



PV Grid-Connected Inverter User Manual

TS75KTL-A10/TS80KTL-A10/TS100KTL-A10/TS110KTL-A10

Prepared by:	Lv pengfei	Date:	6 th June. 2024
Review by:	Ren yujing	Date:	6 th June. 2024
Approved by:	Hao xiaobo	Date:	6 th June. 2024

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1 General information

1.1 About this document

This document describes the mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning of the product as well as the operation of the product user interface.

You will get the latest version of this document and further information on the product in PDF format from our Sales Manager.

It is recommended that this document is stored in an appropriate location and be available at all times.

1.2 Product validity

This document is valid for the following models:

- TS75KTL-A10
- TS80KTL-A10
- TS100KTL-A10
- TS110KTL-A10

1.3 Target group

This document is intended for qualified persons who must perform the tasks exactly as described in this user manual.

All installation work must be performed by appropriately trained and qualified persons. Qualified persons must possess the following skills:

- Knowledge of how an inverter works and is operated.
- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices and installations.
- Training in the installation and commissioning of electrical devices.
- Knowledge of all applicable laws, standards and directives.
- Knowledge of and compliance with this document and all safety information.

1.4 Safety warning symbols guide



DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE

Indicates a situation which, if not avoided, can result in property damage.



Information that is important for a specific topic or goal, but is not safety relevant.

2 Safety

2.1 Intended use

- The product is a transformerless PV inverter with 10 MPP trackers, which converts the direct current of the PV modules into grid-compliant alternating current and feeds it into the utility grid.
- The product is suitable for indoor and outdoor use.
- The product must only be operated with PV modules of protection class II in accordance with IEC 61730, application class A. The PV modules must be compatible with this product.
- The product is not equipped with an integrated transformer and therefore has no galvanic isolation. The product must not be operated with either grounded DC conductors or PV modules whose outputs are grounded. This can cause the product to be destroyed. The product may be operated with PV modules whose frame is grounded.
- When designing the PV system, ensure that all components remain within the permitted operating ranges and the installation requirements at all times.
- The product must only be used in countries for which it is approved or released by TBEA and the grid operator.
- Use this product only in accordance with the information provided in this documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.
- The type label must remain permanently attached to the product.
- This document does not replace any regional, state, provincial, federal or national laws, regulations or standards that apply to the installation, electrical safety and use of the product.

2.2 Important safety instructions

The product has been designed and tested in accordance with international safety requirements. As with all electrical or electronical devices, there are residual risks despite careful construction. To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.



DANGER

Danger to life due to high voltages of the PV array !

When exposed to light, the PV modules generate high DC voltage which is present in the DC cables. Touching live DC cables results in death or lethal injuries due to electric shock.

- Do not touch non-insulated parts or cables.
- Do not touch the DC conductors.
- Do not touch any live components of the product.
- Do not open the product.
- All work on the product must only be carried out by qualified personnel who have read and fully understood all safety information contained in this document.
- Disconnect the product from voltage sources and ensure it cannot be reconnected before working on the product.
- Wear suitable personal protective equipment for all work on the product.



DANGER

Danger to life due to electric shock when touching live system components in case of a ground fault!

If a ground fault occurs, parts of the system may still be live. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Disconnect the product from voltage sources and ensure it cannot be reconnected before working on the device.
- The DC switch may be operated whilst the inverter is in operation.
- Do not touch any parts of the substructure or frame of the PV array.
- Do not connect PV strings with ground faults to the product.



WARNING

Danger to life due to electric shock from destruction of the measuring device due to overvoltage!

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

- Only use measuring devices with a DC input voltage range of 1100 Vdc or higher.



WARNING

Risk of burns due to hot enclosure parts !

Some parts of the enclosure can become hot during operation, touching these parts may cause burns.

- Only touch the DC switch when the inverter is running.
- Do not touch any parts other than the enclosure lid of the product during operation.



WARNING

Risk of injury due to weight of product !

Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted.

- Transport and lift the product carefully. Take the weight of the product into account.
- Qualified person should wear appropriate personal protective equipment.

NOTE

Damage to the inverter due to electrostatic discharge.

Internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Ground yourself before touching any component.



The country grid code must be set correctly.

If you select a country grid code which is not valid for your country and purpose, it can cause a disturbance in the PV system and lead to problems with the grid operator. When selecting the country grid code, you must always observe the locally applicable standards and directives as well as the properties of the PV system (e.g. PV system size, grid-connection point).

- If you are not sure which standards and directives are valid for your country or purpose, contact the grid operator.

2.3 Symbols on the label



Beware of a danger zone

This symbol indicates that the inverter must be additionally grounded if additional grounding or equipotential bonding is required at the installation site.



Beware of high voltage and operating current

The inverter operates at high voltage and current. Work on the inverter must only be carried out by skilled and authorized electricians.



Beware of hot surfaces

The inverter may become hot during operation. Avoid contact during operation.



WEEE designation

Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.



CE marking

The product complies with the requirements of the applicable EU directives.



Certification mark

The product has been tested by TUV and got the quality certification mark.



Capacitor discharge

Danger to life due to high voltages in the inverter. Do not touch live parts for 25 minutes after disconnection from the power sources.



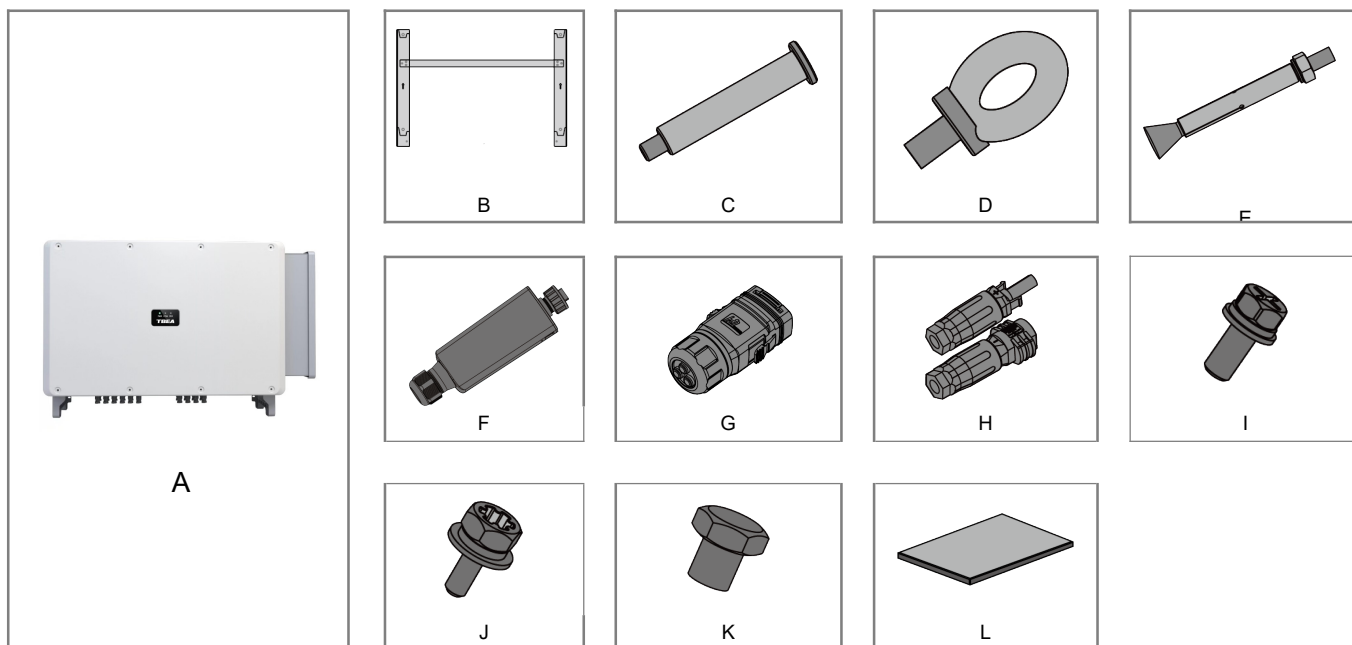
Observe the documentation

Observe all documentation supplied with the product.

3 Unpacking and storage

3.1 Scope of delivery

Check the scope of delivery for completeness and any visible external damage. Contact your supplier if the scope of delivery is incomplete or damaged.



NO.	Name	Quantity
A	Inverter	1
B	Mounting-bracket	1
C	Handle (Optional)	4
D	Lifting ring (Optional)	2
E	Expansion bolt	4
F	WiFi stick	1
G	RS 485 COM plug	1
H	DC connector (pair)	16/20
I	M5×12 Screws	2
J	M4×9 Screws	6
K	M10×20 Bolt	2
L	Document package	1

3.2 Product storage

Suitable storage is required if the inverter is not installed immediately:

- Store the inverter in the original package.
- The storage temperature must be between -30°C to +70°C, and the storage relative humidity must be between 0 and 100%, non-condensing.
- The packing with the inverter shall not be tilted or inverted.
- The product must be fully inspected and tested by professionals before it can be put into operation, if it has been stored for six months or more.

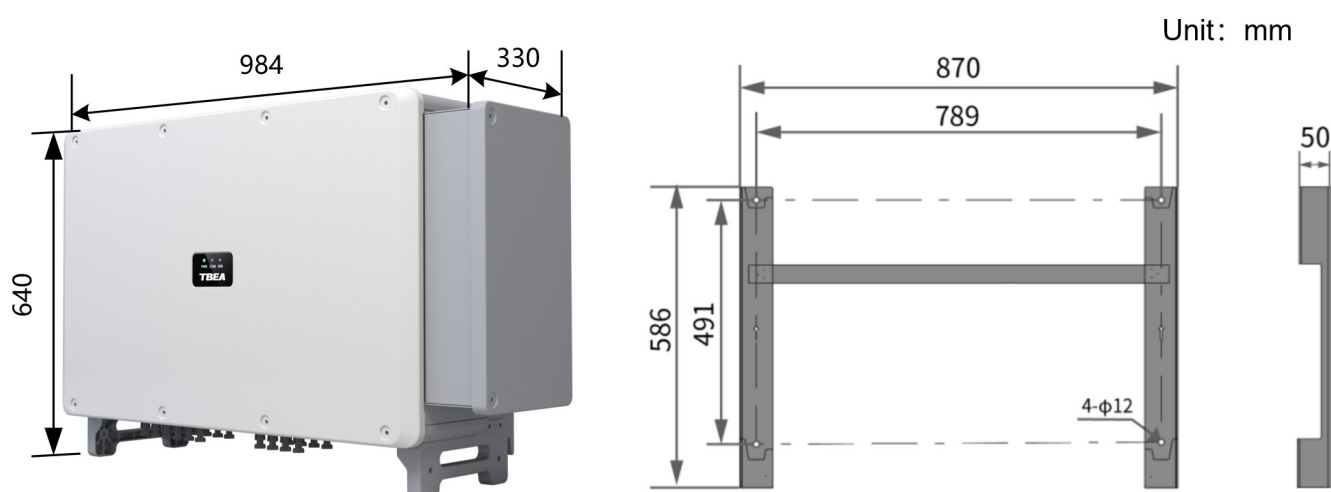
4 Inverter overview

4.1 Product description



NO.	Name	Description
1	Mounting ears	Two ears hang the inverter onto the mounting-bracket.
2	Fan assembly	Maintain and replace the fan.
3	Labels	Warning symbols, nameplate, and QR code.
4	Bottom handles	Two handles, move the product and hang the inverter onto the mounting-bracket.
5	DC wiring area	DC switches, DC terminals and communication terminals.
6	LED indicator	Indicate the present working state of the inverter.
7	AC wiring box	Connect the AC side cables.
8	Additional grounding terminal	Two terminals, at least one of them to ground the inverter.
9	Cable inlet	Seal AC cables after installation.

4.2 Dimensions



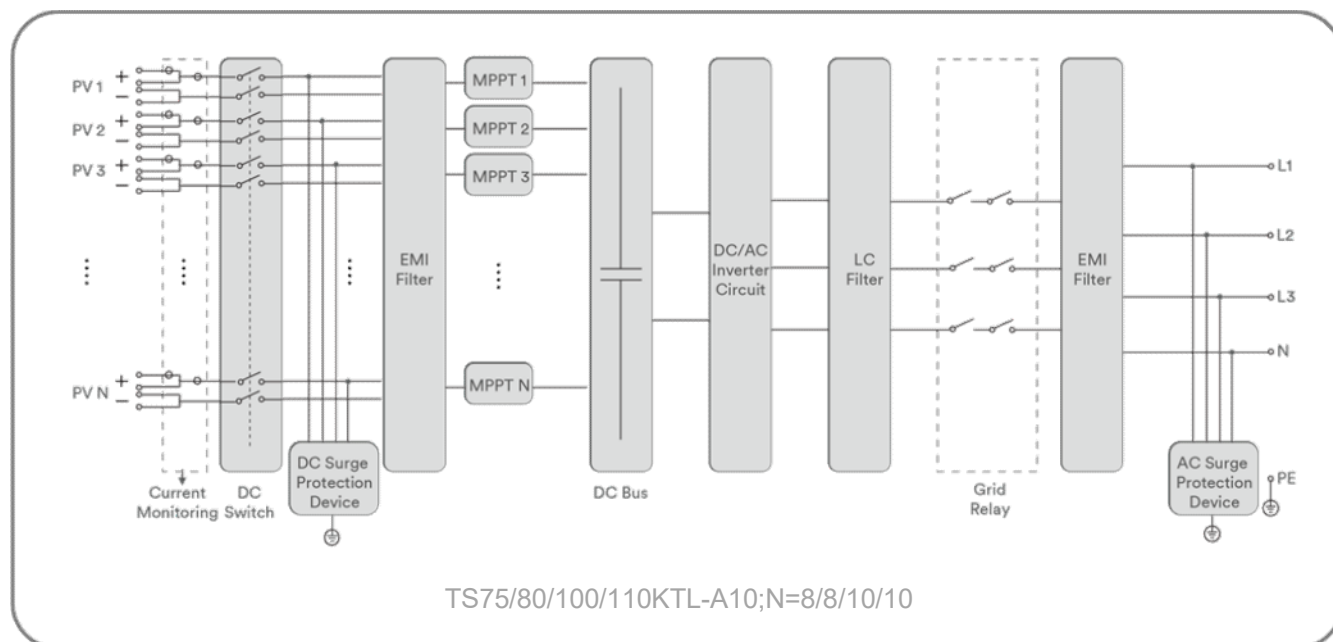
4.3 LED indicator

The LED indicator can indicate the operation state of the inverter.

LED indicator	LED state	Description
PWR (White)	Glowing	The PWR LED is glowing when the product is operating normally.
	Flashing	The PWR LED is flashing when the product is self-checking. e.g. during synchronisation to the utility grid.
	OFF	The PWR LED is off when the product is not feeding into the utility grid.
COM (White)	Pulsing	The COM LED is pulsing when the product is communicating with other devices e.g. WiFi stick. Depending on the data transfer speed, the COM LED pulses fast or slow.
	OFF	When the communication is abnormal or there is no data transmission, the COM LED is off.
ERR (Red)	Glowing	When the product stops supplying power to the power grid due to a fault, the ERR LED is glowing.
	OFF	When the grid fault is cleared, the ERR LED is off.

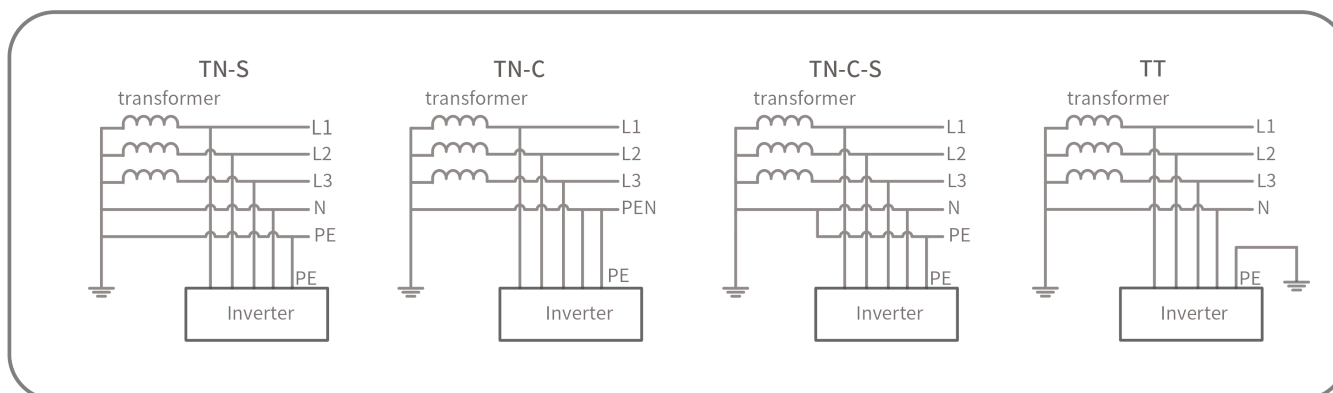
4.4 Circuit diagram

The circuit diagram of TS75/80/100/110KTL-A10 is as follows.



