Hybrid Inverter

Installation and Operation Manual

www.aforenergy.com

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1.About This Manual

1.1 Scope of Validity

This manual mainly describes the product information, guidelines for installation, operation, maintenance and troubleshooting. And this manual applies to Afore Single Phase Hybrid Inverter.

AF3K-DH AF3.6K-DH AF4K-DH AF4.6K-DH AF5K-DH AF5.5K-DH
AF6K-DH AF7K-DH AF7.6K-DH AF8K-DH AF8.6K-DH AF9.6K-DH

Please keep this manual available all the time in case of any emergency.

1.2 Target Group

This manual is for qualified personnel. The tasks described in this manual must only be performed by qualified personnel.

2.Safety & Symbols

2.1 Safety Precautions

1. All work on the inverter must be carried out by qualified electricians.
2. The PV panels and inverter must be connected to the ground.
3. Do not touch the inverter cover until 5 minutes after disconnecting both DC and AC power supply.
4. Do not touch the inverter enclosure when operating, keep away from materials that may be affected by high temperatures.
5. Please ensure that the used device and any relevant accessories are disposed of in accordance with applicable regulations.
6. Afore inverter should be placed upwards and handled with care in delivery. Pay attention to waterproof. Do not expose the inverter directly to water, rain, snow or spray.
7. Alternative uses, modifications to the inverter not recommended. The warranty can become void if the inverter was tampered with or if the installation is not in accordance with the relevant installation instructions.

2.2 Explanations of Symbols

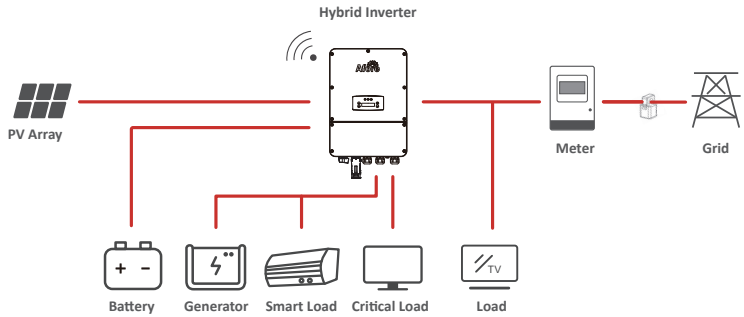
Afore inverter strictly comply with relevant safety standards. Please read and follow all the instructions and cautions during installation, operation and maintenance.

	Danger of electric shock The inverter contains fatal DC and AC power. All work on the inverter must be carried out by qualified personnel only.
	Beware of hot surface The inverter's housing may reach uncomfortably hot 60°C (140°F) under high power operation. Do not touch the inverter enclosure when operation.
	Residual power discharge Do not open the inverter cover until 5 minutes after disconnection both DC and AC power supply.
	Important notes Read all instructions carefully. Failure to follow these instructions, warnings and precautions may lead to device malfunction or damage.
	Do not dispose of this device with the normal domestic waste.
	Refer to manual before service.

3. Introduction

3.1 Basic Instruction

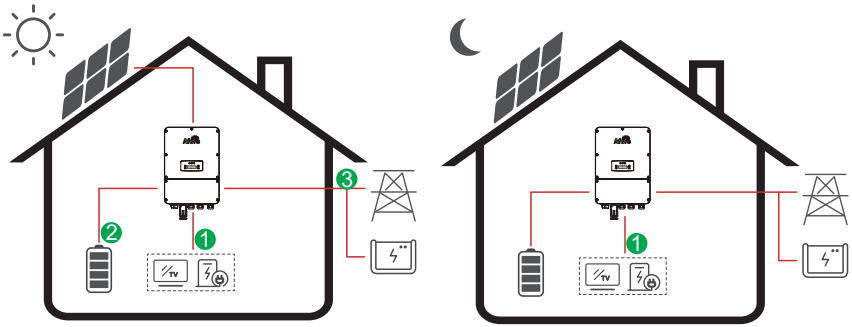
The Afore AF-DH series hybrid inverters are designed to increase energy independence for homeowners. Energy management is based on time-of-use and demand charge rate structures, significantly reduce the amount of energy purchased from the public grid and optimize self-consumption.



3.2 Operation Modes

3.2.1 Self-use

The Self-Use mode is for the regions with low feed-in tariff and high electricity prices. The energy produced by the PV system is used to optimize self-consumption needs. The excess energy is used to recharge the batteries, any remaining excess is then exported to the grid.



Energy flow: PV → Load → Battery → Grid

Note: Advance Setting

When select 0 W under P_Feed menu, the inverter will export zero energy to the grid.

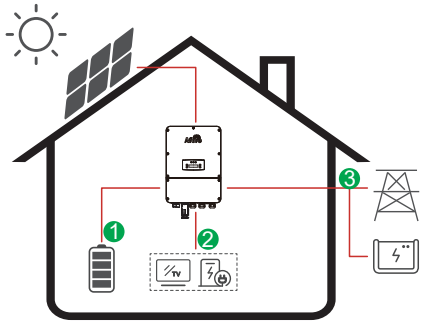
When select xx W under P_Feed menu, the inverter will export customized energy to the grid.

3.2.2 Time of Use

The Time of Use mode is designed to reward customers who do their part to reduce demand on the electric grid, particularly during peak usage periods. Use most of your electricity from PV energy and during off-peak time periods, and you could significantly lower your monthly bill.

A. Charge Setting

PV Charge Mode

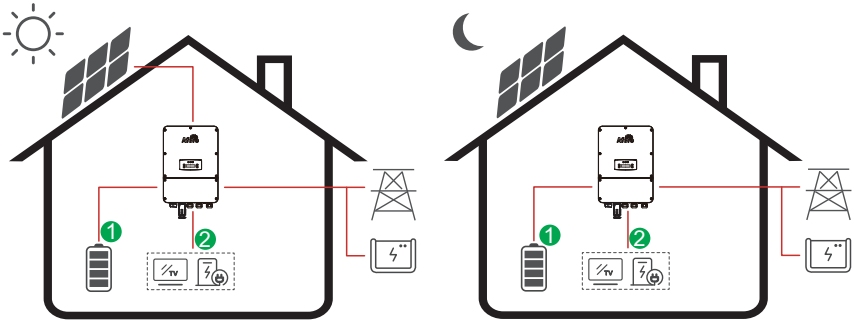


4 periods of time charge setting.

Energy flow:

PV → Battery → Load → Grid

AC Charge Mode



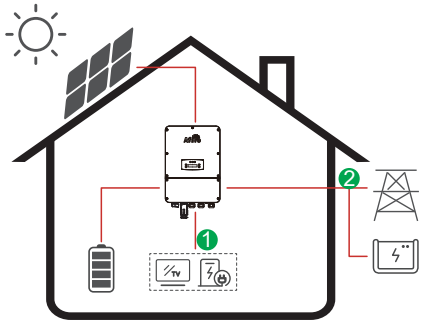
4 periods of time charge setting.

Energy flow: PV and Grid → Battery → Load

Note:
After select AC charge, the AC will also charge the battery when the PV is low or no PV.

B. Forced discharge

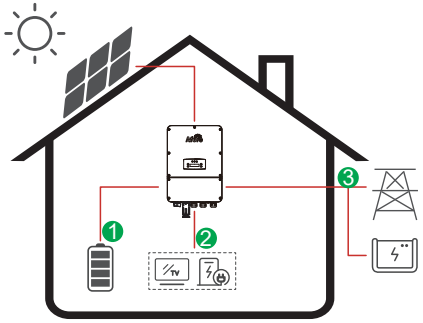
4 periods of time discharge setting



Energy flow:
Battery and PV → Load → Grid

C. Forbidden Discharge

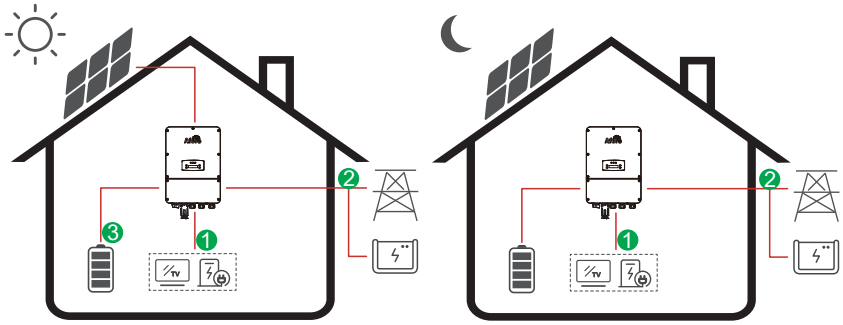
4 periods of time discharge setting, the battery will be charged firstly.



Energy flow:
PV → Battery → Load → Grid

3.2.3 Selling First

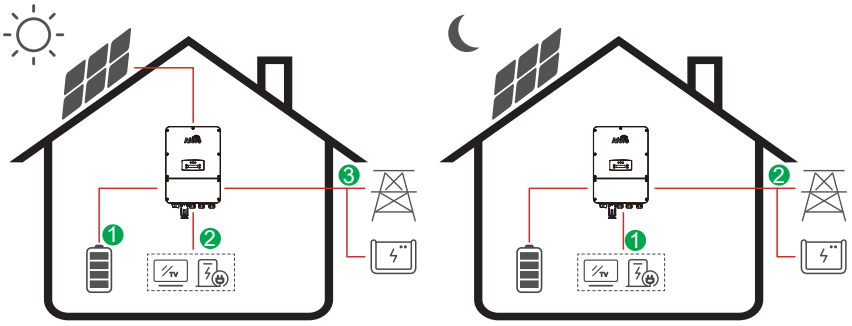
The Selling First mode is suitable for the regions with high feed-in tariff.



Energy flow: PV → Load → Grid → Battery

3.2.4 Back-Up

When the grid fails, the system will automatically switch to Back-Up mode. The back-up loads can be supplied by both PV and battery energy.



Energy flow: PV → Battery → Load→ Grid

4. Installation

4.1 Pre-installation

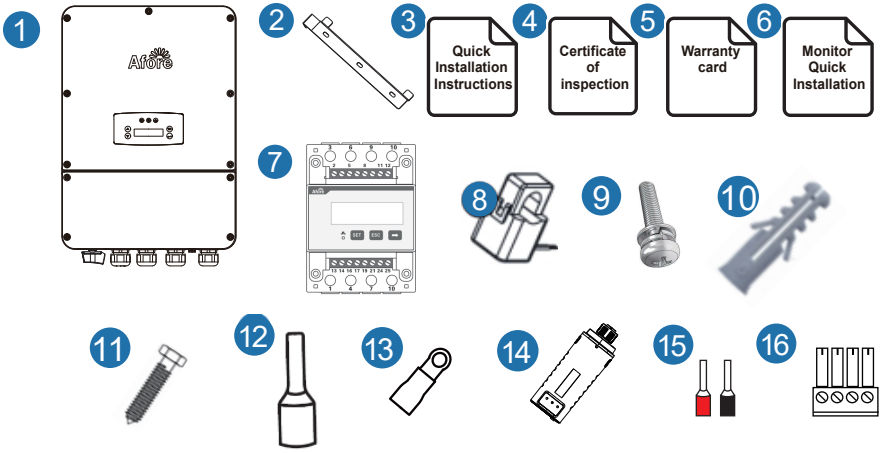
4.1.1 Unpacking & Package List

Unpacking

On receiving the inverter, please check to make sure the packing and all components are not missing or damaged. Please contact your dealer directly for supports if there is any damage or missing components.

