HYD 5 … 20KTL-3PH

Installation and operating manual

Version 01 | May 2022

English



HYD 5KTL-3PH, HYD 6KTL-3PH, HYD 8KTL-3PH, HYD 10KTL-3PH, HYD 15KTL-3PH, HYD 20KTL-3PH

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1 About this manual

This manual contains important safety information that must be observed during installation and maintenance of the device.

Carefully read this manual before use and retain it for future reference!

This manual must be treated as an integral component of the device. The manual must be kept in close proximity to the device, including when it is handed over to another user or moved to a different location.

1.1 Copyright declaration

The copyright of this manual is owned by SOFARSOLAR. It may not be copied – neither partially nor completely – by companies or individuals (including software, etc.) and must not be reproduced or distributed in any form, or with the appropriate means.

SOFARSOLAR reserves the right to final interpretation. This manual may be amended following feedback from users or customers. Please consult our website at http://www.sofarsolar.com for the latest version.

The current version was updated on 20/07/2022.

1.2 Structure of the manual

This manual contains important safety and installation instructions that must be observed during installation and maintenance of the device.

1.3 Scope

This product manual describes the installation, electrical connection, commissioning, maintenance and fault elimination procedures of the **HYD 5K...20KTL-3PH** inverters.

1.4 Target group

This manual is intended for specialist electrical engineers who are responsible for the installation and commissioning of the inverter in the PV system, as well as the PV system operators.

1.5 Symbols used

This manual contains information on safe operation and uses symbols to ensure the safety of persons and property as well as the efficient operation of the inverter. Please read through the following symbol explanations carefully in order to prevent injury or property damage.

⚠ DANGER

Non-observance will result in death or serious injury.

- Follow the warnings in order to prevent death or serious injury!

⚠ WARNING

Non-observance may result in death or serious injury.

- Follow the warnings in order to prevent serious injury!

⚠ CAUTION

Non-observance may result in minor injury.

- Follow the warnings in order to prevent injury!

ATTENTION

Non-observance may result in property damage!

- Follow the warnings in order to prevent damage to or destruction of the product.

NOTE

- Provides tips essential to the optimal operation of the product.

2 Basic safety information

NOTE

- If you have any questions or problems after reading the following information, please contact SOFARSOLAR

This chapter details the safety information pertaining to the installation and operation of the device.

2.1 Safety information

Read and understand the instructions within this manual and familiarise yourself with the relevant safety symbols in this chapter before beginning with the installation of the device and eliminating any faults.

Before connecting to the power grid, you must obtain official authorisation from the local power grid operator in accordance with the corresponding national and state requirements. Furthermore, operation may only be carried out by qualified electricians.

Please contact the nearest authorised service centre if any maintenance or repairs are required. Please contact your dealer to obtain information about your nearest authorised service centre. Do NOT carry out repairs on the device yourself; this may lead to injury or property damage.

Before installing the device or carrying out maintenance on it, you must open the DC switch in order to interrupt the DC voltage of the PV generator. You can also switch off the DC voltage by opening the

DC switch in the Array junction box. Not doing this may result in serious injury.

2.1.1 Qualified personnel

Personnel tasked with the operation and maintenance of the device must have the qualifications, competence and experience required to perform the described tasks, while also being capable of fully understanding all instructions contained within the manual. For safety reasons, this inverter may only be installed by a qualified electrician who:

- has received training on occupational safety, as well as the installation and commissioning of electrical systems
- is familiar with the local laws, standards and regulations of the grid operator.

SOFARSOLAR assumes no responsibility for the destruction of property or any injuries to personnel caused by improper usage.

2.1.2 Installation requirements

Please install the inverter according to the information contained in the following section. Mount the inverter to a suitable object with a sufficient load-bearing capacity (e.g. walls, PV frames etc.) and ensure that the inverter is upright. Choose a suitable place for the installation of electrical devices. Ensure that there is sufficient space for an emergency exit which is suitable for maintenance. Ensure sufficient ventilation in order to guarantee an air circulation for the cooling of the inverter.

2.1.3 Transport requirements

The factory packaging is specifically designed to prevent transport damage, i.e. violent shocks, moisture and vibrations. However, the device must not be installed if it is visibly damaged. In this case, notify the responsible transport company immediately.

2.1.4 Labelling on the device

The labels must NOT be concealed by items and foreign objects (rags, boxes, devices, etc.); they must be regularly cleaned and kept clearly visible at all times.

2.1.5 Electrical connection

Observe all applicable electrical regulations when working with the Solar inverter.

⚠ DANGER

Dangerous DC voltage

- Before establishing the electrical connection, cover the PV modules using opaque material or disconnect the PV generator from the inverter. Solar radiation will cause dangerous voltage to be generated by the PV generator!

⚠ DANGER

Danger through electric shock!

- All installations and electrical connections may only be carried out by trained electricians!

IMPORTANT

Authorisation for grid feed-in

- Obtain authorisation from the local power grid operator before connecting the inverter to the public power grid.

NOTE

Voiding of guarantee

- Do not open the inverter or remove any of the labels. Otherwise, SOFARSOLAR shall assume no guarantee.

2.1.6 Operation

⚠ DANGER

Electric shock

- Contact with the electrical grid or the device's terminals may result in an electric shock or fire!
- Do not touch the terminal or the conductor which is connected to the electrical grid.
- Follow all instructions and observe all safety documents that refer to the grid connection.

⚠ CAUTION

Burning due to hot housing

- While the inverter is being operated, several internal components will become very hot.
- Please wear protective gloves!
- Keep children away from the device!

2.1.7 Repair and maintenance

⚠ DANGER

Dangerous voltage!

- Before carrying out any repair work, first switch off the AC circuit breaker between the inverter and power grid, and then the DC switch.
- After switching off the AC circuit breaker and the DC switch, wait a minimum of 5 minutes before starting any maintenance or repair work.

IMPORTANT

Unauthorised repairs!

- Following the elimination of any faults, the inverter should be fully functional once more. Should any repairs be required, please contact a local authorised service centre.
- The internal components of the inverter must NOT be opened without the relevant authorisation. Shenzhen SOFARSOLAR Co., Ltd. assumes no responsibility for any resulting losses or defects.

2.2 Symbols and signs

⚠ CAUTION

Beware of burning hazards due to the hot housing!

- While the inverter is in operation, only touch the display and the buttons, as the housing can become hot.

ATTENTION

Implement earthing!

- The PV generator must be earthed in accordance with the requirements of the local power grid operator!
- For reasons of personal safety, we recommend that all PV module frames and inverters of the PV system are reliably earthed.

⚠ WARNING

Damage due to overvoltage

- Ensure that the input voltage does not exceed the maximum permissible voltage. Overvoltage may cause long-term damage to the inverter, as well as other damage that is not covered by the warranty!

2.2.1 Symbols on the inverter

Several symbols pertaining to safety can be found on the inverter. Please read and understand the content of these symbols before starting the installation.

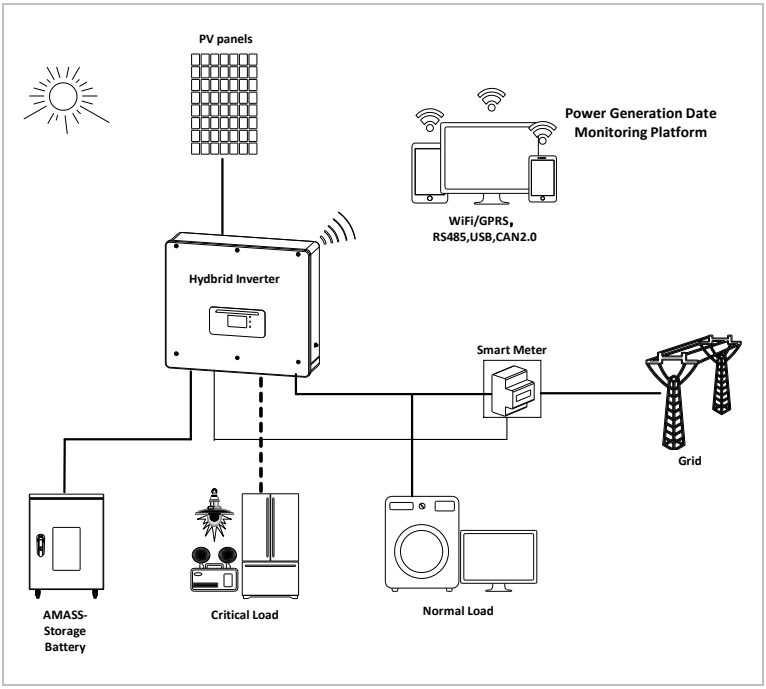
Symbol	Description
	Residual voltage is present in the inverter! Before opening the inverter, you should wait five minutes to ensure that the capacitor has been fully discharged.
	Caution! Danger through electric shock
	Caution! Hot surface
	The product is compliant with EU guidelines
	Earthing point
	Please read the manual before installing the inverter
	Device degree of protection according to EN 60529
	Positive and negative poles of the DC input voltage
	The inverter must always be transported and stored with the arrows pointing upward
	RCM (Regulatory Compliance Mark) The product meets the requirements of the applicable Australian standards.

3 Product features

This chapter describes the product features, dimensions and efficiency levels.

3.1 Product information

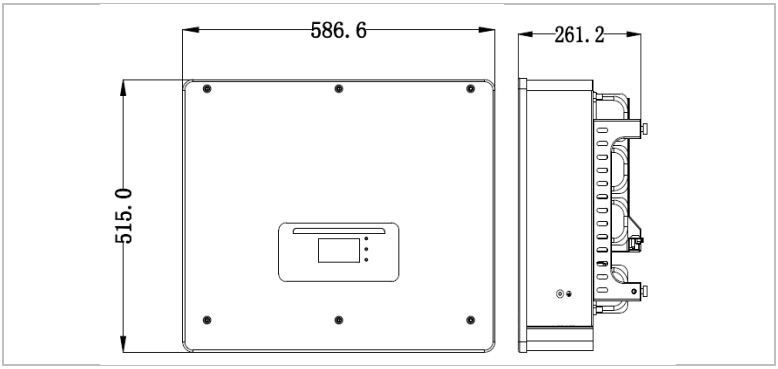
The HYD 5K...20KTL-3PH is a grid-coupled PV and energy storing inverter which can supply energy in stand-alone operation. The HYD 5K...20KTL-3PH has integrated energy management functions which cover a wide range of application scenarios.

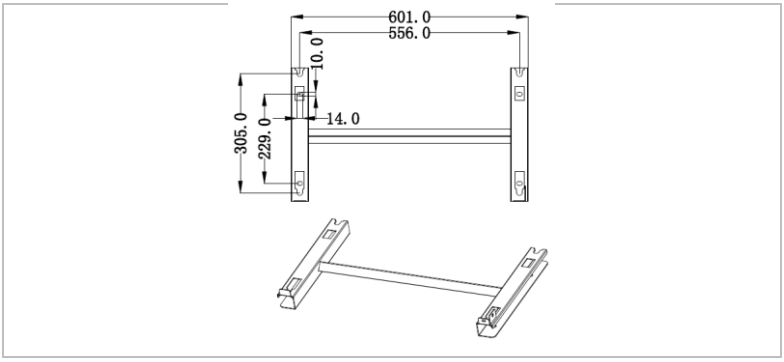


HYD 5K...20KTL-3PH inverters may only be used with photovoltaic modules which do not require one of the poles to be earthed. In normal operation, the operating current must not exceed the limits specified within the technical data.

The selection of the optional inverter parts must be determined by a qualified technician who has good knowledge of the installation conditions.

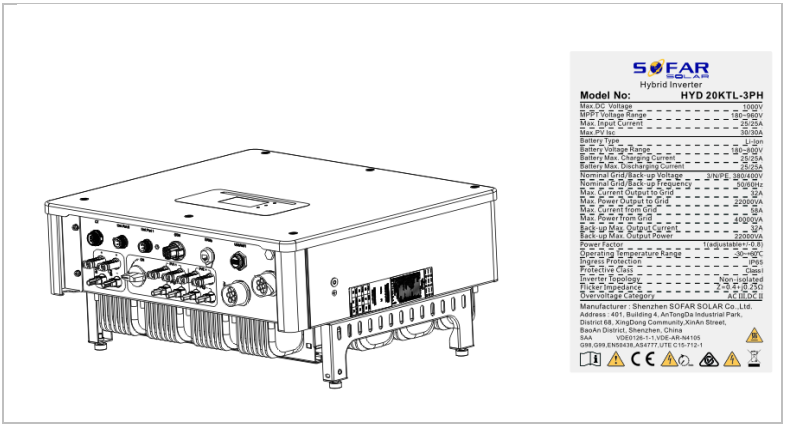
3.2 Product dimensions





3.3 Labelling on the device

Labelling must not be covered or removed!



3.4 Functional features

The DC output generated by the PV generator can be used for both grid feed-in and battery charging.

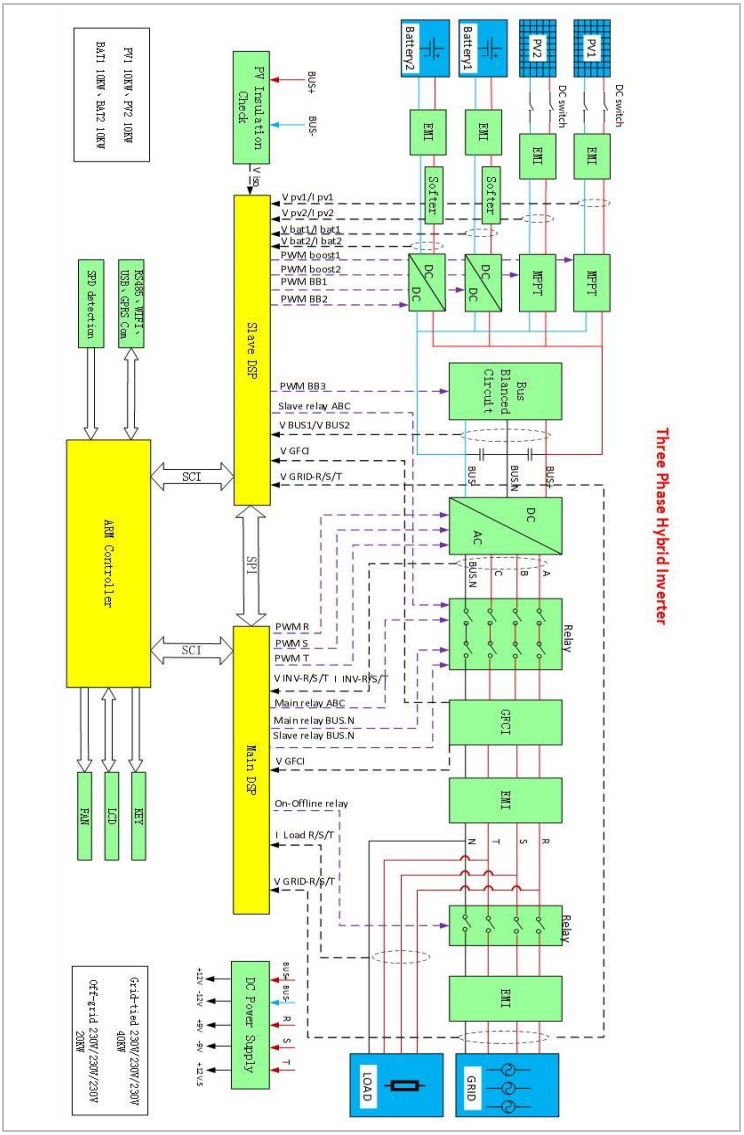
The battery can supply the energy to the grid or the consumer. The emergency current supply mode (EPS) can provide inductive loads such as air conditioning systems or refrigerators with an automatic switchover time of less than 10 milliseconds, and a temporary overload of up to 10% is possible.

3.4.1 Functions

1. Two MPP trackers with 1.5-fold DC overload
2. Flexible switching between on-grid operation and energy storage operation

3. Maximum efficiency when charging and discharging the battery (97.8%)
4. Up to 2 battery strings with a combined maximum charging and discharging current of 50 A
5. Wide battery input voltage range (180–800 V)
6. The EPS output can be connected to unbalanced loads
7. Up to 10 inverters can operate in parallel at the EPS connection and AC connection
8. Monitoring via RS485 and WiFi, optionally via Bluetooth/GPRS

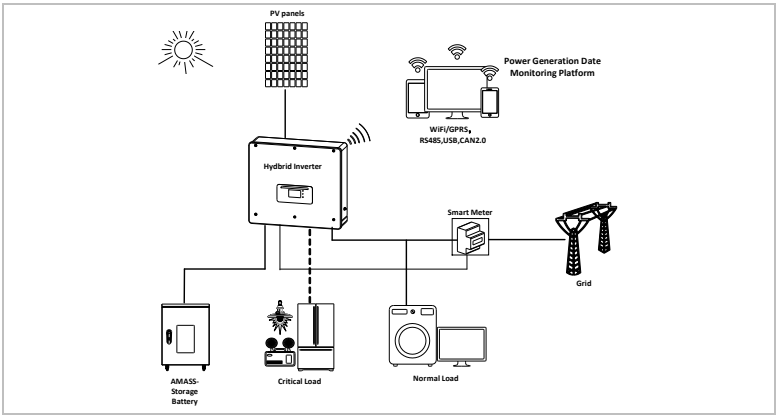
3.4.2 Electrical block diagram



3.5 Application modes

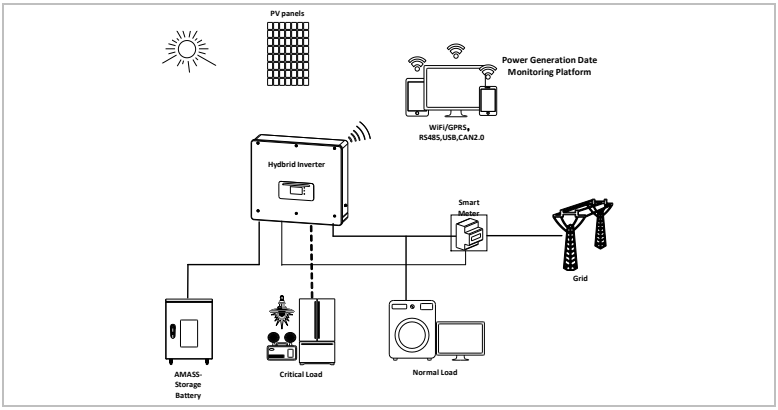
3.5.1 Typical energy storage system

A typical energy storage system with PV panels and battery unit(s), connected to the grid.