4.5 Supported grid types

The grid types supported by TBEA is TN-S, TN-C, TN-C-S, TT, as shown in the figure below:



For the TT grid structure, the effective value of the voltage between the neutral wire and the ground wire must be less than 20V.

4.6 Interfaces and functions

The product is equipped with the following interfaces and functions:

WiFi stick

The product is equipped with a WiFi stick as standard, which provides a user interface for configuring and monitoring the product. The WiFi stick can connect to the Internet via WLAN or the Ethernet cable.

RS485 Interface

The inverter may or may not be equipped with two RS485 interfaces. The inverter can communicate with TBEA communication products or third party devices via the RS485 interface. For more information regarding third party devices, please contact the local TBEA service department.

Modbus RTU

The inverter contains Modbus RTU protocols. The Modbus of the supported TBEA products is designed for industrial use and allows:

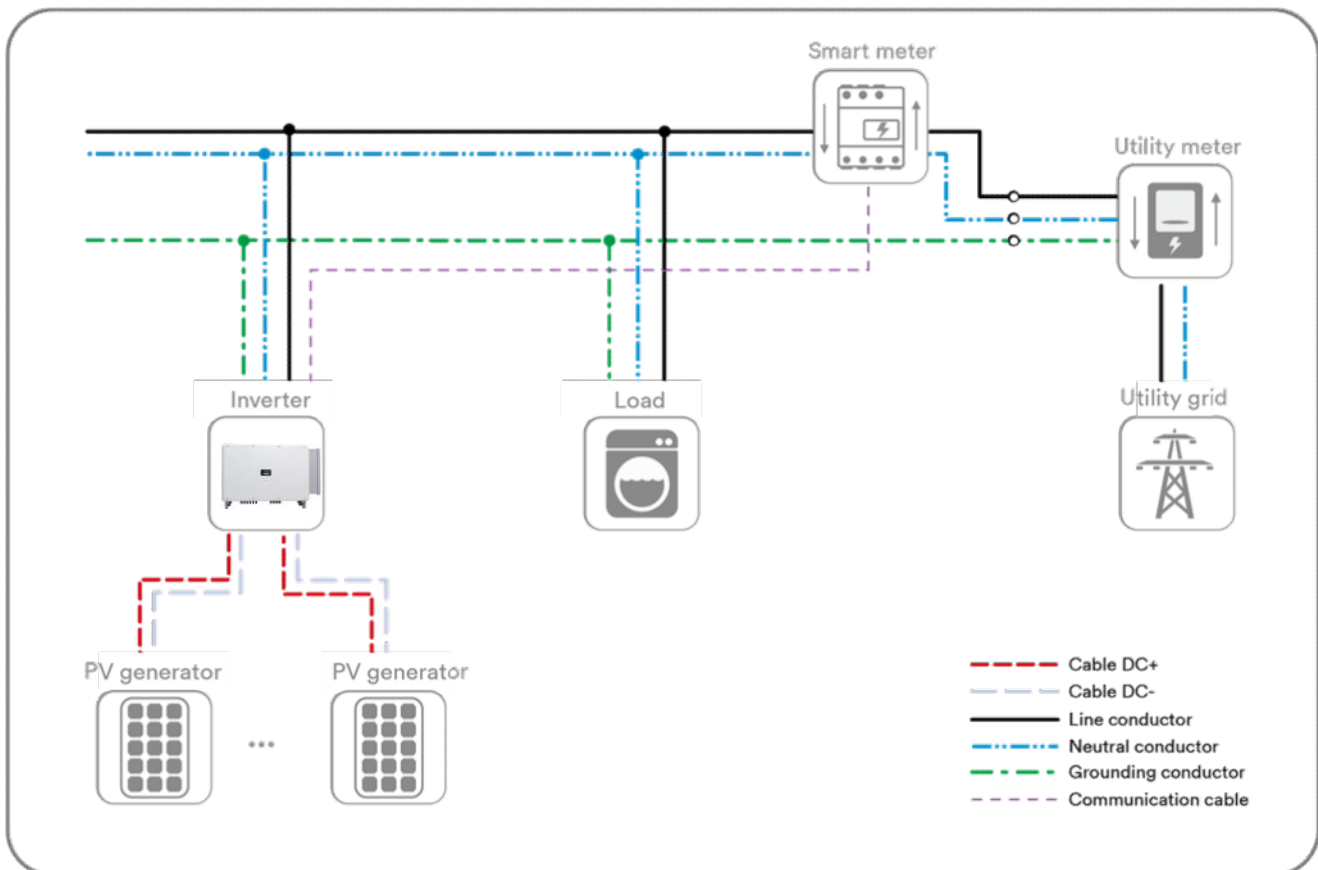
- Remote query of measured values
- Remote setting of operating parameters
- Setpoint specifications for system control

Export active power control

The product is equipped with the export active power limit function, so as to meet the requirements of some national standards or grid standards for limiting the output power at the grid connection point.

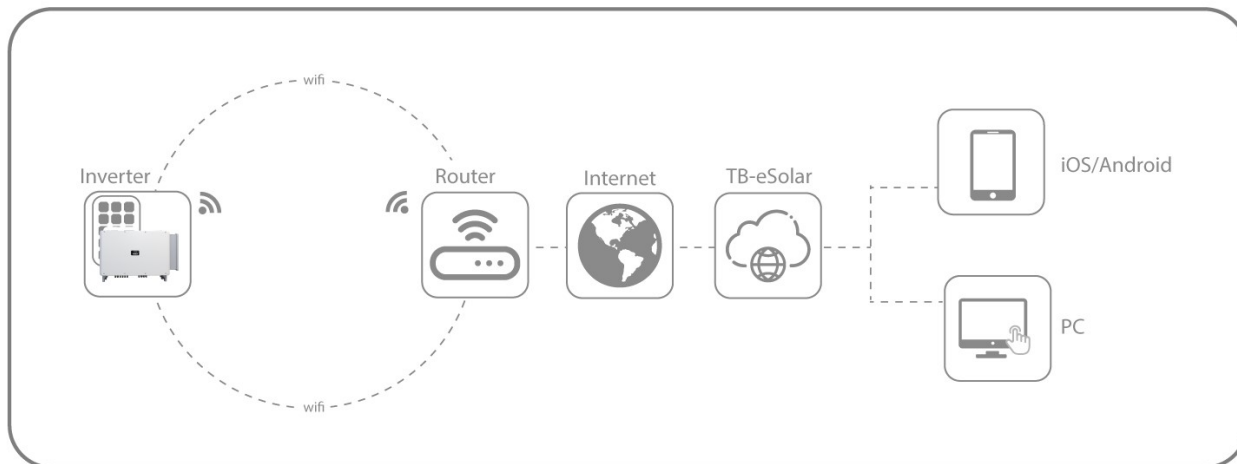
The export active power control solution measures the active power at the point where the customer's PV plant is connected to the distribution system (point of grid connection) and then uses this information to control the inverter's active power output in order to prevent the export active power, to the grid, from exceeding the agreed export power limit.

The smart meter that can be used with inverter product must be approved by TBEA. For more information about the smart meter, please contact the local service team.

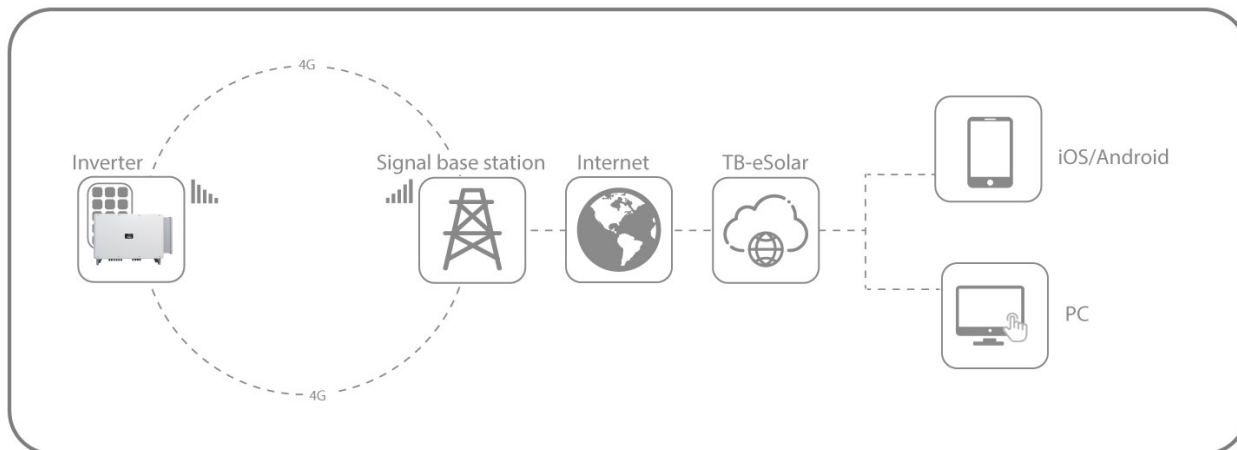


4.7 Communication overview

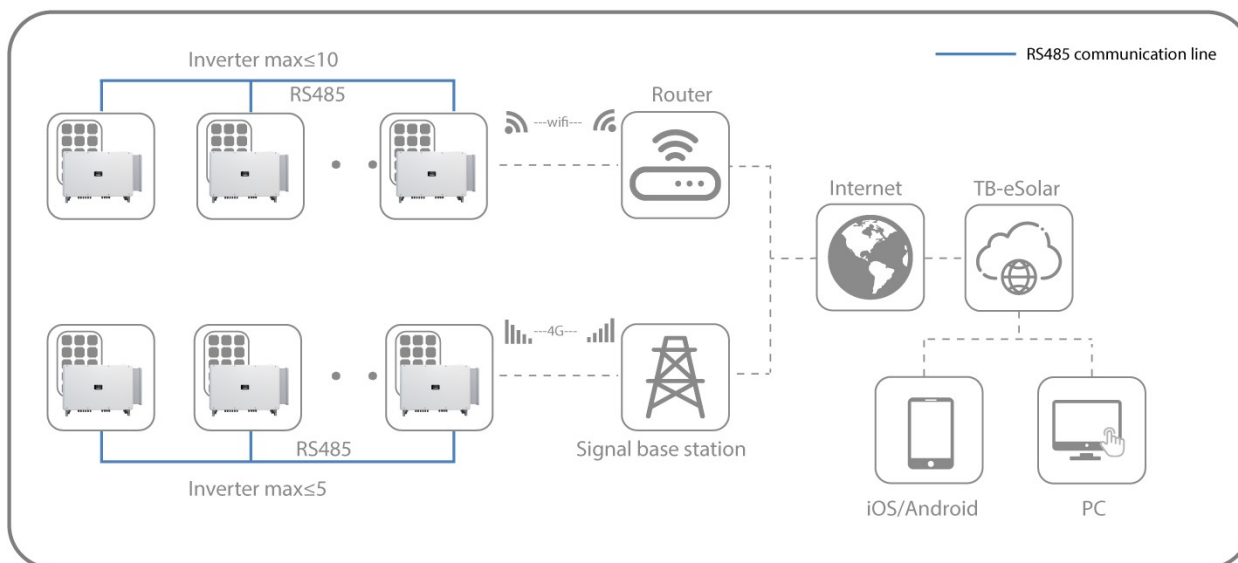
The communication overview with a WiFi stick:



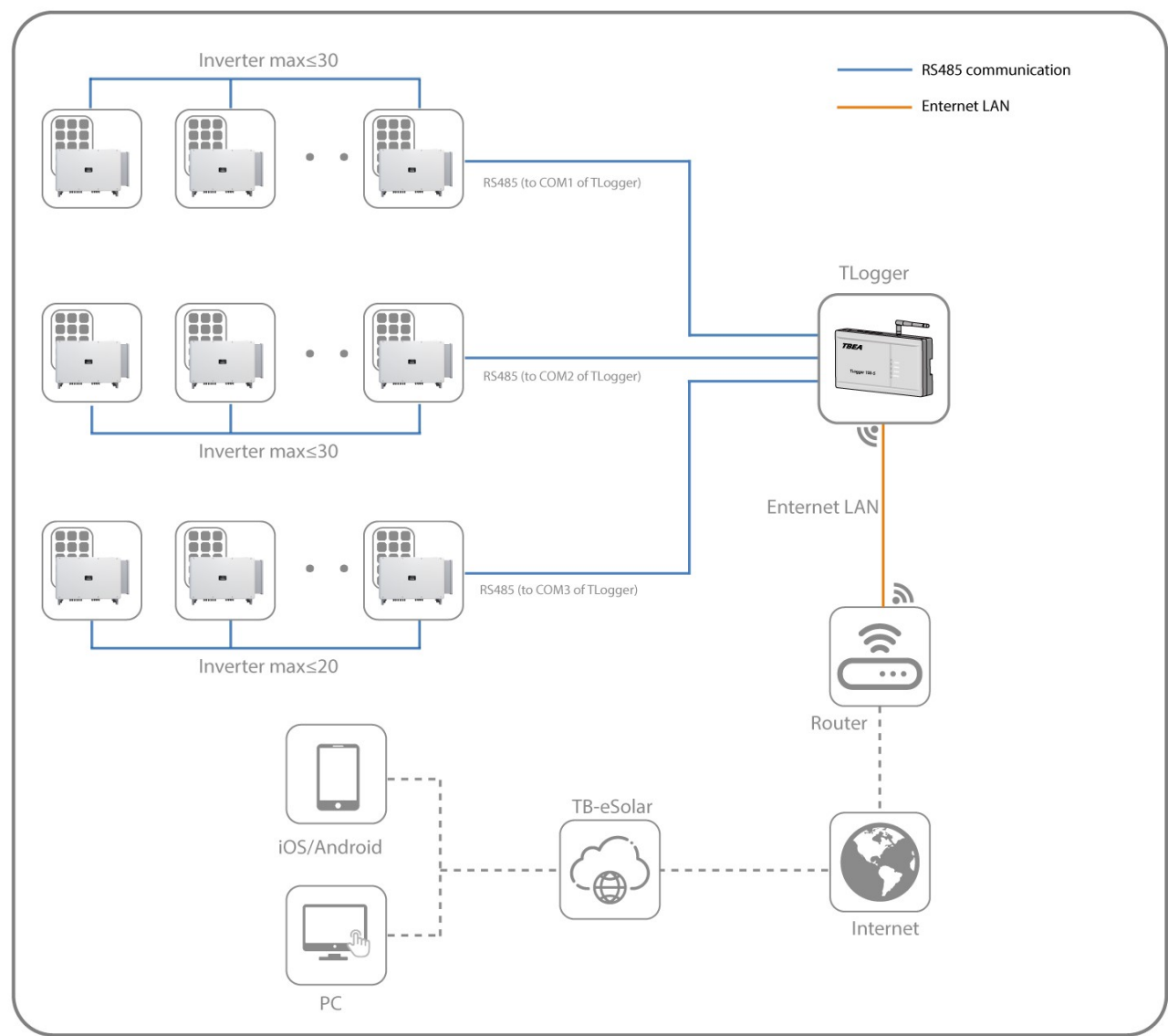
The communication overview with a 4G stick:



One WiFi stick can connect with up to ten devices, and one 4G stick can connect with up to five devices:



The communication overview with TLogger for a large PV plant:



5 Mounting

5.1 Requirements for mounting

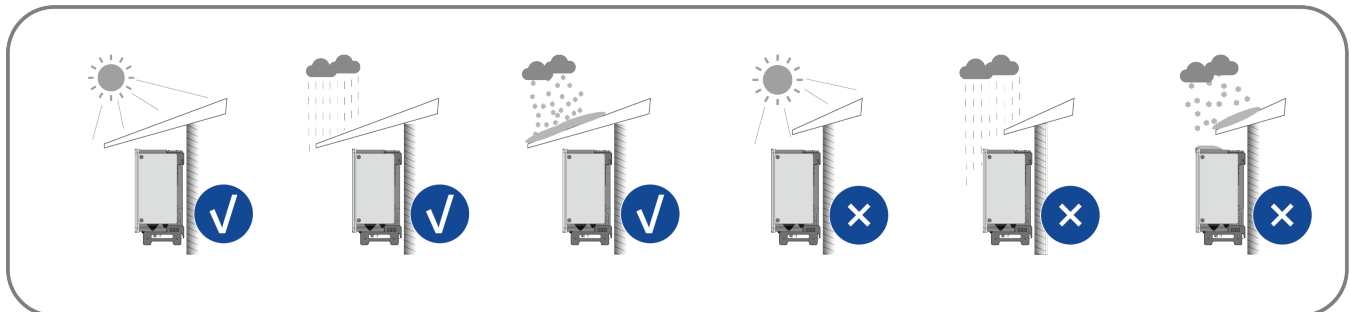


DANGER

Danger to life due to fire or explosion !