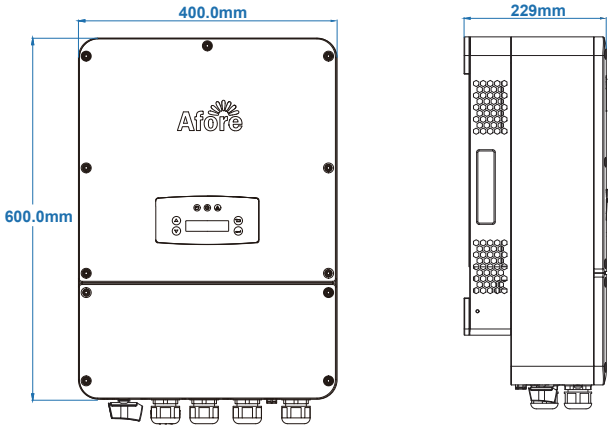
Package List

Open the package, please check the packing list shown as below.

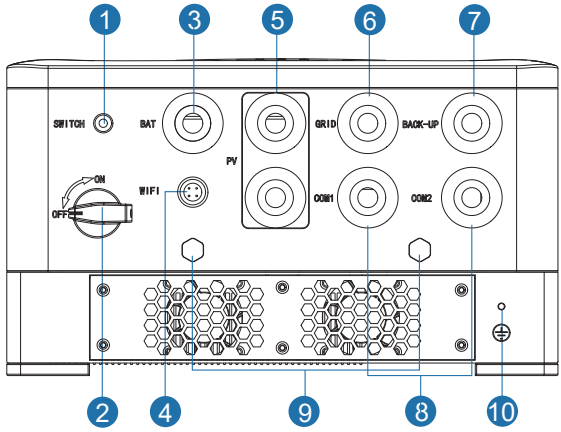


No.	Qty	Items	No.	Qty	Items
1	1	Hybrid Inverter	9	1	Security Screw
2	1	Wall Mounting Bracket	10	3	Expansion Tube
3	1	Quick Installation Instructions	11	3	Backet Screw
4	1	Certificate of Inspection	12	18	Battery Terminals
5	1	Warranty Card	13	4	Earth Terminals
6	1	Monitor Quick Installtion	14	1	Monitor Module
7	1	Smart Meter (Opitional)	15	10	Power Connectors
8	2	CT	16	6	Communication Connectors

4.1.2 Product Overview



Inverter Terminals

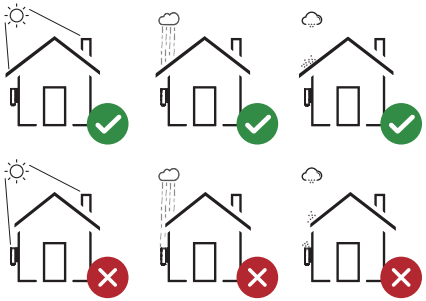


No.	Items	No.	Items
1	Emergency Stop	6	Grid Port
2	DC Switch	7	BACK UP
3	Battery Port	8	Communication Port
4	Wifi Port	9	Waterproof Ventilating Valve
5	PV Port	10	Grounding Screw

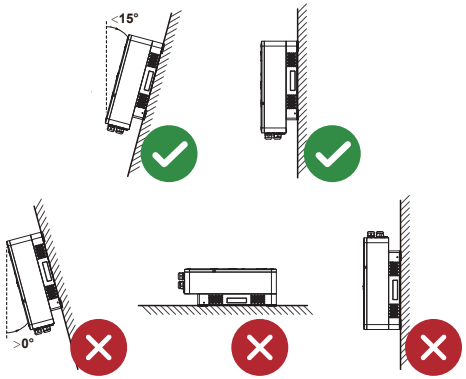
4.1.3 Mounting Location

The inverters are designed for indoor and outdoor installation (IP65), to increase the safety, performance and lifespan of the inverter, please select the mounting location carefully based on the following rules:

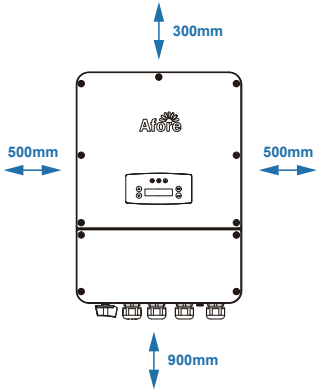
• The inverter should be installed on a solid surface, far from flammable or corrosion materials, where is suitable for inverter's weight and dimensions.
• The ambient temperature should be within -25℃ ~ 60℃ (between -13 °F and 140°F).
• The installation of inverter should be protected under shelter. Do not expose the inverter to direct sunlight, water, rain, snow, spray lightning, etc.



• The inverter should be installed vertically on the wall, or lean back on plane with a limited tilted angle. Please refer to below picture.

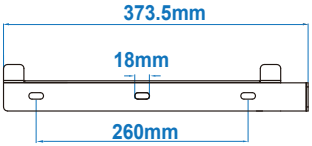


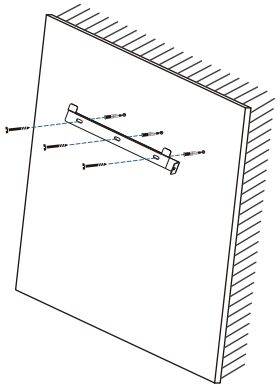
• Leave the enough space around inverter, easy for accessing to the inverter, connection points and maintenance.



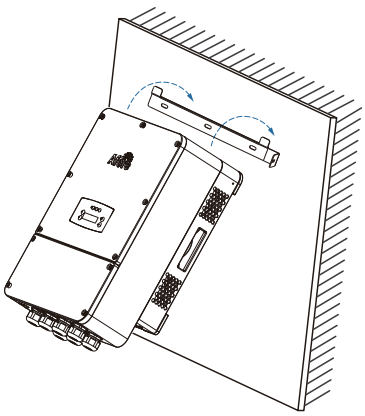
4.2 Mounting

Step 1

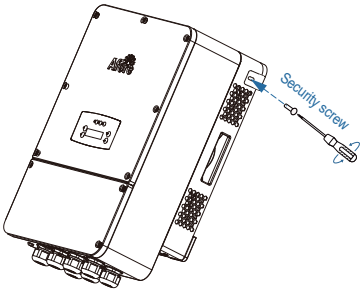


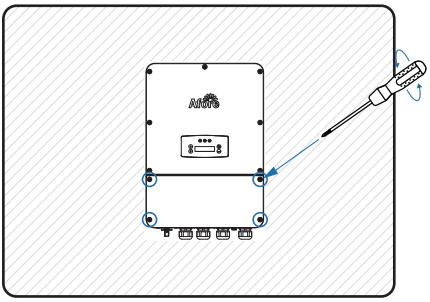


Step 2

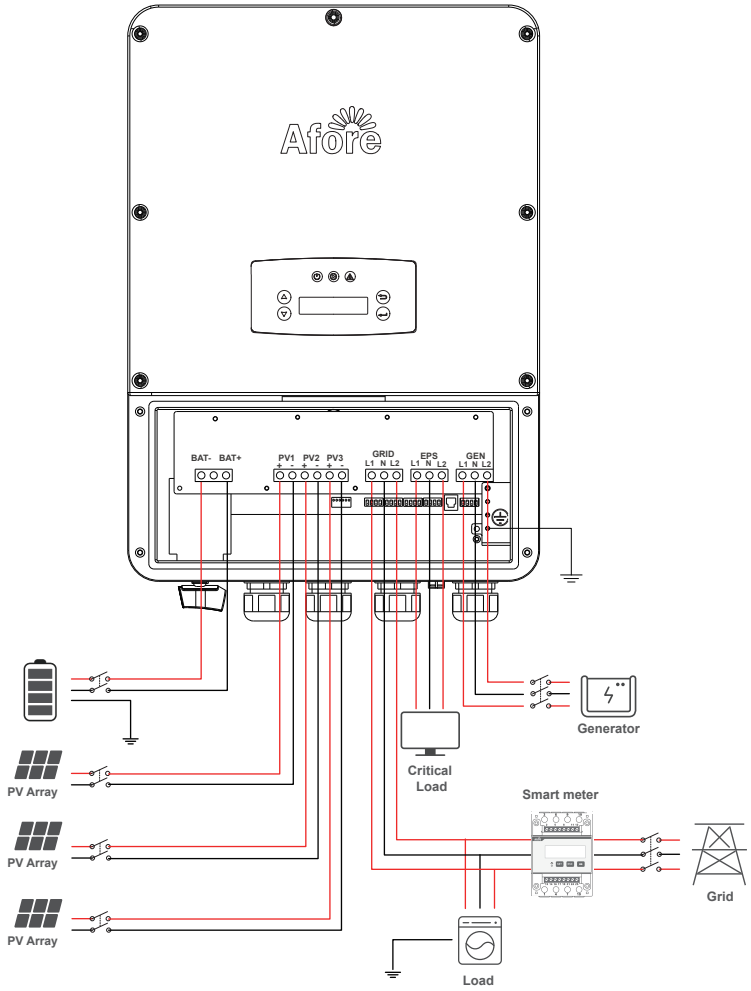


Step 3



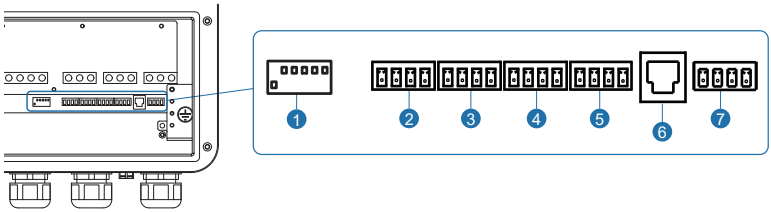


4.3 Electrical Connection



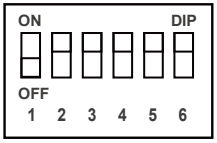
4.3.1 Communication

Communication terminals and configured switches on the bottom of the inverter:



No.	Item	Switch
1	Communication terminal	Adaptation switch
2	Communication terminal	BAT485 and Meter
3	Communication terminal	NTC and BAT CAN
4	Communication terminal	RS485
5	Communication terminal	CT1 and CT2
6	Communication terminal	DRM
7	Communication terminal	Dry Connector

