

Rapid Shutdown USER MANUAL

HRSD-1C
HT10
HT10-Kit

Legal Notice

Hoymiles has made every effort to ensure the accuracy and completeness of this manual. However, the content of this manual is continually reviewed and amended, due to product enhancements or feedback from real-world usage.

Hoymiles retains the right to modify this manual without prior notice at any time. Please refer to Hoymiles official website at www.hoymiles.com or scan the QR code for the latest version.






Warranty

To ensure reliability and warranty compliance, follow the installation instructions in this manual. You can access the current warranty conditions at www.hoymiles.com.

Contact Information

If you have technical queries or any questions concerning Hoymiles products, please contact us.

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Before contact, make sure the following information at hand:

- Model of the product
- Brief description of the problem

Using This Manual

Symbols

Symbol	
•	List
A) ...	Installation steps in a defined order

Tool and Related Documents

To quickly select HRSD or Transmitter, use [Rapid Shutdown Compatibility Calculator](#).
For more information or related documents, refer to the [product page](#) at hoymiles.com.

Revision History

Issues		
V1.0	2022-05-22	Original issue
V1.1	2023-10-13	<ul style="list-style-type: none">Added the rating in "3. Safety Instructions"Added "4. Cable Length and Routing"Updated illustrations in 5.1, 5.2, and 5.3 of "5. Installation"Added "6. Troubleshooting"Updated "7. Technical Specifications"

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1. Products

1.1 HRSD-1C

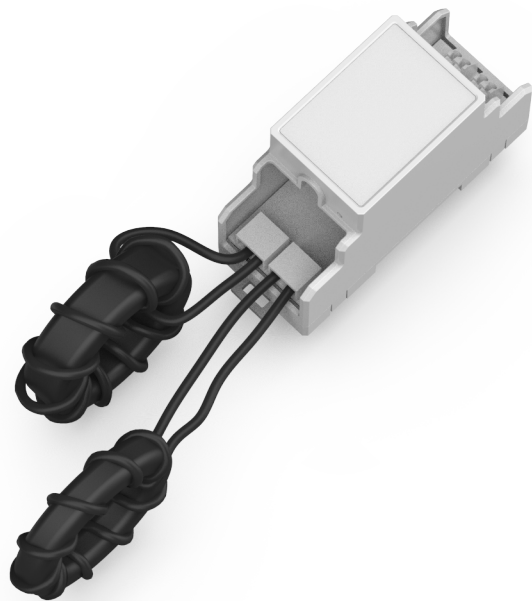


Features	• Meets Sunspec RSD, NEC 2017 & NEC 2020 690.12 requirements
	• Uses Active Bypass to reduce heat generation in shade and other situations
	• Uses graphene heat spreader to improve heat dissipation
	• Plug & play, no configuration required
	• Lower power consumption and wider operating voltage range
	• Able to avoid crosstalk with special communication modulation technique

As part of Hoymiles Rapid Shutdown Solution for PV system, HRSD-1C is connected with one module. It meets NEC 2017, NEC 2020, UL 1741 and Sunspec Rapid Shutdown requirements, guaranteeing PV system safety.

The HRSD device enables proper operation of the PV system when it is installed and receives a “permission to operate” signal from the Hoymiles Transmitter. In an emergency, PV system would enter module-level rapid shutdown mode by simply disconnecting the AC power of Transmitter or using an external initiator.

1.2 HT10



Features	• Complied with NEC 2017&NEC 2020 690.12 requirements
	• Complied with SunSpec RSD requirements
	• Equipped with single/dual Core
	• Achieves rapid shutdown through Transmitter power-off or external initiation

Hoymiles Transmitter HT10 is part of Hoymiles Rapid Shutdown Solution and works with HRSD for module-level rapid shutdown. While powered on, the HT10 uses PLC technology to continuously send a “permission to operate” signal to HRSD, enabling the PV system to start producing power.

In case of emergency, the PV system would enter module-level rapid shutdown mode by simply disconnecting the AC power of Transmitter or using an external initiator.

1.3 HT10-Kit



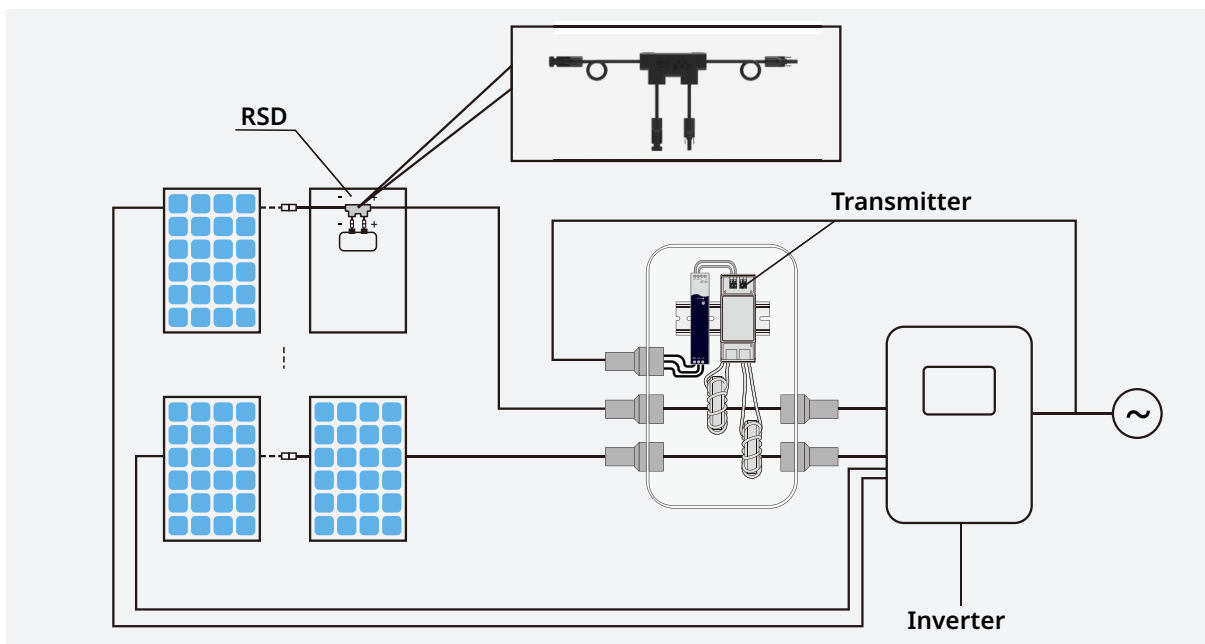
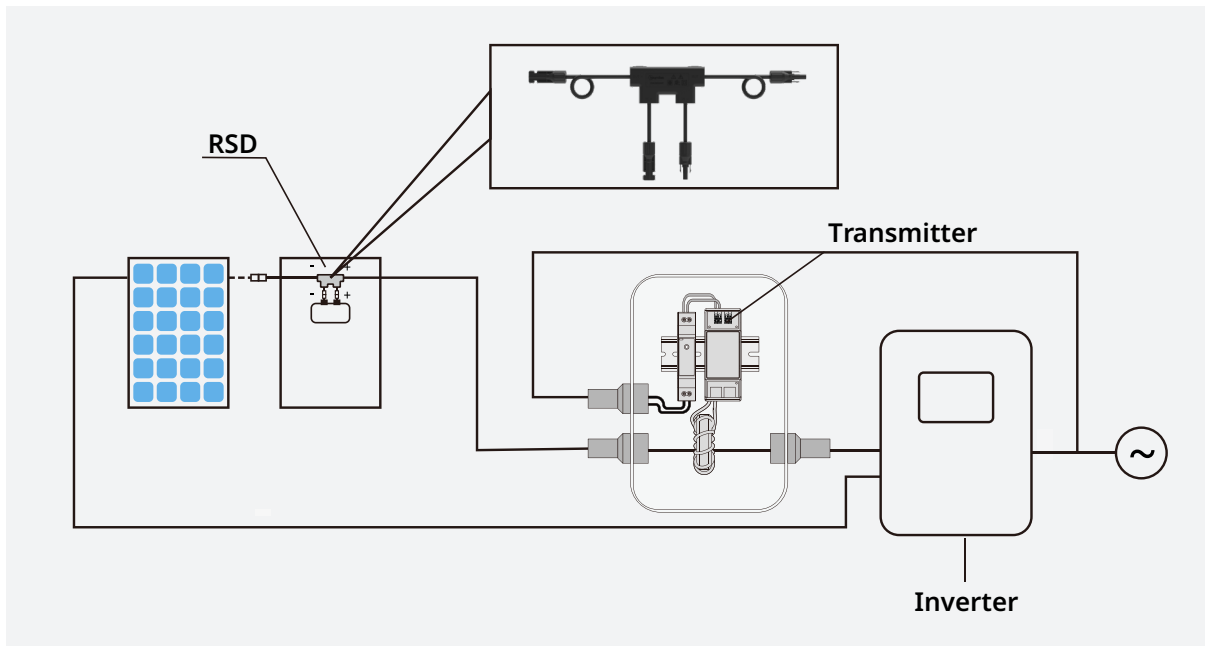
Features	• Module-level rapid shutdown with Hoymiles HRSD
	• Achieves rapid shutdown through Transmitter power-off or external initiation
	• Equipped with single/dual Core
	• Complied with NEC 2017&NEC 2020 690.12 and SunSpec RSD requirements
	• Weatherproof outdoor enclosure
	• Equipped with single- / three-phase power supply

Hoymiles Transmitter HT10-Kit is part of Hoymiles Rapid Shutdown Solution and works with HRSD for module-level rapid shutdown.

While powered on, the HT10-Kit uses PLC technology to continuously send a “permission to operate” signal to HRSD, enabling the PV system to start producing power. In case of emergency, the PV system would enter module-level rapid shutdown mode by simply disconnecting the AC power of Transmitter or using an external initiator.

Hoymiles Transmitter Outdoor Kit includes one Transmitter, single or dual Core, single- or three-phase power supply, and outdoor enclosure.

