TSUN TSOL-RSDM-DS/DD/CQ Module Level Rapid Shutdown Controller User Manual

MORE SAFETY, MORE POWER

TSOL-RSDM-DS-A/B/C/D
TSOL-RSDM-DD-A/B/C/D
TSOL-RSDM-CQ-A/B
User Manual

Contents

Safety Precautions

1.1 Scope of Application

This User Manual describes instructions and detailed procedures for installing, operating, maintaining, and troubleshooting of the following TSUN PV Rapid Shutdown Equipment (PVRSE):
TSOL-RSDM-DS-A TSOL-RSDM-DS-B TSOL-RSDM-DS-C TSOL-RSDM-DS-D

TSOL-RSDM-DD-A TSOL-RSDM-DD-B TSOL-RSDM-DD-C TSOL-RSDM-DD-D
TSOL-RSDM-CQ-A TSOL-RSDM-CQ-B
Please keep this manual all time available in case of emergency.

1.2 Safety Instructions

DANGER

- **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

- **WARNING** indicates a hazardous situation which, if not avoided, can result in death or serious injury or moderate injury.

CAUTION

- **CAUTION** indicates a hazardous condition which, if not avoided, can result in minor or moderate injury.

NOTICE

- **NOTICE** indicates a situation that can result in potential damage, if not avoided.

1.3 Target Group
Only qualified electricians who have read and fully understood all safety regulations contained in this manual can install, maintain and repair the PV rapid shutdown equipment.

Preparation

2.1 Safety Instructions

DANGER

- Do not disconnect TSOL-RSDM while the PVRSS is working. There is possibility of dying due to electrical shock and high voltage.
- To prevent risk of electric shock during installation and maintenance, please make sure that TSOL-RSDM-CQ or any other control unit, such as the DC switch of inverter, are turned off.

WARNING

- The installation, service, recycling and disposal of the PVRSS must be performed by qualified personnel only in compliance with national and local standards and regulations.

- Any unauthorized actions including modification of product functionality of any form may cause lethal hazard to the operator, third parties, the units or their property. TSUN is not responsible for the loss and these warranty claims.
- While TSOL-RSDM-DS or TSOL-RSDM-DD are used without TSOL-RSDM-CQ, be sure that this photovoltaic rapid shutdown equipment (PVRSE) does not perform all of the functions of a complete photovoltaic rapid shutdown system (PVRSS). This PVRSE must be installed with other equipment to form a complete PVRSS that meets the requirements of NEC (NFPA 70) section 690.12 for controlled conductors outside the array. Other equipment installed in or on this PV system may adversely affect the operation of the PVRSS. It is the responsibility of the installer to ensure that the completed PV system meets the rapid shut down functional requirements. This equipment must be installed according to the manufacturer's installation instructions.
- While TSOL-RSDM-DS or TSOL-RSDM-DD are used with TSOL-RSDM-CQ, be sure that this photovoltaic rapid shutdown system (PVRSS) incorporates one or more pieces of equipment that exercise the rapid shutdown control of PV system conductors required by section 690.12 of the NEC (NFPA 70). other equipment installed in or on this PV system may adversely affect the operation of this PVRSS. it is the responsibility of the installer to ensure that the completed PV system meets the applicable rapid shut down functional requirements. this equipment must be installed according to the manufacturer's installation instructions.

⚠ CAUTION

- The TSOL-RSDM-DS or TSOL-RSDM-DD will become hot during operation. Please do not touch the surface during or shortly after operation.
- Risk of damage due to improper modifications.
- All electrical installations must be done in accordance with the National Wiring Rules of Standard and local code.

2.2 Explanations of Symbols

Symbol	Description
	**Danger of high electrical voltage** This device is connected in series to the solar inverter, thus all work to the PVRSE shall onl y be carried out by qualified personnel.
	**Danger of hot surface** The components inside the PVRSE will release a lot of heat during operation. Do not touch the surface during operating.
	**Read the User Manual First** Please read the User Manual first before the installation and operation.
	**Recycling and Disposal** This device SHALL NOT be disposed of in residential waste.
RoSH	**RoSH Directive** This device complies the RoSH Directive.

Product Information

3.1 Application Scope of Products

TSOL-RSDM series Rapid Shutdown System is a fast shut-off device developed according to NEC2020 regulations. It contains the rapid shutdown device (TSOL-RSDM-DS, TSOL-RSDM-DD) and the rapid shutdown controller (TSOL-RSDM-CQ). The Rapid Shutdown System operates one or two standard PV modules, eliminates the high voltage threat of PV system modules. In emergency situations such as fire, protect the personal safety of rescuers and avoid electric shock accidents.

3.2 Specification for Product Model

TSOL - RSD M - D S - A

① ② ③ ④ ⑤

1. RSD: RSD represents for Rapid Shutdown.
2. M: M represents for Module-level.
3. D/C: D represents for Rapid Shutdown Device; C represents for Rapid Shutdown Controller.
4. S/D/Q: S represents for one input; D represents for two inputs; Q represents for four inputs.
5. A/B/C/D: A, B, C, D represents for different configurations.