4.3.1.1 Adaptation Switch

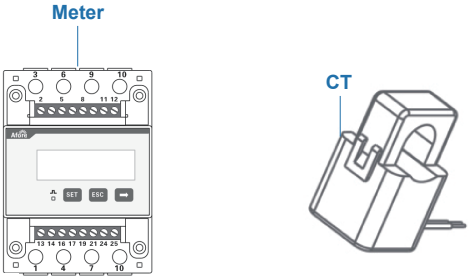


NO.	S1 Adaptation Switch	Remarks
1	Emergency switch, default is off	OFF
2	CAN-BAT	ON
3	CT485	ON
4	BAT485	ON
5	RS485_2	ON
6	RS485-WIFI	ON

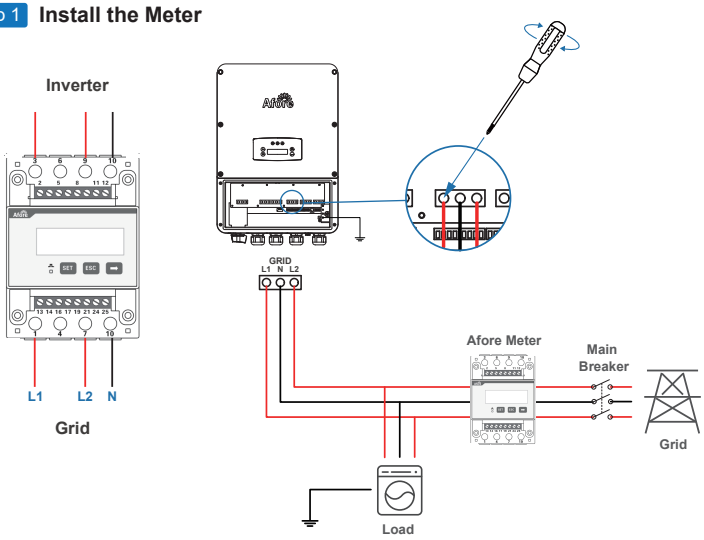
4.3.1.2 BAT/Meter/CT

Meter and a current sensor (CT for short below) are used to detect current power direction of thelocal load and the grid. The output control function of the inverters will be activated basedonthe detected data.

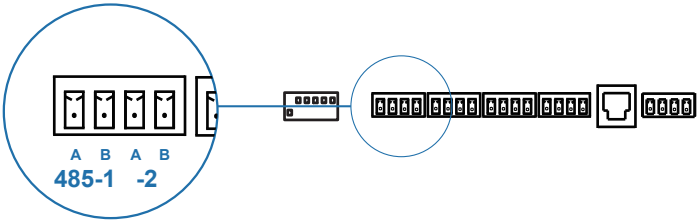
Note:
Set Make sure AC cable is totally isolated from AC power before connecting Smart Meter & CT.
One meter and 2pcs CT used for one hybrid inverter.



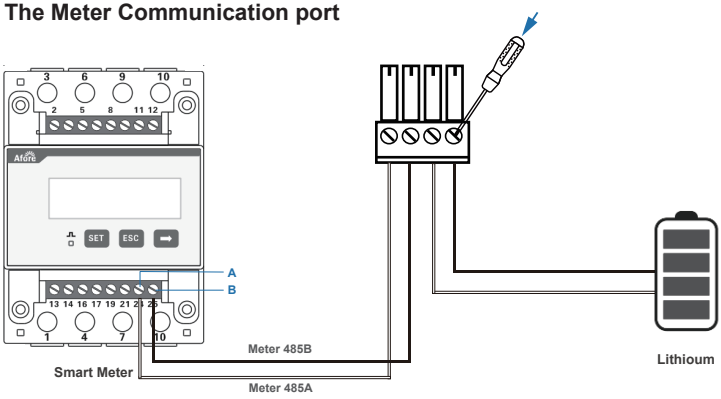
Step 1 **Install the Meter**

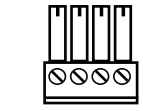


Step 2 **Connect the Meter to the inverter**



The Meter Communication port





Pin	BAT & Meter 485
1	Meter 485A
2	Meter 485B
3	BAT 485A
4	BAT 485B

Connect the meter with the inverter

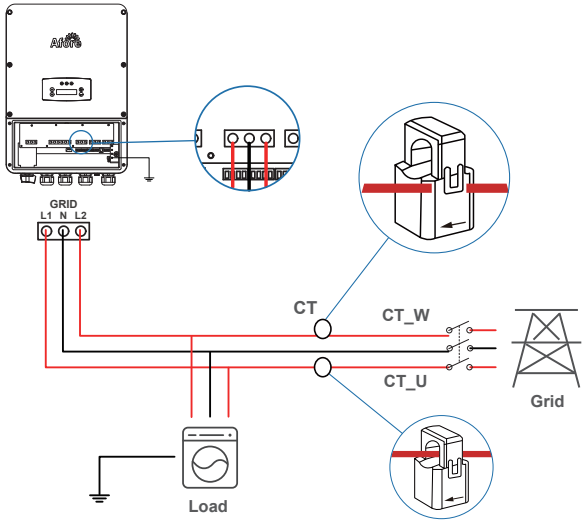
With negative value, the hybrid inverters is feeding power to the grid.

With positive value, the load is consuming the power from grid.

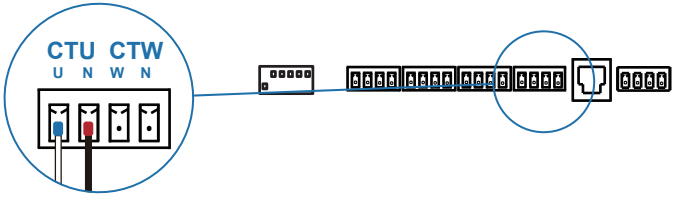
With below figures and “Imp.”, the system is importing active energy.

With below figures and “Exp.”, the system is exporting active energy.

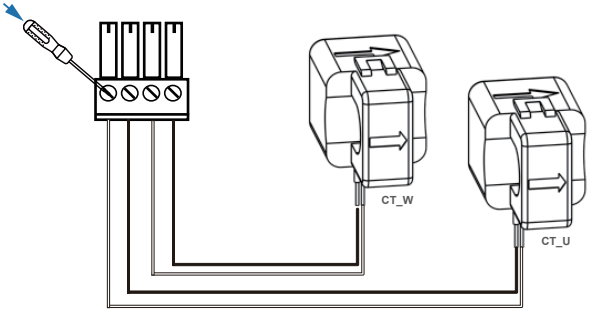
Step 1 **Install the CT**



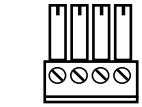
Step 2 **Connect the CT to the inverter**



The CT communication port



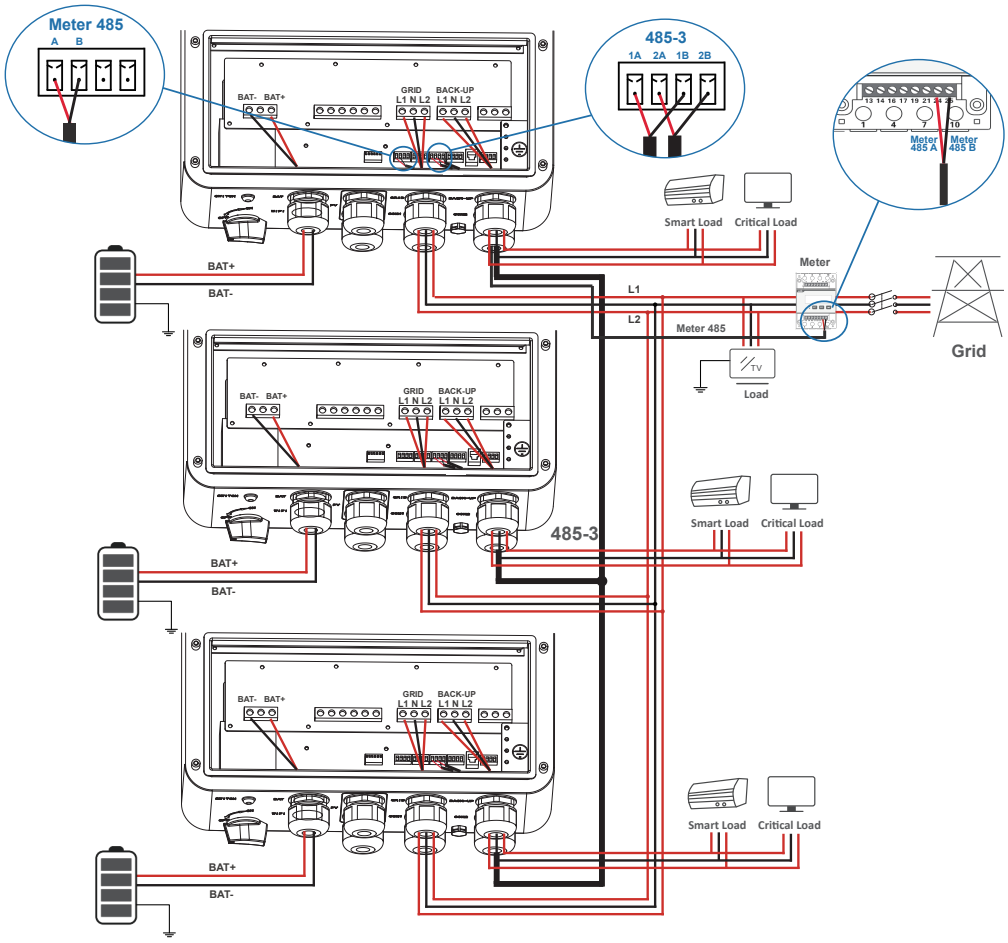
Step 3



Pin	CT-AC/Meter
1	CT_U
2	CT_N
3	CT_W
4	CT_N

4.3.1.3 Adaptation Switch

RS485-3 connector is for Multi inverter parallel communication connection.
Please check with local distributor or AIMS Power for more information.

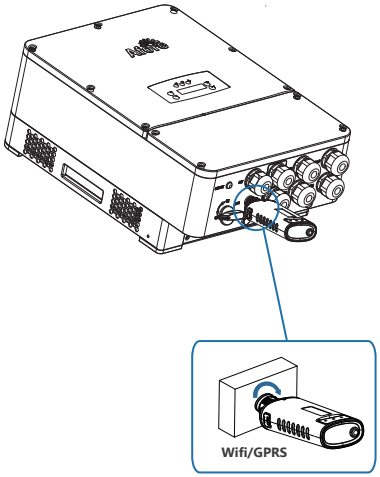


4.3.1.4 WIFI/GPRS/LAN

The WiFi/GPRS/LAN module could transmit data to cloud server, and display data on PC(personal computer), tablet and smart-phone.

Install the WIFI / Ethernet / GPRS / RS485 Communication

Turn on the AC power supply and the AC breaker, until the LED indicator on theWiFi/GPRS/LAN module flashing.