2. System Overview







- The HRSD-1C requires a Transmitter or an inverter with a built-in transmitter for operation.
- Hoymiles recommends that Transmitter power supply be on the same AC branch circuit as the inverter to meet rapid shutdown requirements.
- When power is supplied to the Transmitter, the HRSD-1C turns **ON** and allows full PV module voltage. The HRSD-1C constantly receives a “permission to operate” signal from the Transmitter. When the power supply to the Transmitter is disconnected, this “permission to operate” signal ceases, and every HRSD-1C enters shutdown mode with output reduced to 0.9 V-1.1 V. In this way, PV array enters rapid shutdown in the event of AC grid loss.

3. Safety Instructions



3.1 Safety Symbols



This manual contains IMPORTANCE, NOTICE, WARNING, and DANGER notes. These instructions demand increasingly great attention as the severity levels rise.

The instructions do not cover all the possible conditions and situations that may occur. It is important to use common sense, caution and care during installation, maintenance and operation.

Symbols	Meaning
 DANGER	This indicates a hazardous situation that can result in high level electric shocks and other serious physical injuries.
 WARNING	This indicates a hazardous situation that may result in serious physical injuries.
 NOTICE	This indicates a situation that can result in product damages.
 IMPORTANCE	This indicates complementary information.

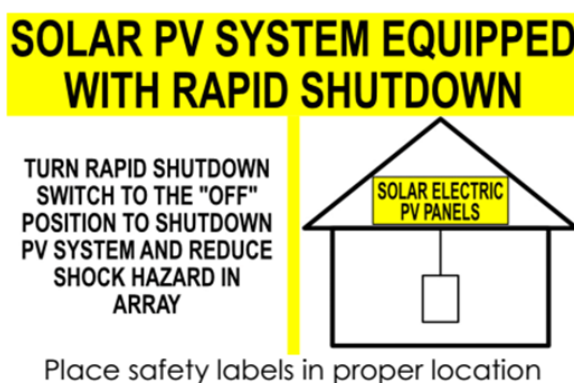
3.2 Safety Instructions

 DANGER
<ul style="list-style-type: none"> No flammable and combustible material should be seen where HRSD is installed. Do not touch any live parts in the system, including the PV array, when the system has been connected to the electrical grid. Do not connect or disconnect under load. Turning off the Inverter and/or the HRSD may not reduce the risk. Internal capacitors within the Inverter can remain charged for several minutes after all power sources are disconnected. Verify that capacitors have discharged by measuring the voltage across inverter terminals before disconnecting wiring if service is required. Wait 30 seconds after rapid shutdown activation before disconnecting DC cables or turning off DC disconnect. Do not remove the cover of the products in case of electric shock. Only professionals should carry out decommission and repair.
 WARNING
<ul style="list-style-type: none"> All the installation MUST comply with local regulations and technical rules. Do not attempt to install in inclement weather. Only professionals should install and/or replace the HRSD and the Transmitter. The professionals must be qualified, trained and skilled, and shall strictly adhere to this Manual during installation, operation and maintenance. The Transmitter must be powered off during HRSD installation. Before installing or using an HRSD or a Transmitter, please read related technical notes (see Tool and Related Documents) and all the instructions and warnings on the inverter system itself as well as on the PV array. Do not operate the HRSD if it is physically damaged. Check existing cables and connectors and ensure they are in good condition and appropriate in rating. Do not operate the HRSD with damaged or substandard wiring or connectors. To install the HRSD, connect the input cables to the PV module first, and then connect the HRSD output cables in series.

<ul style="list-style-type: none"> For parallel string connections, first connect the HRSD to the PV modules, then connect all outputs of HRSD in series, and finally pass one side (+ or -) of the string through the transmitter to turn the system ON.
<ul style="list-style-type: none"> Do not touch the body of the running HRSD because it can reach high temperatures during heat dissipation.
<ul style="list-style-type: none"> To disconnect the HRSD, remove the output cables of the HRSD string first, and then disconnect the input cables from the PV modules.
 NOTICE
<ul style="list-style-type: none"> Do not mix DC connectors from different manufacturers. Damages caused by it will void the Hoymiles warranty.
<ul style="list-style-type: none"> Improper installation may lead to HRSD damage, which is not covered under warranty.
<ul style="list-style-type: none"> Human-made damages caused by improper handling or opening the product will void the warranty.
<ul style="list-style-type: none"> Be sure to verify that the voltage and current specifications of the PV module match with those of the HRSD.
<ul style="list-style-type: none"> Cables of the HRSD inputs and the PV module outputs cannot be extended.
<ul style="list-style-type: none"> Never apply an external voltage source to a module or string equipped with HRSD.
 IMPORTANCE
<ul style="list-style-type: none"> To reduce the system risk, it is recommended that string inverters be able to perform Arc Fault Protection and DC Insulation Resistance Detection during the operation.
<ul style="list-style-type: none"> HRSD is shipped in the OFF position and will measure 0.9 V to 1.1 V when the "permission to operate" signal is not present.
<ul style="list-style-type: none"> Max. cable length from inverter (+) to inverter (-): 2625 ft. (800 m)
<ul style="list-style-type: none"> Recommended max. number of strings connected to HRSD: 30 modules¹
<ul style="list-style-type: none"> Hoymiles recommends that Transmitter power supply be on the same AC branch circuit as the inverter to meet rapid shutdown requirements.
<ul style="list-style-type: none"> Max. current per Core of Transmitter: 75 A or 150 A
<ul style="list-style-type: none"> Max. number of strings per Core²: 5 (75 A Core) or 15 (150 A Core)
<ul style="list-style-type: none"> During the PV system operation, check that the Transmitter Power LED 1 is lit and the Signal LED 2 is blinking.
<ul style="list-style-type: none"> Place rapid shutdown system label no more than 1m (3 ft.) from the Transmitter, initiator (AC disconnect) or service panel.

1. Source: SunSpec RapidShutdown Specification. Please refer to local regulations before installation.

2. With Φ 6 mm DC cable diameter (without DC connector) (Refer to [7.2](#) or [7.3](#) for details.)



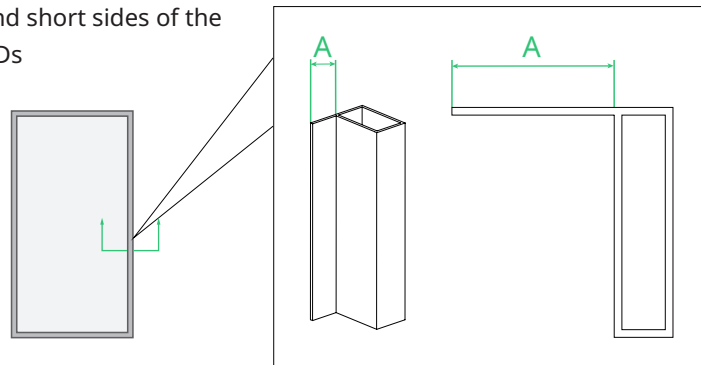
4. Cable Length and Routing

4.1 Configuration of Cable Lengths

HRSDs can be mounted on both the long and short sides of the PV module frame. Choose the suitable HRSDs based on the installation scenario.

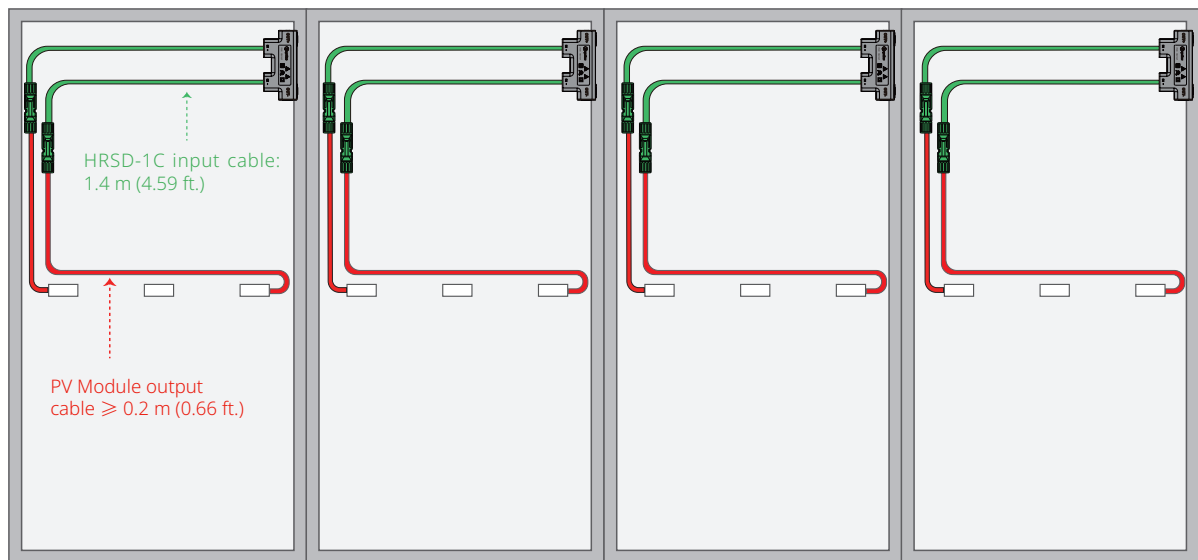
NOTICE

- To securely fasten the HRSD to the PV module frame, ensure A is 15 mm at minimum for clipping.



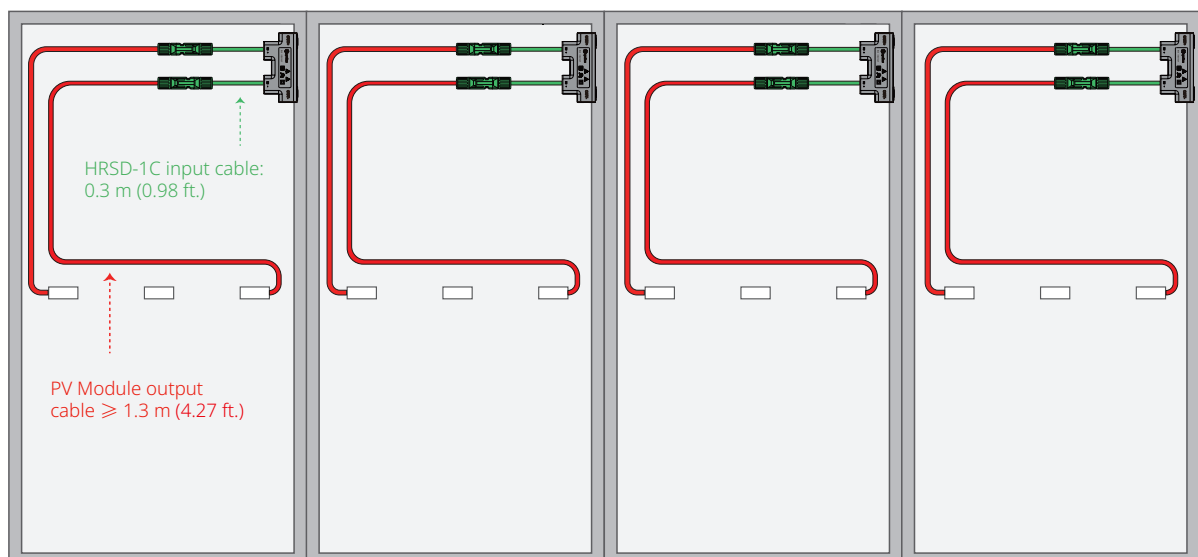
Scenario One: Long-side Installation

For PV modules with short output cables, choose HRSDs with input cables of the suitable length shown below.



