

## 3.1 Unpacking and Inspection

Before unpacking the inverter, check the package appearance thoroughly, such as for holes and cracks, and check the inverter model accordingly. If you discover any damage to the packaging which indicates the inverter may have been damaged, or the inverter model is not the one you requested, do not unpack the product and contact your dealer immediately.

After opening the package, check all of the accessories carefully in the carton. If any damage is found or any component is missing, contact your local installer.

## 3.2 Identifying the Inverter

The nameplate provides a unique identification of the inverter (Product type, device -specific characteristics, compliance symbols).

The nameplate is on the left side of the enclosure.



- (1) Company name and product model
- (2) Important technical specifications
- (3) Compliance symbols
- (5) QR Code for user manual
- (4) Series number
- FIG 3-1 Inverter nameplate

### 3.3 Packing List



#### Note

\*Documents: Quick installation guide, Ex-Factory inspection record, Qualified certificate.

### 3.4 Storage

The following requirements should be met when the inverters need to be stored:

Storage temperature: -40°C ~ +70°C.

Storage humidity: 0% ~ 100%RH (Non-Condensing).

The warehouse should be clean, well-ventilated, and non-corrosive gas (corrosive or flammable gases), meanwhile it should be accessible all the time.

No smoking, no illegal use of electricity and fire.

When storing inverters, do not stack more than the allowed layers to avoid damage, which number marked on the product packaging.



Do not tilt the package or place it upside down. Regular inspection is required during the storage.

## 4 Mechanical Mounting

## 4.1 Safety during Mounting

	Ensure that there is no electrical connection present prior to installation. To prevent electric		
DANGER	shock or other injuries, ensure that there is no electricity or plumbing installations nearby whendrilling holes.		
	To minimize the risk of injury due to improper handling:		
	• Always adhere to the instructions provided when moving and positioning the inverter.		
	Failing to do so may result in injuries, severe wounds, or bruises.		
CAUTION	• Ensure proper ventilation to maintain system performance. Poor ventilation can lead to		
	system performance loss.		
	Keep the heat sinks uncovered to allow for effective heat dissipation.		

### **4.2 Location Requirements**

Choose a suitable mounting location that ensures safe operation, durability, and peak performance.

- The inverter with IP 66 is suitable for both indoor and outdoor installation.
- Ensure that the inverter is installed in a location that provides easy access for electrical connections, operations, and maintenance tasks.

### 4.2.1 Installation Environment Requirements

1) Do not install the inverter on the structures constructed of flammable, thermolabile or explosive materials.

- 2) Ensure the inverter is out of children's reach.
- 3) The ambient temperature should be between -30°C to 60°C.
- 4) The humidity of the installation location should be below 100% without condensation.

5) Do not install the inverter outdoors in salt, sulfur or other corrosive areas.

The inverter would be corroded in salt (i.e. marine environments) area, and the corrosion may cause fire. In salt area refers to the region within 500 meters from the coast.

Please consult the CSI Solar Co., Ltd. technical support department on the use of inverters in special climates (i.e. salt, sulfur, or ammonia areas) which may affect the product warranty.

6) Prevent the inverter from direct exposure to sun, rain and snow.

- 7) The inverter should be well ventilated. Ensure air circulation
- 8) Never install the inverter in living areas. The inverter will generate noise during operation, affecting daily life.
- 9) Install at at an appropriate height for ease of viewing LED indicators and operating switches
- 10) Do not install in small closed cabinet where air cannot circulate freely.



FIG 4-1 Installation site

### 4.2.2 Carrier Requirements

The installation carrier should meet the following requirements:

Made of non-inflammable materials;

Min. load bearing capacity  $\geq$  4 times of inverter weight.

#### 4.2.3 Installation Angle Requirements

Install the inverter vertically or lean back mounting  $(0 \sim 15^\circ)$ . Forward installation or upside down installation is prohibited.



FIG 4-2 Installation angle

#### 4.2.4 Installation Clearance Requirements

1) Ensure ample clearance surrounding the inverter to accommodate adequate heat dissipation, shown as FIG 4-3 (minimum reserved space).



FIG 4-3 Single inverter clearance

2) When installing multiple inverters (no more than 15), ensure that there is adequate spacing between each unit to allow for proper ventilation and avoid overheating, shown as FIG 4-4 (minimum spacing).