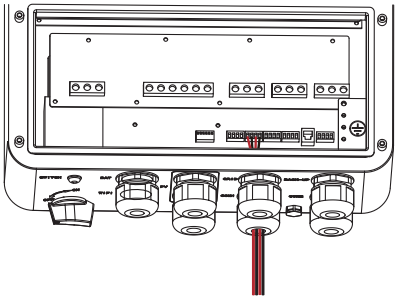


Setting the communication module, router, account registration, etc. For more information, please check the WIFI/GPRS/LAN connection manual via www.aforenergy. com.

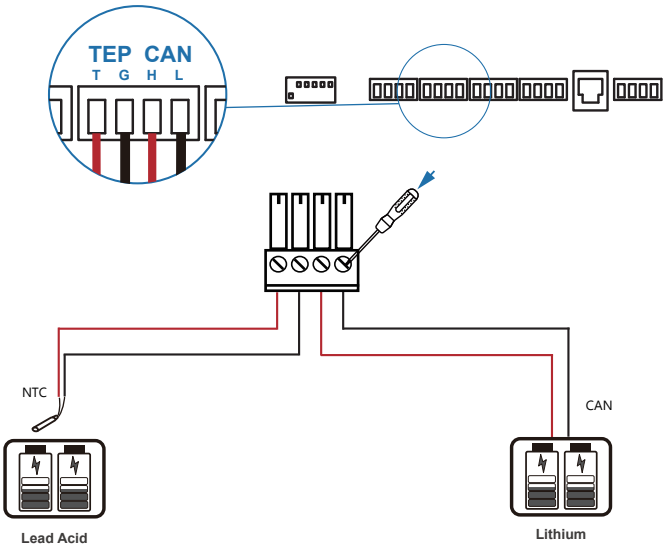
4.3.1.5 BAT-CAN/NTC

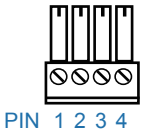
NTC is a temperature sensor, which is installed on the surface of the lead-acid battery byconnecting the lead wire to the TEP terminal of the inverter. If inverter is connected with lithiumbattery, it supports communication CAN & RS485, communication connecting steps please referto Chapter 4.4.2. Connecting steps of the lead-acid battery or lithium battery to the inverter please refer toChapter 4.3.2.

Step 1



Step 2

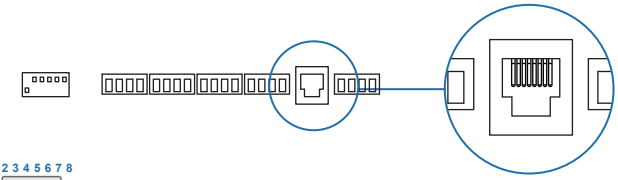




Pin	BAT NTC & CAN
1	TEP T
2	TEP G
3	CAN H
4	CAN L

Note:
NTC（temperature sensor）：Lead Acid
CAN：Lithium

4.3.1.6 DRM (Demand Response Mode)



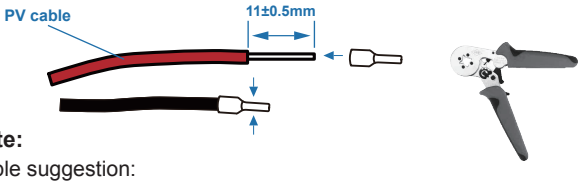
Pin	DRM	Pin	DRM
1	DRM1/5	5	REF/GEN/0
2	DRM2/6	6	3.3V
3	DRM3/7	7	/
4	DRM4/8	8	/

4.3.2 PV Connection

The AF-DH series hybrid inverters up to three MPPT channels, can be connected with threestrings of PV panels. Please make sure below requirements are followed before connecting PVpanels and strings to the inverter:

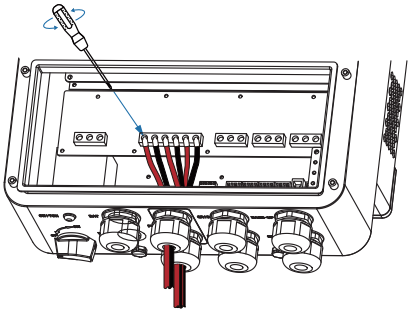
· Disconnect all the PV (DC) switches before wiring
· The open-circuit voltage and short-circuit current of PV string should not exceed thereasonable range of the inverters
· The isolation resistance between PV string and ground should exceed 300 kΩ
· polarity of PV strings are correct
· Use the DC plugs in the accessory box

Step 1



Note:
Cable suggestion:
Cross-section 10-12AWG

Step 2



· PV input wire ≥ 8AWG, stripping length 11±0.5mm, the stripped PV input wire should betightly crimped into the connectors.
· Pass the PV input wire with crimped terminals through the waterproof connector andfollow the system connection diagram as shown above, insert the black wire PV1-, PV2-, PV3- and the red wire PV1+, PV2+, PV3+ into the terminals on the PCB, and tighten thescrews.

Warning:
The fatal high voltage may on the PV string, please comply with electric safety in Chapter 2.0 when connecting.
Please make sure the right polarity of PV strings, otherwise inverter could be damaged.

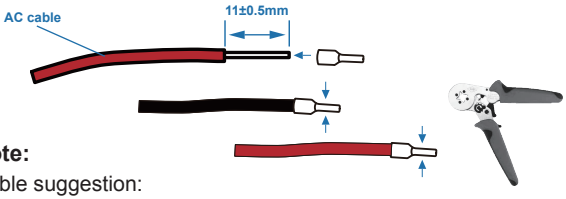
4.3.3 Battery Connection

AF-DH series hybrid inverters are compatible with lithium battery. For lead acid battery or batteries with other brands, please confirm with local distributor or Afore for technical support.

Note:
Set battery type and manufacturer, please refer to Chapter 5.3.

Note:
BMS (Battery Management System) communication is needed between inverter and battery.

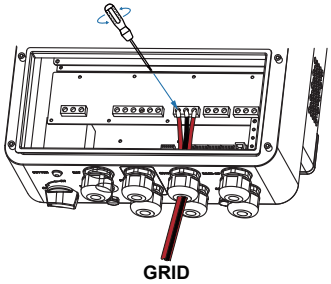
Step 1



Note:
Cable suggestion:
Cross-section 8-10AWG

Note:
Please make sure the battery polarities are correct.

Step 2



4.3.4 AC Connection

There are three AC terminals marking with "GRID", "EPS" and "GEN".

Before connecting, a separate AC breaker between individual inverter and AC input power is necessary. This will ensure the inverter be securely disconnected during maintenance and fullyprotected from current of AC input. An extra AC breaker is needed for On-Grid connection to be isolated from grid when necessary. Below are requirements for the On-Grid AC-breaker.

Inverter Model	AC breaker specification
AF3.0K-DH~AF7.6K-DH	63A/240V/208V AC breaker
AF8.0K-DH~AF9.6K-DH	100A/240V/208V AC breaker

Note:
Qualified electrician will be required for the wiring.

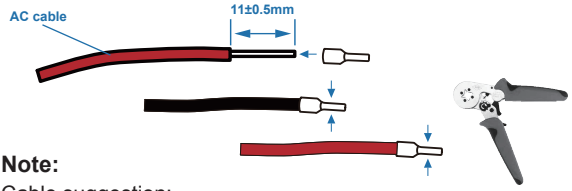
Model	Wire Size	Cable（mm²）	Torque value
6/9.6kW	8-10AWG	6-8	1.2Nm

Please follow steps for AC connection

· Connect DC protector or breaker first before connecting.
· Remove insulation sleeve 11mm (0.5 inch) length, unscrew the bolts, insert the AC input wires according to polarities indicated on the terminal block and tighten the terminal screws.

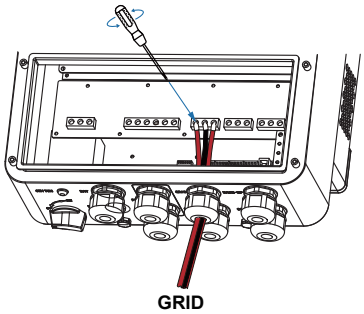
Grid Connection

Step 1



Note:
Cable suggestion:
Cross-section 8-10AWG

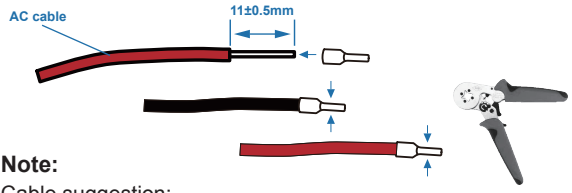
Step 2



Note:
Make sure that AC power source is disconnected before connection.

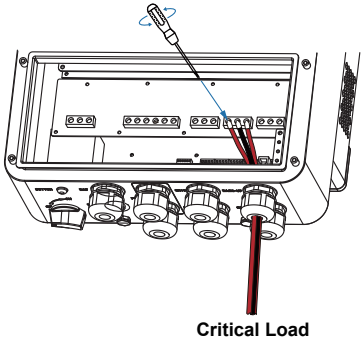
EPS Connection

Step 1



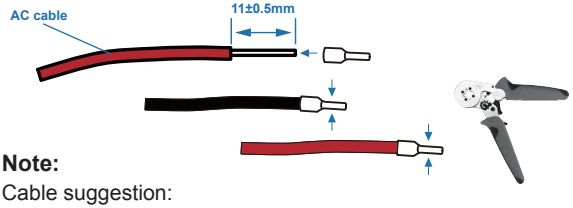
Note:
Cable suggestion:
Cross-section 8-10AWG

Step 2



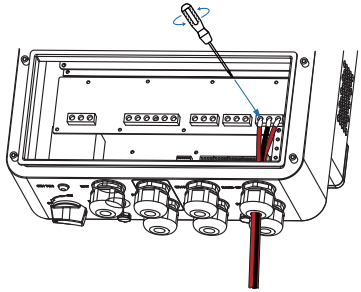
EPS Connection

Step 1



Note:
Cable suggestion:
Cross-section 8-10AWG

Step 2



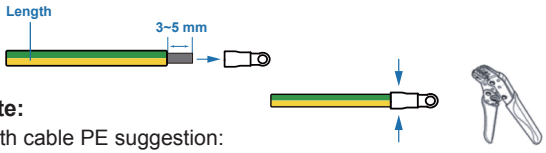
· Then, insert stripped AC output wires into the terminal block according to polarities indicated and tighten the terminal. Corresponding N wires and PE wires to the AC terminal should be inserted as well.

Note:
Make sure the wires are securely connected.

4.3.5 Earth Connection

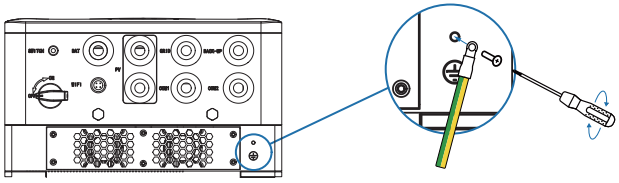
A second protective earth (PE) terminal should be connected to the inverter. This prevents electric shock if the original protective PE wire fails.