* The proportions of the HRSDs have been modified to improve the depiction of the structure.

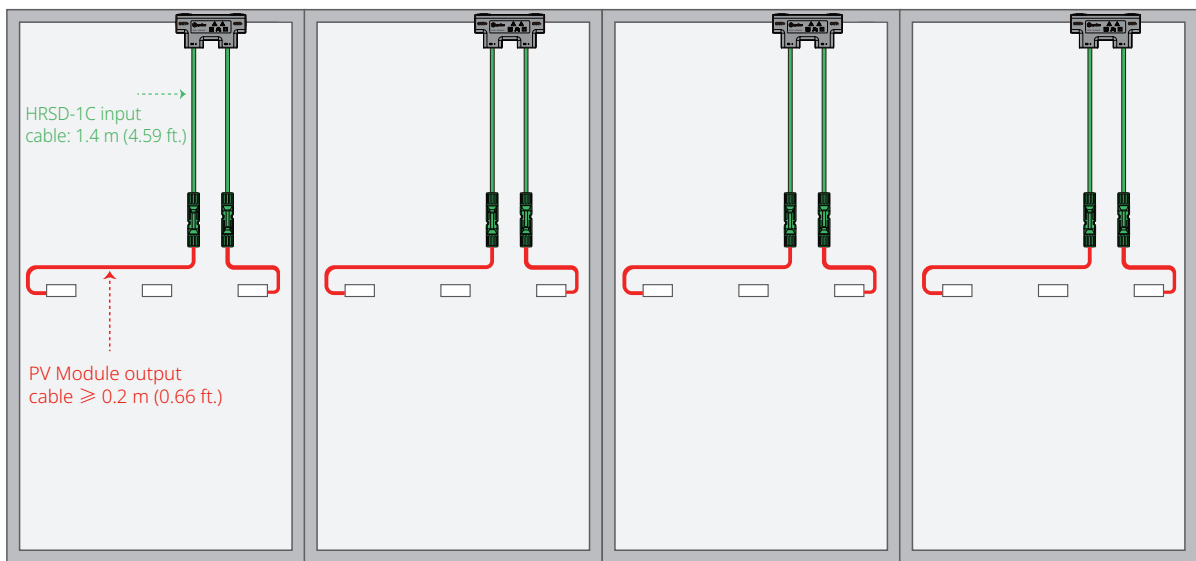
For PV modules with long output cables, choose HRSDs with input cables of the suitable length shown below.



* The proportions of the HRSDs have been modified to improve the depiction of the structure.

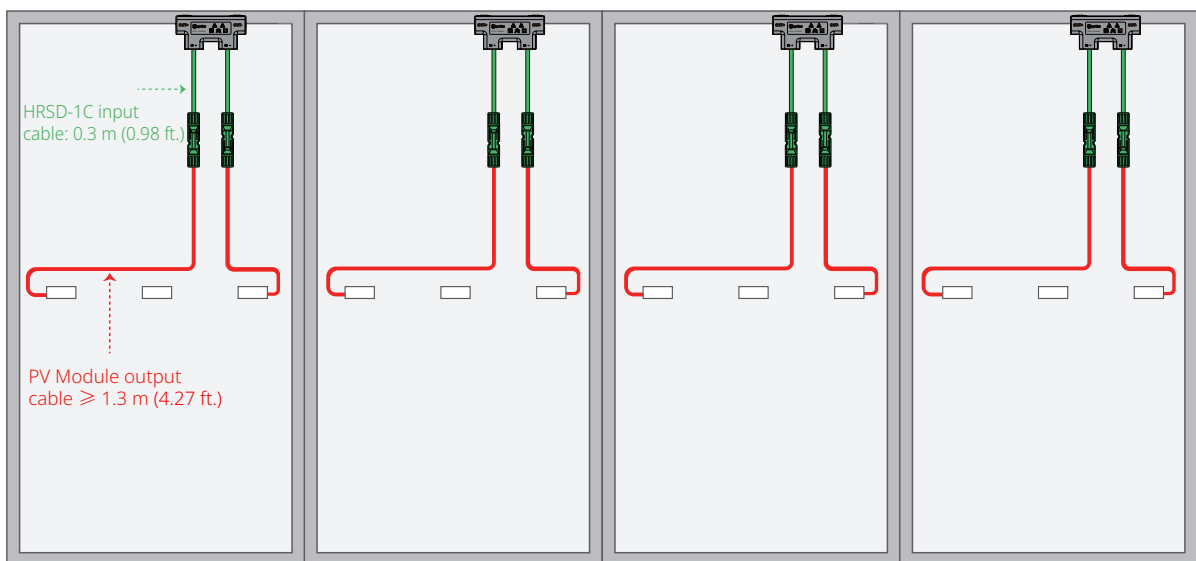
Scenario Two: Short-side Installation

For PV modules with short output cables, choose HRSDs with input cables of the suitable length shown below.



* The proportions of the HRSDs have been modified to improve the depiction of the structure.

For PV modules with long output cables, choose HRSDs with input cables of the suitable length shown below.

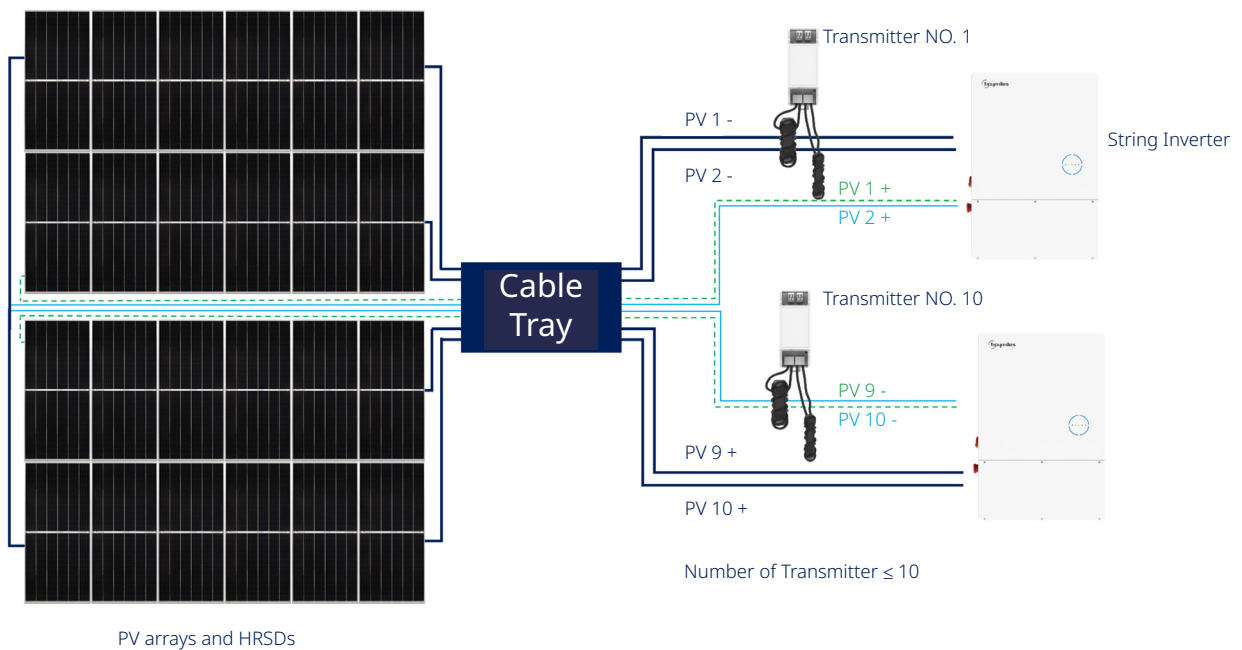
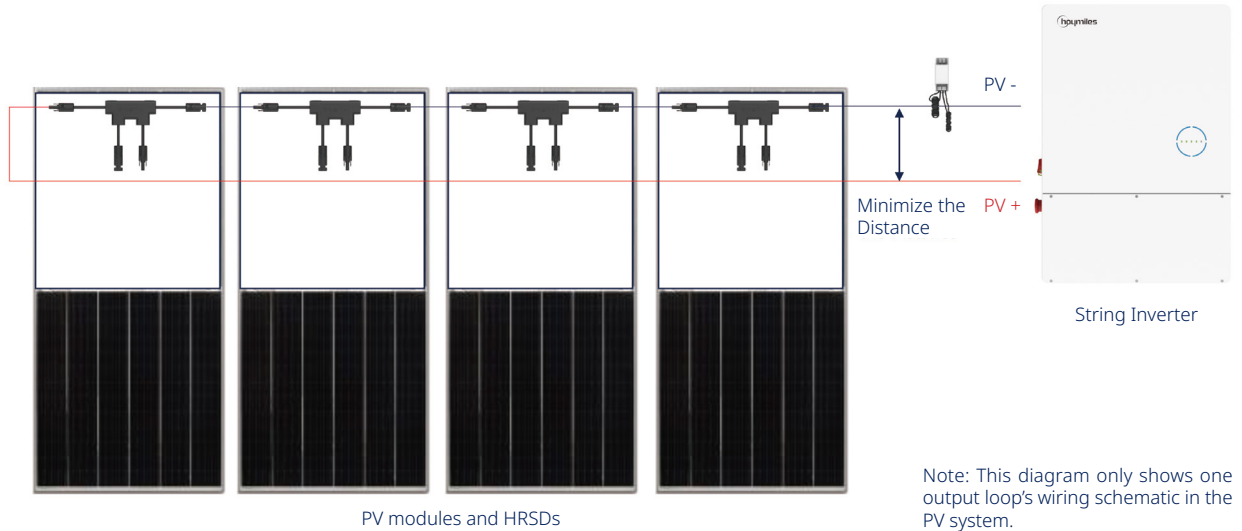


* The proportions of the HRSDs have been modified to improve the depiction of the structure.