Despite careful construction, electrical devices can cause fires. This can result in death or serious injury.

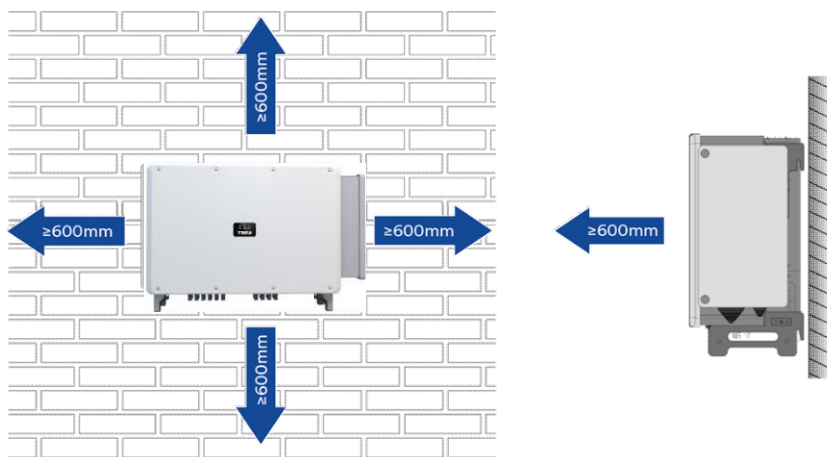
- Do not mount the product in areas containing highly flammable materials or gases.
 - Do not mount the inverter in areas where there is a risk of explosion.
-
- The ambient temperature is recommended below 40°C to ensure optimal operation.
 - A solid support surface must be available (e.g. concrete or masonry). Ensure that the installation surface is solid enough to bear four times the weight. When mounted on drywall or similar materials, the product emits audible vibrations during operation which could be perceived as annoying.
 - The mounting location must be inaccessible to children.
 - The mounting location should be freely and safely accessible at all times without the need for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfilment of these criteria may restrict servicing.
 - The mounting location must not be exposed to direct solar irradiation. If the product is exposed to direct solar irradiation, the exterior plastic parts might age prematurely and overheating might occur. When becoming too hot, the product reduces its power output to avoid overheating.



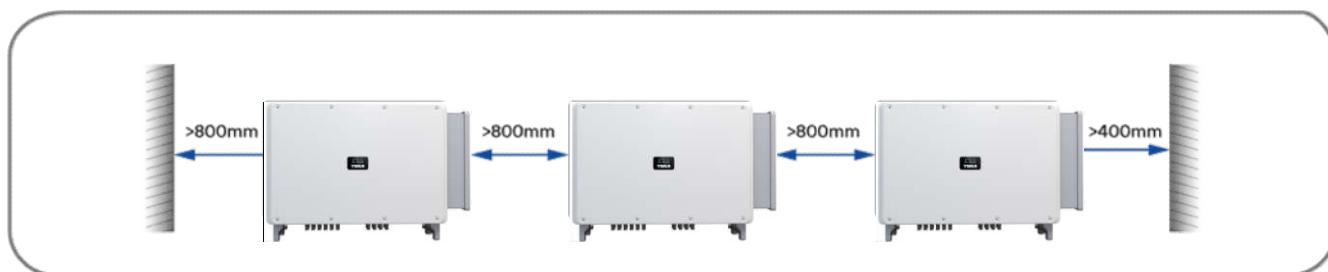
- Never install the inverter horizontally, or with a forward / backward tilt or even upside down. The horizontal installation can result in damage to the inverter.



- Maintain the recommended clearances to other inverters or objects.



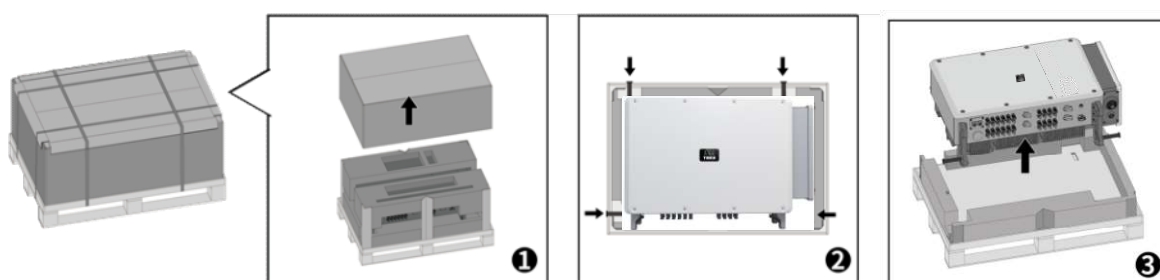
- In case of multiple inverters, ensure the appropriate clearance between the inverters.



- The product should be mounted such that the LED indicators can be viewed without difficulty.
- The DC switch of the product must always be readily accessible.

5.2 Take out the product

Open the box, install the four handles in sequence, and take out the inverter.



5.3 Handling the product



CAUTION

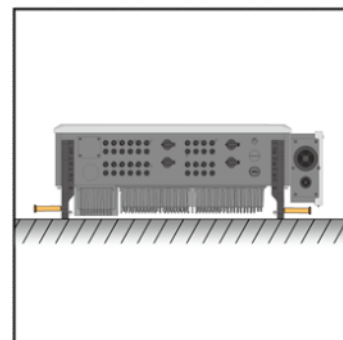
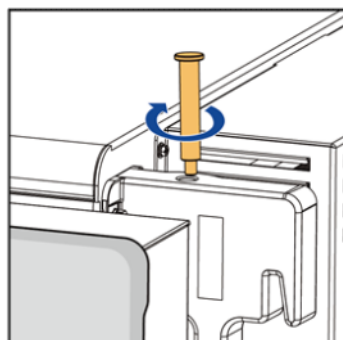
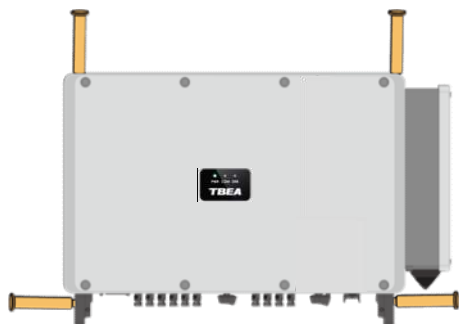
Risk of injury due to the weight of the product!

Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted.

- Wear suitable personal protective equipment for all work on the product.

5.3.1 Manual transport

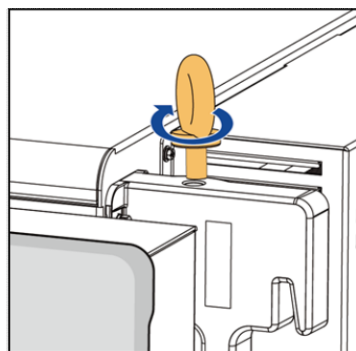
Step 1: Use the handles on the top and bottom of the enclosure to transport the inverter to the destination.



Screw-in handles are optional. The product can be moved by them.

5.3.2 Hoisting transport

Step 1: Screw the two lifting rings into the hangers of the inverter.



Step 2: Lead the sling through the two lifting rings and fasten the tie-down strap.

Step 3: Use the lifting device to lift the inverter 100mm above the ground, and then pause to check the fastening of the lifting ring and sling. After confirming that the connection is safe, lift the inverter to the destination.



Step 4: Remove the lifting ring.



The lifting rings and the sling are not within the delivery scope.

5.4 Mounting



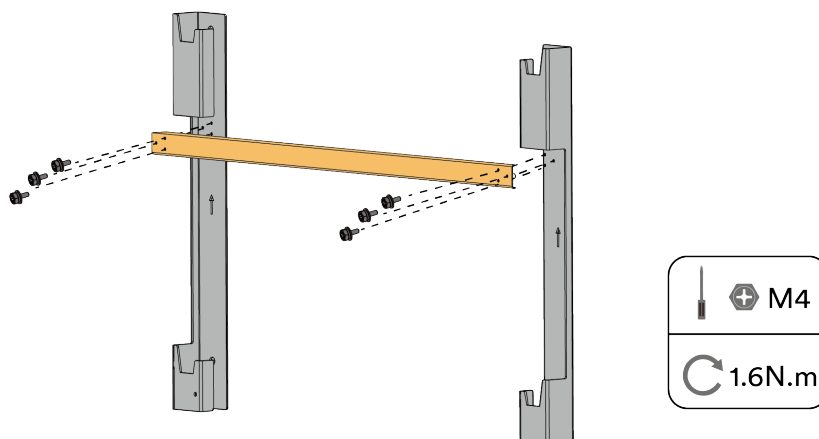
CAUTION

Damage to cable lines can cause personal injury !

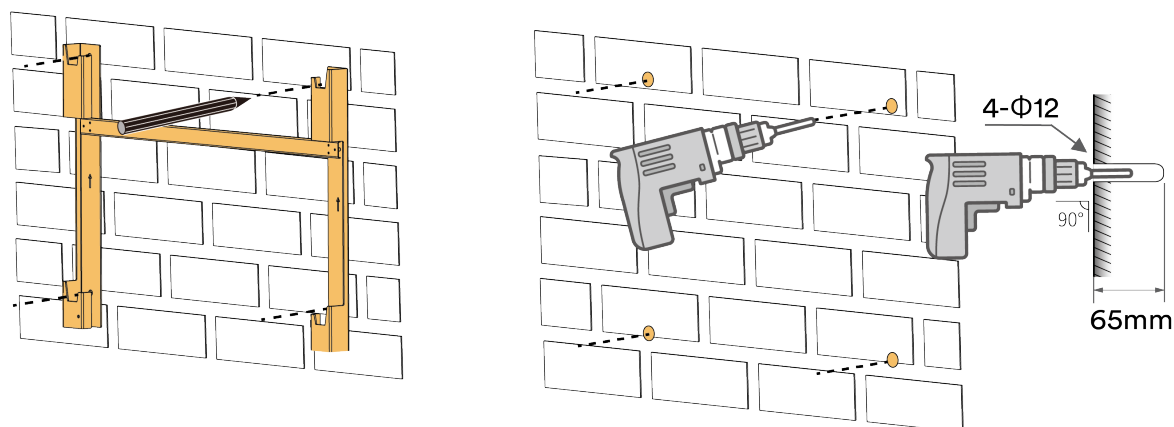
The walls may be covered with power cords or other lines (for example, gas or water).

- Make sure that no cables on the wall or inside the wall cavity are damaged when drilling.

Step 1: Assemble the mounting-bracket by using the connecting bar.



Step 2: Align the wall mounting bracket horizontally on the wall with the arrow upwards. Mark the position of the drill holes. Set the wall mounting bracket aside and drill the marked holes with the diameter of 12mm. The depth of the holes should be about 65 mm. Keep the hammer drill bit perpendicular to the wall to avoid drilling inclined.





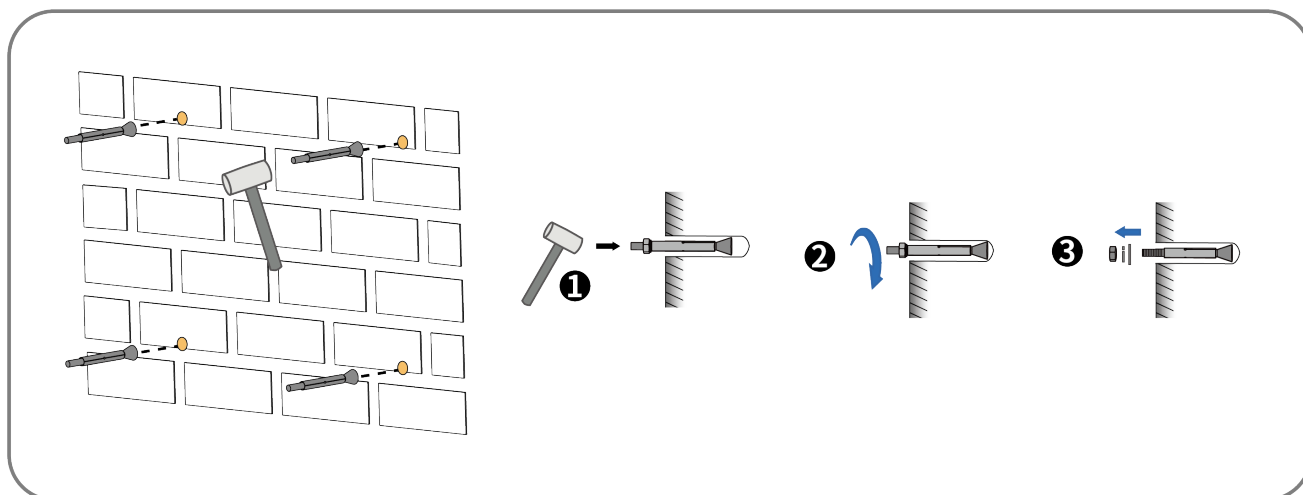
CAUTION

Danger of personal injury due to falling inverter !

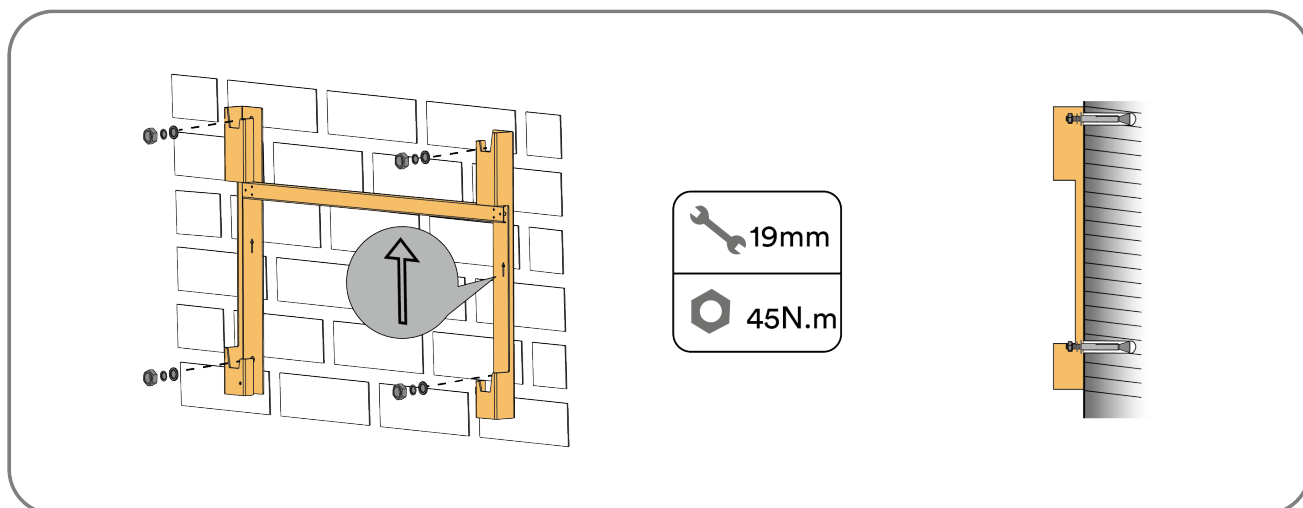
If the hole depth and distance are not correct, the inverter may fall off the wall.

- Before inserting the bolts into the wall, measure the depth of the hole.

Step 3: Clean the dust in the hole, plug 4 expansion bolts into the hole, fix them with a rubber hammer, and tighten the nuts with a wrench, fix the bolt tail, and remove the nut, spring washer and flat washer and reserve them for the next step.

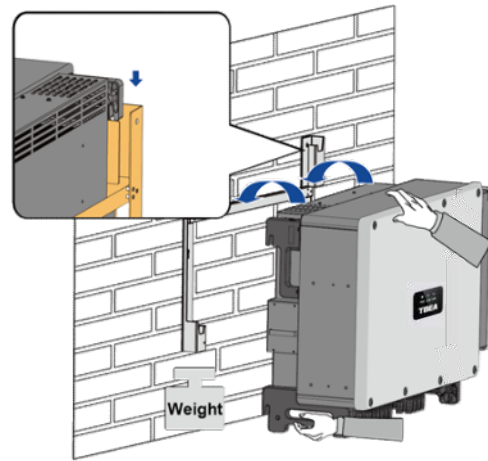
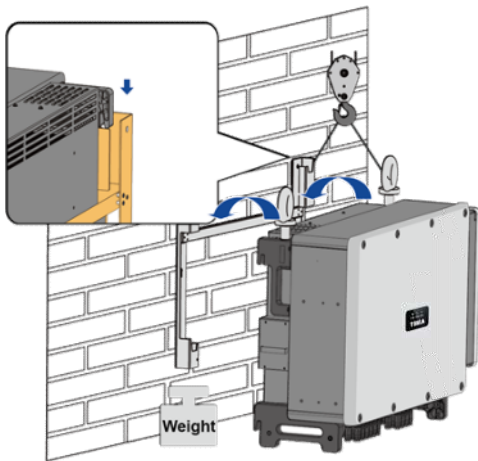


Step 4: Fix the mounting-bracket with the expansion bolts.



