



Growatt Rapid Shutdown Box



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## System Installation & Operation Manual

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## Manual Introduce and Copyright

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## 1.1 Validity

This manual describes the assembly, installation, commissioning and maintenance of the Growatt rapid shutdown system.

## 1.2. Target Group

 CAUTION	This manual is for qualified personnel. Qualified personnel have received training and have demonstrated skills and knowledge in the construction and operation of this device. Qualified personnel are trained to deal with the dangers and hazards involved in installing electric devices.
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## 1.3. Additional information

For further information please find them in download area at [WWW.growatt-america.com](http://WWW.growatt-america.com)

## 1.4. Storage of the manuals

The manual and other documents must be stored in a convenient place and be available at all times. We assume no liability for any damage caused by failure to observe these instructions.




## 2 Safety

### 2.1. Safety Instructions

Rapid Shutdown system is designed to provide compliance with 2014 National Electric Code (NEC) section 690.12 by opening the photovoltaic (PV) circuit(s), disconnecting them from the Growatt inverter and removing all residual voltage and current on the conductors. The rapid shutdown box is to be installed within ten (10) feet of the PV array on the roof or within five (5) feet of the PV circuits entering the building. The array's PV source circuits (strings) are to be connected directly to the input terminals of the rapid shutdown box. Depending on the model chosen, the strings may pass through the box or combine two strings together. Each output conductor is individually disconnected in the event rapid shutdown is initiated. A +12V control conductor provides power to the normally-open contactors which perform the rapid shutdown function.






### 2.2. Warnings in this document

Below is a list of special safety symbols used in this manual that highlight potential safety risks and/or provide useful information. The symbol usage is described below:

Symbol	Description
	<b>CAUTION</b> The reader should stop, use caution and fully understand the operations explained before proceeding.
	<b>Dangerous voltage</b> The product works with high voltages. All work on the PV system must follow the described documentation and must comply with all prevailing codes and regulations associated with high voltages.
	<b>Observe the operating instructions</b> Read the product's documentation before working on it. Follow all safety precautions and instructions as described in the documentation.

### 2.3. Equipment safety warnings

In addition to the safety and hazard symbols, the following symbols are also used in this installation guide.

Symbol	Description
	FCC certificate
	Intertek ETL semko mark, It apply to the Growatt US series inverter, which certify the inverters meet the safety standard UL1741.
	Point of connection for grounding protection.
	Direct Current (DC)
	Alternating Current (AC)

### 2.4. General installation warnings

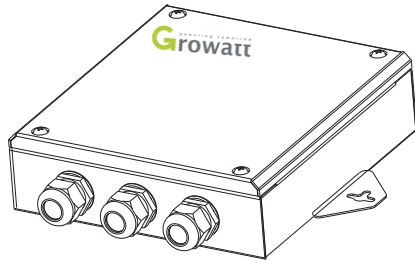
The rapid shutdown system is designed to comply with the 2014 National Electric Code, section 690.12 and tested according to international safety requirements (UL1741); however, certain safety precautions must be observed when installing and operating this product. Read and follow all instructions, cautions and warnings in this installation manual. All operations regarding transport, installation, and maintenance must be carried out by qualified, trained personnel and in compliance with all prevailing local codes and regulations. This rapid shutdown system operates only when properly connected to the power supply and PV strings. These connections must be made only by qualified technical personnel. Wiring methods used should be in accordance with the National Electric Code, ANSI/NFPA 70 and/or any prevailing local codes and regulations.

### 2.5. Assembly warnings

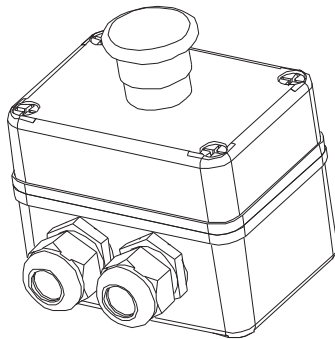
Prior to installation, inspect the unit to ensure the absence of any transport or handling damage which could affect the integrity of the product; the failure to do so could result in safety hazards. Unauthorized removal of necessary protection features, improper use, incorrect installation or operation may lead to serious safety and shock hazards and/or equipment damage.