4.2 Routing Instruction

To ensure effective communication,

- minimize the distance between positive and negative cables within the same string.
- up to 10 Transmitters' DC cables can pass through a single cable tray.



5. Installation

5.1 HRSD-1C



WARNING

- The Transmitter must be powered off during HRSD-1C installation.
- To disconnect the HRSD-1C, remove the output cables of the HRSD string first, and then disconnect the input cables from the PV modules.



NOTICE

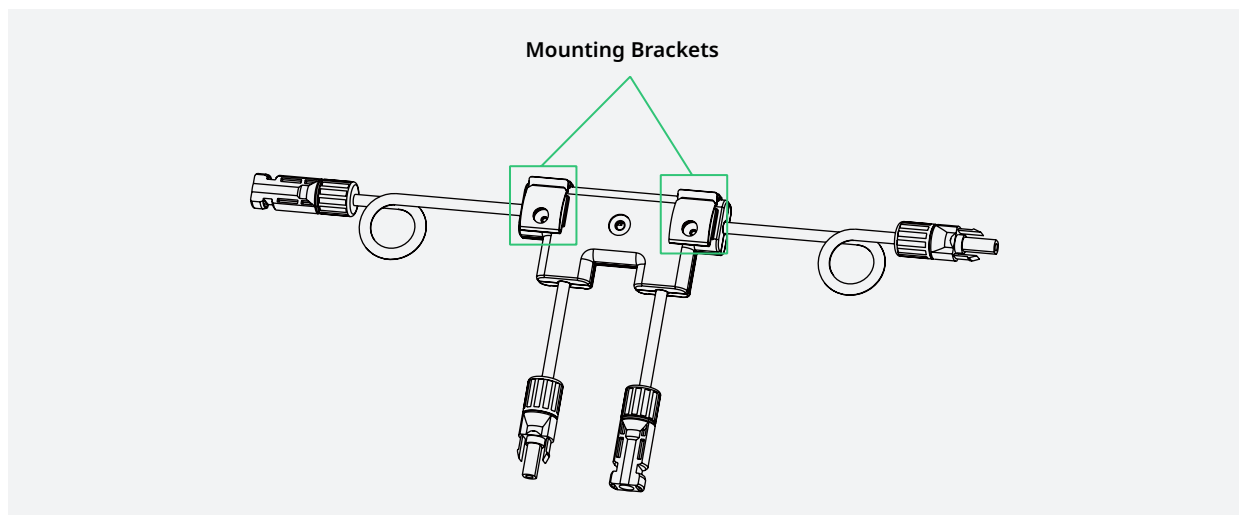
- Cables of the HRSD inputs and the PV module outputs cannot be extended.



IMPORTANCE

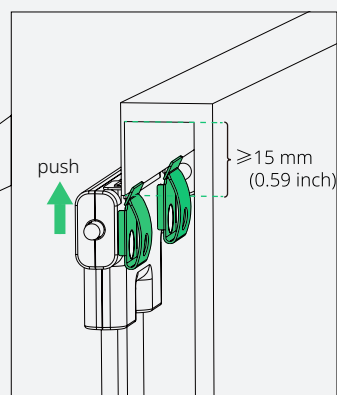
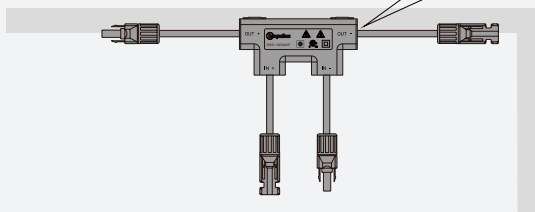
- HRSD-1C output Voltage is 0.9 V to 1.1 V when Transmitter "permission to operate" signal is not present.
 - Max. cable length from inverter (+) to inverter (-): 2625 ft. (800 m)
 - Max. number of strings recommended: 30 modules*
- *Source: SunSpec RapidShutdown Specification. Please refer to local regulations before installation.

A) Buckle HRSD-1C on the PV module frame.

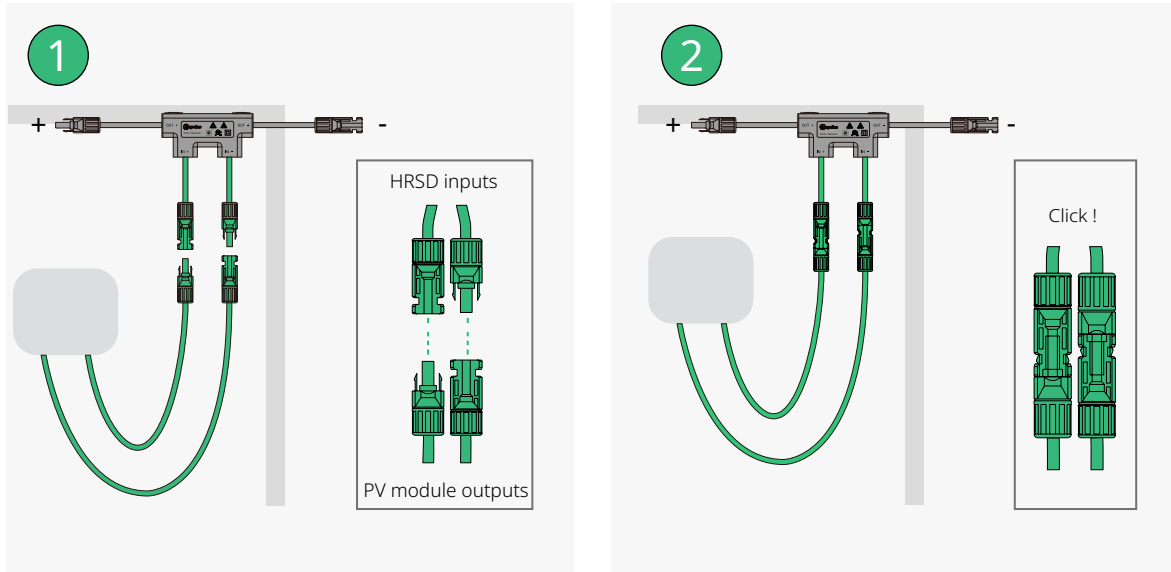


NOTICE

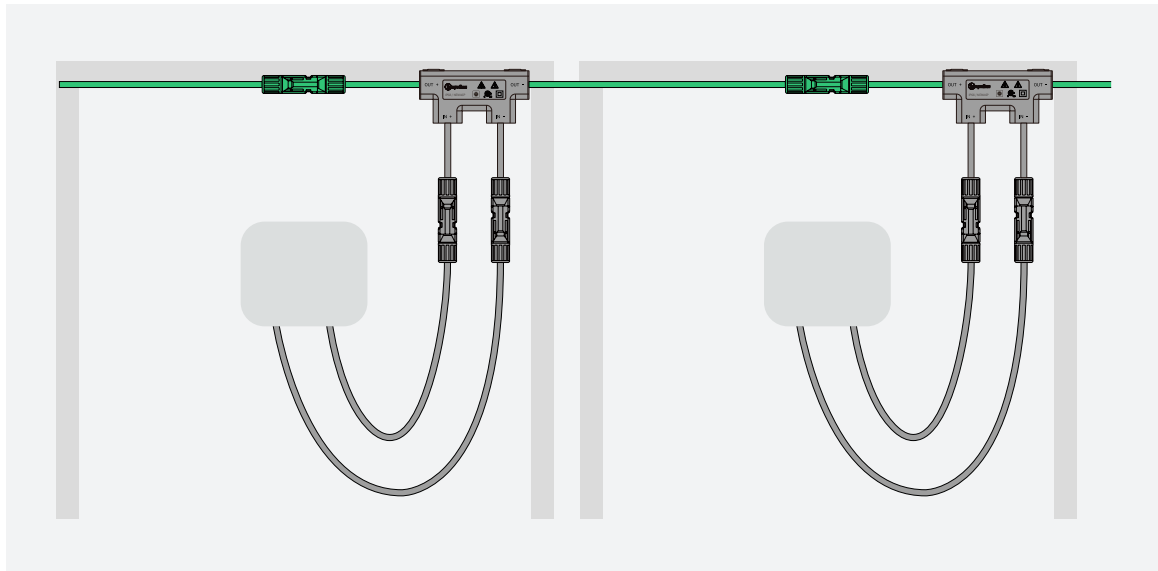
- Maintain a minimum of 1.5 cm (0.59 inch) clearance distance between the roof and the HRSD-1C enclosure to ensure ventilation and heat dissipation.
- Avoid exposing the HRSD-1C and its DC connectors to sunlight, rain, or snow. Don't place them between PV modules due to potential gaps.






B) Connect the PV modules to the HRSD-1C.



C) Connect the HRSD-1C outputs in series.