Step 1



Note:
Earth cable PE suggestion:
Cross-section (Copper) 6-10AWG

Step 2

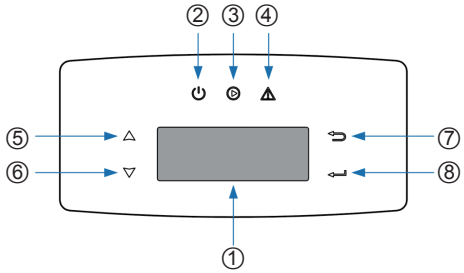


Fix the grounding screw to the grounding connection of the machine housing.

Note:
EMake sure the earth cables on the inverter and solar panel frame are separately.

5. Operation

5.1 Control Panel



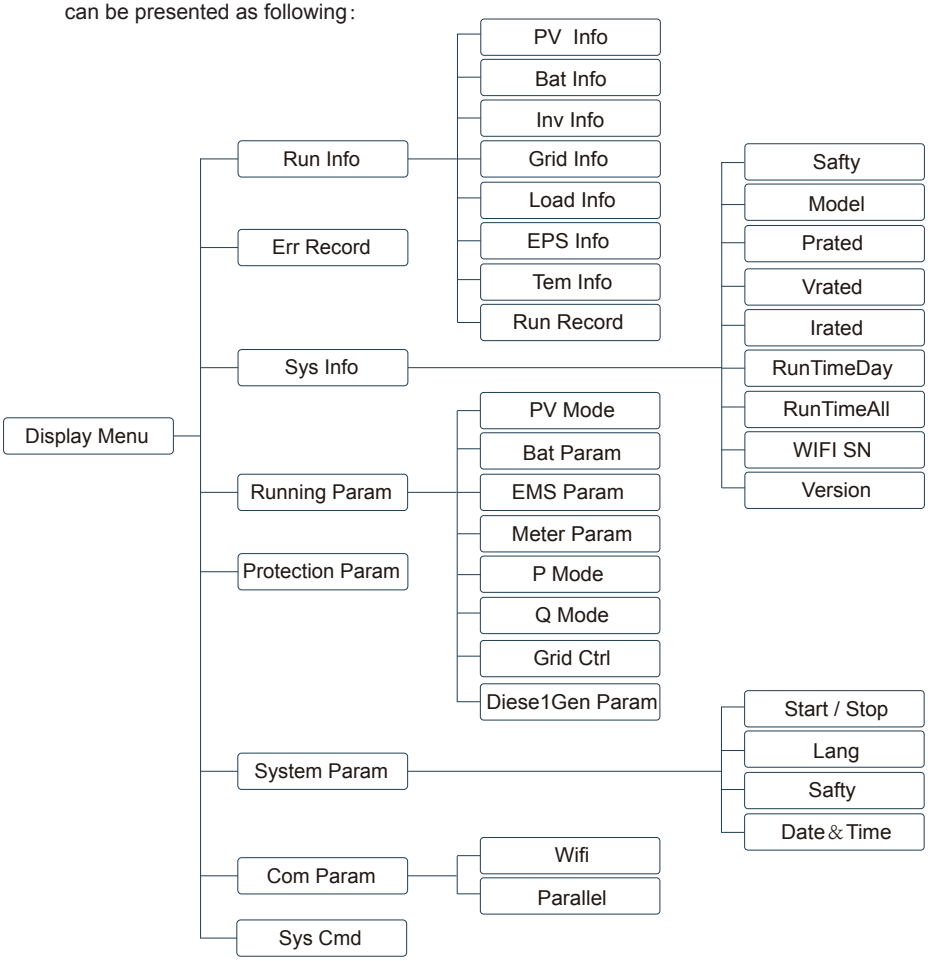
No.	Items	No.	Items
1	LCD Display	5	**UP** Touch Button
2	**POWER** LED Indicator	6	**DOWN** Touch Button
3	**GRID** LED Indicator	7	**BACK** Touch Button
4	**FAULT** LED Indicator	8	**ENTER** Touch Button

Note:
Hold UP/DOWN button can be rolling quickly.

Sign	Power	Color	Explanation
POWER	ON	Green	The inverter is stand-by
	OFF		The inverter is power off
GRID	ON	Green	The inverter is feeding power
	OFF		The inverter is not feeding power
FAULT	ON	Red	Fault occurred
	OFF		No fault

5.2 Menu Overview

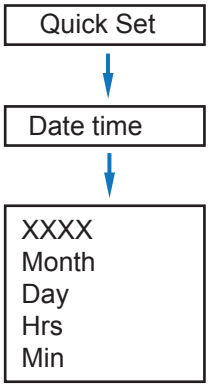
AF-DH hybrid inverter has a LCD for clearly operating, and menu of the LCD can be presented as following:



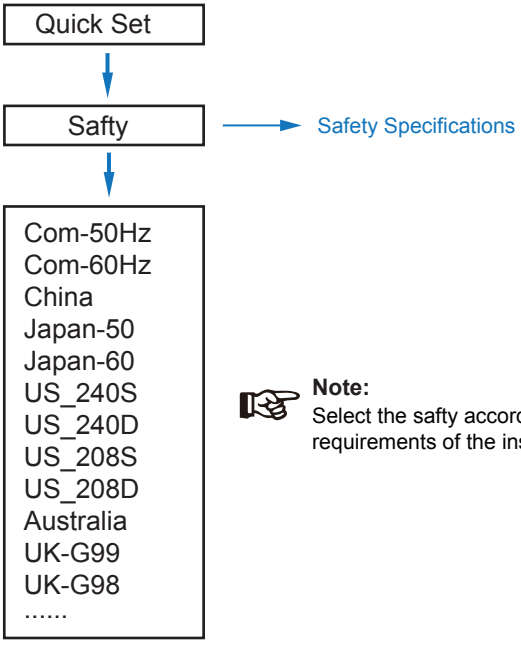
5.3 Inverter Setting

The setting is for AF-DH Hybrid inverter. Any doubts, please contact distributor for more details.

5.3.1 Time & Date

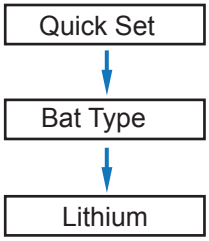


5.3.2 Safety

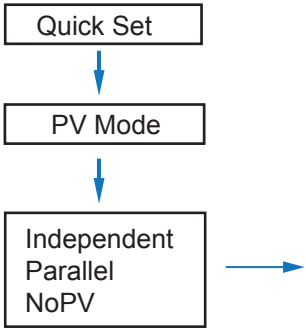


Note:
Select the safty according to the requirements of the installation site.

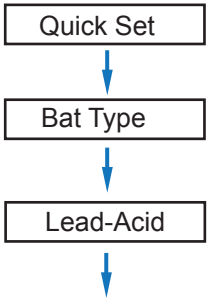
5.3.3 Lithium Battery



5.3.4 PV Mode



5.3.5 Lead Acid



Brand	COMMOM/SACRED
Capacity	0-1000Ah
BatResComp	0-1000mΩ
BatTemcomp	0-500mV/℃
VConstvolt	0-850V
VDiSchgEnd	0-850V
Parallel Qty	0-25V
VPackNorm	0-85V
VPackEmerChgStart	0-85V
VPackEmerChgEnd	0-85V
VPackMax	0-85V
VPackMin	0-85V
VPackChgEnd	0-85V
VPackDisChgEnd	0-85V

1. Lead-acid battery manufacturer.
2. Capacity range.
3. Resistance compensation.
4. Temperature compensation.
5. Constant voltage charging voltage.
6. Discharge termination voltage.
7. Number of batteries in series.
8. One lead-acid battery voltage rating.
9. One lead-acid battery emergency charging starting voltage.
10. One lead-acid battery emergency charging stop voltage.
11. One lead-acid battery voltage overvoltage threshold.
12. One lead-acid battery voltage undervoltage threshold.
13. One lead-acid battery voltage charging upper limit.
14. The lower limit of the discharge voltage of a lead-acid battery.

Note:
After the parameter setting is completed, you need to save the "V" in the lower right corner of the screen.

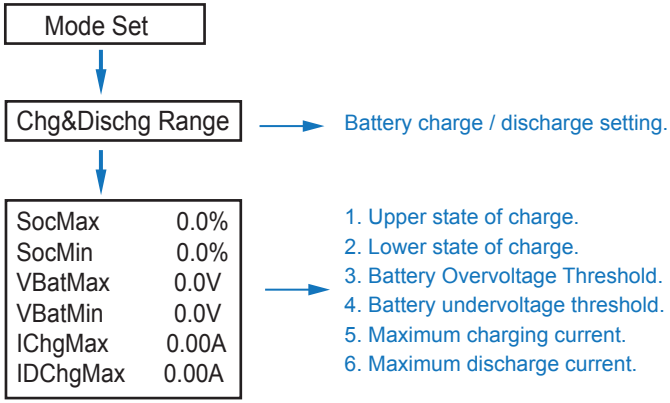
5.3.6 Energy Management System (EMS Param)

Mode Set → General Mode → Self Use / Sell First / Charge First / Command Charge / BAT Maintenance

1. Self-Use
2. Selling First
3. Back-Up
4.External EMS dispatch
5. Battery Maintain (In development)

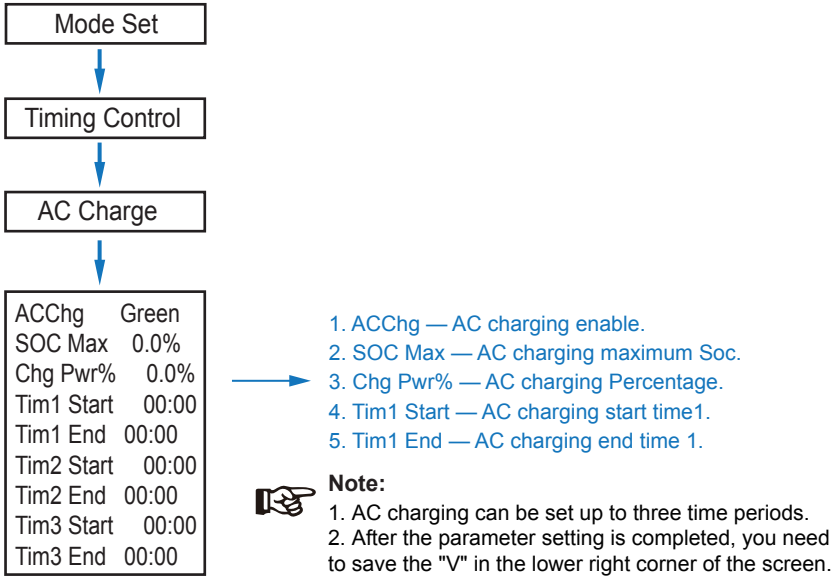
Note:
For detailed introduction of each mode, please refer to chapter 3.2 of the user manual.

