



Tigo®

Installation Manual

TS4-F, TS4-A-F, TS4-A-2F
and RSS Transmitter

IMPORTANT SAFETY INSTRUCTIONS

LETHAL VOLTAGE MAY BE PRESENT IN ANY PV INSTALLATION

SAVE THESE INSTRUCTIONS

- This manual contains important instructions for installation and maintenance of the Tigo product models TS4-F, TS4-A-F, TS4-A-2F, and the RSS Transmitter.
- Risk of electric shock, do not remove cover, disassemble, or repair, no user serviceable parts inside. Refer servicing to qualified service personnel.
- Before installing or using the Tigo System, please read all instructions and warning markings on the Tigo products, appropriate sections of your inverter manual, photovoltaic (PV) module installation manual, and other available safety guides.
- Failure to adhere to these instructions may result in injury or death, damage to the system or voiding the factory warranty.
- To reduce risk of fire and shock hazard, install this device with strict adherence to National Electric Code (NEC) ANSI/NFPA 70 and/or local electrical codes. When the photovoltaic array is exposed to light, it supplies a DC voltage to the Tigo TS4 units and the output voltage may be as high as the PV module open circuit voltage (V_{OC}) when connected to the module. The installer should use the same caution when handling electrical cables from a PV module with or without the TS4 units attached.
    - TS4-F, TS4-A-F and TS4-A-2F are shipped in the OFF position and will measure 0.6V at the output when the keep-alive signal is not present.
- Installation must be performed by trained professionals only. Tigo does not assume liability for loss or damage resulting from improper handling, installation, or misuse of products.
- Remove all metallic jewelry prior to installing the Tigo TS4 units to reduce the risk of contacting live circuitry. Do not attempt to install in inclement weather.
- Do not operate the Tigo TS4 units if they have been physically damaged. Check existing cables and connectors, ensuring they are in good condition and appropriate in rating. Do not operate Tigo TS4 units with damaged or substandard wiring or connectors. Tigo TS4 units must be mounted on the high end of the PV module backsheet or racking system, and in any case above ground.
- Do not connect or disconnect under load. Turning off the inverter and/or the Tigo products may not reduce this risk. Internal capacitors within the inverter can remain charged for several minutes after disconnecting all power sources. Verify capacitors have discharged by measuring voltage across inverter terminals prior to disconnecting wiring if service is required. Wait 30 seconds after rapid shutdown activation before disconnecting DC cables or turning off DC disconnect.
- Always assume TS4 units are in “ON” state, or may turn on when restarting.

The transmitter control power supply MUST be on the same AC branch circuit as the inverter to meet rapid shutdown requirements.

TABLE OF CONTENTS

TS4-F Rapid Shutdown System 4

System Overview: TS4-F 5

System Overview: TS4-A-F 6

System Overview: TS4-A-2F 7

Installation Notes 8

TS4-F Installation 9

TS4-A-F Installation 10

TS4-A-2F Installation 11

RSS Transmitter Installation – Single RSS Core 12

RSS Transmitter Wiring – Single RSS Core 13

RSS Transmitter Grounding – Single RSS Core 14

RSS Transmitter Installation – Dual RSS Core 15

RSS Transmitter Wiring – Dual RSS Core 16

RSS Transmitter Grounding – Dual RSS Core 17

RSS Transmitter Commercial Installation 18

RSS Transmitter Commercial Wiring 19

Technical Specifications – TS4-F 21

Technical Specifications – TS4-A-F 22

Technical Specifications – TS4-A-2F 23

Technical Specifications – RSS Transmitter 24

Technical Specifications – RSS Transmitter Commercial Kit 25

Technical Specifications – RSS Transmitter Outdoor Kit 26

Testing Rapid Shutdown 27

Troubleshooting 28

Conduit Drilling Guide 29

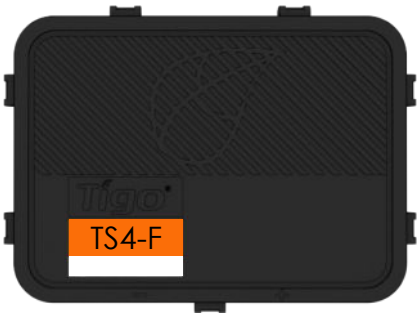
Miscellaneous 30

Installation Complete 31

TS4-F RAPID SHUTDOWN SYSTEM

Tigo's TS4-F (or TS4-A-F, TS4-A-2F) and RSS Transmitter are a UL-certified PVRSS (Photovoltaic Rapid Shutdown System) when installed together. The RSS Transmitter supplies a keep-alive signal along one of the DC homeruns and the TS4-F units on each module will shut down when the Transmitter is switched off.

Module-Level Power Electronics:



TS4-F

- NEC 2017 and 2020 690.12 rapid shutdown compliant
- Module-level deactivation
- PLC communication
- Plug & play, no configuration required

Transmitter:



RSS Transmitter

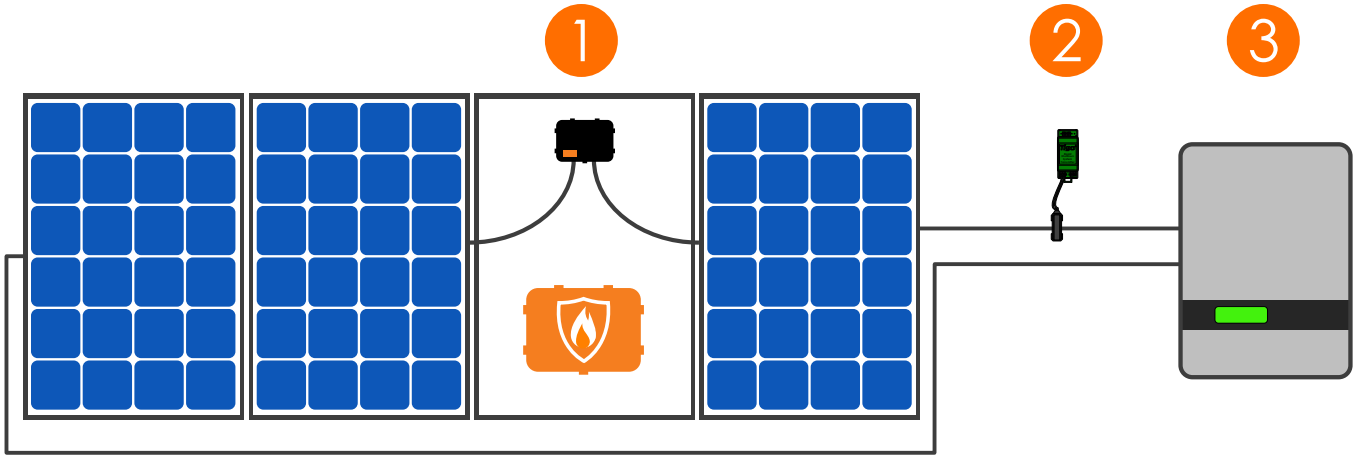
- Rapid Shutdown System Transmitter for rapid shutdown activation of TS4-F, TS4-A-F, or TS4-A-2F units
- The external device that provides a keep-alive signal to the TS4-F via Power Line Communication

SYSTEM OVERVIEW: TS4-F



TS4-F

- Module electronics are contained in the junction box, installed at the PV module factory.
- Connected in series like regular modules
- No additional wiring connections to make



1. Modules with integrated TS4-F
2. RSS Transmitter and RSS Core
3. Inverter

The TS4-F requires a Tigo RSS Transmitter or inverter with built-in transmitter for operation. The Tigo RSS Transmitter is installed in line with a solar PV inverter, as shown, and can be installed inside the inverter or external to it.

Method of Operation
All TS4-F units start in the OFF position and measure 0.6V at the output. When power is supplied to the RSS Transmitter, the TS4-F units turn ON and allow full PV module voltage.

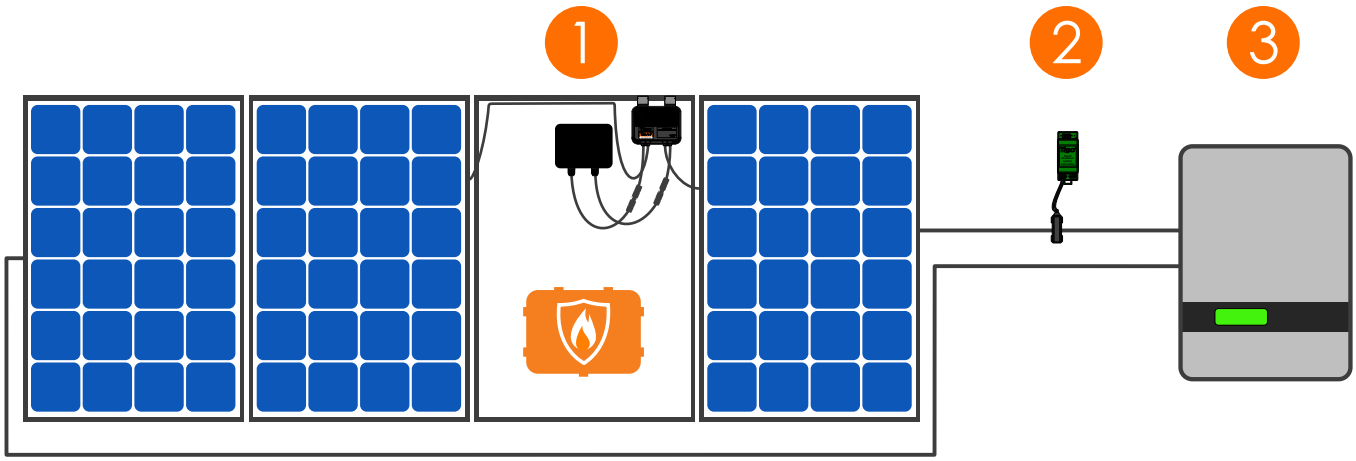
The units constantly receive a "keep-alive" signal from the transmitter over PLC. When power to the transmitter is cut, this keep-alive signal ceases, sending every TS4-F into shutdown mode with output reduced to 0.6V.

SYSTEM OVERVIEW: TS4-A-F



TS4-A-F

- Bracket clips to module frame without tools
- TS4-A outputs are connected in series to form a string
- No additional grounding required



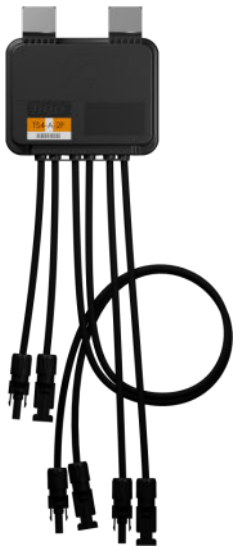
1. Modules with TS4-A-F add-on
2. RSS Transmitter and RSS Core
3. Inverter

Note: connect modules to TS4-A inputs before connecting outputs

The TS4-A-F requires a Tigo RSS Transmitter or inverter with built-in transmitter for operation.