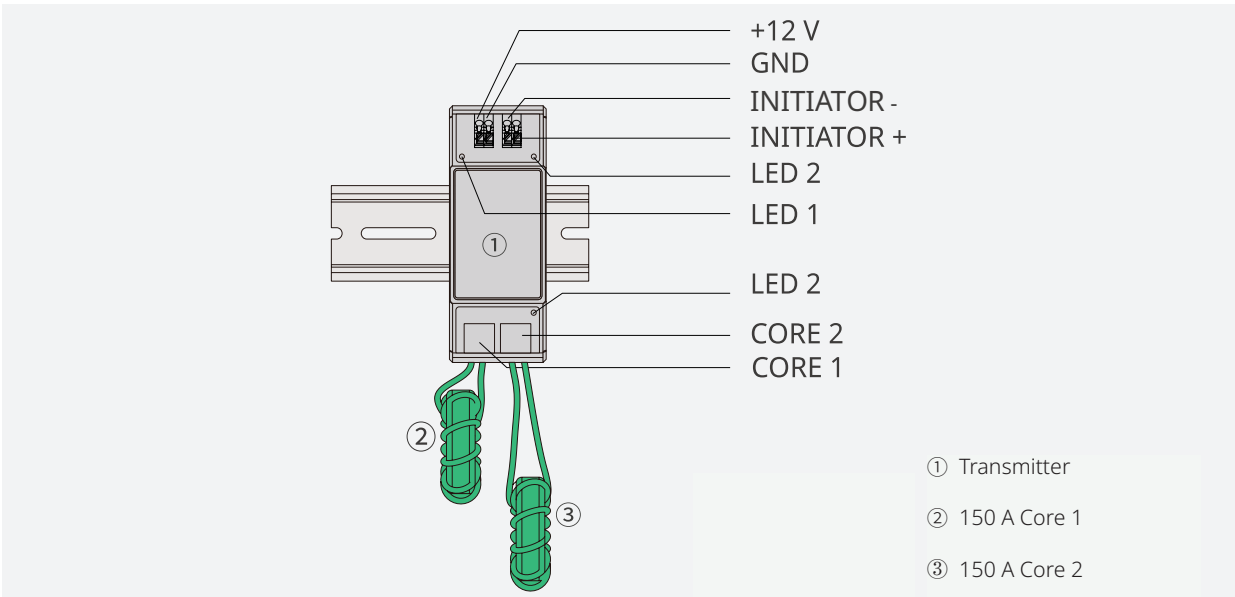
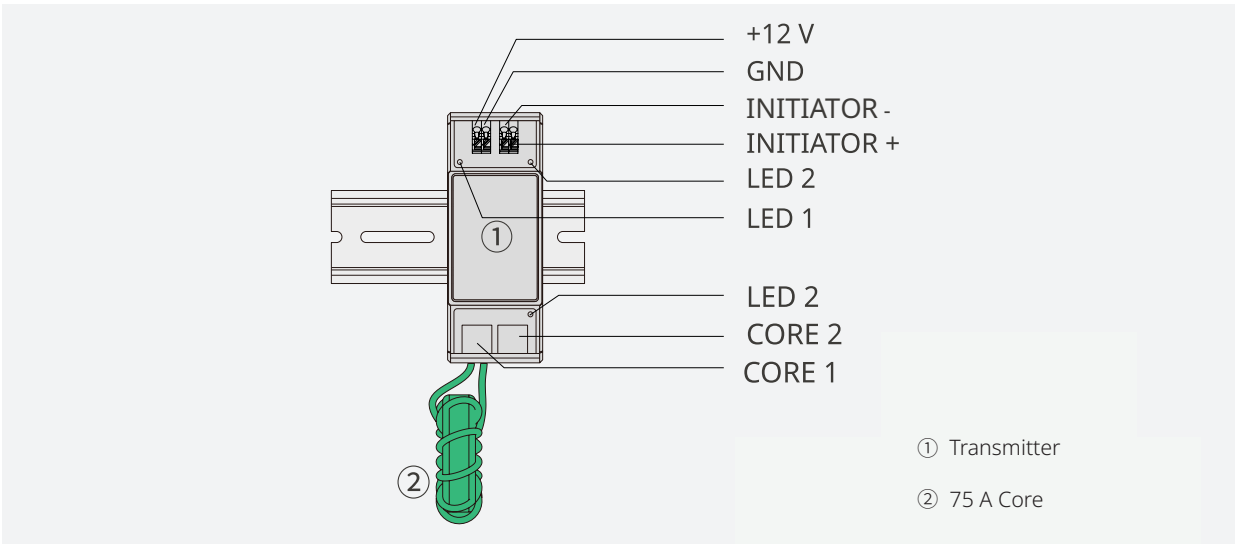
5.2 HT10

 WARNING	<ul style="list-style-type: none">Before powering on the Transmitter, ensure that the HRSD has been installed.
 NOTICE	<ul style="list-style-type: none">Improper installation may lead to HT10 damage, which is not covered under warranty.
 IMPORTANCE	<ul style="list-style-type: none">PSU and the DIN rail are not provided by Hoymiles.Hoymiles recommends that Transmitter power supply be on the same AC branch circuit as the inverter to meet rapid shutdown requirements.During the PV system operation, check that the Power LED 1 is lit and the Signal LED 2 is blinking.Place rapid shutdown system label no more than 1m (3 ft.) from the Transmitter, initiator (AC disconnect) or service panel.Max. current per Core: 75 A or 150 AMax. cable length from inverter (+) to inverter (-): 2625 ft. (800 m)Max. number of strings per Core*: 5 (75 A Core) or 15 (150 A Core)* With Φ 6 mm DC cable diameter (without DC connector) (Refer to 7.2 or 7.3 for details.)

A) - Mount Transmitter HT10 and power supply on DIN rail.

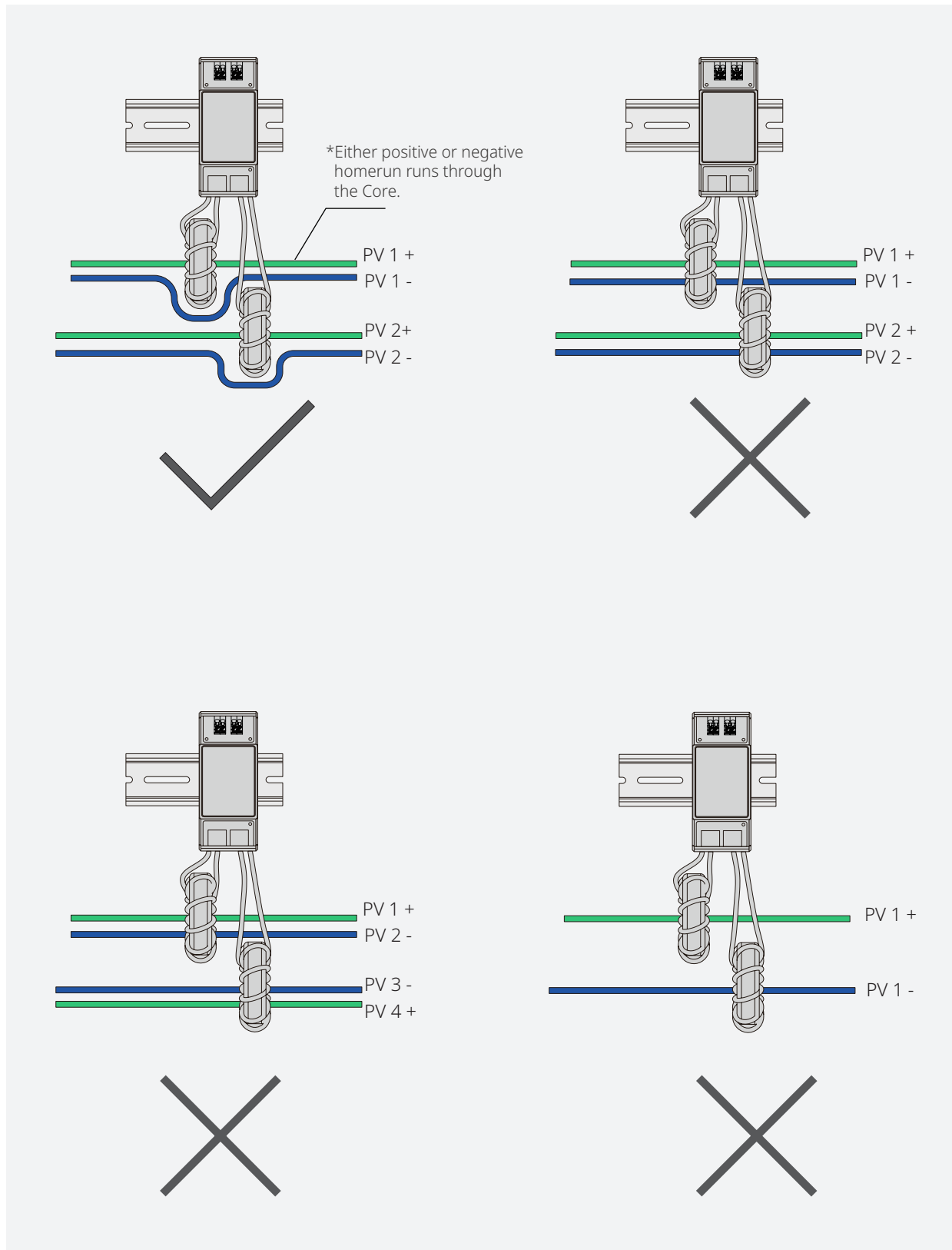
- Connect the Core to the Transmitter.

If there's only one Core to connect, start with Core 1.

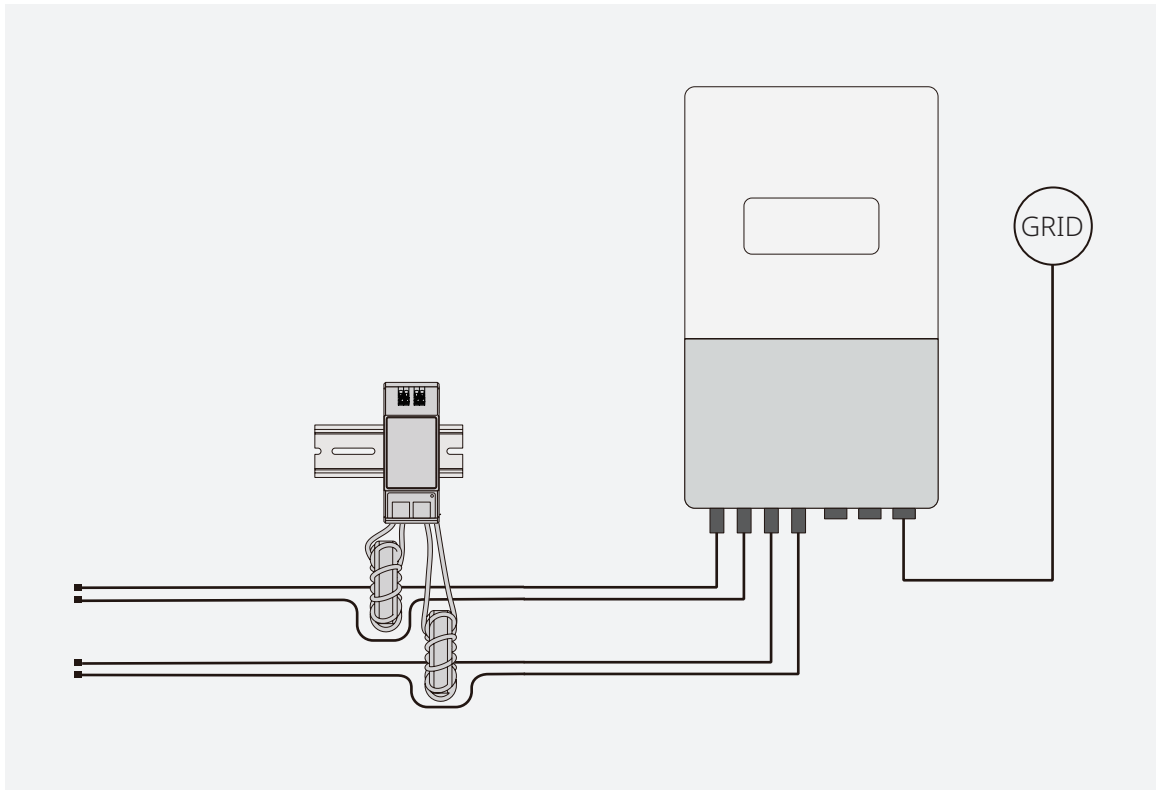


B) - Pass either positive or negative homerun through the Core.