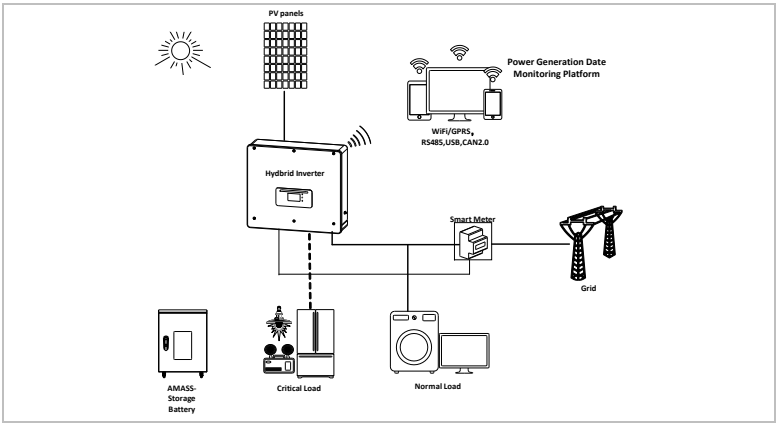
3.5.2 System without PV connection

In this configuration, there are no PV panels connected and the battery is charged through the grid connection.



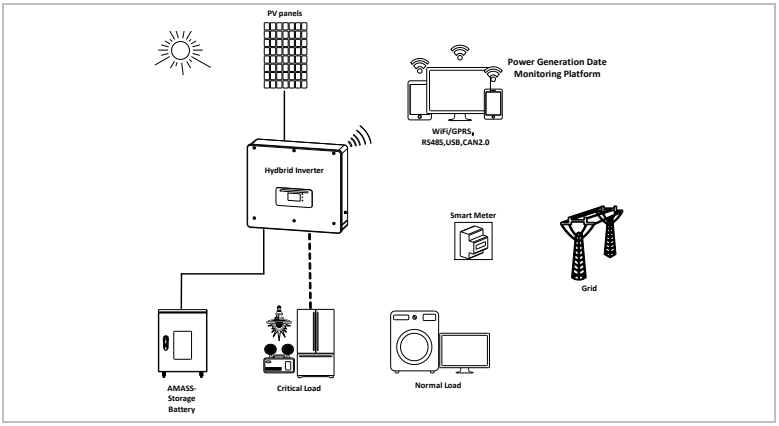
3.5.3 System without battery

In this configuration, the battery unit(s) can be added later.



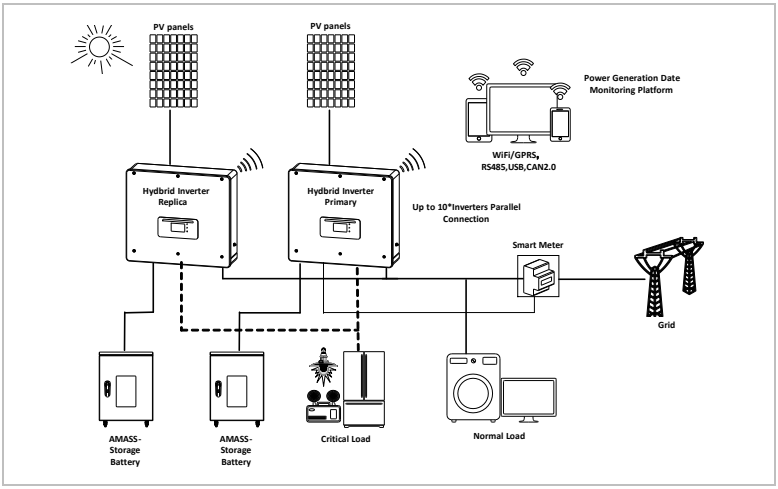
3.5.4 Back-up mode (off-grid)

When there is no grid connection, the PV panels and the battery will provide electricity to the critical load.



3.5.5 System with multiple inverters (5–200 kW)

Up to 10 inverters can be connected in parallel, to the grid and EPS connections, resulting in an EPS output of up to 200 kVA.



NOTE

- The inverters connected in parallel should have the same power and battery configuration.
- The energy meter or CTs are connected to the Master inverter. Control of all inverters takes place via the link cable.
- For the parallel switching of several devices, it is recommended to use a joint AC load break switch for the connected loads at the LOAD connection.
- For the parallel switching of several devices, it is recommended to use a joint AC load break switch for the connected loads at the GRID connection.

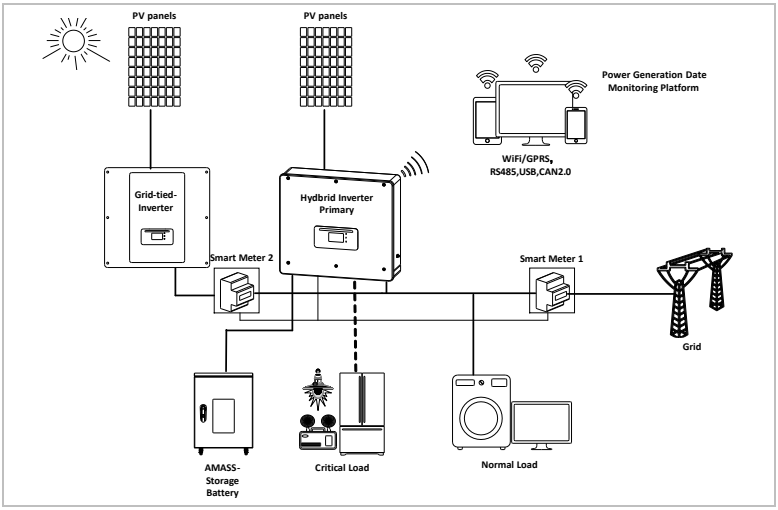
- In order to evenly distribute the loads among the inverters, the cable length between each output and the load must be the same.
- If the maximum apparent power of a load is greater than 110% of the inverter' s rated output, the device must not be connected via the AC LOAD terminal, but rather directly to the grid.

3.5.6 AC retrofit system

In this system configuration, the hybrid system for an already existing PV system is supplemented with a solar inverter of any brand. By installing a second smart meter, the PV production can be taken into account and used for charging the battery.

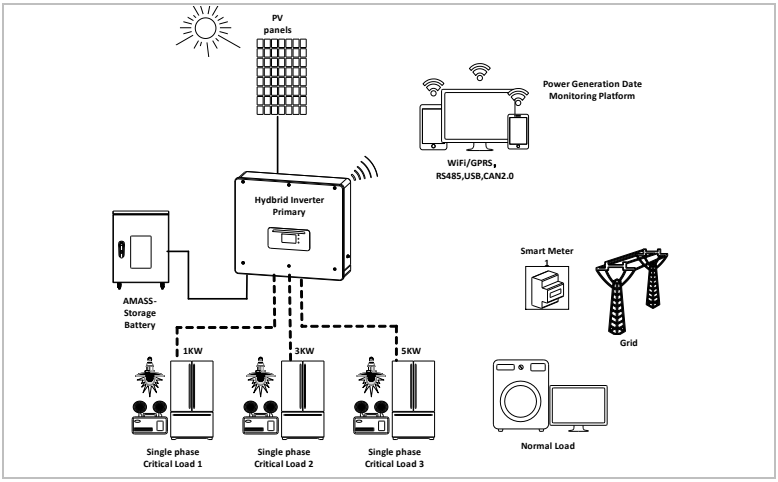
NOTE

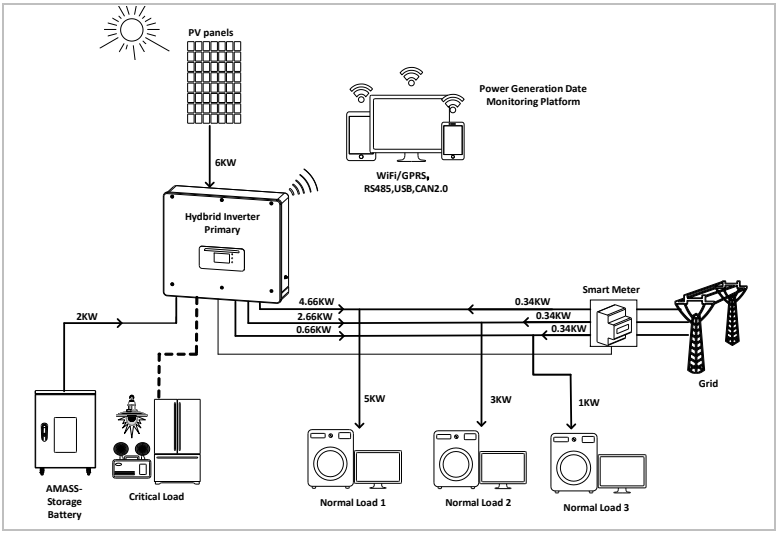
- The communication address of meter 1 should be set to 1. Similarly, the communication address of meter 2 should be set to 2.



3.5.7 Unbalanced load

By enabling the “Unbalanced load” option, the inverter compensates unbalanced loads either in EPS mode or on-grid mode.





3.6 Connecting GTX 3000-H batteries

Using SOFARSOLAR's own battery system GTX 3000-H is the easiest way to build scalable battery systems. A GTX 3000 battery module has a nominal capacity of 2,5 kWh, allowing multiple configurations for one tower from 10 kWh (GTX 3000-H4) to 25 kWh (GTX 3000-H10). Up to four battery towers can be connected in parallel.

Up to four battery towers connected in parallel can be connected to each of the HYD 5K...20KTL-3PH's battery input, with the same DC voltage, resulting in a nominal battery capacity of 200 kWh in the largest configuration.

The HYD 5 ... 8KTL-3PH models have one battery input (max. current 25 A).

The HYD 10 ... 20KTL-3PH models have two battery inputs (max. current 25 A / 25 A). Battery inputs can be set in parallel mode to

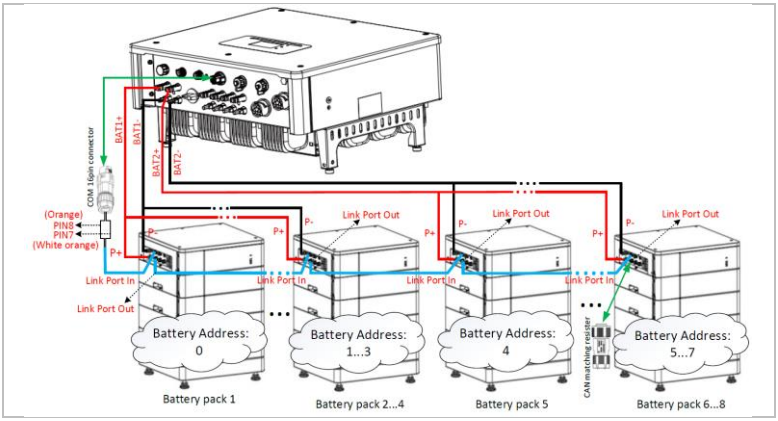
reach 50 A / 70 A. If you connect both battery inputs in parallel, to increase the charging and discharging current, you can only connect 4 parallel battery systems in total with the same DC voltage (up to 100 kWh nominal capacity).

NOTE

- If a battery input is unused, ensure to set this in the inverter's system settings, for example:

  System Settings – Input Channel Config – Bat Channel2 – Not Used.
- Configuration of the battery setup should only be done when the inverter is in standby mode!

  Advanced Settings – 10. Switch on / off – Off



NOTE

- Configuration of the battery setup should only be done when the inverter is in standby mode!

  Advanced Settings – 10. Switch on / off – Off
- If a battery input is unused, ensure to set this in the inverter's system settings, for example:

  System Settings – Input Channel Config – Bat Channel2 – Not Used.
- The battery inputs of different inverters should not be connected in parallel
- Each battery tower corresponds to a unique battery address. Each battery address can be configured from 00–15 or not used
- The other battery parameters should be set according to the battery specifications

4 Installation

4.1 Installation information

DANGER

Fire hazard

- Do NOT install the inverter on flammable material.
- Do NOT install the inverter in an area in which flammable or explosive material is stored.

CAUTION

Burning hazard

- Do NOT install the inverter in places where it can be accidentally touched. The housing and heat sink may become very hot while the inverter is being operated.

IMPORTANT

Weight of the device

- Take into account the weight of the inverter when transporting and moving it.
- Choose a suitable installation location and surface.
- Commission a minimum of two persons for the installation of the inverter.
- Do not set down the inverter overhead.

4.2 Installation procedure

Mechanical installation is performed as follows:

1. Examine the inverter before installation
2. Prepare the installation
3. Select an installation location
4. Transport the inverter
5. Mount the rear panel
6. Install the inverter

4.3 Examination before installation

4.3.1 Checking the external packaging materials

Packaging materials and components may become damaged during transportation. Therefore, the external packaging materials must be examined before the inverter is installed. Check the external packaging material for damage, e.g. holes and cracks. If you discover any damage, do not unpack the inverter and contact the transport company and/or dealer immediately. It is recommended that the packaging material should be removed within 24 hours before installing the inverter.

4.3.2 Checking the delivery scope

After unpacking the inverter, check that the delivery items are both intact and complete. In the event of any damage or missing components, contact the wholesaler.

No.	Image	Description	Quantity
01		Inverter HYD 5K ... 20KTL-3PH	1
02		Wall bracket	1
03		PV+ input terminal	4
04		PV- input terminal	4
05		MC4 connector contact PV+	4
06		MC4 connector contact PV-	4
07		BAT input connector	2
08		BAT+ connector contact	2
09		BAT- connector contact	2
10		Secured metal clamps at BAT+ power input cable	2
11		M6 hexagon screw	2
12		M8*80 expansion screws (wall bracket)	4
13		AC grid connection	1
14		AC load connection	1
15		Link port connection	1

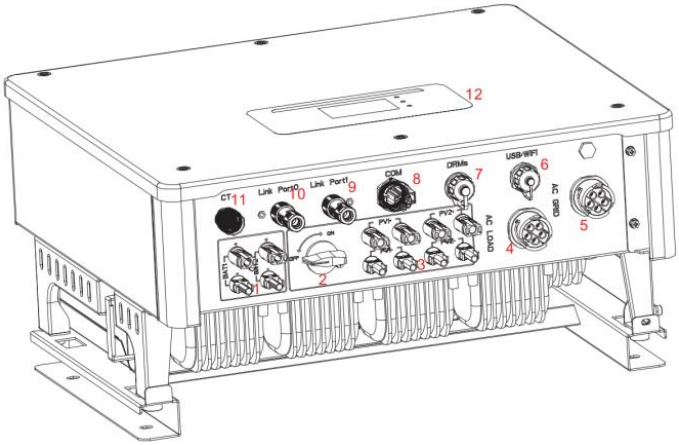
No.	Image	Description	Quantity
16		8-pole terminal Terminal resistance for parallel system	1
17		DRM connection	1
18		6-pole connector for CT	1
19		Three-phase smart meter DTSU666	1
20		CT with divided core (HY94C5-200 or AKH-0.66/K-24 200A/5A) only for smart meters	3
21		COM 16-pole connector	1
22		M4X14 Phillips screw, triple (for DC switch lock)	1
23		Temperature sensor NTC (5M) when using t internal BMS	1
24		Manual	1
25		Warranty card	1
26		Quality certificate	1
27		Test report, output test	1

4.4 Connections

⚠ CAUTION

Damage during transportation

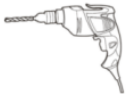
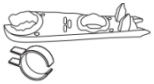
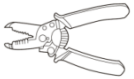
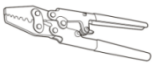
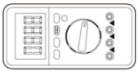
- Please check the product packaging and connections carefully prior to installation.

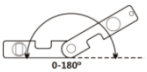
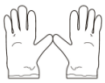


①	Battery connection	②	DC switch
③	PV input terminals	④	AC load connection
⑤	AC grid connection	⑥	USB/WiFi
⑦	DRMs	⑧	Communication connection
⑨	Link port 1	⑩	Link port 0
⑪	Current sensor connection (CT)	⑫	LCD display

4.5 Tools

Prepare the tools required for the installation and the electrical connection.