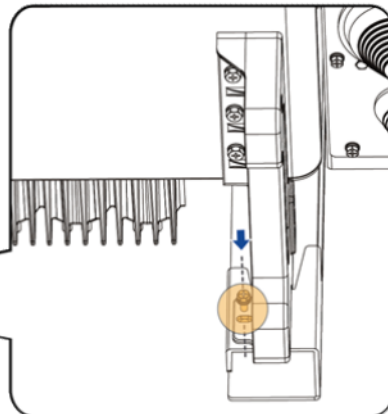
Step 5: Hoist the inverter to the installation position when necessary (refer to "5.5.2 Hoisting transport"). If the installation position is not too high, skip performing this step.

Step 6: Hang the inverter to the mounting-bracket and ensure that the mounting ears perfectly engage with the mounting-bracket.



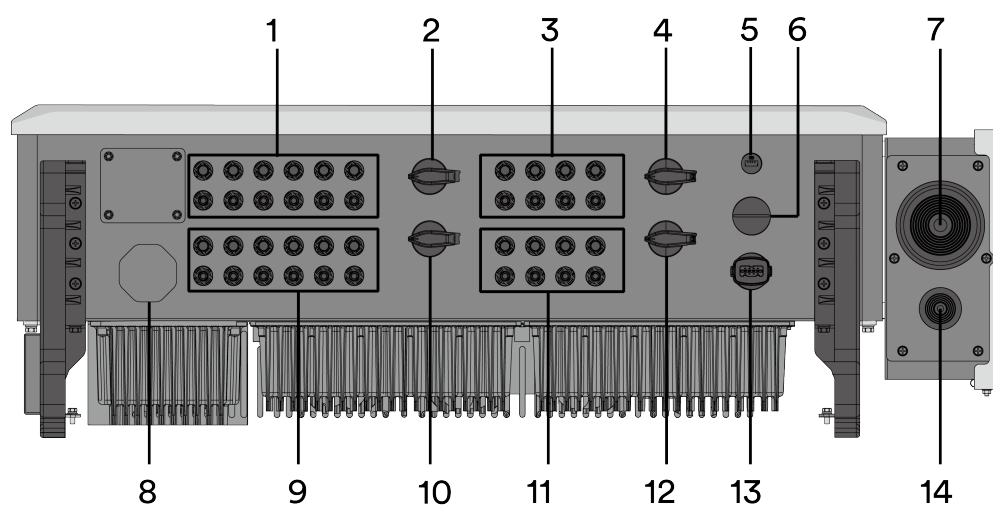
Make sure that the four ears fit well with the groove.

Step 7: Fix the inverter with screws.



6 Electrical connection

6.1 Overview of the connection area



Item	Name
1	DC connector inputs 1-6 (connected to DC switch 1)
2	DC switch 1
3	DC connector inputs 13-16 (connected to DC switch 3)
4	DC switch 3
5	WiFi stick port
6	Reserved terminal
7	AC cable - knockout seal
8	Lock valve
9	DC connector inputs 7-12 (Connected to DC switch 2)
10	DC switch 2
11	DC connector inputs 17-20 (Connected to DC switch 4)
12	DC switch 4
13	RS485 Communication port
14	Reserved grounding - knockout seal

6.2 Connecting additional grounding

The inverter is equipped with a grounding fault monitoring device. The grounding fault monitoring device will disconnect the inverter from utility grid when it detects there is no ground conductor connected. Hence the product does not require additional grounding or equipotential bonding when operating.

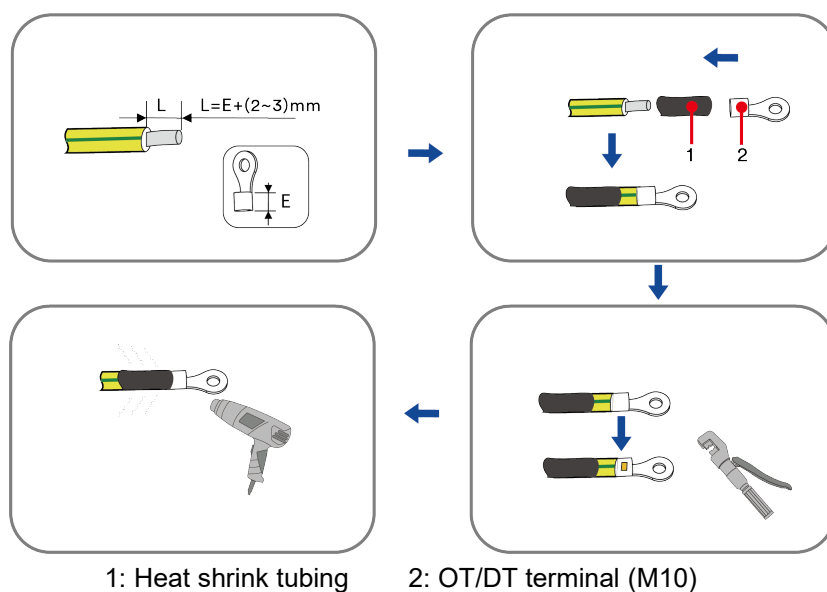
If the ground fault monitoring function is deactivated or the additional grounding is required by local installation standards, then additional grounding can be connected to the inverter.

Requirements for secondary protection ground cable:

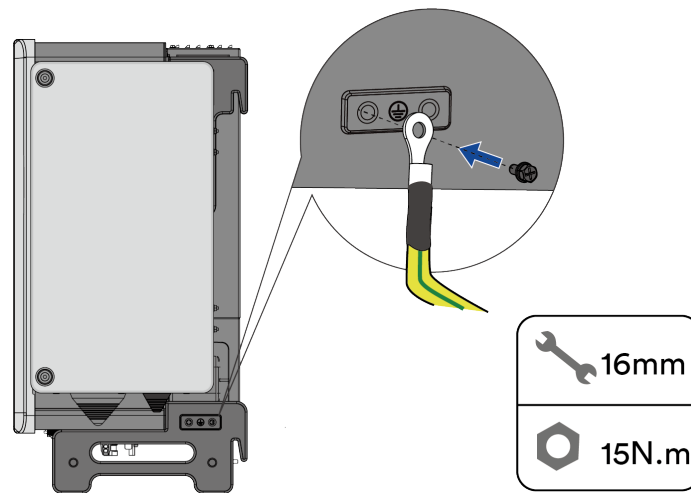
Item	Description	Note
1	Screw	Specifications M10, supplied
2	OT/DT terminal	Specifications M10, provided by the customer
3	Yellow and green ground cable	The same as that of the PE wire in the AC cable.

Procedure:

Step 1: Strip the grounding cable insulation. Insert the stripped part of the grounding cable into the ring terminal lug and crimp using a crimping tool.



Step 2: Remove the screw on the ground terminal, insert the screw through the OT/DT terminal, and lock the terminal using a wrench.



Step 3: Apply paint to the grounding terminal to ensure corrosion resistance.



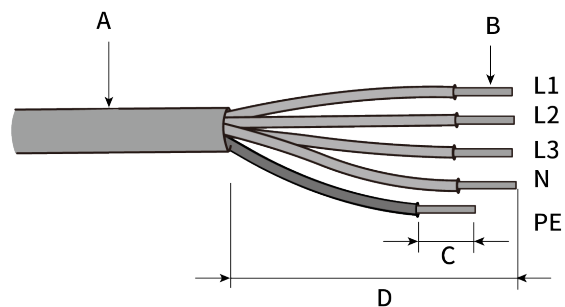
The grounding screws have been anchored to the side of the inverter before delivery, and do not need to be prepared.
There are two grounding terminals. Use at least one of them to ground the inverter.

6.3 AC connection

6.3.1 Requirements for the AC connection

Cable Requirements

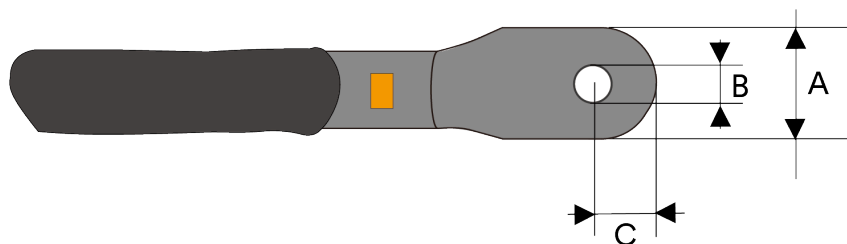
The cable must be dimensioned in accordance with the local and national directives for the dimensioning of cables. The requirements for the minimum wire size derive from these directives. Examples of factors influencing cable dimensioning are: nominal AC current, type of cable, routing method, cable bundling, ambient temperature and maximum desired line losses.



Item	Description	Value
A	External diameter	26 ~ 65mm
B	Copper cable conductor cross-section	98 ~ 185mm ²
	Aluminium cable conductor cross-section	120 ~ 240mm ²
C	Insulation stripping length	Matching terminal
D	Sheath stripping length	260 mm

Requirements for M12 OT/DT Terminal

OT/DT terminals (not included in the delivery scope) are required for fixing AC cables to the terminal block. Purchase the OT/DT terminals according to the following requirements.

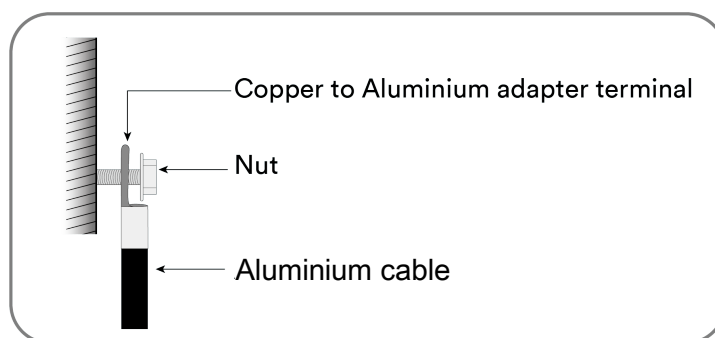


Item	Description
A	$a \leq 44\text{mm}$
B	$12.5\text{mm} \leq b \leq 15.5\text{mm}$
C	$C \leq 25\text{mm}$

Aluminium Cable Requirements

If an aluminium cable is selected, use a copper to aluminium adapter terminal to avoid direct contact between the copper bar and the aluminium cable.

i



Ensure that the selected terminal can directly contact with the copper bar. If there are any problems, contact the manufacturer of terminal.

Direct contact between the copper bar and the aluminium cable will cause electrochemical corrosion and impair the reliability of electrical connection.

Residual current protection

The product is equipped with an integrated universal current-sensitive residual current monitoring unit inside. Hence the product does not require an external residual-current device when operating.



If local regulations require the use of a residual-current device, please install a type A residual-current protection device with a protection limit of no less than 300mA.

Overvoltage category

The inverter can be used in grids of overvoltage category III or lower in accordance with IEC 60664-1. That means that the product can be permanently connected to the grid-connection point of a building. In case of installations with long outdoor cable route, additional measures to reduce overvoltage category IV to overvoltage category III are required.

AC circuit breaker

In PV systems with multiple inverters, protect each inverter with a separate circuit breaker. This will prevent residual voltage being present at the corresponding cable after disconnection.

No consumer load should be applied between AC circuit breaker and the inverter.

The selection of the AC circuit breaker rating depends on the wiring design (wire cross-section area), cable type, wiring method, ambient temperature, inverter current rating, etc. Derating of the AC circuit breaker rating may be necessary due to self-heating or if exposed to heat.

The maximum output current and the maximum output overcurrent protection of the inverters can be found in section 10 "Technical data".

Ground fault monitoring

The inverter is equipped with a grounding conductor monitoring device. This grounding conductor monitoring device detects when there is no grounding conductor connected and disconnects the inverter from the utility grid if this is the case. Depending on the installation site and grid configuration, it may be advisable to deactivate the grounding conductor monitoring. This is necessary, for example, in an IT system if there is no neutral conductor present and you intend to install the inverter between two line conductors. If you are uncertain about this, contact your grid operator or TBEA.



Safety in accordance with IEC 62109 when the ground fault monitoring is deactivated.

In order to guarantee safety in accordance with IEC 62109 when ground fault monitoring is deactivated, carry out the following measure:

- Connect an additional grounding that has at least the same cross-section as the connected grounding conductor to the AC cable. This prevents touch current in the event of the grounding conductor on a damaged AC cable failing.

6.3.2 AC cable connection



WARNING

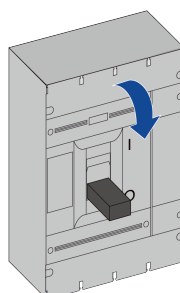
Risk of injury due to electric shock by high leakage current.

If the ground wire is disconnected, touching the product may result in death or lethal injuries due to high leakage current.

- The product must be grounded correctly in order to protect property and personal safety.

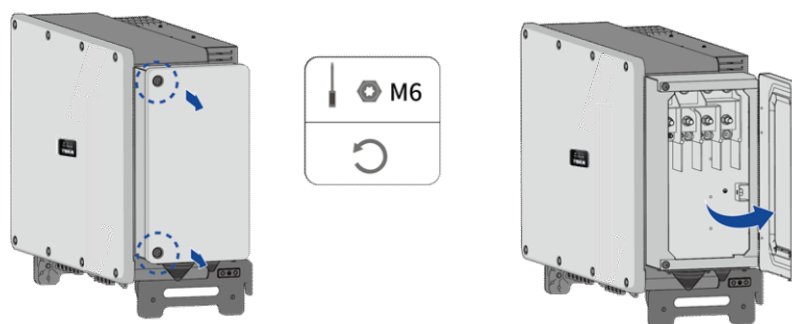
Procedure:

Step 1: Switch off the AC circuit breaker and lock it to avoid it from being inadvertently switched on.

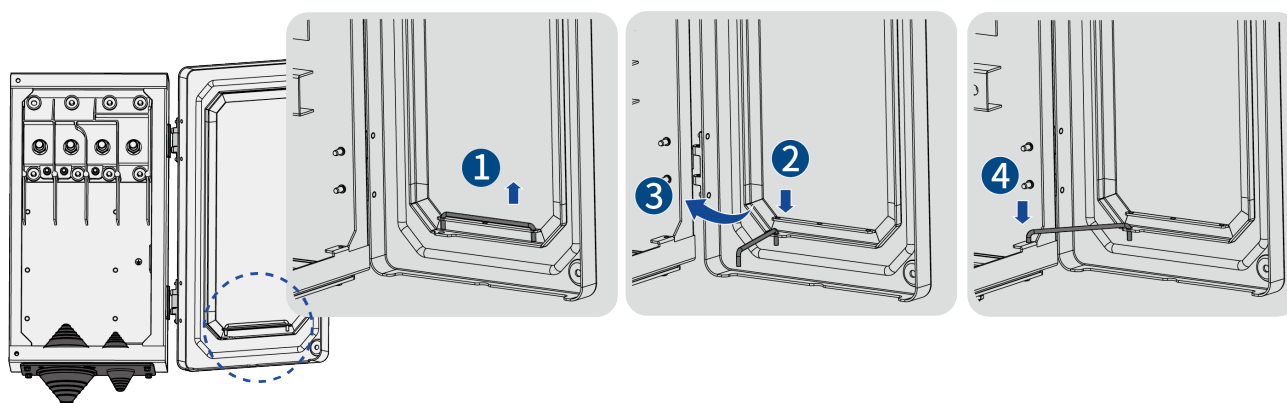


OFF

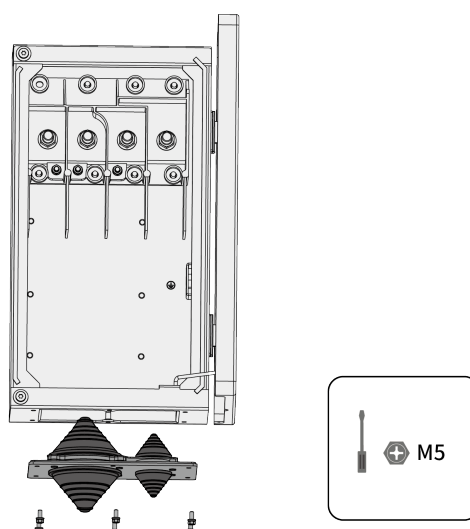
Step 2: Remove the two screws from the wiring compartment using a torx screwdriver and open the wiring compartment.