3.3 System Diagram

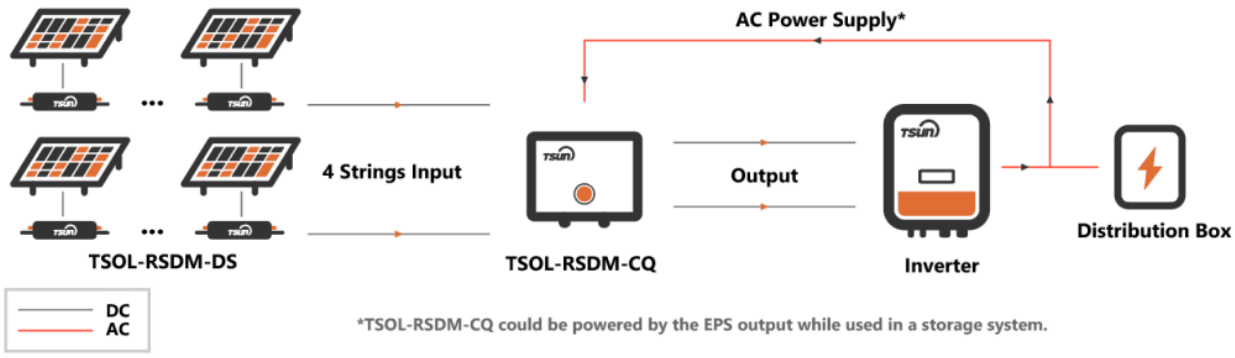


Figure 3.1 System Diagram (TSOL-RSDM-DS and TSOL-RSDM-CQ)

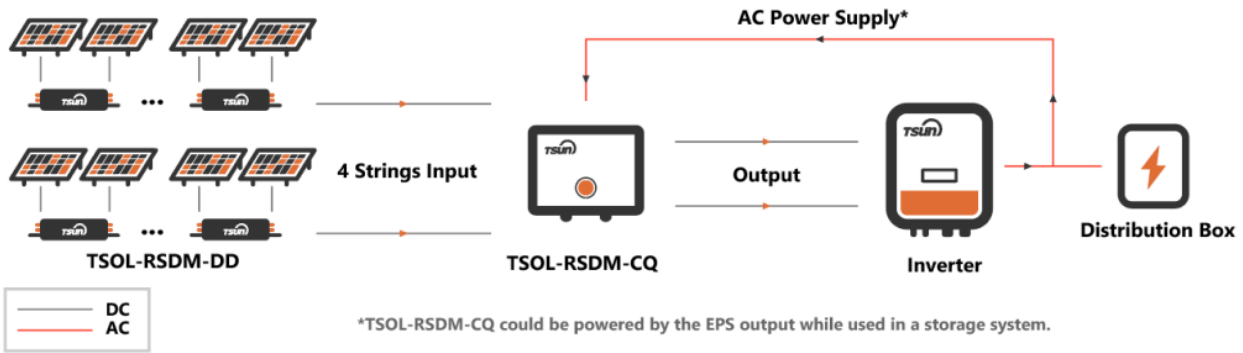


Figure 3.2 System Diagram (TSOL-RSDM-DD and TSOL-RSDM-CQ)

3.4 Overview and Dimensions of products

The dimensions of TSOL-RSDM-DS are shown in Figure 3.3&3.4&3.5.

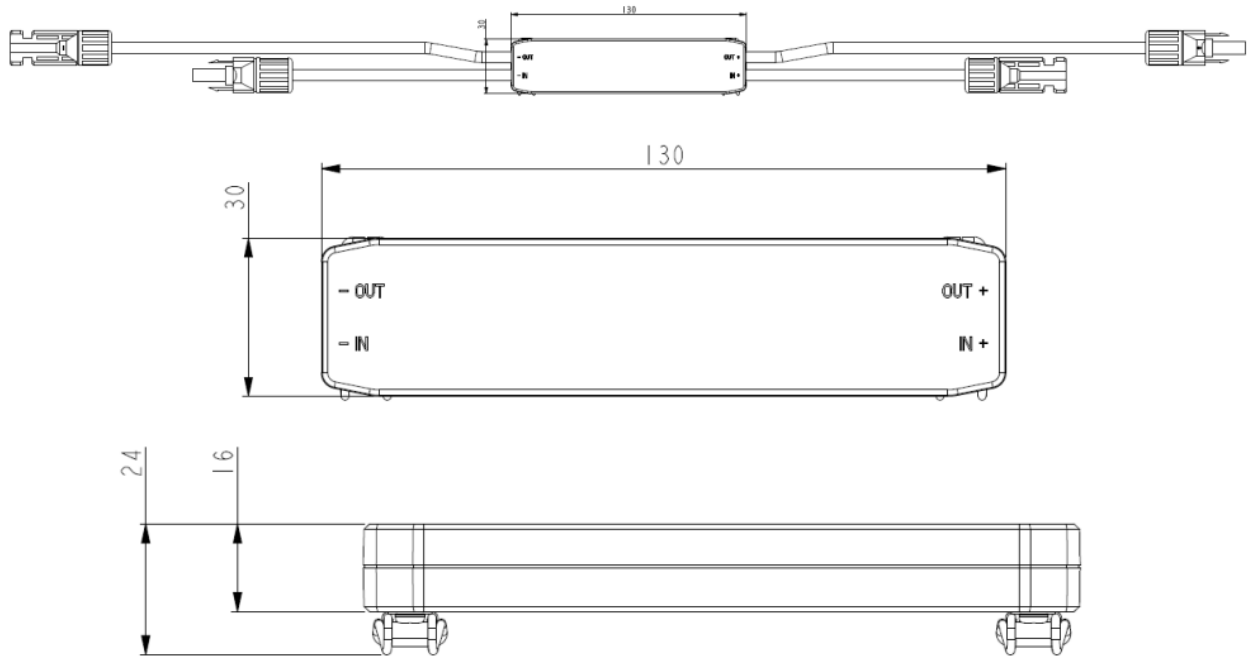


Figure 3.3&3.4&3.5 Dimensions of TSOL-RSDM-DS

The dimensions of TSOL-RSDM-DD are shown in Figure 3.6&3.7&3.8.