FIG 4-4 Multiple inverters clearance

## 4.3 Assembling the mounting-bracket

- Step 1 The left of the following figure shows the position relationship between the hanging panel and the product, where the dotted line is the product outline.
- Step 2 Locate the mounting-bracket according to the installation clearance. Use the mounting-bracket as template to mark drill holes.
- Step 3 Use Ø 11mm drill bit to drill 3 holes with hole depth  $\ge$  55mm.
- Step 4 Screw three self-tapping screws (ST6.3) through the holes in the mounting-bracket into the expansion tube in the wall. Then lock the screws to fix the wall-mounted back plate on the wall.



FIG 4-5 Assembly mounting bracket

#### **4.4 Inverter Installation**

- Note: Before installing the inverter, make sure that the mounting-bracket is correctly and firmly fixed on the wall.
- Step 1 Take the inverter out of the packing box and keep it balanced to prevent the inverter from colliding with walls or obstacles.
- Step 2 Hang the inverter on the mounting-bracket and use M4X14 screw, to fix it (see FIG 4-6). Tool: PH2 screwdriver, torque: 1.8N.m.



FIG 4-6 Install the inverter

## **5** Electrical Installation

### 5.1 Safety

Before making any electrical connections, it is crucial to remember that the inverter features dual power supply – grid and PV modules.

Qualified personnel must wear personal protective equipment (PPE) during all electrical work.

	There is a significant risk of life-threatening high voltage inside the inverter.
	The PV string generates extremely high, potentially lethal voltage when exposed to sunlight.
	Before commencing electrical connections, ensure that both the DC and AC circuit breakers are
DANGER	disconnected, and take measures to prevent inadvertent reconnection.
	Verify that all cables are voltage-free before connecting them.
WARNING	Improper cable connections can result in equipment damage or personal injury. Therefore, only
	qualified personnel should handle cable connections.
	All cables must be undamaged, securely fastened, appropriately insulated and sized.



Adhere to all safety instructions related to PV strings and grid regulations.

All electrical connections must comply with both local and national standards.

Permission from the utility grid is required before connecting the inverter to the grid.

### **5.2 Electrical Connection Overview**

Electrical connection in the PV system includes additional grounding connection, AC connection, and PV string connection.



A) PV string; B) Inverter; C) AC distribution box/cabinet; D) Distribution grid; E) Monitoring device FIG 5-1 General electrical connection diagram

## 5.3 Connecting the PE Cable

Since the inverter is a transformerless inverter, neither the negative pole nor the positive pole of the<br/>PV string can be grounded. Otherwise, the inverter will not operate normally.WARNINGConnect the additional grounding terminal to the protective grounding point before AC cable<br/>connection, PV cable connection, and communication cable connection.The ground connection of this additional grounding terminal cannot replace the connection of the PE<br/>terminal of the AC cable. Make sure those terminals are both grounded reliably.

### 5.3.1 Additional Grounding Requirements

All non-current-carrying metal components and enclosures within the PV power system, including PV module brackets and inverter enclosures, must be grounded. In systems with a single inverter, connect the additional grounding cable to a nearby grounding point.

For systems with multiple inverters, establish an equipotential connection by connecting the grounding points of all inverters and PV array frames to the equipotential cable, taking into account the on-site conditions.

#### 5.3.2 Connection Procedure

Step 1 According to the following figure, prepare additional grounding cable (recommended conductor cross-sectional area range: 4~6mm2). Wire stripping—>crimp terminal.



FIG 5-2 Grounding cables

Step 2 Fix the grounding cable on the inverter with the M4X10 screw in the attachment. Tool: PH2 screwdriver. Torque: 1.8N.m Shown as FIG 5-2



FIG 5-3 Install ground cables

NOTE: Additional ground terminals and screws are included in the accessories of the inverter.

#### **5.4 Communication Cable Connection**

This series of models provides standard wireless communication function and optional wired communication function.

#### 5.4.1 RS485 Communication Cable Connection (Optional\*)

Step 1 Prepare the Signal Cable. Remove the signal cable's jacket about 23mm, and then strip the wire insulation layer about 7mm, as per figure below.

Туре	Core wire cross- sectional area	Outside diameter	$\sum$
Shielded type 2-core twisted pair	0.25-1mm² (24~18AWG)	4~5.5mm	

FIG 5-4 Communication cable requirements

- Step 2 Insert the conductors into the corresponding pins of the plug, and then fix the conductors by screws firmly, as shown in FIG 5-4. Tool: Phillips screwdriver #1. Torque: 0.6~0.8N.m.
- Step 3 Tighten the pressure nut, and then push the threaded sleeve into the plug, as per FIG. 5-5.

Step 4 Finally insert the assembled connector into the RS485 receptacle (COM.-2) on the inverter, as per FIG 5-6.