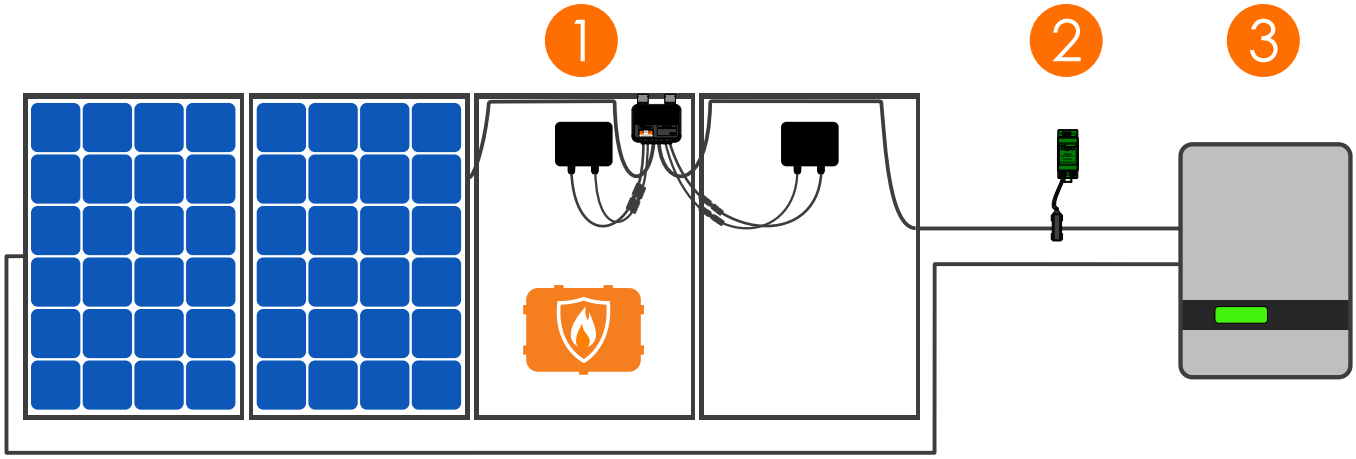
- TS4-A-F mounting is recommended on the upper right as shown, but can be placed elsewhere on the frame or bolted to the racking if needed.
- TS4-A-F cable glands must not be facing up.
- Allow clearance between PV module and mounting surface for air circulation around TS4-A-F.
- For installation on frameless modules, remove metal clips and bolt TS4-A to rail. Do not drill additional mounting holes in the frame or metal bracket.

SYSTEM OVERVIEW: TS4-A-2F



TS4-A-2F

- Bracket clips to module frame without tools
- TS4-A outputs are connected in series to form a string
- No additional grounding required



1. Modules with TS4-A-2F add-on
2. RSS Transmitter and RSS Core
3. Inverter

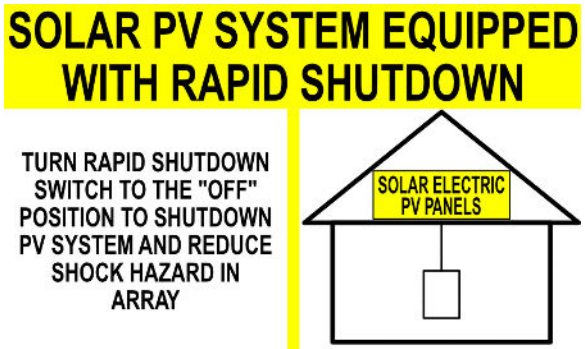
Note: connect modules to TS4-A inputs before connecting outputs

The TS4-A-2F requires a Tigo RSS Transmitter or inverter with built-in transmitter for operation.

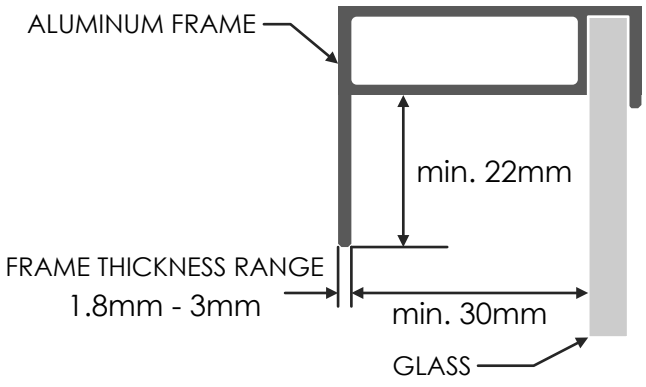
- TS4-A-F mounting is recommended on the upper right as shown, but can be placed elsewhere on the frame or bolted to the racking if needed.
- TS4-A-F cable glands must not be facing up.
- Allow clearance between PV module and mounting surface for air circulation around TS4-A-F.
- For installation on frameless modules, remove metal clips and bolt TS4-A to rail. Do not drill additional mounting holes in the frame or metal bracket.

INSTALLATION NOTES

- TS4-F, TS4-A-F, and TS4-A-2F are shipped in the OFF position and will measure **0.6V** at the output when the keep-alive signal is not present.
- Failing to follow the sequence of installation steps may result in TS4 damage not covered under warranty.
- Connect all TS4-A-F or TS4-A-2F units to their respective modules **before** connecting their outputs in series.
- Install all TS4-F, TS4-A-F, or TS4-A-2F units **before** powering on the RSS Transmitter.
- Never modify or extend wires between RSS Transmitter and RSS Core.
- Never apply an external voltage source to a module or string equipped with TS4-F, TS4-A-F, or TS4-A-2F units.
  - If parallel string connections are needed, first connect the TS4-F, TS4-A-F, or TS4-A-2F to the PV modules, then connect all TS4-F, TS4-A-F, or TS4-A-2F outputs in series, and finally pass one side (+ **or** -) of the homeruns through the PLC transmitter to turn the system ON.
- If connecting TS4-A-2F to a single PV module:
  - Connect PV module to **Input 1**, connect **Input 2** cables together
- Place rapid shutdown system label no more than 1m (3ft) from initiator (AC disconnect) or service panel containing means of disconnection if not at same location.



Place safety labels in proper location

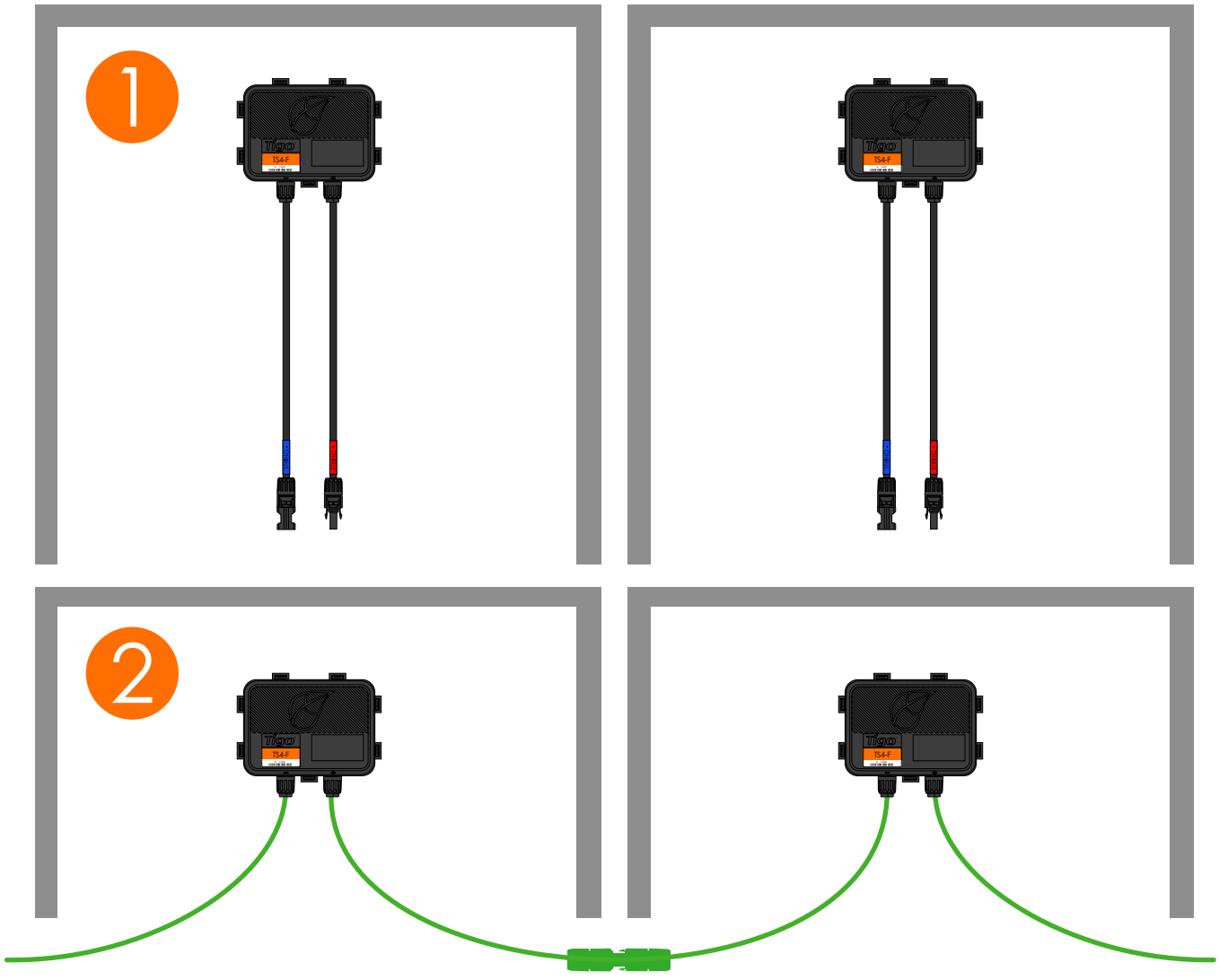


Module frame specifications for mounting TS4-A

TS4-F INSTALLATION

Smart modules with an integrated TS4 Junction box are installed and connected in series just like standard PV modules.

Connect modules with TS4-F in series before powering on the RSS Transmitter.



RSS Transmitter must be powered OFF during TS4-F installation.