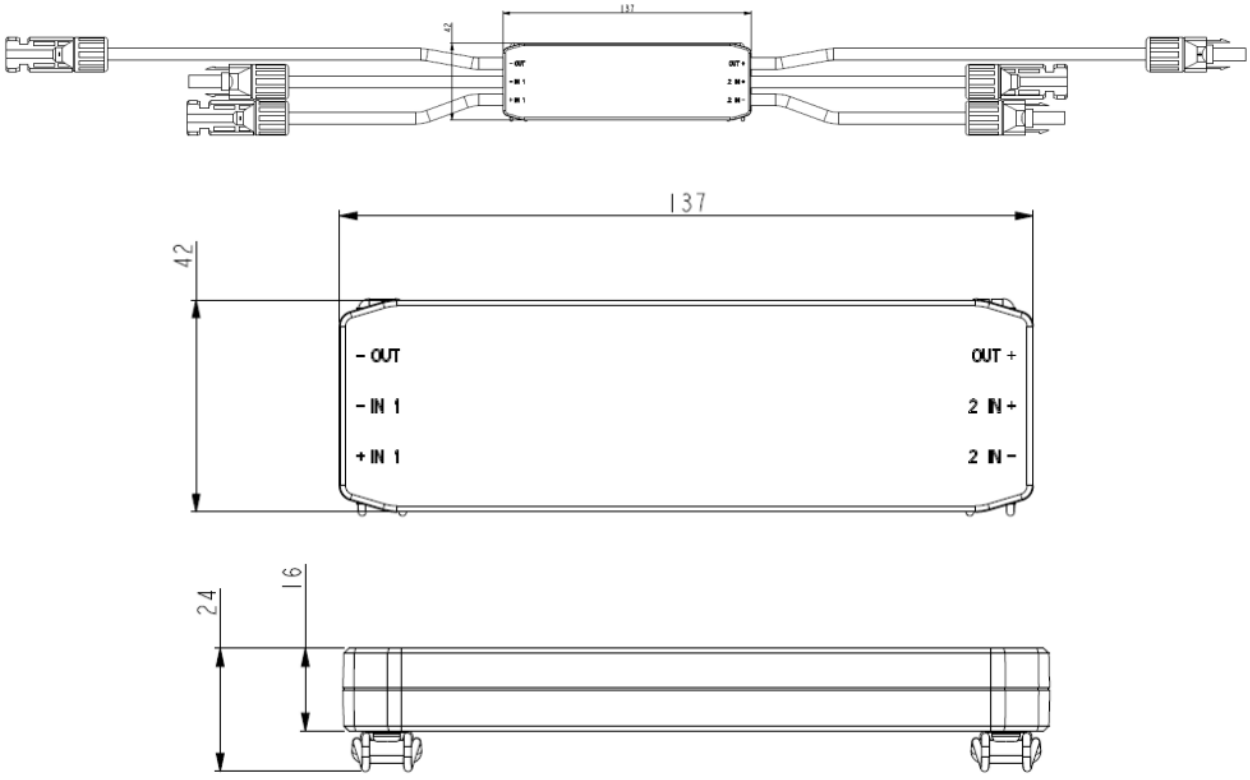


Figure 3.6&3.7&3.8 Dimensions of TSOL-RSDM-DD

The dimensions of TSOL-RSDM-CQ are shown in Figure 3.9&3.10&3.11.