\* Available by default for EMEA region







FIG 5-6 Insert the connector into the receptacle

#### 5.4.2 Multi-inverter communication system



In case of multiple inverters, select COM.-2 port to achieve communication connection in daisy chain form.

FIG 5-7 Multiple Communication Networks

#### 5.4.3 Ripple Control Receiver/ Logic Interface Connection (Optional)

#### 5.4.3.1 DRM and RCR

This series inverters have digital inputs to support Demand Response Modes (DRM) and signals from Ripple Control Receivers (RCR). Use 8-pin connector to access this functionality via communication port COM-3.

Information	<ul> <li>DRMS application description</li> <li>Applicable to AS/NZS4777.2:2015.</li> <li>DRM0, DRM5, DRM6, DRM7, DRM8 are available.</li> </ul>
	<ul> <li>Damage to the inverter due to moisture and dust penetration</li> <li>Make sure the cable gland has been tightened firmly.</li> <li>If the cable gland are not mounted properly, the inverter can be destroyed due to moisture and dust penetration. All the warranty claim will be invalid.</li> </ul>
WARNING	Excessive voltage can damage the inverter! The maximum voltage for all digital inputs is 5V.

FIG 5-8 depicts the functionality of the connector pins and the connection procedure. Please assemble the connector according to the sequence shown in the figure to the left and then plug the connector in port COM-3.



FIG 5-8 Connection of DRM/RCR connector

#### Table 5-1 The functionality of each demand response mode

Mode	Mode activation by shorting the pins		Function
DRM0	8	7	Emergency Stop Dry Contact.
DRM1/5	3 7		Do not generate power.
DRM2/6	4	7	Do not generate at more than 50% of rated power.
DRM3/7	5 7		Do not generate at more than 75% of rated power and reduce the reactive power as far as possible.
DRM4/8	6 7		Increase power generation (subject to constraints from other active DRMs).

Using the Power Control Interface for EU

DRM Socket Pin.No Pin_Name Descrip		Description	Connected To RCR
3	L1	Relay contact 1 input	K1 - Relay 1 output
4	L2	Relay contact 2 input	K2 - Relay 2 output
5	L3	Relay contact 3 input	K3 - Relay 3 output
6 L4 Relay contact 4 input K4 -		K4 - Relay 4 output	
7	5V	Internal voltage supply	Relays common node
8	DI	Remote shutdown	K5 - Relay 5 output

Table 5-2 The connector pin assignment and function

The inverter is preconfigured to the RCR power levels that are shown in Table 5-3. Logic level "1" corresponds to +5V on input.

Table 5-3 RCR power levels	
----------------------------	--

DRM Socket Pin.3	DRM Socket Pin.4	DRM Socket Pin.5	DRM Socket Pin.6	Active power	Cos(φ)
1	0	0	0	0%	1
0	1	0	0	30%	1
0	0	1	0	60%	1
0	0	0	1	100%	1

This logical interface is used to control and/or limit the output power of the inverter. The inverter can be connected to the RCR to dynamically limit the output power of all inverters in the installation. The figure below shows the schematic of RCR interface with inverter.



FIG 5-9 DRM Socket / RCR Control Interface

DI control of inverter, close is 1, open is 0.

#### 5.4.3.2 DI terminal (Emergency Stop Dry Contact)

This dry contact can be configured as an emergency stop contact, and the description of this DI point is shown in Table 1. When the DI contact and+5V contact are short circuited by an external control switch, the inverter stops receiving signals and will start self-checking when the signal is gone.

DRM Socket Pin.8	Inverter state
1	Stop
0	Running



FIG 5-10 DRM Socket / Remote Shutdown Control Interface

#### 5.4.4 Communication Dongle Connection

This product supports CSI communication dongles – WiFi Stick and LAN Stick . For more information, please refer to the Quick Installation Guide of these devices.

#### 5.4.5 Smart Meter Connection (Optional)

The inverter has integrated export limitation functionality. To use this function, a Smart meter must be installed. For installation and operation methods, please refer to the instructions in the Smart Meter manual.

## 5.5 AC Cable Connection

#### 5.5.1 AC Side Requirements

Before connecting the inverter to the grid, it is crucial to verify that the grid voltage and frequency adhere to the specified requirements. For detailed guidance, refer to the provided Specification. If there are any deviations, it is advisable to seek assistance from the electric power company.

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Connect the inverter to the grid only after getting an approval from the local electric power company.

#### 5.5.2 AC Circuit Breaker

An independent four-pole circuit breaker is installed on the output side of the inverter to facilitate safe disconnection from the grid in case of an emergency.