No.	Tool	Model	Function
01		Hammer drill Recommended drill diameter: 8mm	Used to drill holes in the wall.
02		Screwdriver	Wiring
03		Phillips screwdriver	Used to remove and install the screws of the AC terminal
04		Removal tool	Used to remove the PV terminal
05		Wire stripper	Used to strip the wire
06		6mm Allen key	Used to turn the screw to connect the rear panel to the inverter
07		Crimping tool	Used to crimp power cables
08		Multimeter	Used to check the earthing

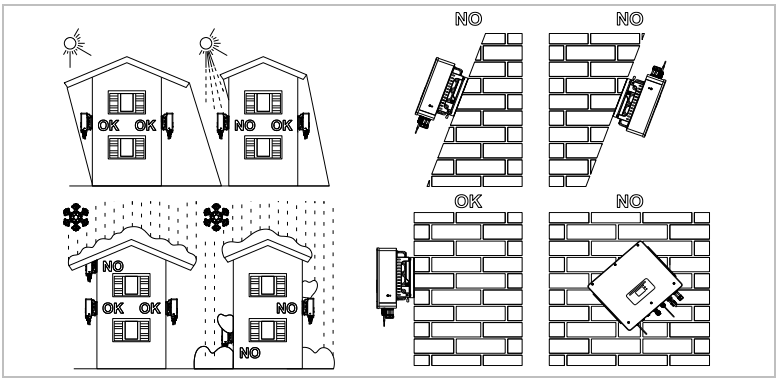
No.	Tool	Model	Function
09		Marker	Used for marking
10		Measuring tape	Used to measure distances
11		Spirit level	Used to align the wall bracket
12		ESD gloves	for the installer
13		Safety goggles	for the installer
14		Anti-dust respiratory mask	for the installer

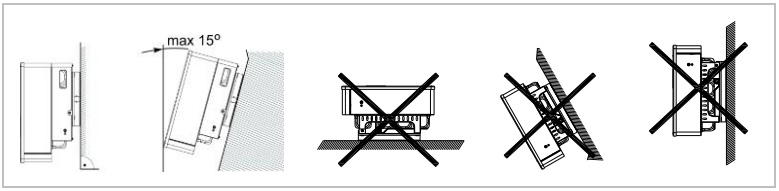
4.6 Installation Environment Requirements

- Choose a dry, clean, and tidy place, convenient for installation.
- Ambient temperature range: -25–60° C.
- Relative humidity: 0–100% (non-condensed).
- The inverter shall be installed in a well-ventilated place.
- Do not place the inverter close to flammable or explosive materials.
- The AC overvoltage category of the inverter is category II.
- Maximum altitude: 4000m
- Pollution degree: 4

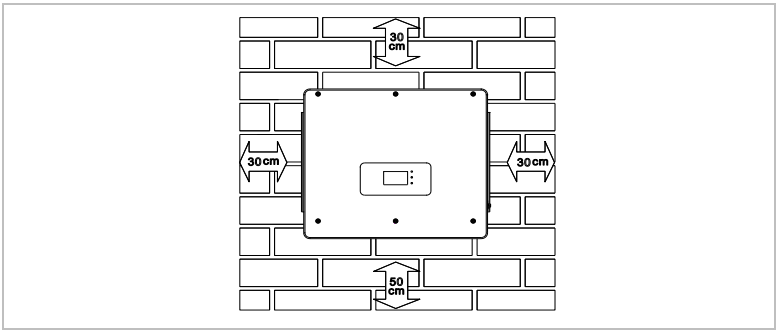
4.7 Installation location

Choose a suitable position for the installation of the inverter. Ensure that the following requirements have been fulfilled:

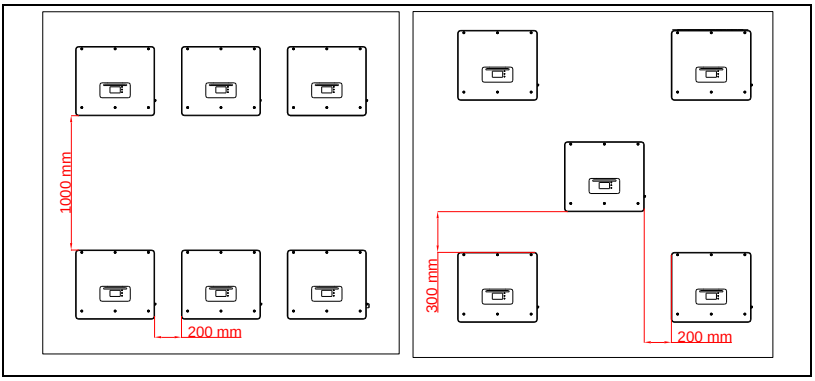




Minimum distances for individual **HYD 5K...20KTL-3PH** inverters:

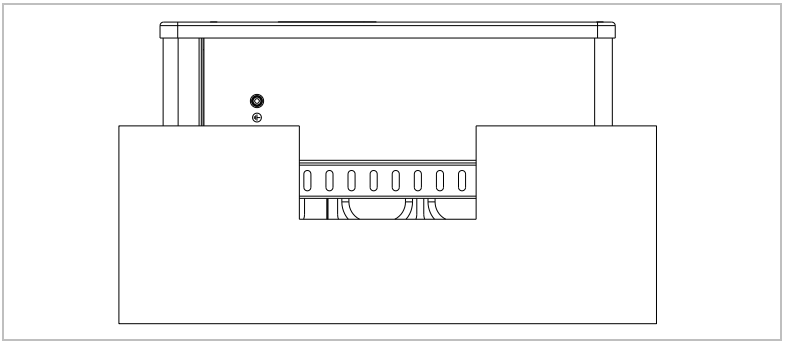


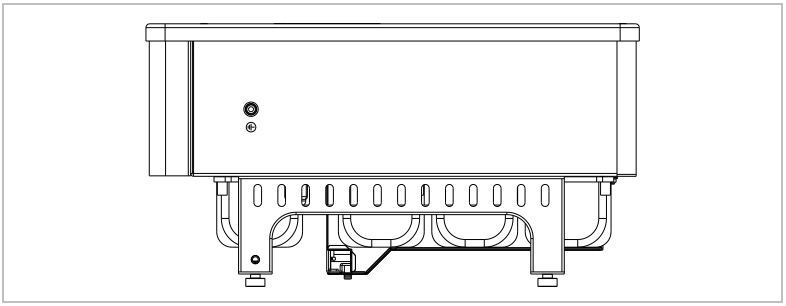
Minimum distances for several **HYD 5K...20KTL-3PH** inverters:



4.8 Unpacking the inverter

1. Open the packaging and grip underneath the inverter at the sides with both hands.





2. Lift the inverter out of the packaging and move it to its installation position.

ATTENTION

Mechanical damage

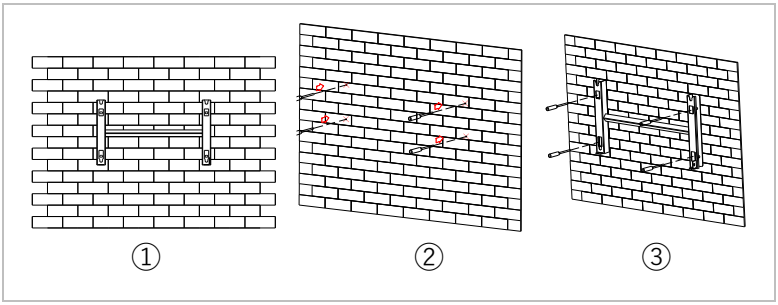
- In order to prevent injuries and damage to the device, ensure that the inverter is kept balanced while it is being moved - it is very heavy.
- Do not place the inverter on its connections, as these are not designed to bear its weight. Place the inverter horizontally on the ground.
- When you place the inverter on the ground, place foamed material or paper underneath it in order to protect its housing.

4.9 Installation of the inverter

1. Hold the wall bracket in the desired place and mark the three holes. Put the wall bracket aside and drill the holes.

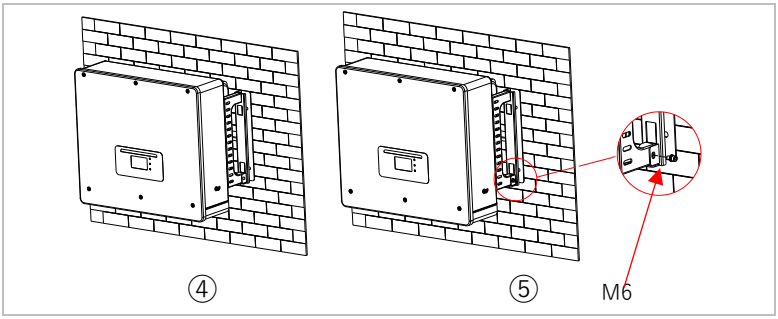
2. Guide the spread screw M8*80 into the hole vertically and ensure that its insertion depth is sufficient.

3. Align the wall bracket with the hole positions and fasten by tightening the spread screw with the nuts.



4. Place the inverter in the wall bracket and fasten it with the M6 hexagon screw

5. You can secure the inverter to the wall bracket using a lock.



5 Electrical connections

5.1 Safety instructions

This topic describes the electrical connections of the inverter HYD 5K ... 20KTL-3PH. Read this section thoroughly and carefully before connecting the cables.

⚠ DANGER

Electrical voltage at the DC connections

- Ensure that the DC switch is OFF before establishing the electrical connection. The reason is that the electrical charge remains in the capacitor after the DC switch has been switched off. Therefore, at least 5 minutes must lapse before the capacitor has been electrically discharged.

⚠ DANGER

Electrical voltage

- PV modules generate electrical energy when exposed to sunlight, and this may present an electrical shock hazard. Therefore, cover the PV modules with an opaque sheet before connecting to the DC input power cable.

⚠ DANGER

Electrical voltage at the DC connections

- Wear rubber gloves and protective clothing (safety goggles and boots) when working on high voltage/high current systems such as inverter and battery systems.

ATTENTION

Qualification

- The installation and maintenance of the inverter must be carried out by an electrician.

NOTE

- The open-circuit voltage of the modules connected in series must be lower than or equal to 1000 V.

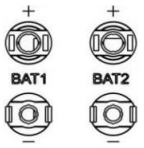
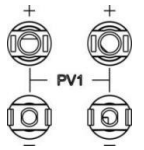
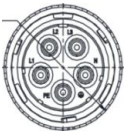
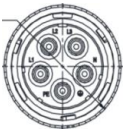
The connected PV modules must be compliant with IEC 61730 class A.

Model	Isc PV (absolute maximum)	Maximum output overvoltage protection
HYD 5KTL-3PH	15 A/15 A	8 A*3
HYD 6KTL-3PH		10 A*3
HYD 8KTL-3PH		13 A*3
HYD 10KTL-3PH	30 A/30 A	16 A*3
HYD 10KTL-3PH-A*		16 A*3
HYD 15KTL-3PH		24 A*3
HYD 20KTL-3PH		32 A*3

The DVC (decisive voltage classification) is the circuit voltage which constantly occurs between two arbitrary live parts during proper use in a worst-case scenario:

Interface	DVC
PV input connection	DVCC
AC connection	DVCC
Battery connection	DVCC
Load connection	DVCC
USB/WiFi interface	DVCA
COM interface	DVCA
CT interface	DVCA
DRMs	DVCA
Link port	DVCA

5.2 Wiring overview

Component	Description	Recommended cable type
	+ : Connect the positive cable of the lithium battery	Outdoor multicore copper cable (4…6mm²)
	- : Connect the negative cable of the lithium battery	
	+ : Connect the positive cable of the PV array	PV cable (4…6mm”)
	- : Connect the negative cable of the PV array	
 Load	L1	Outdoor multicore copper cable (6…10 mm²))
	L2	
	L3	
	N	
	PE	
 AC	L1	
	L2	
	L3	
	N	
	PE	

5.3 System overview

There are different system configurations possible depending on the user's requirements, existing electrical infrastructure and local regulations. The distribution box must be configured to comply to the grid operator requirements.

The inverter has an integrated AC relay to disconnect all phases and Neutral from the grid in case of grid fault or grid outage.

The inverter's generation and feed-in limitation functions require the use of an external measurement device to obtain grid information.

There are 3 system configurations:

System A: direct measurement of energy with CTs (up to 300 A)

System B: measurement of energy with energy meter + CTs

System C: measurement of energy with energy meter (up to 80 A)

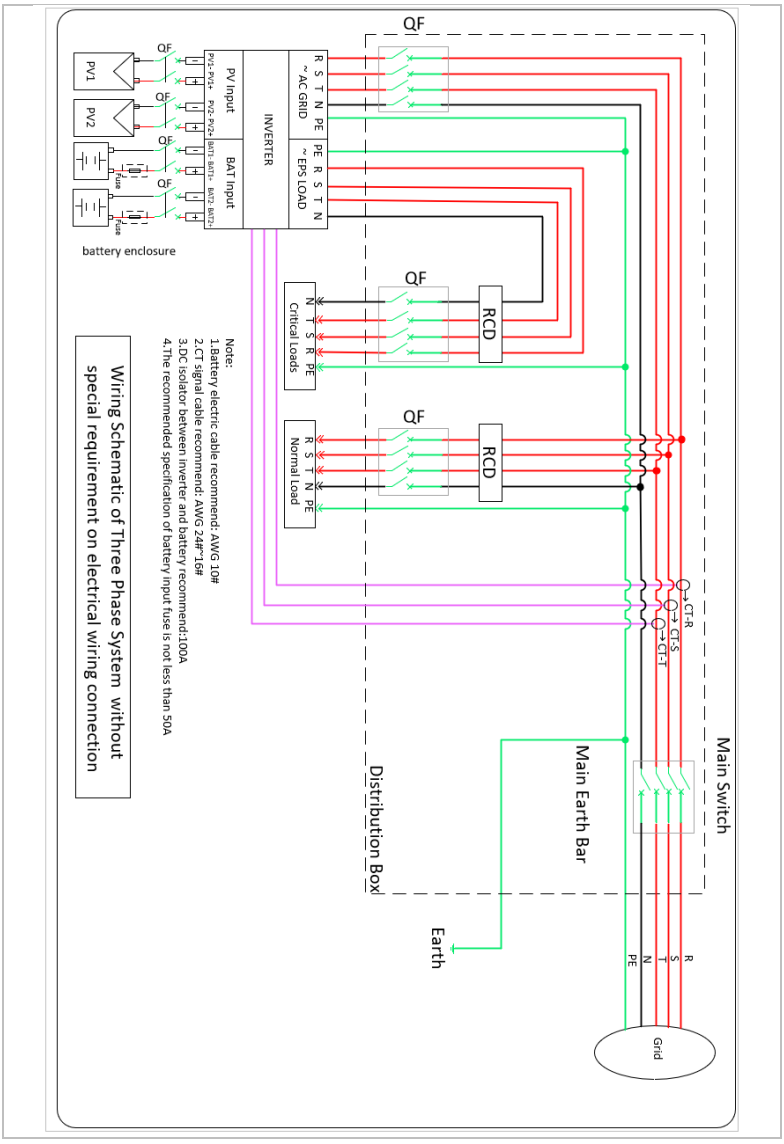
NOTE

- For System B, customers can choose different CTs based on the installation. The secondary current must be 5 A.

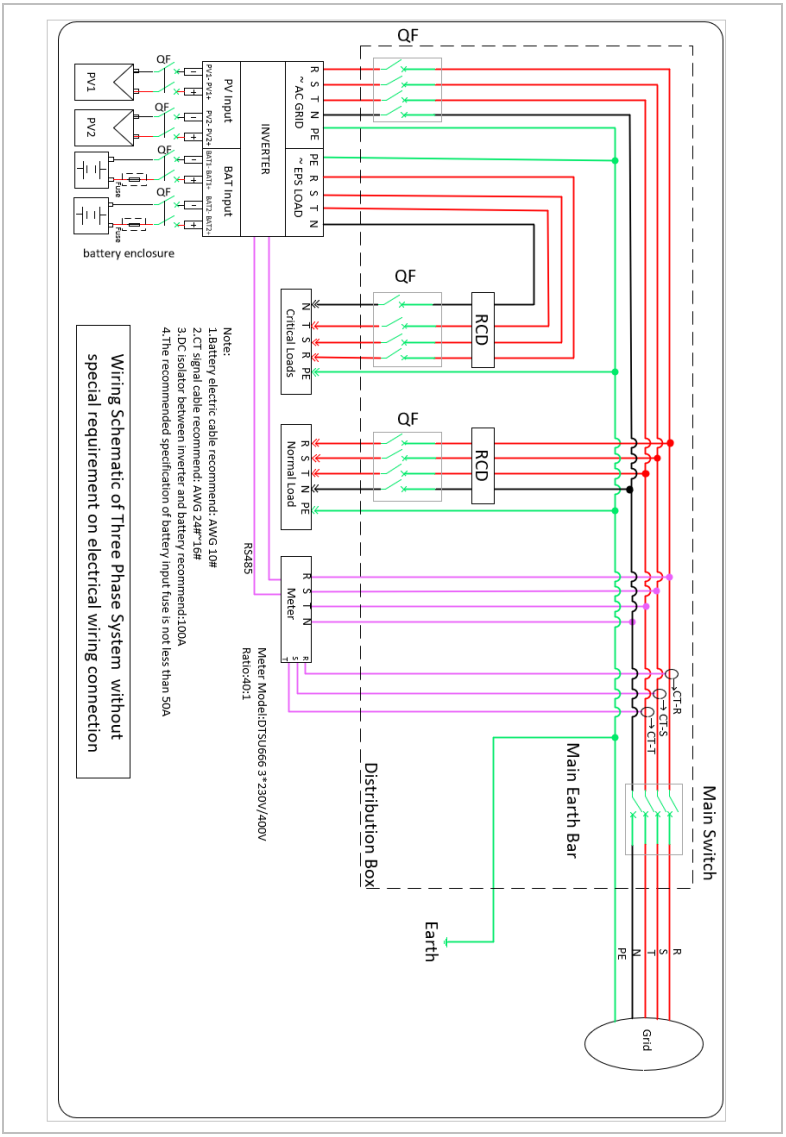
⚠ CAUTION

- In the following three situations, the system must be connected to the fuse first and then to the machine's input terminal:
  - Lead-acid battery
  - Lithium battery without BMS
  - Multiple lithium batteries connected to one input

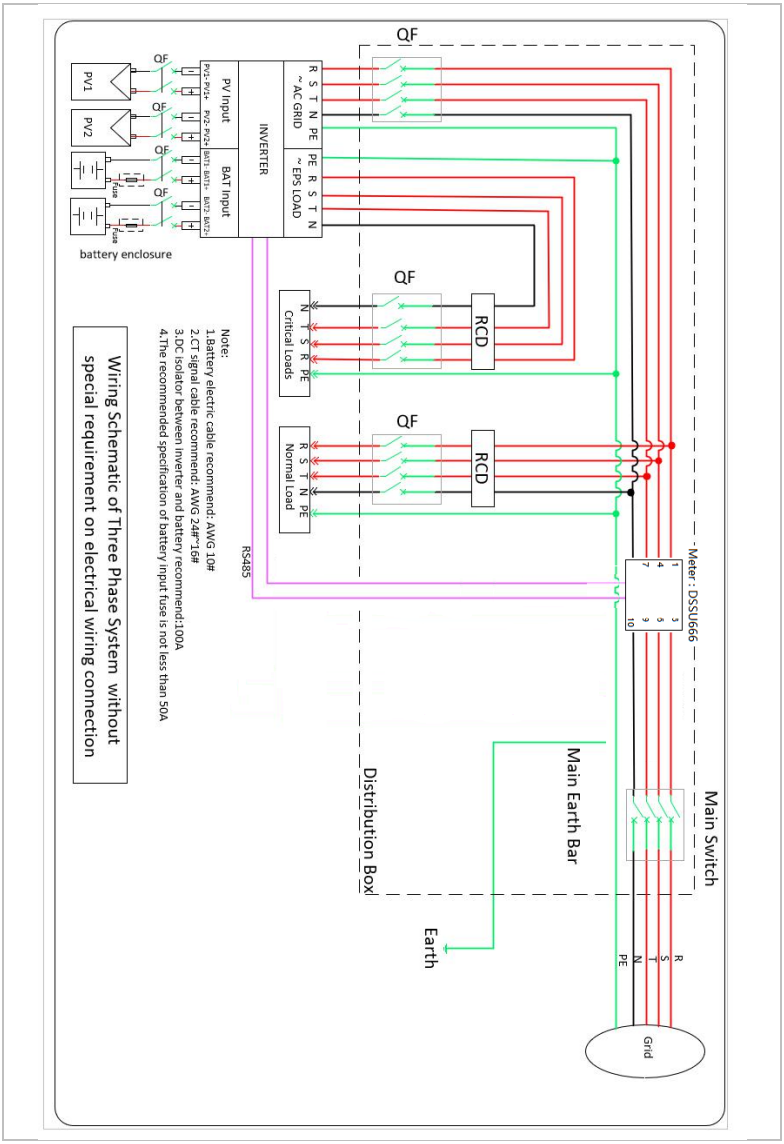
5.3.1 System A: direct measurement with CTs



5.3.2 System B: measurement with energy meter + CTs



5.3.3 System C: measurement with only an energy meter



Energy Meter: DTSU666 (in scope of supply)

Technical Data	
Voltage	AC 3×230/400 V
Current	1.5(6) A
Frequency	50/60 Hz
Pulse	6400 imp / kWh
Power accuracy	Active Class 0.5S, Reactive Class 2

5.4 Electrical connection

The electrical connection is established as follows:

1. Connect PE cable
2. Connect DC input cable
3. Connect battery cable
4. Connect AC output power cable
5. Connect communication cable (optional)

5.5 Connecting the PE cables

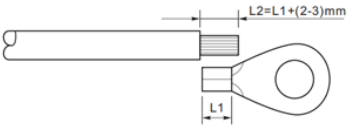
Connect the inverter to the equipotential bonding bar by using the protective earth cable (PE) for grounding.