# 3 Product Description

## 3.1. Rapid shutdown box overview



## 3.2. Power supply box overview



## 3.3. General requirements

### 3.3.1. Compatibility with inverters

Rapid shutdown box compatibility with inverter show as following:

Growatt 1500 MTL-US	Growatt 5000 MTL-US	Growatt 7000 MTLP-US
Growatt 2000 MTL-US	/	Growatt 7600 MTLP-US
Growatt 3000 MTL-US	Growatt 4000 MTLP-US	Growatt 8000 MTLP-US
Growatt 3600 MTL-US	Growatt 5000 MTLP-US	Growatt 9000 MTLP-US
Growatt 4200 MTL-US	Growatt 6000 MTLP-US	Growatt 10000 MTLP-US

### 3.3.2. Environmental Conditions

The rapid shutdown system is intended to be installed on rooftops, but only in environmental conditions indicated in this manual (such as between the operating temperature range of -25°C to +60°C; installation in direct sunlight is acceptable; installation under a module is better). Please take care to provide adequate ventilation if installed indoors.

### 3.3.3. Clothing and protective devices

Appropriate personal protective equipment must be equipped at all times when serving this equipment under any conditions which may expose personnel to hazardous voltages or high temperatures. All equipment operations should be performed with proper electrically-insulated instruments.

### 3.3.4. Appropriate usage

The rapid shutdown system is a remote DC disconnection system that disconnects the current and voltage of the connected PV strings from the output conductors connected to the string inverter. This product is designed for outdoor use, but can be used indoors if installed to specified environmental and mounting parameters stated in this manual, and adherence to the 2014 National Electric Code section 690.12. (See environmental conditions below and environmental checks in section 2 - Installation).

### 3.3.5. Conditions of Use

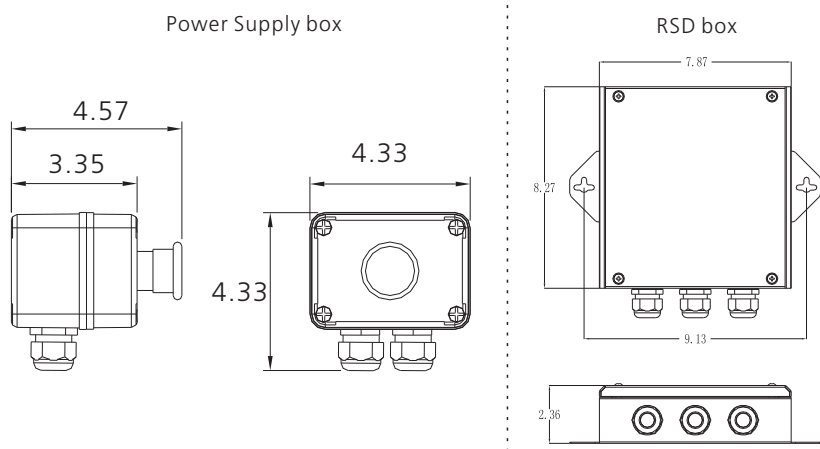
The DC operating current and voltage MUST NOT exceed the limits documented in the technical specifications found in section 9. The rapid shutdown system is to be used only if all the technical requirements in this manual are applied. The rapid shutdown system is certified for use only with Growatt string inverters (600Vdc).

### 3.3.6. Improper or Prohibited Use

The following actions are dangerous and not consistent with acceptable practice under the terms of the warranty:

- a) Installing the equipment in environments with flammable conditions.
- b) Using the equipment with safety devices not working or disabled.
- c) Using the equipment or parts of the equipment by connecting it to other machines or equipment, unless otherwise expressed.
- d) Modifying parts of the equipment in order to vary the performance or change its protection.
- e) Cleaning with products that may corrode parts of the equipment or with products that might generate electrostatic charges.
- f) Using or installing the equipment or parts of it without having read the contents of this manual.

## 3.4 Dimensions and weight



Model	Height (H)	Width (W)	Depth (D)	Weight
Rapid shutdown box	8.27inch	7.87 inch	2.36inch	3.81lb
Power Supply box	4.33inch	4.33inch	3.35inch	0.83lb

## 3.5 Storage of the Product

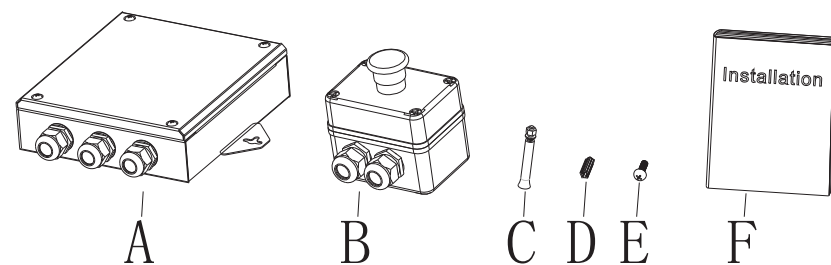
If you want to storage the rapid shutdown in your warehouse, you should choose an appropriate location to store.