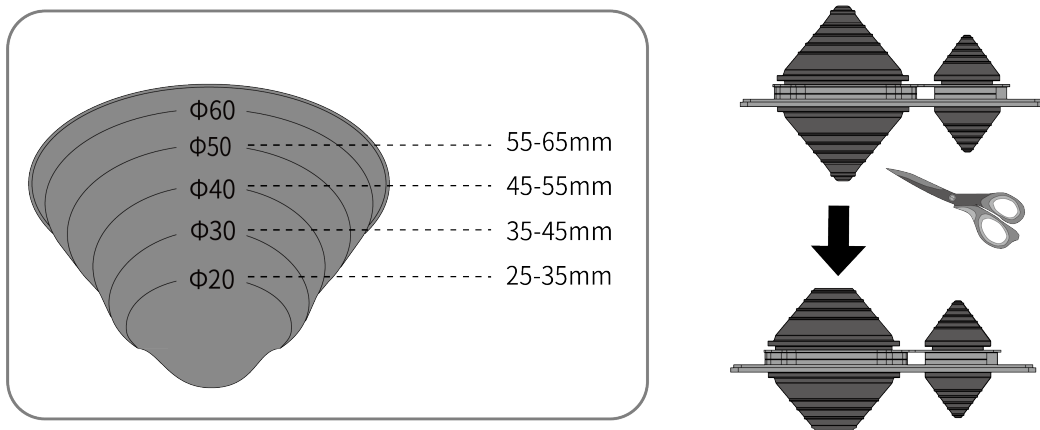
Step 3: Keep the wiring compartment opened during wiring through the limit lever attached to the cover.



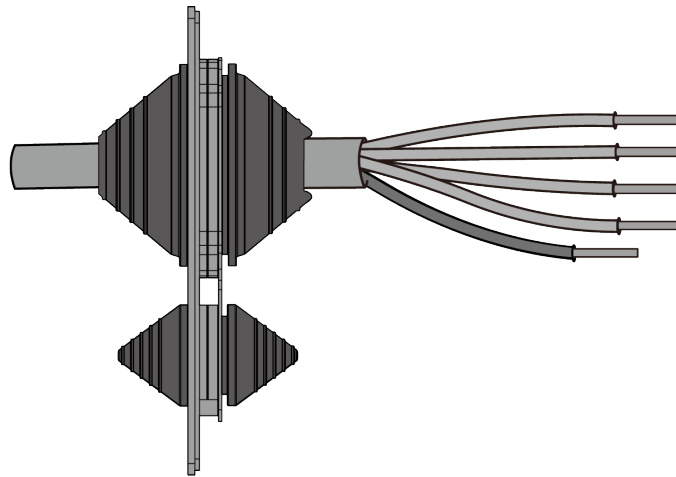
Step 4: Use a screwdriver to remove the waterproof ring at the bottom of the wiring compartment and store the removed screws properly.



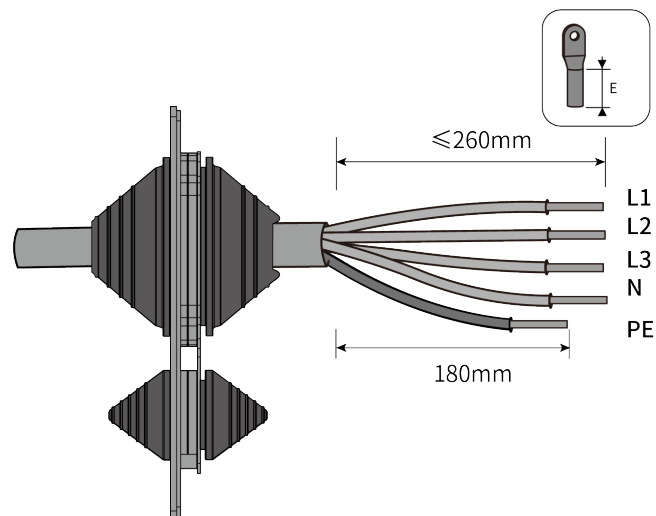
Step 5: Cut the appropriate hole in the tower guard coil according to the selected AC wire outer diameter specification.



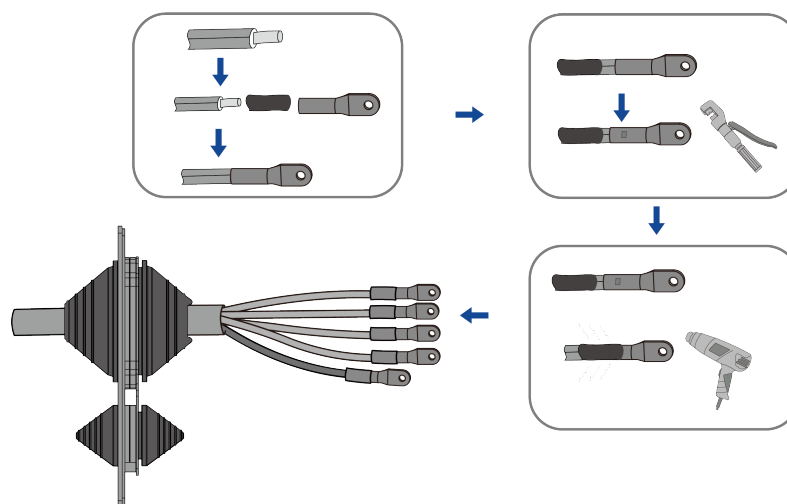
Step 6: Lead the cable with the protective layer stripped through the waterproof ring.



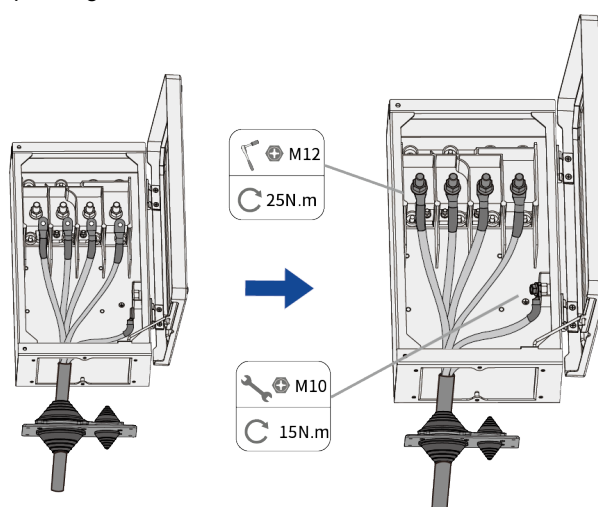
Step 7: Strip the protection layer and insulation layer by specific length, as described in the figure below.



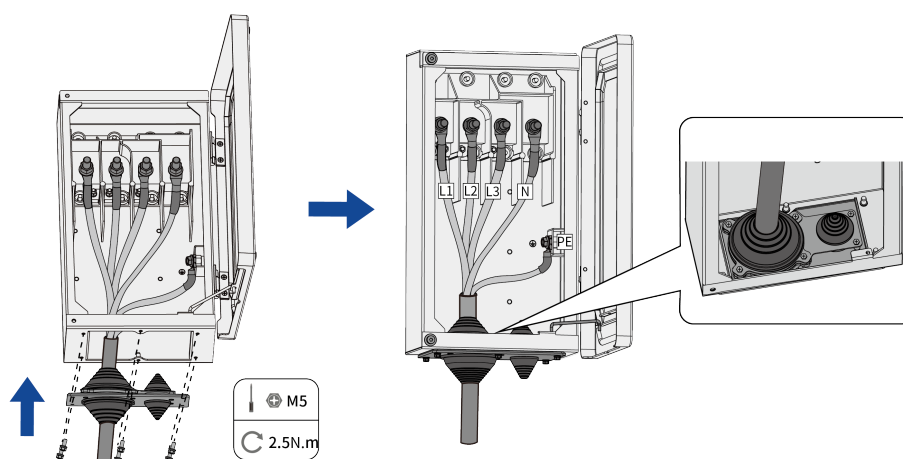
Step 8: Make the cable and crimp OT/DT terminal.



Step 9: Secure the wires to corresponding terminals.

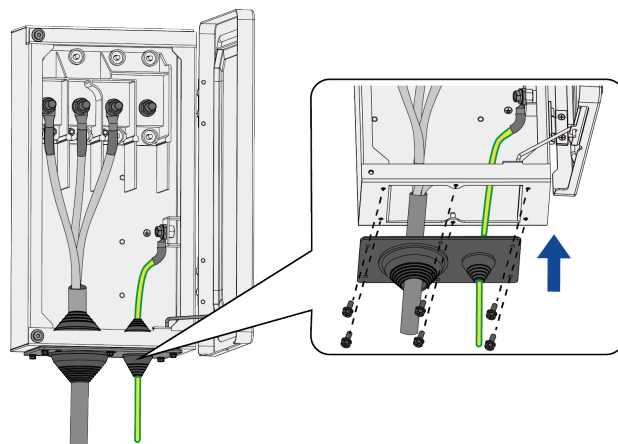


Step 10: Reinstall the waterproof ring.

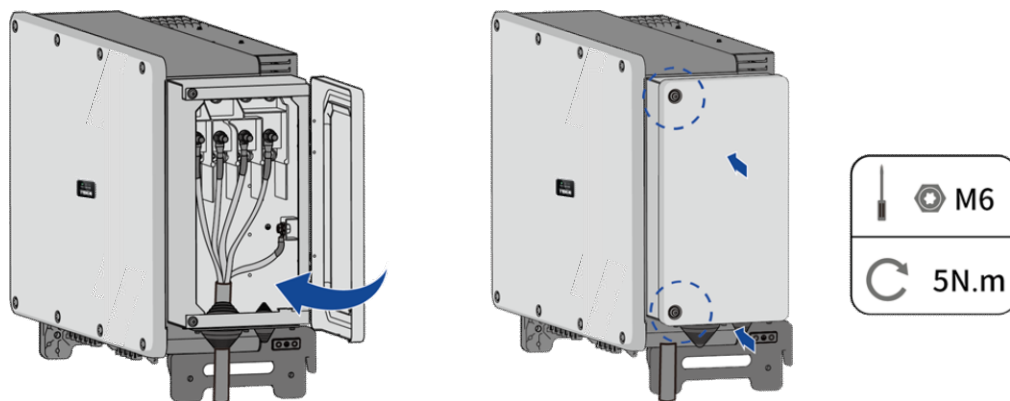




If the PE cable is an independent single-core cable, inserted into the cabinet through the reserved grounding port.



Step 11: Close the wiring compartment and tighten the two screws on the wiring compartment with a torx screwdriver.



6.4 DC connection

6.4.1 Requirements for the DC connection

Requirements for the PV modules per input:

- All PV modules should be of the same type.
- All PV modules should be aligned and tilted identically.
- On the coldest day based on statistical records, the open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter.
- The same number of series-connected PV modules must be connected to each string.
- The maximum input current per string must not be exceeded and must stay within the DC rating of the DC connectors.
- The DC cables to the inverter must be used with the connectors included in the scope of delivery.
- The thresholds for the input voltage and the input current of the inverter must be adhered to.
- The positive DC cables of the PV modules must be used with the positive DC connectors. The negative DC cables of the PV modules must be used with the negative DC connectors.
- To ensure the optimal power generation of the system, the voltage difference between different MPPT circuits shall be less than 200V.

6.4.2 Assembling the DC connectors



DANGER

Danger to life due to electric shock when live components or exposed DC cables are touched !

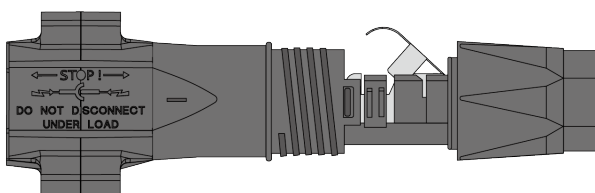
When exposed to light, the PV modules generate high DC voltage which is present in the DC cables. Touching exposed live DC cables may result in death or lethal injuries due to electric shock.

- Do not touch non-insulated parts or cables.
- Disconnect the product from voltage sources and ensure it cannot be reconnected before working on the device.
- Wear suitable personal protective equipment for all work on the product.

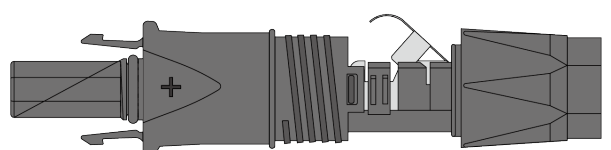
For connection to the inverter, all PV module connection cables must be fitted with the DC connectors provided. Assemble the DC connectors as described in the following.

Assemble the DC connectors as described below. Be sure to observe the correct polarity. The DC connectors are marked with the symbols “+” and “-.”

A



B

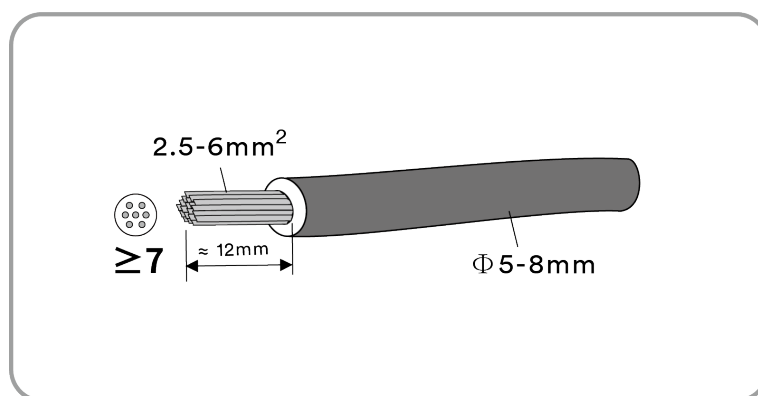


Cable requirements:

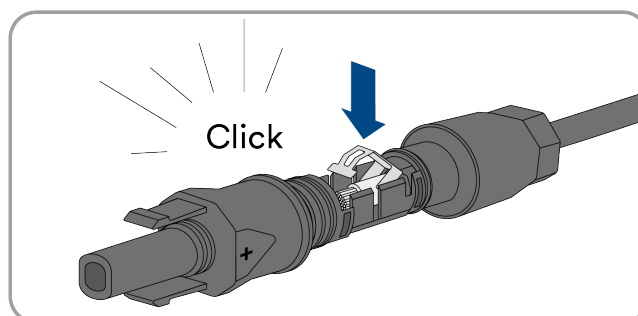
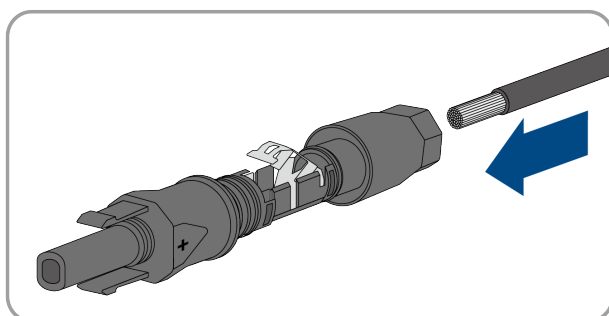
Item	Description	Value
1	Cable type	PV cable
2	External diameter	5-8 mm
3	Conductor cross-section	2.5-6 mm ²
4	Number of copper strands	At least 7
5	The rated voltage	≥1100 V

Procedure:

Step 1: Strip 12 mm off the cable insulation.

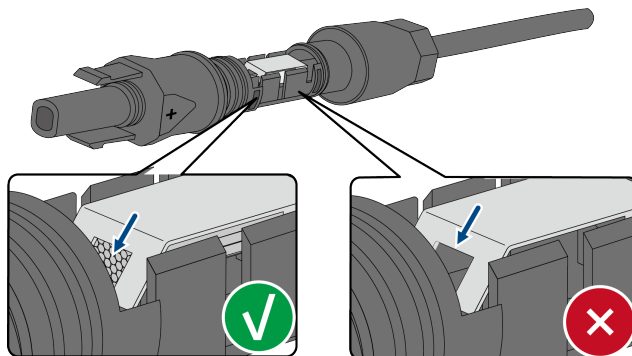


Step 2: Insert the stripped cable into the DC connector up to the stop. Press the clamping bracket down until it audibly snaps into place. The stranded wire can be seen inside the clamping bracket chamber.