ATTENTION

Pole earthing not permissible!

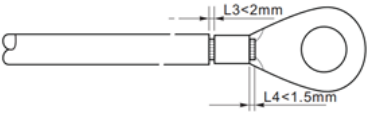
- As the inverter is transformerless, the plus and minus poles of the PV generator must NOT be earthed. Otherwise, the inverter will malfunction. In the PV system, not all live metal parts (e.g. PV module frames, PV frame, generator connection box housing, inverter housing) require earthing.

1. Remove the insulation of the cable. For outside use, cables of ≥ 4mm² are recommended for earthing).

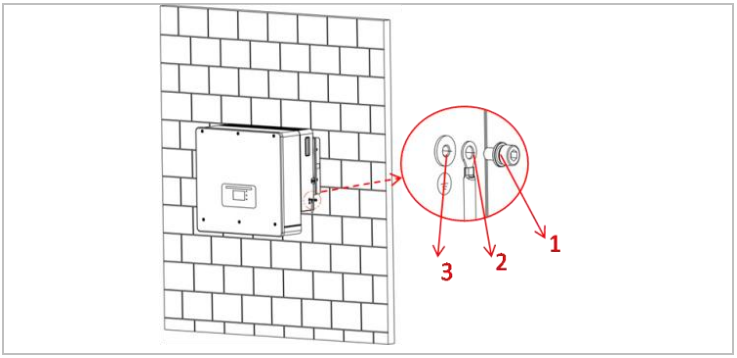


Note: L2 is 2 to 3 mm longer than L1

2. Crimp the cable to the ring terminal:



3. Install the crimped ring terminal and the washer with the M6 screws and tighten these with a torque of 3 Nm using an Allen key:



①	M6 washer	②	Ring terminal
③	Threaded hole		

5.6 Connecting the DC lines for the PV modules and battery

NOTE

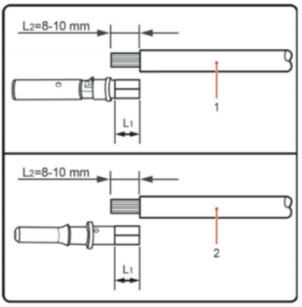
- The connection steps of the battery and PV are the same, only the terminal specifications are different. The colour of the battery terminal is blue, the colour of PV terminal is black.

Please observe the recommended cable dimensions:

Cable cross-section (mm^2)		Outer diameter of cable (mm)
Range	**Recommended value**	
4.0 ⋯ 6.0	4.0	4.5 ⋯ 7.8

1. Remove the crimp contacts from the positive and negative connections.

2. Remove the insulation of the cables:

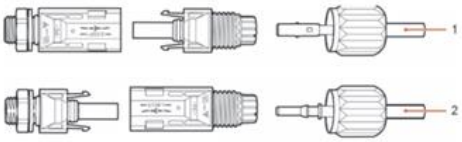


Note: **L2 is 2 to 3mm longer than L1**

①	Positive DC cable	②	Negative DC cable

3. Insert the positive and negative DC cables into the corresponding cable glands.

4. Crimp the DC cables. The crimped cable must be able to withstand a tractive force of 400 Nm.



① Positive power cable ② Negative power cable

⚠ CAUTION

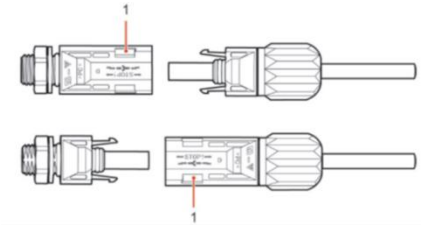
Danger of reverse polarity!

- Ensure that the polarity is correct before plugging into the DC connections!

5. Insert the crimped DC cables into the corresponding connector housing until you hear a “clicking” sound.

6. Re-screw the cable glands to the connector housing.

7. Insert the positive and negative connectors into the corresponding DC input terminals of the inverter until you hear a “clicking” sound.



① Locking

Note: Insert the protective caps into the unused DC connections.

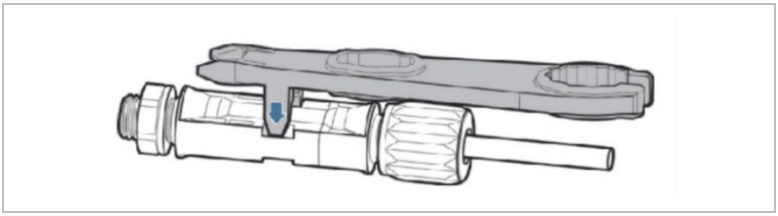
Removing the connectors

⚠ CAUTION

Danger of DC arcing

- Before removing the plus and minus connector, ensure that the DC switch has been set to OFF.

In order to remove the plus and minus connection from the inverter, insert a removal key into the locking and press on the key with the adequate force as shown in the following illustration:



5.7 Connecting the AC power cables

The AC power cables are used to connect the inverter to the critical loads (through the EPS port), and the AC power distributor or the power grid.

⚠ CAUTION

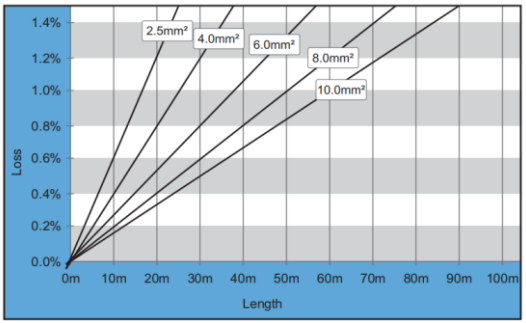
AC connection

- Each inverter must have its own circuit breaker.
- The AC disconnecting device must be easily accessible.

NOTE

- The inverter HYD 5K...20KTL-3PH has a built-in AFI (univ. sensitive residual current protection). If an external AFI is required, we recommend an AFI type A featuring a residual current of 100 mA or higher.
- Please follow the national rules and regulations for the installation of external relais or circuit breakers!

The AC cable should be correctly dimensioned in order to ensure that the loss of power in the AC cable is less than 1% of the rated output. If the AC cable resistance is too high, then the AC voltage will increase; this may cause the inverter to become disconnected from the power grid. The relationship between the leakage power in the AC cable and the cable length, the cable cross-section, is displayed in the following illustration:



5.8 AC connector installation

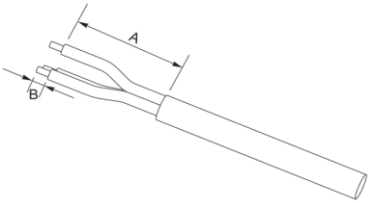
⚠ CAUTION

Electrical voltage

- Ensure that the grid has been switched off before removing the AC connector

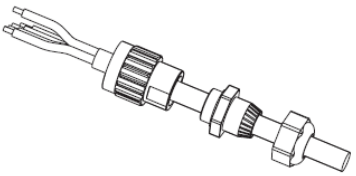
Please follow below steps to install the AC connector.

1. Select the suitable cable in accordance with above diagram. Remove the insulating layer of the AC output cable using a wire stripper and in accordance with the following illustration:

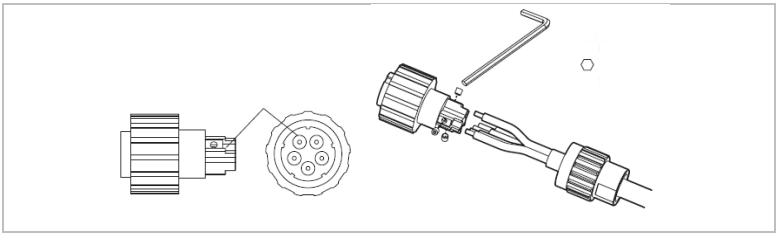


A = 30 ···50 mm
B = 3···5 mm

2. Disassemble the connector in accordance with the following illustration. Guide the AC output cable through the cable gland.

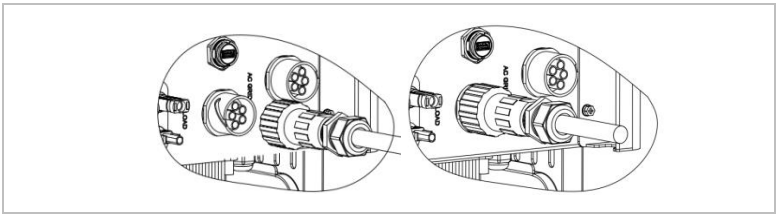


3. Connect the AC cable in accordance with the following requirements and tighten the terminal using the Allen key.



Connection	Cable
L1	Phase 1 (brown)
L2	Phase 2 (black)
L3	Phase 3 (grey)
N	Neutral conductor (blue)
PE	Earthing cable (yellow-green)

4. Assemble the connector housing and screw the cable gland tight.



5. Connect the AC connector to the AC connection of the inverter by turning it clockwise until it locks into place.

NOTE

- Remove the AC connector by turning it anticlockwise.

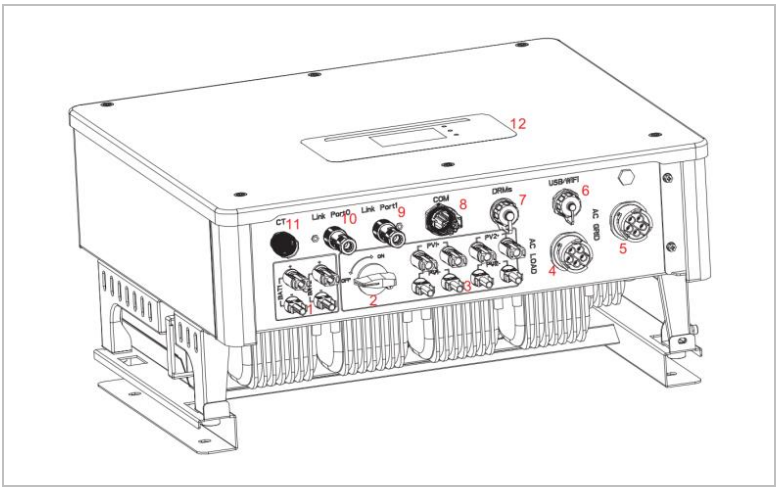
⚠ CAUTION

Electrical voltage

- Ensure that the grid has been switched off before removing the AC connector.

5.9 Communication interfaces

The positions of the communications interfaces of the HYD 5K ... 20KTL-3PH are displayed below:



No.	Connection	Function
⑥	USB/WiFi	USB port for firmware update and safety parameter import; Port to connect Stick Logger (WiFi, GPRS)
⑦	DRMs	Demand Response Modes/Logic Interface to control the inverter
⑧	COM	Multifunctional Communication Port
⑨	Link port 1	Master/Slave operation of multiple inverters
⑩	Link port 0	

5.9.1 Multifunctional Communication Port

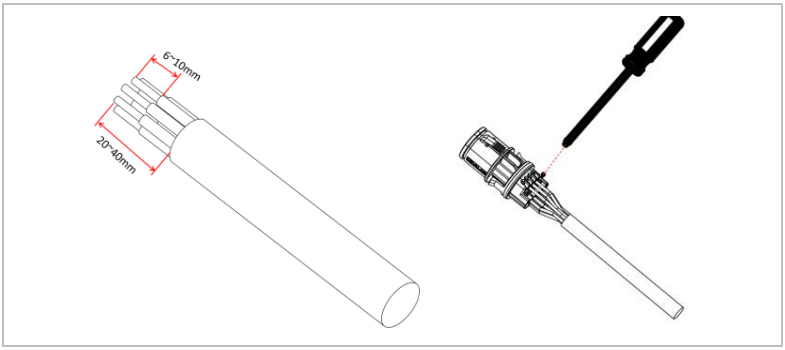
Please refer to the following table for the specific PIN assignments.



Function	Pin	Definition	Note
Inverter monitoring and system control	1	RS485 A1-1	RS485 Signal+
	2	RS485 A1-2	RS485 Signal +
	3	RS485 B1-1	RS485 Signal -
	4	RS485 B1-2	RS485 Signal -
Energy meter port	5	RS485 A2	RS485 Signal +
	6	RS485 B2	RS485 Signal -
Communication with battery management system (automatically identifying CAN or RS485 bus)	7	CAN0_H	CAN high data
	8	CAN0_L	CAN low data
	9	GND.S	BMS communication GND
	10	485TX0+	RS485 Signal +
	11	485TX0-	RS485 Signal -
Temperature measurement for batteries without BMS (for example lead acid)	12	GND.S	Signal GND
	13	BAT-Temp	Battery temperature sampling
Dry contact for electrical switching	14	DCT1	Dry Contact 1
	15	DCT2	Dry Contact 2
12 V power supply	16	VCC	Communication VCC

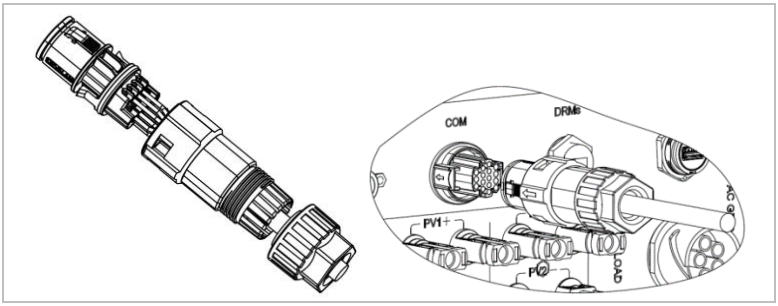
Please follow the steps below to connect the communication cable.

1. Remove the cable sheath at a length of 20 to 40 mm.



2. Connect the wires according to the required functions and pins (refer to the table above).

3. Close the housing and secure the cable gland by turning it clockwise.



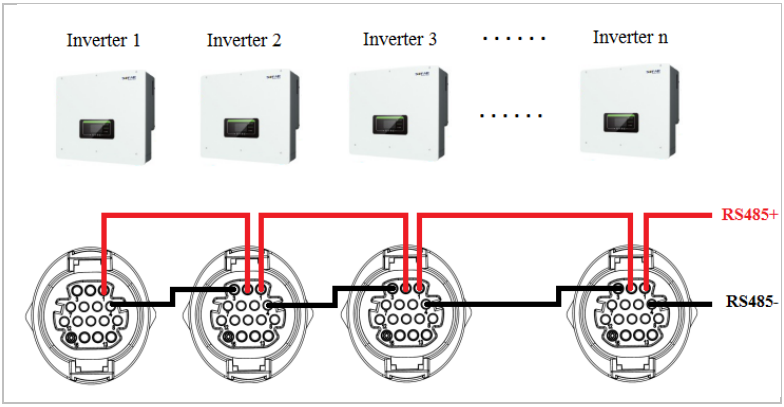
NOTE

- The functions of the communications interface must be set on the inverter's LCD display. Please observe the operating steps in chapter 7.

5.9.2 RS485

For the monitoring and control of several inverters, you connect the RS485 wires in daisy-chain.

At the last inverter, you need to terminate the bus with an 120 Ohm resistor between Pin 3 and 4.



5.9.3 Energy meter

NOTE

- The energy meter DTSU666 0.05-1.5(6) A and (HY94C5-200) CTs are supplied with the inverter.
- Max. current input energy meter: 5 A
- Max. measured current: 200 A (Ratio: 40:1)

The integrated energy management functions integrated of the HYD 5K...20KTL-3PH require to measure the power flow at the point of grid interconnection. There are different system configurations possible. It can be measured using CTs (up to 300 A), or with direct connection (up to 80 A).

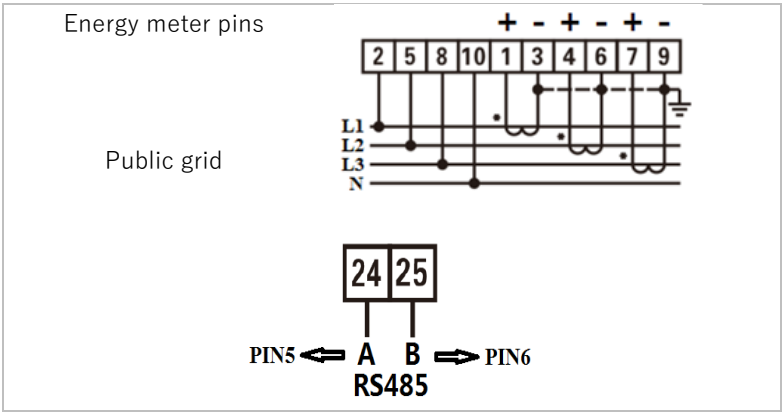
Please refer to below table for the PIN assignments for the RS485 connection between the inverter and the energy meter.