- ▶ The storage temperature should be always between  $-25^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ . And the storage relative humidity should be always between 0 and 100% (without condensation).
- ▶ If there are batch products need to be stored, the max layers for original carton is ten.
- ▶ After long term storage, local installer or service department of Growatt should perform a comprehensive test before installation.


## 4.1. Unpacking and inspection

Thoroughly inspect the packaging upon received. If any damage to the carton is visible, or if you find that the unit is damaged after unpacking, please contact the shipping company and Inverter supplier immediately. Meanwhile please check the delivery for completeness and for visible external damages of RSD box. If there are anything damaged or missing, please contact your dealer. Don't dispose its original package. If you want to transport the product, it is better to store the unit into the original package.

Completed delivery should contain as follows:





A	Rapid shutdown box	1
B	Power Supply box	1
C	M6 mounting screws	2
D	Screws sleeve	4
E	Self-tapping screw	4
F	Manual	1

	<p><b>NOTE</b> Though the packaging box of Growatt is durable, please treat the packing box gently and avoid dispose the packing box. In this package, they are RSD box, cystosepiment and carton from inside to outside.</p>
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# 5 Installation and Electrical Connection

## 5.1. Safety

 <b>DANGER</b>	<p><b>Danger to life due to fire or explosion</b>                  Despite careful construction, electrical devices can cause fires. Do not install the inverter on easily flammable materials and where flammable materials are stored.</p>
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 <b>DANGER</b>	<p>a) All electrical installations shall be done in accordance with the local and national electrical codes. Do not remove the casing. Inverter contains no user serviceable parts. Refer servicing to qualified service personnel. All wiring and electrical installation should be conducted by a qualified service personnel.</p> <p>b) Carefully remove the unit from its packaging and inspect for external damage. If you find any imperfections, please contact your local dealer.</p> <p>c) Be sure that the rapid shutdown box connected to the ground in order to protect property and personal safety.</p> <p>d) The product only operated with Growatt PV generator. Do not connect any other source of energy to it.</p> <p>e) Both AC and DC voltage sources are terminated inside the PV Inverter. Please disconnect these circuits before servicing.</p> <p>f) When a photovoltaic panel is exposed to light, it generates a DC voltage.</p> <p>g) Even after the unit is disconnected from the grid and photovoltaic panels, high voltages may still exist inside the PV-Inverter. Do not remove the casing until at least 5 minutes after disconnecting all power sources.</p>
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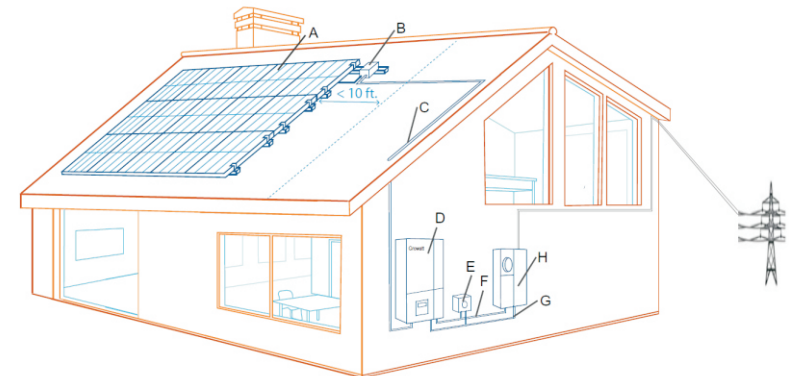
## 5.2. Transportation

The unit is thoroughly tested and inspected strictly before delivery. Our products leave our factory in proper electrical and mechanical condition. Special packaging ensures safe and careful transportation. However, transport damage may still occur. The shipping company is responsible in such cases. Thoroughly inspect the inverter upon delivery. Immediately notify the responsible shipping company if you discover any damage to the packaging which indicates that the inverter may have been damaged or if you discover any visible damage to the inverter. We will be glad to assist you, if required. When transporting the inverter, the original or equivalent packaging should to be used, and the maximum layers for original carton is ten, as this ensures safe transport.