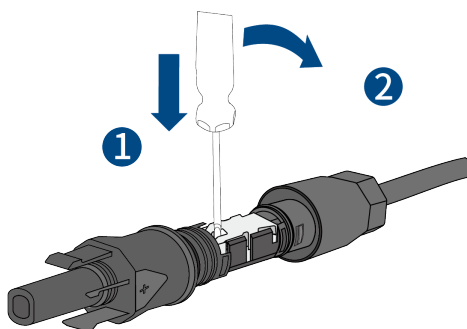




If the stranded wire is not visible in the chamber, the cable is not correctly inserted and the connector must be reassembled. To do this, the cable must be removed from the connector.

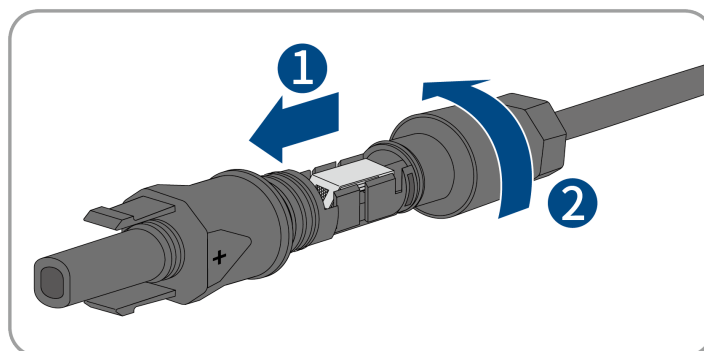


Release the clamping bracket. To do so, insert a screwdriver (blade width: 3.5 mm) into the clamping bracket and pry the clamping bracket open.



Remove the cable and go back to Step 2.

Step 3: Push the swivel nut up to the thread and tighten the swivel nut. (SW15, Torque: 2.0Nm).



6.4.3 Connecting the PV array



DANGER

Danger to life due to high voltages in the inverter!

When exposed to light, the PV modules generate high DC voltage which is present in the DC cables. Touching live DC cables may result in death or lethal injuries due to electric shock.

- Before connecting the PV array, ensure that the DC switch is switched off and that it cannot be turned on.
- Do not disconnect the DC connectors under load.

NOTE

The inverter can be destroyed by overvoltage.

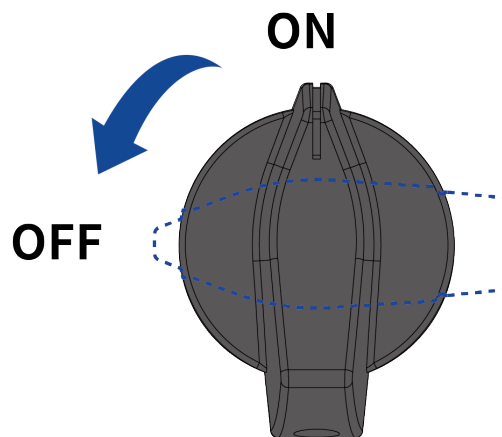
If the voltage of the string

s exceeds the maximum DC input voltage of the inverter, it can be destroyed due to overvoltage. All warranty claims become void.

- Do not connect strings with an open-circuit voltage greater than the maximum DC input voltage of the inverter.
- Check the design of the PV system.

Step 1: Ensure that the inverter AC circuit breaker is switched off and ensure that it cannot be accidentally turned on.

Step 2: Ensure that the DC switch is switched off and ensure that it cannot be accidentally turned on.

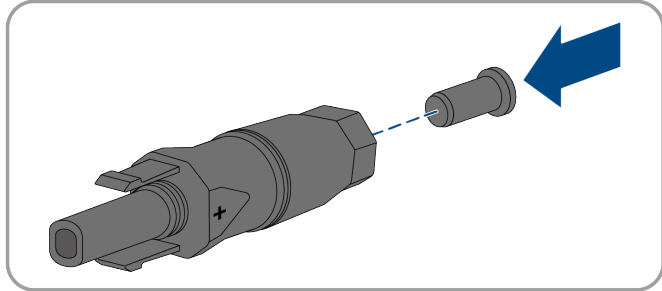
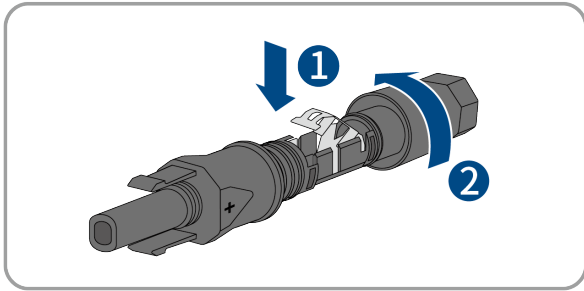
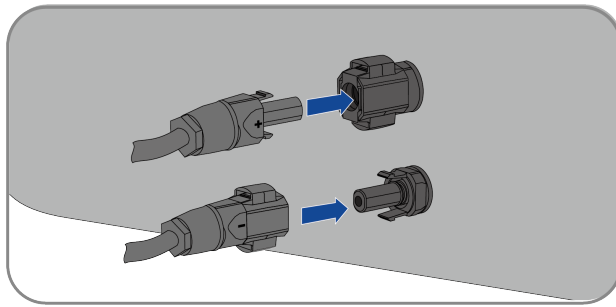


Step 3: Ensure that there is no ground fault in the PV array.

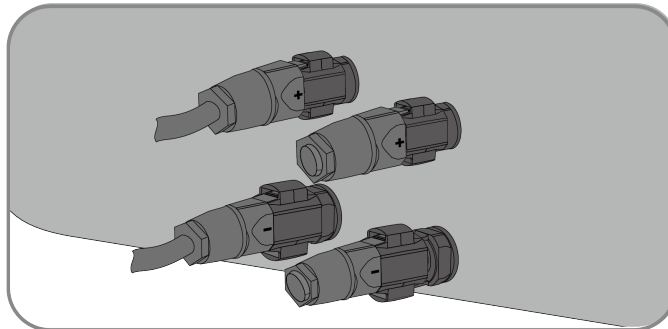
Step 4: Check whether the DC connector has the correct polarity. If the DC connector is equipped with a DC cable having the wrong polarity, the DC connector must be reassembled. The DC cable must always have the same polarity as the DC connector.

Step 5: Ensure that the open-circuit voltage of the PV array does not exceed the maximum DC input voltage of the inverter. Connect the assembled DC connectors to the inverter until they audibly snap into place.

Step 6: Connect the assembled DC connectors to the inverter.



- **Step 7:** For unused DC connectors, push down the clamping bracket and push the swivel nut up to the thread.
- **Step 8:** Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.



6.5 RS485 cable connection

NOTE

Damage to the inverter due to electrostatic discharge.

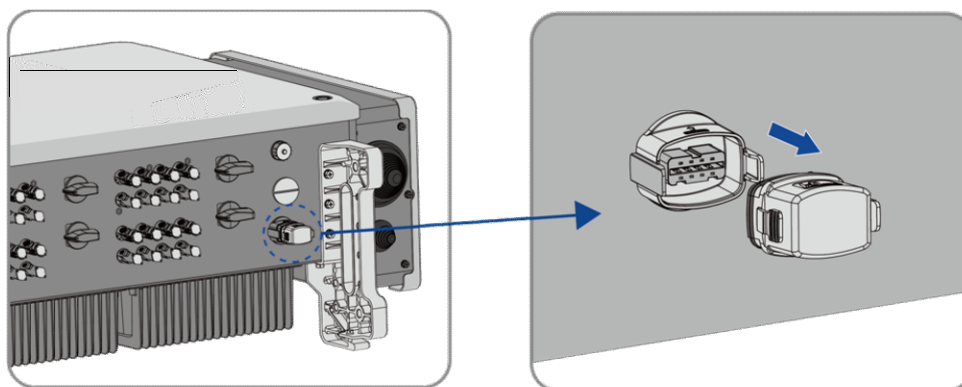
Internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Ground yourself before touching any component.

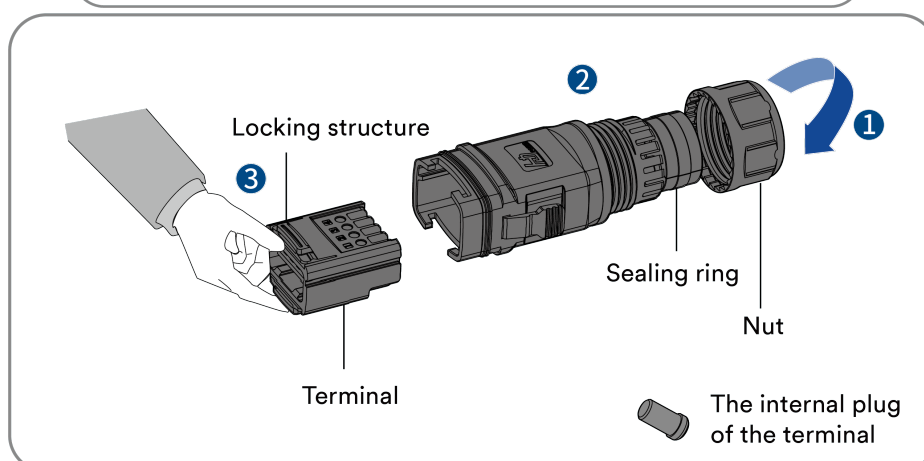
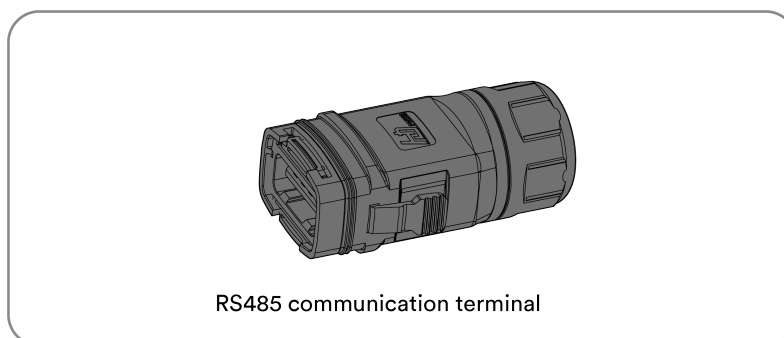
6.5.1 Connection Procedure

Step 1: Take out the relevant accessory from the package.

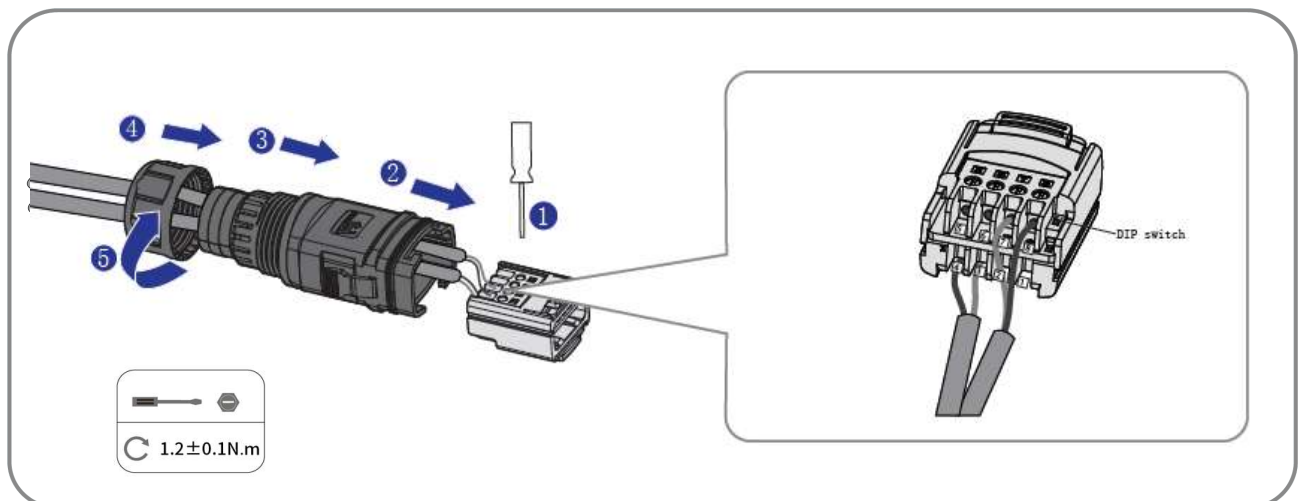
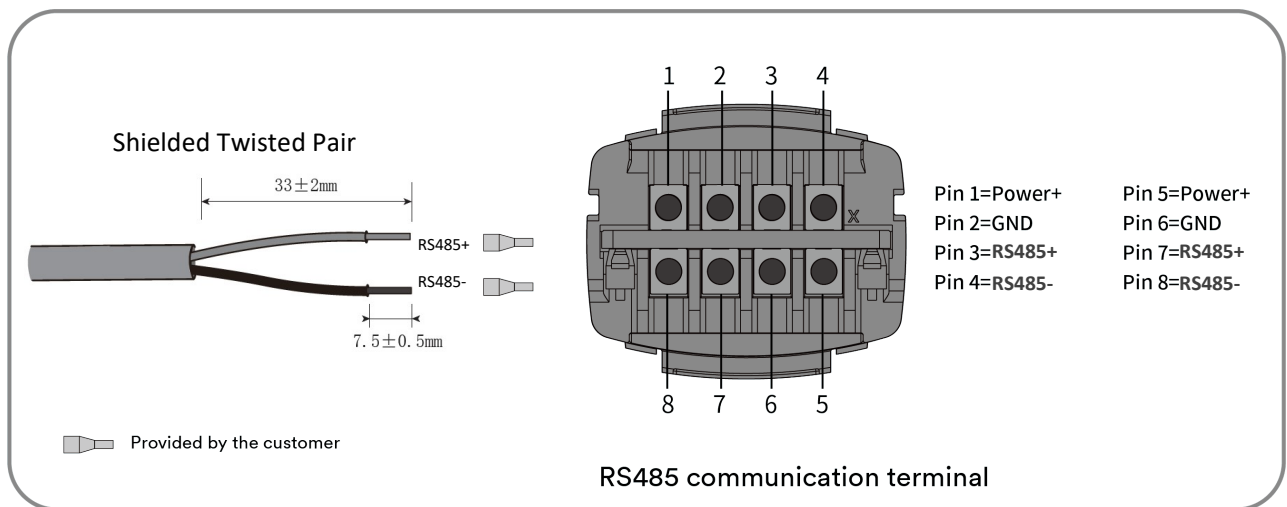
Step 2: Remove the dust and waterproof cover of the RS485 communication on the inverter and retain it.



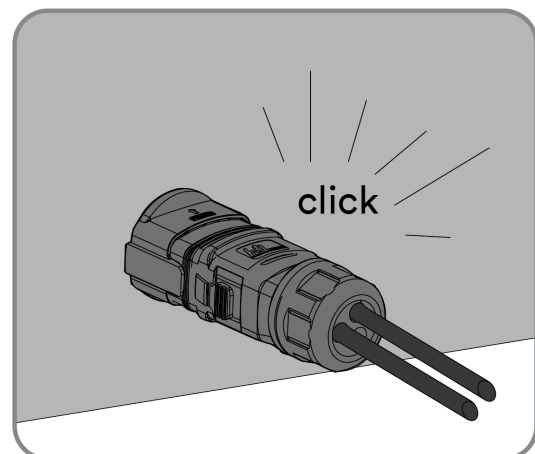
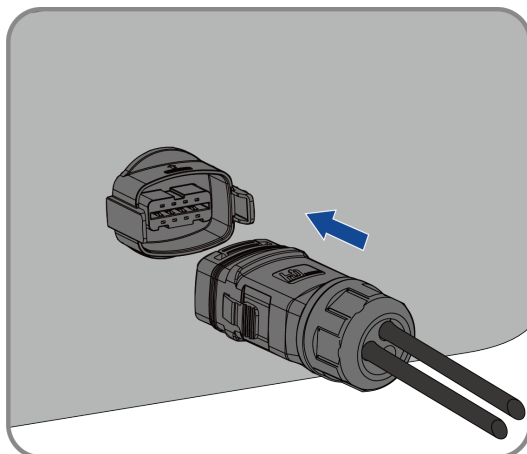
Step 3: Rotate the nut, take out the sealing ring, take out the plug, hold the locking structure, and take out the wiring terminal.



Step 4: Strip the protection layer and insulation layer by specific length. Lock the shielded twisted-pair communication cable to the wiring terminal according to the sequence shown in the following figure, insert the wiring terminal into the sealing head, adjust the communication cable, insert the sealing ring, and lock the nut.



Step 5: Insert the completed RS485 communication terminal plug into the port, until it audibly snaps into place and confirm it is installed firmly.