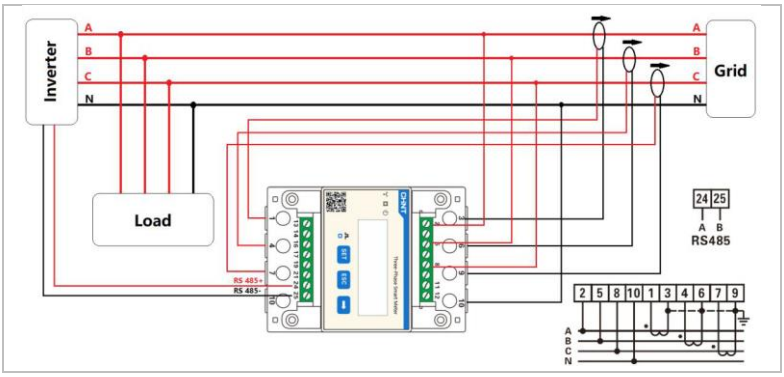
Inverter COM Port Pin	Function	Meter Pin
Pin 5	RS485+ (A2)	Pin 24
Pin 6	RS485- (B2)	Pin 25

NOTE

- Use the shielded twisted pair cable
- The copper outer diameter should be more than 0.5 mm²
- Keep away from power cables or other electric fields
- Maximum distance is 1200 meters

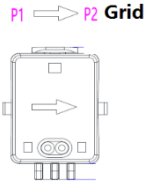
Energy meter with CT connection (System A, default)





NOTE

- The arrows on the current transformers direct to the grid.
- Up to 200 A measurement



Energy Meter Configuration

The energy meter is preconfigured to be used with the inverter with these settings:

Modbus Address: 1

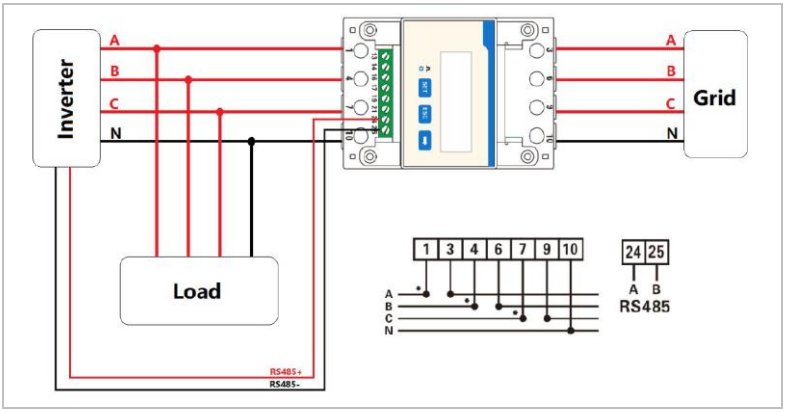
Baud Rate: 9600

Current Ratio: 40:1

Energy Meter direct connection (System C)

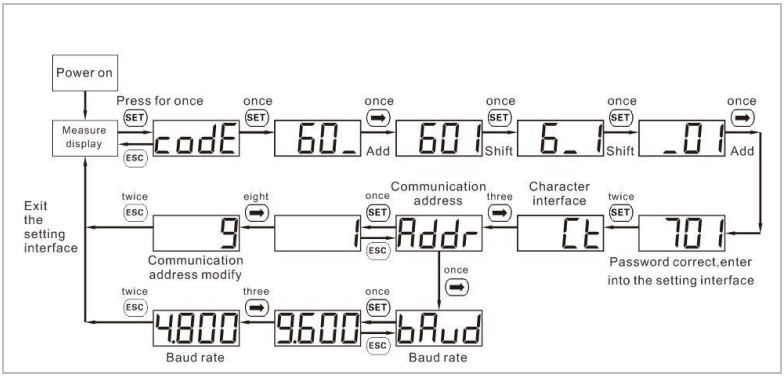
The energy meter type Chint DTSU666 (5/80A) must be purchased separately, it is not included in the delivery.

Max. current input: 80 A

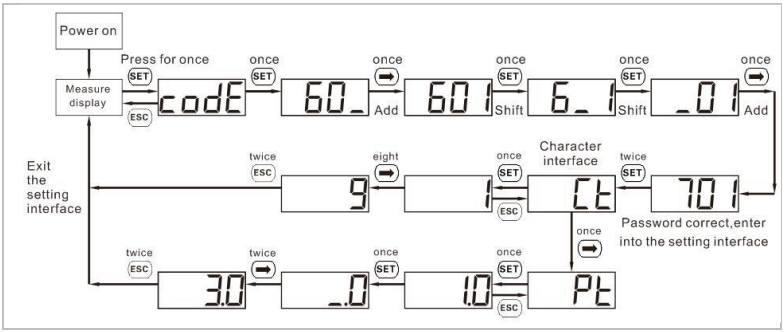


In case you want to change or check the settings, please refer to below procedure:

Modbus Address and Baud Rate setting



Current Ratio setting



5.9.4 Temperature Sensor

For batteries without a BMS (for example lead-acid batteries), you need to connect the temperature sensor which is within the scope of supply. Place the sensor at the battery.

5.9.5 BMS connection

For batteries with a BMS (for example Li-Ion batteries), you need to connect either the CAN Bus or RS485 with the battery management system.

The inverter will use the CAN Bus or RS485 Bus according to the battery selection in the inverter's menu.

Connecting GTX 3000-H

For connecting the GTX 3000-H battery to the inverter, please follow the below pin assignments:

Inverter COM Port	Function	GTX 3000-H communication cable	Battery "Link In" Port
Pin 7	CAN0_H	White-orange	Pin 2
Pin 8	CAN0_L	Orange	Pin 4

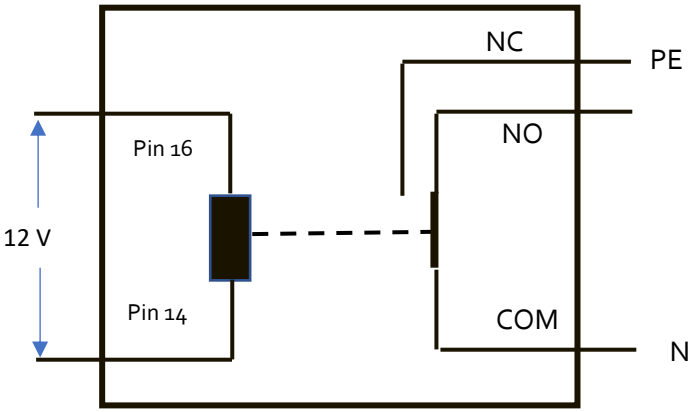
5.9.6 Dry Contact

The dry contact signals the on and EPS mode. It can supply 12VDC during the on-grid state, and goes to 0 V during EPS mode.

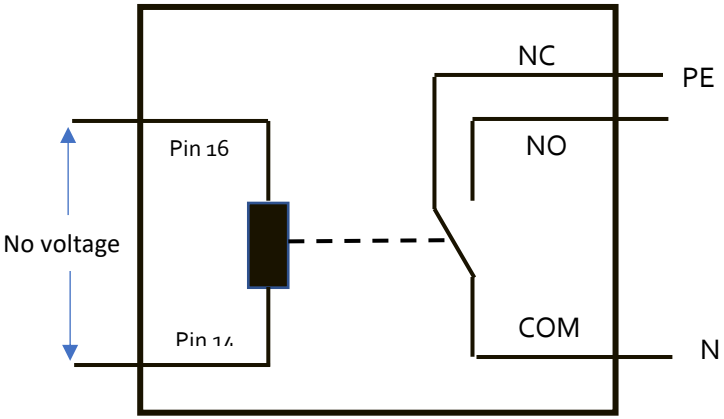
Note: This function is available from Firmware V8

Below is the scheme how it can be used to switch a N-PE connection during off-grid mode:

On-grid state:



EPS mode:



5.9.7 Communication power supply

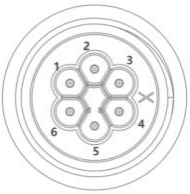
The power supply can be used for external communication devices.

5.9.8 CT Interface

For configurations according to System A, CTs are directly connected to the inverter without an energy meter.

These CTs must be purchased separately and need to have a max. current rating of 100 mA at the inverter connection.

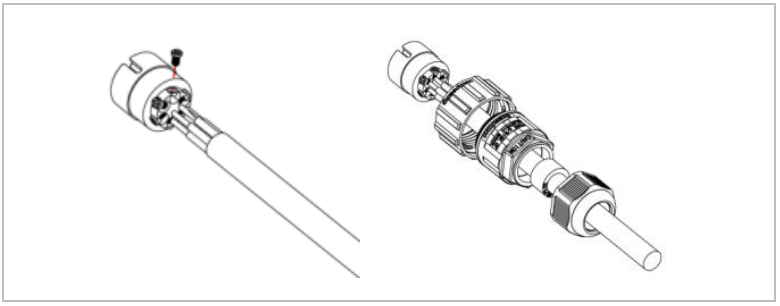
Please refer to the table below for the specific PIN connections.



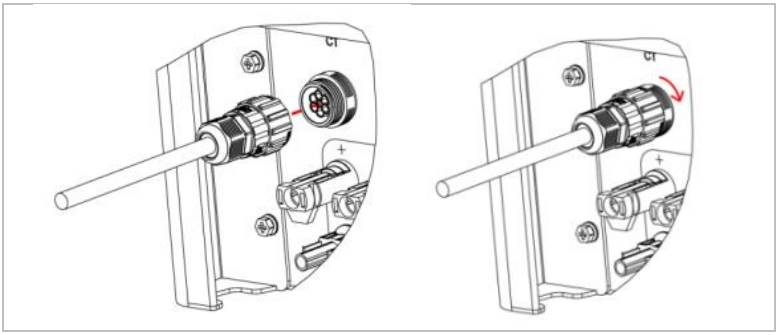
Pin	Definition	Function
1	Ict_R-	Phase R – (Phase L1 -)
2	Ict_R+	Phase R + (Phase L1 +)
3	Ict_S-	Phase S – (Phase L2 -)
4	Ict_S+	Phase S + (Phase L2 +)
5	Ict_T-	Phase T – (Phase L3 -)
6	Ict_T+	Phase T + (Phase L3 +)

Follow below steps to install the CTs.

1. Fix the cables on the terminals according to above table, and put the connector housing over the terminals.

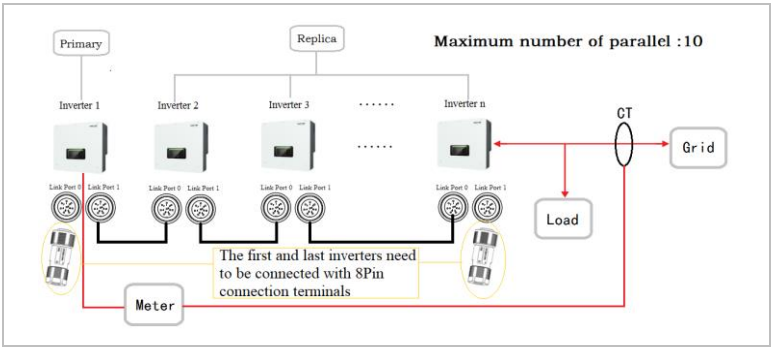


2. Connect and lock the connector by turning it clockwise.



5.9.9 Link Port

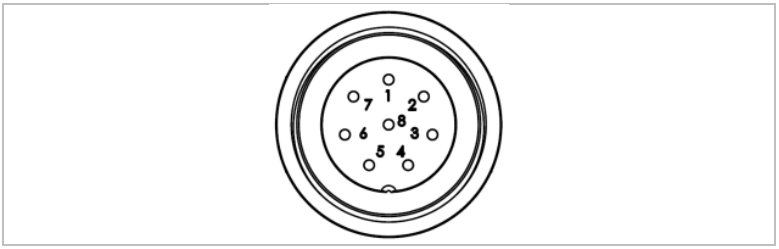
In systems with multiple inverters, you can connect the devices in a Master/Slave configuration. In this configuration, only one energy meter is connected to the Master inverter for the system control.



NOTE

- The first and last inverter need to be connected with the 8 Pin connection terminals!

Pin Connections

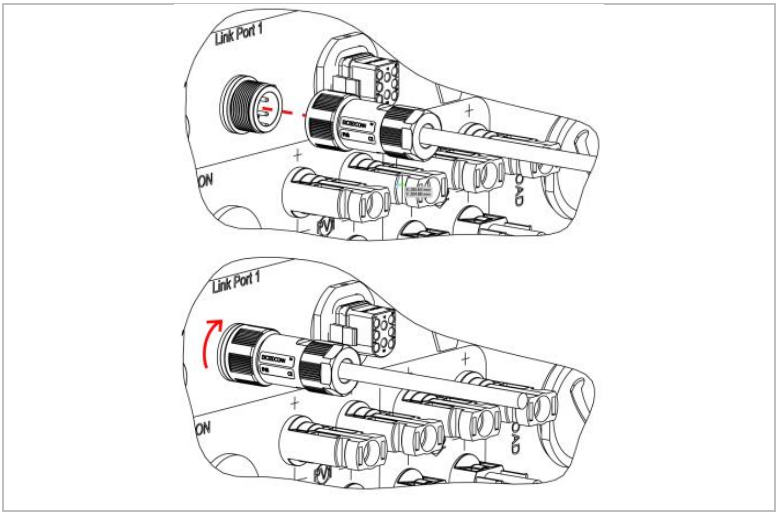


Pin	Definition	Function
1	IN_SYN0	Synchronising signal 0
2	CANL	CAN low data
3	SYN_GND0	Synchronising signal GND 0
4	CANH	CAN high data

Pin	Definition	Function
5	IN_SYN1	Synchronising signal1
6	SYN_GND1	Synchronising signal GND 1
7	SYN_GND2	Synchronising signal GND 2
8	IN_SYN2	Synchronising signal 2

Installation

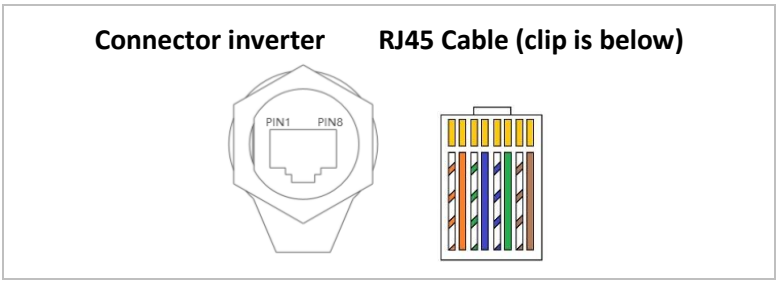
1. Connect and lock the connector by turning clockwise:



5.9.10 DRMs/Logic interface

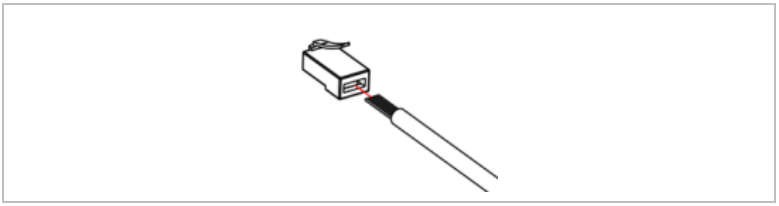
The DRM/Logic interface is used to control the inverter by external signals, usually provided from grid operators with ripple control receivers or other means. The logic interface pins are defined according to different standard requirements.

Please consider the following PIN assignment.

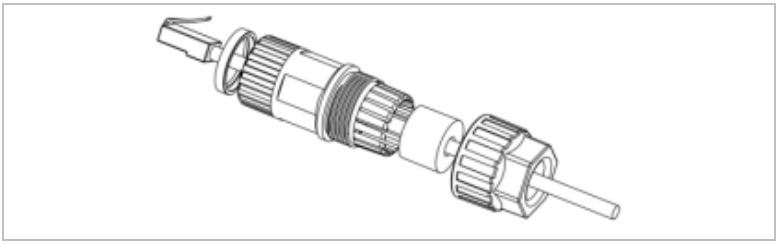


Please follow below installation steps.

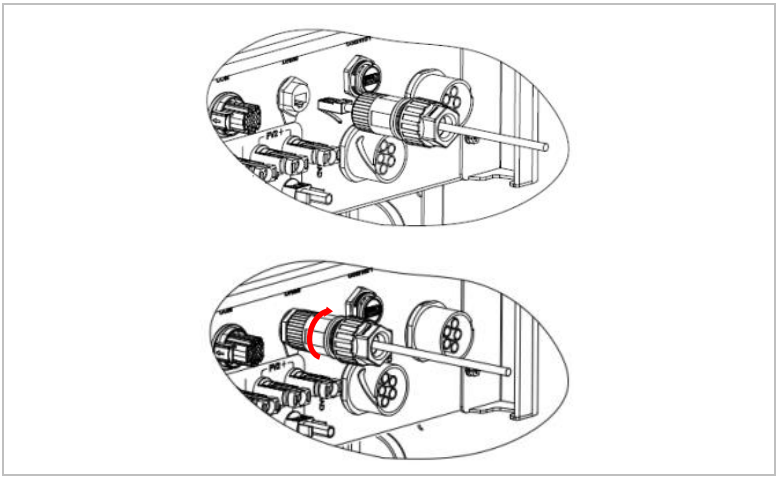
1. Press the wire terminals in colour sequence:



2. Route the cable terminal through the cable gland and insert the communication cable into the RJ45 connector.



3. Lock the connector by turning clockwise:



DRMs for AS/NZS 4777.2:2015 and AS/NZS 4777.2:2020

Also known as Inverter Demand Response Modes (DRMs).

The inverter recognises all supported Demand Response commands and initiates the reaction within two seconds. The inverter will continue to respond while the mode remains asserted.

Supported DRM commands: DRM0, DRM5, DRM6, DRM7, DRM8.