## 5.3. Selecting the installation location

- This is guidance for installer to choose a suitable installation location, to avoid potential damages to device and operators.
- The rapid shutdown box must be installed by qualified installers and/or licensed electricians according to the applicable local code regulations (NEC, CEC, and other). Once physically mounted, the PV circuit wiring must be carried out without control power supplied to the contactors. The PV system disconnect switch or breaker (AC) must be open in order to isolate the power supply and ensure control power is removed from the circuit.
- The rapid shutdown box does not require any clearances to be maintained in order for operation. However, it is recommended to allow adequate access to the box in case maintenance or troubleshooting of the PV system is needed. Refer to section 110.26 of the NEC for the required clearances. When choosing the location and position, comply with the following conditions:
  - a) Install the rapid shutdown box on the PV module mounting rail, racking system, the roof, or in the attic below the PV array.
  - b) The rapid shutdown box may be installed at angles from horizontal to vertical.
  - c) Ensure sufficient working area around the rapid shutdown box to allow easy access for maintenance and/or servicing of the PV system.
- See technical data in section 9, and check the environmental parameters to be observed (degree of protection, temperature, etc.).
  - a) The maximum operational ambient air temperature (+60°C/140°F) must be considered when choosing the rapid shutdown box and power supply box installation location.
  - b) To avoid overheating, always make sure the flow of air around the rapid shutdown box and power supply box is not blocked.
  - c) Do not install in places where gases or flammable substances may be present.
  - d) The humidity of the installation location should be 0~100% without condensation.

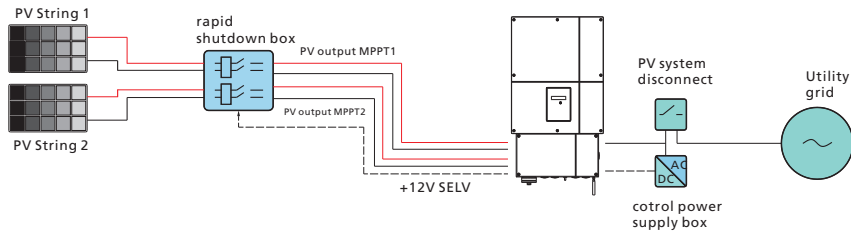
## 5.4. Rapid shutdown solution



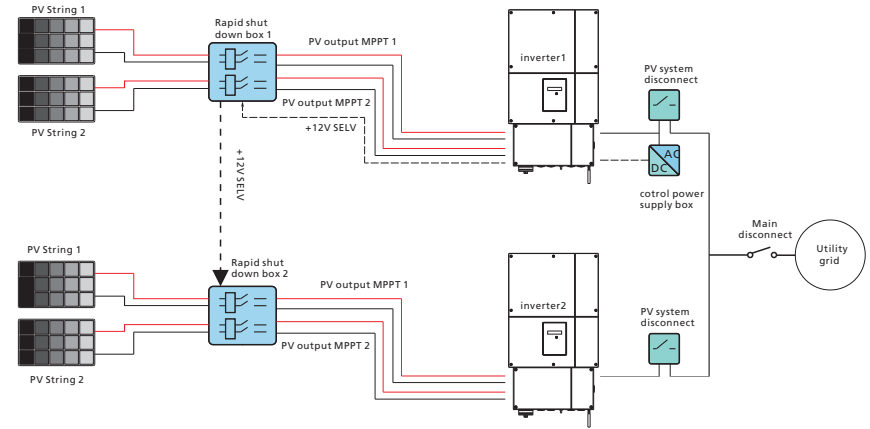
Item	Description
A	PV array
B	Rapid shutdown box
C	PV wiring pipeline
D	PV inverter
E	Power Supply box
F	Communications wire pipeline
G	AC wiring pipeline
H	AC distributor

## 5.1. Rapid shutdown wiring diagram

### 5.5.1. Connecting One rapid shutdown box to one inverter

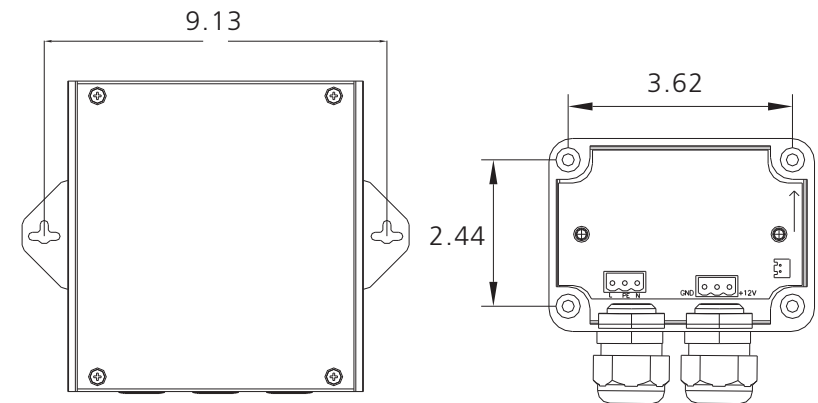


### 5.5.2. Connecting several rapid shutdown boxes to multi inverters




## 5.6. Installation

The dimension of rapid shutdown box and power supply box is shown below:

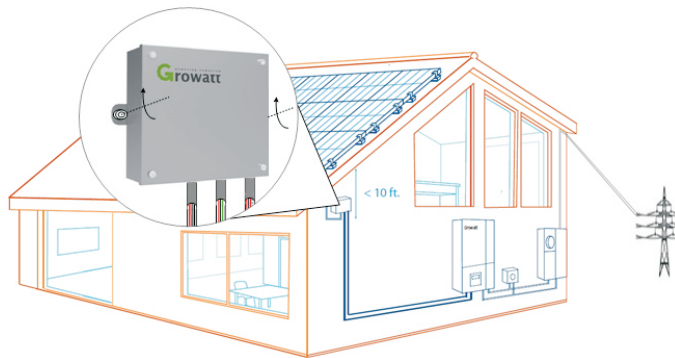




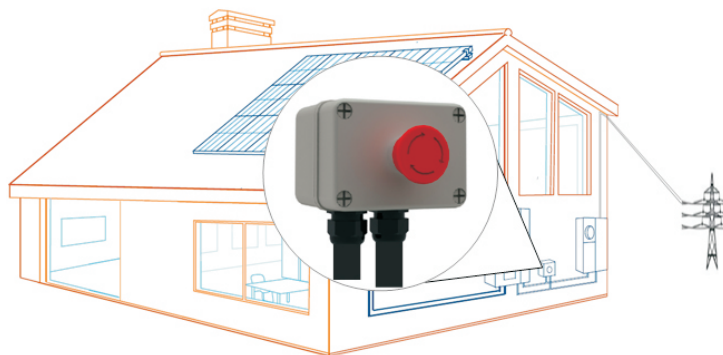
### 5.6.1. Mounting on the wall

 <b>WARNING</b>	<p>In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.</p>
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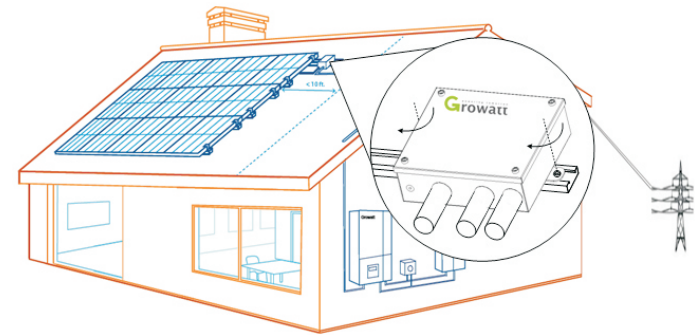
Mounting rapid shutdown box



Mounting power supply box







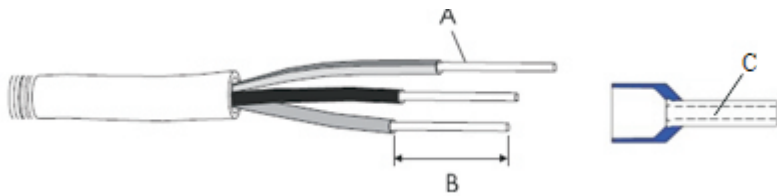
### 5.6.2. Mounting on PV module racking



## 5.7. Electrical Connection

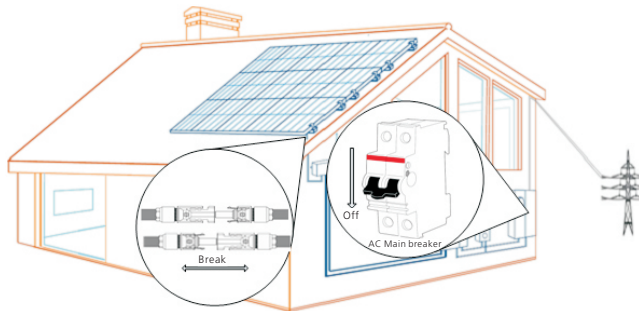
### 5.7.1. Safety

  <b>DANGER</b>	<p><b>Danger to life due to lethal voltages!</b>          High voltages which may cause electric shocks are present in the conductive parts of the unit. Prior to performing any work on the PV system, disconnect the PV system on the AC and DC sides.</p>
 <b>DANGER</b>	<p><b>Grounding</b>          Before connecting the power cables, you must connect the ground wire.</p>
 <b>NOTE</b>	<p>Use only solid or stranded wire but not fine stranded wire.          Use cables with high ambient temperatures.          Use cables with a large cross-section.</p>



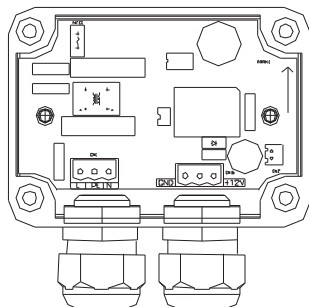
Code	Name	Detail
A	PV wire	14~8AWG
B	Stripping insulation	10mm or 12mm for PV wire
C	Bushing	KST E4010 or E6012 for PV wire

Please make sure the DC and AC side are disconnected from power source before wiring.