5.3.7 Time of Use



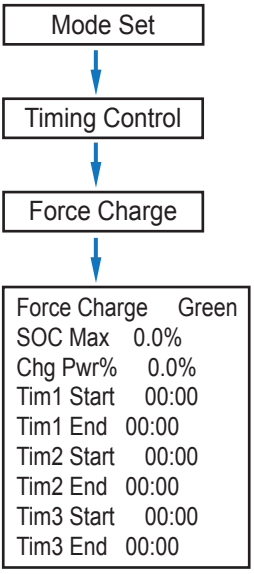
Note:
After the parameter setting is completed, you need to save the "V" in the lower right corner of the screen.

5.3.8 AC Charging



Note:
1. AC charging can be set up to three time periods.
2. After the parameter setting is completed, you need to save the "V" in the lower right corner of the screen.

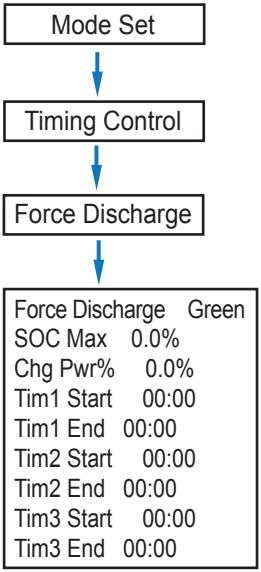
5.3.9 Forced Charging



1. Force Charge — Force charging enable.
2. SOC Max — Forced charging power percentage.
3. Chg Pwr% — Forced charging Max Soc.
4. Tim1 Star — Forced charging start time 1.
5. Tim1 End — Forced charging end time 1.

Note:
1. Forced charging can be set to three time periods.
2. After the parameter setting is completed, you need to save the "V" in the lower right corner of the screen.

5.3.10 Forced Discharging



1. Force Charge — Force discharging enable.
2. SOC Max — Forced discharging power percentage.
3. Chg Pwr% — Forced discharging Max Soc.
4. Tim1 Star — Forced discharging start time 1.
5. Tim1 End — Forced discharging end time 1.

Note:
1. Forced discharging can be set to three time periods.
2. After the parameter setting is completed, you need to save the "V" in the lower right corner of the screen.

5.3.11 Protection Parameters

Advanced Set

↓

Protection Parameter

↓

IsoChk	Green
GfciChk	Green
EarthChk	Green
RSSEn	Green
ISOmin	0KΩ
Vmax 1 level PROT Vlv	0.0V
Vmin 1 level PROT Vlv	0.0V
Fmax 1 level PROT Vlv	0.00HZ
Fmin 1 level PROT Vlv	0.00HZ
Vmax 1 level PROT time	0.00s
Vmin 1 level PROT time	0.00s
Fmax 1 level PROT time	0.00s
Vmin 1 level PROT time	0.00s

→

1. Insulation resistance detection.
2. Leakage current detection.
3. Ground detection.
4. Restart enable.
5. Impedance lower limit.
6. Grid level one overvoltage protection value.
7. Power grid first-level undervoltage protection value.
8. The first-level high-frequency protection value of the power grid.
9. The first-level low frequency protection value of the power grid.
10. Power grid first-level overvoltage protection time.
11. Power grid first-level undervoltage protection time.
12. Power grid first-level high-frequency protection time.
13. Power grid first-level low frequency protection time.

Note:
After the parameter setting is completed, you need to save the "V" in the lower right corner of the screen.

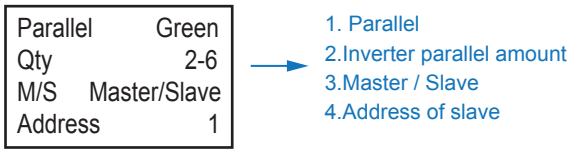
5.3.12 Multi-machine in Parallel

Quick Set

↓

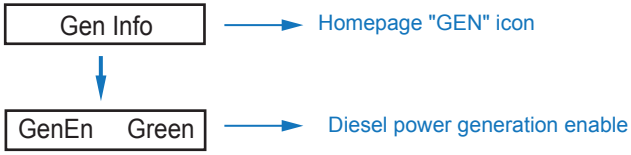
Parallel

↓



Note:
1. Only slave can choose address.
2. After the parameter setting is completed, you need to save the "V" in the lower right corner of the screen.

5.3.13 Diesel Generator Setting



6. Power ON/OFF

Please check the following requirements before testing:
- Installation location is suitable according to Chapter 4.1.3.
- All electrical wires are connected tightly, including PV modules, battery and AC side(Such as the grid side, EPS side, Gen side).
- Earth line and Smart meter/CT line are connected.
- AF-DH hybrid inverters should be set according to the required local grid standard.
- More information please contact with Afore or distributors.

6.1 Power ON

- Turn on DC switch.
- After LCD lighting, hybrid inverter should be set following Chapter 5.3 at the first time.
- When inverter running under normal mode, Running indicator will light up(Ref. to Chapter 5.1).

6.2 Power OFF

- Turn off DC switch (in hybrid inverter) and all extra-breaker.

Note:
Hybrid inverter should be restarted after 5 minutes.

6.3 Restart

Restart Hybrid inverter, please follow steps as below:
- Shutdown the inverter Ref. to Chapter6.2.
- Start the inverter Ref. to Chapter 6.1.

7. Maintenance & Trouble Shooting

7.1 Maintenance

Periodically maintenance are necessary, please follow steps as below.
- PV connection: twice a year
- AC connection(Grid and EPS) : twice a year
- Battery connection: twice a year
- Earth connection: twice a year
- Heat sink: clean with dry towel once a year

7.2 Trouble Shooting

The fault messages are displayed when fault occurs, please check trouble shooting table and find related solutions.

Fault Code and Trouble Shooting

Type of Fault	Code	Name	Description	Recommend Solution
PV Fault	A01	PvConnectFault	PV connection type different from setup	• Check PV modules connection • Check PV Mode setup Ref. Chapter 5.3.
	A02	IsoFault	ISO check among PV panels/ wires and ground is abnormal.	• Check PV modules wires, those wires are soaked or damaged, and then carry out rectification. • if the fault occurs continuously and frequently, please ask help for local distributors.
	A03	PvAfciFault	PV current arcing	• Check PV modules wires and connectors broken or loose connect, and then carry out rectification. • If the fault occurs continuously and frequently, please ask help for local distributors.
	A04	Pv1OverVoltFault	PV Voltage over	• Reconfiguration of PV strings, reduce the PV number of a PV string to reducing inverter PV input voltage. • Suggestion that contacting with local distributors.
	A05	Pv2OverVoltFault		
	A06	Pv3OverVoltFault		
	A07	Pv4OverVoltFault		
	A08	Pv5OverVoltFault		
	A09	Pv6OverVoltFault		
	A10	Pv7OverVoltFault		
	A11	Pv8OverVoltFault		
	A12	Pv9OverVoltFault		
	A13	Pv10OverVoltFault		
	A14	Pv11OverVoltFault		
	A15	Pv12OverVoltFault		
	A16	PV1ReverseFault	PV(+) and PV(-) reversed Connection	• Check PV(+) and PV(-) Connect whether reversed or not. • If reversed, make correction.
	A17	PV2ReverseFault		
	A18	PV3ReverseFault		
	A19	PV4ReverseFault		
	A20	PV5ReverseFault		
	A21	PV6ReverseFault		

Type of Fault	Code	Name	Description	Recommend Solution
PV Fault	A22	PV7ReverseFault		
	A23	PV8ReverseFault		
	A24	PV9ReverseFault		
	A25	PV10ReverseFault		
	A26	PV11ReverseFault		
	A27	PV12ReverseFault		
	A33	Pv1AbnormalFault	PV(+) and PV(-) reversed Connection	• Check PV modules partial occlusion or cells damaged. • Check PV module wires and connectors broken or loose connect, then repair it.
	A34	Pv2AbnormalFault		
	A35	Pv3AbnormalFault		
	A36	Pv4AbnormalFault		
	A37	Pv5AbnormalFault		
	A38	Pv6AbnormalFault		
	A39	Pv7AbnormalFault		
	A40	Pv8AbnormalFault		
	A41	Pv9AbnormalFault		
	A42	Pv10AbnormalFault		
	A43	Pv11AbnormalFault		
	A44	Pv12AbnormalFault		
	A45	Pv13AbnormalFault		
	A46	Pv14AbnormalFault		
	A47	Pv15AbnormalFault		
	A48	Pv16AbnormalFault		
	A49	Pv17AbnormalFault		
	A50	Pv18AbnormalFault		
	A51	Pv19AbnormalFault		
	A52	Pv20AbnormalFault		
	A53	Pv21AbnormalFault		
	A54	Pv22AbnormalFault		
	A55	Pv23AbnormalFault		
	A56	Pv24AbnormalFault		

Type of Fault	Code	Name	Description	Recommend Solution
Battery Fault	B01	PcsBatOverVoltFault	Battery voltage over or under	• Check inverters connected battery lines and connectors broken or loose connect. • Carry out rectification if broken or loose. • Checking battery voltage is abnormal or not, then maintenance or change new battery.
	B02	PcsBatUnderVoltFault		
	B03	PcsBatInsOverVoltFaul		
	B04	PcsBatReversedFault	Bat. (+) and Bat. (-) are reversed.	• Check Bat.(+) and Bat.(-)connect reversed or not. • Make correction If reversed.
	B05	PcsBatConnectFault	Battery wires loose	• Check battery wires and connectors damage or loose connect. • Carry out rectification if break.
	B06	PcsBatComFault	Battery communication abnormal	• Check battery side communication wires damage or loose connect, and then carry out rectification. • Check battery is off or other abnormal, then Mastertenance battery or change new battery.
	B07	PcsBatTempSensorOpen	Battery temperature sensor abnormal	• Check battery temperature sensor and connected wires damage or not , then rectification or change new one.
	B08	PcsBatTempSensorShort		
	B09	BmsBatSystemFault	All these faults will be detected or reported by battery BMS.	• If specific fault high temperature or low temperature, then should change battery installed environment temperature. • Restart battery, maybe can working as normal. • If this fault occurs continuously and frequently, please ask help for local distributors.
	B10	BmsBatVolOverFault		
	B11	BmsBatVolUnderFault		
	B12	BmsCellVolOverFault		
	B13	BmsCellVolUnderFault		
	B14	BmsCellVolUnbanceFau		
	B15	BatChgCurOverFault		
	B16	BatDChgCurOverFault		
	B17	BatTemperatureOverFa		
	B18	BatTemperatureUnderF		
	B19	CelTemperatureOverFa		
	B20	CelTemperatureUnderF		
	B21	BatIsoFault		
	B22	BatSocLowFault		
	B23	BmsInterComFault		
	B24	BatRelayFault		