Table 5-5 Circuit Breaker				
Inverter	Recommended rated voltage	Recommended rated current		
CSI-15K-T4001A-E	400V	32 A		
CSI-17K-T4001A-E	400V	32 A		
CSI-20K-T4001A-E	400V	50 A		
CSI-23K-T4001A-E	400V	63 A		
CSI-25K-T4001A-E	400V	63 A		

If multiple inverters need to share a circuit breaker, the circuit breaker should be selected according to the capacity.

	It is not recommended to connect a load between the inverter and the circuit breaker.
--	---

When connecting multiple inverters in parallel to the grid, it is crucial to ensure that the aggregate number of parallel inverters does not exceed 15.

#### 5.5.3 AC Cable Connection

Step 1 Strip the cable's jacket, and then adjust the relative length of core wires, to make the length of PE wire at least 5mm longer than N and phase ones.



	Description	Specification
А	Cable Outer Diameter	15kW / 17 kW / 20 kW:13-22mm 23 kW / 25 kW:13~26mm
В	Cross Sectional Area of Copper Conductor	15kW / 17 kW / 20 kW : 5x4~16mm <sup>2</sup> (REC 6mm <sup>2</sup> ) 23 kW / 25 kW : 5x6~16mm <sup>2</sup> (REC 10mm <sup>2</sup> )
С	Stripping Length of Copper Conductor Insulation	12mm
D	Stripping Length of Cable Sheath	75mm
Note: The ground wire (PE) is at least 5mm longer than the phase line.		

FIG 5-11 AC cable stripping requirements

Step 2 Insert the conductor into the suitable ferrule and tighten them firmly, and then assemble all parts together. NOTE: ferrule is not provided.



1. connector body; 2. sleeve; 3. sealing ring 2; 4. sealing ring 1; 5. claw; 6. pressing nut. FIG 5-12 AC Connector

NOTE: Please select the appropriate sealing ring according to the actual cable outer diameter and the table below:

Model	Sealing Ring 1	Sealing Ring 1+ Sealing Ring 2
15kW / 17kW / 20kW	18-22mm	13-18mm
23kW / 25kW	18-26mm	13-18mm

Step 3: Insert the assembled plug into the AC socket on the inverter (please refer to the FIG 5-4). Tighten the connection by aligning the arrow on the plug with the circular hole on the socket.

NOTE: Please use the hex wrench provided with the inverter to tighten it.



FIG 5-13 Internal structure of AC connector



FIG 5-14 AC plug connection

### 5.6 DC Cable Connection

	Electric shock!
	Once exposed to sunlight, the PV array generates potentially fatal high voltage.
DANGER	Before performing electrical operations, ensure that all cables are uncharged.
	Do not turn on the AC circuit breaker before the inverter is electrically connected.
DANGER	<ul> <li>Before connecting the DC input power cable, please pay attention to the following items:</li> <li>Ensure that the DC voltage is within the safe range (lower than 60 V DC) and that all the DC switches on the solar inverter are set to OFF. Failing to do so may result in electric shocks.</li> <li>If you turn a DC SWITCH to ON by mistake when connecting or disconnecting DC input power cables, do not remove or insert DC input terminals. If you need to remove or insert a DC input terminal, perform the operations provided in 8.1 for Disconnect the inverter.</li> <li>When the solar inverter operates in grid-tied mode, do not perform maintenance or operations on the DC circuit, such as connecting or disconnecting a PV string or a PV module in the PV</li> </ul>
	string. Failing to do so may cause electric shocks or arcing, which may also cause fire.
	Ensure that the PV array is adequately insulated from the ground to prevent any electrical hazards
	before connecting it to the inverter.
	terminals of PV strings may be short-sircuited to ground if the power cable is not propriety
chonten	installed or routed. In this case, an AC or DC short circuit may occur and damage the
	solar inverter. The caused device is not covered under any warranty.
	There is a risk of inverter damage! The following requirements should be met.
	Failure to do so will void guarantee and warranty claims.
	• Make sure the maximum voltage of each string is always less than 1100 V.
$\wedge$	$\cdot$ The inverter enters a standby mode when the input voltage falls within the range of 1000V to
	1100V. However, once the voltage returns to the MPPT operating voltage range, which is
NOTICE	between 180V and 1000V, the inverter resumes its normal operating state.
	$\cdot$ Make sure the maximum short circuit current on the DC side is within the permissible range.
	$\cdot$ The polarities of electric connections are correct on the DC input side. The positive and
	negative terminals of a PV module connect to corresponding positive and negative DC input
	terminals of the solar inverter.