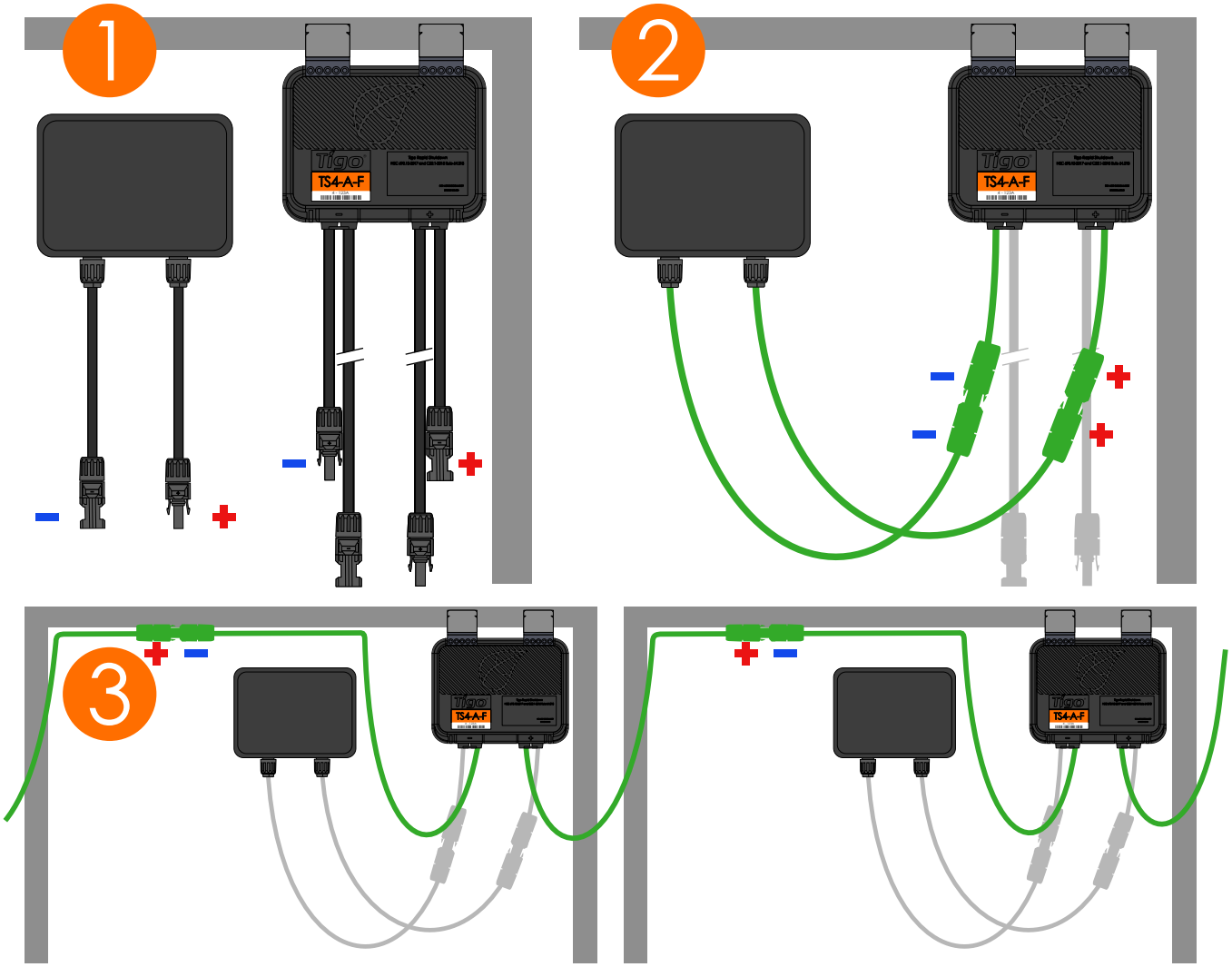
TS4-A-F INSTALLATION

Standard modules can be equipped with TS4-A-F add-on units as shown below.

Always connect modules to TS4-A inputs before connecting outputs.

Each TS4-A-F must have a PV module connected to its input before connecting the outputs of TS4-A-F units in series.

To disconnect TS4-A-F from a module, disconnect the TS4-A-F outputs from the string before disconnecting the TS4-A-F inputs from the module junction box.



RSS Transmitter must be powered OFF during TS4-A-F installation.

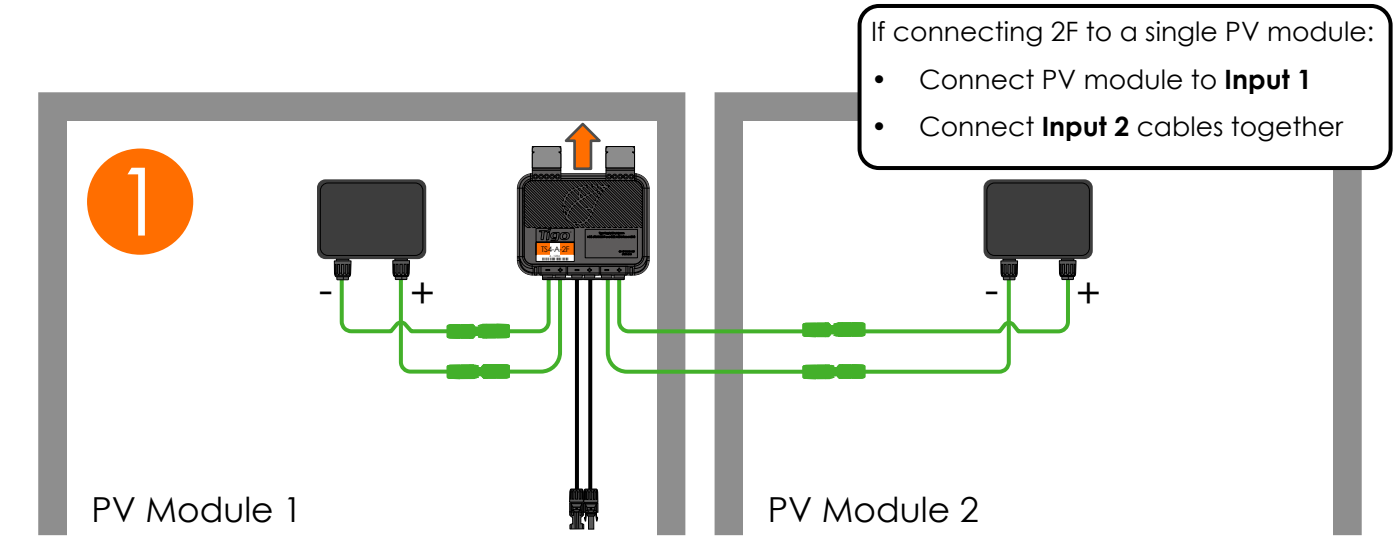
TS4-A-2F INSTALLATION

Standard modules can be equipped with TS4-A-2F add-on units as shown below.

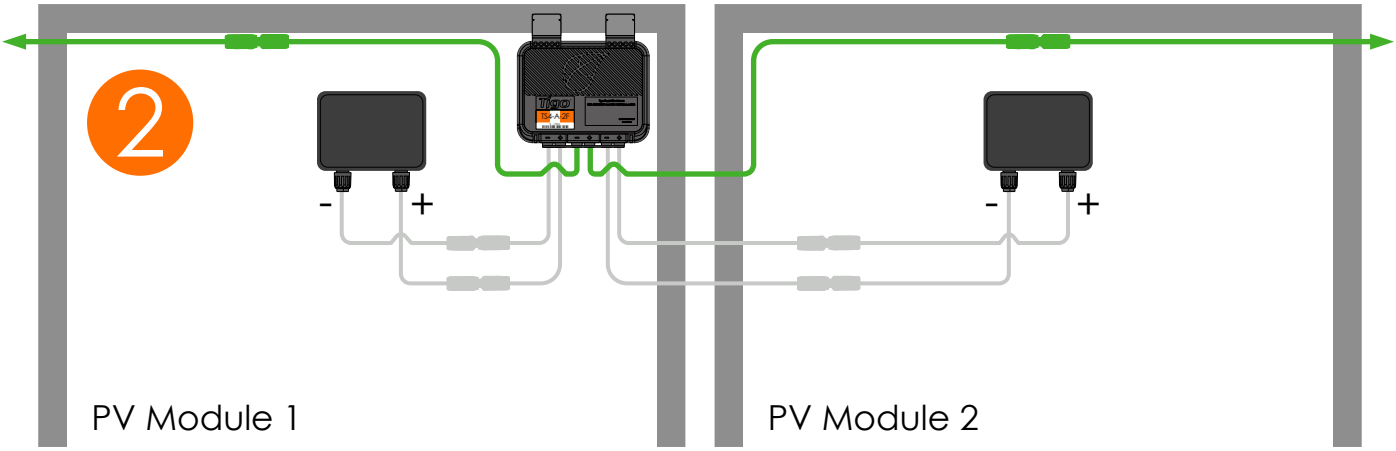
Always connect modules to TS4-A inputs before connecting outputs.

Each TS4-A-2F must have a PV module connected to its inputs before connecting the outputs of TS4-A-2F units in series.

To disconnect TS4-A-2F from a module, disconnect the TS4-A-2F outputs from the string before disconnecting the TS4-A-2F inputs from the module junction box.