- Connect wires to the AC side of the power supply.



- C) - Connect the serially connected outputs of HRSD-1C to the inverter with a DC cable.
- Turn on AC power to Transmitter HT10 power supply to activate the "permission to operate" signal.



5.3 HT10-Kit



WARNING

- Before powering on the Transmitter, ensure that the HRSD has been installed.
- Ground 180-550 VAC PSU with isolation class I. Grounding is not necessary for an 85-264 VAC PSU with isolation class II.



NOTICE

- Improper installation may lead to HT10-Kit damage, which is not covered under warranty.



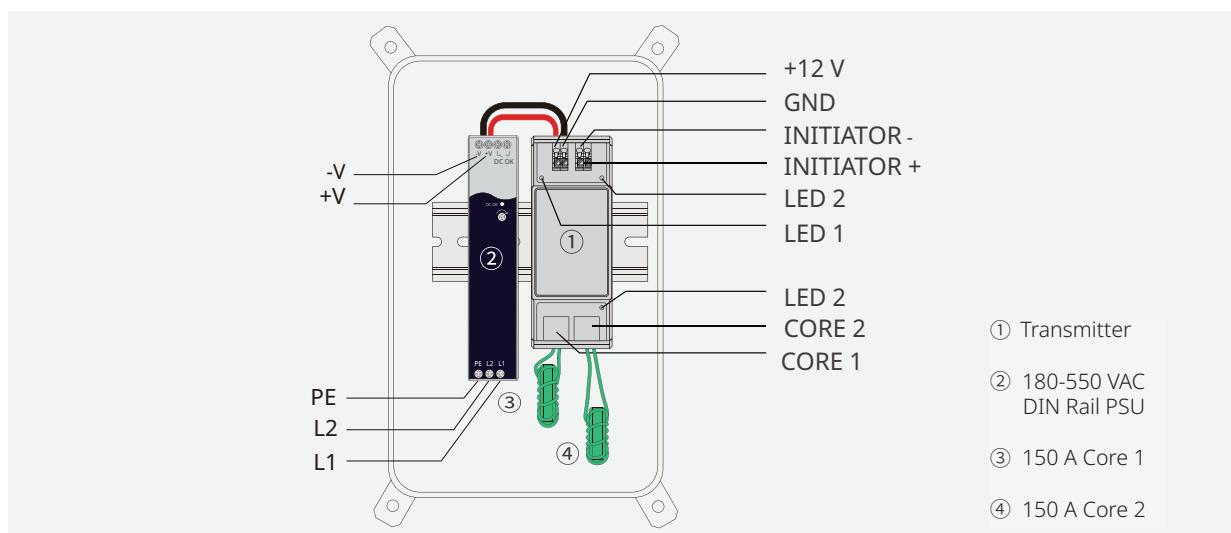
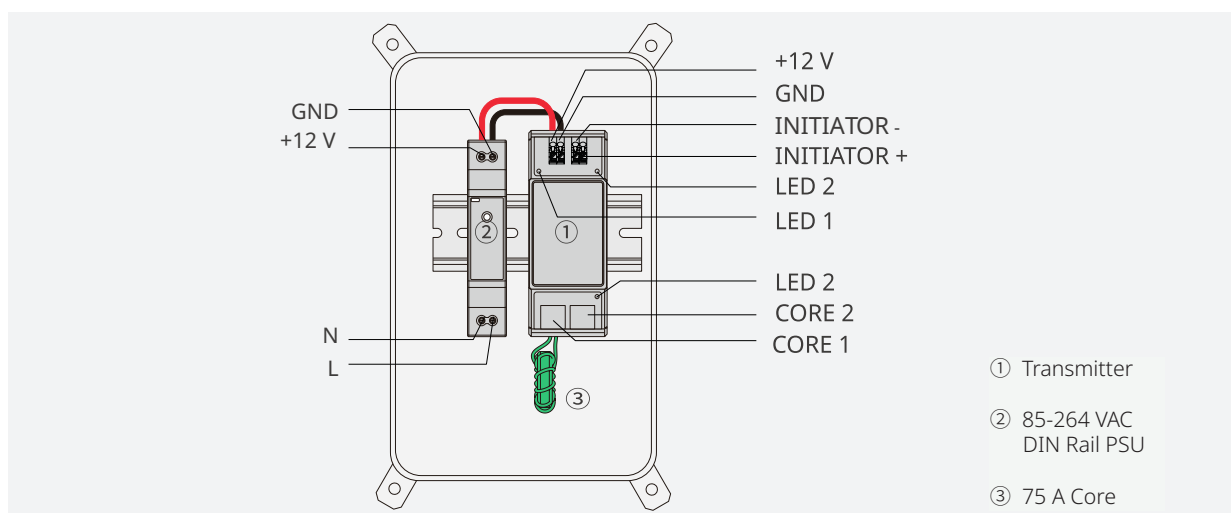
IMPORTANCE

- Hoymiles recommends that Transmitter power supply be on the same AC branch circuit as the inverter to meet rapid shutdown requirements.
 - During the PV system operation, check that the Power LED 1 is lit and the Signal LED 2 is blinking.
 - Place rapid shutdown system label no more than 1m (3ft) from the Transmitter, initiator (AC disconnect) or service panel.
 - Max. current per Core: 75 A or 150 A
 - Max. cable length from inverter (+) to inverter (-): 2625 ft. (800 m)
 - Max. number of strings per Core*: 5 (75 A Core) or 15 (150 A Core)
- * With Φ 6 mm DC cable diameter (without DC connector) (Refer to [7.2](#) or [7.3](#) for details.)

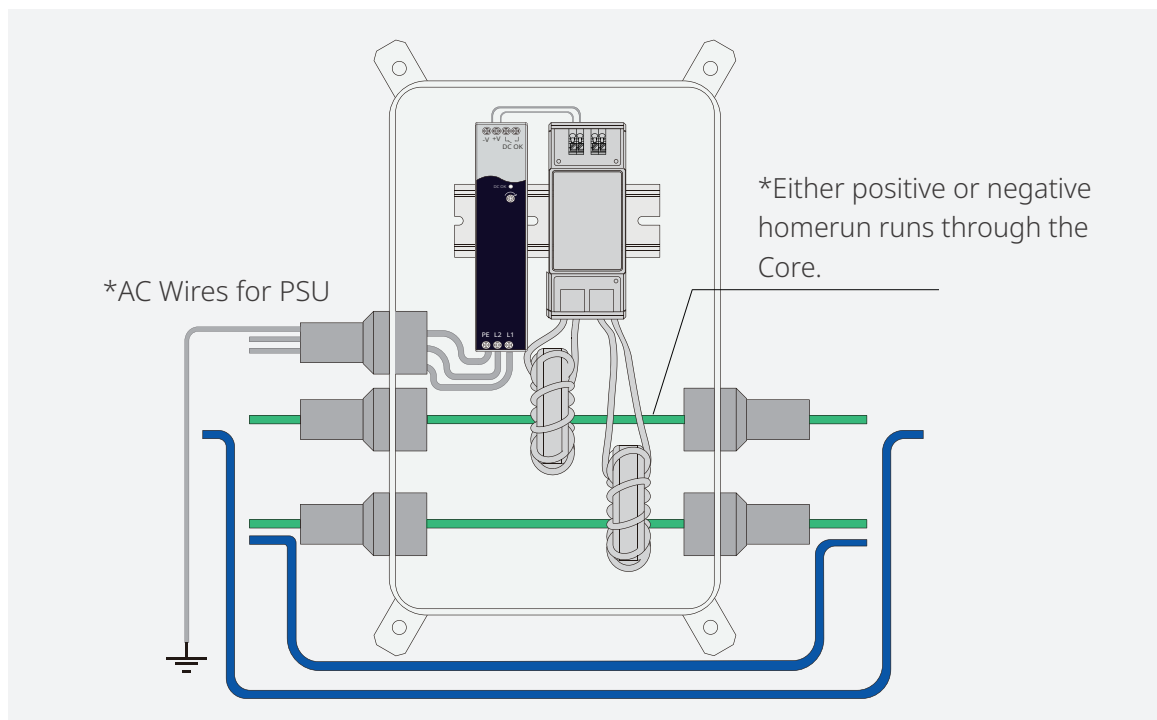
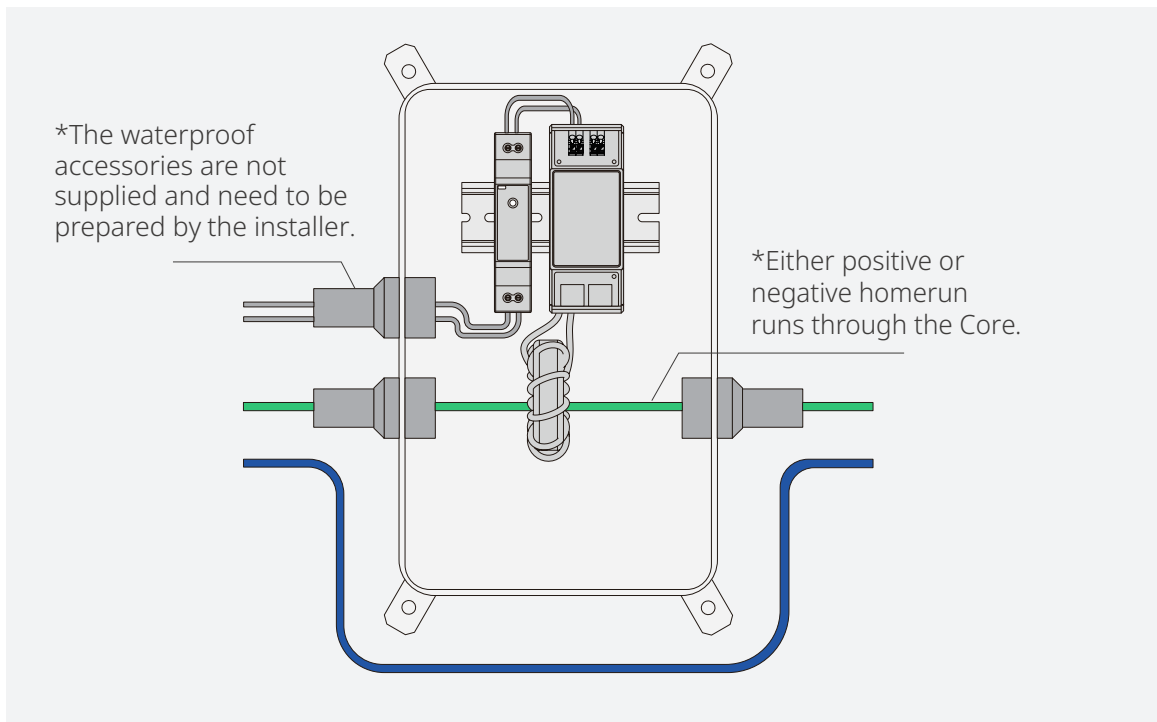
A) - Mount HT10 and power supply on DIN rail.