#### 5.6.1 PV Input Configuration

1) The inverter is equipped with multiple MPPTs and each MPPT has inputs for two strings. Each MPPT operates separately, thus different string configurations may be used, including different PV module types, number of PV modules, angle of tilt, and installation orientation.

2) Each MPPT includes two DC input strings.

The two input PV strings should be the same in PV string structure, including the type, number, tilt, and orientation of the PV modules.

3) The solar inverter is not compatible with full parallel connections of PV strings, which involves connecting the PV strings in parallel externally before connecting them individually to the solar inverter.



Use the connectors delivered with the solar inverter. If the PV connnectors are lost or damaged, purchase the connectors of the same model. The device damage caused by incompativle PV connecotrs is beyond the warranty scope.

#### 5.6.2 DC cable connection

CSI Solar provides corresponding plug connectors in the scope of delivery for quick connection of PV inputs. DC cables should be connected to the inverter via PV connectors which are included in the scope of delivery.

Ţ	Verify the polarity of the PV strings, ensuring that the positive and negative terminals are correctly identified. Only after confirming the polarity, connect the PV connectors securely to the matching
	terminals.
NOTICE	Failure to securely connect the PV connectors may result in arcing or overheating, and CSI Solar disclaims any liability for any resulting damage.

- Step 1 Strip the insulation from each DC cable by 7mm.
- Step 2 Assemble the cable ends with the crimping pliers.
- Step 3 Lead the cable through cable gland, and insert into the insulator until it snaps into place. Gently pull the cable backward to ensure firm connection. Tighten the cable gland and the insulator (torque 2.5 N.m to 3 N.m).
- Step 4 Check for polarity correctness.

The inverter will not function properly if any PV polarity is reversed.



FIG 5-15 DC connector assembly

### 5.6.3 Installing the PV Connectors.

- Step 1 Turn all DC switches to the "OFF" position.
- Step 2 Verify the polarity of the PV string's cable connections, ensuring that the open circuit voltage remains below the inverter's input limit of 1100V.
- Step 3 Securely connect the PV connectors to their respective terminals until an audible click is heard.
- Step 4 Repeat the process for connecting the PV connectors of other PV strings.
- Step 5 Seal the unused PV terminals with the provided terminal caps.



FIG 5-16 DC switch in OFF position



ition FIG 5-17 Check the polarity of PV string



FIG 5-18 Connect the PV connectors to the inverter

	If the DC input power cable is incorrectly connected in reverse while the DC switches are in the
	ON position, it is crucial not to abruptly turn off the switches or attempt to reconnect the positive
Â	and negative connectors. Doing so may result in damage to the equipment, and any such
NOTICE	damage would not be covered by any warranty. It is advisable to wait until nightfall, when solar
	irradiance reduces and the PV string current falls below 0.5 A. At this point, you can safely turn
	off DC switches, detach the positive and negative connectors, and correct the connection of the
	DC input power cable.

## 6 CSI Smart Energy App Local Mode

### **6.1 APP Introduction**

The CSI Smart Energy APP enables connection to the WiFi dongle via the Bluetooth, allowing local access to the inverter. Users can use the App to view basic information, alarms, set parameters, etc.

### 6.2 Download and Install the App

Scan the following QR Code to download and install the App according to the prompt information.



## 6.3 Use the Local Mode to Login the App

Notice: To use the local mode, the following conditions should be met:

- (1) The Wi-Fi dongle is connected to the inverter and powered on.
- (2) The distance between the mobile phone and the dongle should be within 5m and there are no obstacles.
- (3) Make sure the Bluetooth of your phone is turned on.

Step 1 Open the CSI Smart Energy APP.

	🌐 English 🔻
Se CanadianSol	ar
Hello, welcome to use	
User Name	
Password	Ø
Remember Password Thave read and agree (Serv (Privacy Policy)	vice Agreement》、
Sign	in
Register	Forgot Password
🗟 Chinese server	🖹 More tools
<u>L</u>	

Step 2 Select "More tools" -> "Local Access". Scan the QR code of the dongle, and the mobile phone will connect to the dongle automatically.



Step 3 If it is the first time to boot the inverter, you need to set the Grid Code as required on the boot page.

< Boot Wizard	< Select device	< Country and region
	03 - SN012345678900csi0	Brazil Italy Chile China Europe Bulgaria EN50549-CZ Romania General
Hello, Welcome to use the CanadianSolar inverter, Please According Guide To Finish Settings	Next Step	Korea South Africa Poland Spain Germany



A	Select the correct gird code where the inverter is installed. If the gird code is not suitable, it may
	cause the inverter to report an error.
NOTICE	You can also set the grid code on the "Parameter" -> "Inverter Basic Information-DSP" ->" Grid
	Code" .