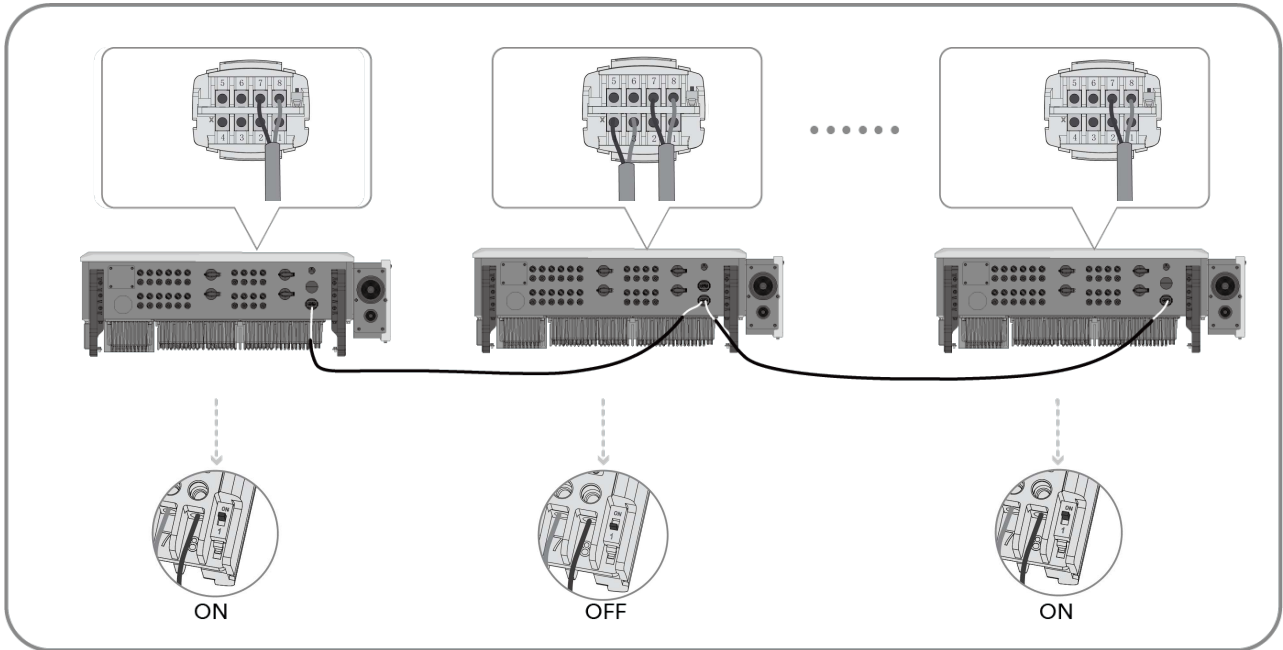
Disassemble the network cable in reverse order.

6.5.2 Multi-inverter connection

In case of multiple inverters, all the inverters can be connected via RS485 cables in a daisy chain configuration.

The inverter has an impedance matching function of the 485 communication bus. If the communication bus needs to match the impedance, turn the DIP switch to the ON position. If the communication bus does not need to match the impedance, turn the DIP switch to the OFF position.

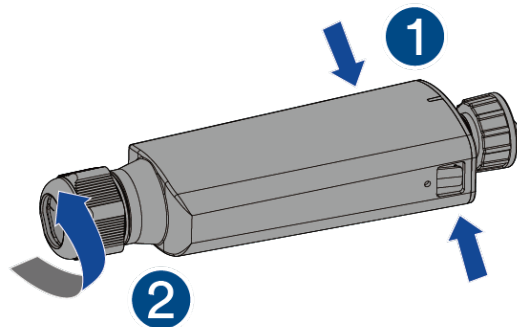
If multiple inverters are connected in a daisy chain communication configuration, the DIP switch settings are as follows:



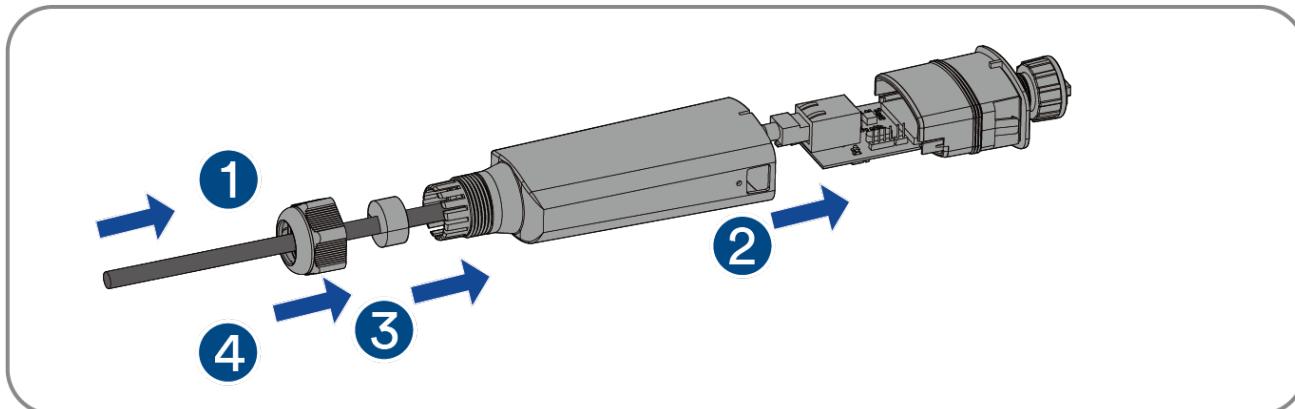
It is recommended to choose 3-core twisted wire to improve the anti-interference ability of RS485 communication. The ground wire of the 3-core twisted wire can be connected to terminal G.

6.6 WiFi stick connection

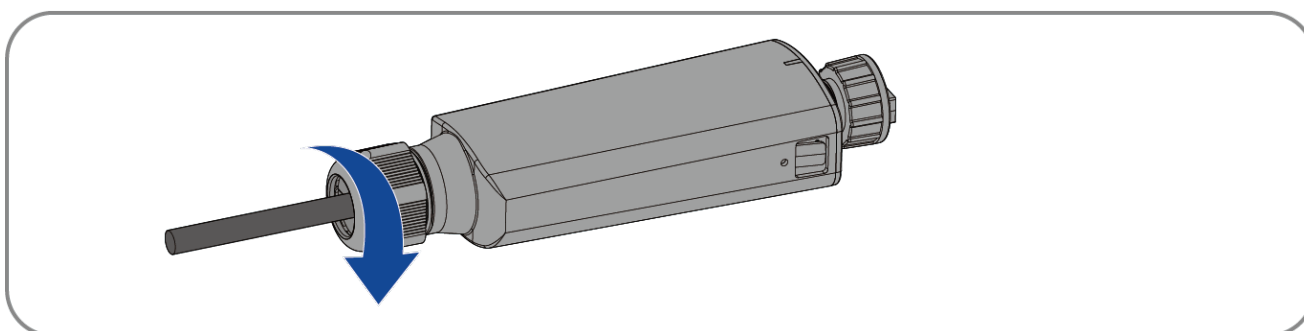
Step 1: Rotate the nut, take out the sealing ring, hold the locking structure, and take out the wiring terminal.



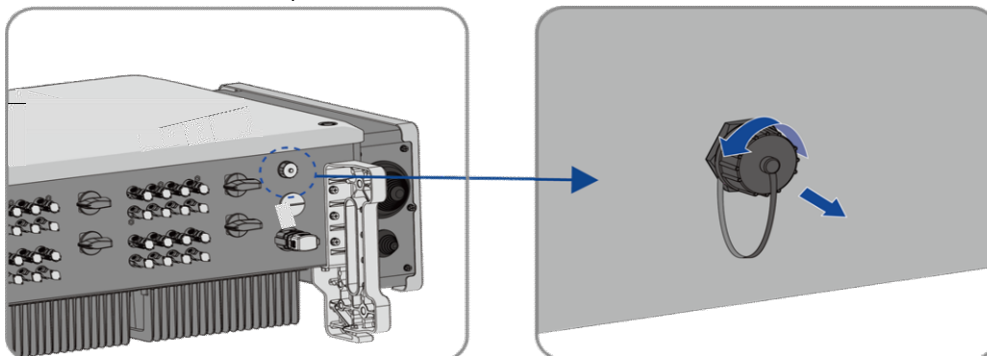
Step 2: Lock the communication cable to the wiring terminal according to the sequence shown in the following figure.



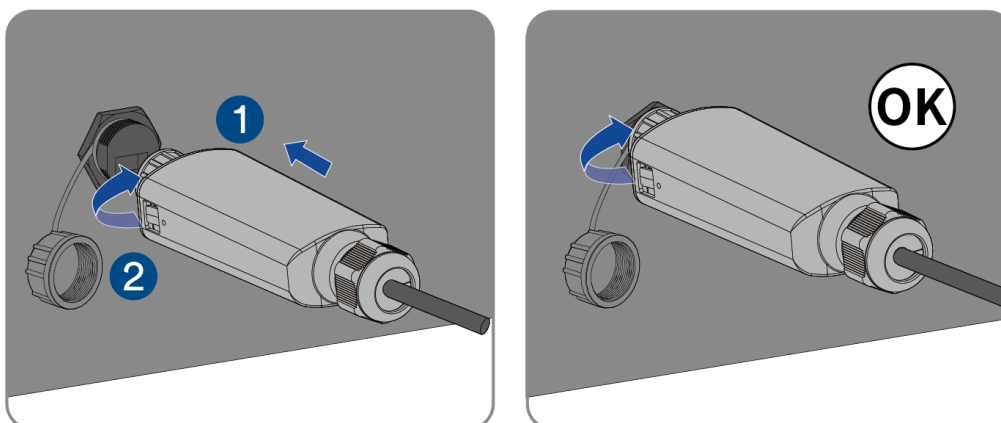
Step 3: Insert the wiring terminal into the sealing head, adjust the communication cable, insert the sealing ring, and lock nut.



Step 4: Remove the dust and waterproof cover of the WiFi stick on the inverter and retain it.



Step 5: Attach the WiFi stick to the connection port in place and tighten it into the port by hand with the nut in the modular. Make sure the modular is securely connected and the label on the modular can be seen.



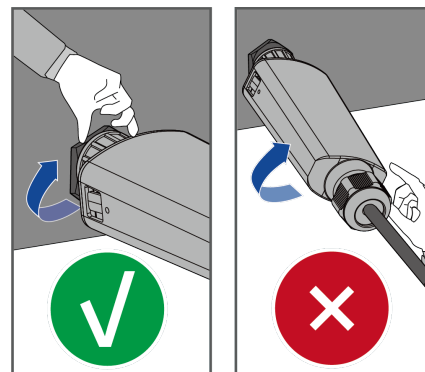
NOTE

Rotating the communication modular will damage the communication modular!

The communication modular is protected by locking nuts to protect the reliability of the connection. If the body of the communication modular is rotated, the communication modular will be damaged.

It can only be locked by a nut.

- Do not rotate the communication modular body.



7 Commissioning

7.1 Inspection before commissioning



WARNING

Danger to life due to high voltages on DC conductors !

When exposed to sunlight, the PV array generates dangerous DC voltage which is present in the DC conductors. Touching the DC and AC conductors can lead to lethal electric shocks.

- Only touch the insulation of the DC cables.
- Only touch the insulation of the AC cables.
- Do not touch ungrounded PV modules and brackets.
- Wear personal protective equipment, such as insulating gloves.

Check the following items before starting the inverter:

- Ensure the DC switch and AC circuit breaker are OFF.
- Ensure the inverter has been correctly mounted onto the mounting bracket.
- Ensure there are no objects lying on top of the inverter.
- Ensure the communication cable and AC connector have been correctly wired and tightened.
- Ensure the inverter's exposed metal surface has a ground connection.
- Ensure the DC voltage of the strings does not exceed the permitted limits of the inverter.
- Ensure the DC voltage has the correct polarity.
- Ensure that the insulation resistance to ground is greater than the insulation resistance protection value.
- Ensure the grid voltage at the point of connection of the inverter complies with the permitted value of the inverter.
- Ensure the AC circuit breaker complies with this manual and all applicable local standards.

7.2 Commissioning procedure

If all of the items mentioned above meet the requirements, proceed as follows to start up the inverter for the first time.

1. Turn the DC switch of the inverter to the "ON" position.
2. Set initial protection parameters via the TB-eSolar App. For details, please refer to "TB-eSolar User Manual."
3. Switch on the AC circuit breaker. If the irradiation and grid conditions meet the minimum thresholds, the inverter will operate normally.
4. Observe the LED indicator to ensure that the inverter operates normally.

8 Decommissioning the product

8.1 Disconnecting the inverter from voltage sources

Prior to performing any work on the product, always isolate it from all voltage sources as described in this section. Always adhere to the prescribed sequence.



WARNING

Danger to life due to electric shock from destruction of the measuring device due to overvoltage.

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

- Only use measuring devices with a DC input voltage range of 1100 Vdc or higher.

Procedure:

- Step 1:** Turn OFF the AC circuit breaker connected downstream of the AC output of the inverter and lock and secure it to avoid inadvertent reconnection.
- Step 2:** Turn OFF the DC switch and lock and secure it to avoid inadvertent reconnection.
- Step 3:** Wait until the LEDs are OFF.
- Step 4:** Use a current clamp meter to ensure that no current is present in the DC cables.



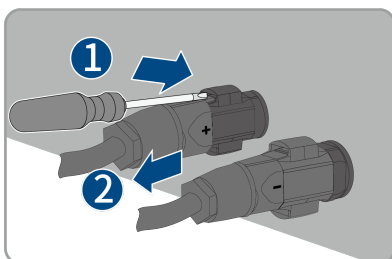
DANGER

Danger to life due to electric shock when touching exposed DC conductors or DC plug contacts if the DC connectors are damaged or loose!

The DC connectors can break or become damaged, become free of the DC cables, or no longer be connected correctly if the DC connectors are released and disconnected incorrectly. This can result in the DC conductors or DC plug contacts being exposed. Touching exposed live DC conductors or DC plug connectors will result in death or serious injury due to electric shock.

- Wear appropriately insulated gloves and use appropriately insulated tools when working on the DC connectors.
- Ensure that the DC connectors are in perfect condition and that none of the DC conductors or DC plug contacts are exposed.
- Carefully release and remove the DC connectors as described in the following.

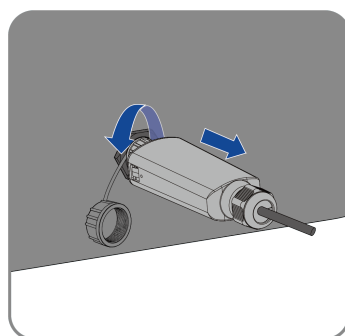
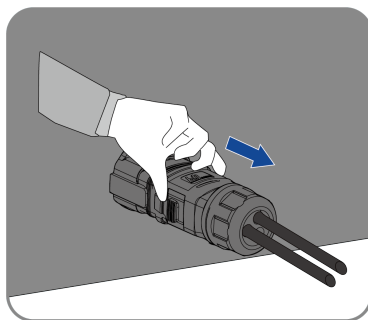
Step 5: Wait until the LEDs are OFF. Release and remove the DC connectors. To do so, insert a flat-blade screwdriver or an angled screwdriver (blade width: 3.5 mm) into one of the side slots and pull the DC connectors out.



- Step 6:** Ensure that no voltage is present between the positive terminal and negative terminal at the DC inputs using a suitable measuring device.
- Step 7:** Open the AC/COM cover junction box and use a multimeter to ensure that the AC wiring terminals isolated from an AC power source. Remove the AC cables in reverse order by referring to “6.3.2 AC cable connection” and “6.5 RS485 cable connection”.

Step 8: Hold down the buckle on the side of the RS485 terminal and pull out the RS485 terminal.

Step 9: Pull out the WiFi stick terminal in reverse order.



8.2 Dismantling the inverter

After disconnecting all electrical connections as described in Section 9.1, the inverter can be removed as follows.

Procedure:

Step 1: Dismantle the inverter referring to “5.3 Mounting” in reverse steps.

Step 2: If necessary, remove the wall-mounting bracket from the wall.

Step 3: If the inverter will be reinstalled in the future, please refer to “3.2 Inverter Storage”.