1. Connect PV modules to TS4-A-2F inputs

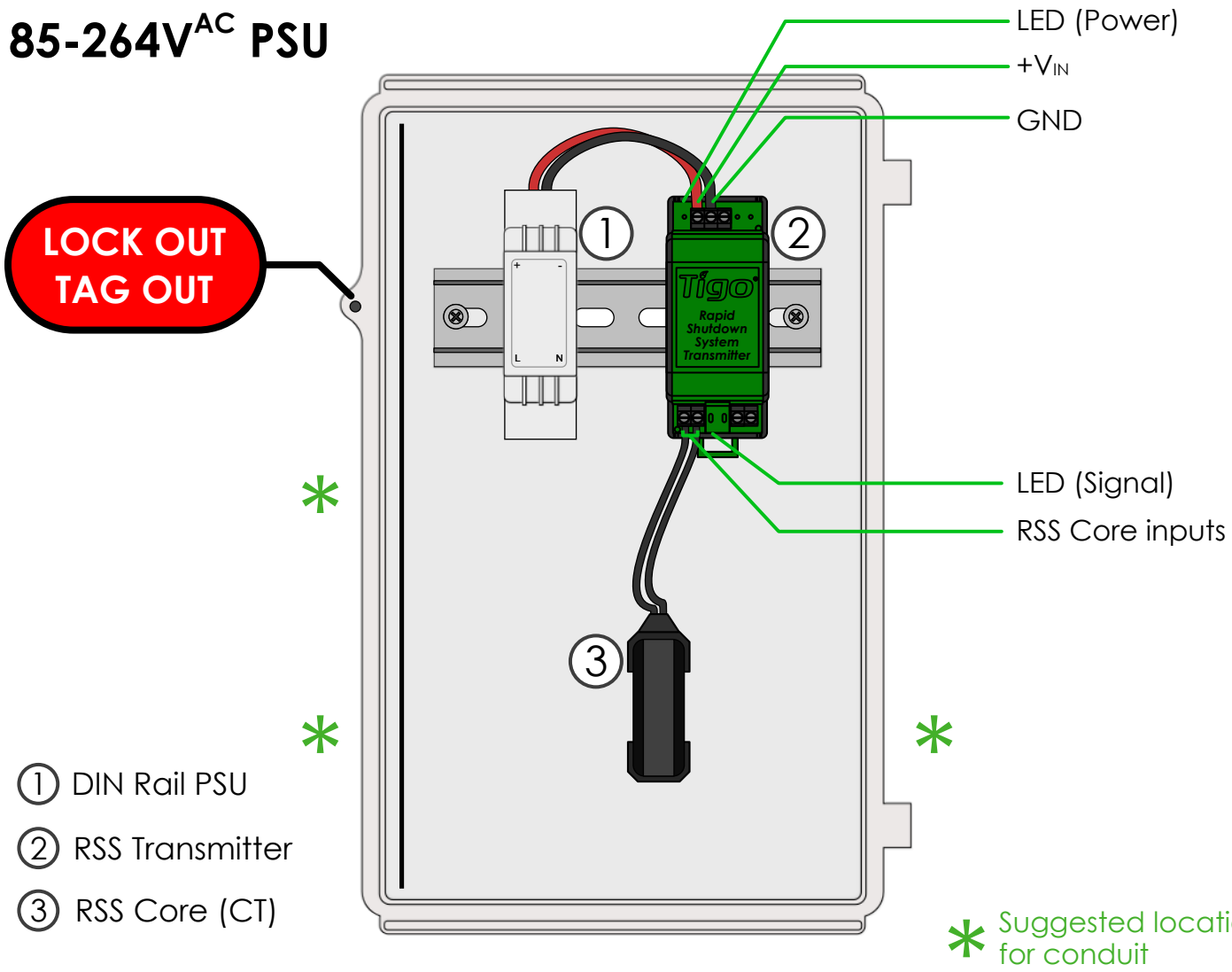


2. Connect TS4-A-2F outputs in series

RSS Transmitter must be powered OFF during TS4-A-2F installation.

RSS TRANSMITTER INSTALLATION – SINGLE RSS CORE

85-264V^{AC} PSU



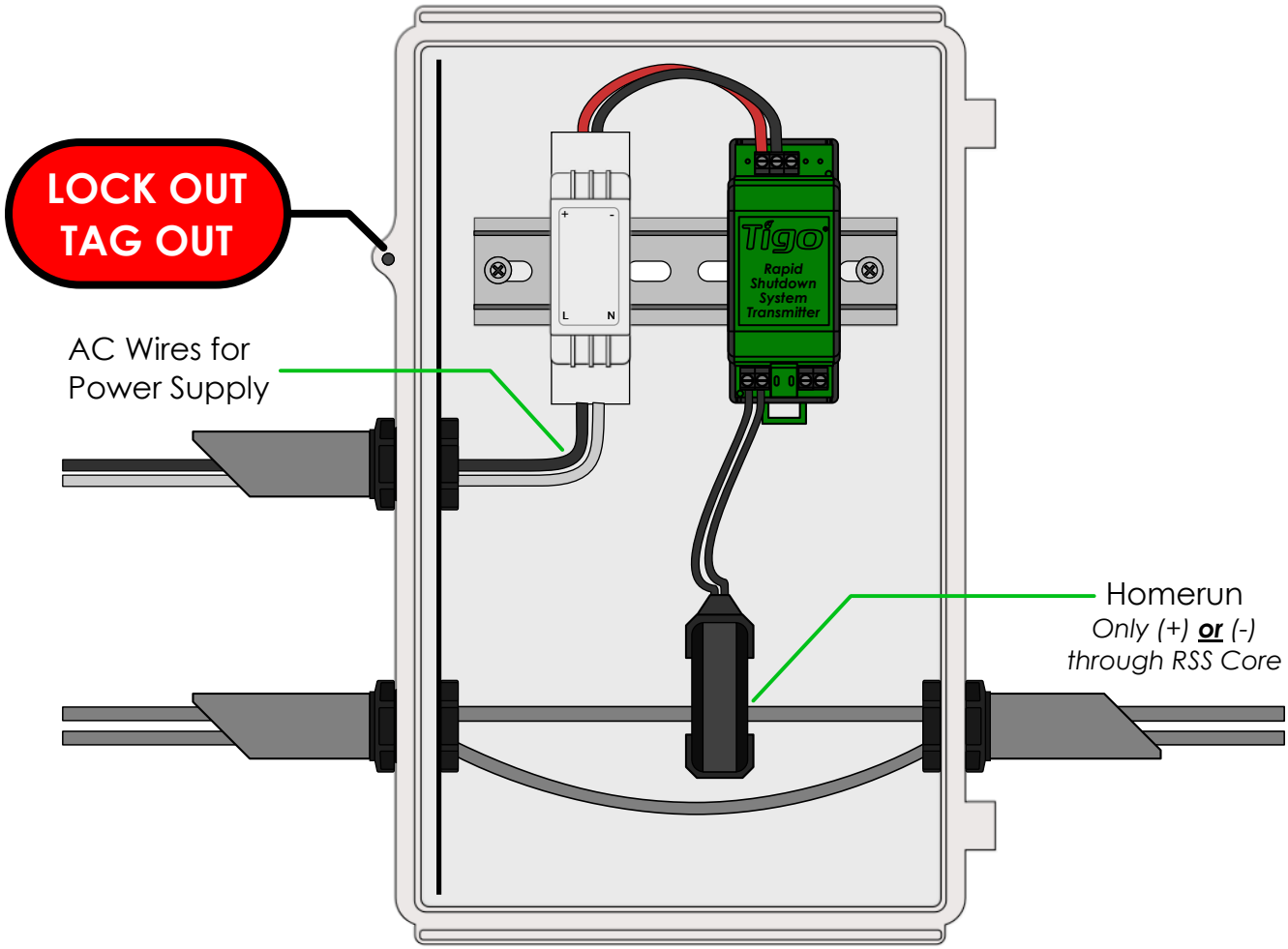
Transmitter power supply must be on same AC branch circuit as inverter to meet rapid shutdown requirements.

Note: Install TS4-F before powering on RSS Transmitter

- Drill holes in enclosure for conduit (see drilling guide for placement)
- Mount RSS Transmitter and power supply on DIN rail
- Connect DC leads from power supply (1) to transmitter (2)
- Connect RSS Core (3) to transmitter

Place rapid shutdown system label no more than 1m (3ft) from RSS Transmitter or AC disconnect if not at same location.

RSS TRANSMITTER WIRING – SINGLE RSS CORE

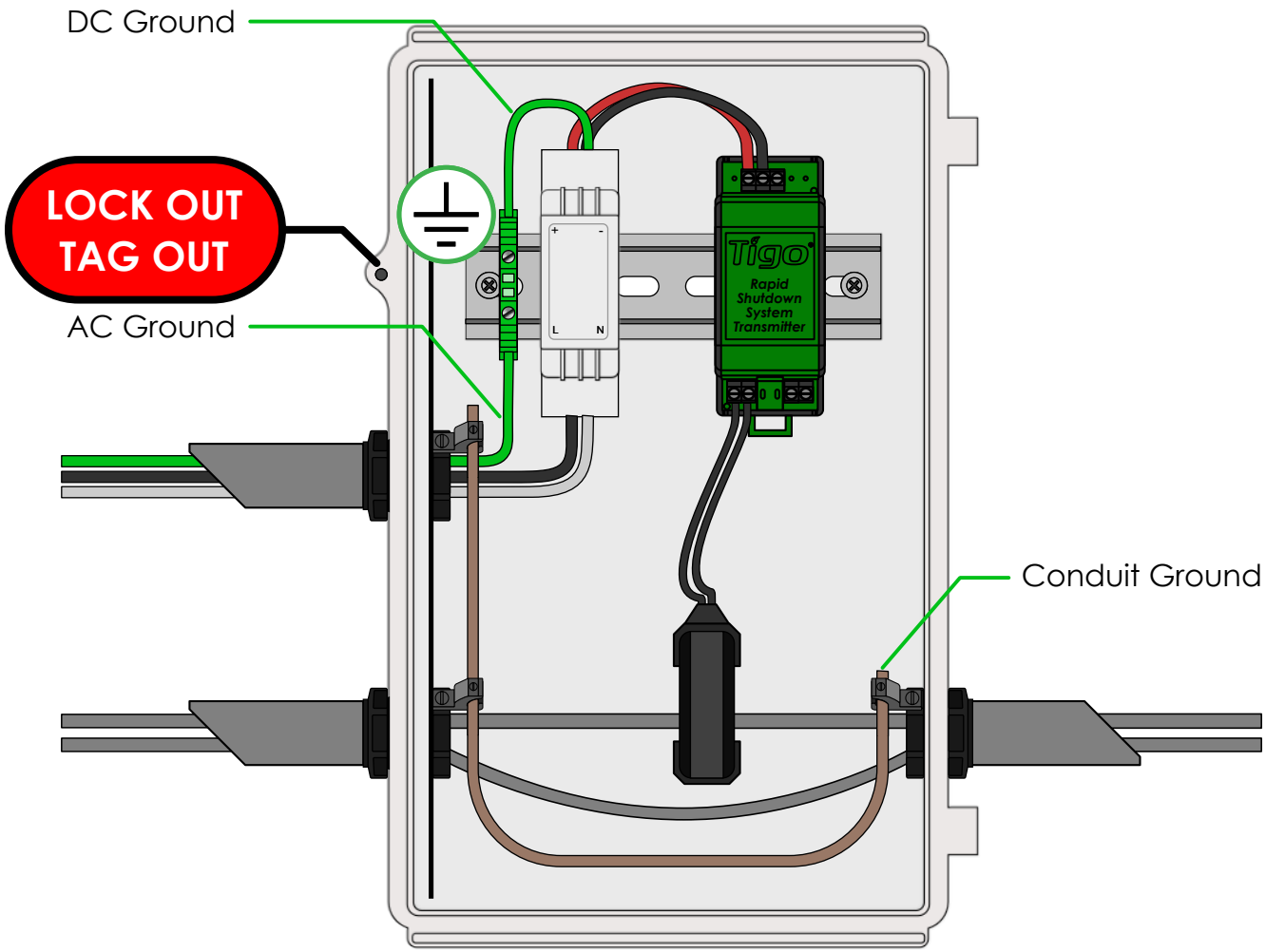


Note: Install TS4-F before powering on RSS Transmitter

- Pass either positive **or** negative homerun through RSS Core
- Connect wires to AC side of power supply