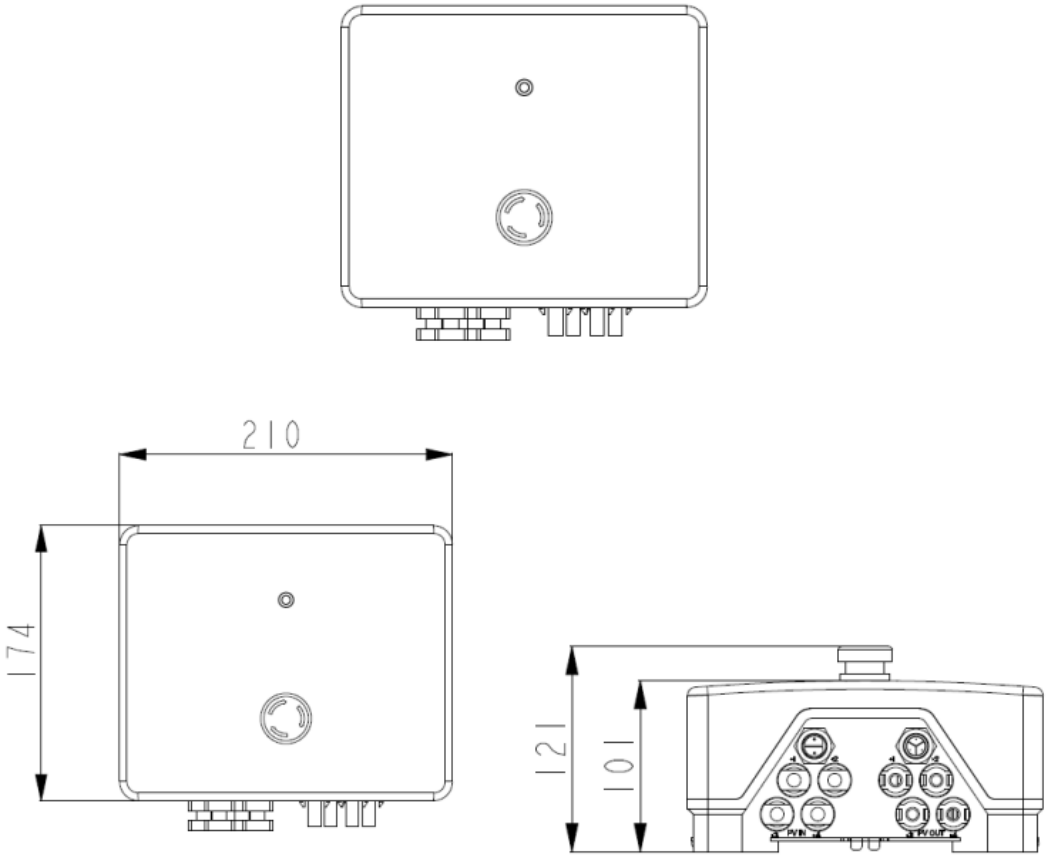


Figure 3.9&3.10&3.11.5 Dimensions of TSOL-RSDM-CQ

3.5 Datasheet

MODEL	TSOL-RSDM-DS-A	TSOL-RSDM-DS-B	TSOL-RSDM-DS-C	TSOL-RSDM-DS-D
Max. DC Input Voltage [V]	80			
MPPT Voltage Range [V]	Dec-80			
Max. Short Circuit Current [A]	20	15	20	15
Max. Continuous Current [A]	20	15	20	15
Max. System Voltage [V]	1500	1500	1000	1000
Rapid Shutdown Time Limit [s]	< 10			
Cable Size / Length	4 mm2 / 300 mm (Panel), 1200 mm (String)			
Operating Temperature [°C]	-40 to +80			
Ingress Protection	Type 6P			
Humidity	0 – 100%			
Communication	PLC			
Overvoltage Category	II			
Mounting	Clip			

Dimension W*H*D [mm]	130 * 30 * 16			
Weight [g]	250			
Connector	MC4 Compatible			
Max. DC Input Voltage [V]	80 / 80			
MPPT Voltage Range per Input [V]	Dec-80			
Max. Short Circuit Current [A]	20 / 20	15 / 15	20 / 20	15 / 15
Max. Continuous Current [A]	20	15	20	15
Max. System Voltage [V]	1500	1500	1000	1000
Rapid Shutdown Time Limit [s]	< 10			
Cable Size / Length	4 mm2 / 300 mm (Panel), 1200 mm (String)			
Operating Temperature [°C]	-40 to +80			
Ingress Protection	Type 6P			
Humidity	0 – 100%			
Communication	PLC			
Overvoltage Category	II			
Mounting	Clip			
Dimension W*H*D [mm]	137 * 42 * 16			
Weight [g]	450			
Connector	MC4 Compatible			

MODEL	TSOL-RSDM-CQ-A	TSOL-RSDM-CQ-B
Max. DC Voltage [V]	1500	
Max. Short Circuit Current [A]	20	40
Max. Continuous Current [A]	20	40
AC Voltage Range [V]	85 – 264	
Frequency [Hz]	50 / 60	
Consumption [W]	< 1	
Operating Temperature [°C]	-30 to +55	
Ingress Protection	Type 4	
Humidity	0 – 100%	
Communication	PLC	
Overvoltage Category	II	
Mounting	Wall Mounted	
Dimension W*H*D [mm]	210 * 174 * 121	
Weight [g]	1100	
Connector	MC4 Compatible (DC), Plug-in Connector (AC)	

Instructions for installation

4.1 Safety Instructions

DANGER

- To prevent risk of electric shock during installation and maintenance, please make sure that TSOL-RSDM-CQ or any other control unit, such as the DC switch of inverter, are turned off.

NOTICE

- All electrical installations must be done in accordance with the National Wiring Rules of Standard and local code.

4.2 Pre-installation Check

Although TSUN's products have surpassed stringent testing and are checked before they leave the factory, it is uncertain that the products may suffer damages during transportation. Please check the package for any obvious signs of damage, and if such evidence is present, do not open the package and contact your dealer as soon as possible.

4.3 Installation of TSOL-RSDM-DS and TSOL-RSDM-DD

WARNING

- While TSOL-RSDM-DS or TSOL-RSDM-DD are used without TSOL-RSDM-CQ, be sure that this photovoltaic rapid shutdown equipment (PVRSE) does not perform all of the functions of a complete photovoltaic rapid shutdown system (PVRSS). This PVRSE must be installed with other equipment to form a complete PVRSS that meets the requirements of NEC (NFPA 70) section 690.12 for controlled conductors outside the array. Other equipment installed in or on this PV system may adversely affect the operation of the PVRSS. It is the responsibility of the installer to ensure that the completed PV system meets the rapid shut down functional requirements. This equipment must be installed according to the manufacturer's installation instructions.