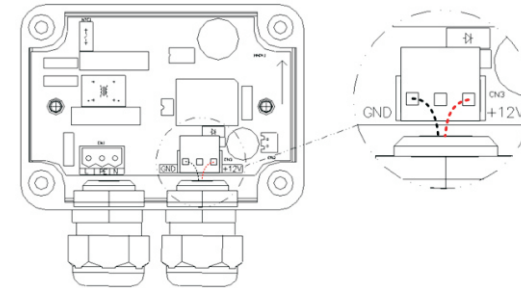
### 5.7.2. Power supply box internal structure

Power supply box internal structure and terminals are shown below:

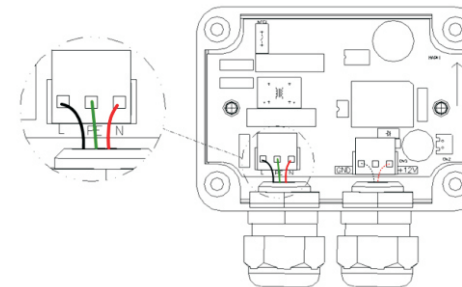


### 5.7.3. Power supply box wiring

Power supply box +12VDC output wiring is shown below:

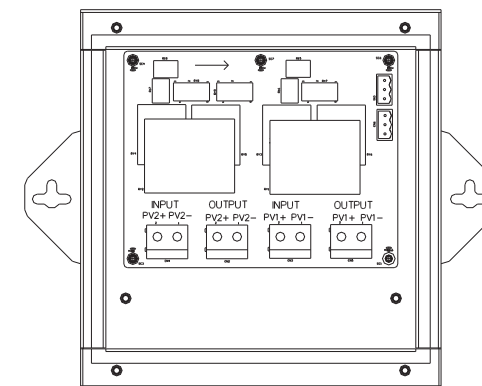


Power supply box AC input wiring is shown below:

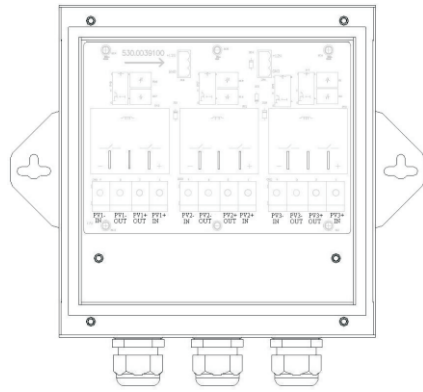


### 5.7.4. Rapid shutdown box internal structure

Rapid shutdown box internal structure and terminals are shown below:



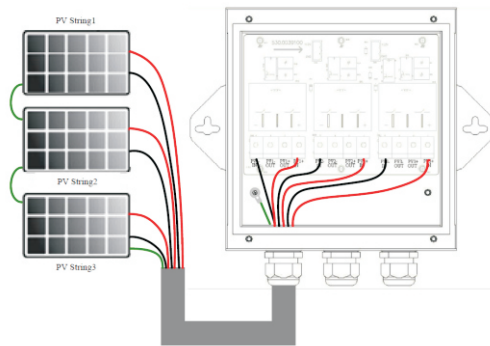
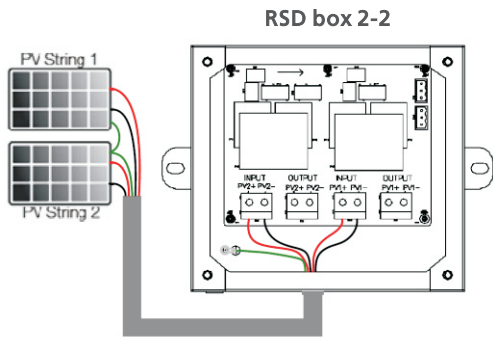
RSD box 2-2