Max number of strings per RSS Core: **10**
Max string length: **30 modules**
Max current per RSS Core: **100A**
Max cable length from inverter (+) to inverter (-): **1000ft (300m)**

RSS TRANSMITTER GROUNDING – SINGLE RSS CORE

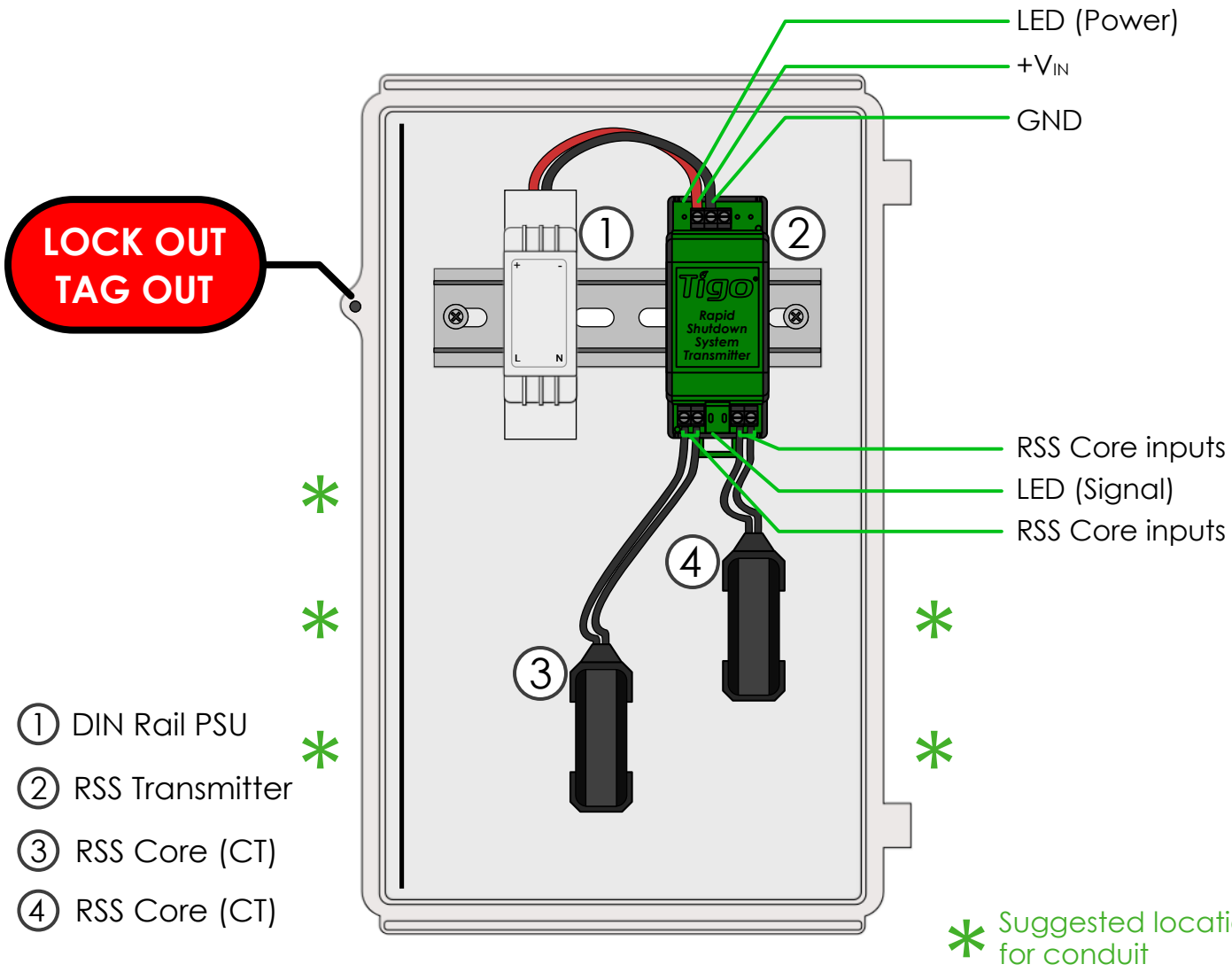


Note: Install TS4-F before powering on RSS Transmitter

- Connect AC and DC ground wires to DIN rail
- Ground all conduit connections
- Turn on AC power to Transmitter power supply to activate keep-alive signal and energize PV array

Warning: nonmetallic enclosure does not provide bonding between conduit connections. Use grounding type bushings and jumper wires.

RSS TRANSMITTER INSTALLATION – DUAL RSS CORE



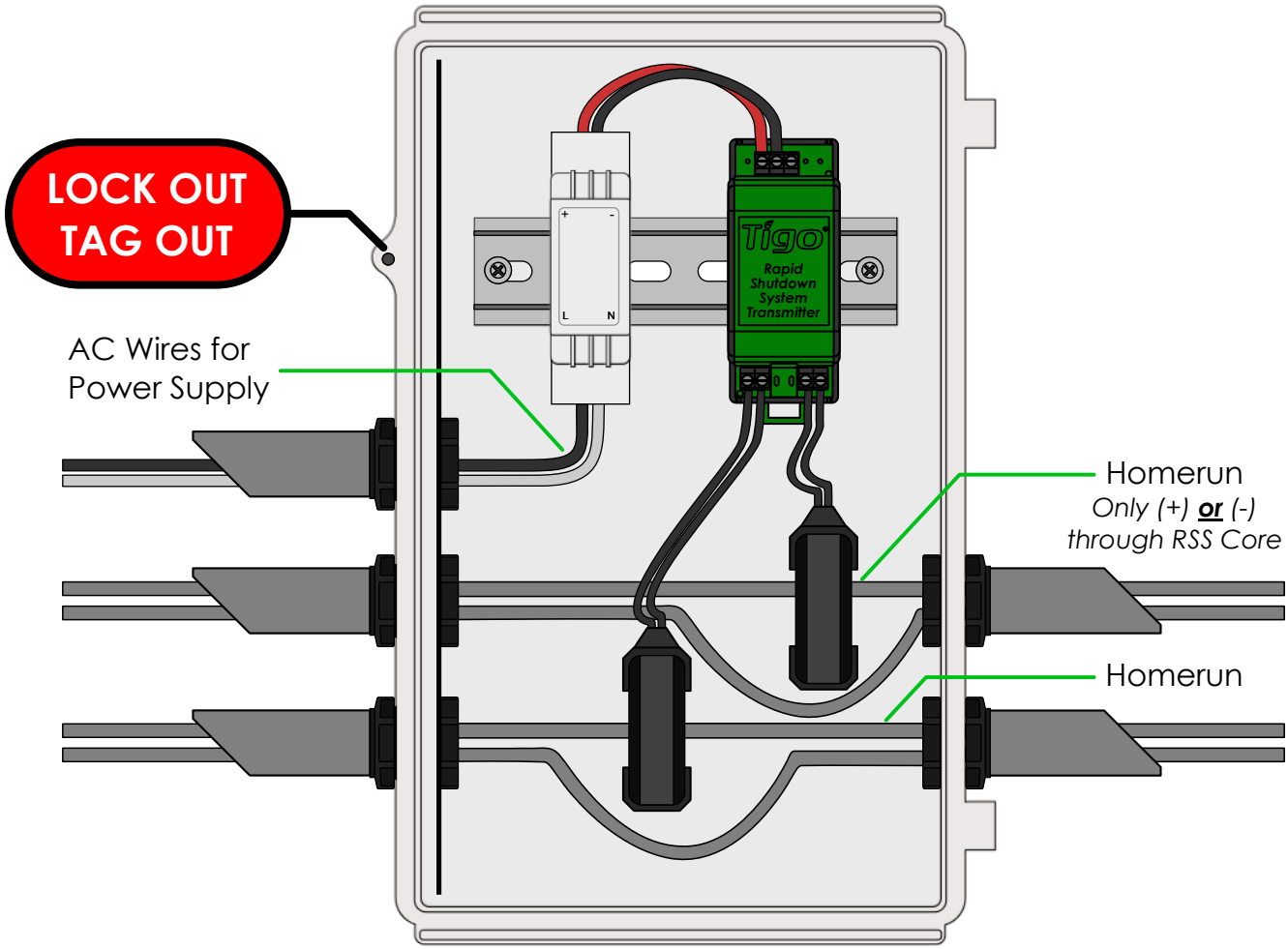
Transmitter power supply must be on same AC branch circuit as inverter to meet rapid shutdown requirements.

Note: Install TS4-F before powering on RSS Transmitter

- Drill holes in enclosure for conduit (see drilling guide for placement)
- Mount RSS Transmitter and power supply on DIN rail
- Connect DC leads from power supply (1) to transmitter (2)
- Connect RSS Core (3) and (4) to transmitter

Place rapid shutdown system label no more than 1m (3ft) from RSS Transmitter or AC disconnect if not at same location.