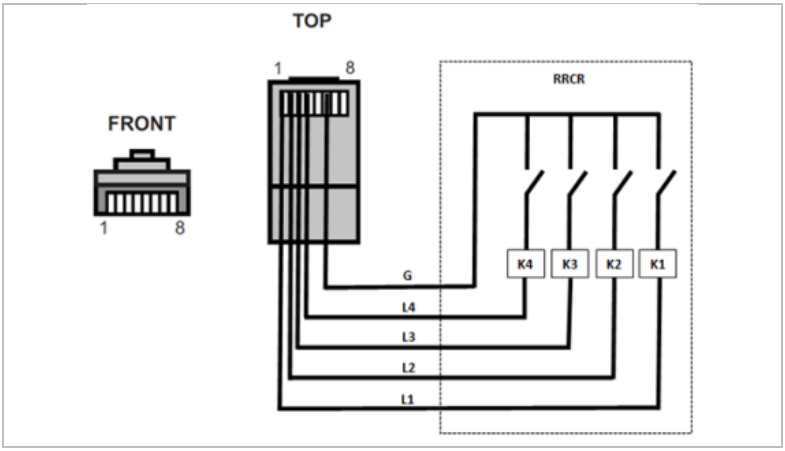
Pin	Colour	Function
1	orange/white	DRM1/5
2	orange	DRM2/6
3	green/white	DRM3/7
4	blue	DRM4/8
5	blue/white	DRM0
6	green	RefGen

Pin	Colour	Function
7	brown/white	Internally shorted
8	brown	

Logic interface for VDE-AR-N 4105:2018-11

This function serves to control and/or limit the output power of the inverter.

The inverter can be connected to a radio ripple control receiver in order to dynamically limit the output power of all inverters within the system.



The inverter is preconfigured on the following power levels:

Pin	Name	Inverter	Radio ripple control receiver
1	L1	Relay 1 input	K1 - output relay 1

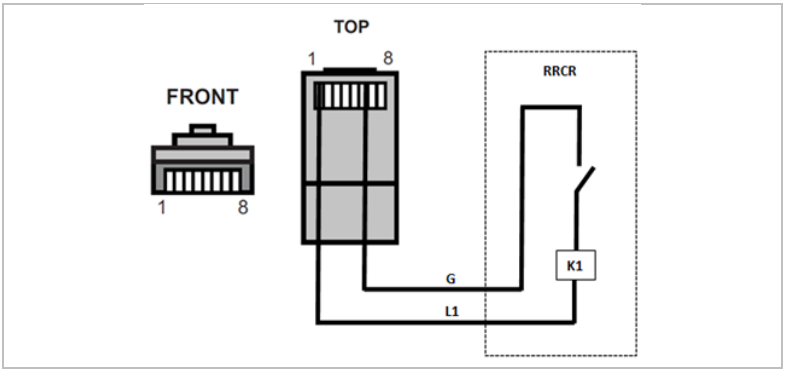
Pin	Name	Inverter	Radio ripple control receiver
2	L2	Relay 2 input	K2 - output relay 2
3	L3	Relay 3 input	K3 - output relay 3
4	L4	Relay 4 input	K4 - output relay 4
6	G	Ground	Relay, common ground

Relay status: Closing is 1, opening is 0

L1	L2	L3	L4	Active power	Cos（ϕ）
1	0	0	0	0%	1
0	1	0	0	30%	1
0	0	1	0	60%	1
0	0	0	1	100%	1

Logic interface for EN50549-1:2019

The active power output can be ended within five seconds following a command to the input interface.



Functional description of the terminal

Pin	Name	Inverter	Radio ripple control receiver
1	L1	Relay 1 input	K1 - output relay 1
6	G	Ground	Relay, common ground

The inverter is preconfigured on the following power levels.

Relay status: Closing is 1, opening is 0

L1	Active power	Power drop rate	Cos（ϕ）
1	0%	< 5 seconds	1
0	100%	/	1

5.10 Feed-in limitation function

The Anti-Reflux Power function refers to SOFARSOLAR's feed-in limitation function. When this function is enabled, the feed-in power

of point of common coupling (PCC) will be limited to the set Reflux Power limitation.

Both the Hard Anti-Reflux Control and Anti-Reflux Control can be used together. However, when the Hard Anti-Reflux control is enabled, the Anti-Reflux power limitation cannot exceed the Reflux power limitation. If the Reflux power exceeds the Reflux power limitation, the overload protection will be triggered.

When the communication signal with the electricity meter is lost, the output power of the inverter is limited to the set value of the soft export limit and the fault protection will not be triggered. When the Hard Anti-Reflux Control is enabled, loss of signal with the meter triggers the inverter's fault protection.

The inverter output of HYD 5-20KTL-3PH series inverter has 4 sets of relays, which are electrically connected to the output end R/S/T/N respectively to ensure the continuity of the electrical connection of load R/S/T/N when the inverter is switched off the grid.

NOTE

- Anti-Reflux Function = Export Limit function
- Reflux Power = Export Power
- Hard Anti-Reflux control = Hard feed-in limitation control
- Anti-Reflux Control = Soft feed-in limitation control

5.10.1 Obtaining grid information via System A

Connect the wires according to the wiring method as shown in System A, enable the Anti-Reflux Power function and set the limitation

parameters on the menu interface of the inverter. Refer to Advanced settings / 3 Anti Reflux in this manual for specific operation methods.

Hard anti-reverse current is enabled by default in some safety settings.

NOTE

- Adjusting the hard anti-reverse current setting requires permission from SOFARSOLAR.
- Only installers and distributors have the permission to use the Bluetooth APP for enabling/disabling settings, and setting up the feed-in limitation function. Refer to Advanced settings / 3 Anti Reflux in this manual for specific operation methods.

5.10.2 Obtaining grid information via System B and C

Follow the wiring instructions according to the wiring method as shown in single line diagram for System B or System C, enable the Anti-Reflux Power function and set the limitation parameters on the menu interface of the inverter.

The configuration of the hard feed-in limitation control follows the same steps as that of System A. The electricity meter function will also need to be enabled via the menu interface of the machine. Refer to 7.4.2 Advanced settings → 3 Anti Reflux in this manual for the specific operation methods.

5.11 System monitoring

The HYD 5K ... 20KTL-3PH inverters provide various communication methods for the system monitoring:

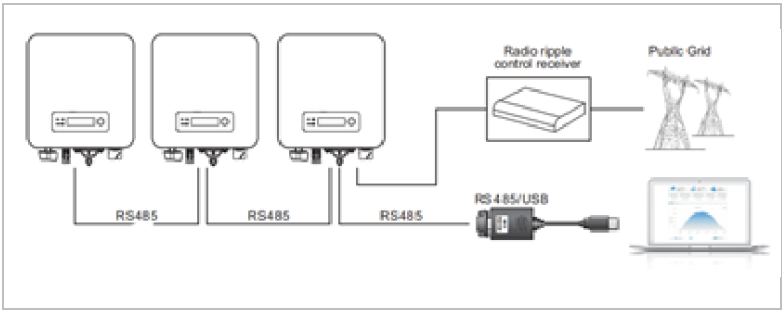
RS485 or WiFi stick (standard), GPRS or Ethernet stick (optional).

5.11.1 RS485

You can connect RS485-linked devices to your PC or a data logger via an RS485 USB adapter.

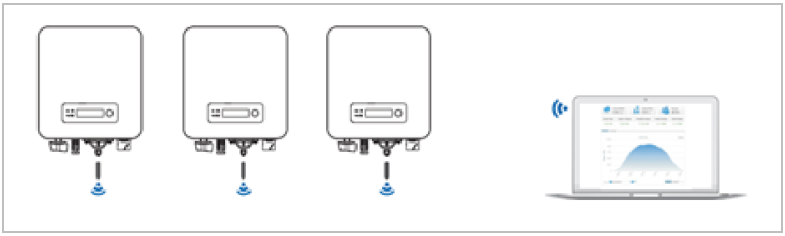
NOTE

- The RS485 line may not be any longer than 1000 m
- Assign each inverter its own modbus address (1 to 31) via the LCD display



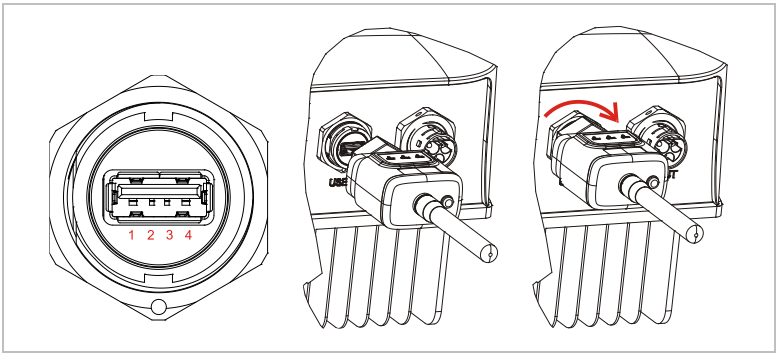
5.11.2 WiFi-, GPRS-, Ethernet stick

When you have installed the stick logger, the inverters can directly upload your operating, energy and alarm data in the SolarMAN monitoring portal.



5.12 Installation of the WiFi-, GPRS or Ethernet stick

1. Remove the protective cap from the USB interface.
2. Install the WiFi/GPRS/Ethernet stick.
3. Tighten the connecting nut.



5.12.1 Configuration of the WiFi stick via the web browser

Preparation: The WiFi stick is installed in accordance with the previous section and the SOFAR inverter must be in operation.

Carry out the following steps in order to configure the WiFi stick:

1. Connect your PC or smartphone with the WiFi network of the WiFi stick. The name of this WiFi network is “AP”, followed by the serial number of the WiFi stick (see rating plate). When you

are prompted for a password, you can find it on the label of the WiFi stick (PWD).

2. Open an Internet browser and enter the address **10.10.100.254**.
3. Recommended browsers: Internet Explorer 8+, Google Chrome 15+, Firefox 10+
4. Enter the username and password, which are both set to **"admin"** by default. The "Status" page will be opened.
5. Click on the "Wizard" in order to configure the WiFi stick for Internet access.

Result The WiFi stick begins to send data to SolarMAN.

Register your system at the website home.solarmanpv.com. For this, enter the serial number found on the stick logger.

Installers use the portal at pro.solarmanpv.com

5.12.2 Setting up the WiFi stick with the app

To download the app, search for "SOLARMAN" in the Apple or Google Play store, or use the following QR codes:

- **SOLARMAN Smart** (for end customers):

- **SOLARMAN Business** (for installers):



Configuration steps

1. After starting the app, register as a new user or enter the current solarMAN access data.
2. Create a new system and save the system data.
3. Scan the barcode of the stick logger to assign an inverter to the system.
4. Go to the newly created system in order to configure the stick logger (device/logger)
5. Press the button on the WiFi stick for 1 second to activate the WPS mode of the stick so that the smartphone can be connected to the WiFi stick.
6. Now, select your local WiFi network for Internet access and enter your WiFi password.
7. The WiFi stick is configured with the access data.

WiFi stick status

The LEDs on the WiFi stick provide information regarding the status:

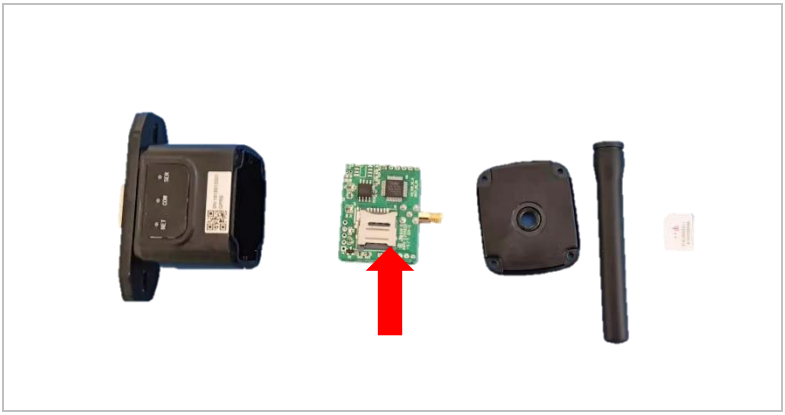
LED	Status	Description
NET:	Communication with the router	**On:** Connection to server successful
		Flashing (1 sec.): Connection to router successful
		Flashing (0.1 sec.): WPS mode active
		Off: No connection to router
COM	Communication with inverter	**Flashing** (1 sec.): Communication with inverter
		On: Logger connected to inverter
		Off: No connection to inverter
READY	Logger status	**Flashing** (1 sec.): Normal status
		Flashing (0.1 sec.): Reset running
		Off: Error status

Reset button

Keystroke	Description
1 sec.	WPS mode
5 sec.	Restart
10 sec.	Restart (reset)

5.12.3 Setting up the GPRS stick

The GPRS stick must be equipped with a SIM card:

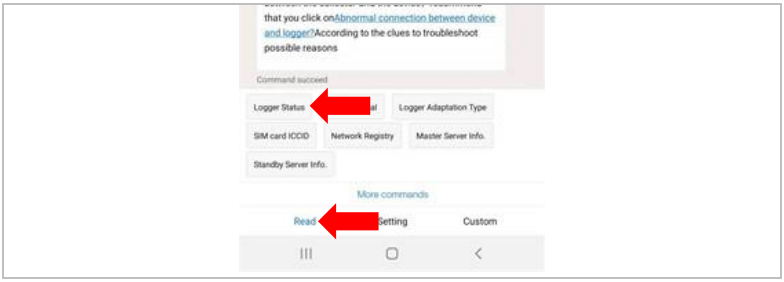


The GPRS stick must be set up via the SOLARMAN Business App:

Observe the following steps:

1. Open the app and call up the Bluetooth Tools menu item
2. Identify the WiFi stick with the serial number and select it.
3. Call up the “Custom” item
4. Enter the command AP+YZAPN= “APN name of your grid operator”
5. (e.g. for T-Mobile: AP+YZAPN=internet.v6.telekom)
6. To check the setting, call up AP+YZAPN

7. You can check the status via the “Logger Status” and “Read” menu item. Depending on the grid operator, wait several minutes until the connection has been established and the status is normal:



5.12.4 Setting up the Ethernet stick

The Ethernet stick is delivered with DHCP as standard, so it automatically gets an IP address from the router.

If you wish to set up a fixed IP address, connect a PC to the Ethernet stick and open the configuration page via the web address **10.10.100.254.**

6 Commissioning the inverter

6.1 Safety test before commissioning

ATTENTION

Check the voltage range

- Ensure that the DC and AC voltages are within the permissible range of the inverter.

6.2 Double Check

Please ensure that the inverter and all the wiring are installed correctly, securely, and reliably, and that all environment requirements are met.

1. Inverter is firmly fastened to the mounting bracket on the wall.
2. PV+/PV- wires are firmly connected, polarity and voltage are correct.
3. BAT+/BAT- wires are firmly connected, polarity and voltage are correct.
4. DC isolator is correctly connected between battery & inverter, DC isolator: OFF.
5. GRID / LOAD cables are firmly / correctly connected.
6. AC circuit breaker is correctly connected between inverter GRID port & GRID, circuit breaker: OFF.
7. AC circuit breaker is correctly connected between inverter LOAD port & critical load, circuit breaker: OFF.

8. For lithium battery, please ensure that the communication cable has been correctly connected.
9. For the lead-acid battery, please ensure that the NTC wire has been correctly connected.

6.3 Starting the inverter

Please follow below steps to switch the inverter ON.

1. Make sure there's no power generation in inverter's phase.
2. Turn ON DC switch.
3. Switch ON the battery. Turn ON DC isolator between battery & inverter.
4. Turn ON AC circuit breaker between the inverter GRID port & GRID.
5. Turn ON AC circuit breaker between the inverter LOAD port & critical load.
6. Inverter should start to operate now.

6.4 Initial setup

You need to set the following parameters before inverter starts to operate.

Parameter	Note
1) Language setting	The default is English
2) System time setting	If you are connected to the server or using the App, the time is set to the local time automatically

3) Safety parameter import	You need to read the Country Code setting from a USB drive. Alternatively, the mobile App can be used for this setting, if you are logged in as a validated installer
4) Set the input channel	With the Input Channel Configuration you define if PV and / or batteries are connected and in what configuration. If aa Input Channels is not used, select (not used)
Input Channel 1 (MPPT1)	if PV strings are connected to MPPT1, select “MPPT1”
Input Channel 2 (MPPT2)	if PV strings are connected to MPPT2 independently, select “MPPT2” If PV strings are connected to MPPT2 in parallel to MPPT1, select “MPPT1”
Input Channel 3 (BAT1)	If a battery is connected to BAT1 input, select “BAT1”, otherwise “disable”
Input Channel 4 (BAT2)	if a second battery is connected to BAT2 independently, select “BAT2” If one battery is connected in parallel to BAT1 and BAT2, select “BAT1”
5) Set battery parameters	Default values can be set according to the input channel configuration in Menu Advanced Settings – Battery Parameter:
	Select Battery Type

Battery Address: 00 for the 1st battery, 01 for the 2nd battery etc.

The default operating mode is the Self-use Mode.

EPS Mode, Unbalanced Support, Anti-Reflux Mode, IV-Curve Scan and Logic interface are disabled.

6.4.1 Configuring the battery setup

The HYD 5 ... 8KTL-3PH models have one battery input (max. current 25 A). The HYD 10 ... 20KTL-3PH models have two battery inputs (max. current 25 A / 25 A).

Battery inputs can be connected and set in parallel mode to reach 50 A / 70 A.

6.4.2 Configuring Parallel Inverter System

To increase the system's EPS and grid power, the HYD 5 ... 20KTL-3PH can be parallelly connected at the Grid port and the EPS port.

For the communication setup, please follow the following steps:

1) Set the Master unit
2) Set the Slave units

NOTE

- Each inverter must have a unique parallel address

Setting the country code

NOTE

- Different distribution network operators in various countries have differing requirements for the grid connection of grid-coupled PV inverters.
- Ensure that you have selected the correct country code according to regional authority requirements, and consult a qualified electrician or employees of electrical safety authorities.
- SOFARSOLAR is not responsible for the consequences of selecting the incorrect country code.
- The selected country code influences the device grid monitoring. The inverter continuously checks the set limits and, if required, disconnects the device from the grid.