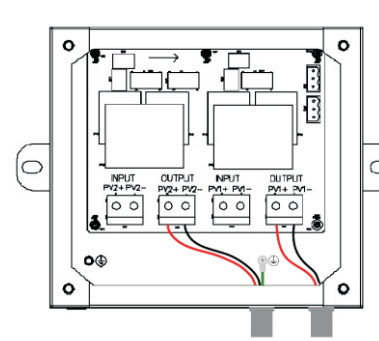
RSD box 3-3

### 5.7.5. Rapid shutdown box wiring

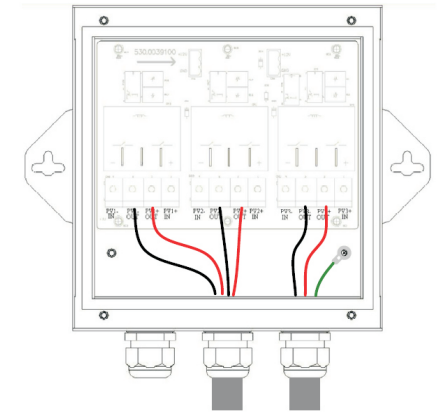
Rapid shutdown box PV input wiring is shown below:



Rapid shutdown box PV output wiring is shown below:

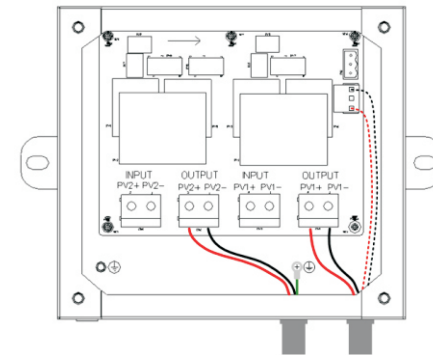


RSD box 2-2

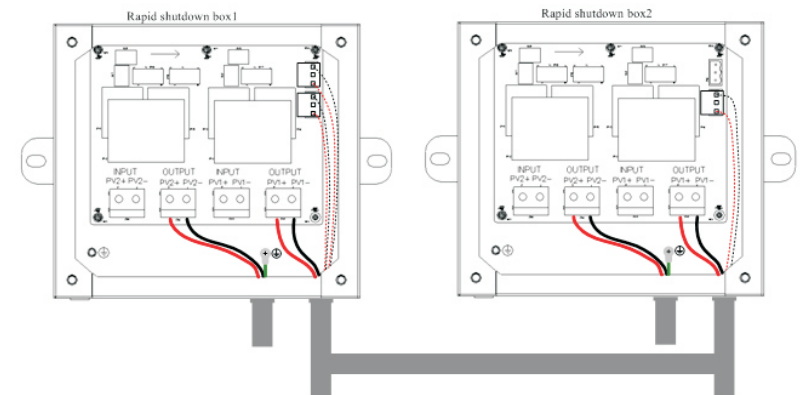


RSD box 3-3

Single control cable wiring is shown below:



Multi control cable wiring is shown below:



## 5.8. Operation

In compliance with NEC 690.12, within the ten-foot perimeter of the PV array or within five feet of entering the building, voltage is required to be reduced to no more than 30V and power to 240VA within 10 seconds. When initiating rapid shutdown, by removing AC power to the inverter or activating an optional remote initiation switch, the voltage and current on the PV conductors between the rapid shutdown box and inverter will be reduced to the required limits within the required time.

**The method of rapid shutdown initiation shall be clearly marked for emergency personnel to quickly activate. A permanent plaque or directory must be installed stating "PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN" according to NEC 690.56(C).**

A number of devices may be used to initiate rapid shutdown, many of which are already required to be installed within a PV system by the authority having jurisdiction (AHJ) or utility company. Some of these devices may not be required in all jurisdictions and one device may serve multiple purposes.

- a. The back-fed PV breaker
- b. The building's main circuit breaker
- c. The PV system disconnect switch
- d. An inverter AC equipment disconnect switch

### 5.8.1. Rapid shutdown function test

Once the PV system has been installed, test the rapid shutdown system by first turning on the PV system. Close all disconnect switches and circuit breakers to begin back-feeding power to the grid. Once the inverter has gone through the startup process and is connected to the grid, perform the following steps to test the rapid shutdown system. A meter will be required to measure the output voltage, and proper Personal protective equipment shall be worn in all steps while working with this equipment.