- Connect DC leads from power supply to HT10.
- Connect the Core to the Transmitter.

If there's only one Core to connect, start with Core 1.



B) - Pass either positive homerun or negative homerun through the Core.




NOTICE

- For common mistakes, refer to 5.2 HT10, [on page 12](#).

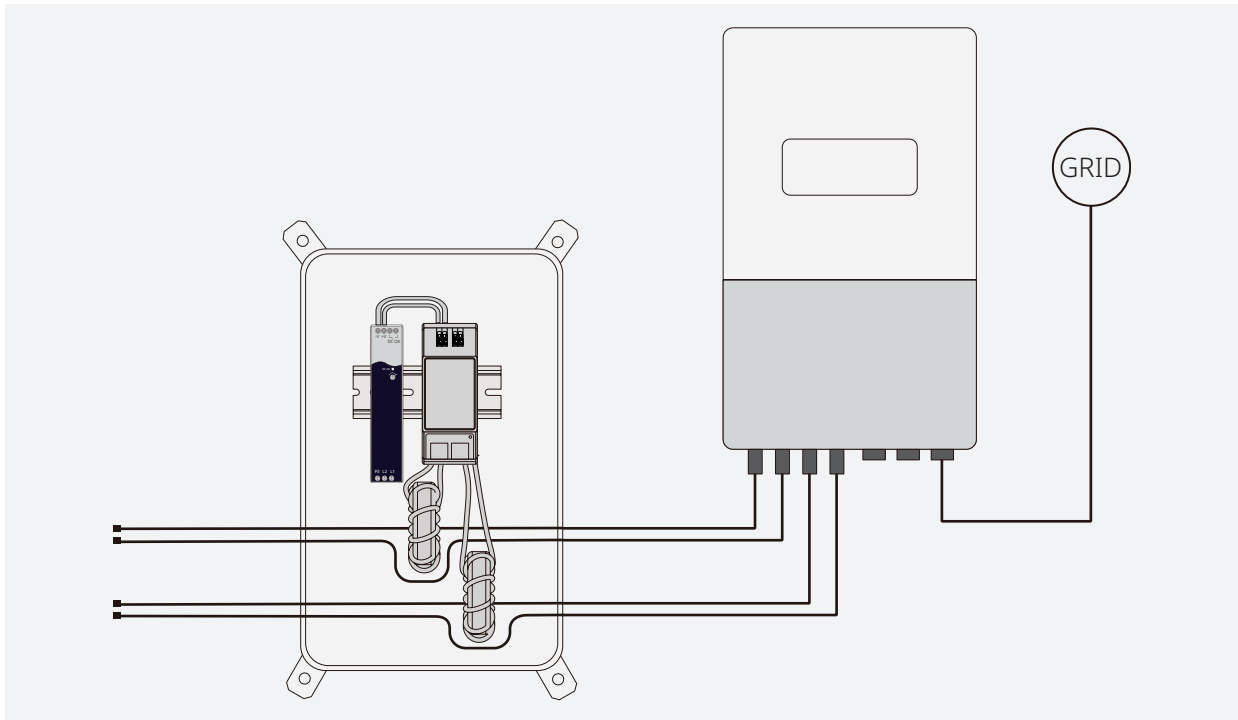
C) - Connect ground wires.

- Ground all conduit connections.

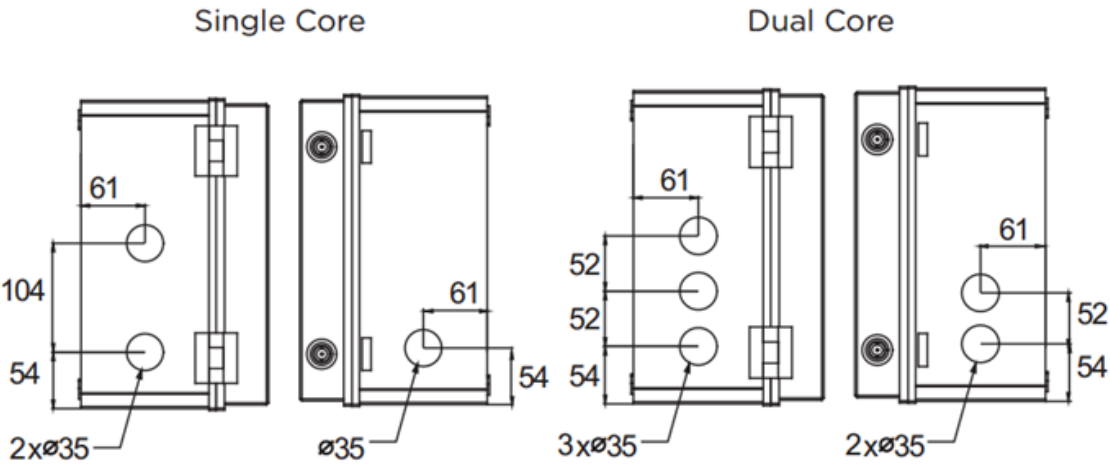
 NOTICE	<ul style="list-style-type: none">• The non-metallic enclosure does not provide grounding between conduit connections. Use grounding-type bushings and jumper wires.
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D) - Connect the serially connected outputs of HRSD-1C to the inverter with a DC cable.

- Turn on AC power to Transmitter HT10-Kit power supply to activate the “permission to operate” signal.



5.4 Recommended Conduit Drilling Guide



6. Troubleshooting

6.1 Term

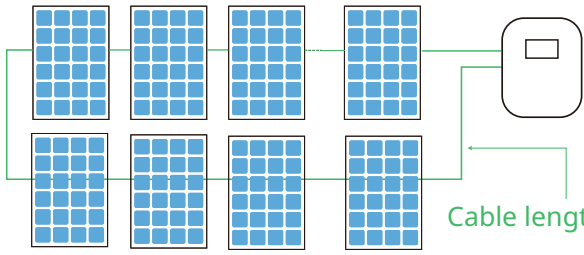
- PV module string: a group of panels wired into a single input on your inverter.
- Voc: Stands for open-circuit voltage, which is the maximum voltage the PV module can produce when it is not connected to a load.

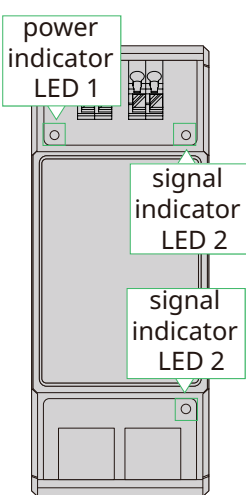
6.2 Troubleshooting Guide

6.2.1 PV module string has no DC voltage (0 V)

Problem	The output voltage of one or more PV module strings is displayed as 0.0 V on the inverter monitoring platform.
Possible Cause	There is an open circuit condition within the PV module string due to the wiring issues in the connectors, or there is an operation abnormal of HRSD.
Troubleshooting Procedure	
Step 1	Find the failed PV module string and disconnect the inverter from it. Check each connector in the faulty string for accidental disconnections or loose connections. If any looseness or disconnection issues are found, replug the connectors and check whether the string voltage displayed on the inverter monitoring platform has returned to normal. If the voltage has not returned to normal, move on to Step 2 .
Step 2	Visually check the HRSD for a bulging cover or any visible damage. If there are visible signs of damage around the HRSD, contact the distributor for a replacement. Otherwise, reconnect the inverters to the PV module strings and observe the voltage changes of the PV module string.
Step 3	If the string output is still 0 V, refer to 6.2.3 HRSD has no output voltage (0 V) .