Country	Code	Standard
Australia	002-000	General
	002-001	AU-WA
	002-002	AU-SA
	002-003	AU-VIC
	002-004	AU-QLD
	002-005	AU-VAR
	002-006	AUSGRID
	002-007	Horizon
	002-008	AU-SA-HV

Belgium	008-000	General
	008-001	HV
Brazil	028-000	220 V grid
	028-001	LV
	028-002	230 V grid
	028-003	254 V grid
China	010-000	General
	010-001	Taiwan
	010-002	MV
	010-003	HV
Croatia	107-000	
Cyprus	024-000	
Denmark	005-000	General
	005-001	TR322
Dubai	046-000	DEWG
	046-001	DEWG MV
EU	018-000	EN50438
	018-001	EN50549
	018-002	EN50549-HV
Europe (general)	022-000	
	022-001	
France	011-000	VDE0126
	011-001	FAR Arrete23
	011-002	VDE0126-HV
Germany	000-000	VDE4105
	000-001	BDEW
	000-002	VDE0126
	000-003	VDE4105-HV
	000-004	BDEW-HV

Greece	006-000	Continent
	006-001	Islands
India	025-000	
Ireland	039-000	EN50438
Italy	001-000	CEI-021 Internal
	001-001	CEI-016 Italy
	001-002	CEI-021 External
	001-003	CEI-021 In Areti
	001-004	CEI-021 Internal-HV
Korea	020-000	
Lithuania	108-000	
Mexico	035-000	LV
Netherlands	007-000	General
New Zealand	027-000	
Philippines	026-000	
Poland	012-000	LV
	012-001	MV
	012-002	HV
Spain	003-000	RD1699
	003-001	RD1699-HV
Sweden	021-000	
Turkey	004-000	General
United Kingdom	009-000	G99
	009-001	G98
	009-002	G99-HV
Slovakia	029-000	VSD
	029-001	SSE
	029-002	ZSD
South Africa	044-000	

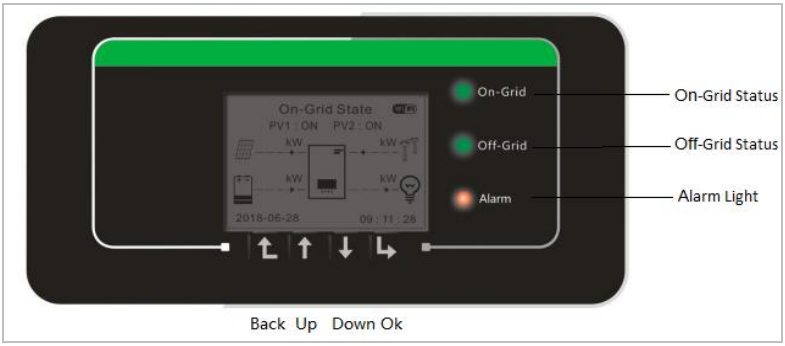
	044-001	HV
Thailand	040-000	PEA
	040-001	MEA
Ukraine	033-000	
	034-000	
IEC EN61727	019-000	
Wide range - 60 Hz	038-000	
LV range - 50 Hz	042-000	

7 Operation of the device

This chapter describes the LCD and LED displays of the HYD 5K ... 20KTL-3PH inverter.

7.1 Control panel and display field

7.1.1 Buttons and display lights



Buttons

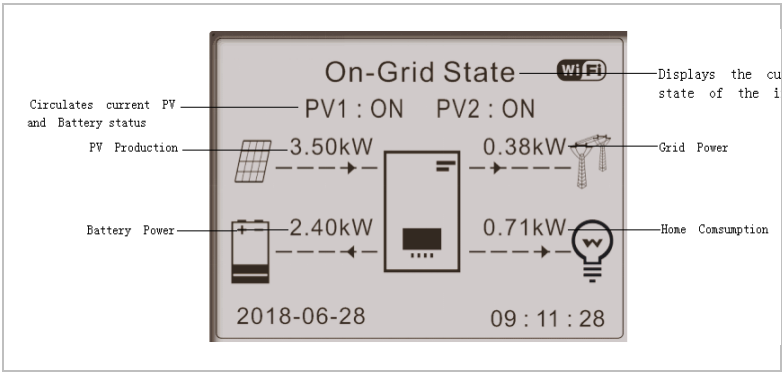
Button	Name	Description
	Back	Previous screen, enter menu
	Up	Select previous menu item, increase setting value
	Down	Select next menu item, decrease setting value
	Enter	Enter Menu item, select next digit, confirm setting

LEDs

State	Colour	State
On-grid	Green	Normal
	Green (flashing)	Standby
Off-grid	Green	Normal
	Green (flashing)	Standby
Alarm	Red	Error

7.2 Standard display

The screen shows all relevant information of the inverter:



↑	Press Up button, to show PV parameters like current, voltage and power
↓	Press down button to show grid parameters such as voltage, current and frequency

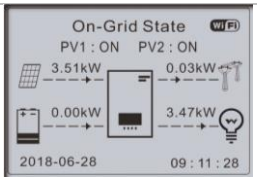
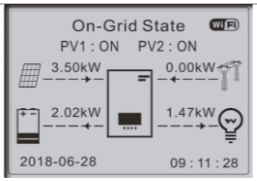
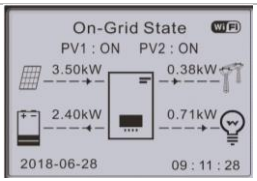
↓	Press down button again to show Battery 1 parameters like current, power, state of charge etc.
↓	Press down button again to show Battery 2 parameters like current, power, state of charge etc.

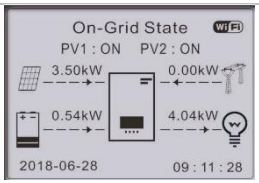
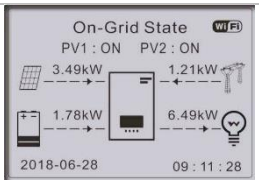
7.3 Energy storage modes

The HYD 5 ⋯ 20KTL-3PH comes with several integrated energy management modes.

7.3.1 Self-use Mode

In the Self-use mode, the inverter will automatically charge and discharge the battery according to the following rules:

	If PV generation equals the load consumption ($\Delta P < 100$ W), the inverter won't charge or discharge the battery
	If PV generation is larger than the load consumption, the surplus power is stored in the battery
	If the battery is full or at maximum charging power, the excess power will be exported to the grid

	If the PV generation is less than the load consumption, it will discharge the battery to supply power to the load.
	If PV generation plus Battery discharge power is less than the load, the inverter will import power from the grid.

The priority of power supply: PV, Battery, Grid

The priority of power consumption: Loads, Battery, Grid

NOTE

- If it is not allowed to export power to the grid, an energy meter and/or CT needs to be installed, and the "Anti Reflux Control" function needs to be enabled.

7.3.2 Time-of-Use Mode

With the Time-of-Use mode, the inverter can be set to charge the battery in defined intervals of time, date or weekday, depending on the State of Charge of the battery. Up to 4 rules (rule 0, 1, 2 and 3) can be set. If more than one rule is valid for any given time, the rule with the lower number is active. Each rule can be enabled or disabled.

In below example, the battery will be charged with 1 kW, if the SOC is below 70%, between 2 and 4 o'clock at night, from 22nd Dec till 21st March:

Set Time-of-use Mode

Rule 0:	Enabled / Disabled		
From	To	SOC	Charge
02h00m	-04h00m	070%	01000W
Effective	date		
Dec.22	-	Mar.21	
Weekday	select		
Mon. Tue. Wed. Thu. Fri. Sat. Sun.			

If no rule applies, the Self-use Mode is active.

7.3.3 Timing Mode

With the Timing Mode you can define fixed times of the day to charge or discharge the battery with a certain power.

Up to 4 rules (rule 0, 1, 2 and 3) can be set. If more than one rule is valid for any given time, the rule with the lower number is active. Each rule can be enabled or disabled, also charging and discharging period for a rule can be enabled separately.

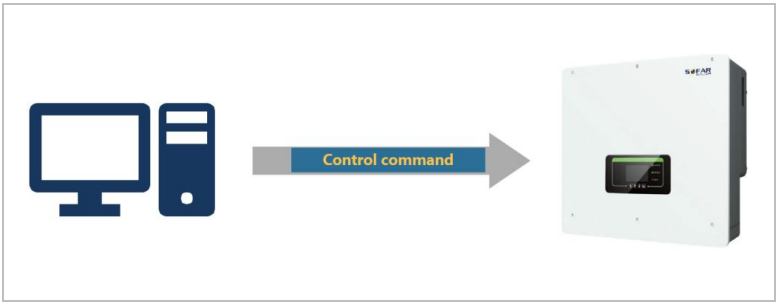
In below example, the battery will be charged with 2 kW between 22 and 4 o'clock at night, and discharged with 2,5 kW between 14 and 16 o'clock:

Timing Mode	
Rule 0: Enabled / Disabled / Enabled charge / Enabled discharge	
Charge Start	22 h 00 m
Charge End	05 h 00 m
Charge Power	02000 W
DisCharge Start	14 h 00m
DisCharge End	16 h 00m

DisCharge Power	02500 W

7.3.4 Passive Mode

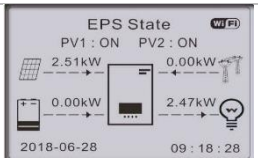
The passive mode is used in systems with external energy management systems. The inverter's operation will be controlled by the external controller using the Modbus RTU protocol. Please contact SOFARSOLAR if you need the Modbus protocol definition for this device.

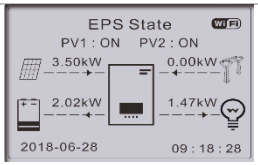
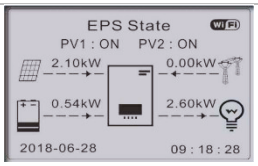


7.3.5 EPS Mode

With the EPS Mode the inverter can provide energy to the loads without public grid connection or during grid outages.

The EPS mode is only available when a battery is connected to the inverter.

	If PV generation equals the load consumption ($\Delta P < 100$ W), the inverter won't charge or discharge the battery

	If PV generation is larger than the load consumption, the surplus power is stored in the battery. If the battery is full or at maximum charging power, the PV power is reduced by adjusting the MPPT
	If the PV generation is less than the load consumption, it will discharge the battery to supply power to the load.

7.4 Menu structure

Press the button  to bring up the main menu.

Main menu

1. System Settings
2. Advanced Settings
3. Energy Statistics
4. System
5. Event list
6. Software update

“System Settings” menu

In this menu you can do the basic settings which are needed to operate the device.

3. Safety Parameters	Sets the country and grid code
4. Energy Storage Mode	Select between Self-use mode (Standard), time-of-use mode, timing mode, passive mode. See “Storage Modes” chapter for details.
5. Auto-Test	(only for Italy)
6. Input Channel Configuration	With the Input Channel Configuration you define if PV and / or batteries are connected and in what configuration. If one of the Input Channels
Input Channel 1 (MPPT1)	if PV strings are connected to MPPT1, select “MPPT1”
Input Channel 2 (MPPT2)	if PV strings are connected to MPPT2 independently, select “MPPT2” If PV strings are connected to MPPT2 in parallel to MPPT1, select “MPPT1”
Input Channel 3 (BAT1)	If a battery is connected to BAT1 input, select “BAT1”, otherwise “disable”
Input Channel 4 (BAT2)	if a second battery is connected to BAT2 independently, select “BAT2” If one battery is connected in parallel to BAT1 and BAT2, select “BAT1”
7. EPS Mode	Enable / Disable the emergency power supply mode (EPS). It is only available if a battery is connected
8. Modbus address	Enter the Modbus address (when several inverters require simultaneous monitoring), standard: 01

“Advanced Settings” menu

In this menu you can do advanced settings.

1. Battery Parameter	Set the battery parameters for Battery 1 and Battery 2. Depending on the selected Battery Type, more settings can be adjusted. See details below.
Battery Capacity (kWh)	Set the capacity of connected battery
Battery address	(only for batteries with integrated BMS) Up to 4 battery addresses for each Battery Input Channel can be set. This is the CAN bus or Modbus ID of each battery stack connected to the Battery Input, depending on the bus type between inverter and the BMS.
Nominal Battery Voltage (V)	Nominal DC voltage of the battery
Battery Cell Type	(for inverter-integrated BMS)
Max. charging current (A)	Max. allowed charging current for the battery
Max. discharging current (A)	Max. allowed discharging current for the battery
Discharge Depth (%)	Max. allowed discharge depth (DOD) for the battery. DOD of 80% means, a battery with 10 kWh

	capacity can be discharged to a minimum energy level of 2 kWh.
Discharge Depth	Max. Depth of Discharge (DOD) for grid-connected mode. Standard 80%
EPS Discharge Depth	Depth of Discharge (DOD) for EPS mode. Standard: 80%
EPS Safety Buffer	State of charge (SOC), where the battery will be recharged in EPS mode. Standard: 20%
Set force charge time	Define the time for the forced charging
2. Battery Activation	
Automatic activation	Enable / disable. If Automatic activation is enabled, the inverter will activate the battery when the inverter need to discharge or charge the battery according to the operational mode settings. If automatic activation is disabled, the battery has to be activated manually by selection the “Manual activation” menu item.
Manual activation	Select “Force activation” to activate a battery from standby mode
Save	After adjusting, select “Save” menu item to save the parameters.
3. Anti-reflux (Feed-in power limitation)	Activates or deactivates the feed-in power function of the inverter and

	sets the maximum feed-in power. This function must be used together with an external current transformer or the smart meter. Details regarding this can be found in the “Communications interfaces” chapter of this manual
4. IV Curve Scan	Cyclical scanning of the IV curve in order to find the global point of the maximum output. Advisable in the case of shaded solar generators
Scan Control	Enable / disable IV curve scan function
Scan Period	Set scan period in minutes
Force Scan	Manually start IV curve scanning
5. Logic interface (DRMs)	Activates or deactivates logical interfaces. Details regarding this can be found in the “Communications interfaces” chapter of this manual
6. Factory Reset	Resets stored data in the inverter
Clear energy Data	Clears total power production
Clear Events	Clears historical events
7. Parallel setting	Defines configuration for parallel inverter operation (Master/Slave)
Parallel Control	For inverters connected with Link port to each other, you set Parallel Control to “Enable”

Parallel Master/Slave	One Inverter need to be set as Master (Primary), all other inverters need to be set to Slave (Replica)
Parallel Address	Set each inverter with an individual parallel address. (It is an independent number from Modbus ID)
Save	After changes, select “save” item to save the settings
8. Bluetooth Reset	Resets the Bluetooth interface of the inverter
9. CT Calibration	This function is used to correct the direction and grid phase assignment of the connected CTs. During CT Calibration, the inverter must be connected to a battery and the grid. It is recommended to turn off the load during calibration. If calibration fails, check if the battery can be charged/discharged correctly
10. Switch On / Off	The inverter can be switched on, switched off, set to standby or set to normal operating mode, which can be useful for installation or maintenance work
11. Unbalanced Support	Default setting: disabled

	In situations where the customer only wants to support the local loads or has a zero-export limit across all three phases. When used in conjunction with the supplied three-phase energy meter and with this option set to "enable", the per phase output current of the inverter will respond independently. Important: for this function to operate properly, the phase on the energy meter must correlate to the corresponding phase when it is wired into the inverter.

Password

Several settings require a password to be entered (the standard password is 0001).

Energy Statistics menu

Today **Month** **Year** **Lifetime**	 Press Down button to move between items Shows PV, Load, Export, Import, Charge, Discharge Energy (kWh) for the selected period

System Information menu

1. Inverter Info

Inverter Info (1)	Serial number, software versions
Inverter Info (2)	Hardware version, Power, Country Code
Inverter Info (3)	Input Channel 1 ⋯ 4
Inverter Info (4)	Energy Storage Mode, RS485 Address, EPS Mode, IV Curve
Inverter Info (5)	Logic Interface, Grid code settings
Inverter Info (6)	Anti-reflux, Isolation resistance
2. Battery Info	
Battery 1/2 Info (1)	Battery Type, Capacity, Overvoltage Protection, Depth of Discharge (DOD)
Battery 1/2 Info (2)	Max. charging / discharging current and voltage
Battery 1/2 Info (3)	Low voltage protection, nominal battery voltage
1. Safety Parameters	
Safety Parameters (1)	Over- / under-voltage protection
Safety Parameters (2)	Over- / under-frequency protection
Safety Parameters (3)	10 Min. overvoltage protection

Event List menu

The event list is used to display the real time event recordings, including the total number of events and each specific ID no. and event time. The most recent events are listed at the top.

2. Event list

Current event	Show latest event
Event History	Show event history

Fault information	001 ID04 06150825 (display of the event sequence number, event ID number and time that the event takes place)

Firmware update

The user can update the software via the USB flash drive.
SOFARSOLAR will provide the firmware update when it is required.

7.5 Firmware update

1. Switch the DC and AC switches off and then remove the communication cover. If an RS485 line has been connected, ensure that the nut is loosened. Ensure that the communication line is not energised. Remove the cover to prevent the connected communications connector from becoming loose.
2. Insert the USB stick into the computer.
3. SOFARSOLAR will send the firmware update to the user.
4. Unzip the file and copy the original file to a USB stick. Attention: The firmware update file must be in the “firmware” subfolder!
5. Insert the USB flash drive into the USB interface of the inverter.
6. Switch on the DC switch and go to menu item “5. Software update” on the LCD display.
7. Enter the password (the standard password is 0715).
8. The system will then successively update the main DSP, auxiliary DSP and ARM processors. Pay attention to the displays.

9. If an error message appears, switch off the DC switch and wait until the LCD screen goes out. Then, switch the DC switch back on and proceed with the update from step 5.
10. After the update is complete, switch the DC switch off and wait until the LCD screen goes out
11. Re-establish a watertight communication connection
12. Switch the DC and AC circuit breaker back on
13. You can check the current software version in item “3. Software version” of the SystemInfo menu.

8 Troubleshooting handling

8.1 Troubleshooting

This section contains information and procedures pertaining to the remedying of potential problems with the inverter.

To carry out troubleshooting, proceed as follows:

- Check the warnings, error messages or error codes displayed on the screen of the inverter.

If no error information is displayed on the screen, check whether the following requirements have been fulfilled:

- Has the inverter been set up in a clean, dry, well-ventilated area?
- Is the DC switch set to ON?
- Are the cables sufficiently dimensioned and short enough?
- Are the input connections, output connections and the wiring all in good condition?
- Are the configuration settings for the relevant installation correct?
- Are the display field and the communication cables correctly connected and undamaged?

Please proceed as follows to display the recorded problems: Hold the button down to bring up the main menu of the standard interface. Select “2. Event list” and hold the button down to bring up the event list.