For detailed description of the App functionality see the User manual of the Smart Energy App.

## 7 Inverter Commissioning

### 7.1 Electrical Inspection

1) The inverter DC switch and external circuit breaker are disconnected

2) The inverter should be accessible for operation, maintenance and service.

3) Nothing is left on the top of the inverter.

4) The inverter is correctly connected to the external devices, and the cables are routed in a safe place or protected against mechanical damage.

5) The selection of the AC circuit breaker is in accordance with this manual and all applicable local standards.

6) All unused terminals at the bottom of the inverter are properly sealed.

7) Warning signs & labels are suitably affixed and durable.

## 7.2 Commissioning Procedure

If all the aforementioned items satisfy the necessary criteria, please adhere to the subsequent instructions to initiate the inverter's initial startup procedure.

- Step 1 Turn the DC switch of the inverter to the "ON" position.
- Step 2 Connect the AC switch (if applicable) between the inverter and the grid.
- Step 3 Connect the DC switch (if applicable) between the inverter and the PV string.
- Step 4: Utilize the CSI Smart Energy App to establish the preliminary safety parameters. Provided that the irradiation and grid conditions are satisfactory, the inverter will operate smoothly.
- Step 5 Observe the LED indicator to ensure that the inverter operates normally.

No.	Description	Indicator Light Status	Flicker Frequency	
1	Wait	green light blinks	1 second on, 1 second off	
2	Normal	green light	/	
3	Error	red light	/	
4	Waiting for grid code setting	Three colors take turns flashing	100ms	

## 8 System Decommissioning

### 8.1 Disconnecting the Inverter

For maintenance or any other service-related tasks, it is imperative to switch off the inverter to prevent lethal voltages or any potential harm to the device.

To safely disconnect the inverter from both AC and DC power sources, follow the following steps:

- Step 1 Wear appropriate personal protective equipment.
- Step 2 Disconnect the external AC circuit breaker and secure it to prevent reconnection.
- Step 3 Turn the DC switches to the "OFF" position to disconnect all PV string inputs.
- Step 4 Allow approximately 5 minutes for the capacitors inside the inverter to completely discharge.
- Step 5: Measure the DC current of each PV input string using a clamp meter.
  - If the current is less than or equal to 0.5 A, go to the next step.
  - If the current is higher than 0.5 A, wait until the solar irradiance decreases and the PV string current decreases below 0.5 A at night, and then go to the next step.
- Step 6 Insert a MC4 wrench into the notch and press the wrench with an appropriate force to remove the DC connector.
- Step 7 Ensure that the AC wiring terminals are voltage-free via a multimeter, and remove the AC wires and communication wires.
- Step 8 Install the MC4 waterproof plugs.

### 8.2 Dismantling the Inverter

- Step 1 Refer to "5 Electrical Connection" for the inverter disconnection of all cables in reverse steps.
- Step 2 Disassemble the inverter by following the reverse steps outlined in "4 Mechanical Mounting".
- Step 3 If necessary, remove the wall-mounting bracket from the wall.
- Step 4 If planning to reinstall the inverter in the future, refer to "3.4 Inverter Storage" for proper preservation instructions.

### 8.3 Disposal of the Inverter

Users are responsible for disposing of the inverter.



Certain components and devices within the inverter, such as capacitors, may pose environ mental hazards. Do not dispose of the product together with household waste; instead, a dhere to the electronic waste disposal regulations applicable at the installation site.

## 9 Daily Maintenance

	Incorrect service may result in inverter damage or personal injury. Keep in mind that the inverter
_	operates with dual sources: PV array and utility grid.
	Before performing any service work, follow the procedure below:
	1) Disconnect the inverter from the utility grid side first and then PV array;
DANGER	2) Wait at least 5 minutes after shut down the inverter, for inner capacitors to discharge
	completely;
	3) Use testing devices to ensure there is no voltage or current present.
$\wedge$	Risk of inverter damage if it is improperly serviced.
	Use accessories and spare parts approved by the inverter manufacturer only. Never modify
NOTICE	the inverter or other components of the inverter. The loss of any or all warranty rights may
	follow if otherwise.
$\wedge$	Any malfunction that may impair the inverter safety operation must be repaired immediately before the inverter is restarted
NOTICE	Inverter contains no customer serviceable parts inside. Please contact local authorized
	personnel if any service work is required.
•	Never attempt to service the device without proper tools, test equipment, or the latest
	revision of the manual that has been fully understood.
Information	