1. Fix the rapid shutdown device (TSOL-RSDM-DD&TSOL-RSDM-DS) on the frame of solar module.

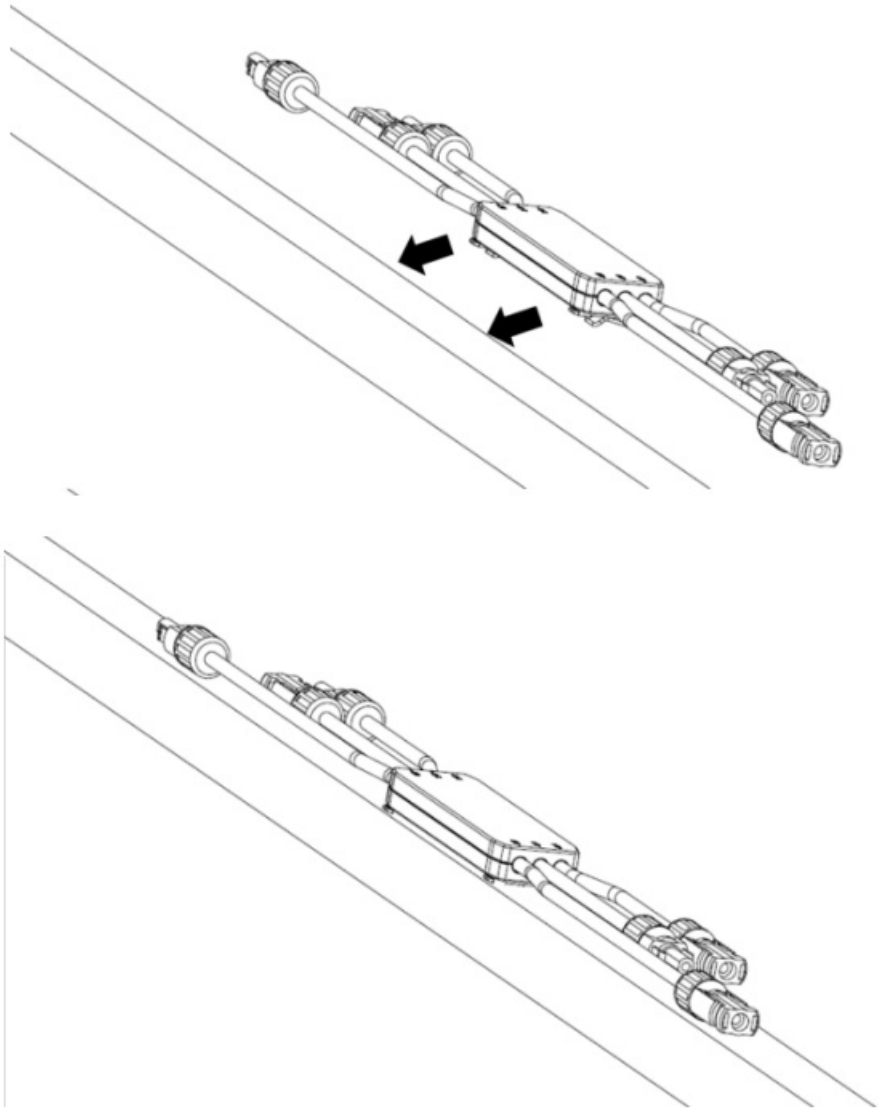


Figure 4.1&4.2 Fixing the Rapid Shutdown Device

2. Connect the input of rapid shutdown device to the solar module.

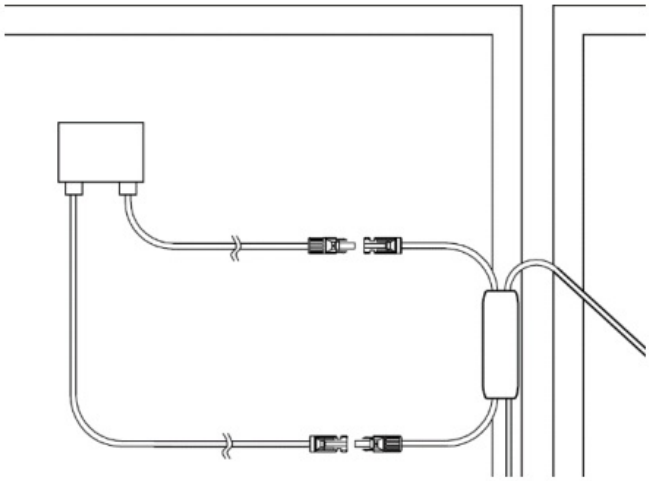


Figure 4.3 Connecting TSOL-RSDM-DS and solar module

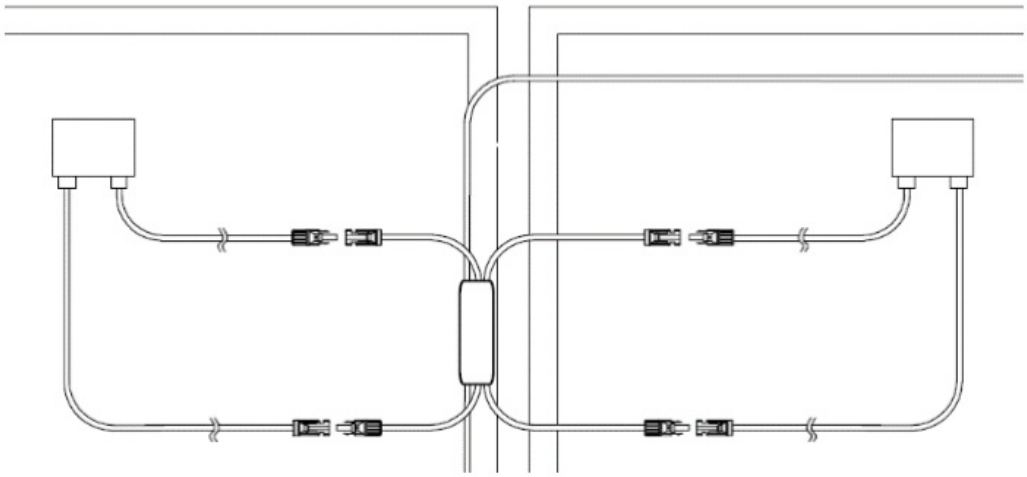


Figure 4.4 Connecting TSOL-RSDM-DD and solar modules

3. Connect the outputs of all the rapid shutdown devices one after another.

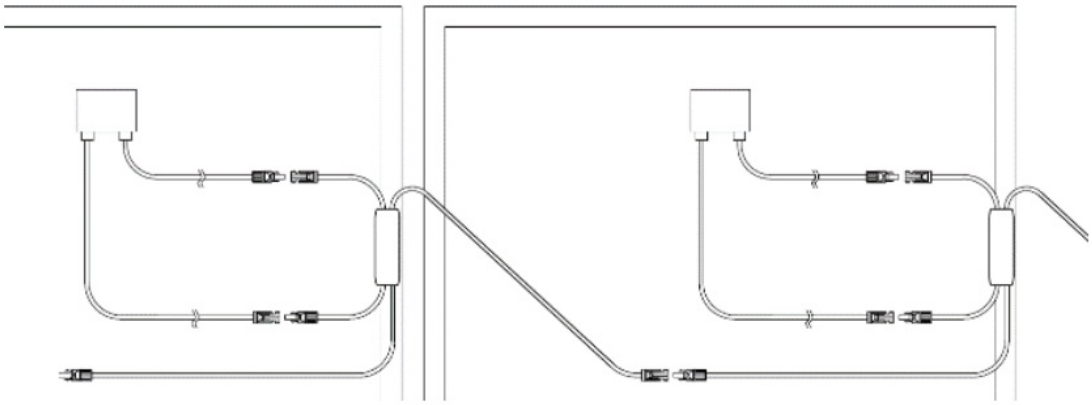


Figure 4.5 Connecting Rapid Shutdown Device in Series

4. While TSOL-RSDM-DS or TSOL-RSDM-DD are used without TSOL-RSDM-CQ, connect each string of the rapid shutdown devices to the solar inverter.