9 Technical data

9.1 DC/AC

9.1.1 TS75KTL-A10/TS80KTL-A10

DC Input	TS75KTL-A10	TS80KTL-A10
Maximum power of PV array	112500 Wp	120000 Wp
Maximum input voltage ^{*1}	1100V	
MPP voltage range ^{*2}	200-1000 V	
MPP voltage range at P _{nom} ^{*3}	460-850 V	
Rated input voltage	630V	
Minimum input voltage	200 V	
Initial input voltage	250V	
Max. input current	32A	
Isc PV (absolute maximum)	48A	
Maximum reverse current into the PV modules	0A	
Number of independent MPP inputs	8	
Strings per MPP input	2	
Overvoltage category in accordance With ICE 60664-1	II	
<div><div>*1.</div><div>“Max. input voltage” is the maximum DC input voltage that the inverter can withstand. If the input voltage exceeds this value, the inverter may be damaged.</div></div> <div><div>*2.</div><div>The input voltage exceeds the “MPP voltage range”, the inverter will not work properly.</div></div> <div><div>*3.</div><div>The full-load MPP voltage range of the inverter is the value measured under the rated AC voltage. If you have any questions, please consult local service personnel.</div></div>		
AC output	TS75KTL-A10	TS80KTL-A10
Rated power at 230V	75000 W	80000 W
Rated apparent power	75000 W	80000 W
Maximum apparent power ^{*4}	75000 VA	88000 VA
Nominal grid voltage ^{*5}	220 V / 380 V [3/N/PE]	
	230 V / 400 V [3/N/PE]	
	240 V / 415 V [3/N/PE]	
Grid voltage range	180 V~ 305 V / 312 V~528 V	
Nominal grid frequency ^{*6}	50Hz/60Hz	
Grid frequency range	45-55Hz/55-65Hz	
Rated current at 220 V	113.7 A	121.3 A
Rated current at 230V	108.7 A	116.0 A
Rated current at 240V	104.2 A	111.2 A
Maximum output current	114 A	127 A
Inrush current	<20% of nominal AC current for a maximum of 10ms	
Contribution to peak short-circuit current ip	330 A	
Initial short-circuit alternating current (Ik" first single period effective value)	114 A	127A
Short circuit current continuous [ms] (max output fault current)	114 A	127 A
Recommended rated current of AC circuit breaker	125 A	160 A
Total harmonic distortion of the Output current with total harmonic distortion of the AC voltage <2%, and AC power >50%	<3%	

of the rated power	
Power factor at rated power	1
Adjustable displacement power factor	0.8 inductive ~ 0.8 capacitive
Feed-in phase	3
Connection phase	3
Overvoltage category in accordance with IEC60664-1	III
Efficiency	
Maximum efficiency	98,6%
European weighted efficiency	98,4%

*4. For European market and AS/NZS4777.2 $S_{max} = 1.0 \times P_n$.

*5. The voltage range meets the requirements of the corresponding national grid code.

*6. The frequency range meets the requirements of the corresponding national grid code.

9.1.2 TS100KTL-A10/TS110KTL-A10

DC Input	TS100KTL-A10	TS110KTL-A10
Maximum power of PV array	150000 Wp	165000 Wp
Maximum input voltage ^{*1}	1100V	
MPP voltage range ^{*2}	200-1000 V	
MPP voltage range at P_{nom} ^{*3}	460-850 V	
Rated input voltage	630V	
Minimum input voltage	200 V	
Initial input voltage	250V	
Max. input current	32A	
Isc PV (absolute maximum)	48A	
Maximum reverse current into the PV modules	0A	
Number of independent MPP inputs	10	
Strings per MPP input	2	
Overvoltage category in accordance With ICE 60664-1	II	

*1. "Max. input voltage" is the maximum DC input voltage that the inverter can withstand. If the input voltage exceeds this value, the inverter may be damaged.

*2. The input voltage exceeds the "MPP voltage range", the inverter will not work properly.

*3. The full-load MPP voltage range of the inverter is the value measured under the rated AC voltage. If you have any questions, please consult local service personnel.

AC output	TS100KTL-A10	TS110KTL-A10
Rated power at 230V	100000 W	110000 W
Rated apparent power	100000 W	110000 W
Maximum apparent power ^{*4}	110000 VA	121000 VA
Nominal grid voltage ^{*5}	220 V / 380 V [3/N/PE] 230 V / 400 V [3/N/PE] 240 V / 415 V [3/N/PE]	
Grid voltage range	180 V~ 305 V / 312 V~528 V	
Nominal grid frequency ^{*6}	50Hz/60Hz	
Grid frequency range	45-55Hz/55-65Hz	
Rated current at 220 V	151.6 A	166.7 A
Rated current at 230V	145.0 A	159.5 A
Rated current at 240V	138.9 A	152.8 A
Maximum output current	158.8 A	174.7 A

Inrush current	<20% of nominal AC current for a maximum of 10ms	
Contribution to peak short-circuit current i_p	330 A	
Initial short-circuit alternating current (I_k first single period effective value)	158.8 A	174.7 A
Short circuit current continuous [ms] (max output fault current)	158.8 A	174.7 A
Recommended rated current of AC circuit breaker	160 A	200 A
Total harmonic distortion of the Output current with total harmonic distortion of the AC voltage <2%, and AC power >50% of the rated power	<3%	
Power factor at rated power	1	
Adjustable displacement power factor	0.8 inductive ~ 0.8 capacitive	
Feed-in phase	3	
Connection phase	3	
Overvoltage category in accordance with IEC60664-1	III	
Efficiency		
Maximum efficiency	98,6%	
European weighted efficiency	98,4%	

*4. For European market and AS/NZS4777.2 $S_{max} = 1.0 \times P_n$.

*5. The voltage range meets the requirements of the corresponding national grid code.

*6. The frequency range meets the requirements of the corresponding national grid code.

9.2 General data

General data	TS75K/80K/100K/110KTL-A10
Width × height × depth	984mm × 640mm × 330mm
Weight	86Kg
Topology	Non-isolated
Operating temperature range	-25°C ~ +60°C
Allowable relative humidity range (non-condensing)	0% ~ 100%
Degree of protection for electronics in accordance with IEC 60529	IP66
Climatic category in accordance with IEC 60721-3-4	4K4H
Protection class (according to IEC 62103)	I
Pollution degree outside the enclosure	3
Pollution degree inside the enclosure	2
Maximum operating altitude above mean sea level	4000m(>3000m derating)
Self-consumption (night)	<3 W
Cooling method	Active cooling
Typical noise emission	< 65 dB(A)@1m
Display	LED indicator, App
Demand response mode in accordance with AS/NZS 4777.2	DRM0
Export active power output	Via connecting Smart meter
Earth Fault Alarm	Audible (AU)
Interfaces	2 x RS485 port, 1 x WiFi stick port

Communication	Modbus RTU
Mounting information	Wall mounting bracket
DC connection technology	Phenix contact
AC connection technology	Terminal block
Radio technology	WLAN 802.11 b/g/n
Radio spectrum	2.4 GHz

9.3 Protective device

Protective devices	TS75K/80K/100K/110KTL-A10
DC reverse polarity protection	Integrated
DC isolator	Integrated
Ground fault monitoring	Integrated
AC short-circuit current capability	Integrated
All-pole sensitive residual current monitoring unit	Integrated
Active anti-islanding protection	Integrated
PV string current monitoring	Integrated
DC current injection monitoring	Integrated
Low voltage ride through	Integrated
High voltage ride through	Integrated
Overvoltage protection	DC Type II / AC Type III

10 Troubleshooting

When the PV system does not operate normally, we recommend the following solutions for quick troubleshooting. If an error occurs, the red LED will turn solid ON. The error code can be read from the TBEA APP.

Error code	Message	Corrective measures
1-5 8-10	Self-diagnosis fault	<ul style="list-style-type: none"> Disconnect the inverter from the utility grid and the PV array and reconnect it after LED's turn off. If this fault is still being displayed, contact TBEA service.
6	Bus over voltage fault	<ul style="list-style-type: none"> Check the open-circuit voltages of the strings and make sure it is below the maximum DC input voltage of the inverter. If the input voltage is within the permitted range and the fault still occurs, it might be that the internal circuit has been damaged. Contact TBEA service.
32	RoCoF fault	<ul style="list-style-type: none"> Check the grid frequency and observe how often major fluctuations occur. If this fault is caused by frequent fluctuations, contact the grid operator to modify to disable RoCof protection or modify the thresholds.
33	Grid frequency fault	<ul style="list-style-type: none"> Check whether the protection parameters are appropriately set via the App or the LCD. Measure the actual grid frequency, and contact the local electric power company for solutions if the grid frequency is beyond the set range. If the preceding causes are ruled out and the fault persists, contact TBEA Service.
34	Grid voltage fault	<ul style="list-style-type: none"> Check the grid voltage and the cable connections at the inverter. Check the grid voltage at the point of connection. If the grid voltage is outside the permissible range due to local grid conditions, contact the local electric power company for solutions. If the grid voltage lies within the permitted range and this fault still occurs, contact TBEA service.
35	Grid loss	<ul style="list-style-type: none"> Check whether any AC circuit breakers downstream of the inverter AC output have switched off. Check the grid voltage to ensure that it is within the permitted values of the grid code. Check the AC cable and the cable connection at the inverter. If this fault is still being shown, contact TBEA service.
36 56-58	GFCI fault	<ul style="list-style-type: none"> Ensure the grounding connection of the inverter is reliable. Conduct a visual inspection of all PV cables and modules. If this fault is still shown, contact TBEA service.
37	PV over voltage fault	<ul style="list-style-type: none"> Check the open-circuit voltages of the strings and make sure it is below the maximum DC input voltage of the inverter. If the input voltage lies within the permitted range and the fault still occurs, contact TBEA service.
38	Isolation fault	<ul style="list-style-type: none"> Check the PV array's insulation to ground and ensure that the insulation resistance to ground is greater than 1 MOhm. Otherwise, conduct a visual inspection of all PV cables and modules. Ensure the grounding connection of the inverter is reliable. If this fault occurs often, contact TBEA service.
40	Over temperature fault	<ul style="list-style-type: none"> Check whether the airflow to the heat sink is obstructed. Check whether the ambient temperature around the inverter is too high.

41-45 47	Self-diagnosis fault	<ul style="list-style-type: none"> • Disconnect the inverter from the grid and the PV array and reconnect after 3 minutes. • If this fault is still being shown, contact TBEA service.
48	10 minutes average over voltage fault	<ul style="list-style-type: none"> • Check the grid voltage at the point of connection of inverter. • If the overvoltage happens in correspondence of the highest inverter production levels, the root cause can be the high impedance of the line. Contact the grid operator to modify the protection thresholds or modify the line. • If the grid voltage lies within the permitted range and this fault still occurs, contact TBEA service.
61,62	DRMs device fault	<ul style="list-style-type: none"> • Check the DRED device communication or operation
65	PE wire connection fault	<ul style="list-style-type: none"> • Check if the ground line is connected with the inverter. • Ensure the grounding connection of the inverter is connected and reliable. • If this fault occurs often, contact TBEA service.

Contact TBEA service if you encounter errors not listed in the table above.

11 Maintenance

11.1 Cleaning the contacts of the DC switch



DANGER

High voltage of PV string may cause life danger!

If the DC connector is disconnected while the PV inverter is working, an electric arc may occur causing electric shock and burns. Wear appropriately insulated gloves and use appropriately insulated tools when working on the DC connectors.

- Please disconnect the circuit breaker on the AC side first, and then disconnect the DC switch.

To ensure the normal operation of the DC input switch, it is necessary to clean the DC switch contacts every year.

Procedure:

Step 1: Turn OFF the AC circuit breaker downstream of the inverter AC output and lock and secure it to avoid inadvertent reconnection.

Step 2: Rotate the DC switch handle from the ON" position to the "OFF" position and repeat five times.

11.2 Cleaning air inlet and outlet



WARNING

Hot enclosure or heat sink may cause personal injury!

When the inverter is working, the temperature of the enclosure or heat sink may be higher than 70°C. Physical contact may cause burns.

- Before cleaning the air outlet, shut down the machine and wait approximately 30 minutes until the temperature of the enclosure decreases to a normal temperature.

A considerable amount of heat is generated as the inverter is feeding power into the grid. The inverter adopts a controlled forced-air cooling method. In order to maintain good ventilation, please check to make sure the air inlet and outlet are not blocked.

Procedure:

Step 1: Turn OFF the AC circuit breaker downstream of the AC output of the inverter and ensure that it cannot be inadvertently reconnected.

Step 2: Turn OFF the DC switch, rotate the DC switch handle from the "ON" position to the "OFF" position.

Step 3: Clean the air inlet and outlet of the inverter with a soft brush.

11.3 Fan maintenance



WARNING

Hot enclosure or heat sink may cause personal injury!

When the inverter is working, the temperature of the enclosure or heat sink may be higher than 70°C. Physical contact may cause burns.

- Before cleaning the air outlet, shut down the machine and wait approximately 30 minutes until the temperature of the enclosure decreases to a normal temperature.

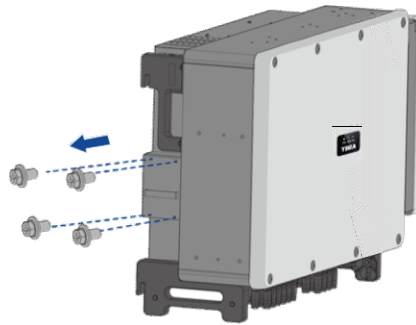
Fans inside the inverter are used to cool the inverter during operation. If the fans do not operate normally, the inverter may not be cooled down and inverter efficiency may decrease. Therefore, it is necessary to clean the dirty fans and replace the broken fans in time.

Procedure:

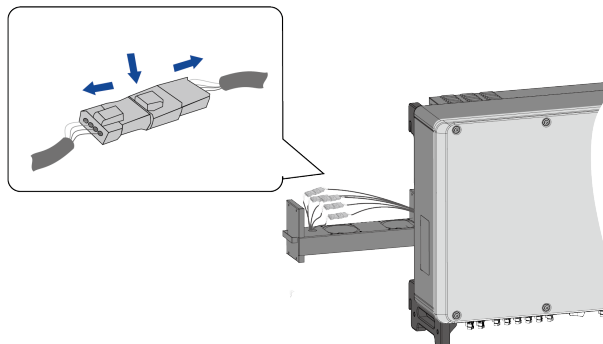
Step 1: **Turn OFF** the AC circuit breaker downstream of the AC output of the inverter and ensure that it cannot be inadvertently turned ON.

Step 2: **Disconnect** the DC switch and rotate the DC switch handle from the “ON” position to the “OFF” position. Wait for approximately 30 minutes until the heatsink temperature is reduced to normal temperature.

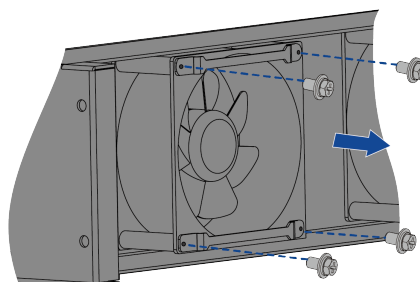
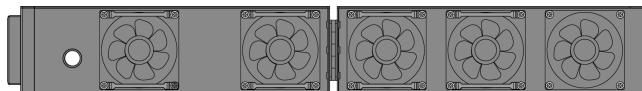
Step 3: **Loosen** the screw on the sealing plate of the fan module.



Step 4: Press the hump of the latch hook, disconnect the fan power connector, and pull out the fan tray.



Step 5: **Remove** the screws at the bottom of the fan. Use a clean cloth, brush, or vacuum cleaner to clean the fan, or replace the faulty fan directly.



Step 6: **Reinstall** the fan back to the inverter in reverse order and restart the inverter.

12 Recycling and disposal

Dispose of the packaging and replaced parts according to the rules applicable in the country where the device is installed.



Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.

13 EU declaration of conformity

Within the scope of the EU directives



- Radio Equipment Directive 2014/53/EU
(L 153/62-106. May 22. 2014) (RED)
- Restriction of the use of certain hazardous substances 2011/65/EU (L 174/88, June 8, 2011) and 2015/863/EU
(L 137/10, March 31, 2015) (RoHS)

TBEA Xi'an Electric Technology Co., Ltd. confirms herewith that the inverters described in this manual are in compliance with the fundamental requirements and other relevant provisions of the above mentioned directives.

14 Service and warranty

If you have any technical problems concerning our products, please contact TBEA service. We require the following information in order to provide you with the necessary assistance:

- Inverter device type
- Inverter serial number
- Type and number of connected PV modules
- Error code
- Mounting location
- Installation date
- Warranty card

Warranty terms and conditions are available through the Sales Manager.

When the customer needs warranty service during the warranty period, the customer must provide a copy of the invoice, factory warranty card, and ensure the electrical label of the inverter is legible. If these conditions are not met, TBEA has the right to refuse to provide with the relevant warranty service.

15 Contact

TBEA Xi'an Electric Technology Co., Ltd.

<http://english.sunoasis.com.cn>

Tel: +86-400-606-6029

Add: No.70 Shanglinyuan 4th Road, High-tech Zone, Xi'an, China

TBEA