8.1.1 Shutdown procedure

If the inverter needs to be shut down for electrical inspection, please follow the following steps:

1. Press the "Back" on the main interface to enter the main menu page, and select Advanced Settings - On/off machine control - Shutdown. Make the inverter shut down safely.
   Note: after using the menu setting to shut down the inverter, the inverter should be checked and reenergising, it still needs to be on the main menu page. Select advanced Settings - switch machine control - start up to enable the inverter to start up and run.
2. Disconnect the AC circuit breaker connecting the inverter power grid port to the power grid.
3. Disconnect the AC breaker connecting the inverter load port to the emergency load.
4. Disconnect the PV side DC switch.
5. Turn off the battery and disconnect the DC switch between the battery and the inverter.
6. Wait for 5 minutes before checking the inverter.
7. Follow the steps below to view recorded problems: Press “Back” to enter the main menu in the normal interface. In the interface screen select "Event List", then press “OK” to enter events.

8.1.2 Earth fault alarm

This inverter is compliant with IEC 62109-2 Clause 13.9 and AS/NZS 5033 for earth fault protection.

If an earth fault alarm occurs, the error is displayed on the LCD screen, the red light illuminates and the error can be found in the error history log.

When the inverter is connected to the battery system, when the battery system has ground fault/leak alarm in accordance with AS/NZS 5139, the inverter will also alarm. The alarm method is the same as above.

NOTE

- In the case of devices equipped with a stick logger, the alarm information can be viewed on the monitoring portal and retrieved via the smartphone app.

8.2 Error list

Code	Name	Description	Solution
ID001	GridOVP	The voltage of the power grid is too high	If the alarm occurs occasionally, it may be due to the power grid. The inverter will automatically return to normal operation when the mains power returns to normal. If the alarm occurs frequently, check whether the mains voltage/frequency is within the permissible range. If so, check the AC circuit breaker and AC wiring of the inverter. If the alarm occurs
ID002	GridUVP	The voltage of the mains is too low	
ID003	GridOFP	The mains frequency is too high	
ID004	GridUFP	The mains frequency is too low	

			repeatedly, contact technical support to adjust the voltage and frequency limits after obtaining approval from the local power grid operator.
ID005	GFCI	Earth fault	If the error occurs occasionally, it may be due to external factors. The inverter will automatically return to normal operation. If the error occurs frequently and lasts for a long time, check whether the insulation resistance between the PV generator and earth (ground) is too low and check the insulation of the PV cables.
ID006	OVRT fault	OVRT function is faulty	ID006-041 are internal faults of the inverter. Turn the DC switch OFF, wait 5 minutes and then turn the DC switch ON. Check whether the error has been cleared. If not, please contact the technical support.
ID007	LVRT fault	LVRT function is faulty	
ID008	IslandFault	Island protection fault	
ID009	GridOVPInstant1	Transient overvoltage of mains voltage 1	

ID010	GridOVPInstant2	Transient overvoltage of mains voltage 2
ID011	VGridLineFault	Fault in the mains voltage
ID012	InvOVP	Inverter overvoltage
ID017	HwADFaultIGrid	Mains current measurement error
ID018	HwADFaultDCI	DC current measurement error
ID019	HwADFaultVGrid(DC)	Sampling error of the mains voltage (DC)
ID020	HwADFaultVGrid(AC)	Mains voltage sampling error (AC)
ID021	GFCIDeviceFault(DC)	Leakage current sampling error (DC)
ID022	GFCIDeviceFault(AC)	Leakage current sampling error (AC)
ID023	HwADFaultDCV	DC load voltage sampling error
ID024	HwADFaultIdc	DC input current sampling error
ID029	ConsistentFault_GFCI	The GFCI sample between the master DSP and the slave DSP is not consistent

ID030	ConsistentFault_Vgrid	The line voltage sample between the master DSP and the slave DSP is not consistent.	
ID033	SpiCommFault(DC)	SPI communication error (DC)	
ID034	SpiCommFault(AC)	SPI communication error (AC)	
ID035	SChip_Fault	Chip error (DC)	
ID036	MChip_Fault	Master chip error (AC)	
ID037	HwAuxPowerFault	Auxiliary voltage error	
ID041	RelayFail	Relay detection failure	
ID042	IsoFault	Insulation resistance is too low	Check the insulation resistance between the PV generator and earth (ground), rectify the fault if there is a short circuit.
ID043	PEConnectFault	Earth fault	Check the PE conductor for function
ID044	PV Config Error	Incorrect input mode configuration	Check the MPPT input mode setting (parallel mode/independent mode) of the inverter and correct if necessary.
ID045	CTD isconnect	CT error	Check that the wiring of the current transformer is correct.

ID049	TempFault_Bat	Battery temperature error	Make sure that the battery does not get too hot. Check that the temperature sensor has been correctly connected to the battery.
ID050	TempFault_HeatSink1	Temperature error heat sink 1	Make sure that the inverter has been installed in a cool and well-ventilated place without direct sunlight. Make sure the inverter is installed vertically and the ambient temperature is below the inverter's temperature limit.
ID051	TempFault_HeatSink2	Temperature error heat sink 2	
ID052	TempFault_HeatSin3	Heat sink temperature error 3	
ID053	TempFault_HeatSink4	Temperature error heat sink 4	
ID054	TempFault_HeatSin5	Temperature error heat sink 5	
ID055	TempFault_HeatSin6	Temperature error heat sink 6	
ID057	TempFault_Env1	Temperature error ambient temperature 1	
ID058	TempFault_Env2	Temperature error ambient temperature 2	
ID059	TempFault_Inv1	Temperature error module 1	
ID060	TempFault_Inv2	Temperature error module 2	

ID061	TempFault_Inv3	Temperature error module 3	
ID062	TempDiffErrInv		
ID065	VbusRmsUnbalance	Asymmetrical bus voltage RMS	Internal error of the inverter. Switch off the inverter, wait 5 minutes and then switch the unit on again. If the error persists, contact technical support.
ID066	VbusInstantUnbalance	The transient value of the bus voltage is unbalanced	
ID067	BusUVP	The DC bus voltage is too low during mains connection	
ID068	BusZVP	The DC bus voltage is too low	
ID069	PVOVP	The PV input voltage is too high	Check whether the PV series voltage (Voc) is higher than the maximum input voltage of the inverter. If this is the case, adjust the number of PV modules in series. After the correction, the inverter automatically returns to its normal state.
ID070	BatOVP	Battery overvoltage	Check whether the voltage of the battery is higher than the maximum input voltage of the inverter. If this is the case, adjust the number of battery modules in series.

ID071	LLCBusOVP	LLC Bus overvoltage protection	Internal error of the inverter. Switch off the inverter, wait 5 minutes and then switch the unit on again. If the error persists, contact technical support.
ID072	SwBusRmsOVP	Inverter bus voltage RMS Software overvoltage	
ID073	SwBusInstantOVP	Inverter bus voltage instantaneous Software overvoltage	
ID081	SwBatOCP	Software overcurrent protection of the battery	
ID082	DciOCP	Dci overcurrent protection	
ID083	SwOCPInstant	Instantaneous output current protection	
ID084	SwBuckBoostOCP	BuckBoost software sequence	
ID085	SwAcRmsOCP	Output RMS current protection	
ID086	SwPvOCPInstant	PV overcurrent software protection	
ID087	IpvUnbalance	PV flows in uneven parallelism	
ID088	IacUnbalance	Unbalanced output current	
ID091	SwAcCBCFault		

ID097	HwLLCBusOVP	LLC bus hardware overvoltage	
ID098	HwBusOVP	Inverter bus hardware overvoltage	
ID099	HwBuckBoostOCP	BuckBoost hardware overflows	
ID100	HwBatOCP	Battery hardware overflow	
ID102	HwPVOCP	PV hardware overflows	
ID103	HwACOCP	Mains current is too high and has triggered hardware protection	
ID105	MeterCommFault	Communication fault with meter unit	Check communication to meter.
ID110	Overload1	Overload protection 1	Please check whether the inverter is operating under overload.
ID111	Overload2	Overload protection 2	
ID112	Overload3	Overload protection 3	
ID113	OverTempDerating	The inverter has throttled due to too high a temperature	Make sure that the inverter has been installed in a cool and well-ventilated place without direct sunlight. Make sure the inverter is installed vertically and the

			ambient temperature is below the temperature limit of the inverter.
ID114	FreqDerating	Mains frequency is too high	Make sure that the mains frequency and voltage are within the permissible range.
ID115	FreqLoading	Mains frequency is too low	
ID116	VoltDerating	AC voltage is too high	
ID117	VoltLoading	AC voltage is too low	
ID124	BatLowVoltageAlarm	Protection against battery undervoltage	Please check if the battery voltage of the inverter is too low.
ID125	BatLowVoltageShut	Low battery voltage shutdown	
ID129	unrecoverHwAcOCP	Mains current is too high and has caused an unrecoverable hardware fault	Internal error of the inverter. Switch off the inverter, wait 5 minutes and then switch the unit on again. If the error persists, contact technical support.
ID130	unrecoverBusOVP	Bus voltage is too high and has caused a non-recoverable fault	
ID131	unrecoverHwBusOVP	Permanent bus hardware failure due to overvoltage	
ID132	unrecoverIpvUnbalance	Input current is unbalanced and	

		has caused an unrecoverable fault	
ID133	unrecoverEPSBatOCP	Permanent battery overcurrent error in EPS mode	
ID134	unrecoverAcOCPInstant	Permanent error due to transient overcurrent	
ID135	unrecoverIacUnbalance	Permanent unbalanced output current error	
ID137	unrecoverPvConfigError	Permanent input mode configuration error	Check the MPPT input mode setting (parallel mode/independent mode) of the inverter and correct it if necessary.
ID138	unrecoverPVOCPInstant	Permanent input overcurrent error	
ID139	unrecoverHwPVOCP	Permanent input hardware overcurrent error	Internal error of the inverter. Switch off the inverter, wait 5 minutes and then switch the unit back on. If the error persists, contact technical support.
ID140	unrecoverRelayFail	Permanent error of the mains relay	
ID141	unrecoverVbusUnbalance	The bus voltage is unbalanced and has caused an unrecoverable error	
ID142	PermSpdFail(DC)		
ID143	PermSpdFail(AC)		
ID145	USBFault	USB error	Check the USB connection of the inverter.
ID146	WifiFault	Wifi error	Check the inverter's WiFi connection.

ID147	BluetoothFault	Bluetooth error	Check the Bluetooth connection of the inverter.
ID148	RTCFault	RTC clock failure	Internal error of the inverter. Switch off the inverter, wait 5 minutes and then switch the unit back on. If the error persists, contact technical support.
ID149	CommEEPROMFault	EEPROM error of the communication card	
ID150	FlashFault	Communication card FLASH error	
ID152	SafetyVerFrault		
ID153	SciCommLose(DC)	SCI communication error (DC)	
ID154	SciCommLose(AC)	SCI communication error (AC)	
ID155	SciCommLose(Fuse)	SCI communication error (fuse)	
ID156	SoftVerError	Inconsistent software versions	Download the latest firmware from the website and launch the software update. If the error persists, contact technical support.
ID157	BMSCommunicatonFault (BMS 1)	Lithium battery communication error	Make sure your battery is compatible with the inverter. CAN communication is recommended. Check the communication line or the connection of the battery and the inverter for errors.

ID157	BMSCommunicatonFault (BMS 2)	Lithium battery communication error	Make sure your battery is compatible with the inverter. CAN communication is recommended. Check the communication line or the connection of the battery and the inverter for errors.
ID161	ForceShutdown	Forced shutdown	The inverter has been forcibly disconnected.
ID162	RemoteShutdown	Remote shutdown	The inverter is shut down remotely.
ID163	Drms0Shutdown	DRM 0 shutdown	The inverter is running with a Drms0 shutdown.
ID165	RemoteDerating	The inverter has reduced its power due to remote control	This message is for information and is not an error
ID166	LogicInterfaceDerating	The inverter has reduced its power due to the digital inputs	
ID167	AlarmAntiRefluxing	Power reduction due to current sensor or SmartMeter configuration	
ID169	FanFault1	Fan 1 fault	Check if the corresponding fan of the inverter is running normally.
ID170	FanFault2	Fan 2 fault	
ID171	FanFault3	Fan 3 fault	
ID172	FanFault4	Fan 4 fault	

ID173	FanFault5	Fan 5 fault	
ID174	FanFault6	Fan 6 fault	
ID175	FanFault7	Fan 7 fault	
ID176	MeterCommLose	Communication fault with meter unit	Check communication to meter
ID177	BMS OVP	BMS overvoltage alarm	Internal error in the connected lithium battery. Switch off the inverter and the lithium battery, wait 5 minutes and then switch the components on again. If the error persists, contact technical support.
ID178	BMS UVP	BMS Undervoltage alarm	
ID179	BMS OTP	BMS High temperature warning	
ID180	BMS UTP	BMS low temperature warning	
ID181	BMS OCP	BMS overload warning during charging and discharging	
ID182	BMS Short	BMS Short circuit alarm	

8.3 Maintenance

Inverters do not generally require daily or routine maintenance. Before carrying out cleaning, ensure that the DC switch and AC circuit breaker between the inverter and power grid have been switched off. Wait at least 5 minutes before carrying out cleaning.

8.3.1 Cleaning the inverter

Clean the inverter using an air blower and a dry, soft cloth or a soft bristle brush. Do NOT clean the inverter with water, corrosive chemicals, cleaning agents etc.

8.3.2 Cleaning the heat sink

In order to help guarantee correct long-term operation of the inverter, make sure that there is sufficient space for ventilation around the heat sink. Check the heat sink for blockages (dust, snow etc.) and remove them if present. Please clean the heat sink using an air blower and a dry, soft cloth or a soft bristle brush. Do NOT clean the heat sink with water, corrosive chemicals, cleaning agents etc.

9 Technical Data

Datasheet	HYD 5KTL-3PH	HYD 6KTL-3PH	HYD 8KTL-3PH	HYD 10KTL-3PH	HYD 15KTL-3PH	HYD 20KTL-3PH
Battery Input Data						
Battery type	Lithium-ion, Lead-acid					
No. of battery input	1			2		
Battery voltage range (V)	180-800					
Battery voltage range for full load (V)	200-800	240-800	320-800	200-800	300-800	400-800
Nominal charging / discharging power (W)	5000	6000	8000	10000	15000	20000
Max. charging / discharging current (A)	25			50 (25 / 25)		
Peak charging / discharging current, duration (A, s)	40, 60			70 (35 / 35), 60		
Charging strategy for battery	Self-adaptation to BMS					
Communication interfaces	CAN (RS485)					
PV String Input Data						
Recommended max. PV input power (Wp)	7500 (6000 / 6000)	9000 (6600 / 6600)	12000 (6600 / 6600)	15000 (7500 / 7500)	22500 (11250 / 11250)	30000 (15000 /15000)
Max. DC voltage (V)	1000					
Start-up operating voltage (V)	200					
MPPT voltage range (V)	180-960					
Nominal DC voltage (V)	600					
Full power MPPT voltage range (V)	250-850	320-850	360-850	220-850	350-850	450-850
Max. input current (A)	12.5 / 12.5			25 / 25		
Max. short current (A)	15 / 15			30 / 30		
No. of MPP trackers	2					
No. of strings per MPP tracker	1			2		
AC Output Data (On-grid)						
Nominal AC power (W)	5000	6000	8000	10000	15000	20000
Max. AC power output to utility grid (VA)	5500	6600	8800	11000	16500	22000
Max. AC power from utility grid (VA)	10000	12000	16000	20000	30000	40000
Max. AC current output to utility grid (A)	8	10	13	16	24	32
Max. AC current from utility grid (A)	15	17	24	29	44	58
Nominal grid voltage	3 / N / PE, 230 / 400 Vac					
Grid voltage range	184 Vac...276 Vac					
Nominal grid frequency	50 / 60 Hz					
Grid frequency range	45 Hz...55 Hz / 55 Hz...65 Hz					
Output power factor	ca. 1 (adjustable 0.8 leading to 0.8 lagging)					

Output THDi (@Nominal output)	< 3%					
AC Output Data (Back-up)						
Nominal output power (W)	5000	6000	8000	10000	15000	20000
Max. output power (VA)	5500	6600	8800	11000	16500	22000
Peak output power, duration (VA, s)	10000, 60	12000, 60	16000, 60	20000, 60	22000, 60	
Rated output current (A)	7.2	8.7	11.6	14.5	21.7	29
Max. output current (A)	8	10	13	16	24	32
Peak output current, duration (A, s)	15, 60	18, 60	24, 60	30, 60	32, 60	
Nominal output voltage	3 / N / PE, 230 / 400 Vac					
Nominal output frequency	50 / 60 Hz					
Output THDv (@symmetrical load)	< 3%					
Switch time	< 10 ms					
Efficiency						
MPPT efficiency	99.9%					
Euro efficiency	97.5%			97.7%		
Max. efficiency	98.0%			98.2%		
Max. battery charge / discharge efficiency	97.6%			97.8%		
Protection						
DC switch	Yes					
PV reverse polarity protection	Yes					
Output overcurrent protection	Yes					
Output overvoltage protection	Yes					
Anti-islanding protection	Yes					
Residual current detection	Yes					
Insulation resistor detection	Yes					
Surge protection level	II					
Battery reverse protection	Yes					
General Data						
Dimension (mm)	571.4*515*264.1					
Weight (kg)	33			37		
Inverter topology	Transformerless					
Standby self-consumption (W)	< 15					
Operating temperature range	-30°C...+60°C					
Relative humidity	0...100%					
Noise	< 45 dB					
Operating altitude	< 4000 m					
Cooling	Natural			Forced airflow		
Protection degree	IP65					
Feature						

DC terminal	MC4
Grid AC terminal	5P Connector
Back-up AC terminal	5P Connector
Display	LCD Display
Monitoring interfaces	RS485 / WiFi / CAN2.0 / Ethernet / Bluetooth
Parallel operation	Yes
Standard warranty	Standard 5 years, optional: up to 20 years
Certifications & Standards	
EMC	EN 61000-6-1, EN61000-6-3
Safety	IEC 62109-1, IEC 62109-2, NB-T32004 / IEC 62040-1
Grid	AS / NZS 4777, VDE V 0124-100, V0126-1-1, VDE-AR-N 4105, CEI 0-16 / CEI 0-21, EN 50549, G98 / G99, UTE C15-712-1

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