6.2.2 PV module string has less output voltage than expected

Problem	The voltage displayed on the inverter monitoring platform is significantly lower than the expected $V_{oc} \times n^*$. *n: Here, n refers to the number of PV modules in each string.
Possible Cause	This issue may be related to various factors, such as power supply failure in the transmitter, signal interference between the transmitter and the HRSD, internal malfunction or power supply failure in the HRSD, wiring issues in the PV module string, or damage to the PV modules.
Troubleshooting Procedure	
Step 1	<p>Confirm the following installation are correct:</p> <ul style="list-style-type: none"> • The current passing through the Core aligns with the data specified in the Transmitter's user manual. • The cable length (the PV+ to PV- loop of each PV string) should not exceed 2625 ft. (800 m). • The homeruns passing through the Core must be of the same polarity, either all positive or all negative.  <p>Cable length: < 2625 ft. (800 m)</p>

Step 2	Check and ensure the power supply to the Transmitter is functioning properly. Observe whether the power indicator LED 1 is solid . If LED 1 is solid , proceed to Step 3 . Otherwise, manually test the power supply with a multimeter to check whether the voltage is 12 V. If the voltage is 12 V, move on to Step 3 . If not, replace the power supply.	 <p>power indicator LED 1</p> <p>signal indicator LED 2</p> <p>signal indicator LED 2</p>
Step 3	Check and ensure the signal indicator of the Transmitter is functioning properly. Observe whether the signal indicator LED 2 is flashing. If the LED 2 is flashing, proceed to Step 4 . If the LED 2 is solid , it means that the Transmitter has not sent a "Permission to Operate" signal. Restart the transmitter and observe whether the LED 2 returns to flashing. If it does, proceed to Step 4 . If the LED 2 is still solid , contact Hoymiles technical support team.	
Step 4	Check whether there are loose connections between PV modules and HRSD. If there are loose connections, reconnect the connectors. Otherwise, proceed to Step 5.	
Step 5	Check if the PV modules and the HRSD are functioning properly. If the Transmitter is functioning and generating a "Permission to Operate" signal, follow the steps below to check the PV modules and the HRSD. (If you don't have the necessary equipment, skip the following steps.) <ol style="list-style-type: none">1. Use a camera or a handheld temperature gun to check if there is a module with an abnormally low-temperature reading in the PV module string.2. Use a multimeter to sequentially test the voltage on OUT+ and OUT- of each HRSD.<ul style="list-style-type: none">• If an HRSD's OUT+ and OUT- give the same voltage, it indicates that this HRSD has no output voltage and should be replaced.• If there is a certain voltage difference between the OUT+ and OUT- of the HRSD, it indicates that this HRSD is working normally. Disconnect this HRSD and measure the PV module's output voltage. If the PV module has no output voltage, it means that the issue may be the PV module and it needs to be replaced.	

6.2.3 HRSD has no output voltage (0 V)

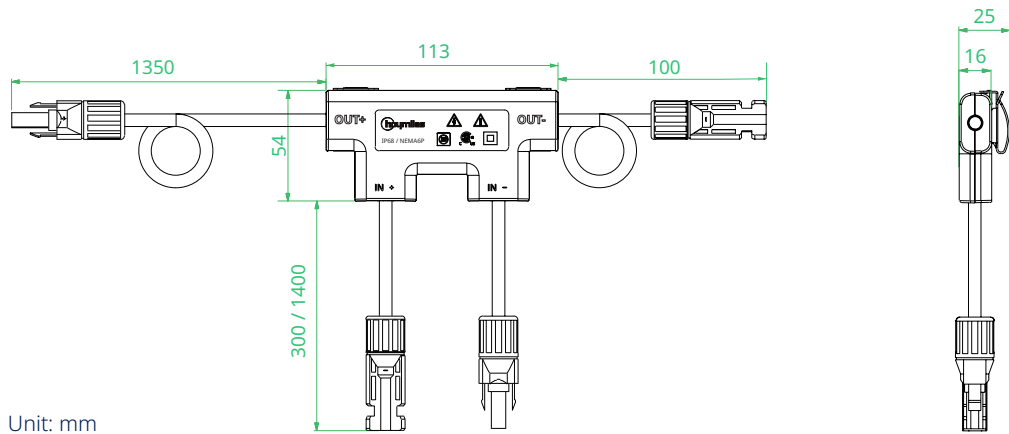
Problem	The output voltage of a certain HRSD is measured at 0 V.
Possible Cause	There is an internal malfunction in this equipment.
Troubleshooting Procedure	
Step 1	Check and ensure the rapid shutdown system is connected properly.
Step 2	Check if the PV modules are functioning properly. Disconnect the HRSD from the PV module and use a multimeter to measure the output voltage of the PV module. If the output voltage is normal (depending on the specification of your PV plant, the standard of 'normal' might be different), it indicates that the issue may be the HRSD. Proceed to measure the output voltage of the HRSD with a multimeter . Otherwise, replace the PV module.
Step 3	Check if the HRSD is functioning properly. Check and ensure that the PV modules are functioning properly and the PV modules and HRSDs are correctly connected. Once these have been confirmed, measure the output voltage of the HRSD with a multimeter. If the output voltage is still 0 V, it means that there is an internal malfunction in HRSD. Contact Hoymiles Technical Support Team to replace the HRSD.

7. Technical Specifications

7.1 HRSD-1C		
Model	HRSD-1C	HRSD-1C-B
Electrical Data		
Input voltage range	13-80 V	13-65 V
Maximum current	15 A	20 A
Maximum short circuit current	25 A	
Maximum system voltage	1000 V / 1100 V (1500 V optional)	
Communication type	SunSpec PLC	
Shutdown output voltage	1 V	
Power consumption	200 mW	
Mechanical Data		
Input connectors	MC4 / MC4 EVO2, optional	
Input cable length ¹	0.3 m (0.98 ft.) / 1.4 m (4.59 ft.), optional	
Output connectors	MC4 / MC4 EVO2, optional	
Output cable length ²	1.35 m (+) / 0.1 m (-) 4.43 ft. (+) / 0.33 ft. (-)	
Dimensions	113 x 54 x 16 mm (4.45 x 2.13 x 0.63 inch)	
Environmental		
Operating temperature range	-40°C to +85°C (-40°F to +185°F)	
Outdoor rating	IP68 / NEMA6P	
Compliance		
Safety	UL1741, CSA C22.2 No. 330-17, IEC/EN 62109-1	
EMC	FCC Part15 Class B, ICES-003, IEC/EN 61000-6-1/-2/-3/-4	

*1: The former matches PV module output cables of 1.3 m (4.27 ft.) at minimum, and the latter matches those of 0.2 m (0.66 ft.) at minimum.

2: Fits PV module in portrait installation. Contact Hoymiles if horizontal installation is needed.



7.2 HT10

Electrical

Transmitter input voltage	12 VDC (+/-2%)
Transmitter input current	1 A
Communication type	SunSpec PLC

Core

Number of configure Core	1	1	2
Max. current per Core	75 A	150 A	150 A
DC cable diameter	Φ 6 mm Φ 6.45 mm Φ 7 mm	Φ 6 mm Φ 6.45 mm Φ 7 mm	Φ 6 mm Φ 6.45 mm Φ 7 mm
Max. number of strings per Core*	5 4 3	15 12 10	15 12 10

Mechanical

Dimensions	93 x 36.5 x 53 mm (3.66 x 1.44 x 2.09 inch)
Mounting type	DIN35 Rail

Environmental

Operating temperature range	-40°C to +85°C (-40°F to +185°F)
Outdoor rating	IP30 / NEMA1

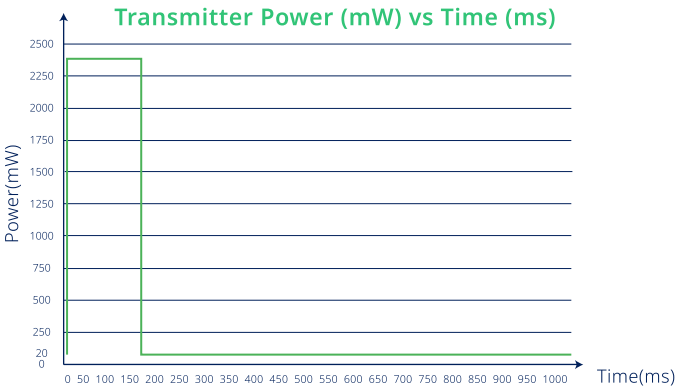
Compliance

Safety	UL1741, CSA C22.2 No. 330-17
EMC	FCC Part15 Class B, ICES-003

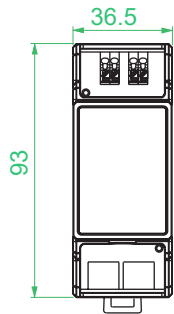
* The maximum number of strings per Core is determined by the DC cable current and diameter. The total current should not exceed the Core's maximum allowed current, and the total cable diameter should not exceed the Core's diameter. If the actual cable diameter exceeds the reference diameter, the maximum number of strings per Core will be reduced accordingly.

When installed inside an inverter, HT10 needs to be powered with the following power curve at least.

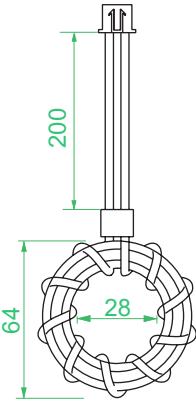
- Voltage: 12 VDC (+/-2%)
- Power Standby: 0.2 W
- Duty Cycle: 16%
- Max. Power: 3W



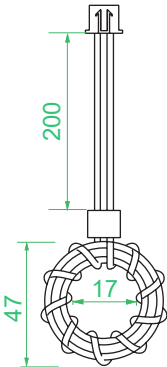
Unit : mm



Transmitter



Core-150 A



Core-75 A

7.3 HT10-Kit

Electrical										
Transmitter input voltage		12 VDC (+/-2%)								
Transmitter input current		1 A								
Input voltage range		85-264 VAC			180-550 VAC			180-550 VAC		
Communication type		SunSpec PLC								
Core										
Number of configure Core		1			1			2		
Max. current per Core		75 A			150 A			150 A		
DC cable diameter		Φ 6 mm	Φ 6.45 mm	Φ 7 mm	Φ 6 mm	Φ 6.45 mm	Φ 7 mm	Φ 6 mm	Φ 6.45 mm	Φ 7 mm
Max. number of strings per Core*		5	4	3	15	12	10	15	12	10
Mechanical										
Dimensions		93 x 36.5 x 53 mm (3.66 x 1.44 x 2.09 inch)								
Mounting type		DIN35 Rail								
Environmental										
Operating temperature range		-40°C to +85°C (-40°F to +185°F)								
Outdoor rating		IP65								
Compliance										
Safety		UL1741, CSA C22.2 No. 330-17								
EMC		FCC Part15 Class B, ICES-003								

* The maximum number of strings per Core is determined by the DC cable current and diameter. The total current should not exceed the Core's maximum allowed current, and the total cable diameter should not exceed the Core's diameter. If the actual cable diameter exceeds the reference diameter, the maximum number of strings per Core will be reduced accordingly.