4.4 Installation of TSOL-RSDM-CQ

⚠ WARNING

- While TSOL-RSDM-DS or TSOL-RSDM-DD are used with TSOL-RSDM-CQ, be sure that this photovoltaic rapid shutdown system (PVRSS) incorporates one or more pieces of equipment that exercise the rapid

shutdown control of PV system conductors required by section 690.12 of the NEC (NFPA 70). other equipment installed in or on this PV system may adversely affect the operation of this PVRSS. it is the responsibility of the installer to ensure that the completed PV system meets the applicable rapid shut down functional requirements. this equipment must be installed according to the manufacturer's installation instructions.

- Installers should determine the installation location of rapid shutdown controller according to local regulations.

1. Push out the bracket of the rapid shutdown controller. Fix the rapid shutdown controller (TSOL-RSDM-CQ) on the wall.

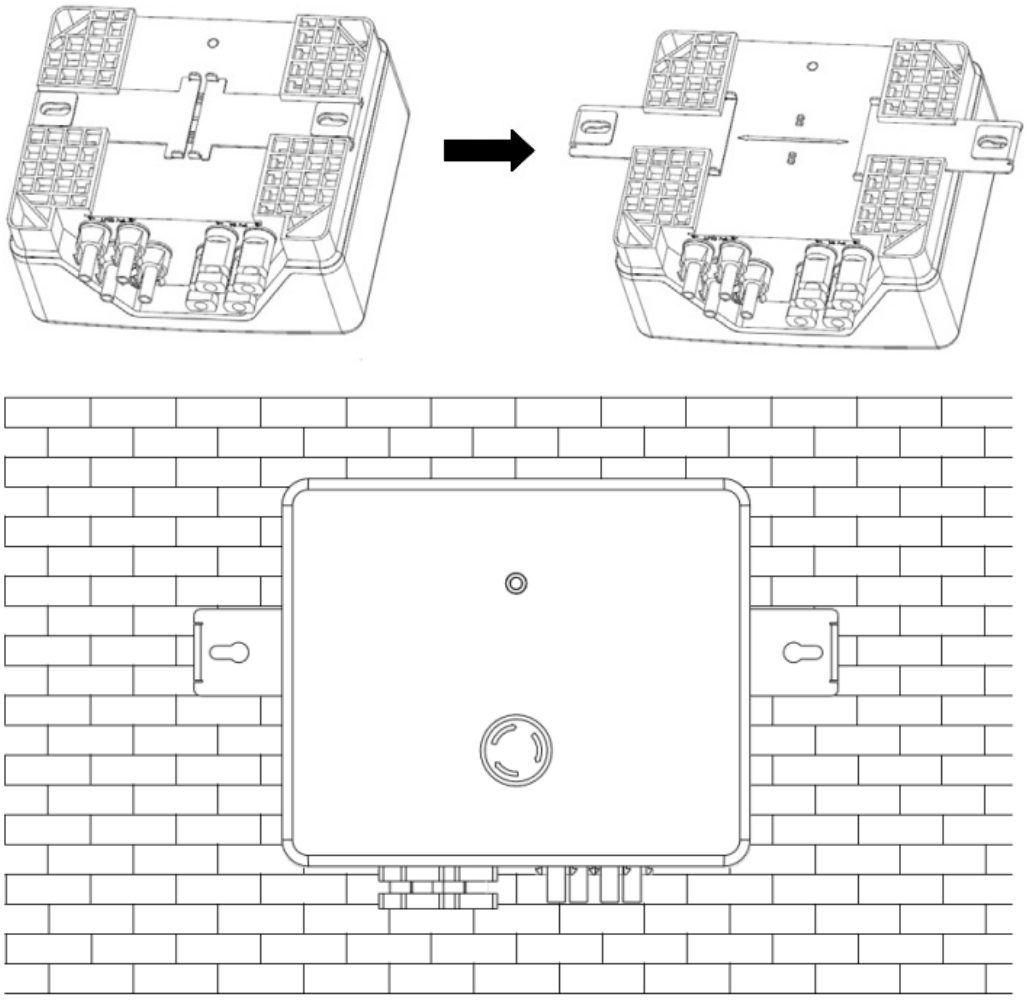
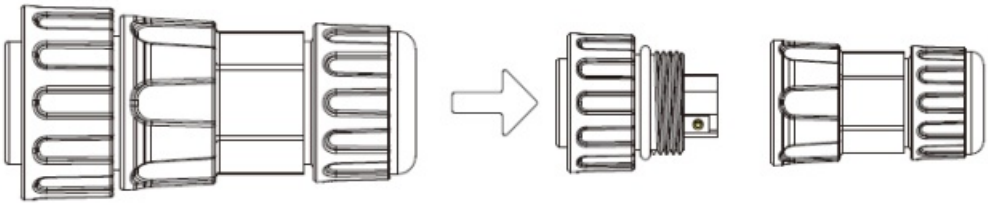