Items	Methods	Period
System clean	Regularly inspect the temperature and dust level of the inverter, and clean the enclosure as needed. Check the humidity and dust of the environment. Meanwhile check whether the filter function of the air inlet is ok.	Six months to a year (it depends on the dust contents in air)
Fans	Check whether there is fan warning using App. Check whether there is any abnormal noise when the fan is turning.	Once a year
Cable entry	Check whether the cable entry is insufficiently sealed or the gap is excessively large, and reseal the entry when necessary.	Once a year
Electrical Connection	Check whether all cable are firmly in place. Check whether a cable is damaged, especially the part contacting the metal enclosure.	Six months to a year

## **10 Troubleshooting**

When the inverter does not operate normally, we recommend the following actions for quick troubleshooting. Please review the error list table carefully.

## 10.1 Warning

The different LED colors and flashing status identify the current operation statuses of the inverter. If the red color is always on, it indicates the inverter fault. Usually the warnings can be cleared through an orderly shutdown / reset or a self-corrective action performed by the inverter.

## 10.2 Errors

Error codes identify a possible equipment fault, or incorrect setting/ configuration. Any and all attempts to correct or clear a fault must be performed by qualified personnel. Typically, the Errors code can be cleared once the cause or fault is removed.

However, some of the (E) codes may cannot be cleared, in this case please contact the dealer or CSI Solar Co., Ltd. to replace a new one.

Errors as indicated in the table below:

Description	Alarm ID	Trouble shooting			
External Fan Warning	1	1. Check whether the fans operate normally and are blocked by sundries. If they are blocked, clear the sundries.			
Internal Fan Warning	2	2. If a fan does not operate normally, stop and disconnect the inverter to replace the fan.			
		Once the power grid returns to normal operation, the inverter			
Crid Line Vel Ovenvelt Err	24	will typically reconnect to it. However, if faults persist or recur,			
	24	follow these troubleshooting steps:			
		1. Ascertain the actual grid voltage and, if it exceeds the set			
		value, reach out to the local electric power company for			
		potential solutions.			
		2. Verify the protection parameters through the App to ensure			
Grid Phase Vol Overvolt	25	they are set correctly.			
Err	25	3. Inspect the cross-sectional area of the AC cable to ensure it			
		meets the specified requirements.			
		4. If the fault is not caused by the foregoing reasons and still			
		exists, contact CSI Solar.			
		Once the power grid returns to normal operation, the inverter			
Grid Freq High Err	27	will typically reconnect to it. However, if faults persist or recur,			
		follow these troubleshooting steps:			
		1. Ascertain the actual grid frequency and, if it exceeds the set			
		value, reach out to the local electric power company for			
		potential solutions.			
Grid Freq Low Err	28	2. Verify the protection parameters through the App to ensure			
		they are set correctly.			
		3. If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.			
		Once the power grid returns to normal operation, the inverter			
		will typically reconnect to it. However, if faults persist or recur			
		follow these troubleshooting steps:			
		1. Verify the reliability of the grid power supply.			
	29	2. Ensure the AC cable is securely connected and in place.			
No Utility Err		3. Check that the AC cable is connected to the correct terminal,			
		specifically ensuring that the live wire and the N wire are			
		properly positioned.			
		4. Confirm that the AC circuit breaker is engaged.			
		5. If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.			

Over Temp Err	31	<ol> <li>Check whether the inverter is directly exposed to sunlight. If so, take some shading measures.</li> <li>Check and clean the air ducts.</li> <li>Check whether there is A001or A002 (fan anomaly) alarm via the App. If so, replace the fans.</li> <li>If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.</li> </ol>		
Iso Low Err	36	<ul> <li>Wait for the inverter to return to normal. If the fault occurs repeatedly:</li> <li>1. Check whether the ISO resistance protection value is excessively high via the</li> <li>App, and ensure that it complies with the local regulations.</li> <li>2. Check the resistance to ground of the string and DC cable.</li> <li>Take correction</li> <li>measures in case of short circuit or damaged insulation layer.</li> <li>3. If the cable is normal and the fault occurs on rainy days, check it again when the weather turns fine.</li> <li>4. If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.</li> </ul>		
GFCI High Err	37	<ol> <li>The fault can be caused by poor sunlight or damp environment, and the inverter will be reconnected to the grid after the environment is improved.</li> <li>If the environment is normal, check whether the AC and DC cables are well insulated.</li> <li>If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.</li> </ol>		
Freq Detect Err	38	<ul> <li>Once the power grid returns to normal operation, the inverter will typically reconnect to it. However, if faults persist or recur, follow these troubleshooting steps:</li> <li>1. Ascertain the actual grid voltage and, if it exceeds the set value, reach out to the local electric power company for potential solutions.</li> <li>2. If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.</li> </ul>		
Grid Volt Unbalance Err	42	<ul> <li>Once the power grid returns to normal operation, the inverter will typically reconnect to it. However, if faults persist or recur, follow these troubleshooting steps:</li> <li>1. Ascertain the actual grid voltage and, if it exceeds the set value, reach out to the local electric power company for potential solutions.</li> <li>2. If the voltage difference among the three phases falls within the locally acceptable limits specified by the local electric power company, adjust the grid voltage imbalance parameter via the App.</li> <li>3. If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.</li> </ul>		
PV1-PV4 Rev Connect Err 52 2. If the fault exists, conta 1. Check whe If so, discont the solar rac 0.5A. 2. If the fault exists, conta		<ol> <li>Check whether the corresponding string is of reverse polarity.</li> <li>If so, disconnect the DC switch and adjust the polarity when the solar radiation is low and the string current drops below 0.5A.</li> <li>If the fault is not caused by the foregoing reasons and still exists, contact CSI Solar.</li> </ol>		