RSS TRANSMITTER WIRING – DUAL RSS CORE



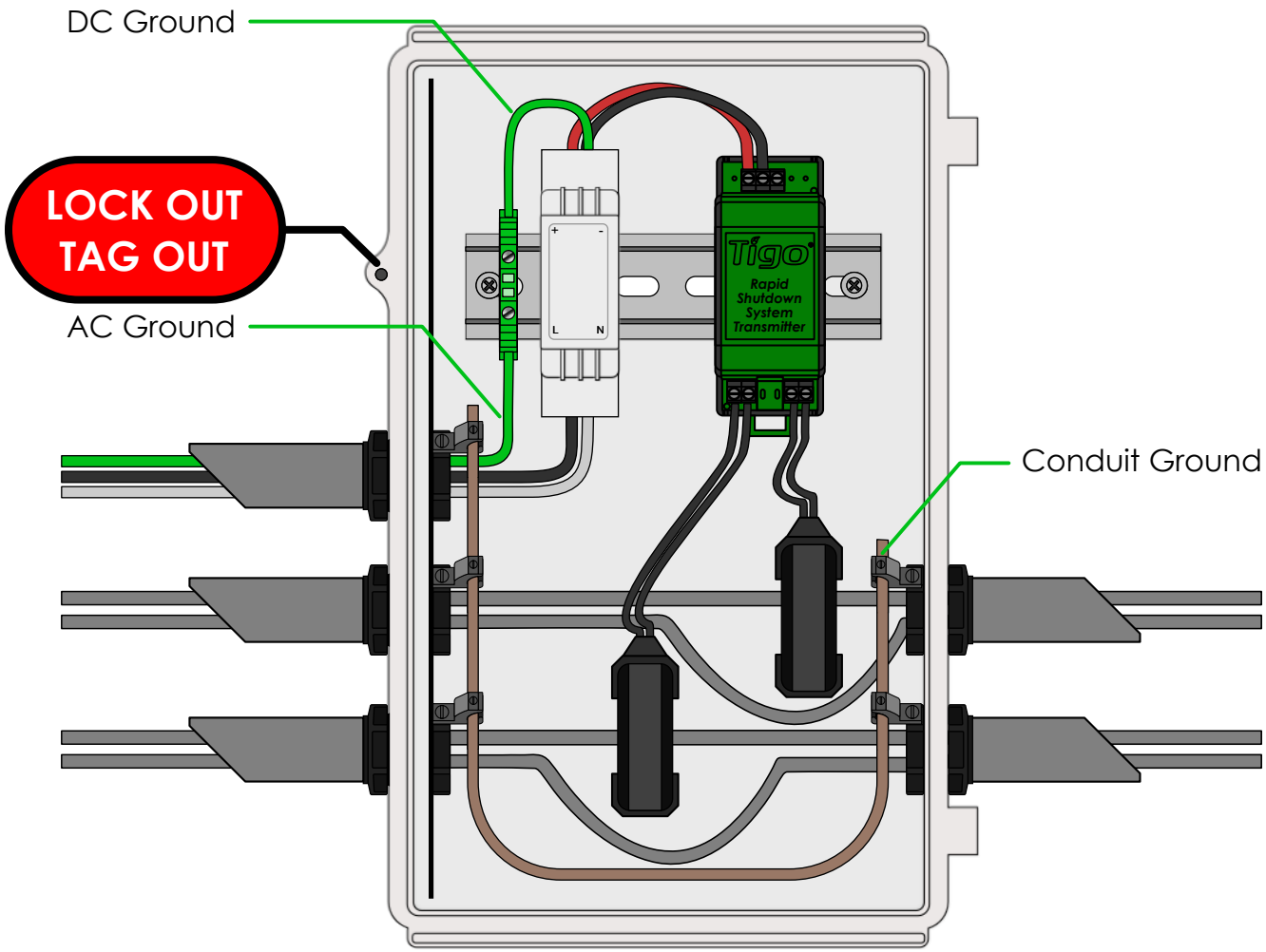
Keep same polarity for all homeruns and RSS Cores throughout the installation

Note: Install TS4-F before powering on RSS Transmitter

- Pass either positive **or** negative homerun through RSS Cores
- Connect wires to AC side of power supply

Max number of strings per RSS Core: **10**
Max string length: **30 modules**
Max current per RSS Core: **100A**
Max cable length from inverter (+) to inverter (-): **1000ft (300m)**

RSS TRANSMITTER GROUNDING – DUAL RSS CORE



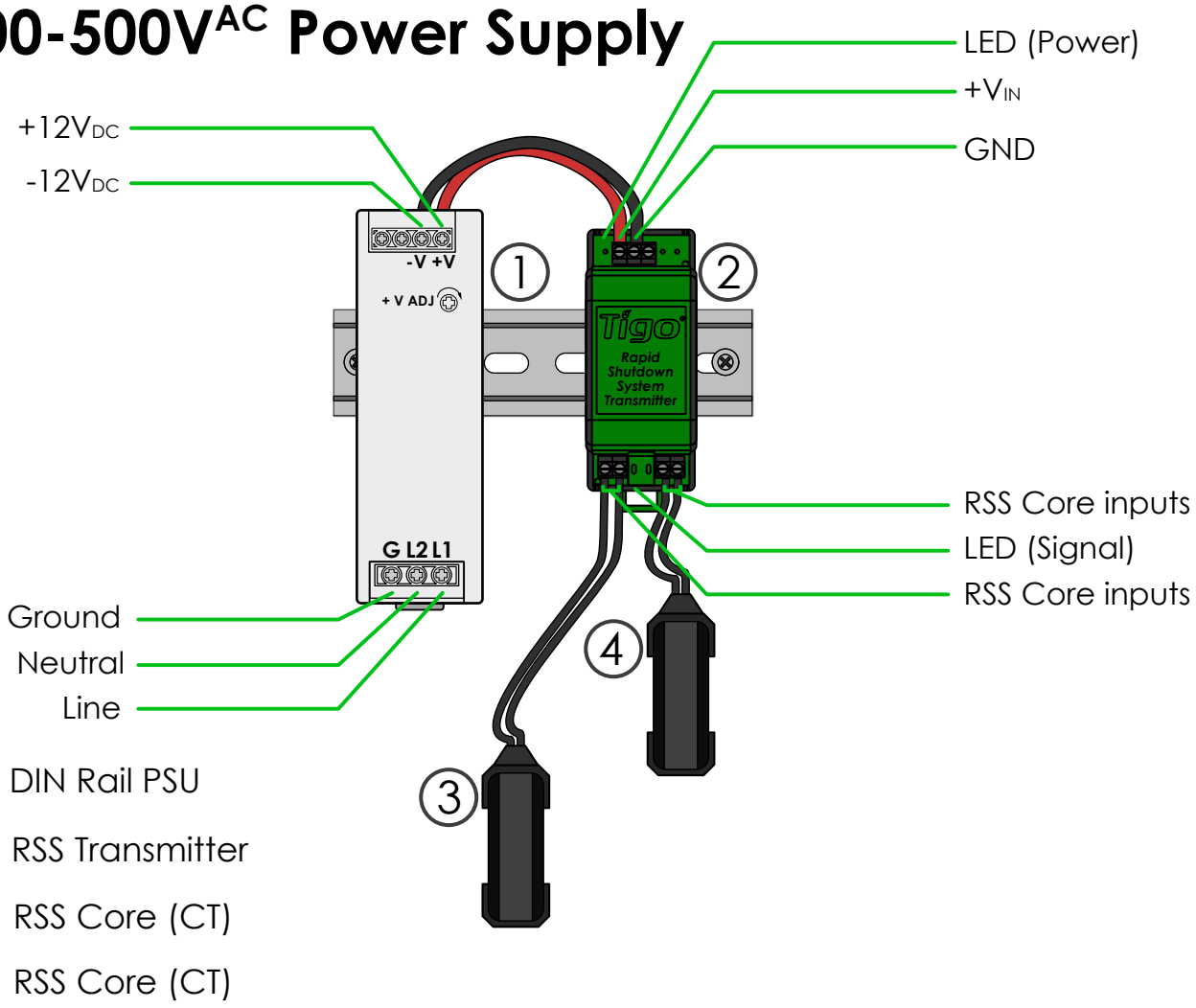
Note: Install TS4-F before powering on RSS Transmitter

- Connect AC and DC ground wires to DIN rail
- Ground all conduit connections
- Turn on AC power to Transmitter power supply to activate keep-alive signal

Warning: nonmetallic enclosure does not provide bonding between conduit connections. Use grounding type bushings and jumper wires.

RSS TRANSMITTER COMMERCIAL INSTALLATION

200-500V^{AC} Power Supply



① DIN Rail PSU

② RSS Transmitter

③ RSS Core (CT)

④ RSS Core (CT)

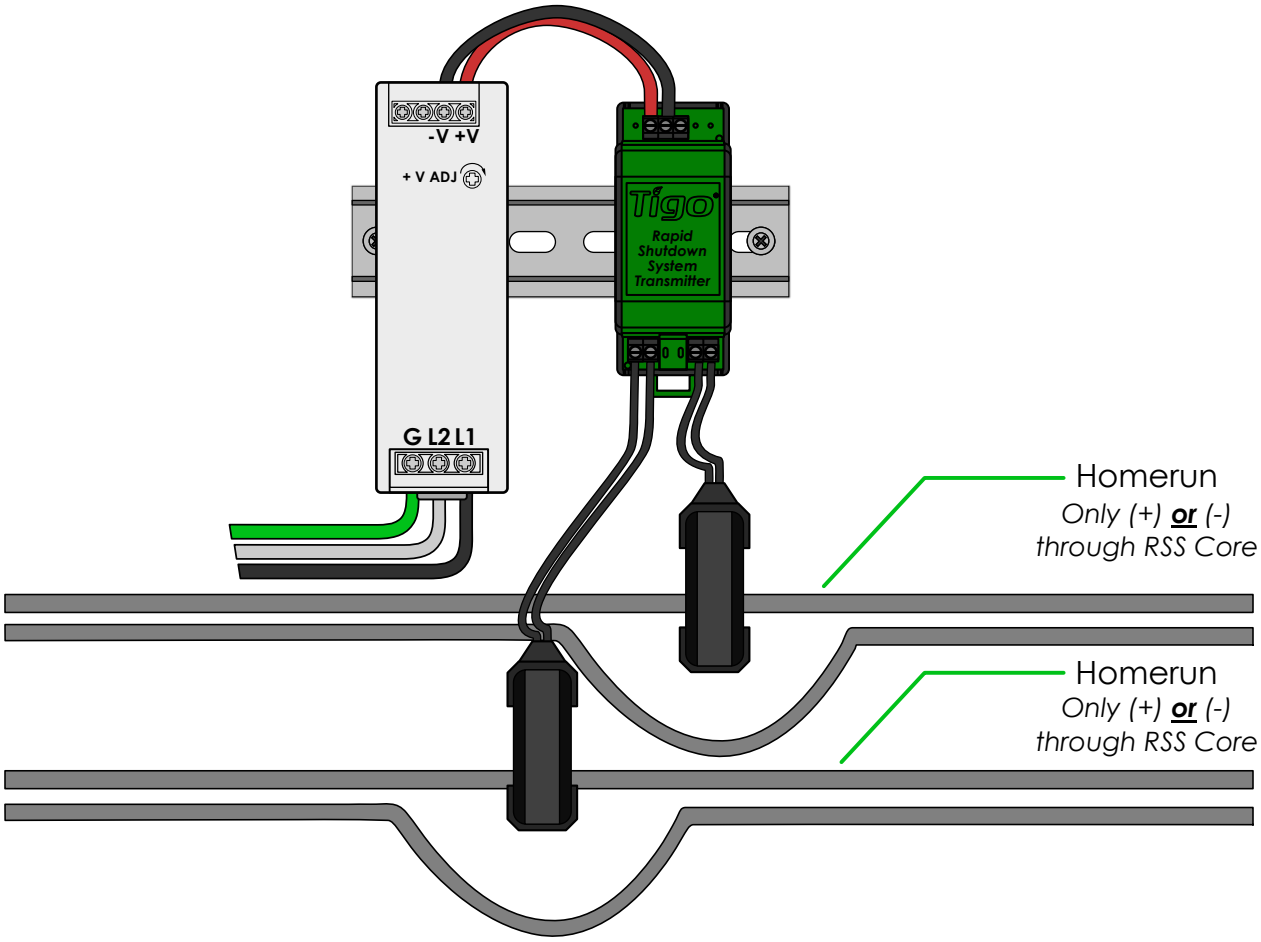
Transmitter power supply must be on same AC branch circuit as inverter to meet rapid shutdown requirements.