Figure 4.6&4.7 Fixing the Rapid Shutdown Controller

2. Separate the AC connector. Connect the AC cable to the Connector. The definition of the port is shown below:

Port 1(Brown/Red):	Live
Port 2(Blue/Black):	Neutral
Port 3(Yellow-Green):	Ground



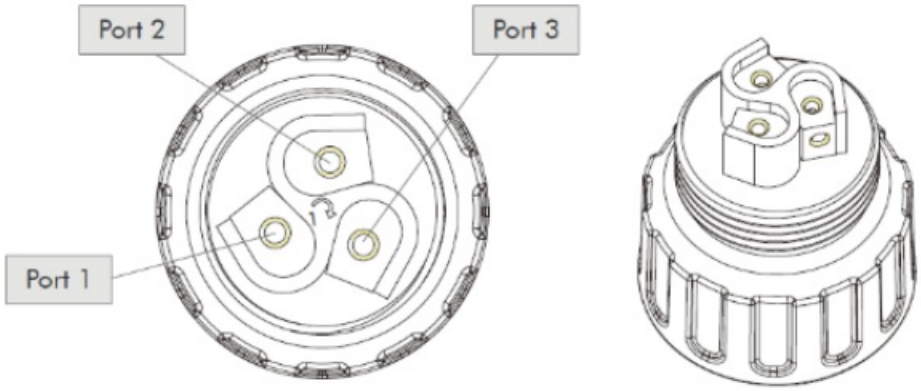


Figure 4.8&4.9 Separate and connect the AC connector

WARNING

·Make sure each cable is connected to the right port.

3. Assemble the AC connector. Plug the connector into the AC socket of rapid shutdown controller. Then connect the other side of AC cable to the distribution box or another power source.

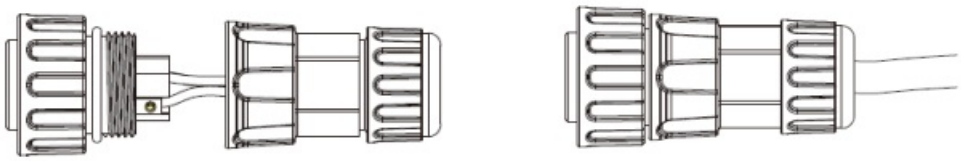


Figure 4.10&4.11 Assemble and connect the AC connector

WARNING

·To prevent electrical hazards, make sure the power source of rapid shutdown controller is turned to “OFF” position.

4. Make the DC cable of each string.

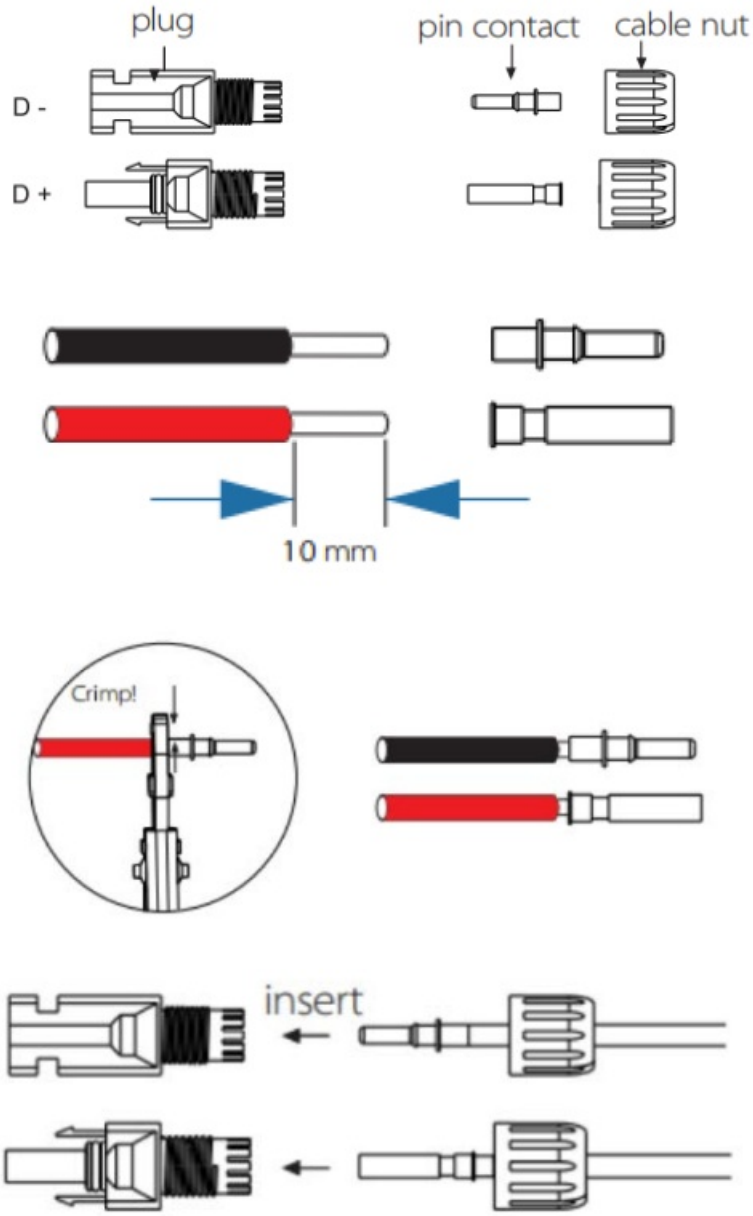


Figure 4.12&4.13&4.14&4.15 Make the DC cable

5. Plug each string of rapid shutdown devices to the rapid shutdown controller. Then plug each output cable to the solar inverter.