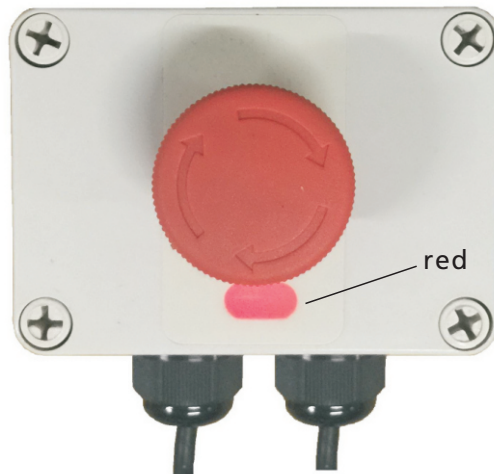
- Under any condition! Make sure the maximum open circuit voltage (Voc) of each PV string is less than 600Vdc.
- Before connecting PV panels, please make sure the polarity is correct.
- Connecting the panel MC4 connector.
- Turn on disconnect switch on AC panel.
- Close the DC separate unit and the DC disconnected on the inverter.
- When the PV panels are connected and PV voltage is greater than 100Vdc but the AC grid is not yet connected, the message on the LCD display produce the following messages in order: "PV Inverter"-> "Waiting" -> "No AC connection". The display repeats "No AC connection" and the LED will be red.
- Close the AC separate unit between inverter and grid. The normal operating sequence begins.
- Under normal operating conditions the LCD displays "Power: xxxx.xW xxxx.xVar". That is the power feed to the grid. The LED turns green.
- Press the button on power supply box, monitor the output conductors of the rapid shutdown box for voltage.
- As soon as the AC supply switch turn back on, the DC supply and inverter will resume.
- With one person monitoring the output of the rooftop rapid shutdown box, initiate rapid shutdown by one of the methods listed above by removing AC power to the PV system.
- After the power supply output voltage and power are verified to be shut down, return AC power to the PV system to resume operation.

Note: when you press the switch of rapid shutdown power supply box, the red indicator on it will be on.

# Decommissioning 6

## 6.1. Dismantling the PV system


- 1 Disconnect PV module and terminal connections on rapid shutdown box
- 2 Turn off switch on AC panel, DC and AC breaker of inverter.
- 3 Wait for 5 minutes then take off the cover to remove the cables between inverter and RSD box.
- 4 Lock the cover back and remove inverter and RSD box



PV disconnected



PV connected

	<b>NOTE</b> For heavy inverters, need two people to work together.
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## 6.2. Packing the Inverter and rapid shutdown

Pack the inverter and rapid shutdown box. Use the original packaging or packaging that is suitable for the weight and dimensions of the products.

## 6.3. Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between -25°C and +60°C.

## 6.4. Disposing of the box

	Do not dispose of faulty inverters and rapid shutdown box or accessories together with household waste. Please accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Ensure that the old unit and, where applicable, any accessories are disposed of in a proper manner.
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## 7 Troubleshooting

If a failure occurs in the rapid shutdown system, the contactors will open, ceasing to export power to the inverter. In the event the inverter is not receiving power from the PV array, check the following items

- a. Check the connection between rapid shutdown box Input and output wire.
- b. Check the wiring in power supply box
- c. Check whether the AC switch for power supply box is on.
- d. Check the voltage for power supply box, make sure the output of supply box can stay on +12VDC stably.
- e. Check the polarity of PV
- f. Check the DC switch of inverter is on
- g. Check the emergency switch is resumed to ON.

If all the conditions above have been checked and are found to be in the correct state, call customer service for further assistance.

## Growatt Warranty 8

Please refer to the warranty card.

## 9 Specification

Model	Growatt RSD box2-2	Growatt RSD box3-3
Specifications		
<b>PV source conductor input</b>		
Max Input voltage	600V	600V
Number of input strings	2	3
Max input current per string	20A@600V	20A@600V
<b>PV output conductors output</b>		
Number of output circuits	2	3
Conductor size	14-8AWG	14-8AWG
<b>Control power supply</b>		
Input voltage range	120~277Vac	
Output voltage	12V	
Power consumption	<6W/0.5A	
Conductor size	28-12AWG	
Stop button	Standard	
<b>Environmental</b>		
Rapid shutdown box Dimensions(W/H/D)	7.87" x 8.27" x 2.36"	
Power Supply box Dimensions(W/H/D)	4.33" x 4.33" x 3.35"	
Rapid shutdown box Weight	4.19 lb	

Model	Growatt RSD box2-2	Growatt RSD box3-3
Specifications		
<b>Environmental</b>		
Power Supply box Weight	0.75lb	
Operating temperature	- 25°C ... +60°C	
Enclosure rating	Type 4X	
Altitude	< 2000m	
Warranty	5 years	
Certification	UI1741	

## Contact 10

If you have technical problems about our products, contact the Growatt Service line. We need the following information in order to provide you with the necessary assistance:

- Serial number of rapid shutdown
- Rapid shutdown system Max. PV input voltage
- Rapid shutdown system Max. PV input current
- How many rapid shutdown box are connected to the 12Vdc of Power supply box
- Input voltage of Power supply box

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