Note: Install TS4-F before powering on RSS Transmitter

- Mount RSS Transmitter and power supply on DIN rail
- Connect DC leads from power supply ① to transmitter ②
- Connect RSS Core ③ and ④ to transmitter

Place rapid shutdown system label no more than 1m (3ft) from RSS Transmitter or AC disconnect if not at same location.

RSS TRANSMITTER COMMERCIAL WIRING



Keep same polarity for all homeruns and RSS Cores throughout the installation

Note: Install TS4-F before powering on RSS Transmitter

- Pass either positive **or** negative homerun through RSS Cores
- Connect wires to AC side of power supply
- Turn on AC power to Transmitter power supply to activate keep-alive signal

Max number of strings per RSS Core: **10**
Max string length: **30 modules**
Max current per RSS Core: **150A**
Max cable length from inverter (+) to inverter (-): **1000ft (300m)**





Tigo®

Appendix

TS4-F, TS4-A-F, TS4-A-2F, RSS Transmitter

TECHNICAL SPECIFICATIONS – TS4-F

Electrical Ratings	TS4-F Fire Safety
Input	
Rated DC Input Power	475W
Input Voltage	16 - 90V
Max Continuous Input Current (I_{MAX})	12.5A
Output	
Output Power Range	0 - 475W
Output Voltage Range	0 – V_{OC}
Communication Type	Power Line Communication (PLC)
Rapid Shutdown UL Listed (NEC 2017 & 2020 690.12)	Yes
Impedance Matching Capability	No
Output Voltage Limit	No
Maximum System Voltage	1500V
Mechanical	
Operating Temperature Range:	-40°C to +70°C (-40°F to +158°F), RH < 85%
Storage Temperature Range:	-40°C to +70°C (-40°F to +158°F), RH < 60%
Cooling Method	Natural Convection
Dimensions (with cover)	178.5mm x 134mm x 25.5mm
Weight (base and cover)	670g
Outdoor Rating	IP68, NEMA 3R
Cabling	
Type	H1Z2Z2-K
Output Length	1.2m standard, other lengths available
Cable Options	1000V rated, 1500V rated
Cable Cross-Section	6.3 ± 0.3mm
Connectors	MC4, MC4 comparable
UV Resistance	500hr with UV light between 300-400nm @65C

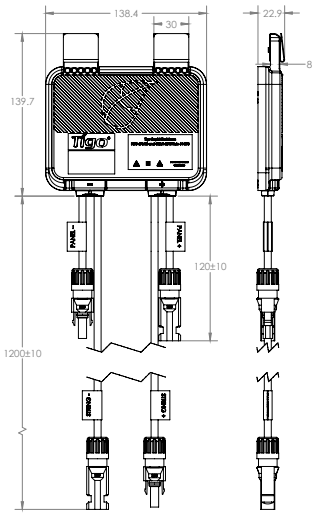
Specify system voltage when ordering (1000V / 1500V) for appropriate cables & connectors.

Rapid shutdown activation requires RSS Transmitter.

TECHNICAL SPECIFICATIONS – TS4-A-F

Specifications	TS4-A-F Fire Safety
Environmental	
Operating Temperature Range	-40°C to +85°C (-40°F to +185°F)
Outdoor Rating	IP68, NEMA 3R
Mechanical	
Dimensions	138.4mm x 139.7mm x 22.9mm
Weight	490g
Electrical	
Input Voltage	16 - 90V
Maximum Continuous Input Current (I_{MAX})	15A
Maximum Power	500W
Output Cable Length	1.2m (standard), other lengths available
Connectors	MC4 (standard)
Communication Type	PLC
Maximum System Voltage	1500V
Rapid Shutdown UL Listed (NEC 2017 & 2020 690.12)	Yes



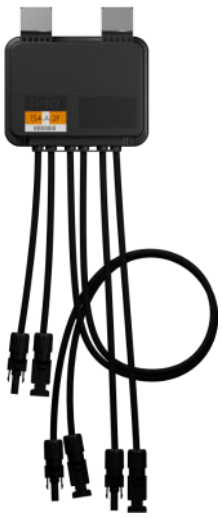


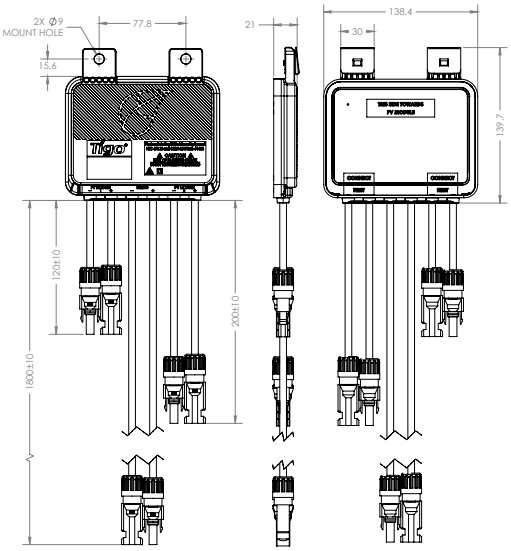
Specify system voltage when ordering (1000V / 1500V) for appropriate cables & connectors.

Rapid shutdown activation requires RSS Transmitter.

TECHNICAL SPECIFICATIONS – TS4-A-2F

Specifications	TS4-A-2F Fire Safety
Environmental	
Operating Temperature Range	-40°C to +70°C (-40°F to +158°F)
Outdoor Rating	IP68, NEMA 3R
Mechanical	
Dimensions	138.4mm x 139.7mm x 22.9mm
Weight	590g
Electrical	
Voltage Range (per input)[1]	16 - 90V
Maximum Current (per input)	15A
Maximum Power (total)	1000W
Output Cable Length	1.2m (portrait) or 2.2m (landscape)
Connectors	MC4 (standard)
Communication Type	PLC
Maximum System Voltage	1500V
Rapid Shutdown UL Listed (NEC 2017 & 2020 690.12)	Yes





Specify system voltage when ordering (1000V / 1500V) for appropriate cables & connectors.

Rapid shutdown activation requires RSS Transmitter.

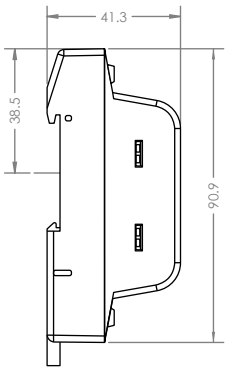
TECHNICAL SPECIFICATIONS – RSS TRANSMITTER

Electrical Ratings	RSS Transmitter
Input	
Input Voltage	$12V_{DC}$ (+/- 2%)
Input Current	1A
Average Supply Power	0.85W
Dimensions(Transmitter only)	90.2mm x 36.3mm x 57.7mm
RSS Core	
Maximum Current	150A per Core (Single Core: 150A, Dual Core: 300A)
Maximum MPPT String Voltage	$1500V_{DC}$
Internal Opening for Wires	~25mm
Outside Dimensions	59mm
Maximum Number of Strings per Core	10
Maximum String Length	30 modules
Environmental	
Temperature	-40°C to 85°C

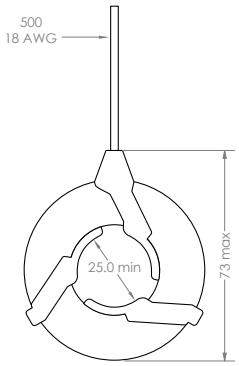
Recommended max. torque 0.4 N/m for wiring (3.5 Lb/in),
Wire range: 14-22 AWG



RSS Transmitter - Front View



RSS Transmitter - Side View



RSS Core - Side View

All dimensions in mm.

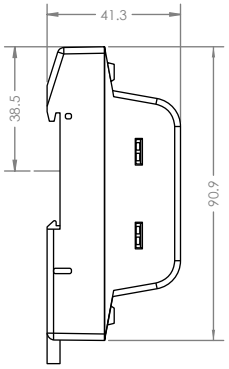
TECHNICAL SPECIFICATIONS – RSS TRANSMITTER COMMERCIAL KIT

Electrical Ratings	RSS Transmitter
Input	
Input Voltage	$12V_{DC}$ (+/- 2%)
Input Current	1A
Average Supply Power	0.85W
Included Power Supply Rating	$480/277V_{AC}$ input, $12V_{DC}$ output
Dimensions(Transmitter only)	90.2mm x 36.3mm x 57.7mm
RSS Core	
Maximum Current	150A per Core (includes 2 Cores for 300A)
Maximum MPPT String Voltage	$1500V_{DC}$
Internal Opening for Wires	~25mm
Outside Dimensions	59mm
Maximum Number of Strings per Core	10
Maximum String Length	30 modules
Environmental	
Temperature	-40°C to 85°C

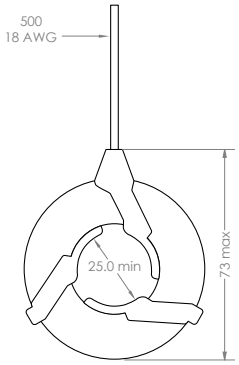
Recommended max. torque 0.4 N/m for wiring (3.5 Lb/in),
Wire range: 14-22 AWG



RSS Transmitter - Front View



RSS Transmitter - Side View



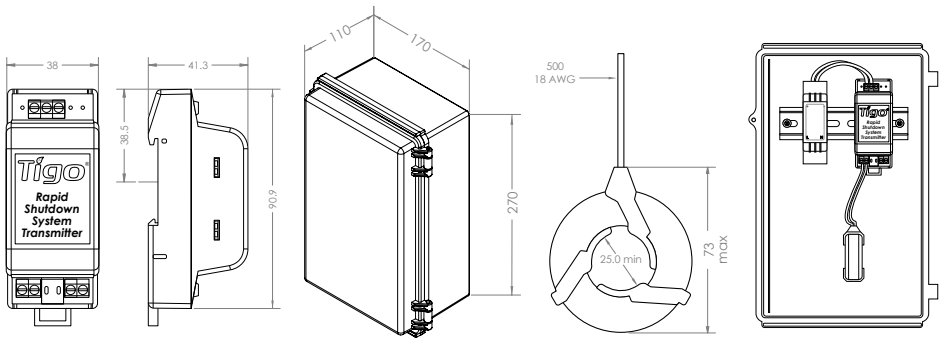
RSS Core - Side View

All dimensions in mm.