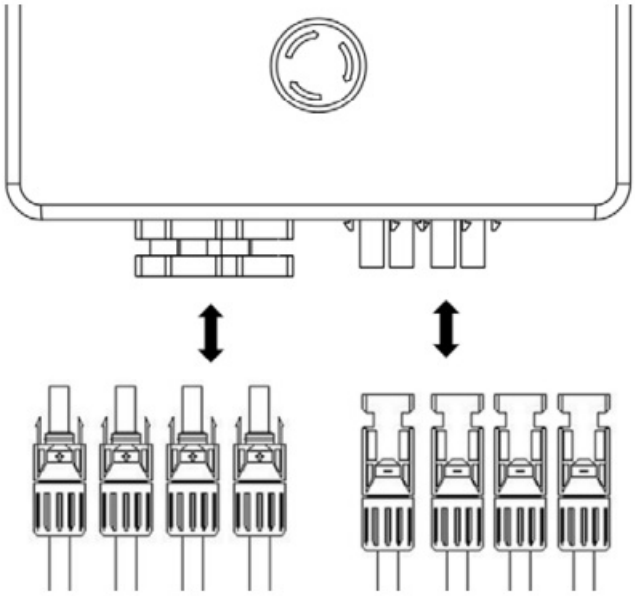


Figure 4.16 Connect the DC cable

6. Put the warning label in the PV system as required in the section 690.56(C) of NEC (NFPA70).

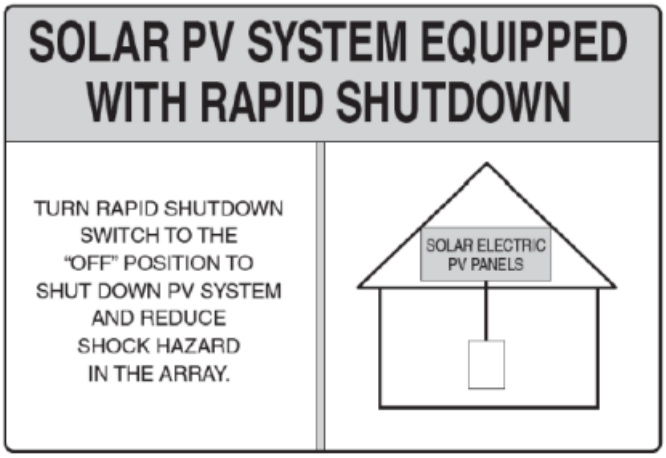


Figure 4.17 Warning Label of PVRSS

4.5 Start the PVRSS system

Turn on the power source of rapid shutdown controller. The rapid shutdown control system will start to work. The status of lights is shown as below:

	On	**Off**
Power (Red)	Rapid shutdown controller is powered on and send signals to the rapid shutdown devices in each string.	Rapid shutdown controller is powered off or st op sending signals to the rapid shutdown devic es in each string.

Table 4.1 Light Status

Firefighters can push the button to cut off all the solar modules while in the emergency.
After the emergency, users can rotate the button and the solar module will work again.

System Test and Troubleshooting

5.1 System test

5.1.1 Function test

Please do the function test regularly.

1. Push the button of rapid shutdown controller. The status of light will be off. Check the solar inverter. The DC current will be cut off and the DC voltage will be lower than 30V in 30 seconds.
2. Rotate the button of rapid shutdown controller. The status of light will be on. The solar will start to work again.

5.1.2 Maintain test

When the TSOL-RSDM-CQ stops working, the TSOL-RSDM-DS will have a continuous 0.9 V output and the TSOL-RSDM-DD will have a continuous 1.75 V output.

1. Push the button and stop the TSOL-RSDM-CQ.
2. Separate the DC cable and rapid shutdown controller. Test the voltage of each DC cable.

System Voltage = 0.9 V * Quantities of TSOL-RSDM-DS or System Voltage = 1.75 V * Quantities of TSOL-RSDM-DD	System Work Normally
System Voltage < 0.9 V * Quantities of TSOL-RSDM-DS or System Voltage < 1.75 V * Quantities of TSOL-RSDM-DD	System Work Abnormally

Table 5.1 System test

5.2 Troubleshooting

Description	**Troubleshooting**
Status light is always off. PVRSS doesn't work.	1) Check if the button of controller is turned to off; 2) Check if the AC power supply is normal; 3) Check if the AC voltage is over the operating voltage rang; 4) Contact TSUN.
Status light is on. DC voltage of inverter is 0V. PVRSS doesn't work.	1) Test the voltage of DC cable. If the voltage of DC cable is zero, check th e connection of DC cable. 2) If the voltage of DC cable is normal as described in §5.1.2, there is som ething wrong in the DC input of inverter. Contact the supplier of inverter. 3) Contact TSUN.
Status light is on. DC voltage of in verter is normal. PVRSS doesn't work.	1) Replace a new rapid shutdown controller. 2) Contact TSUN.
Status light is on. PVRSS work we ll. DC voltage of inverter is abnormal (§5.1.2).	1) Test the output voltage of each rapid shutdown device. If the output volt age is not 0.9V or 1.8V. Replace the rapid shutdown device. 2) Contact TSUN.

Table 5.2 Troubleshooting

Recycling and Disposal

This device should not be disposed as residential waste. A rapid shutdown device or controller that has reached

the end of its life and is not required is to be returned to your dealer or you must find an approved collection and recycling facility in your area.

Guarantee Service

Within warranty period of the products, the invoice and date of purchase are required for the service. Besides, the trademark on the product should be clearly visible, otherwise warranty is not available.
The product warranty covers all damage caused by design or production. However, the followings are not covered:
* Beyond the warranty period;
* No valid warranty card and product serial number;
* Damage in transportation;
* Incorrect use, operation and modification;
* Operation in very harsh environment not as described in this manual;
* Out of the scope of installation and use specified in relevant international standards;
* Damage caused by abnormal natural environment.
More information can be found in TSUN Warranty Policy.

Contact TSUN

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Documents / Resources

	TSUN TSOL-RSDM-DS/DD/CQ Module Level Rapid Shutdown Controller [pdf] User Manual TSOL-RSDM-DS DD CQ Module Level Rapid Shutdown Controller, TSOL-RSDM-DS DD CQ, Module Level Rapid Shutdown Controller, Rapid Shutdown Controller, Shutdown Controller, Controller