Type of Fault	Code	Name	Description	Recommend Solution
Battery Fault	B25	BatPreChaFault		
	B26	BmsBatChgMosFault		
	B27	BmsBatDChgMosFault		
	B28	BMSVolOVFault		
	B29	BMSVolLFault		
	B30	VolLockOpenFault		
	B31	VolLockShortFault		
	B32	ChgRefOVFault		
	C01	GridLossFault	Grid lost (islanding)	• Inverter will restart automatically when the grid return to normal. • Check inverter connected with grid connectors and cable normal or not.
	C02	GridUnbalanVoltFault	Grid Voltage unbalanced.	• The inverter will restart automatically when the grid three phase return to normal. • Check inverter connected with the grid connectors and wires normal or not.con-nectors and cable normal or not.
	C03	GridInstOverVoltFault	Grid instantaneous voltage over	• The inverter will restart automatically when the grid three phase return to normal. • Contact with local distributor or required grid company adjust protection parameters.
	C04	Grid10MinOverVoltFault	Grid voltage Over by 10 Minutes	• The inverter will restart automatically when the grid three phase return to normal. • Contact with local distributor or required grid company adjust 10 minutes protection voltage parameters.
	C05	GridOverVoltFault	Grid voltage over	• The inverter will restart automatically when the grid three phase return to normal. • Contact with local distributor or required grid company adjust voltage protection parameters.
	C06	GridUnderVoltFault	Grid voltage under	
	C07	GridLineOverVoltFault	Grid line voltage over	
	C08	GridLineUnderVoltFault	Grid line voltage under	
	C09	GridOverFreqFault	Grid Frequency over	• The inverter will restart automatically when the grid three phase return to normal. • Contact with local distributor or required grid company adjust frequency protection parameters.
	C10	GridUnderFreqFault	Grid Frequency under	

Type of Fault	Code	Name	Description	Recommend Solution
Off-grid Fault	D01	UpsOverPowerFault	0ff-grid load over	• Reduce loads. • If sometimes overload, it can be ignored, when generation power enough can be recovery. • If those faults occurs continuously and frequently, please ask help for local distributors.
	D02	GridConflictFault	Grid connected to Back-up terminal	• Check the off-grid port connection correct, disconnect both off-grid and grid ports.
	D03	GenOverVoltFault	GenOverVoltFault	• Adjust generator running parameters, make the output voltage, frequency in allowed range. • If this fault occurs continuously and frequently, please ask help for local distributors.
	D04	GenUnderVoltFault	GenUnderVoltFault	
	D05	GenOverFreqFault	GenOverFreqFault	
	D06	GenUnderFreqFault	GenUnderFreqFault	
DC Fault	E01	Pv1HwOverCurrFault	PV current over, triggered by hardware protection circuit	• Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	E02	Pv2HwOverCurrFault		
	E03	Pv3HwOverCurrFault		
	E04	Pv4HwOverCurrFault		
	E05	Pv5HwOverCurrFault		
	E06	Pv6HwOverCurrFault		
	E07	Pv7HwOverCurrFault		
	E08	Pv8HwOverCurrFault		
	E09	Pv9HwOverCurrFault		
	E10	Pv10HwOverCurrFault		
	E11	Pv11HwOverCurrFault		
	E12	Pv12HwOverCurrFault		
	E13	Pv1SwOverCurrFault	PV current over, triggered by Software logic.	• Power off, power on then restart. • If those faults occurs continuously and frequently, please ask help for local distributors.
	E14	Pv2SwOverCurrFault		
	E15	Pv3SwOverCurrFault		
	E16	Pv4SwOverCurrFault		
	E17	Pv5SwOverCurrFault		
	E18	Pv6SwOverCurrFault		
	E19	Pv7SwOverCurrFault		
	E20	Pv8SwOverCurrFault		

Type of Fault	Code	Name	Description	Recommend Solution
DC Fault	E21	Pv9SwOverCurrFault		
	E22	Pv10SwOverCurrFault		
	E23	Pv11SwOverCurrFault		
	E24	Pv12SwOverCurrFault		
	E33	Boost1SelfCheck(boost)Fault	PV boost circuit abnormal when self checking	• Power off, then restart (Ref. Chapter8). • If those faults continuously and frequently, please ask help for local distributors.
	E34	Boost2SelfCheck(boost)Fault		
	E35	Boost3SelfCheck(boost)Fault		
	E36	Boost4SelfCheck(boost)Fault		
	E37	Boost5SelfCheck(boost)Fault		
	E38	Boost6SelfCheck(boost)Fault		
	E39	Boost7SelfCheck(boost)Fault		
	E40	Boost8SelfCheck(boost)Fault		
	E41	Boost9SelfCheck(boost)Fault		
	E42	Boost10SelfCheck(boost)Fault		
	E43	Boost11SelfCheck(boost)Fault		
	E44	Boost12SelfCheck(boost)Fault		
	E45	BusHwOverVoltFault	Bus voltage over	• Power off, then restart (Ref. Chapter8). • If those faults continuously and frequently, please ask help for local distributors.
	E46	BusHwOverHalfVoltFault		
	E47	BusSwOverVoltFault		
	E48	BusSwOverHalfVoltFault		
	E49	BusSwUnderVoltFault	Bus voltage under as running	
	E50	BusUnbalancedFault	DC Bus voltage unbalanced	
	E51	BusBalBridgeHwOver-CurFault	Bus Controller current over	• Power off, then restart (Ref. Chapter8). • If those faults continuously and frequently, please ask help for local distributors.
	E52	BusBalBridgeSwOver-CurFault		
	E53	BusBalBridgeSelf-CheckFault	Bus Controller abnormal when self checking	
	E54	BDCHwOverCurrFault	BiDC current over	• Power off, then restart (Ref. Chapter8). • If those faults continuously and frequently, please ask help for local distributors.
	E55	BDCSwOverCurrFault		
	E56	BDCSelfCheckFault	BiDC abnormal as self checking	
	E57	BDCSwOverVoltFault	BiDC voltage over	
	E58	TransHwOverCurrFault	BiDC current over	

Type of Fault	Code	Name	Description	Recommend Solution
	E59	BDCFuseFault	BiDC fuse broken	• Change fuse.
	E60	BDCRelayFault	BiDC relay abnormal	• Power off, then restart (Ref. Chapter8). • If those faults continuously and frequently, please ask help for local distributors.
AC Fault	F01	HwOverFault	All over current/ voltage by protection hardware	• Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	F02	InvHwOverCurrFault	Ac over current by protection hardware	
	F03	InvROverCurrFault	R phase current over	
	F04	InvSOverCurrFault	S phase current over	
	F05	InvTOverCurrFault	T phase current over	
	F06	GridUnbalanCurrFault	On-grid current unbalanced	
	F07	DcInjOverCurrFault	DC injection current over	
	F08	AcOverLeakCurrFault	Ac side leakage current over	• Check AC insulation and ground wires connect ground is well or not, then repair it. • Power off, then restart (Ref. Chapter8).. • If those fault occurs continuously and frequently, please ask help for local distributors.
	F09	PLLFault	PLL abnormal	• Power off, then restart (Ref. Chapter8). • If those fault occurs continuously and frequently, please ask help for local distributors.
	F10	GridRelayFault	Grid relay abnormal	
	F11	UpsRelayFault	Ups relay abnormal	
	F12	GenRelayFault	Generator relay abnormal	
	F13	Relay4Fault	Relay4 abnormal	
	F14	UpsROverCurrFault	Off-grid output current over	• When off-grid the load start impulse current is over, reduce the start impulse current load. • Power off, then restart (Ref. Chapter8). • If those fault occurs continuously and frequently, please ask help for local distributors.
	F15	UpsSOverCurrFault		
	F16	UpsTOverCurrFault		
	F17	GenROverCurrFault	Generator current over	• Check generator output voltage, frequency is stability, and adjust generator. • Power off, then restart(Ref. Chapter8). • If those fault occurs continuously and frequently, please ask help for local distributors.
	F18	GenSOverCurrFault		
	F19	GenTOverCurrFault		
	F20	GenReversePowerFault	Active power injected to generator	

Type of Fault	Code	Name	Description	Recommend Solution
AC Fault	F21	UpsOverVoltFault	Off-grid output voltage over or under	• Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	F22	UpsUnderVoltFault		
	F23	UpsOverFreqFault	Off-grid output frequency over or under	
	F24	UpsUnderFreqFault		
	F25	DcInjOverVoltFault	Off-grid DC injection voltage over	
System Fault	G01	PV1CurAdChanFault	Sampling hardware abnormal	• Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	G02	PV2CurAdChanFault		
	G03	PV3CurAdChanFault		
	G04	PV4CurAdChanFault		
	G05	PV5CurAdChanFault		
	G06	PV6CurAdChanFault		
	G07	PV7CurAdChanFault		
	G08	PV8CurAdChanFault		
	G09	PV9CurAdChanFault		
	G10	PV10CurAdChanFault		
	G11	PV11CurAdChanFault		
	G12	PV12CurAdChanFault		
	G13	BDCCurrAdChanFault		
	G14	TransCurAdChanFault		
	G15	BalBrigCurAdChanFault		
	G16	RInvCurAdChanFault		
	G17	SInvCurAdChanFault		
	G18	TInvCurAdChanFault		
	G19	RInvDciAdChanFault		
	G20	SInvDciAdChanFault		
	G21	TInvDciAdChanFault		
	G22	LeakCurAdChanFault		
	G23	VoltRefAdChanFault		
	G24	UpsRCurAdChanFault		

Type of Fault	Code	Name	Description	Recommend Solution
System Fault	G25	UpsSCurAdChanFault		
	G26	UpsTCurAdChanFault		
	G27	GenRCurAdChanFault		
	G28	GenSCurAdChanFault		
	G29	GenTCurAdChanFault		
	G30	UpsRDcvAdChanFault		
	G31	UpsSDcvAdChanFault		
	G32	UpsTDcvAdChanFault		
	G37	TempAdChanFault	All temperature sensors abnormal	• Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	G38	VoltAdConflictFault	The sample value of PV, battery and BUS voltage inconsistent	
	G39	CPUAdConflictFault	The sample value between master CPU and slaver CPU inconsistent	
	G40	PowerCalcConflictFault	Power value between PV, battery and AC output inconsistent	
	G41	EnvirOverTempFault	Installation environment temperature over or low	• Change or improve the installation environment temperature, make running temperature suitable. • Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	G42	EnvirLowTempFault		
	G43	CoolingOverTempFault	Cooling temperature over or low	
	G44	CoolingLowTempFault		
	G45	OverTemp3Fault	Temperature3 over or low	
	G46	LowTemp3Fault		
	G47	CpuOverTempFault	CPU temperature over	
	G48	ModelConflictFault	Version conflict with inverter	• Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	I01	InterFanWarning		• Remove foreign matter logged in fan. • If those faults occurs continuously and frequently, please ask help for local distributors.
	I02	ExterFanWarning		
	I03	Fan3Warning		