TECHNICAL SPECIFICATIONS – RSS TRANSMITTER OUTDOOR KIT

Electrical Ratings	RSS Transmitter
Input	
Input Voltage	$12V_{DC}$ (+/- 2%)
Input Current	1A
Average Supply Power	0.85W
Dimensions(Transmitter only)	90.2mm x 36.3mm x 57.7mm
RSS Core	
Maximum Current	100A per Core (Single Core: 100A, Dual Core: 200A)[1]
Maximum MPPT String Voltage	$1500V_{DC}$
Internal Opening for Wires	~25mm
Outside Dimensions	59mm
Maximum Number of Strings per Core	10
Maximum String Length	30 modules
Environmental	
Temperature	-40°C to 85°C

Recommended max. torque 0.4 N/m for wiring (3.5 Lb/in),
Wire range: 14-22 AWG



RSS Transmitter | Outdoor Enclosure | RSS Core | Installation Example

[1] Rating of outdoor enclosure

All dimensions in mm.

TESTING RAPID SHUTDOWN

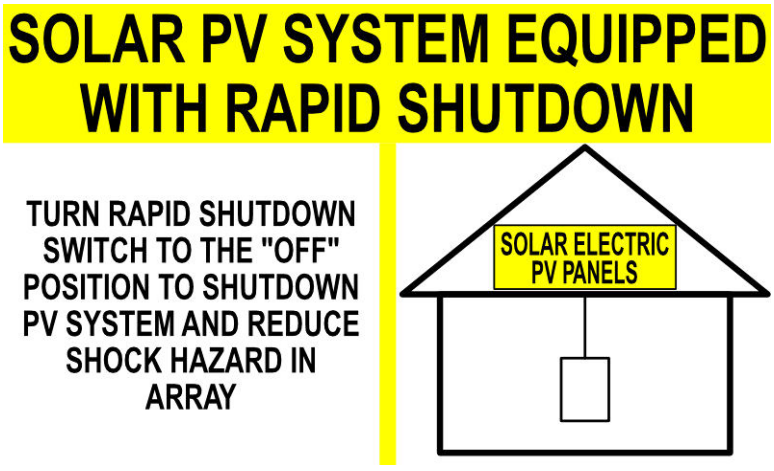
TS4-F (or TS4-A-F, TS4-A-2F) and an RSS Transmitter are a solution to meet NEC 2017 & 2020 690.12 Rapid Shutdown requirements.

TS4-F, TS4-A-F, and TS4-A-2F units automatically enter rapid shutdown mode when the RSS Transmitter is switched off and resume energy production when power is restored to the RSS Transmitter.

Wait 30 seconds after rapid shutdown activation before disconnecting DC cables or turning off DC disconnect.

Test your rapid shutdown system by switching off the AC power to the RSS Transmitter or inverter with built-in transmitter.

TS4-F, TS4-A-F, and TS4-A-2F units will reduce their output to 0.6V when the Transmitter is powered off.



Place safety labels in proper location

The RSS Transmitter control power supply MUST be on the same AC branch circuit as the inverter to meet rapid shutdown requirements.

Click here for more info about Rapid Shutdown

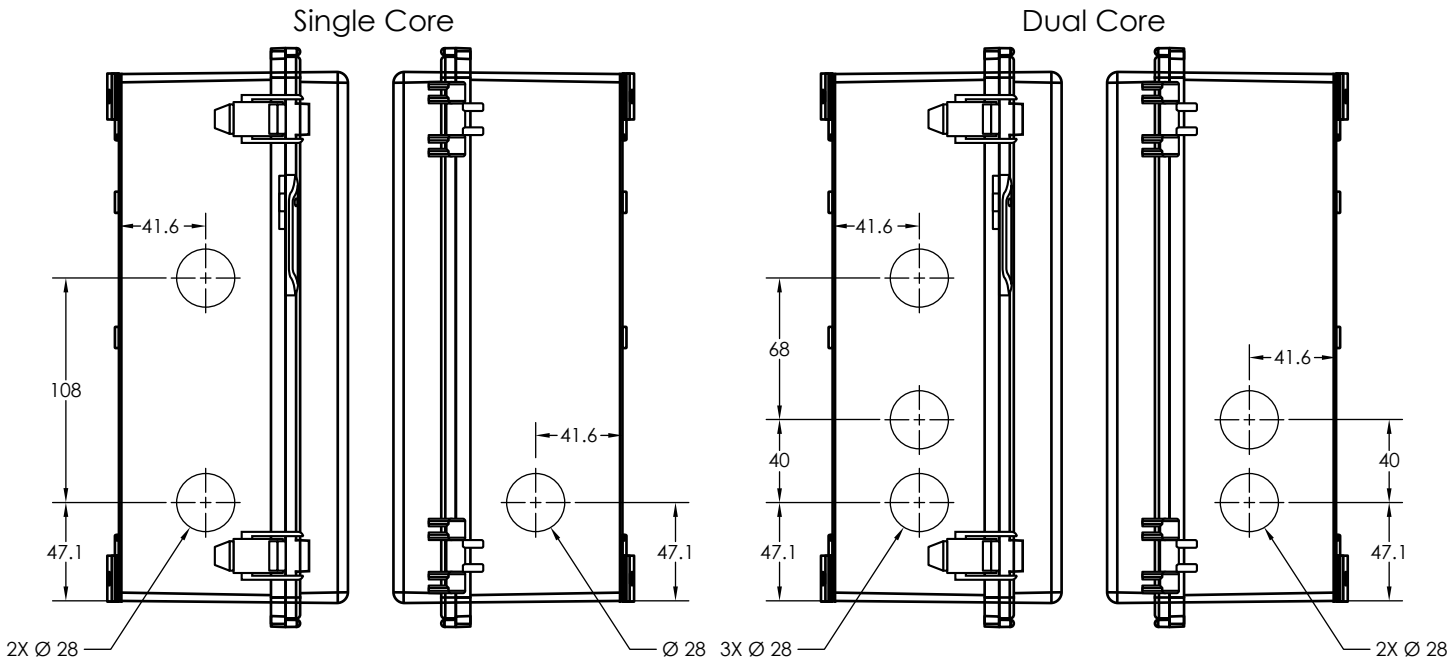
TROUBLESHOOTING

- TS4-F units should pass 0.6V when connected to a PV module and the string is not connected to an active transmitter.
    - If the output measures 0.0V, check connections to the module.
- String voltage should be 0.6V * number of TS4 units in the string when RSS Transmitter signal is not present. (e.g. Transmitter off, open circuit)

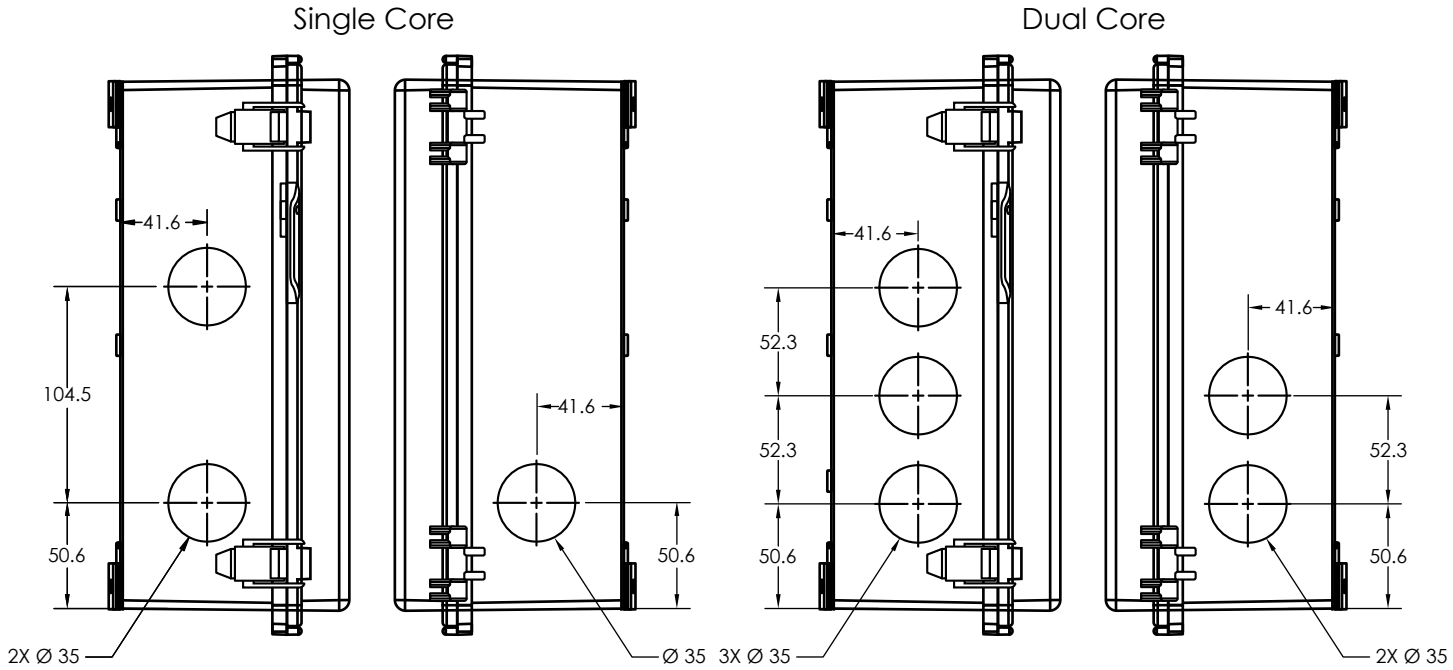
- RSS Transmitter generates keep-alive signal while powered on.
    - Power LED should be solid and Signal LED should be blinking while operating.
        - If Signal LED is not blinking, turn off power to the Transmitter and turn it back on.
        - If RSS Transmitter signal is active but TS4-F units are not producing:
            - Check string for open circuit
            - Check wiring between RSS Transmitter and RSS Core

CONDUIT DRILLING GUIDE

Enclosure Drilling Guide for .75" Conduit



Enclosure Drilling Guide for 1" Conduit



*all dimensions in mm

MISCELLANEOUS

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

INSTALLATION COMPLETE

Problems?

TS4-F Troubleshooting Guide

For more details on designing and installing solutions powered by Tigo, please visit:

Tigo Academy
Resource Center

Or contact us at:

training@tigoenergy.com

Tigo®