# **ANNEX:** Specifications

Model	CSI-15K-T4001A-E	CSI-17K-T4001A-E	CSI-20K-T4001A-E	CSI-23K-T4001A-E	CSI-25K-T4001A-E
INPUT (DC)					
Max. Input Voltage			1100 V	1	
Max. Input DC Power <sup>1</sup>	22.5 kW	25.5 kW	30 kW	34.5 kW	37.5 kW
Start-up DC Input Voltage			180 V		
Rated Input Voltage			600 V		
MPPT Voltage Range		1	60-1000 V		
Max. String Input No.			4		
MPPT No.			2		
Max. Input Current per String <sup>2</sup>			20 A		
Max. Input Current per MPPT			32 A		
Max. DC short-circuit current			40 A		
OUTPUT (AC)			1	Γ	
Rated AC Output Power	15 kW	17 kW	20 kW	23 kW	25 kW
Max. AC Output Power	15 kVA	17 kVA	20 kVA	23 kVA	25 kVA
Rated Output Voltage		3	380V/400V		
Grid Connection Type		3	8 L / N / PE	r	
Max. Output Current	22.8A	25.8A	30.4A	34.9A	37.9A
Rated Output Frequency			50/60 Hz		
THDi			<3%		
Power Factor		0.8 Lead	ling 0.8 Lagging		
Zero Export Solution			Support		
EFFICIENCY					
Max. Efficiency	98.	5%		98.6%	
EU Efficiency			98.0%		
ENVIRONMENT					
Protection Degree			IP66		
Cooling		Intellig	gent Air Cooling		
Operating Temperature Range			30°C~+60°C		
Operating Humidity			0 - 100 %		
Operating Altitude		4000 m	(>3000 m Derating)		
PROTECTION					
DC Switch		I	ntegrated		
Anti-Islanding Protection			ntegrated		
DC Reverse-Polarity Protection		1	ntegrated		
DC Insulation Resistance		I	ntegrated		
Detection		T	ato a voto d		
Residual Current Monitoring		1	ntegrated		
			N/A		
Protection		I	ntegrated		
AC Short Circuit Protection		T	ntegrated		
Grid Monitoring		I	ntegrated		
Anti-PID Module		1	N/A		
		DC Tyr			
AFCI function		Ontional (available	in EMEA region by defa	ault)	
	1	Optional (available	in Emericategion by dete		
Display	-	l FD Ir	dicators & APP		
Communication	WIEL DURING & ATT				
MECHANICAL DATA					
Dimensions (W / H / D)		435 x	520 x 194 mm		
Weight	17	ka		19ka	
DC Inputs Type		J	MC4	e	
AC Outputs Type	Ouick Connection Plug				
CERTIFICATION			y		
Grid Connection Standards	IEC61727 &IEC62116.EN5054	9-1.CEI0-21,NRS097.VDE4105.R	D647,RD1699,RD661.RD	413, UNE 217002.UNE 2	17001,RD 244,NTS2.1
Safety/ EMC		IEC62109	IEC61000-6-1/2/3/4	,	. , ,
<i></i>			, -, -, -		

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<sup>1</sup>Note: Any system with a DC/AC ratio being less than 1.5 is within our warranty scope (All strings are used). Please contact local Canadian solar technical support for further confirmation if otherwise.

<sup>2</sup>Note: Single string per MPPT configuration.

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