Type of Fault	Code	Name	Description	Recommend Solution
Inner Warnning	I04	EnvirTempAdChan-Warning	Some temperature sensors abnormal	• The warnings are not matter influence. • Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	I05	CoolingTempAdChan-Warning		
	I06	Temp3AdChanWarning		
	I07	ExtFlashComWarning	Flash abnormal	• Power off, then restart (Ref. Chapter8). • If this those faults continuously and frequently, please ask help for local distributors.
	I08	EepromComWarning	Eeprom abnormal	
	I09	SlaveComWarning	Communication between slaver CPU and master CPU abnormal	
	I10	HmiComWarning	HMI abnormal	
	I11	FreqCalcConflictWarning	Frequency value abnormal	
	I12	UnsetModel	Running model is not initial	• Contact with local distributor.
Outside Warnning	J01	MeterComWarning	Meter/CT abnormal	• Check the smart meter model, connection or connectors are correct, any loose. • if abnormal, repair or change. • Power off, then restart (Ref. Chapter8). • If those faults occurs continuously and frequently, please ask help for local distributors.
	J02	MeterConnectWarning	Wires connecting type of meter wrong	• Check Meter/CT connection, installed place, and installed direction. • if abnormal, re-installation. • Power off, then restart (Ref. Chapter8). • If this those faults continuously and frequently, please ask help for local distributors.
	J03	SohWarning	Battery SOH low	• Contact with Battery manufacturer.
	J04	GndAbnormalWarning	Earth impedance over by cable loose and so on	• Check earth line connection or earth connecting impedance. • if abnormal, then adjust it. • Power off, then restart (Ref. Chapter8). • If this those faults continuously and frequently, please ask help for local distributors.
Inner Warnning	J05	ParallelComWarning	Communication between master inverter and slaver ones abnormal in parallel mode Fan abnormal	• Check parallel connect communication wires damage, connectors loose, connect port correct or not. • if not, then adjust it. • Power off, then restart (Ref. Chapter8). • If this those faults continuously and frequently, please ask help for local distributors.

8. Specifications

PV Input	AF3K-DH	AF3.6K-DH	AF4K-DH	AF4.6K-DH	AF5K-DH	AF5.5K-DH
Max. Input Power (kW)	4.5	5.4	6.0	6.9	7.5	8.3
Max. PV Voltage (V)	600					
MPPT Range (V)	80 - 550					
Normal Voltage (V)	360					
Startup Voltage (V)	100					
Max. Input Current (A)	15.5 x 2					
Max. Short Current (A)	26.0 x 2					
No. of MPP Tracker / No. of PV String	2 / 2					
Battery						
Max. Charge/Discharge Power (kW)	4.5 / 4.5	5.4 / 5.4	6.0 / 6.0	6.9 / 6.9	7.5 / 7.5	8.3 / 8.3
Max. Charge/Discharge Current (A)	50					
Battery Normal Voltage (V)	230					
Battery Voltage Range (V)	80 - 495					
Battery Type	Li-ion / Lead-acid					
AC Grid						
Max. Continuous Power (kVA)	3.0	3.6	4.0	4.6	5.0	5.5
Max. Continuous Current (A)	15	17.5	19.5	22.5	24.5	27
Nominal Grid Voltage (V)	211 to 264 @ 240 / 183 to 229 @ 208					
Nominal Grid Frequency (Hz)	60					
Output Power Factor	1 default (adjustable from 0.8 leading to 0.8 lagging)					
Current THD (%)	< 3					
Gen Input&AC Back-up	**AF3K-DH**	**AF3.6K-DH**	**AF4K-DH**	**AF4.6K-DH**	**AF5K-DH**	**AF5.5K-DH**
Max. Continuous Current (A)	15	17.5	19.5	22.5	24.5	27
Max. Continuous Power (kVA)	3.0	3.6	4.0	4.6	5.0	5.5
Max. Peak Current (A) (10min)	18.8 / 21.7	22.5 / 26.0	25 / 28.9	28.8 / 33.2	31.3 / 36.1	34.6 / 39.9
Max. Peak Power (kVA) (10min)	4.5 / 4.5	5.4 / 5.4	6.0 / 6.0	6.9 / 6.9	7.5 / 7.5	8.3 / 8.3
Nominal AC Voltage L-L (V)	240 / 208					
Nominal AC Voltage L-O (V)	120 / 104					
Nominal AC Frequency (Hz)	60					
Switching Time (ms)	< 10					
Voltage THD (%)	< 3					
Efficiency						
CEC Efficiency (%)	97.0					
Max. Efficiency (%)	97.6					
PV to Bat. Efficiency (%)	98.1					
Bat. between AC Efficiency (%)	96.8					
Protection	**AF3K-DH**	**AF3.6K-DH**	**AF4K-DH**	**AF4.6K-DH**	**AF5K-DH**	**AF5.5K-DH**
PV Reverse Polarity Protection	Yes					
Bat. Reverse Polarity Protection	Yes					
Over Current/Voltage Protection	Yes					
Anti-Islanding Protection	Yes					
AC Short Circuit Protection	Yes					
Residual Current Detection	Yes					
Ground Fault Monitoring	Yes					
Insulation Resister Detection	Yes					
PV Arc Detection	Yes					
Rapid Shut Down	Yes					
Protection Degree	IP65 / NEMA4X					
General Data	**AF3K-DH**	**AF3.6K-DH**	**AF4K-DH**	**AF4.6K-DH**	**AF5K-DH**	**AF5.5K-DH**
Dimensions (W x H x D)	400 x 600 x 229 mm / 15.7 x 23.6 x 9.0 in					
Weight	25 kg / 55 lbs					
Topology	Tranformerless					
Cooling	Natural Convection					
Relatively Humidity	0 - 100 %					
Operating Temperature Range	- 25 to 60 °C / - 77 to 140 °F					
Operating Altitude	< 4000 m / < 13123 ft					
Noise Emission (dB)	< 25					
Standby Consumption (W)	< 10					
Mounting	Wall Bracket					
Communication with RSD	SUNSPEC					
Display & Communication Interfaces	LCD, LED, RS485, CAN, Wi-Fi, 4G					
Certification & Approvals	UL 1741 SA, UL 1741, UL1699B, UL 1998, IEEE1547, IEEE1547A, IEEE1547.1, CSA 22.2 No.107, Rule21, HECO Rule 14					
EMC	FCC part15 CLASS B					

PV Input	AF6K-DH	AF7K-DH	AF7.6K-DH	AF8K-DH	AF8.6K-DH	AF9.6K-DH
Max. Input Power (kW)	9.0	10.5	11.4	12.0	12.9	15.0
Max. PV Voltage (V)	600					
MPPT Range (V)	80 - 550					
Normal Voltage (V)	360					
Startup Voltage (V)	100					
Max. Input Current (A)	15.5 x 2	15.5 x 3				
Max. Short Current (A)	26.0 x 2	26.0 x 3				
No. of MPP Tracker / No. of PV String	2 / 2	3 / 3				
Battery						
Max. Charge/Discharge Power (kW)	9.0 / 9.0	10.5 / 10.3	11.4 / 10.3	11.5 / 10.3	11.5 / 10.3	11.5 / 10.3
Max. Charge/Discharge Current (A)	50					
Battery Normal Voltage (V)	230					
Battery Voltage Range (V)	80 - 495					
Battery Type	Li-ion / Lead-acid					
AC Grid						
Max. Continuous Power (kVA)	6.0	7.0	7.6	8.0	8.6	9.6
Max. Continuous Current (A)	29.0	34.0	37	39	41.5	46.5
Nominal Grid Voltage (V)	211 to 264 @ 240 / 183 to 229 @ 208					
Nominal Grid Frequency (Hz)	60					
Output Power Factor	1 default (adjustable from 0.8 leading to 0.8 lagging)					
Current THD (%)	< 3					
Gen Input&AC Back-up	**AF6K-DH**	**AF7K-DH**	**AF7.6K-DH**	**AF8K-DH**	**AF8.6K-DH**	**AF9.6K-DH**
Max. Continuous Current (A)	29.0	34.0	37	39	41.5	46.5
Max. Continuous Power (kVA)	6.0	7.0	7.6	8.0	8.6	9.6
Max. Peak Current (A) (10min)	37.5 / 43.3	43.8 / 49.5	47.5 / 49.5	47.9 / 49.5	47.9 / 49.5	47.9 / 49.5
Max. Peak Power (kVA) (10min)	9.0 / 9.0	10.5 / 10.3	11.4 / 10.3	11.5 / 10.3	11.5 / 10.3	11.5 / 10.3
Nominal AC Voltage L-L (V)	240 / 208					
Nominal AC Voltage L-O (V)	120 / 104					
Nominal AC Frequency (Hz)	60					
Switching Time (ms)	< 10					
Voltage THD (%)	< 3					
Efficiency						
CEC Efficiency (%)	97.0					
Max. Efficiency (%)	97.6					
PV to Bat. Efficiency (%)	98.1					
Bat. between AC Efficiency (%)	96.8					
Protection	**AF6K-DH**	**AF7K-DH**	**AF7.6K-DH**	**AF8K-DH**	**AF8.6K-DH**	**AF9.6K-DH**
PV Reverse Polarity Protection	Yes					
Bat. Reverse Polarity Protection	Yes					
Over Current/Voltage Protection	Yes					
Anti-Islanding Protection	Yes					
AC Short Circuit Protection	Yes					
Residual Current Detection	Yes					
Ground Fault Monitoring	Yes					
Insulation Resister Detection	Yes					
PV Arc Detection	Yes					
Rapid Shut Down	Yes					
Protection Degree	IP65 / NEMA4X					
General Data	**AF6K-DH**	**AF7K-DH**	**AF7.6K-DH**	**AF8K-DH**	**AF8.6K-DH**	**AF9.6K-DH**
Dimensions (W x H x D)	400 x 600 x 229 mm / 15.7 x 23.6 x 9.0 in					
Weight	25 kg / 55 lbs					
Topology	Tranformerless					
Cooling	Natural Convection	Intelligent Fan				
Relatively Humidity	0 - 100 %					
Operating Temperature Range	- 25 to 60 °C / - 77 to 140 °F					
Operating Altitude	< 4000 m / < 13123 ft					
Noise Emission (dB)	< 25	< 40				
Standby Consumption (W)	< 10					
Mounting	Wall Bracket					
Communication with RSD	SUNSPEC					
Display & Communication Interfaces	LCD, LED, RS485, CAN, Wi-Fi, 4G					
Certification & Approvals	UL 1741 SA, UL 1741, UL1699B, UL 1998, IEEE1547, IEEE1547A, IEEE1547.1, CSA 22.2 No.107, Rule21, HECO Rule 14					
EMC	FCC part15 CLASS B					